

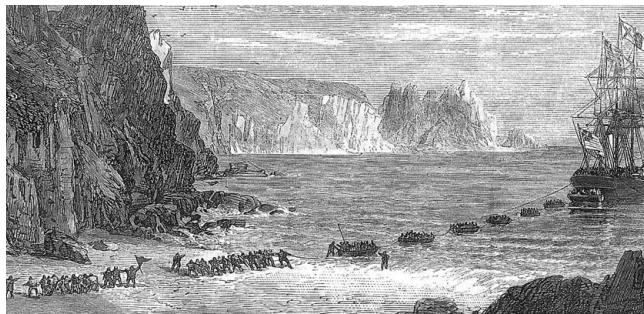
MARCONI AND THE TELEGRAPH COMPANIES

I recently took a trip to Cornwall, England to visit a couple of historic sites that figured significantly in long range international communications. Both of these sites are located at the tip of England near Land's End. It is an area of magnificent cliffs, sweeping bays and hidden coves, carved out by the full force of the Atlantic Ocean.

The first site I visited was the home of the world's largest submarine telegraph station. This is now a unique historical telegraph museum

ing. Cable systems provided independence and protection from interference (both military and political).

By 1870 a cable had been laid from England to Bombay, India. This was extended on to Australia in 1872. The English end was terminated at a cove close to Lands End in the village of Porthcurno, where a cable station was set up. The firms involved in this venture merged to form the Eastern Telegraph Company.



The landing of the first cable at Porthcurno in 1870.

buried deep in tunnels carved into granite cliffs, giving it a sort of "Cheyenne Mountain of the telegraph era" feel. The second site was where Marconi had built his high power wireless transmitter to attempt the impossible—transatlantic wireless communications.

These two locations are relatively close to each other, a fact that the telegraph companies used to their advantage. Realizing that Marconi and his wireless posed a potential threat to their business they set up, as we will see, a clandestine spy station to eavesdrop on his transmissions.

By the middle of the Victorian era, the technology employed in Cyrus Field's 1866 transatlantic cable success had reached a point of maturity. After years of experimentation, both the instrumentation and the undersea cables themselves were much improved.

By this time, Great Britain had a vast world-wide Empire to administer. The need for reliable and timely communications to her far-flung outposts had never been more important. This need helped propel the growth in undersea cable lay-

The importance of this telegraph station grew as the cable network expanded to encompass North and South America, South Africa, New Zealand and Hong Kong. Eventually 14 cables were in operation, making the installation the world's largest submarine telegraph station. It continued in operation until 1970.

Fortunately, following its closure, the site and

equipment were retained to form the "Museum of Submarine Telegraphy." The unique aspect of the museum is that it is subterranean, contained in two large tunnels hollowed out of the granite cliffs, complete with blast proof doors and internal power generators. The tunnels were excavated during World War II, when the telegraph network took on strategic importance. The cable systems were far less susceptible to interception and jamming than wireless communications.

The museum has on exhibit a wide selection of historic pictures, models and equipment showing the development from the first submarine telegraph in 1850. Included are instruments of Morse, Cook and Wheatstone, and Thompson. Later era equipment includes regenerators, Murehead transmitters, and keyboard perforators. Some of the original rooms are still intact—including the cable fault location laboratory, the instrument repair shop and the power generation room.

Located several miles away from Porthcurno, across the wide sweep of Mount's Bay, is the historic site of Poldhu. This is where Marconi set

up his 1901 transatlantic wireless station. This windswept headland is located near Lizard Point, the most southerly point in Britain, where a memorial on the cliff commemorates Marconi's achievement.

Searching around in the adjoining cow pasture, one can find concrete footing and guying blocks used for the aerals as well as remains of the foundation of the station building. (See *Gerry Bracken's letter in "Letters to the Editor" for a description of similar footings at the site of a later Marconi installation, the receiving station near Clifden, Ireland—ed*) In 1900 this was a fairly remote and isolated location, which suited Marconi as it gave him a clear view out to sea while providing an element of secrecy from his competitors and critics.

Marconi had set his sights on spanning the Atlantic. He had been progressing with his wireless system, demonstrating that he could communicate over greater and greater distances. He had successfully transmitted beyond the line of sight over a distance of 150 miles, confirming his belief that the curvature of the earth was not a problem.

He had also determined that the higher the aerial the further the signal would travel. However to cross the Atlantic he needed to radiate significantly more energy than he had been obtaining from Leyden jars; in fact some 100 times more power was deemed necessary.

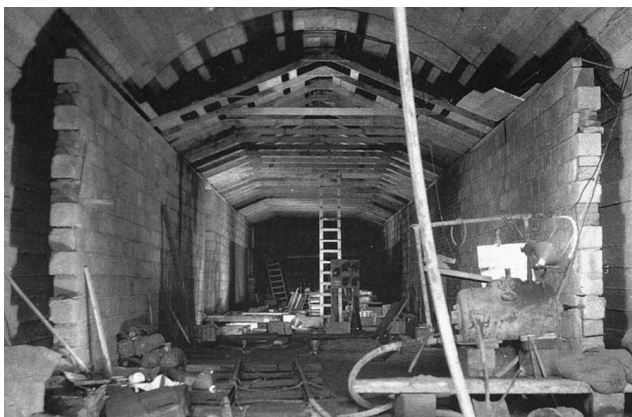
Marconi's group included his advisor George Kemp, engineer R.N. Vyvyan and scientific advisor Dr. J.A. Fleming. Construction on the site started in the summer of 1900. Bringing in some of the large components to such a remote area must have presented quite a challenge.

A 30 HP single cylinder Hornsby-Ackroyd oil engine and a 25 kW Mather and Platt alternator along with transformers, condensers, jigger coils and spark gap components, hundreds of feet of guy lines and aerial wire all had to be hauled in. Also needed at the site were poles for the ring of twenty 200-ft. high wooden aerial masts. These would support an inverted cone aerial array.

A similar wireless station was needed in America, and R. N. Vyvyan went over to oversee its construction. The station was located at Wellfleet on Cape Cod.

In September of 1901, a gale toppled the massive aerial array at Poldhu. A few weeks later the masts at Cape Cod met the same fate. It was a devastating blow. Working furiously, the debris was cleared at the Poldhu site and a smaller and simpler fan array supported by two poles was constructed. Marconi modified his plans and decided to try for a transatlantic transmission over the shorter distance to Newfoundland rather than to Cape Cod.

In the Poldhu transmitter, the alternator output was coupled to the primary of a 2000 to 20,000 volt step-up transformer. The transformer fed two spark gaps operating in cascade and coupled by a jigger (high voltage air core transformer) with the output of a second jigger connected to the aerial and earth. The values of capacitors and

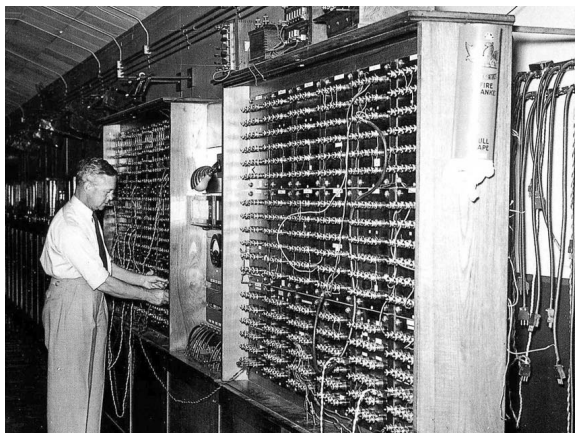


Construction of one of the cable station tunnels circa 1940.

jigger coils were arranged to broadly set the operational frequency. Keying was accomplished by switching in and out a choke in the primary circuit.

In November, Marconi, Kemp and Paget left for St. Johns, Newfoundland. Shrouded in secrecy, the trip was made ostensibly to experiment with ship-to-shore communications. On 12 Dec 1901, Marconi used a kite to send up an aerial at St. Johns. With it he was able to receive the test signal transmitted from Poldhu—the Morse code for the letter “S.” Elated, he sent a message to Poldhu confirming the success via the Anglo-American transatlantic telegraph cable.

Here the story takes an interesting twist, as I learned from my visit to the Porthcurno Telegraph Museum. As documented by John Packer in “The Spies of Wireless Point,” Marconi's success was a wake-up call to the telegraph companies. They suddenly realized what a threat long-distance wireless technology posed to their



Main terminal board for interchanging telegraph lines and equipment.



Tower commemorating Marconi's work at Poldhu.

businesses.

Their first action was to tell Marconi to cease and desist, since the Anglo-American Telegraph Company had a monopoly on communications in Newfoundland. Next it was necessary to determine how big a threat wireless posed and to see if it could be derailed somehow.

The telegraph companies determined that they had to find out first hand how Marconi's wireless really worked and how much progress he was making. Did the system work 24 hours a day, like cable, or only during certain times? How fast could messages be sent? Were the messages reliable or full of errors? In short was Marconi

going to put them out of business?

To get this information, they needed to spy on Marconi's operations, and a number of plans were put into action. Marconi stock was purchased so board meetings could be attended. The Eastern Telegraph Company at Porthcurno, which was in a strategic location, undertook to intercept Marconi's wireless transmissions.

To help in this clandestine operation they needed someone with wireless knowledge and hired Nevil Maskelyne to erect an aerial and wireless hut on the cliff top above Porthcurno. This site was several miles away on the other side of the bay from Marconi's transmitter. According to John Packer, the Directors' minutes for the Eastern Telegraph Company, normally highly detailed, appear purposely vague on this clandestine wireless project.

What Maskelyne discovered was the lack of privacy associated with wireless transmissions, the lack of immunity to interference, and Marconi's difficulties in developing selective tuning (syntony). This information of course was communicated to the press as a way to discredit wireless technology and embarrass Marconi.

To add further embarrassment, Maskelyne carried out another attack. Dr. Alexander A. Fleming was set to present a lecture on wireless at the Royal Institution in London in 1903. Part of his presentation was to demonstrate reception of a transmitted message from Poldhu. However as the lecture got underway the Morse printer connected to the receiver started to print out embarrassing messages that certainly weren't coming from Poldhu!

Maskelyne was sending the rogue messages from his own transmitter not far away from the



Foundations of the Poldhu wireless station.

Royal Institution. Fleming was irate and called the prank “scientific hooliganism”—but had no idea where the false messages were coming from. Maskelyne eventually owned up, stating that he only wanted to demonstrate the system’s lack of privacy and its susceptibility to interference.

Eventually the Eastern Telegraph Company began to see the benefits of wireless, especially for ship-to-shore communications, and started installing it on their cable laying ships. As wire-

less usage grew, the British Government believed that an integrated network of cable and wireless services would best serve the interests of the Empire. A merger between some divisions of the Marconi Company and the submarine cable companies—forming the Cable and Wireless Company—was initiated in 1934. ☐

The author would like to thank the Porthcurno Telegraph Museum for providing photographs and information.

BREADBOARDING, *continued from page 41*

able to rework the converter to bring it up to 3.5 MHz, and added a BFO. It was ugly, but it taught me a lot about how tubes work at low voltages.

Finally, over the last thirty years or so, some of us have forgotten the “one hand in the pocket” rule that we followed when working on tube gear. Poking at circuits with bare fingers has become common in the solid-state era, and with space-charged circuits, you can poke away (and allow

your kids to tinker as well) without fear of electrocution. Have fun! ☐

NOTES

- (1) <http://www.duntemann.com/12vtubes/12vtubesindex.htm>
- (2) <http://www.olderadios.co.nz/hikers/>
- (3) <http://www.amfone.net/AMPX/64.html>
- (4) <http://http://www.thomasdog.com/amps/sopht/index.htm>

THE POWERIZER MYSTERY SOLVED

A reader of my column on the “Powerizer” in the July, 2007 *Journal* has confirmed my theory that the unit was intended to convert battery radios to AC. I was delighted when a copy of Powerizer Junior Operating Instructions came over the transom. My apologies to the sender, whose name I think is well known to readers. But it was written on the mailing envelope only, and flew into the circular file. The copyright date on the pamphlet is 1928. Though the Model P-171 Powerizer Junior is half the size of my model PXY-1 the two units are used similarly. They are, and I quote, “designed for the set owner who, having a good battery set, desires to convert it to complete AC operation employing the new AC tubes and who believes that the output of the 171 tube is sufficient for his needs.” The

set owner could either rewire his filament connections or use a Powerizer wiring harness, with adapter sockets, specifically designed for his set. If you had an A-K, Fada, Freed-Eismann, Kolster, Radiola 16, Sonora, even certain early Zeniths, a Powerizer could bring you right up to date and do away with that nasty car battery under the table. The Radio Receptor Company, maker of the Powerizers, sold a number of kluge-type accessories to help the determined owner free himself from batteries while avoiding the purchase of a new AC set. External volume controls, tube adapters, and series grid resistors could all be had from R-R by mail. The Powerizer market probably dried up about 1929, when AC-only sets had become widely sold.

—Dick Parks