Directions

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Read this article. Then answer question 56.

A Sticky Problem for Farmers

by Nathan Aaseng

TIRED OF WRESTLING WITH THE ROCKY, stump-cluttered soil of New England, farmers in the early 19th century often followed rumors of better land to the midwestern United States. There, in states such as Illinois and Iowa, they found just what they were looking for: prairies full of rich, black dirt that promised to pump life into seeds as fast as they were planted.

Unfortunately, many settlers soon felt like thirsty sailors in the middle of the ocean—water everywhere but not a drop to drink. Rich soil surrounded them, but their equipment could not plow it. That was the problem a blacksmith named John Deere faced when he arrived in Grand Detour, Illinois, in 1836.

His Illinois neighbors had been desperate for a blacksmith ever since they had settled in Grand Detour. No sooner did Deere set foot in town than he found a line of farmers eager to offer him business. Two days after his arrival in Grand Detour, he was hard at work fixing broken equipment.

While working at his shop, Deere frequently heard complaints from farmers about the soil. Their early excitement about the richness of the soil and the ease with which a plow could break the sod had turned to frustration. The soil was too rich. Instead of falling away from the plow like sandy New England soil, it stuck. Farmers had to stop every few seconds to scrape the clumped dirt off their iron plowshares with large wooden paddles. They might as well have been plowing through a rocky field for all the progress they were making. Some farmers were so discouraged by the sticky soil that they left in search of new land; others were ready to join them.

Deere decided to look into the problem. From his previous work on plows, he knew that dirt was less likely to stick to highly polished metal. That thought was in the back of his mind when he visited a sawmill in 1837 and noticed a broken circular saw made of steel, a polished metal that was too expensive to be widely used for implements. Steel had never been used to make a plowshare.[1]

Deere took the broken saw blade home with him and began working on a better plow. He knew that polished steel was not the whole answer; the shape of the plow's bottom was also important.

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[1] Historians now believe that the first steel plowshare was made by John Lane in 1833. However, John Deere was the first to make steel plowshares commercially successful.

The plow Deere wanted to make would have to cut deeply into the soil at a sharp angle so that dirt would fall off, yet it could not put too much burden on the horses pulling it. After some experiments, Deere found the curved shape he needed and pounded the steel saw blade into that shape. He then built a plow, complete with oak handles, and brought it to the farm of his neighbor, Lewis Crandall.

While an anxious crowd of Grand Detour farmers watched, Crandall tried the new plow. He pronounced it a success. Not only did dirt fall away cleanly from the blade, but the plow also turned the soil more quickly than the old cast-iron plows.

Other farmers wanted one of Deere's "self-scouring" plows. The blacksmith could not meet the instant demand, however. For one thing, polished steel was hard to find. Deere could not count on a steady supply of broken saw blades to use as raw material. Steel was only available from England, and it was expensive to import. There was no such thing as mass production in the blacksmithing business; plows were made one at a time according to each customer's needs. Deere and his new partner in the business, Leonard Andrus, manufactured only 2 "self-scouring" plows in 1838 and 10 the following year.

Production gradually increased, however, as Deere imported greater quantities of expensive English steel. Forty handmade plows left his shop in 1840 and, after expanding his workshop to include a foundry in 1843, Deere's production rose to 400 plows a year.

Until then, Deere still considered himself a blacksmith—his plow was just one part of his craft. But after seeing that he could easily sell as many plows as he could make, even using costly English steel, the blacksmith decided to devote his time to manufacturing plows. In 1846 he found a Pittsburgh steel firm that could supply him with all the steel he needed for a lower price than what the English steel cost. The following year, he moved his business to Moline, Illinois, where the Mississippi River provided water power and transportation.

During the early years, Deere's sales strategy consisted of loading a wagon with plows and visiting farms until all his merchandise was sold. He rarely had to travel far. Producing plows before they were ordered was an innovative approach to sales. By 1857 the company, which he had reorganized with new partners under the name John Deere & Company, was making and selling 10,000 plows a year—nearly seven times as many as he had sold just seven years earlier.

A relentless perfectionist, Deere kept tinkering with his plows, trying to make them better. He came out with 10 new versions of his plow in a single year. While this slowed down his production ability, it ensured Deere a solid reputation among his customers. Deere plows became world famous in the 1870s when they outshone the competition in a demonstration in France. That same decade, the company built its first riding plow and designed the leaping deer as its trademark.

Directions

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Read this article. Then answer questions 57 through 59.

Lewis Latimer

by Stephen Currie

Though electric light was slow to catch on among the public, it was evident to scientists and inventors across America that a new age was dawning. Electricity, they realized, was the wave of the future.

Lewis Latimer

One of the first Americans to recognize the potential of electricity was a black man named Lewis Latimer. Born in Massachusetts in 1848, Latimer served in the U.S. Navy during the Civil War. When the war was over, Latimer returned to Massachusetts and got a job with a law firm that specialized in patents and inventions. At first he worked as an office boy, delivering messages and doing other simple tasks that involved little responsibility. Assignments like these made some sense, given his youth and relative inexperience. It is also likely, however, that Latimer's race kept him from being considered for positions that carried more authority—and a larger paycheck.

Latimer did not wish to remain an office assistant for long, though. He soon became intrigued by the work of the company's draftsmen. To apply for a patent, inventors had to provide careful pictures that showed every detail of their inventions. Because most inventors did not have the skill to execute these pictures on their own, patent lawyers typically had expert draftsmen on staff to create the diagrams. Latimer resolved to learn everything he could about drafting. He studied drawing techniques at home and practiced them whenever he could. Before long, his bosses recognized his talent and promoted him to the post of draftsman. By 1875 he was the head draftsman for the firm. As a later newspaper report put it, Latimer had been "thrust upward by his singular talent and drive."

Latimer's drawing work brought him into contact with many inventors. The most famous of these was Alexander Graham Bell, best known as the inventor of the telephone. Latimer made several drawings which helped Bell claim the patents he sought. To draw these designs as accurately as possible, it was necessary for Latimer to learn as much as he could about Bell's work. In the process Latimer became interested in the principles of electricity, principles which underlay much of what Bell was doing. As Latimer read more and more about electric power, he became convinced that this form of energy could help Americans in new and important ways.

Patents

In the late 1870s Latimer began looking for a job that would allow him time to pursue his new interests in technology. He was eventually offered a position at a company called the United States Electric Lighting Corporation. The head of the company, Hiram Maxim, was already well known among scientists for his work with electric power. Though Thomas Edison had already patented the first truly effective electric light bulb, Maxim believed he could improve on Edison's design. In particular, Maxim thought he could increase the life span of the bulb. Toward that end, he hired the most intelligent and hard-working people he could find—including Latimer.

Latimer spent his first few months in Maxim's employ trying to improve the bulb's filament—the wirelike assembly inside the bulb that gives off the actual light. In 1881, just a year after joining Maxim's firm, Latimer and a colleague patented a new and more efficient way of making filaments, using what their application called "a continuous strip of carbon secured to metallic wires." The new procedure resulted in better, cheaper light bulbs even than Edison had been able to produce. In the next months Latimer went on to patent several more inventions, each of which made light bulbs longer lasting and easier to manufacture—and each of which brought more money to the corporation. Maxim's confidence in Latimer had paid off.

Latimer did not spend all his time inventing. His work had made him an authority on electric lighting, and Maxim consequently gave him more and more responsibility. Maxim sent him to Philadelphia and other U.S. cities to oversee factory operations. Later, Latimer traveled to England to set up a new factory and to Montreal, Canada, to guide workers in installing electric lights in train stations. In Montreal he even learned some French to communicate with employees who spoke little or no English. "This was my mighty lesson," he wrote years later. "My day was spent climbing telegraph poles and locating arc lamps on them with the assistance of my laborers who seemed much impressed with my effort to speak their native language."