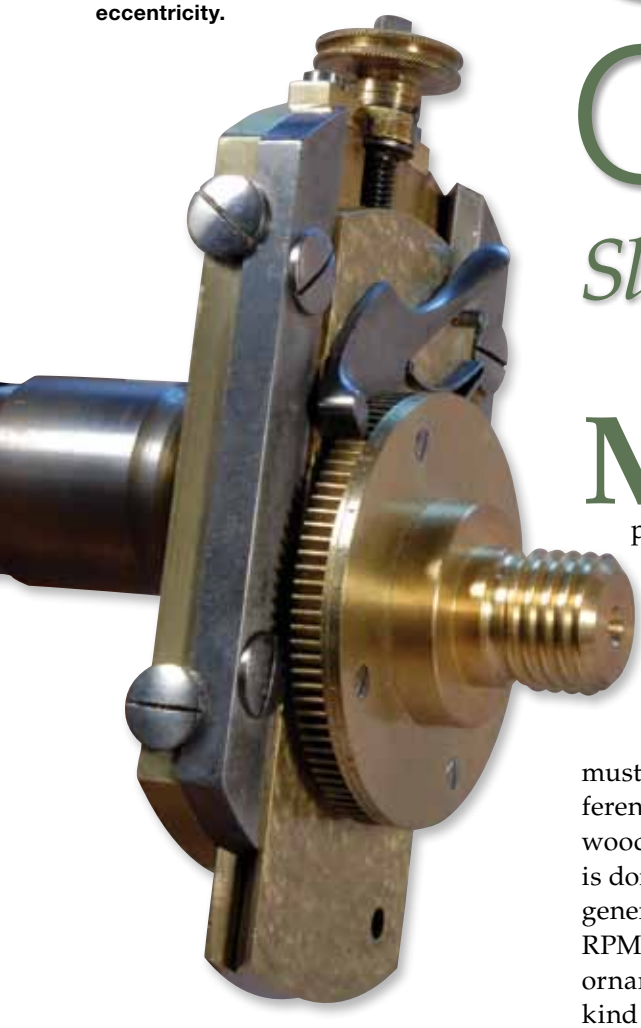
Ornamental Obsessions

Slightly Eccentric

Jon Magill



Antique eccentric chuck mounted on lathe spindle and set to about 1" of eccentricity.

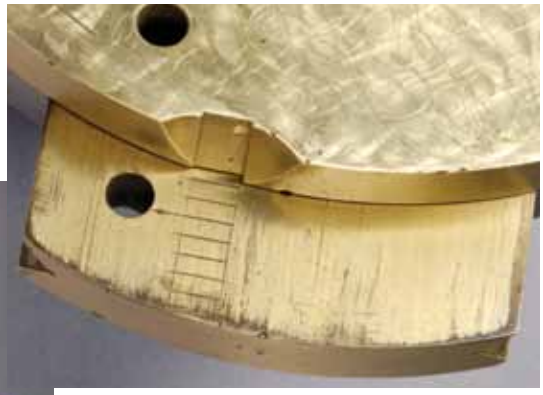
Many woodturners, when looking at ornamental turning (OT) work, will ponder, "How did they do that?" The answer often lies in the myriad of specialized equipment that has been invented and perfected over the centuries.

When studying OT pieces, one must be aware of the two main differences between OT and regular woodturning. First, the cutting in OT is done with a rotating cutter that is generally spinning at a few thousand RPM. Second, the workpiece on an ornamental lathe, depending on the kind of work being done, is either fixed or is rotating very slowly, at usually less than 10 RPM.

Given these two variables, historical ornamental turners, inventors, and toolmakers went to great lengths to devise some of the most esoteric pieces of apparatus ever conceived, simply to decorate various surfaces of a workpiece. There were two options for gadgets that preoccupied most of the OT inventors: devising new cutters to cut in a different way, and inventing new chucks that would allow orienting the workpiece in some specific way.

In the Spring 2008 issue of *American Woodturner* (*AW* vol 23, no 1), I briefly explored the range of cutting frames—the rotating tools in their various incarnations—that allow cutting in a variety of orientations and patterns. These cutting frames are presented to the work at different angles, and often with profiled cutters in an assortment of shapes, to produce a countless number of potential patterns.

Any well-equipped OT setup, or "kit" as the British refer to it, would consist of many different chucks. A dizzying array of ingenious chucks has been invented to enable decoration on any surface of a workpiece. By using these chucks, the woodturner can position the workpiece relative to the spindle-axis of the lathe. Most of these chucks appear ungainly or



(Detail below) The adjusting knob at the top of the chuck has a small scale for fine adjustments.

(Detail above) The eccentricity scale is engraved on the back at the bottom of the chuck. Two holes allow a tapered pin to be inserted, locking the eccentric chuck in its centered position.

dangerous to a normal woodturner; however, the workpiece on an OT lathe is either fixed at an indexed position, or rotating less than 10 RPM. That means that an OT chuck can be wildly out of balance compared to one designed to work on a conventional woodturning lathe turning at hundreds or thousands of RPM.

The simplest OT chuck is the *spiral chuck*, which merely adds an indexing feature at the nose of the spindle. Historically, its main use was in conjunction with the spiral apparatus to enable cutting additional spiral patterns, indexed around the workpiece. Most other chucks have incorporated this useful feature on their own fronts, thereby decreasing the overhang that would result if the spiral chuck was simply screwed on to the front another chuck.

Single-stage geometric chuck from the Victorian era of OT.

Pawl and detent style of indexing on the eccentric chuck. This one has 96 divisions, typical of most antique eccentric chucks.

The next chuck in terms of complexity, and the one that most people start with, is the *eccentric chuck*. Chucks closely related to the eccentric chuck include the rectilinear and double eccentric chucks. These all allow the workpiece to be offset from the (axial) line of the spindle. They all have a provision on their noses to allow indexing the workpiece around as a spiral chuck would *(See photos on page 62).*

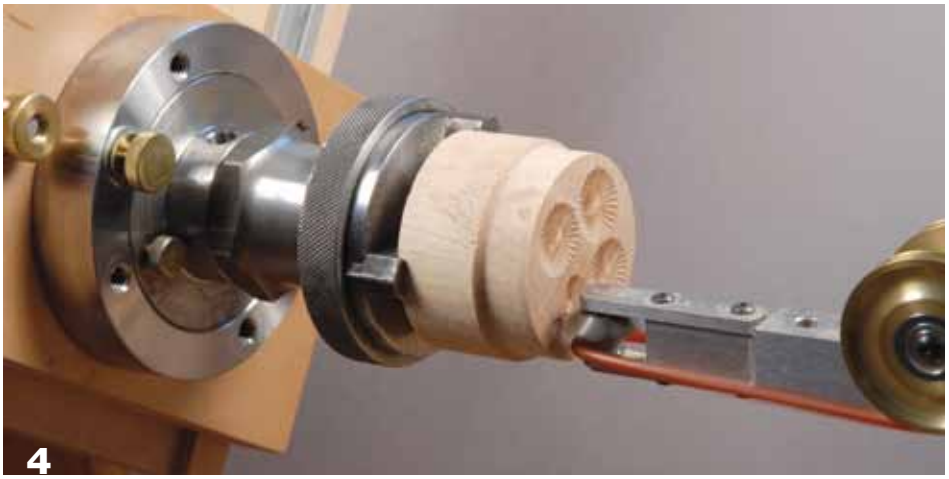
The next level complexity builds on the eccentric chuck, but is designed to hold the workpiece 90° to the spindle's axis. Picture adding a perpendicular platform to the front of the eccentric chuck, like a shelf, and moving the indexing part of the nose to that platform. With the chuck at the bottom of its revolution, the workpiece is now held as though it was placed on the shelf. In their simplest form, these are called *dome chucks* because their orientation enables cutting a dome shape on the workpiece. The mounting stage on a dome chuck can often be tipped out or down (known as *dumping*), which is, in fact, simply the incorporation of yet another chuck known as an *oblique chuck*, mounted to the front of the eccentric slide of the dome chuck.

Complexity of design continues to increase with very specialized oval chucks to allow oval, or more correctly, elliptical work. That complexity escalates until finally the most complex of all chucks, the *geometric chuck*. A well-equipped, multistage geometric chuck enables the creation of a mind-numbing number of looped patterns akin to those produced by a child's Spirograph. In the Victorian era, patterns created with multistage geometric chucks were considered so difficult to reproduce that they were used for printing security papers, such as bank notes *(Photo 1)*.

This shopmade eccentric chuck looks ungainly to most woodturners but works fine turning at 2 RPM.

Rather than give a detailed survey of all the chucks ever invented, let's take a closer look at what can be done with the most common chuck to start with in OT—one that you can build—the eccentric chuck. The eccentric chuck, as its name implies, allows the workpiece to be moved off-center from the normal axis of the lathe's spindle. This is usually accomplished using a pair of parallel slides that let the front plate of the chuck to be offset relative to the back plate, which attaches to the lathe's spindle. On the front plate is mounted some sort of an indexing mechanism. Historically, there were two approaches to indexing, either a click plate with a pawl and detents that enabled discrete indexing, typically 96 divisions, or a tangent screw, similar to a worm and gear that allows infinite adjustment (*Photo 2*).

Generally speaking, most Victorian-era eccentric chucks allow an offset up to about 1½". Modern and shopmade variants can be made to whatever size is appropriate for the task at hand. ▸



Indexed to the fourth position, cutting the final pattern on this simple eccentric design.

A shopmade chuck can be constructed out of almost any material from MDF or plywood to brass or steel. A back plate, with an attached faceplate or spindle adapter mounted, allows attachment to the lathe. The front plate requires some method for sliding or pivoting on the back plate to allow the eccentric offset that lets the chuck work its magic. The shopmade chuck pictured uses a pair of dado slots, just wide enough to capture a t-track. The t-track is screwed to the back plate. Hex-head bolts ride in the t-track, pass through the front plate and are clamped down with brass thumbnuts.

There are many ways to accomplish the front indexing, and the chuck pictured is obviously not the easiest one to make. The threaded spindle nose is held captive in a circular recess by the two brass thumbscrews, while a spring-loaded plunger pin engages in detents behind. A simpler version can be made with a disc of MDF with a 1"-8 bolt tapped through its center and mounted on a central pin allowing it to rotate. Thumbscrews around the edge can lock the disc in the desired positions. Although 96 divisions were typical on a Victorian chuck, you can get by with far fewer. Twenty-four is a versatile choice *(Photo 3)*.

Having a chuck that can be offset and indexed allows you to create patterns around the new center of rotation of your workpiece *(Photo 4)*. The eccentricity of the front plate determines where that center is, and the indexing determines how many times around that center a pattern will be cut. The distance of the cutting tool from the rotational center dictates where the pattern is cut into the workpiece. These three variables will let you explore thousands of patterns *(Below left)*. One last thing to experiment with is the shape of the workpiece itself. Simply doming the workpiece before moving it to the eccentric chuck will lead to a delightful shell pattern *(Photo 5)*. ■

Typical type of pattern that can be cut on a flat surface using an eccentric chuck.

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A pleasant variant appears just by cutting on a convex surface, a perfect example of the surprising versatility of the eccentric chuck.