A Forgotten Sundial Designed By Thomas Jefferson

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In a letter to Charles Clay dated August 23, 1811, Thomas Jefferson wrote [1, p. 98]:

> "While here [Poplar Forest, in Bedford County, Virginia] and much confined to the house by my rheumatism, I have amused myself with calculating the hour lines of an horizontal dial for the latitude of this place, which I find to be $37^{\circ}22'26''$. The calculations are for every five minutes of time and are always exact to within less than half a second of a degree. As I do not know that anybody here has taken this trouble before, I have supposed a copy would be acceptable to you. It may be a good exercise for Master Cyrus to make you a dial by them. He will need nothing but a protractor, or a line of chords and dividers. A dial of size, say from twelve inches to two feet square, is the cheapest and most accurate measure of time for general use and would, I suppose, be more common if every one possessed the proper horary lines for his own latitude. Williamsburg being very nearly in the parallel of Poplar Forest, the calculations now sent would serve for all the counties in the line between that place and this, for your own place, New London, and Lynchburg in this neighborhood. Slate, as being less affected by the sun, is preferable to wood or metal, and needs but a saw and plane to prepare it, and a knife point to mark the lines and figures. If worth the trouble, you will, of course, use the paper enclosed; if not, some of your neighbors my wish to do it, and the effort to be of some use to you will strengthen the assurances of my great esteem and respect."

Thomas Jefferson included with his letter a table of the hour-line angles he had calculated for five minute intervals between 6:00 a.m. and 6:00 p.m.; this table is reproduced in [1, p. 96]. Here is a portion of that table extracted for one hour intervals.

Hour	Horary Angle (deg)	Logarithm Tangent	Hour Line (deg-min-sec)
I, XI	15	9.2112508	9-14-18
II, X	30	9.9446378	19-18-49
III, IX	45	9.7831984	31-15-30
IV, VIII	60	10.0217590	46-26-5
V, VII	75	10.3551459	66-10-56
VI	90	infinite	90-0-0

A check of all 72 table entries for accuracy shows that Jefferson made only a few minor errors. The largest occurs for 2:20 p.m. (9:40 a.m.), for which the hour angle in the table is 23-2-24 whereas it should be 23-1-38, which is a discrepancy of 46 arcseconds; the largest of other discrepancies is 6 arcseconds. That there are so few errors and that they are so small is remarkable given his need to use logarithmic and trigonometric tables and tedious hand calculations.

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While searching for information in the library of the Missouri Historical Society about the Mary Harrison Leighton Shields sundial located in St. Louis's Forest Park, a publication by T. B. Morton [2] was found to contain a surprise – a picture of a horizontal sundial with the caption:

> "Sundial designed by Thomas Jefferson and purchased at a sale of Jefferson's effects at *Monticello* by a Dr. Moman. Eventually presented by William K. Bixby, St. Louis bibliophile and art collector, to the Missouri Historical Society in 1906 where it is on exhibition."

Morton makes no further comments about the dial in [2].

The Missouri History Museum is located in Forest Park in St. Louis. It occupies the Jefferson Memorial Building, which is the first national monument to President Thomas Jefferson. The Missouri Historical Society opened its museum in the building when the two-year construction of the monument was completed in 1913. The sundial mentioned by Morton remains in the museum's collection, but it has not been on display for many years. It is shown in Fig. 1. The dial is made of brass, with the dial plate being 8 inches square and the style rising to 4 inches above the plate. Dial furniture can be seen in Fig. 2. The gnomon, which had become detached, was reattached with some inaccuracy, as is evident in Fig. 3.

The History Museum also has some documents relating to the dial. One such document is an affidavit sworn to in 1903 by G. O'Beirne, who at the time resided in Huntington, VA. The affidavit says:

> "This sundial was made by Thos. Jefferson's own hands, and his name was written by him on the dial, where it can be seen by an inspection of the same. Jefferson put this sundial up at his home in Monticello. When his effects were sold after his death, Dr. Moman, whose son afterwards became resident physician of White Sulphur Springs, VA, now West Virginia, bought the sundial, and his said son afterwards carried it to the said Springs, and put the same up there. Mr. Lewis Caldwell, whose father James Caldwell, was the owner of the White Sulphur Springs, was a great friend of Dr. Moman and the doctor gave the sundial to him. Mr. Lewis Caldwell and the present owner's father, being intimate friends, and his father taking a fancy to the dial, it was given to him by Mr. Caldwell. At the death of the present owner's father, the dial came to him. A number of people around Charlottesville, Albemarle County, VA, the County in which Monticello is located, have been seen and talked to about this sundial and they say that they have often heard their ancestors speak of seeing the dial at Monticello. Mr. Jefferson often told his neighbors, when speaking of the dial, that he fashioned it from an idea of one he saw in Paris while a representative of this County to France. Mr. Jefferson became quite enamored with the French people while in their country and on his return to his native country, brought back many of their ideas and customs, and his enemies said, undertook to affect their manners. Mr. Jefferson was not only a statesman but a natural mechanical genius, and as amusement he often lent his mind and hands to the execution of various mechanical ideas. The dial, in order to tell the time by it, must be set by the North Star, and almost any practical civil engineer can set it. It will be no-

> ticed that the Roman figures on the dial run on one side of 12 from one to eight, and on the other side of 12, from 11 to four, not like the figures on a watch or clock. This is so arranged as to catch the shadow of the Sun. Thomas Jefferson's name in his own hand can be noticed on the dial, between two of the inside circles, near the Roman figure 4 and 5."

The affidavit is signed by O'Beirne and a Notary Public, Thos. R. Shepherd, on the 26th day of February, 1903.

The alleged chain of ownership of the dial starts with its purchase at Monticello by Dr. Moman. He gave it to James Caldwell, the owner of Sulphur Springs. The dial was then inherited by James Caldwell's son, Lewis Caldwell, who subsequently gave it to Gordon O'Beirne's father. Gordon O'Beirne inherited it from his father. Then, in 1903, the dial was purchased from Gordon O'Beirne by William Bixby, a St. Louis bibliophile and art collector. The sworn affidavit was obtained by Bixby at the time he purchased the dial. In May 1906, Bixby gave the sundial to the Missouri Historical Society, which has since kept it in the collection of the Missouri History Museum.

In spite of the sworn affidavit, there is some controversy about the origins of the dial. Silvio Bedini, who until his death in 2007 was a prominent historian specializing in early scientific instruments and who served as curator at the Smithsonian Institution, apparently examined the sundial when it was on loan to Monticello in the 1980s. He reached the view that the dial was not made or owned by Jefferson and was not produced during Jefferson's lifetime. His assessment was based, among other factors, on the similarity in the quality of the brass in this dial with that used in another sundial that is also associated with Thomas Jefferson and is in the collection of the Adler Planetarium and Astronomical Museum in Chicago. Bedini regarded both dials as nonauthentic but, rather, of modern construction. Bedini also questioned Jefferson's signature on the dial, feeling it is out of character for Thomas Jefferson to have signed the dial using his full last name.

Regardless of the controversy raised by Bedini's questioning of Jefferson's signature and the date of construction and by the flawed repair of the sundial held by the Missouri History Museum, the dial follows Jefferson's design specified in his 1811 letter to Clay. After years out of view, it will be placed on display for participants attending the 2008 Annual Conference of the North American Sundial Society and for the public to examine.

References

1. J. Jefferson Looney (Editor), *The Papers of Thomas Jefferson: Retirement Series*, Vol. 4, 18 June 1811 to 30 April 1812, Princeton University Press, 2007.

2. Terry B. Morton, "Sundials," *Historic Preservation Magazine*, Vol. 13, No. 1, 1961.

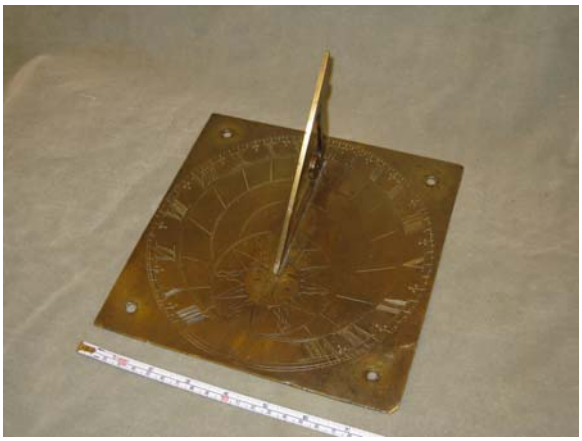

Figure 1. Sundial designed by Thomas Jefferson and in the collection of the Missouri History Museum, St. Louis MO

Figure 2. Closeup view showing dial furniture

Figure 3. Shows correct hour-line angle for 9:00 a.m. A repair resulted in the gnomon being offset from the dial center and at an incorrect angle.