

ANNIVERSARY OF TRANS-ATLANTIC RADIO

By DR. R. L. SMITH-ROSE

ON December 12, Marconi's Wireless Telegraph Co., Ltd., is celebrating the fiftieth anniversary of the first demonstration that electromagnetic waves could be transmitted across the Atlantic Ocean, over a distance of 2,200 miles. Following Marconi's early experiments in Great Britain, wireless telegraphy was developing very rapidly at the turn of the century for short-distance communication; particularly between ships and shore. Early in 1900, Marconi applied for a British patent describing appliances for conducting what was termed 'syntonie telegraphy', in which for the first time provision was made for adjusting the transmitting and receiving apparatus to operate on the same frequency or wave-length. The investigations on what we now understand as 'tuning' the equipment were essential steps in the development of long-distance trans-oceanic wireless telegraphy; and a year later, in January 1901, communication was established between St. Catherine's, Isle of Wight, and the Lizard, Cornwall, a distance of two hundred miles. Prior to this achievement, however, Marconi had already decided to make a serious attempt to send electric waves across the Atlantic; and he had enlisted the services of John Ambrose Fleming to assist in the design and installation of a high-power spark transmitting station at Poldhu in Cornwall. The project was not without its difficulties; and, viewed from the vantage point of fifty years later, the detailed technical history is of some interest and will be found recorded in Fleming's book on "The Principles of Electric Wave Telegraphy and Telephony", the first and second editions of which were published in 1906 and 1910, respectively. Reference may also be made to a "Handbook on Radio Communication", published by the Science Museum (see *Nature*, 135, 326; 1935), and to the fact that this Museum has in its collections some of the items used in these experiments.

Fleming was responsible for specifying the electrical engineering plant to be used (having an output of 25 kW.) and for designing special portions of the apparatus for generating and controlling the, for that time, powerful radiation of electric waves it was desired to create and use. At the same time, Marconi decided on the nature of the aerial system to be erected, which originally comprised a ring of twenty masts, 200 ft. high, arranged in a circle of 200 ft. in diameter, and supporting aerial wires grouped in the form of an inverted cone.

In the early months of 1901, experiments began with the view of completing the arrangements, and numerous telegraphic tests were carried out between Poldhu and Crookhaven in the south of Ireland, and Niton in the Isle of Wight. There were various setbacks, not least of which was the wrecking of the aerial system at Poldhu by a storm on September 18, 1901. The Marconi Company, however, quickly erected two wooden masts 160 ft. high and 200 ft. apart and carrying a fan-shaped aerial of 50 wires. Within two months, sufficient progress had been made to enable Marconi to contemplate making an experiment across the Atlantic; and he left England on November 27, with his two assistants, G. S. Kemp and P. W. Paget, arriving at St. Johns, Newfoundland, on December 5.

Here again, there were difficulties associated with rough weather. The receiving station was located in a government building at Signal Hill, Newfoundland, and the aerial was supported in the first place by a balloon. This was, however, lost on its first ascent, and was replaced by a large kite carrying an aerial wire which was successfully flown to a height of 400 ft. The rise and fall of the kite in the wind caused variations in the capacity of the aerial, and this precluded the use of any of the syntonie receiving apparatus which was then available. The apparatus actually used was simply a self-restoring coherer in series with the aerial and a telephone earpiece.

By prior arrangement, confirmed by cable, a daily programme of transmissions which consisted in sending the letter *s* (three successive dots in the Morse code) began on Wednesday, December 11. These signals were received and recognized on the following day, December 12, at 12.30, 1.10 and 2.20 p.m., and again at 1.38 p.m. on Friday, December 13. In this way, the fact was established that, contrary to the expectations and predictions of some theoretical workers, these electromagnetic waves could be transmitted and successfully detected around a considerable fraction of the curved surface of the earth.

The achievement created an immense sensation in every part of the civilized world, although, of course, there was much to be learned concerning the laws of propagation of radio waves and the influence of the ionosphere as we know it to-day, before communication sufficiently reliable for the transmission of coherent messages could be attained. This accomplishment was the starting point of the past fifty years of development leading to the vast and complex network of communications, broadcasting and navigation services in use to-day.

In December 1902, the Poldhu station began the first trans-Atlantic wireless telegraph service; and with various modifications from time to time this service continued until June 10, 1922, when Poldhu was finally closed for public transmissions. After that the station was used by C. S. Franklin in his experimental work with Marconi on directional short-wave transmission. Poldhu was dismantled in 1933; to-day a memorial column of granite marks the site, and inscriptions on three of the four plaques on its sides summarize the achievements described above. The fourth plaque records that "The site of this column and some six acres of land on the edge of these cliffs together with the cliffs and the foreshore beneath them were given to the National Trust in 1937 by the Marconi Company to commemorate the pioneer work done at the Poldhu wireless station between 1900 and 1933 by its research experts and radio engineers".

In concluding this article, reference may be made to another milestone in the development of radio communication across the Atlantic. This occurred twenty years later almost to the day, when, on December 9, 1921, signals were successfully received in Great Britain from twenty-seven amateur transmitting stations in America operating on wave-lengths between 200 m. and 375 m., some using spark and some continuous-wave equipment. These wave-lengths may be compared with that of about 1,800 m. used at Poldhu, and may be regarded as an intermediate step in the development of the short waves (10-100 m.) which are now used for the bulk of the world's long-distance radio-communication and broadcasting services.