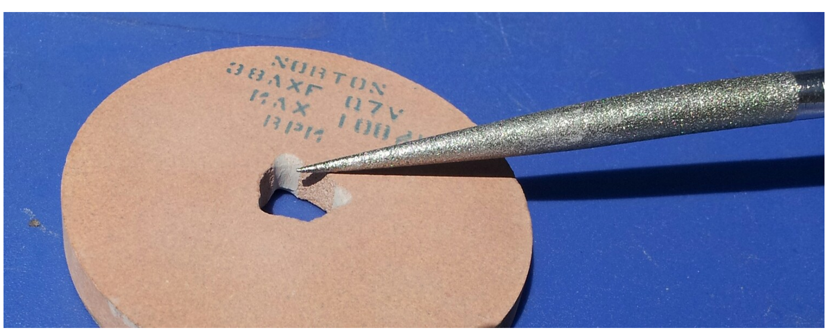
Leading Wheels for Glass Cutting and Engraving

(Note this is a preliminary copy of this document. The final might include additional pictures of the lead pouring process itself. No time right now.)

Grinding wheels for glass work must be leaded to assure repeatability when mounting them onto the end of the lathe shaft or spindle. To lead wheels, the molten lead is poured around a threaded steel rod which matches the shaft onto which it will be used. This threaded spindle and rod may be either taper threaded or straight threaded and is centered in the wheel arbor hole before the lead is poured. Both methods of mounting the wheels are commonly seen. I often utilize old lead wheel weights for the lead but have recently bought some lead sheet for such use.

I melt the lead in a large steel spoon with the tip pinched into a spout for easier pouring of the molten metal. A propane torch is used to heat the lead. Gloves, long sleeves, and safety glasses must be worn plus **everything must be dry**. There can be no traces of water around as it would instantly turn to steam and create an unsafe situation. If your lead is dirty, a bit of soft soldering flux added to the lead will allow skimming off the “dirt” with an old knife blade. This dirt should be removed before pouring the lead.

Arbor holes on grinding wheels come in a variety of sizes. Some wheels have a lead insert from the manufacturer. I always remove this before adding new lead. The removed lead may be remelted. To remove the original lead, I cut through the edge of the lead “donut” with a knife and pull it out with pliers. This must be done carefully to avoid cracking the grinding wheel. To assure a good grip of the new lead on the wheel, it is best to rough up the arbor hole. Some engravers make a few chips in the arbor hole rim. I prefer to grind a few small groves in the edge of the arbor hole using a small diamond coated bur held in a Dremel tool. I do this with a wet wheel to avoid dust. The wheel is allowed to dry completely before pouring the hot lead. This is CRITICAL!



This process may also be done with a tapered round diamond coated file – dry. If the arbor hole is too small for my needs, I redrill it to the desired diameter using a diamond coated core drill on an old drill press. This process is done wet. This roughing up of the arbor hole is necessary for the lead to firmly grip the walls of the arbor hole. It is this firm grip of the lead which prevents the wheel from spinning on the lathe spindle. It is the grip of the lead upon the threaded spindle and inside of the arbor hole which alone holds everything true. If the leading is not done correctly, the wheel never will run or remount reliably.

Traditionally American glass engravers and cutters using a lathe worked with the lathe to the right of the worker. The wheel rotated away from the worker. European workers had the lathe to their left with the wheel rotating toward them. Both methods allowed for right hand threads onto which the wheels were screwed. Either lathe setup did the job.

The American lathes usually had straight threads and spindle extensions which screwed onto the lathe spindle itself. Each spindle extension had a different size of straight threaded section at the tip to accommodate the wide range of wheel sizes dictated by the work to be done.

The European lathes usually had an internal taper into which separate spindle extensions plugged. These might include both straight threaded tips or taper threaded tips. The European lathes were much more costly to manufacture due to the skill involved. Often European lathes were made with a tapered threaded end on the lathe spindle itself.

No matter the system used, all wheels needed to be leaded with internal threads to match those of the spindle tip. The Europeans devised a nice device for this leading of the wheels.

The device shown is by Spatzier and the cast iron base allows for leading a variety of wheel sizes. There are three included inserts which form the lead shoulder when casting the lead. The insert may be removed and the molten lead cast with the depression forming this shoulder for better support of larger wheels. I have spindles with several sizes of tapered threads for mounting the small to large wheels.

The larger the arbor hole in the wheel, the larger holed insert to be used. In these pictures it can be seen how smaller wheels use only the tip of the threaded spindle. As the wheel gets larger, the thicker portion of the spindle is used (to add additional support to the wheel.

To the left is shown a wheel in position ready to accept the molten lead.

Notices the notches files in the arbor hole to allow a better grip of the lead.

The concentric rings on the casting device help in centering the wheel. This minimizes the amount of dressing required on a newly mounted wheel.

The American straight threads could be cast in lead by merely pouring the molten lead around a bolt screwed into a metal base plate. This bolt would match the threads on the spindle extensions. Several sizes of plates with their bolts were required to cast the various sizes required.

After the molten lead cooled, it might well slightly shrink in size causing the lead to be loose in the wheel. Workers usually tapped the lead around the spindle thread with a square masonry nail to force the lead into the walls of the wheel hole and onto the spindle threads. This was a gentle tapping to move the lead slightly. Too hard a pounding can split the wheel.

An advantage of tapered threads is that the tighter the wheel gets threaded onto the spindle, the more the lead forms itself into the wheel and on to the tapered thread itself.

On the American lathe the spindle extensions almost always had a shoulder or flange turned into the end of the extension just before the threaded tip. This gave the wheel something to snug up against to assure true running. Any type of removable flange would not assure repeatability. **The flange must be a permanent part of the extension.** If any lead flowed under the wheel during the casting, it gets carved off of the back side of the wheel so that the wheel itself seats firmly against the flange. This carving away of lead is not needed with the tapered threaded spindle tip. The wheel – once seated on the spindle - tends to remount true. The back side of tapered spindle wheels have a cast in flange on them from the casting device or its inserts.

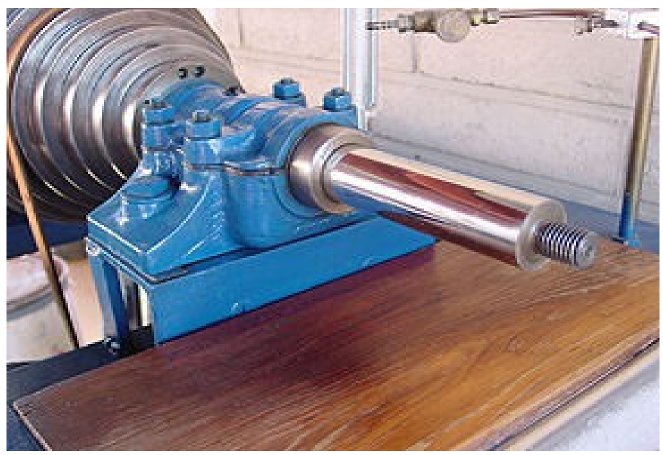
Notice that on the backside of this wheel, the lead has been carved down to the surface of the wheel to allow this wheel to snug up against the stabilizing flange of the lathe spindle or extension.

Please examine the various examples of leading in the photos below. Some were neatly done (by me) and others were done by a previous owner of the wheels (often sloppy but still useable).

To the right is shown the spindle end of a lathe I used to own. It is paterned after the A. B. Knight lathe often seen in US glass houses.

I have known workers to merely mount their wheels on to this threaded end.

On a better equipped lathe, there would be several spindle extensions to accommodate various sizes of wheels.

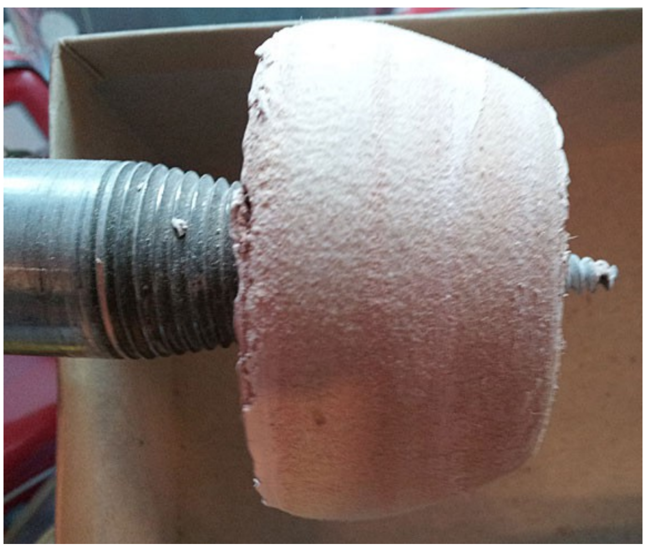


Here are shown four such spindle extensions.

All of the extensions shown here are straight threaded on their tips.

Here are a few of the threaded spindles I purchased in around 1975 directly from Richard Spatzier when I bought my lathe from him.

I mount stone, wood, lead, and felt wheels on these spindles.

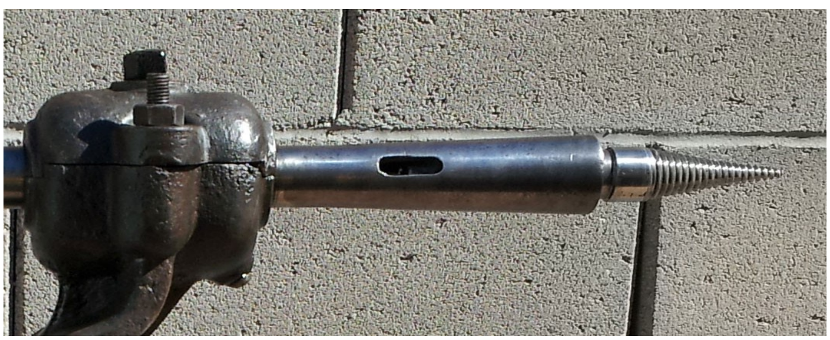


This is the largest tapered threaded spindle I have for my Spatzier lathe. It is approximately 1" at the widest part of the taper.

The latest type of spindle extension tightens by a bolt in the end against the ground washer. This is a type suitable for diamond wheels.

I have just completed restoration of an old glass cutters lathe which came with only one spindle – threaded. I will machine a few different types of spindles if I feel that I need them.

I have setup this lathe with variable speed in addition to the pulley speed changes. This allows for full torque at all speeds. In addition, I have welded up the steel base to hold up to five 8” x 8” x 16” concrete blocks to add mass to the unit. The tub is an old lab sink mounted on a table separate from the lathe.



Note: This document is part of a series that I am making on glass engraving. The complete document will include detailed descriptions of how to make a good copper wheel lathe, a nice stone wheel lathe, making wheels, etc.