

# Cutting Threads on a Lathe Using Hand Held Chasers

by Fred Holder

Hand thread chasing requires very hard woods or plastic like materials (such as epoxy) for best thread development. One can cut threads in the softer hard woods such as maple and oak if some end grain is included in the threaded section; i.e., if the grain runs across the section being threaded so that the threaded section contains some end grain and some side grain, the threads are less likely to break out.



**Figure 1. A pair of hand chasers (top) inside chaser and (bottom) outside chaser. These chasers are for 4.5 tpi threads.**

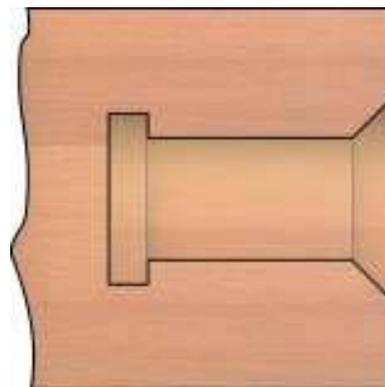
## What you Need to Make Threads

First, you have to have a pair of thread chasers, one for the inside and one for the outside, as shown in Fig. 1. Incidentally, when it comes time to sharpen that chaser, hone or grind on the very top only. Never, ever grind on the face. I sometimes grind the top and sometimes use a diamond hone, either works very well.

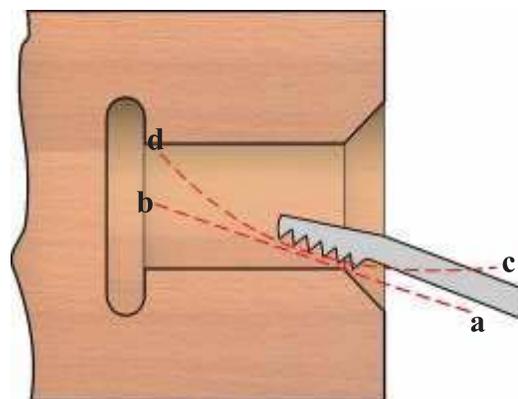
You also need a suitable supply of “hard wood”. Wood that is hard enough for thread chasing is generally wood that will cut cleanly with a scraper: lignum vitae, boxwood, Osage Orange, desert Ironwood, redheart, African Blackwood (the best). I’ve also cut threads in oak, black locust, holly, and mesquite. I’ve even used a bit of Red Lable 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.

## Making the Inside Thread

Prepare your hole for your internal thread like that shown in Fig. 2. 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 cleanly before it hits the bottom of the hole. When the chaser cuts into this recess, you must lift the chaser clear and return it to the beginning.



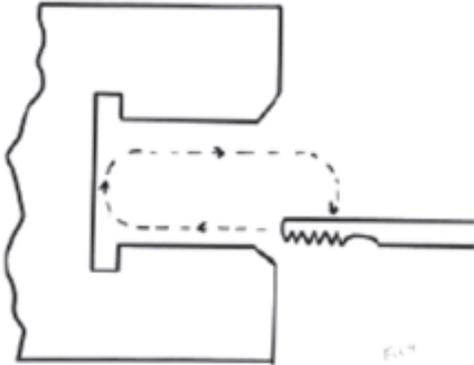
**Figure 2. Preparation of area to be threaded with the internal threads. Note the recess at the back of the hole and the tapered opening.**



**Figure 3. Method of starting described by Holtzapffel in his book.**

Holtzapffel says to start cutting your thread on the beveled part as shown in his drawing, Fig. 3. Your

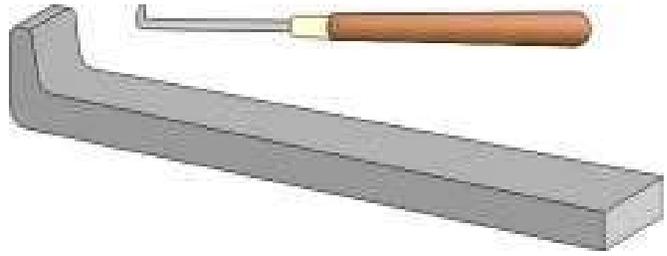
first cuts are along the curve a-b and then along the curve c-d, until you are cutting along the parallel of the cylinder. Lukin says, “Personally, I have found it quite as easy to begin at once upon the end of the cylindrical part...”. I agree with Lukin and proceed as shown in Fig. 4.



**Figure 4. Method I use to start my internal thread.**

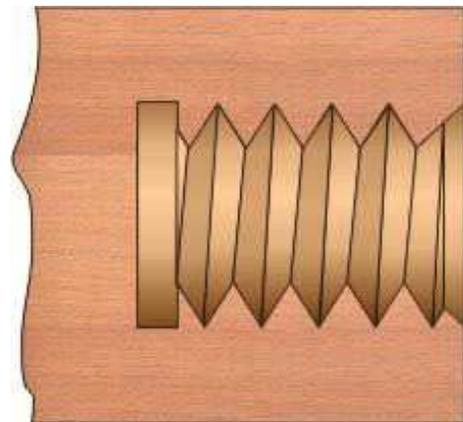
First, I try to have the heel of the chaser ride on the cylinder. It doesn't cut but tends to move the tool along at the rate of speed necessary. A few practice motions like this allows you to get the feel for the speed. The more teeth to the inch the easier it is to handle the chaser, because you are progressing more slowly. 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!

As a beginner, I held the chaser by wrapping my fingers around the tool rest with my index finger over the chaser to apply pressure to cut the threads. Eventually, I acquired an “arm rest”, Fig. 5, which considerably aids in cutting inside threads. You place 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.



**Figure 5. An armrest is a piece of metal with a turned up hook on the end and a wooden handle.**

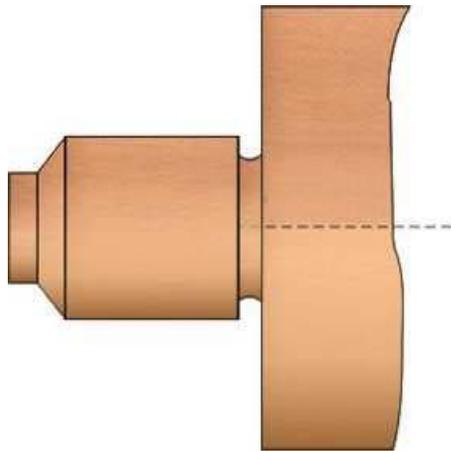
Make additional passes until the thread is deep enough and clean. If you have a specific size that you are trying to achieve, you can measure the inside with calipers and if necessary shave off a little bit with a side cutting tool, make sure the sides remain parallel to the axis of rotation and do not 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 in Fig. 6.



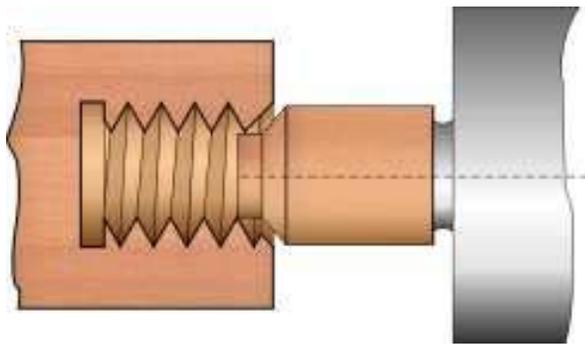
**Figure 6. This is what the finished internal threads should look like in cross section.**

### Making the Outside Thread

Now, prepare the outside thread area similar to that shown in Fig. 7. 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 that will just fit inside the female threaded area, see Fig. 8.



**Figure 7. This shows how the external area to be threaded should be prepared.**



**Figure 8. Showing how the little tenon fits into the internal threaded area.**

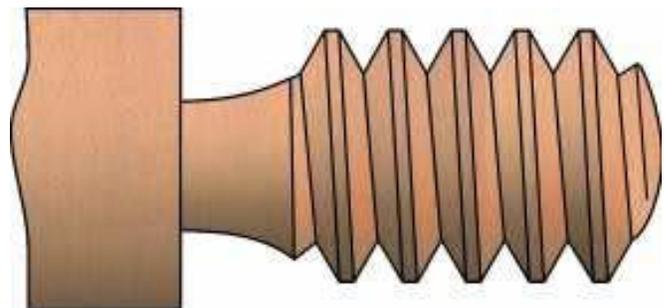
The outside of the cylinder must be at least twice the depth of the threads larger than this area; i.e., if the thread depth is 0.025" then the diameter must be greater than 0.050" larger than the tenon as a very minimum. I recommend that it be a bit larger to allow for mistakes in getting started. This 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 of 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. 9.



**Figure 9. Cutting the external threads.**

As the cutter moves into the recess at the end of the thread 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 in Fig. 10.



**Figure 10. The finished external threads should look something like this.**

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

bit to burnish them.

Well that is about all there is to it. 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 tpi 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.

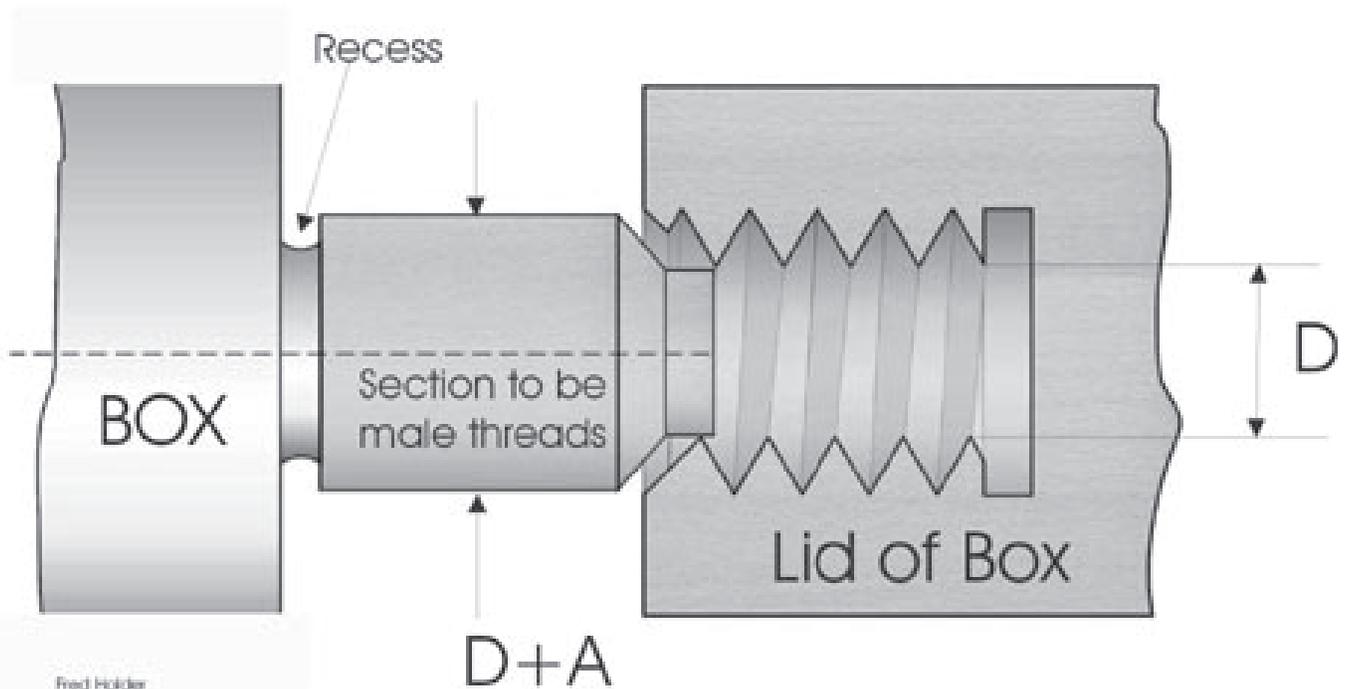
One final note, all of the discussion here has been for cutting right hand threads. To cut left hand threads, move the chaser from left to right. Even though most chasers will be right hand chasers, you can still cut left hand threads by tilting the chaser down so that only the very cutting edge is contacting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

**Note:** When writing my book, "Making Screw Threads in Wood," I developed formulas and drawings to illustrate how to calculate the size of the tenon for the external thread after the internal thread has been completed. That illustration and formula are shown in Figure 11. Robert Sorby has also developed a tool to make these calculations for you. This tool is shown in Figure 12.



**Figure 12. Robert Sorby tool for determining diameters of area to be threaded.**

## FITTING THREADS



$D$  = Inside Diameter of Female Threads  
 $A$  = Adjustment =  $1.38/TPI$  = Increase in Diameter for Male Threads

**Figure 11. This illustration shows the way to calculate the actual size of the areas to be threaded.**