Correspondence.

THE DEVELOPMENT OF THE WIRELESS TELEPHONE.

To the Editor of the SCIENTIFIC AMERICAN:

Owing to the interest evinced at the present time in wireless telephony—an art I have done everything in my power to advance since 1899—the time seems ripe for the statement showing the relative positions of the various contestants in this field of endeavor.

From time to time, as the exigencies of the cases required, I have pointed out in divers technical publications the various methods that could be employed to telephone through space without connecting wires. As far back as 1898 I began to experiment with electric waves as a means for transmitting articulate speech wirelessly, and on July 18, 1902, the SCIENTIFIC AMERICAN published a description and the drawings of an apparatus I had evolved for fulfilling the exacting conditions required in wireless telephony.

The drawings of this early transmitter and receiver of mine are reproduced in Fig. 1, and the following is a paragraph from the article in question referring to its construction:

"*A* is a transmitter, and *B* the receiver. The primary coil is shown at 1, and is in series with the battery 2 and the key 3. One terminal of the secondary winding 4 is connected with a special form transmitter 6, and this to a large capacity 7. The opposite terminal of the induction coil is earthed at 8, and bridged across the terminals of the secondary is the condenser 9; 10 is a 'variator,' which will be again referred to. The receiver is quite simple, and consists essentially of a transformer coil 1, a telephone receiver 2, and a battery 3; the condenser 4 of large and equal capacity to that employed in the transmitter, and 5 the earthen terminal.

"The action of the instruments is as follows: When the key 3 closes the primary circuit, the current is automatically varied by a special device (an arc-light) 10, which takes the place of the ordinary interrupter; this produces alternations in the secondary coil 4, giving rise to high potentials at the intervals 7 and 8; this potential difference is, however, modified by the transmitter 6. The surging of the currents through the circuit formed by 7 and 8 emits waves, and these traveling with the speed of all other electro-magnetic waves reach the plate 4, and finding no other path of greater density surrounding the circuit 4 and 5, it traverses that circuit in preference to passing onward through the earth, since the former offers the least resistance. This sets up alternating currents in the transformer coil 1, and these are impressed on the telephone receiver 2."

It will be observed that the telephone transmitter, which was of the old Blake button type, was placed in the free arm of the high-tension system. At the early date when this apparatus was first used, about the only detectors known for indicating the presence of electric waves were coherers in one form or another; and where the frequencies were high a microphone detector was utilized, and when low and the waves were increased to lengths approximating those set up by mechanical vibration, a telephone receiver was employed direct.

The concluding paragraph of the article states that "both the transmitter and the receiver are mounted on tripods, providing the operators with testing apparatus almost as portable as a camera. The tests from the incipiency of wireless telephony have been made at Narberth, Pa., where the conditions were all that could be desired. In 1899 speech was transmitted to a distance of 200 feet; in 1900 a mile was covered, when with the equipment shown in the engravings articulate speech was transmitted across the Delaware River at Philadelphia; and in 1902, with the instruments placed on hills separated by a railroad, valleys, wooded lands, and numerous streams, a distance of three miles was attained. The results have shown the possible commercial value of this system of wireless telephony, which is soon to be perfected for actual use."

In the past five years I have not striven to cover long distances, the three-mile test at Narberth under the difficult conditions imposed by the geological and geographical features of the country—equivalent to ten or twelve miles over water—indicating clearly enough that wireless telephony was possible over any distance the wireless telegraph could bridge, by increasing the initial power. The real difficulty encountered was not a matter of covering distance, but of getting speech that was articulate and that could be clearly understood. To overcome this untoward result I have bended my efforts, and have succeeded so well that my receiver now produces the spoken words more clearly than does an ordinary telephone, though not so loud.

So much for my early wireless telephone work and the article describing it, and now a word concerning my contemporaneous aspirants for wireless telephone honors—Messrs. Fessenden and DeForest. In the issue of the SCIENTIFIC AMERICAN dated January 19, 1907, Fessenden publishes diagrams of a wireless telephone apparatus, but gives no adequate description of it. While I did not think it of sufficient importance at that time to call attention to many points of similarity to my apparatus of 1902, I feel now, in justice to my early work, to point them out, that he who reads may judge for himself how far I have anticipated Fessenden. Compare my transmitter, Fig. 1, with his transmitter, Fig. 2, and it will be readily seen that these are very alike. There is the same closed circuit containing an electric arc and the primary of a transformer coil. The open circuit, too, is precisely the same, except for the trivial change he has made in placing the transmitter in the grounded arm of the oscillator instead of in the free arm, as shown in my diagram.

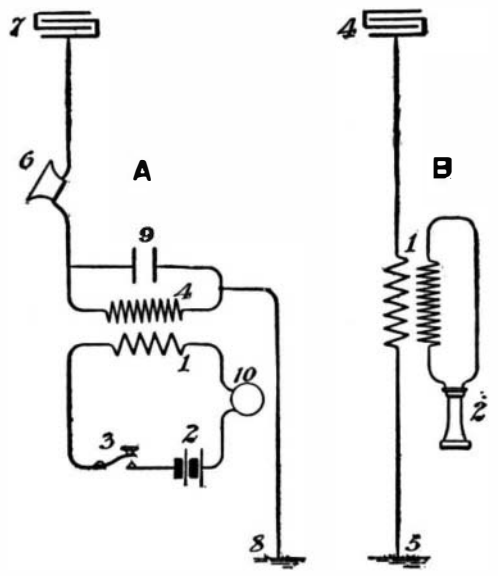

Fig. 1.—Collins Wireless Telephone Transmitter and Receiver.

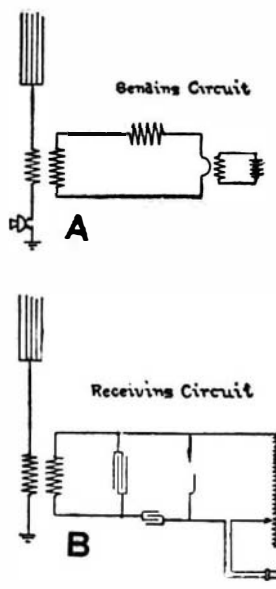

Fig. 2.—Fessenden's System.

It is also apparent that his receiver and mine are virtually the same, if we except the introduction of his electrolytic detector—a very ingenious detector for wireless telegraphy, but oppositely an exceedingly poor device for the reproduction of articulate speech.

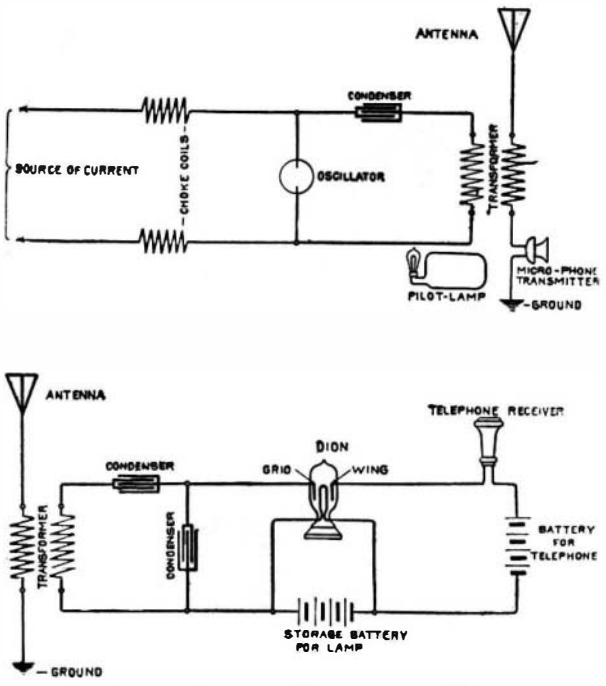

Fig. 3.—De Forest System of Radio-Telephony.

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Fessenden also makes a statement that I strenuously object to, though it does not concern primarily my wireless telephone. In his article he refers to his "arc-gap" method. This arrangement he would have as conformed with the Duddell-Poulsen system for producing continuous oscillations. This "arc gap," as Fessenden terms it, is really the ordinary spark gap employed in all the older systems of wireless telegraphy; it has nothing in common with the tuned arc of Elihu Thomson, and is entirely different from the musical arc of Duddell, the speaking arc of Simon, or the continuous oscillation arc of Poulsen.

A new claimant for wireless telephonic honors is DeForest. Of his apparatus the SCIENTIFIC AMERICAN publishes an account in its issue of September 28, 1907. To illustrate how nearly his arrangements for telephoning without wires are like the 1902 instruments of mine, compare Fig. 3 with Fig. 1. It will be seen at a glance that they are identical in all essential respects, although DeForest copied Fessenden and placed his transmitter in the grounded arm of the oscillator circuit.

An additional detail added by DeForest and not found in my early system is "the arc light maintained in the flame of a small alcohol lamp." This scheme is due to Poulsen, and was described by me in the SCIENTIFIC AMERICAN of December 15, 1906. It has long since been superseded by immersing the terminals of the arc in hydrogen, which gives very much better results.

His receiving circuits are essentially my open and closed circuits with the addition of a detector, called by him an "audion," but which is really the oscillation valve invented by Prof. Fleming, who is Marconi's technical adviser.

With any of the arrangements shown and described, it is quite impossible to obtain satisfactory results; and evidently Fessenden and DeForest are passing through the same difficulties I encountered from 1900 to 1904, i.e., inarticulation of the received speech. Music may be transmitted to better advantage than speech, for a musical tone is simple compared with the spoken word.

In order to reproduce the human voice in clear liquid tones, a further improvement must be applied to the arrangements indicated above, and this I have done and shall make public within the next three months.

11 Broadway, New York. A. FREDERICK COLLINS.

On a Device for Balancing Aeroplanes.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to the letter of Mr. Clark L. Swezey in the SCIENTIFIC AMERICAN for September 21, 1907, on a simplification of the device I had suggested in the SCIENTIFIC AMERICAN SUPPLEMENT for June 29, 1907, I would like to say that while the device suggested is certainly very simple, I hardly think it would be manageable. As I understand it, the aeroplane is to be balanced by the use of a tube, fitted with wires at each end, containing mercury. A tilting would cause the mercury to flow to one end of the tube, and so establish an electrical contact. But it is difficult to see why the mercury would not flow to an end of the tube in the same way whenever the aeroplane were accelerated, as in starting or stopping. The action, it seems, would be the same as that which takes place when a pan of water at rest on a table is suddenly pushed.

It is difficult to see, also, how the device could be modified so as to overcome this feature and yet be sensitive. ROBERT H. GODDARD.

Worcester, Mass., October 4, 1907.

Fluorescence and Chemical Constitution.

MM. Francesconi and G. Bargellini, two Italian chemists, are studying the problem whether there is some connection between the chemical constitution of bodies and fluorescence. They have examined about five hundred organic compounds in various solvents, using an extremely simple apparatus consisting of a test tube located in a dark room. A conical beam of sunlight being projected on this solution, the luminous cone is examined at the upper part of the test glass. If the compound tested is fluorescent, it shows a different color from that of the solution. The following are the main results of these experiments: No compound belonging to the fatty series is fluorescent; while all the aromatical compounds show a more or less intense fluorescence. Each of the different nuclei (benzine, naphthaline, etc.) has a fluorescent power of its own. While certain groups of atoms exert a very energetic activating action on fluorescence, others are reducing agents of more or less intensity.

Peat, which might almost be called the national fuel of Ireland, has never been very successfully exploited in the United States. While peat can be converted into a fair quality of fuel for both domestic and steam purposes, all methods of handling it so far devised require heavy machinery and considerable hand labor, and both of these are expensive. Several experimental plants have been started to test the feasibility of manufacturing peat fuel, but they have not commenced work on a commercial scale. It is estimated that from 500 to 1,500 tons were produced in 1906. During the year there were imported into the United States 8,557 short tons of peat, valued at $45,344.