

# A Brief History of Spark Gap Transmitters

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The first thing to stress is that "SAFETY WAS NOT A MAJOR CONCERN" during the days of Spark, some of the methods used were VERY DANGEROUS. That having been said that, lets move on. There was a certain amount of excitement that was associated with Spark Gap transmitters. Without getting into the theory or design of these Spark Gap Wireless transmitters, lets attempt to get an over-view of their operation.

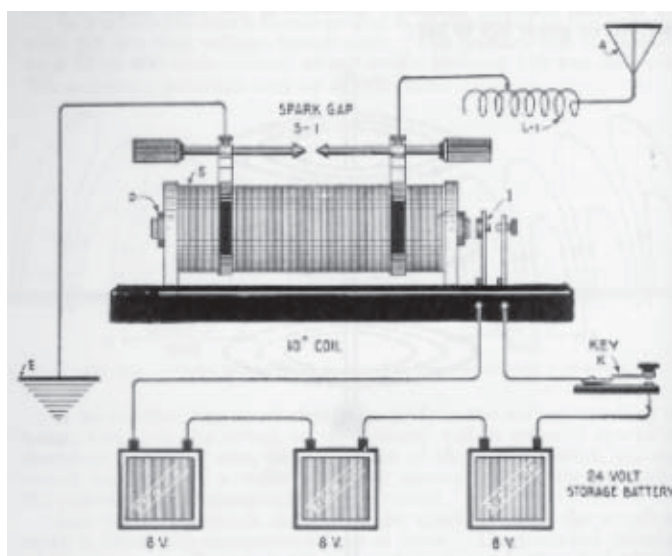
In their simplest form, some of the early models' of the wireless transmitters were designed by Guglielmo Marconi a young Italian inventor. By the age of 21 he had studied many of the experiments of Maxwell and Hertz, and was convinced that it was possible to transmit signals by electromagnetic waves. After having performed many of the experiments himself, Marconi had proven that it was indeed possible to communicate by electromagnetic waves. Some of his early wireless transmitters were powered by either low voltage storage batteries, or a D.C. dynamotor which would produce 5 to 30 volts D.C. The low voltage was fed to one side of a telegraph key. As the telegraph key was depressed, and the



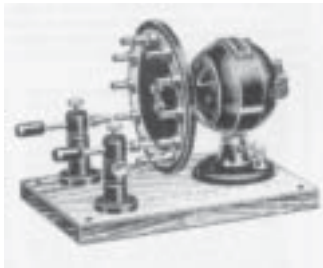
circuit closed, current would flow into the primary side of an induction coil. This would induce high voltage currents to flow in the secondary windings of the coil.

These high currents would charge the antenna, then discharge across the spark gap electrodes to ground. This action would produce electromagnetic waves for each discharge across the Spark Gap electrodes. The antenna was connected to the induction coil by means of another coil with a moveable tap. A broad band wave would then be radiated from the antenna.

Another of the Marconi designs employed a low voltage A.C. source. This low voltage A.C. was fed to the primary side of a transformer. When the telegraph key was depressed, this induced high voltage currents to flow in the secondary windings of the transformer. The high voltage alternating currents at the secondary of the transformer could range from 2000 volts to 25,000 volts A.C. These secondary high voltage currents were then fed into a tuned circuit, which is inductively coupled to the antenna. The alternating currents in the secondary would alternate back and forth within closed oscillator circuit, which was made up of a coil, high voltage condenser and spark gap electrodes. The high voltage currents would first charge and then discharge at a frequency twice that of the source voltage across the gap electrodes. Next the currents were induced into the antenna through a transformer and then radiated.



Other designs would employ a rotary spark gap, also known as a multiple spark system, which was motor driven. On the shaft side of the rotary would be a rotating arm with two electrodes 180 degs apart which would rotate like a wheel. Around the outside of the two rotating electrodes were several fixed electrodes. As the rotary spun, and the telegraph key was depressed, the high voltage currents would discharge across the gaps of the rotary. With each make and break of the heavy copper contacts on the telegraph key, sparks would jump the gap of the electrodes. The rest of the circuit would be somewhat the same as was discussed above. As you can imagine, the contacts of the telegraph key needed to be able to handle 16 to 18 amps. Not only did the telegraph key have to employ heavy contacts, but the electrode gap contacts themselves would heat up due to the discharging of the stored energy. The rotary in the museum uses heavy copper blocks on both the rotary wheel, and for the two stationary contacts. In a Steam and Wireless Museum in South Rhode Island they had a working spark gap transmitter. One can hear the sounds that were made not only from the rotary but likewise the sparks that produced when the telegraph key was depressed, it was quite a sight.



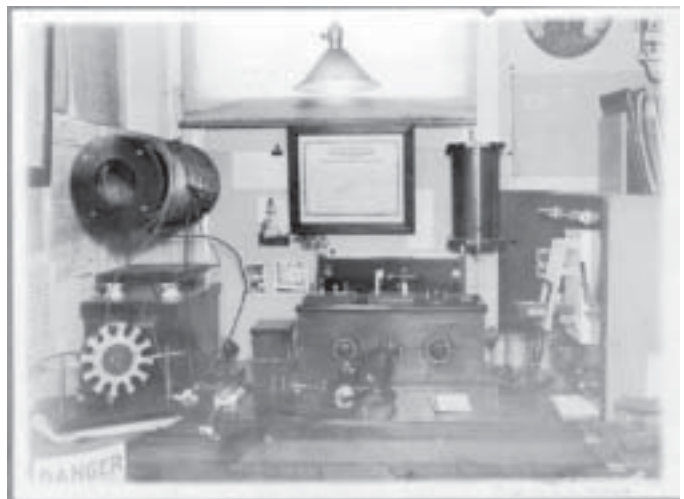
The sounds of the rotary turning and the sparks jumping the air gaps can be heard all over. In the early days of radio these were common sounds. The energy generated by this method was very powerful and obviously dangerous. These were the days when amateurs were experimenting with various ways of generating a wave, various antenna configurations, and receiving apparatus possible. The actual signal produced by this method was very crude sounding as the waves were produced by alternating currents.

Large coils had to be hand wound for use as transformers, oscillator and antenna coils. Large knife switches were used to switch not only the power, but were also used to switch the antenna from the spark gap to the receiving apparatus, as well as antenna to ground. The greatest distance they were able to transmit was about 100 miles. Some might remember pancake transmitter inductances and loose couplers

that made up important parts in the then modern station. A typical station in 1916 might include a ½ kw transformer that supplied 14,000 volts, an eight section condenser and a Hy-Tone rotary gap. The receiver, or Audion was used for reception with Crystaloi and Perikon detectors which served for most of the work. Completing the station might be a six wire antenna 70 ft high. Although this structure is now called an antenna, it was also known as an aerial.

Radio communications had come a long way from the early on experiments of Hertz, Maxwell, Marconi and others. Although the Spark days were quite unique, radio was moving forward. Like everything else, Spark was destined to give way to the next phase of radio. For some, the move to the next phase would be an easy one. While for others the change from Spark would not come so easy.

The American Radio Relay League was founded



by Hiram Percy Maxim and Clarence D. Tuska around June or July 1914. Amateur radio was growing and it was now time for the hobby to move out and make its' mark in the world. Somewhere around 1920 through 1922, spark was on its' out, and radio was beginning a new era.

There are many articles on Maxwell, Hertz, Marconi and others who have contributed. You can visit your local library and read up on some of the very interesting experiments they had performed. Even today radio is undergoing many changes. Transmitting modes have changed from CW and AM to SSB and DSB, from SSB, DIGITAL, DSP, BAUDOT to ASCII CODE and AREALS to SATELLITES.