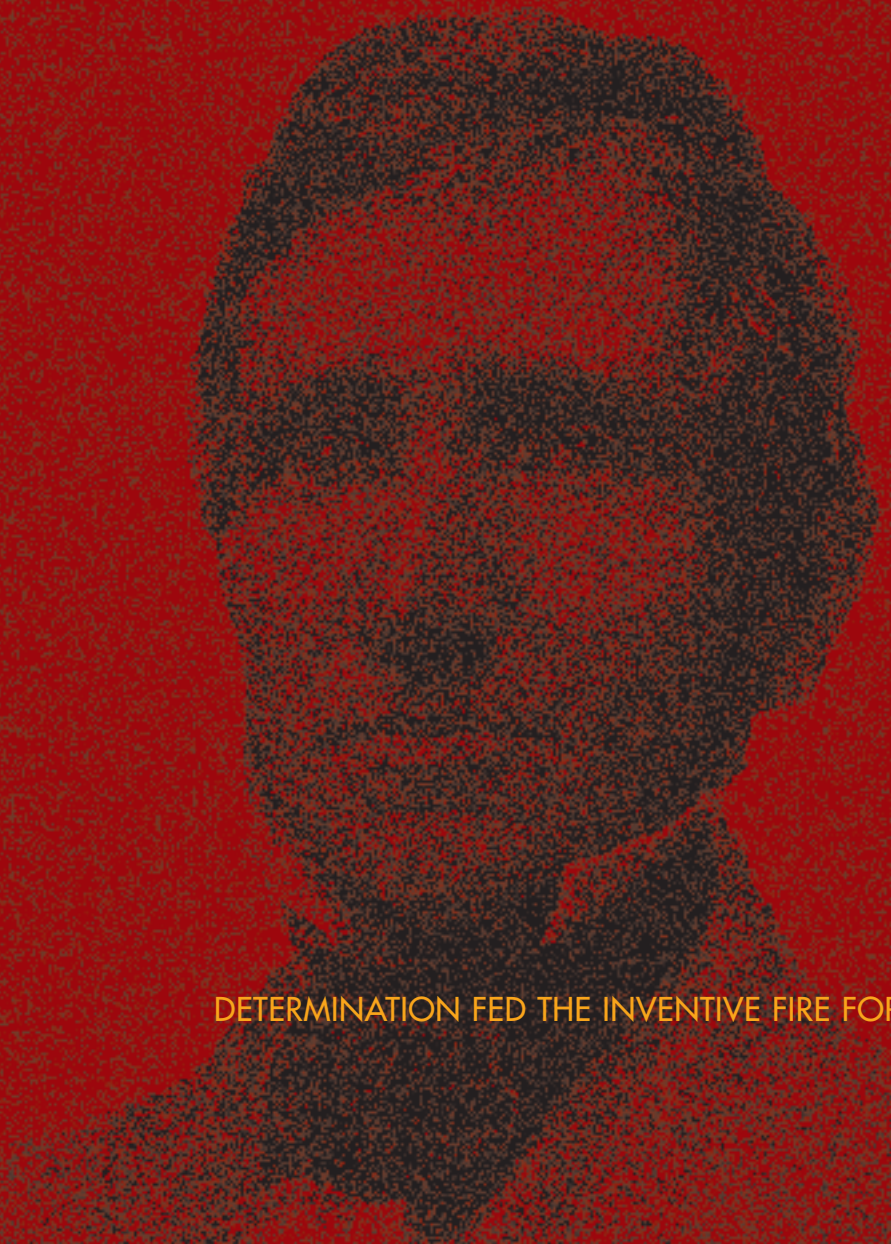
BY **SARAH ACHENBACH**

CHARLES GOODYEAR



IN 2005, the world's multi-billion-dollar rubber industry produced more than 20.8 million tons of natural and synthetic rubber and, across the globe, there is one cultivated rubber tree for every two humans on earth.

With such staggering statistics, it's hard to imagine the rubber manufacturing industry ever had a shaky start. Shakier still was the life and livelihood of Charles Goodyear, the determined, sickly inventor who created the first weatherproof rubber to be manufactured from the oozing sap of the gum rubber tree.

His fanatical vision to create what he called "elastic metal" drove Goodyear in and out of prison for unpaid debts and in courts over dozens of patent battles. But

DETERMINATION FED THE INVENTIVE FIRE FOR THE ULTIMATELY PENNILESS INVENTOR

it also led him to his subsequent discovery of the vulcanization process for rubber—a process that remains nearly unchanged from 1844, when Goodyear patented it, to today. Still, when Goodyear died at the age of 59 in 1860, he was penniless.

Using their kitchen as a factory, Goodyear, his wife and small children made hundreds of rubber over-soles only to watch the entire inventory melt.

The father of modern rubber and the sole inventor of the vulcanization method, neither he nor his family were connected to the company named in his honor: the Goodyear Tire & Rubber Co., the world's largest rubber company

During the early 1830s, "rubber fever" was sweeping America. Inventors, including a bankrupt hardware merchant named Charles Goodyear, worked hard to develop a year-round rubber from natural, waterproof gum rubber. Manufacturers hurried to build factories to meet the demand for new rubber products. In the summer of 1834, the 34-year-old, typically morose Goodyear excitedly presented his rubber valve for life preservers to the Roxbury India Rubber Co. in New York, the country's first rubber manufacturer. After being shown stinking, melted products sitting useless on the factory shelves, Goodyear was shown the door. Pencil erasers notwithstanding, it turned out the new rubber goods so in demand cracked in the cold of the winter and melted into a gluey substance in the summer. Customers were livid, factories were closed, and manufacturers and investors went bankrupt. The rubber revolution, it seemed, wouldn't bounce back.

Goodyear's rejection sparked an idea about rubber's gummy properties—a curiosity that led five years later to his discovery of the vulcanization process. Eager to experiment, he returned home to Philadelphia, only to end up making an immediate and familiar detour: serving time in debtor's prison. With a batch of raw rubber and a rolling pin supplied by his wife, Clarissa, Goodyear conducted experiments in his cell. He had struck upon the idea of adding a dry powder to the naturally adhesive, raw rubber to absorb the substance's stickiness. The "magic" powder for his earliest experiments was magnesia.

After his release from jail, the bankrupt Goodyear talked a friend into investing in the promising results. Using their kitchen as a factory, Goodyear, his wife and small children made hundreds of rubber over-soles only to watch the entire inventory melt. Neighbors complained of the smell, so Goodyear moved his "factory" to a squalid, fourth-floor tenement in New York City.

Relatives and friends urged him to stop his experiments and find a venture that could feed his family, but he continued undaunted, certain that he could single-handedly rekindle the country's faith in rubber. One key to his ultimate discovery came about while trying to remove paint using nitric acid from one of his rubber product samples. The sample turned black, so Goodyear threw it away only to retrieve it days later to marvel at the smooth, dry rubber that had resulted.

With an advance from a New York investor, Goodyear began producing clothes, life preservers, shoes and other products laced with nitric acid. Once again, Goodyear's luck wouldn't hold. The financial panic of 1837 wiped out both

There is a vast contrast between how tires were produced at early Goodyear plants and today's computer-operated, highly technical plants.

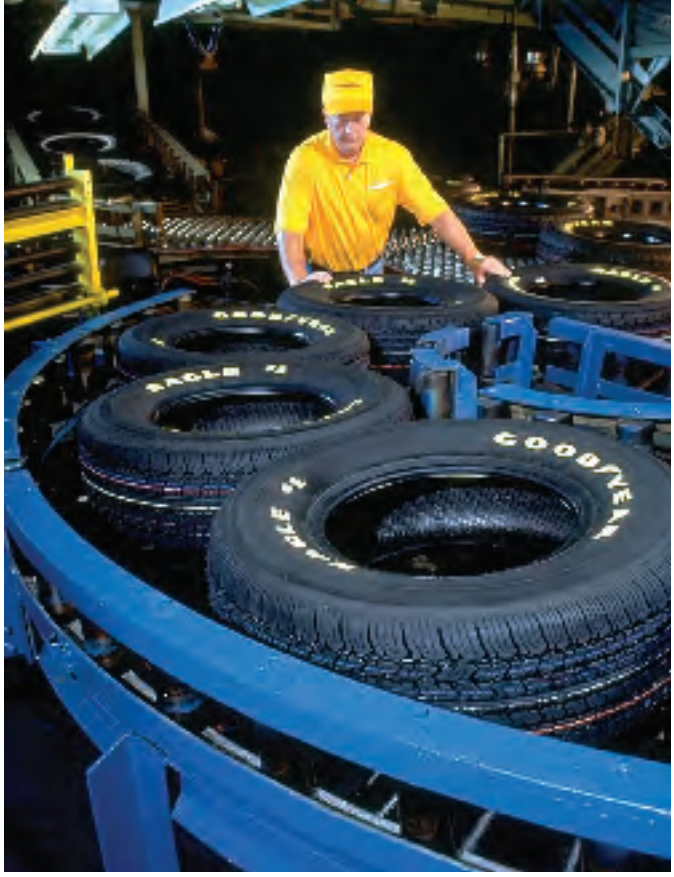
investor and inventor, and Goodyear, now 37, moved his family to an abandoned rubber factory on Staten Island, scrounging for food and financial backing.

Investors in Boston offered him another chance and convinced the government to order 150 rubber mailbags made from Goodyear's nitric-acid process. So confident of his product, Goodyear stored the completed order in a warm room and took his family on a month-long vacation. Every mailbag melted, and he was now destitute. Again, the family packed up, this time moving to Woburn, Mass., so that he could continue his experiments in local factories. Farmers took pity on the inventor and his family, allowing Goodyear to dig in their fields for half-ripe potatoes.

It was in Woburn that Goodyear discovered how to vulcanize rubber during the bitter cold of a New England winter in 1939. By this point, he had abandoned adding magnesia and nitric acid and began using sulfur. Legend has it that Goodyear—now racked with gout—hobbled through the snow on crutches to the Woburn general store to show off his latest experiment. The locals around the pot-bellied stove took one look at him and laughed at the penniless, crippled inventor. Goodyear started to wave his experiment. It flew from his fist and hit the stove, resulting not in a sticky mess, but rather a charred, leathery strip with a springy edge.

Goodyear's daughter writes of a less colorful version. After an experiment, Goodyear brushed some useless rubber and sulfur from his hands onto a hot stove. His daughter observed, "As I was passing in and out of the room, I casually observed a little piece of gum which he was holding near the fire, and I also noticed that he was unusually animated by some discovery which he had made. He nailed the piece of gum outside the kitchen door in the intense cold. In the morning he brought it in, holding it up exultantly. He had found it perfectly flexible, as it was when he put it out."

Whatever the event that sparked the discovery, Goodyear was adamant that his discovery of heating the rubber mixture was due not to circumstance but to providence, that it was meant for the man "whose mind was prepared to draw an inference," and who had "applied himself most perseveringly to the subject." With renewed vigor, he now spent day and night experimenting with



Though Charles Goodyear had no connection to the tire company that bears his name, his discovery of the vulcanization process made success possible for manufacturers around the world.

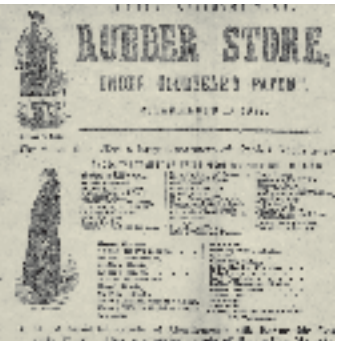
different heat levels from roasting the foul-smelling rubber in hot sand to using the family oven to bake it. To finance his endeavors, he pawned his children's schoolbooks and household furniture. He even sold the dishes, making rubber dishes for the family—though there was little, if any, food to eat. When spring 1839 arrived, he traveled to Boston to find friends who might finance him and was thrown in jail for not paying a $5 hotel bill. Upon return, he found that his infant son had died, one of six of the 12 Goodyear children to die during his lifetime.

Soon, he discovered the perfect level of heat needed for his sulfur and gum mix: steam applied for up to four to six hours at around 270 degrees Fahrenheit. Ironically, for Goodyear, whose family wore rags, the textile industry would be the first to manufacture a product that introduced his discovery to the world. His wealthy brother-in-law and Springfield, Mass., textile manufacturer used Goodyear's suggestion to weave rubber threads to create a better ruffled shirt front, which was the fashion rage in the mid-1800s. Once a manufacturing and consumer nightmare, rubber was now a rousing success, and factories across the world reopened to manufacture rubber products.

Choosing not to invest in manufacturing, Goodyear returned in earnest to his experiments, envisioning uses for rubber in a variety of goods from musical instruments and jewelry to sails and even ships. He fashioned for himself rubber vests and hats and used a rubber calling card. In 1844, in what would be his last smart business move, Goodyear applied for and received a U.S. patent for his invention (#3,633). Thus began the legal battles that would plague the remaining 16 years of his life. Goodyear went to court more than 36 times for patent infringement rights. In 1852, he famously hired Secretary of State Daniel Webster to defend him in the Circuit Court of the United States. With a legal oratory that made headlines, Webster was successful in defending his client's right to be named the sole inventor of vulcanized rubber, named for Vulcan, the Roman god of fire and craftsmanship.

When Goodyear died on July 1, 1860—emaciated and huddled over from sickness—he held more than 60 patents for rubber products. He had also perfected India rubber cloth, a mixture of fiber and rubber gum. He had lived to see his discovery result in hundreds of rubber goods and produce $8 million worth of products annually. Manufacturers were making fortunes from Goodyear's invention, yet numerous court battles over infringements on his 60-some patents cost him dearly. He owed $200,000 when he died. His family eventually became comfortable from royalties, though no Goodyear was ever connected to the company founded in 1898 that bears the family name.

The debt the world owes this disease-addled, debt-ridden inventor with unwavering curiosity and dogged perseverance is immeasurable. In his autobiography—printed on gum elastic sheets and rubber-bound—Goodyear eloquently expressed the philosophy that drove his lifelong fanaticism to create usable, modern rubber. "The writer is not disposed to repine and say that he has planted and others have gathered the fruits," Goodyear wrote. "The advantages of a career in life should not be estimated exclusively by the standard of dollars and cents, as is too often done. Man has just cause for regret when he sows and no one reaps."



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