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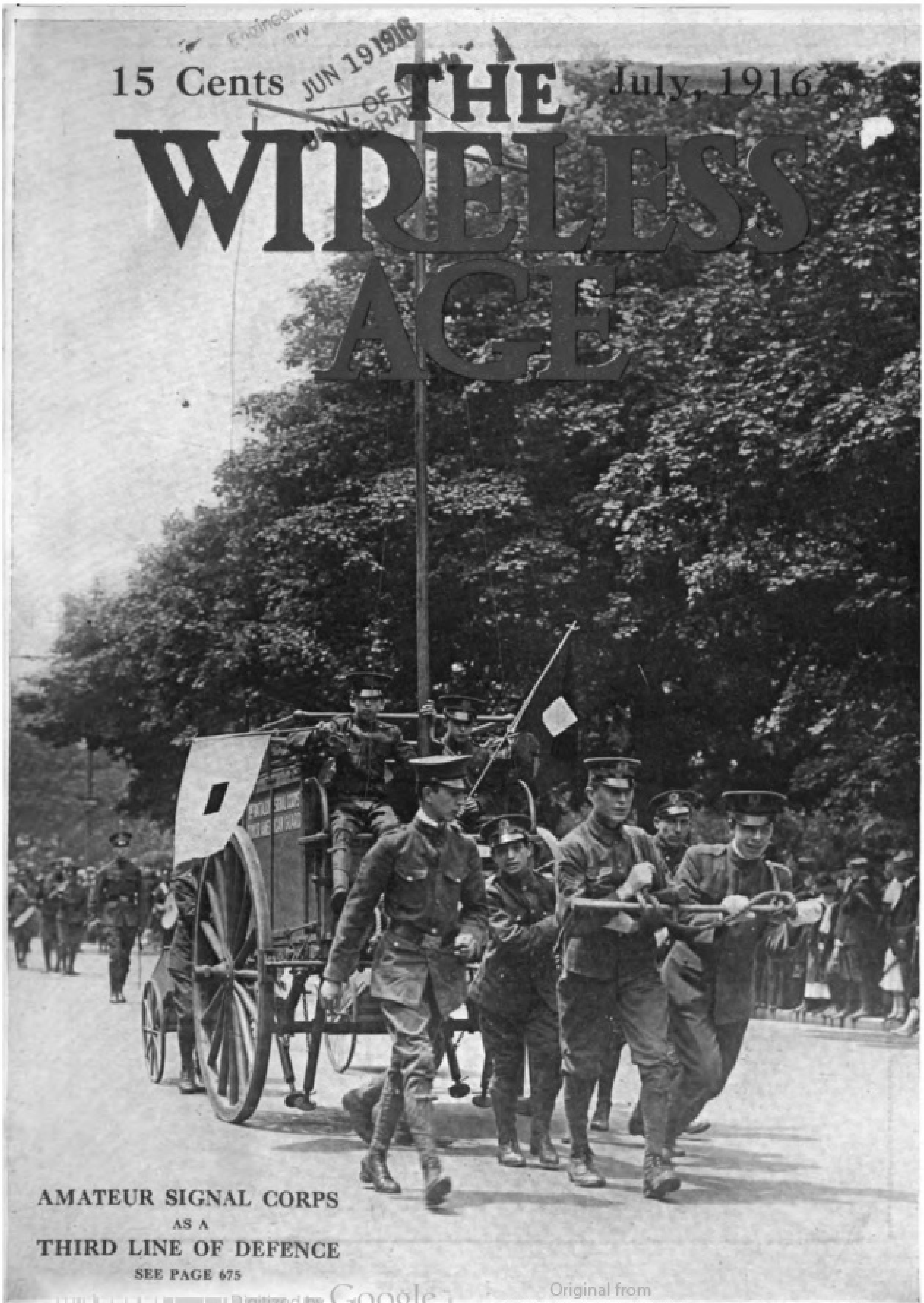
July, 1916

THE WIRELESS AGE



AMATEUR SIGNAL CORPS
AS A
THIRD LINE OF DEFENCE

SEE PAGE 675

THE WIRELESS AGE

Owing to the fact that certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future, and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

JULY, 1916

The head of the column at the beginning of the line of march, showing the marshal and staff and a battalion of the 1,300 young soldiers on parade before 300,000 New Yorkers

Governor Whitman, of New York, and staff in the reviewing stand

Parade of the New York Signal Corps as Third Line of Defense for the Nation

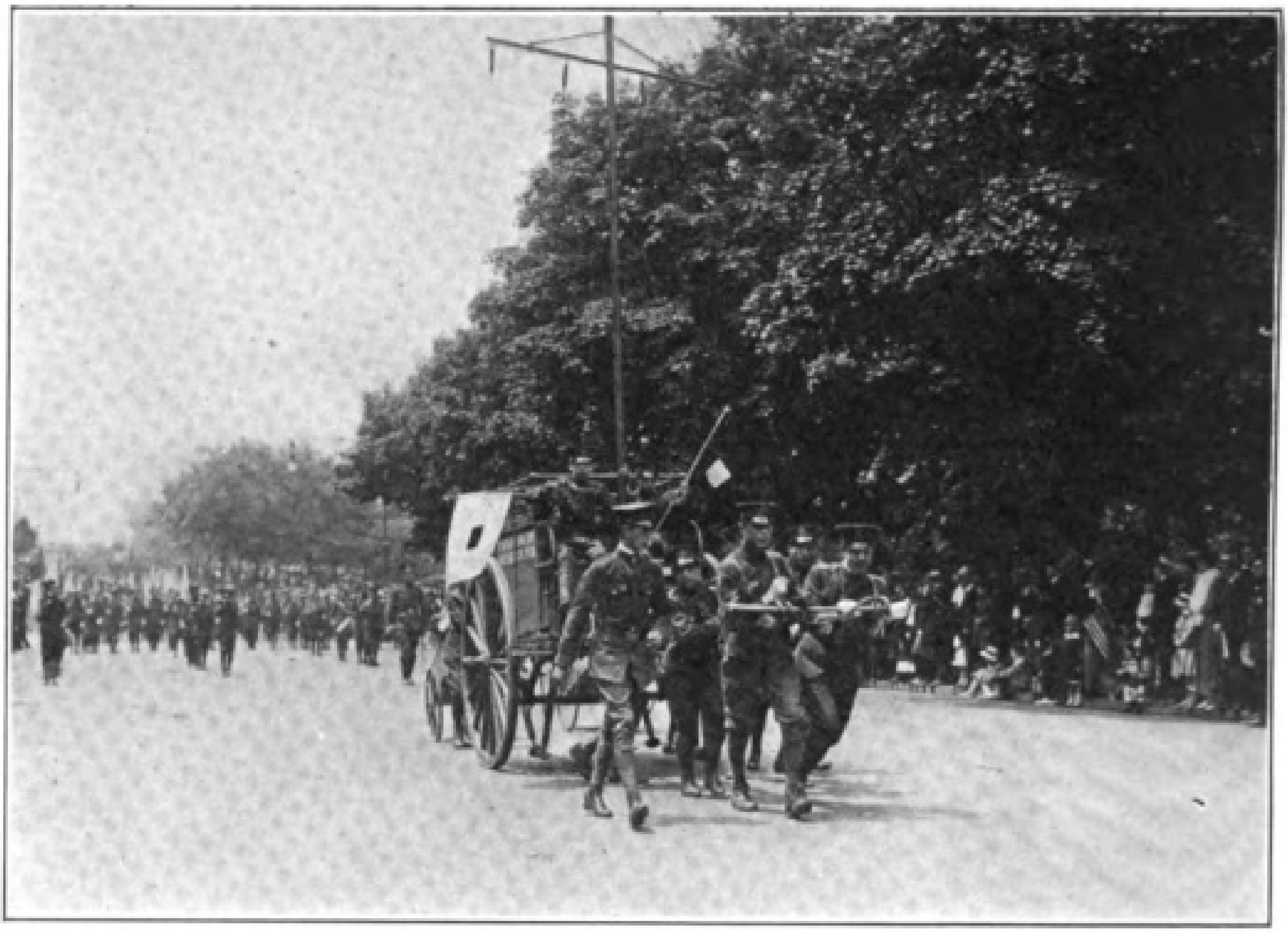
Description of the Memorial Day Review

OVERHEAD a canopy of fleeting clouds with a background of blue sky; underneath, with green foliage and handsome buildings as a setting, a vast throng of enthusiastic spectators; passing in soldiery array before this press, with bands playing and flags flying, a mighty host, of which the members of the National Amateur Wireless Association, affiliated with the Junior American Guard, were conspicuous figures.

These were the marked features in New York City's annual Memorial Day procession in Riverside Drive.

It was a red letter occasion for the members of the Association and the Guard. For months they had been going through the comparatively dull routine of drill and military tactics, preparing themselves to be defenders of the nation, and the parade gave them their first opportunity to appear as soldiers under the batteries of thousands of eyes. In the same column with gray-haired men who had distinguished themselves in the country's service in years gone by they marched up the Drive from Seventy-eighth to Ninety-second streets, ripple after ripple of applause greeting their appearance.

To the 300,000 spectators lined up on either side of the Drive and distributed at points of vantage on piazzas, in windows, automobiles and even on roofs of apartment houses and residences the Signal Corps Battalion of the Junior American Guard and its wireless equipment were apparently objects of endless interest. All along the line of march the U. S. army wireless cart and set, donated to the 1st Battalion Signal Corps by the Marconi Wireless Telegraph Company of America attracted widespread atten-



One of the most conspicuous features of the parade was the wireless cart of the 1st Battalion Signal Corps, followed by the more mobile units of light equipment

tion. Drawn by members of the Guard in a combination of field and dress uniform, it was perhaps the most conspicuous feature in a pageant which was replete with martial features. Viewing the procession from the upper windows of apartment houses, the aerial mast stood out prominently, attracting the eye even before it came close enough to be identified as part of a wireless equipment. On the sides of the cart were the words, "1st Battalion Signal Corps, Junior American Guard." The wireless pack sets carried by members of the Signal Corps were the subject of considerable comment, and the machine guns aroused interest.

More than a thousand members of the National Amateur Wireless Associations and the Guard were in line. Their enthusiasm regarding the parade and things military had been increased perhaps by the fact that the opening of the Association's summer camp at Birchwood Lake, Sullivan County, N. Y., where drills and preparedness practice will be the order of the day, will occur in July.

When the members of the Association and the Guard gathered in Seventy-eighth street, near Broadway, soon before nine o'clock in the morning to form in line they looked somewhat apprehensively at the lowering clouds. A short time afterward, however, the sun broke through and the threatening skies rolled away. It was more than an hour later when the Junior American Guard division swung into the line of march which had formed at Seventieth Street.

Mounted on horses were the marshal, Major William H. Elliott, and his staff, consisting of Major J. Andrew White, chief signal officer, Captain Joseph T. Griffin and Lieutenant Heyworth J. Campbell. The First Battalion Signal Corps, under command of Major White, consisted of two companies commanded by Captain C. F. White and Captain Logan, the main wireless section, of course, being included in this corps.

In the line of march were the First Provisional Regiment, headed by a brass band and forty pieces of field music, comprising the Seventh (St. George's) Battalion, Major George Grocott commanding; the Eighth (Washington Heights) Battalion, Major Edward E. Gilman commanding; the Third (Lenox Hill) Battalion, Major George C. Erbeck commanding; the Second Provisional Regiment, consisting of the Lone Star Battalion Fife, Drum and Bugle Corps; the Second (Lone Star) Battalion, Major Charles S. Nyman commanding; the Twelfth (Cayuga) Battalion, Major Charles Frieder commanding; the Sixth (U. S. Grant) Battalion, Major R. S. Davis commanding; the Nurse Corps Detachment (Lone Star Battalion); the Third Provisional Regiment, consisting of the Alexander Battalion Fife, Drum and Bugle Corps; the Twenty-first (Alexander) Battalion, Major J. H. C. Smith commanding; the Sixteeenth (Bayonne) Battalion, Major Warren Roy commanding, and the wireless detachment (Alexander Battalion).

At the reviewing stand at the Soldiers' and Sailors' Monument at Eighty-ninth street was Governor Charles S. Whitman. Five members of the Board of Governors of the Junior American Guard were on the governor's staff. They were Colonel Charles Elliot Warren, Lieutenant Commander Louis M. Josephthal, Major Francis L. V. Hoppin, Captain Alvan W. Perry and First Lieutenant Maunsell S. Crosby.

The parade disbanded at Ninety-second street and Broadway, where the wireless cart was surrounded by an interested crowd, several of the spectators being so much impressed that they enrolled at once as members of the Signal Corps.

Several complimentary expressions of opinion regarding the Guard came from men of prominence. Brigadier General Andrew C. Zabriskie, who commands the organization received the following letter from Colonel Warren:

June 1, 1916.

I am sure you wil! be gratified to

The three provisional regiments were headed by the staff officers; these are, reading from left to right, Major White, Chief Signal Officer, Captain Griffin and, in the foreground, Major Elliott, Adjutant General

The "mother station" wireless cart swinging into line

A signal corps company, showing wig-wag and semaphore flags know that we were all very much pleased with the appearance of the Junior American Guard, in which you are so deeply interested, on the occasion of the Memorial Day parade. I was in command of the Guard of Honor to the Governor, and I said to him as your boys marched by that I had the honor of being on the Advisory Committee, Board of Governors, of this guard, and that personally I was pleased to see the tremendous strides they had made. They really presented in every way a most creditable, excellent, military appearance, and were all commended by the Governor, the Adjutant-General, and everyone on the stand.

The governor had a staff of about fourteen officers with him: and they all, barring the Governor himself, who was called elsewhere, lunched with the Veteran Corps of Artillery at the Columbia Yacht Club immediately after the review, and individual members of the staff were all of the same opinion concerning the members of the Junior American Guard. I cannot speak too highly in their praise. They are certainly splendid young soldiers; and you can be quite satisfied that they will prove in after life a credit to you and your continued effort for their development and good.

Very sincerely yours,
(Signed) Charles Elliott Warren.

This tribute was paid to the Signal Corps Battalion by Major Elliott:

June 3, 1916.

Major J. Andrew White, Acting President,
National Amateur Wireless Association,

Dear Major White:—

General Zabriskie wishes me to thank you for your co-operation in helping to make the Memorial Day parade a success, so far as the Junior American Guard was concerned.

The Signal Corps Battalion, organized under your direction, made an excellent showing and the wireless cart and equipment donated to us by the Marconi Company was a wonderful addition to our division and was commented upon very favorably by several members of our Executive Committee, who are members of the Governor's staff and who accompanied him as Reviewing Officer on Memorial Day.

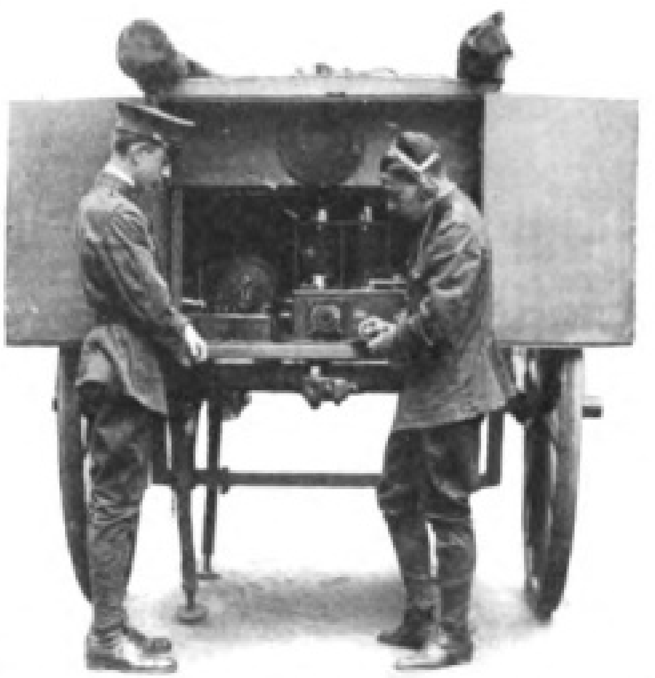
Kindly convey our sincere thanks to the Marconi Company for the privilege extended to us in allowing us to use the wireless cart and equipment.

The staff reviewing the Junior American Guard at the end of the march. From left to right: Major William H. Elliott, marshal; Lieutenant Heyworth J. Campbell, Major J. Andrew White, Captain Joseph T. Griffin

Commander F. M. Tiernan, grand marshal of the Grand Army of the Republic, wrote Major Elliott that "It affords me great pleasure to compliment you and the Junior American Guard of your division for the splendid showing in the Memorial Day parade."

Following the exhibition of the wireless cart in the procession there were many inquiries regarding the equipment. The set is made up of apparatus of the type used by the Marconi Company for auxiliary equipment—an installation that has stood the test of operation in life and death emergencies. It was this type of set that Jack Binns employed to flash the S O S from the steamship Republic when she was wrecked. Numerous instances of its efficiency have been recorded from time to time.

The equipment consists of a Marconi 10-inch induction coil, leyden jar condenser, a set of storage batteries, an ordinary Marconi type key, a type 107-a tuner, and an aerial tuning induc-



The signal corps cart open and working; showing 10-inch induction coil, aerial tuning inductance, leyden jars and tuner. On the top of cart are mast sections encased

ance of the latest type made up of a copper strip spiral wound on a large disk of insulating material. The spiral is of the type used on modern Marconi commercial apparatus. All of these parts are mounted in the wireless cart, which is of the regulation signal corps type.

The detector on the tuner is of a carefully selected quality of carborundum which is mounted in standard Marconi crystal holders. A pair of double head phones are employed for receiving.

The mast attached to the cart is portable and can be increased or decreased at will. When raised to its full height, it extends sixty feet into the air. The aerial comprises four wires running from the top of the mast down to the leading-in insulator on the cart. The aerial is insulated by standard Marconi aerial insulators of the kind employed in the merchant marine.

Under favorable conditions and with the aerial raised to its greatest height the set can transmit from twenty-five to fifty miles. Its maximum receiving range is about 150 miles.

Questions from applicants resulted in an interesting talk by the commanding officer, after the parade. It was explained that there are many uses to which the portable set can be put in active army service. For instance, a detachment of the signal corps is detailed to accompany the main body of the independent cavalry, many miles ahead of the regular base of the army. Of course time is at premium and knowledge of events is essential to the commander of the main force. So the advance Signal Corps men are depended upon to establish when necessary instant communication with the base. With the main body of the army is a portable set mounted in a cart. The cavalrymen, however, take with them pack sets borne by horses.

For hours, perhaps days, the advance may proceed without incident. Scattered far and wide over the country are the men of the cavalry, keeping a sharp lookout for the enemy. Then, while the men are pressing swiftly onward, comes a sharp command to halt. The enemy's outposts are at hand and it is imperative that the officer at the base should be informed of this fact at once.

"Open section" is the command given by the section chief to the men of his command and they turn and dismount. The horses are placed in a circle and the men give their attention to the burdens borne by the pack animals. These loads consist of boxes containing wireless apparatus and sections of poles. On the back of one of the horses is a small iron frame. When the latter is taken from the horse one man raises a section of a pole to which is attached the antenna. A man on the frame lifts the pole and section after section is joined to it.

Comes next the task of driving the insulating pegs into the ground and dragging out four long lines of wires which make up the counterpoise or artificial ground. Adjustments of wires are made, the chest is coupled to a wire from the mast, and connections effected with the ground. A hand generator, connected to the instrument chest, is fastened to the iron frame and the set is ready for operation.

Hurriedly the commander of the cavalry scribbles a message to the general at the base, giving him the information wanted, and places it in the hand of the sergeant at the head of the Signal Corps. At the main headquarters of the army the wireless cart set and its operators are ready to receive the communication and with lightning-like speed it is delivered to the general.

Thus has the portable wireless set done away with the necessity of sending mounted messengers back to carry communications—a long, hard journey involving loss of time, the risks of being cut off by the enemy, and the consequent failure to deliver the communication.

During the trouble which the United States had with Mexico in 1914 the Mexicans demanded the surrender of the detachment which was guarding the water works at El Tejar. In command of the small American force was Major Russel. It looked like a serious situation for his men, who were considerably outnumbered by the Mexicans. However, disregarding a demand to surrender, he flashed a wireless message to General Funston at Vera Cruz. Came a reply by wireless within a few minutes that reinforcements were hurrying to El Tejar. As a result, within an hour the little garrison caught sight of the uniforms of seven companies of the Fourth Infantry and two battalions and three companies of marines.

Excellent examples of the efficiency of the United States Signal Corps were afforded in Vera Cruz. Marines from the transport Prairie had not been ashore more than an hour when members of the Signal Corps had erected a mast on top of the Terminal Hotel. By means of the installation information and requests for instructions were transmitted to Rear Admiral Fletcher in the harbor, thence to Rear Admiral Badger, who was nearing Vera Cruz with another division of the North Atlantic Fleet.

A large force of Mexicans was discovered hurrying over the hills on the

Arrival of the first radio section of the 1st Battalion Signal Corps for the Memorial Day Parade in New York. Two sections of the 60-foot mast were erected and carried throughout the line of march for exhibition purposes outskirts of the city soon after the Americans took possession of the custom house. It was apparent that their intention was to flank a United States battalion in the railway yards. A wireless message containing this information was therefore sent at once to the Prairie and the transport's guns effectually blocked the interference of the enemy.

An officer of the National Amateur Wireless Association pointed out that the basic principle upon which signaling companies operate is to provide for transmission of information and orders from commanding officers to their subordinates and returning information from these subordinates to the commanders. In war times communication without interruption must be established and continued. The means employed are visual or electric signaling and the troops are expected to execute the orders of their commanders no matter what difficulties it is necessary to overcome in order to do so. Visual signaling is employed only when electrical means of communication does not avail, but it is obvious that the members of the signal corps are expected to comprehend the various methods of signaling.

When a company is organized it is divided into wire and wireless sections. In the wireless section are placed all of the recruits detailed to the establishment and maintenance of a wireless station. One first-class sergeant, who is chief of section; one sergeant, two corporals, operators, antenna men and messengers make up a pack wireless section. In a wagon wireless section will be found one first-class sergeant, who is chief of section; one sergeant, two corporals, the engineer, the wagoner, operators, antenna men, guy men and messengers. A first-class sergeant as chief of section, one sergeant, two corporals, operators, linemen and messengers comprise the wire section. Pack wireless sections make up the first four sections of a field wireless company; the remaining two are wagon wireless sections.

Included in the means of electrical signaling are the wireless telegraph, buzzer and telephone. Members of the National Amateur Wireless Association have been advised to familiarize themselves thoroughly with the code in order to meet any emergency that may arise as signal corps men. The Signal Corps, it should be understood, is called upon to keep parallel columns in communication while marching, and it may also be commanded to "jam" the stations of the enemy. Whether in the field, on the march, or in battle, it is essential that the detachments be near the commanding officer with whom communication is to be maintained. As a rule, the signal officer retains a position near the commanding officer in order that he may keep well in touch with the situation.

The nurse corps of the Lone Star Battalion, an indication of the completeness of the military organization

The Summer Camp of the N. A. W. A.

Birchwood Lake, Where Drills and Preparedness Practice Will be the Order of the Day

NESTLED among the ranges of the Shawngunk Mountains in Sullivan County, N. Y., 1,600 feet above the level of the sea, is picturesque Birchwood Lake, the site of the summer camp of the members of the National Amateur Wireless Association. Here on July 1 the outdoor home of the Interstate Military and Athletic Encampment Association, with which the National Amateur Wireless Association and the Junior American Guard are affiliated, will be established.

Birchwood Lake is about four miles south of Monticello and a little more than 100 miles from New York City. Arriving at Monticello, the campers will be transported along a road that winds up and down through thickly wooded country.

On the south shore of the lake is a rebuilt farm house which will be used as the general headquarters of the camp. It is a large structure with two wings, one of which is two stories in height and the other three. There are twenty rooms with windows, commanding an attractive view of the lake and the surrounding country. One large room will be used as a dining hall which will accommodate 400 persons.

The official headquarters of the National Amateur Wireless Association and the wireless station to be operated under its auspices will be located on a knoll in the rear of the house. A tall pine tree may be used as one of the supports for the antenna. In charge of the station will be a competent operator who will also give instruction in the art. A number of pack sets to be provided by the National Amateur Wireless Association for its members will be used to supplement the work of the station. It is expected that the station will be the center of activities in the camp, for there are several amateur equipments in Monticello and the neighborhood which will doubtless be in touch day and night with Birchwood Lake.

Out of the 300 acres which the camp will occupy 100 acres consist of cleared ground. The fields are segregated by trees fifteen to fifty feet in height, so that the various divisions of the camp will have independent quarters. A fifteen-acre tract has been laid out for field manoeuvres which will be among the most attractive features of the camp life.

In addition to the routine program mapped out for those who go to the camp several other diversions have been planned. A bathing pool has been built and the lake provides boating and excellent pickerel fishing. There are many points of interest within hiking distance. Among them is the 25,000-acre deer preserve of C. W. Chapin at Lebanon Lake, two miles away. Nearby also is the preserve of the Patchogue Rod and Gun Club. The camp is about a mile from the Mongaup River and a half mile from the crest of the ridge overlooking the Mongaup Valley. At the head of the valley in the town of Liberty.

Officers of the National Amateur Wireless Association recently visited Birchwood Lake to inspect camp sites. Members who wish to go to the camp should make application to the headquarters of the Association at No. 450 Fourth avenue, New York City. For $2 a week a member of the Association will be able to obtain sleeping quarters in a tent. It is optional whether he obtains table board with the accompanying serv-

This photograph shows a view of Birchwood Lake, which will play an important part in the recreation of the campers. The lake attracts a considerable number of fishermen to it every year because of its reputation as the home of pickerel that are not too wary to be caught. It will provide boating as well as fishing for the wireless amateurs

A rebuilt farm house, a large building with two wings, will be used as the general headquarters of the camp. In the structure are twenty rooms, one of which will be turned into a dining hall. The windows of the building command attractive views of the lake and the surrounding country

One of the most prominent features of the camp will be the wireless station to be maintained by the National Amateur Wireless Association on a knoll in the rear of the general headquarters. A tree which may be used as a support for the aerial of the equipment can be seen in this picture of the camp

ice in the dining room in the headquarters building at $8 a week or joins a company having a cook who will buy food from the commissary. In the latter case the cost of the camper's meals will be $2 a week. Therefore he has the choice of board and lodging at $4 or $10 a week. From July 5 to September 9 the Erie Railroad will sell round trip tickets from New York to Monticello for $1.50.

Officers of the Association have strongly indorsed the camp and its objects, pointing out that it provides healthful, instructive recreation as well as the advantage of meeting and exchanging ideas with well known amateurs. The camp will remain open until September 9.

How To Conduct A Radio Club

(Especially Prepared for the National Amateur Wireless Association)

Receiving Detectors For Wireless Telegraphy.

By Elmer E. Bucher

ARTICLE XXV

IN the article of this series published in the June issue of THE WIRELESS AGE, the two chemical receiving detectors, the whisker-point electrolytic and the primary cell detector, were discussed. Some important points concerning the adjustment and manipulation of the various types of crystalline detectors will now be taken up.

Mineral Detectors—Certain minerals found in Mother Earth, or crystals compounded by various processes, possess the property of rectification and will accordingly convert an alternating current of radio frequency to a unidirectional or pulsating current, thereby changing the signals of a distant transmitting station to a form suitable for attracting the diaphragm of a telephone receiver. One of the most rugged and practical of all crystalline detectors is the crystal of carborundum, which is much used at commercial radio stations.

It should be known at the start that the crystal of carborundum is not a native mineral, but a product of the electric furnace, a combination of sand, salt, sawdust and coke. The finished crystal is known to chemists as carbide of silicon.

The Carborundum Detector—Although various holders have been devised for crystals of this type, and all are to some extent satisfactory, the one shown in Fig. 5 is recommended, since it allows a sensitive point to be located at any point on the crystal. The crystal of carborundum, R, is imbedded in Woods metal or other soft metal in the containing cup, C. The movable arm, A, has a double movement, sidewise, at the point B, and "round and round" at the offset cup, C-1. A steel phonograph needle is soldered in this cup with a slight portion of the point projecting.

Adjustment—Sensitive carborundum crystals cannot be told at sight, nor can specific instructions be given for locating the sensitive point. It is sufficient to say, however, that the steel needle is oriented about the crystal and "jabbed in" at different spots until a buzzer tester indicates a sensitive condition. As compared with certain other crystals, this one demands a rather heavy pressure on the contact, C-1.

The adjustment of this detector cannot be considered complete until correct values of current from the local battery, B, are applied.

Circuit for the Carborundum Detector—The preferred diagram of connections for the carborundum crystal appears in Fig. 7. The head telephones, P, are of 2,000 to 3,000 ohms resistance, the potentiometer, P-1, has a value of 400 ohms and the battery, B, an electromotive force of 3 volts. The condenser, C-2, may have a value between .01 and .04 microfarad. As it is extremely important that the current from the battery, B, flow in a certain direction, the connections to it should be reversed during the test; the same effect is obtained by turning the crystal about in the holder, the former being left in the position where the loudest signals are obtained.

With the usual crystals of carborundum the use of the local battery is absolutely essential; therefore the potentiometer should be one giving fine gradations of the applied voltage.

Some experimenters prefer for the carborundum detector the circuit indicated in Fig. 6, stating that it gives added response from a given station.

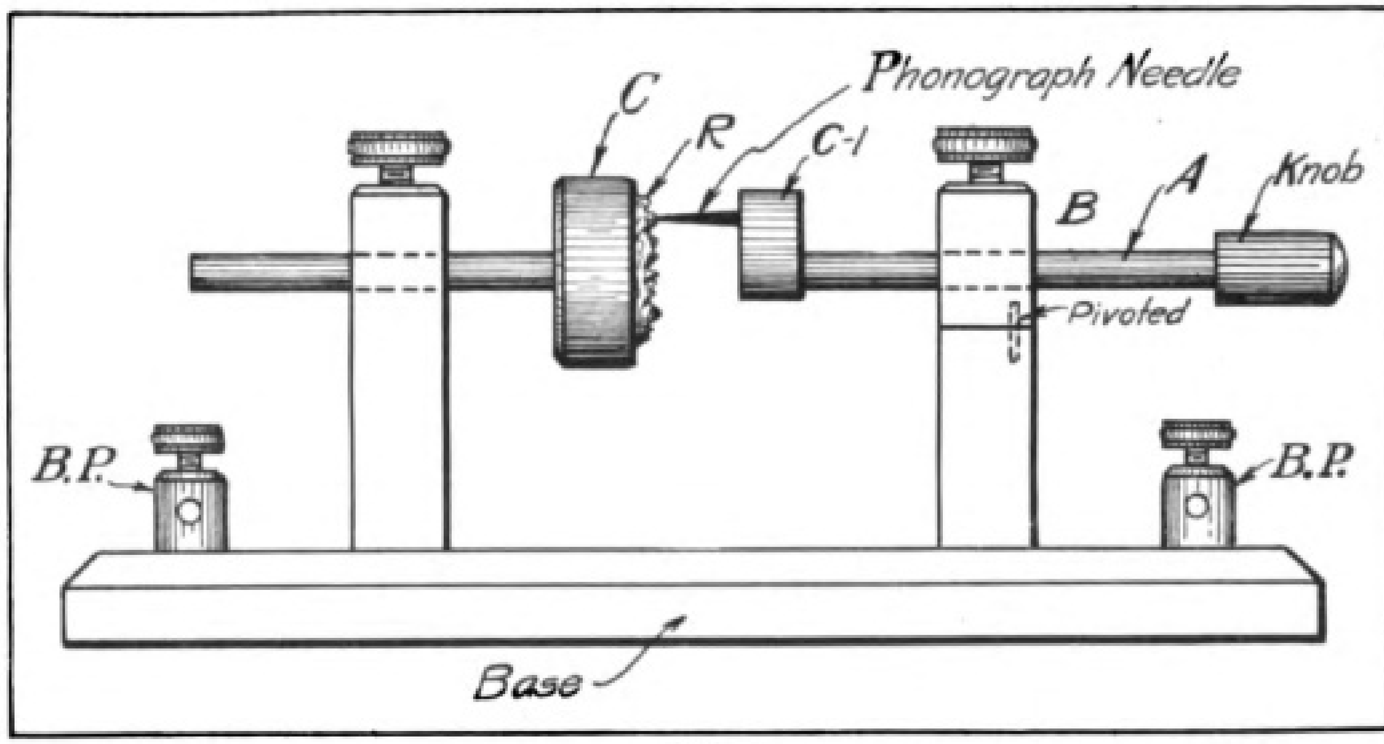


Fig. 5

It will be noted in this diagram that the telephones are shunted about the fixed condenser of the local circuit, the potentiometer being connected in series. With a circuit of this type it is often of value to have the condenser, C-2, variable in capacity.

The Galena Detector—This mineral is a natural sulphite of lead, generally found in the formation of cubical crystals. It has a blue gray color with a noticeable metallic lustre. One of the peculiar characteristics of this crystal when used as a wireless telegraph detector is that no local battery is required and that the opposing contact must be extremely light. The crystal holder indicated in Fig. 5 is applicable to galena, but the phonograph needle must be removed and a very light piece of elastic wire wound in the form of a spring substituted.

Adjustment—Specific directions for the adjustment of galena crystals can-

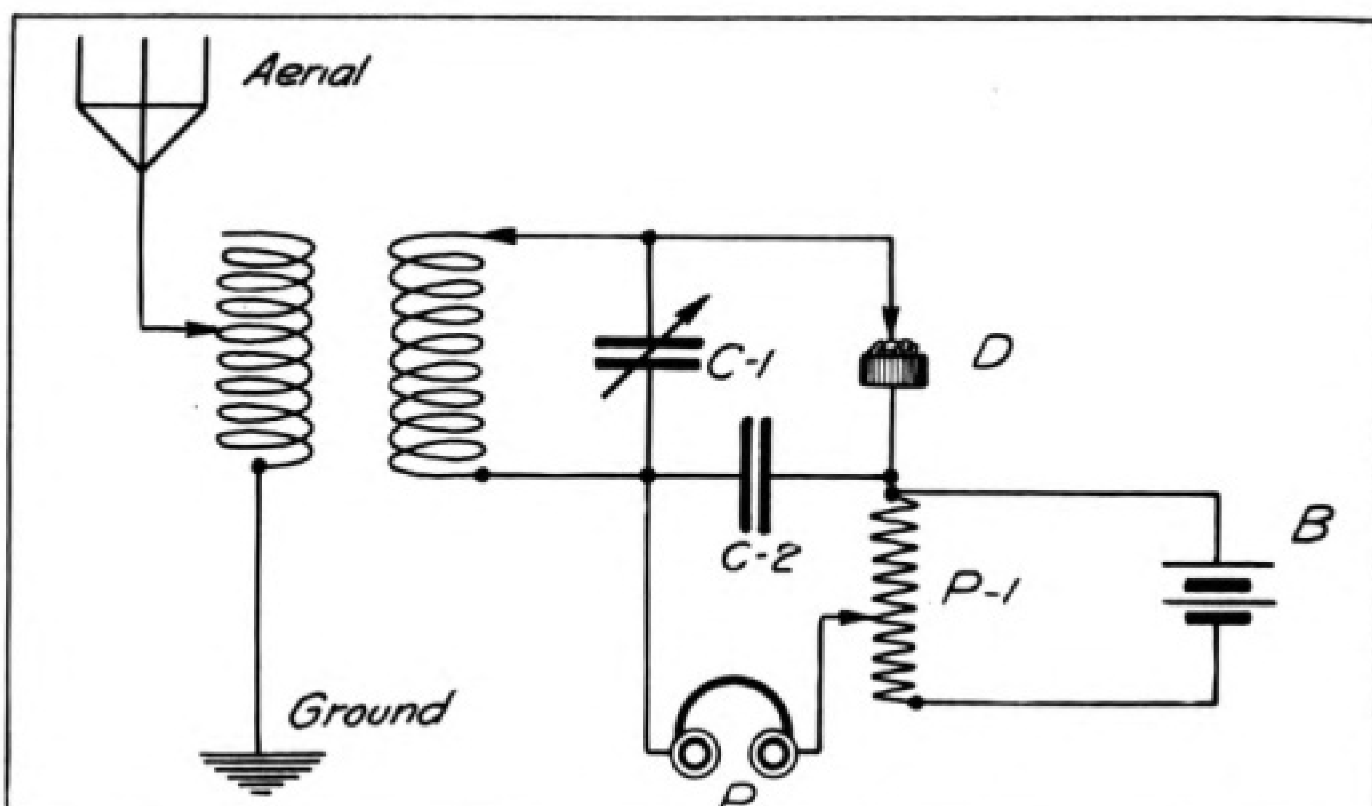


Fig. 6

not be given, but the fine point should be placed in light contact with the crystal at various points until by means of a buzzer tester the most sensitive spot is located.

If a more positive contact than that afforded by a "whisker" is desired, a piece of graphite from a lead pencil may be employed. Increased pressure can then be applied.

Circuit for Operation—The best circuit for the galena detector is that shown in Fig. 6, provided the potentiometer and battery are eliminated from the telephone circuit. With certain crystals of galena, the author has obtained increased sensitiveness by the use of a very small potential from the local battery, but to obtain similar results there must be connected in series with the main potentiometer a fixed resistance of about 2,500 ohms.

The Zincite-Bornite Combination—Because of the ease with which a sensitive spot is located many amateurs favor this combination of minerals, but owing to the fact that adjustment of the detector cannot be continuously maintained under the rugged conditions of commercial or amateur service it is not as well adapted to practical use as some other crystals, notably carborundum.

Zincite is a native oxide of zinc. It is a rather brittle substance of blood red color, due to the presence of manganese.

Bornite is a copper ore consisting of about sixty parts of copper, fourteen of iron and twenty-six of matrix crystals. It possesses a rather odd bronze color.

The crystal holder in Fig. 5 is suitable for this combination of minerals. It is the custom to place several crystals of zincite in the large cup, C, and a single crystal of bornite in the revolving cup, C-1. During adjustment the crystal of bornite is touched at various spots on each of the crystals of zincite until a sensitive spot is located. A slight electro-motive force from the local battery is of great value to this detector; hence the circuit shown in Fig. 6 is correct, provided a fixed resistance of about 2,000 ohms is connected in series with the usual potentiometer of 400 ohms.

With a fresh set of crystals this detector is found to be more sensitive than crystals of carborundum and hence will give the stronger signals from a given station.

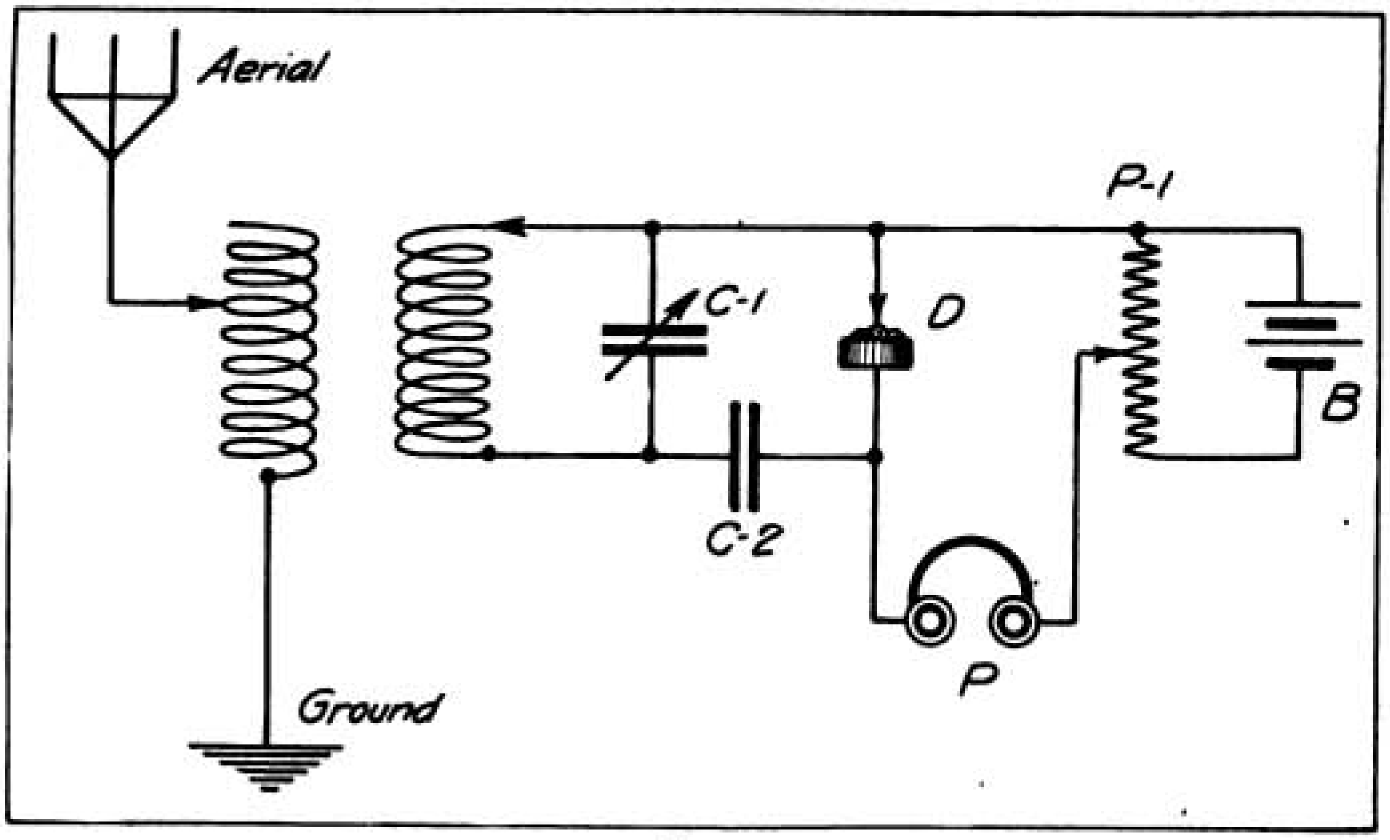


Fig. 7

In the earlier forms of the device copper pyrites or chalco pyrite was used in place of the bornite crystal and it was frequently observed that a sensitive spot could be located more easily with the latter combination than with the one previously described. A copper pyrite crystal is easily distinguishable. It is a copper sulphate containing considerable iron, possessing a brilliant brass yellow color and a rather bright metallic lustre.

With either combination of elements it is necessary from time to time to clean the zincite crystals because the filings from the bornite or chalco pyrite crystal caused by rubbing the two crystals together may deposit themselves upon the crystals of zincite, thus destroying the sensitiveness. The crystals of zincite may be cleansed with ordinary soap and water, with gasoline or with a solution of carbon bi-sulphide. After the crystals are thoroughly dry they will be found, to some extent, to possess their original degree of sensibility.

The Silicon Detector—Silicon is non-metallic and one of the most abundant elements in nature. It is not, however, found in an uncombined state. The crystals used in wireless telegraphy are a gray metallic looking substance. This element possesses properties somewhat similar to that of galena, and, like galena, generally requires a rather light opposing contact. Hence it is customary to use a small whisker point of steel wire or other elastic wire for making contact with various points on the crystal. The holder described in Fig. 5 is applicable to this crystal, but the cup, C-1, is fitted with a light piece of wire in place of the rigid steel phonographic needle. The silicon detector functions with or without a local battery, but with certain types of crystals the best results are obtained by the slight application of a local potential.

In one form of silicon detector the crystal is ground down on an emery wheel to a smooth polished surface, but amateur experimenters frequently report that they obtain the best results from the rough crystals in their natural state.

As in the case of the galena crystal we can, in this instance, apply the diagram of connections in Fig. 6, provided a fixed resistance of 2,500 ohms is connected in series with the standard potentiometer.

It is needless to say that a number of other elements have been found to possess the property of rectification. For example, the crystal of molybdenite in conjunction with a contact of copper has been found to possess a considerable degree of sensibility. Likewise, a crystal of iron pyrites in combination with a steel contact will act efficiently as a receiving detector. Occasionally a crystal of tellurium with a contact of aluminum is used. In fact any single element of the foregoing combinations may be combined with an element of another combination. For example: Zincite and galena give good rectification and are fairly sensitive. Likewise iron pyrites and zincite are often used in combination. A crystal of zincite in contact with a piece of light steel will act as a detector of radio signals. A crystal of copper pyrites in contact with an extremely light wire "whisker" often responds with marked intensity to the signals of a distant station; but it is found extremely difficult to keep this arrangement in adjustment.

A New Holder for Carborundum Crystals—A sensitive spot on a carborundum crystal may often be more quickly obtained by means of the holder and the method indicated in Fig. 8.

The overhanging arm, A, carries the vertical post, B, cut with gear teeth to take the gear wheel, G. At the lower extremity of the rod is placed the cup, E, in which is mounted the carborundum crystal, D, by means of Woods' metal.

The lower cup, H, may be of glass, brass, rubber or copper and is filled with mercury to about one-half its depth. It should be 1 inch in diameter, and about 1 inch in depth. It is, of course, connected to the binding post, B, by means of a wire running underneath the base.

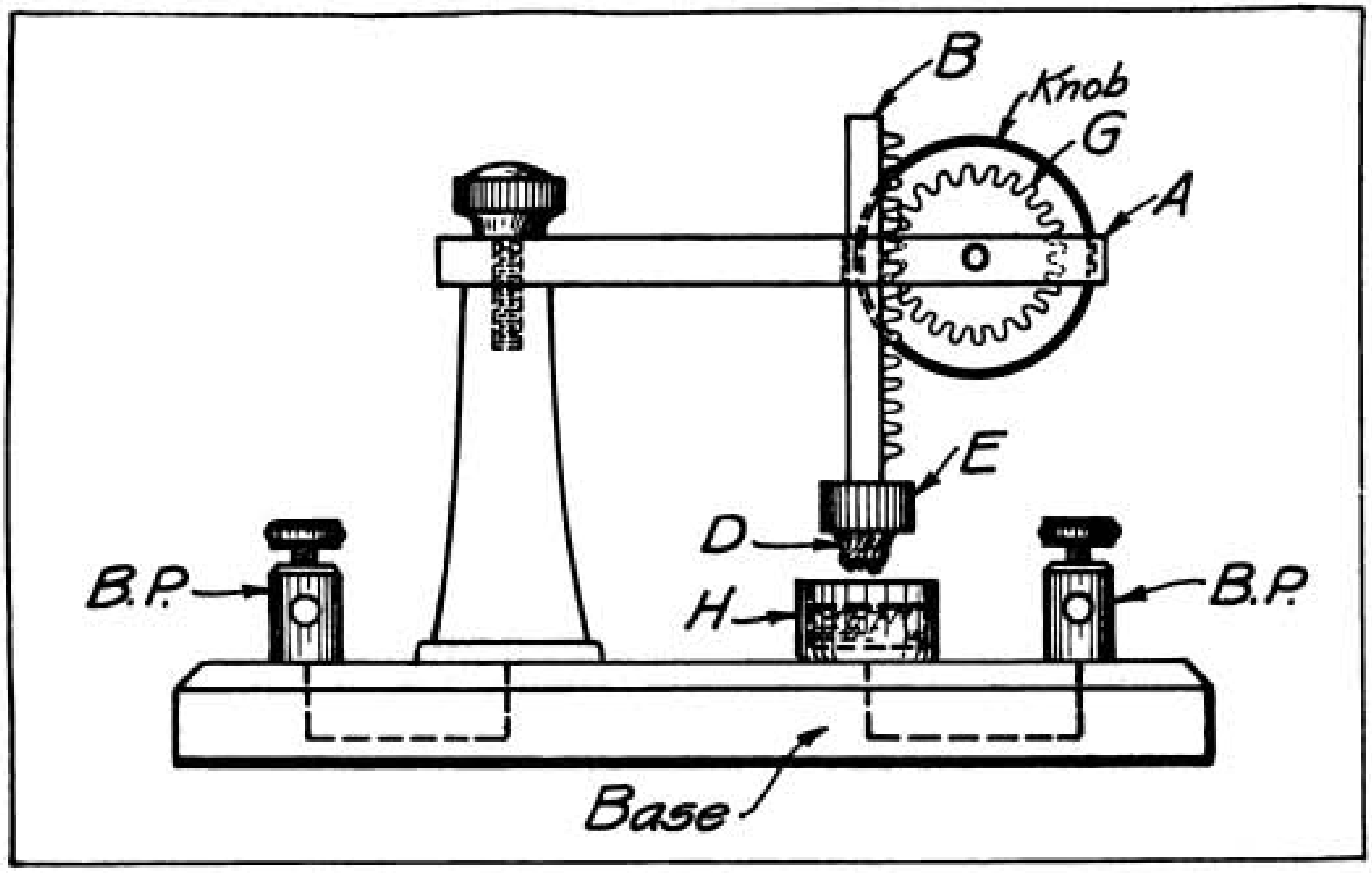


Fig. 8

During the adjustment the crystal, D, is gradually lowered into the mercury in the cup, H, until a sensitive spot is located. If care is taken to place this detector in a spot free from vibration the adjustment will be maintained indefinitely. It has been found that a more sensitive adjustment is obtained with this device than by means of the ordinary sharp-point contact. It is probable that similar results might be obtained with other crystals by means of the mercury contact.

The Filings Detector—There has recently appeared on the amateur market in the United States a new form of crystalline detector modeled somewhat after the original Marconi coherer, consisting essentially of a cartridge, C, Fig. 9, in which are placed two brass lugs, D and E, which fit snugly into the inside of the cartridge. The space between the two brass lugs is filled with a mixture of scrapings from some of the well-known crystals. The manufacturers of the device are reluctant to give the constituents, but good results have been obtained with mixtures of galena and silicon filings, to which has been added a slight amount of brass and nickel filings. In fact, the scrapings of any of the crystalline detectors known today may be used. It is only necessary to separate the brass lugs by a distance of about ¼ of an inch and half fill the intervening space with a mixture of scrapings. The entire unit is then sealed up tightly and in some cases exhausted by means of a vacuum pump. The detector is then connected in the circuit of an ordinary receiving tuner in the standard manner and the tube revolved by hand until a sensitive spot is located.

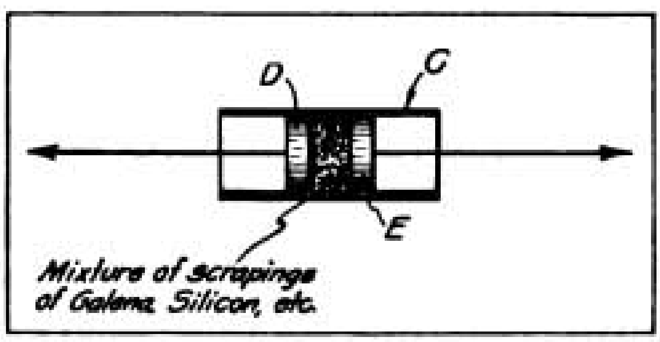


Fig. 9

In order to facilitate the adjustment to a sensitive condition, a buzzer tester, one side of which is directly connected to a terminal of the detector is employed. When the buzzer is turned on, certain of the filings will cohere and thus automatically select a sensitive point of rectification. It is rather difficult to state, offhand, just how these detectors operate, but it is probable that the action is no different from that in an ordinary rectifying mineral; however, it may be that with so many filings in contact a sensitive point of rectification is more readily located than by the ordinary means. Some experimenters advance the theory that a certain form of coherence takes place between the crystals. If this is a fact it is difficult to understand how the decoherence of the filings takes place, which, as is well known, is essential for telephonic reception. Some detectors of this construction are found to have a rather low value of resistance and consequently are used in series with the condenser and the coil of wire of the secondary circuit for the usual receiving tuner. It then becomes necessary to change the usual type of stopping condenser to one of variable capacity because it is now an active element of the oscillatory circuit.

It has been found in some types of the filings detector that a rather high value of local battery current is required much in excess of that used by the usual crystals of zincite, bornite, etc. Hence good results are obtained by the use of a vacuum valve amplifier for increasing the strength of signals obtained.

It is asserted by the manufacturers that the filings detector will stand considerable jarring and will remain in adjustment under conditions that would not be possible with the ordinary types of crystals.

(To be continued)

NEW DEVELOPMENTS IN AEROPLANE WIRELESS

Several English newspapers have recently reported an interview with Guglielmo Marconi, who has just returned to London from Italy with news of important developments in wireless science.

"The new developments," he says, "will not only make wireless communication in this war more efficient than ever before, but will make it more difficult for the enemy to intercept messages.

"These improvements will apply to instruments in aeroplanes and airships. Hitherto aeroplanes have been at a disadvantage with airships in wireless work, for although they were able to transmit messages, they have not been able to receive them. This was because the receiving signal was too faint to be distinguished, being drowned by the noise of the aeroplane engine. Now we have been able to strengthen the receiving signal sufficiently to enable messages to be taken."

According to a German report, the new German naval and military airships are equipped with wireless apparatus of great power. Wireless impulses are diffused and received by an aerial made of a three-millimeter phosphor bronze wire that as the airship rises is unwound from a spool to its full length of 750 feet, and that when the airship is aloft floats freely in the air. The apparatus itself is very compact; with its small dynamo it weighs 270 pounds, and has a minimum range of 120 miles. Every large aerodrome in Germany has its wireless station; those at important centers like Johannisthal, Cologne, Friedrichshafen, Frankfort, and Mannheim are very powerful. Taken together they form a continuous ring and keep German airships in constant touch with a German base.

GERMANY AND SAN FRANCISCO IN COMMUNICATION

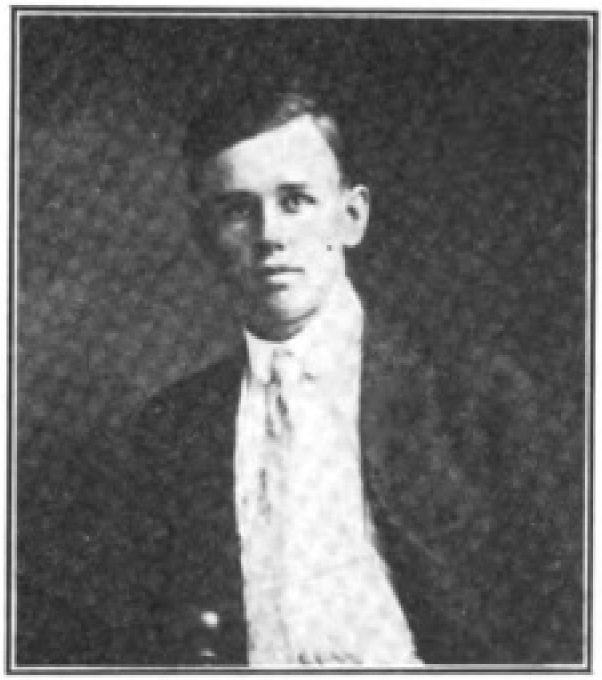
A newspaper report says that wireless messages originating in Germany have been picked up by the powerful government radio station on Yerba Buena Island near San Francisco, as well as commercial wireless stations on many occasions recently, according to operators at government stations.

Commercial stations along the Pacific Coast likewise have picked up Hanover messages, according to Lawrence Malarin, of the Marconi Company.

"Our station at Point Reyes has picked up many messages from Hanover, in the last few months," said Mr. Malarin. "It is unusual, as our station is not tuned to work with the German stations."

The Sinking of the Roanoke

A Disaster of the Pacific in Which Operator Chamberlain Lost His Life



George E. Chamberlain

FOR a disaster of the sea to occur without some instance of noteworthy achievement by wireless or act of bravery on the part of wireless men is somewhat unusual, and the sinking of the steamship Roanoke off the California coast on May 9, was no exception to the rule. In this disaster forty-six persons out of a total of forty-nine lost their lives. George Ernest Chamberlain, Marconi operator, sailing on his first permanent assignment, was among those who met death. Like others in the service who have died in brave performance of their duty, he left behind him fine memories of courage and zeal.

Chamberlain was assigned to the Roanoke on April 23 when she touched at San Diego, Cal., on her last northbound voyage. She steamed away from San Francisco, bound for Valparaiso, at midnight on May 8, laden with a cargo which consisted of 600 tons of dynamite, 1,300 tons of wheat and several hundred drums of gasoline and oil. At four o'clock on the morning of May 9 the yacht Benicia sighted the Roanoke sixty-five miles south of San Francisco. Captain Thomson of the Bencia reported that a heavy west-northwest sea was running, and that the wind was blowing at the rate of twenty miles an hour. Notwithstanding these conditions the steamship was standing up under wave and wind without difficulty.

Several messages were received from the vessel after she left San Francisco, the last one giving the position of the ship at eight o'clock in the morning, as ninety miles south of San Francisco. From that time until the arrival at San Luis Obispo, of one of the Roanoke's small boats containing the three sole survivors, there is a hiatus. Later another boat containing the lifeless body of one of the vessel's officers was picked up.

There is more than one report as to the manner in which the Roanoke foundered, but none throw light on just how Chamberlain met his death. The story of one survivor is to the effect that the vessel began to list heavily several hours before it sank, and preparations were made to take to the lifeboats. Several boats were swamped in the heavy sea and others caught in the davits as they were being lowered into the water.

Whether Chamberlain met his death in one of the lifeboats, or remained to find, as her captain did, his final resting place in the vessel's watery grave, on the foundering Roanoke, is a matter of conjecture. As soon as the first boat was picked up at San Luis Obispo, instructions were immediately flashed from all coast stations to ships at sea to search for additional boats and wreckage. There were several ships passing up and down in the vicinity of the wreck and a careful investigation was made. It was without result, however.

The Roanoke had been sailing in the passenger trade for a considerable number of years. Chamberlain was detailed on board after he had shown his mettle in filling temporary vacancies. When it was decided to send her as a freighter on her voyage to Valparaiso, Chamberlain was detailed as operator, the operator who had been in charge having asked for leave of absence.

Expressions of sympathy have been conveyed to Chamberlain's parents by officers of the Marconi Wireless Telegraph Company of America. Chamberlain, who was born in Fortuna, Cal., September 5, 1895, lived with his parents at No. 121 North Sixth street, Sawtelle, Cal. In a letter written to a friend a short time before his death he expressed the fear that he would lose his life on the Roanoke. . . . "I don't know whether I'll ever come back," he wrote. "Don't tell . . .—not that I am afraid, but it would worry my mother."

SPARKS

Poem Written by George Ernest Chamberlain Shortly Before His Death

We list through the night
  To our comrades afar,
On the tropical seas
  Or beneath the North Star,
We flash out glad tidings—
  Some of sorrow and hate,
Of a tempest arising
  Or a ship warned too late.
Now we're hearing a ship
  And her cries of appeal
Of the wave-wrecked reef,
  That is clutching her keel.
Ah! Her set is now still;
  Not a spark rends the air,
And we dream of the story
  Of death and despair.
We think of a face—
  He—my pal to his death;
It is hard to believe
  He has breathed his last breath
He's a man among men,
  E'en the Devil's defied;
He has now met his God
  As the wireless men died.

In Friendship's Name

I have learned more about wireless from The Wireless Age than any other source.—L. E. F., *New York*.

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

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

I have received my four months' trial subscription to The Wireless Age and find it to be as you claim the *best magazine* on the wireless subject that I have ever read.—D. I. B., *Iowa*.

How Wireless Has Served the Sea

Ships Disabled by Accident or Crippled by Tempest and Gale

Part III

THE one accident that the best of navigators cannot foresee and the finest nautical skill cannot avert, is that caused to the vessel which crosses the path of a hurricane. In one fell swoop the proudest craft has become a crippled plaything of the waves, with a broken propeller, a ruptured shaft or her steering gear awry. To many a tempest-tossed ship, whose brine-soaked and exhausted crew have been working day and night in the effort to keep a deck under their feet, the silent voice of the wireless message has come as a harbinger of help from heaven.

One may well imagine the unexpected joy of the crew on the water-logged bark Medora, on New Year's Day, far back in 1901, when a tug came steaming out to tow them into port. The plight of the bark had been reported by the wireless operator aboard the steamship Princess Clementine. That was one of the first instances on record of wireless saving a disabled craft.

Nearly three years after in December, 1903, the passengers on a large trans-Atlantic liner, which had been disabled in mid-ocean, were cheered by the wireless messages that were interchanged with land stations, apprising friends and relatives of the safety of all on board, and telling them that the vessel was returning to the nearest port. This was the Red Star Line steamer Kroonland which on December 5, had steamed from Antwerp on her passage to New York. The Kroonland was one of the four large Red Star Line steamships that had just been equipped with the Marconi system, and was the first of the number to make use of the wireless in her distress. The weather was hazy and a gale was blowing. On the afternoon of December 8, the Kroonland communicated by marconigrams with Brow Head stating that she was then seventy-eight miles west of Fastnet, returning to Queenstown with her steam tiller smashed and her steering gear disabled. She steered her way to port with the use of her engines. And thus the wireless message demonstrated its usefulness by ending all anxiety as to the fate of the big passenger steamer and the men, women and children she carried.

The incalculable service rendered by the radio message was next demonstrated in the case of the Clyde Line steamer Arapahoe, which, in April, 1907, broke her propeller while coming up the coast from Jacksonville. At the time of the accident the vessel was in the vicinity of Winter Quarter Shoals. The weather was thick but the captain figured that the steamer Apache of the same line, bound south, must be in the neighborhood, so he began to call her by wireless. His calculations proved correct, for soon there came back the answering signal. The Apache ran down to her disabled sister ship and succeeded in passing a hawser to her. The Apache towed the Arapahoe to within thirty miles of Five Fathom Bank off the Delaware coast, where the lines parted and both vessels went ashore. Wireless distress calls were immediately sent to land, and the Iroquois rescued both vessels from their predicament.

Plunging slowly through a tremendous seas stirred up by a westerly gale, the schooner Ann J. Trainer was reported on the night of March 11, 1909, creeping up the Jersey coast at the end of a stout steel hawser attached to a sea-going tug. The vessel was almost dismantled, and the skipper, Captain Derrickson, and his crew were exhausted from days and nights of toil to keep the deck under them. The salvage of the Trainer was but another proof of the efficacy of wireless at sea, for it was through the exchange of messages between ship and shore that help was obtained for the stricken craft. The first news that came to shore of the plight of the schooner was when a party of fishermen ,after a hard battle with wind and wave, made a landing at Egg Harbor Life Saving Station, N. J., and told of having sighted a schooner in distress. The life savers, unfortunately, could not get their boat through the surf, but they sent word to the wireless station on the pier at Atlantic City. The wireless operators there sent out a call for help with the result that the Marconi operator on the Old Dominion liner from Norfolk for New York picked up the message. The Jamestown obtained general directions and was soon racing to the schooner's aid. As she steamed along, guided by information from shore, the operators at the respective instruments talked together, and the Atlantic City man told of the fishermen who had reported the distressed vessel and gave the steamer clearer directions to guide her on her search. Two hours later, the Marconi man on the Jamestown flashed back to Atlantic City: "We have found her."

The Trainer was sighted wallowing about in a sea that rolled her rails under and sent tons of water thundering upon her decks. Two of her masts were gone and all her upper rigging torn out. Captain Derrickson thanked the officers on the Jamestown, and signalled that he was going to stick to his vessel. He had put up his flag, Union down, to notify passing craft that he needed a tug. The Jamestown flashed this information to Atlantic City and the station there passed word on to Philadelphia. From that city word was sent to Delaware Breakwater, and the ocean-going tug Atkin Hughes started out in search of the derelict, found her and towed her to New York.

In the same month of March, the steamer City of Racine was disabled in Lake Michigan, and the wireless was instrumental in saving the lives of 200 passengers aboard her. It effected a similarly brilliant rescue on the same waterway on June 27, of the same year, when the steamer City of South Haven, of the Chicago & South Haven Steamship Company, had her rudder torn away en route from Chicago to South Haven, Mich. The vessel was then placed at the mercy of a heavy sea. Assistance was quickly obtained through wireless, and the steamer was towed to port with her 100 passengers.

In this year another accident happened to the Clyde Line steamer Arapahoe, which had been served to such good purpose by wireless two years before. On this occasion the Arapahoe was bound from New York to Charleston and Jacksonville, heavily laden and with many passengers on board. This was on August 11, 1909. The wireless station at Beaufort, N. C., received a message from the Clyde liner that she had broken her tail shaft near Diamond Shoals and was drifting helplessly. The Arapahoe at the time flashed her S O S, which was now being used in place of the C Q D as a distress signal. An hour later the steamer Huron of the Clyde Line arrived to the aid of the disabled steamer and stood by her until her rescue was effected.

The fall and winter of 1909 was one prolific of accidents to lake and coastwise steamers. On September 21 the steamer Caris of the Clyde Line, bound from New York to Wilmington, N. C., and Brunswick, Ga., with passengers and cargo, was compelled to come to anchor off Cape Hatteras after her machinery had become disabled.

She sent out the S O S call, to which rescuing vessels responded and towed her into port. In the next month, October 13, the steamer Georgia of the Goodrich Transit Company was rendered helpless by the loss of her propeller blades in a heavy sea and high wind when off Kewaunee, Wis. A wireless message was sent out asking for assistance, in response to which a tug was dispatched from the harbor, which towed the Georgia into Kewaunee. There were two accidents in the following month, one to the steamer Alliance of the California & Oregon Coast Company, which, on November 1, lost her rudder at the entrance of Goose, Ore. Tugs were summoned by radio and the vessel was towed into port. Then, on November 22, the steamer Puritan of the Graham & Morton Transportation Company, when off Benton Harbor, Lake Michigan, in a winter gale, was disabled by breaking her steering gear, and the vessel was buffeted about in the rough seas. The steamer Benton Harbor and a tug were dispatched from Ludington, Mich., in response to the distress call which the Puritan had sent, and the disabled steamer was promptly towed into St. Joseph, Mich.

The year's record wound up with an accident to another Clyde liner during the Christmas holidays, when, on December 27, the Iroquois, while bound from New York to Jacksonville, lost her propeller just north of Frying Pan Shoals. Wireless distress calls brought responses from nine steamers, and the San Marcos of the Mallory Line towed the Iroquois, which herself had been a rescuing steamer in the past, to Charleston, S. C.

From the very beginning of the year 1910 the Marconi wireless system inaugurated a record of brilliant service to vessels disabled on lake and sea. Two sister ships of the Clyde Line again figured as rescuer and rescued on January 3, when the Algonquin, while bound from Boston to Galveston, broke her tail shaft off Cape Hatteras in a blizzard. The Apache picked up the wireless distress call, went to the assistance of the Algonquin, and towed her back to port.

Four days later, in the middle of Lake Michigan, and at night, the steamer Arizona of the Goodrich Transit Line, burst her cylinder heads, and found it impossible to make progress through the ice floes. She sent out distress calls by wireless. The steamer Indiana came to her aid and towed her to dock in Chicago.

A remarkable instance of the instrumentality of the Marconi Wireless Service in saving life occurred on February 5, when the steamer Kentucky, a wooden vessel, bound from New York to the Pacific Coast, via Cape Horn, to enter the Tacoma-Alaska service, sprang a leak off Cape Hatteras. The Marconi operator on board sent out a distress call just before the vessel sank, 210 miles east of Charleston. The steamer Alamo responded to the call and reached the spot just in time to prevent the captain and forty-six men aboard the Kentucky from going down with her. Similarly effective was the rescue of ninety-five persons from the steamer Santa Clara of the North Pacific Steamship Company, which foundered off the coast of California on April 13. The persons whose lives were saved were taken off the sinking Santa Clara by the tug Ranker, which had been summoned by the wireless distress call.

The casualties continued. It was a bad year in the shipping world. On May 9 the steamer Preston of the United Fruit Company, plying between Mobile Ala., and Central America, lost her propeller and was rendered helpless. A wireless message to Mobile notified the home office of the trouble, which was soon remedied.

Next occurred a tragedy in the middle of Lake Michigan, in which a Marconi operator, S. S. Sczpanck, lived up to the splendid traditions of the Marconi service in spending his life that others might be saved. It was on September 9 that the Pere Marquette Car Ferry No. 18 sank in the lake. Operator Sczpanck stuck to the sinking craft long enough to send out the S O S call, and then went down to his death. The call, however, was received by the Ludington wireless station and the steamer Pere Marquette

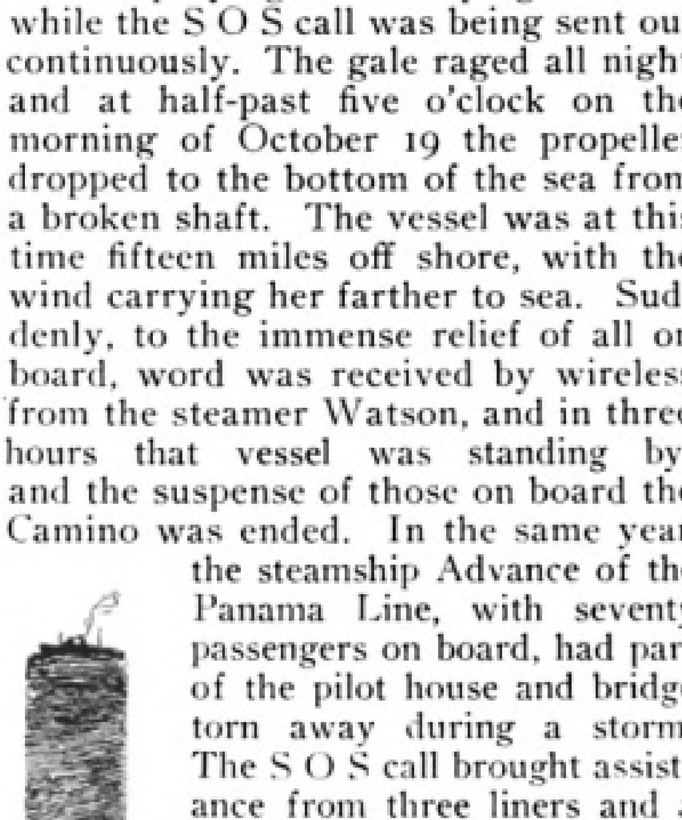
No. 17. The latter arrived at the scene of the accident in time to rescue four of the passengers and two members of the crew.

Shortly afterward another accident occurred, this time in Lake Erie, in which there was a happier ending. On September 21 the steamer Western States of the Detroit & Buffalo Steamship Company while on her eastern trip from Detroit to Buffalo, was disabled off Long Point, Canada. By means of the wireless apparatus on board, her captain was enabled to communicate with the owners, who promptly sent relief to the helpless ship.

On October 18 occurred the first instance in which the passengers and crew of a distressed dirigible airship were rescued in midocean from their craft by a steamer through the medium of wireless telegraphy. On the night of October 18 the Wellman dirigible balloon America was drifting helplessly over the Atlantic Ocean. Irwin, the wireless operator on the airship, was sending out the S O S. The lights of the dirigible were sighted from the deck of the Royal Mail steamship Trent, just about the time when Marconi Operator Ginsburg, aboard the Trent, picked up the marconigram. Communication was had from the deck of the Trent with the Morse code of signals, and after that the wireless was used in all further communication between ship and airship. Walter Wellman soon sent word to the captain of the Trent that the airship could not put her lifeboat in the water and asked the steamship to keep close. Shortly afterward, Operator Irwin, on the dirigible, informed Ginsburg, the operator on the Trent, that the airship America's crew wished to abandon the balloon. The rescue of Wellman and his men was made without mishap, and the news of the disaster to the America and the safety of her crew was flashed to shore stations 500 miles distant and was published in all the newspapers of the country.

Sea casualties were fewer in number during the year following. Wireless telegraphy, however, played a prominent part in saving life on April 11, 1911, on the steamer Western States of the Detroit & Buffalo Steamship Company, which only nine months before had met with mishap in Lake Erie. It was on June 15 that the same steamer was disabled by the blowing out of a cylinder head while in the middle of the lake, bound for Buffalo. Two vessels responded to her distress call, and all of the passengers, 200 of whom were members of the Michigan Bankers' Association, were rescued.

Wireless again was the savior of the coastwise liner Camino, which arrived at San Francisco in October, 1912, in tow of the steamship Watson, six days out from Portland, Ore., with a story of furious weather danger and disablement. The Camino had cleared from Portland with eighty passengers. Off Astoria she ran into a stiff southeast gale, eighty miles an hour in velocity. Heavy seas swept the decks and the terrified passengers gathered in the saloon, praying and weeping. Meanwhile the S O S call was being sent out continuously. The gale raged all night and at half-past five o'clock on the morning of October 19 the propeller dropped to the bottom of the sea from a broken shaft. The vessel was at this time fifteen miles off shore, with the wind carrying her farther to sea. Suddenly, to the immense relief of all on board, word was received by wireless from the steamer Watson, and in three hours that vessel was standing by, and the suspense of those on board the Camino was ended. In the same year the steamship Advance of the Panama Line, with seventy passengers on board, had part of the pilot house and bridge torn away during a storm. The S O S call brought assistance from three liners and a vessel of the revenue cutter service.



Radio messages flashed between ship and shore were the means of saving the cargo schooner Frank B. Witherbee on February 14 ,1913. Without the wireless aid, the vessel and those on board of her inevitably would have been lost. For three weeks the gales had made a target of the three-masted schooner, which was loaded with stone. On February 14 the schooner was still in a howling gale off the New England coast, with the water rushing into her strained hull. She managed to creep within ten miles of Highland Light, where her signal of distress was sighted. A wireless appeal was flashed to Captain Broadbent of the Revenue Cutter Service. In turn, the cutter Itasca, cruising near Cape Cod, was notified by wireless and went promptly to the rescue. She not alone saved all those on board the imperilled schooner but safely towed the disabled craft into Boston Harbor.

Passengers and crew of the steamship Texas, bound from Christiania to Galveston, were battling with a severe storm on the evening of Good Friday, 1913, when suddenly the propeller was wrenched off. For a day and a night the vessel rolled helplessly in the sea, but at length the C. F. Tietgen of the Scandinavian-American Line received the wireless call for aid and came to the rescue of the distressed ship.

The steamship Riverside was wrecked and sunk off the California coast on June 19. Marconi Operator R. H. Brower sent out continuous calls for aid which were finally heard and rescuers arrived to save all on board.

In November of this year (1913) storms on the Great Lakes destroyed nineteen vessels, none of which was equipped with wireless. All those vessels which were wireless equipped, however, received warning of the coming storms and sought and found safety.

Through the heroic efforts of Marconi Wireless Operator William Davis, on board the oil tank steamship Oklahoma, in January, 1914, one-third of the crew were saved, who otherwise would have perished. The S O S call sent out by Davis reached out over miles of mountainous seas and brought rescuers to the scene after the Oklahoma broke in two about seventy-five miles south of Sandy Hook on January 4. Twenty-seven members of the crew of forty were lost when small boats were launched in a raging gale. The Spanish steamship Manuel Calvo sighted the wreck, but itself was helpless to go to the assistance of the crew. It sent the message it had received to the Marconi station at Sea Gate, however, and rescuers started on their way. But on January 5 the Hamburg-American liner Bavaria sighted the signals from the small boats and took off all the men, among whom was Davis, the Marconi operator.

The lumber schooner Yellowstone, in distress in a storm off the Pacific coast, on February 14, hailed a passing vessel and asked that a wireless call for assistance be sent out. This was done, and another lumber vessel responded and succeeded in towing the Yellowstone to San Francisco.

The account of the sinking of the steam schooner Francis H. Leggett, sixty miles south of the Columbia River, in September of this year, provides the world an example of self-sacrifice that will live long in the memories of those who record and appreciate acts of heroism on the sea. Clifton James Fleming, the young senior operator on the doomed craft, was clinging to floating wreckage when he saw a woman struggling in the water. The wreckage would not support two persons, but was sufficient to hold one above the water. 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 so long as there was opportunity of rendering assistance, winning a place among the wireless men who have 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 cargo of lumber. She cleared Gray's Harbor and ran into seas which tossed her here and there and battered her mercilessly. She arrived off the mouth of the Columbia River on September 17, and on the 18th the effects of the pounding she had received began to tell. Captain Charles Maro, commander of the vessel, realized the danger which confronted them, and took measures to protect the passengers and crew. He ordered the cargo to be jettisoned, but this measure was to no purpose, since the ship was being struck with terrific force by large waves which washed over the decks and tore open the hatch, causing water to pour into the hold. Efforts made to use the lifeboats were rendered fruitless. So soon as they struck the water they capsized and the occupants were drowned.

The Leggett, beginning to list, lurched suddenly and capsized before the majority of those on board had the opportunity to jump into the water. Alexander Farrell, of Sacramento, Cal., was on the bridge and was carried down by the suction of the ship. When he again came to the surface he was pulled to safety on a railroad tie by Operator Fleming, who had remained on board until the last and was among some thirty persons afloat on wreckage after the vessel sank. These survivors disappeared one by one until only Fleming, Charles Pullman, a member of the crew and three women were left. One of the women lost her hold on the wreckage which was keeping her afloat and was washed against Fleming. He helped her to grasp the tie, and realizing that it could not support them both, he let go and sank. Harry F. Otto, the junior Marconi operator, had been carried down by the suction of the ship.

The Marconi station at Astoria, Ore., intercepted a message containing information of the sinking of the Leggett, which had evidently been sent from a foreign cruiser to a Canadian station. The Astoria station notified all ships in the vicinity to look for survivors. Only two persons were rescued, among them being Alexander Farrell, who was picked up by the oil tanker Frank H. Buck. The steamship Beaver, which had intercepted one of the wireless messages from the Leggett, ran into the wreck and rescued the only other survivor.

Four further accidents to disabled steamships wound up the events of the year. The steamship Proteus of the Southern Pacific Steamship Company, en route to New Orleans from New York, broke her main shaft and lost her propeller. The steamship El Oriente answered her wireless distress calls and towed her safely into New Orleans. This was on October 28. On December 8 the steamship Momus sent out an S O S call when her steering gear became damaged. The tug El Ray went to her assistance in response. Three days later the steamship Centralia asked for assistance by wireless and the steamers Harvard and Bear went to her aid. On December 30 the steamship Colorado had her machinery disabled while off Little Egg Harbor, New Jersey. There was aboard a crew of thirty-five persons, but no loss of life ensued, since tugs brought the vessel in safety to New York in answer to her wireless calls.

There were numerous marine disasters in the year 1915, in which many disabled vessels were succored by the wireless service. At the very beginning of the year, the steamship Iowa was crushed in the ice of Lake Michigan, off the mouth of the Chicago

River. Marconi Operator Keefe sent out the S O S signal and remained at his post until five minutes before the steamer sank. The vessel foundered before the rescue tugs arrived in response to the call. But all the members of the crew were fortunate enough to be able to walk safely across the ice to shore.

On January 18 another accident occurred to the steamship Camino, which had suffered so serious an accident in 1912, when she found herself helplessly adrift at sea. The Marconi operator on board sent out the S O S, which brought the Canadian Government steamer Lady Laurier and several other vessels to her rescue.

The oil tank steamship Chester, her superstructure demolished by the waves, was drifting where it pleased the seas to hurl her, on February 4. She was not equipped with wireless, but she did have among her officers one, named Waale, who holds a cargo grade wireless certificate. All of the tanker's signal lights, excepting one, having been extinguished through saturation with water, it devolved upon Waale to send out the S O S by flashlight. While the Chester's men were hoping and waiting for rescuers to appear, the American Line steamship Philadelphia was making her way, unknown either to her commander or to that of the tanker, toward the wreck. The Philadelphia reached a point to within a few miles of the Chester, so near, in fact, that the officers of the former could distinguish Waale's S O S spelled out in the darkness. On the Philadelphia were Marconi Operators Jones and Moore. The latter was summoned to the bridge to respond to the signals of Waale, and he then received the messages which told of the hopeless fight the crew of the Chester had been making against the sea. The men on the wrecked tanker were at once informed that the Philadelphia would "stand by," and soon after, the tanker's entire ship's company of thirty-three men was transferred safely to the Philadelphia.

On March 18 the steamship Santa Anna was disabled on account of boiler trouble off Kodiak Island, Alaska. The steamship Windber responded to the S O S call, and no lives were lost.

Another triumph for the Marconi service was achieved by the Marconi operators who sent out and received the news of the sinking of the Mallory Line steamship Denver, thus being instrumental in the saving of the lives of sixty-five persons. Buffeted by the seas until she was in a sinking condition, the Denver sent the S O S call broadcast over the ocean when she was in the mid-Atlantic, 1,300 miles from New York, on March 22. Despite unfavorable weather conditions, aid was at hand in less than twenty-four hours after the appeal had been flashed, and those on the distressed craft were rescued. Eighteen ships were at hand, ready to give assistance, when the rescues were effected. The Marconi operators on the ill-fated craft were Henry McKiernan, first operator, and Frederick H. Crone, his assistant.

On April 29 the Edgar H. Vance was in danger of sinking just outside of San Francisco harbor, her rudder having broken. A distress call was sent by radio and the vessel that responded brought the necessary assistance. No lives were lost.

On May 31 the steamship Seward, when thirty-five miles off Cordova, Alaska, began to list badly because of the shifting of her cargo. She sent out a wireless call, and two ships, fifty and eighty miles distant, answered immediately. The Seward was wrecked, but all on board were saved.

On August 4 the steamer Emma Angel was storm-battered and waterlogged forty-five miles southeast of the Highlands. She signalled to the Bermudian near by, which sent out a wireless distress call, to which the Seneca responded, and all on board were saved. Several weeks later the Edith of the Alaska Steamship Company, when forty miles northeast of Cape St. Elias, listed badly on account of the shifting of her cargo of copper concentrates. Her S O S call brought the necessary aid, and all on board were saved. The vessel was abandoned to her fate.

On December 21 of this year the

steamship Minnesota, when 760 miles south of San Francisco, sent out a wireless stating that her machinery was disabled. The necessary aid was rendered by the Iroquois and the tug Dauntless, which responded promptly upon hearing the distress call. Similar assistance was rendered by means of the wireless to the steamship Shabenee, which broke her propeller off Newfoundland. Her call for assistance was answered by the steamship Muskogee and the disabled vessel was towed into St. Johns.

The casualties of the year were wound up by two accidents that occurred to the Greek Line steamship Thessaloniki. The wreck of this steamer was marked by the devotion to duty of the Marconi wireless operators on board of her, Aristotelis Vranicas, Kimon Paleologos and James Lambros. Vranicas, the chief operator, Paleologos, his assistant, and Lambros summoned rescue ships to the aid of the battered Greek craft to take off her passengers. The Thessaloniki at the time was west of the Azores in heavy weather, with her engine room flooded and her lifeboats carried away. On December 22 the S O S was sent out and was heard by the Italian steamship Stampalia, wh ch came to the scene and stood by until the pumps on the Greek ship were got working again. Then the Stampalia steamed away. On December 26 the storm broke again. The vessel's wireless was crippled but was repaired. On December 28 the Thessaloniki found herself again in distress and again sent out the S O S call. This was responded to by the steamship Florizell, the United States revenue cutter Seneca and the steamship Patris. The latter took off 215 passengers and began towing the Thessaloniki, but the hawser broke in the gale. The Thessaloniki was again left alone, and the wireless men on board were compelled to send out further calls for help. Then the steamship Perugia came and rescued the ninety members of the crew from the ill-fated vessel.

The casualties of the present year began with the rescue through the use of wireless, of the steamer Vandeggen, which was not equipped with Marconi apparatus but was observed by the steamer Muskogee displaying signals of distress. The Muskogee sent a wireless message broadcast, giving the position of the disabled steamer, which was later towed to port.

Thirty-five souls, members of the crew of the British steamer Pollentia, were rescued from the vessel through the medium of the S O S signal, while she was in distress 706 miles off Cape Race. A wireless message was received from the disabled ship at Halifax, Nova Scotia, on January 19, stating that she was in a sinking condition in latitude 36.30, longitude 35.04. The calls for help were almost immediately answered by several vessels, among them being the Giuseppe Verdi, the America, the Moncenisio, the Westerdyk and Narragansett. For four days the Giuseppe Verdi stood by, giving all the assistance possible. At no time was there any hope of saving the Pollentia, but attempts to take off the crew were deferred because of the gale and the tremendous seas. The captain and crew of thirty-five were finally rescued by boats from the Giuseppe Verdi while the Narragansett poured oil on the waves.

Marconi Operator Earl Diamond did yeoman's service on board the steamship Centralia when the ship became disabled and the aerial was carried away by heavy seas. In the midst of the tossing sea, Diamond repaired the damage and then called the S O S signal. The accident occurred on January 22 off the Columbia River. The waves washed away the deck load, broke the rudder and flooded the engine and wireless rooms. The call for assistance was answered by the steamships Governor, Adeline Smith, Yosemite, Admiral Schley, Eurana, and land stations at Marshfield and Eureka. The weather and sea finally moderated and the ship made San Francisco safely without assistance.

Two days later the oil tanker Frank H. Buck lost her rudder, 355 miles north of San Francisco. This was the same craft that had gone to the rescue of the Francis H. Leggett during September of the previous year and rescued one of the two persons saved from that unfortunate vessel. The Buck, however, met with no more dangerous mishap, since the use of her wireless brought immediate aid.

The month of March produced many shipping casualties, the first of the number being an accident to the steamship Apache, which had her machinery disabled forty-five miles south of Cape Henry, and was compelled to anchor in twenty-five fathoms. In answer to her wireless message, wrecking tugs arrived and towed her to port. On the following day, March 5, the steamship Principe de Austrias foundered off Ponta Boi near Santos. She had 1,000 souls aboard at the time and in response to frantic calls for aid by wireless, the steamship Vega arrived and succeeded in rescuing most of those on board. Passengers to the number of 338 and eighty-six members of the crew were lost, however.

Wireless was the means of saving the twenty-eight members of the crew of the Norwegian ship Svaland, which had left Liverpool on February 24, bound for New York. Her masts were carried away by a storm that swept the North Atlantic and she began to drift helplessly. The coast guard cutter Seneca reported by wireless on March 27 that she had located the Svaland, dismasted and adrift, in a raging storm 235 miles southeast of Halifax. She waited until the gale had abated, and then took the disabled craft in tow.

One of the most remarkable wireless exploits of the year was that performed by L. A. Hooke, the wireless operator on the auxiliary bark Aurora of the Shackleton antarctic expedition. who sent the first tidings to the world of the plight of that vessel. The message, published on March 25, was made possible by a "freak" performance on the part of the wireless equipment of the Aurora. The message was received by the Naval Radio Station of Williamstown and the radio station at Melbourne when the ship was at least five times more distant than the normal range of her transmitting equipment.

The Aurora, which was the relief ship of the expedition, broke from her moorings in Ross Sea on May 6, 1915, and was adrift in the ice for ten months. The wireless equipment, a gift from the people of Sydney, Australia, had originally an effective transmitting radius of only 200 miles. A month before the ship started on her long drift, there were added twenty feet to the aerial masts of the Aurora. As soon as she broke away from her moorings, Hooke endeavored to get in touch with the members of the marooned party ashore, hoping that they had been able to erect the receiving set previously landed and it is just possible that the land party learned by these signals of the Aurora's ill fortune and were able to make the earliest possible provision against an unexpected twelve months on land.

On June 1, 1915, Hooke, basing his hopes on the fleeting possibilities of abnormal wireless conditions, commenced to call Australia, but without success. He attributed his total failure to electrical phenomena peculiar to the polar regions, and he made exhaustive experiments with all sorts of makeshifts in the hope of getting definite results. It is well, perhaps, for Hooke and his fellow adventurers that they did not know the real reason for their non-success, as the hopes of relief which buoyed them up until their return might have been shattered.

In the first place, the Commonwealth of Australia, in the interests of economy, had recalled the staff of the wireless station at Macquarie Island. This removed the first possibility of intercommunication with the little party drifting in the antarctic ice. Secondly owing to military reasons, the transmitting apparatus at Awarua had been transported to a more distant place, so that had it been possible for the Aurora, by a combination of favorable circumstances, to send distress signals as far as New Zealand, she would not have received any reply.

Hooke, however, stuck to his post. It was on July 22, 1915, that the Aurora was terribly crushed in the ice. The vessel was then 100 miles from land and 500 miles from the nearest food depot. Hooke again overhauled his apparatus, even to the extent of lowering and re-erecting his masts, in the hope that by doing so he might help those on shore and his fellows on what appeared to be a doomed ship. Night after night he sat in his cabin with the telephone receivers strapped around his head, straining to catch sounds which would tell of the world's knowledge of their fate and efforts at rescue. Twice he heard faint signals, on August 17 and 26, but they were unintelligible.

Then there came the blizzard. On September 5, 1915, the Aurora was dismasted, the wireless aerial going with the débris. Twice were new antennae devised by linking up the mainmast with ice hummocks, but Macquarie Island remained silent—no one had been left to listen. At the end of February, 1916, with the ice breaking, the Aurora was freed to drift with her broken rudder. But the wireless operator's story now changes from sadness to joy. On March 25, with a quadruple aerial eighty feet above deck, he succeeded in obtaining definite signals from stations in Tasmania and New Zealand, 900 miles distant. Then followed the message which startled the globe. This message was transmitted 900 miles with an apparatus normally suitable for about 200 miles radius ,and eclipsed for a day at least the interest in the great world war. Hooke admits that navigation was greatly assisted on the return journey by the time and other signals received by him from the New Zealand wireless stations.

(To be concluded)

AN INTERESTING NEW BOOK FOR TELEGRAPHERS

Jeff W. Hayes, the well-known old-timer and author, has just brought out an interesting and unique volume of telegraphic stories, which no doubt will meet with a hearty reception in the ranks.

It is some years since a book of this character made its appearance, and the fact that such books do appear once in a great while is evidence that operators have not yet lost their appreciation of telegraphic literature of the lighter vein.

It has the unique distinction of being at once personal and impersonal. There are many pages containing facsimile reproductions of the signatures of officials, managers, operators and other employees in many of the large offices in the country and of other persons who were formerly in the telegraph service. This feature of the book gives it a distinctive and personal character, and it is certainly interesting and "catching." Throughout the pages are scattered half tone portraits of many well-known old-timers.

The stories are, in the main, new and relate to Western life and experiences, many of the contributors being well known to the telegraph fraternity and acknowledged reputation as writers. Interspersed throughout the book are several poems which will appeal to those of a poetic nature.

The autographs fasten the attention of the reader and recall many pleasant memories and experiences over the wire in years gone by. Many of the names are familiar and make a character study of deep interest.

The price of the book is $2.50 per copy and copies may be obtained by addressing J. W. Hayes, 95 West Maumee street, St. Adrian, Mich.

FORT RILEY STATION CLOSED

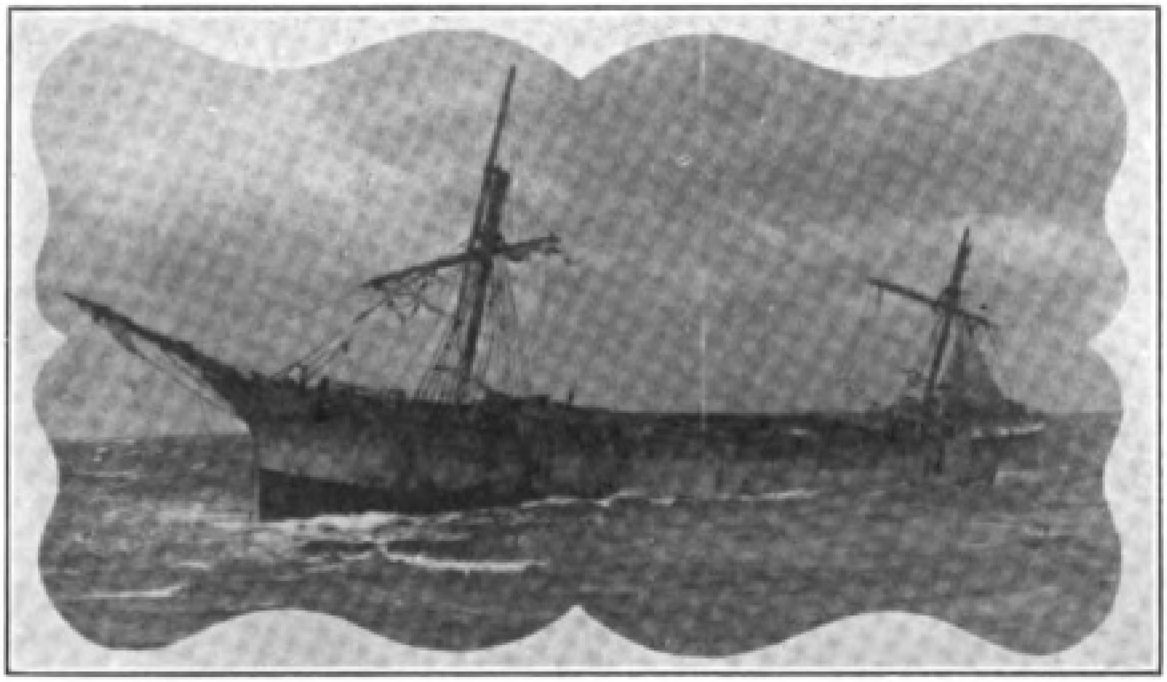
Because of the small force now stationed at Fort Riley, Kans., the wireless station at the post has been closed for the present. Private Henderson, first class, signal corps, who has been on duty at the station, has been ordered to Fort Sam Houston, Tex., for duty. The wireless has been used extensively in the past for transmitting and receiving orders between Fort Riley and Fort Leavenworth and other nearby posts, and it will be reopened for operation when troops are returned for permanent station.

The Guards of the Sea Lanes

Battling With Storms and Ice On the Vessels of the North Atlantic Patrol

WINTER has broken on the Grand Banks. The wind that blows across the sea before the dawn has lost its merciless cold and the northward flying gulls, bound for their Labrador rookeries, scream that summer is at hand. To the wireless men on the revenue cutters storm and the peril of floating ice or drifting derelict is about to begin.

Stanch steel steamers, usually schooner-rigged and somewhat larger than a good-sized steam yacht, are employed as patrol vessels. They are capable of standing up against the heaviest kind of weather, for if the

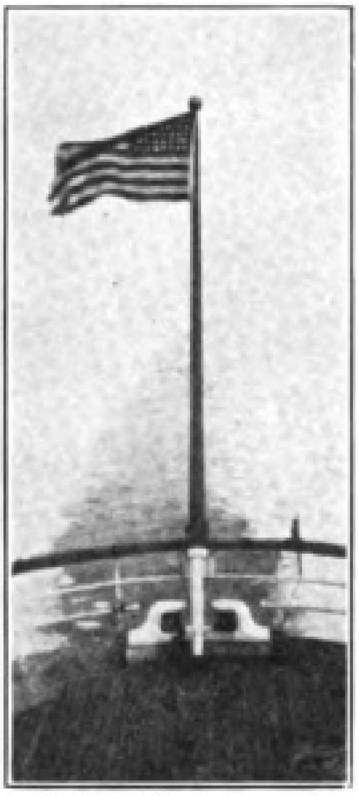


The dismasted Svaland as the revenue cutter Seneca found her

patrolling the sea lanes these signs have considerable meaning—they are harbingers of days marked by pleasant cruising from port to port, regattas or other aquatic sports serving to vary the life aboard ship. But as summer wanes and autumn comes on the yachts and motor boats are towed into their havens, double reefs are taken in the sails of the small fishing schooners as they skim the lead gray seas, and winter descends in the form of a howling northeaster. Then the men on the revenue cutters cast aside their summer clothes and bring out their oilskins and reefers for the more irksome work of the North Atlantic patrol that guards the travelers on the sea lanes against the mischance of wreck and wireless brings word that a craft is in distress they must be prepared to put to sea, regardless of wind or wave.

The discipline and life on board are in all essentials the same as in the Navy, the regulations applying of course to the wireless men. Mounted on the cutters are a few handy rapid-firers, used for the most part in knocking to pieces parts of wrecked vessels that might stove in the bows of some steamship. Boat drills, too, are of the liveliest, for any day a crew may be called upon to put over side in small boats during a shrieking gale when a blunder means almost certain death in ice-cold water.

Naturally, great dependence is placed on the radio equipments of the revenue cutters and the men who operate them, for it is of vital importance that communication be maintained, even though the seas are threatening to deal the patrol craft a death blow. The cutters use several wave-lengths—300, 600, 750, and 1,000 meters. The sets are of Marconi or composite types.



Ploughing through the ice fields

A typical winter cruise of a cutter was recently reported by Captain Commandant E. P. Bertholf, of the Seneca.

"The Seneca," he relates, "sailed from New York on February 19 to take up the duty of ice observation on the Grand Banks of Newfoundland. We ran to the eastward on the back of a strong westerly gale and arrived at the tail of the Bank on February 24.

"The Seneca's course was then set to the northward along the eastern edge of the Grand Bank and a sharp lookout for ice was maintained, as the steamer Brindilla had reported field ice in lat. 48 deg. 00 min. N., lon. 49 deg. 28 min. W., and later in lat. 46 deg. 55 min. N., lon. 51 deg. 37 min. W. At noon, 25th, Seneca was in lat. 45 deg. 54 min. N., lon. 50 deg. 18 min. W., and no ice in sight. Set course NW., passing twenty miles south of Virgin Rock and running through streaks of soft field ice early on the morning of the 26th. At 10 a. m., 26th, in lat. 46 deg. 15 min. N., lon. 53 deg. 10 min. W., the ice becoming so thick and heavy that the Seneca made very slow progress through it, and Cape Race radio station having informed me that the ice was packed close against the coast of Newfoundland, I turned to the southwest and worked out to the southern edge of the ice and then along it to the westward. At 3 p. m. reached the western limit of the ice, then stood along the edge to the northward. The night of the 26th was foggy and moderate SE. gale and Seneca was running through patches of soft field ice until 1 a. m. of the 27th."

Gun crew destroying a derelict

Captain Bertholf put into Halifax for coal on March 12. After a short stay the cutter put out to sea again and on March 22 she received a call from Sable Island to the effect that the Norse bark Svaland had been partly dismasted and, although the Swedish tramp Murjek was standing by, the damaged vessel needed immediate aid. The revenue cutter searched the Banks for four days before she picked up the two ships.

By this time the Svaland was rolling in the trough of the sea with her mainmast overside and her decks littered with wreckage. The Murjek had attempted to tow her, but without success, the seas having parted the hawsers each time they were attached to the distressed craft. The waves were running so high that the Seneca's captain decided to postpone the launching of a boat until they had moderated, and, after attempting to pass a line with a shoulder-gun, he stood by for the night. Meanwhile the Murjek had steamed toward Kirkwall.

For two days the Seneca and the Svaland lay together, drifting before the storm, for it was impossible to navigate the cutter under steam more than a few minutes at a time, without risk of losing sight of the Svaland. At last the captain of the Svaland signaled that he as short of provisions and, the gale having lost some of its force, the Seneca's lifeboats were launched. Nineteen men—one suffering from a broken knee cap—were brought to the Seneca, and a hawser was extended from the revenue cutter to the bark. Five men remained on the wreck to steer her on her long tow to Halifax—a distance of more than 400 miles.

The Seneca's mascots—two Newfoundland pups

This is only one instance of timely service by a patrol vessel and her men. There are many others, some of which have been chronicled at various times. But there are no speeches and no heroics—it's all in the day's work—and the wireless man does his share.

LONG DISTANCE RECORDS ON THE PACIFIC

Two interesting long distance records have been made recently on the Pacific Ocean. The China Mail Company's steamship China, the only passenger and freight steamship in the trans-Pacific trade flying the American flag, was in communication with the Marconi Hillcrest (Cal.) station from the day she left San Francisco until she was 2,800 miles away from that port. While the steamship J. A. Moffett, returning to San Francisco from the Orient, was 2,600 miles from the Pacific Coast, the night operator at the Hillcrest station picked her up. Both the China and the Moffett are equipped with the new Marconi quenched gap sets.

NEW SUPERVISOR AT SAYVILLE

The wireless station at Sayville, L. I., which is under guard of the United States naval authorities, has a new supervisor, Lieutenant A. A. Merrick, from the battleship Michigan. He succeeds Lieutenant Windsor, who has been in charge since the United States assumed charge of the station. Lieutenant Windsor will go to Honolulu.

Reports that the guard of marines at the station was to be increased have been denied. There are sixteen men at the station at present.

DR. AUSTIN DISCUSSES DARIEN EXPERIMENTS

At a meeting of the Institute of Radio Engineers, held recently at the Engineering Societies' Building, No. 33 West Thirty-ninth street, New York City, Dr. Louis W. Austin read a paper on the "Experiments at the United States Naval Radio Station at Darien, Canal Zone." He discussed this investigation, as well as the station's work with reference to the effect and reduction of strays. A second paper, entitled "Some Small Direct Current Sets," was read by Bowden Washington.

WIRELESS AIDS THE POLICE

A lively exchange of wireless messages between the steamship Plymouth of the Fall Fiver Line and the Cambridge, Mass., police, resulted in the arrest recently of two brothers. They were taken into custody when the boat arrived at her North River pier, New York City.

A third passenger on the Plymouth overheard a conversation between the brothers and carried it to the Captain. A wireless message to the Cambridge authorities brought the response that the two men were wanted on the charge of swindling a confectioner out of $1,400 which he was induced to invest in a proposed knitting mill.

With the Amateurs

Washington is to be headquarters of a woman's radio club, with branches in several large cities, notably Boston. This is one of the first organizations showing the permanence of the National Service School's incentive to the women of the country to develop along new lines.

First intimation of this radio club was given by Mrs. Alexander Sharp, Sr., who is in charge of the volunteer instruction section of the woman's preparedness camp, working in co-operation with the Red Cross instruction courses in first aid, dietetics, home care of the sick, etc. Mrs. Sharp has been working since February on the organization of this instruction school. She has had as her chief aid Miss Sophy P. Casey, who is an expert chauffeur.

The course of instruction of which Mrs Sharp is in charge includes plain and wireless telegraphy, signaling by wigwag, semaphore and heliograph. All of these classes are under expert service instructors and women who are professionals in their particular lines.

The wireless classes during the first course were in charge of A. A. Penland, electrician of the first class, who was recalled on account of sickness. He has been succeeded by H. L. Pitts, electrician of the first class from the President's yacht, the Mayflower, assisted by C. E. Schneider, from the Arlington radio station. An advanced class has been started with a dozen young women who are sending and receiving about eighteen words a minute. The signaling is in charge of Chief Quartermasters Walter J. Fanger and Earl D. Shipp, both petty officers of the navy.

The telegraphy classes are in charge of B. J. Beal, who has been instructing operators for more than thirty years. There are now more than thirty in his classes. The advanced class can now send and receive entire messages and the beginners can most of them send and receive a ten-word sentence.

All of the twenty-four men who have been graduated from the Y. M. C. A. wireless school at Seattle, Wash., this spring have positions and have received first-grade licenses from the government, according to George A. Mead, head of the school. Opportunities for employment in the wireless field are excellent, Mr. Mead says.

W. F. Lachelt passed the examination with a perfect grade. Others who have graduated and obtained positions are L. M. Runge, William Hoferkorn, H. L. Sherwood, E. Emanuel, George Comstock, Frank Hartman, E. V. Wampler, J. R. Moore, J. M. Hill, A. W. Johnson, J. W. James, Lynn B. Drury, C. E. Baker, J. S. Knowles, Harold Birkland, W. F. Good, Charles Morenus, Bart Mignerney, W. E. Price, M. Valentine, H. M. Currie, J. A. Johnson and A. L. Wollaston.

The demand is so great for operators that a new class in wireless is being organized for the summer. More than 125 students have been graduated from the wireless school of the Y. M. C. A. in the last two years, and, according to Mr. Mead, none of them have had any trouble in securing employment in wireless work.

Dr. John Stone Stone, member of the Institute of Radio Engineers, in an address before sixty prominent amateur radio experimenters and inventors at Columbia University on the evening of May 12, urged them to aid the society in appealing to Congress to revise the radio laws of the country. He said the institute had named a committee to investigate wave-length regulations and formulate a revision of the law to meet present and future requirements, especially as regards experiments.

Dr. Stone said radio science was going through a development period similar to that through which telephony passed years ago, and that had the latter been restricted by such regulations as are imposed on radio communication the obstacles never would have been overcome.

Students of the High School of Commerce in Omaha, Neb., who are interested in wireless telegraph have installed a wireless station at the school and are operating every day. The aerial has been strung from the water tower of the Omaha Van and Storage Company to the top of the telegraph annex of the school, with the result that sufficient spark is obtained to "work" with Graceland College at Lamont, Ia., 110 miles away, and Sioux City, 120 miles away.

One of the most interesting meetings held since its organization was the weekly session of the New London Radio Club in the Y. M. C. A. building on the evening of May 23. Two speakers from New Britain, who were to have been present, disappointed the boys at the last minute, but this did not dampen the enthusiasm of the youthful operators. The meeting was the last of the weekly sessions to be held until fall.

The club voted to hold a meeting and banquet in their rooms on Friday, June 2, as the culmination of the first quarter's work. A committee composed of Herbert Scaplen, Frank Mallen, Fred Ackley, Paul Tilden and Roland Starr was appointed to make the arrangements.

A series of nineteen lessons has been offered the Radio club with instructions by an operator from the local naval base. Acors Boss, Perry Stone and William Krauth were appointed to take the matter under advisement and report.

A membership campaign for the purpose of enrolling all amateur wireless operators in the city, is being conducted by the Wireless Amateurs' Club, of New Orleans, with headquarters at No. 1024 Marigny street.

To hear the human voice transmitted by the wireless telephone was the privilege of Iowa University wireless operators recently. A message was sent from Arlington, Va., to Key West, Fla., as a test, and the Hawkeye operators caught it although they could not distinguish the words.

In this photograph is shown the aerial in the rear of Hiram Percy Maxim's home in Hartford, Conn. Mr. Maxim has received messages from many distant points

Saturday and Sunday, May 6 and 7, were busy times for the members of the New Hampshire Radio Defense League, with continuous service at the Central station on Arlington street, Manchester, from 4 o'clock Saturday noon, until Sunday noon, the regular meeting of the league Saturday night and field section drill Sunday morning.

Beginning Saturday afternoon at 4 o'clock, five operators of the club kept watch at the central station listening for signals connected with the test of the United States navy radio stations and telegraph and telephone communications.

From the standpoint of radio communication the test, so far as the local club was concerned, was not a success. While Chief Operator W. H. Hitchcock, Lieut. G. G. Starket, Sergt. R. H. Worral and Operators J. T. Webber and J. D. Valliere relieved each other in two hour tricks during the afternoon, night and morning, static or atmospheric conditions greatly hindered the work of reading the signals of the different naval stations.

At the meeting of the league Saturday evening routine business was transacted.

Sunday morning at 10 o'clock, the field section assembled under Lieut. Starkey and marched to the central station where a short address was given to the members of the section by Chief Operator Hitchcock on the purpose of the organization and on discipline. From the central station, the section marched to Derryfield park where the field radio drill was given, followed by formation drills.

While this was the first drill by the section, remarkable time was made in erecting the station. In twelve minutes from the time the section left the Arlington street station, the field operators were working with the chief operator at the central station. The actual time of erection after the section had reached the park, was four minutes.

The section made up Sunday was as follows: Lieut. G. G. Starkey; Sergts. R. H. Worrall, Thomas Smith; Corp. Mark Mordecai and Private Julian T. Webber, operators; Corp. R. A. Nixon, Privates Ernest Parker and G. R. Durgin, mast men; Frederick Scheer, Wallace Macaulay, J. D. Valliere and Walter E. Moulton, aerial men; Nelson Rackliffe, C. W. Phillips, Harry Foster and Archie Thomas, counterpoise men.

Wireless Operator Harold Warren was on duty on the afternoon of May 7 at the Y. M. C. A. in Asbury Park, N. J., and heard distinctly the conversation between Secretary Daniels and Captain Chandler, of the New Hampshire, as did a number of friends that were called in.

Secretary Daniels' order to Captain Chandler was to return to the mouth of the Potomac river and participate in tests which were held with the Annapolis naval acadamy.

United States Radio Inspector Dillon said recently, the fact that the district office was to be removed to Chicago brought in forty new applicants for amateur wireless operators' licenses in a single week.

G. W. Alves, wireless operator on the submarine D-3, stationed at the local naval yard, as the speaker at the regular meeting of the New London Radio Club, of New London, Conn., held in the club rooms in the Y. M. C. A. building recently. Mr. Alves kept the attention of his nineteen listeners during his talk on wireless operation in war time on the undersea ships.

The club has had a new sending set installed in its rooms and is now planning a trip to New York where the principal wireless stations will be visited.

On May 3 a free lecture on wireless telegraphy was given in the lecture room of the Y. M. C. A. of Stamford, Conn. H. Berel, V. A. Hendrickson and Leonard H. Marshall, all graduates of the New York Berel School of Telegraphy participated in the demonstration and lecture. At the end of the course, first grade graduation certificates were granted to successful students and first grade amateur certificates to amateurs.

Bushwick Battalion, of Brooklyn, officially the Twelfth Regiment of the United States Boy Scouts, has received permission from the New York Board of Education to install a wireless station at its headquarters, Public School No. 70, Patchen avenue and Macon streets, Brooklyn. Captain Walter C. Parker will be in charge of the radio corps, assisted by four wireless operators. Daily communication will be maintained with Arlington, Va.

The members of the physics classes of the Hartford High School saw the high school wireless outfit in operation on May 13. E. Hart, formerly operator at the Boston navy yard, was on hand, assisted by Owen Protheroe, of the junior class. He told the members of the fundamental workings of the wireless. Messages were then sent to and received from the Brooklyn navy yard and other stations. The time and weather were received from Arlington, Va., and the press news from Cape Cod.

Miss Charlotte Baylies, of Boston, Mass., has been awarded an amateur's wireless license of the first class by the United States government. For the two weeks she has attended the "Women's Plattsburg" at Chevy Chase, near Washington, D. C., and it was there that her prowess as a wireless operator was recognized by Uncle Sam. She is the sixth woman in the United States ever to have merited this distinction.

The Technology Wireless Society, of Boston, Mass., has found that it will be able to take an active part in the celebration when the new buildings are dedicated. Up to a short time ago the club had planned to merely set up its apparatus for purposes of exhibition. Investigations have revealed the possibility of having an entire station in active operation by June 13. The Marconi Wireless Telegraph Company has offered the coöperation of its Boston station during this period, and a license has been obtained from Radio Inspector Gawler. As a result, Technology will be able to send messages to all parts of the world, and to tell its alumni everywhere about what is happening at the new site.

At a recent meeting of the E. T. C. Radio Club, of Jersey City, the following officers were elected: Carl Schultz, president; Fred. Doran, vice president; Lincoln Daub, secretary; William Wall, treasurer, and Clarence Maves, instructor and electrician. Alexander West was elected as an honorary member. A committee consisting of Harry Reich and William Scully was appointed to draw up a constitution and by-laws. Its headquarters are located at the Young Men's Christian Association.

Troop 15, Boy Scouts, of Rochester, N. Y., presented a play, "Won by Wireless," on May 19 at Brick Church Institute. In the cast were Dean Shedd, Harvey Morgan, Nelson Wilmot, Arthur Sutherland, Paul Whipple, Edmund Miller and Elwood Harber.

An appropriation of $50 for the installation of a complete wireless telegraph outfit at the Colorado Springs High School was granted by the Board of Education at its regular monthly meeting, held in the board offices May 3. It is thought probable that different commercial bodies may be asked to contribute toward the erection of the outfit.

Ralph Krows gave an interesting talk on wireless telegraphy to the boys of the University district at the University Branch Library, Seattle, Wash., on the evening of May 26. A model wireless apparatus was on exhibition and Krows performed a number of experiments.

Two other talks were given on successive Wednesdays at the same place and dealt with other uses of electricity, such as the telephone and the dictaphone. These talks were open to the public and free.

On April 28, Philip D. Naugle gave a talk on radio-telegraphy at the Central Library, Fourth avenue and Madison street. The talk was for men and boys who have some practical knowledge of the wireless telegraph and was naturally more advanced than the talks for boys given by Krows.

About twenty men and boys attended the opening of the wireless school in the Y. M. C. A. at Stamford, Conn., on May 8, under the supervision of V. A. Hendrickson and L. H. Marshall.

Two sets of aerials will be installed on the roof of the building, one with a range for the State and the other with a range to San Diego, Cal. A number of Boy Scouts have signed for the course, and will start their studies shortly.

Farrell Young, sixteen years old, a boy of Pocatello, Idaho, has perfected a wireless apparatus that has range sufficient to catch messages sent out by ships at sea on the Pacific. The young man has repeatedly communicated with Salt Lake and San Francisco. The station was built by Farrell himself at a cost of approximately $100.

Sergeant Charles E. Pearce, in charge of the police wireless

Wireless for

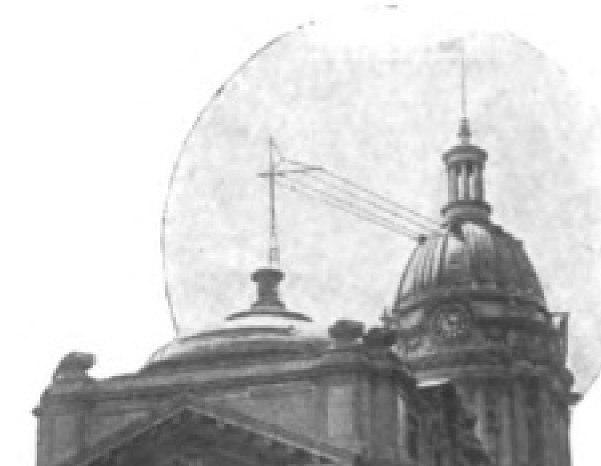
How the New York for the Detection Crime, Quelling Ri and Property in ing for Defense

WIRELESS BAGS BURGLARS

The wireless equipped patrol wagon, of the West 100th street police station, demonstrated its utility in a remarkable fashion early this morning. A portable radio set has been installed on this wagon, the current to operate it being supplied by the patrol wagon motor. The patrol wagon was just returning from the Men's Night Court, when Wireless Operator Jones picked up a radio message that was being flashed to the police stations on the Upper West Side from the wireless branch of Police Headquarters. The message stated that an amateur wireless operator, who lives opposite the Monumental Apartment House on Riverside Drive, had noticed burglars operating in an apartment on the top floor of the building. The amateur at once flashed the news out over the city by radio, the message being first picked up by the Senior Night Operator at Police Headquarters.

When Operator Jones picked up the warning, the West 100th street station's patrol wagon was within three blocks of the Monumental Apartments. It took the wireless equipped patrol wagon just one minute and a half to reach the building, and five minutes later the burglars had been bagged, handcuffed, and were on their way to the station.

(Clipping from a New York morning newspaper, 1917.)



The aerial on the Headquarters building

WIRELESS telegraphy will henceforth be an important factor in the detection and punishment of crime in New York City; in the quelling of riots or other disturbances; in the handling of unruly crowds, or large concourses of people; in the protection of life and property in the five boroughs of New York City, and on the two rivers and the bays that wash its shores. Radio, in fact, is now an adjunct in the maintenance of order and the preservation of safety in the metropolis of the United States.

the Police

Department is Providing and Punishment of ots, Protecting Life the City and Training of the Nation

RIOTERS QUELLED BY RADIO

Flynn, senior operator at the wireless branch of the Police Department Telegraph Bureau, Manhattan Headquarters, 6:40 P. M., received radio message from Operator Herman, Bronx Headquarters, that strikers have taken possession of the Bathgate Brewing Company's plant.

Bronx Headquarters, wireless branch, 7:10 P. M.:—Rioters have destroyed all telephone and telegraph connections within a radius of twenty blocks. Police Booth at East 207th street has been wrecked. Radio messages have been flashed to all police stations in the Bronx, calling out the reserves.

Manhattan Headquarters, wireless branch, 7:15 P. M.:—Mounted Squad, West Sixty-sixth street, instructed by wireless, is on its way to the scene of the trouble.

Manhattan Headquarters, wireless branch, 9:05 P. M.:—Riotous disturbances at Bathgate Brewing Company quelled. Police have taken charge of the plant. Twenty men arrested. Twelve men injured. Ambulances summoned by radio from Fordham and Harlem Hospitals and injured men removed there.

(Page from a Police Station blotter, New York, 1917.)

MUTINEERS AND RIVER PIRATES WORSTED BY WIRELESS

Police Headquarters, Borough of Richmond, Borough Hall, Tompkinsville, Staten Island, New York:—

"Ten minutes after midnight, the operator in our wireless station received a flash from the Marconi operator aboard the India merchantman, Bombayan, anchored off Bedloe's Island, New York Harbor, reporting that a mutiny had broken out among the Lascar crew and the ship's officers had been overpowered. The Marconi man had barricaded himself in the wireless room, and stated that the mutineers were trying to break down the cabin door.

"Our operator flashed out a call for the police patrol steamer Patrol, and received a radio reply from her a few minutes later, just as she was entering East River. We reported the situation to the Patrol, which vessel said she would make full speed to the Bombayan, and on her way would ask the Old Slip Station for police reserves to be sent out to her aid.

"At one o'clock this morning we received a radio from the Patrol, reporting that she had found river pirates cooperating with the Lascar crew. Six chests of tea had been thrown overboard by the Lascars, and the pirates were loading them aboard their launch. Shots were exchanged between the Patrol and the launch, which was soon in a sinking condition. The river pirates then surrendered, and were taken on board the Patrol.

"At one-thirty this morning we received further word from the Patrol. She had been joined by a United States Revenue Cutter, bearing police reserves from Old Slip. The policemen from the two craft boarded the Bombayan. The Lascars put up a stiff fight, but after four of them had been wounded, they gave themselves up. The ship's officers and the wireless operator were liberated."

(Report submitted in the year 1917 by marconigram from Richmond Borough Police Headquarters to Manhattan Borough Police Headquarters.)

This innovation is a result of the programme of "Preparedness in the Police Department" inaugurated by Commissioner Arthur Woods, of the New York Department of Police. In order that the department of which he is the head might cope with any eventuality that may arise in the life of the city, Commissioner Woods appointed a "Preparedness Committee," composed of the various inspectors of the department. These were instructed to consider and recommend the most modern and scientific applications in the conduct of the Metropolitan police, in order that in times of emergency New York's police force could immediately and efficiently co-operate with the naval and military authorities in the event of serious disturbance and danger to the public life.

One of the immediate results of the recommendations of this Committee of Inspectors is the fact that 3,000 members of New York's police force are now obtaining, in squads of 300 men at a time, courses of military instruction in camps at Fort Wadsworth, Staten Island. The next step was the inauguration of a wireless telegraphy department at Police Headquarters, which is the beginning of the adaptation of wireless telegraphy to every branch of the police service.

Application has already been made to the Federal authorities for a license, and by the time these lines are in type, Police Headquarters on Manhattan Island will have become a licensed wireless telegraph station. An aerial is already installed on the northern end of the Police Headquarters building, with a thirty-five foot mast and an elevation of 180 feet. The aerial has a stretch of about 100 feet, being connected with the gilded dome of the structure's tower. A 1 k.w. quenched spark gap Marconi wireless apparatus is now in operation on the fifth floor of the building at headquarters. A photograph accompanying this article shows the apparatus clearly.

Furthermore, a school for the training of policemen in the art of radio telegraphy is now being conducted on the third floor at Headquarters. The previous activities of all the thousands of policemen in New York's police force have been carefully investigated, and all those who have had experience in telegraphy have been selected to attend the classes of the wireless telegraphy school.

But the scheme adopted by Commissioner Woods has been even more far-sighted than this. There are in New York City from 500 to 600 licensed amateur wireless telegraphers, and the co-operation of these amateurs has been solicited by the Department in the use of the radio message as a protection to the city. The services of these amateurs have been obtained at such points where their co-operation may be needed in emergencies. Officials of the Department pay a warm tribute to the enthusiasm and public spirit of these amateurs, who have willingly volunteered their services in co-operating with the Police Department in any time of need.

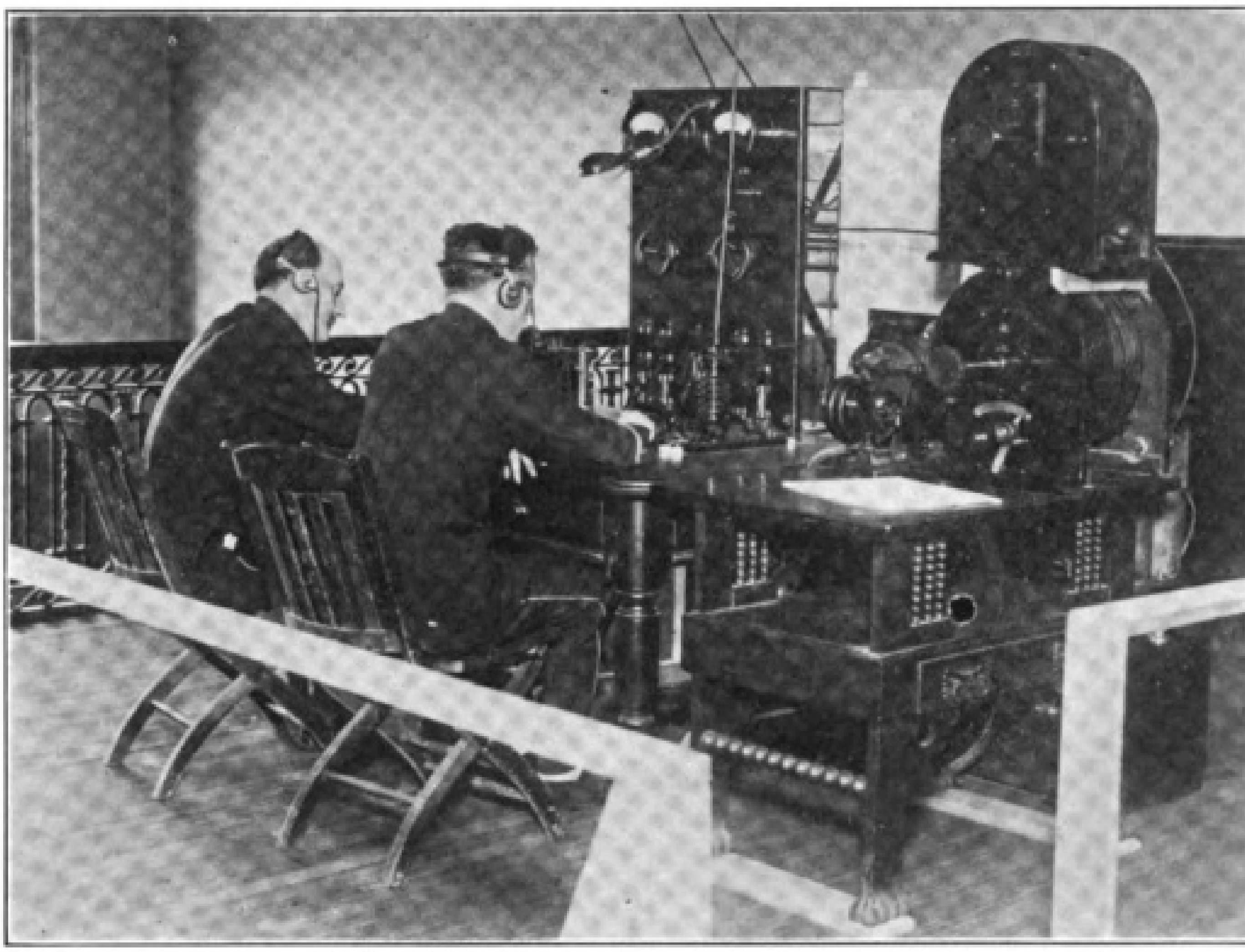
So much for what has already been accomplished.

The program for the future in the adaptation of radio to the Police Department is one of a most far-reaching character, embracing the application of the new art to nearly every one of the activities of the Department. The next step to be taken is the installation of official branches of wireless telegraphy in the police headquarters of the other four boroughs of New York City, thus including the Boroughs of Brooklyn, Queens, the Bronx and Richmond. This is to be followed by the installation of wireless stations in each of the sixteen Inspection Districts of the New York Police Department, and eventually it is intended to have a wireless emergency outfit in each of the eighty-five police stations in Greater New York.

Nor does the plan for the adaptation of wireless in the Police Department end here. It is the desire of officials of the Department to adopt portable wireless sets for use in other emergencies; to have wireless installation on the steamer Patrol of the New York police harbor patrol, under the jurisdiction of the Harbor Police. They are considering also the adoption of a portable wireless set that may be placed on the patrol wagons, the current to operate which may be generated from the patrol wagon motors. And as a further aid in the instruction of the members of the Department in wireless and its many uses, it is hoped that a wireless station may be installed at the military training camp of New York's police at Fort Wadsworth, so that communications and instructions may be interchanged in the course of military training designed for the 3,000 men of the

Department during the twenty weeks of the life of the encampment.

A visit to Police Headquarters is sufficient to convince anyone of the earnestness with which the Department is pursuing the program for preparedness. In the office of Chief Inspector Max F. Schmittberger, two huge maps are spread upon the walls, one of Manhattan and the other of Brooklyn. Upon these maps are being pinned miniature representations of all the important public service buildings and stations in the city, which are vital to the economic life of the metropolis, and must be protected in case of disturbance or danger. Miniature gas tanks protrude from the maps, indicating the locations of the gashouses of the city. The city's entire system of water supply, gas and electricity is outlined in relief, the buildings being shown in miniature of the pumping stations, and gate houses; also the high pressure pumping stations of the Fire Department; the armories, the bridges and buildings of the Dock Department. Also the power houses in every part of the city that might be endangered in the event of public disturbance. Beside the most important of these buildings are pinned little towers, topped with wire antennae. These are the licensed stations of amateur wireless operators, whose co-operation has been sought and obtained by the Department.



The Marconi 1 k. w. 500 cycle quenched spark gap set in operation at Police Headquarters. The call letters of the station are 2-ZA

"Yes, we are Johnny-on-the-spot," said Chief Inspector Schmittberger. "Ours is the first Police Department, not only in the United States, but in the world, that has adopted the wireless service in the conduct of its activities. There is not a power house or recreation pier, not an important building devoted to public life and public service, or where throngs of New York citizens gather, that is not being covered by our proposed scheme of protective service. And all such build-

Commissioner Arthur Woods

ings will be under the protection of the Department in the event of any emergency that endangers them or their vicinity."

The Chief Inspector spoke highly of the licensed wireless amateurs who have joined the Department in the interests of home defense and order. Of the 500 to 600 in the city, said the Chief Inspector, a list of about 200 was first made out from the Government records, and this number was scaled down to sixty-four, as a limit for the needs of a preliminary organization. At the present time, he said, from thirteen to fourteen are now listed by the Department as aids in emergency. This first list has been made up of those licensed amateurs whose aerials are situated in the districts of the city where defense is of the most urgent necessity.

The wireless telegraphy innovation is at the present time a branch of the Telegraph Bureau of the Police Department, of which Inspector Michael R. Brennan is Superintendent. The wireless branch is in charge of Sergeant Charles E. Pearce, who is a radio operator of the commercial first grade—in fact, the only licensed wireless operator in the Police Department at the present time. Sergeant Pearce is a radio enthusiast, and has followed the art of wireless for the last six years. The Sergeant's hobby was so well known in the Department, that when the preparedness movement was inaugurated, his advice was sought, as that of a practical policeman, as to its adaptability to departmental work. The sergeant made a series of suggestions, which were taken up for consideration by the Preparedness Committee of Inspectors. They finally sent for Sergeant Pearce and appointed to him the task of developing that branch of the service for the Police Department. It was realized from the very beginning that the wireless system of communication should be placed in working order as soon as possible for use in case the departmental wires were put out of commission through any cause whatever. It was Sergeant Pearce who installed the wireless apparatus in the headquarters building, and he also constructed the aerial on the headquarters' roof, and built a light, strong, wooden mast of his own design, one which he thought best calculated to meet the needs of the occasion.

The necessity for a school of wireless instruction then came up, and Pearce was selected as the one man in the Department fitted to outline a course and initiate a corps of selected men to the art. The sergeant is himself an old railroad telegrapher, having been engaged in that capacity years ago on the Long Island Railroad, before he joined the Police Department. The instructions of Commissioner Woods were carried out in selecting the men most available to make up the initial class in wireless telegraphy, and fifteen men were selected, three of whom are lieutenants and twelve patrolmen. Each of these men is a former railroad, press or commercial telegraph operator.

"They are all rattling good operators," was the eulogium of the Sergeant when he spoke of the members of his class. "And I can assure you that they are all very enthusiastic about wireless. A telegrapher isn't apt to forget his old craft, no matter how long he has ceased to carry on the work. Communication in the Police Department at present is carried on mostly, if not altogether, by telephone, so none of the men in the wireless school has been in active practice ot telegraphy for a long period, except some who, like myself, keep up their practice at home. Personally, like many another telegrapher, telegraphy has always been my hobby since boyhood days when my schoolboy friends and I started a home-made telegraph line with six stations, and had the greatest fun of our lives as amateur telegraphers. That was long before the days of wireless, of course. I was smitten with the wireless fever about six and one-half years ago, and studied the art and made it my business to get a license as soon as possible.

"This wireless set has not been installed at Headquarters as a demonstration of the utility of radio telegraphy in departmental work alone. It is the intention of the Commissioner, if the operation is successfully carried out, to have wireless service in each of the five borough headquarters, and then in each of the sixteen inspection districts of the Department. Naturally, there is a broader view as to its application in the near future, when radio apparatus will be a feature of the police service in every police station in New York City."

The wireless telegraphy training school at Police Headquarters is a typical schoolroom, with desks and blackboards. Here one may see the grizzled veteran of the Police Department, the old campaigner who has experienced all the trials and tribulations of the service, and has seen human life in all its phases, as only the policeman sees it, seated beside the recruit new to the service to which the uniform and brass buttons have just attracted him. Each of these first fifteen men has been assigned to attend the classes for radio instruction daily for a period of thirty days up to June 30, and they are promptly at their desks from nine o'clock in the morning until five o'clock in the afternoon.

The instruction given the men is based on the system of wireless instruction of the Marconi Wireless Company of America, "How to Pass the U. S. Government Wireless Examination," being used as a textbook. Two hours of every morning

Chief Inspector Max F. Schmittberger

are devoted to instruction in diagrams and technical work and one hour to code practice. In the afternoon, two hours are devoted to each of these branches. The men are spurred on to effort by the fact that the Commissioner wishes them to make good as wireless operators in the short space of thirty days, a record time in which to gain a mastery of the art. But all of them being practical telegraphers, it is the hope and ambition of this first class in wireless telegraphy organized by any police department in the world, to make a record showing. The regulation wireless instruction is being extended to the pupils of the headquarters school that will enable them to pass the Government examination and get a Federal license. Long before this class has passed the first stage of its studies, Commissioner Woods hopes to have others organized from the members of the Police Department, for it is his aim to get as many men as he can, as soon as he can, to make the Department familiar with wireless telegraphy and efficient in its operation.

"Until we get all of our stations in the Department in operation," said Sergeant Pearce, "it is the intention of the Commissioner to have us try to locate the

Sergeant Pearce giving instruction to the wireless class at headquarters. Those who have had experience in telegraphy have been selected to attend this school of instruction

better grade of amateur stations that are situated near the station houses, which can handle the business that will be given to us from Police Headquarters. It is to be taken for granted, however, that the work of such amateurs will prove a valuable auxiliary to the Department permanently in picking up messages that will be of service in the line of police duty and also in emergency work in times of great disturbance and public necessity.

"The adaptation of wireless to departmental work is, of course, an amplification of the preparedness plan of the Commissioner. He has selected 3,000 men out of 10,000 men of the Department to obtain an efficient course of military training at Fort Wadsworth, Staten Island. A training camp is already in operation there. Of the men selected, 300 are taking a two weeks' course at Fort Wadsworth in regular military tactics. These two weeks are being given to the men in addition to their ordinary vacation. The entire 3,000 will be instructed in this manner, over a course of twenty weeks. The men have a regular encampment, where there are drills during the day, instruction in the manual of arms, rifle shooting, and, in fact, the regular training of a soldier. It is intended that the New York Police Department will in this way be enabled to join with the naval and military forces of the country should the need ever arise.

"We hope to be able to install a wireless station at this encampment at Fort Wadsworth as soon as possible, that the value of the wireless service in police duty may be more strongly emphasized. And this is primarily so, because it is realized that in case of any great public disturbance, such as strikes, riots or rebellion, the telephone system of the Police Department might be interfered with or destroyed, and reliance would have to be placed absolutely on wireless communication for the marshalling of the police forces in the maintenanec of order in the city.

"It is realized also that portable wireless sets will be of immense service to the Department, sets such as the field packs that are used in army service. The New York Police Department maintains order not only in the city, but also in the waterways surrounding the city Wireless installation on harbor craft, such as the steamer Patrol of the Harbor Squad, would be invaluable in the protection of life and property along the river fronts and in the Bay. In addition to that, we are also looking for a set that can be put on the patrol wagons, where the electric current to operate it may be generated from the motors of the automobile wagons."

Talks with officials of the Police Department as to the wider application of the wireless in its adaptation to police work reveal the great benefits that the service would derive from radio telegraphy in the ordinary course of police surveillance. One of the most tragic disasters that ever occurred in New York was the destruction by fire of the excursion steamer General Slocum in Long Island Sound some years ago. Had a system of wireless communication been in force at the time of this great disaster, the work of Police Headquarters on land and water would have been expedited in great measure, and the loss of life would undeniably have been averted, or at least greatly minimized.

Another factor in the life of New York, which is one of the greatest ports of the world, is the frequent occurrence of disorder and even mutiny aboard the steamships that are anchored in New York Harbor. The sending of aid to such vessels is often a difficult matter, in that information of such disturbances is delayed. Were there an efficient wireless service in the Department, covering land stations and the craft of the Harbor Police, the maintenance of order on the great waterways about the Metropolis would be on a far more efficient basis.

Nowhere more than in police work is it realized that criminals are apt to take advantage of every step forward in invention and scientific discovery. It is the boast of the efficient burglar that he can break the most modern safe. This, of course, is due to the fact that the streak of criminality runs through all phases of the social body, and the trained and efficient workman is often as apt to become a lawbreaker as his more ignorant fellow worker. Strange as the term may sound, it is nevertheless an established fact that river piracy is a great menace to property interests along the great and extensive waterways of New York. Warehouses alongside of docks are looted and vessels moored to piers are despoiled of valuable portions of their cargoes by thieves of the waterside, who have all the resources of co-operation with corrupt watchmen and mercenary crews, and can bear their booty away in motor launches of the most modern type. The vigilance of the Harbor Police would undeniably be made much more efficient were the wireless service added to their equipment.

Added to this, the dangers attendant upon the frequent occurrence of fire on board vessels in New York Harbor would be lessened greatly, if a wireless service could provide prompt notification to the Harbor Police, who could thus notify and work in conjunction with the New York Fire Department in the lessening of such calamities.

Periodically, great, and it would appear, unavoidable calamities occur in every large community. While some of them originate from social unrest and economic stress, others are due to natural causes, such as earthquakes and floods. Again, vast conflagrations occur. It is of vital consequence to the social body that order be preserved during such periods of trial, and this duty, the maintenance of order, with its concomitants, the protection and preservation of life and property, fall to the lot of the police departments of great cities. That the wireless service is an aid and even more than that, a salvation, goes without saying. Where large bodies of policemen must be hurriedly sent to certain danger points, and in the meantime the ordinary means of communication have been destroyed, the wireless affords a method of communication to which there is no danger of interruption of service. Squads of men can be sent through the medium of radio communication to given points from headquarters far distant from the scenes of disaster, where efficient and watchful officials are kept in touch with the needs of such occasions. Naturally, in such days of calamity, the value of a large force of men, trained in the art of wireless telegraphy is made manifest. But such organizations cannot be created in a day. They are the result of foresighted plans of efficient departmental heads, who realize the value of trained bodies of men in the great and inevitable emergencies to which unexpected occurrences subject modern communities.

As cities grow and countrysides become populated, casualties wax in proportion. It is the duty of civil communities to be prepared for days of disaster. So long as the human equation prevails in life, so long as the millennium does not arrive, strikes and riots are unavoidable occurrences in the economic life of the nation. Order must be maintained. A police department efficiently equipped, can cope with any emergency.

From and For those who help themselves

Experimenters' Experiences.

The editor of this department will give preferential attention to contributions containing full constructional details, in addition to drawings.

FIRST PRIZE, TEN DOLLARS
A Home-Made Aerial Hot Wire Ammeter

An important acquisition to any amateur station is a hot wire ammeter for determining the current flow in the antenna circuit and conditions of resonance between the primary and secondary windings of the oscillation transformer. I constructed an instrument of this type after the designs indicated in Figs. 1, 2, 3 and 4, and it has proved satisfactory in every respect. The majority of materials for this instrument can be found in the junk at the average amateur radio station; this, coupled with the fact that only a few tools such as drills and taps are required to construct the instrument, should appeal to the experimenter whose laboratory equipment is limited. The dimensions and sizes for the various screws and pieces of brass may vary considerably without destroying the efficiency of the meter, with the one exception—that the spring brass referred to should not be thinner than 1-16 of an inch.

The general arrangement of this meter is indicated in Fig. 1. The expanding hot wire is of No. 30 copper and is kept tightly between the lugs A and B, which are mounted on two square, hard-rubber blocks. The brass lugs are constructed to take the wire, thereby holding it in place and allowing the tension to be rather carefully regulated.

Fig. 2 indicates in detail how the brass block is mounted on the hard-rubber base and, as shown, the former is split with a hacksaw ¾ of its length to take the expanding wire.

The pointer for the instrument and the balancing arm are shown in detail in Fig. 3 and Fig. 3-a. The latter figure indicates the manner in which the balancing arm should be turned. It is drilled with a 1-16 inch drill on each end with the center part 3 filed flat on the top and bottom. A 1-16 of an inch hole is drilled through the flat side to receive the spindle and, as will be observed, the filing of this part to a flat shape will leave two small tips on each side.

To continue the construction: Take two common pins and cut off the tips about ¼ of an inch from the head. Lay them in between these lips and pinch them tight with a pair of pliers, leaving the heads on one side pointing down and on the other side pointing up. It is to this arrangement that the silk thread is tied.

The aluminum pointer is constructed by shearing a thin strip from a sheet. If a sheet of this material cannot be obtained, substitute a piece of copper wire; however, aluminum is to be preferred. The details for the construction of the spindle are given in Fig. 4. This can be made from a 1-16-inch drill shank, as it is short and will not completely ruin the drill. This shank may be pointed at both ends by placing it in the chuck of a lathe and tapering it to a fine point by means of a sharp file. It should then be polished with a fine oil stone. Particular care must be

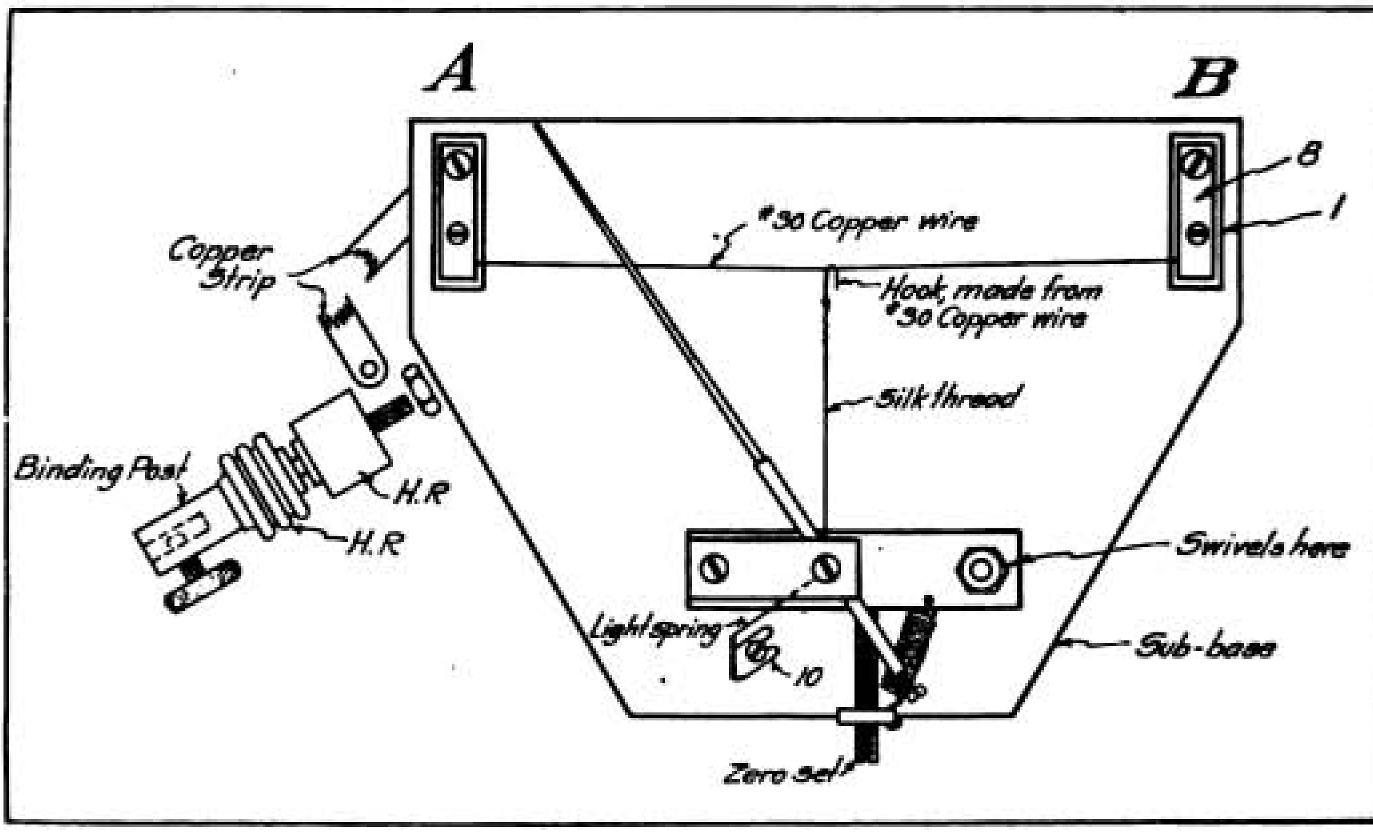


Fig. 1, First Prize Article

ken in the formation of this point to make it perfectly smooth and true. After completion the ends of these points are placed in the small lugs indicated in Fig. 4. The latter can be made from 8-32 machine screws drilled on the end to form a cup.

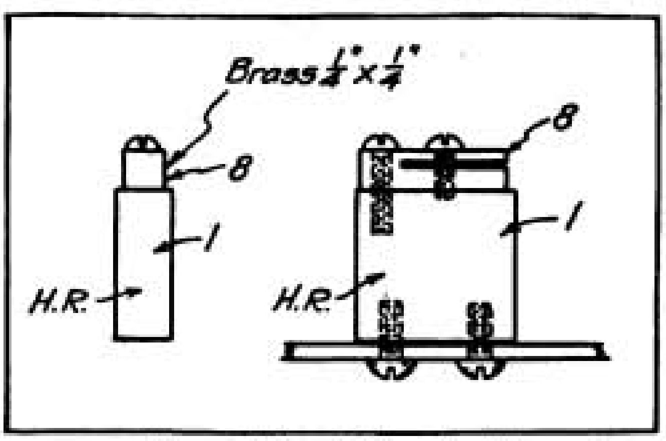


Fig. 2, First Prize Article

A very light phosphor bronze spring is indicated in the detail 10, Fig. 4. To this is attached the silk thread which is wound around the spindle, Fig. 4, and is fastened to the pin heads. The function of this spring is to keep a tension on the pointer, thus tending to wind up the thread which is wound around the other end of the

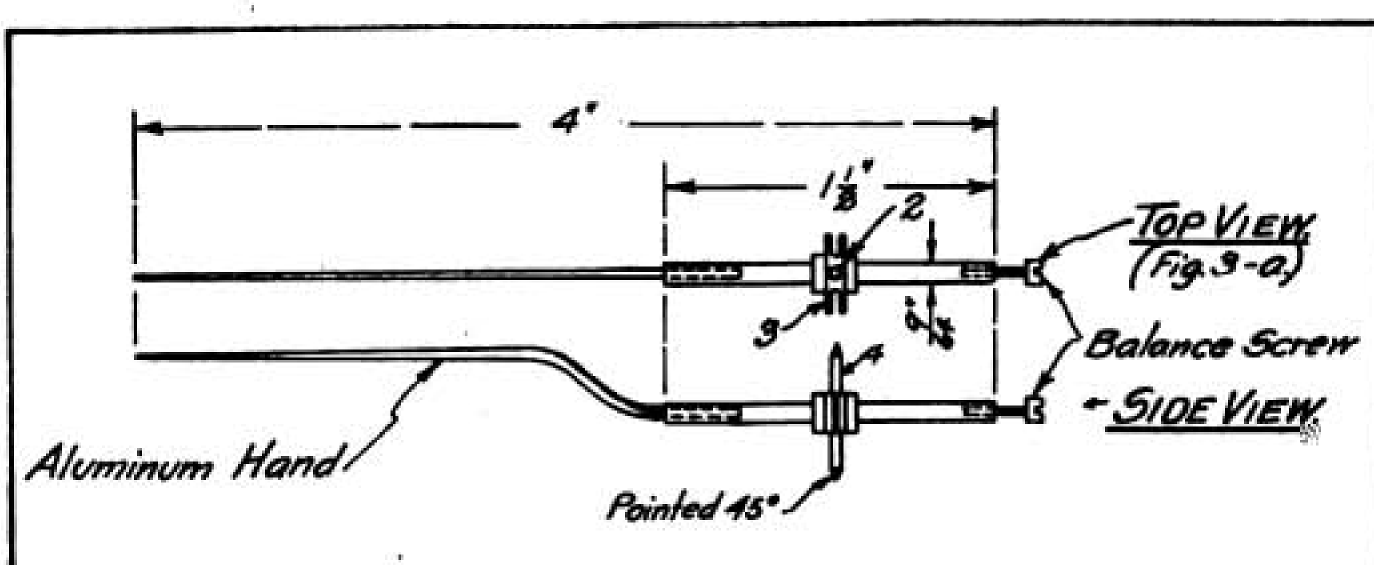


Fig. 3, First Prize Article

spindle fastened to a small hook attached to the expanding wire.

The balancing arm should be perfectly balanced in the holder before the silk threads are fastened.

The entire instrument is then fastened on a sub-base as indicated in Fig. 1, after which it is to be mounted in a wood or metal box. This instrument can be satisfactorily calibrated by connecting it in series with another ammeter and supplying them with definite values of current.

If No. 30 wire is used for the expanding element the instrument will have a range of about five amperes which is quite satisfactory for a 1 k.w. transmitting set. By the use of No. 32

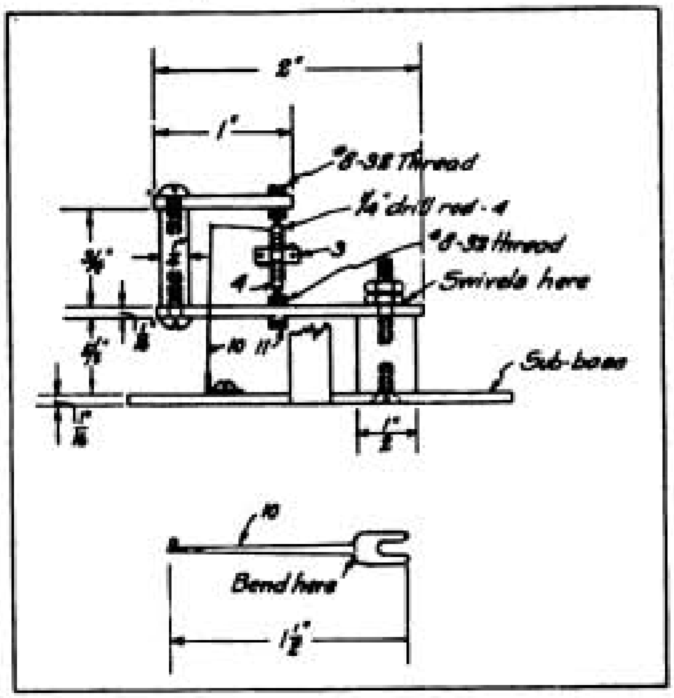


Fig. 4, First Prize Article

copper wire the instrument will give a full scale reading of approximately three amperes. Similarly, No. 36 copper wire will give a full scale reading of about one ampere, which is quite suitable for the average spark coil set.

The complete operation of this instrument can be readily understood from the drawings, current flowing through the expanding wire from post A to B causes this to heat and expand. This, of course, decreases the tension on the silk thread, which in turn releases the tension on the shaft and through the medium of the phosphor bronze spring the pointer is moved from the zero towards the full scale position.

G. R. SIMMONS, *Louisiana.*

SECOND PRIZE, FIVE DOLLARS

A Practical Dead End Eliminating Switch

In my opinion the attention of the average electrical experimenter is more apt to be held by the description of a wireless instrument requiring for its construction a simple set of tools and supplies rather than one necessitating the use of a machine lathe or an elaborate workshop equipment. Hence I will describe the design of an important part of the receiving tuner which may be constructed by any amateur possessing a couple of small drills, an old pair of scissors, a file and a soldering iron.

The device I am about to describe is known as a dead end eliminating switch, the important feature of the design being that this switch operates in conjunction with the inductance-changing switch, cutting the several units of inductance into the circuit as they are required. The switch may be effectively employed in either the primary or secondary windings of the receiving tuner, and by use of it increased strength of signals is obtained when used with a tuner designed to cover a considerable range of wavelengths.

The principal parts of the switch can be purchased ready for use and it is simply a matter of drilling a few holes to continue the assembly. Referring to the detail drawing: detail P is a hard rubber sheet 1/4 of an inch or 5-16 of an inch in thickness. Drill a hole in it 5-16 of an inch in diameter to a depth of 1/8 of an inch, and then continue right through the rubber with a 5-32 drill. The 5-16 of an inch hole, 1/8 of an inch in depth, is intended to take the end of the nut which projects through the washer so that it will lie flush with the surface of the hard rubber.

Detail D is a brass washer 7/8 of an inch in diameter, with a 5-16 of an inch hole. This is a stock size and can be purchased at any store selling material of this kind.

Detail G is a battery nut from a Columbia dry cell. With a little pressure it can be forced into the 5-16 of an

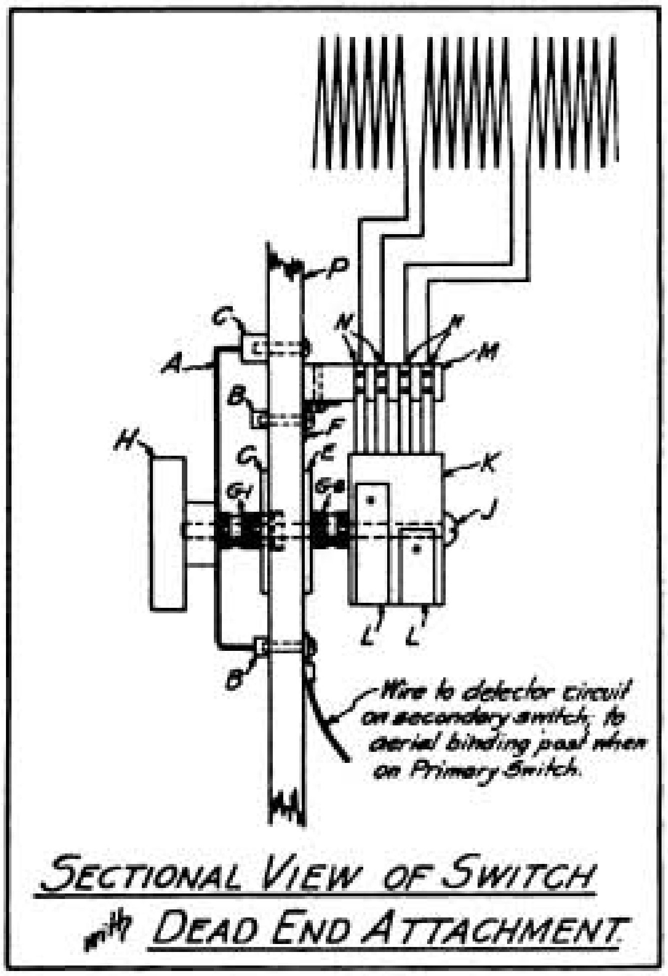


Fig. 1, Second Prize Article

inch hole in the washer D, the rough end of the nut preventing it from falling through. Next lay the two pieces on a flat surface centering the nut in the washer, after which they are soldered together. Follow this by running a 5-32 inch drill through the nut to clean off the thread. The bearing for the entire switch is now complete.

Detail C is the usual ¼ inch in length by ¼ inch in diameter switch stud. Detail A is a phosphor bronze strip ½ inch in width with a 5-32 inch hole drilled as per the drawing. It is bent over at the dotted line.

Detail B is 3-16 of an inch in width and is cut from an old piece of brass pipe 2 inches outside diameter. The edges are finished smooth with a file. If a piece of pipe is not available, an ordinary solid brass curtain ring can be used if it is filed a little flat on both sides. This portion of the switch is the most important; the usual design, where the wire is soldered to the screw J or to a washer underneath it, is not recommended. The ring insures a perfect self-cleaning contact at all times.

Detail E is a piece of flat brass or a washer with a 5-32 hole. The actual shape of it is not important, but the surface must be true.

Detail G is a nut from a Columbia dry cell having a perfectly true surface.

Detail J is an 8-32 machine screw, 2¼ inches in length.

Detail H is a hard rubber handle.

The dead end switch can be constructed according to the following explanation: Detail K is a piece of fibre rod 1¼ inches in diameter and ¾ of an inch in length, to which are attached two copper strips, L, ¼ of an inch in width. Copper is recommended for this part, as it is soft and will retain its shape when bent around the fibre rod, K. The copper strips, L, are fastened to the fibre rod with small machine screws. It is well to drill a hole slightly smaller than the screws through the copper and into the fibre rod. The screw will then cut its own thread. After this, cut the head off the screw and file it down smooth and level with the copper strip.

Detail M is a piece of fibre ⅜ of an inch in thickness, ½ of an inch in width, and 1⅛ inches in length, to which are fastened the four strips, N, of phosphor bronze. The latter are ⅛ of an inch in width and 1 inch in length. Small wood or machine screws can be used to hold them in place. The

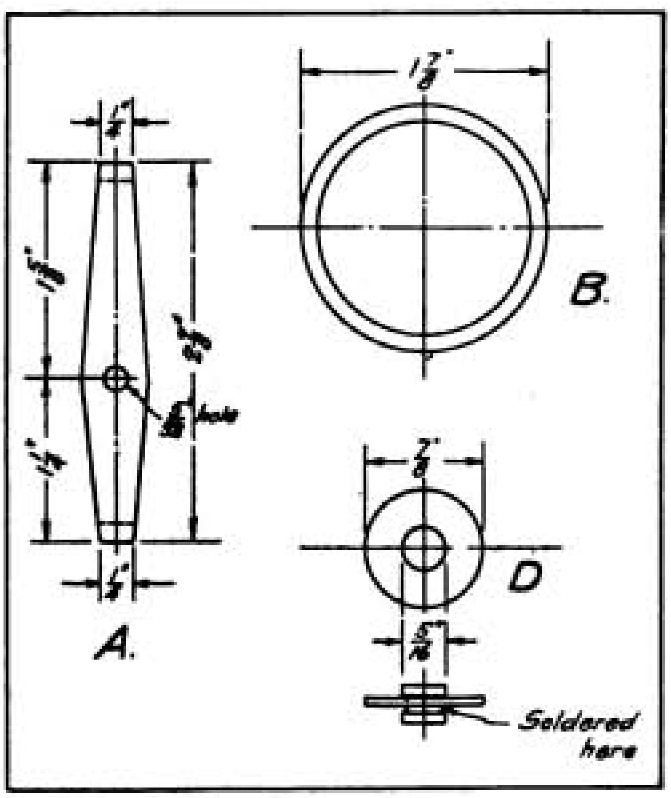


Fig. 2, Second Prize Article

strips should be cut a little long if necessary so that when the switch is assembled a slight turn on the end of each will enable it to slide over the copper strips, L, smoothly.

A small piece of ⅜-inch angle brass to support the fibre, M, is indicated in detail F. Fibre is preferred at this point instead of rubber because it holds the screws better.

The actual length of the copper strips, L, depends on how the dead-end taps are to be taken from the coil. If a complete circle of switch points is decided on and the coil is divided into three equal parts, the length of one copper strip, L, will equal in length ⅔ of the circumference of the rod, K; the other strip, of course, will equal ⅓ of the circumference. The longer strip will close up the first break in the inductance coil and the shorter strip the second break. It will continue to do so until the last switch point is reached.

It should be mentioned during the assembly of the switch that the nut, G-2, must be screwed as tightly as possible against the fibre rod, K, the latter having a 5-32 inch hole drilled exactly in the center.

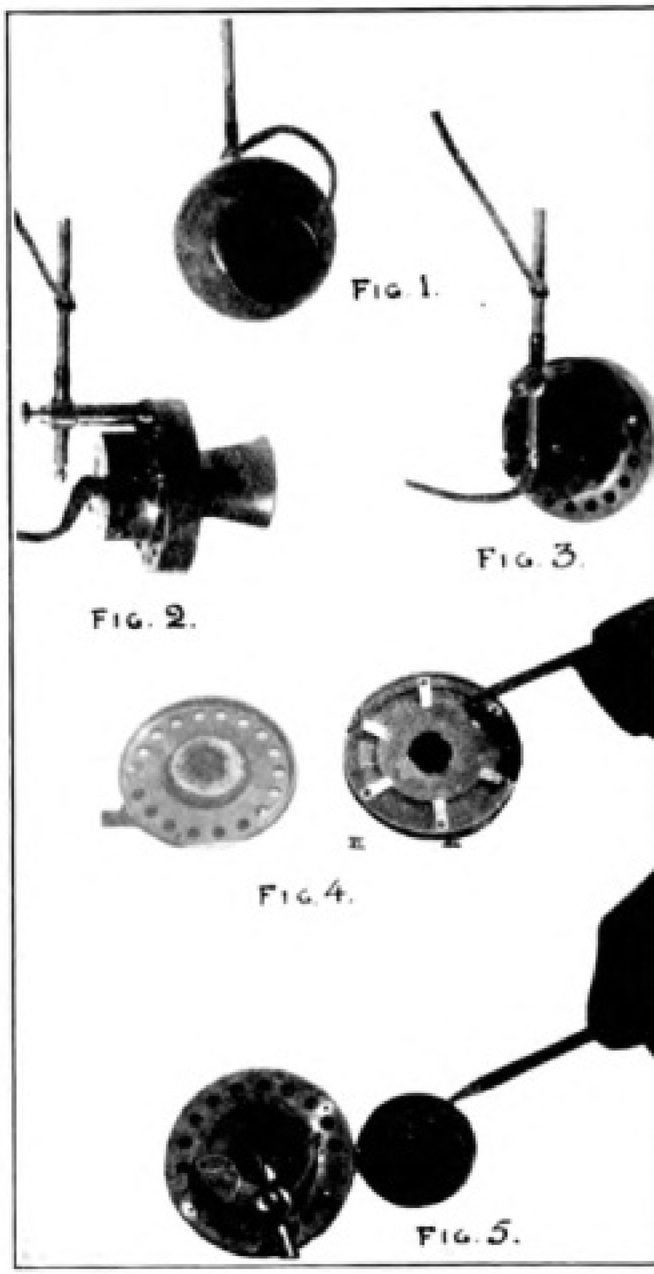
I believe that the complete assembly of the switch will be clear from the drawing and if the builder will take the pains to nickel plate the various metal portions he will possess a dead end switch of unusually neat appearance and one which will not be apt to give trouble from day to day.

Joseph Furlong, *Massachusetts.*

THIRD PRIZE, THREE DOLLARS

A Heavy Current Transmitter for the Radio Telephone Experimenter

In the columns of magazines devoted to the American electrical experimenter, one often sees a query concerning the construction of a reliable transmitter that can be used for radio telephone work. As is well known, the ordinary microphone transmitter is not well suited for this purpose because the amount of energy that it can handle is rather limited, and in view of the fact that considerable energy must flow through the transmitter when employed in wireless telephone work, it is necessary to construct a microphone of unusual current carrying capacity. In the design here presented no dimensions are given, for a change in the size of the various parts does not materially affect the workings of the complete transmitter; hence it is expected that the experimenter who duplicates our



Illustration, Third Prize Article

design will make use of those materials he may have at hand.

A front view of the transmitter is indicated in the accompanying photograph, particularly Fig. 1. In order to give the experimenter some idea of the size of the microphone we have constructed it may be stated that it is 4 inches in diameter. A side elevation of the device may be seen in Fig. 2; this photograph brings out clearly the construction of the chamber holding the insulated slate cup, which in turn contains a teaspoonful of carbon grains. The latter may be purchased from any large electrical company handling telephone supplies, but care should be taken to select the types that are larger than the grains used in the ordinary telephone transmitter, as the larger ones do not burn up as quickly as the smaller. At the extreme rear of the chamber is shown the fibre insulation used to conduct the electrodes into the cup containing the carbon grains.

In the photograph, Fig. 3, the details of the round fibre piece are shown. The two set screws at the circumference are used to prevent the electrodes, shown in the center of the fibre plate, from moving in and out after once being adjusted. In actual use, one wire of the aerial circuit at a given radio station connects to these electrodes, the other wire of the aerial circuit being fastened to the metal standard which is used to support the transmitter in any desired position. This is effected by means of the set screw shown on the metal projection. The front half of the transmitter is fastened to the back half by two set screws shown near the circumference of the piece 4 inches in diameter, and the holes indicated are drilled out to permit air to circulate and to keep the inner chamber cool.

The right hand character in Fig. 4 shows an inner view of the front half of the transmitter. A circular piece of thin mica is used to hold the carbon diaphragm in place. The six springs shown also keep the tension of the carbon diaphragm constant. The long threaded screws are those mentioned as holding the front and back halves of the transmitter together. The left hand character in Fig. 4 shows the inner chamber holding the carbon grains. The photograph also indicates clearly the main chamber of slate while a ring of soft asbestos may be seen. The purpose of the latter is to keep the carbon grains from packing under the slate cup and the carbon diaphragm. In the center of this cup is a thick piece of mica which is not generally necessary, but was used by us in certain experiments requiring the use of two sections of carbon grains in the cup.

The rear inner construction of the slate chamber is indicated in Fig. 5, also the electrodes that conduct the current into the cup holding the grains. To the ends of the electrodes are attached pieces of ordinary hard carbon.

A novel feature of this transmitter is that the chamber holding the grains may be made to hold more carbon by simply loosening the set screws holding the electrodes in place and drawing them outward. This feature also assists in making the initial adjustments during the preliminary tests.

The mouthpiece of the transmitter is similar to that found on all instruments of this type. It may please your readers to know that a transmitter of this type has actually been used in a circuit carrying a considerable current, and so far it has functioned perfectly in constant service.

EARLE HANSON AND ALBERT MARPLE,
California.

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

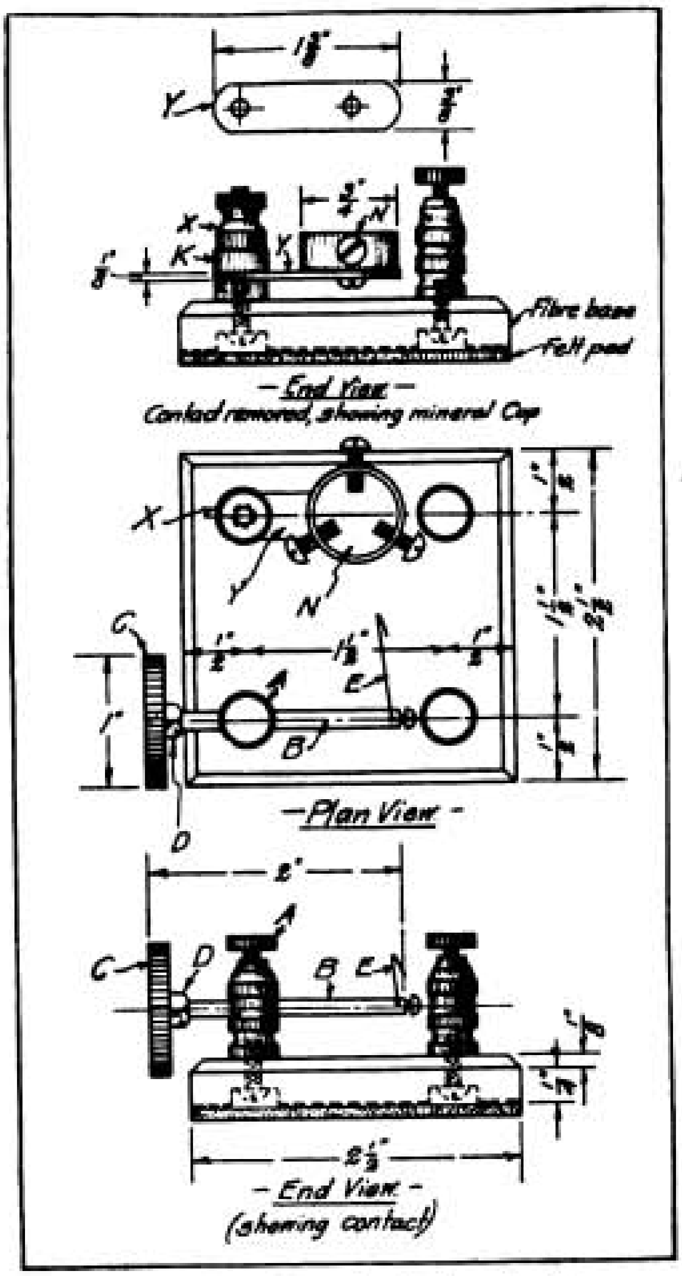
A Universal Crystal Holder Which Will Appeal to the Amateur

All minerals used in receiving detectors with which the writer is familiar have certain parts which are more sensitive than others. So a detector-holder enabling one to quickly and easily search the surface of the mineral for the most sensitive point, and which, when found, maintains its position upon it with any desired pressure, constitutes the maximum of desirable qualities. The accompanying drawing gives the constructional details of a detector containing all these points, and, moreover, its simplicity of construction is at once apparent.

In the accompanying drawing, Y is a brass strip 1-16 inch thick, 3/8 inches in width, and 1 3/8 inches in length. One end is bored to fit loosely over the 8-32 bolt in the binding post, X, while to the other end a mineral-cup is either bolted or soldered, preferably the latter. The binding-post, X, has an additional lock-nut, K, permitting the part Y to swing to the right or left.

Part B is a 3-16 inch brass rod two inches in length with one end tapped to receive a lock nut and a composition or fibre knob, C. The other end of B receives the phosphor bronze wire, which is of No. 26 or No. 30 gauge by either soldering it or by tapping the rod and inserting a small clamping screw, as shown in the detail 1. The binding post, A, is tapped so that the rod, B, will have a snug fit.

As will be apparent, any spot on the surface of the mineral can be easily



Drawing, Fourth Prize Article

reached by the contact point, either by swinging the mineral cup to the right or to the left, or by pushing in or pulling out the rod, B, while pressure is obtained by revolving the knob, C. Should there be any discrepancy in the fit of the rod, B, in the hole in the binding post, A, a clamping screw may be utilized to maintain it in any position desired.

CHARLES E. BEALOCK, *California.*

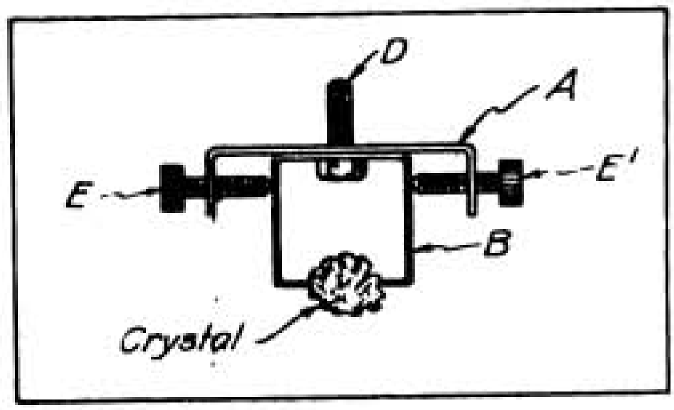


Fig. 1, Honorary Mention Article, H. Dwight

HONORARY MENTION

A Novel Detector Cup of Considerable Merit

Being unable to purchase a detector cup of the usual design in the local supply shops, I constructed a crystal holder which I believe to be more convenient than those ordinarily supplied. The holder consists essentially of a piece of strip brass ⅜ of an inch in width 1¼ inches in length, and about 1-32 of an inch in thickness, bent at right angles ¼ of an inch from each end, after which it is drilled and tapped to take the bolt and the thumb screws, E and E′, as indicated in Fig. 1. B is a piece of hard drawn copper ribbon, or preferably a piece of phosphor bronze, ⅜ of an inch in width and 1½ inches in length.

As shown in Fig. 2, this strip should be cut down to ⅛ of an inch in width at each end and drilled for the bolt D. It should then be bent to take the shape as in Fig. 1. A and B are bolted together with a small machine screw or bolt D and the thumb screws, E, E′, inserted in the tapped holes. The spring should be bent with the jaws well open, so that there will be the correct degree of tension on the thumb

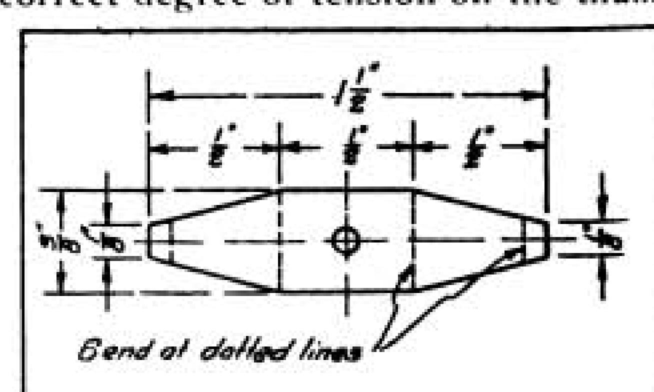


Fig. 2, Honorary Mention Article, H. Dwight screws to grip the crystal firmly. It is found extremely easy to insert small pieces of crystal into this holder which, as is well known, is not the case with certain types of detector cups.

H. W. Dwight, *Massachusetts.*

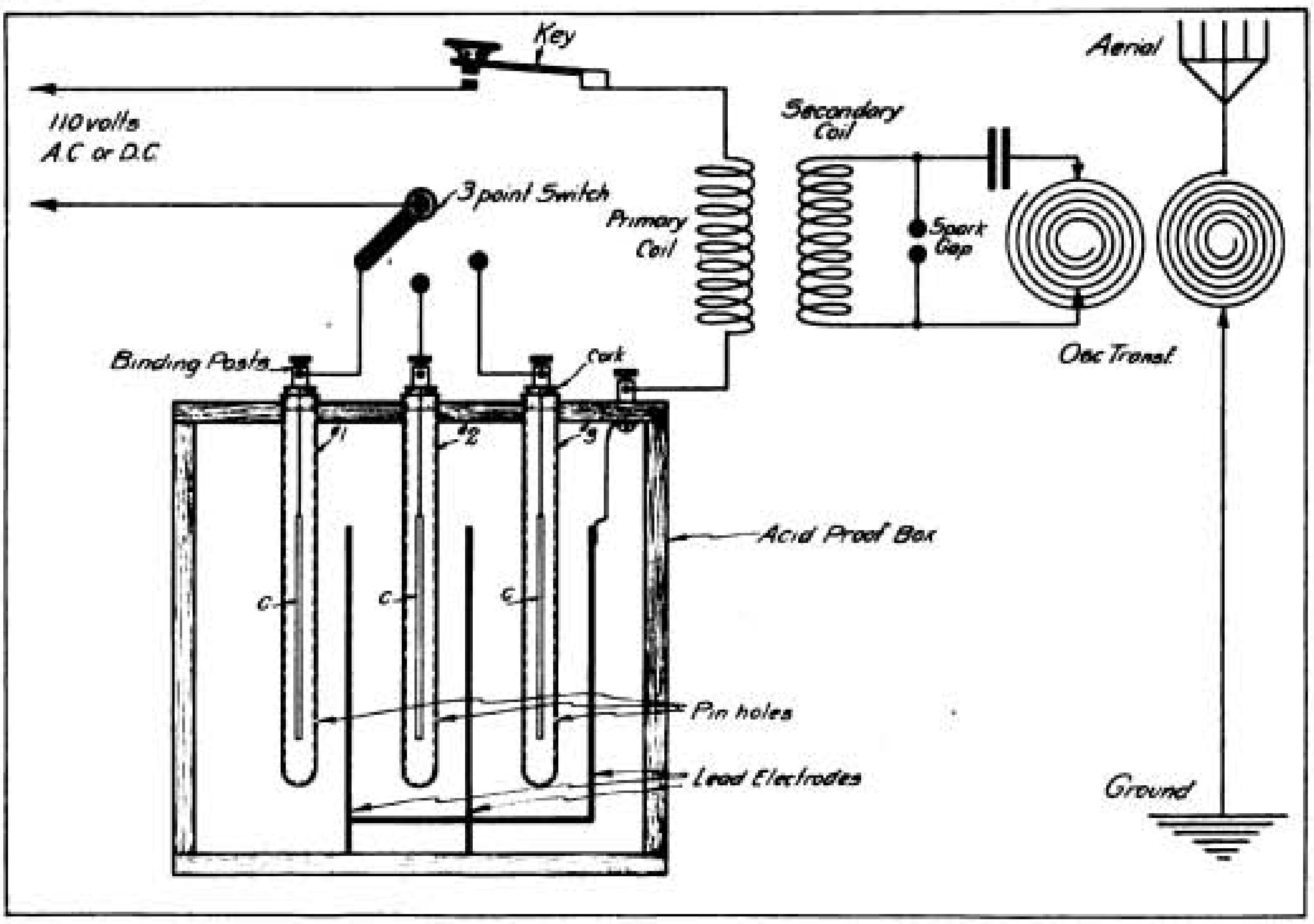
HONORARY MENTION

A Multi-Tone Interruptor for a Spark Coil

The accompanying drawings cover the construction of a three-tone interruptor which I have used continuously for five months at my station, and so far I have experienced no trouble whatsoever. In addition, I find that it gives a spark note equal to any rotary gap which, as is well known, cannot be used with an induction coil.

The important parts of this interruptor are the test tubes 1, 2 and 3, which are about 12 inches in length, 1 inch in diameter. The most difficult part of the construction work is the puncturing of a small hole in the ends of the tubes. About 1 inch from the closed end of the test tube file away the glass with a small sharp three cornered file and turpentine. If this work is done very carefully the glass may be filed so thin that the point of a small pin can be passed through the tube.

To continue the construction an acid-proof box is required which may be made from heavy oak boards boiled in paraffine wax. In the cover bore three holes just large enough to take the test tubes. In each tube is suspended a copper electrode, C, which is connected to the external circuit by means of a binding post mounted in a cork over the mouth of the tube. At the bottom of the tank are placed three sheets of lead connected together and finally connected to the extreme right hand binding post. These sheets may be about 1½ inches in width, from 8 to 10 inches in length, and about ¼ of an inch in thickness. The interruptor box is then filled with three parts of water to one of sulphuric acid.



Drawing, Honorary Mention Article, George Levine

As will be observed from the drawing, any one of the interruptors may be connected in series with the primary winding of the induction coil by means of the three point switch and if care is taken to make a hole of different diameter in each tube three distinct tones will result which are highly pleasing

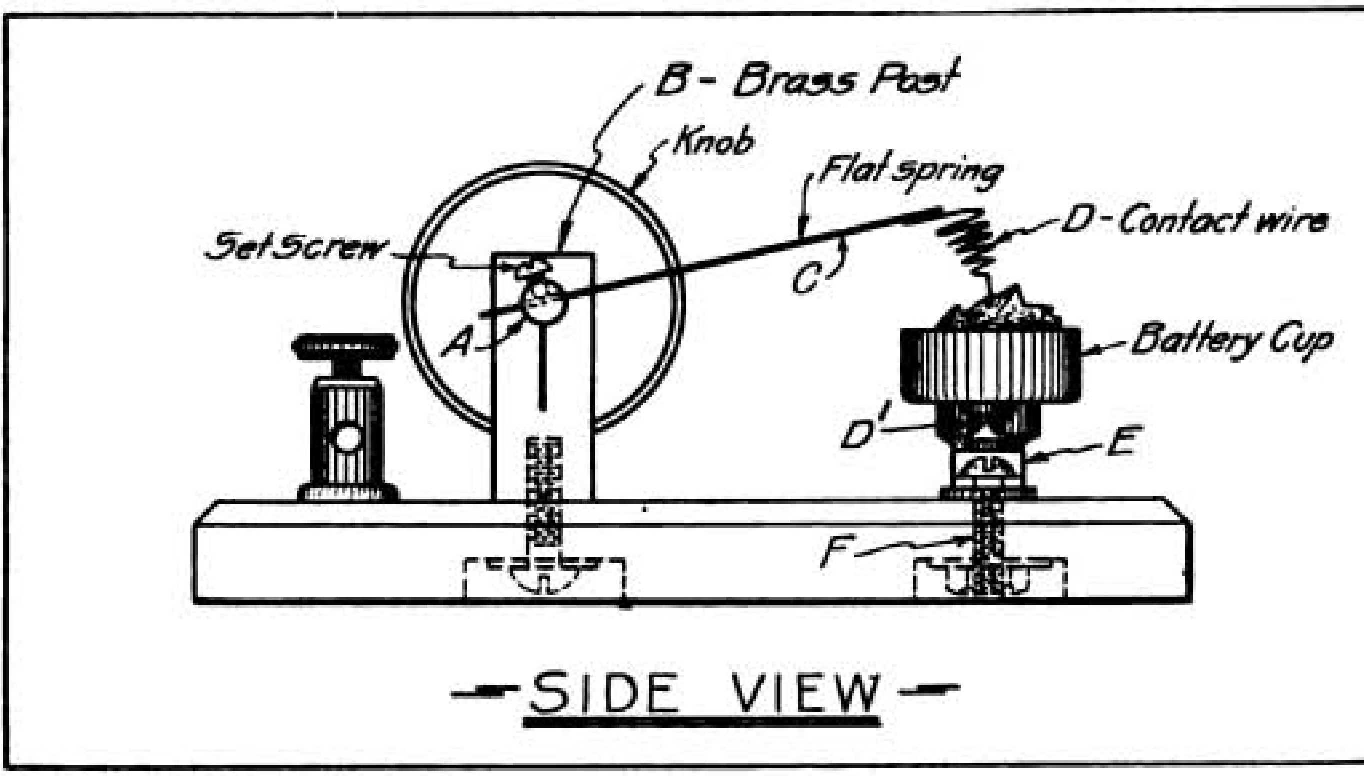


Fig. 1, Honorary Mention Article, William A. Barnes

to the ear. For a low tone one of the holes should have a diameter of about 4 pin points; for a medium tone about twice the size of an ordinary pin point, and for a high tone the diameter of a single pin point suffices. I have found by experiment that the dimensions given do not hold for all sizes of spark coils and will have to be varied with each different design. Different percentages of the acid solution will also often increase the pitch of the note. If care is taken in punching the holes in the test tubes and the right ingredients are used in the solution, the experimenter can afford considerable amusement to his fellow amateurs by sending out signals of different tones. It is possible by more elaborate construction to construct six or eight interruptors of different tones in this manner and thereby imitate the octave of an entire scale.

George Levine, *Iowa.*

HONORARY MENTION

A Crystal Holder Applicable to All Types of Minerals

A convenient design for a crystal detector holder is presented in Figs. 1 and 2. One of this type has been found extremely useful at my station, since it is applicable to crystals of all types and kinds. The construction and adjustment to sensibility will be apparent from the following description:

A side view of this detector is indicated in Fig. 1, and an end view in Fig. 2. The post, B, is of brass which is slit through the center with a hacksaw and drilled to take the ¼-inch brass rod, A. The latter rod should fit the hole snugly, the tension being afforded by pressing the ends of the upright post, B, together with a large pair of pliers after the slit has been made. The adjusting rod, A, is fitted with a large hard rubber knob and is slit at its opposite end and fitted with a set screw to take the flat spring, C, on the end of which is mounted the contact wire, D.

The arm, E, is made of heavy brass strip drilled to take the bolt, F. On the oppposite end it has mounted the hard rubber knob, G, and the crystal cup which is fastened in place by means of the knurled battery post nut, D, which is also soldered on E. The crystal cup is taken from round battery carbon and being inexpensive, each mineral may be mounted in a separate cup which may be screwed into the nut, D, and quickly removed for a change. The spring, C, being interchangeable, any type of contact with different degrees of elasticity may be employed.

It will now be apparent from the drawings that the crystal mounted in the cup on the lever, E, may be moved back and forth by the knob, G, allowing the contact, D, to be placed on various portions of the element. The tension on the contact, D, is regulated by the large hard rubber knob but different points on the crystal are obtained by moving the cup about. Because of the ease with which a sensitive spot on the crystal can be located, a detector of this type is particularly recommended for experimental purposes and for testing out the sensibility of various minerals.

WILLIAM A. BARNES, *Connecticut.*

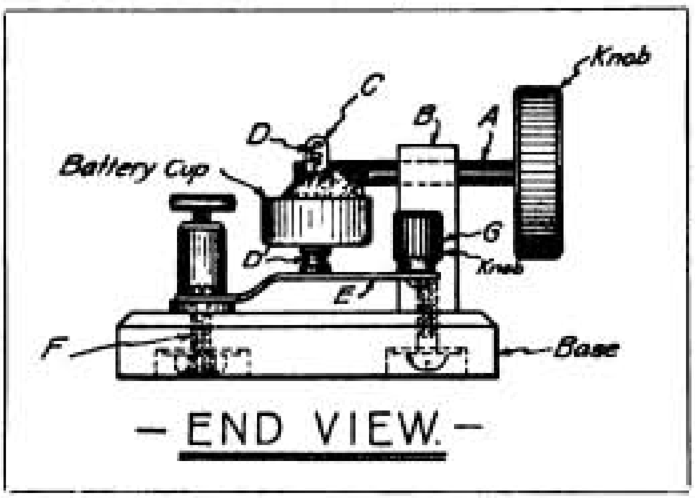


Fig. 2, Honorary Mention Article, William A. Barnes

HONORARY MENTION

The Removal of Inductive Effects Caused by Power Lines

I notice from various publications that a great many amateurs have trouble from alternating current inductive effects on their receiving sets. Having been a chief engineer of different hydro and steam plants over the West for the past ten years, and having experimented with wireless apparatus for the past two years, a few notes on my experience may be of interest to your readers. At present I have a station where the instruments are located but thirty feet from a large alternator and forty feet from the switchboard and fifty feet from a high tension line.

I hear many medium and high-power stations in the United States and Canada, including Alaska. Quite often I hear the Mare Island Navy Yard at San Francisco and Arlington on 2,500 meters at the same time.

For a period I experienced considerable trouble from induction when using a vacuum valve detector, but found it to be due to a battery and buzzer connected to a ground wire in the building. At another period my vacuum valve seemed to emit severe inductive noises, but later I found it was due to the fact that the high voltage battery was reversed in polarity. At one time I experienced an unusual amount of induction from a power house, and discovered later that my ground connection was making a very poor contact. I take the precaution now to keep all drop cords and lamps from two to four feet from my receiving set, for occasionally I find that the inductive influences are led to the receiving apparatus through them. During the reception of signals, I also keep my hands clear from all metallic parts of the instrument. I have insulated the lead-in and ground wires thoroughly. So far in my experience the only inductive noise I have not been able to eliminate entirely is that produced by the contractors on the Tirrell regulator. Our exciter commutators and collector rings at this power plant are kept in good shape, but as soon as they are allowed to get out of this condition, considerable inductive effects are experienced from them.

We have frequently experienced disastrous inductive noises in our receiving apparatus when the high tension line and the telephone line on the same poles become grounded. In a case of this kind it simply puts the wireless telegraph receiving apparatus out of business, and I believe that it is a trouble of this sort that many amateur experimenters experience, but they do not know where it comes from. If every amateur experimenter would take the precautions that I have and would keep all unnecessary batteries, power lines, etc., away from his apparatus, and if he finds by these expedients that the trouble cannot be eliminated it is up to him to tell the man in charge of the power house to clear the ground from his machine or at least clean the commutator.

A. C. CAMPBELL, *Montana.*

Wreath for Wireless Operators

The Marconi Wireless Telegraph Company inaugurated a fitting custom on Memorial Day by placing a wreath on the monument in Battery Park, New York, to the operators who have given their lives in the service of the key. Year by year the sea has taken its toll of the lives of the wireless men and as yet no one has failed in the time of crisis to pay the last full measure of devotion. In honoring such fidelity and sacrifice, the company honors itself.

About ten o'clock in the morning a committee consisting of R F. Miller and M. H. Paine, both formerly operators in the Marconi service, placed on the shaft the wreath given by Edward J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Company of America, in the name of the company. It is expected that the custom will be continued hereafter annually on Memorial Day.

Wreath placed on monument to wireless heroes

The monument itself was dedicated on May 12, 1915, with impressive ceremonies in which Commodore Fred B. Dalzell of the Maritime Association and Acting Mayor McAneny participated, assisted by clergymen and enlisted men of the United States Navy. Upon the column behind the fountain are inscribed the names of the operators for whom it was erected, with a space for those whose deeds will call for commemoration in the years to come.

It has been announced that the wireless station at Great Lakes, Ill., has been completed and weather reports, time signals and storm warnings will be sent from that point. Aside from the help this first lake station will be to marine men, it will also be of interest to the amateur operators.

Heretofore the storm warnings have been given to vessels upon their arrival at ports. Now those equipped with wireless will know what sort of weather to expect as soon as Washington learns it.

WIRELESS TORPEDO EXPLODES

R. S. McGuire of Grand Forks, N. D., and two engineers of the United States Government were thrown into the Mississippi River at St. Cloud, Minn., recently when the boat in which they were testing a wireless torpedo steering device invented by McGuire was capsized by the explosion of the war engine. The latter was loaded with seventy-five pounds of gun cotton. The wireless instruments sank, but the three men reached shore safely. By means of his wireless apparatus McGuire had steered the torpedo against a pile of logs in the river. The force of the explosion hurled a large piece of wreckage against the boat, capsizing it.

LONG DISTANCE RECEIVING AT SEA

The American steamer Ventura, from San Francisco, reports that it picked up wireless messages from the station at Tuckerton, N. J., when 9000 miles from the American plant. This is declared to have broken all records.

Some Problems in Antenna Construction

Part II (Conclusion)

Antenna Supports

By A. S. Blatterman, B.Sc.

Wood Pole With Horizontal Load Near Top—We will consider a supporting structure consisting of a single round wood pole with foundation in the earth and the load applied near the top, as in Fig. 4. The load, P, is the combined load due to the pull of the wires plus the wind pressure on the pole. The pull of the wires is calculated by the methods given in the first part of this paper. The wind pressure is in reality distributed along the whole length of the pole, but it is more convenient to consider it as a single equivalent load applied at the top. In estimating this equivalent load one-half the total wind load can be considered as applied at the top. This gives the same results as the application of the total pressure at the middle of the pole. It is well to remember, however, that the wind velocity is comparatively small at ground level and increases with the height.

We must first compute the required diameter for a given value of P. This is determined from the formula:

$$d = \sqrt{\frac{P}{0.662 \times T \times t}} \quad \ldots\ldots \ (12)$$

where d = diam. in inches where load is applied.

P = pull in pounds.

T = allowable tension in the wood in pounds per square inch and is given in the following table.

t = natural taper of pole. (See following table.)

The weakest point in the pole, or the place where the pole will break if failure occurs is at the section, A, distant x from where the load is applied.

$$x = \frac{d}{2t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (13)$$

The diameter of the pole at this point $\left(d_w\right)$

is: $d_w = 1.5\,d \quad \ldots\ldots\ldots\ldots\ldots\ldots (14)$

Constants for Poles

Kind of wood.	Natural taper, t	T	E
White cedar..	0.0165	670	700,000
Spruce	0.016	720	1,200,000
Chestnut	0.016	1,200	900,000

The deflection of the pole or the amount of which the pole is bent from the vertical at the point where the load is applied is:

$$u = \frac{6.78\,P\,h^3}{E\,D^4} \text{ in.} \quad \ldots\ldots\ldots\ldots (15)$$

when the pole is a round pole of uniform section. When the pole is tapered,

where D = diam. of pole.

d_g = diam. at ground surface.

d = diam. where load is applied.

E = modulus of elasticity. (See table.)

Rigid Steel Tower.—When the supporting structure is a four-legged steel tower of the type shown in Fig. 5, with load applied at the top, the deflection can be shown to be approximately:

$$u = \frac{Ph^3}{Ab^2E}\left(1 - \frac{\pi}{b}\sqrt{\frac{I}{A}}\right) \quad \ldots (17)$$

b = spread at the base in inches.

E = modulus of elasticity.

= 29,000,000 for structural steel.

A = cross-sectional area of one of the corner legs.

I = moment of inertia of section of one of these legs. (Found from handbooks published by steel companies.)

As an example let us calculate the deflection from the vertical of a steel tower of the above type, whose corner legs are 4 inch by 4 inch by ¼ inch angle iron, h = 65 ft., P = 12,000 lbs., b = 16 ft.

We have:

P = 12,000 pounds

b = 16 x 12 = 192 inches

h = 65 x 12 = 780 inches

A = 1.94 (from Carnegie handbook)

I = 3.0 (from Carnegie handbook)

Therefore:

$$u = \frac{12{,}000 \times 780^3}{29{,}000{,}000 \times 1.94 \times 192^2} \times \left(1 - \frac{\pi}{192}\sqrt{\frac{3.0}{1.94}}\right) = 2.2 \text{ inches.}$$

Guyed Masts—It is often more economical to erect a thin pole and brace it with guy wires than to attempt to use a single heavy pole as discussed in this article. In fact this is a very usual construction.

It is important in this case to properly locate the guys on the mast and determine the size of the guy wires since these carry practically the entire load. The size of the pole itself is also of importance. The strength of a given structure, including the size of the pole and the size and dispensation of the guys can be accurately calculated. It is, however, beyond the scope of this paper to cover this matter in detail and we shall confine ourselves here to the determination of the size of the main guys on a mast. These are calculated as follows:

It is a safe plan to figure a single guy directly behind the load as able to sustain the total load. See Fig. 6. The tension in pounds in the guy wire is then:

$$\text{Tension} = \frac{P}{\sin \Theta} = \frac{P \times OC}{CD} \quad \ldots\ldots (18)$$

The pull, P, is taken as the pull of the antenna wires plus half the total wind pressure on the pole. The wind pressure, P, in pounds per square foot on a flat surface normal to the direction of the wind for any given velocity, V, in miles per hour is given by the formula:

$$P = 0.004\, V^2 \quad \ldots\ldots\ldots\ldots\ (19)$$

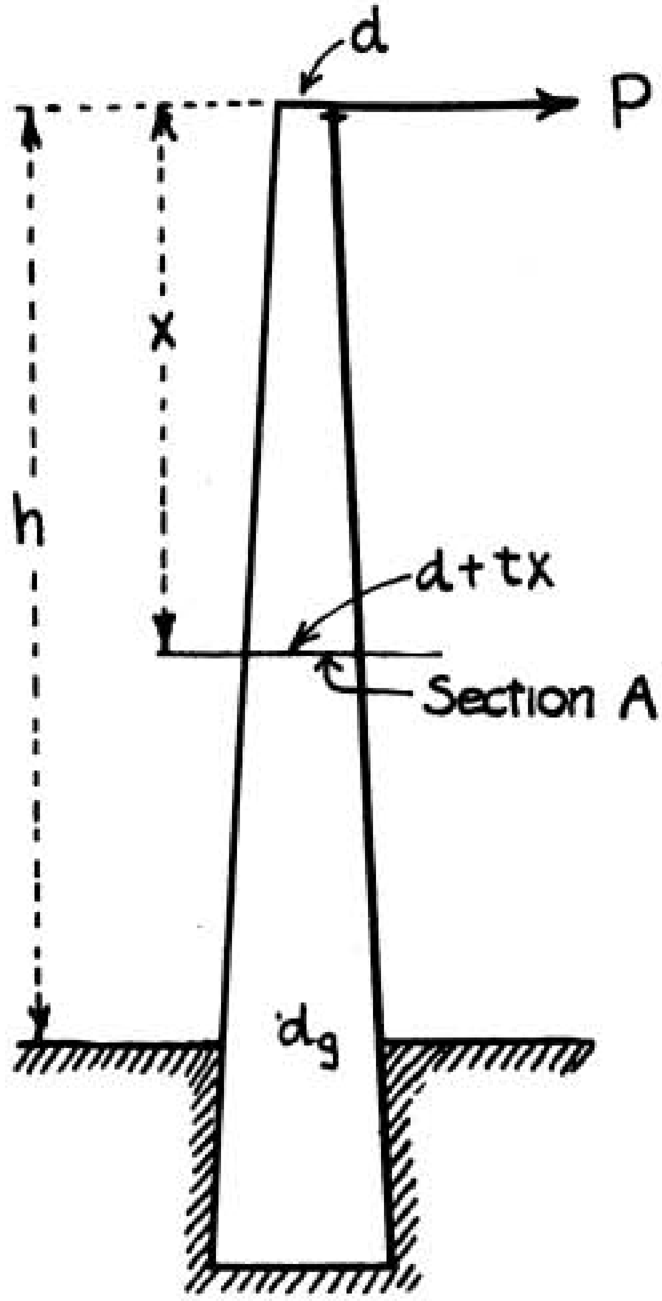


FIG. 4.

When the pole is round the formula is:

$$P = 0.0024\, V^2 \quad \ldots\ldots\ldots\ldots\ (20)$$

If it is necessary to place a second system of guys below the main guys, as in Fig. 7, a rough indication of the size of wire required can be had by assuming a guy placed in the center of the mast (Fig. 7) to sustain the total normal wind pressure, P', on the pole. On this assumption the tension in the wire is:

$$= \frac{P' \times BC}{CD} \text{ .... (21)}$$

a 60 foot round pole 3 inches in , guyed as in Fig. 7 against an wind, BD = 30 feet, CD = 40 = 50 feet, would require the ys to withstand a pull of

$$= \frac{60 \times 1/4 \times 0.0024 \times 6400 \times 50}{40}$$

$$= 288 \text{ pounds}$$

ning the wire factor of safety 10 should be used.

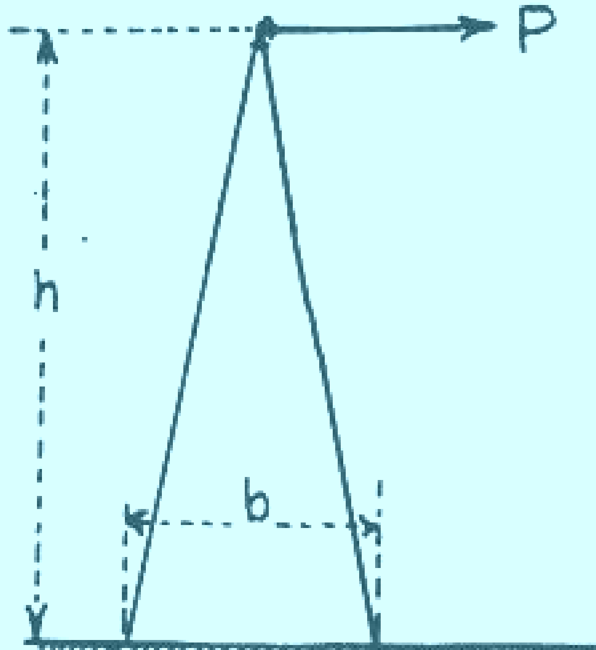
rs—It is sometimes the custom the guy wires to anchors sunk round. The anchor may take everal forms. Concrete may be l in figuring the volume of con- uired to resist the lifting force uy the weight of concrete may at 140 pounds per cubic foot; chor may be of the type shown . In this case the anchor tends cone of earth of height h foot r base 2r foot as shown in the For ordinary earth the weight cone at 100 pounds per cubic

$$100\ (r^2 + 0.11h^2 + 0.58\ rh) \text{ .... (22)}$$

cal Considerations—We have in the foregoing, some of the portant mechanical features of construction. The size of the been determined in respect to th, and the mechanical stresses in the supports by the pull of is known. Now the number of be used is fixed by the value na capacity required. The ca- so depends on the spacing of the d upon their diameter. Apart effect of the size of the wires electrical capacity with respect the size of the wire is directly d with a loss of power from the due to the formation of corona discharge.

a wire is charged to a high po- f the order of a hundred thou- ts there is a leak of energy into unding air, and if the potential a certain critical value this leak panied by a visible halo-like glow surface of the conductors to e name "corona" has been given.

The loss due to this leakage of current from the conductor into the surrounding air is practically negligible for voltages below the "disruptive critical value;" no account need be taken of such leakage when the voltage is below 40,000. At 80,000 volts, however, the loss may be considerable, and a visible corona may even be formed toward the



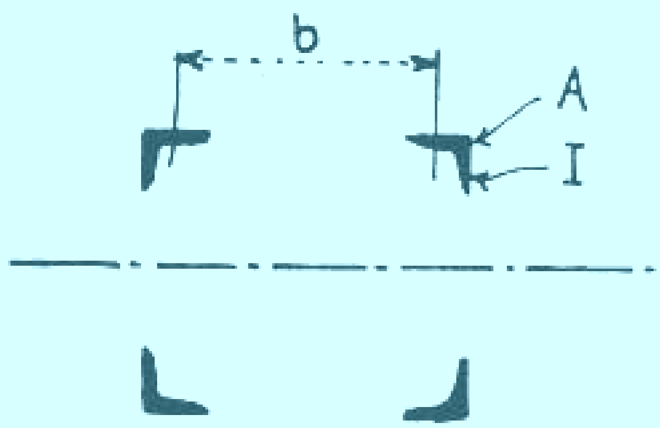


FIG. 5.

upper end of the antenna if the wires are of small diameter.

F. W. Peek* has given a formula for the disruptive critical voltage V_o which for ordinary engineering purposes can be simplified to the following:

$$V_o = 74{,}000\ d \log_{10} \frac{4\,h}{d} \text{ .... (23)}$$

where d = diameter of wire in inches.
h = height above ground in inches

This is the potential at which leakage

* F. W. Peek, Proc. A. I. E. E., June, 1912.

Tension

Thus diamete 80-mile feet, B lower g

$$\frac{P' \times BC}{CD}$$

In desi of abou

Anch to attac in the one of used, ar crete re of the be take or the a in Fig. to lift and low figure. of this foot is: W = π

Elect outlined most in antenna wire ha its stren produce one wir wires t of ante pacity a wires a from th on thei to earth connect antenna or brus

When tential sand vo the surr exceeds is accon on the which t begins and the loss depends on the amount by which the actual voltage of the antenna exceeds this value.

The potential at which corona first becomes visible is always higher than this.

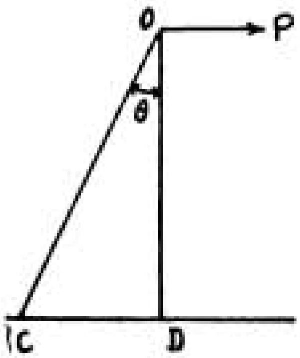


FIG. 6.

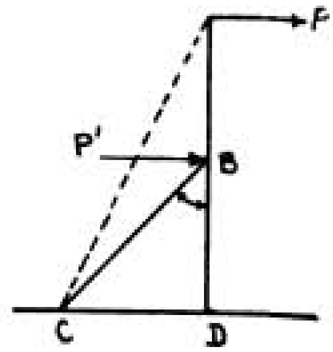


FIG. 7.

Mr. Peek's formula for the critical visual voltage can be expressed with sufficient accuracy for ordinary purposes as follows:

$$V_1 = 71{,}500\, d \left(1 + \frac{0.267}{\sqrt{d}}\right) \log_{10} \frac{4h}{d} \quad \ldots (24)$$

The appearance of corona is an indication that there is a loss of power into the air. Mr. Peek has given a formula for the loss of power per unit length of a single wire, all points of which are at the same potential, as in the case of a high-tension transmission line, which is of the form:

$$P = K\,(V' - V'_o) \quad \ldots\ldots\ldots (25)$$

Where V' is the effective value of potential on the wire (to neutral), V'_o is the effective disruptive critical value of potential (to neutral) and K is a constant for any given set of conditions, depending among other things on the frequency, the diameter of the wire and in this case on the height above ground.

Now in a freely resonating wireless antenna there is a standing wave of potential produced with a maximum at the upper free end of the aerial and zero potential at the earthed end. From the free end to the earth the potential gradually decreases approximately according to a sine law, the variation usually being represented by a figure like Fig. 9, the dotted curve showing the distribution of potential with a maximum (V) at the extreme end and zero at earth. Hence, the whole antenna is not at the same potential and therefore the power formula (25) must be modified to properly take into account the variation of the quantity $(V - V_o)$.

The disruptive critical voltage may be represented by the dashed line of Fig. 9. The power loss only extends throughout the length $(l - x)$ where l is the overall length of the antenna and x is the distance from the earth to the point where the potential is $v = V_o$. "x" is calculated from the following formula, which assumes a sinusoidal variation of voltage along the antenna.

$$x = \frac{2l}{\pi} \sin^{-1} \frac{2V_o}{V} \quad \ldots\ldots (26)$$

V_o being calculated from (23) and V being the maximum value of potential found at the open end of the system.

The writer has developed the following approximate formula for the power loss from an antenna for the case of damped oscillating currents and a sinusoidal distribution of potential based on the formula given by Mr. Peek.

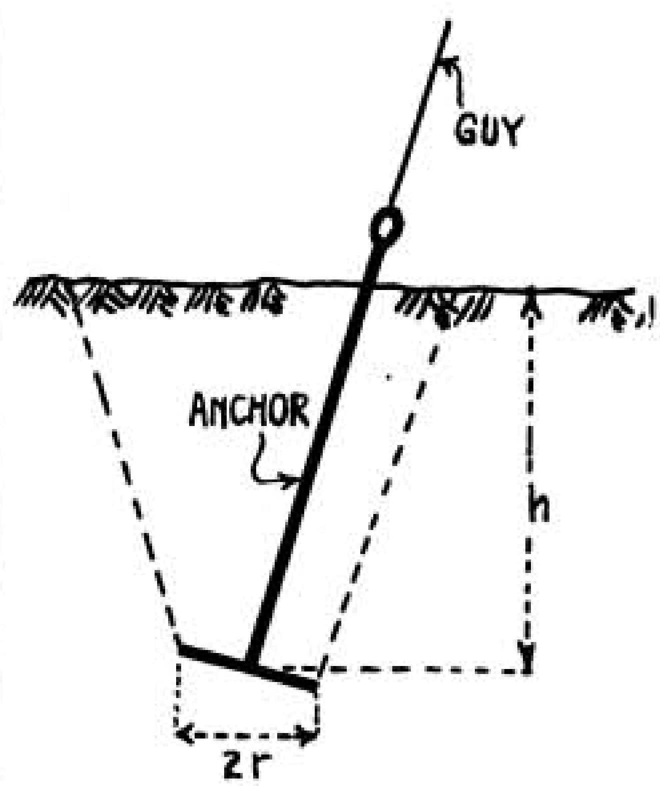


FIG. 8

$$P = \frac{265}{10^{13}} \frac{N}{8} \sqrt{\frac{d}{h}} \left(\frac{V}{2} - V_o\right)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (27)$$

where P = power loss in watts from one wire per ft. length of

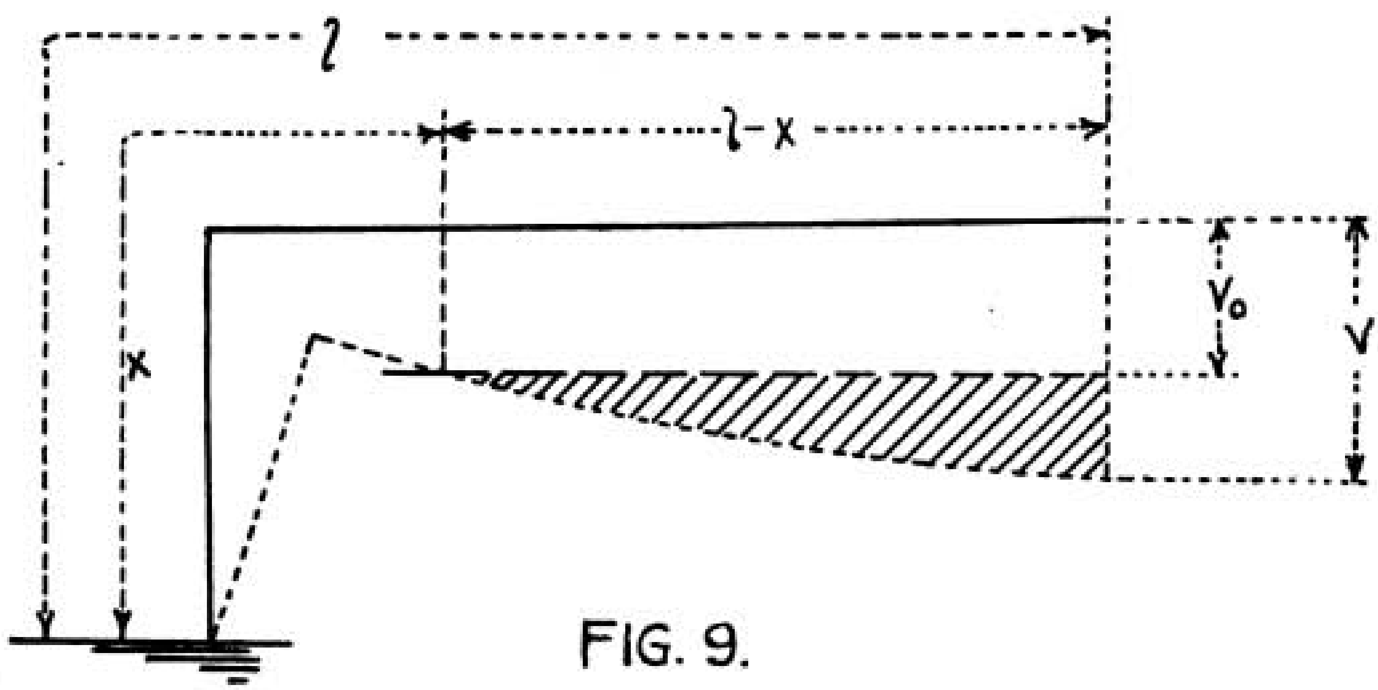


FIG. 9.

the portion whose potential is above the value V_0.

N = spark frequency of transmitter.

δ = decrement per semi-period.

h = height of horizontal part of antenna, in inches.

d = diam. of wire in inches.

V = max. volt. on aerial.

V_0 = disruptive critical volt. (formula 23).

The maximum voltage (V) is determined by the effective capacity of the aerial, the current produced therein, the decrement, the wave-length and the spark frequency.

$$V = \frac{26I}{C}\sqrt{\frac{\lambda\delta}{N}} \text{ approx. } \ldots\ldots \quad (28)$$

where I = current at base on aerial.

C = capacity of antenna in microfarads.

λ = wave-length in meters.

δ = decrement per half-period.

N = spark frequency.

Suppose we have an antenna 80 feet high and 100 feet long, 4 No. 14 wires, having a capacity of 0.001 microfarads, the current at the base being twelve amperes and let N = 1000, δ = 0.08, and λ = 600 m. Then, by (28)

$$V = \frac{26 \times 12}{.001}\sqrt{\frac{600 \times 0.08}{1000}}$$

$$= 68{,}500 \text{ volts.}$$

by (23)

$$V_0 = 74{,}000 \times 0.064 \log \frac{4 \times 960}{0.064}$$

$$= 22{,}650 \text{ volts.}$$

by (27), the power loss per foot of each wire is:

$$P = \frac{265 \times 1000}{10^{13} \times .08}\sqrt{\frac{0.064}{960}} \times$$

$$(34{,}250 - 22{,}650)^2$$

$$= 0.364 \text{ watts per foot.}$$

by (26) the distance "X" to the point where the potential is V_0 is:

$$x = \frac{2l}{\pi} \text{Sin}^{-1} \frac{22{,}650}{34{,}250}$$

$$= \frac{2 \times 180}{\pi} \times \frac{\pi}{4.35} = 83 \text{ feet.}$$

Therefore, the length (l — x) from which loss occurs is:

(180 — 83) = 97 feet.

The loss per foot of one wire is...... 0.364 watts.

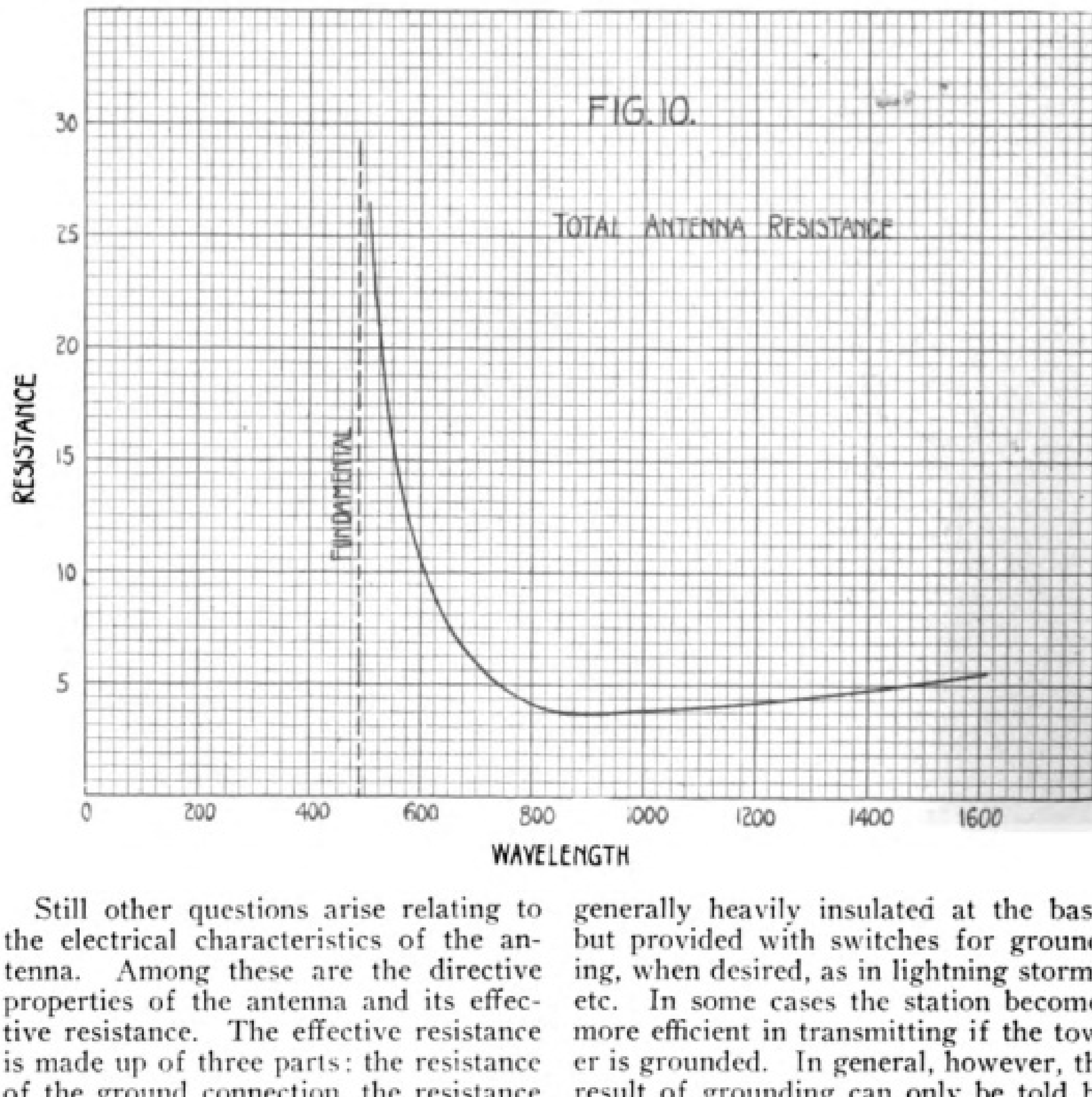
The total loss for 4 wires is .... 4 × 97 × 0.364 = 141 watts.

If the same current were produced in an antenna of the same linear dimensions, damping and wave-length as that referred to, but of one-half the capacity, the loss would be approximately 3 k.w. Now it requires something of the order of 2 or 3 k.w. to produce an aerial current of twelve amperes, so that in this case practically the whole power goes into corona loss in the air.

If the diameter of the wires were less, say, 0.05 of an inch, the loss would be approximately 400 watts.

Thus, we see that the capacity of the antenna, which depends particularly upon the number and spacing of the wires for a given wave-length, decrement and spark frequency, as well as the diameter of the wires, is a very important factor. The antenna must be proportioned so that the potentials produced on it under a given set of conditions do not give rise to excessive loss of power through corona.

portant as it might seem to be, as it has been shown both by theory and experiment that in general the radiation resistance is many times the resistance of the wires themselves. A typical curve of total antenna resistance is shown in Fig. 10, where it is seen that the resistance is greatest near the fundamental wave-length of the antenna and is smallest at a wave-length about one and a half or two times the fundamental. It is at or near this point that many stations work most efficiently.



Still other questions arise relating to the electrical characteristics of the antenna. Among these are the directive properties of the antenna and its effective resistance. The effective resistance is made up of three parts: the resistance of the ground connection, the resistance of the antenna conductors and the radiation resistance due to the production of radiant energy. Both the antenna resistance and the radiation resistance change with the wave-length. A very low resistance in the antenna wires is not as im-

When steel towers are used, they are generally heavily insulated at the base, but provided with switches for grounding, when desired, as in lightning storms, etc. In some cases the station becomes more efficient in transmitting if the tower is grounded. In general, however, the result of grounding can only be told by tests at the receiving station on the loudness of the signals, and not by the reading of the hot-wire ammeter in the antenna of the transmitter.

The disposition of the lead-in wires is also of importance. Contrary to the frequently observed method of keeping the lead-in wires separated up to the point where they enter the station, it is a better plan to bunch these closely together near where they join the flat-top part of the aerial. This reduces the capacity of the lead-in and confines most of the capacity to the elevated flat-top where the potential is highest. It also gives the lead-in a higher inductance which is a desirable aid in tuning, the tuning being sharper when the inductance is increased.

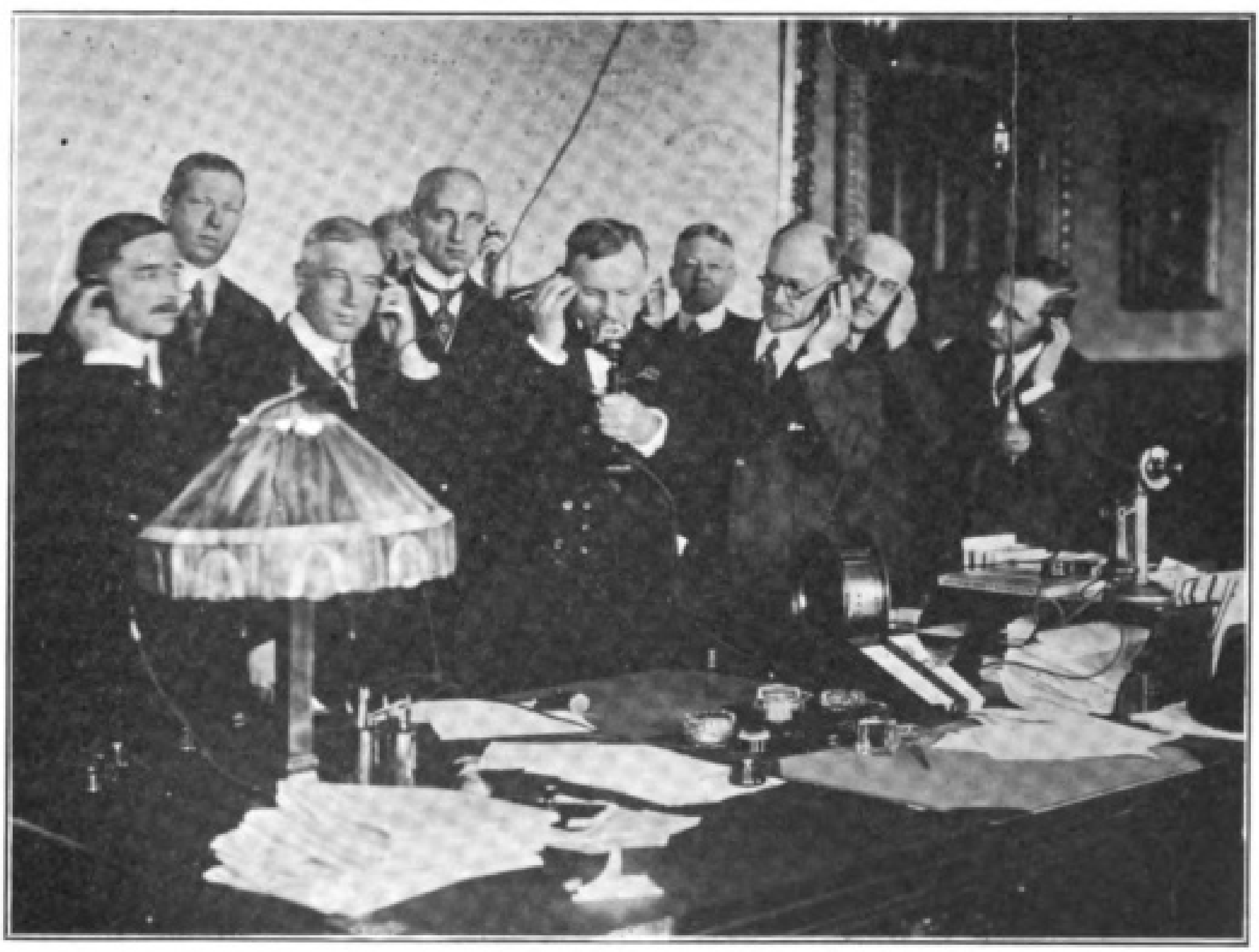
In conclusion, consideration of the points here discussed and their proper embodiment into the calculations and construction of the antenna according to the methods presented, will enable the experimenter to erect his radiating structure so that it will resist the loads imposed by severe storm conditions and will at the same time efficiently satisfy the various electrical requirements of a good antenna.

RAILROAD WIRELESS IN CANADA

It has been announced in a newspaper that wireless telegraph will be used instead of the old poles and wire by the new Canadian government railway which is to connect Hudson Bay with the Canadian Northern at Le Pas, Manitoba. The chain of wireless stations has already been constructed between Port Nelson and Hudson Straits.

The Philadelphia To-day and Tomorrow Civic Exposition was opened May 15 by a wireless message from President Wilson to George W. Norris, president of the board of managers.

The Naval Wireless Telephone Test



The wireless experts and Secretary of the Navy Daniels in Washington holding wireless telephone conversation with the battleship New Hampshire at sea off the Virginia Capes, and with the station at San Diego, Cal.

VESSELS RECENTLY EQUIPPED WITH MARCONI APPARATUS

Names	Owners	Call Letters
Aloha (S. Y.)	Commodore A. C. James	KYH
Hiram B. Everest	Vacuum Oil Co.	KRS
Brammell Point	Vacuum Oil Co.	KRO
Bayamon	Vacuum Oil Co.	KDX
Rawson	Oriental Navigation Co.	LML
Buyo Maru	Standard Oil Co. of New York	JBY
Venezuela	Pacific Mail Steamship Co.	WBG
Columbia	Pacific Mail Steamship Co.	WBH
Ecuador	Pacific Mail Steamship Co.	WBN
Nevadan	Garland Steamship Corporation	WKZ
Westoil	Standard Oil Co. of New Jersey	KJT
Hazel Dollar	Robert Dollar S. S. Co.	VEE
Mooremack	Moore & McCormack Co.	WCL
Gettyburg	Moore & McCormack Co.	Not assigned
Josephine (S. Y.)	Joseph Widener	KZU
Aztec (S. Y.)	A. C. Burrage	KZC
Tintoretto	Lamport & Holt	ZNM

THE SHARE MARKET

New York, June 6.

During the past month the shares of the Marconi companies were inactive with slight gains in the English stock and fractional declines in the Canadian quotations, the market closing stronger in the American shares. In the Dominion, the buying movement that lifted the bid price above 2 has apparently subsided. On the New York Curb, notwithstanding the expression by some of disappointment at the non-payment of a dividend, it was generally considered that under the conditions imposed by the world-war, such conservatism is to be commended and dealers say that they expect more activity and a rise in price.

Bid and asked quotations to-day: American, 3-3⅜; Canadian, 1¾-2⅛; English, common, 10-12; English, preferred, 9-11.

MARCONI MEETING POSTPONED

Owing to the lack of a quorum, the meeting of the Marconi Wireless Telegraph Company of America, scheduled for twelve o'clock, noon, on May 17, was postponed sine die. There was little business to be transacted except the election of directors to take the places of those whose terms expire; under the law these hold over till the next annual meeting.

SPANISH RADIO TELEPHONE

A company has been organized in Spain, according to newspaper report, for operating wireless telephone systems in Spanish cities, also to connect with Spanish vessels at sea and with the Spanish possessions in Africa. It is proposed to erect wireless stations at Cordoba, Seville, Cadiz, Huelva and twenty-nine other places.

The government of Holland is said to be planning to establish direct wireless communication between the home country and the Dutch East Indies, to supplement the present cable.

The government of Portugal is reported to have planned an extensive system of wireless telegraph stations to link Lisbon with its colonies and other European capitals.

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.

W. J. K., Allentown, Pa., inquires:

Ques.—(1) Please state how the wave-length of an aerial is determined.

Ans.—(1) It can be actually measured by means of a wave-meter after the method described in the book, "How to Conduct a Radio Club"; the matter is also fully explained in the book, "How to Pass the U. S. Government Wireless License Examinations." We may compute the capacity and inductance of an aerial from its dimensions by means of the formula developed by Cohen which appeared in the London Electrician, February 21, 1913. In the book, "How to Conduct a Radio Club," the natural wave-length of four wire aerials, up to 150 feet in length, is tabulated.

Ques.—(2) How is the upper range of wave-length adjustments of a receiving tuner calculated?

Ans.—(2) We must first determine the inductance of the primary and secondary windings. If the inductance and capacity of the aerial are known or measured by the method described in the book, "How to Conduct a Radio Club," we may then add the inductance of the primary winding to that of the aerial itself and afterwards multiply this value by the capacity of the aerial in microfarads. We then extract the square root of the resultant product and multiply it by sixty to determine the wave-length adjustment of the antenna circuit. This method is not strictly accurate, as has recently been shown by a famous physicist. The subject is more fully explained in "The Wireless Telegraphists' Pocketbook of Notes, Formulæ and Calculations," by J. A. Fleming. A simple method for computing the inductance of the coils of a receiving tuner is given in the second edition of the book, "How to Conduct a Radio Club." In order to determine the upper adjustment of the secondary circuit, we must know the capacity of the condenser, shunted across the terminals. If the inductance is expressed in centimeters (L) and the capacity in microfarads (C) then the wave-length $\lambda = 59.6 \sqrt{L C}$.

* * *

P. E. G., Franklinton, La.:

Ques.—(1) I have a receiving tuner which, when connected to a crystalline detector, responds to stations using long and short wave-lengths, but when connected to a vacuum valve detector gives faint signals on the longer wave-lengths and strong signals on the shorter wave-lengths. What is the trouble?

Ans.—(1) This question has been answered in detail in previous issues of The Wireless Age. Amateur receiving tuners usually have an insufficient value of inductance for a given wave-length when used with the vacuum valve. For the vacuum valve detector the condenser in shunt to the secondary winding should have a capacitance not in excess of .0002 to .0005 microfarad. If a capacity in excess of this value is employed, the grid potential of the valve is lowered, resulting in a decrease in the strength of signals. Note the article appearing in the May issue of The Wireless Age, in which several tuners designed for a definite range of wave-lengths and a minimum value of capacity in shunt to the secondary winding are described.

Ques.—(2) Are bottles filled with water on the inside and a layer of tinfoil on the outside efficient as condensers for a transmitting set?

Ans.—(2) Yes, provided the inner and outer surface of the glass are kept free from moisture. Cover the water with kerosene to prevent evaporation and also wipe the outer surface of the jar from time to time with a dry cloth.

Ques.—(3) Will it be necessary for me to construct a special inductively coupled receiving tuner to obtain response from stations using wave-lengths between 8,000 and 10,000 meters, or can I use my present receiving apparatus, with loading coils connected in series with the primary and secondary windings, to raise the wave-length to this value?

Ans.—(3) It is probable that your present tuner has insufficient values of self inductance or mutual inductance for the best response at long wave-lengths. You are advised to construct a receiving apparatus like that described in the book, "How to Conduct a Radio Club," which was specifically designed for use with the vacuum valve detector. This circuit responds to damped and undamped oscillations and works with particular efficiency on the longer wave-lengths. The equipment is slighty complicated, but after a few trial experiments the adjustments for best operation become self-evident.

Ques.—(4) Where can I secure a diagram of connections for amplifying the signals from a galena detector by means of a vacuum valve?

Ans.—(4) See the book, "How to Conduct a Radio Club."

* * *

C. L. Pittsfield, Mass., inquires:

Ques.—(1) Please calculate the fundamental wave-length of an aerial 145 feet in length, 45 feet in height, composed of three strands of No. 14 wire spaced 2½ feet apart.

Ans.—(1) The fundamental wave-length is approximately 335 meters.

Ques.—(2) Can you approximate my receiving range with the aerial referred to connected to an inductively-coupled receiving tuner with a primary 4 inches by 6 inches, and a secondary 3½ inches by 5 inches? I also have a small condenser and a crystaloi detector. The receiving telephones have a resistance of 2,000 ohms; the ground connection is made to the water pipe.

Ans.—(2) With this apparatus you should hear stations on the Atlantic coast from Maine to Florida; also ships at sea. If the primary winding is wound with No. 24 wire and the secondary with No. 32 S. S. C. wire the equipment will respond to a wave-length of 3,000 meters.

Ques.—(3) Where can Marconi used apparatus be purchased?

Ans.—(3) From the Marconi Wireless Telegraph Company of America, No. 233 Broadway, New York City. Excellent bargains in first-class apparatus are available.

Ques.—(4) Does the Marconi station at Cape Cod, Mass., use a continuous wave set?

Ans.—(4) No: discontinuous waves are employed, the oscillations being generated by the discharge of condenser across the spark gap.

* * *

K. M. D., No. Monmouth, Me., inquires:

Ques.—(1) I have been told that stranded electric light cord is the best wire for connecting up the various parts of a wireless receiving set. Is this true?

Ans.—(1) Stranded wire possesses a slightly lower value of high frequency resistance than a solid conductor, but it is not necessary to use wire of this diameter for the purpose. No. 18 or 20 annunciator wire or double silk covered wire will be satisfactory.

Ques.—(2) I have a two-wire aerial, 100 feet in length, the wires being spaced 8 feet apart. It is 65 feet in height at one end and 32 feet at the other. Could I obtain better results by adding two more wires and spacing them 4 feet apart?

Ans.—(2) A slight increase in the sending distance can be obtained by adding two more wires, but for receiving only, the aerial may remain as it is.

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

Ans.—(3) Approximately 260 meters.

Ques.—(4) How far should I be able to receive with a double slide tuning coil adjustable to 700 meters, a loading coil having a value of 4,800 meters, Blitzen forty-five-plate rotary variable condenser, a fixed condenser, a crystaloi detector, buzzer, 2,000 ohm head set, etc.? My receiving apparatus also includes a Tierney test circuit resonator for adjusting the detector.

Ans.—(4) We cannot see how the loading coil, supposed to raise the wave-length to 4,800 meters, could be of any value unless a similar loading coil were connected in series with the secondary circuit, that is in series with one of the leads to the receiving detector. Unless this is done the circuits will be hopelessly out of resonance and inefficient. It is rather difficult to estimate the range, but you should hear stations, ship and shore, all along the Atlantic coast at night.

Ques.—(5) Is the enclosed diagram of connections correct for the apparatus referred to?

Ans.—(5) Yes.

* * *

A. C. F., Allentown, Pa., inquires:

Ques.—(1) Is an amateur violating the oath of secrecy of the United States regulations if he in any manner publishes the weather report or the Government press news?

Ans.—(1) We understand that the matter contained in these reports is intended for universal use.

Ques.—(2) What causes wireless signals to fade out entirely and come in strong again a little later?

Ans.—(2) This effect usually takes place when the receiving station is out of the daylight zone of the transmitting station. It has been attributed to various causes, but the problem has not been fully solved. It is often accounted for by the reflection and refraction of the wireless telegraph waves, due to the conducting surface which the rarified air presents at a space of several miles from the surface of the earth. It is undoubtedly due to causes external to either the transmitting or the receivng station. The matter has been discussed at considerable length in the Proceedings of the Institute of Radio Engineers. It has also been taken up in the more important text books on wireless telegraphy.

Ques.—(3) What is the fundamental wave-length of a two-wire aerial, 125 feet in length, 50 feet in height at one end and 20 feet at the other? The lead-in is taken from the upper end.

Ans.—(3) Approximately 300 meters.

Ques.—(4) What stations correspond to the call letters: JPR and WFD?

Ans.—(4) The letters WFD are for the steamship Iowa, of the Goodrich Transportation Company, plying on the Great Lakes. Our records include no assignment for the letters JPR.

* * *

R. J. H., Chicago, Ill., inquires:

Ques.—(1) Are the dimensions for the coils of the best receiver described on page 82 of the book, "How to Conduct a Radio Club," correct?

Ans.—(1) The dimensions given are correct and were designed for a circuit having a high value of inductance and a very low value of capacity. The circuits were actually tested, tried over a number of months and found efficient.

* * *

W. C. K., Melrose Highland, Mass., inquires:

Ques.—(1) What is the wave-length of a single wire aerial 132 feet in length, about 32 feet in height, with a 20 foot lead-in?

Ans.—(1) Approximately 205 meters.

Ques.—(2) What would be the wave-length of this aerial if there were two wires spaced 6 feet apart instead of one?

Ans.—(2) The wave-length is slightly increased. The value would probably lie in the neighborhood of 225 or 230 meters.

Ques.—(3) With the aerial referred to, would it be possible to receive signals from Darien, Isthmus of Panama, Tuckerton and Sayville, provided I used a vacuum valve with the proper tuning devices?

Ans.—(3) If you use apparatus like that described in the book, "How to Conduct a Radio Club," you will be able to hear the signals from Sayville and Tuckerton during the daylight hours, and Darien at night.

Ans.—(4) It is very difficult to estimate the night range of a given commercial station. This can only be determined by test and varies from night to night. Usually any of the shore stations of the Marconi Company, operating at a wave-length of 600 meters, have a night range of about 1,500 miles, and sometimes it is considerably in excess of that distance. There is no hard and fast rule to follow, as the long distance effect is governed by conditions external to the transmitting station.

Ques.—(5) What is the wave-length of a two-wire aerial, 40 feet in length, 30 feet in height, with the wires spaced 4 feet apart? The lead-in is 15 feet in length. What would be the range of this aerial with a ½-inch spark coil and a 2-inch spark coil?

Ans.—(5) The fundamental wave-length is about 125 meters and, with a ½-inch spark coil, you would have a range of from two to five miles. The 2-inch spark coil would cover from three to ten miles, the distance depending upon the receiving apparatus used at the receiving station.

* * *

L. B., Albion, Mich., inquires:

Ques.—(1) Please tell me if there has been an instrument invented for detecting and locating submarines in the water.

Ans.—(1) This is not accomplished by wireless; the presence of submarines is detected by means of a microphone placed in the water. By a series of experiments the pitch of certain types of propellers has been observed, also the probable range of sound produced by them; hence, to some extent, the nearness of the submarine to the microphone can be determined by the strength of signals received. Vacuum valve amplifiers are used to amplify the variations of current produced by the microphone.

* * *

F. S. McT., Mercer, Pa., inquires:

Ques.—(1) Should not the rheostat connected in series with the filaments of the vacuum valve be ten ohm resistance, and is not the statement that it is 100 ohms, incorrect?

Ans.—(1) The statement is probably a typographical error. It is the usual practice to employ a rheostat in series with a filament of ten ohms resistance.

Ques.—(2) I have seen the statement that from fifty to 100 cells are required in the local circuit of a vacuum valve; however, the makers of the vacuum valve detector recommend about thirty cells. How can you explain the discrepancy?

Ans.—(2) Certain types of vacuum valves have appeared on the market in which it was essential to have from fifty to 100 cells in order to secure the best results. Valves have been constructed by the General Electric Company which require from 600 to 700 volts in the local circuit.

Ques.—(3) In the book, "How to Conduct a Radio Club," the statement is made that the beat receiver described on page 82 is of the correct dimensions for use with an aerial having an actual period of about 450 meters. If the natural wave-length of the aerial is doubled, to what extent can the size of the condensers of the various coils be reduced?

Ans.—(3) A reduction in the size of the aerial will have no effect on the constants of the local detector circuit, but the dimensions of the loading coil can be reduced by a little less than one-half. The actual reduction, however, is best obtained by experiment, as the natural wave-lengths of aerials vary considerably, depending upon the nature of the structures surrounding them.

Ques.—(4) Could not the loading coils of the beat receiver described in that publication be included in the primary and secondary windings as a continuation of it?

Ans.—(4) Yes; but the receiving couplers would prove to be rather bulky and awkward in appearance.

* * *

S. E. D., Takoma Park, D. C., inquires:

Ques.—(1) Referring to the heterodyne receiving apparatus described in the February number of the Monthly Service Bulletin of the National Amateur Wireless Association, what apparatus is needed and how should it be connected in order that a crystalline detector may be substituted for vacuum valve No. 1?

Ans.—(1) The crystal detector can be connected to the circuits in the regular manner, eliminating the high potential battery and the filament battery for the vacuum valve. Perhaps better results would be obtained, however, if the size of the loading coil connected in series with the secondary winding is reduced and a larger value of capacity employed at the secondary condenser.

Ques.—(2) Are the coils L-10 and L-11 and L-12 essential?

Ans.—(2) Yes.

Ques.—(3) Can a telephone transmitter be used instead of the telegraph key to transmit beats?

Ans.—(3) Yes; it may be connected in series with the earth lead.

Ques.—(4) What is the best resistance for a pair of wireless head phones?

Ans.—(4) The value varies with the type of detector. With a crystalline detector, the resistance should lie between 2,000 and 3,000 ohms. With a vacuum valve detector, the resistance may vary from seventy-five to 2,000 ohms. The Marconi magnetic detector employs a seventy-five-ohm receiver.

Ques.—(5) Is the diagram enclosed satisfactory for the reception of damped or undamped waves?

Ans.—(5) Yes, provided the primary and secondary windings have sufficient values of inductance for the longer range of wavelengths. The circuit you have indicated is known as the oscillating vacuum valve, wherein the wing circuit is electrostatically coupled to the grid circuit. Careful adjustment of all the condensers, A, B, C and D, will cause the vacuum valve to oscillate and by the production of beats in that circuit the signals will be amplified.

* * *

F. R. P., Somerville, Mass., inquires:

Ques.—(1) I wish to ring a bell a quarter of a mile away by means of wireless signals. Is the enclosed hook-up correct, and is the B battery essential?

Ans.—(1) The enclosed diagram of connections is quite correct and the B battery must be employed. You may receive better signals by connecting a coil of inductance in series with the receiving aerial in order that the aerial system and the coherer connected in series may be in resonance with the transmitter.

Ques.—(2) I have a ¼-inch spark coil, which gives a spark discharge of large volume and has transmitted to a distance of eight miles. How many condenser plates, 4 inches by 5 inches, coated on both sides with tinfoil, are required for best results and how large a margin should there be between the edge of the foil and the edge of the glass?

Ans.—(2) Usually about 2 plates of this condenser, connected in parallel, each plate being coated on both sides with foil, 3 inches by 4 inches, will suffice.

Ques.—(3) Please give a simple formula for finding the wave-length of an inductively coupled receiving tuner.

Ans.—(3) This subject is described in detail in the second edition of the book, "How to Conduct a Radio Club." We must first calculate the inductance of the secondary winding and then know the value of capacity to be placed in shunt. We then multiply the inductance by the capacity, extract the square root and multiply the result by sixty. This gives the wave-length of the closed circuit. We next calculate the inductance of the primary winding, also of the aerial, together with its capacity. We add all the inductance values together and multiply them by the capacity of the aerial and extract the square root of the result. After this has been done, we multiply the result by 60, and obtain the upper range wave-length adjustment of the antenna circuit.

An answer to your query concerning the number of turns of wire for a given coil can be found in the second edition of the book, "How to Conduct a Radio Club."

The information requested in your fifth query is contained in the first and second editions of "How to Conduct a Radio Club," the construction of a variometer being described in detail.

* * *

R. S. M., Hartford, Conn., inquires:

Ques.—(1) What is the upper limit of wave-length to which an aerial having a natural period of 350 meters can be raised? Also what is the lower limit of wave-length?

Ans.—(1) Theoretically there is no upper limit to the wave-length to which an aerial system can be raised by means of a series inductance, but from a practical standpoint it is not feasible for receiving work to go above 10,000 meters. Better results on the longer waves will be obtained with an aerial of increased dimensions. It is not possible to reduce the wave-length to quite one half the natural period of the antenna system. For example: Your antenna with a period of 350 meters can be decreased to a value of about 200 meters by the use of very small values of capacity of a series condenser. Viewing the problem from the opposite standpoint: By the insertion of loading coils in the antenna circuit, the impedance of the circuit is considerably increased and when the total effective resistance, R, becomes greater than twice the square root of the inductance divided by the capacity, the circuit becomes non-oscillatory. In connection with the transmitting apparatus it is not desirable to raise the fundamental wave-length of the antenna to a value above four because it usually results in excessive potentials on the antenna wires and a loss of energy due to the impedance of the coils. It has been found by experiment that in the usual case the best wave-length for a given aerial to be operated upon for transmitting purposes is twice the fundamental or natural wave-length.

Ques.—(2) What is the correct value of capacity for the variable condenser to be used in series with the antenna circuit? I have found a condenser of .0008 microfarad to be almost useless, while one of .004 microfarad worked very well indeed even with only .008 microfarad in use. The same condenser was used in both cases, the extra capacity being obtained by filling the condenser unit with castor oil.

Ans.—(2) The series condenser will have but little effect upon the antenna system unless its value of capacity is somewhere near that of the antenna system. When two condensers of unequal capacity are connected in series the resultant capacity is less than that of the smaller condenser. You will then understand that to have a particularly noticeable effect upon the wave-length of the antenna circuit the series condenser must be used at values of capacity below that of the antenna itself. To explain fully the phenomenon you have observed it would be necessary for us to know the inductance and capacity of your antenna system and the wave-length to which your receiving apparatus was adjusted when you found the capacitance of .0008 microfarad had no effect upon the wave-length of the circuit. It would seem, however, that if the receiving tuner possessed sufficient values of inductance for the wave-length of the signals received and, in fact, had a range beyond this value you should have heard the signals from the distant station even with the condenser of .0008 microfarad capacity. The average amateur aerial has a capacity of about .0004 microfarad and in consequence we do not quite understand why you required one of increased capacity to effect the desired results.

Ans.—(3) The great difficulty in obtaining the number of watts flowing in an antenna circuit by observing the reading of the hot wire ammeter connected in series at its base, is the fact that it is difficult to separate the radiation resistance of an antenna system from its ordinary resistance due to the wire itself. The practical determination of the antenna resistance in radiation is given on page 206 of "The Wireless Telegraphist's Pocketbook of Notes, Formulæ and Calculations," by J. A. Fleming. This is on sale by the Marconi Publishing Corporation.

Ans.—(5) We refer you to the circuit diagrams for the vacuum valves given in the December, 1915, issue and the January, 1916, issue of the National Amateur Wireless Association Monthly Service Bulletins. The circuits are for an oscillating vacuum valve which should amplify Arlington signals on your receiving tuner to a considerable extent. Duplicate, if possible, the diagram for the primary and secondary winding of the receiving tuner, as shown in the January, 1916, issue. Properly adjusted, the oscillating vacuum valve should give better signals from Arlington than the crystalline detector, but it requires some experience on the part of the experimenter to get the best results from circuits of this type.

* * *

E. W. D., Cal., inquires:

Ques.—(1) Can you give me the dimensions for an inductively-coupled receiving tuner to have a maximum wave-length adjustment of 215 meters to be used in connection with a single wire aerial of No. 18 annunciator wire, 150 feet in length? Would it be possible to arrange the construction of this tuner so that the necessary wave-length adjustments are made in the primary and secondary circuits by means of a shunt condenser rather than with a sliding contact?

Ans.—(1) The complete dimensions for a receiving tuner of this type, also the constructional details are given in the last chapter of the book "How to Conduct a Radio Club," published by the Marconi Publishing Corporation. By a little experimenting a value of inductance in both the primary and secondary windings could be located so that the necessary variation of wave-lengths could be obtained by means of the shunt condenser. For example: You might slightly decrease the number of turns indicated in the article in the book and obtain the necessary adjustment in both circuits by the condensers as desired.

Ques.—(2) Referring to the article "How to Conduct a Radio Club" in the February, 1915, issue of THE WIRELESS AGE: Are the winding and the condenser given in table No. 7 efficient as a secondary winding of a loose coupler and will they give results equal to the usual winding of tap-offs?

Ans.—(2) The coil described will give good results as a secondary winding of a receiving tuner, but in order to secure the maximum value of voltage for a given value of inductance many experimenters prefer to use No. 32 wire for the secondary windings of receiving tuners.

Ques.—(3) In the construction of the secondary winding of an inductively coupled receiving tuner, should the turns for the lower values of wave-lengths be on the end of the tube nearest the head or on the opposite end?

Ans.—(3) The construction of receiving tuners should be so arranged that only the used turns of both the primary and secondary windings are in inductive relation to each other. For example: Take the usual type of loose coupler where the primary winding is at the left hand of the box and the secondary winding at the right hand. The turns of inductance for the lower values of wave-lengths of the primary winding should start from the right hand side of the primary and continue to the left hand, while the turns of the secondary winding should start at the left hand of the secondary and continue to the right hand.

* * *

T. A. M., Brooklyn, N. Y.:

Vacuum valves of all types are applicable to the reception of damped or undamped oscillations. The fact that one maker puts a different trade name on it than the other does not affect the working properties of a given bulb. To state the length of a coil of inductance without indicating the type of circuit or at what point at a given circuit it is to be connected means nothing. To determine the possible wave-length adjustment from a coil 3 feet in length by 6 inches in diameter, wound with No. 28 S.C.C. wire, it would be necessary for us to know the values of inductance or capacity with which it is to be employed in any given circuit.

The diagram you have given in connection with your fourth query is entirely practical, but many amateur stations prefer circuits of greater simplicity.

C. M. B., Tchula, Miss.:

It is hardly probable that the buzzing and hissing sounds which you hear on the telephone train dispatching line come from wireless telegraph stations. Wherever a telephone line is in inductive relation to telegraph or power circuits peculiar sounds are heard, due to fluctuation of current in these wires, which at times may induce the belief that radio stations are sending. In certain localities the signals from wireless stations can be heard on the telephone wires, but this is due to the fact that some part of the telephone circuit is in inductive relation to the aerial wires. There may be certain amateur stations in your vicinity which set up inductive influences in your telephone line and you should have no difficulty in determining the origin of these signals.

* * *

H. W. McK., Fulton, N. Y.:

Rather than fit your ½ k.w. transformer coil with a magnetic interrupter, we advise you to purchase a satisfactory electrolytic interrupter. The higher powers are handled more easily with the liquid interrupter than with one of the magnetic type. Get in touch with the makers of X-ray apparatus. They will be able to supply you with an electrolytic interrupter that will give fairly continuous service. We cannot tell whether or not this coil can be used as a transformer on alternating current unless we are supplied with data concerning the winding.

* * *

D. G. T., Grosse Point, Mich.:

The taps from the winding of a receiving tuner can be taken off without exposing the wires by boring a small hole at the point of connection and placing through it a loop of wire; that is to say, the winding is extended through the hole to the point on the multiple-point switch and, without being broken, led back again through the same hole and the winding continued. In this manner no bare wire is left exposed and the continuity of the circuit remains unbroken.

* * *

L. E. B., Calabar, Mont.:

A continuously operative magnetic interrupter for induction coils has not yet been devised. The sticking of your vibrator during operation may be due to a poor grade of platinum at the contact points or to irregularities in the contact surfaces. Possibly excessive value of current flows through the primary winding, which causes the contacts to heat and arc. The vibrator of a 3-inch spark coil should be shunted by a condenser of considerable capacity—at least 5 microfarads.

Your receiving equipment already responds to stations on the Atlantic and Pacific coasts; hence there are no additional statements that we can make regarding your over-all range. That you secure response at this distance indicates that you have an efficient receiving equipment.

* * *

F. B., Liberal, Kas.:

Your 2-wire aerial, 150 feet in length, with an average height of about 30 feet, has a fundamental wave-length of approximately 335 meters.

A tuning coil, 10 inches in length by 3 inches in diameter, wound with No. 26 or No. 28 wire, will permit response to wave-lengths inclusive of 2,500 meters. One of the sliders is connected to the aerial system, the second to a terminal of the detector and the third to a terminal of the fixed condenser. The earth wire should be attached to one end of the coil.

The design of step-down transformers is outside the scope of this department.

* * *

A. W. D., Tracy, Cal.:

Ans.—(1) Regarding your wave-meter: You had better hold to the dimensions of the coil given. The actual inductance of the coil depends upon the distribution of the magnetic flux, and the rearrangement of the design you have suggested will only slightly change the value of inductance. For extreme accuracy, however, it is better to employ twenty-six turns of 18 D.C.C. annunciator wire on a form 5½ inches in diameter. This can be considered as a reply to your question No. 1.

Ques.—(2) Can not the balance or resonance between the open and closed circuit of a transmitter be obtained just as well with a wave-meter as with a hot wire ammeter? Can not the conditions of resonance be determined without knowing the actual value of current flowing in the antenna circuit?

Ans.—(2) Yes; the circuits are in resonance if they are individually adjusted to the desired value by means of a wave-meter. This subject was discussed in the article on "How to Conduct a Radio Club" which was published in the February, 1916, issue of The Wireless Age.

Ques.—(3) What is the best material for the vibrator spring on an induction coil? What gauge brass spring would be suitable for a 3-inch coil?

Ans.—(3) A vibrator spring is preferably made of hard spring phosphor bronze strip. No. 26 gauge will fulfil the requirements.

Ques.—(4) On what wave-length was the wireless telephone conversation from Arlington carried on and could the voice be heard on an ordinary crystalline detector circuit?

Ans.—(4) The wave-length employed for these tests was about 7,000 meters. The signals can be received on an ordinary crystalline detector circuit, provided the apparatus has the right values to be placed in resonance with the wave-length of the station.

* * *

F. F. G., Charleston, S. C., inquires:

Ques.—(1) I have a United Wireless portable transmitting and receiving outfit, No. 13, mounted in an oak case. What is the rating in inches of the spark discharge when used as an induction coil?

Ans.—(1) Without a condenser connected in shunt to the secondary winding the spark will bridge a gap of approximately 6 inches.

Ques.—(2) What voltage is necessary to give the maximum efficiency?

Ans.—(2) The set was primarily designed for a potential of twelve volts.

Ques.—(3) Approximately how many kilowatts or fractions of a kilowatt will this coil absorb if used as an open core transformer on 110 volts A. C. 60 cycles?

Ans.—(3) If operated on alternating current, this coil must have a reactance winding connected in series. It will then consume ½ k.w.

Ques.—(4) How many Murdock moulded types of sending condensers are required for this coil in connection with a rotary or quenched spark gap?

Ans.—(4) Five sections of this condenser connected in parallel will give the correct value of capacity.

Ques.—(5) What is the correct speed and the number of points for the disc for a satisfactory rotary spark discharger?

Ans.—(5) The disc should be about 8 inches in diameter, fitted with ten spark electrodes equally spaced. It should revolve at a speed of 2,400 revolutions per minute.

* * *

R. H. S., Rutland, Vt., inquires:

Ques.—(1) I have a hot wire ammeter with a range varying from 0 to 5 amperes, connected in series with an antenna system 400 feet in length. The apparatus of this set consists of a ½ k.w. transformer supplied with 110 volt 60 cycle primary current, a glass plate condenser and an eight-point rotary gap. I also have an oscillation transformer which allows close variation of the degree of coupling. The secondary voltage of the high potential transformer, by the way, is 13,200 volts. When I place the ammeter in series with the ground or the aerial lead, I get absolutely no deflection of the pointer on the scale. But if I connect the ammeter across the terminals of the secondary winding of the oscillation transformer I obtain a reading of 4½ amperes. The amateurs in this locality say that my signals come in very strong. To aid you in solving my problem I enclose a diagram of connections. What is the cause of the trouble?

Ans.—(1) Assuming that the high potential condenser has the correct value of capacity for this transformer, the trouble is undoubtedly due to lack of resonance in the circuits of radio frequency. The fundamental wave-length of the aerial system is about 500 meters, which is far in excess of the United States restrictions. The condenser of the closed circuit should have a capacitance of approximately .008 microfarad for operation at the wave-length of 200 meters, but you must rearrange the design of your aerial to comply with the regulations. With an aerial of the T type (the lead-ins attached to the center), the flat top portion cannot exceed 120 feet in length if it consists of four wires with the usual spacing. After you have properly proportioned the two circuits your ammeter should indicate from 2 to 3½ amperes in the aerial circuit, depending upon the overall efficiency of the set. The fact that the signals are heard strong locally is no indication of the effectiveness of the set. Even with ½ ampere in the aerial circuit your signals may come in strong at receiving stations within two or three miles. Your trouble is undoubtedly due to lack of proportion of the circuits.

* * *

H. M., Monticello, N. Y., inquires:

Ques.—(1) What is the fundamental wave-length of an inverted L aerial composed of four wires 75 feet in length with an average height of 75 feet? The spacing of the wires is 2½ feet; the lead-in is 25 feet in length.

Ans.—(1) The fundamental wave-length is approximately 270 meters.

Ques.—(2) How many discs are required for a ½ k.w. quenched spark gap discharger? What should be the dimensions of the disc?

Ans.—(2) The average amateur installation requires from eight to fourteen of these discs. Complete dimensions and instructions for the operation of a ½ k.w. quenched set are given in the article "How to Conduct a Radio Club," in the February, 1916, issue of THE WIRELESS AGE.

Ques.—(3) Where can mica rings for insertion between the plates of a quenched gap be purchased?

Ans.—(3) The commercial types of dischargers generally use a fibre ring. Those of the dimensions described in the February issue of THE WIRELESS AGE can be purchased from the Engineering Department of the Marconi Wireless Telegraph Company of America for 25c. each.

Ques.—(4) How far will a ½ k.w. Thordarson transformer transmit with the aerial described in my first query?

Ans.—(4) From thirty to eighty miles, depending largely upon local conditions and upon the nature of apparatus used at the receiving station.

* * *

W. H. B., Cameron Park, Raleigh, N. C.:

Your ½ k.w. transmitting set should permit a sending distance of about fifty miles under the best conditions. Your 60-foot aerial with a height of 60 feet has a fundamental wave-length slightly in excess of 200 meters, the value allowed by the United States regulations. You may reduce it by a series condenser or you may attach the lead-ins to the center portion of the flat top. Complete diagrams for the connections of wireless apparatus appear in the book "How to Conduct a Radio Club," published by the Marconi Publishing Corporation.

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A national organization of wireless amateurs was announced in the October, 1915, number of THE WIRELESS AGE. Further details of the organization are given in an address made by J. Andrew White, which was published in the November WIRELESS AGE. Reprint copies sent upon request.

MEMBERS' EQUIPMENT.

1st. CERTIFICATE OF MEMBERSHIP.

The handsomely steel-engraved Certificate, with shadow background half-tone, is sealed and signed by Officers, with the endorsement of Senatore Marconi, as President. Every member will want to frame and place it alongside of his Government License certificate, two documents establishing status as wireless amateurs.

2nd. AERIAL PENNANT.

The 36 inch aerial pennant, painted in four colors on scarlet felt, will stand long service at your aerial mast head. Every member will be proud of the National Insignia flying from his aerial.