

RADIO MAGIC

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Magic, Myth and Marconi: Part 2

“Everyone steals in commerce and industry.” —Thomas Edison

“Everyone”

At the dawn of the 20th century, the fledgling commercial wireless world of Guglielmo Marconi was in total turmoil. He was no longer that idealistic and carefree teenager “playing” with wireless in his backyard with his older brother; he was now in his late twenties, facing a stern, bearded board of directors and panicky principal investors who weren’t all too happy because his Company continued to bleed red ink, and was hounded and hunted by ravenous packs of domestic and international competitors—like a wounded rabbit on the run. To make matters even worse, his close relationship with the British Postal Service (BPS) with its considerable funds and support, and its politically powerful director, William Preece, ended on a sour note when he formed his own wireless company to go it alone because of divergent differences. Preece wrote derisively about this in *Page’s Engineering Weekly* (issue 2):

“Unfortunately, Mr. Marconi was captured by a financial syndicate, and his relations with the Post Office were severed. Nearly six years have elapsed, and yet the system has not yet reached the practical stage. It is still experimental. Marconi's ambition is evidently to conquer great distances. It is not wanted across great oceans—it is wanted across narrow, rocky channels, and between tide swept island homes.”

Even a 14-year sole source contract with Lloyd’s of London to only use his wireless equipment at their lightship and land signal stations wasn’t a big enough “bandage”; Marconi’s Wireless Telegraph Company was heading slowly but surely towards the rocks of bankruptcy. The embryonic wireless technology, itself, was no longer a “backyard” activity—it had gone global, and many conflicting wireless patents were issued on top of other countries’ existing patents because each rival nation (and courts) favoured their own native sons. For example, in early 1900, Marconi’s famous four sevens “7777” British patent was granted even though it was based on the total obfuscation of any prior knowledge of earlier well-known wireless works. But when he tried the same stunt on this side of the Atlantic, it was rejected outright because the U.S. patent office noted, somewhat incredulously, “Mr. Marconi’s *pretended ignorance* of the ‘Tesla oscillator’ was a little short of absurd.” The Tesla oscillator (“Tesla coil” to us), invented by Nikola Tesla in 1891 (see Figure 1), was the most powerful spark gap wireless transmitter on the planet; capable of transmitting spark gap electrical energy and/or Morse code messages using telluric (earth) currents or ether (Hertzian) waves.

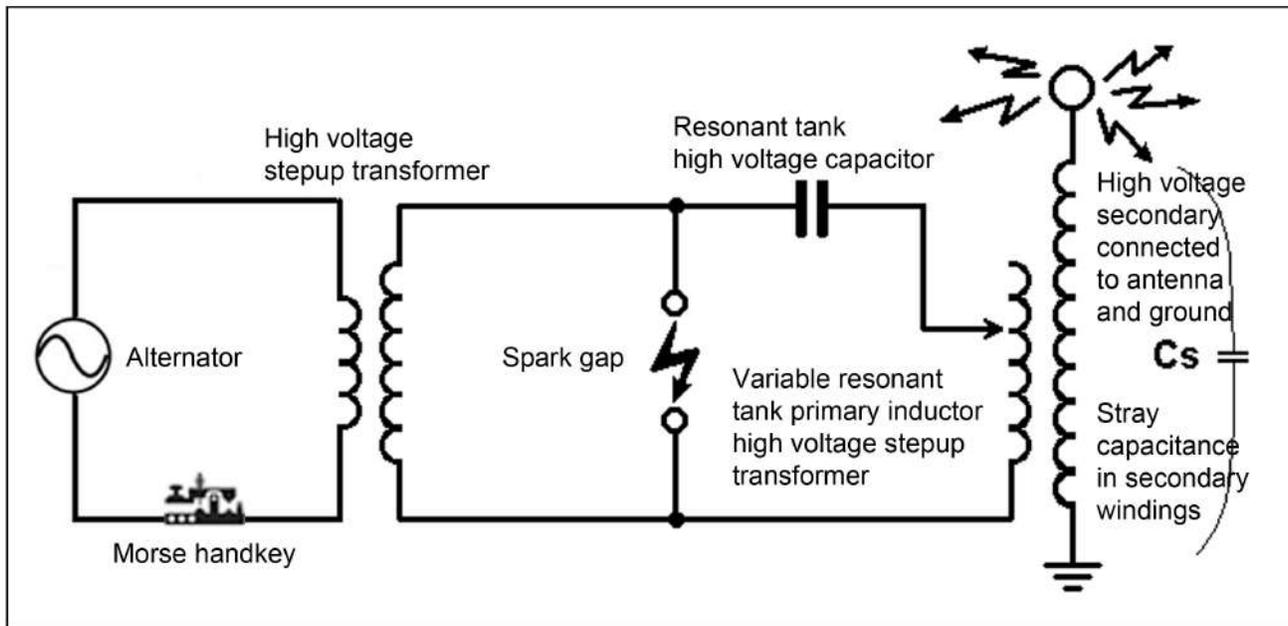


Figure 1: Tesla oscillator/coil spark gap transmitter

It could be tuned from very low (VLF) to medium frequencies (MF) and capable of generating huge amounts of radio frequency (RF) energy. Tesla blatantly “borrowed” from the “spark-excited resonant transformer”, invented in 1889 by physicist Henry Rowland who neglected to patent his design.

Tesla believed that the first method was the future for wireless applications while Marconi believed it was the second. But Tesla somehow convinced or deluded himself that his opponent also planned on using telluric current transmissions and his transmitter to steal his thunder as he had done to Lodge, a few years earlier (see part 1). Nikola was mostly correct, except he didn't know when and from where Marconi would strike to make his attempt.

A combined game of blind man's bluff, poker and chess was about to be played by the two men to determine who would rule and shape this "kingdom". But a wireless "arms race" also began for world dominance and control of this new technology among the British, French, German and Russian Empires versus American Manifest Destiny. Adolf Slaby, a study buddy of Heinrich Hertz, who just so happened worked with Preece and Marconi during their wireless signalling experiments across the English Channel, immediately recognized its [military] significance; everything he learned and observed was duly and dutifully reported back to the very interested German Kaiser and his Imperial War College. And on the home front, Professor Oliver Lodge was also on a tirade; he formed his own wireless company to go head-to-head against the young upstart, and give him a good and proper schoolboy "trashing". But, I digress...

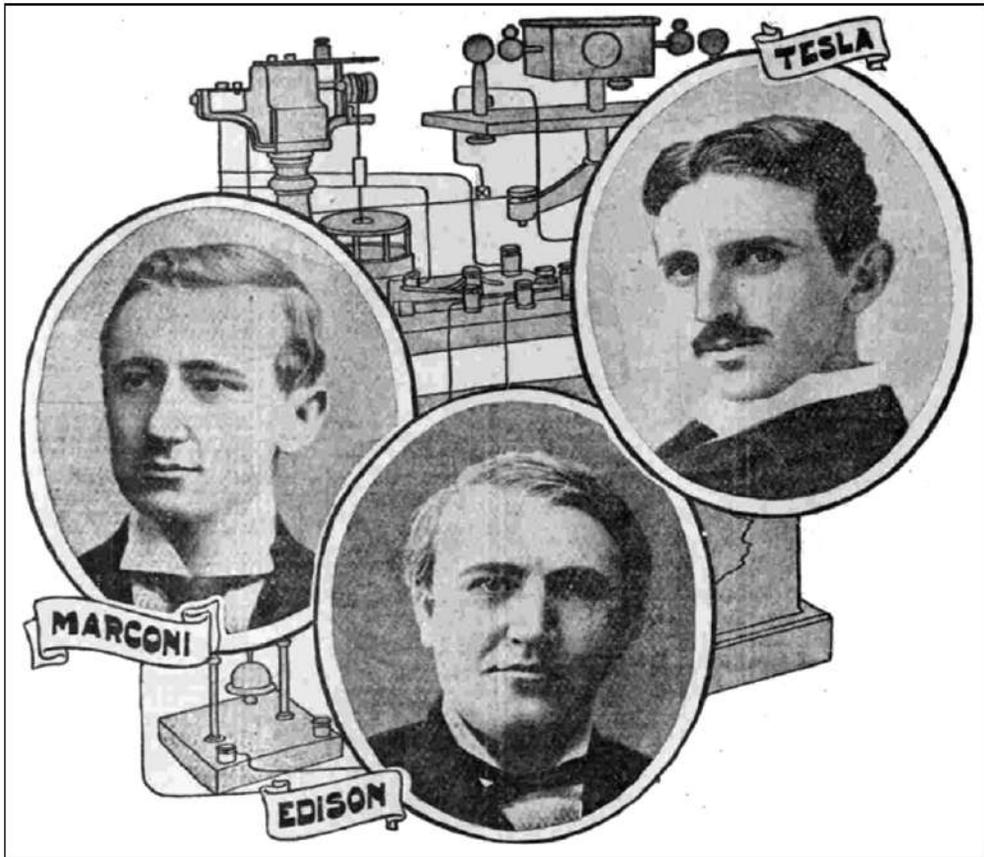


Figure 2: The King and the Princes

Edison would do everything in his power to thwart Tesla and see Marconi seated on the wireless "throne". Credit: *The Topeka State Journal*, "Latest Discoveries in Wireless Telegraphy", 1 January 1901.

Because of the U.S. patent office rejection, "William" Marconi (his name anglicized for the English-speaking market) had a very tenuous toehold in America, going up against many regional telegraph landline turned wireless companies, all of whom were jousting for the same investor capital, and they certainly didn't take too kindly to this foreign "page boy". In "My Father, Marconi", his daughter Degna Marconi writes: "After father went to England he became rather a dandy, but even London tailoring failed to disguise his youth. Reporters wrote, when he arrived in New York for the first time, that "he looked the student, with dreamy eyes."

Ouch! It also didn't help that her father was naturally shy and reserved, and was not at all comfortable in the limelight. His rival, Tesla, also dressed the part (in ill-fitting clothes) of a high society dandy, but Nikola was very flamboyant, confident, gregarious, tall and swarthy with a macho-man moustache. But more importantly, he was a naturalized U.S. citizen and therefore "one of us". Everyone knew the three renowned "combatants" involved and their intertwined relationships (see Figure 2, previous page); everyone now waited with bated breath to see who would emerge victorious in this wireless "war". Tesla bested the "Wizard of Menlo Park" (Thomas Edison) in their famous "War of the Currents", and everyone expected Tesla to easily put down the young "usurper" Marconi despite Edison's behind-the-curtain assistance.

"They"

The cable companies had the most to lose in this war because they greedily controlled a vast global telecommunications money making "empire" (see Figure 3, next page), and they were doing their very best (or worst) to sabotage any wireless interlopers by using their considerable monies, legal and political clout to thwart them every which way. They weren't going to give up without a long, expensive and drawn out fight to the bitter end. The mercantile maritime world was the primary user of the global telegraph cable communication systems; any ship's captain, at any major world port could easily, quickly, and confidentially communicate back and forth with his company and/or agent(s) using the transoceanic telegraph cable and landline communication systems that encircled the globe, and that was something that wireless just couldn't do in the first years of the 20th century because it had no infrastructure whatsoever.

However, in just five short years, spark gap Morse code wireless messaging distances increased to an amazing 300 kilometres (km), but because there was no transoceanic wireless communication capability, any wireless messages received overland and needing to go overseas were transferred to a competing cable company that, quite naturally, added a hefty handling surcharge, which increase wireless operating costs to cross oceans.

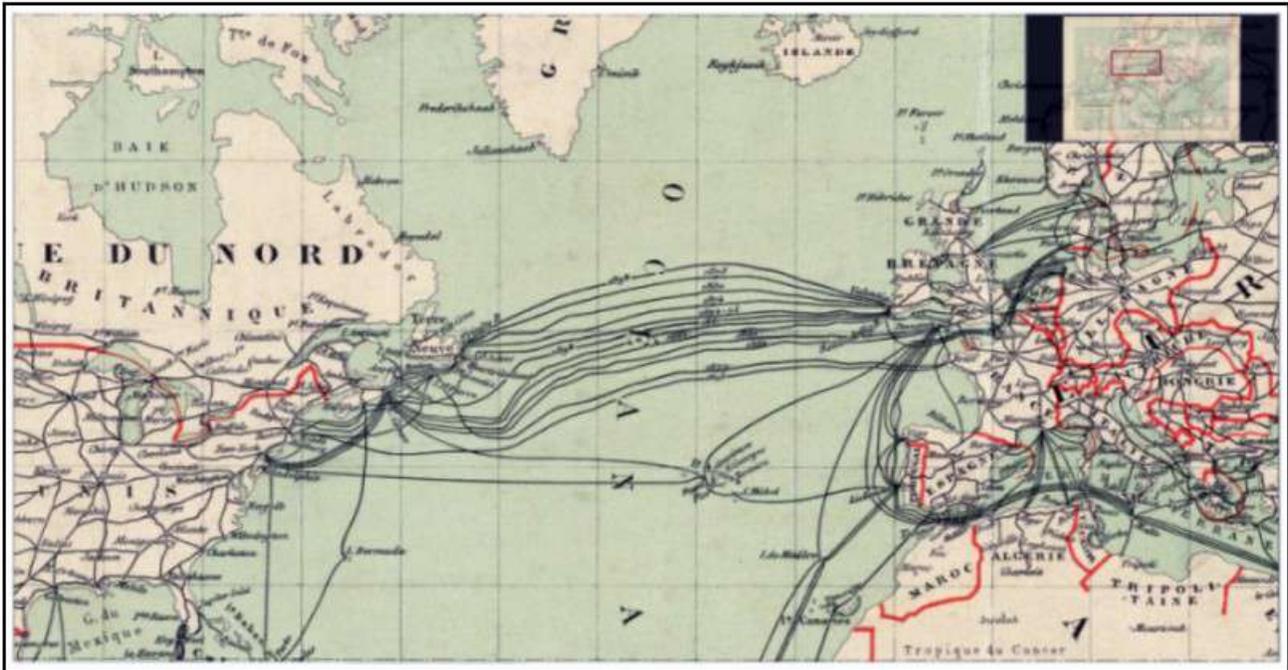


Figure 3: Telegraph landline and cable map

Small segment of a world map with already over 320,000 km of telegraph landlines and undersea cables circling the globe in 1901. Note the number of money making, two-way Atlantic Ocean cables between Europe and North America. Credit: Norman B. Leventhal Map Center Collection, Boston Public Library.

Wireless had to break the domination of the cable companies and drive down messaging costs so that it could compete for customers and the only way to do this was to hit them in their only Achilles heel—the extremely high cost of laying down new and continually repairing old undersea cables each year (millions annually in today’s dollars). This cost was only more than offset by the tremendous amount of two-way revenue messages generated between European and American markets (stock, bank, shipping, mercantile, etc.). They could only be “dethroned” if and when wireless signals were successfully sent and received across the Atlantic.

The Tesla Factor

Unlike Marconi, Nikola Tesla wasn’t born under a lucky star with a silver spoon stuck in his mouth. He was born, in 1856, during a fateful and frightful lighting storm with a crazy-scary genius and Nostradamus-like gift of prophecy. A self-made man, he left his native Serbia with a few dollars in his pocket and a letter of reference that got him hired by Edison.

But two alpha-male geniuses under the same roof was one too many, and they soon had “failure to communicate”, allegedly over money owed to Tesla, but more likely over Edison’s direct current (DC) versus Tesla’s alternating current (AC) power generating and distribution systems. Tesla left to go it alone, but his short-lived AC electric power company failed (he was a truly awful businessman), so he joined forces with Edison’s life-long “archenemy” George Westinghouse (Westinghouse Electric), who was a truly brilliant business man, and the “War of the Currents” was on. Tesla “weaponized” Westinghouse with his AC patents, and later forgave a fortune in owed royalties so Westinghouse could hold the line against Edison. Tesla truly believed his inventions should be for the benefit of humanity and not for the benefit of his bottom line (he would die a pauper). When Westinghouse won the contract to light-up the famous 1893 “World’s Columbian Exposition” (Chicago, Illinois) using AC, Edison grudgingly yielded the field and retreated to live and fight another day. It was a Pyrrhic victory because “When you strike at a king you must kill him.”—Emerson.

In early 1901, Tesla boasted loudly and boldly (and too often) in the press that he would be the first to send wireless signals across the Atlantic within the year from his soon-to-be-built Wardencliff Tower, near Manhattan, New York (see Figure 4, next page). Perhaps it was a feint to force his foe’s hand because Nikola knew that he was sitting back on his heels playing defense, and a good jolt would force him to come out from his “castle keep” and fight. But Marconi stayed put, bit his tongue, and waited for everything to be ready and right. But then an unexpected blow from out of the blue struck suddenly when a major U.S. wireless company offered cheap, speculative “get rich quick” stocks based on what Tesla was saying (without actually mentioning his name) using large and bold advertisements (see Figure 5, next page). This quickly siphoned off badly needed monies away from Marconi’s U.S. based company; he couldn’t afford to wait—it was now or never!

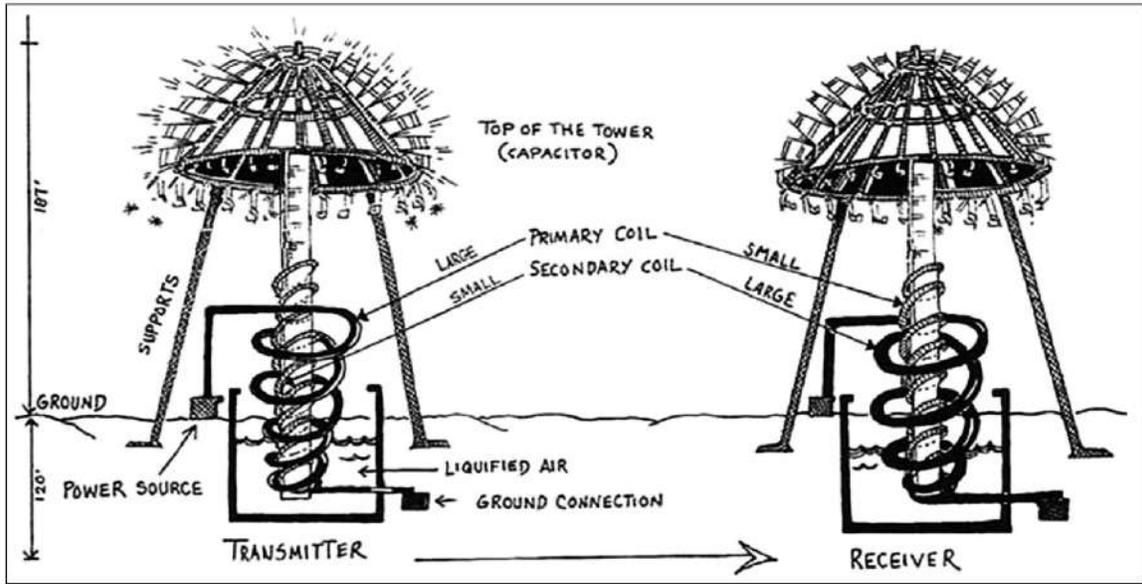


Figure 4: Tesla's real plan

The envisioned worldwide “wireless” electric power generating and distribution system, but it was never developed beyond a small-scale model. Credit: Nikola Tesla, ca. 1893.

A PHENOMENAL RECORD.
WIRELESS TELEGRAPHY STOCK will soon be difficult to secure at any reasonable figure.
Your Opportunity is Now.
50 cents a Share
Until November 1.
 It is Predicted by Eminent and Well-informed Financiers that Stock in the
FEDERAL WIRELESS TELEPHONE AND TELEGRAPH COMPANY
 Will Advance in Price to Several Dollars a Share Within the Next Few Months.
THE ONLY QUESTION FOR YOU TO DECIDE.
 The Cream of the Whole Territory in the United States is Absolutely controlled by the
FEDERAL WIRELESS TELEPHONE AND TELEGRAPH COMPANY.
The Whole World is Talking About Wireless Telegraphy.
 The inventor of this system, in an interview in the “New York Journal” on August 20th, states that he has no more doubt that he will in a short time be sending wireless messages across the Atlantic Ocean than he has that cars run up Broadway. A Most Marvelous Invention!
Don't Delay. The Opportunity is Yours. Will You Grasp It?

Figure 5: U.S. wireless stock promotion

The Federal Wireless Telephone and Telegraph Company was a small subsidiary of the American Telephone and Telegraph Company (AT&T). It was involved in a decade long stock swindle (among many at the time) that left investor's with worthless paper. Credit: *The Washington Times*, 27 October 1901.

The Plan

Marconi lacked Tesla's raw genius, but he had the business acumen and ruthlessness of his idol Edison combined with the instincts and battle tactics of a young Napoleon. Plus he had the very best of the very best "electricians" (electrical engineers) working in his camp. One was the ramrod rigid, ex-Royal Navy petty officer George S. Kemp, who just so happened worked for the BPS and assigned by Preece, in 1897, to mentor the young and inexperienced Marconi in his wireless quest. Kemp became Guglielmo's life-long assistant and loyal lieutenant; he was like a second older and protective big brother (see Figure 6). The two men worked together for 35 years (until Kemp's death)—much longer than Marconi's two marriages!



Figure 6: Kemp and Marconi

Still from the first silent film made about wireless. George Kemp's (seated) hand is on a "grasshopper" key next to a spark gap transmitter. Marconi reads a Morse code register (printer) paper tape. Credit: Biograph Company, 1902.

Another was John Ambrose Fleming, who just so happened was a former Edison-Swan British electric light company engineer. He was contracted to design and build the required “weapons of war” for the soon-to-be famous Poldhu (south Cornwall coast, England) wireless station—namely the AC electrical power plant and high-powered spark gap transmitter (a Tesla coil, badly done) connected to a massive vertical antenna array.

When Marconi’s board of director’s was told of his daring plan and the cost they were absolutely horrified because its failure would mean utter financial ruin for him and his company (and them, too) if any word leaked out to the press and the stock market because the BPS (Preece), Lodge or some other wireless conglomerate would just swoop in for the easy “kill”. Everyone knew Tesla was a boastful braggart who was all too prone to over-exaggeration (“all show and no go”), so let him to try first because he most likely would fail in spectacular fashion and that would be the end of that. But Marconi realized it was really a coin toss because the double-edged “Sword of Destiny” swings and cuts both ways and Tesla could just as easily succeed in spectacular fashion, and that, indeed, would be the end of that! The 27-year old Guglielmo steeled himself to go all-in (and all-out) in a “blaze of glory”; he gambled the staggering sum (even for that time) of 50,000 British pounds sterling (15+ million dollars, today) to be the first to do what many men of science thought was impossible—“when pigs fly”—to be the first to send and receive a wireless signal across the Atlantic!

He initially intended to sail from England to the United States (Cape Cod, Massachusetts) taking only the loyal Kemp and another trusted employee (Percy W. Paget) with him. His board of directors demanded that everything must be done in strict secrecy so no third party witnesses, whatsoever, were to be present. His word of honour as a “proper” gentleman would suffice—if he succeeded. In either case, he must notify them immediately so they (and the principal investors) could buy or sell company stocks before the general public press release increased or decreased their value. *Note: At the time, “insider trading” was perfectly legal in Great Britain and considered an executive “perk”.*

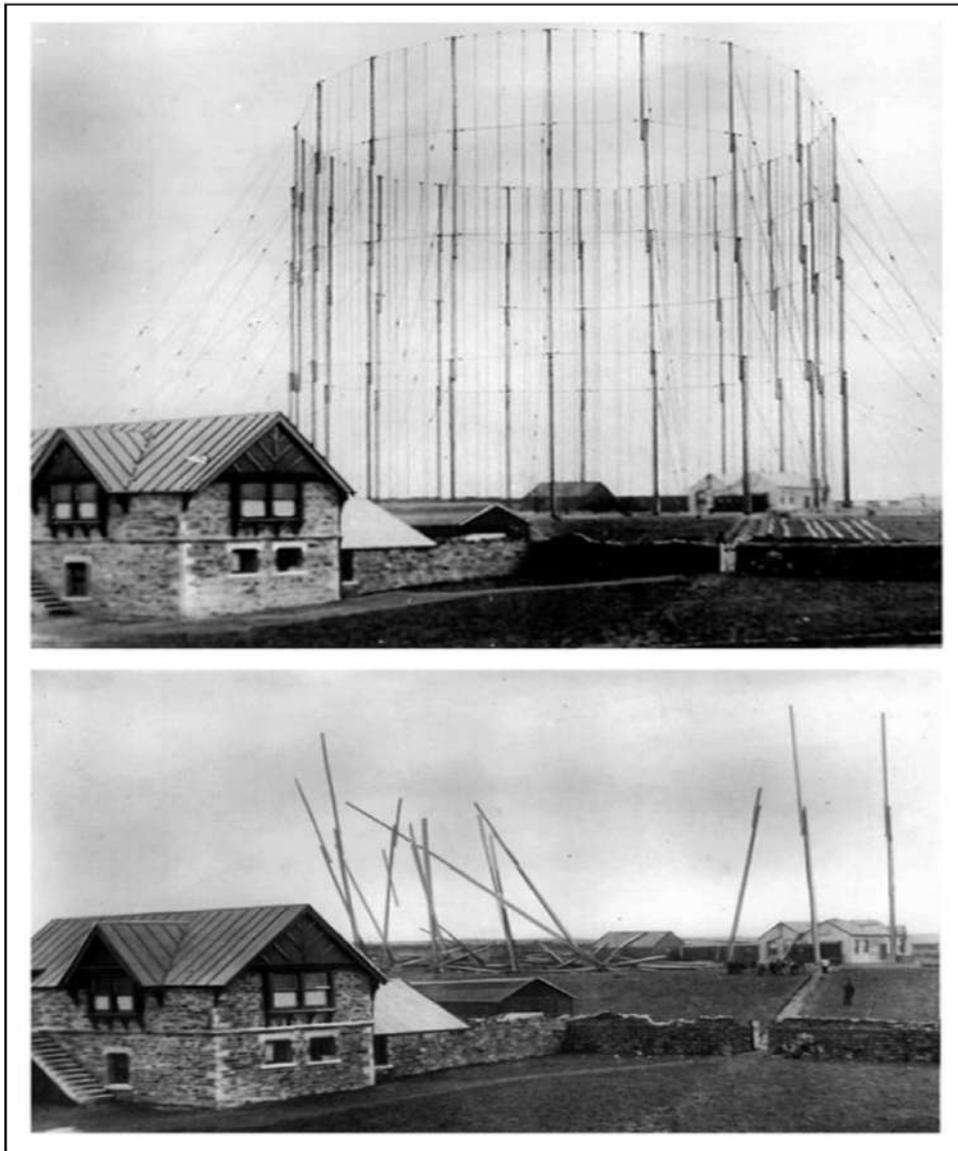


Figure 7A: Poldhu original antenna before and after

The original antennas at Poldhu and Cape Code consisted of a ring of twenty 50 m tall wooden spar masts using 400 wires (!) in an inverted cone. Credit: Archive of Marconi Corporation, PLC.

By early September 1901, everything was ready to go at Poldhu as was the intended receiving station constructed at Cape Cod (about 4800 km from England). Then a hammer blow, literally struck from out of the blue, when a raging Atlantic storm demolished Poldhu's structurally unstable antenna array (see Figure 7A). Then, incredibly, the Cape Cod antenna (same design) collapsed during another Atlantic storm a few weeks later!

If Tesla suspected Marconi was up to something, he must have thought that there was just no possible way his “wounded” adversary would be able to recover until the next year. Perhaps Tesla thought that he now had the field all to himself and could easily “finish off” Marconi at his leisure.

A Hill to Die On

But it turned out that Nikola was wrong—dead wrong! A redesigned replacement antenna was secretly and hurriedly erected by Kemp and ready by late November 1901, albeit far less capable than the first (see Figure 7B, next page). Still fearing that Tesla would make his attempt before Christmas (the “fog of war” now engulfed both sides), Guglielmo decide not to delay and departed immediately for St. John’s, Newfoundland, instead of Cape Cod because it was closer (about 3700 km from England). Unbelievably, he made this fateful decision even though he knew that everything needed to build a wireless receiving station “al fresco” (only Poldhu would transmit signals) had to go with him by ship because there was nothing but old, abandoned, ramshackle buildings at the place to be selected called “Signal Hill”.

But Kemp knew St. John’s very well because he served onboard the British cruiser HMS Blake when it raced to the rescue, from the British naval base in Halifax, after the early July 1892 “Great Fire of St. John’s” incinerated much of the City leaving over 11,000 people homeless and desperate. He had the contacts there who could help and who could be trusted to keep quiet because secrecy was everything—especially if things went south. Fortunately, St. John’s was also a hub for transatlantic cable two-way messaging and Marconi could keep constant, confidential contact with Poldhu. It was rather ironic that the future of two-way wireless telegraphy now depended totally on two-way landline telegraphy!

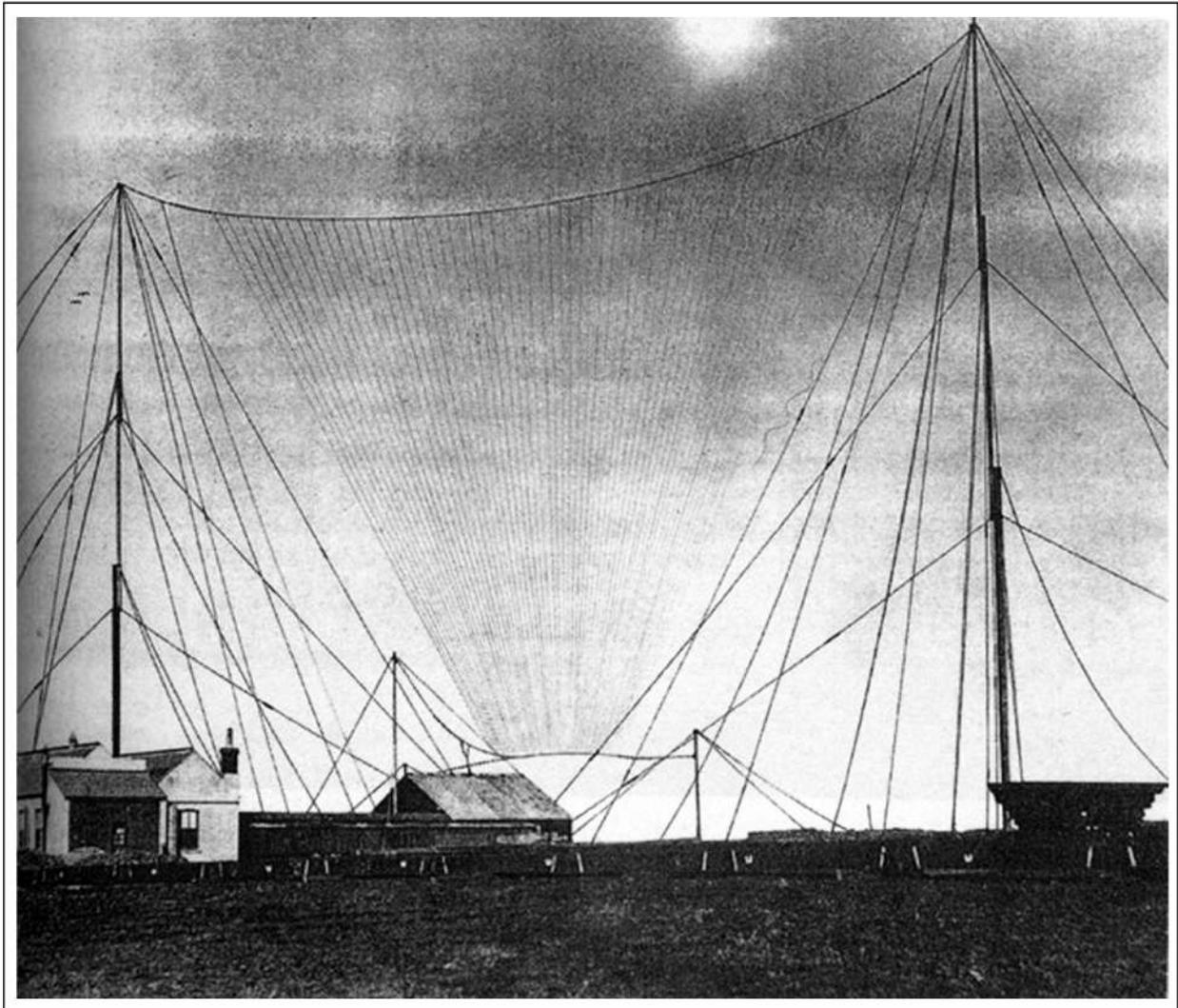


Figure 7B: Poldhu replacement antenna

Used only the once, it consisted of 50 wires (according to Kemp) arranged in a fan shape array supported by a messenger rope strung between two 60 m tall wooden sectional spar masts.

Credit: Archive of Marconi Corporation, PLC.

Prior to departing for St. John's, Marconi released a carefully crafted cover story (see Figure 8, next page) to explain the purpose of his overseas trip in order to deceive Tesla (and anyone else). "All warfare is based on deception."—Sun Tzu

Figure 8: The cover story

Credit: *The San Francisco Call*, 24 November 1901.

MARCONI WILL TRY THE NORTH

Celebrated Inventor to Experiment in New- foundland

Special Dispatch to the Call

London, Nov. 23.—Marconi will sail Monday for St. John's, Newfoundland to carry out some interesting scientific experiments. As it would be tedious and expensive work to erect a huge mast at each spot selected for an experimental station Marconi takes with him two balloons of 20,000 cubic feet capacity. These balloons will be used to suspend aerial wire from the shore station. Ordinarily the balloons will be kept about 150 feet in the air, but may be up about 300 feet.

The sea station will be on a steamer equipped with a pole 120 feet high. The effect of rocky shores, enclosed bays and fogs will be studied. Electrical disturbances at present form one of the most aggravating obstacles to distinct and uninterrupted communication.

"It is quite possible that the result of our trip will be nil," said Marconi. "It has been claimed that there are certain atmospheric conditions more favorable to wireless telegraphy than others."

"Do you expect to reach a greater distance by making experiments from a balloon?" asked The Call correspondent.

"No. I think the present maximum of say 200 miles, is as far as communication is likely, at least for some time to come."

It was a truly crazy insane plan!

Guglielmo had to get to St. John's with all his gear (some was damaged in transit), then quickly set up and work, in what turned out to be just awful weather conditions, leaving him only a few days to catch "flying pigs" wireless signals transmitted from Poldhu before he was found out. But with no other options, no time or money left, "William" would raise his battle standard on Signal Hill, and on that hill he must conquer or die.

My Final

Part 3 uses George Kemp's first person account of the events on Signal Hill; then Marconi speaks about his work in his 1909 Nobel Prize lecture. It was the time when wireless was all the "teenage rage" of the Edwardian Age; when early Amateurs blazed their own trail through the ether and sparked a second wireless war. Everyone knew his name because it was synonymous with wireless or "radio"; even today everyone believes he invented radio, and once a myth is written into the fabric of society it can't be unwritten whether it's true or not.—73