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A Cage For a Sandglass

by Raymond S. Rio (NY)

Editor's Note: The author is a retired tool and die maker who became interested in clocks when he noted the many contributions the field of horology had made to the machine tool industry. Mr. Rio made clocks long before he became a member of the NAWCC. See the June 1984 and October 1990 BULLETINs for other articles by Mr. Rio.

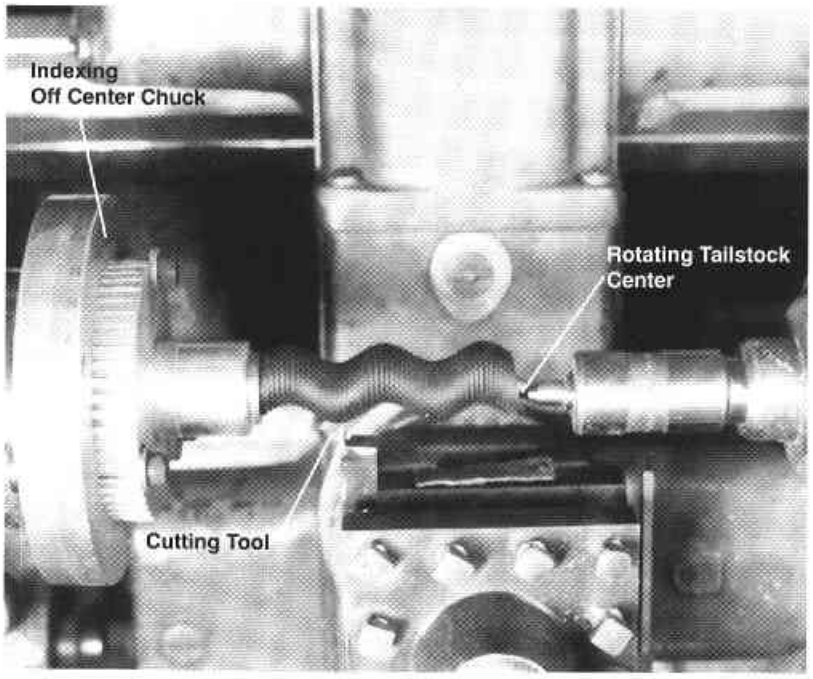

Figure 1. Eccentric Chuck.

For a number of years I have been in pursuit of an ancient sand glass to add to my collection of horological oddities. This simple item has completely eluded my grasp. Though I have attended many marts, regionals, and conventions I never found a glass that I would be proud to own.

In the fall of 1988, while attending a seminar at the American Clock and Watch Museum, I came across a fascinating display of ancient horological devices. There nestled among a variety of sun dials, navigational instruments, nocturnals, etc., was an extensive collection of sand glasses. One in particular caught my attention, it was enclosed within a magnificent ivory cage. I could see that it was decorated by a difficult ornamental turning process as described in John Jacob Holtzapffel's marvelous book, *The Principles and Practice of Ornamental or Complex Turning.*

I became quite excited by the thought that perhaps I could come close to making one of similar quality. Upon further reflection I realized that a number of obstacles had to be overcome. The first was that I knew nothing about blowing glass, secondly I did not own an ornamental turning lathe, and lastly, the import of ivory is banned in this country. I had put aside my desires, when one day as I was browsing through one of my wood working catalogues, I found what looked like a nice hourglass for sale, no cage included. I immediately sent for one, and found it to be first rate. Then some ebony that was headed for the trash heap fell into my hands. I thought it should be sufficiently exotic to make a good cage. Upon reading John Jacob Holtzapffel's books I learned that ivory was the premier material for ornamental turning. Ebony was considered unsuitable as it contains silica which quickly dulls the cutting edges of tools. I decided to ignore this warning as I reasoned that Holtzapffel did not have the advantage of using high speed steel, an alloy which is known to have superior wear characteristics. I later proved to my satisfaction that I was correct.

The matter of tooling cleared when I looked over my equipment and decided it was sufficient to do a credible job of embellishing the cage. Though Holtzapffel could have completed the whole of the project on one of his versatile lathes, I used three metal working machines, plus three simple homemade cutters to do the same. The

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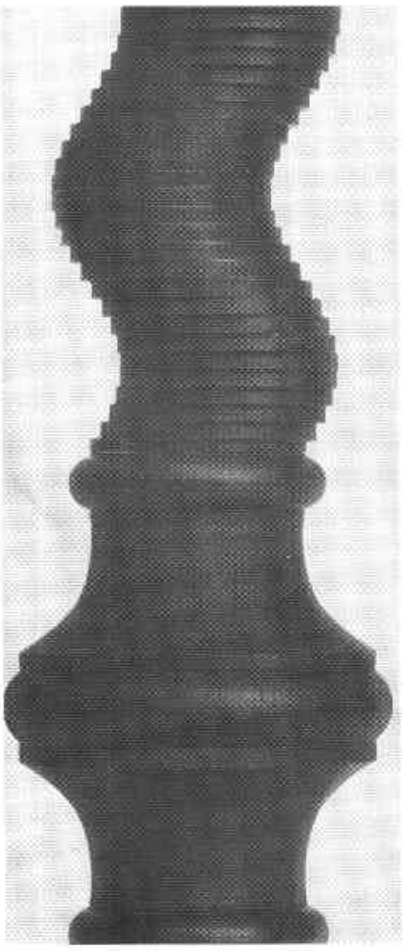
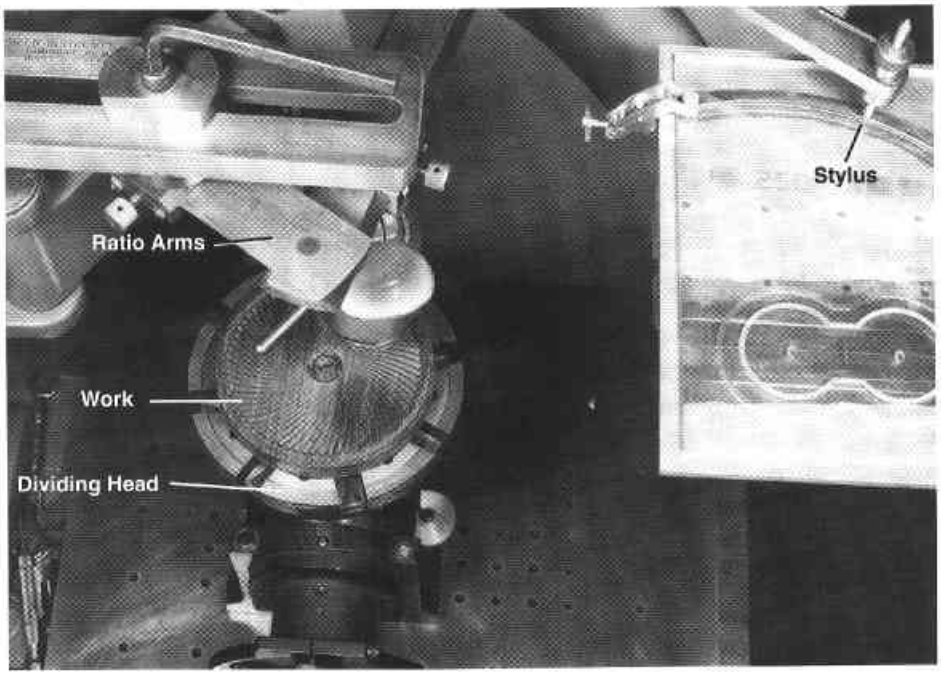


Figure 2. Spiral joining plain turning at center.

columns were made on a ten-inch "Tool Room Model" South Bend lathe equipped with an eccentric chuck. I cobbled up a crude but effective chuck from odds and ends of 2024 aluminum found in my scrap box. (See Figure 1.) The columns look like a spiral stair (see Figure 2) each step is .050-inch high and advances upward in .050-inch increments as they spiral 18 degrees of rotation for each step. Therefore, there are 20 cuts to the inch to complete one twist, and three twists make one column section. Two sections, with a plain turning joining both at the center, makes a full column. The columns are turned in an eccentric orbit of .100 inches around the lathe spindle axis.

The caps are decorated with off-center spiral grooves. (See Figure 3.) The grooves are spaced five degrees apart for 72 cuts on each face of the caps. The work was tilted two degrees so that the grooves would deepen and widen as they approach the periphery. The edges are decorated with what I call a basket weave pattern. (See Figure 4.) They are small circular cuts .100 inches wide. There are three rows of these on the cap edges. The two outer ones step in unison while the center one is half a wave out of step. This work was done on a wheel cutting engine. This tool was fabricated by me for building and repairing clocks. (See Figure 5.) The cage is as it came off the machine, no sandpaper was used anywhere. The finish is one coat of Watco Danish Oil, which further darkens the wood. Since an excess of 1200 cuts was required, I found the O.T. process painful in some respects. Once a design decision is made you are locked in, the freedom of making subtle

Figure 3. Cutting the spiral grooves.



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changes as in simple hand turning is non-existent. The whole of the project must be thought out before hand, and a disciplined schedule adhered to. If a mistake is made, the choices are few. First, you could possibly cut everything to a smaller dimension, second you could live with the mistake, third you could chuck it out and start over. As luck would have it, I muddled through without any errors, but if the need arose, number three would be my choice.

I tried to make this glass in a style befitting a time when it would be a cherished and useful possession. I must have succeeded, as a number of people thought it to be an old object of a bygone era and offered to purchase it.

When I start an undertaking such as this, I always build up my enthusiasm by reading as much history as possible on the subject. The following are a few interesting facts I gleaned from my library of readily available books. Sand glasses were prominent during the fourteenth century and retained their position for several hundred years thereafter. Old glasses were made in two parts and joined at the waist with what appears to be either gut or string. Later ones, such as mine, were fused at the center, the air exausted to a partial vacuum and the glass hermetically sealed. This would keep moisture from entering, which would aid in keeping the sand dry.

The sand glass is an interval timer and had a number of uses. The following are a few. It was used to time watches in various armies, or aboard ship. A special one was used to limit the length of speeches or sermons: it was composed of a row of four glasses of varied durations, ¼, ½, ¾, and one hour; in this way fractions of an hour could be observed. It was used by cooks and chemists, and to time knightly bouts, and at a later date, to time

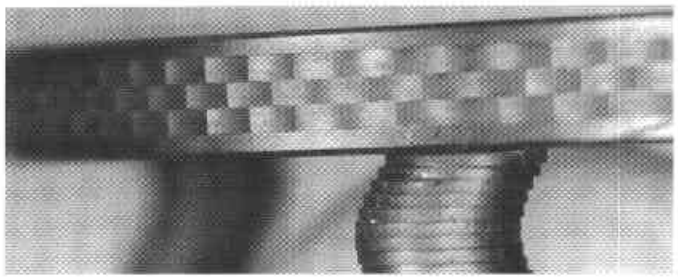


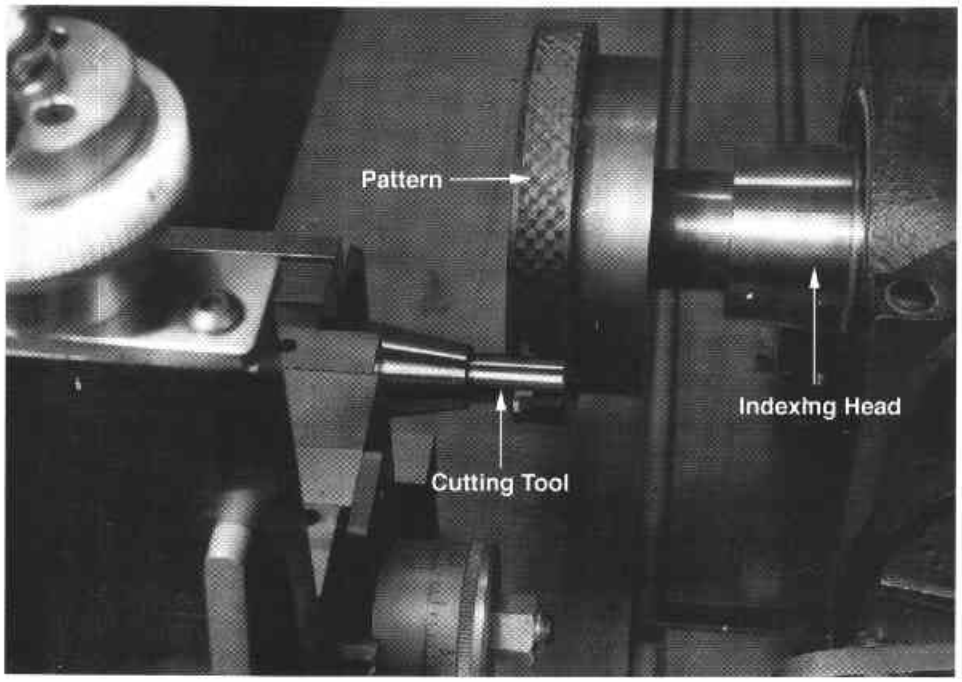
Figure 4. Basket weave pattern.

various industrial operations. Inquisitors found them useful for judging the length of torture sessions. It may be interesting to note that glasses of one hour, a half hour, and 28 seconds were standard issue aboard H.M. Ships until the year 1839. The 28-second glass helped in performing an important function. It was used in determining the speed of the vessel. In his book *Time Telling Through the Ages* Brearley gives a very concise description of how it was used: "The log-line was divided by knots, at intervals of forty-seven feet, three inches, and this distance would go into a nautical mile as many times as 28 seconds would go into an hour. When the line was thrown overboard the mariner counted the number of knots slipping through his fingers while his eyes were fixed on the tiny emptying sand-glass, and in this way so many 'knots' an hour denotes the ship's speed in miles." This information leads one to wonder how close could this mariner come to a 28-second reading.

The sand glass has been used in a symbolic manner to illustrate the sands of life running out.

It is said that the sand glass is an offshoot of the clepsydra, when sand was substituted for water. It has some

Figure 5. Cutting the pattern.



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advantages: it cannot freeze, it does not evaporate, it runs at a steady rate, and it discourages the growth of algae, which could clog the orifice of a clepsydra.

I have learned that the simplest horological device can be of considerable interest. Sun dials, astrolabes, etc., can be complicated and thought provoking. Why is it then that most NAWCC members give these devices scant attention? My own theory is that in this age of profuse stimuli, these aged instruments are too quiet, they do not tick or tock, they do not bing or bong, sing, dance, trumpet, imitate birds, chime, or play music; they just quietly go on doing their job.

The construction of ancient time related instruments encompasses many skills: wood working, metal working, engraving, calligraphy, decorative and graphic arts, to name a few. I encourage all of you who are so inclined to give it a try. Success may depend on how simple or complicated one chooses to get. I have derived much satisfaction from my endeavors and I believe you would too.

References

Brearly, Harry C. *Time Telling Through the Ages.* New York: Doubleday, Page & Co., 1919.

Bruton, Eric. *A History of Clocks and Watches.* New York: Rizzoli, 1979.

Gould, Rupert T. *The Marine Chronometer: Its History and Development.* London: Holland Press, 1960.

Holtzapffel, John Jacob. *The Principles and Practice of Ornamental or Complex Turning.* New York: Dover, 1973.

Milham, Willis I. *Time and Timekeepers.* New York: Macmillan, 1941.

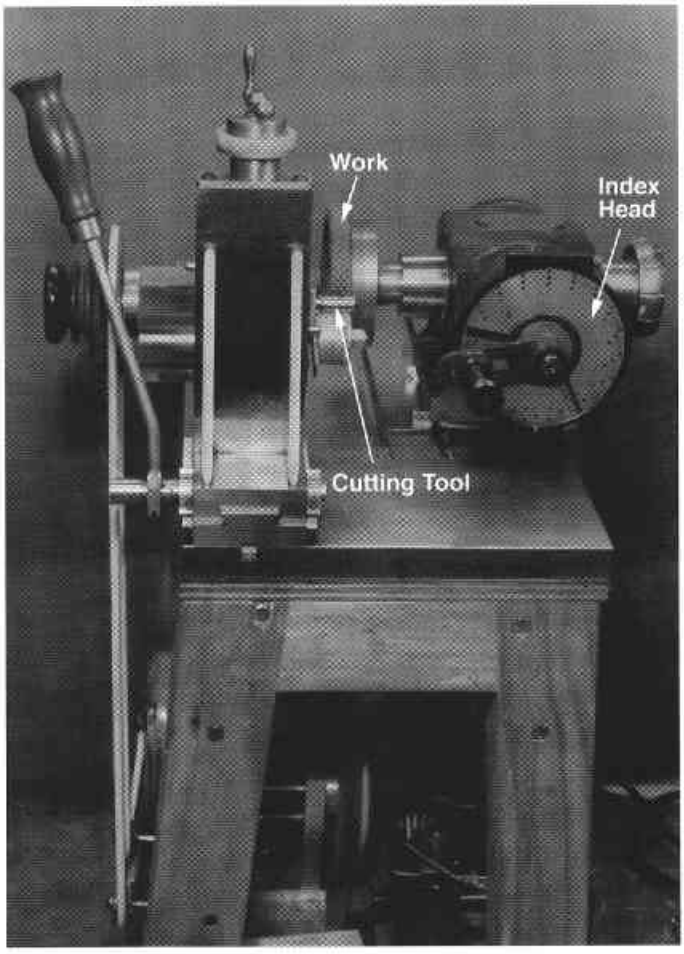
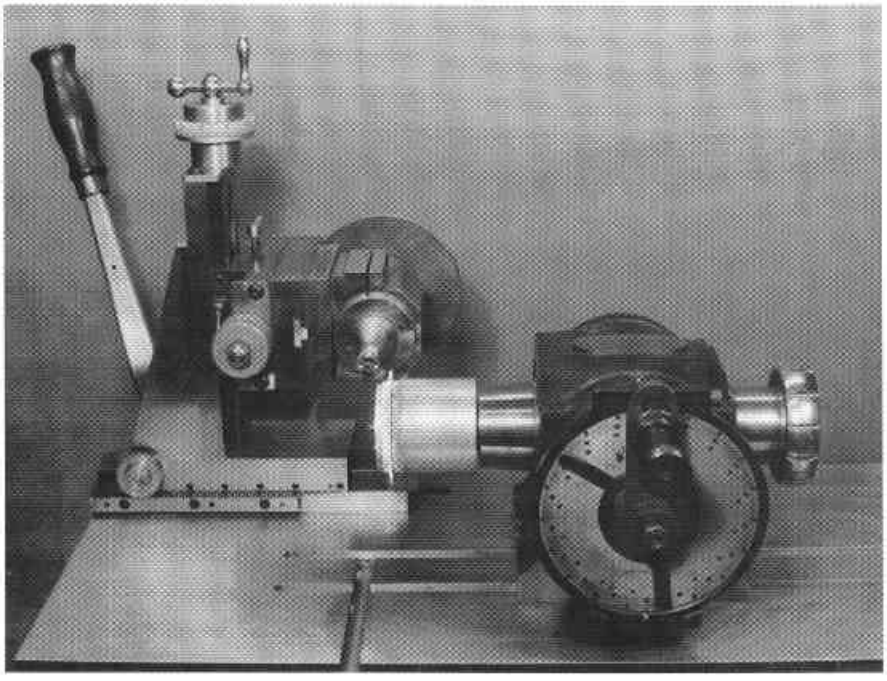
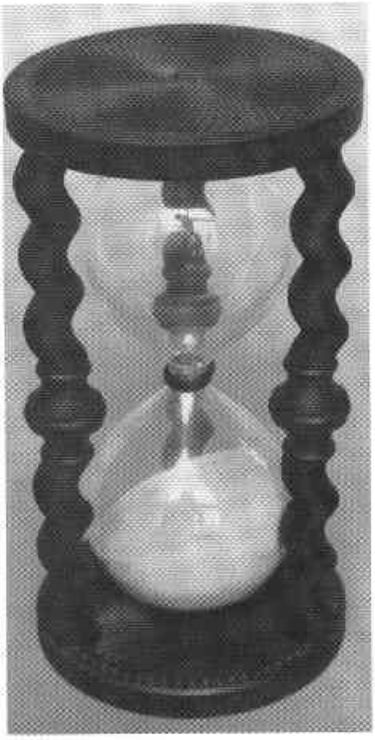


Figure 6. Cutting the pattern—overall view.

Left, Figure 7. Wheel cutting engine cutting a wheel. Right, Figure 8. Finished sand glass.