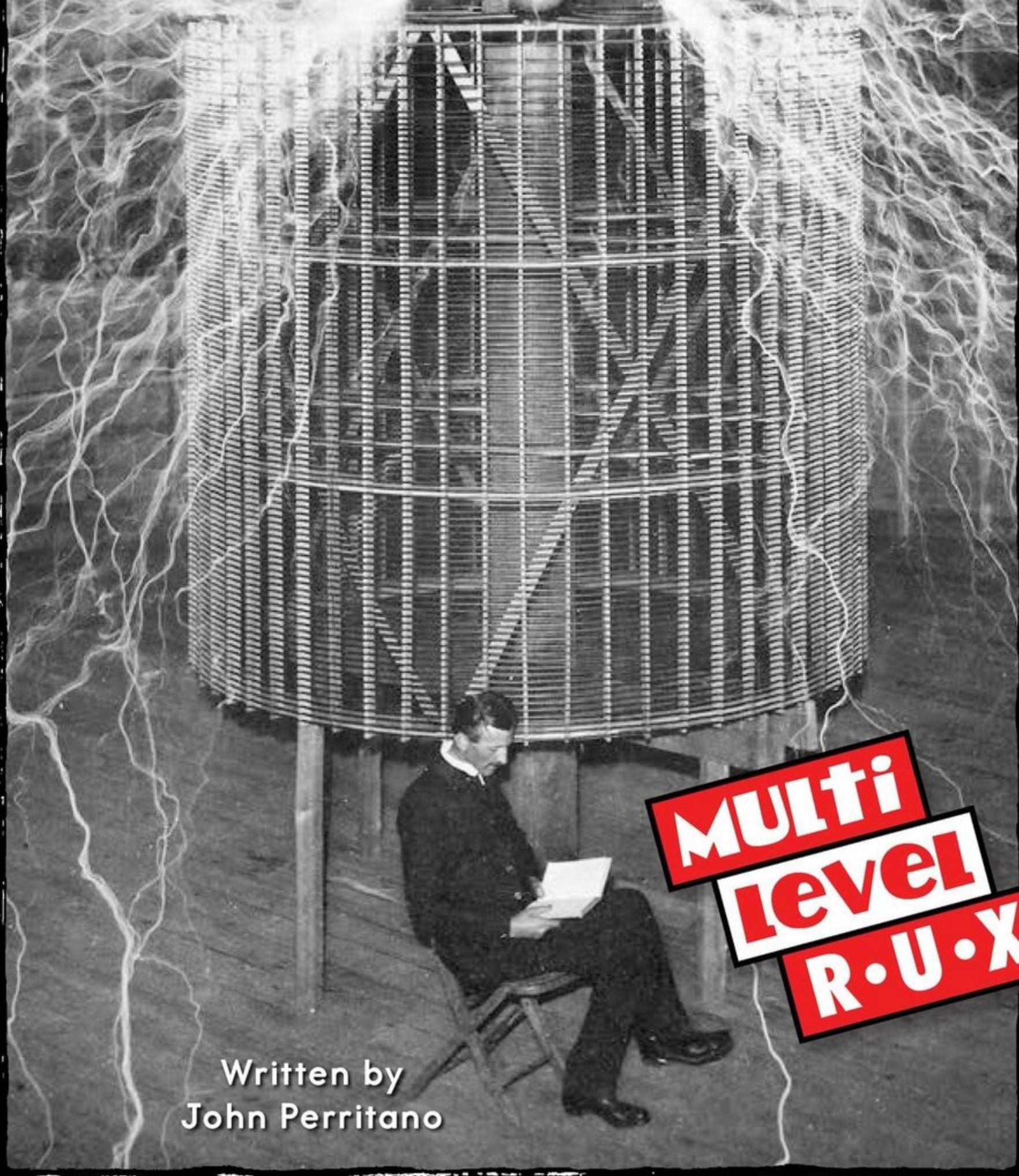


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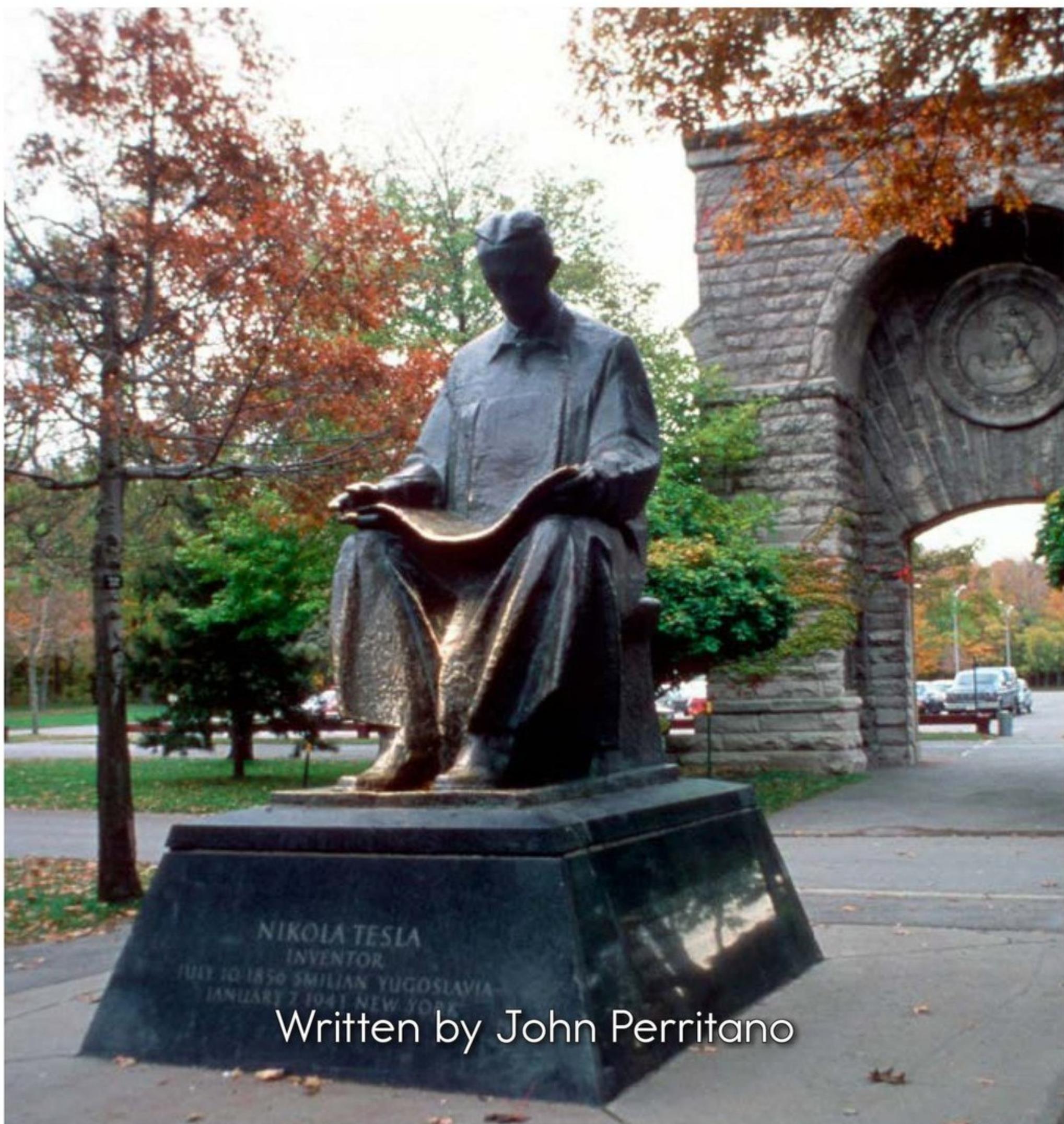
The Genius of Tesla



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Written by
John Perritano

The Genius of Tesla



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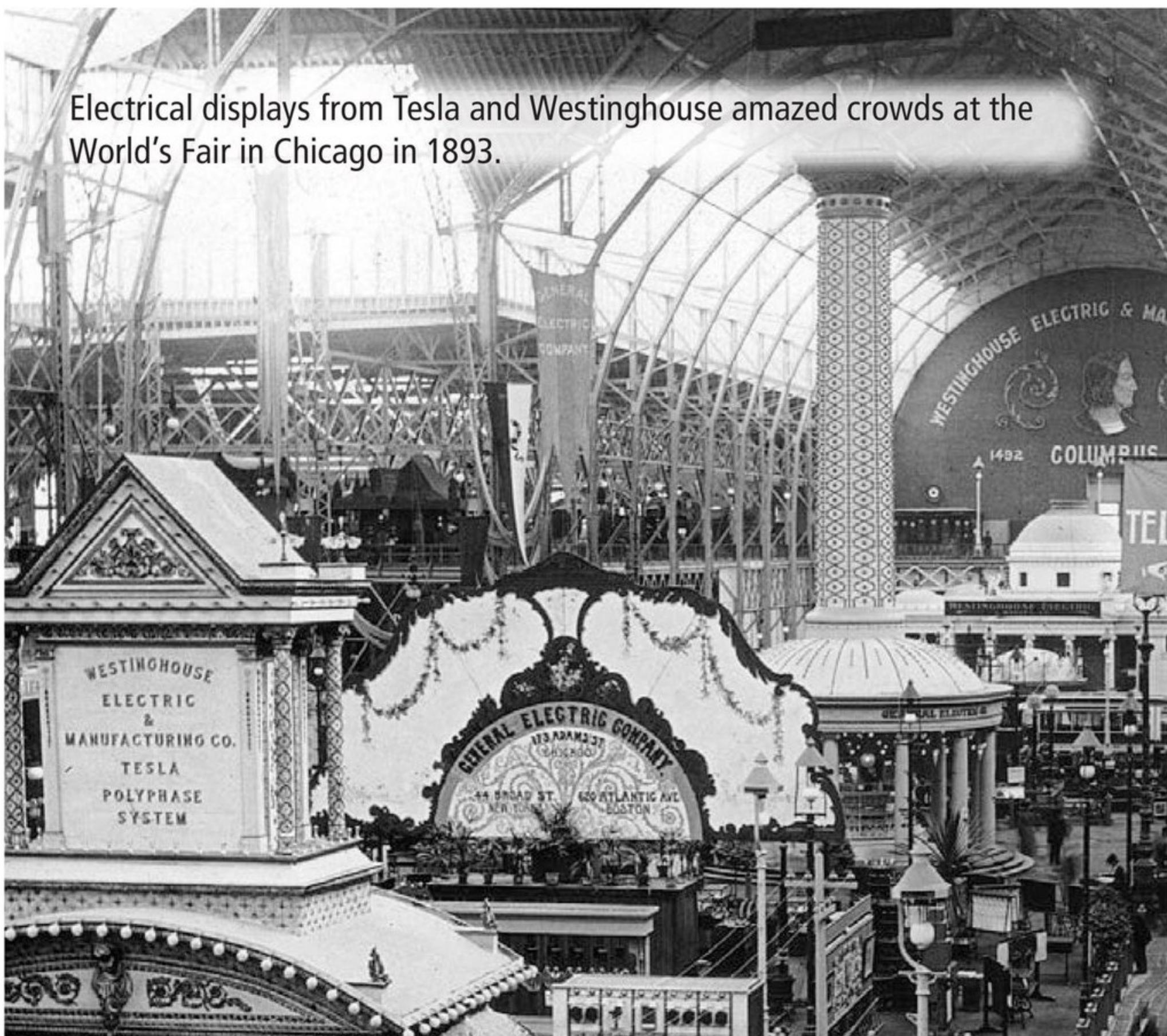
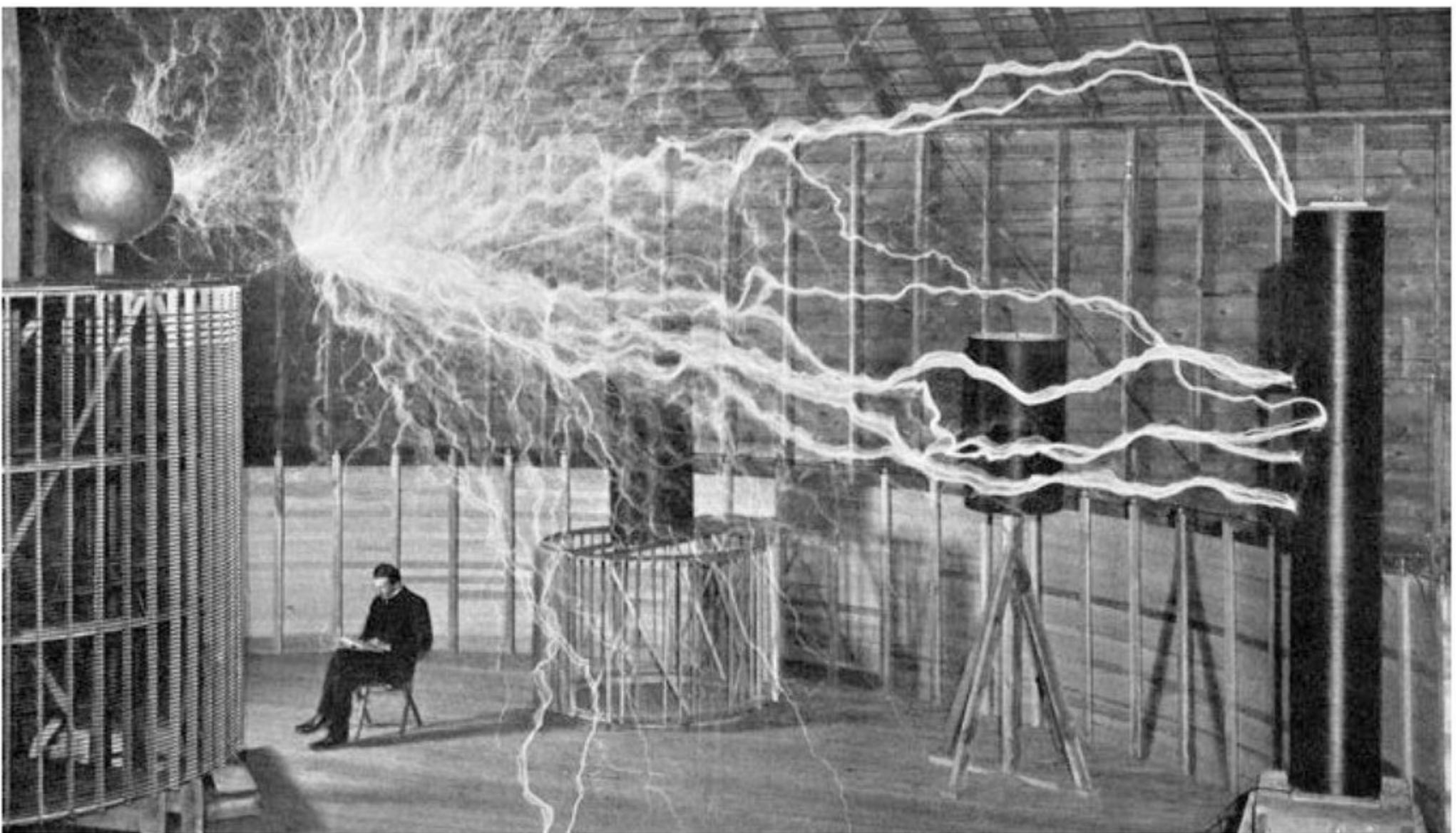


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Tesla sits calmly reading a book while artificial lightning fills his laboratory.

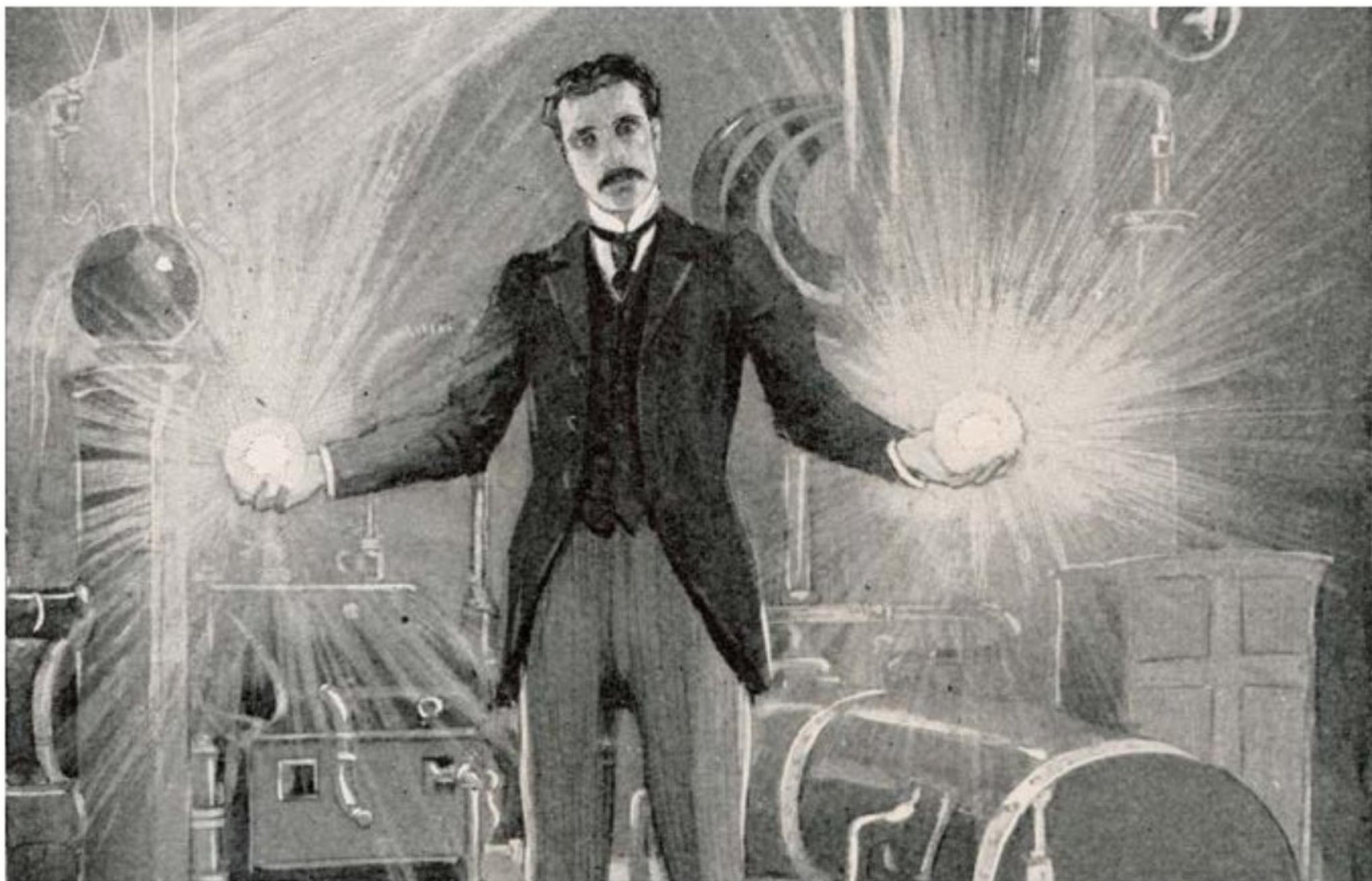
The Magician

One day, a man with dark hair and a mustache invited a group of people into his New York City laboratory to witness one of his electrifying experiments.

As the audience settled into their seats, the man, Nikola Tesla, strolled calmly to a wooden platform and sat on a chair. Under the platform was a **generator** capable of producing millions of volts of **electricity**.

Tesla flipped a switch.

Wild streaks of light sparked across the room as if a lightning storm raged inside. Some struck Tesla. When the light show was over, Tesla stepped off the stage unharmed. The audience burst into applause.



Tesla's demonstrations of new technology were often spectacular.

Tesla was no magician. He was a scientist who had just demonstrated how safe a newly discovered form of electric **current**—alternating current (AC)—was. His discovery revolutionized the world. It would eventually power modern industry and light up nations.

Tesla was more than a scientist. He was a **visionary** who challenged established scientists of the day with his astonishing **inventions** and ideas. Many experts believe that it is largely thanks to Tesla that we now have smartphones, wireless communication, television, robots, radar, and other amazing devices. Despite his scientific genius, Tesla was not a great businessman. He died penniless while others made millions of dollars off his work.

Meeting Mr. Edison

Tesla was born during a lightning storm in 1856 in what today is the country of Croatia, in Eastern Europe. As a young boy, Tesla studied hard. His father was an Eastern Orthodox priest. He had a large library of books that Tesla eagerly read. Tesla's love of inventing came from his mother, who built small household appliances in her spare time.

Electricity interested Tesla as a boy. He longed to become an electrical **engineer**. After years of study and work, he figured out a way to generate electricity more **efficiently** and safely by using alternating current.

Armed with that knowledge, Tesla set sail for the United States in 1884 at age twenty-eight. On his second day in America, he walked into

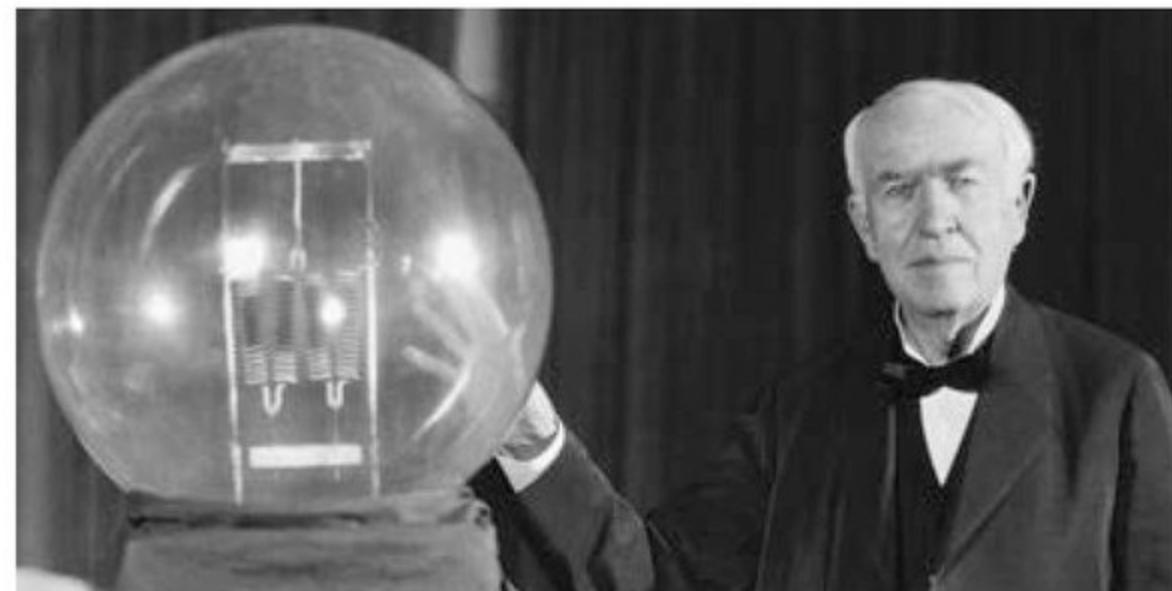


Thomas Edison's New York office. Tesla handed the great inventor a letter from one of Edison's European friends. It read: "My Dear Edison: I know two great men and you are one of them. The other is this young man!"

Thomas Edison was a smart businessman as well as an inventor.

At the time, Edison was considered the father of the electrical age. He had invented a lighting system that used incandescent lamps and direct current (DC) power stations.

DC power was dangerous because it flowed at high **voltage** all the time. The power poles going up in cities supported exposed wires that could electrocute whatever touched them. When electric trolleys in Brooklyn passed, sparks flew from the lines, forcing people to dodge the fiery bolts. Escaping the sparks was so common that Brooklyn's baseball team was called the Dodgers.



Edison's first successful lightbulb gave off the light of sixteen candles.

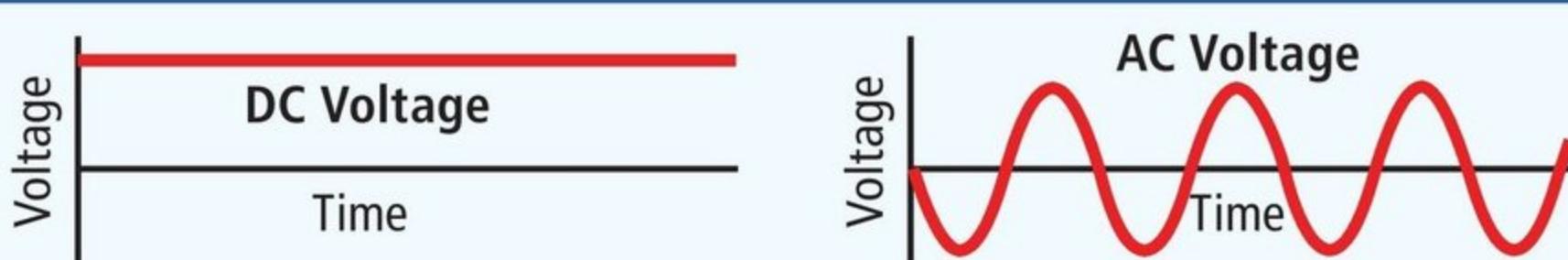
Tesla told Edison that direct current was weak and expensive. To light a city, Tesla said, hundreds of DC generators would need to be built. Tesla said that alternating current was a less expensive way to deliver power.

Although wary of AC power generation, Edison gave Tesla a job. Edison promised the young engineer \$50,000 if he could increase the voltage of Edison's DC electric system in New York City. Tesla accepted the challenge.

Digging Ditches

Tesla, hoping to win Edison's challenge, worked long hours. He slept and ate very little. A few months later, Tesla announced success. Edison, however, refused to pay the \$50,000. He claimed his offer had been made in jest. "When you become a full-fledged American, you will appreciate an American joke," Edison said.

Tesla was angry. He quit his job and stormed out of Edison's office. Regardless, word spread about Tesla's achievements. A short time later, a group of **investors** approached Tesla and asked him to invent a more efficient lightbulb.



AC and DC: What's the Difference?

Electricity is the flow of charged particles called *electrons*. Electricity can flow in two ways: by an alternating current or by a direct current. Direct current moves in one direction as a straight line and is difficult to transmit over long distances without losing energy. Direct current is not easily changed to higher or lower voltages.

In an alternating current, electrons move rapidly back and forth, changing direction sixty times per second. Transformers can easily convert alternating current to lower and higher voltages. Transformers allow alternating current to be sent over long distances efficiently.

Tesla did as he was asked and invented a highly efficient lightbulb. For his efforts, the investors gave Tesla shares of stock (part ownership) in a company that soon became worthless. While the investors grew rich on the sale of the lightbulb, Tesla made little money.

Poverty forced Tesla to take a job digging ditches for Edison's light company. It paid \$2 a day. Tesla's fortunes changed when the head of the ditch-digging crew introduced Tesla to A. K. Brown of the Western Union Company.

Tesla told Brown about his AC theories. Brown was impressed. He invested in Tesla's AC power-generation ideas. Working just a few short blocks from Edison's office, Tesla developed all the parts needed for an AC power station, including the motors that generated the electricity.

The Life of Nikola Tesla

- **July 10, 1856:** Tesla born at midnight as a lighting storm rages.
- **1873:** Tesla, 17, nearly dies from cholera. Tesla's father agrees to send his son to an engineering school if he recovers.
- **June 6, 1884:** Tesla arrives in America and begins to work for Thomas Edison.
- **March 1885:** Tesla founds the Tesla Electric Light Company.
- **1891:** Tesla builds a special coil that produces high-voltage, high-frequency alternating current.
- **May 1, 1893:** Tesla's AC generators illuminate the Chicago World's Fair.
- **1895:** Tesla experiments with radio waves.
- **1898:** Tesla demonstrates the first robot—a remote-controlled boat.
- **Jan. 7, 1943:** Tesla dies at the age of 86.

Battle of the Currents

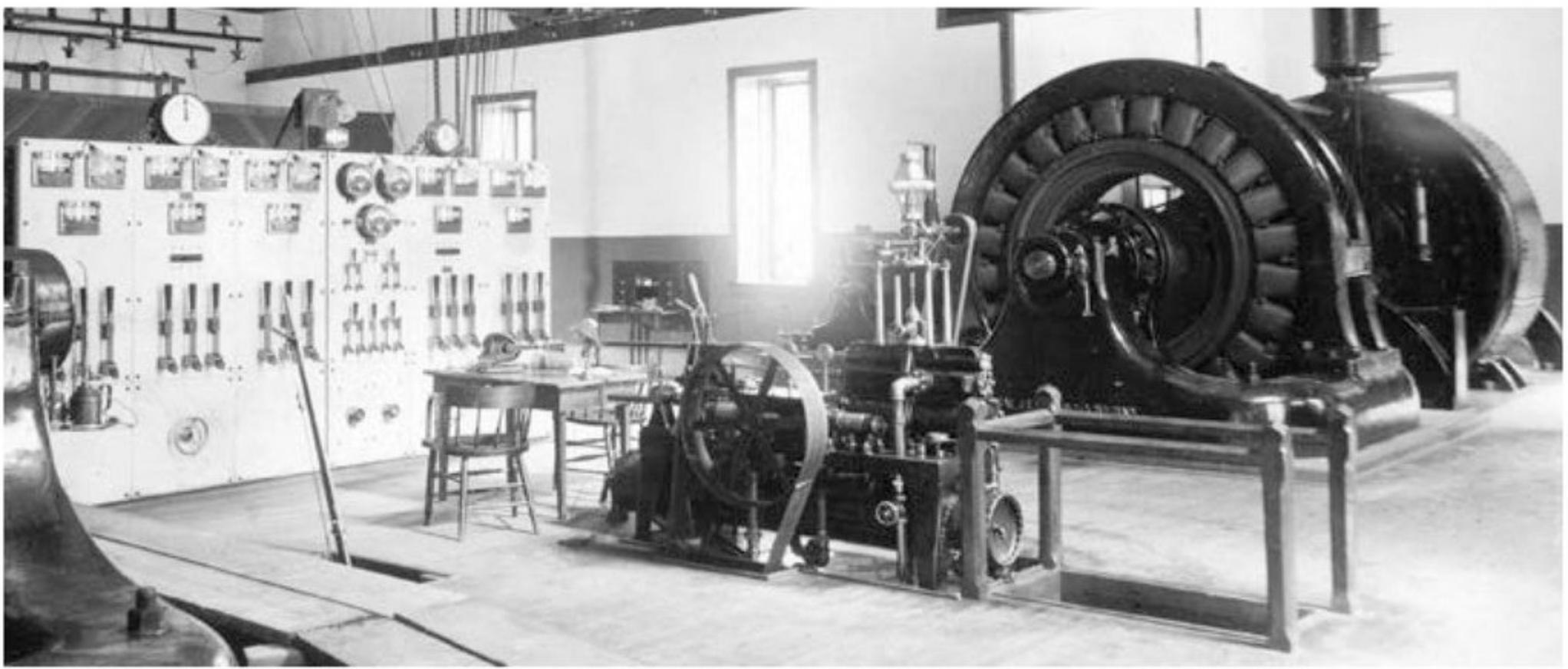
Tesla found a major backer in George Westinghouse. Westinghouse had invented several improvements for trains and was one of America's wealthiest businessmen.

Westinghouse was positive that alternating current was the wave of the future. He bought all Tesla's **patents** for \$60,000—about \$1.4 million today—plus 150 shares of stock in Westinghouse's company. Westinghouse also gave Tesla royalties (ongoing payments) on the amount of power his AC motors could generate.

Tesla quickly spent his earnings on a new laboratory. The two men then began to electrify the United States. Edison was angry as Westinghouse began installing AC generators in rural areas that Edison's DC system could not reach. Westinghouse sold the electricity at a cheap price in order to cut into Edison's business.

Edison stood to lose a lot of money. He tried to discredit Westinghouse. Edison warned the public that alternating current was dangerous.

Westinghouse got a chance to promote alternating current when he won the job of lighting the 1893 World's Fair in Chicago. Westinghouse asked Tesla to install his AC generators.



Tesla designed large AC generators for Westinghouse, such as the ones shown here.

When opening day arrived, U.S. President Grover Cleveland pushed a button. One hundred thousand incandescent lamps sparked to light, prompting delighted *oohs* and *aahs* from the crowd.

The “City of Light” burned brilliantly. The demonstration showed that AC power was much more efficient to use than DC power and not as dangerous as Edison had claimed. Westinghouse then won a contract to build AC generators for a new power plant in Niagara Falls, New York.

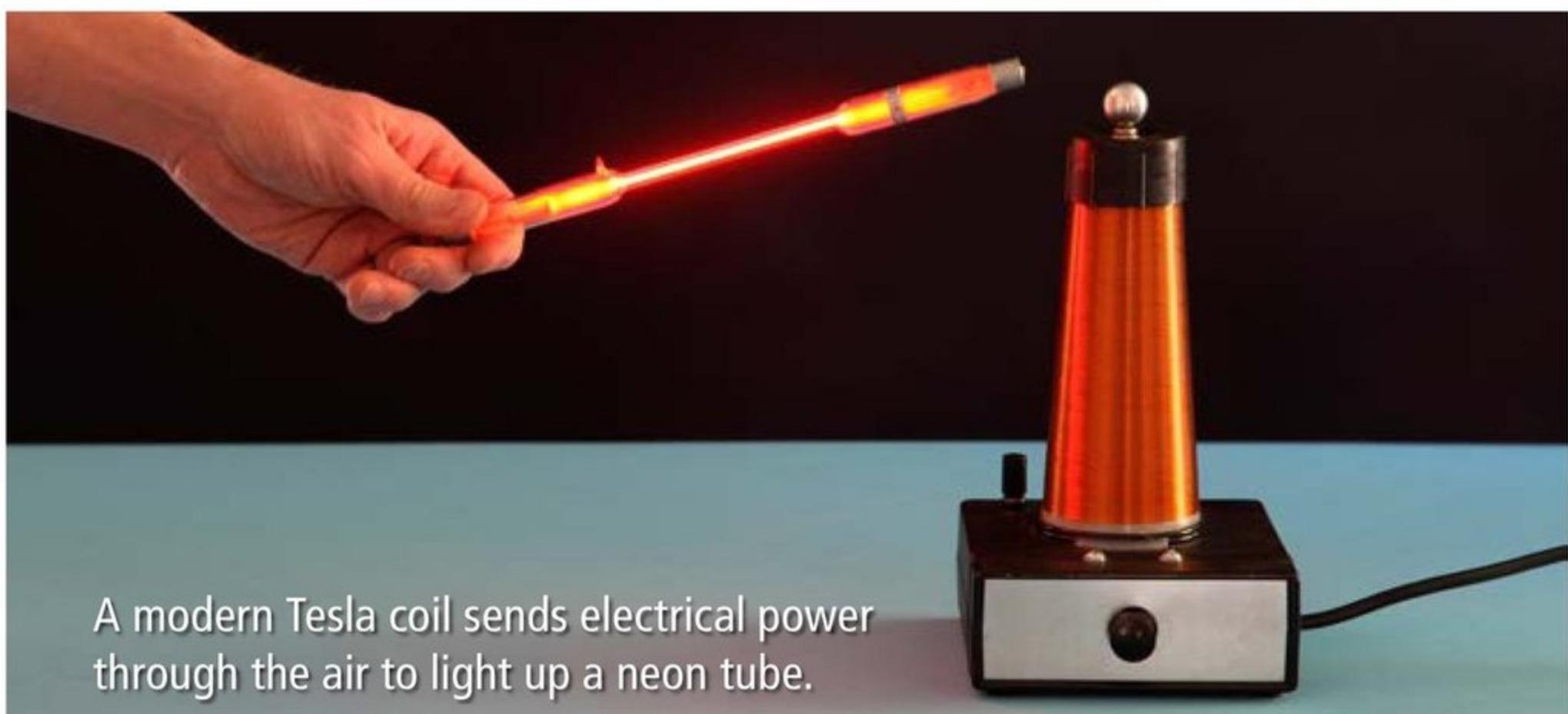
However, years of fighting with Edison almost bankrupted Westinghouse’s company. To save the firm, Tesla tore up the contract he had signed with Westinghouse. In return, Westinghouse paid Tesla a one-time fee of \$216,000 for the right to use Tesla’s patents forever. Consequently, Tesla lost millions of dollars over the decades, while Westinghouse became wealthier.

Radio Days

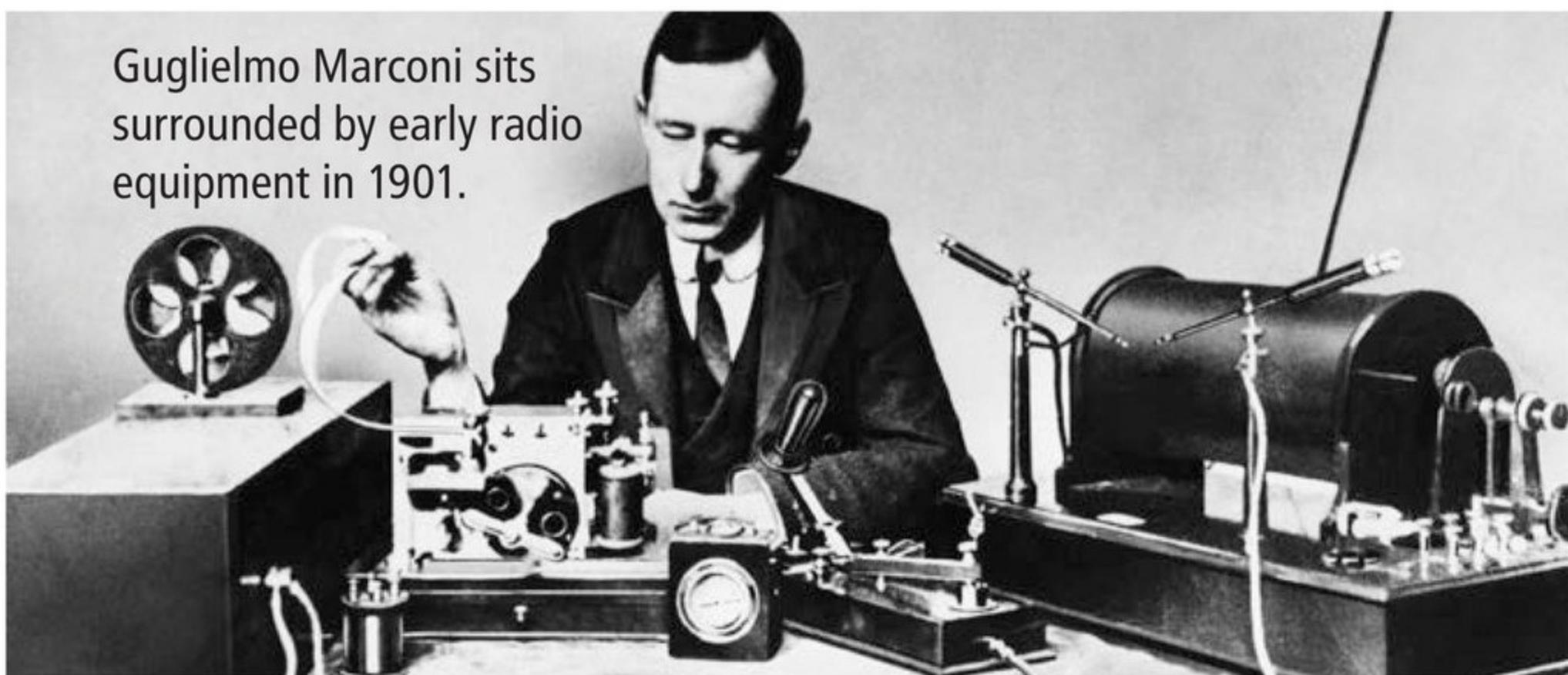
Once Tesla had won the war of the electric currents, he began exploring ways to send electricity through the air without wires. To that end, he built a special wire **coil** that produced high-voltage, high-frequency alternating current. Tesla used the coil to develop the first neon and fluorescent lights. He also used the device to take the first X-ray photographs.

In November 1890, Tesla used the coil to achieve the unthinkable. He sent an AC current through the air to light up a vacuum tube.

Soon afterward, he began experimenting with radio waves as another way to send signals without wires. In early 1895, as Tesla was ready to send a radio signal fifty miles from New York City to West Point, New York, disaster struck. An accidental fire destroyed his laboratory.



A modern Tesla coil sends electrical power through the air to light up a neon tube.



Guglielmo Marconi sits surrounded by early radio equipment in 1901.

It was a stroke of bad luck. At the same time, in England, Guglielmo Marconi was also trying to figure out how to use radio waves to send electrical signals. In 1901, Marconi, using many of Tesla's ideas, sent a radio signal across the Atlantic Ocean. The transmission made Marconi a huge star. People—including Tesla's rival, Thomas Edison—gave Marconi money to start up a radio company.

When told of Marconi's success, Tesla replied, "Marconi is a good fellow. Let him continue. He is using seventeen of my patents."

Much to Tesla's disappointment, the U.S. Patent Office gave Marconi credit for inventing the radio. Tesla filed a lawsuit but was so strapped for cash after spending his fortune on many failed projects that he could not pursue the case. It wasn't until 1943 that the U.S. Supreme Court finally credited Tesla with the invention, calling him the "father of radio."



Tesla's tower at Wardenclyffe, New York, might have changed the world if it had been completed.

The Great Tower

Still, Tesla worked to develop wireless technology. In 1901, he began building a tower on Long Island that he hoped would be powerful enough to send out electronic telephone calls, pictures, stock market reports, and weather information.

"When wireless is fully applied the Earth will be converted into a huge brain, capable of response in every one of its parts," he said.

Tesla ran out of money before the tower was finished. He lost ownership of the property, and the tower was demolished.

A Lasting Influence

In 1943, Tesla died at age eighty-six while living in a hotel room that had been paid for by Westinghouse.

Although Tesla spent his riches on failed project after failed project, and while he never received the credit he deserved for his research and inventions, the inventor had a huge effect on technology and the shape of the modern world.

His innovations with alternating current powered modern cities and transformed life in rural areas that had been without electricity. His experiments with robots, radio, radar, and X-rays pointed the way to the future.

Tesla's dream of a wireless world eventually came true. His fingerprints are all over things that we today take for granted, such as the Internet and wireless communication.

Tesla's love of creating things made him a giant among modern-day scientists. He once said, "I do not think there is any thrill that can go through the human heart like that felt by the inventor as he sees some creation of the brain unfolding to success."

Glossary

coil (<i>n.</i>)	a loop or series of loops in a length of something, such as rope or wire (p. 12)
current (<i>n.</i>)	the flow of electrical energy (p. 5)
efficiently (<i>adv.</i>)	in a way that makes good use of time or resources (p. 6)
electricity (<i>n.</i>)	energy created by moving charged particles (p. 4)
engineer (<i>n.</i>)	a person who designs, builds, or repairs machines, buildings, bridges, or other structures (p. 6)
experiments (<i>n.</i>)	scientific tests or trials (p. 4)
generator (<i>n.</i>)	a machine that turns motion into electricity (p. 4)
inventions (<i>n.</i>)	new devices or processes (p. 5)
investors (<i>n.</i>)	a person, company, or organization that buys something or puts money into a business hoping to make a profit (p. 8)
patents (<i>n.</i>)	documents granting the right to make money from inventions (p. 10)
visionary (<i>n.</i>)	one who has exceptional imagination and ideas about the future (p. 5)
voltage (<i>n.</i>)	the force of a flow of electricity, measured in volts (p. 7)

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Front cover: Tesla sits in his Colorado Springs laboratory while his “magnifying transmitter” sends electricity arcing around the room in 1899.

Back cover: Portrait of Nikola Tesla with his invention, the induction motor. The induction motor became the most widely used type of electrical motor and led to the adoption of alternating current as an electrical standard.

Title page: A memorial statue of Tesla sits in a park at Niagara Falls, Ontario, Canada. Tesla and his business partner, George Westinghouse, built the first hydroelectric power station at Niagara Falls—the first large-scale power-producing dam in the world.

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