Charles Goodyear & The History of Rubber

By Mary Bellis, About.com Guide

In 1852, in Trenton, New Jersey, two men appeared in the Circuit Court of the United States, the legal giants of their day, to argue the case of Goodyear vs. Day for patent infringement.

Rufus Choate represented the defendant (Day) and Daniel Webster the plaintiff (Goodyear). Daniel Webster, in the course of his plea, pointed to his client. The man whose cause he pleaded was a man of fifty-two, who looked fifteen years older, sallow and emaciated from disease. This was Charles Goodyear, inventor of the process which put rubber into the service of the world.

Trial of Charles Goodyear

The following five paragraphs are the words of Daniel Webster defending Charles Goodyear.

"And now is Charles Goodyear the discoverer of this invention of vulcanized rubber? Is Charles Goodyear the first man upon whose mind the idea ever flashed, or to whose intelligence the fact ever was disclosed, that by carrying heat to a certain height it would cease to render plastic the India Rubber and begin to harden and metallize it? Is there a man in the world who found out that fact before Charles Goodyear?

If Charles Goodyear did not make this discovery, who did make it? Who did make it? Why, if our learned opponent had said he should endeavor to prove that some one other than Mr. Charles Goodyear had made this discovery, that would have been very fair.

On the contrary they do not meet Charles Goodyear's claim by setting up a distinct claim of anybody else. They attempt to prove that he was not the inventor by little shreds and patches of testimony. Here a little bit of sulphur, and there a little parcel of lead; here a little degree of heat, a little hotter than would warm a man's hands, and in which a man could live for ten minutes or a quarter of an hour; and yet they never seem to come to the point. I think it is because their materials did not allow them to come to the manly assertion that somebody else did make this invention, giving to that somebody a local habitation and a name. We want to know the name, and the habitation, and the location of the man upon the face of this globe, who invented vulcanized rubber, if it be not he, who now sits before us.

Well there are birds which fly in the air, seldom lighting, but often hovering. Now I think this is a question not to be hovered over, not to be brooded over, and not to be dealt with as an infinitesimal quantity of small things. It is a case calling for a manly admission and a manly defense. I ask again, if there is anybody else than Charles Goodyear who made this invention, who is he?

Is the discovery so plain that it might have come about by accident? It is likely to work important changes in the arts everywhere. **It introduces quite a new material into the manufacture of the arts, that material being nothing less than elastic metal.** It is hard like metal and as elastic as pure original gum elastic. Somebody has made this invention. That is certain. Who is he? Mr. Hancock has been referred to. But he expressly acknowledges Charles Goodyear to be the first inventor. I say that there is not in the world a human being that can stand up and say that it is his invention, except the man who is sitting at that table."

Charles Goodyear - Sole Inventor of Vulcanized Rubber

The court found for the plaintiff, and this decision established for all time the claim of the American, Charles Goodyear, to be the sole inventor of vulcanized rubber.

When Christopher Columbus revisited Haiti on his second voyage, he observed some natives playing ball. Columbus' own men had brought their Castilian wind-balls to play with in idle hours. However, they found that the balls of Haiti were incomparably superior toys; they bounced better. These high bouncing balls were made from a milky fluid, the consistency of honey, which the natives harvested by tapping certain trees and then cured over the smoke of palm nuts.

Introducing Rubber

In 1736, a French astronomer was sent by his government to Peru to measure an arc of the meridian, He brought home samples of the milky fluid and reported that the Indians used it for lighting. He wrote that it burned without a wick very brightly and that the indians made shoes from it which were waterproof. The Indians collected the gummy fluid from trees in pear-shaped bottles on the necks of which they fasten wooden tubes. Pressure on the bottle sends the liquid squirting out of the tube, so they resemble syringes. Their name for the fluid, he added, was cachuchu or caoutchouc.

Thirty-four years later, an English writer wrote about a different use for the tree gum and a new name. A stationer accidentally discovered that it would erase pencil marks, And, as it came from the Indies and rubbed, of course it was renamed India rubber.

Rubber Soled Shoes

About the year 1820 American merchantmen, sailing between Brazil and New England, often carried rubber as extra ballast on the home voyage and dumped it on the wharves at Boston. One of the shipmasters exhibited to his friends a pair of native shoes made from rubber. Another, with more foresight, brought home five hundred pairs, and offered them for sale. They were thick, clumsily shaped, and heavy, but they sold. There was a demand for more. In a few years half a million pairs were being imported annually. New England manufacturers bid against one another along the wharves for the tree gum which had been used as ballast and began to make rubber shoes.

Macintosh Elastic Fabric

European vessels had also carried rubber home; and experiments were being made with it in France and Britain. A Frenchman manufactured suspenders by cutting a native bottle into fine threads and running them through a narrow cloth web. And Macintosh, a chemist of Glasgow, inserted rubber treated with naphtha between thin pieces of cloth and evolved the garment that still bears his name.

Waterproof Fabrics

At first the new business in rubber yielded profits. The cost of the raw material was infinitesimal; and there was a demand for the finished articles. In Roxbury, Massachusetts, a firm manufacturing patent leather treated raw rubber with turpentine and lampblack and spread it on cloth, in an effort to produce a waterproof leather. The process appeared to be a complete success, and a large capital was employed to make handsome shoes and clothing out of the new product and in opening shops in the large cities for their sale. Merchants throughout the country placed orders for these goods, which, as it happened, were made and shipped in winter.

Rubber Has Problems in the Heat and Cold

But, when summer came, the huge profits of the manufacturers literally melted away, for the beautiful garments decomposed in the heat; and loads of them, melting and running together, were being returned to the factory. And they filled Roxbury with such noisome odors that they had to be taken out at dead of night and buried deep in the earth.

And not only did these rubber garments melt in the heat. It presently transpired that severe frost stiffened them to the rigidity of granite.

It was in the year 1834, shortly after the Roxbury manufacturers had come to realize that their process was worthless and that their great fortune was only a mirage, and just before these facts became generally known, that Charles Goodyear made his entrance on the scene. He appeared first as a customer in the company's store in New York and bought a rubber life-preserver. When he returned some weeks later with a plan for improving the tube, the manager confided to him the sad tragedy of rubber, pointing out that no improvement in the manufactured articles would meet the difficulty, but that fame and fortune awaited the inventor of a process that would keep rubber dry and firm and flexible in all weathers.

Charles Goodyear Takes Up The Divine Cause Of Rubber

Charles Goodyear felt that he had a call from God. "He who directs the operations of the mind," he wrote at a later date, "can turn it to the development of the properties of Nature in his own way, and at the time when they are specially needed. The creature imagines he is executing some plan of his own, while he is simply an instrument in the hands of his Maker for executing the divine purposes of beneficence to the race." It was in the spirit of a crusader, consecrated to a particular service, that this man took up the problem of rubber.

The Life of Charles Goodyear

Charles Goodyear was born at New Haven, December 29, 1800, the son of Amasa Goodyear and descendant of Stephen Goodyear who was associated with Theophilus Eaton, the first governor of the Puritan colony of New Haven. It was natural that Charles should turn his mind to invention, as he did even when a boy; for his father, a pioneer in the manufacture of American hardware, was the inventor of a steel hayfork which replaced the heavy iron fork of prior days and lightened and expedited the labor of the fields.

When Charles was seven his father moved to Naugatuck and manufactured the first pearl buttons made in America; during the War of 1812 the Goodyear factory supplied metal buttons to the Government. Charles, a studious, serious boy, was the close companion of his father. His deeply religious nature manifested itself early, and he joined the Congregational Church when he was sixteen. It was at first his intention to enter the ministry, which seemed to him to offer the most useful career of service, but, changing his mind, he went to Philadelphia to learn the hardware business and on coming of age was admitted to partnership in a firm established there by his father. The firm prospered for a time, but an injudicious extension of credit led to its suspension. So it happened that Goodyear in 1834, when he became interested in rubber, was an insolvent debtor, liable, under the laws of the time, to imprisonment. Soon afterward, indeed, he was lodged in the Debtor's Prison in Philadelphia.

It would seem an inauspicious hour to begin a search which might lead him on in poverty for years and end nowhere. But, having seen the need for perfect rubber, the thought had come to him, with the force of a religious conviction, that "an object so desirable and so important, and so necessary to man's comfort, as the making of gum-elastic available to his use, was most certainly placed within his reach."

Thereafter he never doubted that God had called him to this task and that his efforts would be crowned with success. Concerning his prison experiences, of which the first was not to be the last, he says that "notwithstanding the mortification attending such a trial," if the prisoner has a real aim "for which to live and hope over he may add firmness to hope, and derive lasting advantage by having proved to himself that, with a clear conscience and a high purpose, a man may be as happy within prison walls as in any other (even the most fortunate) circumstances in life." With this spirit he met every reverse throughout the ten hard years that followed.

Luckily, as he says, his first experiments required no expensive equipment. Fingers were the best tools for working the gum. The prison officials allowed him a bench and a marble slab, a friend procured him a few dollars' worth of gum, which sold then at five cents a pound, and his wife contributed her rolling pin. That was the beginning.

Charles Goodyear Experiments with Rubber

For a time he believed that, by mixing the raw gum with magnesia and boiling it in lime, he had overcome the stickiness which was the inherent difficulty. He made some sheets of white rubber which were exhibited, and also some articles for sale. His hopes were dashed when he found that weak acid, such as apple juice or vinegar, destroyed his new product. Then in 1836 he found that the application of aqua fortis, or nitric acid, produced a "curing" effect on the rubber and thought that he had discovered the secret. Finding a partner with capital, he leased an abandoned rubber factory on Staten Island. But his partner's fortune was swept away in the panic of 1837, leaving Goodyear again an insolvent debtor. Later he found another partner and went to manufacturing in the deserted plant at Roxbury, with an order from the Government for a large number of mail bags. This order was given wide publicity and it aroused the interest of manufacturers throughout the country. But by the time the goods were ready for delivery the first bags made had rotted from their handles. Only the surface of the rubber had been "cured."

This failure was the last straw, as far as Charles Goodyear's friends were concerned. Only his patient and devoted wife stood by him; she had labored, known want, seen her children go hungry to school, but she seems never to have reproached her husband nor to have doubted his ultimate success. The gentleness and tenderness of his deportment in the home made his family cling to him with deep affection and bear willingly any sacrifice for his sake; though his successive failures generally meant a return of the inventor to the debtor's prison and the casting of his family upon charity.

The Rubber Vulcanization Process

The nitric acid process had not solved the problem but it had been a real step forward. It was in the year 1839, by an accident, that he discovered the true process of vulcanization which cured not the surface alone but the whole mass. He was trying to harden the gum by boiling it with sulphur on his wife's cookstove when he let fall a lump of it on the red hot iron top. It vulcanized instantly. This was an accident which only Goodyear could have interpreted. And it was the last. The strange substance from the jungles of the tropics had been mastered. It remained, however, to perfect the process, to ascertain the accurate formula and the exact degree of heat.

Poverty

The Goodyears were so poor during these years that they received at any time a barrel of flour from a neighbor thankfully. There is a tradition that on one occasion, when Goodyear desired to cross between Staten Island and New York, he had to give his umbrella to the ferry master as security for his fare, and that the name of the ferry master was Cornelius Vanderbilt, "a man who made much money because he took few chances." The incident may easily have occurred, though the ferry master could hardly have been Vanderbilt himself, unless it had been at an earlier date. Another tradition says that one of Goodyear's neighbors described him to an inquisitive stranger thus: "You will know him

when you see him; he has on an India rubber cap, stock, coat, vest, and shoes, and an India rubber purse without a cent in it!

Charles Goodyear's trials were only beginning. He had the secret at last, but nobody would believe him. He had worn out even the most sanguine of his friends. "That such indifference to this discovery, and many incidents attending it, could have existed in an intelligent and benevolent community," wrote Goodyear later, "can only be accounted for by existing circumstances in that community."

The great losses that had been sustained in the manufacture of gum-elastic: the length of time the inventor had spent in what appeared to them to be entirely fruitless efforts to accomplish anything with it; added to his recent misfortunes and disappointments, all conspired, with his utter destitution, to produce a state of things as unfavorable to the promulgation of the discovery as can well be imagined. He, however, felt in duty bound to beg in earnest, if need be, sooner than that the discovery should be lost to the world and to himself.

How he subsisted at this period charity alone can tell, for it is as well to call things by their right names; and it is little else than charity when the lender looks upon what he parts with as a gift. The pawning or selling some relic of better days or some article of necessity was a frequent expedient. His library had long since disappeared, but shortly after the discovery of this process, he collected and sold at auction the schoolbooks of his children, which brought him the trifling sum of five dollars; small as the amount was, it enabled him to proceed. At this step he did not hesitate. The occasion, and the certainty of success, warranted the measure which, in other circumstances, would have been sacrilege."

His itinerary during those years is eloquent. The goal might be an attic room or shed to live in rent free, or a few dollars for a barrel of flour for the family and a barrel of rubber for himself, or permission to use a factory's ovens after hours and to hang his rubber over the steam valves while work went on. From Woburn in 1839, the year of his great discovery, he went to Lynn, from Lynn back to the deserted factory at Roxbury. Again to Woburn, to Boston, to Northampton, to Springfield, to Naugatuck; in five years as many removes. When he lacked boat or railway fare, and he generally did, he walked through winds and rains and drifting snow, begging shelter at some cottage or farm where a window lamp gleamed kindly.

1844 Patent

Goodyear took out his patent in 1844. The process he invented has been changed little, if at all, from that day to this. He also invented the perfect India rubber cloth by mixing fiber with the gum a discovery he considered rightly as secondary in importance only to vulcanization. When he died in 1860 he had taken out sixty patents on rubber manufactures. He had seen his invention applied to several hundred uses, giving employment to sixty thousand persons, producing annually eight million dollars' worth of merchandise--numbers which would form but a fraction of the rubber statistics of today.

Goodyear lived for sixteen years after his discovery of the vulcanization process. During the last six he was unable to walk without crutches. He was indifferent to money. To make his discoveries of still greater service to mankind was his whole aim. It was others who made fortunes out of his inventions. Goodyear died a poor man.

In his book, a copy of which was printed on gumelastic sheets and bound in hard rubber carved, he summed up his philosophy in this statement: "The writer is not disposed to repine and say that he has planted and others have gathered the fruits. The advantages of a career in life should not be estimated exclusively by the standard of dollars and cents, as it is too often done. Man has just cause for regret when he sows and no one reaps."