

# Benjamin Holt

**T**HE word *bulldozer* brings to mind an off-road piece of equipment with a large scraper blade in front. A bulldozer moves easily over rough terrain because it has a track-laying system. The vehicle lays down its own track to spread its weight over a large area, which keeps it from getting stuck. Farmers used the first successful track layer on 20-ton tractors they operated on the soft, rich soil of northern California. Benjamin Holt and his three brothers built it in the course of trying to make a maneuverable agricultural power unit that had a large ground-contact area. Holt developed a pair of crude wooden crawlers and successfully tested the world's first practical track-laying tractor on Thanksgiving Day in 1904.

Four Holt brothers were born into a Concord, New Hampshire, family that had a sawmill that processed hardwoods for wagon construction. Concord's popular wagons and coaches, first made in 1813, carried passengers and mail throughout the entire New England area. Charles was the oldest son, followed by William, Ames, and, finally, Benjamin. The three older brothers moved to the San Francisco area in 1864, where they founded C. H. Holt and Co., which did business in hardwood, lumber, and wagon materials. They primarily dealt with structural applications such as axles, wheels, and frames. They had hardwood from their home state shipped west by cargo ship, and they dried it in the arid climate near Stockton, California. Benjamin stayed in New Hampshire to handle that end of the family business.

The Holt brothers soon organized the Stockton Wheel Co., and in 1883 Benjamin moved west to manage the company. The factory had cost \$65,000 to construct. For power, it used a single 40-horsepower



Courtesy of the Caterpillar Tractor Co.

**Born:**  
January 1,  
1849, in  
Concord,  
New  
Hampshire

**Died:**  
December 5,  
1920, in  
Stockton,  
California

Corliss steam engine that had been manufactured in Providence, Rhode Island. All its machinery was belt driven by the Corliss engine. Production in the first year of operation totaled 6,000 wagon wheels and 5,000 carriage bodies. Among their more popular wheel sizes was a 10'-diameter model. Redwood loggers used two of these, connected by a strong 10' axle. The loggers would fasten a large log to the axle and pull it from the forest with a team of horses.

Many people who came to California during the Gold Rush of 1848 did not, as they had hoped, become instant millionaires. Instead, they found livelihoods farming wheat fields in the northern part of the state. Land was plentiful in the mid-1800s and the huge farms required large numbers of people and horses to harvest the crops. One farm was 36,000 acres in size, and

California ranked sixth in wheat production among the states.

Benjamin proved to be the most technically competent of the Holt brothers, and he soon expanded the company into the manufacture of farming equipment. He bought patent rights to some equipment and enlarged the factory to accommodate up to 300 employees. The company sold its first huge combine, a combination harvester and thresher, in 1886. It had a 14' cutting bar and was pulled by 18 horses. The largest combine the Hols built had a 50'-long cutting bar. (A 20' cutting bar is now considered large.) Combines were expensive combinations of gears, belts, and shafts that required as many as 40 horses to operate. Even a slight provocation, such as gear noise or a bee sting, could cause a stampede that damaged parts and required costly repairs. That problem and the difficulty of controlling so many animals made obvious the need for a more compact power source.

Holt built his first experimental steam-powered tractor in 1890. It had a 24'-long frame and developed 60 horsepower from a single 11"-diameter, 12"-stroke piston. Customers could order it equipped to burn wood, coal, or oil as fuel. When loaded with its 675 gallons of water, it weighed 48,000 pounds and rode on large metal wheels. In spite of their weight and awkward size, Holt's tractors were popular because they could harvest large fields for one-sixth the cost of horse-drawn combines. Although

they were designed for farming use, foresters bought them to haul redwood logs where there were no roads. Holt claimed his standard engine could haul 40 to 50 tons at 3 mph, and at half the cost of using horses. The tractors were extremely powerful and useful, but they were so heavy they often got stuck in the soft soil. Holt unsuccessfully tried to eliminate the problem by using large wheels. One tractor had wheels 7-1/2' in diameter and 6' wide—resulting in a 46'-wide tractor. The tractor was expensive, difficult to transport, and difficult to maneuver in the field. Holt experimented with multiple wheels until he decided to try a track-laying technique.

The use of tracks on moving machinery was not new at the time that Holt made his first attempt. Well over 100 worldwide patents had already been issued. However, all the designs were mechanical failures that did not work well in the field. Since most of the patents were British, Holt traveled to England in 1903 to investigate the courses of their development. He used his knowledge along with the company's expertise in design, metallurgy, and testing to develop a practical track layer. His 1904 crawler tractor proved a success from the beginning, and Holt soon introduced models under the Caterpillar trademark. Company photographer Charles Clements had observed that the tractor crawled like a caterpillar. Holt responded, "Caterpillar it is. That's the name for it!" The first production Caterpillars had a track frame on each side that measured 30" high x 42" wide x 9' long. The tracks were 3" x 4" redwood slats. Holt sold his first steam-powered tractor crawlers for \$5,500.

Holt started developing gasoline-powered tractors in 1906. Gasoline engines offered the advantage of producing more power per pound since they did not have the added weight of the heavy boiler water needed for steam engines. The first 40 hp gas-powered models went into production in 1908. The company sold 28 of them for use in building a 233-mile aqueduct to supply water to the city of Los Angeles. The most popular gas-powered tractor was the Model 75, manufactured a few years later. It weighed 24,000 pounds and had a 75 hp engine.

The older Holt brothers realized that Benjamin had insight into mechanical devices



Courtesy of the Caterpillar Tractor Co.

One of Holt's original track-laying tractors working a field in northern California

that they lacked. By 1905, his brothers had either died or left the area, and Benjamin managed the factory by himself. His company became enormously profitable by making tracked vehicles for farming, road construction, and the military. Before the outbreak of World War I, 2,000 Caterpillar tractors were in service in more than 20 countries.

Holt was a quiet and unassuming man who loved his work. He was happiest when experimenting at the factory with whatever mechanical problems faced him at the time. He took out several patents. Holt's factory workers liked him, and he left a trust fund for former employees who found themselves in financial difficulties. He died in 1920, but his wife lived until 1952 and served as a regent of the University of the Pacific for 25 years. In 1925, the Holt Co. merged with one of its competitors, the C. L. Best Co., and took the name Caterpillar Tractor Co.

One noteworthy modern vehicle that uses the track-laying concept is the bulldozer. The precise origin of the word *bulldozer* is obscure and appears to be lost to history.

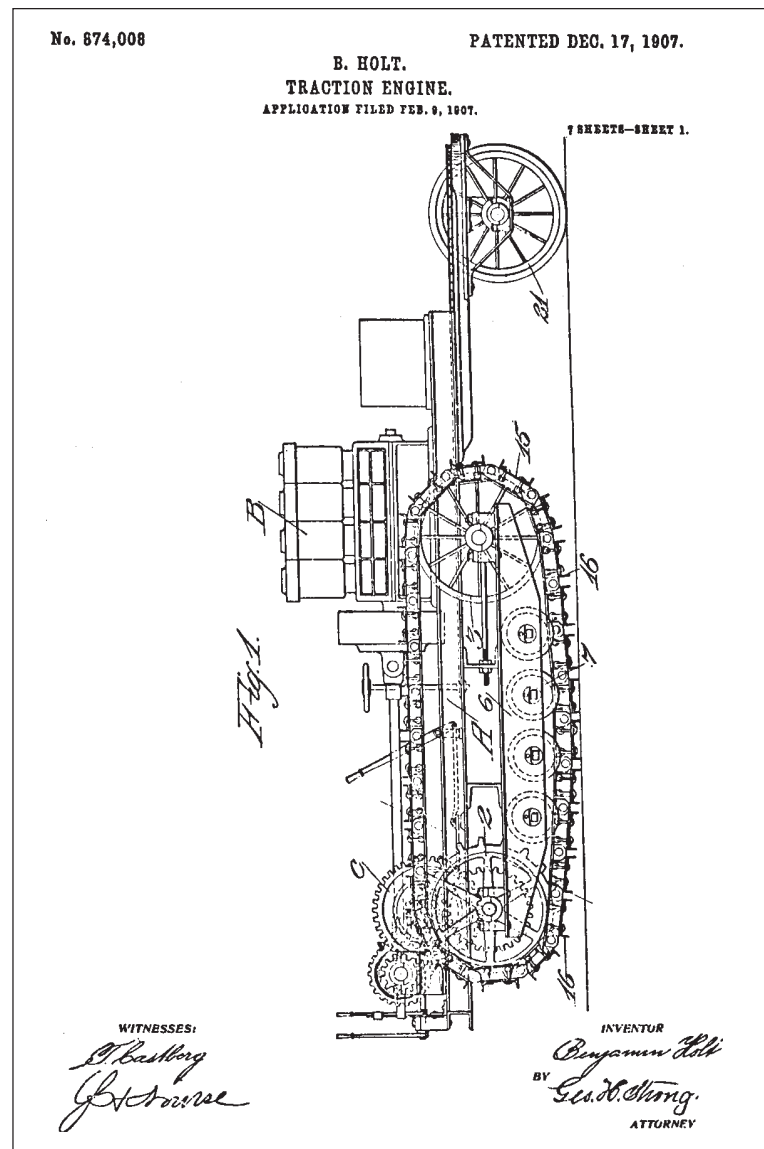
### References and Resources

*Benjamin Holt—The Story of the Caterpillar Tractor* edited by Walter A. Payne, University of the Pacific, 1982.

*Caterpillar—Century of Change*, Caterpillar Tractor Co., 1984.

"Holt Caterpillar Tractor Designated International Landmark," in *Mechanical Engineering*, June 1981.

Information from Holt trade journals stored at the Ford Archives, Dearborn, MI.



Holt's original track-laying patent