

When Was The First Slide Rule Produced In The United States?

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OK, here is a challenge for OS members! Can we determine who produced the first slide rules in the United States and when as well as where they were they made?

We know that there is a long history of slide rule production and use in England beginning in the 1620s with William Oughtred. The adaptation of the slide rule for use by Officers of the Excise in the late 1600s established the slide rule as a practical and widely used mathematical device. The application and use of the slide rule was re-enforced by James Watt when he commissioned John Jones to design and produce basic but accurately calibrated slide rules for his Soho-based steam

engine technicians in the late 1700s.¹ However, the early roots of U.S. slide rule production and use are not nearly as well defined.

A candidate for one of the earliest American-made slide rules is a two-foot, two-fold carpenter's rule made of boxwood with a two-cycle brass logarithmic slide and brass end pieces or leg tips. The slide operates between a two-cycle upper scale and a girt line, and, although difficult to make out, the rule is marked:

**CLARK & CO. PATENT
BRATTLEBORO, V^t
WARRANTED BOX WOOD**



FIGURE 1. Clark's Carpenter's Rule

The two sides of a two-foot, two-fold, boxwood and brass rule with a logarithmic slide and a unique circular hinge. Note classical font used on inch scale.

As illustrated in Figure 1, the distinctive circular hinge on this Clark-made carpenter's rule distinguishes it from other American and English-made two-foot, two-fold rules. This patented feature is a key factor in dating the device.

According to Philip Stanley:

Sometime about 1833 or 1834, an S.M. Clark had started a rule-making business in Brattleboro, Vermont, which operated there for several years. By 1837 this business had been shut down, and a year later one of Clark's former employees, Edward A. Stearns, purchased the factory, machinery, and remaining stock, and began the manufacture of rulers under the name E.A. Stearns & Co. Stearns was a stickler for quality, and his rules quickly acquired a reputation as the most accurate and best finished in the

country. Much of their reputation for accuracy was due to the use of "special machinery" to graduate them, machinery invented by a Lemuel Hedge, of Windsor, Vermont, and perfected by him while a Stearns employee.²

In fact, Donald Wing of Marion, Massachusetts, who has done considerable research on early rule makers, points out that the Clark operation actually lingered on until about 1840. The successor company to E. A. Stearns was eventually acquired by Stanley Rule & Level Co. In 1987, Clifford Fales described a carpenter's rule identical to the one described above but with steel leg tips. He also wrote:

Lemuel Hedge was a very interesting man. With a background in blacksmithing and cabinet making he turned his creative mind to creating solutions for improving

efficiency and accuracy of the rulemaking business as well as in other fields...His most significant patent relating to rules was his "dividing engine" which mechanized the previously hand executed operations of stamping graduation marks and numerals during the manufacture of rules. It has been claimed that Hedge's original dividing engine remained in use in the Stanley Rule and Level Co. plant at least as late as 1923.³

As depicted in Figure 2, the U.S. patent for this circular hinge design, titled "Carpenter's Rule Joint" is dated April 22, 1835 (No. 8783X). The applicant claimed:

My joint...possesses a degree of elasticity operating as a perpetual spring which prevents this joint from ever becoming loose.

Interestingly, the patent application was submitted by Lemuel Hedge and was witnessed by S. M. Clark and John Holland, while the rule carries the Clark name. Unfortunately, only page two of the two-page patent has survived. Peter Hopp comments that the relationship between Hedge and Clark is not clear.⁴

The circular hinge design patented by Hedge and produced by Clark was a clear departure from other flush and often ornate hinge designs appearing on various two-fold rules in the 1800s. This was a straightforward and practical solution to hinge design, but it did not prevail for long. For one, hardware merchants objected that the rule did not "lie flat."

Mr. Wing points out that brass end plates replaced iron end plates on the Clark rule about 1840. He also notes that the number of concentric circles on the hinge increased over several years of production. Thus, based on available information, the carpenter's rule designed by "Clark & Co.", with its sliding Gunter scale and unique circular hinge in Figure 1, was probably made in the period 1835 to 1840, more than 170-years ago!

On reflecting, that the oldest U.S.-made slide rule may well have been a carpenter's rule is not surprising. This was a young, developing country. In 1835, Americans were still exploring its vastness and settling new lands. Gold and silver lay undiscovered in the lodes and placers of California, Nevada, and Colorado. A cross-country railroad was but a dream. Petroleum as an energy source was decades in the future. In short, America was still in the pioneer period, and there would have been little demand for a single-purpose calculating device. The era of large engineering and construction projects and major manufacturing facilities, where single-purpose slide rules would have been useful, was still over the horizon. Until the mid-1800s, such a slide rule would have been little more than a curiosity. A folding two-foot carpenter's rule that incorporated a logarithmic or so-called "Gunter's" slide would have been far more practical and attracted more buyers. Thus, the Clark-made carpenter's rule must be among the earliest, if not the earliest slide rule that was produced in the United States (see Figures 4 and 5).

NAME AND DATE PATENT

CARPENTER'S RULE JOINT -

Lemuel Hedge -

April 22, 1835

(Page one is missing from the patent files and is presumed lost in one of the early patent office fires. Page two follows.)

... for rules to my knowledge possible as follows. The common joint is composed of more or less pieces of metal, which when placed together forms a solid mass, of the thickness of the rule and is attached to the boxwood or other material composing the legs of the rule by removing a portion of their thickness to receive the joint which diminishes their strength. This joint possesses little or no elasticity consequently as it wears it becomes loose. My improved joint is applied to the rule without removing any of its thickness to receive it which is one of the principles I claim as my invention.

The manner of forming the joints of thin plates attached to the sides of the two legs, the intervening space being filled with the substance of the rule itself instead of the more expensive mode of filling that space with metal is another principle I claim as my invention. My joint thus formed and applied possesses a degree of elasticity operating as a perpetual spring which prevents this joint from ever becoming loose.

Witnesses
S.M. Clark
John Holland

Lemuel Hedge

FIGURE 2. The Hedge Patent

One possible contender for the earliest U.S. slide rule was described by Bruce Babcock in his article *A Guided Tour of an 18th Century Carpenter's Rule* published in 1994. He observed:

The rule was made prior to 1826, as indicated by the gauge points for ale and wine gallons.

Note that the conversion to Imperial units in England actually occurred in 1824. He went on to write,

The numbering of the inch scale gives some reason to believe that this slide rule was made in the U.S. or American Colonies.

However, according to Philip Stanley, right and left numbering is not an entirely reliable way of determining the origin of a rule.²

I doubt that the AG (ale gallon) and WG (wine gallon) gauge points would have appeared on an American-made slide rule because these alcohol-related terms were typical of the rules used by English Officers of the Excise.

If someone has an American-made sliding Gunter designed for use by mariners, it could be a candidate for the title of “Earliest American Slide Rule”. Nathaniel Bowditch commented on the use of the slide rule by mariners in early 19th century editions of his *The New American Practical Navigator: Being the Epitome of Navigation* that was first published in 1802.⁶ The 1st edition of Bowditch's work describes the use of the Gunter rule and the sector, but not the sliding rule. The sliding rule first appears in the 2nd edition that appeared in 1807, but was dropped some time in the latter half of the 19th century, although the descriptions of the Gunter scale and the sector continued to be included for some years thereafter.⁷

Because the sliding Gunter was a recognized navigational instrument by Bowditch in his widely-respected *Practical Navigator*, that a number of these special-purpose slide rules may have been produced in the United States as well as in England in the early 1800's is possible. The challenge would lie in tracing the instrument's provenance and confirming its age, because many sliding Gunters provide no information as to who made them.⁸

Donald Wing points out that the intricate interrelationships of the early New England rule makers made tracing the history of various rule makers difficult. Mr. Wing is quick to point out that these early rules are normally well-worn (“beat up” in his words) and often hard to identify.

However, the roots of American-based rule production can be traced back to as early as 1822 when Thomas Belcher immigrated to America. He was the son of English rule maker Zachariah Belcher of Sheffield, who made rules beginning in

the late 1700s. Thomas' brother, William, came to America in 1824, and together they founded T. & W. Belcher. The name of the Belcher firm, which was based in New York, went through several stages:

1824 – 1832: T. & W. Belcher was formed with Thomas in charge of production and William handling sales.

1832 – 1853: Name changed to Belcher Brothers in 1832 when the founders' sons joined the company.

1853: The name was changed to Belcher Brothers & Co.

The Belchers were well known for their quality products, which included a full line of folding boxwood and ivory rules, as well as board and log measures, gauging and wantage rods, tailors' squares, and other measuring devices.

D. M. Knapen's *Mechanic's Assistant: A Thorough Practical Treatise on Mensuration and the Sliding Rule* depicts a two-foot two-fold carpenter's rule by “Belcher Brothers Makers” with an ornately embellished “N” and “Y” in “New York” (See Figure 4). This rule would have been produced some time between 1832 and 1853. Knapen describes the use of the carpenter's rule as well as “Belcher's Engineer's Sliding Rule”.⁹

Figure 5 depicts a fully bound brass and boxwood two-foot twofold carpenter's rule with a Gunter's scale marked “Belcher Bro's & Co New York” from the author's collection. This is a later Belcher model produced sometime between 1853 and 1877, when the company finally stopped making rules.

While the Clark two-foot two-fold rule with the circular hinge and sliding Gunter's scale described in this article is an example of an early American-made slide rule, Belcher also produced two-foot two-fold rules. However, any two-foot twofold rule labeled “T. & W. Belcher” with a Gunter's slide would have been produced in the period 1824 to 1832 and would be older than the Clark rule described here.

Do other readers know of a slide rule produced in the United States that predates the ones described here? Let me hear from you if you have thoughts on this question.

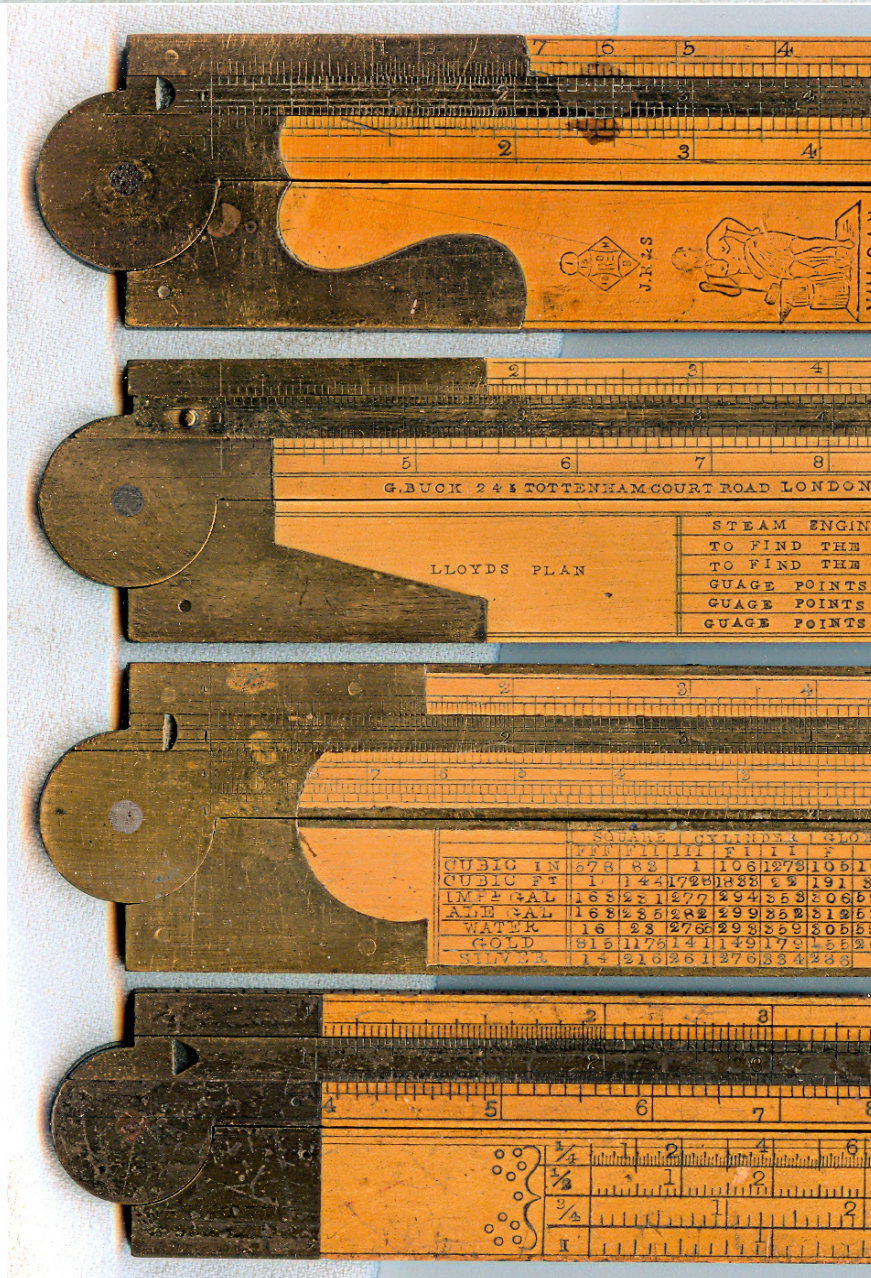
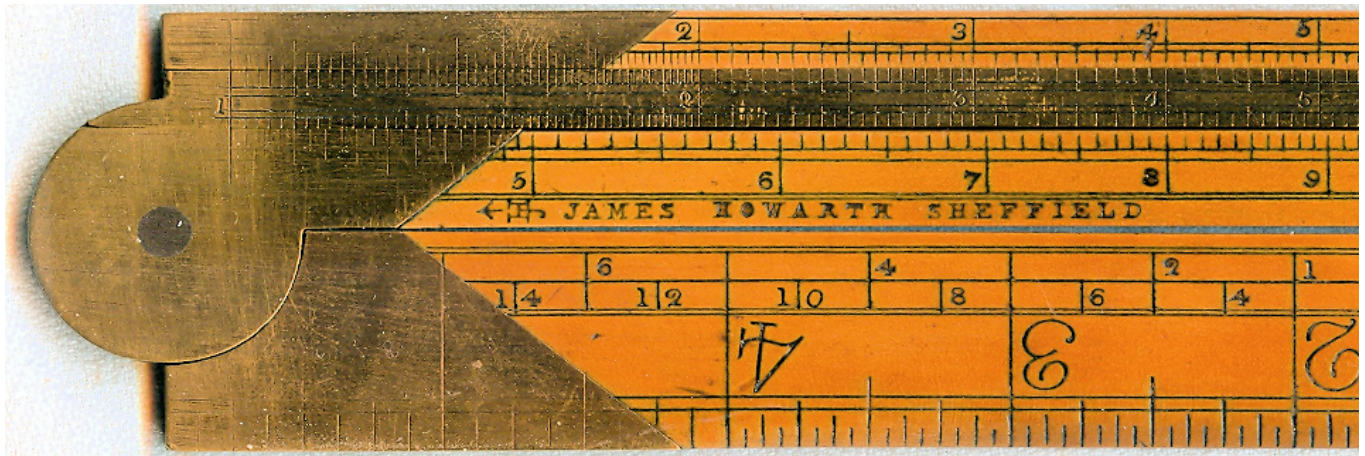


FIGURE 3. Hinge Designs
 Examples of “flat-lying” hinge designs found on 19th century folding rules with Gunter scales.

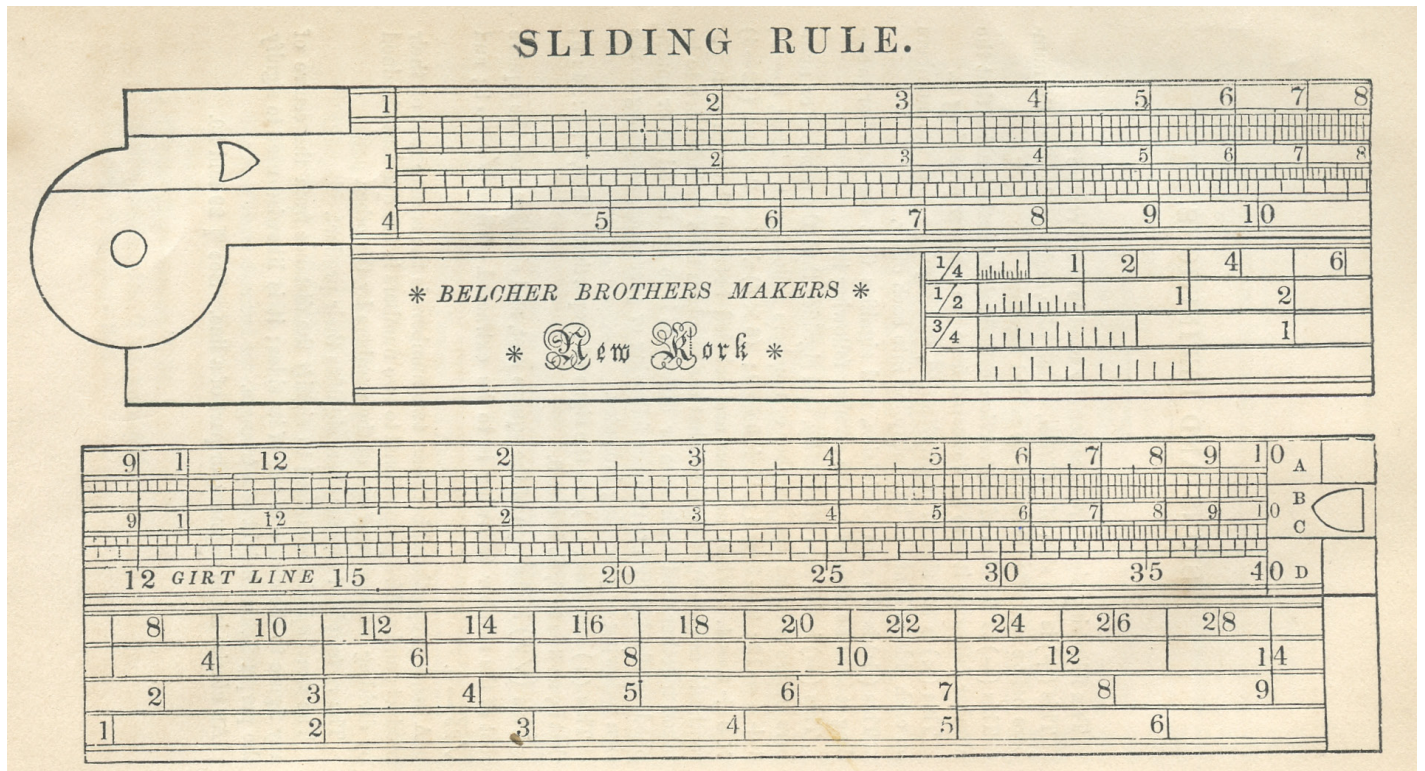


FIGURE 4. Illustration of a Belcher Rule

Two foot two fold rule made by Belcher Brothers as seen in Knapen's *Mechanic's Assistant*

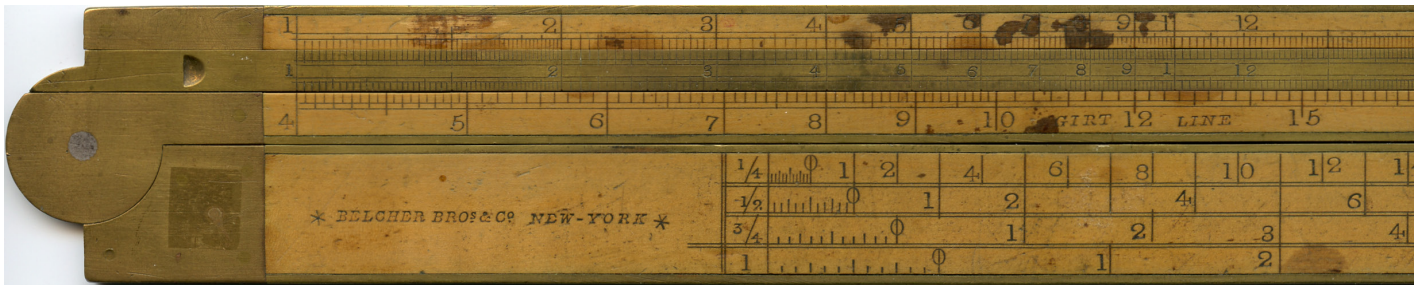


FIGURE 5. Belcher Rule

A fully bound two foot two fold boxwood carpenter's rule produced by Belcher Brothers

Notes

1. Wyman, Thomas, *Soho Steam Engines The First Engineering Slide Rule and the Evolution of Excise Rules*, "Journal of the Oughtred Society, 22:2., 2013, page 3.
2. Stanley, Philip D., *Boxwood and Ivory, Stanley Traditional Rules, 1855-1975*, The Stanley Publishing Co., Westborough, MA, page 2.
3. Fales, Clifford D., *The Hedge/Clark Connection, or, An Unusual Rule Joint*, The Gristmill, No. 47, March 1987, pages 10-11.
4. Hopp, Peter M., *Joint Slide Rules, Sectors, 2-foot 2-fold and similar slide rules*, Hexagon Press, 2009, page 84.
5. Babcock, Bruce, *A Guided Tour of an 18th Century Carpenter's Rule*, The Journal of the Oughtred Society, 3:1, March 1994, pages 26-34.
6. Bowditch, Nathaniel, *The New American Practical Navigator: Being the Epitome of Navigation*, Edmund M. Blunt, New York, 1802 with numerous subsequent editions.
7. Based on personal communication from Lloyd Kannenberg dated September 2, 2011.
8. Wyman, Thomas (Tom), *Description and Use of the Sliding Gunter in Navigation*, Journal of the Oughtred Society, 20:2, 2011, pages 33 to 38. See also Wyman, *Slide Rules of the Stanley Rule & level Company and other American Makers*, The Chronicle of the Early American Industries Association, Vol. 54, No. 3, September 2001, pages 114-117.
9. Knapen, D. M., *Mechanic's Assistant: A Thorough Practical Treatise on Mensuration and the Sliding Rule*, D. Appleton, New York, 1850, page 10.