An Inventor's Tale: The Story of Howard Gilbert Freeman

"If a man write a better book, preach a better sermon, or make a better mousetrap than his neighbor, tho' he build his house in the woods, the world will make a beaten path to his door."

—Ralph Waldo Emerson

"Familiar things happen, and man does not bother about them. It requires a very unusual mind to undertake the analysis of the obvious."

—Alfred North Whitehead

The ability to see and appreciate the obvious—this is the quality that separates the inventor from the average man. In his eyes, even everyday objects seem ripe with possibilities for change and improvement. To him, the vast, complex panorama of our technological world is a landscape replete with unfilled niches. What the rest of us call problems and obstacles, he calls opportunities. His is a world where there are no rules, no guidelines—where everything is possible with imagination and vision.

But inventiveness without enterprise is like a rocket without fuel, and it is the rare inventor who has the insight and initiative to turn his new ideas into marketable products. Rarer still is the entrepreneur with the savvy and instincts needed to make a new company soar. During its history, Worcester has produced more than its share of these exceptional men. Few, however, have realized the success of Howard G. Freeman.

It might be said that Howard Freeman was born to be an inventor. The grandson of Russian and Swedish immigrants, Freeman developed a love of tinkering early on by observing his father, an entrepreneur with an affinity for mechanical devices, and his uncle, a successful engineer and inventor. "The idea of tinkering with mechanical things was part of my family environment," he once told a newspaper reporter.

Born and raised in Winthrop, Mass., a suburb of Boston, Freeman set his mind on becoming a mechanical engineer while enrolled at Winthrop High School. An exceptional student, he was offered scholarships to MIT, RPI, and WPI. MIT was a bit too close to home, and RPI a bit too far, so in 1936 he enrolled at Worcester Polytechnic Institute. He enjoyed his classes, but at times found the highly structured curriculum too confining for his inquisitive mind and diverse interests.

As a student, Freeman displayed an inventive bent. Required to complete an engineering project, most of his fellow students were content to merely demonstrate principles and techniques they had learned in class. Freeman chose instead to solve a real manufacturing problem. He set out to build a device that could remove bobby pins from a pile and place them neatly on a card to be sold. Before he was done, he had found a way to make the pins line up by placing them on belts running at different speeds.

Though he never reached his ultimate objective, Freeman says the project taught him a valuable lesson. "I learned," he said years later, "how easy it is not to succeed when faced with a practical problem."
Outside the classroom, Freeman enjoyed a wide range of interests and activities. He also developed a love of literature, especially poetry—an interest he has maintained throughout his life. "I believe in poetry," he once said, "not only as something emotional and spiritual, but because people who read poetry communicate better." Years later he would surprise a new assistant by suggesting that she take a poetry course. Asked once by some students to define engineering, he replied simply, "Doing engineering work is like writing poetry."

Like most families in the mid-1930s, Freeman's was caught in the grip of the Great Depression. It was only through scholarship aid that he was able to pay his tuition bills. To afford room and board and meet expenses, Freeman worked 35 hours each week washing dishes in a boarding house for WPI students. "Because I could never have gone through the four years without the financial assistance made available to me, I'll never cease to be grateful to Tech," he would later write a fellow alumnus.

In 1940, Freeman received his degree in mechanical engineering and set out to launch his professional career. A year later he would begin another important chapter of his life when he married the former Esther Smith of Medford, Mass.

Not wishing to join a large company, Freeman took a job with Rockwood Sprinkler Company in Worcester, founded in 1908 by George I. Rockwood, WPI Class of 1888, who was briefly a professor of steam engineering at the Institute. "The president of the company decided that he needed a new department," Freeman says. "I reported to work on the first day expecting training and a job description. I got neither. I was told to do whatever I wanted. There was no structure. I created my own job."

Freeman created more than a job. He built Rockwood's research and development department—consisting initially of just himself, but later numbering about a dozen engineers. For the young inventor, it was a dream come true. Freeman turned his attention first to a seemingly mundane problem—improving the spray nozzles that were just then being developed for fighting fires. The need for improved fire fighting technology would take on a special urgency when the Japanese attacked Pearl Harbor in December 1941.

The U.S. Navy called on Rockwood and several other companies to find a new way to fight oil fires on ships. Using traditional fire fighting methods, naval crewmen attacked fires by directing streams of seawater at them. The technique was proving ineffective—the Navy was losing too many ships to fires that raged out of control. Freeman traveled to Washington, D.C., with a Rockwood manager. After listening to the presentations, he realized the work he was doing on spray nozzles held the answer.

Within two weeks, Freeman worked out a design for a nozzle that could create a fog of water particles. The fog, Freeman deduced, could extinguish an oil fire far more effectively than a water stream and it had the added advantage of shielding a fire fighter from the heat of the flames—enabling fires to be fought inside ship compartments. The nozzle—named "Waterfog"—was evaluated at the Navy's test station in Norfolk, Va., where it worked exactly as Freeman had predicted. The Navy approved the design and sent Freeman back to Worcester to begin setting up a pilot production facility.

As the first units were coming off the line, the Navy called again. Off the coast of Nova Scotia the troop ship Wakefield—a converted passenger liner and the largest ship in the naval fleet—was ablaze. Rockwood rushed to complete enough nozzles to fight the fire and delivered them to the Quonset Naval Air Station in Rhode Island. From there they were flown to waiting destroyers and put to work successfully extinguishing the blaze. During the war the nozzles Freeman designed would save not only dozens of naval vessels, but thousands of American lives. Suddenly, this 23-year-old engineer was a hometown hero.

Toward the end of the war, Freeman was again consulted by Washington. The Navy was facing a new threat—kamikazes. The nozzles that Freeman had designed were not proving effective against the gasoline fires that erupted as these manned bombs
crashed on the decks of U.S. ships, and Freeman was asked to develop a device that could generate a fog of fire-fighting foam.

With no precedent to follow, Freeman relied on his own intuition and devised a combination of a special fog nozzle and a metal screen that "worked so well, it was unbelievable," he says. In short order, Freeman solved a problem that had puzzled the Navy's own researchers for several months. After the war, the nozzles were adapted for use on the crash rescue vehicles used at most military and commercial airports.

Freeman was involved with another critical project during the war—though he did not know how critical it was at the time. To better understand how to fight fires in high voltage transformers, Freeman worked with WPI professors Victor Siegfried and Hobart Newell to evaluate how the transformers would react to the spray from a fog nozzle. The work was part of a major U.S. government effort called the Manhattan Project. It was only after the war that Freeman learned that the transformers were being used to supply the extraordinary quantities of power needed to separate plutonium for the first atomic bombs.

His work at Rockwood won Freeman a host of patents, including one for a new type of sprinkler head that used fog-forming nozzles. In fact, of the 22 patents he has earned during his career, most were for his Rockwood inventions. But, working in fire safety had one important disadvantage—it usually took an accident or a disaster to demonstrate the effectiveness of Freeman's inventions. He began to think about starting his own company to develop technology that could be put to work in everyday life.

Through his work at Rockwood, Freeman came to understand the advantages and limitations of the valves then in common use. In particular, he became intrigued with a device known as the ball valve—in essence a ball with a hole through it seated inside a pipe. The valve had inherent advantages, not the least of which was its ability to completely open and close with just a quarter turn. This simplicity of operation made the valves good candidates for use in automated systems.

But Freeman was also well-acquainted with the drawbacks of the ball valve. When fluids of different temperatures passed through them, the balls tended to contract or expand, creating gaps that caused leaks. The models then in use also tended to become tight and wore out much too soon. These problems limited the wide acceptance of the ball valve. But, where others saw insurmountable problems, Freeman saw an opportunity. During his 14 years at Rockwood he had become skilled at taking the state of the art and advancing it to new dimensions. He became convinced he could do the same for the ball valve.

In 1954 he left Rockwood and set up an experimental laboratory in a bedroom of his home on Jamesbury Drive in Worcester: it was this address that gave his new company its name—Jamesbury Corporation. In his lab he began the basic investigative work that would become the foundation of his first product. "In this, as well as other fields, practical progress is impossible without scientific research," he would later tell a reporter.

What Freeman developed in his laboratory would revolutionize the valve industry. To compensate for the expansion and contraction of the ball due to changes in temperature or pressure, Freeman invented a flexible valve seat. The seat was able to change its shape to maintain a tight seal around the valve and also adjust automatically for wear. The valve seat could be made from a variety of materials, including plastic, rubber and metal; it became one of the earliest industrial applications for a new Du Pont material called Teflon. The design for the seat would win Freeman yet another patent.

Freeman knew he would need special skills to develop, manufacture and market the new valve. He turned first to his brother Julian, who had worked in sales since graduating from the University of Michigan in 1939. It is a measure of the confidence Julian had in his younger brother that it was only after a lengthy conversation about the technical details of incorporation that he finally asked, "By the way, what are we going to manufacture?"

Freeman would later credit Julian, who died in 1975, for a good deal of the company's early success.
“Julian, through the establishment of ethical and practical procedures,” he would note, “avoided many of the pitfalls that new companies can get into. Very often a company begins with good manufacturing and product ideas, but a poor marketing policy. Julian’s work in establishing marketing excellence attracted the interest of industry quickly.”

Howard Freeman became president and general manager of the new firm, while his brother took charge of developing marketing plans. Worcester native Saul L. Reck, owner of a Worcester fur shop and warehouse, came on board to design the company’s financial plan (he would later leave to found Goddard Industries). The three entrepreneurs raised $85,000 by selling stock to 25 Worcester investors.

Looking back, Jamesbury’s first few years read like a classic Horatio Alger story. Freeman’s first office was a desk in his son’s bedroom. From there, the company moved to a loft in downtown Worcester where model-making and testing of the new valve design began. As the design progressed, a local businessman, Oscar R. Vaudreuil, inventor of the first reciprocal lawn sprinkler, offered Freeman the use of his plant for preproduction work. The company was transplanted again to a 6,000-square-foot shop where manufacturing began. Jamesbury had six employees in 1956 and brought in just over $35,000 in sales.

In 1957, just three years after Freeman founded Jamesbury, the company was ready to move again, this time to a 12,000-square-foot plant on New Street in Worcester. By all measures, the young firm’s success was skyrocketing. Jamesbury’s work force grew from 200 in 1960 to 500 in 1969. During that same period, sales grew from $5 million to $16 million. By the end of the 1970s, Jamesbury employed 1,250 people in facilities around the world, had about 2,000 stockholders, and was recording annual sales of nearly $80 million.

In time, Jamesbury’s ball valves won overwhelming acceptance by virtually every type of process industry, especially the petrochemical industry. The company also developed and marketed automatic electric, hydraulic and pneumatic actuators to control its valves. Over the years Jamesbury would expand its

An early Jamesbury ball valve (top). Freeman’s patented valve seat revolutionized the valve industry and made Jamesbury one of the world’s most important valve manufacturers. The company makes other types of valves, including six 48-inch butterfly valves that flood the launch pad to cushion the shock of the space shuttle’s engines as the spacecraft lifts off.
product line to include other kinds of valves, especially butterfly valves, which operate much like dampers with a disk that controls the flow of a liquid.

The U.S. Navy became an early customer. By developing a special variation of its commercial valve, Jamesbury won a contract to supply ball valves for the Navy's brand new fleet of nuclear submarines in 1957. The Navy realized that no conventional valve could operate reliably under the conditions the subs would experience at the depths to which they were designed to dive. The Jamesbury valves were also easier to operate and far quieter than conventional valves. "The Navy came to us with their submarine valve problem," Freeman says, "and we were able to solve it."

Tackling the technical challenges of making valves for submarines would prove to be the easiest part of Jamesbury's relationship with the Navy. Not long after the company began supplying valves for the nuclear fleet, the Navy allowed its other suppliers to infringe Jamesbury's patents. Without patent protection, Freeman knew his company's survival would be on the line. Even more, the Navy's action offended Freeman's sense of ethics.

"We saved their necks," he explained to a writer years later. "They had the nuclear submarine George Washington ready to launch, and they had no valves capable of working in the conditions to which the sub would be subjected when deeply submerged. We designed a valve and it worked the first time it was tested under simulated conditions. Naturally, we expected some substantial contracts from Electric Boat, the primary design and manufacturing facility for the submarines, but instead EB began manufacturing our valves themselves, assuming we wouldn't fight."

But Jamesbury did fight, filing a patent infringement suit against the Navy in 1963. It would take 17 years for the case to wend its way through the courts, but in 1980 Freeman received the moral and financial judgement he had sought. The court ruled in favor of Jamesbury and awarded the company $8 million. It was the second largest patent infringement award ever granted in the United States and the largest granted to a living inventor.

NASA was another early customer. Seven of the valves in the Mercury space capsule were made by Jamesbury. In 1961, when the re-entry system in Alan Shepard's capsule malfunctioned, the astronaut had to fly the spacecraft in manually. It was a Jamesbury valve he opened to start the re-entry procedure. Today six 48-inch Jamesbury butterfly valves supply a spray of water that cushions the shock waves from the space shuttle's engines as the spacecraft lifts off. Once again, Jamesbury valves are performing flawlessly under demanding circumstances, injecting between half a million and a million gallons of water at the base of the pad in just over a minute.

In 1984, 30 years after he launched Jamesbury in his bedroom workshop, Howard Freeman sold the company to Combustion Engineering for $100 million. The company changed hands again in 1988 when Combustion Engineering sold Jamesbury to Rauma Repola, a large Finnish manufacturer. Rauma Repola merged Jamesbury with its Neles Division, creating Neles-Jamesbury, one of the world's leading valve makers.

When Freeman decided to sell what he had devoted so much of his life to, he was understandably particular about the qualities he wanted in a buyer. More than anything, Freeman wanted a company that would treat Jamesbury employees with the same respect that he had always shown them. Soft-spoken but self-assured, Freeman does not easily take credit for the things he has done, preferring instead to praise the men and women who make up the Jamesbury community. It is this quality that has formed the core of his approach to managing people.

While he made a point of taking management courses when time permitted over the years to sharpen his skills, he also credits good instincts for his success as a manager. Those instincts led him to hire the best people he could find and then treat them as he liked to be treated himself. For example, he never had a secretary, but an assistant. On his frequent visits through the plant, he greeted employees by their first name and took the time to get to know their interests and concerns. Freeman was deeply saddened when, hit by the worldwide recession of 1982, Jamesbury was forced to lay off 250 workers.
“You learn a lot about people by the way they treat taxi drivers, waitresses and elevator operators,” William Rawstron ’57, vice president for quality and engineering at Neles-Jamesbury, who worked with Freeman for 27 years, once told Worcester Magazine. “Howard has a great deal of respect for the dignity and the needs of all individuals.” Not surprisingly, Jamesbury was a leader in employee relations in the greater Worcester area. Committed to fairness in all of its personnel matters, the company was one of the first to provide equal benefits to shop and office workers.

From the beginning, Freeman was also determined to make his company not only a fair employer, but a good neighbor. Under his leadership, Jamesbury contributed regularly to educational and civic groups in the area. “Community participation actually helps in our operations,” he once said. “A quality product has to reflect quality from within as well as without. You can’t have one without the other.”

His dedication to the world outside of Jamesbury has carried over to his relationship with his alma mater. In 1947 Freeman continued his WPI education by completing the requirements for a professional engineering degree in mechanical engineering. In 1962, he joined the Alumni Council and seven years later was elected a member of the Board of Trustees. He became secretary of the corporation in 1977, vice chairman of the board in 1979 and board chairman in 1984. Though he stepped down as chairman in 1990, he continues as an active trustee.

During his term as chairman Freeman provided advice and counsel to two of WPI’s 13 presidents. As a trustee he also participated in what became one of the most significant chapters in the history of the Institute—the development and implementation of the WPI Plan, the college’s innovative undergraduate education program. From the beginning, Freeman saw the tremendous potential in this project-oriented approach to engineering education, for it embodies a philosophy of learning close to his own heart.

“I feel that successful people are those who can exist and prosper in an unstructured environment,” he told a group of WPI students a few years back, adding that students also need an appreciation for art, music and culture to relate well to the world and the people around them. When asked why he has been so actively involved in WPI over the years, he once replied, “I believe strongly in education. I also have a deep love for young people and want to help them in any way I can.”

WPI has twice honored Freeman for his accomplishments in life and his uncountable contributions to the success of the Institute. In 1972 the college gave him its Robert H. Goddard Alumni Award for Professional Achievement. At Freeman’s 50th reunion in early June 1990, the WPI Alumni Association presented him with its distinguished service award.

As an astute businessman, Freeman has long recognized the importance of fund-raising to the growth and development of an institution of higher learning. He has held leadership positions in three WPI capital campaigns, most recently as chairman of the Board of Trustees during the highly successful
The Freemans' generosity and concern extend beyond the WPI campus. A distinguished collector of fine art, Esther Freeman has long been an active volunteer and corporator for the Worcester Art Museum, one of the finest small museums in the nation. Howard joined the board of trustees of the museum in 1978 and is now an honorary trustee. Esther has also devoted countless hours of service over the years to the School for the Performing Arts in Worcester as a trustee and volunteer. The school provides instruction in music and theater to children from the city.

Howard Freeman is also a member of the American Antiquarian Society in Worcester and is a corporator of the Greater Worcester Community Foundation. He was New England Chapter chairman of the Young Presidents' Organization and later became a member and New England Chapter chairman of its continuing organization, the Forty-Niners Inc. As a distinguished engineer and inventor, Freeman has played an active role in the American Society of Mechanical Engineers, the National Fire Protection Association and the American Management Association. Freeman received the 1976 Scientific Achievement Award from the Worcester Engineering Society and the "Heart of the Commonwealth Award" from the Society for the Advancement of Management in 1965. The former Central New England College awarded him an honorary degree in 1981.

Freeman once described himself as "economically conservative and socially liberal." While he has never sought the limelight for himself or his achievements, he has never shied from speaking out on issues that touch him deeply. In the 1960s, as the conflict in Indochina escalated, he joined Business Executives Against the War in Vietnam. More recently, he has lent his support to Business Executives for National Security, an organization of top U.S. business people committed to finding ways to cut federal military spending without harming national security.

While he has given generously of his time to his community over the years, Freeman has also closely guarded his personal time, choosing to devote as
many of his hours away from the office as possible to his family and to sailing, one of the Freemans’ greatest passions. “I was in high school when I met this skinny little girl with big brown eyes,” Freeman once said of his introduction to Esther. “I liked her and invited her to go sailing with me. She’s been sailing with me ever since.”

On their ketch *Snowbird*, the Freeman’s have sailed to many ports along the Atlantic coast over the years. A member of the Blue Water Sailing Club, Freeman has several times raced *Snowbird* to Bermuda. Four years ago, he crossed the Atlantic with five friends in a square-rigged boat based on a 19th century design. The vessel spent 20 days in open ocean.

It may be no coincidence that Howard Freeman has felt a special attraction to the sea and to sailing. Like sailors down through the ages who have set out into the unknown to chart new courses and explore new worlds, Freeman has undertaken his own voyage of discovery over the past half century. Combining an inventive knack, unbridled creativity and uncommon common sense, he has looked beyond the obvious to see what no one else ever has. In the process, he has truly changed the world. That is the greatest legacy any inventor can hope for.