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THE WIRELESS AGE



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NOVEMBER
1914

**CONNECTING
CALIFORNIA
WITH HAWAII**

**OPENING OF THE MARCONI
TRANS-PACIFIC
SERVICE**

IN THIS ISSUE

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The Postal Life Insurance Company pays you the commissions that other companies pay their agents

ON entrance into the Company you get the agent's average first-year commission less the moderate advertising charge. Other companies give this commission-money to an agent: the POSTAL gives it to you.

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THE WIRELESS AGE FOR NOVEMBER
In your letter be sure to give:

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2. Your Occupation.
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No agent will be sent to visit you: the Postal Life employs no agents.

Assets:
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Insurance
in force
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THE WIRELESS AGE

An Illustrated Monthly Magazine of
RADIO COMMUNICATION

Incorporating the Marconigraph

J. ANDREW WHITE, Editor

WHEELER N. SOPER, Asst. Editor

Volume 2 (New Series)

November, 1914.

No. 2

CONTENTS

	PAGE		PAGE
The Radio Review	82	In the Service—Lee Lemon	121
Connecting California with Hawaii	85	The Voice of the Night. Verse. By John Augustine Nash	122
Vessels Equipped with Marconi Apparatus ..	92	How to Conduct a Radio Club. Article VIII. By E. E. Butcher	124
Contract News	92	In the Service—William B. Vansize	129
Injunction Suit Dismissed	92	From and for Those Who Help Themselves .	130
The Application of Wireless Telegraphy to Meteorology. By R. G. K. Lempfert, M. A.	93	A Novel Detector	138
The Use of Wireless in the War	100	Comment and Criticism	139
The Wireless Equipped Aeroplane	101	Two Heroes	140
The Eye of the Wireless. A Fiction Story. By William H. Allison	104	The Metapan Sunk	142
The Northern District	113	In the Wireless Cabin	143
"Freak" on the Pacific	115	Radio League Station List Ready	144
Book Review	115	My Wireless Station. By A. L. Groves	145
Marconi's Apparatus for Generating Alternating Electric Currents	116	Wreck of the Montmagny	147
War Incidents	117	New Ship Fitted	147
		When You Stop to Consider	148
		Marconi Men	149
		Queries Answered	155

RENEWALS When your subscription expires you will find a renewal blank enclosed here. You should fill out and return same with remittance at once to avoid missing a number. Positively no copies will be mailed on any subscription after same expires unless renewed, and we cannot agree to begin subscriptions with back numbers.

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Issued Monthly by Marconi Publishing Corporation, 450 Fourth Ave., N. Y. City.
Yearly Subscription, \$1.50 in U. S.; \$2.00 Outside U. S.; Single Copies, 15 Cents.

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

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is the *only* wireless
magazine in the U.S.**

Our advertising solicitor is well worth knowing; he can tell you a whole lot about scientific selling. The slightest hint will bring him to you.

*Postcard a request to 450
Fourth Ave., N. Y. City*

THE WIRELESS AGE

Statement of the ownership, management, circulation, etc., of THE WIRELESS AGE, published at New York, N. Y., required by the Act of August 24, 1912. Editor, J. Andrew White, 233 Broadway, New York; Managing Editor, J. Andrew White, 233 Broadway, New York; Business Manager, John Curtiss, 450 Fourth Avenue, New York; Publisher, Marconi Publishing Corporation, 450 Fourth Avenue, New York; Owners: Marconi Publishing Corporation, 450 Fourth Avenue, New York.

Stockholders holding 1 per cent. or more of total amount of stock: Marconi Wireless Telegraph Company of America, 233 Broadway, New York City.

Stockholders of Marconi Wireless Telegraph Company of America holding 1 per cent. or more of total amount of stock: Grenfell & Co., 3 London Wall Bldgs., London, England; Francis Robert Gregson, 5 Lowndes Street, London, S. W., England; Heybourn & Croft, 43 Threadneedle Street, London, E. C., England; Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, London, W. C., England; Simon Siegman, c/o Kuhn, Loeb & Co., 52 William Street, New York, N. Y.; Swiss Bankverein, London, England; Nieuw Amsterdamsch Administratiekantoor, Heerengracht, 136, Amsterdam, Holland.

Known bondholders, mortgagees, and other security holders, holding 1 per cent. or more of total amount of bonds, mortgages, or other securities: None.

JOHN CURTISS,

Business Manager.

*Sworn to and subscribed before me this 18th day of
September, 1914.*

OSCAR M. HOLEN,

*Notary Public,
New York County, No. 1798,
New York Register, No. 6216,
Commission Expires March 30, 1916*

NOVEMBER, 1914

THE RADIO REVIEW

ONE of New York's greatest daily newspapers has taken up the idea which originated with the technical press and is conducting a contest with the object of ascertaining what are the seven wonders of the modern world. In every previous contest of this nature wireless telegraphy has been awarded first place. Not only has this been true of "popular" contests, where the readers of a paper or periodical are the judges, but also in dignified voting contests limited to university professors and others of proven erudition.

The Seven Wonders of the Modern World

The actual figures are not at hand, but in a general way we have been informed that the university men who seriously considered modern achievements returned a unanimous vote giving wireless telegraphy the leading position.

By contrast, no less than 151,764 readers of a Berlin newspaper were represented by answers in a contest recently concluded, and wireless telegraphy again won first place, but only with 17,147 votes; the Panama Canal coming second with a thousand less, and the flying machine, radium, motion pictures and the steamship *Imperator* finishing in the order named.

Some interesting comments on the psychological aspects of this result appear in a German scientific periodical.

THE writer asks: What is a world wonder in the accepted sense? Apparently none exists. If there was one world wonder standing above all others it is to be assumed that all the 151,764 votes would have included it. The wireless telegraph won, yet only one-eighth of all the votes included wireless. Thus it might be assumed that 134,616 contestants never heard of Marconi and his achievements, or did not consider wireless of very great importance.

What is a World Wonder?

The obvious answer is that 151,764 persons will never agree upon the pre-eminence of any single human achievement without restricting the voting to a limited selection of definite inventions, structures or discoveries.

In a general contest, analysis of the selected wonders fall into three classifications:

Inventions, such as the motion picture machine, the dirigible and the aeroplane.

Structures, such as the steamship *Imperator* and the Panama Canal.

Scientific discoveries, such as the application of radium and wireless telegraphy.

How do the voters estimate the relative merits of these wonders? Our German friend believes mainly by mob suggestion, or publicity, as we would term it.

This would account for the Panama Canal running a close second to wireless and the Emperor receiving almost as many votes. Both are noteworthy achievements in their way, but it must be admitted that the success of the achievement depended in a large measure upon unlimited financial resources; and since a greater ship has already been built, and a larger canal may be constructed, neither is a world wonder in the true sense of the term.

This would indicate that the field of technology should offer more world wonders than any other form of human activity.

Yet in this Berlin contest the aircraft and motion picture machines trailed along behind the Panama Canal, a fine example of engineering work, but in point of size not greatly overshadowing the new steel structures in Key West and New York.

NOW all the foregoing is very pretty reasoning, but it proves nothing in particular. Like most conclusions of psychological analysis it is interesting but not convincing. Why? Is it because the public cannot be trusted to do its own thinking? Does not the press of the day influence most of its beliefs? Following this suggestion, a glance at the current issue of the New York daily shows contestants voting for all manner of things.

*The Queer
Turns in
Voting
Contests*

There are nine contributions. A vote is cast for color photography, fine enough in its way, but little known to men who make photography their business, and certainly not vital to the world's activities. Another votes for the machine gun, because "an apparatus that can kill thousands is certainly a marvellous improvement over the ancient method of one at a time." And this is civilization!!!

Another votes for the progress in the agricultural field, overlooking the fact that general progress is an ever-present condition and a wonder, properly speaking, is some remarkable achievement. Further light on the gyrations of some intellects is revealed in a vote for "the ballot box."

But the real provincial New Yorker is revealed in glaring colors by the vote for the "New York Public Library at Forty-second street."

FURTHER examination of these nine serious expositions reveals the interesting detail that seven voters feature wireless telegraphy and the remaining two include it under "electricity."

*The Psychological
Aspect of
Wireless
Selection*

So wireless will probably win again, and newspaper readers will be duly impressed to a degree proportionate with their interest in contests of a general nature.

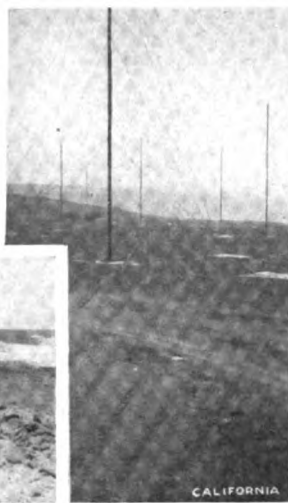
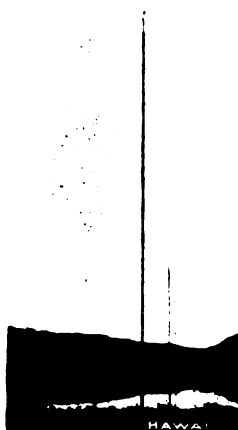
That indiscriminate voting of this kind is of little value in determining the relative position of other human achievements is evident from the examples abstracted at random from the day's paper.

Yet in combination with the unanimous award of first place by the university professors, the fact that wireless telegraphy is always paramount in these contests bears some relation to humanity's debt to the great Italian inventor whose unflagging zeal for the welfare of the world's progress animates the spirit of this publication.

THE EDITOR.

CONNECTING CALIFORNIA WITH HAWAII

Opening of the Marconi Trans-Pacific Service



WITH simple but impressive ceremonies the trans-Pacific stations of the Marconi Wireless Telegraph Company of America at Bolinas and Marshalls, Cal., and Kahuku and Koko Head, Hawaii, were formally opened on September 24. The inauguration of the service had aroused interest throughout the world, and men prominent in the affairs of nation and empire sent marconigrams appropriate to the occasion, which marked the opening of three of the largest wireless stations on the globe.

The Marconi Company entertained representative citizens taking part in the inauguration both at Bolinas and Kahuku. In California the members of the San Francisco party invited to the inauguration left the Sausalito ferry at fifteen minutes after nine o'clock on the morning of the opening. They rode in a special car provided by the Northwestern Pacific Railroad, arriving at San Anselmo at fifteen minutes after 10 o'clock. Here they entered automobiles and were driven to Bolinas, which they reached at noon.

Among the guests of the Marconi Company were James Rolph, Jr., Mayor of San Francisco; R. P. Schwerin, Vice President and General Manager of the Pacific Mail Steamship Company; Captain Robert Dollar, President the Dollar Steamship Company;

M. H. De Young, Vice President of the Panama-Pacific International Exposition; C. F. Michaels, President of the San Francisco Chamber of Commerce; Mr. Forbes, Secretary of the California Development Board; F. S. Samuels, assistant to the President of the Oceanic Steamship Company; C. H. Gaunt, General Manager of the Western Union Telegraph Company, Pacific Coast Division; George E. McFarland, President of the Pacific Telegraph and Telephone Company.

A. P. Taylor, San Francisco representative the Hawaiian Promotion Committee; P. S. Teller, President of the Commercial Club; J. A. Buck, Sr., President of the Honolulu Plantation Company; J. Hooper, Vice President of the First Federal Trust Company; B. D. Dean, Assistant Cashier of the Crocker National Bank; R. B. Woolverton, United States Radio Inspector; Thomas P. Boyd, District Attorney of Marin County; M. J. Pedrotti, President of the Board of Supervisors of Marin County; F. A. Kolster, Assistant Physicist of the Department of Commerce; Mr. Gardner, Supervisor, Marin County; John D. McKee, President of the Mercantile National Bank; A. W. Foster, Secretary of the Panama-Pacific International Exposition; A. W. Foster, Jr., President of the Marin County Water Company; C. A. Horn,

representing the Associated Press; E. H. Hamilton, representing the San Francisco Examiner; E. S. Kellogg, representing the San Francisco Chronicle.

Charles H. Taylor, supervising engineer of the Marconi Company, explained the operation of the system. An idea of the power of the stations may be gained from the statement that they have an installation of 300 kilowatts and a voltage of 13,000. There are nine steel masts, each 300 feet in height and carrying thirty-two wires, each 2,000 feet in length, from which the messages are flashed across the seas.

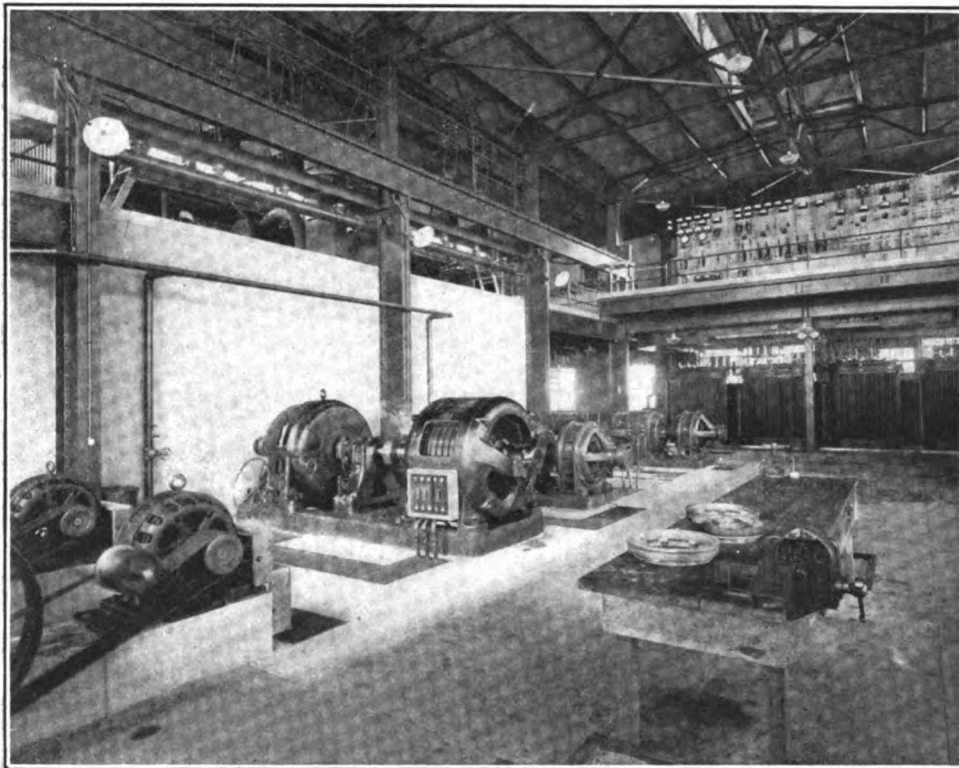
The duplex system is used at Bolinas, messages being received and sent at the same time. This is accomplished by means of the station at Marshalls, twelve miles to the north of Bolinas,

on Tomales Bay, where the incoming messages are not blurred by the noise of the sending station. The current is received on underground cables from the Pacific Gas and Electric Company's transmission line at a voltage of 2,200 and sixty cycles. It is first transformed to 440 volts, all the mechanical parts of the plant being operated at that voltage, including the motor that drives the alternator, changing the current to 210 cycles and 2,000 volts.

It is then stepped up in transformers to 13,000 volts, at which voltage it charges the condensers and is sparked across the discharger which is mechanically connected with the alternator by a shafting and run at 1,800 revolutions a minute, the number of studs in the discharger giving a spark frequency of 420. From the condenser banks to the discharger the

THE OPENING CEREMONIES AT BOLINAS. Standing in the background (left to right): A. H. Rau, C. F. Michaels, R. P. Schwerin, Hon. James Rolph, A. H. Ginman, C. C. Forbes. Seated in doorway (left to right): G. E. McFarland, George Jessop, M. H. De Young, Robert Dollar, C. H. Gaunt, F. M. Samuels. Left hand corner table: C. H. Taylor and newspaper representatives. Right hand corner table: J. A. Buck, Sr., Hawaiian Plantation Co., P. S. Teller. At table in front of fireplace (left to right): R. B. Woolverton, J. Hooper, D. B. Dean. In the foreground: F. A. Kolster, T. P. Boyd.





Interior of the transmitting station of the great Marconi trans-Pacific plant at Bolinas, Cal.

current, instead of being carried on copper wires, is transmitted over continuous copper sheets more than a foot in width.

In order to facilitate the inspection of the plant by the visitors, the latter were divided into groups and placed in charge of a representative of the Marconi Company. Under the guidance of the Marconi men the visitors spent an hour looking over the plant and listening to detailed explanations of its workings. Then they went to the Marconi Hotel where they enjoyed luncheon.

The luncheon was the occasion for congratulatory remarks on the opening of the link connecting the United States and Hawaii. Mayor Rolph was introduced by R. P. Schwerin. The Mayor spoke of the advantage of the Marconi service to the world at large and California and Honolulu in particular. He recommended a vote of thanks to the Marconi Company, and proposed a toast to the success of its

undertaking. A. H. Ginman, General Superintendent of the Pacific Coast Division, the Marconi Company, responded, thanking the Mayor for his expressions of good will.

Luncheon at an end, the visitors returned to the power house.

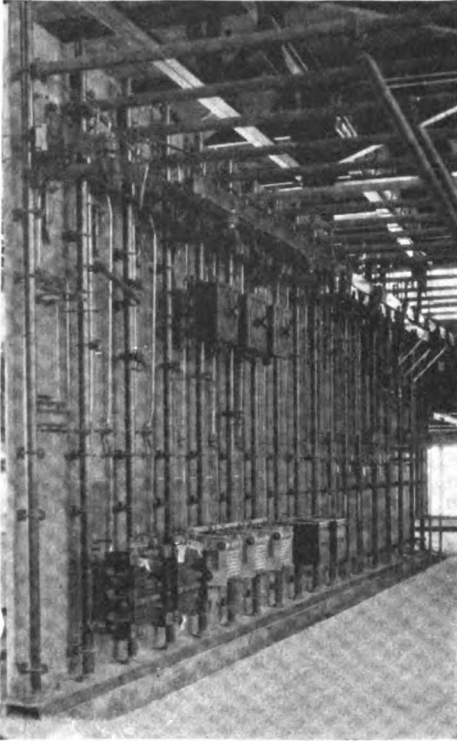
At Kahuku, in faraway Hawaii, was another representative gathering. Here were Governor Pinkham and 200 representative men of Hawaii assembled at luncheon given by the Marconi Company. The first message was sent from the luncheon table, being from Governor Pinkham of Hawaii to President Wilson. It was as follows:

"Kahuku, Sept. 24, 1914.

"President Wilson,

"Washington, D. C.

"With time and distance annihilated and space subdued through wireless triumphs and impulse, the Territory of Hawaii conveys its greetings, profound respect and sympathy to Woodrow Wilson, President of the United States,



An interesting view of the rear of the main control switchboard at Kahuku

as he so earnestly seeks the blessing of peace and good will for all men and all nations.

“L. E. PINKHAM.”

Then came a marconigram from Mayor Fern of Honolulu to Mayor Rolph. It read:

“Honolulu, Sept. 24, 1914.

“Honorable James Rolph,
Mayor of San Francisco.

“Availing myself of the kind invitation extended me by the representatives of the Marconi Wireless Telegraph Company, I herewith send you the greetings and personal Aloha and good wishes of the city and county of Honolulu. “FERN.”

Mayor Rolph answered as follows:

“Mayor Fern, Honolulu.

“Your cordial message has been received by me in the operating room of the Marconi Wireless Company at Bolinas, and with me a large delegation of San Franciscans. We are the guests to-day of the Marconi Company, wit-

nessing the inauguration of their new wireless service with our neighbors in Hawaii. We send you hearty greetings and join with you in wishing success to this new enterprise, which benefits us all. Aloha from San Francisco to Honolulu, to which I add personal regards to you.

“JAMES ROLPH, Jr., Mayor.”

Guglielmo Marconi sent the following marconigram to Superintendent Ginman:

“Please accept for yourself and convey to Taylor (Supervising Engineer of the Marconi Company) and all those associated with him my warmest thanks for their effective work in forging the first link in the Pacific chain.

“MARCONI.”

Among the other marconigrams sent were the following:

“Hon. L. E. Pinkham,

Governor of Hawaii, Honolulu.

“The Panama-Pacific International Exposition sends cordial greetings to the people of Hawaii and congratulates them on the additional facilities for communicating with the outside world provided by the Marconi Wireless Telegraph Company, and earnestly hopes these will stimulate both trade and travel and contribute materially to the prosperity and happiness of your people.

“CHARLES G. MOORE,
“President.”

“Washington, D. C., Sept. 24.

“His Excellency, the Governor of Hawaii, Honolulu, via San Francisco and Bolinas.

“Through the courtesy of the Marconi Company I have the pleasure of sending as my first communication over the new radio circuit between California and Hawaii my congratulations to the Governor and the people of Hawaii on the establishment of this new means of communication which will promote our co-ordination of effort and unity of endeavor and bring the people of the territory into still closer relationship with their fellow-citizens on the mainland.

“JOSEPHUS DANIELS.”

“Washington, D. C., Sept. 24.
 “Chamber of Commerce, Honolulu,
 via San Francisco and Bolinas.
 “Greetings and best wishes from the
 Chamber of Commerce of the Capitol
 of the United States.

“WILLIAM F. GUDE,
 “President.”

“THOMAS GRANT, Secretary.”

“Washington, D. C., Sept. 24, 1914.
 “General Carter, Honolulu,
 via San Francisco and Bolinas.

“I wish to extend my heartiest greet-
 ings to the people of Hawaii on this,
 our first opportunity for direct com-
 munication by the most modern of
 means. This occasion merely serves to
 emphasize the close ties that will al-
 ways bind the people of this country
 to our fellow citizens in Hawaii. I
 feel sure that it will result in further
 increasing the present well-deserved
 prosperity of that beautiful island.

“GARRISON,
 “Secretary of War.”

“Washington, D. C., Sept. 24, 1914.
 “Doctor Montague Cook, Honolulu,
 via San Francisco and Bolinas.

“Remembering pleasantly brief visit
 at your home fall of 1910, permit me
 express my hope opening wireless tele-
 graph with Honolulu will unite friends

more closely and permit frequent re-
 newals of delightful meetings. Re-
 gards to self and wife.

“WILLIAM C. REDFIELD,
 “Secretary of Commerce.”

“San Francisco, Sept. 24, 1914.
 “Governor Pinkham and the People of
 Hawaii.

“To one who has watched the grad-
 ual evolution in transportation and
 communication in Hawaii with the rest
 of the world the opening of the Mar-
 conic vast wireless system between the
 Pacific Coast and Hawaii is an enter-
 prise which ranks with the opening of
 the Panama Canal. One shortens dis-
 tance for commerce, the other anni-
 hilates time and brings the Hawaiian
 Islands into direct touch with the fire-
 sides and offices of every other country.
 Once news was new when it came to
 Hawaii eight to twelve days old. Now
 it is a question of mere minutes. Ha-
 waii now becomes the real crossroads
 of the Pacific, and Mercury has been
 outdone. A. P. TAYLOR,

“Resident Representative Hawaii Ex-
 position Commission.”

“New York, Sept. 24, 1914.

“Governor Lucius E. Pinkham,
 Honolulu.

“We congratulate you and the peo-



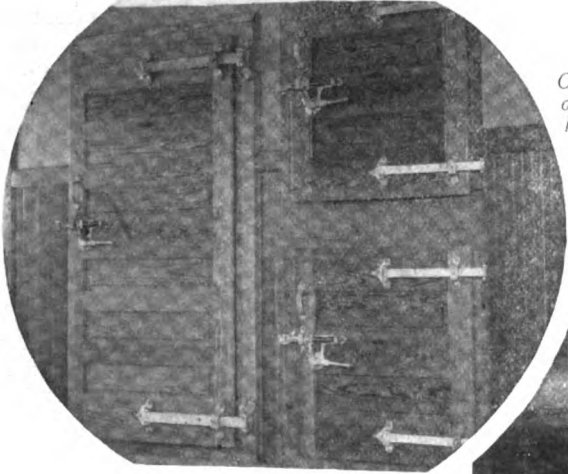
The powerful motor generators on the road to Bolinas. This picture shows the character of the country and the grades over which the heavy machinery had to be transported

ple of the Hawaiian Islands on the establishment of another link of communication with the United States.

"NEW YORK TIMES."

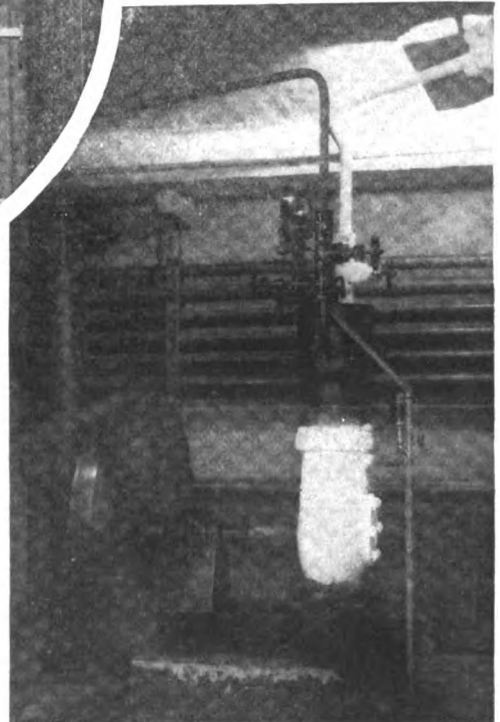
Other marconigrams were sent by the commandant at Mare Island and the Chief of Staff of the United States Army at Washington. When these messages had been dispatched the stations were opened for regular business.

in Hawaii." He outlined briefly the annals of the cable, the telephone and wireless telegraphy, as Hawaii knows them. His text was "All things come to those who work," and he related how Hawaii had a telephone system when the telephone was still regarded as a toy on the mainland. Now, he said, she has the foremost commercial wireless system in the world. H. N. Slaughter,



On the left is shown the entrance to the old storage rooms adjoining the kitchen of the hotel provided for the operating staff.

Below, ammonia compressor of the ice plant



At Honolulu, the opening ceremonies were more formal, and were attended by a large number of guests. A special train was chartered for the trip from Honolulu to Kahuku, a distance of about sixty miles. Governor Pinkham, Mayor Fern of Honolulu, and about two hundred persons, consisting principally of the prominent business men of Honolulu, were taken to the station as guests of the Marconi Company. In their presence in an improvised out-door dining room Governor Pinkham formally opened the station for service from a seat at the head of the table by pressing a silver key mounted thereon which set the wireless machinery in motion. Among those who witnessed the opening were Major-General Carter, Rear-Admiral Moore, Brigadier-General Edwards and R. Carter, President of the Chamber of Commerce of Honolulu.

During the luncheon a number of speeches were made, the first speaker being Lorrin A. Thurston, who dealt with "The History of Communication

Marconi engineer in charge at Kahuku, spoke of the plant and its various features.

Governor Pinkham made an address appropriate to the occasion. It was in part as follows:

"The Territory of Hawaii, for its size, occupies a large space in the attention of the world. We do more

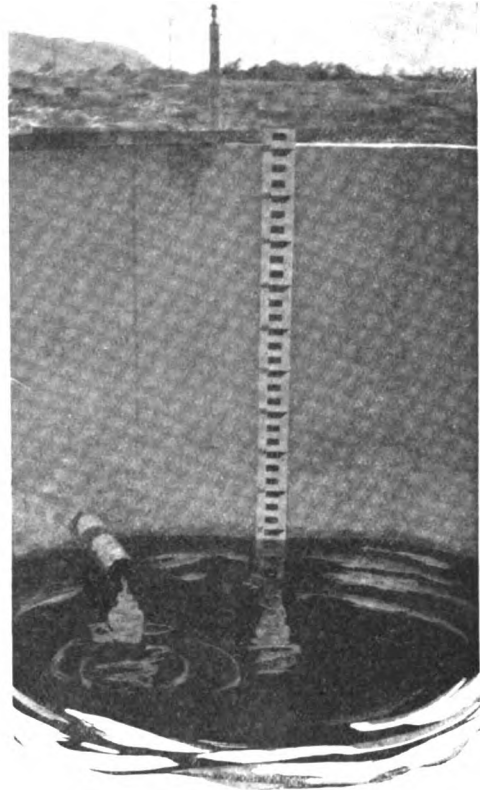
with our limited area than any other place with similar conditions in the world, and today we are celebrating an event which emphasizes our conditions. Hawaii should have a sympathy for every man, woman and child affected in the events now moving the world. If we of Hawaii have any prayer to offer let it be that Hawaii, standing in the mid-Pacific, may be spared the horrors of war. We have brave men with us—men who would not hesitate to sacrifice themselves in defense, but we would rather meet them as we do now than in blood and war.

"Today's increased means of communication can easily be presented as additional inducements for others to come and share the pleasures of these islands, where they will be in easy communication at moderate expense with their friends elsewhere."

The great plant at Kahuku, which is literally the largest wireless station in the world, was a revelation to the visitors. The huge concrete power house, with its bewildering mass of machinery, its huge coils, its mysterious glass tanks, its "spark room," into which a few of the venturesome stepped with ears stopped with fingertips, and its gleaming, red "danger" signs on the walls, was a source of wonder to them. The hotel for Marconi men, the administration building and the great towering steel mass, covering the country for a mile, with aerials reaching out in every direction, also impressed the guests deeply.

The Honolulu office of the Marconi Company is located in Port street, the principal business street of the city. The dimensions of the office are fifty by twenty-five feet. The interior presents an attractive appearance, being furnished in light oak. In front are standard Marconi signs. W. P. S. Hawk is in charge of the office. He is assisted by Clifford A. Cunningham and Manuel de Coite. Three messengers dressed in uniforms of khaki with red facings are employed. Four wires connect the Honolulu office with Kahuku—the transmitting station—and six wires extend between the city and the receiving station at Koko Head.

The engineering Department of the



The concrete reservoir for fresh water built at the Hawaiian stations

stations at Kahuku and Koko Head is in charge of N. H. Slaughter. The Commercial Department is in charge of James Brown. He has with him Operators L. Farthing, G. H. Davis and A. W. Walsh.

The Engineering Department at Marshalls and Boinas is in charge of A. H. Rau, who, has been in charge of these stations for the Marconi Company since the work of building them began. The commercial department is in charge of G. E. Baxter. With him are Operators A. W. Peterson, S. W. Bartlett, C. E. McNees, A. E. Gerhard and F. M. Roy.

The services and rates in effect over the San Francisco-Honolulu circuit are as follows:

Full rate messages, 25c per word; Marconi lettergrams, 13 words for \$1, additional words, 8c; Marconi week-end lettergrams, 25 words for \$1.50, additional words, 6c; Press service, day

rate, per word, 10c; Press service, night rate, per word, 5c.

The Marconi lettergram, if filed by midnight, is delivered at its destination the following morning at eight o'clock.

The Marconi week-end lettergram, is filed up to midnight Saturday for delivery at its destination the following Monday morning.

With the opening of the trans-Pacific service came praise for the en-

terprise of the Marconi Company. Perhaps the best indication of what the service will mean to the business world is contained in an official report from San Francisco, dated Saturday, September 26, at eight o'clock in the morning—the beginning of the business day—reading as follows:

“Bolinas reports having already received twenty paid messages from Honolulu to-day.”

VESSELS EQUIPPED WITH MARCONI APPARATUS SINCE THE OCTOBER ISSUE

<i>Name</i>	<i>Owner</i>	<i>Call Letters</i>
Oceana	Morse Dry Dock and Repair Company	KNV
Glenartney	Caledonian Steamship Company	MZS
Mills	General Petroleum Company	KRR
S. V. Luckenbach	Luckenbach Steamship Company	KGU
Platuria	Standard Oil Company of New Jersey	KSE
Llama	Standard Oil Company of New Jersey	KSI
Rembrandt	Lamport & Holt Steamship Line	MEU
Hawick Hall	Isthmian Steamship Line	KLT
Anglo-Bolivian	Nitrate Producers' Steamship Co., Ltd.	GRA
Anglo-Patagonian	Nitrate Producers' Steamship Co., Ltd.	GRC
Nessian	Leyland Line	GTV

CONTRACT NEWS

A standard 2-k.w. Marconi set has been installed on the steamship Oceana, of the Morse Dry Dock and Repair Company. The vessel has also been equipped with an auxiliary wireless apparatus which will operate from a storage battery equipment to be used exclusively for the operation of the wireless panel set in case of emergency when no power is available from the engine room.

The steamship Mills, owned by the General Petroleum Company of California, has been equipped with a Marconi panel set. The Mills has undergone re-

pairs in Brooklyn, N. Y. She is to be used in the oil business.

A panel set has been installed on the S. V. Luckenbach, of the Luckenbach Steamship Company. This company has equipped all of its vessels with Marconi apparatus.

The steamships Platuria and Llama, owned by the Standard Oil Company of New Jersey, have been equipped with standard Marconi 2-k.w. sets. These vessels were of foreign entry, but were admitted to American registry under the act of August 14, 1914.

INJUNCTION SUIT DISMISSED

Judge Veeder in the United States District Court has dismissed the suit instituted by the Marconi Telegraph Company of America to restrain the Secretary of the United States Navy from interfering with the transmission and reception of messages at the company's stations at Sea Gate and Sagaponack, L. I. The Assistant Attorney General argued that the court had no jurisdic-

tion in the matter, and on October 8 the suit was dismissed.

Following a report to Washington that a wireless message had been sent from the Marconi station in Hawaii telling of the arrival of the German gunboat Geier at Honolulu, an explanation was asked of the company on the ground that there had been a violation of neutrality. A satisfactory explanation was furnished, and the matter was settled.

The Application of Wireless Telegraphy to Meteorology*

By R. G. K. LEMPFERT, M.A.

(Superintendent of the Forecast Division of the British Meteorological Office.)

THE application of wireless telegraphy to the collection and distribution of information regarding the weather has already assumed considerable dimensions and there can be little doubt that in the future it is destined to play an even larger part therein. Weather forecasting, or the art of foretelling future weather from information as to the present weather, collected by telegraph, dates from the middle of the last century. By that time the phenomenon of the "travel" of weather, which we shall have occasion to examine more closely presently, had become familiar, and the development of the electric telegraph made it possible to apply it practically to such problems as the issue of warnings of gales. Public attention was forcibly directed to the matter by a violent gale which occurred in the Crimea in November, 1854, and did great damage to the allied French and British fleets. The French astronomer, Le Verrier, was able to trace the progress of this storm across southern Europe, and to demonstrate that, given means for promptly collecting and distributing information about it such as the telegraph provides, it might have been possible to warn extensive areas of the approaching danger. In this country the severe gale of October 26, 1859, in which the Royal Charter was wrecked off Anglesey, with great loss of life, further stimulated public interest. The upshot was that organizations were called into being, in France in 1858, and in this country in 1861, for the collection at a central office of daily tele-

graphic reports of the weather. Reporting stations were established in many localities, and the information which they transmitted put the central office in possession of what may be called a bird's-eye view of the weather conditions over a large area. The system has been greatly extended since those early days, and similar offices now exist in all countries.

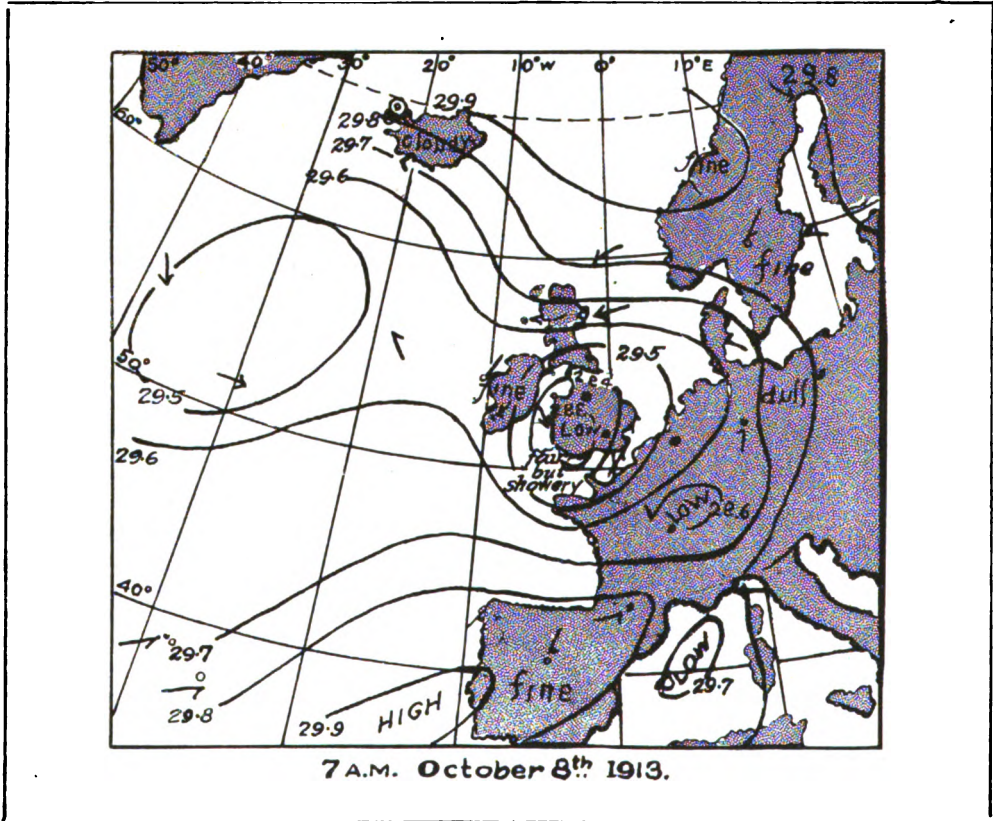
Let us glance briefly at the organization as it exists to-day in our own country. Observations are made each morning at 7 A. M. of the mean time of the meridian of Greenwich, at 31 stations distributed over the length and breadth of the British Isles. They are forthwith coded and telegraphed to the Meteorological Office in London. Similar observations are taken at the same hour on the continent of Europe, and an elaborate system exists for the exchange of information between the various countries. Reports reach the Meteorological Office daily from forty-two stations distributed over western Europe and the Atlantic Islands from Iceland to Madeira and the Azores. By 9 A. M. the exchange of observations ought to be complete, so that the work of drawing up reports and forecasts may be taken in hand. Similar, though less extensive, sets of observations are taken at 1 P. M. and 6 P. M., and reported to the Meteorological Office by telegraph.

The information communicated includes the reading of the barometer, the direction and strength of the wind, the temperature of the air and the state of the weather, using the word in the more restricted sense, whether it be rainy, cloudy, cloudless, foggy and so on. Immediately after their receipt

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

the reports are plotted on an outline map of Europe. Specimens of these maps on a reduced scale are shown in the illustrations. The barometer readings at the individual stations have been omitted from these reduced maps. Instead lines are shown which have been drawn in such a way that the height of the barometer has a definite and constant value along any given line. These isobars, as the lines of

a similar system is centered over Denmark. The map for October 9 shows examples of other systems, in which the isobars again form closed curves, but with the highest barometer at the center of the system. Systems of this kind are shown over Spain and the north of Scandinavia. The name "cyclone" is applied to systems in which the lowest barometer occurs at the center, while a system having the



equal barometric pressure are called, give the key to the meteorological situation from the forecasting point of view. It will be seen that they arrange themselves in more or less definite shapes or systems. In the maps reproduced there are examples of systems in which the isobars are approximately concentric circles, with the lowest barometric values at the centers of the systems. On the map for October 8 such a system covers the British Isles, while on that for October

9 a similar system is centered over Denmark. The map for October 9 shows examples of other systems, in which the isobars again form closed curves, but with the highest barometer at the center of the system.

Systems of this kind are shown over Spain and the north of Scandinavia. The name "cyclone" is applied to systems in which the lowest barometer occurs at the center, while a system having the highest readings at the center is called an "anti-cyclone." A very close relation is found to exist between the isobars and the direction and force of the wind, indicated on our maps by arrows. A cursory acquaintance with weather maps will confirm the statement that the general direction of the wind is along the isobars, though slightly deflected towards the side of lower barometer. In the northern hemisphere the direction is such that the region of low barometer

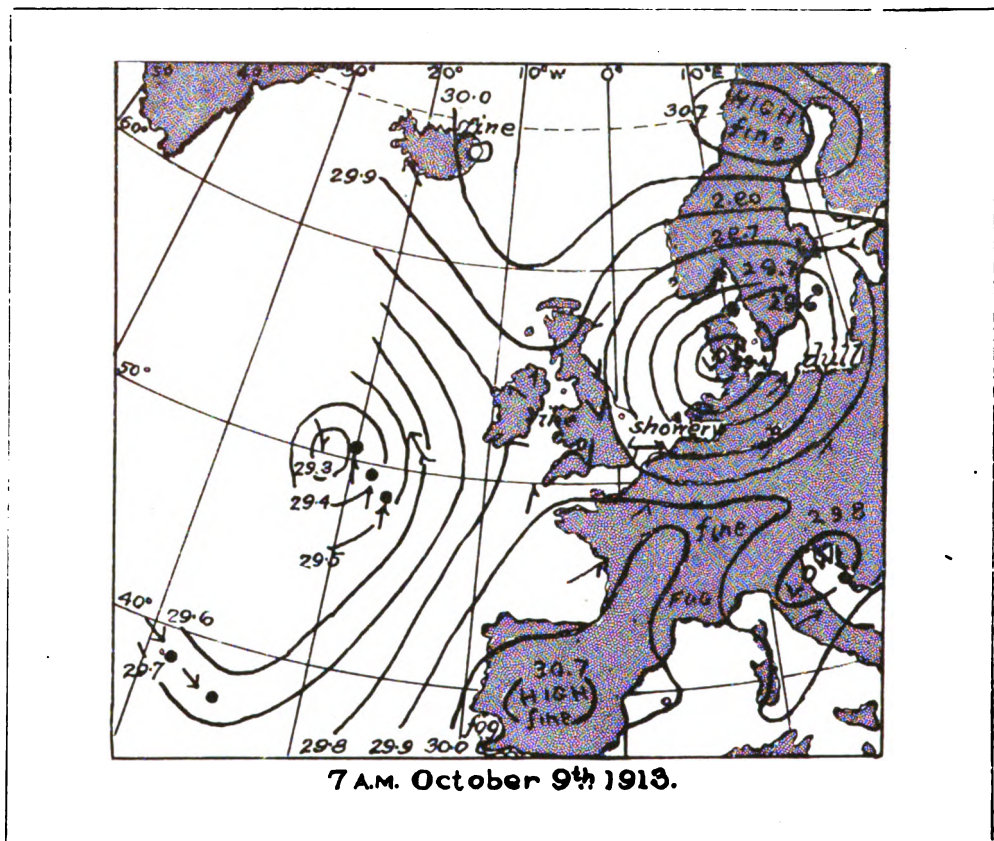
is on the left of an observer standing with his back to the wind; in the southern hemisphere this relation is reversed. As regards the strength of the wind, we may generalize and say that the less the distance between the isobars the stronger the wind. In the map for October 9 there are light airs over France, Spain and the British Isles, where the isobars are far apart, but in the region covered by the cyclone, where the isobars are more crowded, the winds are much stronger. Winds of gale force are shown over the north of Denmark and south of Sweden.

The distribution of weather with regard to systems of isobars is also subject to law, though the relation is not so easily defined as in the case of wind. Note in the diagrams the regions of rain, indicated by conspicuous black dots, to the north and east of the centers of the cyclones, and the regions of showers and clearing sky southwestward of the centers. Note also in the anti-cyclones over Spain and Scandinavia the fine weather, marred locally by fog. These distributions are typical. Space does not allow of a detailed description of what is known of the relation of "weather" to isobars. Suffice it to say that if it be possible to anticipate the distribution of the isobars twelve or twenty-four hours ahead, we can also anticipate with great accuracy the direction and force of the winds, and form a tolerably good estimate of the distribution of rainfall and other types of weather.

What is to guide a forecaster in constructing the mental picture of the future isobars on which his forecast must be based? The first place must undoubtedly be given to the principle of "travel" to which reference has already been made. Our maps illustrate this point. The cyclone shown over the British Isles on the morning of October 8 traveled northeastward, and on the morning of the following day its center lay over Denmark. The distribution of wind and weather around the center of the system is roughly the same in the two maps, and we may infer that a place over which the system

has passed has experienced the sequence of changes of wind and weather depicted on the maps in the parts of the cyclone which have passed by. In such a case it is easy to see the general lines on which a successful forecast could be framed. It would be rash to conclude that "travel" is the only factor which has to be taken into account. The possibility of the development of new systems, or the disintegration of existing ones, or changes in what we may call their intensity, have also to be reckoned with and unexperienced development naturally leads to forecast failure. Even the principle of travel may be incorrectly applied, for the direction and rate of progress of meteorological systems show great variety and cannot always be successfully estimated from the examination of a weather map and comparison with its predecessors. It is not the object of this article to discuss such points in detail, for further information on the subject reference must be made to one of the many text books of meteorology.

Without going into details it may, however, be stated that the most usual direction of travel of meteorological systems in temperate latitudes is from west to east, or, rather, from some westerly to some easterly point; and from this it will be apparent that a knowledge of the weather conditions over the Atlantic Ocean must be of great importance in the problem of forecasting the weather of western Europe. Attempts have been made to utilize weather reports transmitted by cable from America, but the developments which weather systems undergo in transit over so vast an area as the Atlantic Ocean have proved a barrier to effective use of such reports for forecasting purposes. When the cables to Iceland and the Azores were laid, the meteorological services were not slow to take advantage of them for securing reports from those places, but even then there remained an important area immediately to the westward of our own coasts outside the ken of the forecaster. By the time that even the fastest liners brought in their reports the weather situation had changed too



much for them to be useful for forecasting.

Wireless telegraphy has now rendered it possible to transmit much of this valuable information in time for its immediate application. The honor of the first systematic attempt in this direction belongs to the Daily Telegraph newspaper, which in the year 1906 made arrangements for collecting and publishing weather reports from Atlantic liners. In 1907 arrangements were authorized by the Admiralty for the occasional dispatch of wireless reports to the Meteorological Office by ships of H. M. Navy. Early in 1909 the British and German Meteorological Offices arranged with the Marconi Company for a three months' experiment for the organized collection of wireless reports from liners. The shipping companies and their officers co-operated cordially in this scheme, which proved to be the commencement of the present extensive system for the

collection of observations from British ships.

Practically all British liners engaged in the North Atlantic trade co-operate in this scheme. Observations are taken at the same hours as at the land stations, viz., 7 A. M. and 6 P. M. Greenwich time, and while ships are east of 20° West, also at 1 P. M. The information coded in the reports comprises the date and hour of the observation, the position of the ship, indicated by quoting the number of the one degree square in which it is situated at the time, the reading of the barometer, the direction and force of the wind and the "weather." Observations of temperature would also be most desirable, but there is no space for them in the code as at present arranged. The observations are supplemented by control observations, giving the same particulars as observed three hours earlier. These control observations are useful in enabling the forecaster at the Meteo-

rological Office to detect errors which may have crept in in taking the observations, in coding them, or in course of transmission. For example, if the positions of the ship at the time of the control observation and at the time of dispatch of the message are inconsistent with one another, an error is obvious and reference to the sailing chart issued by the Marconi Company or to previous reports received from the same ship will often serve to elucidate the mistake and so prevent wrong deductions being made from the observations. Similarly, if the two barometer readings show an unreasonably large difference, an error may be assumed and allowance can be made for it. But the utility of the control observation is not limited solely to the detection of errors. The rate at which the barometer is rising or falling is a most important consideration in forecasting, and a comparison of the two barometer readings gives valuable information on this point. Important inferences may also be drawn from a change of wind occurring between the control observation and the dispatch of the message. The matter is complicated at sea by the fact that the ship is itself moving, but allowance can be made for that in interpreting the results.

A glance at the maps will show the application of wireless observations to forecasting. The second map, for October 9, shows the presence of a cyclone with the center approximately in latitude 49° North and longitude 21° West. Without wireless reports the forecaster would have suspected the existence of a disturbance off the west coast of Ireland from the fact that the wind at the Irish stations had shifted from north, the direction appropriate to the rear of the cyclone centered over Denmark, to south or southeast, but as the barometer over Ireland was not falling he would have had no direct evidence to confirm his suspicion. Actually only the most easterly of the five ships' observations shown on the chart reached the Meteorological Office on the morning of the 9th, but even this one report materially extended the knowledge of

the forecaster. It showed a strong southeasterly wind and a barometer reading of 29.54 inches in longitude 16° West. The reading at Valencia, in the southwest of Ireland, was 29.75 inches. The draughtsman would therefore have to draw two isobars, those for 29.70 and 29.60 inches in his pictorial representation of the barometer readings to the westward of Ireland. From this the forecaster would assume that the new system was one of moderate intensity and his experience of past maps would lead him to expect that it would follow approximately the same path as its predecessor. A forecast for the eastern districts of England of wind shifting from northwest to south or southeast was thus tolerably safe, and when the Irish observations later in the day indicated a fall of the barometer little hesitation was felt in issuing telegraphic instructions to the storm-warning stations in Ireland to "hoist south cone." The map for the following morning, October 10, showed that the eastern margin of the new cyclone had advanced to the North Sea, and storm warnings to the South of Ireland, if delayed till then, would have been too late. It will be seen that the usefulness for forecasting of such observations depends on their receipt at the Meteorological Office within an hour or so of the taking of the observations. Under present circumstances many reports that might be most useful occupy so much time in transmission from ship to ship that the time for their application to the forecast for the day has gone by when they reach the office. It is gratifying to be able to note a considerable change for the better in this respect during the past few months and further improvement may be confidently expected as the range over which ships can signal increases.

A word may not be out of place with regard to the accuracy required in barometer readings which are to be used in the preparation of maps for forecasting. An officer at sea wishing to use the indications of his barometer to assist him in anticipating the nature of the weather he is likely to encounter naturally pays most attention to the changes which his instrument shows.

It is a matter of comparatively little interest to him whether it be correctly set. It may read 29.5 or 29.3 inches without materially affecting his deductions. He requires primarily to know the rate at which it may be rising or falling. To the forecaster the difference between 29.5 and 29.3 inches is vital. If, for example, the reading on October 9, to which reference has already been made, had been received as 29.34, instead of as 29.54, four isobars instead of two would have had to be drawn between Valencia and the position of the ship. The forecaster, if he had accepted the report as correct, would have drawn the conclusion that the oncoming cyclone was one of great violence and would have issued storm warnings with quite needless profusion.* Mercury barometers which have been compared with the standard instrument at a central institution, such as the National Physical Laboratory, are the most trustworthy, but their readings must be corrected for temperature before they can be entered on a weather chart, and so great is the height of the modern liner that a correction must also be applied to reduce the reading to sea level. Aneroid barometers are more convenient to read, but they almost always require a correction to reduce their readings to "standard," and the correction may vary from time to time. It is therefore necessary to check the correction at frequent intervals, which may be done with considerable accuracy by taking readings when in port at 7 A. M. and 6 P. M. and seeing whether they are concordant with the weather maps published in the Daily Weather Report of the Meteorological Office.

Errors in the position of the ship or the date and hour of the observation may prove equally misleading. A source

*A case of this kind occurred in January, 1914, while this article was in the press. Two ships reported strong southeast winds and a low barometer in longitude 15° W., and as the reports confirmed one another they were accepted as correct, and instructions to hoist storm cones were issued to the South of Ireland and South-West of England. Soon after a report was received from a third vessel which threw doubt on the first two observations, but as it was possible that the error was in the later report, the instructions to hoist cones were not cancelled. At the following hour of observation the ships reported themselves in close proximity to the Irish coast, and it was then obvious that the first two barometer readings required corrections of about 0.2 inch.

of uncertainty which does not affect reports from land stations is introduced into ships' reports by the elements of time and place. For a land station the place name identifies the position with certainty, and as the messages are generally received within an hour or so of their dispatch the time on the telegram serves to identify the time of the observation, though occasionally confusion arises on this score after an interruption of communication. The name of a ship does not identify her position, and as messages are occasionally several days in transit, the time on the telegram, which is the time of receipt at the shore station, affords no clue to the time of the observations. These particulars have, therefore, to be given in code in the text of the message.

Hitherto we have considered only the application of wireless telegraphy to the collection of information from ships at sea with a view to its application to forecasting, but wireless telegraphy also plays an important part in the distribution of information regarding present and future weather. This aspect of the subject engaged the attention of the International Conference which met in Paris in September, 1912, to discuss the question of wireless time signals and kindred matters. Each morning and afternoon a weather report is signalled from the Eiffel Tower immediately after the time signals. It includes a selection of the reports collected by the Meteorological Department of France from Newfoundland, Iceland, Europe and the Azores, and gives information for the construction of a weather map of the European area with sufficient detail for the identification of the main weather systems. The report is intended primarily for the information of ships at sea, but institutions on land which are interested in meteorology have not been slow to realize the advantages it offers.

Ships at sea have the further opportunity if they wish of supplementing the report from the Eiffel Tower by means of reports exchanged with other ships. On most days it would be possible to construct at sea a weather map of the North Atlantic and Western

Europe from data contained in the Eiffel Tower message and in the reports in course of transmission to the Meteorological Office.

In addition to the reports from the Eiffel Tower, reports and forecasts having reference principally to the weather of the North Sea and the Baltic are prepared each day by the German Meteorological Department for issue from the wireless station at Norddeich. In this country the Meteorological Office prepares forecast messages intended primarily for the use of H. M. ships in home waters, which are signalled twice a day from the Admiralty station at Cleethorpes.

In the present state of meteorological knowledge forecasts must be limited to comparatively short periods. As a general rule the forecasts issued by the Meteorological Office refer to the twenty-four hours commencing with the noon or midnight next following their issue. It is only on comparatively rare occasions that the conditions are sufficiently definite to justify the addition of a "further outlook" extending the period covered to two or more days. It follows that the utility of a forecast system must depend greatly on satisfactory means for the rapid collection at the central office of the observations on which the forecasts are based, and for the prompt distribution of the forecasts to those who may wish to use them as guides in deciding their course of action. Though the cable and the telegraph line may remain the principal means for collecting the reports from individual stations at the central offices, wireless may play an important part in the future in the distribution of forecasts. At present the distribution is mainly by means of the newspaper press, and it is unavoidable that a considerable part of the twenty-four hours to which they refer should have elapsed before the forecasts are actually in the hands of the public. Widespread distribution by ordinary telegraphy has proved too expensive and distribution from a centrally situated wireless station of sufficient power supplemented by the telephone may ultimately prove a satisfactory solution of the present difficulties standing

in the way of effective circulation. The number of private receiving stations is already large, and it is likely to increase. Such stations are not expensive to install or to maintain and no great skill is required on the part of the operator to take off messages such as those sent from the Eiffel Tower.

Apart from the application of meteorology to practical affairs, the study of weather stands to gain largely from the extension of wireless communication. It is unreasonable to suppose that the weather of one region is entirely independent of the weather of other parts of the globe, and meteorologists look forward to the day when it shall be possible to discuss the meteorological relations of the world as whole. No doubt the day is distant when it will be possible to draw a weather map for the whole globe day by day, but progress in that direction is steady though slow. It may be noted in passing that from the beginning of the current year the Weather Bureau of the United States has published on the back of its well-known Daily Weather Report a chart showing the distribution of pressure and temperature over the Northern Hemisphere. As a means of linking up outlying regions, wireless communication offers special facilities. We already know enough to make it highly probable that great importance will attach to the weather conditions of the Polar regions when the problem of making forecasts for long periods comes to be tackled, and a notable step in the direction of securing knowledge of them was made at the beginning of 1913, when the establishment of regular wireless communication with Spitzbergen, in latitude 78° North, made it possible to secure regular reports from a place within 800 miles of the North Pole. It is also to be hoped that the day is not far distant when wireless communication will be available between Greenland and Iceland, so that regular meteorological reports may be secured from another important outpost. The southern point of Greenland juts out to latitude 60° North, the same as that of Shet-

land and St. Petersburg, and it is so near to Labrador that it could easily supply a link of connection between the old world and the new.

The chief feature of the impression which experience leaves on the mind of a forecaster is the imperative need for accuracy in the barometric readings and the specification of the position of the ship. No words can describe the feeling of paralysis which comes over the maker of a weather map when he tries to reconcile discordant readings. When an observation arrives at the office the first question is how it fits in with the system of which the outlines are already laid down, and if there is any uncertainty

about a new reading the question whether to modify the system or reject the reading becomes a perplexing enigma.

In earlier days with land observations, enigmas of this kind were not infrequent, and history repeated itself in the earlier days of "wireless," but with perseverance and the cordial cooperation of the ships' officers and Marconi operators such enigmas are gradually disappearing and we may here record the debt of gratitude which meteorologists on shore owe to their colleagues afloat in the endeavor to make the collection of information about the weather of the greatest benefit to those on land and sea.

The Use of Wireless in the War

WIRELESS telegraphy is the new force in modern warfare which has changed all the old problems of communication. Formerly the aim was to capture and destroy the enemy's telegraph lines or submarine cables. Nowadays the matter is not so simple, for the wireless zones cover Europe, and ships at sea may be in touch with the war offices in their capitals. Professor Frank Waldo gives an interesting description of wartime uses of the wireless. He says:

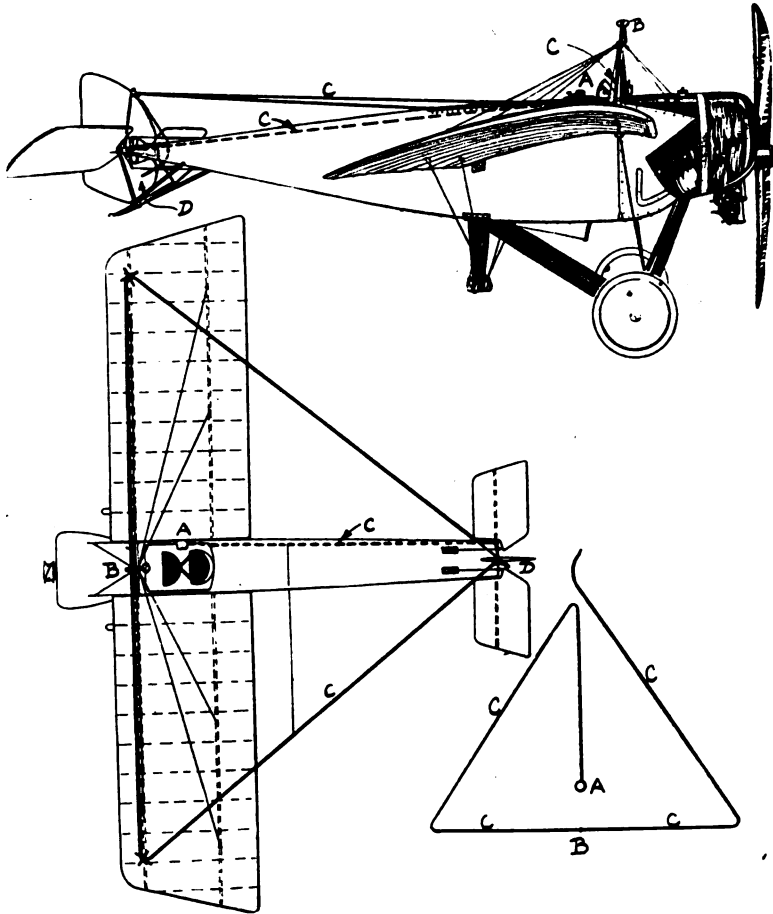
The stopping of all telegraphic and telephone communication between the belligerents at the first breathings of war has drawn attention to wireless. The value of the art on and across the seas has been particularly noticeable. But the bottling up of any place so that it cannot hold communication with the outside is a thing of the past. The fact that a wireless apparatus cannot be easily hidden prevents the surreptitious use which might be made of it in regions under control of the belligerents; although for short distance communication, such as along frontiers or between close-lying countries as in western Europe, a small wireless receiving apparatus might be secretly used, especially if it were temporarily strung

under cover of the darkness, and taken down before daylight. In such work there will be a new field for signal-corps work and scouting.

As regards the more powerful land stations, those which will keep up communication 500 miles and upward, these can be easily kept under government supervision; but the use of wireless on ships for sending messages up to from 250 to 500 miles, and receiving them at still greater distances from powerful land stations, will be subject only to such artificial interference as may be put in operation by the belligerents. There can be no doubt that the experience in the present war will result in the closer governmental control of private and amateur wireless installation.

Austro-Hungary has four important government wireless stations: Castelnuevo, Pola and Sebenico, with a normal range of 250 miles by day and 500 by night, and Trieste, with a day range of 160 miles and a night range of 300. Germany has seventeen wireless stations, of which eight are lightships with small range of from twenty to sixty miles.

France has eighteen stations, while Russia has twenty-eight.



Drawing showing arrangement of aerial on war monoplanes used by French and Belgians

The Wireless Equipped Aeroplane

THREE dozen aeroplanes flying successfully across the channel from England to the Allies' military base in France is the picture painted by an officially censored dispatch relating to the doings of military aircraft in the war.

The machines belonged to the Royal Flying Corps with the British Expeditionary Armies, and this movement across the twenty-two-mile strait is reported as a detail in the mobilization of its aerial squadrons at the scene of hos-

tilities. The incident which is treated in a manner so matter-of-fact takes on added strength by the assertion that other machines of the same type, and almost equal in number, crossed the day before.

Thus has the aeroplane come into its own as a scouting device of distinct reliability and a big factor in modern warfare. Theoretically, this has long been the case, but these sturdy machines and splendid pilots have conclusively settled

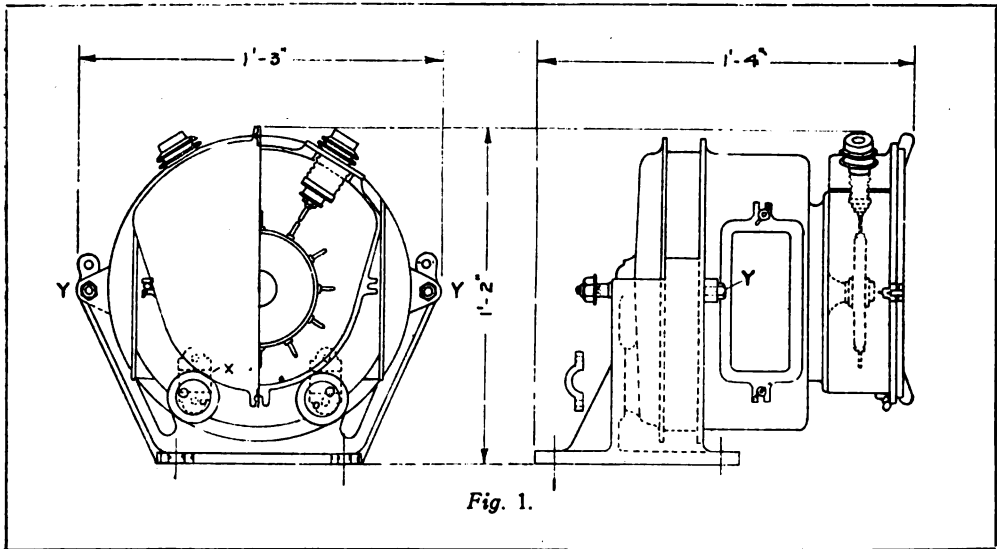


Fig. 1.

the issue. Wounded officers back from the front also speak of a regular system of flights for definite purposes and over predetermined routes above the battlefields during the engagements.

There can be no further question, therefore, that the aerial scout has stepped from the pages of romance to occupy a fixed place in the modern fighting equipment of the great war machine.

And in line with the phenomenal progress made in the art of flying wireless telegraph equipment for aircraft has made proportionate advances. Only four years ago we were startled when Aviator McCurdy communicated a full message to a land station over a distance of three

miles; yet five months later Lieut. Beck of the U. S. Signal Corps transmitted messages more than forty miles, while at a height of 1,000 feet McCurdy again came into the limelight four months later by effecting transmission to a New York skyscraper when fifty-five miles away, on two successive days.

The intervening period has seen a wide application of wireless to military aircraft and marked improvements over the earlier equipments are noted in the recent sets. The type L Marconi aeroplane set, for example, has been so constructed that it may be adapted to any type of machine. To effect a wide margin for the distribution of weight, a con-

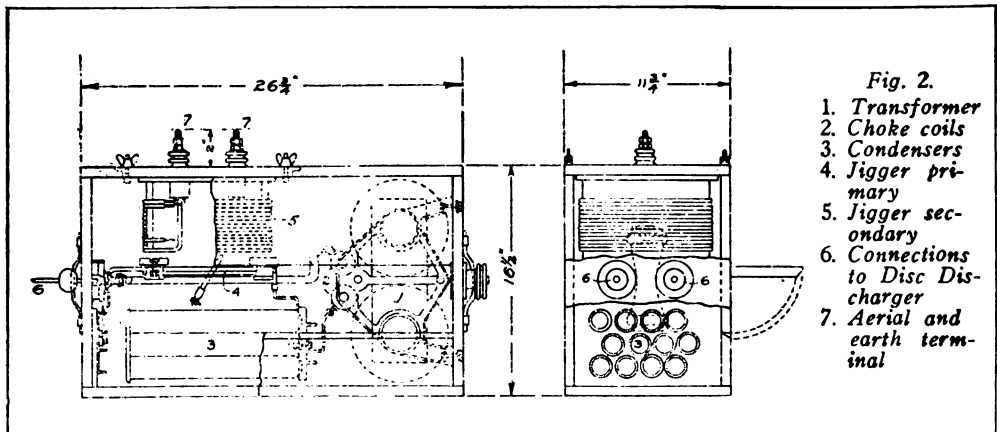


Fig. 2.

1. Transformer
2. Choke coils
3. Condensers
4. Jigger primary
5. Jigger secondary
6. Connections to Disc Discharger
7. Aerial and earth terminal

sideration of the greatest importance, it has been made up into several separately contained units which may be fitted underneath the pilot's seats and in any position; even placed upside down if necessary.

Figure 1 gives the front and side views of the disc discharger attached to the shaft of the motor generator. The generator is run by a belt drive from the motor of the aeroplane and absorbs less than two-thirds of one horsepower. The dynamo can be supported by a horizontal tube at X, one and one-eighth inches in

The portable receiver, shown in Figure 3, is built exceptionally light, weighing less than 20 pounds.

A general view of the equipment fitted to a monoplane now in use by the French and Belgian armies is shown in the drawing. Using the upper pylon, B, as a mast, the aerial wire is run once around the plane from tail to wing tips and back, the remainder of the wire trailing from the extreme end of the tail skid. A counterpoise capacity is used in place of a ground connection, or in place of other trailing wire used when the

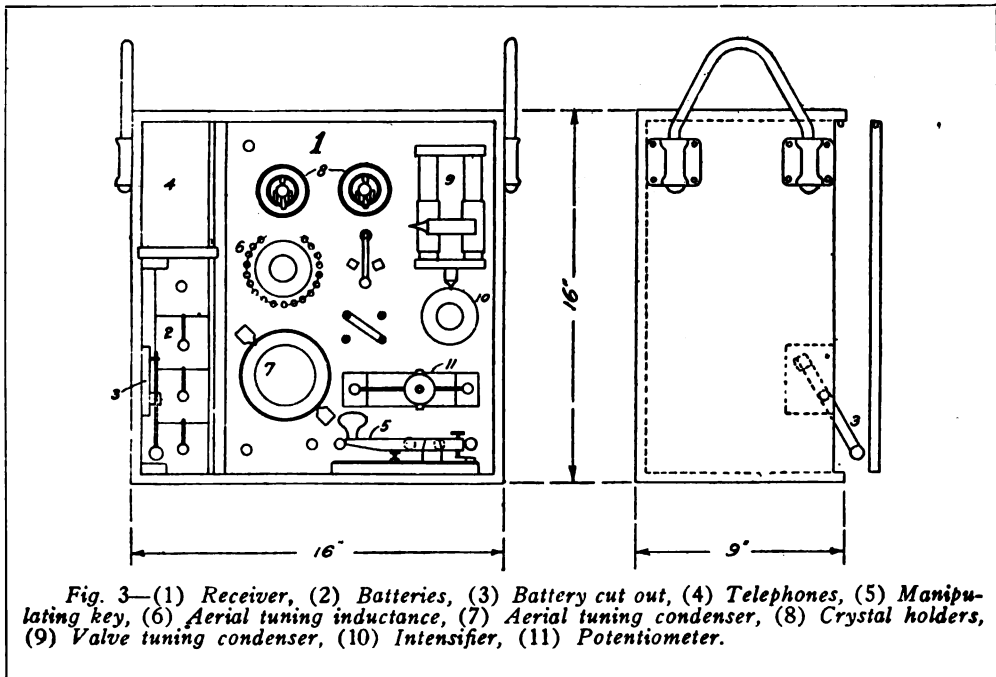


Fig. 3—(1) Receiver, (2) Batteries, (3) Battery cut out, (4) Telephones, (5) Manipulating key, (6) Aerial tuning inductance, (7) Aerial tuning condenser, (8) Crystal holders, (9) Valve tuning condenser, (10) Intensifier, (11) Potentiometer.

diameter, and with the lugs at Y, in which case the supporting pedestal shown is not required. The total weight of the generator and disc discharger is 80 pounds.

Primary or secondary batteries can also be used, and if the latter type are adopted a special unspillable accumulator case is supplied, preventing acid from splashing out and damaging the machine in the event of a rough landing or a fall.

The transmitting unit, shown in detail in Figure 2, is contained in polished hardwood case and weighs 84 pounds.

outfit is fitted on a biplane. The plan to the left of the drawing shows a general view of the antenna seen from above the plane.

The three units are placed in the cockpit of the monoplane in front of the pilot's or observer's seat, with the receiving unit and manipulating key so placed to the right of either of them that adjustments can be made on the tuning coils or the key be operated by either one.

All parts are highly insulated and there
(Continued on page 152.)

THE EYE OF THE WIRELESS

by
WILLIAM H. ALLISON

Chapter I.

IT was the 19th of May in the year 1917. The big towers at Arlington had just finished sending out the ten o'clock time signals. Robert Cameron in his laboratory in New York sat before a long table, nervously turning knobs and moving sliders on the most complicated piece of apparatus ever set up in a wireless station. The lights were turned off, but the room was weirdly illumined by the blue glow from the cathode tubes on the back of the instrument. A small rotary converter hummed softly in a far corner of the room, but aside from this there was no noise.

Suddenly the telephone bell under the table jangled wildly. Cameron switched off the motor and flashed on the lights. "Who in blazes can be calling me at this time of night?" he muttered.

He lifted up the receiver and recognized the voice of his friend, John MacDonald, of the Universal Detective Agency.

"Is that you, Bob? I'm coming right over—it's mighty important."

The voice of the detective was full of suppressed excitement. He was evidently in great haste also, for he left the telephone almost before Cameron had given him assurance that he would be waiting for him.

Pushing the strange piece of apparatus to one side, Cameron reached up

and pulled the covers down over that part of the table on which the instrument rested. He wanted no one but himself to know of its existence. Then he sat down by his regular wireless apparatus, picked up a cloth, and began to wipe the dust off his instruments. After he had cleaned things up to his satisfaction he put on the receivers, tuned in Wellfleet's sleepy hum, and began to copy her press.

He was in his twenties, slim, light complexioned, of medium height, and possessed average good looks. He had devoted himself to wireless during his spare time for eight years; he didn't know why. His friends told him he was foolish to "waste" his time and money on it, but it gripped him like a magnet and he couldn't get away. Baseball, theatres, automobiles, girls and society in general did not interest him at all as compared to wireless. Cameron was deeply absorbed in the flow of words from Wellfleet when MacDonald, entering through the door which had been left open in anticipation of his arrival pulled over a chair and sat down near him. Six years older than Cameron, he was short, rather stout and good natured. He bore none of the proverbial earmarks of the detective and a large part of his success was undoubtedly due to this fact. Five or six years before he had erected a wireless station of his own, but had given

it up without even learning the code. It was during this period that he had made Cameron's acquaintance.

"Listen, Bob," MacDonald began as soon as Cameron had taken off his head phones, "we're up against one of the queerest and most difficult cases that ever came up. You've heard of old Hamilton—J. C. Hamilton, the steel magnate. Well, a scheme has been hatched to make him turn over a million dollars in cold cash."

Cameron showed his astonishment by whistling.

"Any idea who is making this demand?" he asked.

"Not the slightest," MacDonald replied, "and we want your help in finding out. Here's the dope. Every day, for the last twelve days, Hamilton has received a telegram, signed X Y Z, ordering him to place the cash in an iron box with a chain attached, and deposit it in the Hudson River at a secluded point about forty miles from New York, extending the chain along the river bottom toward the shore so that the box can be easily drawn out. This place has been carefully indicated on a small map of the locality. The communications caution him against using an empty box in an attempt to capture him, and say that he will pay for bad faith with his life. The detective paused to light a cigarette. "And here's the puzzling part of it," he went on, "they warn him that he is being watched, that they could kill him at any minute, and then they prove it to him by describing in the telegram his actions to the minutest detail at the very time when he thinks he is most alone. Today he received this."

He reached into his inside coat pocket, from which he took a telegram. "J. C. Hamilton, New York," he read. "Why did you at 2 P. M. today lock self in library pull down curtains and write letter to son asking him to come home from vacation? Why should you worry when million closes deal? We grow impatient.

XYZ.

"He received that telegram, less than an hour after he wrote the letter. He had not even mailed the letter. He

has the letter now. We searched the place thoroughly. There is a closet in the library, but it was locked. Hamilton's sight is good, and his hearing is very acute; he swears he would have heard it if the door opened. There is no other place where a man could hide, the curtains were down tight, and yet—somebody must have been looking over his shoulder when he wrote that letter."

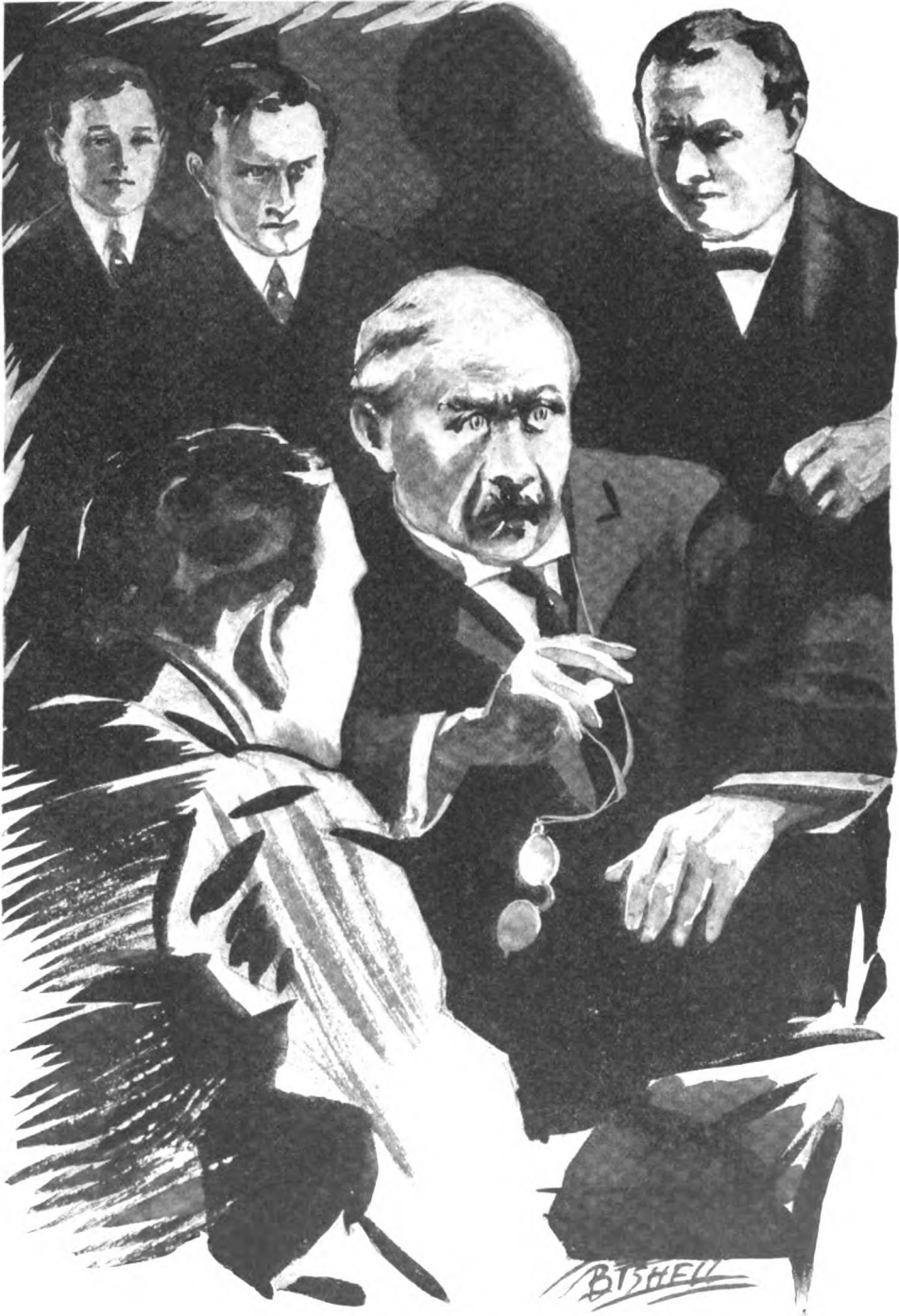
"But how do you account for the fact," Cameron asked, "that the communications come from Albany.?"

"There is only one solution," his friend answered, "somebody in New York is watching Hamilton. Then he telegraphs his observations by wireless to his accomplice in Albany, and the latter writes the telegrams. We have gone to the telegraph offices. Today there was not a telegram sent to Albany, or any of its suburbs, between the time that Hamilton wrote the letter and the telegram was received. Our agents at Albany verified these statements. We have interviewed most of the commercial wireless operators in New York, but they all say they have heard nothing unusual. The police have been notified, and they are trying to solve it, but they are as much at sea as we are. We have visited all the amateur wireless stations in Albany that we know of, but can find no clue."

"One minute," interrupted Cameron, "how do these messages get to the telegraph offices in Albany?"

"Boys bring them in," replied MacDonald, "newsboys sometimes; always it is a different boy. They have been located, and questioned, and they all tell the same story. A man met them on the street, he was in a great hurry, he gave them the telegram and a ten dollar bill, told them to bring it to the office, pay the charges, and keep the change. Their descriptions of the man vary. They are worse than useless."

Cameron shook his head. "Your wireless theory seems to be the only feasible one, but I have heard nothing of a suspicious nature. Of course it would take a pretty powerful station to reach Albany, especially in the day-



"Look! Look!" he shrieked, "he is watching me now"

time. It would take a more powerful outfit than the law allows for private use. Still, I will listen for it. If I hear it I will trace it out. We can rig up a portable directional aerial, and get results after a while, although it will take time, unless the sending is done for a long period at a stretch. Of course I —"

He was interrupted by the jingling of the telephone bell. A man in the Office of the Universal Agency was on the wire. Something new had developed in the Hamilton case, he said, and MacDonald was wanted at once at the home of the steel man.

Chapter II

In a taxicab driven at top speed Cameron and the detective ten minutes later raced by the armed men detailed to guard the Hamilton residence. They found the aged master of the house, querulous and nervous, seated in the library with his son Horace.

"Isn't there any law in the land, gentlemen?" he said plaintively. "Am I to be bullied out of a fortune?"

He pointed a trembling hand at his son. "Show it to 'em, Horace," he said, partly rising from the chair in his agitation. "See what I'm facing, now. It's awful! Awful!"

He sank back in his chair while young Hamilton handed MacDonald a telegram. It was dated Albany and read as follows:

"J. C. Hamilton, New York:

"Unless you close deal before 10 A. M. tomorrow the Hamilton Building burns down.

XYZ."

The detective read the telegram aloud. His voicing of the words on the typewritten slip had an ominous ring, bringing new terror to the heart of the elder Hamilton.

"Don't let him do it, MacDonald," he shrieked, waving his hands wildly. "Jail him! Jail him!"

MacDonald spoke soothingly to the aged man, but the latter was filled with dread of the situation.

"Look! Look!" he shrieked, "they

are watching me now. I feel them. There—look—there he is!" Pointing at the blank wall he rose from the chair and staggered toward it. His son caught him in his arms just as he was sinking to the floor, exhausted.

"You are tired, father," he said "there is nothing to be seen. Come, you must go to bed. It is late" A servant came to help him, and they carried the fainting man away.

Young Hamilton joined MacDonald and Cameron a few minute afterward, and the three viewed the case from all its angles.

"Have you notified the police of this telegram?" asked MacDonald.

"Yes," replied Hamilton. "They have promised to keep a sharp watch. I have arranged to have over a hundred of my employees stationed throughout the building. We are getting the men together now. That building won't be fired if I can help it."

He did not appear to be deeply concerned over the matter and MacDonald was reassured by his attitude. Cameron, however, advised against the opening of the building.

"I believe," he said, "that the fire will be started in spite of all your precautions. Unless I am greatly mistaken you are matching your wits against a very clever criminal."

MacDonald smiled. "This thing has got on your nerves," he said. "You'd better have a good night's sleep and see if you can't get a line on this crook's wireless. If nothing happens come down to the Hamilton Building at ten in the morning and watch me get him if he tries to start anything."

Chapter III

Cameron "listened in" in vain the next morning for a wireless message that would lead to the identification of XYZ. While he sat at the table before his set in the words in the telegram buzzed through his mind. As the hands of his watch crept toward ten o'clock he became uneasy and nervous. What was happening in the Hamilton Building? Had MacDonald and the guards succeeded in captur-

ing the sender of the threatening communications. Finally he started for the financial district, where was located the Hamilton Building, towering above even the tallest of its neighbors.

As he ascended the steps leading out of the subway station at Wall Street he was brought to a halt by a congestion of traffic on the sidewalk. He raised his eyes to the sky above the Hamilton Building and a little cry of fear involuntarily escaped him, for hovering above the giant structure was a black pall of smoke. Then he directed his glance toward the hands of the clock on St. Paul's church. They showed that the time was four minutes past ten o'clock. "X Y Z was prompt," he muttered with a shudder.

He made his way toward the burning building. The interior was a roaring furnace and tongues of flame were darting from the windows. The firemen had abandoned their efforts to save the building and were attempting to prevent the flames from spreading to the neighboring structures. Cameron heard a man standing near him remark that 150 persons had been trapped in the building and burned to death. Through the crowd came an ambulance, its gong sounding a warning to those in its path. As Cameron pushed his way through the throng he came face to face with MacDonald. There were dark rings under his eyes and his face was drawn.

"I've just been spending a bad hour and a half with myself, Bob," he said, "and my confidence in my judgment has gone down considerably. I was on the second floor of the building when the fire started. At ten o'clock smoke began to pour up the elevator shafts. Almost at the same time fires started all over the building; on the roof, and on every floor there was fire. The people tried to get out, but the flames spread so quickly that some of them were caught."

"What's your theory of how X. Y. Z. brought this about?" Asked Cameron.

"He had a room in the building and must have been working on his scheme for weeks," replied MacDonald. "At night, if he was familiar with condi-

tions he could do it all. He had probably planted his combustibles all over the building, under the floors, in obscure places everywhere; then he wired them up, and today he sat in his room and made the connection that set them all off. Any spark coil would do it. There were spare wires in the telephone cables. He might have used these. He was right under our noses all the time, and now he has escaped."

Cameron did not agree with the detective's theory of how X Y Z had operated. He had a theory of his own regarding the fire and the way to bring about the capture of the black-mailer. He said nothing, for he was not prepared to divulge his plans.

Soon after he left MacDonald he went to his laboratory, leaving orders he was not to be disturbed.

Chapter IV

In the meantime MacDonald had decided to place a box in the river, as demanded by X Y Z, and then attempt to capture the person attempting to remove it. X Y Z had become more peremptory. He sent a letter to Horace Hamilton, advising him to order his father to accede to the writer's demands. He ridiculed the detective and boasted that he could not be captured.

So it was not in a hopeful frame of mind that MacDonald, accompanied by Horace Hamilton, made his way to the Hudson and sank an empty box in the place designated by the covetor of the Hamilton millions. Several detectives were stationed nearby to await developments. As the box disappeared beneath the surface of the water MacDonald casually glanced at his watch and noticed that the hands pointed to five minutes after three o'clock.

This part of the plan having been successfully carried out, MacDonald and young Hamilton started toward New York. The elder Hamilton had evinced much interest in the scheme to apprehend X. Y. Z., requesting that a report be made to him as soon

as the box had been placed in the river.

As the detective and his companion neared the Hamilton home they were aware of an unwonted air of activity about the premises. In front of the house stood the automobile of the Hamilton physician, and Dr. Grayson himself came out of the door of the house as they were about to enter. At sight of Hamilton he halted.

"What is it doctor?" cried the young man. "Is father worse?"

The physician turned away his head and did not answer. The significance of his action was not lost upon Hamilton. Uttering a moan of despair he hurried into the house, followed by MacDonald. A grave faced servant lead the young man into a small reception room and pointed silently to the lifeless figure of the head of the house stretched upon a couch. With a low cry young Hamilton knelt by the side of the bed, his frame quivering with the intensity of his grief.

MacDonald drew the servant to one side and questioned him.

"Mr. Hamilton had just come in here to read the early edition of an afternoon newspaper," said the man. "He had asked for a newspaper about fifteen minutes before and I went out to get it for him. He had made no complaint of being in pain and settled down in a chair to read. I turned to go out of the room. Suddenly I heard the newspaper flutter to the floor. I turned to pick it up when I noticed that Mr. Hamilton had sunk deeper in his chair and that he was perfectly motionless. I called some of the other servants and telephoned for Dr. Grayson. He got to the house about fifteen minutes after Mr. Hamilton died."

"And what time was it that you heard Mr. Hamilton's newspaper flutter to the floor?" asked MacDonald.

"Why, I should say it was about seven minutes after three. I went out to get the newspaper soon before three and when I came in I noticed that the clock showed it was five minutes after the hour. I should estimate it was about two minutes afterward that Mr. Hamilton died."

MacDonald started. His mind went back to the empty box in the river. It was two minutes after it had been sunk beneath the water that Hamilton had died. XYZ. had lost no time on a second occasion in carrying out his threat! While he was attempting to analyze the circumstances leading up to the latest development in the case he received a summons to the telephone. Cameron was on the wire, a servant said. He spoke jerkily. "Come to my laboratory at once. Don't bring Horace Hamilton. Vital importance."

Only these words came over the wire; they were uttered in a tone so low that MacDonald had difficulty in understanding them. He knew enough of Cameron's character, however, to realize that the latter had something of considerable consequence to communicate and he instinctively felt that the net was closing about X Y Z.

Chapter V

Thus it was that he was prepared in a measure for the exultant look on Cameron's face when he arrived at the laboratory. The wireless man extended his hand to the detective. "First," he said, "let me tell you that the man you want is Frederick Hoffman, of Albany. He is the sole conspirator against the Hamilton family. He has not tried to remove the iron box because he knows that it is empty and also guarded, but if it were not, he has means at his disposal that would enable him to safely acquire it. There is no outside aerial, but he employs a very cleverly designed radiator in the attic of his house. You will see his face. Arrest him when he leaves the house to send one of his letters or telegrams. If you enter the house you will never leave it alive, for he controls a ray that will cause instant death. It was this ray that destroyed the Hamilton Building, and killed Horace Hamilton's father."

MacDonald's face remained blank as Cameron was speaking and the latter smiled.

"I can see," he said, "that you are

wondering how I came by this information. I will show you."

He uncovered his table, exposing a rather large, rectangular-shaped box, on the outside of which were mounted numerous switches, knobs and handles. It was the apparatus that Cameron was experimenting with on the night that MacDonald first asked his aid in the Hamilton case. The outside of the box was now covered with heavy lead foil.

"It is a matter of considerable disappointment to me," said Cameron, "that a device upon which I have been working for years should be perfected by another just at the time when I was about to succeed. It must have been apparent to you from the start that the man for whom you were seeking possessed remarkable powers of observation, and yet, not being a scientific gentleman, you neglected to look for a very possible condition that might exist, although it has previously been unknown."

Cameron darkened the room, and then folded back the middle part of his mysterious box which disclosed a mirror that moved into position in the back part of the box. He moved a couple of switches, starting the rotary converter, and began moving the knobs on the outside of the box. A light was cast upon the mirror from the forward part of the box, and, as he adjusted the instrument, vague shadows moved over the mirror. These gradually became sharper and clearer until, as Cameron stepped back from the instrument, the detective beheld a section of Broadway. It was clear and distinct, with all the traffic moving back and forth, just as it would appear if he were standing in the thoroughfare at that moment.

The detective stared in astonishment.

"It is no doubt evident to you now," continued Cameron, "how Hoffman, with the aid of an apparatus like this, watched Hamilton and before proceeding any further, I am going to outline to you briefly the principles upon which the working of it depends.

"You will recall that it was in 1865 when Maxwell evolved his famous elec-

tromagnetic theory of light, and predicted the discovery of the longer electric waves that are used in the wireless telegraphy. Since 1888 when Hertz confirmed Maxwell's theory by proving the existence of these waves, this theory has been generally accepted. In brief, light, as we know it, is produced by the action of electric energy in the form of ether waves upon matter. It is these same ether waves, only of longer length, that we produce with the electric spark, and which we use to carry our wireless messages. It has always seemed to me, since we can detect these waves at a great distance from their source, that there is no good reason why, with suitable apparatus, we cannot electrically transform and detect light waves, the nature of which is identical. I have demonstrated to you with this instrument that I have designed that my theory is correct.

"My theory, which differs somewhat from the orthodox theory of light, is that the electric waves from the sun cause the electrons which compose the atoms of matter to vibrate, and thus produce secondary ether vibrations of such great frequency that visible light is produced. By reason of their arrangement in different atoms, these electrons have different periods of vibration in different substances, and so the various colors are produced. These light vibrations, upon striking a properly tuned circuit are changed into extremely rapid electric oscillations which, upon passing through this wave transformer, are changed back into light waves, and produce upon the mirror an actual picture of the area upon which the instrument is focussed. Although the eye cannot distinguish objects through an intervening substance, unless it be transparent like glass, I have found that light waves actually do pass through all substances, and persist for a great distance, although, of course, they gradually decrease in strength as the distance increases. So, you see, that material appearing opaque to the eye which is really a very poor detector of light energy, is in reality transparent, and does not prevent the light

waves from a distant object from passing readily through it."

Cameron stepped back to the instrument, and moved a handle on it. Instantly the scene changed; MacDonald caught glimpses of the Hudson, of farms, villages, and forests as the handle slowly turned. Finally he stopped, and again stepped back.

Large and distinct upon the mirror loomed the figure of a man about forty-five years old. He was a well-dressed foreigner, evidently a German, and was nervously smoking a cigarette. He, also, was gazing into a mirror. but on his mirror there appeared the reflection of Horace Hamilton.

Chapter VI

The German's gaze never left the mirror. Occasionally he smiled, and wrote something on a pad of paper that he held in his left hand.

Cameron faced the detective. "That man shown in the mirror is Hoffman. His name and address I obtained from letters addressed to him that he received and were shown in the mirror.

MacDonald gasped, but not a muscle moved as he gazed fixedly at the reflections.

"Now, I'll tell you how he made himself so dangerous. You may remember reading of the experiments of the Italian engineer, who in the summer of 1914 on the River Arno claimed to prove the power of certain infra-rays, by exploding bombs placed on

the river during a test conducted before officers of the Italian navy. He claimed to have directed these rays from a wireless station located more than ten miles away from the scene of the explosions. I believe at that time considerable skepticism was expressed by certain scientists as to the genuineness of this demonstration, but today I have witnessed a demonstration by this demon, Hoffman, on a much greater scale that proves this feat at least to have been possible. By directing radiant heat waves of a certain critical wave length against a focal point many miles away, this man has produced such violent electronic vibration that rapid atomic disintegration has occurred, accompanied by an intense heat if the ray is not immediately extinguished. You see, why I cautioned you not to bring Horace Hamilton here today, for Hoffman watches him almost continually."

Cameron handed the detective a slip of paper. "Here is Hoffman's address," he said. "You'd better hurry and make the arrest. He may get away."

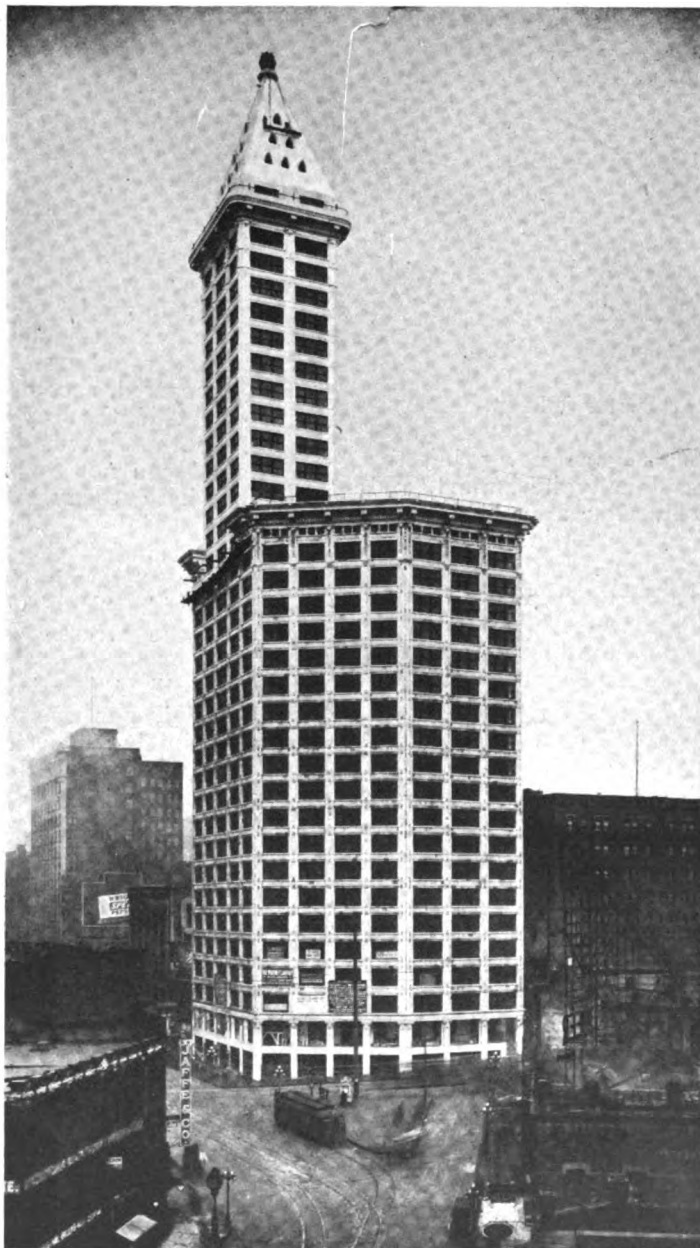
"Get away?" A ferocious glint leapt to the special operative's eyes. "Just you watch in that little mirror—eight of my best men go to Albany with me to-night!"

In silence he extended a tense hand, nodded a curt farewell and was gone.

Cameron smiled.

"And that about ends the career of Hoffman, alias X Y Z, and the Hamilton case," he observed grimly.





The new 42-story L. C. Smith Building in which the Seattle Marconi Station and executive offices of the district are located



The Seattle waterfront, viewed from the Marconi offices in a new skyscraper.

The Northern District

What Marconi Is Doing for the Progressive Northwest.

ALTHOUGH little is known of the Northern District of the Pacific Coast Division, this division of the American Marconi Company is probably the largest in point of territory of the many districts in the Marconi organization.

It embraces the states of Oregon and Washington and the territory of Alaska. Oregon has 94,560 square miles and Washington 66,880 square miles, while the area of Alaska is 590,884 square miles, or more territory than is comprised in Great Britain, Ireland, France and Spain.

Until last year the only means of telegraphic communication between the United States and Alaska was the inefficient and insufficient Government



Superintendent John R. Irwin, who recently completed a 9,000-mile inspection tour in his district.

cable; it remained for the Marconi Company to blaze the trail to this wonderland through a commercial wireless service that reaches the principal points

in the great territory for which Congress recently passed a bill authorizing the construction of a railroad at a cost of forty million dollars.

There are now under construction at Ketchikan and Juneau powerful wireless stations to communicate with Astoria, Ore., the United States terminal which will relay by wireless to Seattle.

The headquarters of the division are located in Seattle, the largest city in the State of Washington, the phenomenal growth of which daily furnishes additional evidence of the enterprise and almost unlimited extent of western resources. Strategically, it is the logical wireless center. It has an extensive coastwise and export trade, with regular steamers to Alaskan and Asiatic ports, besides being the principal industrial and commercial center of a large region exporting coal, timber, fish and agricultural products.

A large number of ships are operated and maintained by the Seattle staff, and an equal number make it a port of call. Fourteen shore stations, ten of which are in Alaska, add to the activities of the district.

One of the principal shore stations is located at Astoria, a northern seaport of Oregon, about forty miles from Portland. As the principal port of entry for the Columbia River country and the headquarters of the salmon fishing industry of the north Pacific Astoria maintains considerable wireless business with substantial steamship traffic conducted from here. A score or more of large salmon canneries and extensive manufacturing of lumber products further add to the profitable

operation of this Marconi station.

A very material increase in the importance of the Northern District is to be looked for in the development of Alaska, according to Superintendent John R. Irwin, who recently returned from a 9,000 mile tour of inspection. In this great treasure house approximately \$18,000,000 in gold is extracted annually with crude appliances, and it is estimated that the forests of the interior are capable of affording an ample supply of timber to the United States for a half-century, should other areas become exhausted. The salmon-packing industry also ranks high in Alaska's industrial enterprises and yields about \$5,000,000 a year.



The contrasts of the great Northwest are graphically revealed in a comparison of this view of the receiving building at Astoria with the magnificent structure on page 112, its connecting link

Literally, only the surface has been scratched. With the new transportation facilities Alaska's yield will be multiplied one hundred fold and wireless telegraphy will become an increasingly important factor.

The greater part of the territory is heavily wooded and with a widely scattered population the installation and maintenance of any other means of communication but wireless is made prohibitive by the expense; thus interior as well as seaport business will in time be embraced in the wireless chain.

The nucleus of this chain is represented primarily by the establishing of wireless communication between Astoria in Oregon and Ketchikan and Juneau in Alaska, with 25 kilowatt stations at the two former points.

Trade in Juneau is principally confined to the export of furs and blankets a large woolen mill being located nearly opposite Douglas Island, where the famous Treadwell Gold Mine has



Living quarters at Ketchikan and Juneau have been designed with special provisions for the comfort of the Alaskan operators

established the largest quartz-crushing mill in the world.

Other Marconi stations are located at Kogguing, Naknek, Clarks Point and Nushagak, on Bristol Bay, Chignik, on the Alaskan Peninsula, Karluk, and Ellamar, on Prince William Sound.

The plans for expansion in this territory necessitated the relocation of the Seattle station and provided for an increase in power. A central location in the city was essential and this was provided through the enterprise of Burns Lyman Smith, owner of the new 42-story L. C. Smith Building in which magnificent structure the Seattle station and the headquarters of the Northern District has just been housed.

Coincident with the removal came the announcement that the opening of the new system for public service has been set for an early date.

"FREAK" ON THE PACIFIC

Another interesting "freak" communication has cropped up in wireless working on the Pacific ocean. Signals from the Marconi Station at Cocos Island, where the apparatus is of but $1\frac{1}{2}$ k. w. power with a normal range of 150 miles, were heard by the operator on the Siberia, then 180 miles north of Manila and 2,400 miles distant from the shore station. That the signals were very clear and distinct is more remarkable when it is considered that in order to reach the vessel they had to traverse an almost equal distance on each side of the Equator, admittedly the worst portion of the globe for long distance wireless working.

The communication took place in clear weather on a star-lit night. There was very little static and other distant stations were clearly heard by the "Siberia," notably the station at Sambang, about 2,000 miles away.

BOOK REVIEW

The new book "Experiments" from the pen of Phillip E. Edelman, while it is not confined to wireless, has many interesting features in connection with the radio art, and should be of particular interest to those with a leaning toward persistent effort in experimental work.

As outlined in the author's foreword, the volume is intended for those who delight in doing things. It comprises two distinct books, in that one part is devoted to experiments which are to be repeated, while the other leads to new and original work. Some of the most famous experiments, the most brilliant demonstrations, have been included as examples and desirable little problems. The aim has been to make such examples clear and at the same time simple enough for inexpensive reproduction by beginners. In every instance, ample room has been left for the employment of individual ingenuity.

Bound in cloth the book sells at \$1.50. It is also published as a gift book bound in leather at \$3.00. Copies may be obtained through the Book Department of the Wireless Age.

MARCONI'S APPARATUS FOR GENERATING ALTERNATING ELECTRIC CURRENTS

Guglielmo Marconi has invented an improved means for generating alternating electric currents. The object of the invention is especially to provide an apparatus for currents of high frequency such as are employed in wireless telegraph and telephone transmitters.

In the specifications of his patent Mr. Marconi says:

The drawings show diagrammatically apparatus constructed in accordance with my invention.

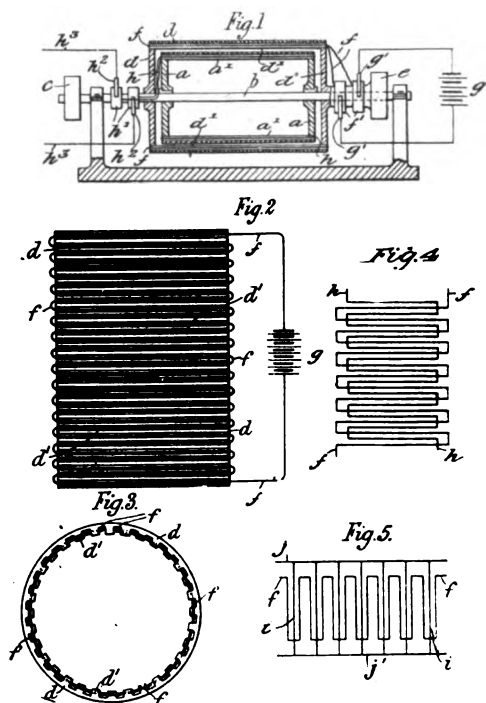
Figure 1 is a diagrammatic section. Figure 2 is a developed view of the inside of the outer cylinder shown in Figure 1, and Figure 3 is an end view of the outer cylinder with the end removed. Figure 4 is a representation of the windings of these two cylinders and Figure 5 shows an alternative arrangement.

A is a cylinder keyed to a shaft, *b*, which is driven by a pulley, *e*, fixed to it.

D is an outer cylinder loose upon the shaft, *b*, and driven by the pulley, *e*, in an opposite direction. The interior of the cylinder, *d*, has equally spaced ridges or teeth, *d*¹, formed upon it along generating lines, and the wire, *f*, is wound backward and forward between these teeth as seen in Figure 2.

The ends of the wire, *f*, are connected to a pair of rings, *f*¹, to which current is led from a source, *g*, of continuous current by brushes, *g*¹. The inner cylinder is similarly provided with inwardly projecting ridges or teeth, *a*¹, between which a wire, *h*, is wound backward and forward in a similar manner to that employed for the wire, *f*. Portions of the two wires, *f* and *h*, will therefore appear, as in Figure 4, when the relative positions of the two cylinders are such that the parts of the wire, *f*, lie halfway between the parts of the wire, *h*. On rotating one cylinder relative to the other, or on rotating both cylinders in opposite directions, a rapidly alternating current is induced in the winding, *h*, the ends of which are connected to rings, *h*¹, on the cylinder, *a*. This current is conveyed to the working circuit, *h*², by the brushes, *h*².

Figure 5 is a diagram similar to Figure 4, but it shows an alternative arrangement of winding the secondary circuit. The primary circuit, *f*, is wound as described, but the secondary circuit consists of a number of parallel wires, *i*, lying between the ridges of the cylinder, *a*, and connected together in parallel by a wire, *j*, at one end connected to one of the rings, *h*¹, and a wire, *j*¹, at the other connected to the other ring, *h*¹. In this case there are half as many wires, *i*, and therefore ridges in the cylinder, *a*, as there are wires and ridges in the cylinder, *d*.



In order to prevent the cylinder, *d*, from flying to pieces by centrifugal force, it is well to coil around its exterior fine wire such as piano wire, but this is not shown in the drawings. In order also to obtain a greater relative speed between the cylinders and therefore a higher frequency of alternation in the circuit, *h*³, I prefer to rotate not only the outer cylinder but also the inner cylinder, and if the pace of the inner cylinder be great I protect it with coils of thin wire in a manner similar to that employed for the outer cylinder.

War Incidents

Some Stirring Experiences of Wireless Operators in the Theatre of War

WIRELESS telegraphy continues to figure in incidents of the European war that occur from day to day. The importance with which it is looked upon is shown in accounts of the activities of the German armed cruiser Kaiser Wilhelm der Grosse. It is related that when the German craft held up the English ship Galician, the wireless operator on the latter attempted to summon aid, but was told, "Stop your wireless. We blow up the bridge if another letter appears."

The threatening of British craft by the German cruiser Emden on the trade routes of the Indian Ocean has brought forth the theory that the Kaiser's warship may have been directed by wireless from Berlin.

"We may picture Von Tirpitz in his office in Berlin," says a British naval expert. "He receives news of the situation in the Bay of Bengal and realizes the opportunity for a little coup. There is a cruiser a few miles away which has been carefully hidden until some such chance presented itself. He calls her up and gives information and orders. The raider does the rest."

The wireless operator has not been lost sight of in the war. Included among the incidents of the hostilities is the story of a wireless man—a British subject—who was detailed on a German freighter. When the operator was ordered to communicate with a German cruiser he refused to do so, even though threatened with violence, and wrecked the wireless apparatus of the freighter.

How G. D. Smith, wireless operator on the German freighter Mazatlan, remained steadfast in his determination not to aid the Kaiser's cause by communicating with the German cruiser

Leipzig, even though he was threatened with violence, was told by the wireless man to Rear Admiral Pard, superintendent of the Twelfth United States Naval District, in San Francisco. Smith is a British subject. He said that the Leipzig was coaled and provisioned near Magdalena from the cargo of the German freighter Mazatlan. The Leipzig, according to Smith, took mail and supplies direct from the Mazatlan, but took on board the coal after it had been transferred from the freighter. He was ordered to communicate with the Leipzig off the coast of Lower California, he said, but refused and wrecked the wireless apparatus of the freighter.

After much correspondence with Washington the Mazatlan, with 900 tons of coal aboard, was permitted to clear from San Francisco for Guaymas, Mexico, August 13, under \$20,000 bond to deliver the coal as consigned. Two days later, said Smith, Captain Frederick Jebsen, the owner, who is a German reservist; a German officer called Zuer Helle, and one Gustave Traub were taken on at San Pedro.

"When I refused to communicate with the Leipzig I was threatened with a beating," Smith declared. "To make good my refusal I put the appara-



tus out of commission. North of Magdalena Bay, however, we picked up the Leipzig and transferred mail

and stores to her. The coal we carried to Guaymas, where it was transferred to the German steamship Marie, which in turn later coaled the Leipzig. Somehow the British cruiser Newcastle got wind of us and came cruising southward, but the Leipzig gave her the slip."

The Mazatlan formerly was under the Mexican flag. During the series of revolutions in Mexico she was transferred for safety to German registry, and when the European war broke out she again hoisted the Mexican flag. The coal she carried south was said to have been originally consigned to the Leipzig, but later was declared to have been sold to others for delivery at Guaymas.



The following is from the Arlanza edition of The Wireless Mail, the daily news bulletin, published on board vessels of the Royal Mail Steam Packet Company. It is dated August 18:

"This issue of our Wireless Mail will, we feel sure, be a 'welcome' souvenir to some of our passengers; welcome, perhaps, is hardly the word, as the experience we have gone through since our last issue is one few of us will ever want to undergo again, and while it lasted and grave doubts hung in the balance, the emotion and feelings we felt can be better imagined than described. A short account of our 'happy escape' is as follows:

"On August 16 at 12:50 P. M. we sighted on our starboard beam a four-funneled steamer, apparently steaming about S. E.; shortly after we saw her she altered her course and came direct for us. On getting within signalling distance we made her out to be the German armed merchant cruiser Kaiser Wilhelm der Grosse. She at once hoisted the German ensign and signalled us to 'Heave to, or I will fire.' This signal we need hardly say

was at once acknowledged and acted on, as what can an unarmed passenger steamer do in such a case with the lives of 1,600 or 1,700 people at stake? The following signalling then took place:

"Lower away and heave overboard all your wireless telegraph installation.

"Have you any women on board?

"Dismiss, on account of your having women and children on board.

"Lower away and heave overboard all your wireless telegraph installation. (Repeated.)

"I have no further commands to your captain.'

"During this signalling the cruiser remained within 200 or 300 yards of us, and after she had seen our wireless aerials, etc., thrown overboard she steamed away in a southerly direction, much to the relief, we are sure, of all who witnessed it. We needed no second bidding, and our good ship Arlanza was at once put on her course for Las Palmas.

"A short description of our enemy will be of interest.

"The Kaiser Wilhelm der Grosse was built in 1897 at Stettin. She is 14,349 tons gross, 626 feet in length, 66 feet beam, 39 feet depth, and has a speed of 22½ knots, and belongs to the North German Lloyd Company. As far as we could make out, she appeared to be armed with nine 12-pounders, so we think you will agree with us that we should stand a very poor chance against such an enemy.

"Las Palmas was reached at 7 A. M. on August 17, and here our commander at once landed and reported the occurrence to H.B.M. Consul; by 9 A. M. the report was telegraphed to the Admiralty at London, also to the R.M.S.P. Company, and at 3 P. M., after leaving Las Palmas, we had the satisfaction of knowing that our report had been received. At noon we left the Canaries, and meeting the British cruiser Cornwall outside, the affair was reported to her captain by semaphore. And as soon as this was finished and we started on our homeward run, a loud burst of cheering for the captain and crew of the Cornwall came from the hearts of all our pas-

sengers, and we cannot help thinking that all on board must have felt a great deal of satisfaction, knowing that a British man-of-war was within hail and always ready to uphold her place as Mistress of the Seas. We must mention that by 9 A. M., or say seven hours after the wireless telegraph was thrown overboard, a complete new set was in place and in working order."



The Galician of the Union-Castle line was off the Canary Islands on August 17 when the Kaiser Wilhelm der Grosse came alongside and signalled to the British craft to stop and not to send out any wireless messages. The latter part of the order was not heeded, however, and the wireless operator on the Galician sent out the S O S. He had flashed the first three letters of the ship's name when this marconigram came from the German craft: "Stop your wireless. We blow up the bridge if another message appears." In the meantime another vessel appeared. She conveyed through signals the information that she was a German liner disguised in the colors of the Union-Castle line. The German cruiser, however, demanded a more adequate explanation and the third vessel was not permitted to proceed until she had raised the German mercantile flag and revealed her name.

The cruiser then sent a boat with two officers to the Galician and the wireless apparatus on the English craft was destroyed. The Germans mustered and inspected the passengers and crew and also examined the ship's papers. What happened next is told as follows by the correspondent of a London newspaper:

"At 5:30 P. M. Germans left ship, taking with them Lieutenant Deane, first-class passenger, and Gunner C. Shearman, third-class passenger, and

ship's papers and documents, etc. At 5:40 P. M. we were ordered to precede merchantman at full speed and to steer S. 25. Mag.; at 6 P. M. we received orders to keep all lights extinguished and to have all effects belonging to passengers and crew ready on deck and to provision all boats, and to have everything in readiness for leaving the ship at daylight. At 8:30 P. M. we were ordered to alter the course to S. 17 E. Mag.; on which course we continued until 3:40 A. M., August 16, when we received orders to steer S. 455 W. Mag. Merchantman throughout following closely in our wake. At 5 A. M. the merchantman sent the following message to Captain Day: 'I will not destroy your ship on account of the women and children on board. You are dismissed. Good-bye.' To which the following reply was sent: 'To German Captain—Most grateful thanks from passengers and crew. Good-bye.' Lat. 25.35 N., Long. 17.20 W., the merchantman then left us at full speed and we turned ship and shaped a course for Tenerife.—Note: The German officers were most courteous throughout."

A breezy story of a chase after the German warships Goeben and Breslau by the British ship Gloucester is contained in a letter written by T. Marsden, wireless operator on the English vessel, to his mother. The Gloucester, according to his description of the engagement, opened fire upon the Breslau, but her first shot did not reach the German craft. Thirty shots were then fired by the Breslau. Two of them took effect, two of the British vessel's boats being smashed on their davits. In his letter Marsden said:

"After the first shot our lads were quite happy," adds Mr. Marsden, "and they kept firing as quickly as possible. One chap nearly swallowed his chew of baccy when the first shot fell short. The next one he spat on for luck, and it took half the Breslau's funnel away. He repeated the operation with the next shot, which cleared the Breslau's quarter-deck and put her aft gun out of action. Then he began to smile."

The German cruiser Emden has made her appearance after having been in hiding for a period which began before the declaration of war. She is now menacing the trade routes of the



Indian Ocean. British cruisers are searching for the cruiser which has already sunk and captured seven merchantmen.

The question has been asked: How did the Emden obtain the information necessary for her to play such havoc? It has been suggested by the naval correspondent of a London newspaper that she was in touch with some one in authority in Germany. He says:

"This is not improbable, for the sweep of the wireless messages from Nauen is wide. It reaches the east coast of America, and therefore very likely touches at points within a semi-circle which includes the West Indies, the north coast of Brazil, the west coast of Africa as far south as Wal-fish Bay, and the east coast to Lorenzo Marquez, and right across the Indian Ocean to Rangoon. If this assumption is correct, it would account for the way in which the German raiders now appear to be seeking this area from other parts of the world. It would be natural for them to do this if their communications outside this radius had failed owing to the destruction of wireless stations beyond the Fatherland.

"The notion of the people in Berlin being able to direct operations at such a distance is almost uncanny. If they do so, no more striking exhibition of the use of wireless in naval war could well be imagined. We may picture Von Tirpitz in his office in Berlin. He receives news of the situation in the Bay of Bengal and realizes the opportunity for a little coup. There is a cruiser a few miles away which has been carefully hidden until some such

chance presented itself. He calls her up and gives information and orders. The raider does the rest."

While Germany and Austria, through their military organizations, surrounded themselves with a wall through which no dispatches were allowed to pass unless the Governments wanted them to, these countries were keeping in touch with the outside world, it was learned recently, independent of the cable lines, by using wireless.

The big German Navy has been pressed into service with its wireless apparatus, and if the Kaiser wishes to communicate with a German Government agency in the Far East, for instance, he can do so by using his warships.

It is said that the German Government sent an important message from Berlin to Hong Kong, relayed from Buenos Aires. From this it is believed that German warships are scattered from the North Sea and Mediterranean through the North Atlantic and South Atlantic Ocean.



What is believed to have been an attempt to wreck the Eiffel Tower wireless apparatus in Paris was made on September 27, according to a dispatch from that city. Out of the dense fog which hovered over the city a German military aeroplane suddenly appeared and dropped its first of four bombs. The bomb missed the tower supporting the wireless apparatus, which transmits war messages to and from the front, and exploded in the Avenue du Trocadero at the corner of Rue Freycinet, killing a man and his child. The aviator turned and might have tried again to hit the Eiffel Tower, but his aim was bad again and the attempt resulted in no further damage than to rock buildings and shatter windows.

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION



In these bustling days when step lively is the slogan of men of affairs, a hurried review of the activities of Lee Lemon, superintendent of the Marconi-Telegraph Cable Company, who has lived up to the spirit of the watchword, speaking both figuratively and literally, should be of interest. During the period when Lemon was a telegraph operator in the employ of the Pennsylvania Railroad, he was detailed at a tower at a considerable distance from his home, being compelled to ride to and from his work on freight trains. Sometimes the trains stopped to let him on and off, but more frequently they did not, and Lemon was compelled to jump. Then began his training in the step-lively school—a training which he continues to apply to his work to-day.

Telegraphy has been the life work of Lemon. He was born in Mifflin, Juniata County, Pa., forty-seven years ago. To Lemon and other boys in Mifflin the operator in that town was not merely a man who handled a key—he was a person of consequence who by some happy chance was able to sit at a desk and keep in touch with the march of events by listening to the click of an instrument. So at the age of fourteen Lemon entered the telegraph service of the Pennsylvania Railroad. He afterwards became an operator of the Western Union Telegraph Company, and was employed in Trenton, N. J., Harrisburg, and at 195 Broadway, New York. He joined the ranks of the Baltimore and Ohio Telephone Company when that company was formed and remained until it was ab-

sorbed by the Western Union. He was appointed chief operator of the Postal Telegraph Company in Indianapolis in 1887. He resigned this post a year afterward, however, to install a quadruplex apparatus

on the Northern Pacific Railroad in Montana. He became manager of the Postal Company in Baltimore, Md., in 1890, also serving as superintendent of the City Fire Telegraph Department. He rebuilt the plant and station while he held this office. He was promoted to be superintendent of the Postal Company in 1899, and transferred to Philadelphia three years later as superintendent of that district.

It was during this period that the disastrous Baltimore fire occurred. For hours the city was cut off from telegraphic communication with the outside world. Repairs to the lines were finally made, however, and messages were exchanged with New York and Philadelphia, Lemon having opened an office in a shop outside the fire lines.

He was made division superintendent of the Eastern Division of the Postal Company, with headquarters in New York City, on January 1, 1909. Four years later he resigned and was engaged in construction work until the early part of this year, when he entered the Marconi service.

Like others active in the radio field, he believes in observing wireless at close range. To this end he has placed a set in his home.

"I believe that wireless offers better opportunities for the man interested in it than anything since the invention of the telephone," is his explanation of how he was attracted to the Marconi service.



THE VOICE

John Aug

Marconi W

*We're two nights out from England,
And steaming fast for home,
But in the head 'phones on my ears
No messages intone.
For awful is the scourge of war,
When proud and mighty ships
Must steal about with voices stilled.
Like thieves with silent lips.*

Missing the cheery buzz of traf'.
I cuss the lagging clock;
I nod; and doze . . . When sudden comes
A rude and chilling shock!
The hum and drone of a distant spark
Pounds hard with nervous stress.
The call that chills the heart to stone—
The beseeching S O S.

A shivering, creeping chill I feel.
That comes with the silent Fear:
I straighten, tense upon my chair,
Pressing 'phones to the list'ning ear;
For he's many, many miles away,
And his spark is almost drowned;
He sounds a call . . . and silence then
Succeeds the awful sound.

I hope with all my power to hope
In that silence so profound;
And, barely breathing, reach the switch,
When my hand drops quickly down,
As in my receiver comes a buzz:
"I'm K S F, hard by."
And he begins to whisper queries
To that lone, despairing cry.

More silence then, for moments long,
While dread gnaws at the heart,
But again through the ether spaces
The S O S calls dart.

F THE NIGHT

Ernest Nash

ess Operator

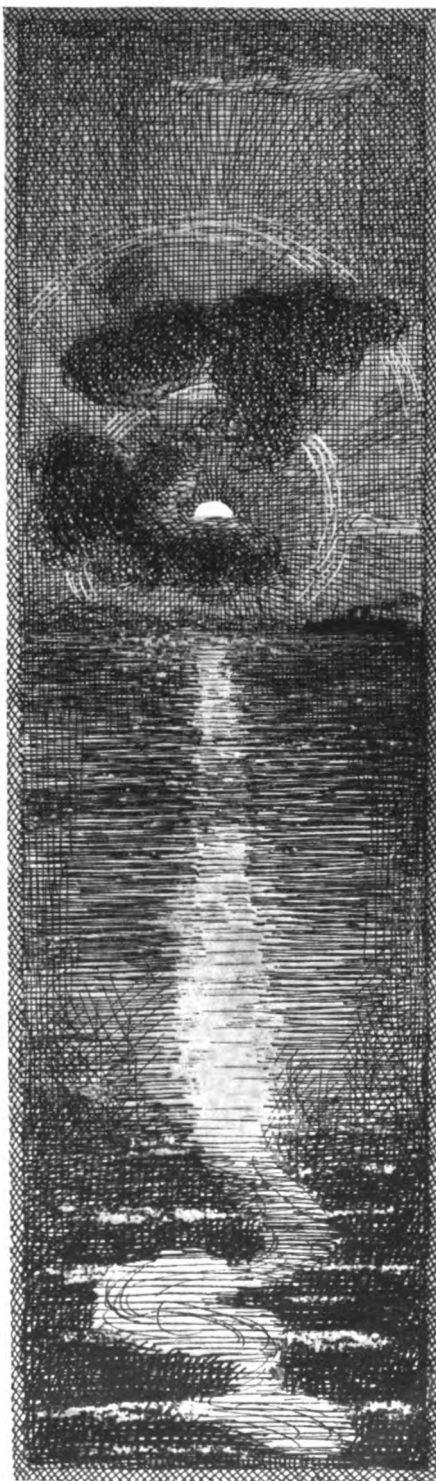
Then I hear his fingers, more composed,
Begin to spell out sense;
And the cool and steady signals
Lift a world-load of suspense.

He's in the Bay of Biscay,
Just where, he can hardly state;
But the ship seems badly wounded,
And he implores us all to wait.
So I turn and 'phone to the pilot-house,
And tell them all I know.
"God help them!" breathes the officer,
"No use for us to go."

"We couldn't, had we twice the speed,
Get over in a day;
The distance that's between us—
Nine hundred miles, I'd say."
Just then that spark zit-zits again:
'Tis a wireless false alarm!
The ship's wound he thought was mortal
Has done but little harm.

"We're all right now," comes the report,
"To Vigo we'll proceed.
But thanks, old man on the K S F,
For standing by in need. . ."
Then the ether filled with buzzing sound
Slips quietly to rest,
And the Kroonland, good old rescue ship,
Plows steadily toward the West.

*We're two nights out from England,
And steaming fast for home,
But in the head 'phones on my ears
No messages intone.
For awful is the scourge of war,
When proud and mighty ships
Must steal about with voices stilled,
Like thieves with silent lips.*



How to Conduct a Radio Club

By E. E. Butcher

ARTICLE VIII

IT is apparent that the problem of "dead-ends" in receiving tuners is becoming a matter of considerable concern among amateur experimenters. It is likewise a fact that the losses from this effect are not so serious as many would have us believe.

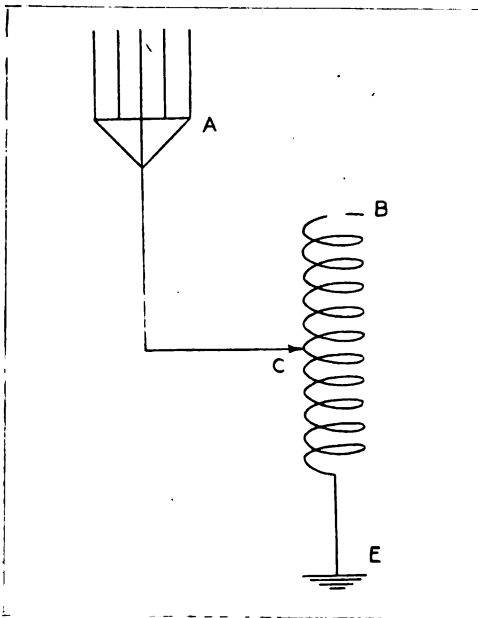


Fig. 1

For the benefit of readers who are not clear on the subject of "dead-ends," a simple explanation may not be amiss. Referring to Figure 1: Let the coil, B to E, represent the primary winding of a receiving tuner and let the circuit, A C E, represent the path of the oscillations in the antenna circuit through the coil to earth. The portion of the coil, C to B, is known as the "dead-end" portion, and is therefore useless if only the amount of inductance shown is necessary for a given wave-length.

It is possible with certain windings that the coil, B to E, may have a natural wave-length of the same order as that of the antenna circuit. For example, A C E may be adjusted to 600 meters, while the coil, B to E, may have the same or nearly the same wave-length. If this is the case, considerable energy will be absorbed by the coil itself, which is equivalent to the extraction of a certain amount of energy from the detector circuit, resulting in a reduction of the strength of signals.

If the wave-length of the coil, B to E, is decidedly different from that of the antenna circuit, the losses due to the "dead-ends" are not so objectionable. Suppose, for example, that for the greater portion of his receiving work the amateur receives from 600-meter stations, and he is interested to

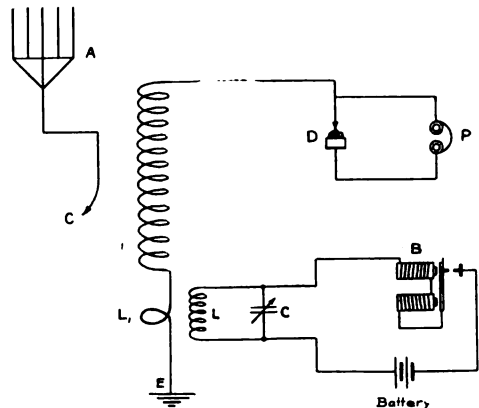


Fig. 2

know whether the "dead-ends" of his receiving tuner are of sufficient proportions to produce energy losses. If so, it can easily be determined whether the wave-length of the coil approximates that of the antenna circuit. It will be understood that if this factor

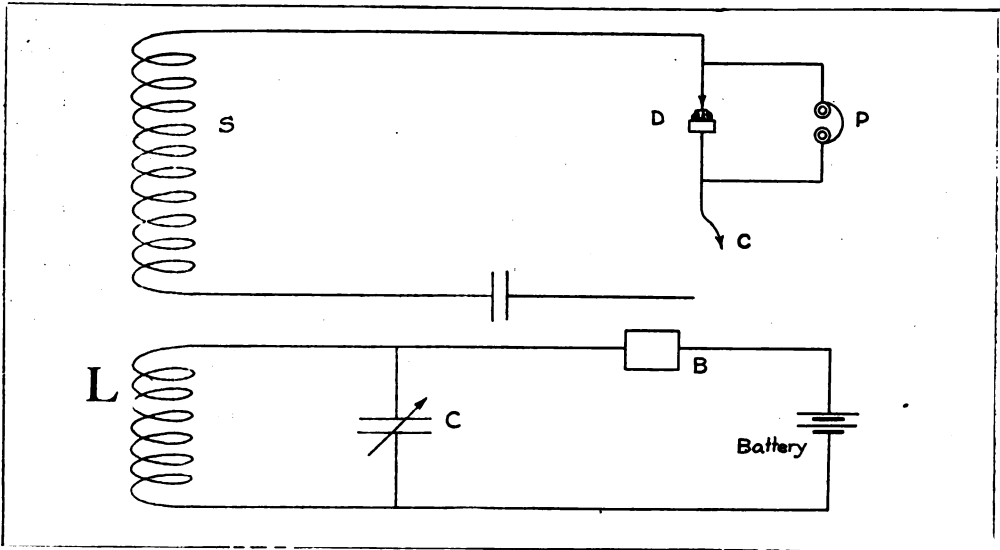


Fig. 3a

is evaluated the amateur may reconstruct his receiving tuner accordingly.

By reference to Figure 2 the antenna connection, C, is removed from the coil, B, a sensitive crystal detector is connected, as at D, and shunted by the head telephones, P. The wave-meter, L C, is set into excitation by buzzer, B, and the battery cells as shown. A single turn of wire, L, is inserted in series with the earth lead for the purpose of coupling with the inductance, L.

The crystal, D, is then adjusted to sensitiveness. The capacity of the condenser is altered until a maximum of response is secured in the head telephones, P. By reference to the wave-length chart accompanying the meter the reading obtained may be taken as the natural wave-length of the coil, B to E. If this value is found to be in the neighborhood of the wave-length at which the receiving is generally done, it is at once evident that a change in the design of the primary winding will be necessary if it is desired to receive signals with the maximum degree of efficiency.

The natural wave-length of the secondary winding may be obtained in much the same manner as per Figure 3a. The detector circuit is broken at C and the head telephones are shunted

around the crystal detector, D. The coil is excited by the wave-meter as in the previous experiment, the capacity of the condenser being altered until a maximum of response is secured. This reading is the natural wave-length of the coil, S. If only portions of the coil, S, in connection with the variable condenser, C, are required (Figure 3b) for wave-lengths of a definite value, say, 600 meters, and the period of the coil itself is 600 meters, some energy

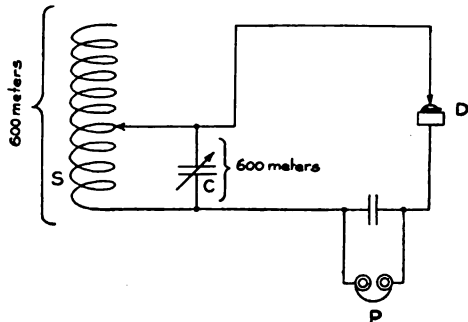


Fig. 3b

losses may be expected for that particular wave-length and it is of advantage to rearrange the design.

The writer does not intend to infer that the energy losses are only present when the coil has the wave-length of the received oscillations, but he insists

that such effects in the average amateur tuner are not violent unless conditions of resonance are approximated.

"Balancing Out" Aerials

It is believed that few amateurs are aware of the results that may be obtained in the prevention of interference through the proper use of "balancing out" aerials. Experiments of interest in this respect may be made in a simple manner. As far as the writer is aware the method to be described

P. If the circuits of either aerial contain variable elements, such as a loading coil or a series condenser, allowing a wide range of adjustment, the aerials, A and B, may be decidedly dissimilar in construction—that is to say, while the aerial, A, may be of standard four-wire construction, the aerial, B, may consist of a single wire of fair dimensions.

The operation of the apparatus is simple and quite self-evident. Suppose, for example, the aerial, A, is ad-

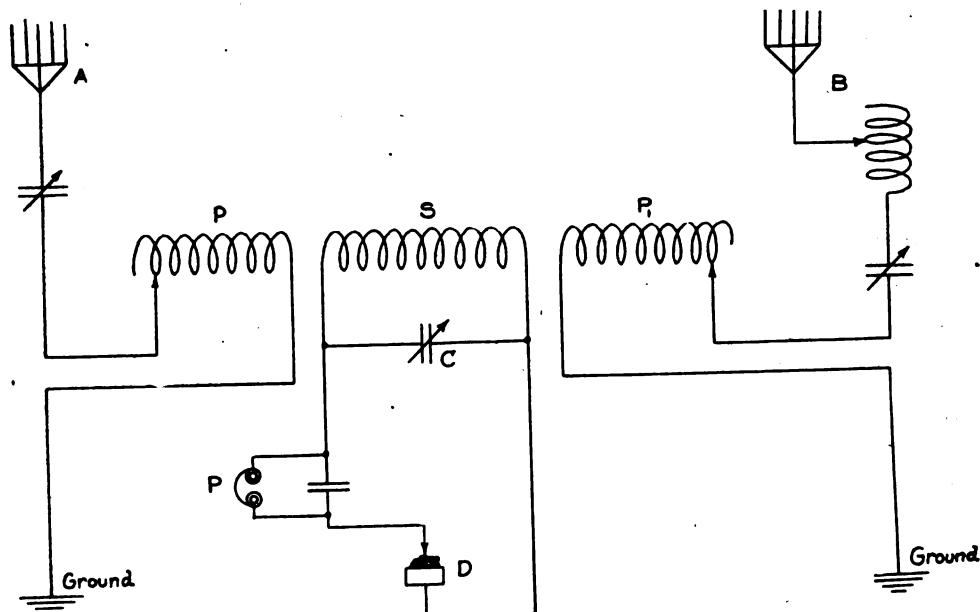


Fig. 4

was first used by the Marconi Company.

Rereferring to Figure 4, A represents the aerial at any amateur station, while B indicates a second aerial which is preferably placed at right angles to the aerial, A, or at least at some distance from it. S is a secondary winding of the receiving tuner, and is preferably a winding of a fixed value of inductance, but should be so designed in connection with condensers, C, as to afford a range of wave-lengths over which it is desired to work. The coil, P, is the primary winding connected to the aerial, A. The coil, P₁, is connected to the "balancing out" aerial, B, and is placed in magnetic opposition to

justed to a wave-length of 600 meters and, due to the nearness of certain high-power stations, interference is experienced simultaneously on a wave-length of 2,800 meters; then the condenser and inductance values of the antenna, B, are adjusted to a wave-length of 2,800 meters and the winding, P₁, is coupled to the winding, S, just sufficiently to destroy the energy of similar wave-lengths set up in the winding, S, by the winding, P. While the strength of signals may be somewhat decreased by this arrangement, it will be found that the 600-meter signals can be heard and the energy from the 2,800-meter interfering signal wholly eliminated. Actual experi-

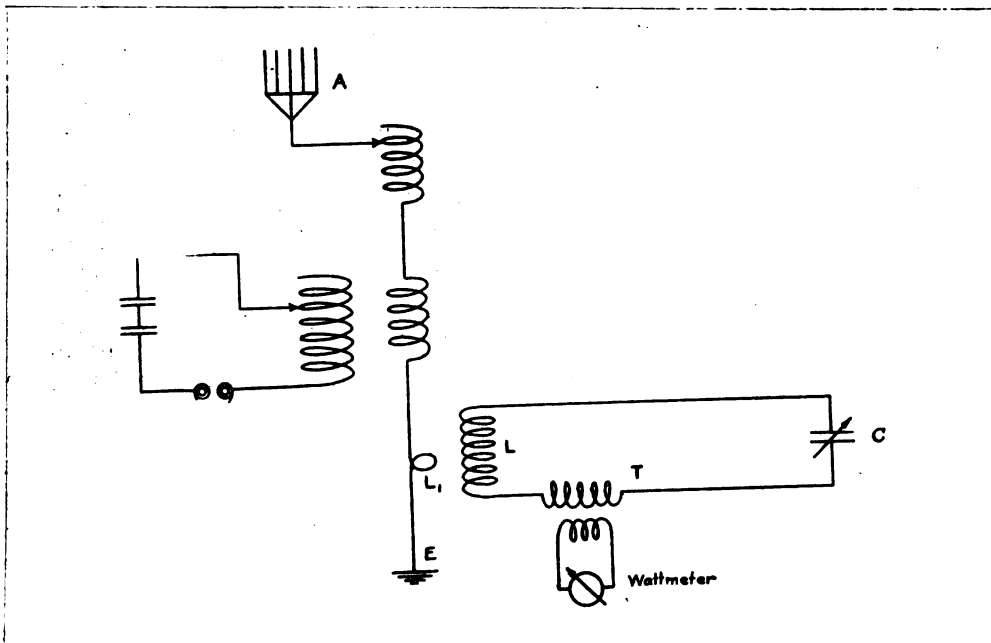


Fig. 5a

ments have proved that this arrangement of circuits, in many cases, allows communication which otherwise could not be accomplished.

Experiments have been made with a more elaborate arrangement where two "balancing out" aerials were used for eliminating the signals from the second interfering station. The coil of the second "balancing out" aerial was constructed to slide over the outside of the winding, S, while the coils, P and P1, at the same time telescoped inside it.

The necessity for having the secondary inductance of the receiving tuner at a fixed value is at once apparent, and if it is desired to work over a wide range of wave-lengths, two or more of such coils having different values must be at hand.

Concerning the Audion

Notes have been received frequently from amateurs using the audion detector containing the complaint that the local telephone circuit seems to require an increase of voltage from day to day until the limit of the cells furnished with the equipment is reached.

This is due to a gradual increase of vacuum, which may be lowered by the application of a small alcohol torch or lamp to one side of the bulb for a few moments; care should be taken that the heat does not increase to such a point as to melt the glass. If a full voltage is left on the telephone circuit while this operation is in process a hissing or musical sound is heard, which indicates that the original condition of the bulb has been somewhat destroyed.

Measurement of the Decrement

An alcohol torch is not absolutely necessary, for the same result can be obtained by several applications of a lighted match. Up to a certain point an increase of voltage in the telephone circuit is of benefit, and if the necessary battery power is available an increase of sensitiveness should result.

An amateur radio organization has requested the writer to furnish a simple explanation of the methods and apparatus in use by commercial companies and government inspectors for obtaining the logarithmic decrement of damping; the organization also asked whether the apparatus required is be-

yond the means of the average amateur club.

The principal pieces of apparatus required are a wave-meter (one of amateur construction will serve the purpose) and a high frequency wattmeter having a range of from 0.01 to 0.1 watts. The latter instrument may be purchased at a price of from \$30 to \$40. The condenser of the wave-meter should have a calibration curve showing the capacity in microfarads corresponding to the scale reading.

When measuring the decrement, the wattmeter is generally connected to the wave-meter, as shown in Figure

smoothness. The capacity of the wave-meter condenser is altered until a maximum reading is obtained on the wattmeter. This is, of course, the point of resonance. The inductance coil, L , is then moved about—that is to say the coupling between it and the antenna coil, L , is changed until the maximum reading of the wattmeter falls (as a matter of convenience) on some even number, say, 0.08 watts. Furthermore, suppose that the condenser capacity corresponding to this reading lies on 130° on the condenser scale, giving a value of a certain number of Mfds. Let this value be repre-

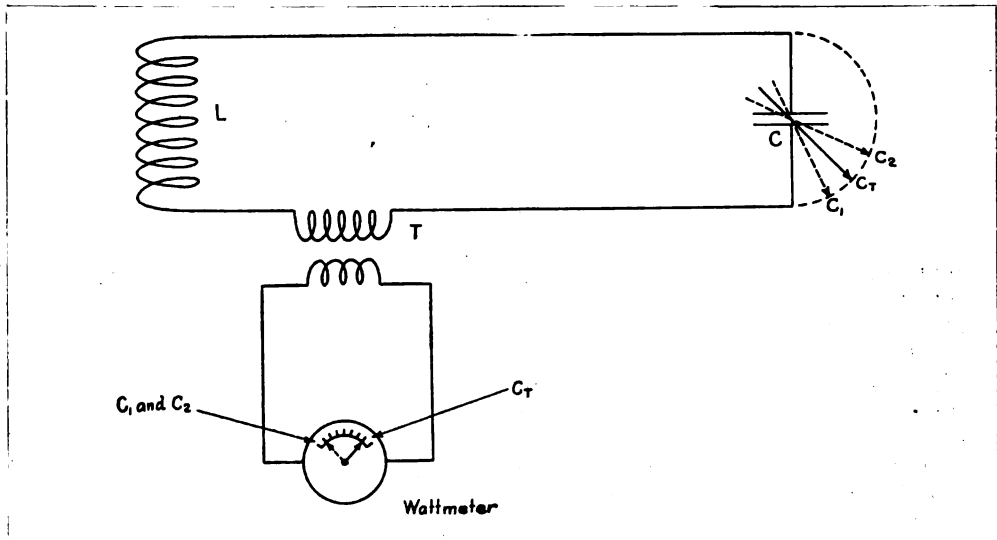


Fig. 5b

5a, where L is the inductance coil of the wave-meter, C the variable condenser, and T a small step-down transformer, which generally has about five turns in the secondary winding and ten turns in the primary. The latter winding is connected in series with the condenser and inductance of the wave-meter. The wattmeter should be connected with the transformer as shown. As it is a sensitive instrument care should be taken not to place the coil of the wave-meter too near the antenna circuit to be measured or the wattmeter may be burned out.

The key of the transmitting set is then held down continuously and the spark gap adjusted for clearness and

resented by C_r . The pointer of the condenser is then placed at some point above 130° where the wattmeter registers just one-half the reading at resonance, viz., 0.04 watts; let the capacity corresponding to this reading be represented by C_1 . The pointer of the variable condenser is then moved to some point below 130° , where the wattmeter reading again drops to 0.04 watts. The condenser capacity corresponding to this reading may be represented by C_2 .

We then substitute these values in the following formula:

$$\text{Total decrement} = \frac{C_1 - C_2}{C_r} \times 1.57$$

(Continued on page 152.)

IN THE SERVICE



Defining certain activities is difficult, but it may truthfully be said of William B. Vansize that he is a legalized telegrapher. To which must be added that he is a lawyer and also a wireless man.

Furthermore, he employs his radio-legal ambidexterity effectively as the patent attorney for the Marconi Wireless Telegraph Company of America.

A glance over the history of the Vansize family reveals that the subject of this sketch was born in Utica, N. Y. He received his early education in the schools of that city and then cast his eyes about for a chance to make himself felt in the working world. Telegraphy appealed to young Vansize as a vocation and he applied himself to the task of mastering it, with the result that in March, 1870, he obtained a position as operator in the Western Union telegraph office in Oneida, N. Y.

Vansize developed considerable skill as a telegrapher during the following year, but he also developed something which was to stand him in good stead in the future—character. This showed itself in a restless ambition which hadn't even a bowing acquaintance with difficulties and discouragements. What Vansize wanted he went after by direct methods without quibbling or useless circumlocution. It occurred to him that a knowledge of shorthand would be an excellent asset, and he accordingly set about attaining his object by expending the required amount of dynamic energy. This was one of the steps leading to the goal which he eventually reached, for

when he went to Albany as a telegraph operator in 1875 he found his services as a shorthand writer in occasional demand by lawyers.

Personal contact with some of the brilliant men of the Albany legal profession served as a spur to Vansize's ambition, and in 1877 he entered the Albany Law School. His studies were not pursued under conditions which enabled him to lead a life of ease, however; he held a "trick" as a telegraph operator and gave attention to the law outside of working hours. In May, 1879, he was admitted to the Bar and left Albany for New York City. He was connected at various times thereafter with the legal departments of the Western Union Telegraph Company and Atlantic & Pacific Telegraph Company. He subsequently became a member of the patent department of the American Bell Telephone Company, of which Theodore N. Vail was general manager. When the latter established the Electrical Accumulator Company Vansize became the patent attorney for that company. He conducted the suit of the company against the Julien Electric Company to determine the question of the infringement of the Julien battery and the validity of the Faure and Swan patent, the case being decided in favor of the plaintiff.

Mr. Vansize sums up his reasons for being attracted to the wireless field in this terse statement:

"Wireless looked like a live thing—in fact, like the biggest and most vital thing in the electrical world to-day—that's all."

From and For those who help themselves

Experimenters' Experiences.

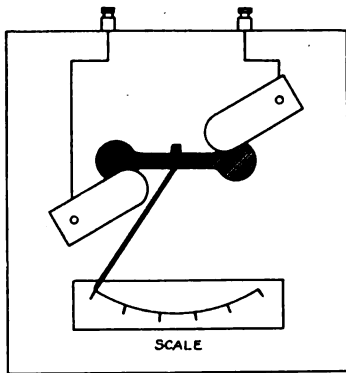


FIRST PRIZE, TEN DOLLARS

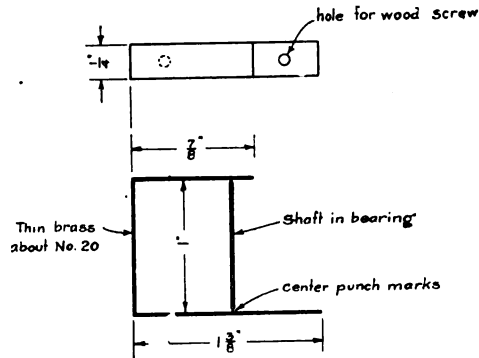
The Electro-Static Voltmeter, and Some of Its Applications

An electro-static voltmeter is one that depends on the repulsion or attraction of two surfaces carrying electro-static charges. In its most common form it consists of two fixed quadrants or vanes connected to the source to be measured, with a light vane swinging in between. At any instant,

quadrants, each of which is made of two flat pieces of the same material, separated so that the vane passes between them. When the pointer is at zero, the vane should be slightly under the quadrants. The shaft is made of a small steel rod pointed at each end. The vane should be forced on the shaft and two clamps also forced on, so as to make the shaft perpendicular to the vane. A small dab of thick shellac will hold the pointer, vane and shaft to-



General Arrangement



Bearing

Drawing, First Prize Article

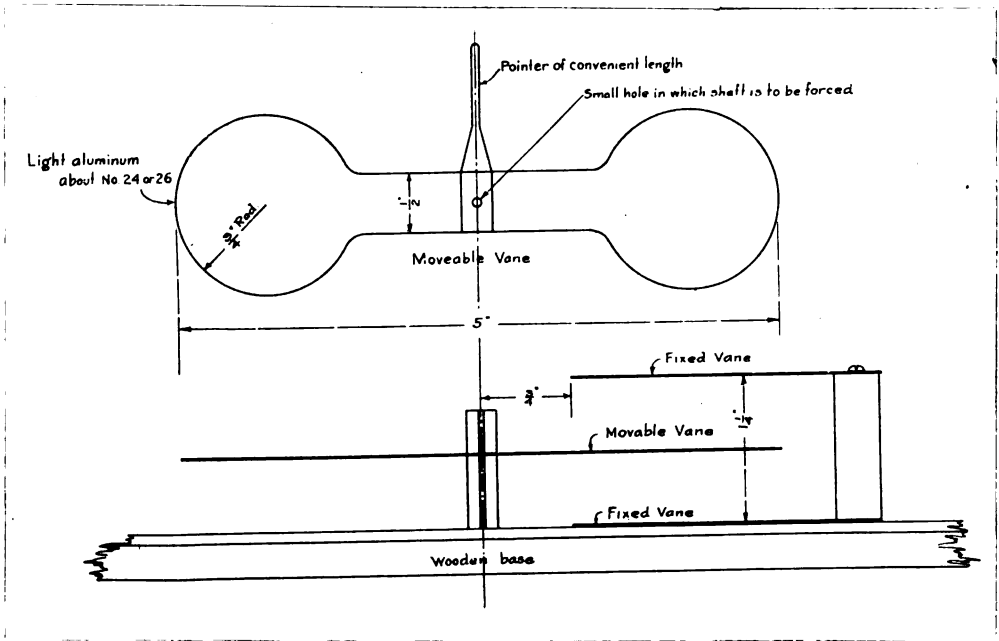
the two quadrants having opposite polarities, will induce charges of the opposite sign in the light vane, which will be attracted under the quadrants. These instruments are usually controlled by gravity and must be used in a fixed position.

An instrument of this type can easily be made by any amateur, and can be used for many purposes. One constructed by the writer will be described.

A light vane made of aluminum is arranged to swing under two fixed

gether, as no strain is applied. The whole movement should be as light as possible and swing without friction.

The bearings can be made by bending a small strip, as shown in the accompanying sketch, and placing center punch marks to serve as jewels. When the two fixed vanes are connected to a source of high potential, the movable vane will be drawn up under them. The instrument can be calibrated by means of a needle spark-gap, or by connecting to a circuit the pressure of which is known. By connecting a con-



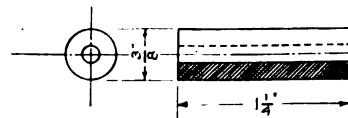
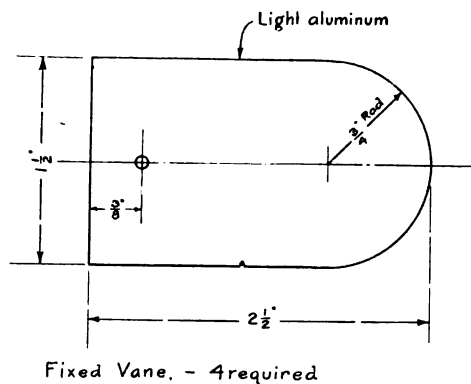
Drawing, First Prize Article

denser in series, the range of the instrument can be greatly increased, as the vanes form a condenser of small capacity and the impressed E.M.F. divides inversely as the capacities.

One of the best uses of the voltmeter is to set the secondary of the wireless transformer and the transmitting condenser in resonance. If this condition is obtained, the range of the set may be

materially increased and a better spark will be had. For resonance to take place it is necessary that the inductive reactance in the circuit be neutralized by the capacity reactance. Reactance is the resistance offered to the passage of an alternating current due to inductance of capacity; it varies with the frequency and is measured in ohms.

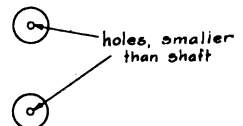
When resonance takes place, the only



Metal separators.
(washers may be used)

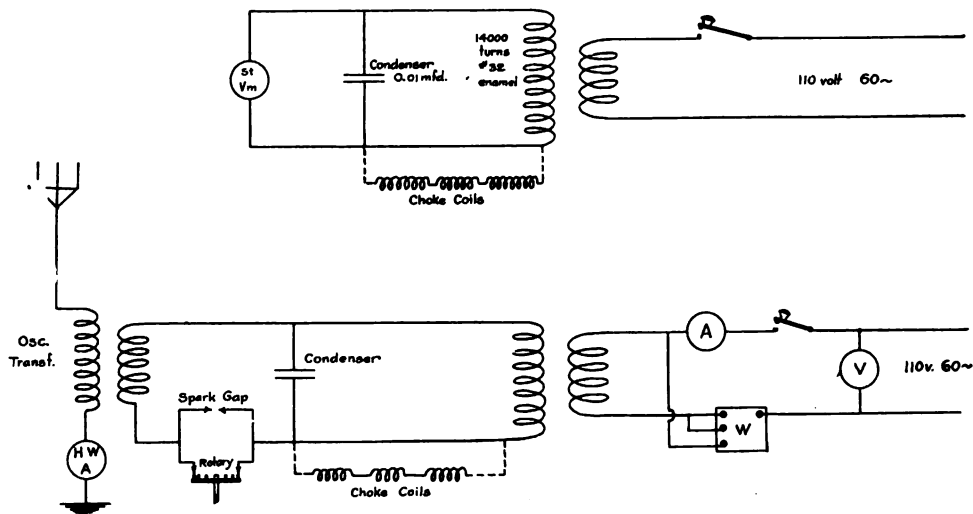


Shaft.



Clamps
to fasten movable
vane to shaft.

Drawing, First Prize Article



Drawing, First Prize Article

thing that limits the current is the resistance due to the wires in the coils, and the current increases greatly. The reactance of the condenser itself has not been changed, and this larger current causes a rise in voltage across it.

If the voltmeter is connected across the condenser in such a circuit and the inductance changed by placing choke coils in series, the voltmeter will generally show an increase in voltage as the choke coils are added. If the voltmeter shows a decrease, there is already too much inductance, and the condenser should be made smaller.

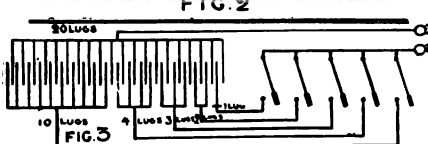
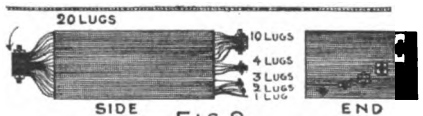
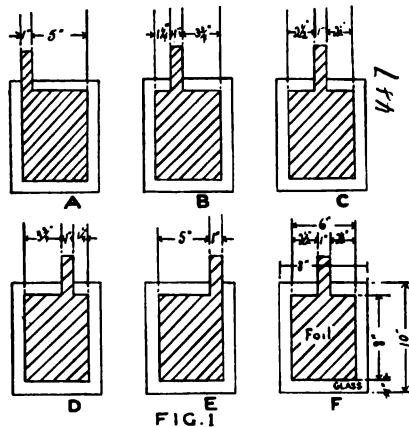
The writer has a transmitting set consisting of a home-made closed-core transformer with a magnetic leakage gap, rated at $\frac{3}{4}$ k.w. A rotary is generally used which runs 3,600 revolutions per minute and has 14 points on a 10-inch disk, thus breaking the spark up into 840 groups per second, corresponding to 420 cycles. The aerial is 60 feet high, 120 feet long, "T," two wires, 7 strands No. 22 copper wire. Last winter we were heard in Toronto, 350 miles, using about 800 watts.

The following data may be of interest to some one making the resonance adjustments described previously.

Transformer voltage, only, 9,000 volts.

	Voltage Across Condenser
Adjustment.	
No. 1. Condenser only.....	13,300

- No. 2. 1,000 turns No. 32 on 7 sq. in. core18,000
- No. 3. 2,000 turns of above coil.....21,600
- No. 4. Magnet coil, 1,000 turns No. 26 in series22,500
- No. 5. Another magnet coil, 500 ohms No. 34 in series22,800
- No. 6. Similar coil in series also.....23,500



Drawing, Second Prize Article

It is believed that the resistance of these choke coils prevents the current

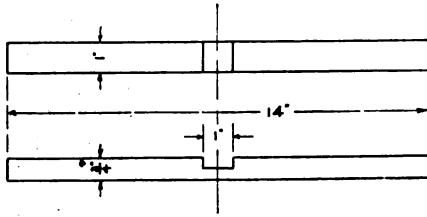


Fig. 1, Third Prize Article

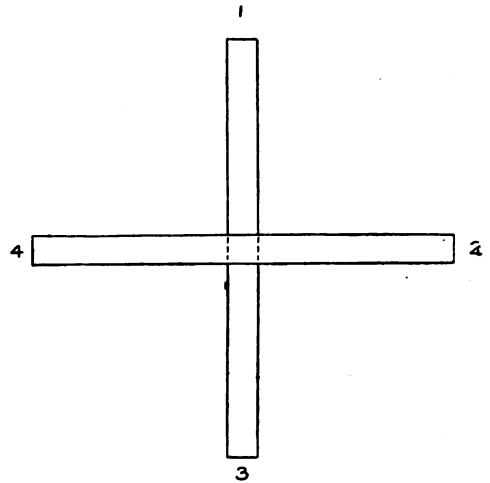


Fig. 2, Third Prize Article

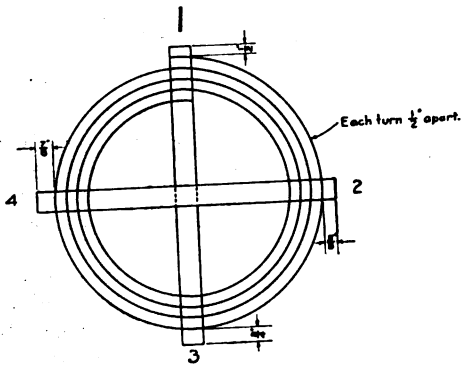


Fig. 3, Third Prize Article

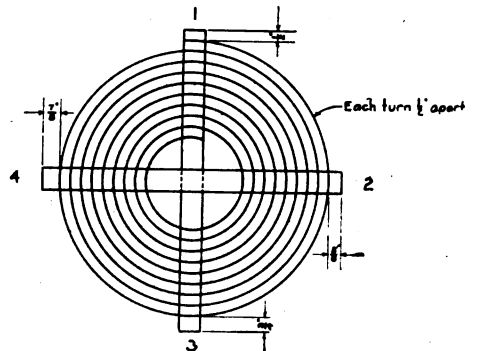


Fig. 4, Third Prize Article

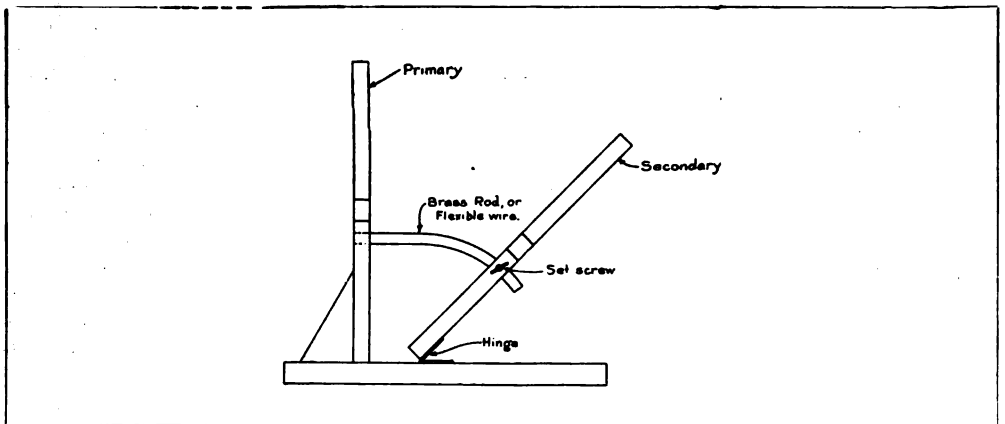


Fig. 5, Third Prize Article

rising to the true resonance value. If the writer possessed a choke coil that had low resistance and high reactance at 60 cycles, the rise in voltage might have been greater. However, the voltage was raised from 13,300 to 23,500 by inserting choke coils in series.

The next set of readings are those of a test of the transmitting value of these former adjustments when hooked up to a spark-gap and aerial. It will be seen that when the rotary is used the power-factor of the transformer is very poor, while the radiation is good. These tests were made on the low power tap of the transformer.

Adjustment.	Volts.	Amps.	Watts.	P. F.	Radiation.	Remarks.
No. 1	103	10.6	585	.535	3.0 amps.	Rotary gap.
	"	9.3	720	.75	2.1	Straight gap.
No. 2	104	7.8	600	.74	2.5	Very long gap, poor spk.
	"	88.2	540	.635	2.3	Short gap.
No. 3	"	7.2	400	.535	1.6	Short gap.
	"	7.8	720	.89	2.65	Long gap, good spk.
No. 4	"	77.7	700	.87	2.5	Long gap, good spk.
	"	7.0	500	.69	2.35	Short gap, poor spk.
No. 5	"	7.8	700	.86	2.65	Long gap, fine spk.
No. 6	"	7.7	680	.85	"	Long gap, fine spk.
	"	7.0	500	.69	2.4	Short gap, higher note.

Wave length 200 meters.

When these adjustments were tried on the rotary, the results were very unsatisfactory. It is thought that the circuit must be set in resonance for the rotary frequency and experiments are now being made to determine this. However, it will be well worth the time spent for amateurs to construct the voltmeter and try the effect of choke coils, even if they are using a rotary. It is not necessary to calibrate the voltmeter for this purpose, as comparative values only are needed.

H. R. SEARING (address not given).

SECOND PRIZE, FIVE DOLLARS A Design For an Efficient Condenser

No doubt many sets prove inefficient more through losses brought about by a poor condenser than from any other source; these losses in some stations amount to as much as 33 1/3 per cent. of the total energy. Why not save this lost energy by building the condenser right in the first place?

From any large photographer procure forty used plates, 8 by 10 inches. He will give you all you can carry away. These plates are particularly suited for this purpose, as they are absolutely free

from flaws. Remove the film from the plates as explained by F. C. Beekly in "Advice From Amateurs" in the September number of THE WIRELESS AGE. These plates may seem small, but they allow the use of 6-inch tinfoil, which is much easier to procure than larger sizes.

Between two and three pounds of tinfoil will be needed, as the lugs and plates are to be cut in one piece. Cut the pieces 6 by 8 inches with a lug 1 inch wide and 3 inches long, on one end. Alternate these lug ends so that on adjacent plates the lugs come out at opposite ends of the pile of plates. The first lug should be placed as at A (Figure 1); the next

two as at B (Figure 1); the next three as at C (Figure 1); the next four as at D (Figure 1); the next ten as at E (Figure 1), and the remaining twenty as at F (Figure 1).

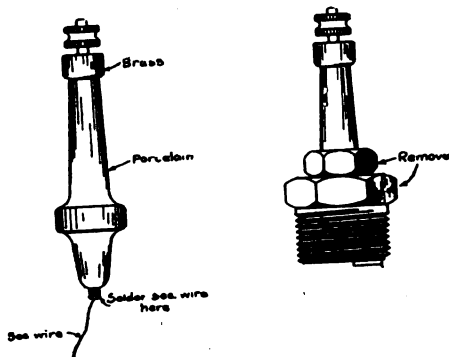
The glass plates are now thinly coated with vaseline; the plates of tinfoil are placed on the glass so as to clear the edges by 1 inch all around, and the foil is rolled tight to the plate. The vaseline makes an excellent adhesive for this purpose, and, as it does not harden, all of the air is easily expelled from underneath the tinfoil. When the foil is rolled tight, coat the entire plate with about 1/16 of an inch of vaseline. Treat the remainder of the plates in a similar manner. Now pile up the plates so that at one end twenty lugs appear at the center, while at the other end there are five bunches of one, two, three, four and ten lugs each, respectively. These bunches of lugs must come from consecutive plates and be on the same part of the plate. The pile should appear as in Figure 2. Compress the pile and tape it together.

Build a box of oak (5/8-inch stock) 10 by 14 by 5 inches (outside measurements). Miter or rabbet the corners.

glue the bottom one, and fasten the top on with nicked round-headed brass screws. The box may be filled and varnished, or just shellacked, as preferred. It should be well shellacked inside, how-

plates from 1 to twenty can be cut in by closing the proper switches. For instance, if seventeen plates were desired, the switches connected to the bunches 3, 4 and ten plates would be closed, and so on. The vaseline practically destroys the brush discharge and furthers the general insulation. This condenser is designed to be used on any coil or transformer up to and including 1/2 k. w.

E. C. ERIKSEN, California.



Figs. 1 and 2, Fourth Prize Article

ever. On one end of this box a hard rubber or fiber plate 1/4 by 4 by 9 inches should be fastened. On this plate mount five 15-ampere S. P. S. T. knife switches and two large binding posts. The lugs of the condenser should be connected as in Figure 3. One end of every switch

THIRD PRIZE, THREE DOLLARS An Efficient Type of Oscillation Transformer.

This is a description of an efficient type of oscillation transformer, that allows very sharp turning with a minimum of energy. It can be used on sets from the smallest size up to 1 k. w. It has the added advantage that all points on both coils are quickly accessible, furthermore, it does not require much space and limits the wave-length to amateur use.

Brass strips of soft copper ribbon

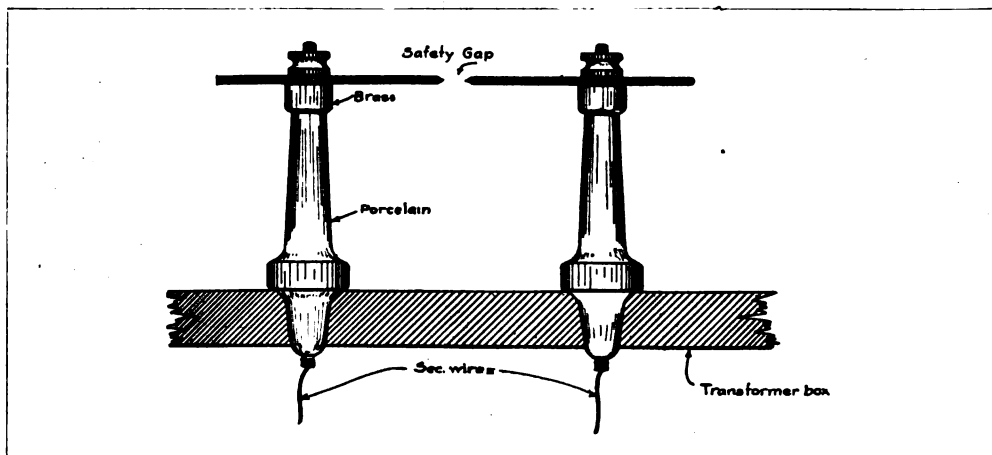


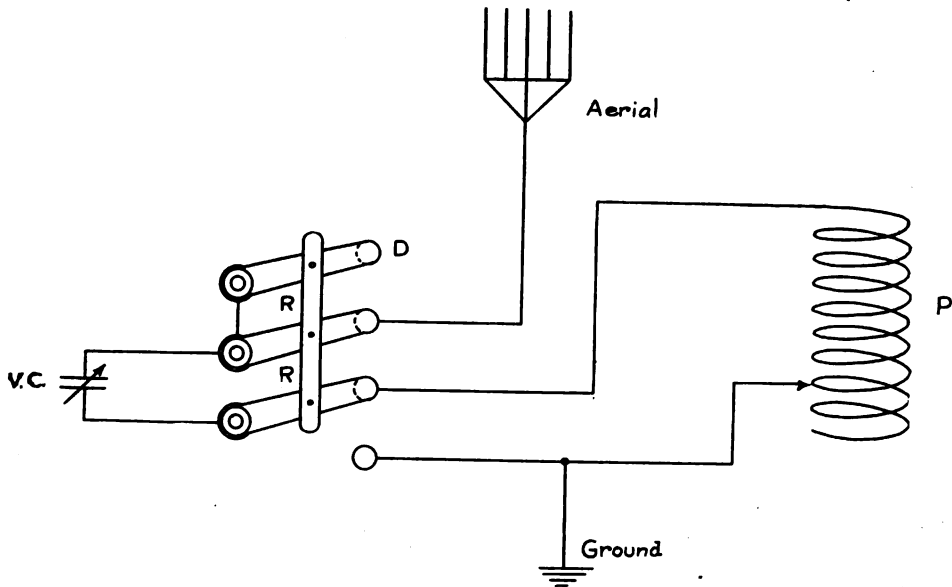
Fig. 3, Fourth Prize Article

should be connected to one of the binding posts by a copper bus-bar. The five other ends are connected to the five bunches of lugs 1, 2, 3, 4 and 10 in order. The lugs at the other end of the plates are all connected together and to the other binding post. The case should now be filled with a good grade of transformer oil.

This about completes the construction. By this arrangement any number of

are used in the construction of both primary and secondary. A total of about 36 feet will be needed for both coils.

Obtain four strips of well-seasoned wood 14 inches long, 1 inch wide and 3/4 inch thick; join them as shown, with half joints at the centre. Mark numbers one to four on the ends of each set of cross pieces as shown so that when the two sets



SWITCH THROWN FOR SHORT WAVES

Fig. 1, Honorable Mention Article, Joseph M. Dean

are put together again, the outside ends will be in consecutive order. The slots are exactly $\frac{1}{2}$ inch apart, 5-16 inch deep and 1-16 inch wide; they are laid off beginning $\frac{1}{2}$ inch from the outside starting on the strip numbered one, and continuing around in order. Each slot in turn is $\frac{1}{8}$ inch nearer the centre than the one before. This forms a gradual spiral free from all unevenness when the pieces are set up in proper order. Both sets of cross pieces are slotted in the same manner, but the primary has slots for four turns, while the secondary has nine turns.

A 5-16 inch hole is bored in the centre of each set of cross pieces. The cross pieces should not be stained on account of the danger of high voltage leakage. They should preferably be boiled in paraffine and then covered with two coats of shellac to which a small quantity of burnt bone dust has been added. If inconvenient to boil in paraffin the cross pieces should be given two or three coats of shellac and bone dust.

Before winding the brass or copper ribbon it should be polished with a piece of emery paper. The winding

is started from the inside, and as the ribbon is hammered gently into the slots, it is well to see that the spiral is symmetrical. The projecting ends are then cut off close to the last slot.

A base can be made of any suitable size, but it is preferable to have it small and have it screwed to the wall facing the operator. The two completed coils are then suitably fastened to the base, the movable one to be arranged with a hinge to allow for movement. Suitable clearance should be allowed between them in order to permit the moving without having the ends interfere with one another. One leaf of the hinge is fastened to the base and the other to the back of the cross piece on the movable coil. The support for the primary coil can be made of a right angle piece of wood fastened to the back of the cross piece.

After the primary is fixed solidly a $\frac{1}{4}$ inch brass rod is passed through the hole in the centre. After being fastened by nuts on the outside, it is then bent in a curve, taking the same arc as that taken by the hole in the primary when it moves downward from an upright position. The sec-

ondary is then slid, or rather swung, onto the rod and fastened in the most advantageous position which can only be found by experimenting. In view of the difficulty which may be experienced by some amateurs in bending a piece of 1/4 inch rod accurately enough to allow the secondary to swing as desired, an alternative method for gaining the same result is as follows:

Place a spacer between the spirals so that they cannot touch each other then fasten a flexible wire to the swinging spiral at the center and pass

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE
A High Potential Terminal for Amateur Use.

The following is a description of a potential terminal I have designed for amateur use:

The terminal is made from an old spark plug, as shown in Figure 2. The nuts are removed, and it leaves the plug as shown in Figure 1. Holes are bored in the transformer box and the plug put in as shown in Figure 3. The

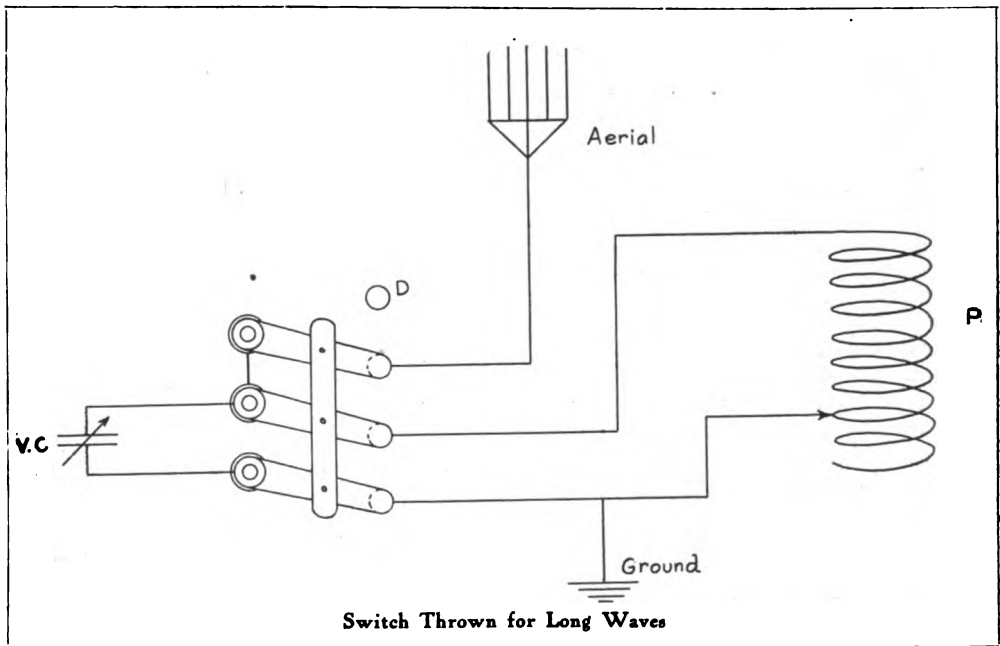


Fig. 2, Honorable Mention Article, Joseph M. Dean

it through the hole in the centre of the stationary spiral. The secondary winding can then be held in position by a clamp on the wire back of the stationary spiral.

The contacts from a D. P. D. T. switch will do for the connection clips, two for the primary, and two for the secondary. Although this instrument may not increase the range to any appreciable extent, yet it insures a wave of pure form fully complying with the United States regulations.

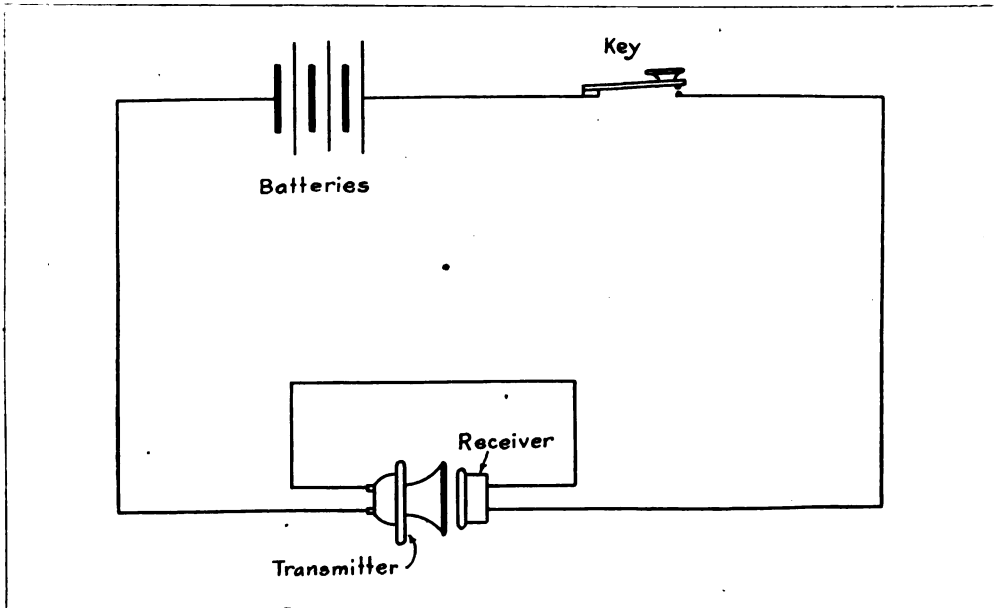
C. FOGLER OUDIN, Massachusetts.

small secondary wires are soldered to end of wire going through center of plug.

O. E. COTE, Rhode Island.

HONORABLE MENTION
Simple Switch for a Shifting Condenser

This article is accompanied by a sketch of a novel switch arrangement. It is well known that in order to receive waves shorter than the natural period of the aerial, a condenser must be inserted in the lead from the aerial



Drawing, Honorable Mention Article, Earl C. Hanson

to the primary of the receiving oscillation transformer, and it is also well known that if a condenser is shunted around the primary of the receiving transformer, somewhat longer waves may be received.

In order to make this change quickly a switch like the one described may be used with great satisfaction. Referring to the diagrams, V C is the variable condenser, P is the primary of the "loose-coupler," and G is the ground. R R is merely an insulating rod pivoted to the switch arms. The switch handle is fastened to this rod. D is a dead point and is used only for the end arm to rest upon, while the switch is thrown to the left. Figure 1 shows the switch thrown for short waves, and Figure 2 shows the switch thrown for long waves.

JOSEPH M. DEAN, Iowa.

HONORABLE MENTION

A High Frequency Device for Code Practice

I have seen numerous descriptions of high-pitched buzzers from time to time, but they all possessed the disadvantage of using contacts which invariably cause considerable trouble and require periodical attention. The ac-

companying diagram describes and explains the making of a high frequency device to be used for code practice.

Mount on any suitable base a telephone transmitter and receiver, facing each other but not touching. Connect the transmitter, receiver batteries and telegraph key in series and you have the ideal high-pitched buzzer without trouble from movable contacts.

The note derived resembles the characteristic spark used by the Marconi Company. No adjustment is necessary to this apparatus if the note remains constant during the test.

EARL C. HANSON, California.

NOTE.—The phenomenon accompanying this action has never been fully explained, but it may be demonstrated on any telephone transmitter and receiver. If the receiver is struck against the transmitter and then slightly separated from it, a loud musical sound is produced which resembles a high frequency alternating current spark.—Technical Editor.

A NOVEL DETECTOR

A novel feature of a combination perikon detector made in Albany is the cat-whisker, which is interchangeable with either cup and enables the operator to use any mineral requiring a brass spring contact, such as silicon, galena and ferron.

Comment and Criticism

The following communication from an amateur should be of interest:

The first question of C. M. W., Jr., of Hampton, Va., in the Queries Answered Department of THE WIRELESS AGE interested me because I have had a similar experience. I could come to only one conclusion, and it is that conclusion which I offer as a possible solution.

When installing my first receiving set I made the joints rather carelessly. After the set had been in operation for about a year, I noticed that some of the stations within fifteen miles could occasionally be heard when the detector point was not in contact with the mineral. The mineral could be removed and the point, a gold stickpin, very lightly touching the partly oxidized nickel-plated zinc connecting strip, would detect signals. Again, the detector was short-circuited and still signals came in, quite weak, of course. I found three loose connections, any one of which, if short-circuited, would not act as a detector, but when all three were undisturbed the detection took place. One loose joint was between the telephones and loose-coupler, the other two in series between the detector and loose-coupler secondary.

The only conclusion to which I could come was that the nickel or zinc oxide in one case, and the copper oxide or possibly sulphide in the other, acted as detecting agents. I suggest that C. M. W., Jr., try to eliminate all loose joints in both his antenna and connecting wires and then see whether the "phenomenon" still occurs.

S. G. D., Newark, N. J.

It is just possible that one of these high resistance joints possessed the properties of rectification and therefore signals of fair intensity could be heard the same as with any detector.

* * *

The "fading" or "swinging out" of wireless telegraph signals from certain stations has long been a topic of much discussion. The following communication from an amateur brings up some interesting points:

I have recently been very much interested in observing a peculiar effect. It is somewhat similar to that spoken of by M. F. in the Queries and Answers Department in the June issue.

What I am speaking about is liable to appear on any night, mostly summer, as far as I have been able to ascertain. For instance, when WCX has been repeating the weather bulletin received from Arlington, the signals

would come in fine for a short period and then suddenly fade out, and then in about twenty or thirty seconds, they would gradually come in and soon regain their normal intensity. I also noticed that if the buzzer test was operated while the station was inaudible, the act of operating the test would bring the station back to normal intensity again. I have noticed this on open spark ship stations, as well as VBE (Sarnia) and WDR (Detroit). M. F. says he has noticed this effect on stations using the rotary gap. It has occurred at every amateur station in the vicinity, as far as I can learn.

The answer given in the Queries and Answers Department states that this effect would not be observed if the receiving station was in the daylight range of the sending station. Would you not consider an amateur in Toledo within daylight range of Cleveland? Has there been any data collected upon this subject that you could publish? As this phenomenon has been observed in the summer and within the daylight radius of the sending station, I wondered if this was merely a continuation of the effect or something totally different? Can you explain it?

W. K. W., Toledo, Ohio.

Whether an amateur's station at Toledo, Ohio, is in the daylight range of Cleveland depends entirely upon the efficiency of his equipment. Does our correspondent mean to infer that he is able to hear the signals from Cleveland in daylight? If so, our previous statement in connection with this phenomenon must be modified. If, however, the signals from the Cleveland station die out and then are suddenly restored by excitation from the buzzer, it is positive proof that the trouble lies in the detector itself.

Our correspondent may make an interesting experiment. Let him adjust his silicon, galena or perikon detectors to a maximum degree of sensitiveness and then suddenly breathe upon the crystals. He will find that the moisture will have a decidedly adverse effect upon the sensibility of the detector.

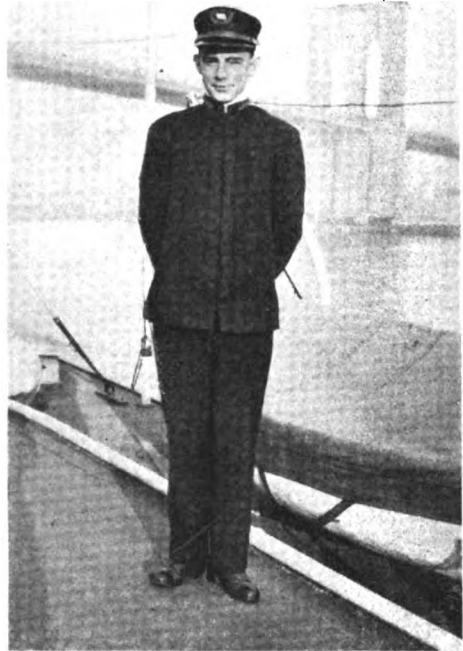
If the crystal is slightly heated up by placing an incandescent bulb near it, its original sensitiveness will be restored. Crystal detectors do not hold their adjustment day in and day out; they require periodical readjustment. It may be possible that our correspondent's re-

(Continued on page 152.)

*Operator Fleming,
who gave his life to
save another.*

Two Heroes

The Noble Conduct of
Young Men New
in the Marconi Service
Lost in the
Wreck of the
Francis H. Leggett



WHILE the hostile armies of Europe are trying to annihilate one another with all the modern means of warfare, the wireless men are waging battles with the perils of the sea. And whether it be victory or defeat that is recorded there is always written the annals of brave deeds performed by the men of the key under circumstances that would try the most courageous. The story of the sinking of the steam schooner Francis H. Leggett contains an example of self-sacrifice that will live long in the memories of those who follow acts of valor. Clifton James Fleming, the young senior operator on the doomed craft, was clinging to some floating wreckage when he saw a woman struggling in the water. The bit of wreckage would not support two, but it would hold one above the water. So Fleming, knowing that he was going to his death, deliberately relinquished his grasp and gave up his place to the woman.

Harry F. Otto, the junior operator, remained on the ship as long as there was

opportunity of rendering assistance, winning a place among the wireless men who died in fulfilling their duty.

The Leggett, which was owned by the Hicks-Hauptman Navigation Company of San Francisco, was bound for that city with a full passenger list and a large cargo of lumber. She steamed away from Portland, Ore., on September 12, and reached Aberdeen on September 16. On the evening of that date she left Aberdeen. She experienced no serious weather trouble until she had cleared Grays Harbor. Then she ran into seas which tossed her here and there and battered her unmercifully. However, she arrived off the mouth of the Columbia river at eight o'clock the next morning in such condition that among those on board there was no thought of real peril. This was indicated by the marconigram which was sent from her at that time, reporting all on board well.

But on the next morning—the 18th—the effects of the pounding she was receiving began to tell. Captain Charles

Maro, the commander of the vessel; saw the danger and took measures to protect the passengers and crew. He ordered the cargo jettisoned in the hope that when the load of the vessel was lightened she would ride the waves more easily. This was to no purpose, and the seas broke over the craft continually.

The ship labored on through the seas, but her fate was not sealed until she was struck with terrific force by a large wave which washed over the decks and tore open a hatch, allowing the water to pour into the hold. Then preparations were made to launch the lifeboats. Reports of the wreck declare that Captain Jens Jensen, a passenger, took charge, Captain Maro, it is believed, having been washed overboard.

Two boats were launched, one containing two women and four men, and the other containing four women and their husbands. As the second boat was being made ready for launching several men rushed for it, but Captain Jensen ordered them to fall back, declaring that he would shoot the first man who stepped aboard until all the women had been cared for. The effort to use the lifeboats was useless, however, for as soon as they struck the water they were capsized and their occupants were lost.

In the meantime the water had been pouring through the hatch in great torrents, and soon the Leggett began to list. Then she lurched suddenly and capsized, before even the majority of those on board had an opportunity to jump into the water and try to get out of the suction caused by the sinking vessel.

Alexander Farrell, of Sacramento, Cal., was on the bridge and was carried down by the suction of the ship. When he came to the surface he was pulled to safety on a railroad tie by Operator Fleming, who remained on board the Leggett until the last, and was among some thirty persons afloat on wreckage after the vessel sank. These persons disappeared one by one, until only Fleming, Charles Pullman, a member of the crew, and three women were left.

One of the women lost hold of the wreckage which was keeping her afloat and was washed against Fleming. He helped her to grasp the tie which he was gripping, and then, realizing that it would not support both, let go and sank.

Little is known of the circumstances surrounding the death of Junior Operator Otto. The reports of the wreck do not say that he was near Fleming, so it is believed that he was carried down by the suction of the ship.

Clifton James Fleming—Clifton he was called—was a studious boy. He was born in Portland, Maine, February 2, 1897. He attended the public schools of that city until eight years of age, then after a period of eight months spent in California on a visit he returned to Kennebunk, Maine, and continued his studies, reaching the second class in the High School, October, 1912.



Harry F. Otto, junior operator, is believed to have been carried down by the suction of the ship. Young Otto was a well known schoolboy athlete and at one time made several daring flights in an aeroplane of his own construction, shown in the photograph below. Forced by his father to abandon aviation after a slight accident, he devoted himself to wireless and entered the commercial field two weeks before his death.



At the age of twelve years he became interested in wireless and became proficient without receiving knowledge from outside.

By doing remunerative odd jobs he earned sufficient money to buy his own set. He secured his first position on the freight boat Pequonick, December 12, running between New Bedford, Mass., and New York; then he was detailed on the Concord, plying between Providence and New York. At the age of fifteen Fleming took his examination at the Brooklyn Navy Yard, and received a first-class license. For a year and a half he served on the Concord of the Colonial Line, leaving to go to California. On the 15th of August, after six weary weeks of untiring effort to engage himself, he went on the Francis H. Leggett and after one trip was promoted to first operator.

Harry F. Otto was born in Lawrence, Mass., January 19, 1895, his parents being natives of Germany who had been residing in Massachusetts a number of years. In 1906 they moved to California. Harry finished his third year in the Stockton High School in June, 1914, of which institution he was one of the leading athletes. He made several daring aeroplane flights in a machine built by himself in 1911, but after a slight accident he was stopped by his father. He then took up wireless, and made a great many devices for handling electric current. He made his own wireless apparatus, capable of receiving messages six hundred miles successfully. After leaving school in Stockton, and during the summer months, he decided to take a course in the Marconi School and was given his only assignment on September 2.

The full details regarding the part which wireless telegraphy played in the wreck have not yet come to light. The steamship Beaver received a vague wireless message from a vessel supposed to be a foreign cruiser soon after dark on the evening of September 18. From the Associated Oil tanker Frank H. Buck came a more definite marconigram at half twelve o'clock the next morning. This was to the effect that the Leggett had gone down.

The Beaver ran into wreckage of the

lost ship soon after midnight, and a short time afterward came in sight of the Buck. Farrell had already been picked up by a boat from the tanker. According to newspaper accounts of the wreck Pullman was also rescued by the Buck.

The first news to reach land concerning the wreck came in messages supposedly sent from the foreign warship to the Marconi station at Astoria, Ore. A. M. Greenwell, operator in charge at Astoria, declared that at fifteen minutes to four o'clock on the afternoon of September 18 a message to the effect that WSB was sinking sixty miles south of Columbia river was sent to a station in Canada. The Astoria station then called North Head, conveying the information regarding the marconigram and making the request that North Head attempt to find out more details. The North Head station communicated with the ship, but did not obtain any further information.

The Astoria station then called craft in the vicinity and told them what had been reported. Information regarding the wreck was also sent to San Francisco and Seattle. During the early part of the evening further attempts were made to communicate with the warship, but without success. At about nine o'clock, however, communication was established with the vessel, and the following message was sent:

"Have you received further information from WSB? She is American steamer Leggett. Advise if you are rendering any assistance. Important."

In reply a marconigram was received saying that information about the matter could be obtained from Vancouver. This was the last word obtained from the vessel during the night.

THE METAPAN SUNK

The Metapan, of the United Fruit Company's line, was rammed in a fog by the freighter Iowan, of the Hawaiian-American line, at the entrance to the Ambrose Channel, New York harbor, on the afternoon of October 15, and sank. All on board were rescued. When the collision occurred the wireless operator on the Metapan sent out an S O S call which was responded to by vessels in various parts of the harbor.

IN THE WIRELESS CABIN

WHAT GOES ON IN WAR TIME

A FLEET of battleships is cruising about at night in hostile waters. Ordered to spread themselves out as the vanguard of other vessels, the big cruisers steam silently along without lights showing, on the lookout for the enemy. Ceaselessly they communicate with one another, for in each vessel is the soundless and padded wireless room. Here, with an electric lamp glowing above his head, is the operator at work. A messenger enters with an order from the commander; immediately, as the handle of the door is touched and pulled open, the lights go out and darkness prevails until once again the door is closed behind the messenger.

In various parts of the ship are posted men who are detailed to keep a sharp lookout. There is always the chance that one of the enemy's destroyers may come rushing along, shoot a torpedo into the ship and escape unscathed. In the darkness the possibilities of the enemy's escape are increased and only the eyes of the crew and watchers can, as far as possible, safeguard mishap.

As soon as anything which excites suspicion is sighted, it is reported to the battle fleet. This is done by wireless telegraphy, and the operator is compelled to work at high pressure, for he has to read every message a cruiser sends, inform his captain and get in touch with the fleet himself if his officer should wish to send a reply. There is the admiral of the fleet to be considered, also. It is necessary for the operator to keep alert in the event that some battle order should be transmitted from him.

All this time the ship is cruising at imminent risk not only from the actual attacks of a secret enemy, but from the danger of floating mines and even

aerial attack. It requires no little personal courage, therefore, for the operator to remain in that closed wireless cabin whence, should disaster occur, there is no chance of escape, and all the time he must keep his head and send and receive messages with as much nonchalance as though he were seated at home.

The great importance of wireless telegraphy in time of war is not generally realized. Take, for instance, a fleet of English battleships at sea while Great Britain is at war with another power. Each ship in that fleet has its wireless installation, adjusted so that it can send and receive signals and messages to other squadrons at sea or in harbor and to stations ashore. One ship of that fleet is always in direct touch with the Admiralty. The chance of interference from an enemy's ship is reduced so as to be almost not worth counting. Each ship in a battle fleet is responsible for some station ashore, or for a cruiser squadron or flotilla of torpedo boat destroyers.

- The importance of having one ship in a fleet always looking out for messages from the Admiralty can be easily seen. All foreign intelligence and the movements of foreign ships go to the capital by telegraph, cablegram and wireless from different parts of the world, and from thence it is transmitted to the admiral in charge of the fleet, who directs his ships accordingly. The whole safety of a battle fleet depends on wireless telegraphy in time of war. When a number of battleships is steaming along, perhaps looking for the enemy, it would not do for them to run into a superior number of the enemy's battleships.

To guard against this, a great number of cruisers are sent out ahead and spread a number of miles across. The

duty of these ships is to keep a thorough lookout and report to the ship in the battle fleet looking out on their particular tunc. This ship, in turn, reports by semaphore or morse-lamp to the admiral of the battle fleet. The cruisers are sometimes assisted by torpedo boat destroyers. If thirty of these ships are used it will be readily seen that the area of their vision is enormous, and it would be almost impossible for a fleet to pass unobserved. Immediately any of the ships sight the enemy's squadron they would report at once by wireless, stating the number of ships sighted, with their speed, latitude and longitude, etc. The admiral would then give his orders, also by wireless. If the admiral determines to attack, he directs the cruisers to steam at full speed and take refuge behind battle fleet.

RADIO LEAGUE STATION LIST READY

It is announced from the Hartford headquarters of the American Radio Relay League that the organization has been finally completed, and that the official list of stations is ready for distribution. This list is of especial interest, as it not only gives the names, addresses and call letters of all of the official relay stations which have been appointed, but it also gives the sending range and power, tone of spark, usual listening hours, words per minute that can be received, whether or not the station has telephone connection for the delivery of messages, and the license, if any, which is held. Most of the best amateur stations of the country are given and the information is of great value, as it indicates just what stations can be counted upon to answer a call.

In addition to the list of stations a pad of official relay message blanks is furnished. This blank is arranged after the manner of the regular commercial wireless blank, and its use will assist amateur operators in conducting the business of their station on correct

commercial lines. These blanks are furnished with the list of stations.

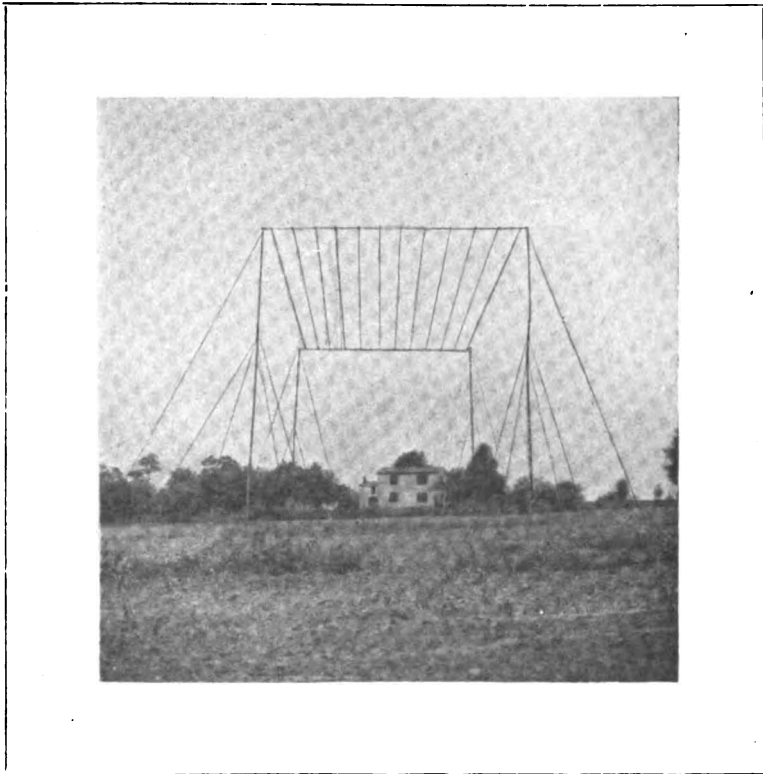
Another feature which is supplied is a map of the United States, upper Mexico and lower Canada. This map contains all the relay stations in each State except where they are too closely clustered to be separated as is the case in the cities of New York and Philadelphia. Special sections are provided on the margin of the map showing these stations separately. Each station is given a number on the map and this number corresponds with a similar number in the list of stations.

An instruction sheet is also furnished which gives information regarding the proper form to follow in operating. The special Relay League attention call is given as is also the proper procedure in calling a station, giving the check for the number of words, and the signing in.

The secretary of the American Radio Relay League will supply all of the items referred to upon request and the receipt of fifty cents in stamps, currency or post office money order, which covers the cost of printing and sending by parcel post. Any amateur wireless operator can obtain them by addressing the secretary at Hartford, Conn.

Supplementary lists will be issued at regular intervals and any operator of a wireless station which is kept in good working order can be appointed operator of an official relay station by filling in the blank form obtainable from the secretary. A chain of stations already exists between New Brunswick and Canada and the Pacific coast. Amateurs will be able to reach nearly any point in the country by relay as the membership in the League increases.

A notice in the list requests that a study of the map be made with a view to bridging the wide gaps in states represented in the chain. It is presumed that in most of these places there are stations not known at headquarters, and various members acquainted with conditions in these vacant territories can assist in filling up a gap by the liberal distribution of application blanks among friends.



My Wireless Station

By A. L. Groves

SINCE the publication of excerpts from a communication written by me which appeared in the June issue of *THE WIRELESS AGE*, I have been in receipt of numerous inquiries regarding my station and the apparatus in use. I am therefore led to believe that a description of the station and equipment may not be amiss. The photograph on this page shows my aerial and the masts. Referring to the diagram (Figure 2) the aerial is composed of fourteen No. 12 copper wires, spaced 5 feet apart. The flat top portion is about 140 feet in length and the lead-in wires about 80 feet in length to the aerial switch. Connections from the aerial switch to the transformer give a total length of about 225 feet. The aerial is 80 feet in height at the northern end and 75 feet

in height at the southern end, and lies almost due north and south.

The diagram of connections, as shown in Figure 2, gives a wide range of adjustment in wave-length. Such adjustments may be made quickly and accurately with a minimum loss of energy. Switch No. 1 is a S. P. S. T. battery switch, switches Nos. 2 and 3 are D. P. D. T., and switch No. 4 is a four-pole D. T. switch made from two D. P. D. T. battery switches.

Switch No. 4 is used to throw either the large or small receiving transformers into service, as required. When switch No. 1 is closed and switch Nos. 2 and 3 are opened, connection is made direct from the aerial to either transformer as desired. If the condenser is required in series with the aerial, switch No. 1 is

opened, and switches Nos. 2 and 3 are closed in an upward position. When it is desired to read signals of long wave-length, it is only necessary to open switches Nos. 1 and 3 and close switch No. 2 in a downward position. This brings the loading coil in series with the aerial. If a still longer wave-length adjustment is desired in the detector circuit, switch No. 3 is pushed downward, thereby connecting both variable condensers in parallel across the secondary coil of the receiving tuner. These connections are very easily made and the range of wave-lengths afforded should appeal to all.

I find that if amateurs are using mineral detectors—especially the silicon—and double head telephones of 2,000 or 3,000 ohms resistance, the results from weak signals can be improved by using but one of the telephones. This no doubt will be a surprise to many, but it is suggested that it be given a try-out. Signals from nearby stations will not appear as loud as when being heard on both sides of your head, but if you confine the energy of weak signals to one receiver rather than make them operate the diaphragm of two receivers, stronger signals will result. I have tried out several high-class receivers, such as Murdock,

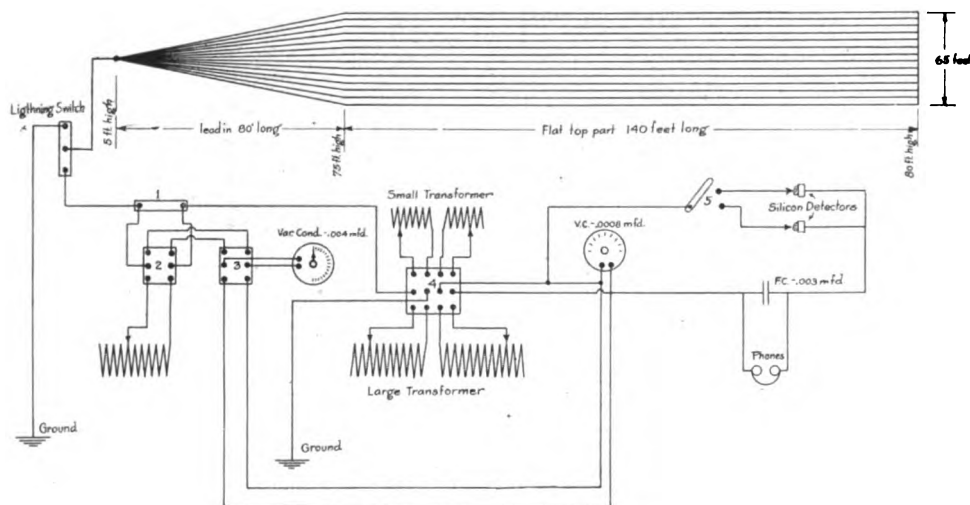


Fig. 2.

Switch No. 5 controls the detectors. Personally, I prefer silicon as a detector because of its ease, stability of adjustment and extreme sensitiveness. Having in view the improvement of my range, I conducted a number of experiments and found that a short piece of the "E violin string" connected to the detector, as shown in Figure 3, and used as a point, afforded an extreme degree of sensitiveness, combined with quick and accurate adjustment. Adjustment of a detector of this type should be made when some station whose signals are weak is sending.

Holtzer-Cabot, Brandes, etc., and invariably find that one receiver will allow greater distances to be covered than two.

A mistake of the average amateur is in trying to make nearby signals come in very loudly, it being taken for granted that if he can get such signals loudly his set is in a sensitive condition. Nothing could be further from the truth and if he will experiment along these lines, the range of his set should be materially increased.

After much experimenting I find that to tune to the wave-length of Glace Bay

a transformer, the secondary of which should not be smaller than 5¼ inches in diameter and 8 inches in length, wound full with No. 22 or No. 24 S. C. C. wire, should be used. Larger coils can be used with good results. The size of the primary winding will vary with the size of the aerial. For aerials about the same size as mine, the primary winding may be as small as 6 inches in diameter and 8 inches in length, wound full with No. 22 or No. 24 S. C. C. wire, and a loading coil about the same size; the loading coil should have 8 taps. A variable condenser of at least 0.0008 mfd. capacity should be used in shunt with the secondary.

In order to tune in the Marconi high power station at New Brunswick, N. J., I find that the secondary coil should not be smaller than 5¼ inches in diameter and 16 inches in length, wound full of No. 24 or No. 26 S. C. C. wire. It should be shunted with a variable condenser of about 0.004 mfd. capacity. The primary winding should be at least 6 inches in diameter and 16 inches in length, wound full of No. 22 or No. 24 S. C. C. wire. The loading coil should be about the same size and wound full of No. 22 S. C. C. wire with about ten or twelve taps taken off.

In building transformers, keep in mind that a coil small in diameter with considerable length will give better results than a coil large in diameter and short in length. For example: I find that a coil 6 inches by 16 inches will give a better response to longer wave-lengths than one having dimensions of, say, 8 inches by 12 inches.

I suggest in order to enable amateurs to assist one another in "tuning in" long distance high power stations that a small space be allotted each month in THE WIRELESS AGE and a table published similar to that given below. Data for the table should be supplied by amateurs:

Station	Call	W.-Length
Arlington	NAA	3700
Arlington	NAA	2550
Sayville	WSL	2800
Brooklyn	WCG	2000
		2300

These stations are only given as examples. Amateurs should consider the amount of work they may cause the ed-

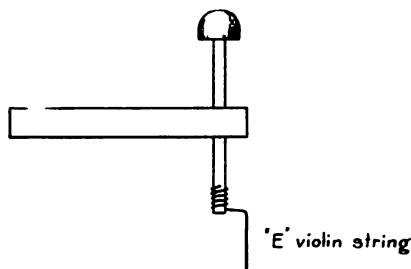


Fig. 3.

itors of the magazine by sending many unnecessary tables of the same kind. The amateurs residing on the Gulf coast countries should send information about stations in Cuba, South America and Mexico. Amateurs in the north should furnish information regarding the Canadian stations.

WRECK OF THE MONTMAGNY

The steamship Montmagny, owned by the Department of Marine and Fisheries of Canada, sank on September 18 in the St. Lawrence river, about 50 miles below Quebec, as the result of a collision with the collier Lingan, under charter to the Dominion Coal Company. Fourteen persons were drowned. Among the survivors who were brought to Quebec was P. Colton, wireless operator. The Montmagny sank too quickly to permit the sending of the S O S.

NEW SHIP FITTED

On instructions from the Donaldson Line the Marconi Wireless Telegraph Company of Canada has equipped the steamship Laconia with a 1.7 k.w. wireless set.

Schedule
2 P. M. E. S. Time.
7 P. M., 8 P. M., 10 P. M., 12 noon and after finish of 2 P. M., schedule above. E. S. Time.
9:05 P. M. E. S. Time.
8:30 P. M. E. S. Time.

When You Stop to Consider

Every production of genius must be the production of enthusiasm.

* * *

When you know a thing to hold that you know it; and when you do not know a thing to allow that you do not know it; this is knowledge.

* * *

The mind of a man is like a clock that is always running down and requires to be constantly wound up.

* * *

A wise man will make more opportunities than he finds.

* * *

Order means light and peace, inward liberty and free command over one's self; order is power.

* * *

He that can have patience can have what he will.

* * *

Concentration is the secret of strength in politics, in war, in trade, in short, in all manner of human affairs.

* * *

The future is purchased by the present.

* * *

If you miss the first button-hole you will not succeed in buttoning up your coat.

Marconi Men

The Gossip of the Divisions

Southern Division

Operators Rosenfeld and Brubaker, assigned to the newly equipped steamer San Silvester at Lambert's Point, Va., are returning from London on the San Zeferino of the Eagle Oil Transport Company.

Operator W. P. Grantlin relieved Operator H. H. Faithful on October 3 on the Mexicano of the Norway, Mexico and Gulf Line. The Mexicano is bound to Norway from Newport News.

Operator Roy Gardner, formerly of the steamship Freida, has returned to the Marconi service, having been detailed as senior operator of the Dorchester, out of Baltimore. Gardner went to Cleveland, where he obtained employment with one of the telegraph companies. He thinks the Marconi service the best after all.

Operators Marsano and Cautilli of Philadelphia reported at Baltimore for the Dorchester. Cautilli was assigned to the Cretan as junior on October 5, after one trip on the Dorchester to Boston.

Installer Murray is bound to Baltimore on the Suwannee. Murray says he is glad the land of the living is in sight.

Installer Morris completed the equipping of the new steamship Gulf-light for the Gulf Refining Company on September 28. Operator F. G. Evans will be detailed to the Gulf flight.

The steamships City of Annapolis and City of Richmond are soon to have new 1 k.w. outfits installed in place of the present tuned coil sets.

The United States torpedo boat Downes will soon be equipped by the Marconi installers at Philadelphia for a trial trip for the New York shipyard.

The new Miami station is very busy at this time working with ships and Nassau. Additional antennae have been put up for Nassau, the long wave being 1,605 meters. The short wave for Nassau is 550 meters, while the ships are

worked on 600 or 300 meters. The 550-meter wave carries well, and Miami can be heard any time after dark on the Bay Line steamers in Chesapeake Bay. The signals are clear and steady and the note of the spark is excellent.

Operator H. G. Hopper on the Junata and Operator Lecompte on the Cretan have been relieved from duty.

Operator H. G. Austin of the Honolulan paid his respects to the superintendent's office of this division before sailing for San Francisco.

Friends of Operator Daggett of the Borgestad will regret to learn of his illness. Daggett is now confined to the Maryland General Hospital in Baltimore.

Operator J. Lange has been detailed to the Borgestad.

Operator L. E. Richwein has resigned to enter the Navy wireless school at New York.

Operators Roger Wolcott and Harry Fields have returned to school at Norfolk after spending the summer on the ocean.

Operator Otto Curtis has entered the Revenue Cutter Service, and is now on the cutter Androscoggin off Portland, Me.

Operator D. Levin has been transferred from the Suwannee to the steamship City of Macon.

Operator Thompson has been transferred from the City of Macon to the Noruega at Newport News.

Operator Gordon Scott has re-entered our service after an absence of several months due to illness.

Operator Gaborwitz has been relieved from the steamship City of Macon.

The wireless colony at Hatteras has been increased to the extent of a junior operator, the son of Operator and Mrs. Dailey.

Great Lakes Division

H. J. Whittaker, officer in charge at the Manistique, Mich., station has been relieved by L. W. Hull. Whit-

taker has left for his home at Akron, Ohio.

H. Underwood, second operator on the Lakeland, has returned to his home at Fulton, Ky., on account of the illness of his mother. Operator A. S. Fraser relieved Underwood for two trips when the Lakeland's passenger season closed. She is now being operated as a package freighter. Operator Richardson remained aboard as operator and quartermaster.

The Northland "laid up" recently at Buffalo, N. Y. First Operator A. J. Main has been transferred to the Eastern States. Second Operator E. C. Wahl is at his home in Buffalo.

The Seeandbee arrived in Cleveland, recently, on her last trip of the season, and has left for Detroit, Mich., for her winter mooring. Operator W. A. Hutchins has left for the Eastern Division where he expects to enter the services of the Marconi Company.

Operator Joseph Newton of the Snyder, Jr., has been transferred to the Ashtabula as purser and operator.

The City of Detroit III, made her last trip into Detroit recently, when she was "laid up" for the season. First Operator F. C. Goulding has been transferred to the City of Alpena. Second Operator F. Stehmeyer has been transferred to the Western States.

The Colonel James Schoonmaker came into collision recently with a crib in Lake Superior. She was badly damaged below the water line, but was able to proceed to Lorain, Ohio., after making temporary repairs, to unload her cargo. Operator F. Marshall of the Schoonmaker has been transferred to the Snyder Jr.

The City of St. Ignace "laid up" at Detroit, Mich., recently, when Operator George Commerford was relieved.

Pacific Coast Division

H. Dickow has been assigned to the Adelaine Smith, relieving J. L. Sabo.

J. Hauselt has joined the Admiral Dewey as assistant.

E. S. Fayle is temporarily relieving on the Admiral Schley as assistant.

W. D. Collins has been assigned to Barge No. 91.

A. A. Beck is now serving on the

Bear as assistant. Beck has just returned from a sick leave, but is looking happier than ever.

J. M. Flottman, who has been acting assistant of the S. S. Beaver for the past fourteen months has been granted a thirty day leave of absence. Mr. Flottman's record for that period, covering both the wireless and newspaper work, will, undoubtedly, make his relief do a little hustling.

E. Livesey, formerly first operator on the Harvard is now assistant on the Beaver.

H. J. Tannenbaum has been assigned to the Camino. The Camino is now on the San Francisco-New York run.

S. E. Miller has joined the City of Topeka as first operator.

The Norwegian steamer Cuzco of the W. R. Grace Company has been equipped with an auxiliary. Operator E. J. Browne is in charge, and C. B. Johnson is assistant. The installation was made at Astoria.

C. Berry has been assigned to the Colonel E. L. Drake.

E. D. Perry has been assigned as assistant on the Celilo.

F. Wiese has been assigned to the Coronado.

P. S. Lewis recently relieved J. J. O'Brien as operator in charge of the Damara, at New York. O'Brien was with us for over a year, and we are sorry he is leaving the Golden Division.

R. J. Phair is now operator in charge of the F. H. Buck.

R. A. Moody has replaced J. M. Lankston as operator on the George W. Fenwick.

R. E. Smiley has been assigned to the Georgian. The Georgian is expected to leave in the near future for her second trip to New York.

J. H. Southard and C. A. Peregrine are holding down the first and second positions aboard the Governor.

J. C. Mitchell left on the Henry C. Scott, as operator in charge on October 2nd.

F. W. Brown has been assigned to the J. A. Chanslor.

J. A. Harris and T. M. Prior are acting as first and second of the J. B.

Stetson, now sailing in place of the Francis H. Leggett, which was sunk.

R. Nelson has relieved C. Berntz-willer as operator in charge of the Klamath.

K. E. Soderstrom, having rendered good service on the Norwood for the past year, has been transferred to the Lansan.

J. F. Woods and A. C. Forbes left on the Manchuria September 20 as first and second respectively.

C. Fitzpatrick has been temporarily assigned to the Navajo.

B. R. Jones has been assigned to the Norwood.

C. T. Nichols has been assigned as operator in charge of the Northland.

R. Baer of the St. Helens has been transferred to the Nome City as assistant.

E. S. Clark has joined the Oleum.

C. Bailey and R. M. Moss, have been assigned as first and second respectively to the Oliver J. Olson.

O. B. Mills and L. McCargar, recently left as first and second of the Pennsylvania.

R. G. Landis relieved F. E. Johnston on the Portland at San Pedro recently. Mr. Johnston is leaving the service to resume his studies.

J. E. Dickerson, who returned from a season at Koggiung, has been temporarily assigned to the President.

J. L. Bartire has been assigned as second on the Queen.

B. McLean, formerly first of the Persia, has been assigned as assistant on the Rose City. The Rose City will now be entered in the race with the Bear and Beaver for a newspaper record.

W. H. Stevenson has been assigned as first of the Rome City.

F. W. Shaw, after a trip to Honolulu as first on the Sierra, has resumed his duties as manager of the Hillcrest Station. A. M. Quasdorf, the regular third trick man at Hillcrest, was acting manager in Mr. Shaw's absence, with E. T. Jorgensen, first of the Sierra as second trick man, and E. D. Bryant on as third trick man.

N. J. Marthaler has been assigned to the St. Helens. The St. Helens is on her voyage from San Francisco through the canal to New York.

G. S. Bennett is scheduled to go as assistant on the Sierra. Mr. Bennett is anxious to begin on the newspaper work, and this chance is expected to make him a "comer."

J. F. Parenti has been received as second assistant on the Speedwell.

C. M. Jackson has been transferred to the Washtenaw.

J. W. Morrow and P. E. Riese have been assigned to the Yosemite as first and second respectively.

C. E. McNees, assistant on the President, has been transferred to the Bolinas station.

F. M. Roy, in charge of the Yale, has been transferred to the Bolinas station.

Seattle Staff Changes

The cannery ships St. Nicholas (N. McGovern), St. Francis (W. Chamberlain), W. B. Flint (C. B. Johnson and William Hineline), Berlin (E. S. Sanders) and the Reuch (M. Dinesdale) have returned from the North to their winter quarters at Astoria and Seattle. McGovern is now in charge of the Admiral Evans, W. Chamberlain is second on the Mariposa, Johnson is bound for South America on the Cuzo, and Dinesdale is first on the Delhi. Sanders and Hineline are on a vacation.

J. C. Meade, second on the City of Seattle, has taken charge of the tug Pioneer.

J. A. Wiehr, a brother of H. F. Wiehr, is now second on the City of Seattle.

H. Hatton, first on the Spokane, has been transferred to the San Francisco District on the Queen. G. P. Williams of the Queen has returned to the Spokane.

R. S. Powell, first on the Mariposa, has been promoted to the position of stock clerk in the Seattle shop.

I. L. Church and M. O. Smith have been transferred to the Seattle District on the Admiral Watson, which will now run North in place of the Admiral Sampson, recently wrecked.

S. L. Mastick, in charge of the Wal-lula at Astoria, has resigned to engage in another kind of work. He has been relieved by P. J. Palmer.

C. P. Trevett, of the Governor and D. M. Taylor of the Minnesota have exchange positions.

How to Conduct a Radio Club

(Continued from page 128)

The relative positions of the pointer of the variable condenser corresponding to C_1 , C_2 , C_r , are shown in Figure 5B.

The term "total decrement" includes the decrement of the antenna circuit plus the decrement of the wave-meter, and the value of the latter must be subtracted from the total to give the decrement of the antenna itself. The decrement of the wave-meter may be obtained by direct calculation or by actual measurement. The method will be described in another article of this series.

If the variable condenser is well constructed so that the capacity varies directly with the scale reading, then we may substitute in the formula the condenser degrees in place of the actual values of capacity. If it is definitely known that the condenser possesses the "straight line law of calibration" it is not necessary that the value of either the inductance or the capacity be known or that the combination be calibrated directly in wave-lengths (in order to measure the decrement), provided they are of such value as to allow resonance with the circuit under measurement. To repeat, then, if the members of an amateur club have on hand a variable condenser of good construction they may fit to it inductance coils of such value as to allow resonance with the transmitting circuits they desire to measure. This apparatus, with the high frequency wattmeter, is all that is required for measurement of the decrement of damping.

(To be continued)

Comment and Criticism

(Continued from page 139)

ceiving detector is subject to whiffs of wind containing moisture, which may at certain intervals destroy the sensitive adjustment of the crystal.

Irregularities of the spark gap would also cause "fading" of signals, oftentimes due to improper insulation, and a portion of the energy of the spark gap,

at certain periods, is diverted. Again, the fading of signals is supposed to be due to atmospheric conditions, which, for the time being, cannot be explained.

Many theories have been evolved and put forth in support of such a phenomenon, as reflection from the upper atmosphere, etc. Data on this matter is always of interest and we shall be glad to hear from experimenters in the field.

The Wireless Equipped Aeroplane

(Continued from page 103)

is no danger of either person receiving an electric shock.

The aerial trailing wire attached to the tail skid is fitted with a safety catch adjusted to stand only as much strain as it would be subjected to when the machine is flying; in the event of its becoming entangled in trees, housetops or any other obstruction, it frees itself immediately. Aerial trailers lost in this fashion are replaced by spare wires provided for the purpose.

As the wave-length is comparatively short, the receiving apparatus is seldom troubled by interference and little adjustment is required in tuning.

This efficient aeroplane equipment has recently been applied with success to submarines, an insulated jet of water being used as an aerial conductor.

Thus two new fields in wireless operation have been opened up and will be closely watched by all nations during each operation in the present European war.

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

A man was recently arrested on an ocean steamship by means of wireless telegraphy and sentenced to prison in England for defrauding T. Cook & Sons, tourist agents, by whom he had been employed.

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MARCONI WIRELESS TELEGRAPH COMPANY

OF AMERICA

WOOLWORTH BUILDING

233 BROADWAY, NEW YORK

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Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

E. P. K., New York City:

Copies of the "Call List of the World," which could formerly be obtained at the office of the Marconi Company, 233 Broadway, New York, have become exhausted, and it will therefore be necessary for you to purchase copies direct from the International Bureau of the Telegraphic Union, Berne, Switzerland. Inquiries as to the subscription price of the list should be made direct to the Berne Bureau of that address. Remittances should be made by International Postal Money Order.

* * *

C. B., Brockport, N. Y., asks:

Ques.—(1) What is the meaning of the letters PAX which Sayville has been calling lately?

Ans.—(1) The combination of letters PAX is a test signal sent out continuously from the Sayville station in an effort to establish communication with Nauen or Eile.e. Germany. These letters have no particular significance, having simply been used for the purpose stated.

Ques.—(2) Please give the names of some of the companies that manufacture complete detector sets.

Ans.—(2) The Marconi Wireless Telegraph Company of America is the only concern legally qualified to make the valve detector. There are many other solid element detectors, but among these the cerusite detector made by the same company is considered superior in many respects. The other elements of a complete detector set are widely manufactured and are easily obtainable from any supply house.

Ques.—(3) Please tell me where I can obtain an audion bulb.

Ans.—(3) They cannot be purchased singly. They can only be obtained in connection with the complete apparatus. Get in touch with the Radio Telephone and Telegraph Company, 309 Broadway, New York City.

Ques.—(4) I am now using a $\frac{1}{2}$ k. w. transformer, wound for 110 volts, 60 cycles, on 110 volts, 25 cycles, with a reactance. Would a rotary gap with 32 points, 4,000 R. P. M., raise the tone of the set? How many points should be used? The gap is similar to the one described in the April issue of THE WIRELESS AGE.

Ans.—(4) A rotary gap will increase the tone to some extent, but the results will not

be so satisfactory as those obtained with a frequency of 60 cycles. If a musical note is desired, do not use more than 8 points on the disc at a speed of 4,000 R. P. M.

Ques.—(5) Where can I obtain a radioson detector?

Ans.—(5) From the Electro Importing Company, New York City.

* * *

M. S., Ely, Minn., asks:

Ques.—(1) When the frequency of a transmitter is changed, is the wave-length also altered?

Ans.—(1) We suppose you refer to spark frequency or the frequency of the alternator. If so, with a given capacity and inductance in the closed circuit, the wave-length is not changed by a change in the primary frequency.

Ques.—(2) Please tell me why I cannot receive any messages from Duluth, a distance of 85 miles, with a set containing a 1,000-meter two-slide tuning coil directly coupled, a silicon and galena detector, fixed condenser and a 1,000-ohm receiver. The aerial is 30 feet in height and 60 feet in length and consists of four wires, spaced eighteen inches apart. Surrounding geographical conditions seem to be poor, for this is in the iron ore region and among hills.

Ans.—(2) It is rather difficult to say off hand why you do not hear the station at Duluth. We are not fully aware of its range inland. Your aerial is rather small for work at this distance and we advise you to erect one of greater height and length. We suggest that you erect a new aerial about 200 feet in length and 60 feet in height.

Ques.—(3) Do stations around here do any wireless work on Sundays?

Ans.—(3) Yes.

Ques.—(4) When an amateur applies for a license does he have to pass an examination?

Ans.—(4) Yes, he must take both a technical and code examination.

Ques.—(5) What capacity condenser is required for a $\frac{1}{2}$ k. w. transformer, voltage 5,000, rotary gaps of 500 cycles frequency and wave-length to be 200 meters?

Ans.—(5) Try a capacity of 0.008 Mfd. The voltage of the transformer is very low, indeed, and the results you obtain may not be wholly satisfactory. You should have a potential with this capacity of about 15,000

instead of 5,000 volts for best results. If a condenser were fitted to your transformer so as to afford maximum efficiency, its capacity would be too great for a wave-length of 200 meters.

* * *

R. D. P., Branchville, N. J.:

See the answer to C. B.'s query in this issue.

* * *

C. H. K., Rochester, N. Y., writes:

Ques.—(1) Kindly inform me whether the Marconi Wireless Station at Belmar, N. J., is in operation and what kind of dispatches are sent and received.

Ans.—(1) The station at Belmar is not yet in commercial operation. It will be used to send and receive commercial messages with corresponding stations in England.

Ques.—(2) What station do they communicate with on the other side and where is it located?

Ans.—(2) The transmitting station in England is located at Carnarvon, Wales, and the receiving station at Towyn, Wales.

Ques.—(3) How many words can they send and receive a minute?

Ans.—(3) It is planned to communicate at a speed of 60 to 90 words a minute, automatic transmission being used.

* * *

G. E. T., Jubilee, N. B., writes:

Ques.—(1) Please inform me regarding the following calls: KIK, WLO, PAX, VGO, VGP, VGV, GIB, VDS, BEC, BED.

Ans.—(1) KIK, not assigned; WLO, not assigned; VGO, SS. Evangeline; PAX, test letters used by Sayville; VGP, SS. Halifax; VGV, SS. Seal; GIB, SS. St. George; VDS, Land Station at Simcoe; BEC, SS. Suffolk; BED, SS. Sutledge.

Ques.—(2) Where can I obtain a cerusite crystal without the detector stand?

Ans.—(2) These crystals are not sold without the stand. Complete detectors may be purchased from the Marconi Wireless Telegraph Company of America, 233 Broadway, New York City.

Ques.—(3) Which valve is more sensitive, the Fleming valve or the De Forest audion?

Ans.—(3) The result depends entirely upon the circuit used.

Ques.—(4) For what reason does the Marconi station at Glace Bay, N. S., frequently make the letter V?

Ans.—(4) This is a test letter used in conducting special experiments.

The information sought in reference to the rotary gaps is not available for publication.

* * *

C. B., Clyde, N. Y., asks:

Ques.—Please tell me what length a four-wire aerial should be to have a natural wave-length of 200 meters when using the following: Lead-in, 65 feet; ground wire, 10 feet; Adams-Morgan 1 k. w. oscillation transformer; a Hunt & McCree 2-inch coil and 2 sections Murdock sending condenser. In-put in primary is 11 volts, 10 amperes. The leads on secondary of oscillation trans-

former average 4 feet, the leads on the primary of oscillation transformer, including coil and gap, average 5 feet. I use a common gap. Height of aerial is 50 feet.

Ans.—Since your aerial has a height of 50 feet the flat top portion should not be greater than 60 feet for a natural wave-length of 200 meters. When you add the secondary winding of your oscillation transformer in series with this aerial, you of course understand that the natural wave-length will be increased to a value beyond 200 meters. The information regarding the oscillation transformer is not sufficiently complete to allow us to give definite advice as to the effect it will have on the wave-length.

* * *

A. W. F., Petaluma, Cal., writes:

Ques.—(1) What station is MMQ?

Ans.—(1) SS. Persian.

Ques.—(2) Does the Marconi Company employ any second-grade operators?

Ans.—(2) Operators holding second-grade certificates are employed on certain vessels, when first-grade men are not available.

Ques.—(3) What is the charge for attending the Marconi School? Are the sessions held at night or in the day time?

Ans.—(3) Instruction is given in the day time only. The tuition fee for the complete course is \$35.00.

* * *

H. C. L., Hartford, Conn., asks:

Ques.—(1) Please tell me the wave-length of an aerial and range of a station, consisting of two strands of copper wire 175 feet in length, 35 feet in height at one end, 25 feet at the other, lead-ins 25 feet. The receiving set consists of a loose coupler tuning 3,000 meters, two Arnold variable condensers, one fixed condenser, an audion detector and a pair of Brandes 2,800-ohm telephones. Conditions fair.

Ans.—(1) The fundamental wave-length of the antenna is approximately 315 meters. The night range of the set during the winter months may be placed at about 1,800 miles, daylight range 350 miles. You should be able to tune efficiently to wave-lengths up to 3,000 meters.

Ques.—(2) How is the audion amplifier connected up? Can it be done with two audions?

Ans.—(2) See the article on "How to Conduct a Radio Club" in the January, 1914, issue of THE WIRELESS AGE, where full instructions are given for the proper connection of the duplex audion amplifier.

Ques.—(3) Can the same gauge wire be used in winding the secondary of a loose coupler as that in the primary? Is there any essential difference in using finer wire?

Ans.—(3) There is no distinct difference except that it is an advantage with detectors requiring considerable potential to have smaller wire in the secondary than in the primary. Losses due to described capacity are thus decreased and a maximum of potential secured. A good course to pursue with any receiving tuner using crystal detectors is to wind the primary with No. 26 wire and the secondary with No. 32.

Ques.—(4) Please give a list of stations using undamped oscillations. Is there any other way besides using the Poulsen tikker that these stations may be received? How does the Poulsen tikker work?

Ans.—(4) Poulsen stations at Los Angeles, San Francisco, Honolulu, Goldschmidt station at Tuckerton, N. J. In the August issue of THE WIRELESS AGE is described a sliding wire tikker which may be used in place of the regular Poulsen tikker. The vacuum type receivers are also adaptable to the reception of undamped oscillations and are extremely sensitive in this respect. The methods for securing these results, however, are not available for publication.

Ques.—(5) How many square inches of tin-foil should be used with a two-inch spark coil?

Ques.—(2) What is the wave-length of the station at Tuckerton, N. J., and what are the call letters?

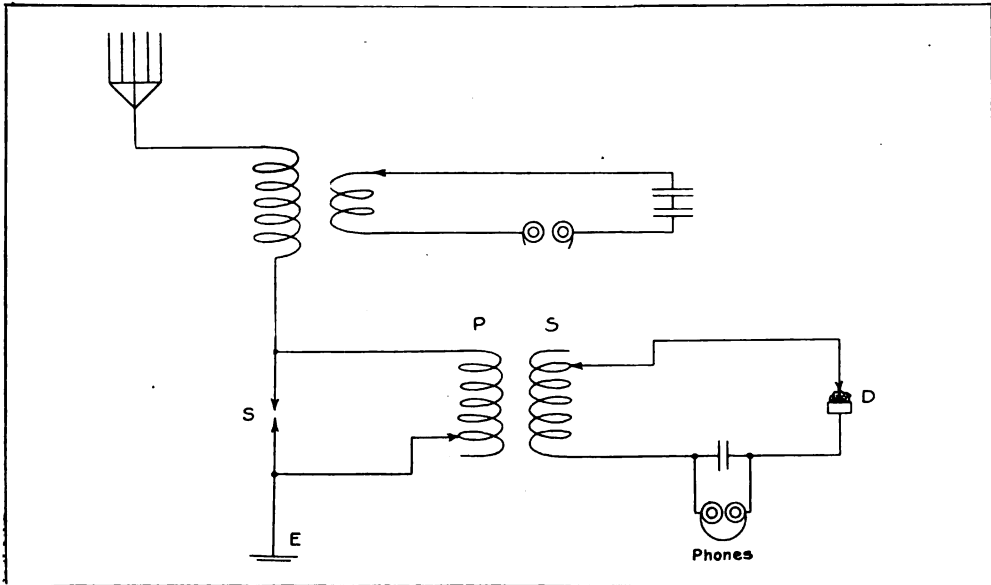
Ans.—(2) The call letters of the station at Tuckerton are WGG; the wave-length is about 8,000 meters.

Ques.—(3) What does AST (. — . . . —) mean when NAA stops sending the "wind" reports at 10 o'clock?

Ans.—(3) We believe you have made a mistake in reading this abbreviation. We have never heard a signal of this character. Perhaps you mean QST, which is a general alarm call for all stations to copy.

Ques.—(4) Please publish a drawing showing how to use a sending and receiving set with an anchor gap and no switch (two points A. G.)

Ans.—(4) A method is shown in the accom-



Ans.—(5) We advise you to experiment with a condenser until you secure best results. It is rather difficult to advise just how many inches of foil should be used, as the actual size of the condenser will depend upon the general design of the interrupter and the number of breaks given by it per second of time. For coils of this size Leyden jars are generally made of small test tubes. Such a condenser may be purchased from the Electro Importing Co., New York City.

* * *

G. C. R., Richmond, Va., asks:

Ques.—(1) Please inform me regarding the following: VRG, WCL, PAX, RCX, RCY.

Ans.—(1) VBG, Marconi Station at Toronto; WCL, not listed; PAX, test letters used by Sayville. We have no records of RCX and RCY. Are you sure that these letters should not be WCX and WCY? If so, WCX is the Marconi Station at Cleveland and WCY the Marconi Station at Cape May, N. J.

panying drawing applicable for your use. S' is a miniature spark gap in series with the antenna circuit and placed as near to the earth connection, E, as possible. P and S are the primary and secondary windings respectively of the ordinary receiving tuner. If care is taken to keep the cap of S down to at least 1/100th of an inch, the actual current flowing in P will be exceedingly small. Some means should be at hand to shunt the detector, D, when the transmitting key is pressed, for otherwise the energy set up in S by P may throw the detector out of adjustment.

* * *

G. O. W., Long Branch, N. J., inquires:

Ques.—(1) Is the enclosed diagram wired correctly?

Ans.—(1) The diagram, though complicated, is quite correct.

Ques.—(2) Is the Belmar station for sending and New Brunswick for receiving, or vice versa, and would a set that tunes to 6,000

meters be able to catch signals sent out by the sending station?

Ans.—(2) The New Brunswick station sends, Belmar station receives. A set the range of which is limited to 6,000 meters will not be able to catch signals from these stations, as the wave-length is considerably above that.

Ques.—(3) Please publish a drawing for placing a primary condenser in series or shunt through the use of a two-point switch.

Ans.—(3) It is impossible to switch a condenser from a series to a shunt connection by the use of a simple two-point switch.

Ques.—(4) Can Instructions to Operators be secured by anyone, and if so, at what cost?

Ans.—(4) Instructions to Operators, known as Circular 114B, is out of print and there will be no re-issue.

* * *

C. F. O., Marblehead Neck, Mass., says:

Ques.—(1) Please tell me what length the wires in an umbrella aerial should be in order to conform to the 200-meter wave-length, if all wires are connected at the bottom end and brought to a distributing point. They are then joined to a lead-in 38 feet in length. The ground wire is 32 feet in length. The pole of the umbrella aerial is 30 feet in height on a roof 54 feet above ground.

Ans.—(1) We cannot answer this query, as we have no definite data in respect to the capacity and inductance, and therefore the wave-length that may be expected from an umbrella aerial of given dimensions.

Ques.—(2) Is the transmitted wave pure if the wires of an umbrella aerial are of the same length and the leads from the bottom of each wire to the distributing point are unavoidably of different lengths?

Ans.—(2) It should have no distinct effect upon the purity of the wave.

Ques.—(3) Is a special license necessary for a wireless telephone? Please tell me if it is possible to use A.C. to talk 6 miles with a $\frac{1}{4}$ k.w. and what instruments are necessary. Please publish a drawing, stating the size of the condensers, choke coils, etc.

Ans.—(3) If the station already has a certificate licensing it for the use of *wireless telegraph apparatus*, it is not necessary to secure another license for the operation of a wireless *telephone* set provided the wave-length allowed in the original *telegraph* license is not exceeded. If the station already carries a license for *telegraphy* and desires to conduct experiments in *telephony*, the radio inspector in that district should be advised of the fact, giving full particulars regarding the station, the amount of power used and what increase of wave-length is desired.

It is possible to construct a crude wireless telephone using a $\frac{1}{4}$ k.w. transformer and we therefore suggest that you secure a copy of the August, 1914, issue of THE WIRELESS AGE and note the Third Prize article which appears on page 926. In this article is a full description of a combination wireless telephone and telegraph set.

Ques.—(4) What size of ground wire is best

for a $\frac{1}{4}$ k.w. set? Please tell me how many strands of No. 12 B. & S. rubber covered wire equal it.

Ans.—(4) If you intend to use No. 12 wire for a ground lead we suggest that you use eight strands in parallel.

Ques.—(5) What is the wave-length of the new Marconi transmitting station at New Brunswick, N. J.? If one has a tuner capable of receiving very high wave-lengths, can he copy the trans-Atlantic messages or is the speed too great? Is the frequency of the signals beyond audibility?

Ans.—(5) The wave-length of the New Brunswick, N. J., station has not yet been decided upon. The average amateur tuner is not capable of receiving such wave-lengths, and furthermore when these stations are in commercial operation the speed will be too great for ear receiving. It will then be necessary to have some high speed recorder to detect the signals. The group frequency of these stations is decidedly within the limits of audibility.

* * *

H. F., Lancaster, Pa.:

No articles have been published on the Marconi multiple tuner.

* * *

J. R. H., Mountainair, N. M.:

The queries contained in your communication are virtually government examination questions and therefore cannot be answered in this department.

* * *

A. S., Quincy, Ill., writes:

Ques.—I wish to erect an antenna of the type shown in the accompanying drawing. It consists of 6 wires phosphor bronze stranded (7 No. 20). I intend to use 4 vertical wires leading to an 100-ampere D. P. D. T. switch, one end for grounding when not in use, and one point for lead-in. What I wish to know is this: Whether it is safe against lightning simply to fasten the supporting ends of the aerial to the tower at one end and to the top of the tin roof at the other. Both the tower and the roof are provided with lightning rods. Then what will be the natural wave-length of my aerial? It consists of 6 wires spaced about 32 inches apart, 130 feet in length; 4 vertical wires about 50 feet in length; height about 120 feet.

Ans.—You need have no fear in disposing the aerial as shown in your drawing. It is seldom that a wireless station is struck by lightning, as the aerial wires themselves afford sufficient protection in this respect. The natural wave-length of your antenna is approximately 390 meters.

* * *

R. K., Des Moines, Iowa, writes:

Ques.—Lately I have heard considerable about the directional effect in wireless telegraphy. Some people say the aerial should be swung east and west, while others say it should be parallel to the transmitting station for best results. Please tell me which is correct or give any data you may have on the subject.

Ans.—Your query is not quite plain. If you have flat top aerials at both the transmitting and receiving stations and if the high potential end of the transmitting aerial points to the west, the high potential of the corresponding receiving aerial should point to the east. Flat top aerials give decidedly directional effects only when the flat top portion is of considerably greater length than the vertical portion. The average amateur's aerial is not sufficiently directional to make any difference as to which way it is swung or placed.

* * *

N. S., Ithaca, N. Y.:

Regarding your query as to the Poulsen tikker and the valve as receivers for undamped oscillations: The Poulsen tikker is simply a circuit interrupter, no matter how constructed. It will effect the purpose if it is constructed to break the detector circuit, say, three or four hundred times per second. The sliding wire tikker was described in the August issue of THE WIRELESS AGE. Information concerning the audion as a receiver for undamped oscillations is not available for publication.

Regarding your trouble with the Fleming valve, we note from your drawing that you employ no potentiometer, which is quite necessary. The potentiometer should be placed in shunt to the cells which light the filament and a lead connected from the telephone condenser to the sliding contact on the potentiometer. There is then no reason why you should not obtain good results.

Regarding your query in reference to the receiving tuner for 10,000 meters we have the following suggestions to offer:

The secondary winding should be 10½ inches in length by 6⅝ inches in diameter, wound with one layer of No. 30 S.S.C. wire. If this coil of inductance is placed in shunt with a variable condenser having a maximum capacity of 0.001 Mfds it will allow the reception of wave-lengths beyond 10,000 meters.

The primary winding may be of similar dimensions—say 10 or 11 inches in length, 6 inches in diameter and wound with one layer of No. 24 S.S.C. wire.

* * *

J. W. H., New York City, asks:

Ques.—(1) Can you tell me the trouble with my transmitting outfit? I am using a Mesco 1-inch coil, one section of Murdock condenser, plain gap, and an oscillation transformer of the type described in the July issue of THE WIRELESS AGE in the "Instruction to Boy Scouts," Article 2, but slightly smaller. I use a standard hook-up. My aerial is 100 feet in height, 40 feet in length, consisting of 3 wires of stranded phosphor bronze, with a 90-foot lead-in. I get practically no results. Am I right in assuming the condenser capacity is too high for the coil?

Ans.—(1) Your statements are not sufficiently definite for a reply in full. Do you mean that you do not secure a spark or does the spark discharge over the gap with no radiation from the antenna? We believe that one section of a Murdock condenser is decidedly too much capacity for this coil. Try two or three sections of the same size con-

denser in series and see if better results are obtained.

Ques.—(2) I have a rotary gap on hand. Could I use it to advantage in conjunction with my set?

Ans.—(2) The operation of a rotary gap in connection with a 1-inch spark coil has never proven satisfactory.

Ques.—(3) What is the range and wave-length of the outfit referred to with and without the oscillation transformer?

Ans.—(3) The range of this set if placed in operating condition will be about 8 miles; the wave-length is about 220 meters. With the oscillation transformer in series it will be roughly 260 meters, which, of course, will not comply with the amateur law.

* * *

G. A. B., New York City, writes:

Ques.—(1) Can an aerial used for wireless purposes cross a street?

Ans.—(1) The laws of many cities will not allow an aerial to be placed across a street. Perhaps, however, by obtaining special permission from the city authorities it may be done.

Ques.—(2) How does the "Billi" condenser of the Marconi work? On what principle does it operate? Is it constructed entirely different from any other condenser?

Ans.—(2) The only difference between the "Billi" condenser and the ordinary condenser is in the construction. The "Billi" condenser consists of two concentric sliding tubes, which are insulated from one another by a very thin sheet of hard rubber, as in the dielectric. The maximum capacity of this condenser is very small—not over .0001 Mfds. The capacity of the condenser is progressively varied by simply drawing the tubes apart or placing them inside one another.

Ques.—(3) What kind of communication does WHB deal with?

Ans.—(3) WHB is the station of the New York Herald and is not maintained for commercial purposes, but sends "press" out to ships in the vicinity of New York harbor at certain times throughout the day. The station is a feature of the Herald and is used for marine communication and obtaining information from steamship companies concerning conditions at sea.

Ques.—(4) Please tell me how far I will be able to send with the following: Mesco 1-inch spark coil, straight zinc spark gap, power from 6 dry cells, key, and aerial to be of 4 aluminum wires spaced 1½ feet apart; length of aerial 72 feet and height about 60 feet.

Ans.—(4) You should be able to send about ten miles with this outfit.

Ques.—(5) If a condenser will give me a longer wave-length, please give the dimensions of one, and how many plates I should need.

Ans.—(5) This query is not plain, but if you propose to add a condenser and an oscillation transformer to this outfit we suggest that you avoid it. You will secure better results by simply connecting the spark gap of the set in series with the antenna circuit.

G. W. D., Tracy, Cal., asks:

Ques.—(1) Is No. 18 stranded lamp cord efficient for winding a loose coupled tuner? If this is used for primary, should same be used for secondary or what should be used?

Ans.—(1) Lamp cord is not the proper material for winding a receiving tuner. The primary winding of the average amateur tuner should be made of No. 26 S. S. C. wire, and the secondary of No. 32 S. S. C. wire.

Ques.—(2) Is it a good plan to build a loose coupler in the form of two spirals facing each other with additional units of the variometer type for higher waves, and use a variable condenser to shunt the primary, also one for the secondary?

Ans.—(2) There is no objection to this type of construction with the exception of the variometers which, of course, you understand are productive of energy losses. A little consideration of the matter will show that when the coils of the variometer are in opposition so as to give a small value of inductance, oscillations passing through them will encounter the entire D. C. ohmic resistance of the two coils, which will give greater losses than if a straight coil of an equivalent amount of inductance were inserted in the circuit. A variable condenser is of value if shunted to the secondary winding, but of no particular use if shunted to the primary. The series condenser is of value in the antenna circuit for the shorter wave-lengths.

Ques.—(4) Please give an approximate estimate of the capacity of variable condensers used in the majority of commercial wavemeters?

Ans.—(4) The capacity of the variable condenser of the average wavemeter may be taken as 0.005 Mfd.

* * *

J. L. B., Brooklyn, N. Y., writes:

Ques.—(1) Will you please tell me the number and size of condenser plates, number of turns of wire on helix and proper size of aerial to be used in the secondary circuit of a 1½-inch coil, to comply with the radio law and produce greatest efficiency. This coil is to be used on 9 volts.

Ans.—(1) We cannot give you definite data because the construction of induction coils varies widely. We suggest that you simply experiment with a small oscillation transformer and condensers until you get results. A number of tests were made in the laboratory of THE WIRELESS AGE and it was found that, ordinarily speaking, a satisfactory spark discharge could not be obtained with a coil giving less than a 3-inch spark discharge. The condenser capacity necessary with a 1½-inch coil is exceedingly small and we suggest that you experiment until a satisfactory spark discharge is produced. In the November, 1913, issue of THE WIRELESS AGE, data was given for the construction of a condenser and an oscillation transformer to comply with the United States laws. If you cannot secure a copy of this issue, the following information may be of interest. The data given, however, is for a 3-inch coil and not for one of 1½ inches capacity. The condenser consisted of four plates 8 by 8 inches

having an average thickness of 3-32 inch. These plates were covered with sheets of tin-foil 6 by 6 inches. The primary winding of the oscillation transformer consisted of eight turns of No. 10 D. B. R. C. wire on a form having an outside diameter of 1¼ inches. The secondary winding, of course, will vary with the length of the antenna and we suggest that the secondary winding have 15 or 20 turns and that connection be made at various points until a wave-length of 200 meters in the antenna is secured. You may try a condenser of these dimensions with a 1½-inch coil and see if satisfactory results are obtained.

* * *

H. P. H., Alton, Ill., asks:

Ques.—(1) Does high altitude increase the receiving range?

Ans.—(1) Not necessarily. It is often an advantage to place an antenna on a bluff or at a considerable height in order to avoid interference due to some nearby obstacle, and it is a fact that hills and mountains when nearby to either a transmitting or receiving station play havoc with the transmission or reception of signals. These conditions, however, can generally be overcome by a little experimenting. If the antenna is erected at too great a height, very severe atmospheric electricity is encountered which is, of course, a decided disadvantage. If we were to choose, in the location of a station, between a bluff and a valley we should select the bluff.

Ques.—(2) I am located about 150 feet above the Mississippi River, which flows by this city. Please tell me whether I should have any difficulty in receiving Sayville and Key West with the following apparatus: Aerial 60 feet in height and 85 feet in length, composed of four wires; receiving transformer, fixed condenser, two variable condensers, silicon detector, loading coil and 3,000-ohm head set.

Ans.—(2) You should be able to hear Key West and Sayville during the winter months at night.

Ques.—(3) When will the United States Naval Station at Lake Bluff be in operation and what will its wave-length and power in kilo-watts be?

Ans.—(3) We have no information at hand concerning the United States Naval Station at Lake Bluff, Ill. We suggest that you communicate with the Superintendent of Radio Service at Radio, Va.

* * *

G. A. B., New York City:

Concerning your query in reference to the High-Tone Rotary Spark Gap described on page 922 of the August issue of THE WIRELESS AGE, one lead from the condenser and helix is connected to both stationary spark points. The other side of the circuit may be completed through the binding posts supporting the shaft, or by the brush in actual contact with the copper disc. While the explanation might have been a little more explicit, it was believed that those in the wireless field would understand where the other connection was to be made.

F. F. L., New Rochelle, N. Y., asks:

Ques.—(1) In a number of your magazines in this department, you state that a 1 k. w. transformer operating on a 200-meter wave only uses 750 watts. If this is the case, what is the advantage of using a 1 k. w. transformer instead of a $\frac{3}{4}$ k. w. transformer, 750 watts?

Ans.—(1) The number of watts which a transformer will consume on a 200-meter wave-length depends upon the voltage capacity and frequency employed. There is no advantage whatsoever at a frequency of 60 cycles in attempting to use a 1 k. w. transformer, for the full rating cannot be employed for 200-meter work unless frequencies above those generally used by amateurs (60 cycles) are employed.

Ques.—(2) What other instruments should be used with a $\frac{1}{2}$ k. w. transformer, Thor-dosen type, 110 volt, 60 cycle, 5 amperes, giving 5,000 volts, to make it comply with the law and give best results?

Ans.—(2) The voltage of your transformer is too low for efficient results. The transformer should give a potential of at least 15,000 volts. By careful construction you may employ a rotary gap in connection with the transformer, but the points should be lined up evenly so that the actual length of gap will be very small indeed. If you desire to work on a wave-length of 200 meters with this transformer, the condenser should have a capacity of 0.01 mfd. You might then employ a rotary gap having eight points and traveling at a speed of about 2,400 or 3,000 revolutions per minute. The disc for the rotary gap should be about 6 or 7 inches in diameter. On account of the low voltage we are not sure that the results will be satisfactory.

Ques.—(3) Please tell me what power this oscillation transformer is capable of handling for best results: Pancake type, primary seven turns, $\frac{1}{2}$ inch brass ribbon, $\frac{1}{2}$ inch apart, 9 inches in diameter. Secondary, 13 turns $\frac{1}{4}$ inch brass ribbon, $\frac{1}{4}$ inch apart, 9 inches in diameter?

Ans.—(3) This oscillation transformer will handle the output of a 1 k. w. transmitting set.

Ques.—(4) Is it against the law to operate a 1-inch coil without condenser or helix? I notice you state that they cannot be operated with them. I have at present a one-inch spark coil, 6-volt storage battery, one silicon Murdock condenser, 0.0017 mfd., zinc gap, $\frac{3}{8}$ inch, plugs the oscillation transformer. Aerial 50 feet in length and 40 feet in height; four wires No. 14 C. $1\frac{1}{2}$ feet apart; lead-in, 10 feet; ground, No. 12 C wire, 30 feet, to three water pipes. The rating of the coil is as follows: amperes in primary, $1\frac{1}{2}$ to 2; volts across primary, 6; input in watts, 12 to 15; secondary rating in watts, 7 to 10.

Ans.—(4) A radio inspector informs us that amateur stations in respect to equipment and particularly in reference to the character of the emitted wave, come under the same regulations as the commercial stations; that is to say, the emitted wave should be sharp, pure and have a decrement less than 0.20.

If the amateur station is located outside the range of commercial communication and the signals from this amateur station positively do not reach or interfere with any commercial stations, the chances are that the government inspectors will issue a license to stations not employing an oscillation transformer. If, however, the station is located within the zone of possible interference, then an oscillation transformer must be employed and the coupling sufficiently decreased, so that the emitted wave will comply with the United States regulations.

Ques.—(5) Under ordinary conditions what distance should I be able to get with this?

Ans.—(5) With the equipment you have at hand you should be able to transmit about 8 or 9 miles.

* * *

G. F. K., Woodlawn, N. Y., writes:

Ques.—(1) Please let me know the approximate wave-length of an aerial consisting of one wire 240 feet in length from instruments. The ground wire is 10 feet in length.

Ans.—It will have a wave-length of approximately 360 meters.

Ques.—(2) If this aerial has a natural wave-length of more than 200 meters, will you kindly give me the size of series condenser to be inserted in order to bring the wave-length down to say 150 meters to be tuned up to 200 with an oscillation transformer. I have found this type to be best suited for my requirements, as my aerial is strung between trees and I have considerable trouble in keeping the wires from twisting, due to swaying of the trees.

Ans.—(2) We are unable to give you the exact size of the series condenser to bring the wave-length of this antenna down to 200 meters because we do not know the capacity in microfarads. If we had this data we could furnish you with the necessary information.

* * *

C. M. A., Minneapolis, Minn., asks:

Ques.—(1) Please let me know whether I have a chance to hear the government station at Arlington, Va., with the following apparatus: loading coil wound with 360 feet of silk wire, 2 variable condensers, "loose-coupler," silicon detector, fixed condenser, 2,000-ohm telephones. My aerial is 65 feet in height at one end and 40 feet at the other. It is 90 feet in length and consists of 4 strands of wire spaced 2 feet apart.

Ans.—(1) Your query is very indefinite. You have not given us the value of the "loose-coupler" or the value of capacity of the condenser. Lacking this information, we cannot advise over what range of wave-lengths your apparatus will be responsive. Your aerial is rather low for long distance work, but during the very cold winter months and at night you may possibly be able to hear the Arlington signals.

The remainder of your queries are also indefinite and we therefore cannot reply. The proper answers to the latter questions would depend upon the range of wave-lengths over which your inductively coupled receiving tuner is already responsive.

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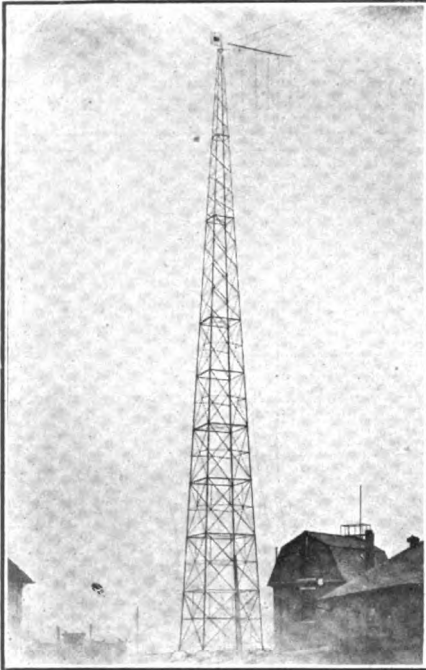
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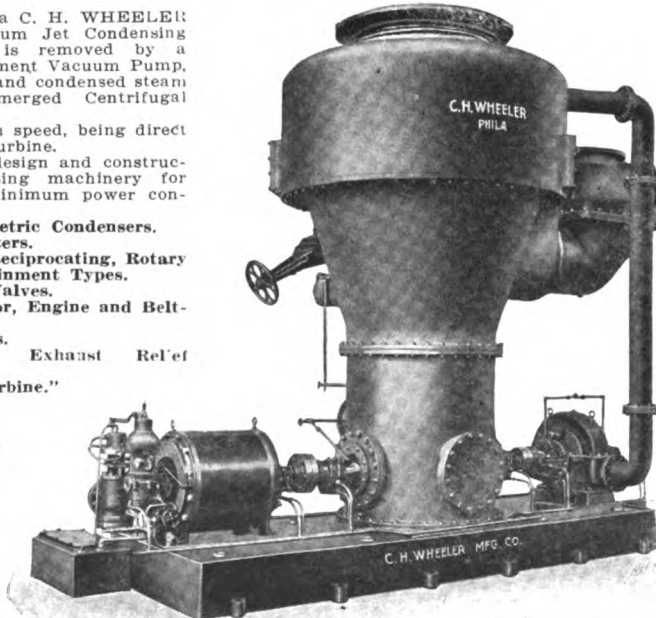
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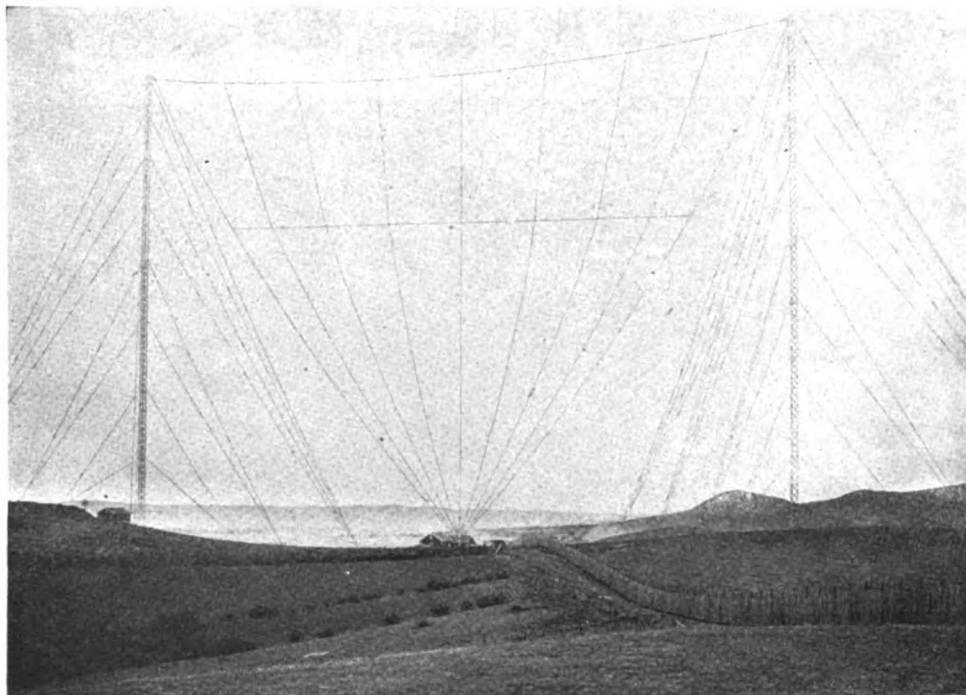
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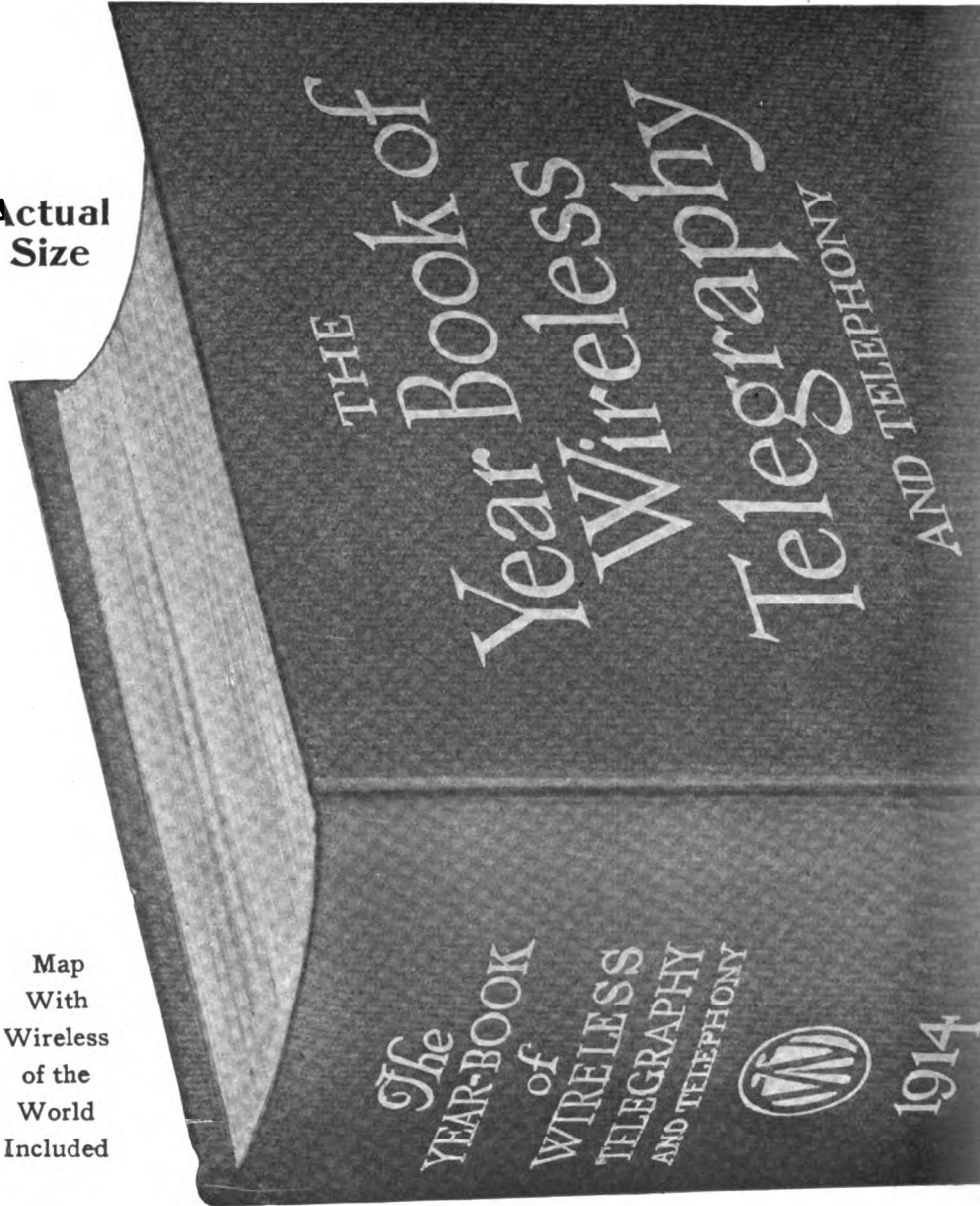
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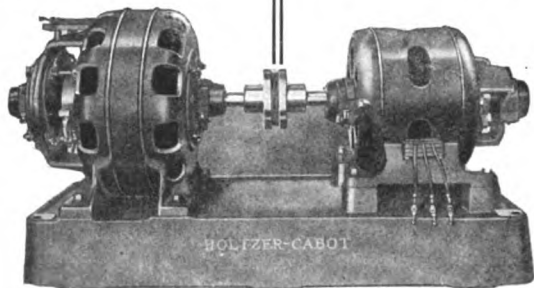
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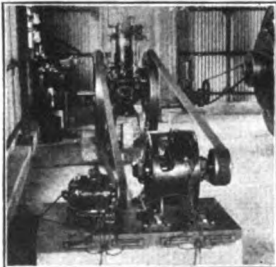
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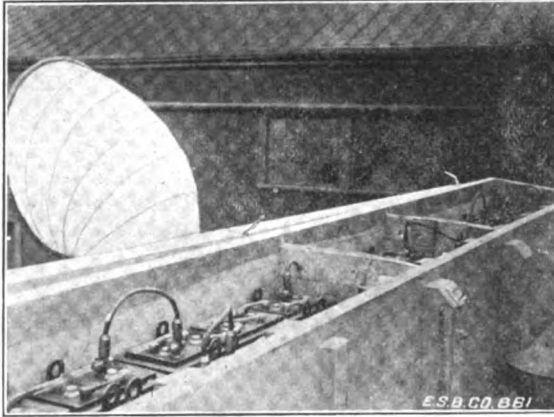
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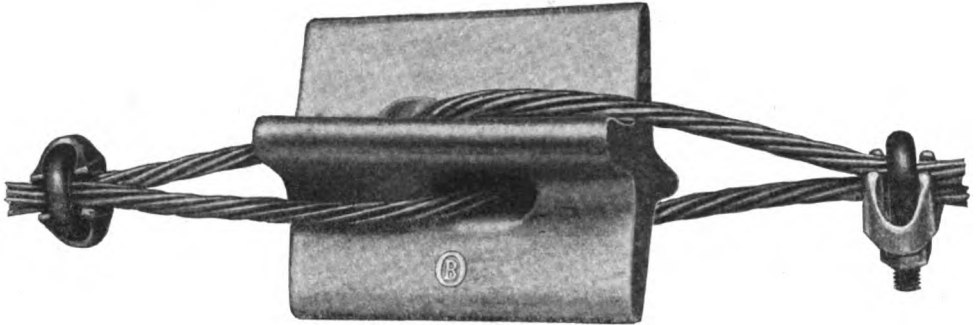
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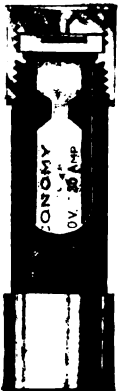
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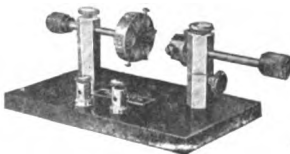
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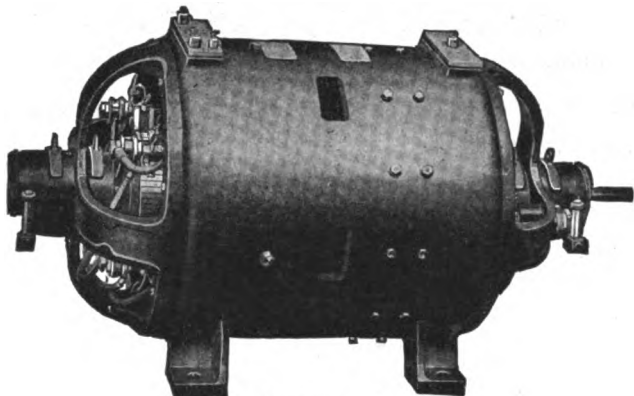
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