

# Joel Baily Of Chester County

By Silvio Bedini

**T**he name of Joel Baily III (1732-1797) might have achieved mention in the Hall of Fame of Surveying History, had there ever been one, or at least a listing as a runner-up, in view of his many talents and historical associations. Born on December 16, 1732 on his father's farm along the Brandywine in West Marlborough Township, Chester County, Pennsylvania, he was one of nine children of Joel and Betty (Caldwell) Baily. After spending his early years on his father's farm, he purchased 38 acres in Bensalem Township in 1758, which later became part of West Marlborough, and was eventually joined to Pocopson Township. On October 11, 1759, Baily married Elizabeth Marshall from neighboring Northbrook. Five years later, his holdings were increased when he received a tract of 125 acres adjacent to his land from his parents. Baily was active in community affairs and a participant in the Bradford Meeting of the Society of Friends between 1759 and 1790.

During the early years of his marriage, while Baily was occupied with developing his farm and tending to a growing family, he also served as the local surveyor. Local tradition stated that he also worked as a clockmaker and at least one of his clocks has survived. He was married three times. After the death of his first wife, he married Margaret Evans of the Exeter Monthly Meeting, and following her death, in 1793, he married Mary Woodward.

In 1763, when the English astronomer-surveyors Charles Mason and Jeremiah Dixon arrived in Philadelphia to undertake their famous survey to establish the Pennsylvania-Maryland boundary, they first established the southernmost point of the city, then moved westward to make their center of operations some 31 miles west of Philadelphia on John Harland's farm along



*Plain surveying compass made and signed by "Joel Baily West Bradford 1765."*

the west branch of Brandywine Creek, three miles west of Baily's home. Their observatory was erected a short distance north of the Harland farm, from which Mason and Dixon made celestial observations to determine the latitude of the point of beginning. This was marked by a monument that became known as the "Star Gazer's Stone." In addition to an astronomical regulator clock made by John Shelton and loaned to them by the Royal Society, and another timepiece borrowed from the Penn family, their observatory featured a zenith sector made by John Bird for the Penn Proprietors—the most sophisticated instrument of the period and the first to be used on the North American continent.

Early in 1764, the English scientists began their field work, for which they employed a total of 39 men from Chester County to work as axe-men and assistant surveyors. As the local surveyor in the region, Baily was among those selected, and he worked on the survey intermittently until its completion in 1768. Work had to be interrupted periodically during the winter months, when it became impossible to work outdoors because of the weather, and

Mason and Dixon returned to their headquarters on the Harland farm. During these periods of leisure, they became familiar figures in the community.

As their work progressed, Mason and Dixon were commissioned by the Astronomer Royal and the Royal Society of London to measure a degree of longitude upon a parallel of latitude at Philadelphia. Soon after the English surveyors had rendered their final reports to the Maryland and Pennsylvania Proprietors in January 1768, they returned to the Harland farm to undertake a second series of measurement of courses from the Star Gazer's Stone southward.

Baily, who had assisted in the earlier survey, was now engaged to build sturdy rectangular frames made of pine to carry the 20-foot brass-tipped fir rods. Each frame was equipped with a plumb line hanging within a tube at its center, set up with the rod in a horizontal position along the line being measured, and its position marked to 1/100th inch on a stake placed at the lower point of the plumb bob. The next frame was placed in line end to end and aligned with

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the plumb line. The rods were periodically checked against a five-foot brass standard of length which had been provided by the Royal Society. The levels were used in this manner for a distance of 82 miles, a major undertaking, which Baily accomplished with competence. According to Mason's journal, Baily also recorded daily temperatures at two o'clock in the afternoon for several months in 1767 by means of the party's thermometer.

Despite his involvement with the survey, only a few entries relating to Baily are noted in the terse daily record maintained by Charles Mason in his manuscript journal. The journal, *Mason & Dixon's Line. Original Journal of the Commissioners, 1763*, is now in the collections of the National Archives and Records Administration. On February 2, 1768, Mason recorded that the surveyors were "At Mr. Joel Bailey's [sic] who is making two levels in order to carry two of the Rods each, as by the figure following. The Rods having been a long time kept in a Dry room I measured them when the Thermometer stood at 54° 5."... On February 18, "Mr. Bailey informed me the Levels still continue too long for the Rods, as on the 10th instant." On February 22, "Mr. Bailey brought to Mr. Harland's the Levels (each 20 feet in length) for measuring the Lines."

In addition to his other skills, Baily was locally recorded as a maker of mathematical instruments, but only one example has come to notice, a plain surveying compass made by Baily in 1765 while the Mason-Dixon survey was in progress; it may in fact have been used on that project.

Soon after the survey had been completed and the English scientists had returned to England, in 1769, the American Philosophical Society in Philadelphia was hastily making preparations for observing the transit of Venus. Baily was selected to be a member of one of three observing parties, with Owen Biddle and Richard Thomas, to make observations from Cape Henlopen. The three observers set out by water from Philadelphia and arrived at Lewes, Delaware on May 26th. The fol-

lowing day they set up their instruments at a site about a quarter mile from the town. Baily and Thomas measured the distance from the observatory site to the provincial west line run from Fenwick Island so that their observations would be connected with the Mason and Dixon line. During the transit, Baily used a four-and-a-half-foot Dollond refracting telescope equipped with a ball-and-socket fixed to a post to observe the phenomena.



**Detail view of the dial plate of the Baily surveying compass, illustrating the fine quality of engraving.**

In January 1770, probably as a consequence of his work on the Mason and Dixon line and his participation in the transit of Venus observations, Baily was elected to membership in the American Philosophical Society. On May 18, 1770, the threesome at the Henlopen observing site were commissioned by the Society "to take the courses and distances from the New Castle Courthouse to the State House Observatory" so that the latitude and longitude of each could be determined.

The advent of the American Revolution apparently ended Baily's association with his friends in Philadelphia and the American Philosophical Society. For the next 12 years Baily does not come to notice again except for an entry in 1775 in one of the *Deed Books* of the Office of the Recorder of Deeds which referred to "Joel Baily of West Bradford, gunsmith." His name is not included in the lists of Pennsylvania gunsmiths of the Revolutionary period, however, and it is likely that he was assigned to one of the Pennsylvania companies or regiments as a repairer of weapons in the field,

a role in which presumably he served until the end of hostilities.

By 1786, Baily more or less relinquished his farming activities and turned them over to his son John, reserving to himself a portion of the spring and winter grain harvests. He died on October 29, 1797. The inventory of his personal property provided few clues to his scientific activities. In addition to a turning lathe with all its supplementary equipment, it listed a silver watch, an eight-day clock, a case of instruments and a surveying staff.

A letter written on May 20, 1834 by the Pennsylvania botanist William Darlington (1782-1863) to Franklin Bache (1792-1863), chemist, physician and a secretary of the American Philosophical Society, could appropriately have served as Baily's eulogy. In response to Bache's request for information about Baily, Darlington wrote, "The Joel Baily referred to, was an ingenious and self-taught man, who resided in West Bradford Township, near Brandywine river, in this County. He was a maker of Mathematical Instruments, & I believe also of clocks; and at the time of Mason & Dixon's Survey, those gentlemen were encamped, & engaged for some time, in the neighborhood of Mr. Baily. His taste for Mathematics led to an acquaintance with Mason & Dixon; and I understand he rendered them considerable assistance, in their operations. This circumstance, I have no doubt, was the occasion of Mr. Baily's being introduced to the notice of the Philosophical Society... But all I can now say with certainty, is, that Joel Baily, of Chester County, who was a member of the Philosophical Society died at an advanced age, in the year 1797—and that his reputation as an ingenious self taught artist, & mathematician, was very considerable; somewhat analogous to that of his friend, & near neighbor, HUMPHREY MARSHALL,<sup>1</sup> in the Department of Botany—for which the latter was also made a member of the Said Society." **PS**

<sup>1</sup>Humphrey Marshall (1722-1801), botanist, author of *Arbustum Americanum, The American Grove* (1785).