

MAKING YOUR OWN LATHE TOOLS

What we will be making is a simple but very useful tool. One of the most frequent tools I use is a .5" round nose scraper for finishing surfaces of turned work, especially in the inside of a bowl or vessel.

Some tools have to be forged, as in the case of a bowl gouge or any kind of gouge. But some tools lend themselves from ordinary flat or round bar stock. Scrapers can all be made from various sizes of bar stock.

I will go thru the all steps to make one yourself.

BUY YOUR BAR STOCK

The first thing you will need to do is obtain your bar stock material. For economy, and since this is your first tool, I recommend you get A2 steel. Its very easy to work with prior to treating it. It cuts and grinds easier than cold roll steel. After you have made a few tools successfully you may want to opt for a better quality steel. It will cost more, but with experience you can yield a top quality tool from these finer grades of steel. They offer M2, M4 and High Speed Steel (HSS) in addition to the type we will use.

If you don't know anyone locally selling tool steels, you can go to my favorite website and buy it online. For this tutorial you will need .5" wide, by .312" (3/16ths), by 12" long. It comes in either 18 inches or 36 inch lengths. The size you need will cost you **\$11.50 plus tax and shipping.**

At their site, they accept all major credit cards and debit cards. Here is a link straight to the page you select your bar stock from:

[Tool and die A2 bar stock](#)

Now, that you have this done you need to gather tooling you will need.

WHAT YOU WILL NEED

Bench grinder or angle grinder
Bench vise
2 propane torches
2 C clamps big enough to fit around the torch tanks
Vise grip pliers
Box of rock salt
16 oz. of light weight machine oil (10 weight)
1.5 gallons of hot water
Cheap 2 gallon plastic or metal pail
Cheap toaster pan at least 9" by 13" (steel not aluminum)
Some pieces of ceramic tile
2 x 2 oak, or hardwood stock
1" O.D. steel sleeve

- You will use the grinders, either of your choosing, to grind the ends of your bar stock.
- The vise grip pliers are for handling your tool when you are heat treating it.
- the torches are used in tandem to heat treat your tool
- The salt, oil and water are for a quenching brine you will prepare and have on hand when you heat treat your tool.

- The pan and ceramic tile are for annealing your tool after it is heat treated.
- The hardwood stock is to make your handle, and the steel sleeve goes on the end of your tool handle where the tool fits in

MAKNG YOUR QUENCHING BRINE

Now is a good time to make your brine.

When you heat treat metal, most of them need a quenching agent that you immerse the tool in as soon as it reaches the proper temperature. Making this brine is simple and requires ordinary materials you can find at a grocery or hardware store.

Buy your bucket. It needs to hold 2 or more gallons, but 2 is perfect for this. Don't spend a lot of money on this, you may not ever do this again so don't put a lot into it unless you plan on doing a lot of it. If you do decide to make more tools, you will want to construct a lid for this bucket so you can store it.

Get a bucket that has a smooth top rim with no handle tabs. It needs to be level all the way around. You can cut a piece of good quality $\frac{3}{4}$ " plywood into a circle that will fit inside the top of your bucket. Then cut another circle large enough to sit on top of the rim of the bucket. Attach the two circles together making sure they are concentric with each other. If you want, mix up some fiberglassing epoxy and put a coat on all sides of your lid. When it dries you will have a solid lid that is impervious to the brine humidity, and the elements outside the bucket cannot enter your brine either.

Okay, making the brine. Run some tap water until it is hot as it is going to get, and fill your bucket half way with it. Pour at least two big handfuls of rock salt in the bucket. Now take a stick or something to stir with, and work the salt to dissolve as much of it as you can.

When you have most of the salt dissolved, add cold water to the bucket till it is about $\frac{3}{4}$ filled. Now take your oil and slowly pour it into the salt water. Try to hold the oil container as close as you can to the water so it will not break up into globules. Put all of the oil in the bucket. Now just cover it, and set it somewhere it cant get knocked over.

WHATS THE TILE FOR?

After heat treating a piece of metal it is very hard, but it is also very brittle. After it has cooled, you could drop it on a cement floor and it could shatter into many pieces. So remember to be careful not to drop it or bang it on anything once it is hardened.

To alleviate this condition, tools have to be annealed. What this does is realign the molecules in the metal back close to their original state. This is also called work hardening by some. This will strengthen your tool and make it stand up to the harshest of treatment. It will also make it safe to use.

NEVER, EVER harden a tool and skip the annealing process!

It can shatter when you are using it and seriously injure you.

You want to take the tile, and break it into narrow strips if possible. But small pieces roughly 1" square will work fine. If you have a tile saw though, use it to cut the tile into 1" wide strips. You will take these strips and place them on the pan, then lay your hardened tool on top of the strips to raise the tool off of the pan surface. Don't omit this step when annealing. You will not get a thorough annealing laying the tool on the bare pan.

That's about it for preparation. If you have all of this out of the way, you will be ready to make your tool when the stock is in your hand.

MAKE YOUR TOOL HANDLE

After all, we are making lathe tools here. To be purists we might as well make our handles too! You may want to purchase a handle, but good quality oak stock is available at Lowes or Home Depot at a very reasonable price. And its just plain fun to make a handle for a tool you will use and come to appreciate. You can use what ever you like as long as it is a hard wood. Ash is my preference and what I have made most of my tools with.

You will want to drill a .5" hole in your handle. This is perfect for your tool shank. Drill this diameter 3" deep. Then change over to a .375" (3/8) drill and go 1" deep. This will firmly grip the end of your tool and keep it from twisting.

SHAPING YOUR TOOL

Now you have your raw stock. You don't HAVE to make it 12 inches long, but I like to put at least 4" of my tools into my handle and have plenty of business end left so I wont have to buy or make another one for a long, long time.

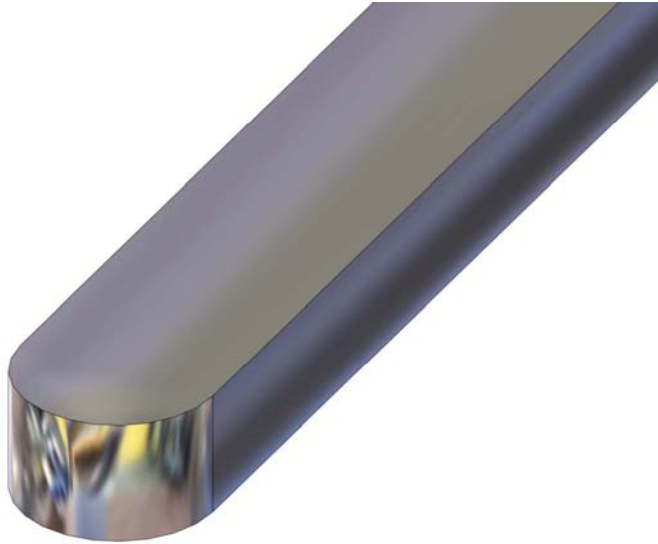
First off, grind or mill, the handle end of your bar stock as the picture below show, so it will facilitate entering your handle. It doesn't have to be perfect, the object is to have a square end and a gradual taper on the sides. Aim for your sides to taper out at about an inch.



If you are grinding this, have a quart jar or bigger of cold water handle to cool your work down. If you start seeing blue or black, stop grinding and quench it in the cold water (**not in the brine**).

Next you want to shape the profile on the business end of your tool. This would be best done with a course wheel on a bench grinder. Set up your grinder rest so your bar will be laying perpendicular to the wheel for this. Your last grinds will be one fluid motion starting at the extreme of one side of the tool end

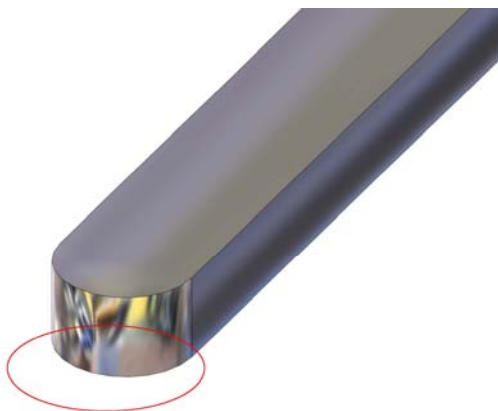
sweeping around to the other. You start by making small sweeps to grind the square corners. As you see the corner taking shape, compliment it by bringing the other side to the same shape. Below is the radius you want.



Again, this does not have to be perfect. But the closer it is to a full .250" radius, the easier it is to grind the relief. When you are close you will notice the symmetry between the profile and the bar width.

The last cuts now are much easier. You will change the attitude of your grinder rest slightly up. You want about 10 degrees from perpendicular. When you have this locked down, go back to grinding the full sweeps just as you did for the profile. Remember to cool your tool often.

You will be removing material from the bottom up. So your first passes will begin taking metal away from the bottom of the profile face, where I have the tool circled below.

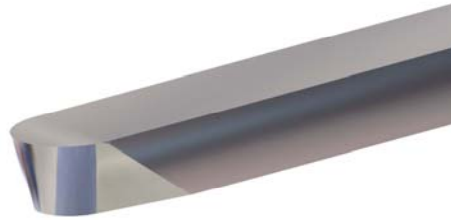


When the grinding wheel starts throwing sparks above the tool bar surface you are looking down on, you have ground the relief as far as it needs to go, and it meets the top surface of the bar. You will notice discoloration to the cutting edge too as you get the relief ground to the proper place. Make your last passes doing this light, but securely.

Your tool should look like the pictures below now.



SIDE VIEW



ISOMETRIC VIEW

Your tool is ready to be heat treated now !

HEAT TREATING

****IT WOULD BE BEST TO READ ALL THESE STEPS SEVERAL TIMES AND COMMIT THEM TO MEMORY BEFORE YOU START THIS PROCESS****

Now you need a bench vise. If you don't have a bench vise, a drill press vise will also work.

Have your quenching brine on the floor, NOT on top of the bench or work table, down close to where you will heat the tool. If you can place it up against a table or wall but within one step of you, this would be the best scenario.

Remove the cover. Ensure you have a solid layer of oil on top of your brine. If you do not, add more oil until it completely covers the salt water.

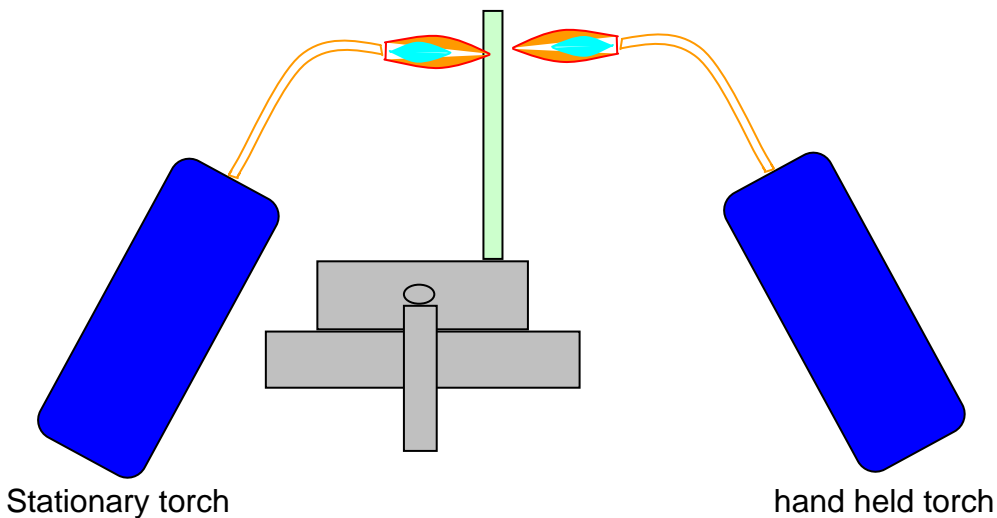
Get the vise grip pliers, and clamp them on the handle end of your tool.

Now clamp your pliers, with the tool clamped in them, in your vise. Only tight enough to hold it securely, don't over tighten the vise. You will want to be able to hold the grip pliers with one hand and loosen the vise with the other when the time comes to quench your tool.

For added safety, you can don shop gloves on the hand you will grab the pliers with, but the pliers should not get that hot if you clamp the tool by the far end (handle end).

Clamp your tool in the vise in such a manner as to allow you to aim one torch on one of the .5" sides, and the other torch aimed at the opposite.

Ideally, place your tool and stationary torch so you can affix the first torch in place while it blasts on one surface. You will hold the other torch by hand, and slowly move it up and down only half an inch parallel with the length of the tool bar to start.



You want to gradually heat the top 2 inches of your tool to a bright orange red. This should be in the neighborhood of about 1200 degrees.

As the first signs of red begin to appear move your hand held torch slowly from top to bottom of the glowing spot to increase the size of the red hot area. Be patient, this takes several minutes. Move the torch as precisely as you can and don't stray more than 1/8th of an inch from the glowing spot.

When you have 1.5 to 2" solid orange, or close to this, set the hand held torch down so it will not tip over or catch anything on fire. Swiftly grab the pliers with one hand, and loosen the pliers from the vise with the other hand.

Turn the gripped tool over pointing down as you move it to the brine solution, and lower the red hot end into the brine. Don't go to fast, you want the oil to perform a certain action before the tool hits the cold salt water.

Ideally you should move the tool into the brine at about 2 inches per second. You should have the tool immersed up to the pliers in about 3 seconds.

It will sizzle, pop and smoke as you lower it into the brine. Don't be alarmed, its supposed to do this. When you have it all the way in the brine, slowly stir the tool in the brine for at least a minute. Pull the tool out and observe if it is still steaming. If it is put it back in the brine and stir. You want it room temperature before you proceed.

NOW A WORD OF CAUTION !

I have heard that some people have ignited the oil slick on the brine when they lowered the tool into it. The only way this can happen is if you have too much oil or you lower it way too slow.

Ensure you only have about ¼ to ½ inch of oil on top.

DO NOT stop lowering once you start. Go all the way down without stopping.

Since this is a possibility, you can add a measure of safety by placing your brine out side your building or shop. But you will have to move very quickly once you take the torch off the metal.

I have made 5 tools this way and never had a problem like this. My first two events I put the brine outside my shop door. The remaining 3 I had the bucket 2 ft away from me on the floor.

Only you can make this determination. This procedure to heat treat metal is an accepted and established method, but you are responsible for your own measures of safety.

THE SECOND HEAT TREATMENT

Now you will repeat the steps you have just undergone with one exception.

You will heat the tool only to **cherry red** this time. This will be about 900 to 1000 degrees. When you have it heated to a nice even cherry red quench it immediately. If you have to wait more than 3 seconds, heat it to orange red. DO NOT heat it to bright glowing orange again, stop when it starts showing signs of this color and quench it.

That is it, you have hardened your tool. You can test it once it is room temperature by trying to scratch the hardened end with a nail or other sharp object. It should be very hard to scratch it. An 8 penny nail should only rub across it and never pierce the surface.

Now that you have successfully hardened your tool, BE VERY PROUD OF YOURSELF.

This is an old art, and as time goes by fewer and fewer people have this knowledge. Your ancestors several hundred years ago did this to every tool, weapon and utensil that required it just like this, by hand.

Now its time for the last step in treating your tool.

ANNEALING YOUR TOOL

Your tool now needs to be annealed. This “relaxes” the tension you created in the metal, and makes it safe, durable and hold an edge.

You can use any standard oven that will reach 500 degrees. Preheat the oven to 450°.

Get the tile pieces now, and lay two pieces about 10” apart from each other lengthways in the pan. Lay your tool on top of the two pieces. This keeps it elevated.

ONLY WHEN THE OVEN HAS REACHED 450 do you place the pan in the oven, being careful not to let the tool fall off the tiles.

The temperature should remain at 450 for one hour. At the end of one hour, drop the temperature down to 400°. Let the tool stay in this temperature oven for 3 more hours. At the end of that time, turn the oven off but **DO NOT OPEN THE DOOR OR REMOVE THE PAN.**

Go to bed, read a book, watch a movie, get jiggy with it... do something else!

But don't be tempted to open the oven door. This is a critical point in your heat treatment. The tool needs to cool very slowly. If you interrupt this cycle you will loose some of the hardness you instilled.

It should take at least 6 hrs for the tool to reach room temperature. When you go to check feel your oven door, then feel the top burner. If you detect any heat, let it remain in the oven a few more hours. When all surfaces including the top burner plates are cool to the touch, you can remove the pan and your tool.

It will have a blue appearance. What you have done is also known as blueing the metal. Some guns are done this very same way.

You now have a ready tool. Go put a sharpening on it, and try scraping a scrap piece of wood. It should dig in quite quickly. Now its time to mount it in your handle. I have my own preference for this and I will explain it.

First, I have a set of rectangular oak blocks with a vee cut into them. I place these on either side of my handle and grip the handle in the vise with these so it wont damage the handle. Next, I use a very stout steel sleeve, you can get one at Lowes. The inside diameter is $\frac{3}{4}$ " , and the wall thickness is .125. Get one 1.5" long or 1".

Turn your handle to match the length sleeve you get.

Very important. Turn the shank notch on your handle slightly tapered so the sleeve will start getting tight half way down the shank for it. You want the top of your shank to measure .725, and the bottom to measure .765.

Next, have a scrap block of oak at least an inch square, and long enough you can hold it with your hand well away from hammer blows.

Place your tool, with the proper end going in first into the hole you drilled in the handle. Push it down firmly as far as you can by hand. Be careful not to cut your hand on the tool.

Now place the sleeve on the handle shank, and push it down firmly as far as you can by hand. Now take a $\frac{7}{8}$ " box end wrench and slip it down over the tool shaft, down to the sleeve and locate the wrench on top of the sleeve evenly. Take a hammer and tap the wrench to knock the sleeve down some, but not all the way. Stop a $\frac{1}{4}$ " from the should of the shank bottom.

Remove the wrench.

Hold the 1" oak stick and place the free end on to of the end of the tool, right on the cutting edge of the tool. Make sure the tool is in the middle of the stick width, and have plenty of the stick overhanging the tool so it wont slip off while you strike the wood stick and hammer the tool down into the hole.

You will feel it stop moving when it hits the bottom of the hole, but it is a good idea to measure and calculate how much should be sticking out of the handle. If you did it per my tutorial, you will have 8" inches of tool beyond the wood handle end.

If you are doubtful on whether you are seated or not, just stop and measure what is sticking out.

When you have the tool seated, and provided your handle did not split (yikes!) you can get the $\frac{7}{8}$ " wrench and fully seat it against your handle.

That being done...

YOU ARE FINISHED.

You now have a half inch scrapper, retailing for at least \$40 easy.

But you have \$3 in tool steel, and the cost of the sleeve and handle. If you had to buy all the other things then you will have to factor that in but essentially you made a good quality tool for a fraction of what it cost to buy it.

I hope you enjoyed this tutorial, and have enjoyed the experience of learning an old world art.

My name is James “cad” Holland, a member of NC Woodworkers Forum.

I hope to make more tutorial like this for members in the future, and share what I have learned in 47 years. You can learn more about me by visiting my website at

<http://handturnedbowls.biz>