# The Radio Hotel – Antenna Origins – Part 1

## By Rick Hiller -- W5RH

"Sherman! Set the Wayback Machine for Bonn, Germany 1886," requests Mr. Peabody on The Rocky and Bullwinkle Show. "We are going to visit Dr. Heinrich Hertz at the University". If only we could do just that, time travel, wow! However, the only way we can go back in time is thru contemporary articles, books and pictures. For me, researching the beginnings of antennas (and radio, really) was quite shocking (pun intended). You see, the basis of RF experimentation for Dr. Hertz was the electrical "spark". Moving forward in time, to just inside the 20th Century, the method of transmission for wireless telegraphy communication, including Hams, was also "spark". Spark based communication has a nomenclature of its' own. Words like brushing, decrement, EMF reception factor, wave train and Signal to Stray Ratio are quite commonplace and need to be defined during any research. Spark, due to the mechanical method of generating higher frequency pulse, was limited to 200 thru to 600 Meters. We know this as 1.5MHz to about 500 KHz. Currently the AM broadcast band.

Ward Silver, in his 2014 Greater Houston Hamfest presentation, delineated Ham Radio history into 5 Generations…the first, 1901 to 1924, he called "Spark and Mad Scientists". With that moniker I completely concur. This time period is the focus of this article - Part 1.

**Antennas Determine the Operating Frequency**

Simply, a spark is a pulse of energy. A sharp pulse, like a spark, contains a wide band of frequencies. That is why your car's ignition noise, if you have that problem in your HF mobile set-up, is typically heard on many bands. For the spark based Ham in the 1900's, there was a legal requirement to limit the spark's wide bandwidth. In the technical descriptions written about spark transmission systems, the antenna was described as one of the "determining factors" of the final frequency of the "wave train". The antenna, connected directly to the spark transmitter's output LC "tank circuit", had a major influence on the output frequency. As a circuit element, the antenna was an additional "capacitor" with the physical antenna wires being one capacitor plate and the Earth being another (See Fig. 1). Any changes in the antenna length or height would affect the output frequency. One comment in QST in 1922 was that hams with "longer aerials" were the cause of violations of the Radio Act of 1912. This law prohibited hams from transmitting with more than 1 KW on wavelengths greater than 200 Meters.

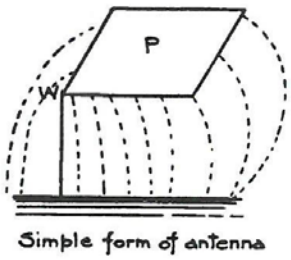


**Fig. 1**

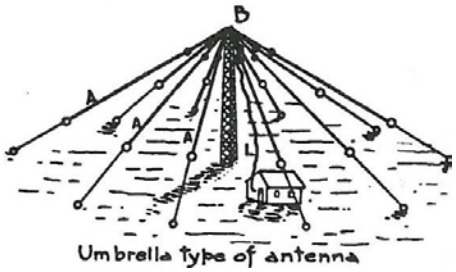


**Fig. 2**

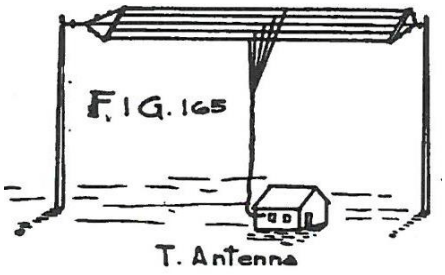


**Fig. 3**

From a hobbyist stand point, Amateur Radio was at its' utmost infancy in the early 1900's. Homemade Spark gap transmitters and simple cat whisker receivers connected to "iron wire" were the means to getting on the air. Focusing specifically on antennas, you have the 'MO' of the day….put up as much wire as you can, as high as you can and then tune it to get the most out of it. QST March 1992 spoke of these initial antennas: "Antenna (Aerial) technology was primitive, the main idea being to get as much wire as high into the air as possible, commonly in the form of a T or inverted L, and maximizing its RF-current drain as indicated on the station RF meter." Bigger and higher were the goals of all Amateur Radio antenna builders. Large antennas required an appropriately sized structure to support this antenna high above Earth -- (See Fig 2 and 3). Looks like we continue to have the same antenna 'MO' as those hams of last century – Bigger and Higher!

*Figures from a 1918 U.S. Army Signal Corps Pamphlet, "The Principles Underlying Radio Communication".*

**Next time…. Antenna Origins - Part 2 How the Audion Vacuum Tube Changed Antenna Design**

*The purpose of **The Radio Hotel** is to give you a practical kickstart into exploring the workings of antenna systems. It is a series, so go back and read the previous columns to get the whole picture, as one month relies on the previous month's information. Google the buzz words and find out what they mean. Read up on antenna system theory to see how it all works together. You will be glad you did.*