BIRTH AND GROWTH OF WIRELESS

Coming of Marconi

COLUMBUS OF RADIO

No. II.

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IN this, the second of the series of articles on the history of wireless, written exclusively for "The Advertiser," Professor Kerr Grant tells of the phenomenal advances made in a few years, through the genius of Signor Marconi.

GREAT, however, as was the interest aroused in scientific circles by the discoveries mentioned in my first article, it is safe to say that very few, if any, men of that day had even the faintest prevision of the extraordinary developments which would flow from them. Hertz himself is reported to have replied adversely to a question put to him regarding the possible application of these waves to the purpose of telephonic communication, giving as his reason that their frequency—many millions per second—was far too high to produce sound vibrations in a telephonic plate. Yet, had he known it, there already existed in the microphone of Hughes, an instrument which would have served to indicate by an audible click in a telephone the arrival of each train of waves resulting from a spark in the transmitter. Hertz's experiments were repeated and varied by many other scientific men, notably by Oliver Lodge in England, by Branly in Paris, and by Righi in Italy, and Bose in Calcutta.

Lodge's early experiments were mainly a repetition of those of Hertz. He used, however, the discharge of a Leyden jar to generate electrical oscillations, an effect which had been predicted on theoretical grounds by Lord Kelvin, and showed that these produced waves identical in character with those of Hertz and possessing the power of exciting similar oscillations in a similar adjacent Leyden jar circuit. His highly important discovery of the great gain in responsiveness obtained by "tuning" the frequency of oscillation of the one circuit to that of the other was not published until 1897. Branly in 1890, repeating some earlier experiments of the Italian professor, Onesti, on the effect of an electric spark in causing a loose heap of metal filings to conduct electricity, made the highly important discovery that electric waves produced a similar effect, and embodied this discovery in his "coherer," a glass tube in which a few silver or nickel filings lay loosely between the ends of two metal rods included in a battery circuit. For many years Branly's coherer was the most popular form of detector for Hertzian waves.

Marconi's Inspiration

I recollect, clearly, witnessing a demonstration of Hertzian waves at Melbourne University over thirty years ago. A Leyden jar charged by an induction coil was arranged to discharge across a spark-gap; on the other end of the lecture-bench was a similar jar the coatings of which were connected in circuit with a Branly coherer, which, when the waves from the discharge of the other jar passed, became conducting and closed a battery circuit containing an ordinary house-bell. The two jar circuits were tuned after the manner prescribed by Lodge.

Professor Righi, of Bologna, was among those who repeated the experiments of Hertz. Righi showed that more vigorous oscillations and waves resulted if the two balls between which the spark of the transmitter passed were immersed in oil. He also succeeded in modifying the circuit in such a way as to produce exceedingly short waves. But Righi's greatest contribution to the advancement of wireless telegraphy was undoubtedly the inspiration which he implanted in the mind of one of his

pupils, a young man named Guglielmo (William) Marconi, son of an Italian father and an Irish mother.

Weaving the Web of Knowledge

A just apportionment of the credit of an invention among the numerous claimants is notoriously as difficult as would be the task of deciding whether the cat, the rat, the rope, the butcher, the ox, the water, the fire, the stick, or the dog was the effective agent in making the old woman's pig jump over the stile. Every discovery and every invention, in fact, resembles the pudding, in the making of which over a thousand men were employed.

When we single out the names of Thales, Gilbert, Volta, Oersted, Ohm, Gauss, Ampere, Weber, Faraday, Maxwell, and Hertz as links in the long chain of discoveries which culminate in the invention of wireless communication, we do injustice by omission to hundreds of others who form intermediate links, or at least took part in the forging and connecting of the links. Even the metaphor of a chain has a misleading simplicity. Rather should we compare the growth of knowledge and invention to the weaving of a vastly intricate web, so various, so complex, and so subtle are the connections which bind the fabric into a whole. But it is the man who hands the dish to the diner who receives the meed of thanks, not the server at the far end of the table, much less the cook who prepared it, the tradesmen who supplied the ingredients, or the husbandmen or workers who grew or concocted them. Columbus alone is named as the discoverer of the new world. The part played in that discovery by the ancient astronomers who first proved the earth a sphere, by the geographers who mapped its known parts, and revealed the extent of the unknown, the thousands of navigators, of shipwrights, of sailors, who brought the art of navigation and that of shipconstruction to a stage which made his perilous voyage possible of success must not be overlooked.

Vision of a New World

Marconi is the Columbus of wireless. He boldly sailed the scantily-equipped barque of his youthful imaginings into waters on which the wisest of his contemporaries had not dared to venture, and he visioned with prophetic power the existence of a new world of human achievement—how fully to be realised in his own lifetime not even he could have dared to hope. But in his first youthful efforts to transmit signals by electric waves, Marconi employed no device which had not already been used by his predecessors. His oscillator was of a type similar to that which he had seen in operation in the laboratory of his eminent professor, an ordinary induction coil supplied the high-voltage charge, and the essential element in his receiving circuit was the coherer of Branly.

It is true that at an early stage in his experiments he was led to adopt an "aerial" consisting of an elevated metal plate or cylinder connected by a conducting wire to one end of his receiving circuit, and that he was quick to recognise the advantage of increasing the elevation of this "aerial." But even in this improvement and conclusion—the value of which for the future progress of wireless was undeniably of the first importance—he had been forestalled by the Russian professor, Popoff.

Confidence of Youth

Neither to the theory nor to the practice of electric wave signalling had the young Marconi made any notable contribution when as a lad of 22 he came to England fired with his great idea and full of the magnificent confidence of youth in its own powers of accomplishment. He was singularly fortunate in one of his letters of introduction. Mr. Campbell Swinton, himself an inventor of genius, took the young Italian to Sir William Preece, Engineer-in-Chief to the British Postoffice. Preece had himself made many experiments in the attempt to dispense with the customary line wires of the telegraph system, but he had attempted to use the earth rather than the air as the medium of communication. To the

young inventor he gave both encouragement and assistance. Aided by such influential backing Marconi pushed on his experiments with astonishing energy and success. The range of transmission was increased from a distance of two miles in his first experiment to eighteen miles in the next, and to eighty-five in the third year thereafter. From this date, 1899, it may be said that the future of wireless methods of signalling was assured of success. Henceforward adequate financial backing and the co-operation of expert technical assistance lent their powerful aid to its progress.

Accomplished the Seemingly Impossible

A transmitting station far exceeding in power any hitherto constructed was erected at Poldhu, in Cornwall, and from this station communication was maintained with ships at sea over distances reaching hundreds of miles. The experience thus gained led to rapid improvements in the details, both of transmitting and of receiving apparatus. The adoption of the method of transferring the oscillations from the spark circuit to the aerial by magnetic coupling as proposed independently by Oliver Lodge and by Ferdinand Braun, of Strasburg, is especially notable since it permitted of a much sharper tuning of both circuits to a definite frequency. The range of communication steadily increased.

Then Marconi's imagination leapt forward to a project which all authoritative opinion at that time would doubtless have condemned as utterly chimerical, nothing less than the transmission of signals across the Atlantic Ocean, between England and America. In a straight line drawn from a place on the one to a place in the other country, is interposed a mass of earth and water, both impervious, or nearly so, to electric waves, over 100 miles in height and nearly 2,000 miles in thickness. Undeterred by this formidable obstacle to success, Marconi decided to make the experiment. The event justified his expectation. On the 12th of December, 1901, Marconi, at St. Johns, in Newfoundland, heard, faintly but unmistakably the signals, which less then one-tenth of a second earlier had left the transmitter at Poldhu. In just a year from the date of this experiment the first trans-Atlantic messages were exchanged between the Poldhu station and a similar station at Cape Breton, in Canada. The first great step in the consummation of world-wide radio communication was accomplished.

The third article of this series will appear to-morrow. The first article was published in "The Advertiser" on Saturday.