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Michigan History

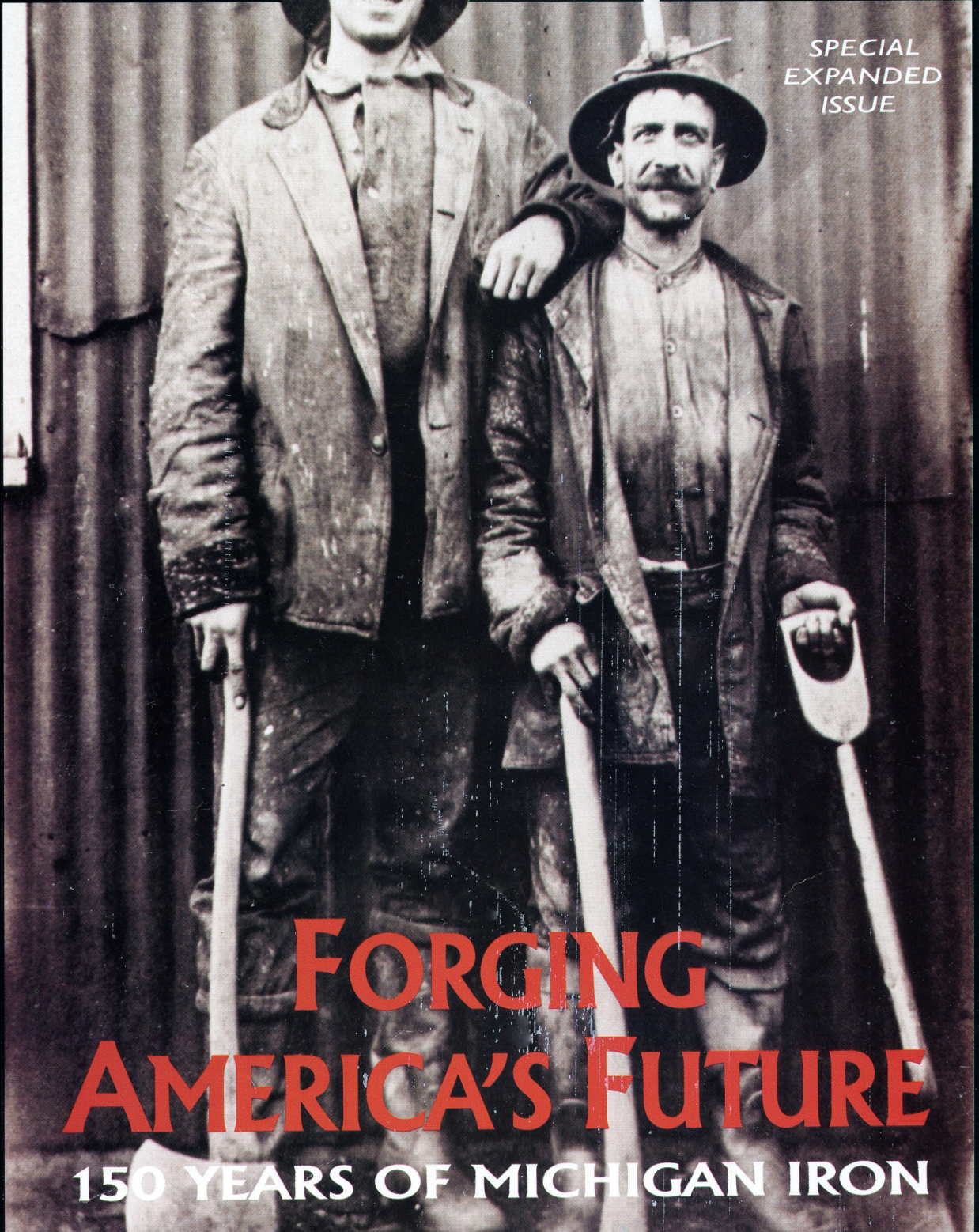
\$3.95

NOVEMBER / DECEMBER

1994

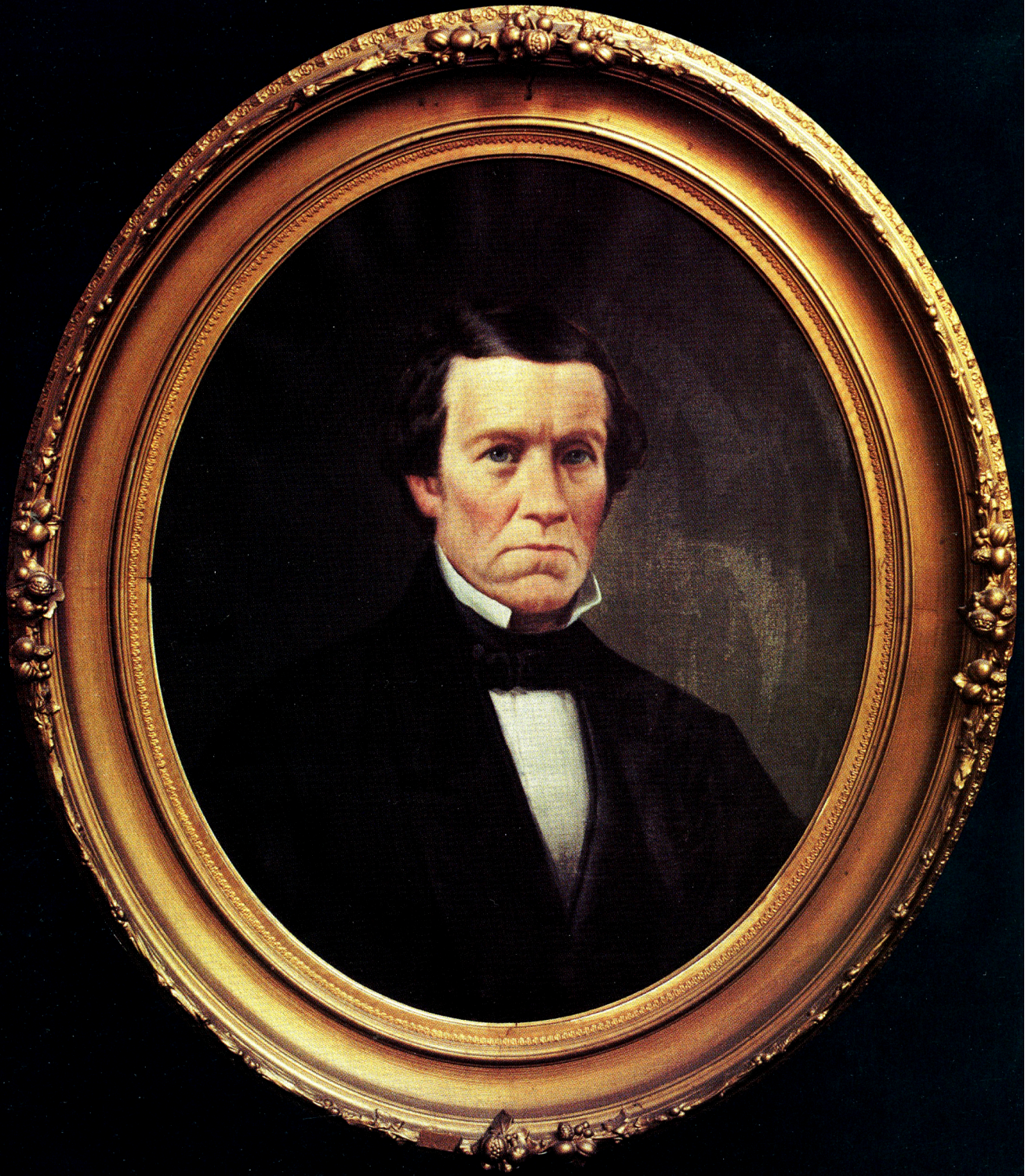
MAGAZINE

SPECIAL
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ISSUE



FORGING AMERICA'S FUTURE

150 YEARS OF MICHIGAN IRON



On September 19, 1844, near Marquette County's Teal Lake, William Austin Burt and his survey crew watched as the needle of their compass fluctuated wildly. Burt had no idea that this accidental discovery would provide the foundation for America's Industrial Revolution when he called out . . .

"Boys, look around and see what you can find."

William Austin Burt was a man who personified the rugged early American pioneer. His inventions included America's first writing machine, but it was his solar compass that earned him fame as one of the most accurate of the early pioneer surveyors. At age fifty-two, Burt had been running lines and exploring the wilderness as a U.S. deputy surveyor for eleven years when he and his party first encountered a mountain of iron ore in Michigan's Upper Peninsula. Although quiet and unassuming, he was an articulate conversationalist who often talked with his men long after the campfires had died out. His precise, scientific mind had already earned him a reputation as an ingenious inventor, a knowledgeable woodsman and a determined surveyor with an obsession for accuracy. A lifetime of preparation served him well in overcoming the challenges he faced in the Upper Peninsula.

Burt's ancestors left England in 1638 and settled in Taunton, Massachusetts. In 1790 his parents, Alvin and Wealthy Burt, moved the family to Petersham, a small settlement northwest of Boston. There, William, the Burts' fifth child, was born on 13 June 1792. Soon after the turn of the century, crop failures forced Alvin to sell his farm and relocate the family to Freehold, then Broadalbin, New York.

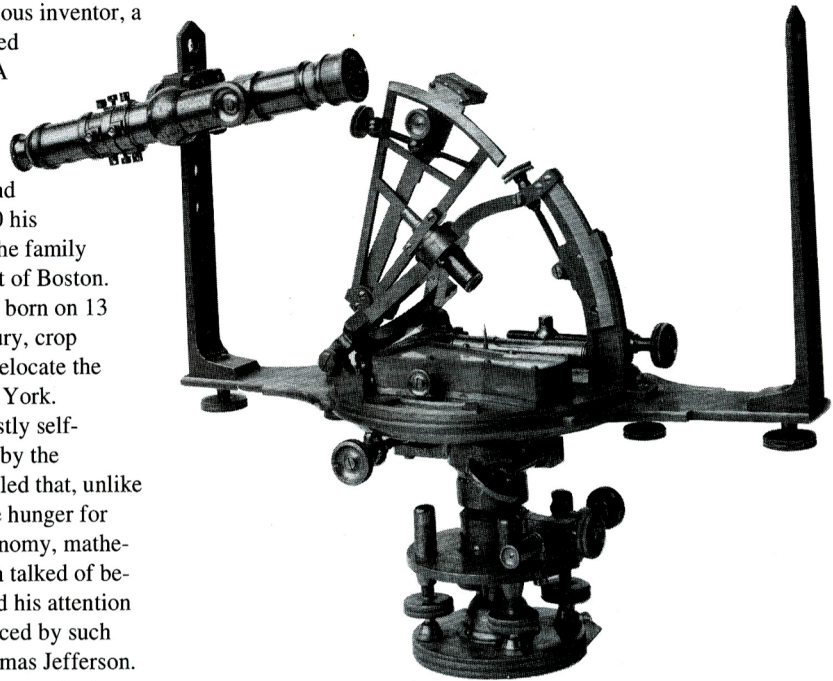
William Burt's early education was mostly self-taught from borrowed books read at night by the light of a burning pine knot. He later recalled that, unlike most children his age, he had an insatiable hunger for knowledge. He favored subjects like astronomy, mathematics and navigation (for a while he even talked of becoming a sea captain). But he concentrated his attention on surveying, an esteemed vocation practiced by such statesmen as George Washington and Thomas Jefferson. From a textbook young William learned the nautical traverse tables. He even built a quadrant without having

by John S. Burt

seen one and accurately determined the location of his father's house.

In 1810 the Burts moved to Wales Center, New York. During the war of 1812 William spent two tours of duty with the New York militia. During the interim between tours, he returned to Broadalbin to marry Phebe Cole, his former neighbor. Following an unsuccessful business venture with his father-in-law, Burt formed a partnership with friend John Allen and constructed mills throughout Erie County. Active in the community, Burt was appointed justice of the peace, school inspector, town clerk and postmaster for Wales Center.

By 1817 William Austin had grown restless. The birth of two sons—John in 1814 and Alvin in 1816—had



increased his responsibilities, and at age twenty-five he traveled westward to St. Louis, Missouri, returning home through the Michigan Territory. Northeast of Fort Wayne, Indiana, at Fort Defiance, Ohio, Burt recorded in his diary: "poor land." Here, two years earlier, surveyor Benjamin Hough had established the southern point of the Michigan meridian. Hough's critical report caused Surveyor General Edward Tiffin to conclude that the 2 million acres of military bounty land in Michigan were not worth the cost of surveying and that less than one percent of the land was fit for cultivation.

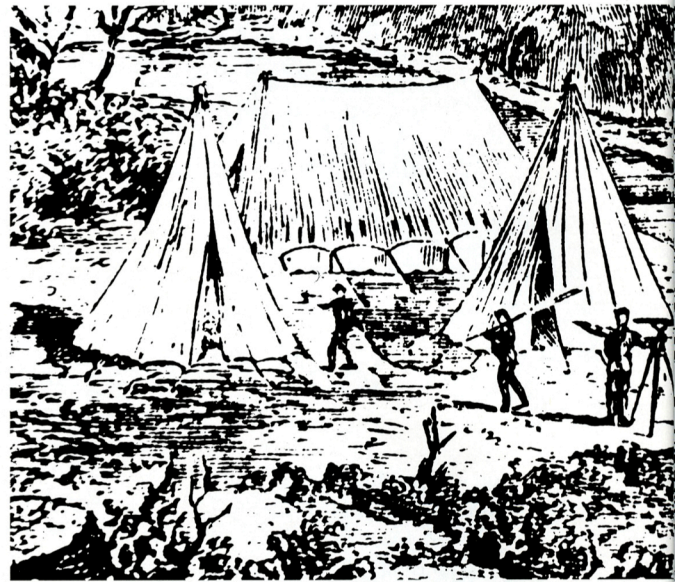
In 1822 Burt returned to Michigan, hoping to find a job on the government surveys. Surveying work was scarce, however, and there was already a long list of applicants. Just north of Detroit, Burt purchased eighty acres of land in Mt. Vernon for \$160, where he moved his family in 1824.

Three more sons were born to the Burts: Austin in 1818, Wells in 1820 and William in 1825. With five growing boys to feed, William Austin returned to millwrighting. In 1826 he was elected to Michigan's territorial council. Two months before his term ended, he was recommended for work on the government surveys. The surveyor general's principal deputy, John Mullett, noted, "I know of no one better qualified than Mr. Burt. He is honest and intelligent, well acquainted with surveying. He is universally respected." Unfortunately, the surveys had been halted and new deputies were not being hired. Again Burt resumed millwrighting.

In 1831 Burt was elected Macomb County surveyor. The following year he was appointed district surveyor by George B. Porter, Michigan's territorial governor. On 23 April 1832 William Austin joined the Macomb County Circuit Court as an associate justice. On 23 November 1833 he was appointed a U.S. deputy surveyor. His friend Lucius Lyon, Michigan's delegate to Congress, which, during the territorial years, was a nonvoting representation, had recommended him as "a gentleman of high standing in the county where he resides and his statements may in all cases be confidently relied on."

The first government contract required Burt to subdivide twelve townships near Port Huron. Since it was his first survey Burt decided to take his time and do it right. Experienced surveyors, however, knew the key to making money under the contract system was to perform the greatest amount of work in the shortest amount of time. This often resulted in inaccurate surveys. Burt's attention to detail did cause him to lose money and not complete the job until the following season. Surveyor General Micajah T. Williams, however, was impressed with Burt's work, telling Lyon, "Your friend Mr. Burt, proves to be an excellent surveyor. For the first contract, he has returned the most satisfactory work I have yet met with."

On his second government contract in the fall of 1834, Burt was required to subdivide thirteen townships in what



became Wisconsin Territory in 1836. He soon faced a dilemma that had plagued surveyors since the federal surveys began—the lines did not meet properly. Burt checked the work and confirmed his crew had not caused the problem. Instead, mineral attraction in the ground had deflected the needle of their magnetic compass just enough to produce angular errors. Other surveyors simply coped with the problem. For Burt, coping was not good enough.

To solve the problem Burt applied his knowledge of astronomy to the art of surveying. While the township lines were to run by the true meridian, the magnetic compass pointed to magnetic north, which could be about one thousand miles away from the true North Pole. By knowing the location of the sun in relation to his position on the earth, the surveyor could adjust the solar compass for the sun's declination from values found in an ephemeris table and his latitude set from noon observations of the sun. After setting the latitude and declination for that day, the surveyor would move the indicator on the hour circle to the "local apparent time" and rotate the instrument until the lens bar pointed at the sun. When rays of sunlight passed through the lens and focused between crosshatched lines on a target area, the sighting vanes of the compass would be aligned on the true meridian.

In 1835 Burt built a prototype of his solar compass and sent it to William J. Young, a prominent Philadelphia instrument maker, who made a more precise model, which was sent to the U.S. Patent Office. On 26 February 1836 Burt's solar compass was issued patent number 9428X.

William Austin Burt taught surveying to each of his five sons during their youth. In 1836, Alvin, at age twenty, was the first to use the solar compass while surveying in Wisconsin. Later that year, William Austin employed it successfully during his survey of the Fifth Principal



State Archives of Michigan

Burt's survey party camped on the edge of Teal Lake, near present-day Negaunee (left), in September 1844.

Meridian in Iowa and reported that it was even more accurate than he had expected. Burt's early successes with his solar compass drew the attention of the U. S. surveyor general, who faced the difficult task of having Michigan's newly acquired Upper Peninsula accurately surveyed.

In 1840 William Austin Burt was given a contract to begin the linear surveys in the Upper Peninsula, as the surveyor general had decided all township lines would be run with the solar compass. William Austin, assisted by his five sons, considered the survey of the Upper Peninsula his most difficult one to date. On 25 August 1840 he established the northern point of Michigan's principal meridian, Sault Ste. Marie, from which all land in Michigan is surveyed.

In 1842 William Burt offered to loan the government four thousand dollars for road construction in the Upper Peninsula. In a letter to U.S. Senator William Woodbridge, he suggested the two best routes, including a military road from Little Bay de Noc in Lake Michigan to Grand Island in Lake Superior. He added, "Of the importance of the Ste. St. Maries Canal to our state and to the general government I need not speak. Perhaps something may be done towards the accomplishment of all of these objects by Congress." Ten years later Burt assisted in the preliminary survey of the canal, and in 1853, as a Michigan legislator, he presented the final resolution for approval of the Soo Canal bill. His son John successfully lobbied in Washington, DC, for land to fund the canal. When the locks were completed in 1855, John became its first superintendent.

Although Dr. Douglass Houghton, Michigan's first state geologist, acknowledged Burt's earlier assistance in locating and determining several geological formations, he feared that without additional funding it would be

months, perhaps years, before the geological mapping of the state could be completed. In late 1843 he convinced Congress to fund a combined U.S. linear and state geological survey that would require the surveyors to make detailed observations and collect specimens at one mile intervals along the lines they were running. It would cost the government only a half cent per acre more than the cost of the linear survey alone.

On 17 June 1844 Congress appropriated \$20,900 for the survey. Houghton was assigned to head the survey; William Austin Burt became his principal field assistant. The rest of the crew included William Ives, compassman; Jacob Houghton, Douglass's younger brother, barometer operator; and brothers Harvey and Richard Mellen and James King, chainmen and axemen. Later, John Taylor and Bonney, two Native Americans who accompanied Burt on several earlier trips, served as packmen. The crew's work, encompassing four thousand miles of township and sectional lines in the Upper Peninsula, was completed within three years.

On 1 August 1844, the surveyors left Detroit aboard the steamship *Illinois*; at Mackinaw City they rendezvoused with Houghton, W. Norman McLeod and the two packmen. After purchasing supplies, the men traveled by boat to the mouth of the Escanaba River near present-day Escanaba. Houghton and McLeod then returned to Mackinaw. Houghton felt that he could accomplish little so late in the summer.

On August 14 Burt and crew headed north along the bank of the Escanaba River with their equipment and supplies loaded on their backs. Upon reaching a sawmill, Burt purchased lumber and had a flat-bottom boat made, filling it with all their provisions. With great difficulty, the boat was pulled up river about twelve miles to the south boundary of Township 43 North, where their survey began. Through the rugged wilderness, the surveyors headed north, establishing section lines and making geological observations. On September 15 they reached Lake Superior and began extending the line westward between Townships 47 and 48.

During the evening of September 18, after setting the corner post between Ranges 26 and 27 West, Burt completed his field notes while he and his survey party camped on the edge of Teal Lake. On page 26 he recorded the terrain as rolling—except for the swamps—covered with yellow birch, fir, spruce, white pine and sugar-maple trees. A high ledge of granite lay nearby. The following day they planned to run a random line from their corner post six miles south, then return on the true range line.

The following morning, September 19, the weather was clear as the surveyors proceeded south along the eastern

edge of Township 47 North, Range 27 West. As they reached a hill on the first mile, section one, compassman Harvey Mellen (he had replaced William Ives, who had sustained a leg wound days earlier and had been left behind) noticed the magnetic needle of his solar compass spinning crazily. Burt was both astonished and excited. As he moved the solar compass, he noticed the needle pointed opposite to where it should. Burt observed that “where the variation was so large the needle appeared like one nearly destitute of magnetism and difficult to determine within one or two degrees where it should settle.”

Burt called out, “Boys, look around and see what you can find.” They all returned with specimens of magnetic iron ore gathered from outcrops. They had discovered a portion of the Marquette Range, the first of the Lake Superior iron ranges to be located. Burt and his survey party, however, still had a job to do. Undeterred by the unreliable magnetic needle, they just continued surveying with the solar compass.

On September 21, six inches of snow blanketed the ground. The snowy conditions allowed a limping William Ives to catch up with the survey crew, which he found nearly out of food. The weather had delayed their progress, and they were still several miles from where they had left their provisions. With thick clouds obscuring the sun, they were unable to use the solar compass until two days later. Fortunately, three porcupines, trapped in a birch tree, were captured and roasted over a burning pine stump. Although this satisfied their hunger until they reached their supplies, they had survived six days on two days of rations.

Eleven samples of iron ore were collected during the 1844 survey. Each sample was referenced in Burt’s field

notes and later turned over to Dr. Houghton. For the season Burt completed only 205 of the 4,000 miles of township lines to be run, but he had discovered a vitally important source of wealth for Michigan.

Perhaps it is not surprising that neither Burt nor any member of his survey crew ever attempted to profit from their discovery. Because the metal had to be extracted with great difficulty from the heavy rock, profits would be difficult to obtain from iron ore. It would be an expensive, time-consuming venture to market the product. In fact, no stockholder in an Upper Peninsula iron mine received a dividend during Burt’s lifetime. Burt did participate, together with his sons, in the formation of the Peninsular Iron Company in 1854. His son John became active in the Lake Superior Iron Company, which would yield more iron ore than any other Michigan iron company during the nineteenth century.

In 1845 a group from Jackson, Michigan, headed by Philo Everett, was led by Ojibwa chief Marji-Gesick to the site of Burt’s discovery. Soon the Jackson Mine was established and the city of Negaunee grew up around it.

William Austin Burt and Douglass Houghton returned to the Upper Peninsula in June 1845 to continue their work. Houghton examined the area just south of Burt’s 1844 discovery and predicted that “this bed of iron ore will compare favorably, both for extent and quality, with any known in our country.” The following season, Burt, with sons John and Austin, discovered an additional fourteen beds of iron ore, including the western portion of the Menominee Range.

In 1847 Burt and his sons were given contracts to run the lines of eighty-seven townships that were bordered on

the west and south by the Wisconsin Territory. First, Burt surveyed the sixty-four-mile Michigan/Wisconsin boundary line between Lake Brule to the Montreal River headwaters, the first state boundary line run with his solar compass. He received eighteen dollars for each mile of line run, the highest rate ever paid for a public-land survey in Michigan. A cadastral engineer who resurveyed Burt's line in 1929 reported it as one of the best early surveys he had reestablished.

Although William Austin Burt's survey work had been completed in the Upper Peninsula, four of his sons received contracts for subdividing townships in the Upper Peninsula during 1848. That year John Burt discovered several more iron ore deposits, including the location where the Republic Mine was established in 1870. Later John became a prime mover in the growth and development of Marquette.

While in Washington, DC, Burt intended to request an extension of his solar compass patent, which was about to expire. Instead, land-office officials and several prominent congressmen persuaded him to relinquish his rights. Since the government was about to require the use of the solar compass in all U.S. land surveys, the instrument would prove more affordable to surveyors if no royalty fees were paid. Promises of congressional compensation to Burt for the past and future use of his compass in public surveys never materialized. Burt and his heirs pursued this compensation claim for over fifty years without success.

Burt's solar compass was internationally recognized in 1851, when he exhibited it at the Great Exposition in London. Prince Albert awarded it a medal and a certificate. Sir John

Herschel, president of the Royal Astronomical Society, told Burt, "I have long understood the elements of your instrument, but could not see how they could be carried out mechanically. It has fallen to your lot, Sir, to not only conceive the necessary astronomical elements, but also to carry them into practical effect, mechanically." In the United States the solar compass was adopted for general use by government surveyors in 1851 and used continuously for almost eighty years. U.S. land-office officials estimated that between 1849 and 1878 the government saved over \$15 million by using Burt's invention.

During the early 1850s Burt counseled others in the proper method of constructing solar compasses. In 1855 he applied the principles of his solar compass to the nautical compass. His "equatorial sextant" was patented the following year in the U.S., then later in England, France and Belgium. In February 1858, while instructing a group of sea captains on the use of his new invention, William Austin Burt suffered a heart attack from which he never fully recovered. Six months later, on 18 August 1858, he died at his Detroit home. He is buried in Detroit's Elmwood Cemetery.

In his unfinished autobiography, William Austin Burt wrote he had resolved at an early age to use his abilities to render something profitable to the world and mankind while making a decent living. Considering the accurate surveys and significant cost savings that resulted from his solar compass and the important industry that grew out of his 1844 iron ore discovery, he accomplished his goal. ■

John S. Burt, a direct descendant of William A. Burt, authored *They Left Their Mark: A Biography of William Austin Burt and His Sons* (1985). Burt portrait Marquette County Historical Society, solar compass Smithsonian Institution.
