Turning Metal on the Wood Lathe Using Woodturning Tools.

John K Jordan, Aug 16, 2022

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1) INTRO

Turning brass, aluminum, and steel (maybe).
I'll list the specific alloys of metals I use and the tools I found useful.

I use standard woodturning tools such as Thompson spindle gouge, parting tool, skew, and negative rake scrapers. Work is held in a scroll chuck.

Since turning metal is slower than turning wood, I stick to relatively small diameters such as 3/8" to 1". These sizes are useful for small all-metal turnings as well as smaller things that can enhance a woodturning.

Three examples described in this document:

- **Aluminum turning tool handle insert** with set screws. I use these a lot with Thompson and Hunter tools. One handle can be used with lots of tools, reducing the cost and the tool storage space.

- **Brass for feet and finials** for a wooden lidded box.

- I'll also mention **turning steel** and other non-wood material, specifically plastic.

2) METALS and ALLOYS

- Brass: 360 brass, also called "free machining" brass, turns and polishes nicely. I usually use 3/8" and 1/2" round rod.
- Aluminum: 6061 alloy in round rods
- Steel: mild carbon steel. Turning steel, while possible, is not much fun.

I usually buy metals from Online Metals, listed in the Resources section. I also find good deals at a metal recycling company. Near me in Oak Ridge is Nobel Metals – you never know what you'll find. I've come home with bronze, brass, copper, aluminum, steels, titanium, and plastic. One disadvantage is the specific metal alloy is usually unknown.

3) TOOLS and supplies I use

- Lathe: capable of running at a slow speed is helpful. Variable speed is nice – I use high speed for polishing.
- HSS Turning tools: parting tool, gouges, skew, point tool, bedan, and scrapers. I generally use Thompson tools but others should work fine. I sharpen them the same as I do for wood.
- Chuck and jaws. I use Nova chucks. The most useful jaws for small diameter turning are the NOVA 6026 mini spigot jaws. These grip small diameters such as the 3/8" brass rod I use for small feet and finials. There's a picture in the "Brass" section below. The Nova pin jaws are also useful but won't quite close on a 3/8" rod.
- Jacob's chuck to drill on the lathe
- Useful: drill press (to drill holes for set screws)

- Sandpaper. More on this later.
- Other: hacksaw, grinder, center drill bits, drill bits, taps, deburring tool, set screws, allen wrenches, file

4) SAFETY

- DON'T forget the eye protection. Turning metal sometimes produces thin strands or needle-like slivers, some of which may be thrown a short distance. A full face shield would be best, but at least wear safety glasses. Not much risk of a hazardous impact.
- There can be razor sharp edges on work in progress. Keep fingers away.
- The thin strands can also be sharp so use caution. They can wrap a birdsnest around the turning requiring stopping the lathe for frequent clearing. I wouldn't want to get my fingers tangled up in the strands while spinning.
- Sometimes tiny, sharp metal splinters can stick in the skin of my left hand which is closer to the work. I often wear a nitril glove on my left hand which stops this irritation.
- Another potential hazard: a thin strand of metal can fall behind the lathe and short out the power to the lathe if it gets in the wrong place. Makes a loud noise and smoke. Don't ask me how I know this.

5) TOOL HANDLE INSERT FROM ALUMINUM

I started making these after buying some commercially available inserts. These inserts are glued into a wooden handle with epoxy. I use two set screws to hold the tool securely.

I usually make them out of aluminum rod. I use them almost every time I'm at the lathe.

These inserts are fantastic for spindle turning, boxes, and general bowls and platters. They might not be sturdy enough for huge bowls and hollow forms in the hands of someone prone to get big catches!

Some inserts I bought were a much larger diameter than needed, making them awkward to hold. For example an insert made to hold 1/4" diameter tools was 1" in diameter – way too big.

I decided to make my own so I could make the tool more comfortable to hold when gripping it near the handle end. A more comfortable grip can result in better tool control.

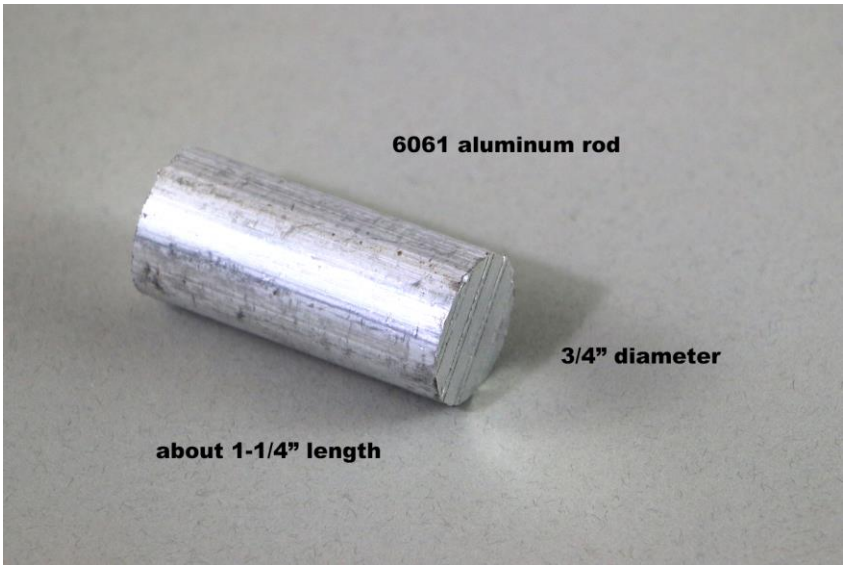
I use handles with inserts for a lot of tools.

I make the handles with deep holes so the tool shaft can be inserted deeply to adjust the length projecting from the end – a shorter projection can help with fine tool control and detail work.

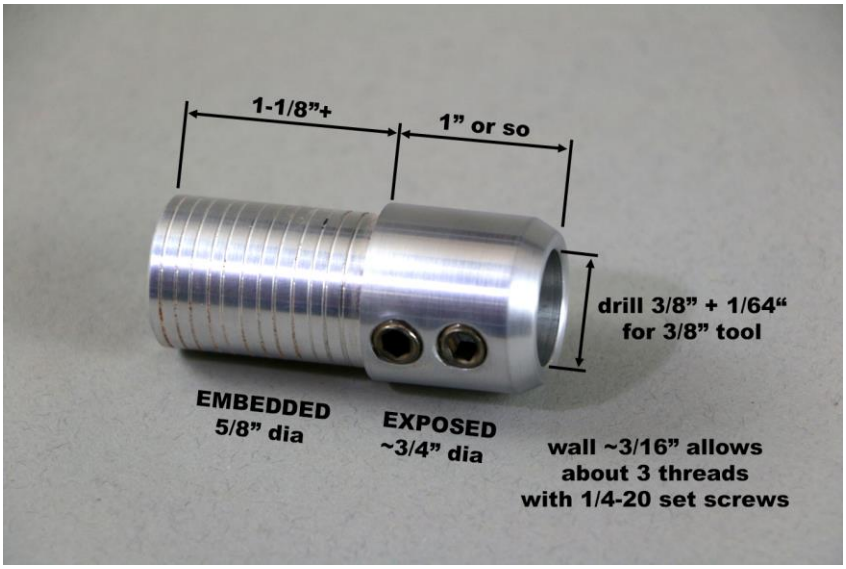
Since I have a lot of these inserts, I buy tools without handles. This not only reduces the cost but tools without handles don't take up very much storage space. I keep a couple of dozen turning tools in one shallow drawer within arm's reach of the lathe.

Perhaps oddly, another advantage to using inserts concerns sharpening. For example, I keep six 3/8" Thompson spindle gouges with identical grinds. When one gets dull, I take it out of the handle and put in a sharp one. When all six are dull, I stop, set up the Tormek for that grind, and sharpen all six. Since much of the sharpening time is setting up the jig, sharpening them all at once is more efficient.

I usually use 1" or smaller aluminum rod, depending on the diameter of the shaft of the tool I want to use. For example, for a 3/8" tool shaft I generally start with a section of 3/4" rod.



On a recent insert I used these dimensions:



Procedure (my basic steps when turning these inserts):

- Cut a length of rod long enough for the entire insert. Warning: cutting can leave sharp edges – remove with a file.

- Measure and mark the length of the section that will be embedded in the handle, the smaller diameter section.

- When drilling for the tool shaft, drill all the way through the blank. Drill at least 1/64" over the tool shaft diameter, 25/64ths for a 3/8" tool shaft. For best results, use a center drill bit to start the hole. I drill in stages: first drill a relatively small diameter bit, then one close to the finished size, then finally the finished diameter.

  NOTE: the hole can be drilled at any point – drill the unturned blank or at any step during the turning. I usually drill into the EXPOSED end after I grip the EMBEDDED end.

  Measure the diameter of the tool shafts carefully since some vary. For example the shaft of the small Hunter Hercules is machined nicely to 3/8”. However, the 3/8” Thompson spindle gouges have just a few inches on the end machined down to 3/8” so I sometimes drill 1/32th over 3/8” so they will fit better. Before removing the insert from the lathe I like to test fit the tools I want to use.

- Grip what will be the EXPOSED end tightly in the chuck. Don't worry about marring the surface – it will be cleaned up later. Allow a little extra extension to permit turning the EMBEDDED end all the way to the mark.

- Use the parting or other tools to reduce the diameter to the final embedded diameter. I use 5/8" diameter for the 3/8” insert.

Use a spindle gouge, parting tool, skew, bedan, or scraper to turn the embedded end to the final diameter. Measure often.

Since the insert will be glued into the handle with epoxy the fit doesn’t have to be exact. But cutting away too much may weaken the insert.

- Lathe speed: with some tools I get a better result with a very low speed. With others a higher speed works better. Experiment!

- I use a point tool to cut a series of grooves in the embedded end to give the epoxy a better grip when gluing the insert into the handle.

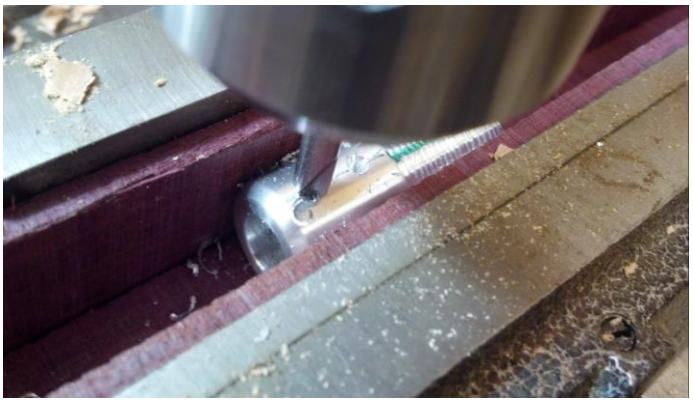
- Remove the blank from the chuck, turn it around, and grip the completed EMBEDDED end tightly. Allow a little working space from the end of the jaws.

  Turn what will be the exposed surface of the insert just enough to clean up the metal surface.

  Round or chamfer the outside diameter and the end. Deburr or lightly chamfer the end of the ID since it might be sharp.

  Sand and polish the EXPOSED end as desired. Remove from the chuck.

- Decide on the set screw size and thread. For this size insert I usually use 1/4"x20 tpi set screws and sometimes 5/16"x18 tpi. Consult a thread chart for drill size. For example, use a #7 drill for a 1/4x20 set screw. Home Depot and others sell an inexpensive set containing a tap and the proper drill bit.

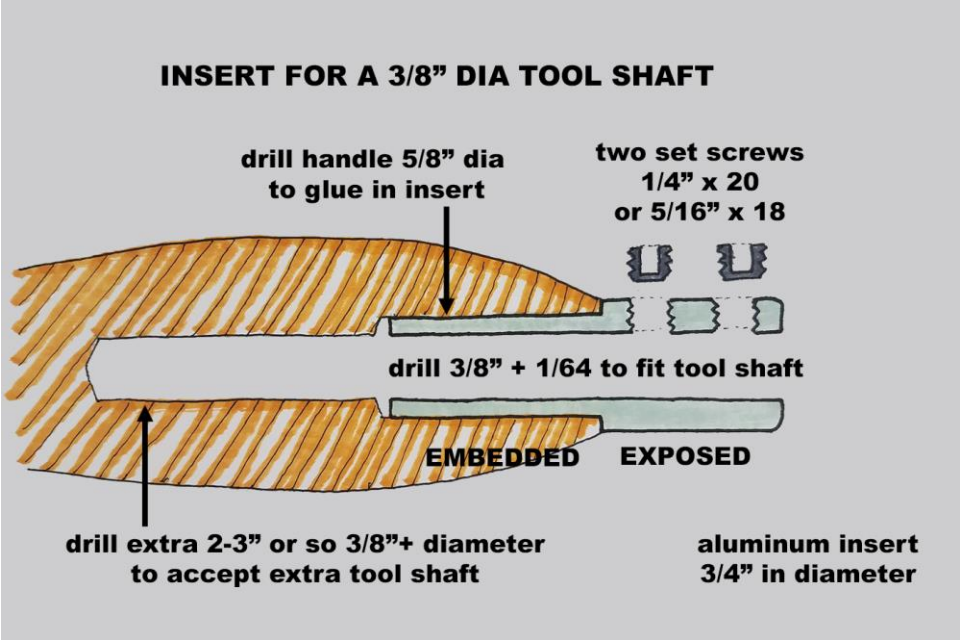


Prepare a v-block or means to hold the insert to drill the holes for the set screws. Mark the locations and use a center punch to dimple the metal for the drill bit. With the mark at the top, hold the blank securely, and start each hole with a center drill bit. I hold the part with a machinist's vise.

- Use a tap to thread both holes. Deburr if needed.
- Prepare the set screws. New set screws might be much too long for these inserts. I hold the set screw in an Allen hex key and grind the end until it fits nicely in the hole. It might end up being pretty short!

Preparing and assembling the handle

Mount a wood blank for the handle. I mount the blank between centers and turn a tenon on the end to hold securely in a chuck. Hold the right end with the point of a tailstock live center to keep it aligned while tightening the chuck.



Drill a hole to fit the embedded section of the insert and a longer hole to clear the end of the tool shaft if desired. Support the handle blank with the tailstock (cone or wood end for the live center to fit the hole). I like to turn the handle so it merges nicely with the insert. Sand and perhaps texture the handle for a better grip.

Glue the insert into the handle. I use 1-hour epoxy and let it cure overnight. All Done!

8) TURNING BRASS – THREE FEET AND FINIAL FOR A LIDDED BOX

The best type of brass for turning is the 360 “free machining” alloy. It turns nicely with HSS parting tool, spindle gouge, and other tools.

For small things I usually start with 3/8” diameter brass rod. Brass is relatively expensive and I think things made from this less expensive diameter are just the right size. And smaller things are quicker and easier to turn.

I generally cut the rod into 6” pieces.

I can easily make three feet and one finial from a 6” length. A longer rod could be mounted through the lathe spindle and chuck, but if too long the length inside the lathe spindle can flex and rattle.

It’s quick to cut a 3/8” brass rod with a hacksaw.

I use Nova chucks. My favorite jaws for 3/8” to 1” rod are the NOVA 6026 mini spigot jaws. The Nova pin jaws are also useful but won't quite close on a 3/8" rod. Before I got the mini spigot jaws I would wrap a few layers of aluminum tape around the.

The chuck slides themselves with no jaws will also grip thin rods, at least on the Nova. Works well but gives a little less clearance on the left side.

The basic steps

1. Make one foot.
2. Turn to suit, with a short tenon on one end to glue into the woodturning.
3. Try to make two more to match!

Turning the first foot

I first turned one brass foot about 5/8” long then measured the key points with dial calipers. I used those measurements to mark the brass for the other two feet.

Turning the other feet

Once happy with the first foot I measured and transferred the dimensions to the next piece. There is a trick machinists use: the points on the caliper or an awl can scratch a line on soft metal at the precise place. Painting a thin coat of Dykem Blue layout fluid on the metal will make the marks easier to see. An Extra-Fine Sharpie pen is also good for marking the blank.

For this foot, I extended the brass rod about 3/4” from the end of the chuck.

Duplicating the first one is a lot easier with clear marks. Use calipers to check diameters while turning.

Turning brass, tools and such

I use several HSS tools to shape the brass, none ground specifically for metal. Experiment with the lathe speed. Some tools and grinds work better with a high speed (2000+ rpm); some with a very low speed (200 rpm or slower) .
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One of the most useful tools is a spindle/detail gouge. It's best to remove metal a tiny bit each rotation. A gouge ground with a pointy tip is better than one with a broad curve which may try to take a bigger "bite". On small things I do most of the shaping with a 1/4" Thompson detail gouge. It's often best to remove metal by cutting from the side rather than cut radially.

The lathe can be run at a fairly high speed with a spindle gouge. Use a firm grip and steady pressure and when the angle is right the gouge will remove long, thin strands of metal.

The spindle gouge is also good to smooth the metal when used in the shear-scraping mode. Sometimes I use a 3 /8" detail spindle gouge (with a slow lathe speed) for smoothing.

Other tools I reach for:

Parting tool. I use a Thompson and an old Craftsman diamond parting tool. These can cut flats but may create a lot of chatter if used with too much pressure. A very low lathe speed helps.

Small negative rake scrapers with rounded cutting edges are great for shaping curves. I have a variety of NRS with straight and curved cutting edges, ground from Thompson 10V (A11) round rods, rectangular stock, or even detail gouges. I think the steel in these tools holds an edge well.

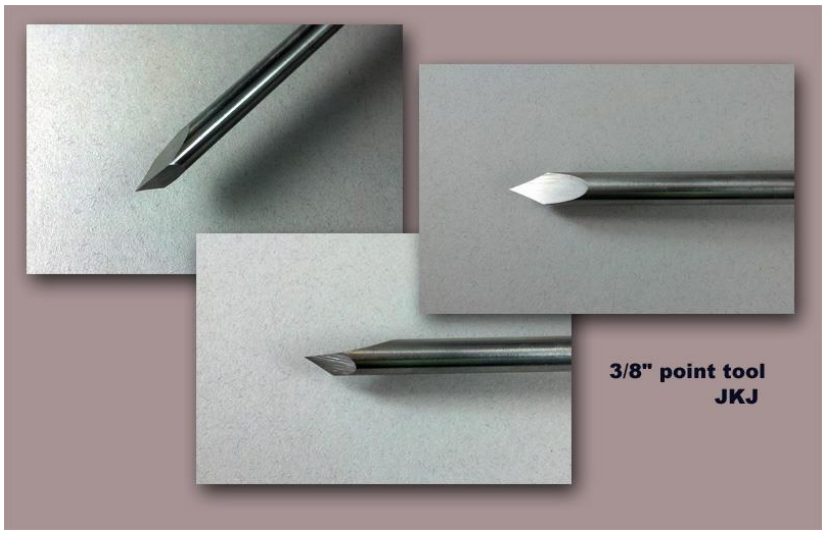
With any NRS I usually use a low speed for the best cut.

Another type of scraper is useful, made from flat stock and ground with a sharp corner on the left side. I shape these much like a tool bit used on a metal cutting lathe. With a slow lathe speed move the tool from right to left to remove a nice shaving.

I also found the tiny HSS cutting tip in a hollowing tool useful, both for reducing diameters and for shaping small coves. Those I have are ground with a small radius. I used a medium speed on the lathe, about 100 rpm or so.

For making grooves and removing metal in tight places I use a type of point tool. Point tools are typically ground with three equally beveled faces on the end of a round rod.

I far prefer my own 3-bevel design, which I call the “wicked point tool”. I grind this with a nearly-horizontal top face at the point. Two faces ground on the bottom result in sharp edges which cut well in both wood and soft metals. I sometimes use a 1/4” version of this when turning metals.



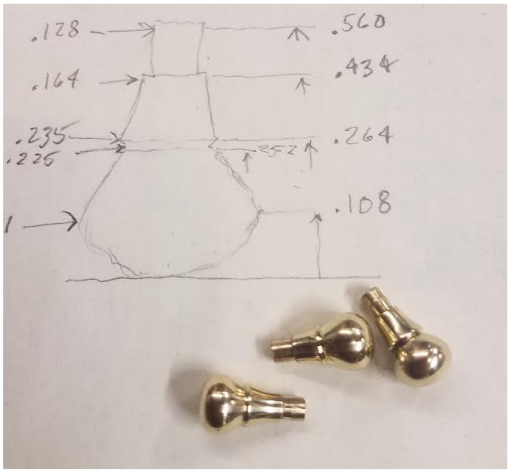
Sanding, smoothing

After shaping, smooth as needed. I usually start with 400 grit or finer and work through 600, 800, 1000, and 1200 grit. Fine steel wool (0000 Liberon) will make an almost-polished surface when used with a high lathe speed. I follow the steel wool with a polishing compound. A bit more about this in section 9, General Polishing and Finishing.

One of the three feet ready to cut off the lathe.

To remove the turned foot from the lathe I don’t use the parting tool but saw it off with a small fine-toothed saw.

The three feet, more or less following my sketch. They are not perfect, but obviously hand made!



I used the same techniques to make a short finial for lidded box.

Turning and drilling the box

I turned a lidded box with a rounded bottom that could benefit from some feet. I drilled holes in the bottom of the box to hold the feet, glued with epoxy.

It's tricky to get the holes in the right place and at the best angle, perpendicular to the curve. Once I figured out where I wanted the feet I drew a circle on the bottom then used dividers to locate and mark the three positions on the box. I made a quick jig to hold the box at an angle for drilling.

To hold while drilling I reused the jam chuck I had used earlier to hold the box to turn the curved bottom, fastening it to a piece of plywood supported at the desired angle. A better jig might have an adjustable angle.

I drilled the three holes evenly spaced around the bottom of the box, 120 degrees apart

Finally, I drilled a hole in the lid to hold the brass finial. Measure carefully to keep from drilling through!

7) TURNING STEEL

Turning steel is possible but not much fun. It's very slow on the wood lathe. It leaves zillions of fine splinters which get everywhere. The tools require repeated sharpening.

However It can be done. I used a Thompson scraper to reduce the diameter of a set of Nova pin jaws to hold fidget spinners (when they were popular). The machined chuck jaws perfectly fit the bearing hole to simplify making precision balanced spinners.

However, my advice is to turn steel on a metal lathe. MUCH easier!

8) TURNING OTHER NON-WOOD MATERIALS

Plastics

Plastics can be wonderful. I've turned HDPE, Delrin, Nylon, ivory substitute, and others.

My favorite material is cast acrylic, available in a variety of colors. It turns, sands, and polishes nicely. Very easy to turn and easily combined with wood and metals.

Cast acrylic is not cheap, especially in larger diameter rods. A good source is DelviesPlastic.com. Search for Acrylic Rod.

Most of my acrylic turning is with colored rods 1.5" in diameter.

BTW, from my experience, reading, and advice from others: extruded acrylic is not very useful for turning but cast acrylic is great.

9) GENERAL POLISHING AND FINISHING

Any sandpaper can remove the tool marks. I might start with 400 or 600 grit. My favorite fine sandpaper is Indasa Rhynowet Redline. This comes in sheets so I cut them into strips about 1"x3". Flexible, long lasting. I generally sand to 1200 before polishing.

I have experimented with the MicroMesh sanding kit. Sanding through 24000 grit can leave the surface highly polished. But MicroMesh is expensive now.

I usually don't polish aluminum but just use fine sandpaper and maybe steel wool or non-woven abrasive pads for a brushed effect.

Brass can be beautiful when polished. I put some polishing compound on a small piece of cloth and apply it with the lathe spinning at high speed.

Any plastic or metal polishing compound will work. I often use the widely available Simichrome but have others that work as well.

Brass will tarnish and turn dark with age. For protection after polishing spray several light coats of lacquer from an aerosol can.

10) RESOURCES

- Metals: OnlineMetals.com has an extremely wide variety of metal alloys, shapes, and sizes. Metals and shipping are reasonably priced and customer service is excellent. 800-704-2157.
- Favorite fine sandpaper: Indasa Rhynowet Redline.
- Steel wool: Liberon 0000.
- Metal polish. Simichrome can be found on Amazon and hardware stores.
- Thompson tools: thompsonlathetools.com

11) Contact info

John K Jordan
jordanjk@gmail.com