

AN EARLY RADIOPHONE



THE MODERN reader has difficulty in fully appreciating the impact of some of de Forest's earlier discoveries on the technical world of the time. So obvious are their effects today that it is difficult indeed to realize that they were by no means so to the wireless authorities of the 1900's.

Readers can get a fair idea of how the radiophone was looked upon in those days from the following article, reproduced verbatim from MODERN ELECTRICS, August, 1908:

The new art of wireless telephony has advanced to such a stage that the U. S. Navy has lately equipped 32 war vessels with complete sets. This point alone is a guarantee of the practicability of the wireless telephone, as it is a well known fact that the government does not adopt any apparatus until its utility has been proven.

The sets were sold under a contract to hold unbroken communication up to a distance of five miles regardless of fogs or atmospheric disturbances. This distance, however, has been doubled several times, and the latest records

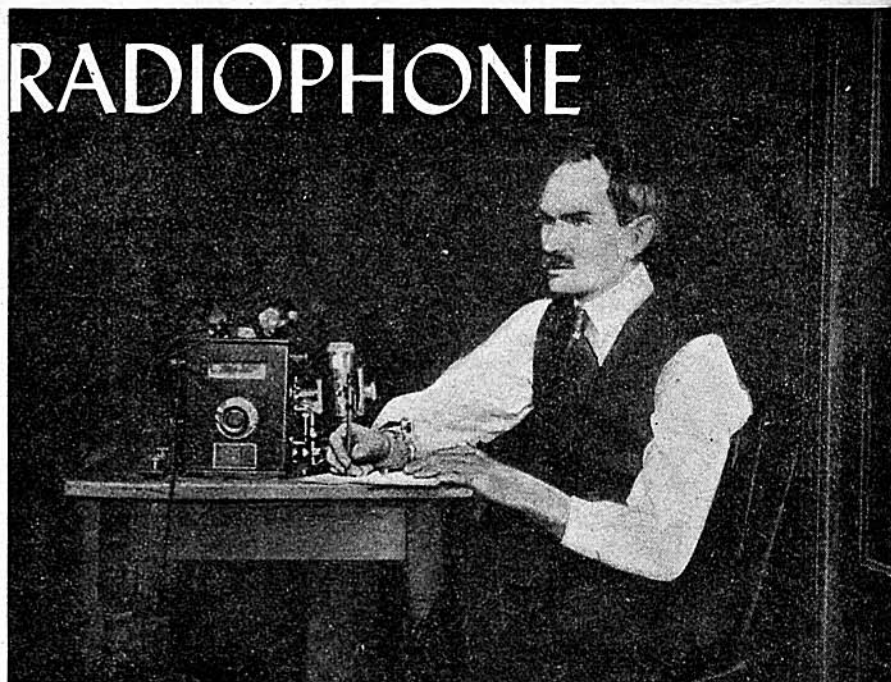


Fig. 2—A photograph of de Forest at one of the instruments described in this article.

show that a distance of 26 miles has been covered, the messages being picked up by the receiving end of a wireless telegraph set which no doubt could have been farther extended by the use of the special telephone receiving sets as employed with the telephone.

The fleet which sailed around the Horn to the Pacific was equipped with complete sets. Admiral Evans could keep in constant communication with any of the ships—directing the movements of the whole fleet from one point

which may sound the death knell of the old wig-wag system of signaling used for an indefinite period by the navy.

The naval attachés are particularly proud of the fact that the U. S. navy is the only one in the world utilizing this means of communication but already foreign ambassadors are negotiating with the makers for like sets.

In operation the wireless telephone is very simple, and depends on the same principle as telegraphy, that is, the generation of Hertzian waves that pass through space 186,000 miles per second. While the principle is the same, yet the actual working is vastly different,

as was soon realized by the numerous investigators who took up the subject with the introduction of wireless telegraphy. In telegraphy the transformer or transforming device is supplied by alternating current with periodic break or direct current with mechanical break. In either case the emitted wave is periodic. This, however, would not answer for wireless telephony, as the break would destroy all properties of speech.

The problem now was to provide some means for generation of a continuous wave current and impress thereon the modulations of the human voice which would possess the same qualities when caught at the distant receiving end and reproduce the spoken words.

The generation of such waves was made possible by the use of Duddell's arrangement, which is identical with the wireless telephone of the day with the addition of a few changes.

The circuits of the de Forest sending and receiving ends as shown in the May issue are repeated here for sake of clearness.

The transmitting set consists of an ordinary arc lamp (oscillator) burned in the flame of an alcohol lamp from a 220-volt circuit, which sets up oscillations. The latter flow through the condenser and primary of transformer, exciting the secondary, which has one terminal leading to the ground through a telephone transmitter, and aerial wire.

It can now be understood that the wave current in flowing through the transmitter to the ground and aerial wire will be changed to the same proportion as the voice which falls against the diaphragm of the transmitter. A certain portion of this wave is caught by the antenna of the receiving end, which flows through the primary of a transformer set to the same wave length; passing the secondary, it flows

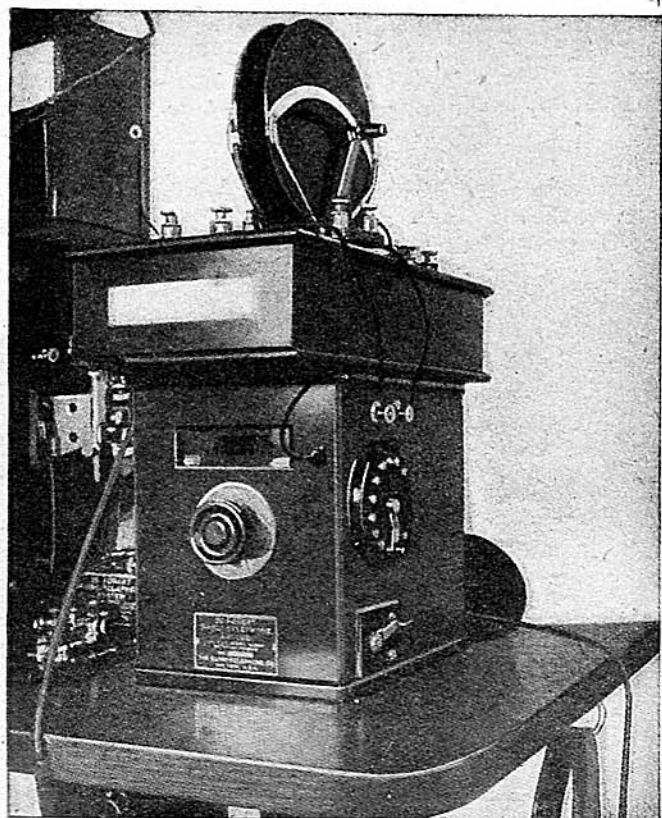


Fig. 4—Close-up of receiving apparatus and tuning equipment.

through the capacity condensers to the "Audion"; here it produces a like change in the ionized gases which changes the current from a local battery flowing through a telephone receiver, resulting in the spoken words increased in sound to a large extent.

Here we have the complete de Forest system, which of course required a considerable amount of ingenuity and work on the part of Dr. de Forest to bring the apparatus to its present stage of perfection.

In the June issue of this magazine was described a "Flame Audion" which works on the same theory as the one employed in wireless telephony. The "Audion" used by de Forest is an ordinary incandescent lamp with a platinum grid and wing sealed in a lamp bulb, as shown in the diagram. The "Flame Audion" has the platinum contacts inserted in the flame impregnated with certain salts.

In Fig. 3 is shown a set designed for portable use, and is packed ready for transportation. [It was not possible to reproduce this figure.—Editor].

With this set communication can be established in a short while, as portable and easily handled aerial arrangements are being provided for this purpose.

To the left is the transmitter, consisting of the high tension coil placed in case with telephone transmitter mounted on an arc lamp in the back. The telegraph key and a device known as the "chopper," which resembles the ordinary buzzer, are shown in the front. The "chopper" is inserted in the aerial wire, and when the key is pressed operates the wireless telegraph apparatus, for calling, etc.

The complete receiving set is shown in Fig. 4. Here we have the "pancake" syntonizer on top, adjustable condenser, tuning arrangement, and reserve "audion" for use in emergency.

In Fig. 2 is shown Dr. de Forest at the instrument, the audion is seen between his hands.

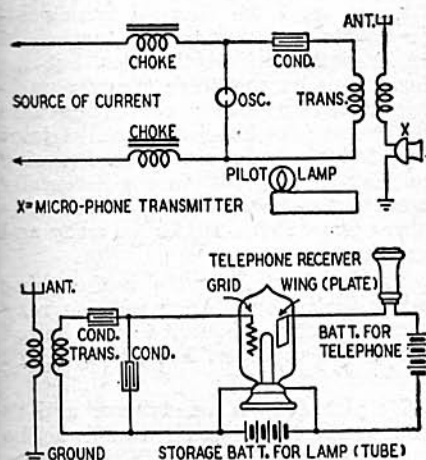


Fig. 1—Transmitter and receiver schematics. These were typical of early de Forest equipment. Oscillator symbol represents a carbon arc in its pot. The telephone receiver shows strong influences from the 75-ohm line type, indeed often used with radios of that period.

FIRST RADIO ASSOCIATION

By Hugo Gernsback

SOME TIME during the early fall of 1908, when wireless was booming, the writer became convinced that it was necessary to band together the wireless amateurs into a national body. Accordingly, he set out to launch an association. The chief reason at that time was to organize a national body to ward off adverse legislation against the wireless amateur.

In those heydays there was no radio law. Anyone who had a transmitter just helped himself to whatever wavelength he took a fancy. Obviously, such a condition could not continue for long, and

association. Late in October, 1908, Dr. de Forest accepted. The other founders, all well-known radio personages, were John S. Stone of radio fame, who became Vice President; William Maver, Jr., author of one of the first radio engineering books, was Secretary; the writer was Chairman and Business Manager.

The league finally was organized in November, 1908. The first announcement of the new body "The Wireless Association of America" appeared in the writer's publication MODERN ELECTRICS, in the January, 1909, issue,

MODERN ELECTRICS

Wireless Association of America

Under the Auspices of "Modern Electrics"

Board of Directors

DR. LEE DE FOREST
JOHN S. STONE
WM. MAVER, JR.
HUGO GERNSBACK

President
Vice-President
Secretary
Chairman & Business Manager

The Wireless Association of America has been founded with the sole object of furthering the interests of wireless telegraphy and aerophony in America.

We are now on the threshold of the wireless era, and just beginning to rub our intellectual eyes, as it were. Sometimes we look over the wall of our barred knowledge in amazement, wondering what lays beyond the wall, as yet covered with a dense haze.

However, young America, up to the occasion, is wide awake as usual.

Foreign wireless experts, invariably exclaim in wonder when viewing the photographs appearing each month in the "Wireless Content" of this magazine.

They cannot grasp the idea that boys 14 years old actually operate wireless stations successfully every day in the year under all conditions, but they are all of the undivided opinion that Young America leads the rest of the world wirelessly.

Even Dr. Lee de Forest, America's foremost wireless authority, confessed himself surprised that so many young men in this country should be in the possession of such well constructed and well managed wireless stations, which is only another proof that the clear headed young men of this country are unusually advanced in the youngest branch of electrical science.

So far America has lead in the race. The next thing is to stay in the front, and let the others follow. In fact he would be a bold prophet who would even dare hint at the wonders to come during the next decade.

The boy experimenting in an attic today may be an authority to-morrow. However, not even the cleverest inven-

tors or experimenters always have the opportunity of making themselves known to the world, and it is right here that we are confronted with a mystery so far unsolved. Out of 100 per cent of young wireless experimenters, 90 per cent. are extremely bashful. Why this should be so is a mystery.

As stated before the new Wireless Association's sole aim is to further the interests of experimental wireless telegraphy and aerophony in this country.

Headed by America's foremost wireless men, it is not a money-making institution. There are no membership fees, and no contributions required to become a member.

There are two conditions only. Each member of the Association must be an American citizen and must own a WIRELESS STATION, either for sending or for receiving or both.

The Association furnishes a membership button as per our illustration. This button is sold at actual cost and will be mailed to each member on receipt of 15 cents (no stamps nor checks).

This button is made of bronze, triple silver-plated. The flashes from the wireless pole are laid in hard red enamel, which makes the button quite distinctive. The button furthermore has the usual screw back making it easy to fasten to buttonhole. The lettering itself is laid in black hard enamel. Size exactly as cut.

On account of the heavy plating it will last for years and is guaranteed not to wear "brassy."

Its diameter is 3/4 inch. This is a trifle larger than usual, the purpose being to show the button off so that it

can be readily seen from a distance. The reason is obvious. Suppose you are a wireless experimenter and you live in a fairly large town. If you see a stranger with the Association button, you, of course, would not be backward talking to the wearer and in this manner become acquainted with those having a common object in mind, which is the successful development of "wireless."

The Association furthermore wishes to be of assistance to experimenters and inventors of wireless appliances and apparatus, if the owners are not capable to market or work out their inventions. Such information and advice will be given free.

Somebody suggested that Wireless Clubs should be formed in various towns, and while this idea is of course feasible in the larger towns, it is fallacious in smaller towns where at best only two or three wireless experimenters can be found.

Most experimenters would rather spend their money in maintaining and enlarging their wireless stations, instead of contributing fees to maintain clubs or meeting rooms, etc., etc.

The Board of Directors of this Association earnestly request every wireless experimenter and owner of a station to apply for membership in the Association by submitting his name, address, location, instruments used, etc., to the business manager. There is no charge or fee whatever connected with this.

Each member will be recorded and all members will be classified by town and State.

After February 1st, 1909, members are at liberty to inquire from the Association if other wireless experimenters within their locality have registered. Such information will be furnished free if stamped return envelope is forwarded with inquiry.

To organize the Association as quickly as possible it is necessary that prospective members make their application at once, and without delay.

If you are eligible fill out application sheet and state particulars as follows: Full name; town; State; age; system and apparatus used; full description of aerial.

The above is a reproduction from the January, 1909, issue of MODERN ELECTRICS. Illustration in the center is the first radio association insignia: a lapel button of that time.

already there were rumbles that Congress intended to do something about it.

Everyone feared that the amateur might be put off the air entirely. It was the writer's thought that if a national body of amateurs existed, they could make their voice felt in Washington, which indeed they did when the first radio law was enacted in 1912.

To give the proposed association a solid standing the writer, in October, 1908, wrote a number of letters to well known radio personalities. Even in these early days Dr. Lee de Forest was easily the outstanding radio figure in this country. For that reason the writer proposed to de Forest to become the first president of the first national wireless

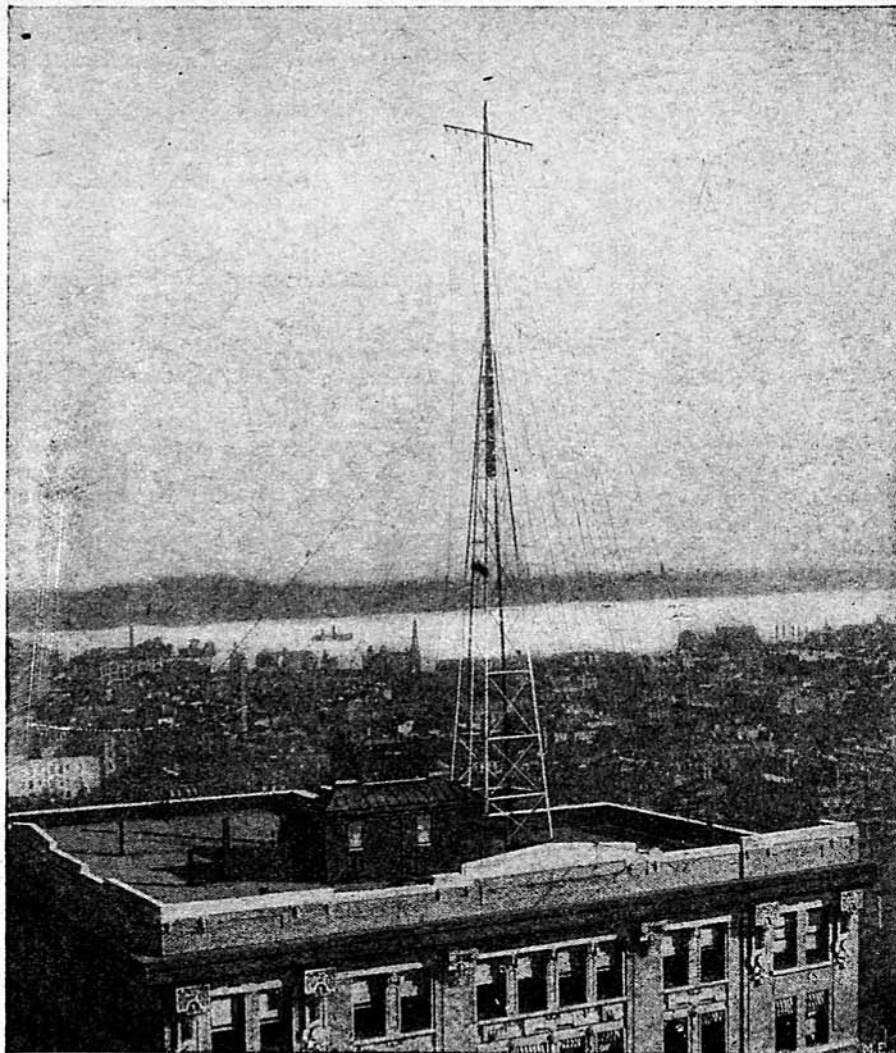
which was on the newsstands in December, 1908. This was the first national radio association anywhere in the world.

By the end of 1912, the Association had some 14,000 members scattered all over the country and each member was given a lapel button to wear.

The Association also printed a book with the names and addresses of the members. Its title was: *The Wireless Bluebook*; it also was the first radio association membership book in print.

It is significant that Dr. Lee de Forest, who has so many firsts attached to his name should also have been the first President of the first Wireless Association.

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This "Aerophone Tower" was erected by de Forest's Radio Telephone Co. in 1908, on the Terminal Building, 42nd Street and Park Avenue, New York City. Intended for use in telephone communication with ships, it was 125 feet high and supported an antenna of eight phosphor-bronze wires, which ran from the top of the mast down to the edge of the building's roof.

music and voices coming through space by wireless, telephoned to New York newspapers and told of their experience. Stories were published around which reporters wove mystery as to through whom, where, and how such a new kind of wireless had come into being. As a result of this publicity the *Literary Digest* wanted a special story of the invention. A reporter and photographer called for particulars. De Forest gave them the details and they prepared to take a photograph of all the apparatus, including the original audion and its seven-plate Witherbee storage battery as well as the recently assembled wireless telephone transmitter which was now encased in a mahogany cabinet on top of which was the alcohol lamp. At the moment when all was in readiness for the camera shot I came in the door, just as the reporter said:

"I think if one of you men stood in front of these instruments it would be more appropriate and descriptive of what it is."

"Go ahead, Frank," said de Forest promptly, "You stand up in front of them—you've got your coat on."

Doubtless he did not realize at the time the tremendous historic importance that photograph would one day assume, else he instead would justly and rightfully have stepped up in my place even though he was coatless. As it was, that picture — herewith reproduced — appeared in the June 15, 1907, issue of the *Literary Digest*. A few months afterward a disastrous fire destroyed the Parker Building, completely consuming all of de Forest's possessions, including his priceless records, and all the original audions and wireless telephone apparatus. Thus this picture represents the only physical evidence in existence of that basic equipment from whence grew radio broadcasting and all forms of electronic speech.

FIRST RADIO ASSOCIATION

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More important than this is the fact that the Father of Radio clearly saw the great future of radio, even at that early date, and was willing to lend his name to radio amateurism then. Dr. de Forest proved himself a most staunch friend of the amateur, because it was he also who, in those pioneering days, set aside many of his Audions which were sold to the wireless amateurs.

The following description of the *Wireless Association of America* was written by radio historian Clinton de Soto, in his book *Two Hundred Meters and Down*, the Story of Amateur Radio, published by the A.R.R.L.

"The *Wireless Association of America* was a child of Hugo Gernsback, publisher of *MODERN ELECTRICS*. After the first few months of its existence, Gernsback announced a membership totalling 3200. By November, 1910, he claimed that this number had jumped to 10,000.

It was easy to recruit members for such an organization; there were no dues and no obligations. Youthful electrical experimenters signed up in swarms, attracted by the famous names in the honorary membership group and the ease of becoming a member. The membership represented a fairly accurate index of national interest in radio, although not, of course, of the number of active transmitters. Even so, the number of worthwhile amateur stations on the air had, according to conservative observers, increased from perhaps one hundred and fifty in 1905 to five or six hundred. The number of small spark coils in use was several times that figure.

"In early 1910 the first *Wireless Blue Book* of the Association appeared dated 1909. It listed ninety U.S. amateur stations who were members of the Association together with the call letters used, approximate wavelength in meters, and

the spark length of the induction coil. Stations were listed in the following states: Massachusetts, New York, New Jersey, North Carolina, Missouri, California, Texas, Rhode Island, Oregon, Illinois, Ohio, Pennsylvania, Connecticut, Florida, Indiana, West Virginia, Montana, Washington, Minnesota, Wisconsin and Maine. Wavelengths ranged from 32 to 950 meters. The average spark gaps were from $\frac{1}{2}$ to 3 inches. Two stations had the exceptional length of 10 and 14 inches, respectively.

"The second *Blue Book* appeared June 1, 1910. Meanwhile the number of copies of *MODERN ELECTRICS* printed had increased from the initial 2000 to 30,000. The *Wireless Association of America* continued to send out more and more gaudy membership certificates, and the cumulative numbers on the membership rolls mounted higher and higher."