The Engineer

Di **Tom Gidwitz**

He was born in 1867 and grew up surrounded by precision machinery and innovation. His grandfather, Alvord Perret, was one of the first publishers of Civil War photographs, and his father imported watches. Most of all, he was a child of the Electrical Age. From his family's Brooklyn home he watched as inventors and entrepreneurs wove New York in a cat's cradle of power lines for telephones, stock-tickers, and fire alarms. When he was sixteen the Brooklyn Bridge opened for traffic; at night its bright carbon arc lights burned a brilliant white against the sky.

But the electrical revolution had a long way to go. Batteries were huge and inefficient. Power poles stretched as tall as fifteen stories and carried hundreds of sizzling, paper-wrapped wires that smoked, rusted through, and fell sparking to the ground. In winter, snow-laden poles tipped and snapped, dragging down neighboring poles one by one in a chain reaction collapse. And despite the network of wires, human muscle moved most loads, and gas and oil lamps supplied light.

In 1886 Perret enrolled in the Brooklyn Polytechnic Institute and earned honors in chemistry, physics, and engineering. But his chosen field, electrical

engineering, was still in its infancy. There was no defined curriculum, and he quickly realized he could learn more in machine shops and laboratories than in any school. Before his first academic year was over, he dropped out and took a spot in the most hallowed academy of all -- Thomas Edison’s lab.

In 1881 Edison had launched a bold program to stimulate sales of his new incandescent light bulbs by providing reliable electric power to homes and factories. He dug up downtown Manhattan streets, laid down a grid of power cables and hooked them to the world’s largest electrical generators, housed in a three story building on Pearl Street. The distribution network used 225 of Edison’s inventions and pumped power through Edison copper cable, Edison fuses, Edison sockets, and Edison meters, into Edison junction boxes and up the walls through Edison wires to Edison’s glowing bulbs.

The strategy worked in New York City and elsewhere. When Perret joined the laboratory more than fifty Edison generating stations across the United States were pumping power to 400,000 incandescent bulbs.

The company headquarters was in a Fifth Avenue brownstone, but Perret worked at its creative center, Edison’s own lab on the second floor at 17th Street near the East River. While 300 laborers made parts for the electrical system downstairs, Edison and his staff pursued new challenges.

Perret was assigned to the team in search of a safe and reliable lightweight battery. The day’s lead batteries weighed hundreds of pounds, quickly corroded, leaked sulfuric acid, short circuited, and failed. An inexpensive portable battery would have unlimited applications.

Edison and his staff pursued success through trial and error, brutally long hours, sleepless nights, and exhausting work. Perret joined his colleagues as they pushed themselves to their physical limit. They launched experiments nonstop, laboring among exploding

test tubes, bubbling acids, and vapor clouds that stung their eyes, burned their noses, and set them coughing.

But Perret's career had barely begun when workers at the Edison Machine Works in lower Manhattan went on strike. After two weeks Edison shut the factory and shipped its machinery and two hundred willing workers north to Schenectady where land and labor were cheap. By the end of the year Edison had moved his home and headquarters to New Jersey.

Perret, however, remained behind in Brooklyn. His head was full of inventions, and he joined forces with Edison coworker John A. Barrett to start the Elektron Manufacturing Company. Perret was only 19, so young that his father had to sign the company's incorporation papers.

Most other entrepreneurs named their companies after their products or themselves, but Perret and Barrett paid homage to something elemental. Elektron is Greek for amber, the translucent gemstone of petrified tree sap. When rubbed with wool it absorbs a negative charge -- loaded with static electricity, it attracts and repels objects as if by magic.

Perret was fascinated with the interaction of electricity, magnetism, and metal, and how, united, they could generate and distribute rotary motion, the key to achievement in the Industrial Age.

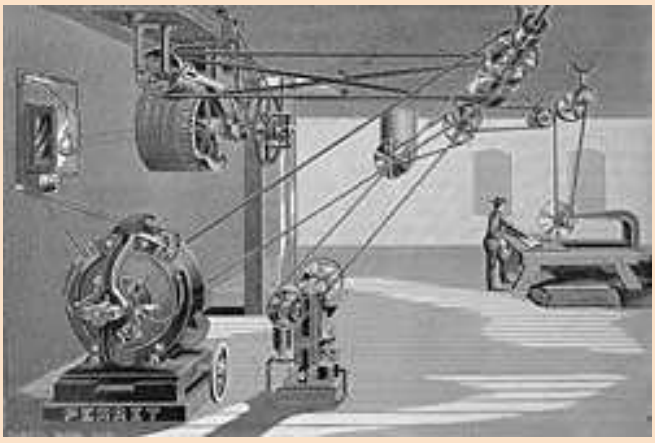
The era's factories relied on water wheels, wind mills, and steam engines that spun elaborate webs of shafts and belts that wound through floors, walls, and ceilings to turn more shafts and ultimately belts hooked directly to machines. But these systems were inefficient and dangerous. Friction ate up much of the power. Belts broke and flew through the air. Careless workers with loose clothing or long hair were often snatched into the spinning shafts.

Electric motors promised salvation. They were safer, quieter, and modular – if an individual motor broke down, the entire factory did not come to a halt.

Engineers could place them anywhere current was available, and they could design production lines to suit the assembly process, not the building's skeleton of humming shafts..

Perret and Barett set up shop in a loft in downtown Manhattan where access to Edison's electric grid had spawned a neighborhood alive with frantic invention. Nearby more than a dozen competitors were producing two pole motors – machines in which a wire-wound, electrified shaft spun in the embrace of a solitary electromagnet made of heavy, forged iron. Two-pole motors were the state of the art, although they spun at high speeds, burned out easily, and required complicated gearing systems to power the most common machines.

Perret introduced a six-pole motor that used three magnets and spun slowly enough to power saws, lathes, and printing presses without gears. He invented a lightweight magnet assembled from sheets of steel, which made his motors less expensive to manufacture, ship, and install. He patented a safety switch that protected motors from burning out, a flexible insulated electric wire, a new dependable arc lamp, an electric elevator, and an electric street car. .



Salesmen in seven cities spread Elektron's gospel, and soon thousands of Perret's machines were at work across the country, lighting railway trains and steamboats, mining coal, and printing newspapers. Elektron motors pumped oil and water, blew air through pipe

organs, spun sugar and cut candy. Joseph Pulitzer, owner of the New York World, installed an Elektron dynamo to light up his 170-foot yacht. An Elektron elevator hoisted passengers at Boston's Edison Building; others hauled books at the New York Bar Association and the Massachusetts State House. Elektron installed four freight elevators and seven automatic push-button dumb waiters at Delmonico's eight-story restaurant in New York City. A single motor could transform an entire shop – at a local woodworker's a ten horsepower Elektron powered two elevators, pumped water to the roof, spun a ventilation fan and the shop's buzz saw.

By November, 1889, the company had doubled in size, and in 1891, after Perret's partner Barrett left the business (he eventually made a fortune manufacturing batteries and wire insulation), Elektron's parts and machinery were loaded into twelve box cars, and the company moved to Springfield, Massachusetts.

Springfield had been a sleepy Berkshire backwater until 1777, when George Washington established the Springfield Armory to store weapons and build gun carriages and casings for the Continental Army. In 1794 the armory became the federal musket maker, and by the end of the Civil War it was producing 3,000 guns a month.

Guns are robust devices that harness gunpowder explosions to launch a projectile on a predictable path. They demand tight fittings and tough alloys, and Springfield became a center of innovation in metallurgy, precision machining, and mass production. Manufacturers flocked to Springfield to take advantage of its skilled workers and managers.

In Springfield, Elektron found a way to have both cheap real estate and labor. The company teamed up with the Springfield Christian Industrial and Technical School. The school gave Elektron a multi-story 150-foot long former gun factory; in exchange Elektron agreed to train and apprentice twenty of the school's students.

In 1893, Elektron displayed its wares at the Columbia Exposition in Chicago. On the first floor of the Electricity Building straw-hatted salesmen sat amongst the company's lamps, fans, motors, and a water pump that filled a tank until the current was miraculously shut off with a float. The exhibit's main draw was an elevator that lifted thrilled visitors to the gallery above; in one month alone it took nearly 50,000 passengers aloft.

But a new wave was breaking. That fall, a twenty-three-year-old Springfield bicycle mechanic set the nation's ambitious engineers in a whole new direction. On September 20, Frank Duryea, a bicycle designer, built the country's first horseless carriage and took it for a ride, a 200-foot jaunt on the outskirts of town that ended when he ran into a pile of dirt. Two years later, on a snowy Thanksgiving Day, Duryea won the continent's first car race, besting five rivals in a ten-hour 54-mile round trip between Chicago and Evanston, Illinois. In 1896, as Edison engineer Henry Ford demonstrated his first gas powered "Quadricycle" in Detroit, the Duryea Motor Wagon Company produced thirteen cars, one of which, with Springfield resident Henry Wells behind the wheel, ran over a New York City bicyclist in the first car accident.

Springfield's inventors rushed to follow Duryea's lead, abandoning their businesses to build steam, kerosene, gasoline, and battery-powered cars. Perret himself left Elektron, betting that electric cars, which ranked second to steamers but outnumbered internal combustion automobiles by almost two to one, would be the vehicle of choice. He returned to Brooklyn, established the Perret Storage Battery Company, and unveiled his first attempt -- a five-passenger car burdened with a battery that weighed more

than half a ton. He refined his design and in 1898 tried again, debuting a one-person, 440-pound car with a single 175-pound battery. It could carry a 250-pound man for forty miles on a single charge and tootled along silently at 13 miles per hour. It had tiller steering and pert brass headlamps, and rode high off the ground on 28-inch spoke wheels. Perret donned a beaver hat, thick black gloves, and velvet-collared coat to show the car off to photographers.

In 1900 he patented a lightweight electric car with an articulated frame and independently tilting axles for off-road travel over bumpy terrain. It was, in essence, the country's first electric SUV.

And then Perret stopped cold. In the spring of 1902, after sixteen years of frenetic activity, he suffered a breakdown, what a friend described as a "nervous prostration caused by overwork," a condition so mentally debilitating that he dropped all and took refuge in his Brooklyn family home. He was thirty-five years old.

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