



FAMOUS RADIO BEGINNERS

An Editorial by HUGO GERNSBACK

THE BEGINNER in radio always is interested in what other radio beginners did before his time, and he particularly wants to know what made radio the great art which it is today. In all arts there have been famous beginnings that eventually assumed great proportions. While these beginnings at the time may have seemed unimportant, when looked at from a distance of 20 to 50 years they now assume tremendous importance.

The present art of radio, as most of us know, dates back to the brilliant and *practical* researches of that most famous of all radio beginners, Heinrich Hertz, a famous German research scientist, who did most of his work in electromagnetic radiations about the year 1887 at Karlsruhe, Germany. We have him to thank for the brilliant research work which laid the foundations of modern radio, for his was an effort to experimentally prove the existence of the very waves predicted in 1864 by James Clerk Maxwell of Scotland in a series of masterful *theoretical* researches. It was Hertz, incidentally, who was the first to transmit power by "wireless," (radio) which he did by observing small sparks from a single metal wire loop not connected to his transmitter by any intervening wires. It was also Hertz who demonstrated that the new wavelengths could be refracted similarly to light, an experiment that lay dormant for several decades—or until Marconi later on made use of Hertz's discovery.

Another famous radio beginner was the Frenchman, Doctor Edouard Branly, who invented the coherer—merely a glass tube containing two metal plugs and, between them, metal filings. Branly observed that when the tube was placed in a strong electric field produced by a spark coil (while sparks jumped between the two electrodes of the coil) these filings became highly conductive.

Guglielmo Marconi, another famous radio beginner, had by this time read about Hertz's discovery and Branly's coherer. He put two and two together, added a few ideas of his own, and pretty soon, on his father's estate in Italy, he was able to send and receive "wireless" (radio) impulses over considerable distances by means of improved types of Hertz's spark coil and a spark gap transmitter and Branly's coherer receiver. In due time, Marconi made other notable beginnings. He invented the aerial, and the use of a ground connection, both of which are used in modern radio. Still later he invented the magnetic detector, discarding Branly's coherer. He is responsible also for the tuning coil which was used for many years, and which in one form or another still is used in radio.

Our own Reginald Fessenden, another famous early radio beginner, is responsible for many radio devices that have stood the test of time. It was he who gave us the electrolytic detector which he patented in 1903. This detector was far more sensitive than any that Marconi and other radio beginners had used up to that time. Because of its great sensitivity it was used for many years. Fessenden also invented the high-frequency alternator, which was used (and still is used today) for certain types of long-wave commercial transmission.

Another famous American beginner was Greenleaf W. Pickard. It was he who experimented with all sorts of substances for use as detectors, and it was he who gave us the *silicon* detector, the *galena* detector, the famous *perikon* detector, and many others.

Long before this there was still another famous beginner in radio, none other than Thomas A. Edison. It was he

who really was responsible for the present-day vacuum tube. Way back in the 80s, Edison discovered what is now known as the *Edison effect*. He found that if you sealed within a glass bulb two independent filaments which do not touch anywhere, you could make an electrical current jump the space between the two glowing filaments, *by electronic emission*. However, Edison did not do much with this important invention—he had many more important ones to play with—until the English scientist Ambrose Fleming came along and used the idea (with some modifications) as a wireless (radio) detector.

Fleming used a heated *filament* and a cold *plate*. This became known as the *two-element Fleming valve*, because it acted exactly as a valve, wholly in an electrical sense.

Our own Dr. Lee deForest who had heard about this valve began to experiment with it, and he soon found that in many respects it was a very unsatisfactory device. He, in turn, made a new "valve" by adding a third element—the so-called *grid*—between the filament and the plate. From this early beginning the modern radio vacuum tube evolved. Because of its extreme sensitivity the deForest vacuum tube as a detector reigned supreme over the radio world for several decades; in fact, due to this, and its ability to function as an R.F. and A.F. amplifier and oscillator, the entire radio industry has been reared upon the vacuum tube.

Soon deForest made another notable and perhaps the most notable radio beginning, when he discovered *regeneration*. This immediately made the vacuum tube circuit so tremendously sensitive (responsive) that it was possible, and is possible today, with a single tube to bridge distances of 3,000 miles, and more, in radio reception!

Early in 1909 deForest using the vacuum tube as transmitter began sending out radio telephone impulses through space. One of the first emissions was a Caruso phonograph record which was thus broadcast for the first time. Astonished radio amateurs from New York City almost fainted when they first heard clear music in their ear phones, where heretofore there had only been dots and dashes. But broadcasting did not begin in earnest until Westinghouse station KDKA at Pittsburgh through the endeavors of one of its engineers, Dr. Frank Conrad, another famous radio beginner, started broadcasting in the Pittsburgh area. In a few months, hundreds of broadcast stations sprang up over the entire country, and the *radio age* had really begun.

But what was badly needed were better and more sensitive radio circuits, so a number of other "radio beginners" started to improve these circuits or hookups; particularly outstanding among these men were Dr. Hazeltine in this country and Marius Latour of France, both of whom became responsible for *tuned radio frequency* circuits.

But still more important radio circuits were yet to come. Pretty soon the *superheterodyne* was invented; this hookup, one of the most famous in radio, is used today to the exclusion of almost all others. This circuit was invented in France by Levy; but Latour, already mentioned, also did valiant work on this circuit.

Another famous beginner is our own Professor Edwin H. Armstrong, to whom we are indebted for many brilliant circuits; including improved superheterodynes, as well as one circuit which, being extremely efficient on short wavelengths, is coming into great prominence, namely—*super-regeneration*.