THE INDUSTRIAL STRENGTH

by MICHAEL RIORDAN

MORE THAN A DECADE before J. J. Thomson discovered the electron, Thomas Edison stumbled across a curious effect, patented it, and quickly forgot about it. Testing various carbon filaments for electric light bulbs in 1883, he noticed a tiny current trickling in a single direction across a partially evacuated tube into which he had inserted a metal plate. Two decades later, British entrepreneur John Ambrose Fleming applied this effect to invent the "oscillation valve," or vacuum diode—a two-terminal device that converts alternating current into direct. In the early 1900s such rectifiers served as critical elements in radio receivers, converting radio waves into the direct current signals needed to drive earphones.

In 1906 the American inventor Lee de Forest happened to insert another electrode into one of these valves. To his delight, he discovered he could influence the current flowing through this contraption by changing the voltage on this third electrode. The first vacuum-tube amplifier, it served initially as an improved rectifier. De Forest promptly dubbed his triode the audion and applied for a patent. Much of the rest of his life would be spent in forming a series of shaky companies to exploit this invention—and in an endless series of legal disputes over the rights to its use.

These pioneers of electronics understood only vaguely—if at all—that individual subatomic particles were streaming through their devices. For them, electricity was still the fluid (or fluids) that the classical electrodynamicists of the nineteenth century thought to be related to stresses and disturbances in the luminiferous æther. Edison, Fleming and de Forest might have been dimly aware of Thomson's discovery, especially after he won the 1906 Nobel

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