

# CHASING THREADS

*Simple tools and a lot of practice makes perfect*

FRED HOLDER

ONE OF THE ANCIENT TURNING techniques that has been gaining interest over the last few years is the art of hand chasing threads. I first became interested in this almost forgotten technique while reading Bill Jones' column in *Woodturning* magazine. I had never heard the term before. Thus, began a search, in fact, almost an obsession to learn how to do it. I've been making threads in metal with tap and die for many many years, but the thought of freehand threads on a lathe intrigued me. The road from hearing about thread chasing to actually chasing a successful thread was not an easy one, but the journey has been interesting.

The first stage of my journey was Jacob Holtzapffel's book, *Hand or Simple Turning*, where he discusses tools and techniques for chasing threads on hardwood and ivory. I made a chaser, but it didn't work. Finally, I found some used chasers for sale from G&M Tools in England. They sold them for \$6.00 each or \$12.00 per pair. I ordered several pairs and wound up with chasers for 11 tpi, 16 tpi, 19 tpi, and 24 tpi. They didn't work either. I decided it must be the speed, my lowest lathe speed was 500 rpm. I even

tried using my Carba-Tec lathe and turning it by hand to get the speed down to a manageable level. Nothing seemed to work. I was almost to the point of giving up.

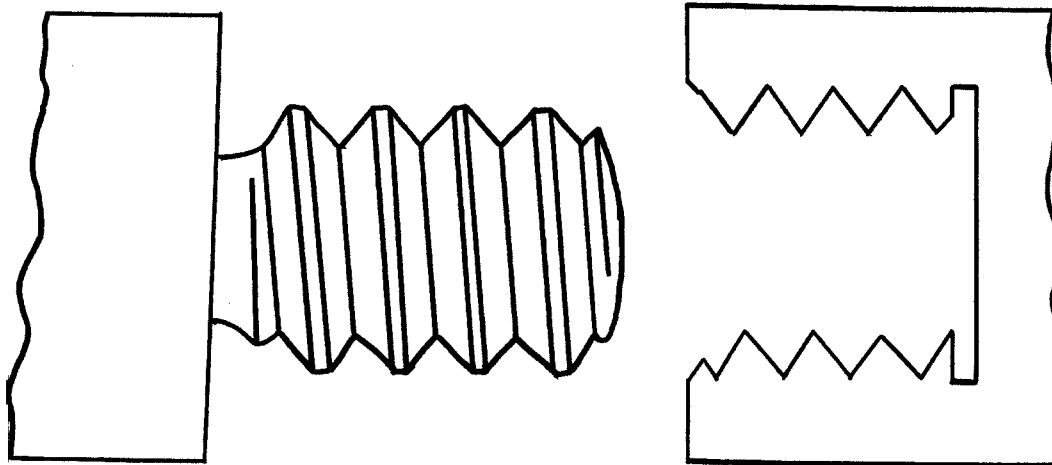
In re-reading Holtzapffel's book, I eventually noticed he described chasers cutting threads in hardwoods and ivory, and said a different technique was required for cutting threads in softwoods. I didn't see this at first, or at least it didn't register. I began to rethink my definition of hardwoods. I had been using maple and apple woods, considering them "hard wood." I had some cocobolo on hand, so I chucked up a piece onto my Carba-tec turning the lathe by hand. I tried the 11 tpi chaser, thinking that the coarser thread would be easier to cut. I was wrong about that, but it worked anyway. I was elated and the journey continued with a search for more answers. I purchased one of Dennis White's videos that included thread chasing and James Lukin's book, *Turning Lathes*, which also has a good section on thread chasing. Anytime I had some spare time to play and a piece of suitable hardwood, I cut a few threads. Incidentally, that chaser I had made in the beginning now worked also. I'm

afraid my main problem was in the definition of what is "hard" wood.

I was chasing threads on a Carba-Tec lathe by turning the lathe with my left hand while I held the chaser with my right hand. It worked very well and I've cut a lot of threads in that manner. Both Holtzapffel and Lukin used treadle lathes.

Before treadle lathes, turners had used springpole lathes. So, I graduated to my foot powered lathe, it is a spring pole type with a lathe spindle and a full three revolutions per downward stroke. Wow, this was even easier than turning the Carba-Tec by hand; I now had both hands to work the tool. I began to feel confident. Enough so that when I agreed to demonstrate my foot powered lathe at the January 1997 meeting of the Seattle AAW Chapter, I included thread chasing. Since then, I often demonstrate this technique at craft shows when people ask how I cut the threads in one of my threaded boxes. I have now progressed to chasing threads at 500 rpm. I will admit, however, that a speed of 100 or 200 rpm would make it a great deal easier.

I share the above with you to explain how I got from hearing about thread chasing to actually doing it



Thread chasing is an ancient technique that can still challenge and delight turners today. All you need are a few simple tools, some very hard wood, a touch of patience and lots and lots of practice.



Fred Holder working on his mini-lathe

successfully. I'm sure it would have been easier if I'd been able to watch Bill Jones or Allan Batty demonstrate the technique, but I didn't until after I had finally learned to chase threads on my own.

First, you have to have a pair of thread chasers, one for the inside and one for the outside, as shown below right. Incidentally, when it comes time to sharpen the chaser, hone or grind on the very top only, never ever on the face. I sometimes grind the top and sometimes use a diamond hone, either works well.

You also need a suitable supply of "hard wood." Wood that is hard enough for thread chasing is generally wood that will cut cleanly with a scraper: lignum vitae, boxwood, Osage Orange, desert Ironwood, red-heart, African Blackwood (the best). I've also cut threads in oak, black locust and mesquite. I've even used a bit of thin hot stuff CA glue to harden apple wood enough to cut threads in it, but I don't recommend the softer woods. The key is a dense hard wood that will take and hold fine detail. This defined, let's get to making threads.

In all of the literature I read there was no definite answer as to which you should make first: the inside (female) thread or the outside (male) thread. Bill Jones didn't seem to think that it mattered, but Allan Batty recommends making the inside thread first, because it is more difficult to make, because you can't see

what's going on inside the hole. I agree with him. A lot of my thread chasing practice has been to take a 16 tpi chaser and make a thread to fit a 3/4 in.x16 tpi nut. This was always a trial-and-error situation until I watched Batty demonstrate at Provo in June 1997. He said to make your inside thread first and then on the end of the external thread to make a short tenon that just fits into the inside thread. This tenon is then the bottom of the external thread, when your

chaser marks this area, your nut or box top will screw on. Therefore, we'll make the inside thread first.

Prepare your hole for your internal thread like that shown in Fig 1 on the facing page. The only limiting factor for the diameter of the hole is that it must be large enough to enable your chaser to be properly entered into the hole. The sides of the hole must be parallel to the axis of rotation unless you want a tapered thread. Use a straight edge, pencil, or something to lay along the cylinder and compare this to the lathe bed. The entrance to the hole should be beveled or rounded to prevent the chaser teeth from catching on a sharp edge and the recess should be cut at the back of the hole to allow the chaser to cut clean before it hits the bottom of the hole. One nice thing about turning the lathe by hand, you can feel when you've hit the bottom of the hole; at 500 rpm this is not the case. When the chaser cuts into this recess, you must lift the chaser clear and return it to the beginning. Bill Jones refers to this as a sort of figure eight motion; I consider it sort of a loop.

Holtzapffel says to start cutting your thread on the beveled part as shown in his drawing, Figure 1. Your first cuts are along the curve a-b and

#### Sources for Thread Chasers

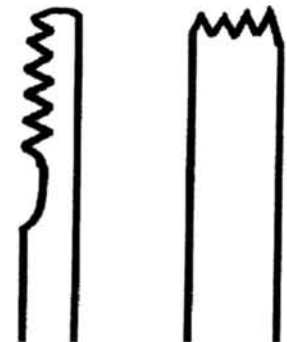
**Craft Supplies USA;** 1287 E. 1120 S.; Provo, UT 84606 USA TEL: (800) 551-8876

Thread Chasers in sizes 16, 18, 20 TPI.

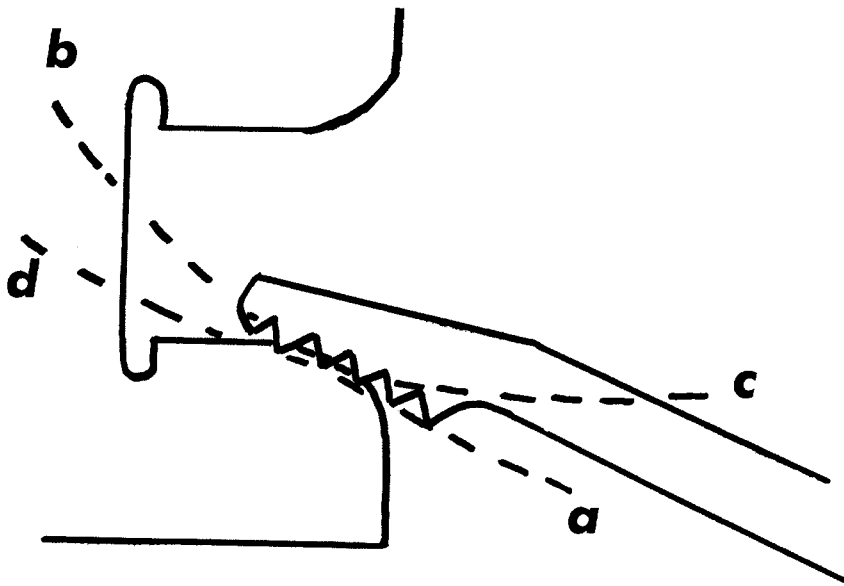
**Woodcraft Supply;** PO Box 1686; Parkersburg, WV 26102 USA TEL:(800) 225-1153 Thread Chasers in 18, 20 TPI.

**G&M Tools;** The Mill, Mill Lane; Ashington, West Sussex; RH20 3BY United Kingdom Chasers in pairs in 4, 5, 6, 7, 8, 9, 10,11, 14, 19, 22, 24 TPI. ; Contact: Tim Muddle.

**Tracy Tools Limited;** 2 Mayors Avenue; Dartmouth; South Devon; TQ6 9NF United Kingdom, Chasers in 5, 6, 8, 9, 10, 11, 14, 16, 19, 20, 26, 27,32, 34, 40 TPI.



Cutting ends of the male, left, and female, right, tools.



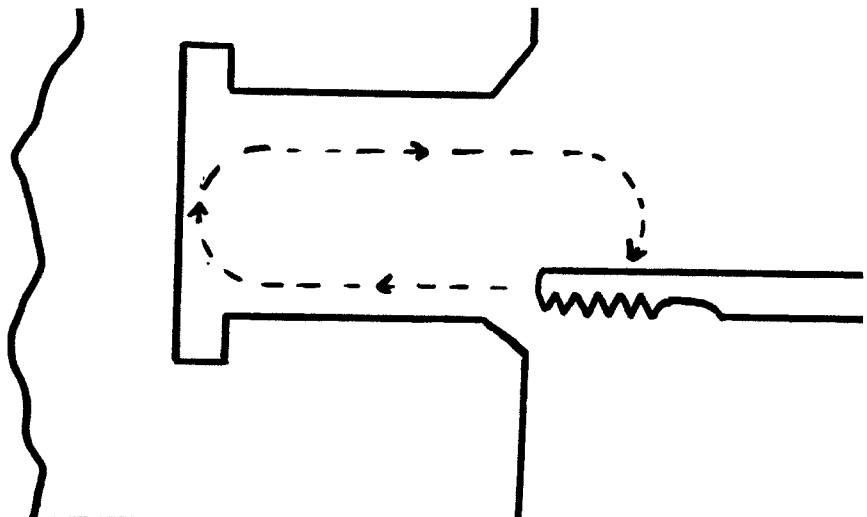
**FIGURE 1:** Holtzapffell's method of striking the thread. The first pass should be a to b and the next pass should be c to d and then you go down the parallel section. Note the hole for an inside thread must have sides that are parallel with the axis of rotation and a recess at the bottom of the hole to allow the chaser to fully cut the thread before hitting the bottom. A rounded or chamfered opening helps prevent a sharp edge from catching a tooth of the chaser and creating circles, not threads.

then along the curve c-d, until you are cutting along the parallel of the cylinder. Lukin says, "I have found it quite easy to begin at once upon the end of the cylindrical part ...". I agree with Lukin and proceed as shown in Fig. 2, below right.

First, I try to have the heel of the chaser ride on the cylinder. It doesn't cut but tends to move the tool along at the necessary rate of speed. A few practice motions like this allow you to get the feel for the speed. The more teeth to the inch the easier it is to handle the chaser, because you are progressing slower. Once you feel you have the speed down, allow it to cut lightly and move it evenly and smoothly (not faltering) at the desired speed. This is called "striking the thread." Once you have grooves cut deep enough to guide the chaser, you no longer have to move it, but you do have to lift it out of the grooves before it reaches the bottom of the hole. You must exert care to insert the tool into the grooves each time, miss and you may cut a double or triple thread, not good!

Until recently, I turned the "T"

across the face of the area to be threaded, wrapped my fingers around the tool rest and hooked my index finger over the chaser to apply pressure against the cylinder during cutting. I recently acquired an "arm rest", Fig. 3, which considerably aids in cutting inside threads. You place



**FIGURE 2 :**Holder recommends this motion with the inside chaser to cut the threads. The chaser should just cut clean into the recess and must be lifted clear before the chaser end hits the bottom of the hole. This is why it is more difficult to chase threads with fewer teeth per inch. The chaser is moving so much faster it is difficult to lift clear before touching the bottom.

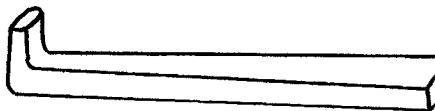
the handle under your left arm, the arm rest on the "T" and the chaser on the arm rest with the hook (turned up part) touching the chaser. The arm rest is then tilted up and down as necessary to position the chaser and is pulled back to exert pressure during the cut. It makes cutting the inside thread much easier. Both Bill Jones and Allan Batty consider the arm rest indispensable for internal thread chasing. I say it is a lot easier; I was making threads without it.

Make additional passes until the thread is deep enough and clean. If you have a specific size that you are trying to achieve, you can measure the inside with calipers and, if necessary, shave off a little bit with a side cutting tool. Make sure the sides remain parallel to the axis of rotation and do not remove all of the thread; leave enough to guide the chaser for additional passes. Then make more passes until you have a good thread again. I do not hesitate to rotate the lathe by hand and make a few passes with the chaser at this very slow speed as final touch up. If you were to

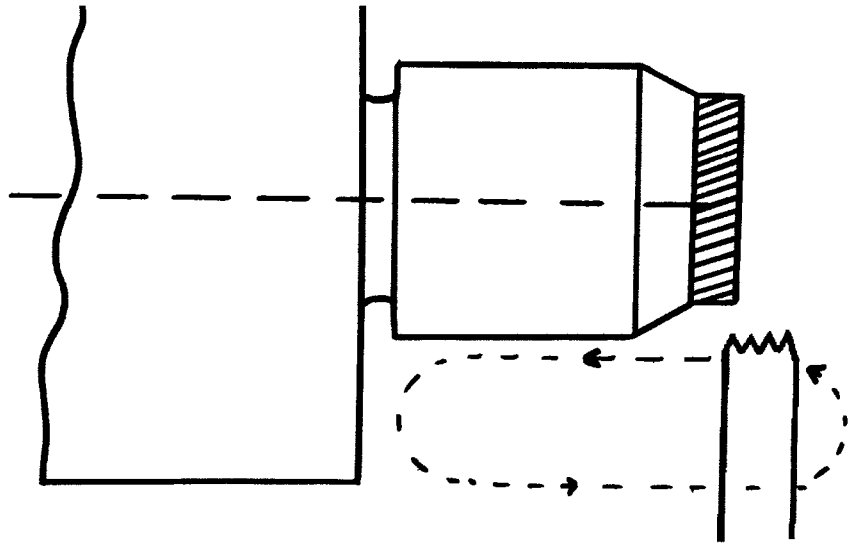
slice the finished piece in half, you should have a thread that appears to be very similar to that shown on the first page of this article.

Now prepare the outside thread area similar to that shown in Fig. 4. The sides of the cylinder must be parallel to the axis of rotation, there must be a recess cut at the end of the threaded area, there must be a bevel or rounded area at the beginning of the threaded area, and there must be a little tenon (shaded area in the figure) that will just fit inside the female threaded area. The outside of the cylinder must be at least twice the depth of the threads larger than this area; i.e. if the thread depth is 0.025" then the diameter must be greater than 0.050" larger than the tenon as a very minimum. I recommend that it be a bit larger to allow for mistakes in getting started. This is especially important when learning this technique.

Before actually starting to move the chaser along the tool rest, it is important that the rest be dressed smooth, any nick or rough spot can stop or cause the chaser to falter and create problems with your thread. Again, with the area below the cutting edge rubbing on the wood get a feel for the rate feed that will be necessary. Make a few trial passes before allowing the tool to start cutting. Then move the tool along evenly at the determined speed allowing the edge to cut lightly as shown in Fig. 4.



**FIGURE 3:** The armrest is a smooth steel shaft about 7- to 9-in. long. that can be fit into a handle. The left hand grasps the tool rest and the left thumb presses the tool down onto the armrest and the entire assembly down onto the tool rest. The tool rests against the hook on the armrest so side pressure can be applied as threads are cut.



**FIGURE 4:** This drawing illustrates the movement of the chaser as it cuts the thread. The chaser should just cut into the recess and then be lifted clear of the wood before the chaser comes in contact with the shoulder. When the chaser just marks the shaded tenon, the thread should be ready to receive the inside threaded piece.

As the cutter moves into the recess at the end of the threaded area pull it away from the wood and reapply at the beginning. Your chaser should be moving from right to left. Repeat this operation until the thread is well formed. If the chaser hasn't started to make scratches on the small tenon (shaded area on the illustration), use a square end scraper and take a light cut on top of the threads. Then cut the threads deeper until the chaser just cuts on the small tenon.

If everything was done properly, i.e., the threaded area was parallel to the axis of rotation and the threads are cut to the correct depth, the female thread should screw onto the threads you've just cut.

You may still have to relieve this a bit. I generally turn off the lathe and rotate it by hand while making some final passes with the chaser. Then try your nut or lid again. If it screws on fully, but is a little stiff, apply some soft wax and work it a bit. If that still doesn't free it up, then take another pass with the chaser while rotating by hand. When everything fits, your thread should look something like the thread shown on the first page of this article.

Clean the threads with a soft cloth and apply a light coat of soft wax as a finish. Work the threads a bit to bur-

nish them.

Well that is about all there is to it. As Bill Jones says, "start making little boxes with threaded lids, by the time you've made half a gross, you'll be a thread chaser." Once you have the tools and the inclination and a little bit of know how, all that remains is a lot of practice. Remember, a lathe with a speed of 100 to 200 rpm would be best. Lacking that, try chasing threads while hand turning the lathe. Start with a fine thread (16 to 24 tpi) in the beginning and use a good hard wood. One of the best that I've used is African Blackwood, it is a bit pricey, but it sure makes a nice thread.

One final note, all of the discussion here has been for cutting right hand threads. To cut left hand threads, move the chaser from left to right. Even though most chasers will be right hand chasers, you can still cut left hand threads by tilting the chaser down so that only the very cutting edge is contacting the wood. Move at the same speed, but from left to right. Have fun making threads!

*Fred Holder is a turner and writer living in Camano Island, WA. Currently president of the Northwest Washington Woodturners and newsletter editor, he will be a demonstrator at the AAW Symposium in Tacoma, WA.*

**A TREASURE TROVE OF IDEAS AND INFORMATION**

WHEN I BEGAN MY WOODTURNING adventure eight years ago, I quickly found that the thrill of turning was matched by the excitement of figuring out what additional decoration I could add to the turning. As time went on, the process of decoration or ornamentation became the dominant concern of my hobby. In short, the woodturning became nothing more than a palette to decorate. Like many turners I began experimenting with textures, paints, carving, and a dental drill to decorate turnings. With the drill, I thought I had found the perfect tool for my creative outlet (see *American Woodturner* 11.3:50). Then I read about another type of highly decorative turning, called Ornamental turning or OT, for short. I first became aware of OT at the 1994 AAW symposium where a few OT enthusiasts were showing their work and a very fancy contraption called an ornamental lathe. The lathe and the work was very impressive but I wasn't ready to jump into anything new. The idea stuck with me, and I tried to find out more information about OT. A book search turned up a few magazine articles, and only a handful of books - most now out of print. The most notable of these books was the "Principles & Practice of Ornamental or Complex Turning" by John Jacob Holtzapffel. This is the "bible" of OT work, but it is also VERY difficult to read without some mechanical background. Even after you finish reading it, you probably still could not complete an OT project. It doesn't convey information in friendly terms.

My search for information continued, but again very little turned up until I discovered the Ornamental Turners International (OTI) in the US and the Society of Ornamental Turners (SOT) in Britain. In 1997, the OTI held an ornamental turning symposium in Portsmouth, NH where I discovered SOT publications, which contain as much as a hundred pages of useful information and articles supplied by its members. It is very comparable to the

Journal of the AAW - filled with project tips, stories, historical and practical information on the legacy of the Holtzapffel lathes, plus a lot of general and fun information on OT. These bulletins are such a valuable source of information, that a collection of original bulletins can bring in a fairly high price at auction. At the symposium, an idea was hatched to compile the collection of their bulletins onto a CD and to make it available at a reasonable price. And so, the monumental task of gathering all the past issues, scanning them, organizing them, and producing a CD collection was started.

After an almost two year effort, the CD is now available from both the OTI and the SOT. It was produced by Steve Johnson, current president of the OTI, in direct cooperation with the Society of Ornamental Turners and several key members who provided the loan of collected issues of the bulletins. The CD is comprised of the first ninety-eight issues of the SOT bulletins as well as three other important treatises on OT work, and spans the years between 1948 and 1998. Each issue has been completely scanned and indexed and stored onto the CD in the popular Adobe PDF ( Portable Document Format), an interchange format which makes it easy to move non-compatible documents between computers. To read a PDF file, a program such as Adobe's Acrobat Reader is required, and a version is included with the SOT CD.

Installation of the CD on PCs is relatively easy; full instructions are provided. From then forward, it is just a matter of using the reader to open the compiled bulletins or the index provided on the CD. Macintosh, UNIX, or other platform owners can obtain free copies of Acrobat Reader from Adobe. Since the PDF format is touted as being platform independent, the data on the CD should still be readable by the other platforms. No system requirements are included with the CD, but my system is a now-obsolete 75 MHz Pentium platform, with only 16 MB of memory,

and I've had no problems

CD users printing the material face one minor irritation. The bulletin format fits European A-4 size paper, which is 12-X-8.5 in. You may have to reduce the print size to 90% of the original.

The CD is organized numerically, with each of the 98 SOT bulletins in its own file. In addition, 3 essays on OT work are also included: "The Rose Engine Lathe", a "Bibliography on the Art of Turning and Lathe and Machine Tool History" and "The Art and Craft of Ornamental Turning".

The CD also has an index which works like a normal book index, but it let's you click any entry to jump immediately to that selection. You can also use Acrobat's search capabilities to look for any word or phrase on the CD.

As to the bulletins themselves, they are comprised of heavily illustrated articles submitted by the worldwide membership of the SOT. The information is invaluable and varies from simple tips and advice, descriptions of OT techniques with modern developments, invention of new apparatus, to complete walk-throughs of OT projects. The projects presented in picture form are exactly what beginners need to take an idea and transform it into turned ornaments. It's probably the only information a beginner may find, because there are so few OT turners around. This CD is like finding a lost gold mine.

The SOT CD is available directly from the Society of Ornamental Turners in England, or from the Ornamental Turners International in the US. Contact Alan Bugbee (860-658-4764) for details. The cost is \$80 for members and \$125 for non-members. Let us also hope that this will start a trend of lost back issues of our favorite journals being compiled onto other CD collections.

- Nick Siloa is an amateur ornamental turner in Garland, Texas and Vice-President of the Ornamental Turners International. He will present a beginners OT class at the 1999 symposium in Tacoma, WA.