

How the Radio Valve Grew Up

An intimate story of the development of the radio valve from the first crude rectifiers to the modern multi-mu valve of to-day, told by that great pioneer of radio

Dr. Lee de Forest



Lee de Forest, Ph.D., from whose researches two decades ago modern radio evolved.

WITHOUT the audion, or three-element valve, there would be no radio industry. At least, the radio industry would not be catering to the public at large, supplying millions of radio sets and tens of millions of radio valves each year, and maintaining over six hundred broadcasting stations pouring forth a steady stream of entertainment and enlightenment—and considerable advertising. Rather, there would be a relatively small communication business for the handling of marine and trans-oceanic traffic. In the final analysis, it is the valve that has brought about simplified and practical radio. Hence, in the production of valves—the veritable footlights of the world's stage—is reflected the rapid progress of the radio art, science and industry.

The giant valve industry of to-day came about through an accident. Many of my readers may recall the story. However, for the newer members of the radio fraternity, I may be permitted to repeat the brief details.

Back in 1904, while engaged as associate editor of "The Western Electrician," I spent my spare time in wireless experiments. Among my possessions was a large jump-spark coil. One evening, I noticed that each time the spark jumped the gap, the near-by Welsbach mantle flickered. It occurred to me that the Hertzian or wireless waves must have some influence on the particles of heated gas in the Welsbach mantle. Perhaps, after all, this might be the basis for a new wireless detector, which was sadly needed in those days of crude co-herers. And so I looked into the proposition.

The first gaseous detector took the form of a standard Bunsen burner, with a trough-like electrode containing common table salt

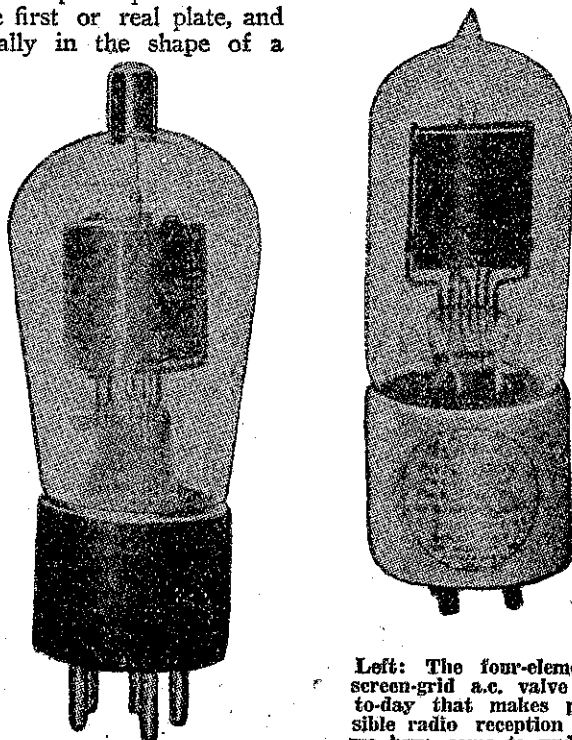
and a piece of platinum wire about it, placed in the blue flame of the burner. A battery and headphone were shunted across the flame, through the electrodes. The salt was used to improve the action. The antenna and ground were connected to the two electrodes. Fair results were obtained from this detector.

However, marine wireless was our main consideration in those days. And since there was no illuminating gas available on shipboard, I decided to use a glass bulb filled with gas, and a heated filament as the source of heat, operated entirely by batteries. One discovery led to another. The fact that much of the signal energy passed through the battery and headphone instead of through the gaseous medium led to the idea of a separate and distinct path for the wireless signal, and in turn the third element made its appearance, first as a metal band around the outside of the glass bulb, then as a second plate quite close to the first or real plate, and finally in the shape of a

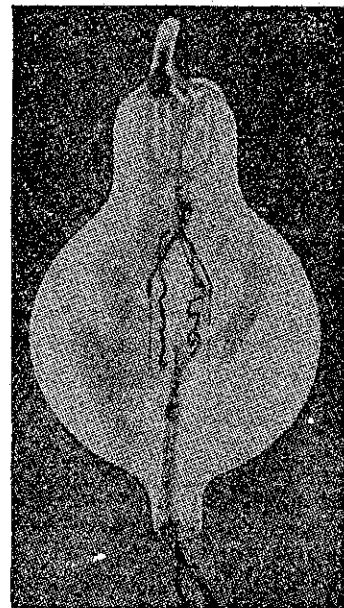
zigzag length of wire which, for want of a better name, I called the grid. So by 1906 I had developed the audion or three-element valve, in all respects similar to the standard radio valve of to-day.

The next step was to manufacture the audion. At first I tried to interest the large lamp companies, since the audion was very much in their line, being a modified electric lamp. But to no avail. The lamp companies had no time to bother with this fantastic experiment. Somewhat of a contrast, to be sure, with present-day conditions when so many lamp companies have rushed into the valve business.

I succeeded in interesting one McCandless, a producer of miniature electric lights, located on Park Place, New (Continued on p. 29).



Left: The four-element, screen-grid a.c. valve of to-day that makes possible radio reception as we have come to understand it.



Three stages in the growth of the valve. Above: One of the original audions of 1912 or thereabouts, hand-made and of fragile construction, gassy, non-uniform and short lived. The valve of 1924 (centre) illustrates the intermediate period. We can see in it the modern valve taking shape.