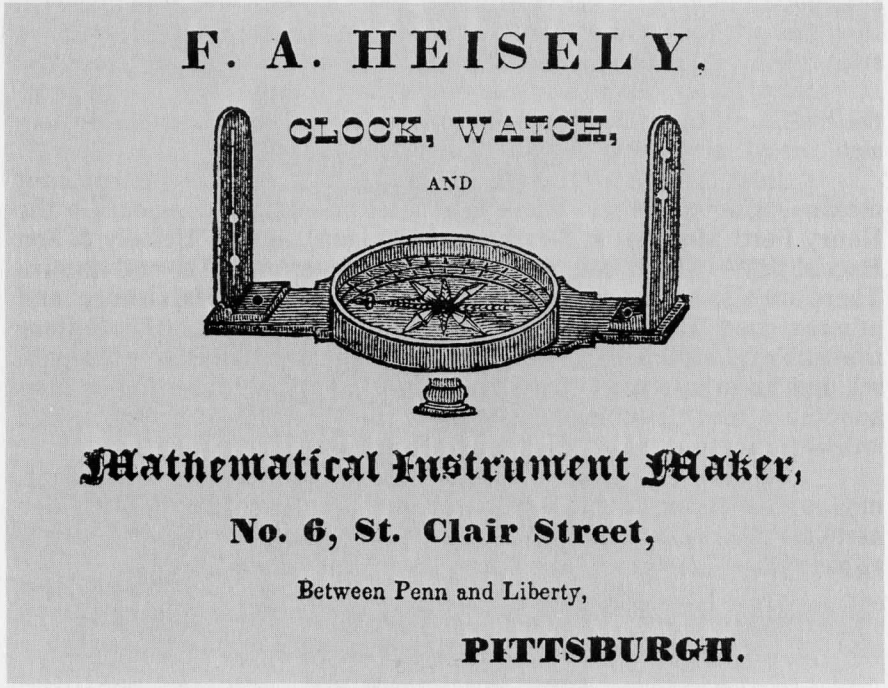
1. Charles Smart, *The Makers of Surveying Instruments in America Since 1700* 2 vols. (Troy, NY, 1962 and 1967).

2. Smart, *op. cit.* See also William Guthman, "Surveyor's Equipment of the Western Frontier," *Antiques* (Sept. 1970), p. 424.

3. Deborah Warner, "The Surveyor's Compass," *Rittenhouse* 1 (1987): 66.

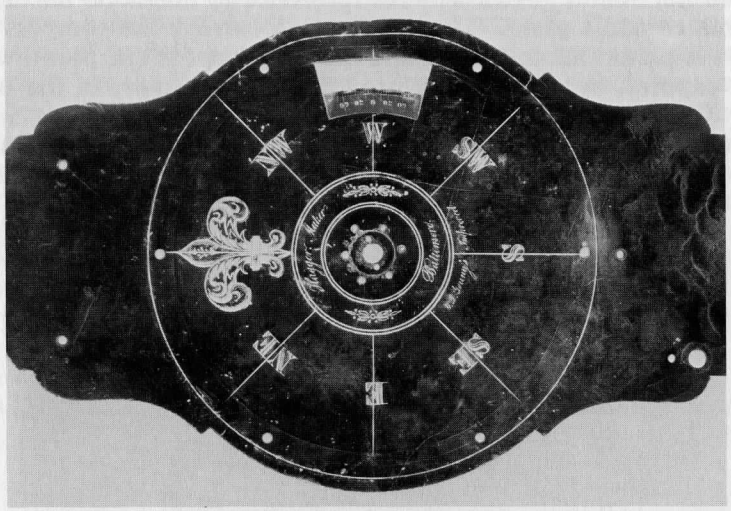
4. shown in Silvio A. Bedini, *Early American Scientific Instruments and Their Makers* (Washington, D.C., 1964), p. 61.



from Harris' *Pittsburgh Business Directory*, 1837.

YOUNG'S IMPROVED COMPASS MADE BY HAGGER

Deborah Jean Warner

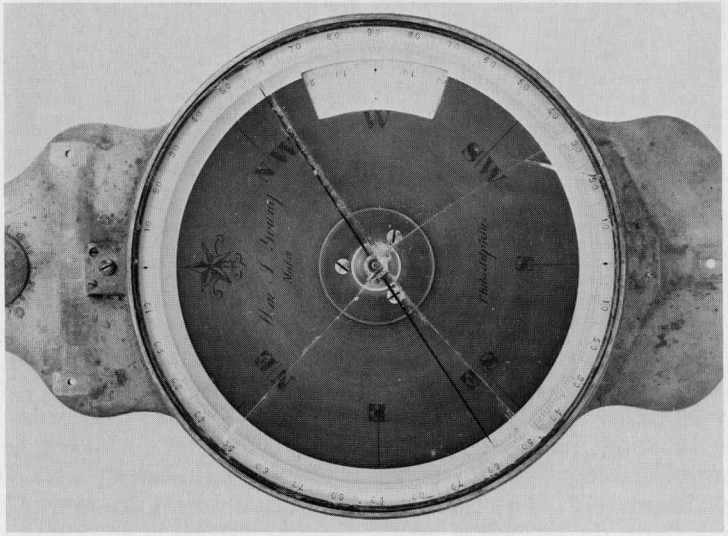


Brass Object from Rio Grande County Museum and Cultural Center

This brass plate was found in 1961 at Saguache, Colorado, near a shelter used by Native Americans. It is now in the Rio Grande County Museum and Cultural Center in Del Norte, Colorado. The plate is 16" long; the center section is 6¼" diameter. Marked around the center are the words "Hagger Maker Baltimore", and "W. J. Young's Improved". The cardinal and ordinal points are marked with letters; a fleur-de-lis marks north. At west there is an opening (1½" x ½") with a vernier (60-30-0-30-60) with 12 divisions to each side of the central zero (presumably reading to 5'). There are 6 small holes evenly spaced around the edge of the center section (presumably to hold a graduated ring); 3 holes at the end of each arm (to hold vertical sights); 2 holes on the northern arm (for an e-w level) and 2 on the southern arm (for a n-s level); 2 more holes, one larger than the other, on the southern arm (to hold the tangent screw). Surrounding the central hole (through which the needle pivot and a shoulder on the center passed) there are several more small holes (to hold the center to the upper plate, to attach a cover plate to the lower end of the center, and for the needle lifter screws).

This Colorado instrument appears to be the upper plate of a surveyor's vernier compass of the form invented by William J. Young (1800-1870),[1] an enterprising mathematical instrument maker in Philadelphia.[1] Young applied for a patent on his improved compass

late in 1830, and received it in 1832.[2] Because of legal technicalities, the patent was surrendered, and reissued in 1834.[3] Young's improved compass had two features. The first, which enabled surveyors to measure horizontal angles without reference to magnetic north, was a double compass plate. The upper plate carried the compass box. The lower plate was graduated, and hidden except at one point, where it was exposed by an opening, provided with vernier, in the upper plate. Young's second innovation, designed to relieve eye strain, consisted of coloring the surface of the compass plate green or bronze, rather than silver. A narrow silvered rim surrounding the colored surface gave a distinct view of the needle point.

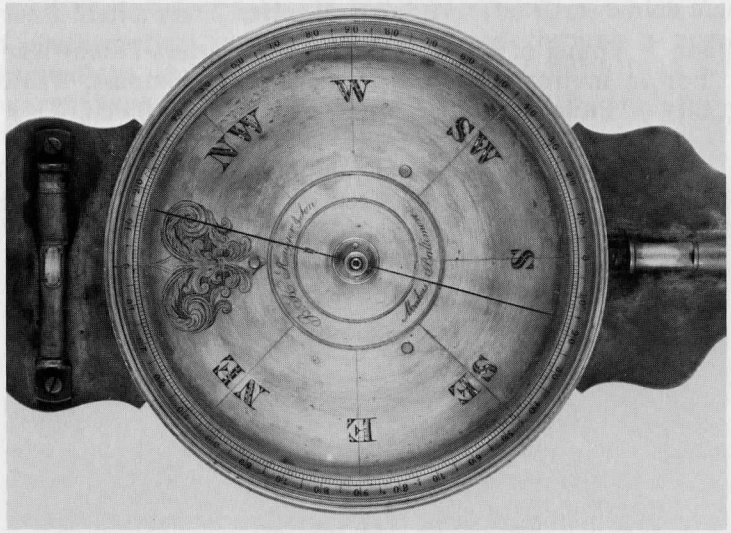


Surveyor's Vernier Compass marked "Wm. J. Young Maker Philadelphia"
(NMAH--Gift of Gettysburg College)

It is probably impossible to determine how many improved compasses Young produced, but it is clear that his design was well received in some quarters. Following their discussion of his patent the Franklin Institute noted that "Those who are aware of the excellence of the instruments made by Mr. Young, will be prepared to believe that what he denominates improvements are really such, and the result in the present instance will certainly justify the anticipation." An example of Young's improved compass is now in the National Museum of American History. This instrument must date from the the period 1840-1852/53--after Young changed his signature from "W. J. Young" to "Wm. J. Young", and before he began to mark his instruments with serial numbers. Since it does not carry the word "patent", it may in fact date from after the expiration of Young's patent in 1846. A later

modification of Young's compass, with the vernier moved outside the compass box, became the standard railroad compass.

The Colorado compass suggests a collaboration, otherwise unknown, between William J. Young and the Hagger familiy of Baltimore. A native of Massachusetts, Benjamin K. Hagger (ca. 1769-1834) moved to Baltimore in 1817 and opened a navigational instrument shop "At the Sign of Hadley's Quadrant."[4] He took his son John into the business in 1827. In 1830, according to an advertisement in the *Baltimore American*, Hagger & Son were now trading "At the Sign of Dr. Franklin". They also boasted "an extra establishment for the purpose of manufacturing surveyors compasses and levelling instruments, which we are now making of a superior quality, and offer for sale wholesale and retail at very reduced prices." A surveyor's plain compass marked "B. K. Hagger & Sons Makers, Baltimore" is stylistically similar--especially the letters and the fleur-de-lis--to the Colorado compass. (Note that Young used a fleur-de-lis to mark north on his patent drawing and on his earliest compasses. By the 1840s he had begun using a combination of fleur-de-lis and 5-pointed star.)



Surveyor's Plain Compass marked "B. K. Hagger & Son Makers, Baltimore"
(NMAH--Gift of Baldwin-Wallace College)

The vertical sights (now missing) of the Colorado compass were attached to the upper plate. Although this configuration seems awkward, it was in fact described in the text of Young's patent. The patent drawings, however, show the sights attached to the lower plate, and the Gettysburg College instrument is constructed in this manner.

Young's most important innovation was the surveyor's transit, which he introduced in 1831. This new instrument may be seen as a modification of his improved compass in which the open sights (attached to the upper plate) were replaced with a telescope which could be transited. The transit was an immediate success, becoming the standard instrument for laying out railroads and other engineering projects.

It is intriguing to speculate about who brought the improved vernier compass west from Baltimore to Colorado. Could it have been one of the great explorers, such as John C. Fremont (his 4th expedition), Otto Mears, John Williams Gunnison, Edward Fitzgerald Beale, or George M. Wheeler. Probably not. Young's compass was a special purpose instrument designed for engineering work. It is too heavy for general reconnaissance, and not sufficiently precise for triangulation.

1. Deborah Jean Warner, "William J. Young: From Craft to Industry in a Skilled Trade," *Pennsylvania History* 52 (1985): 53-68.

2. "For an improved Surveying Compass; William J. Young, City of Philadelphia, January 17," *Journal, Franklin Institute* (1832): 34.

3. "William J. Young of Philadelphia, Penn. Letters Patent" Jan. 11, 1834. "For an improvement in the Surveyor's Compass; William J. Young, city of Philadelphia," *Journal, Franklin Institute* (1834): 113.

4. For a surveyor's plain compass marked "BENJ. K. HAGGER, BALTIMORE" see James Mulder, "Benjamin K. Hagger," *Rittenhouse* 2 (1988): 51.

A LYMAN PROTRACTING TRIGONOMETER

MADE BY HELLER & BRIGHTLY

Robert C. Miller

Peggy Kidwell's article in *Rittenhouse* (vol. 3, #1, pp. 11-14) discusses Josiah Lyman's protracting trigonometer as made in Brattleboro, Vt. It appears that there is a second chapter to this story. I purchased in 1984, in southeastern Pennsylvania, a similar instrument marked on the protractor:

HELLER & BRIGHTLY
MAKERS PHILA

and

PAT'D MAY 25,58-REIS. MAY 15, 60
EXT'D MAY 25, 72
2^{D} PAT. ISS'D APR 11 74

Heller & Brightly was founded in Philadelphia in 1870 by Charles S. Heller and Charles H. Brightly. The firm, which manufactured mathematical instruments, continued through a number of reorganizations and changes in management until 1946 when all operations were suspended and the tools, parts, and unfinished instruments were placed in storage.