ANTIQUE RADIOS

Inventors and inventions

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MANY MEN HAVE CONTRIBUTED DIrectly to the advancement of radio. Some, like Edison and Marconi, are well-known, even by the general public; others, like Tesla and de Forest, are known mostly in the the technical community. Still others are almost totally unknown, yet they left their indelible marks on radio. Amos E. Dolbear is one such person.

Antique of the month

Professor Dolbear (1837–1916) was born in Norwich, CT; he was involved in many fields of physics, and he wrote books on many of them. In the year 1882 Professor Dolbear demonstrated a wireless telephone system in London. A reproduction of his system is shown in Fig. 1; the transmitter is shown in Fig. 1-*a*, the receiver in Fig. 1-*b*.

In the transmitter, a battery is connected in series with a carbon

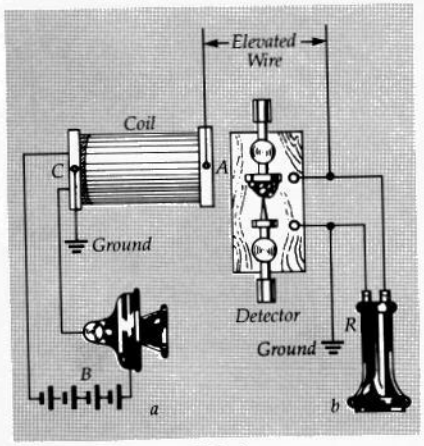

FIG. 1

mouthpiece and the primary winding of a coil. The secondary of the coil is connected to an antenna and to ground. In operation, the diaphragm of the mouthpiece vibrates when you speak into it, and that causes changes in the resistance of the carbon, which thereby varies the current flowing through the coil. That current variation is passed on the transmitting antenna and then is picked up by the receiving antenna, which is connected to one side of the receiver. The other side of the receiver is grounded.

It's interesting to note that Professor Dolbear tried several schemes to increase transmission range. For example, he attached the antenna wires to kites, and also tried various schemes using pre-charged condensers (capacitors) raised to great heights.

Marconi

In the late 1800's a young man from Bologna, Italy was already at work in a little shack on the Southwest tip of England (in Cornwall). Guglielmo Marchese Marconi (1874–1937) was working on short-distance propagation.

In one early experiment, a group of experimenters including Marconi worked with a coherer tube (which we'll discuss momentarily). It was hoped that transmitters in Poldhu and Gibralter would excite the coherer. When transmission began, lo and behold—the coherer responded. After some adjustment, it responded strongly. It was Gibralter calling, and Marconi answered personally.

Of course, that was not the end of Marconi's career. Another emotional event happened on December 11, 1901, at Signal Hill, Newfoundland. A tall antenna stood atop the castle at Cabot tower there; Marconi used that antenna to receive the first trans-Atlantic wireless telegraph message from Cornwall, England. By 1907 Marconi had established the trans-Atlantic wireless telegraph service for public use between the United States and the United Kingdom.

Marconi continued experimenting with wireless right into the 1930's. He received many awards and much recognition for his work, including a shared Nobel prize for physics in 1909.

He was successful because, among other things, he started at an early age and had adequate funding. His well-equipped yacht, *Elettra* (a former British mine sweeper), gave him a place to conduct many experiments. Part of the *Elettra* is preserved at an Italian museum near where Marconi lived. After he died in 1937, the yacht was sold and made some history of its own. Long before that, however, while anchored off Civitavecchia, Italy, the yacht was almost lost to a fire. Fortunately, the fire was in the engine room and not in the radio lab.

Marconi's floating lab had been the setting for many historic radio experiments, including early shortwave conversations from the Mediterranean to America and Australia. The yacht also figured in experimental wireless "beam" transmission, a system that concentrates radiated electricity in the form of a strong directional beam.

The coherer

In Marconi's wireless, the received electrical waves pass through a glass vial containing metal filings. The filings cling (or

cohere) to the inner plugs in the vial, thereby creating a path through which current can flow. A representation of the coherer appears in Fig. 2.

Marconi did not invent the coherer; a man named Branley did. Branley found that certain combinations of metallic flakes were affected by radio waves. Experiments showed that different combinations of flakes produce different resistances. After the wave passes, the coherer particles must be separated by jarring the tube.

Edison

Thomas Alva Edison (1847–1931) was a tireless and versatile inventor. He was born in Milan, Ohio, and spent his childhood years playing with a chemistry set. There

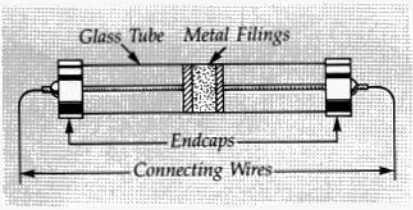

FIG. 2

seemed to be no end to his discoveries. Many of us in radio connect Edison with the "Edison effect," which was discovered in 1883 in conjunction with his work on the incandescent lamp.

The Edison effect describes what happens inside a charged glass bulb. Edison noted that carbon particles moved toward the positive end; later it was understood that electrons were being emitted by the heated filament.

One of the ironies of history is that when Edison discovered his effect, there was no thought that it might make something useful—such as a diode, which Fleming did not invent until some twenty years had passed. According to some authorities, Edison himself sent information about the effect to various experimenters who might want to work with it. That explains why working on the Edison effect was so popular.

Besides Edison's obvious accomplishments (including the incandescent light bulb and multiplex telegraphy), one pet project consumed much of his time: the phonograph. The book *From Tin Foil to Stereo* by Oliver Read and Walter Welch, published by Howard W. Sams, documents many interesting facets of the history of the phonograph.

Tesla

Like Edison, many early inventors worked with electricity, but were not involved with wireless. Yugoslavian-born experimenter Nikola Tesla (1856–1943) was one such inventor. Tesla emigrated to the U. S. at the age of 28, after being educated in Paris and Prague, and working in Hungary.

Tesla went to work for Edison in Edison's New Jersey laboratory; later Tesla opened his own lab. He is credited with many electrical inventions, especially those related to AC power distribution. His most famous invention, probably, is the Tesla Coil, an air-core transformer used to create very high voltages. But Tesla was also one of the first to recognize how important the tuned circuit is for long-distance radio transmission.

De Forest

Another American inventor, Lee de Forest (1873–1961), was born in Council Bluffs, Iowa. De Forest was educated at Yale University, and fought in the Spanish-American war. Like Edison, he was another tireless inventor. He obtained more than 300 patents, the most famous of which is the audion, the first amplifying vacuum tube. In early experiments, de Forest used a gas flame to heat the tube so that electrons would be emitted. He was also first to broadcast phonograph records over the wireless in 1907.

In 1906 de Forest discovered that an element placed between the cathode and the plate of a tube could be used to control electron flow. The grid (so-called because it resembled a stove grid) was the link between the crude communications that preceded it and our modern systems. Early solid grids trapped all of the electrons going to the plate; de Forest's idea was to use a fine wire mesh. On December 30, 1915, a practical triode was demonstrated. A government radio station in Arlington, Virginia sent telephone messages via the airwaves to Hawaii and France. **R-E**