

Notes from the Oesper Collections

The Twitchell Hydrometer

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A previous issue of *Museum Notes* was devoted to the Twitchell “acidometer” and its inventor, Henry Twitchell (1816-1875), who served as Ormsby Mitchel’s assistant at the Cincinnati Observatory from 1846-1861, and later worked as a local optician (1). In that installment it was also noted that, in addition to his acidometer, Twitchell was credited with the invention of both a novel hydrometer and an early form of the astronomical chronometer. Not only do the Oesper Collections own a surviving example of the acidometer, we have now acquired – thanks to the generosity of Mr. Robert J. White of Cincinnati – a surviving example of Twitchell’s hydrometer as well.

A hydrometer is, of course, a device designed to measure the density or specific gravity of liquids (2). It is usually made of either glass (figure 1) or metal (figure 2) and consists of a weighted float or bulb with an attached graduated stem of some sort. When dropped in the liquid of interest (usually contained in a tall cylinder known as a hydrometer jar), it will sink to the depth at which the reading on its stem matches the density of the liquid in question. If one is working with a specific kind of liquid solution having variable composition, such as alcohol and water, the specific gravity of the solution is generally directly proportional to its concentration and the stem of the hydrometer can than



Figure 1. A selection of glass hydrometers and hydrometer jars (Jensen-Thomas Apparatus Collection).



Figure 2. A brass hydrometer jar with handle and thermometer and two metal hydrometers probably designed to monitor the fermentation of beer (Jensen-Thomas Apparatus Collection). The handle would facilitate scooping samples from the open beer vats.

be directly calibrated in concentration rather than density units. Indeed, hydrometers have been used to measure the concentration or proof of alcoholic spirits since the 17th century (3).

Also designed to measure the alcohol content of wines and spirits, the Twitchell hydrometer came in a beautiful wooden maple container machined to resemble a miniature wine bottle (figure 3) with the name “H. Twitchell, Cincinnati,” imprinted on the bottom.



Figure 3. The (1.5" x 9") wine-bottle shaped maple case containing Twitchell's alcohol hydrometer.

Unscrewing the top half of the container reveals a metal hydrometer with a conical float and a rectangular stem (figure 3). On one face of the stem, near the bottom, is engraved "H. Twitchell Cin. O." and above it a scale that goes from 0-15. On the opposite face there is a scale that goes from 106-50.

Though of extremely high craftsmanship, there doesn't appear to be anything scientifically "novel" about the hydrometer itself and use of this adjective by Twitchell's contemporaries to describe the device apparently refers to the shape of its wooden container instead. This, at least, was the conclusion of *The Report of the General Committee of the Cincinnati Industrial Exposition* (figure 3), which was held from 21 September to 22 October 1870 in the original Exposition Hall (figure 3), and to which Twitchell had submitted both his acidometer and hydrometer for display (4):



Figure 5. A damaged colored lithograph of the original Exposition Hall where the Cincinnati Industrial Exposition of 1870 was held. Made of wood, it was torn down a few years later and replaced with the current brick structure known as Springer or Music Hall.



Figure 4. Twitchell's (1.25" x 7.75") metal hydrometer for determining the alcohol content of wine and spirits.

Nos. 640 and 641. Henry Twitchell exhibits two very useful instruments – an acidometer for wine and vinegar, and a hydrometer for testing the alcoholic strength of spirits. The acidometer is a very ready, neat, and convenient apparatus for determining the percent of acid in wines and the percent of acetic acid in vinegar, with sufficient accuracy for the purposes of the wine-maker and dealer and the vinegar manufacturer. It is an inexpensive apparatus, not likely to get out of order, easily handled, and adapted to the intelligence of an ordinary workman. The hydrometer is a standard arrangement, well made, and accurate in its indications.

Both of Twitchell's submissions were awarded premiums by the prize committee.

Unlike the case of the acidometer, I have not come across any evidence that the Twitchell hydrometer was

THE TWITCHELL HYDROMETER

ever sold by standard laboratory supply houses.

References and Notes

1. W. B. Jensen, "The Twitchell Acidometer," *Museum Notes*, No. 20, May/June 2013, Oesper website.

2. A. D. Morrison-Low, "Hydrometer," in R. Bud, D. J. Warner, Eds., *Instruments of Science: An Historical Encyclo-*

pedia, Garland: New York, NY, 1998, pp. 311-313.

3. W. B. Jensen, "The Origins of Alcohol 'Proof'," *J. Chem. Educ.*, **2004**, *81*, 1258.

4. *The Report of the General Committee of the Cincinnati Industrial Exposition Held in Cincinnati Under the Auspices of the Ohio Mechanics Institute, Board of Trade, and Chamber of Commerce from September 21st to October 22nd, 1870*, Cincinnati, OH, 1870, p. 286.