Chucking

Wells Shoemaker

Santa Cruz Woodturners

February 18, 2023

A Congress of Chucks

Heroic Chucks

Not *These* Chucks

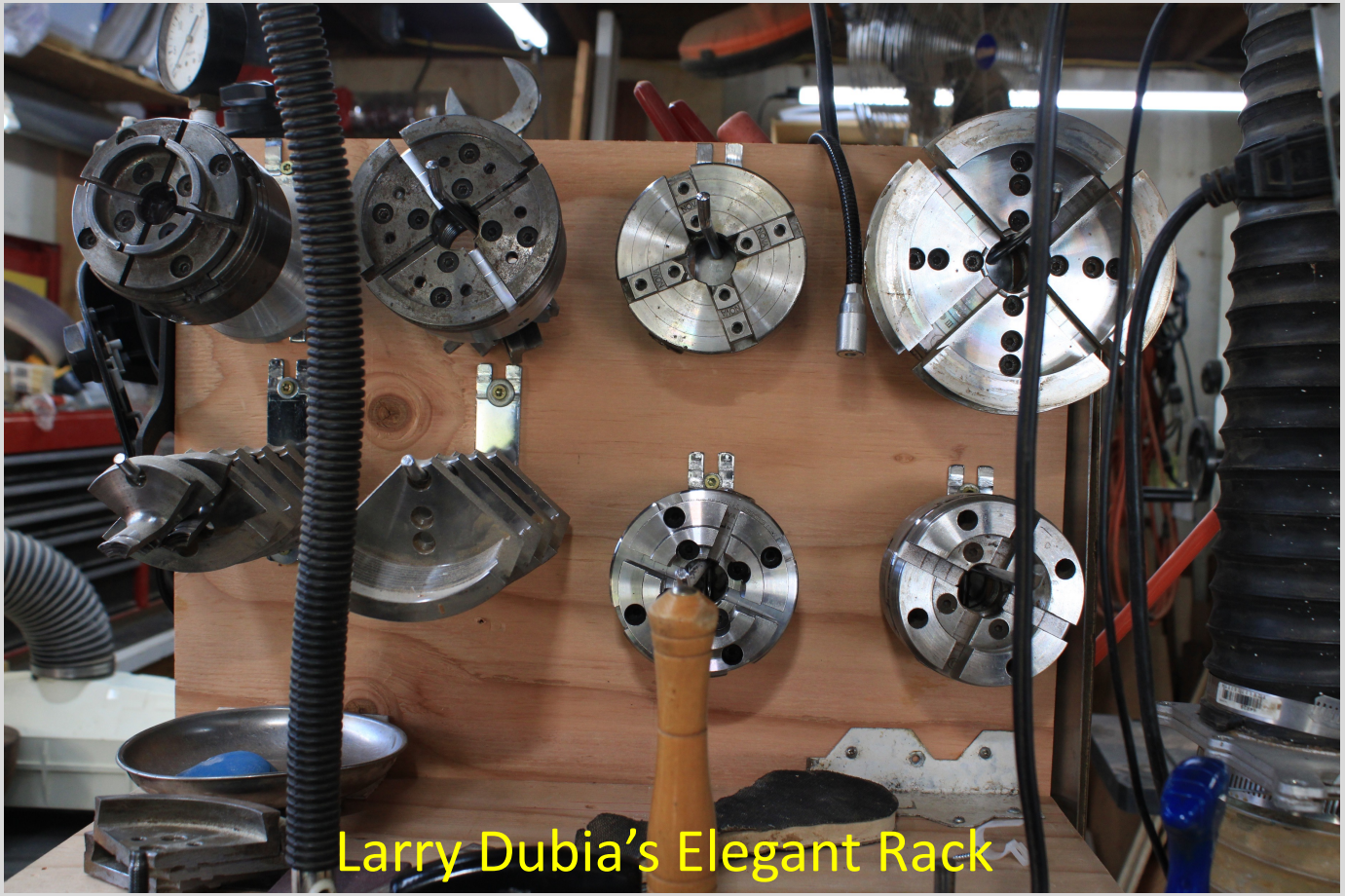
Mr. February, indeed

Not This One, Either

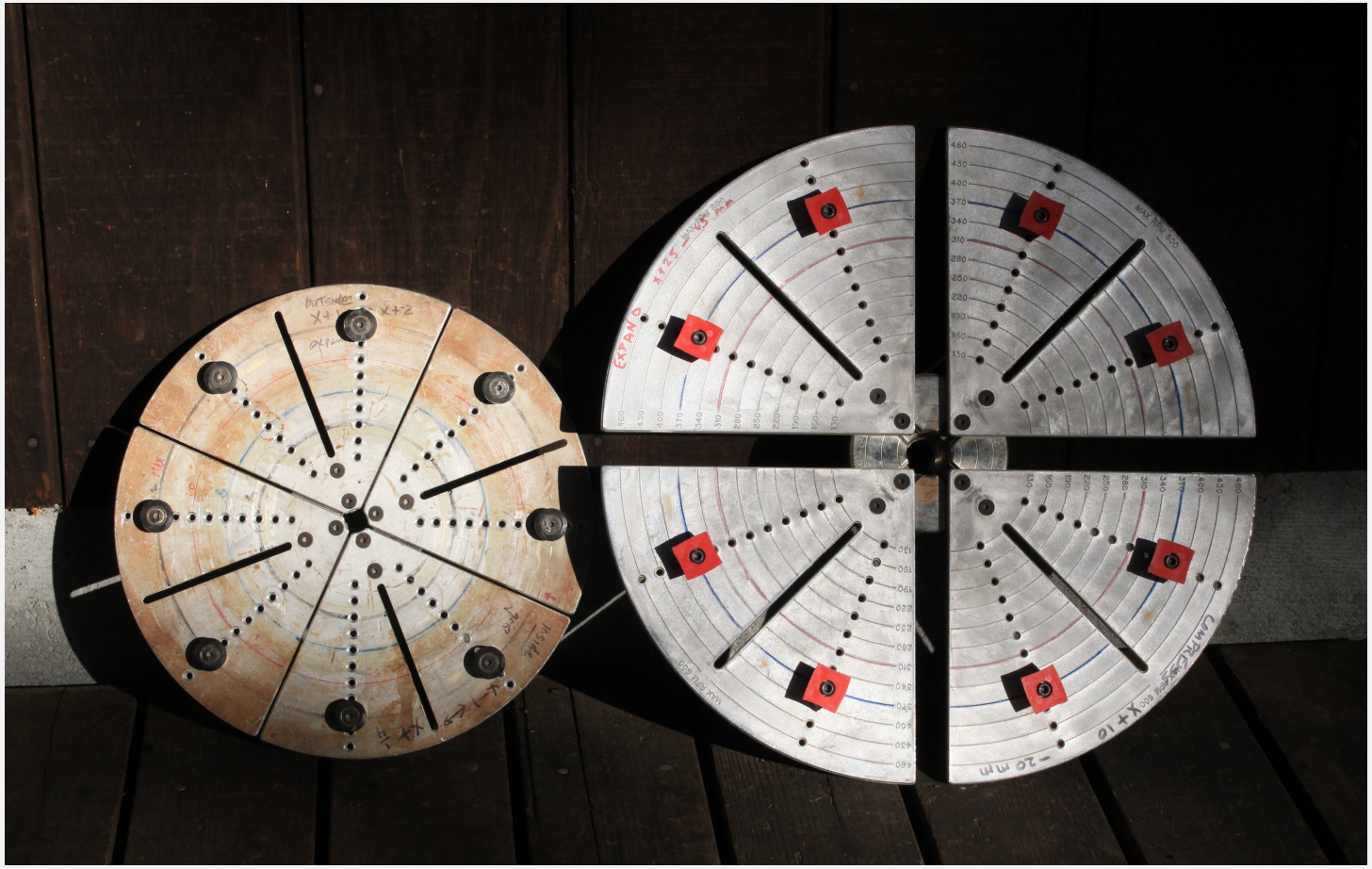
Chuckwalla

These Chucks

And These



And These Big Ones



Shopmade Jam Chucks

All sizes of jam chucks

And These Suckers, Too

Screw these Little Ones

We'll discuss each of these... And then feature cameos!

Linda: Ever the Teacher…and Turner

Roy Holmberg:
A Traditional Jam Chuck

Roy knows jam chucks

John Wells

Round John

Happiness is...

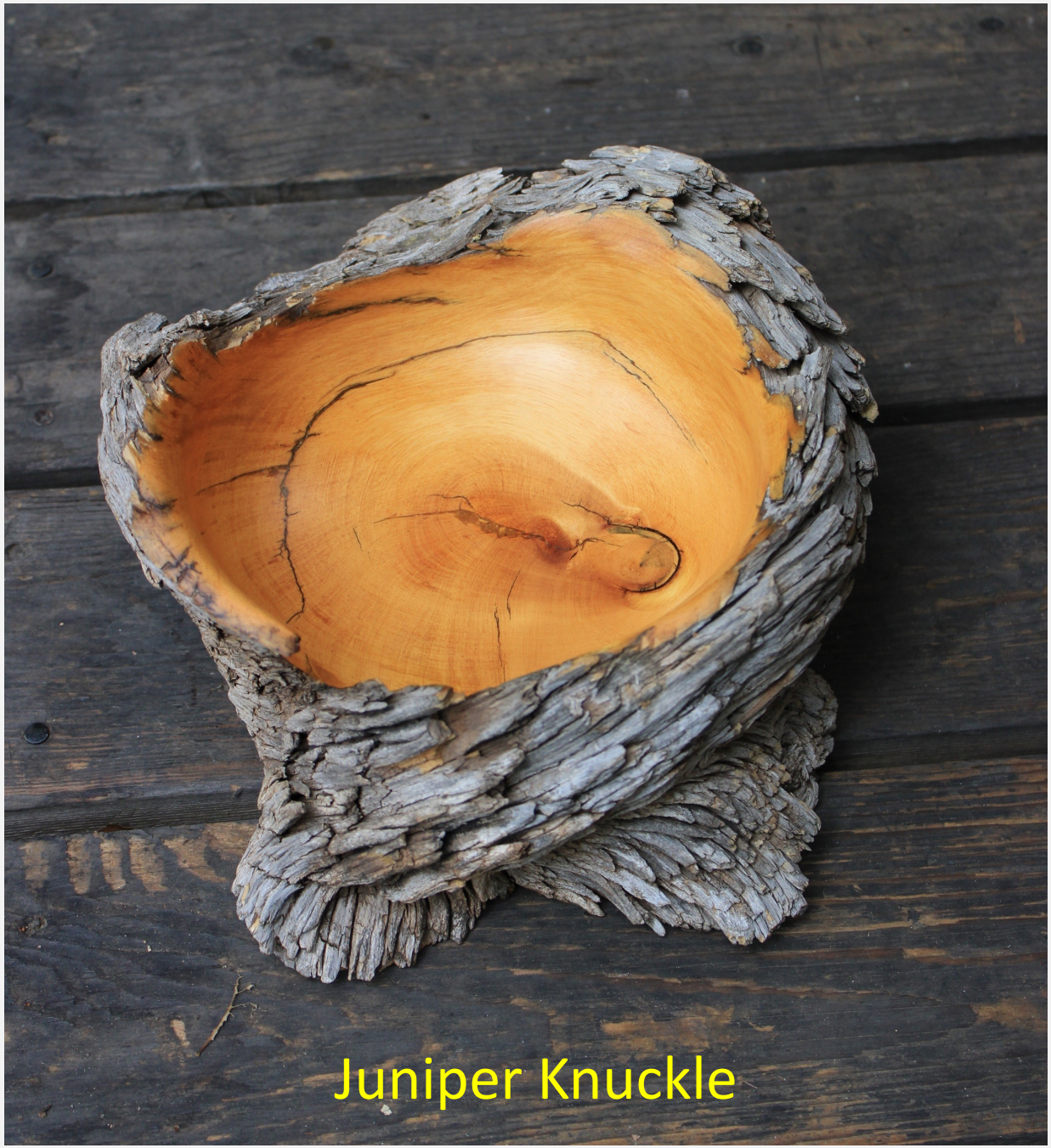
...a warm shop!

...and a clean chuck.

Larry Dubia

We'll do basics...and then some special chucking

Piñon Swirl


Juniper Knuckle

Turners have a fetish about bottoms! That's what chucks do best

We'll heed the Law of Eovaldi

There are always at least three ways to solve any problem in woodturning.

First the Basics—Security & Safety

The venerable self-centering, screw operated, mechanical chuck

This is not what we want in the shop

Boulder Creek Watershed?

Arithmetic of a Ballistic Owie

- A 12” diameter blank has a 3 foot circumference
- At customary 600 RPM, a spot on that rim is moving 1800’ per minute
- That’s 20 miles an hour

- That blank goes airborne against your face shield?
- No contest!
- It *will* leave a mark
- Make new friends in the ER

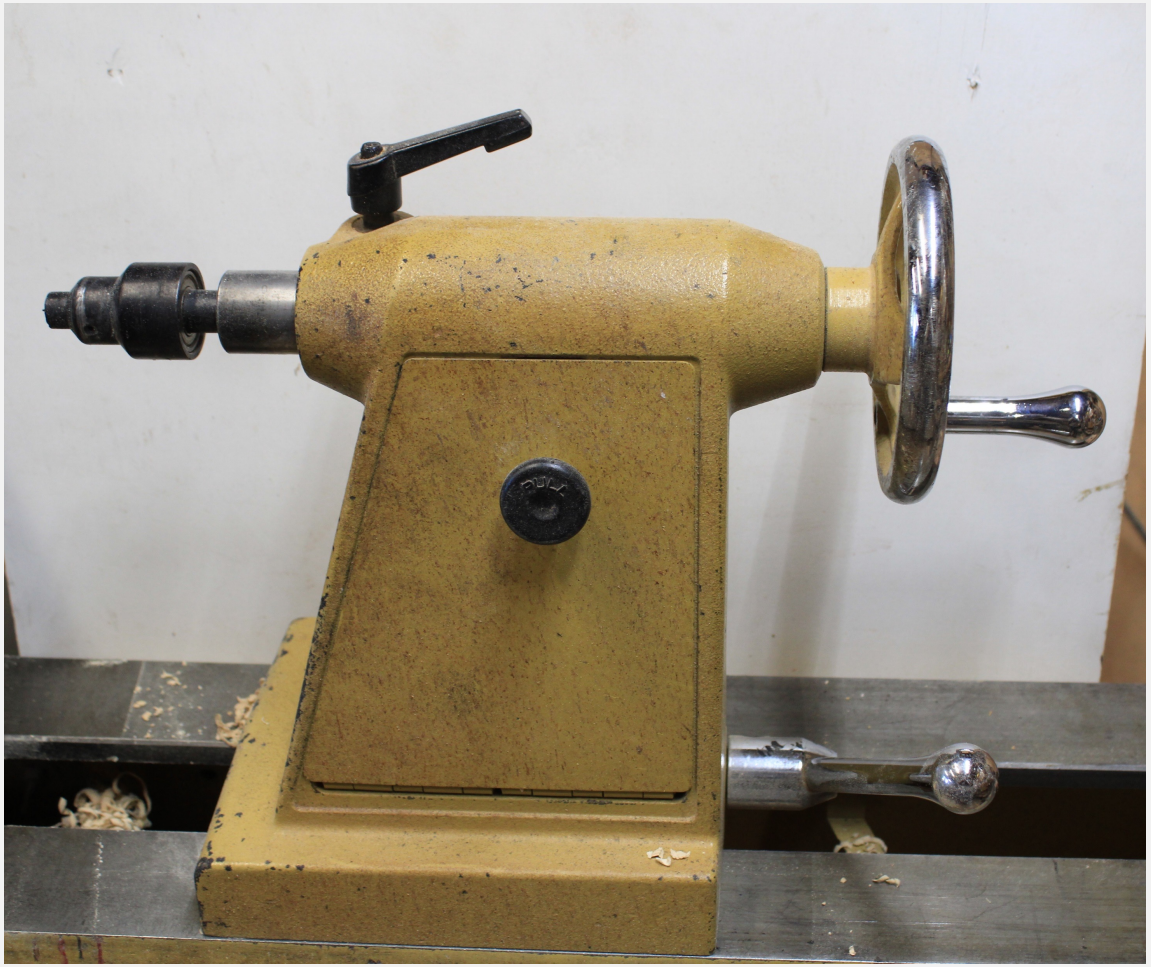
Get a Grip!
Two basic mechanical chuck modes

Compression—Tenon

Expansion—Mortise

Interchangeable Jaws: Convenience...and Caution

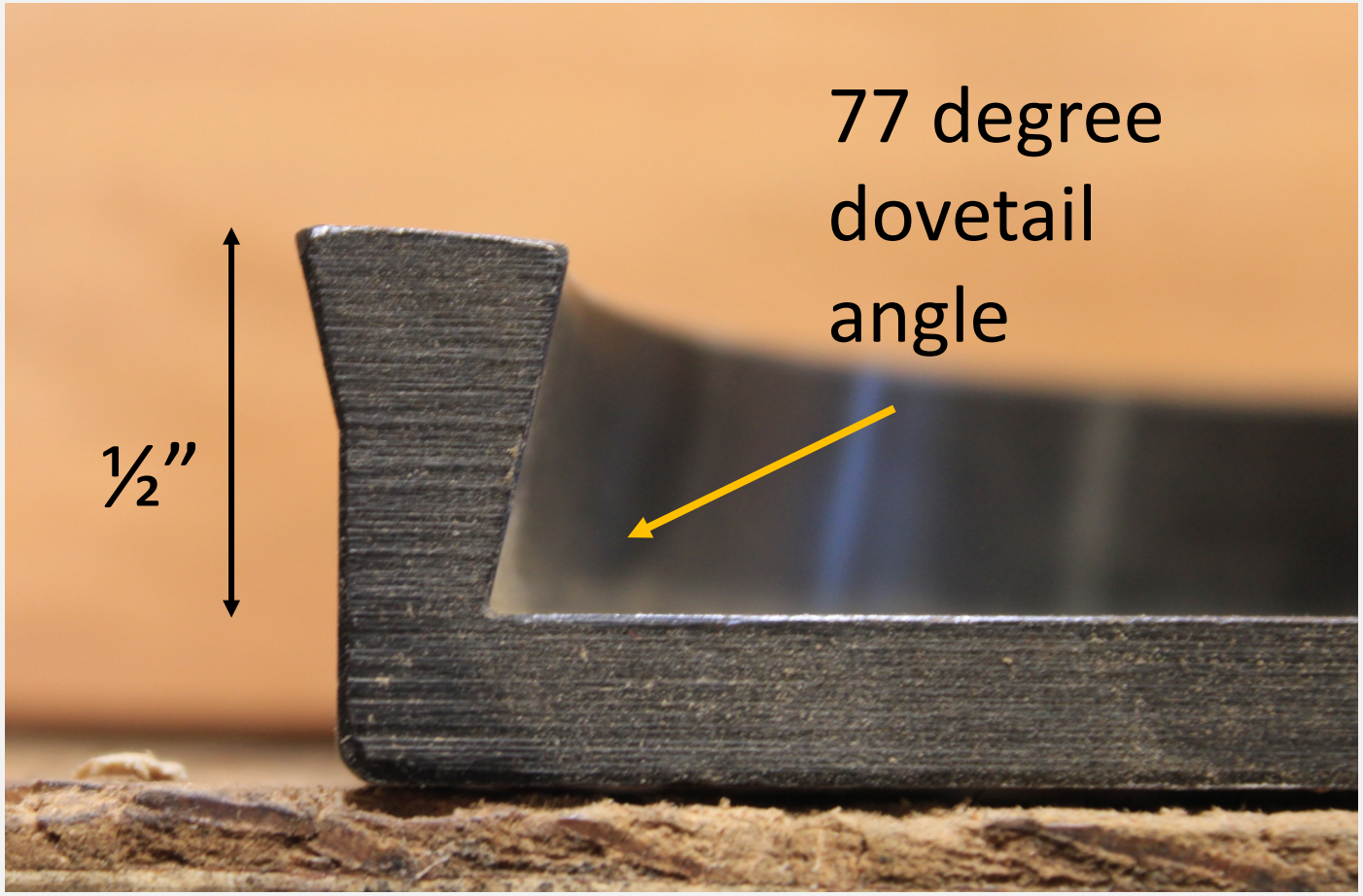
Your Everlasting Friend and Protector—No Matter What Grip



Investors
love
tech stocks

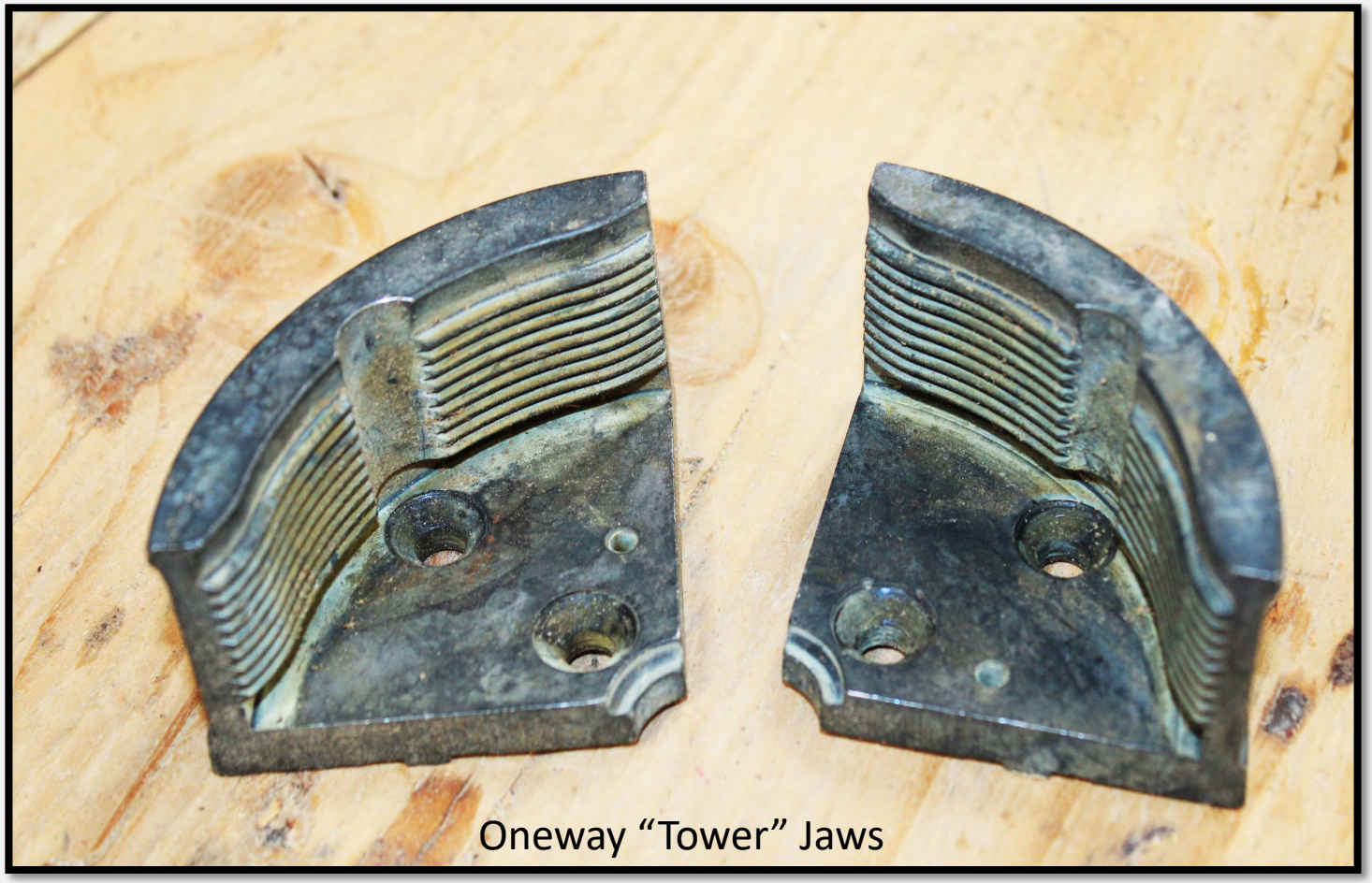
Turners
love
tailstocks

Jaws for Dovetail Tenons!



Vicmarc jaws. Oneway and others have similar features

Contoured Jaws—Special uses



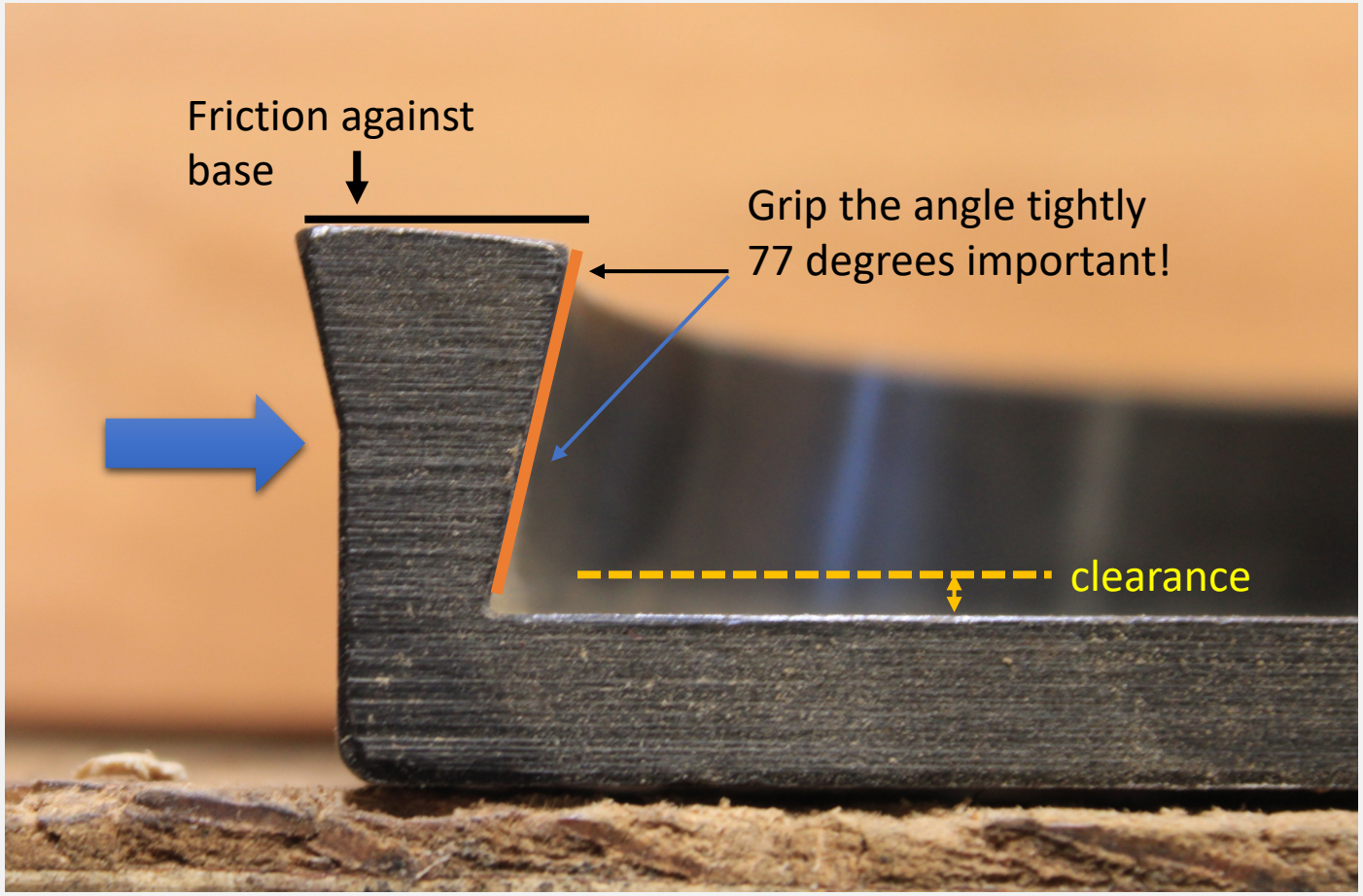
Oneway “Tower” Jaws

Serrated grip not great for soft or wet wood. Chews up contours

Pin Jaws to grip small cylinders and expand into small openings

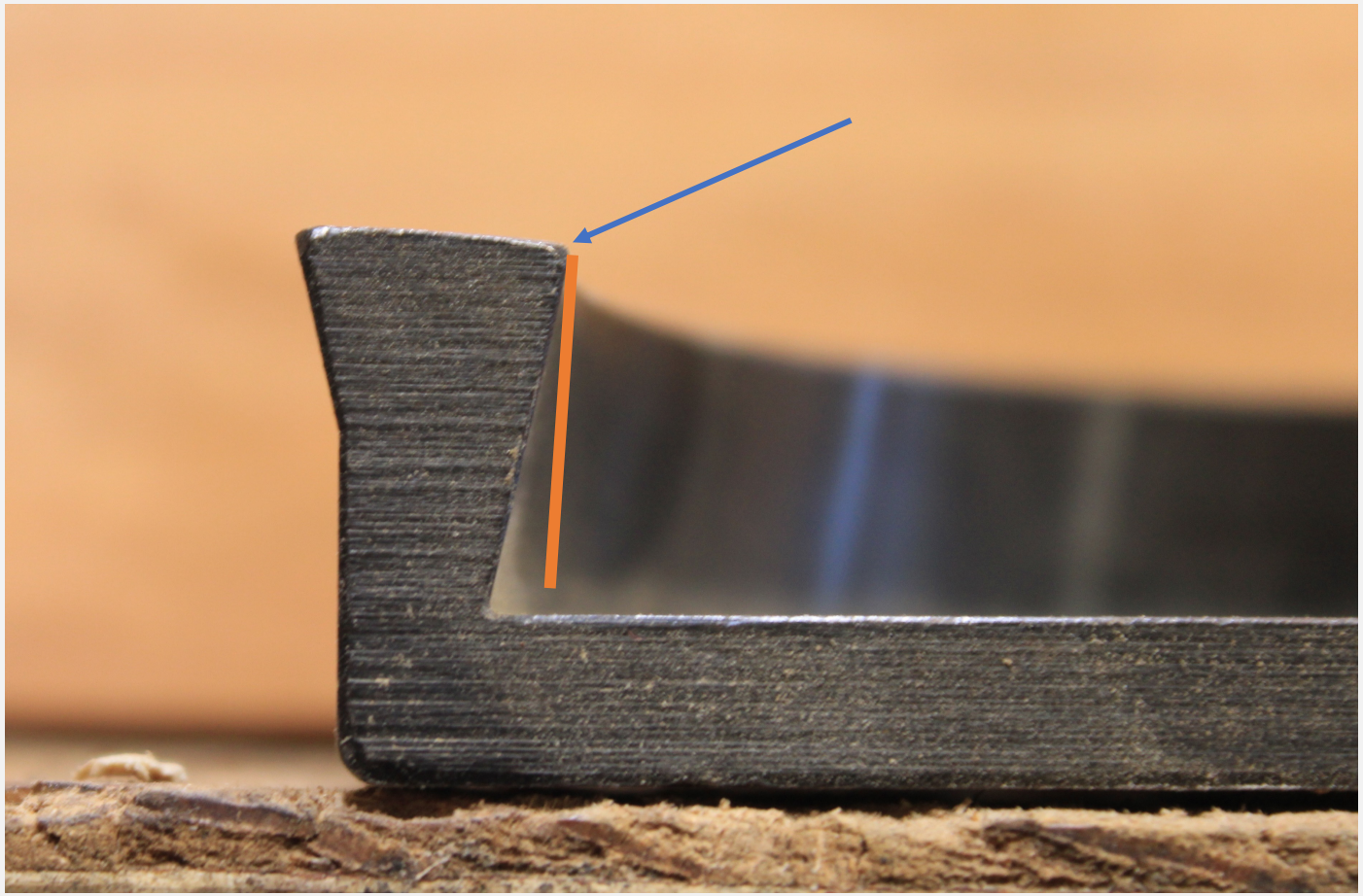
Three mechanical grip modes for dovetail jaws

Force

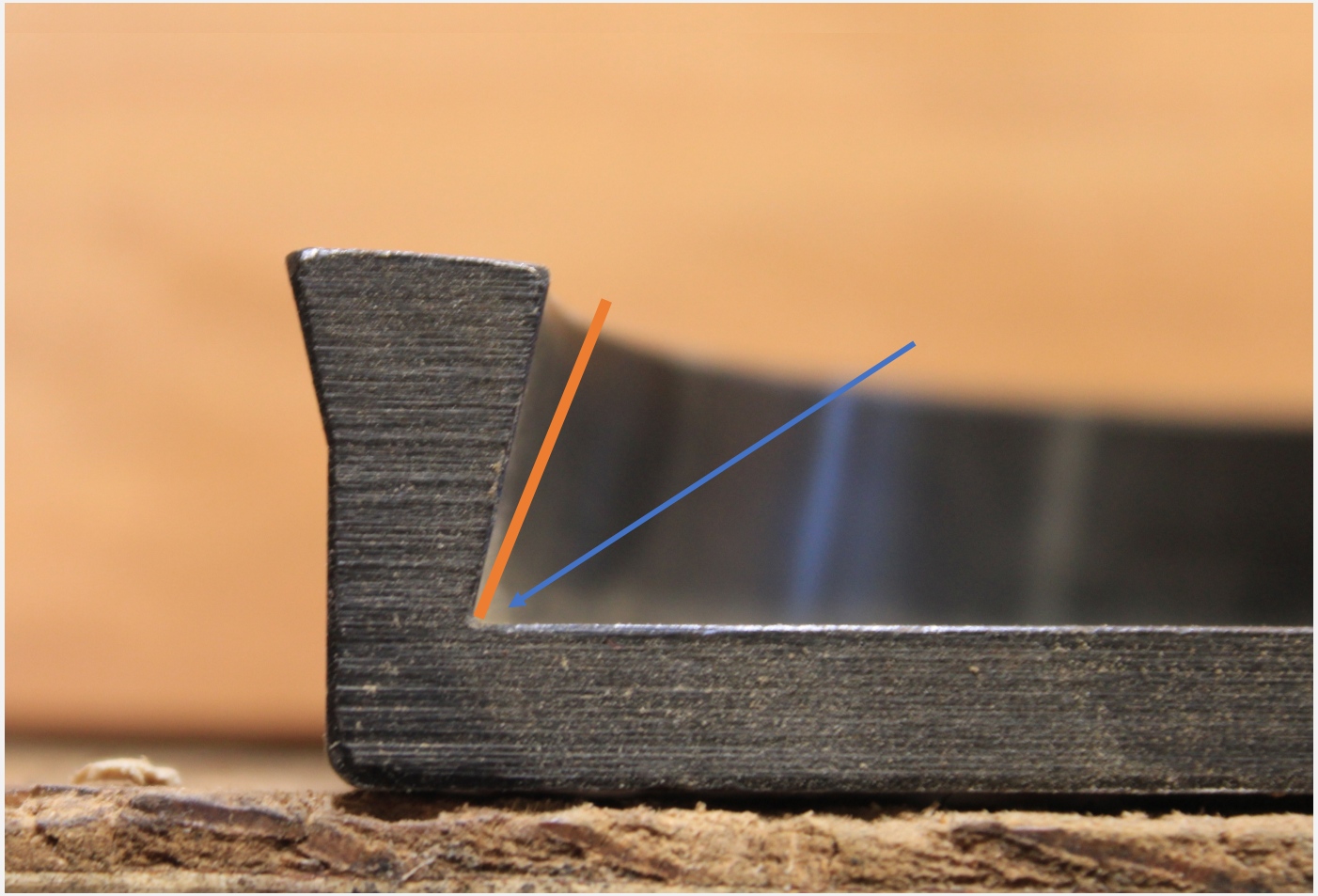


Geometric dovetail, compression, and friction fit against bottom of bowl

Dovetail angle cut too obtuse: Thin line of contact



Angle too acute:
Thin line of contact

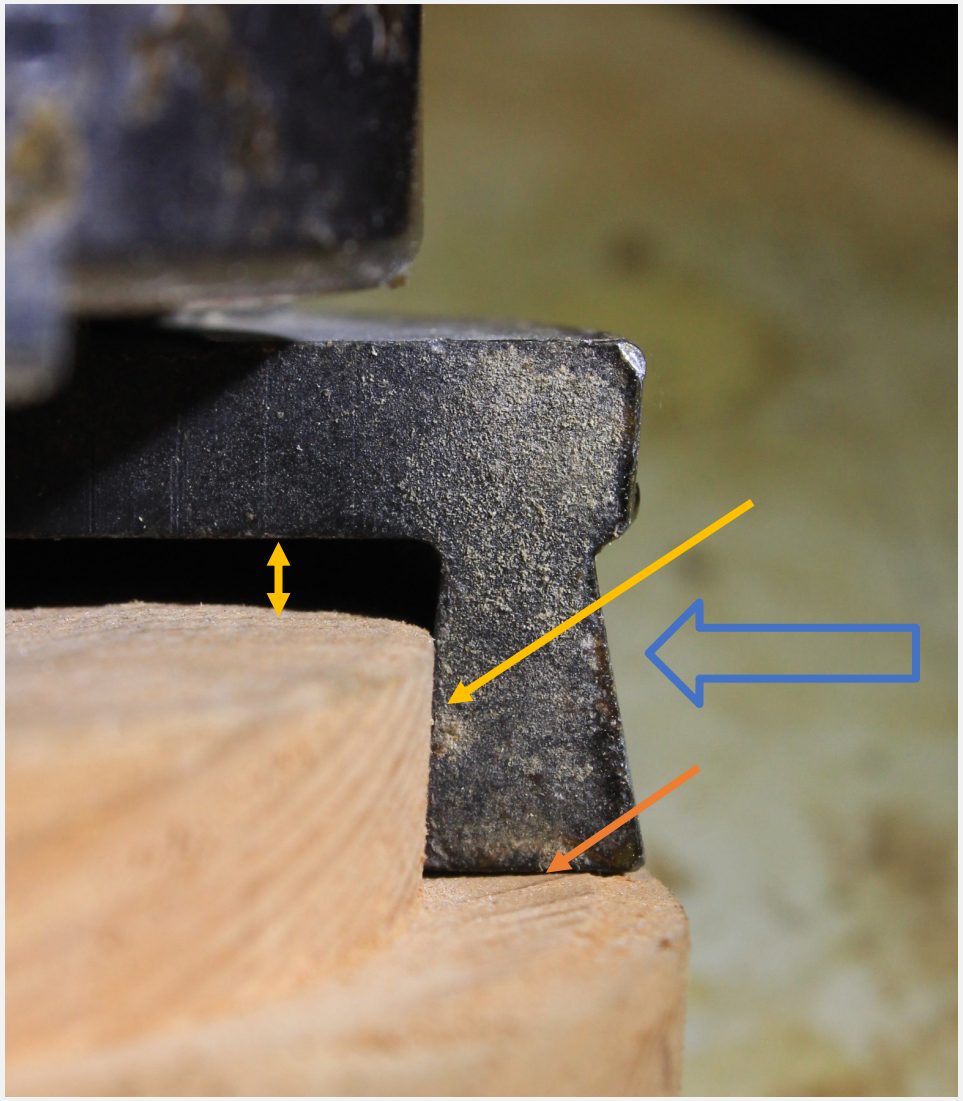


Cutting 77 Degrees…lots of ways

Shopmade scraper Commercial spear point (GL) Spindle gouge

Close Up Right Fit

1. Compression power!
2. Grip angle accurately
3. Tight fit at base
4. Clearance

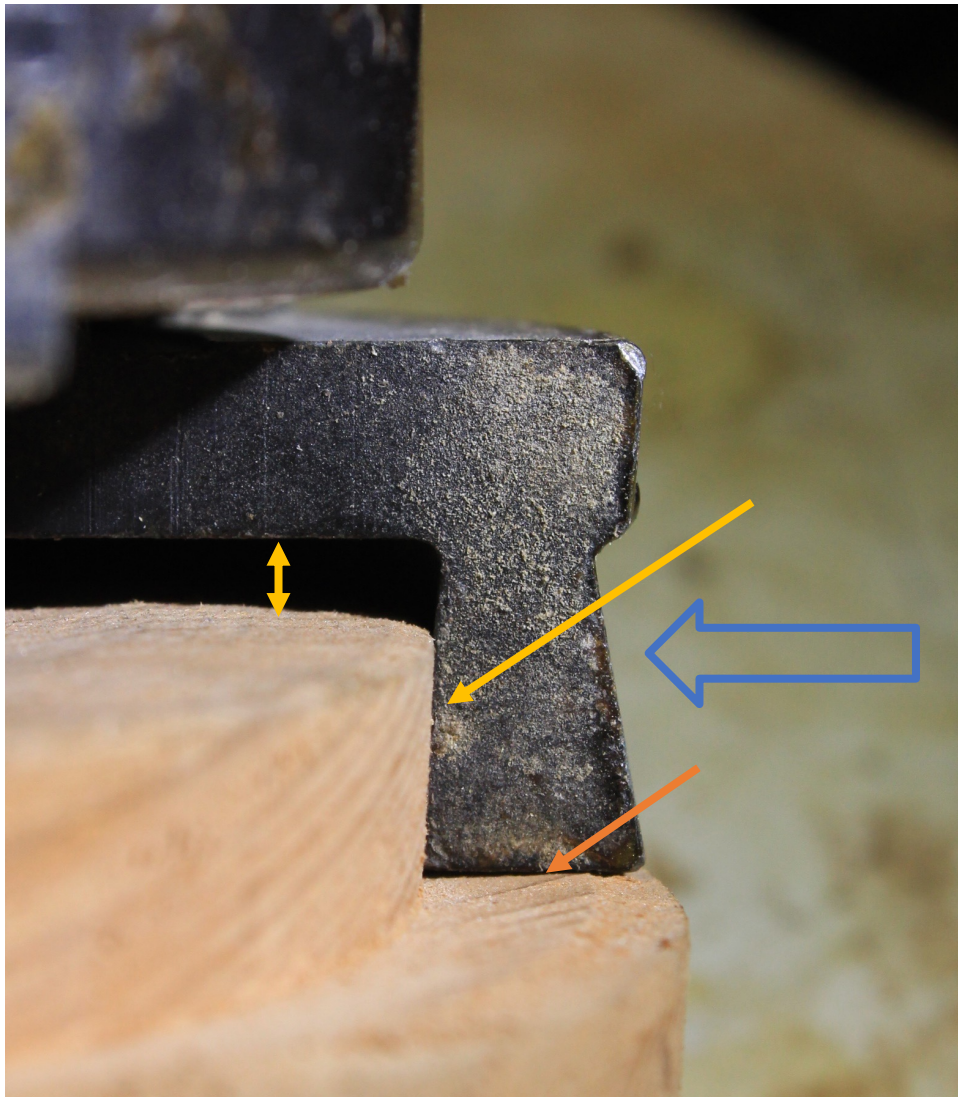


Oneway Jaws #4

Tight fit chuck jaw ring against bottom of bowl—Kirk's $100 bill test

Close Up Right Fit

1. Compression power!
2. Grip angle accurately
3. Tight fit at base
4. Clearance



Oneway Jaws #4

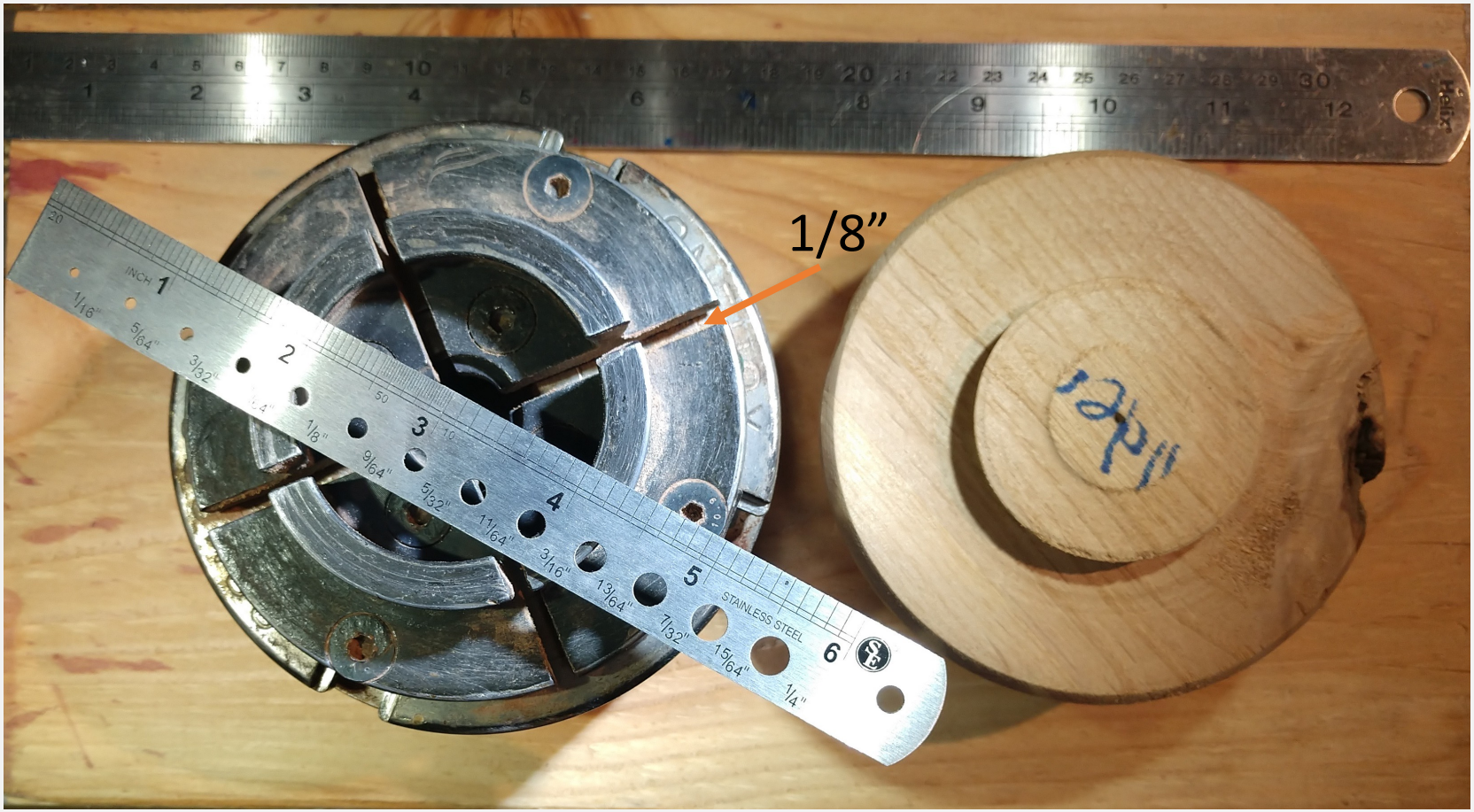
Size Matters!
π X Diameter = Circumference
More length of grip contact is better!

- Undersized tenons are a hazard, especially with deep, unbalanced, irregular, or heavy blanks...and even more with suspect quality wood or grain.

- Use the largest diameter tenon that fits your vessel. Deeper tenon likewise (but less than ½”). The more surface area gripped, the more likely it will hold.

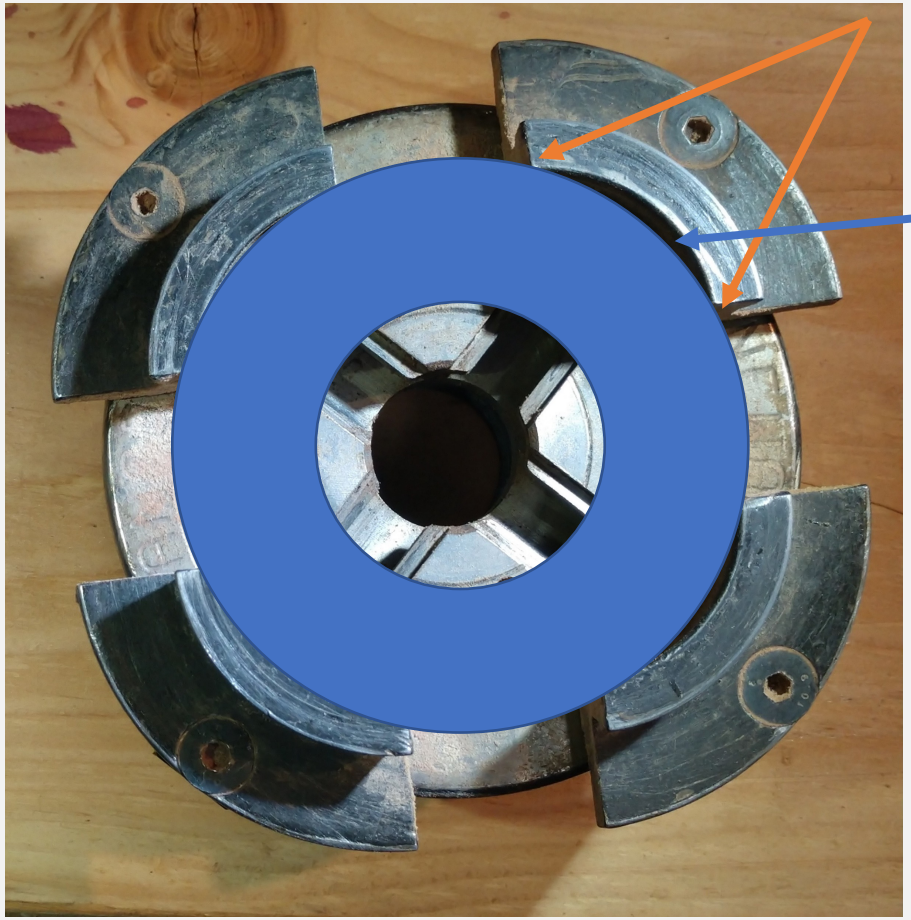
- Use the chuck that accommodates this diameter when nearly closed. If you don’t have it...borrow or buy one...but don’t take the chance of a UFO.

Full Circumference Grip



Jaws wide open→ Only 8 contacts versus a full circumferential grasp

Weak!



No contact
Just air

Traction
Doctrine of
Corvair:
Unreliable
at any speed

Bad Fit!
Another view of a weak grip

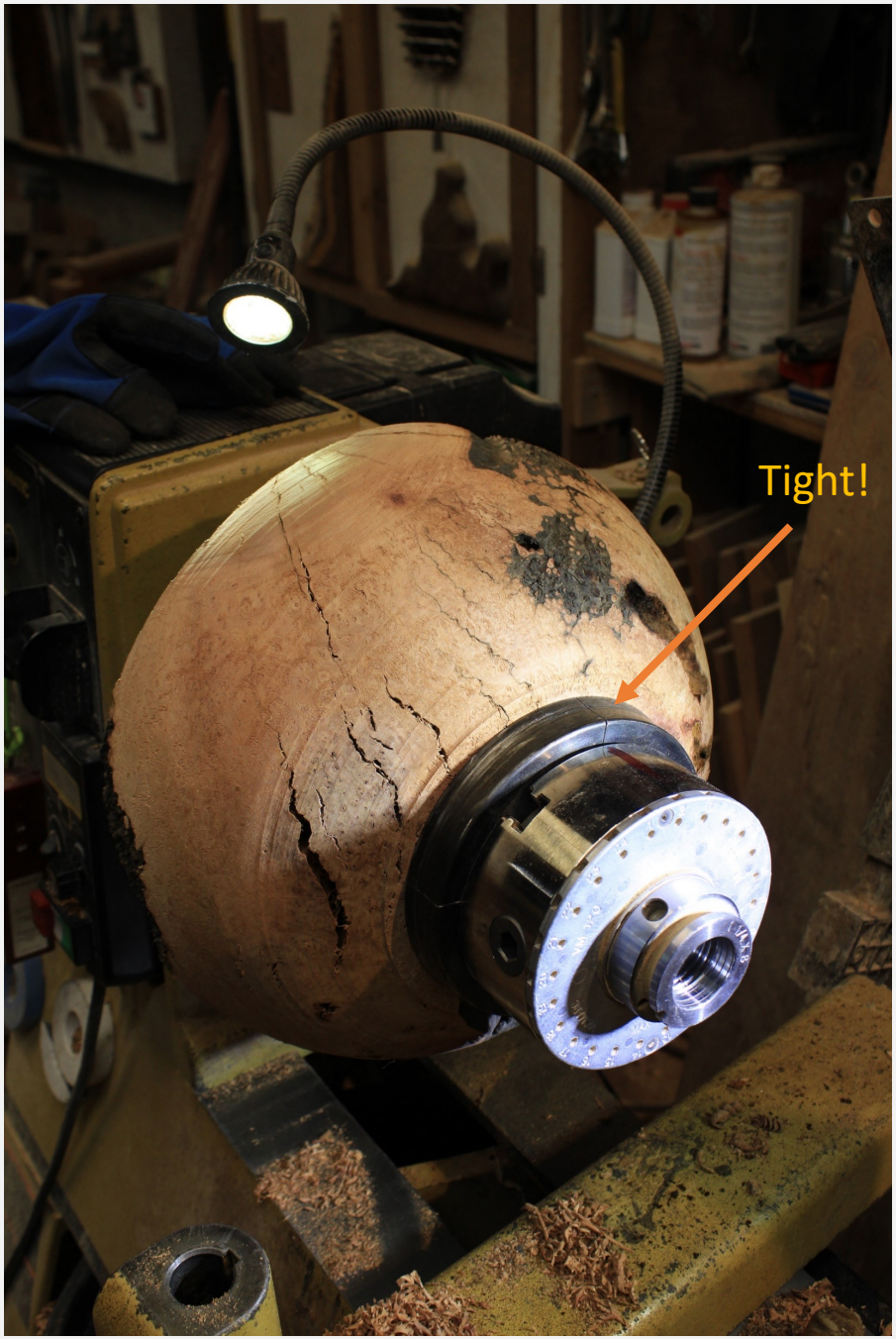
Good Fit

Mattie's gnarly burl

Test fit tenon before Removing from lathe

Almost perfect circular grip

Beefy Vicmarc 120 with 6" jaws!

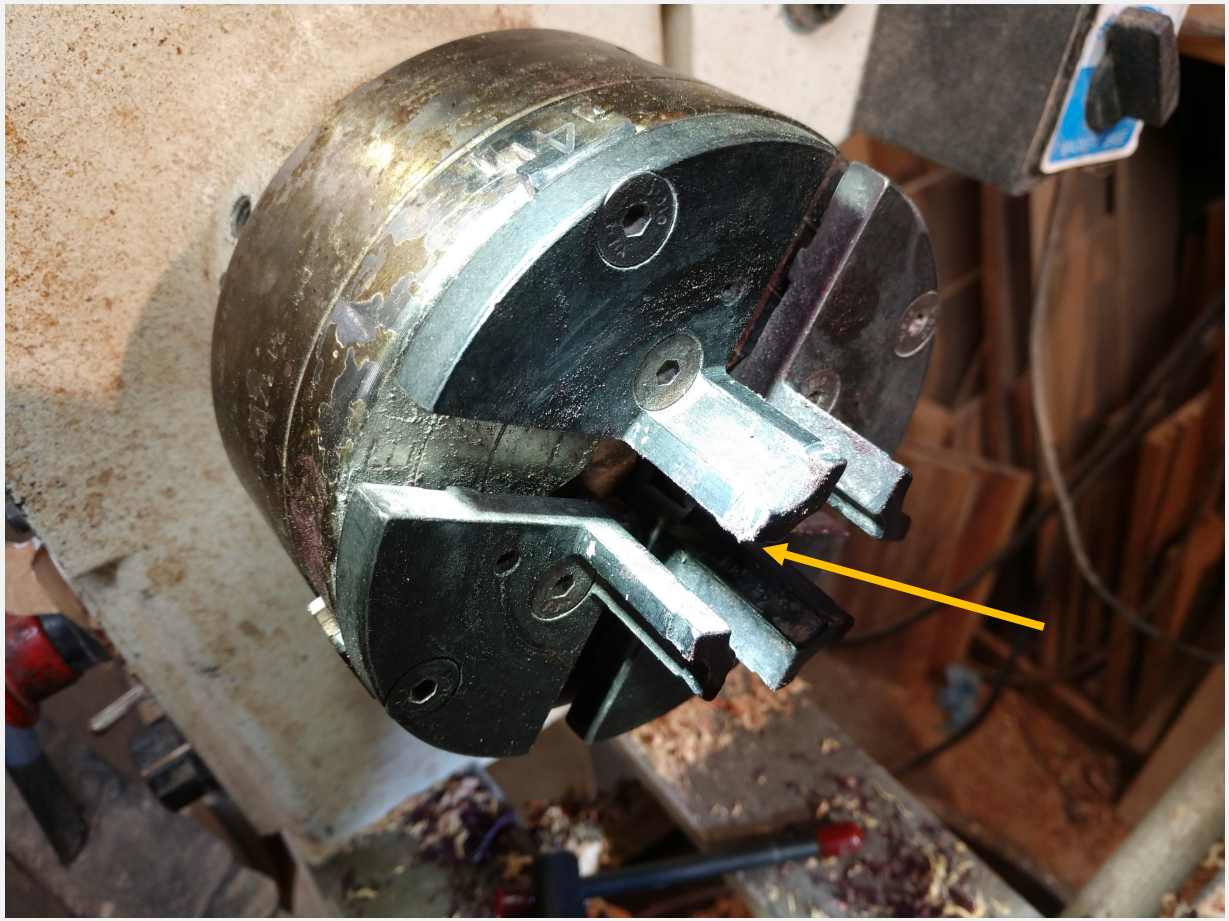


Expansion Mode: Use a standard chuck in for an incurved or undercut rim

Smooth, convex steel jaws won't leave divots if chuck diameter in expansion is nearly circular

It’s *not* cheating to know these diameters and cut these dimensions on purpose. It’s smart.

These sharp-edged pin jaws *will* leave a mark



Don’t want to mar the wood with edgy steel jaws?

Itsy bitsy undercut bowl

Tape doesn’t pad well and leaves residue. Cloth, paper, or compressible material won’t grip firmly enough for turning

Pad the jaws with leather!

Voila! Non marring jaws

Of course, a jam chuck would work, too! Depends on how many you're making!

Leather sheath works on compression, too

Pin jaw chuck gripping cylindrical tenon which needs to avoid damage

Denser rubber or inner tube works But be wary of the points!

Wood Weaknesses→ Failed Tenons

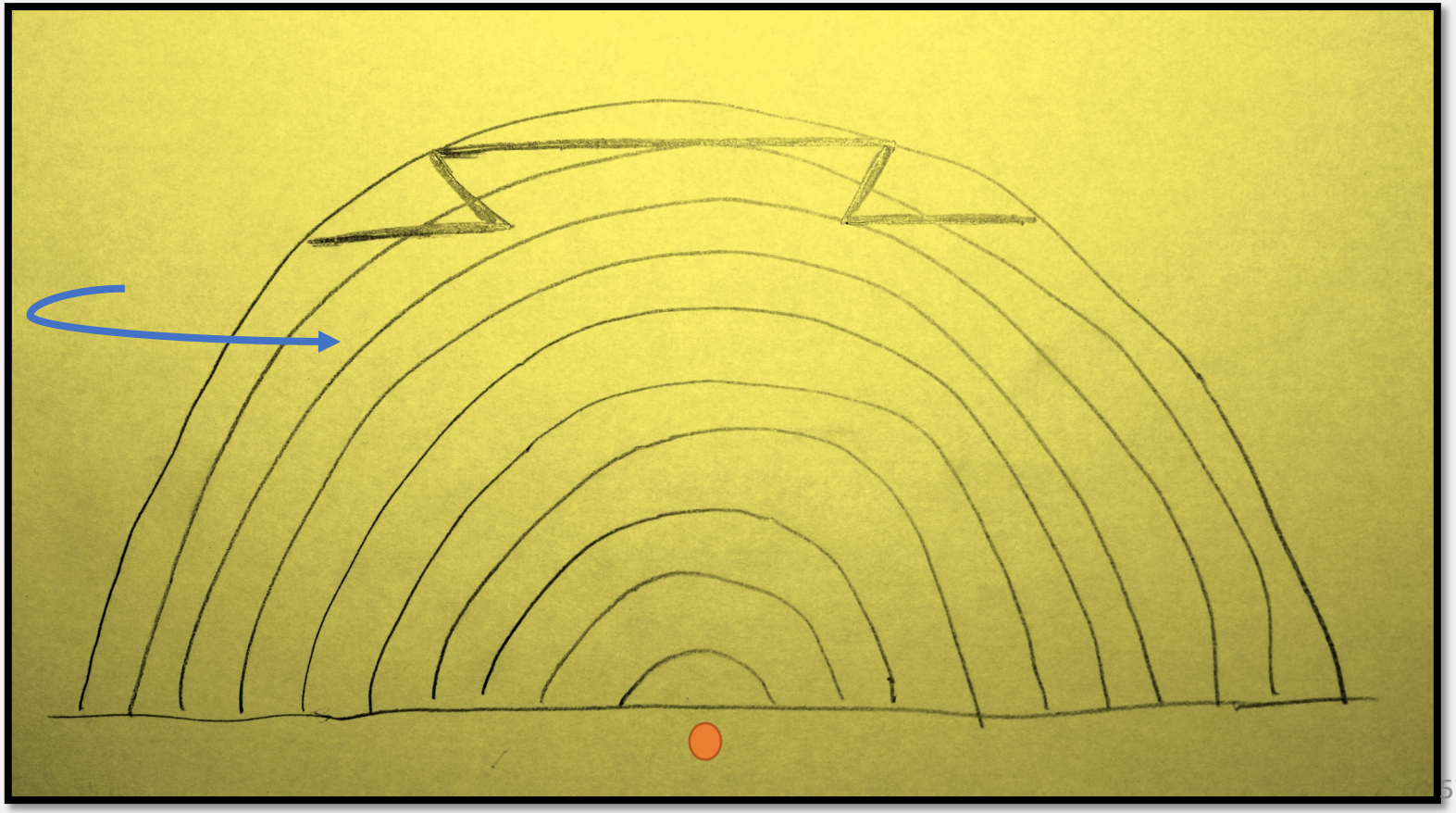
- Spalted—deforms, crushes, tears, gives up
- Wet—squishy, loses water and diameter → loose
- Soft—over-tightening crushes fibers→ loose
- Center pith—think “pith is pathetic”
- Cracks—torque increases exponentially w RPMs
- Bug damage—can be worse than you think
- Peripheral (younger) wood has weaker bonds between adjacent growth rings, especially sap wood in certain species (Doug fir, walnut, black acacia, soft maple, some oaks)

Maturity Matters for Wood Integrity

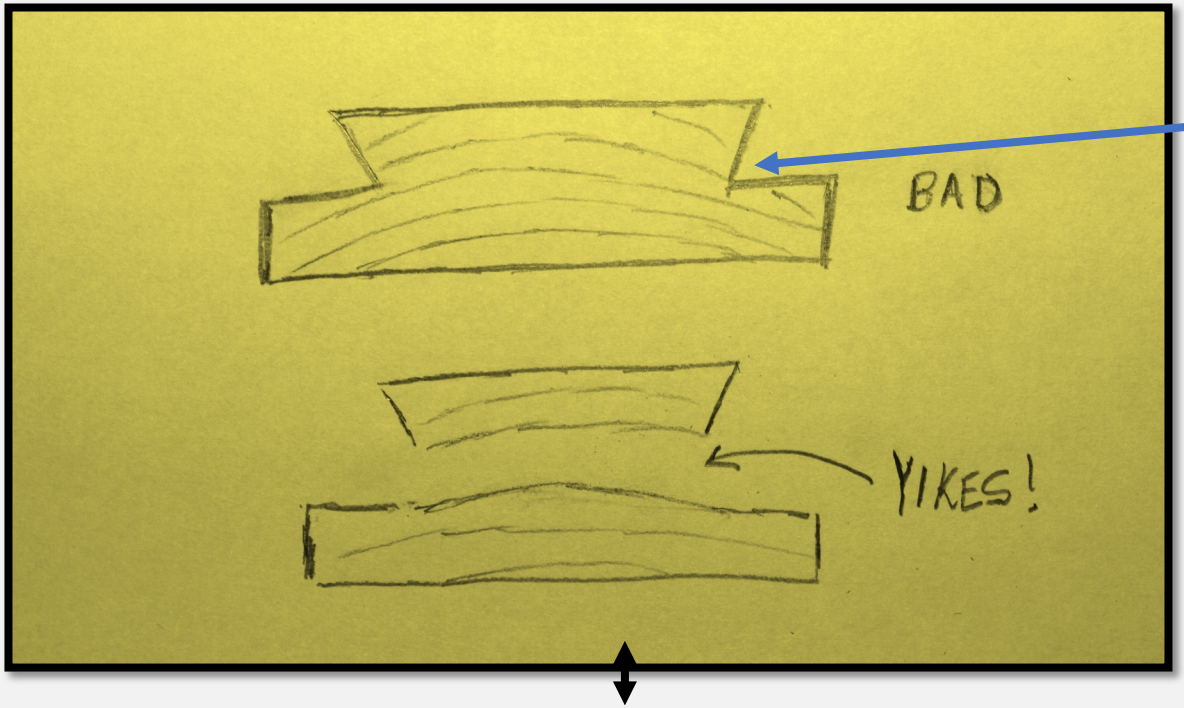
- We like to use as much of a blank as possible.
- If the bowl is oriented pith-up, by far the most common, it means the tenon will be made from the peripheral wood...the newbie layers.
- Wood that was cambium last year is likely weak.
- Move in 3-5 growth rings for tougher wood before trusting that tenon.
- Image next slide

Peripheral wood makes suspect tenons

Weak bonds between adjacent growth rings can just “peel off”



Grain orientation affects security (Same issue for waste blocks)



Chuck jaws drive a "splitting wedge" between weak rings.

Twist or a jolt or a catch

Leaves a biscuit
In your chuck
and the blank in the rafters.

The Regal Mortise *(*Not *rigor mortis)*

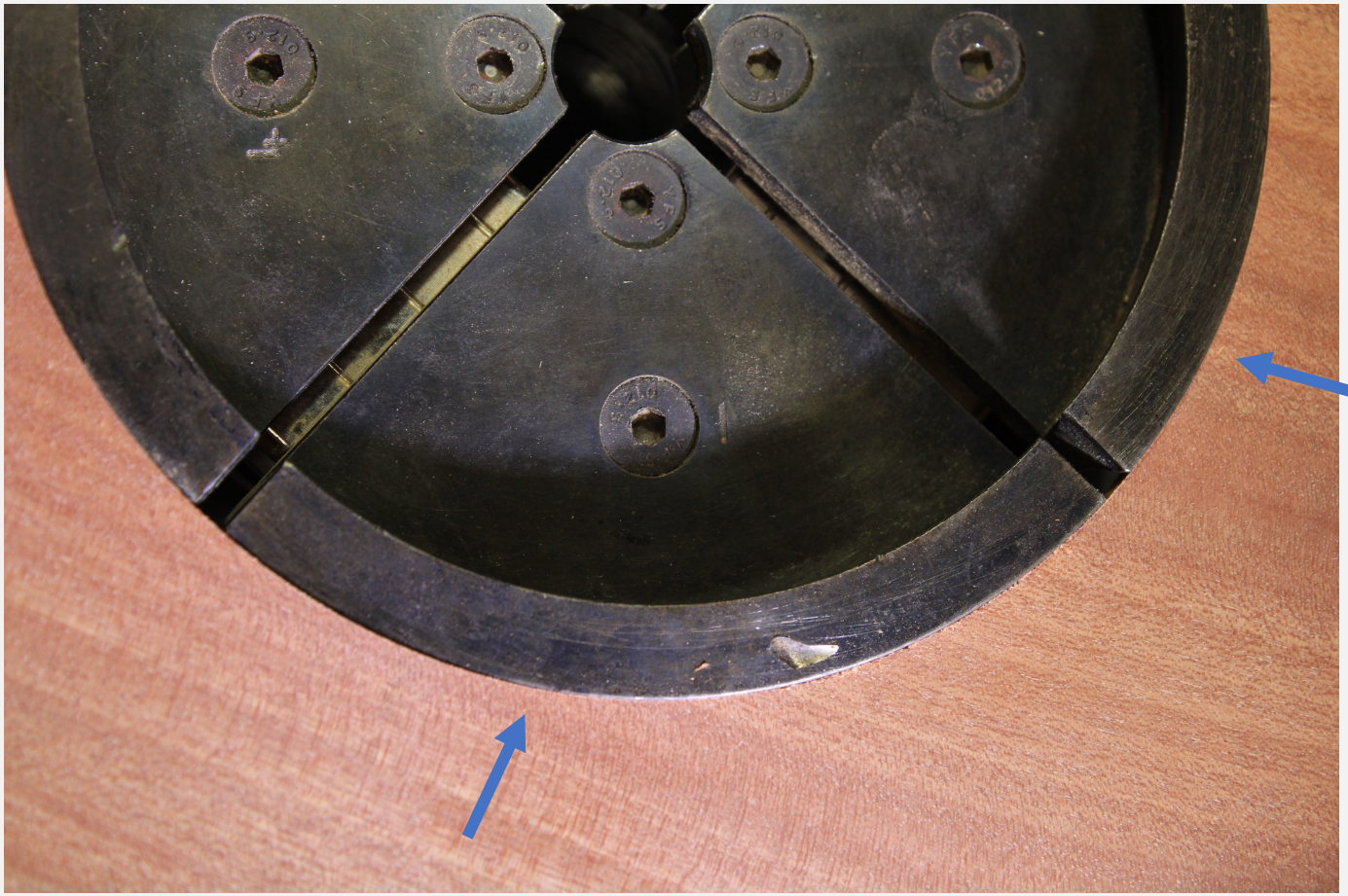
Effective, but not as strong as a well-formed tenon.
Unsuited for large, heavy, unbalanced blanks.

Mattie Guthrie's hands

Mortise Advantages

- Saves a little depth of a vessel that would be lost in a tenon
- Makes bottom form rather easy
- Works especially well for platters and shallower bowls which run true—not so well for deep or unbalanced blanks. Torque can twist the jaws out of the opening too easily, and then it takes off.
- Use tailstock until the last, delicate steps

The Perfect Mortise



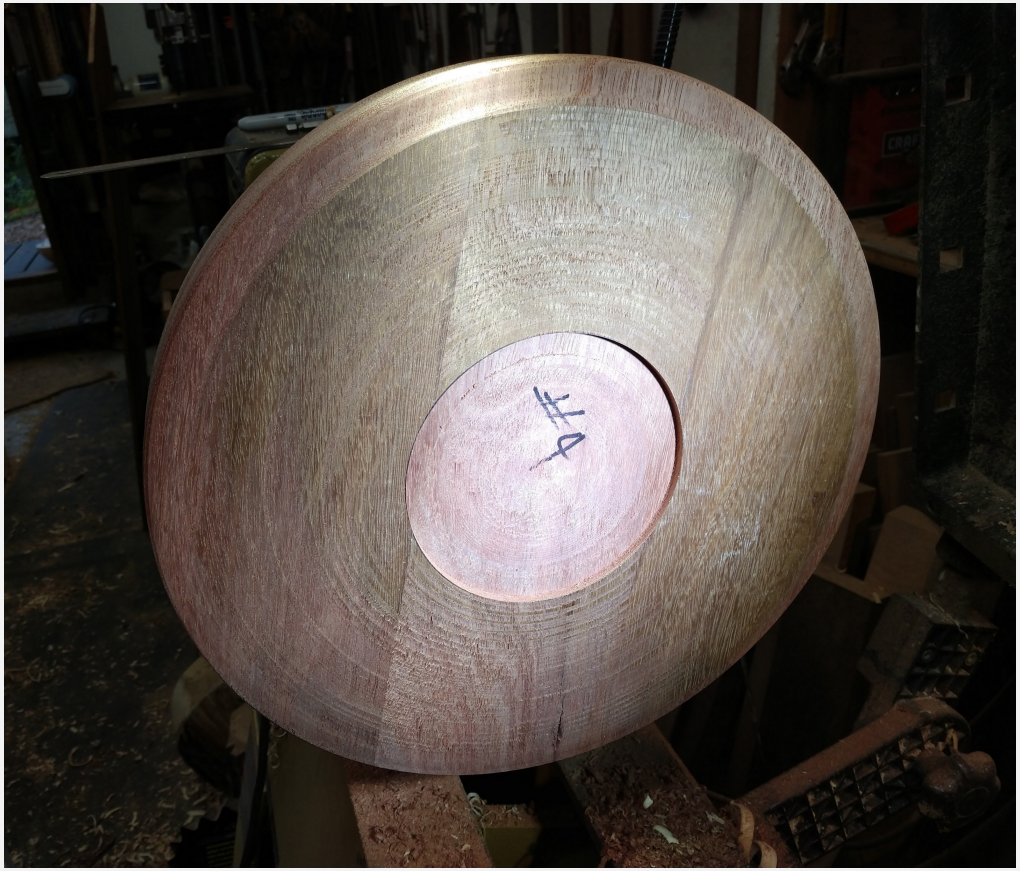
No air gap

Jaws nearly closed for circular contact

Rim ideally 3/4” or more *in sound wood*

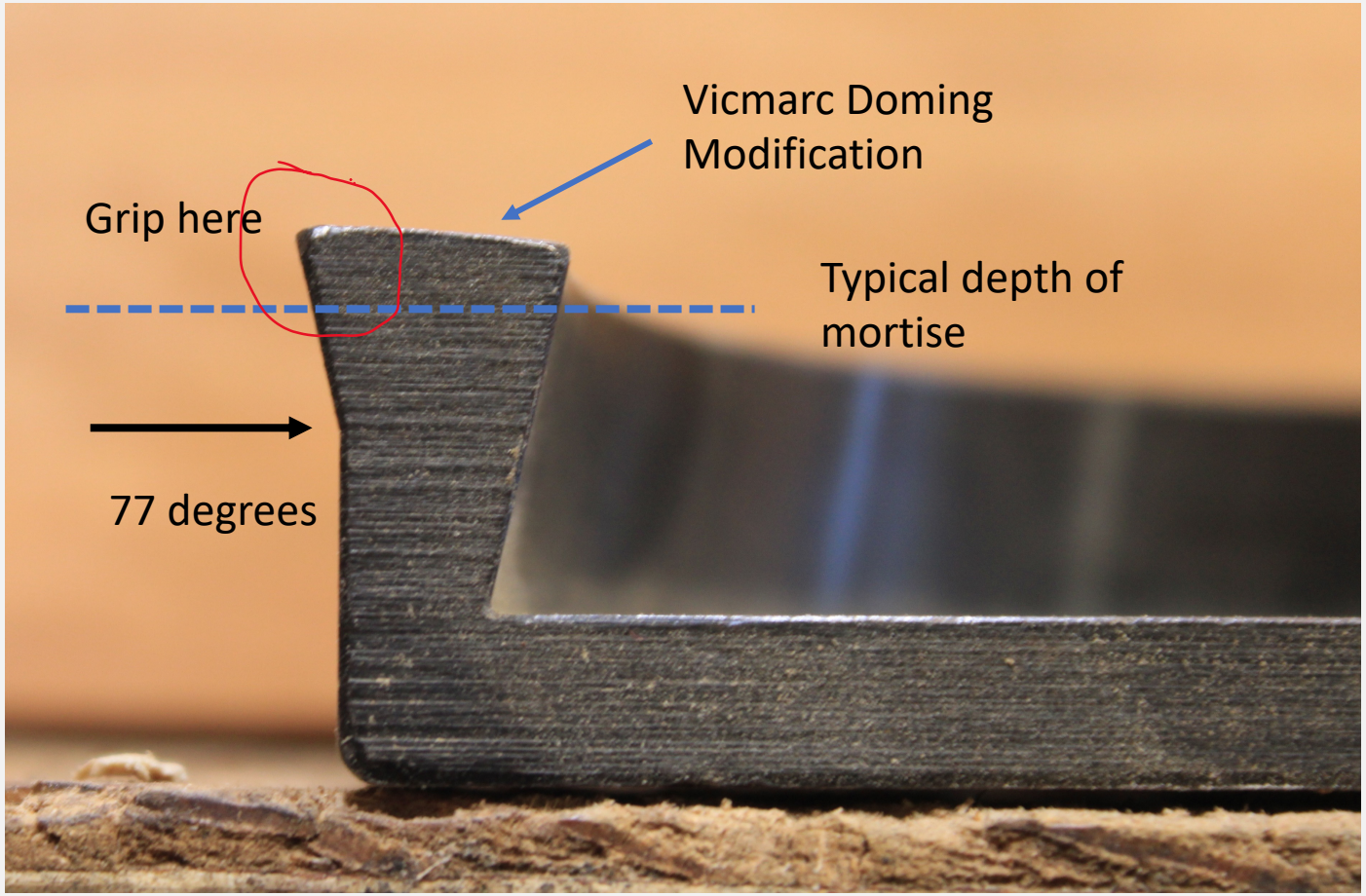
Thin rim blowouts occur way to often. Experience can be a cruel teacher.

Let’s Cut a Mortise for a Platter



1/8” deep mortise holds well if large diameter, tight circular fit, accurate dovetail, and sound wood. Secure w tailstock

Dovetail (almost) essential



1. Face off the Blank

Must be clean...mortise rim needs to be in a plane

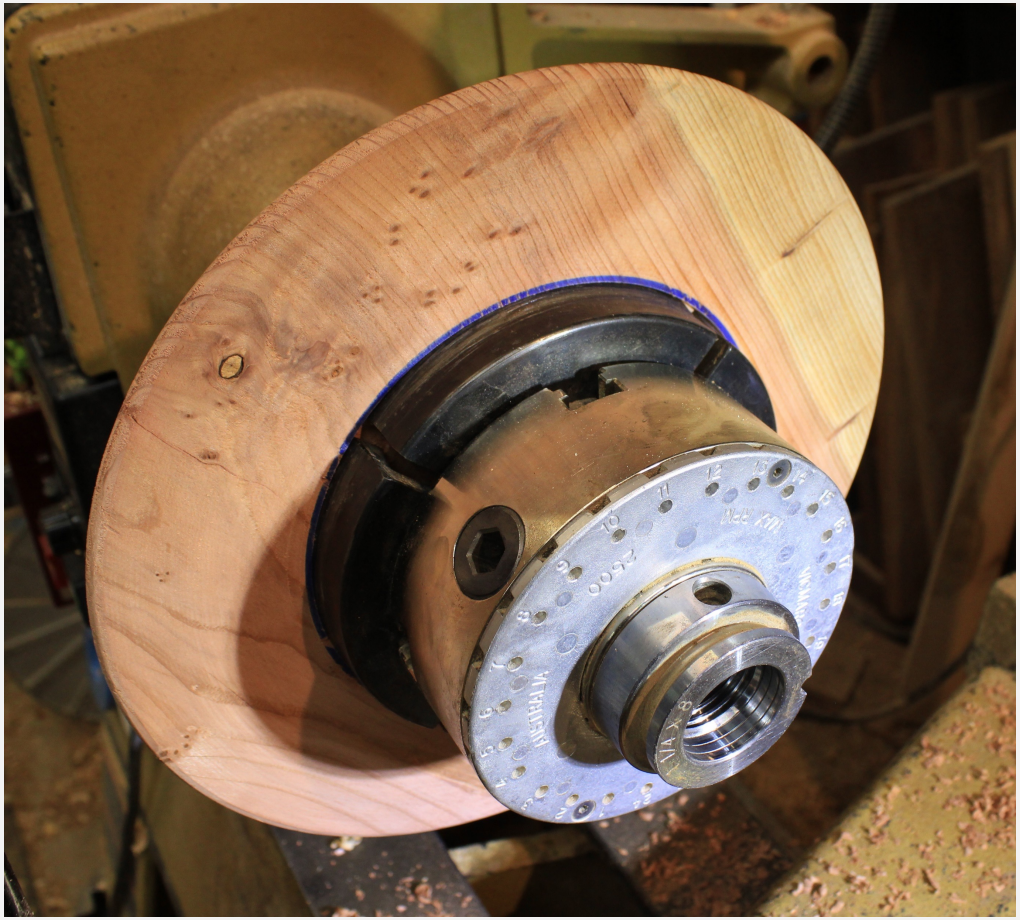
2. Measure and Mark the Margin Ideally 4-7” diameter—fit your chuck

Measure for Diameter of Closed Jaws + 1/8”
Sharpie, pencil, dividers—your choice—but don’t guess!

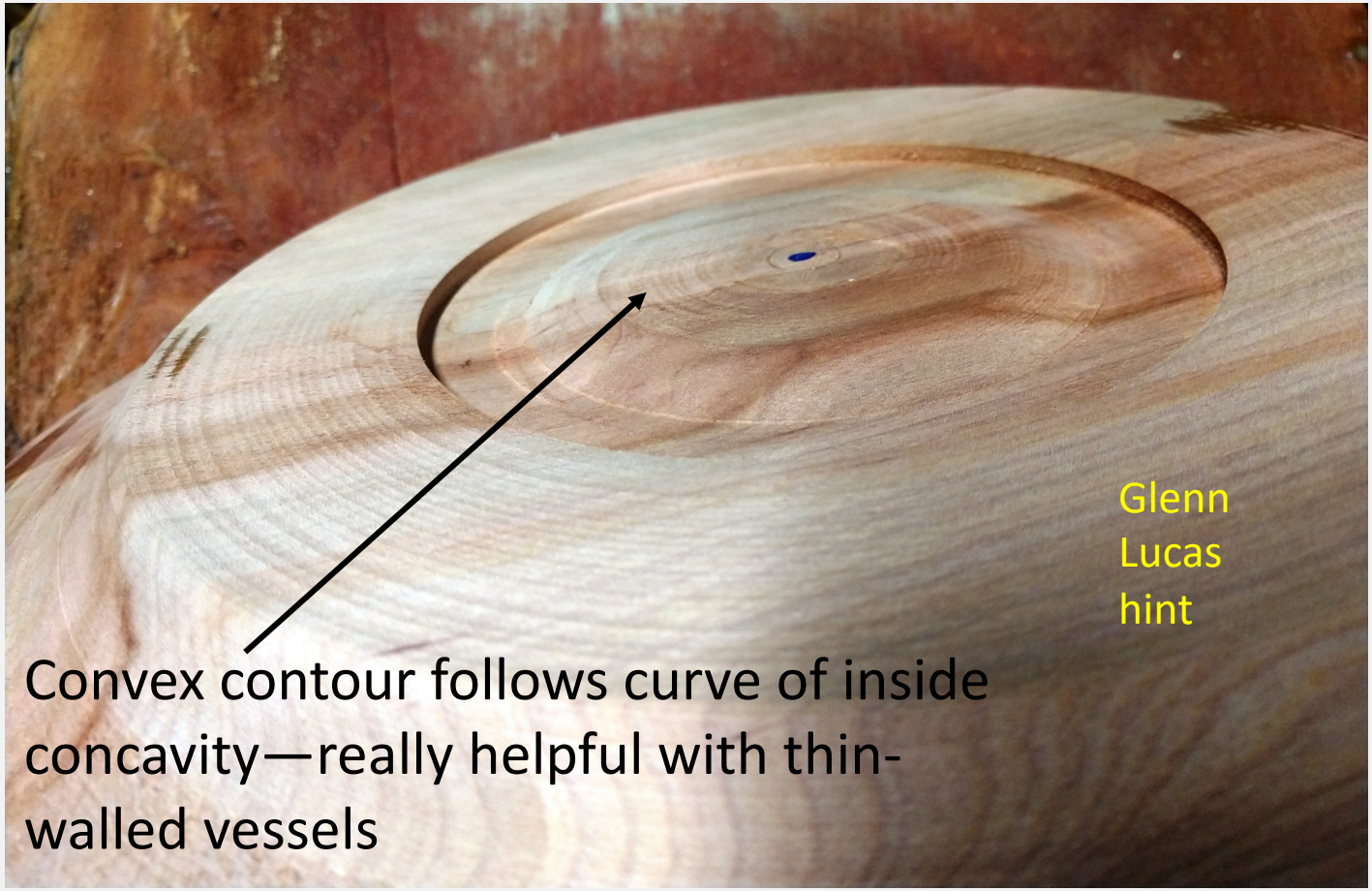
3. Using Gouge, Cut a shallow (1/8”) hollow up to that line

4. Form the shoulder of the mortise using bedan or 77-degree scraper

5. Verify fit with chuck jaws in expansion mode...while still on lathe



Optional: Refine central contour with subtle dome



No Blown Mortises!
Avoid the Usual Suspects

- Spalted wood
- Cracks and center pith
- Wet wood
- Soft wood
- Damaged wood and Notorious splitters
- All weaknesses get worse with depth of vessel
- Tailstock imperative for these risky ventures
- Go slower than usual to reduce chance of catches

This list sounds familiar, eh!

Faceplates

Faceplates

- Most of your elders learned on these.
- Handy, esp for gnarly blanks
- Favored for even easy ones by experts like Glenn Lucas
- Affordable & Indestructible
- No moving parts
- Sensible to buy used
- Lots of sizes (common 3-6”)

Hint: See one at a garage sale?
Be certain spindle thread is correct
e.g. 1 ¼ x 8 TPI

Safety

- Use enough screws—more for end grain, soft, or damaged wood.
- Deep enough for at least a ½” grip in firm wood, longer for soft, wet, and suspect wood
- No wimpy screws--#12 or #14 minimum for anything heavy
- I like stainless steel—avoids nasty black iron stains from regular alloys, especially if left a few days in wet wood.

One Bad Ask Burl

Chip off loose bark
(future projectiles)

Prototypical Scary Blank Even with a Faceplate

Oak burl

Spongy Mycelium

Bugs

Wet

Heavy!

Lots of screws!

Go Slowly

Faceplate Downsides

- Need a flat surface of adequate diameter to start
- Shims maybe OK if you use lots of screws
- No fun to take down and reinstall. (Mark it!) Not easily suited to multiple simultaneous projects
- Screw holes in the opening—no worries
- In the bottom, however, screw holes are a big nuisance, plague of the last century.
  - Can mitigate by sacrificing depth and turning off bottom to delete holes *(naah),* or filling with paste *(naah),* or using waste block. Raf uses this, carefully—tell you why soon—and successfully.

Screw Chucks

3” and 2” Screw Chucks (Precision). About $50. Daily use for 6 years, going strong

Versatile and Fast

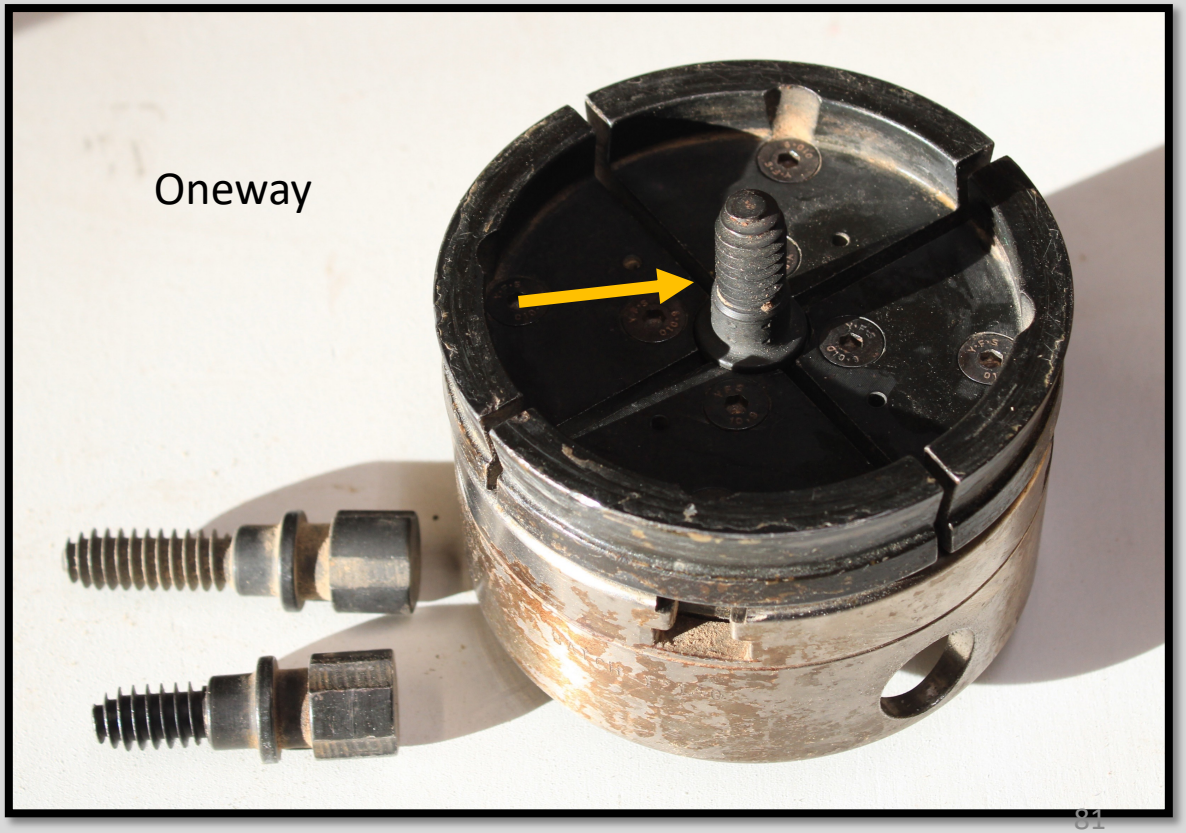
- Drill ¾” deep pilot hole
- Use simple jig
- Equivalent to 3/8” lag screw

- I use almost daily for blanks ranging 3” to 19” diameter.
- Rarely strip out, even in wet wood
- When they do, use woodworm screw (1/2” lag equiv)
- Verify you have unencumbered swing before turning on the lathe! Lathe motor will strip it out.

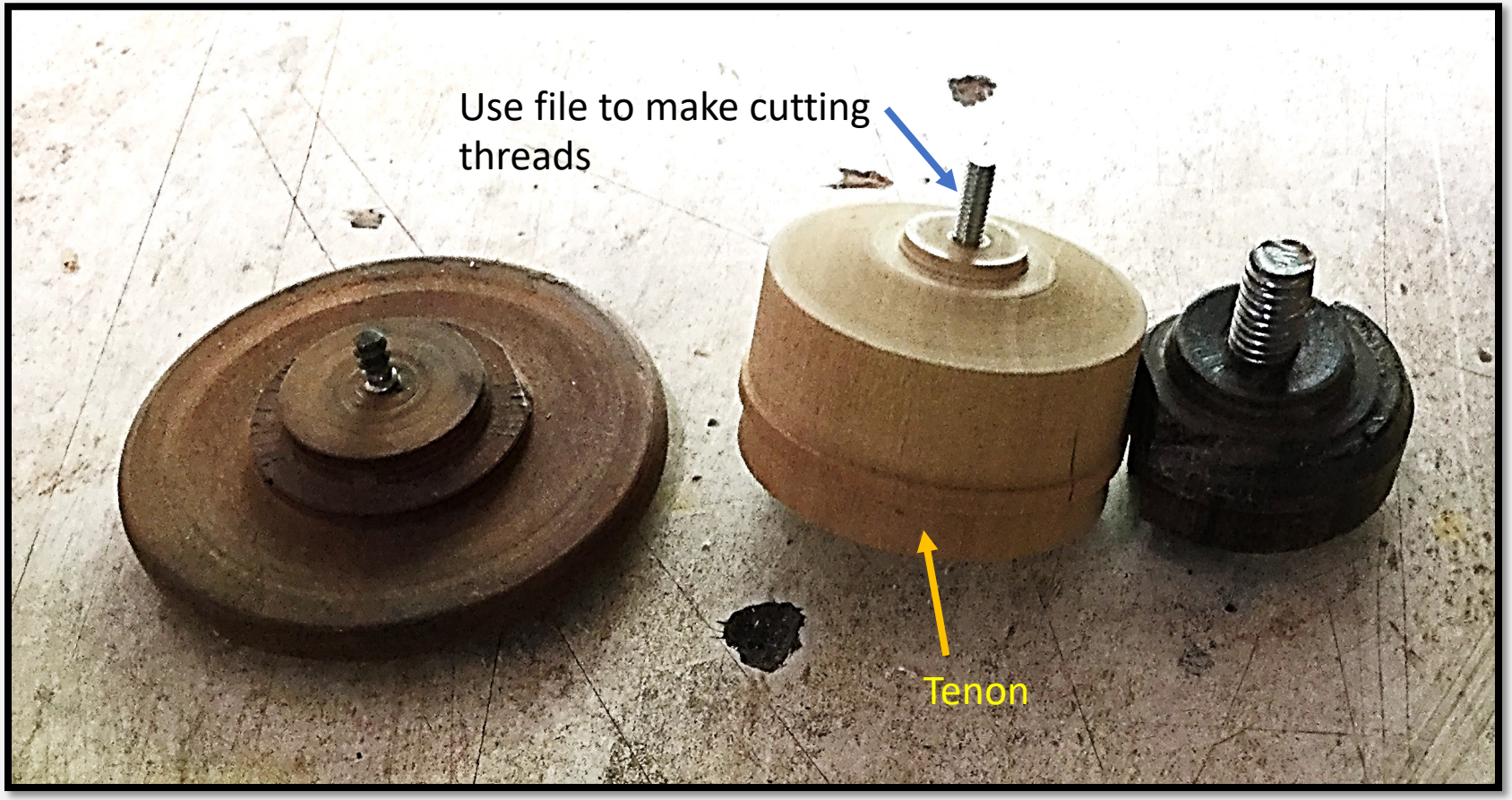
The Woodworm Screw

- Mounts inside a standard chuck, gives equivalent of wide plate grip depending upon which jaws you use.

- Most chuck brands have one like this
- Inexpensive, simple, & pretty fast
- Too hefty for little vessels



John Wells' shop-made screw chucks



Safety Alerts with Screw Chucks

- Advanced spalted wood won't hold a screw.
- Penetrating center pith...punky...unreliable. Shallow screw may not grab firm wood.
- Termite damage nearby
- Bark inclusions
- Entering a knot. They can fracture and blow up.
- Cracks nearby—can yield under stress

- Use a faceplate instead
- Tailstock engaged!

Center Pith
A problem so many ways

Origin of
radial cracks
which can
blow up under
Stress

Erratic shrinkage

Punky wood

Stress in adjacent
wood

Species vary
Sometimes tight
and sound

Sometimes
hopelessly soft

This is our
Big leaf maple

Black walnut

Most conifers

This was pushing the limits

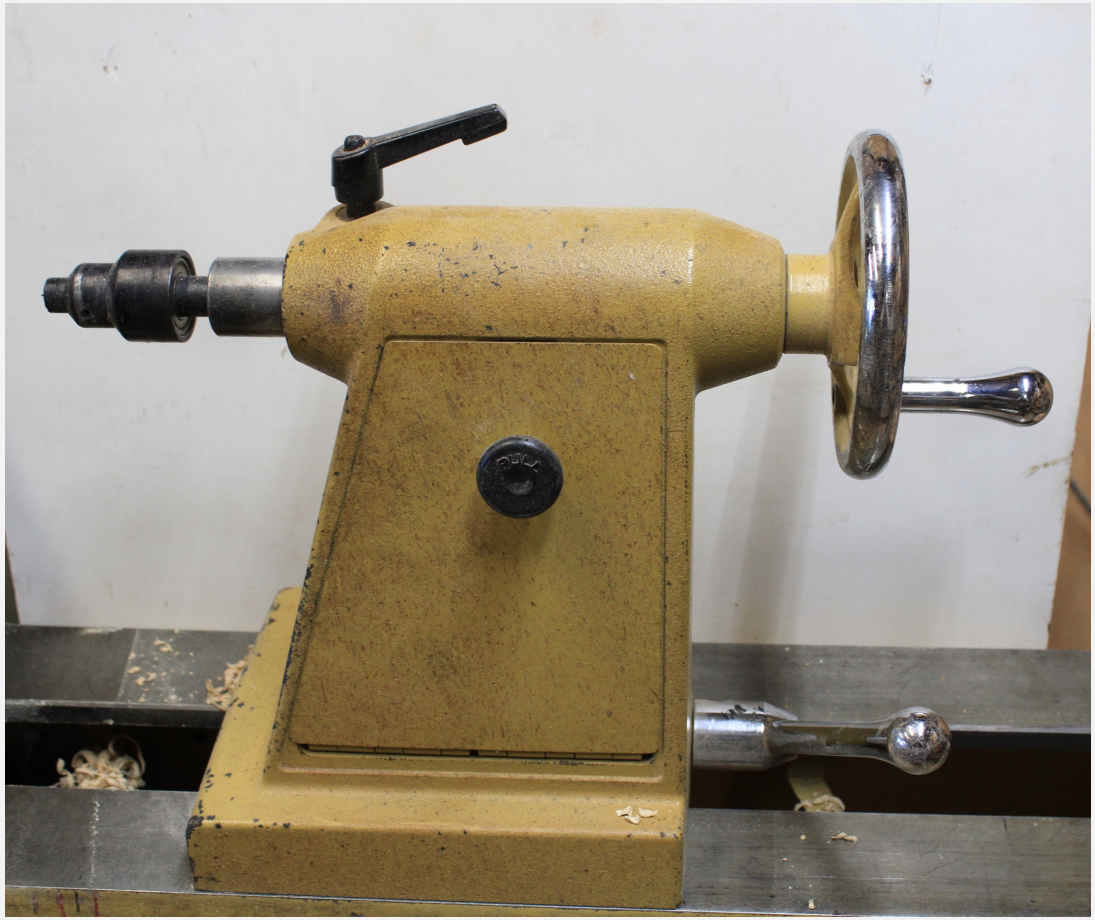
Faceplate might have been smarter

Center pith + spalting

Rationalizations:

- Tested for deep "bite"
- Not heavy
- Balanced
- Large 3" contact
- *Tailstock the whole duration*

Remember your best friend



Screwing it up
This blank looked promising…

Dig in and see what's underneath

Trim off roots

Illustration only. Was secured!

Uh oh—deep, punky voids

Large bug holes, too

We've invested a lot of time here… Let's see if we can grip this

Eyeball for 3" screw chuck

Secure and drill a flat

Rats! Punky & Unsafe Just Say No!

The Laws of Wells

Our President John Wells:
Know when to stop

This Wells:

Never trust a turner with a spotless sweatshirt

Jam Chucks

- Create a shape that firmly fits into an opening of your blank, grips the inside, or grips the outside.

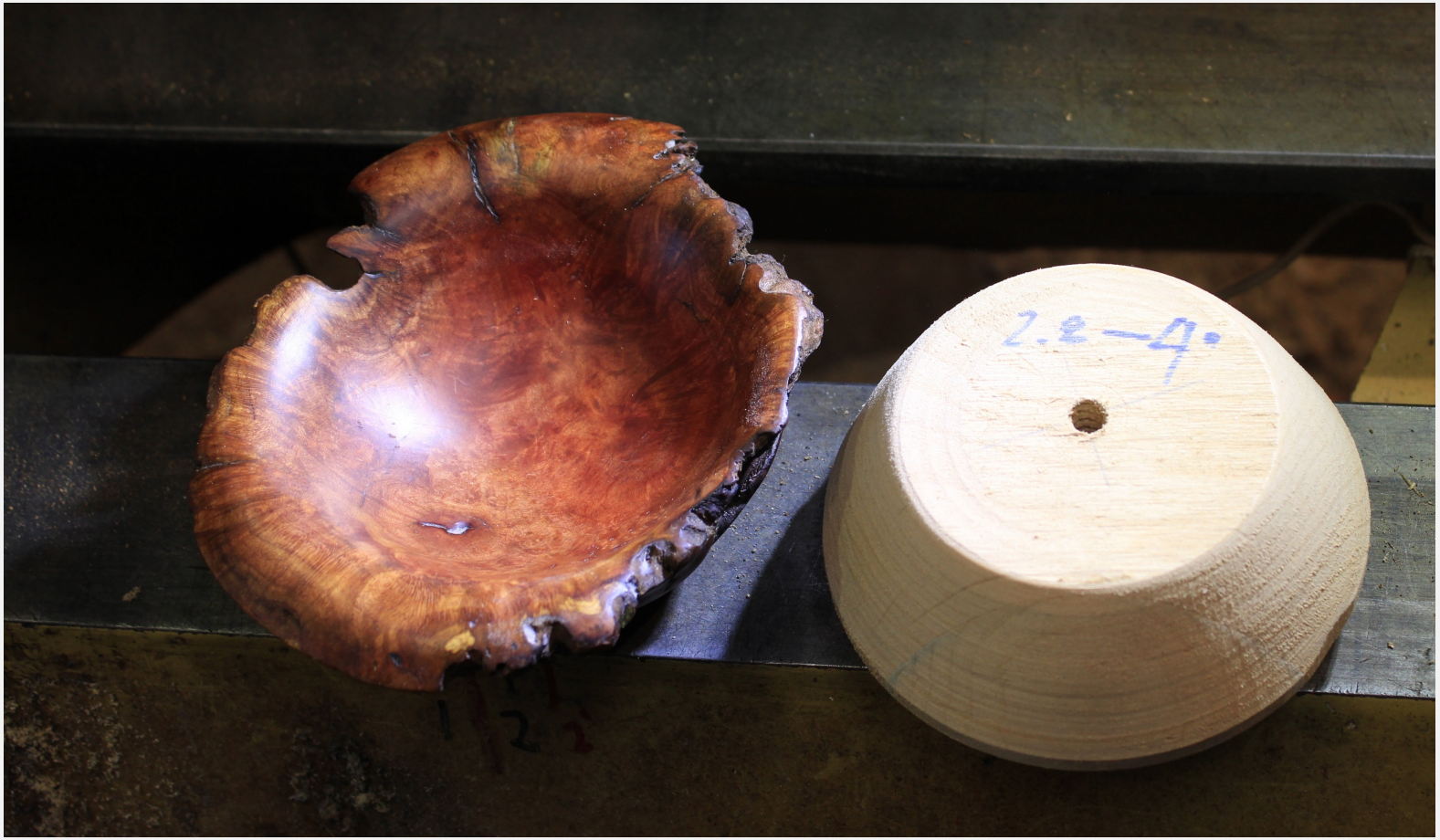
- Allows you to finish the bottoms & external walls
- Shop-made, practically zero cost
- Please that latent engineer in every turner
- Need the tailstock to hold the assembly in place
- Integral to box making, too

A Better Manzanita Bowl

Started out w screw chuck, made a tenon, turned the bowl w curled natural edge

Now we need to cut off this tenon

Find or make a Jam Chuck to grip the inside



How can I grasp this cute, natural edge manzanita bowl to finish the bottom?

Test fit

Packrat Wells had an old jam chuck just the right size

Pad the Jam Chuck for friction grip and protection from marring

Old wet suit
Neoprene,
or rug mat,
or leather
for non-marring
friction fit

Align with the center

Essential to pin the center with tailstock to turn true

Spin it!

Use gouge to remove tenon, leaving a nub

Use modest RPM, turn off the tenon, finish the last wee nub with a knife, sandpaper, or Dremel

Might as well use the heavy chuck as a platform for sanding safely

80 grit...you're up first

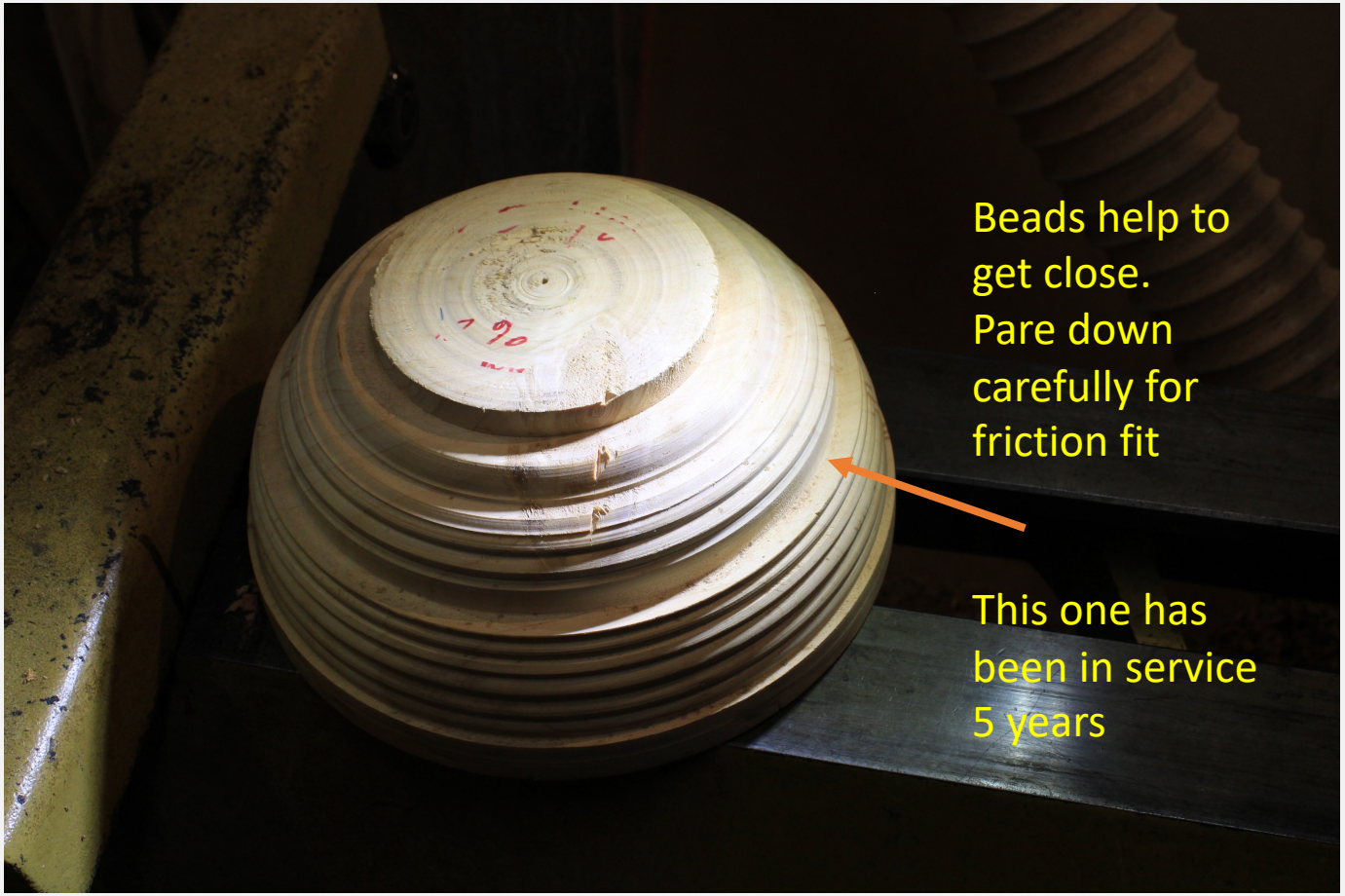
Finish through 120-180-220-320-400-600

Sanded, then abrasive wax
Finish with Mahoney's wax

You can use a jam chuck many times! It gets whittled down, but slowly

Handy to use Cypress—firm but on the soft side. Not abrasive for friction fit

Custom fit into an incurved calabash bowl



This jam chuck has a tenon on the small end, mortise on the large, for versatility

A Jamboree of Chucks

Keep these around if you have space

Coming up soon: Roy!

Special considerations for Jam Chucks

- Jam chuck to finish a delicate bowl where an expanding chuck could crack it
- Natural edge bowl with fragile edges

Vacuum Chucks

Intimidating? Not too bad

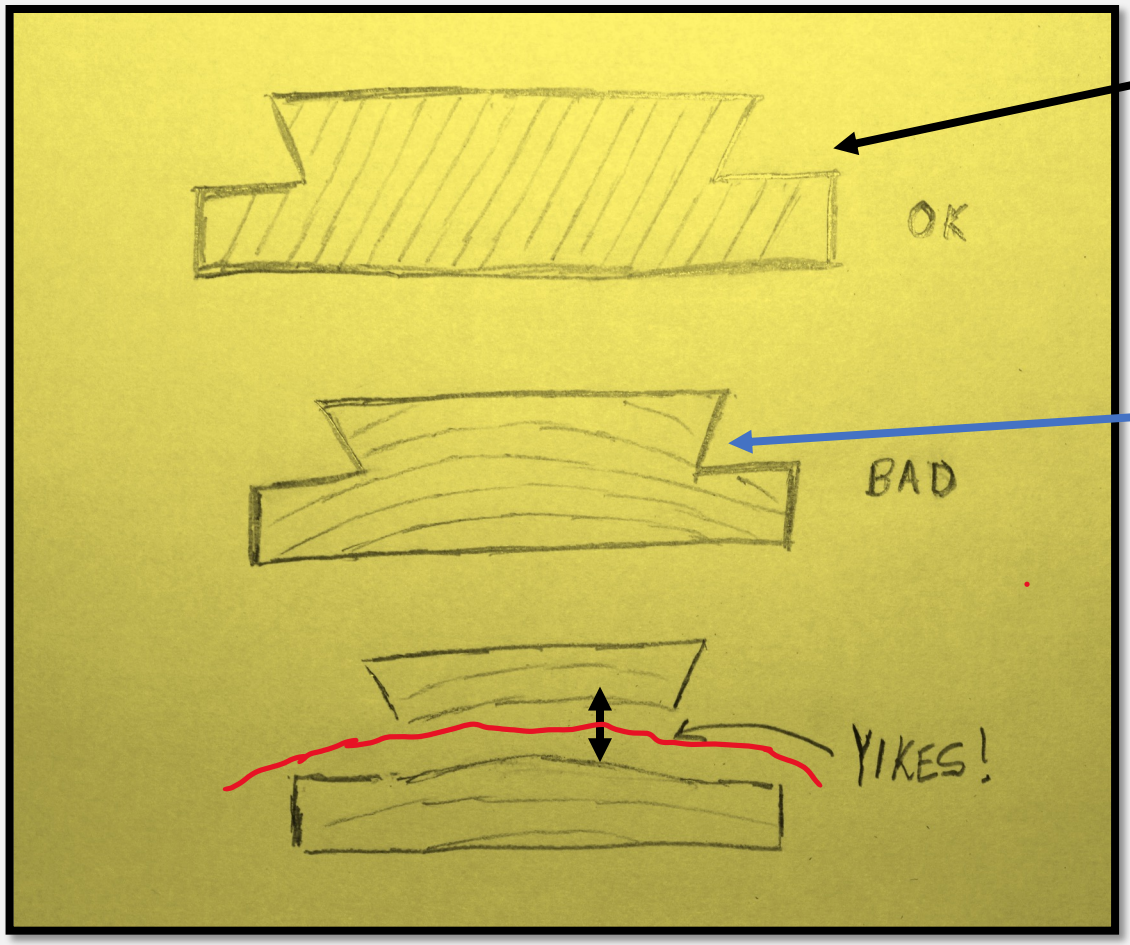
Vacuum Chucks

- Efficient for finishing bottoms of sound bowls
- Re-chucking for revisions and repairs after the tenons or mortises are long gone
- Fast, non-marring
- Need a blank which doesn't leak air!
  - Too thin, too wet, termite holes, cracks, voids
- It's yet another gadget. Not the most expensive, nor the least

- John is going to expand on this!

Waste Block...an Unfortunate Term
This has to be your *best* wood!

Grain orientation: Ideal quartersawn, not tangential



Chuck compresses growth rings

Older, harder wood

Chuck jaws drive a splitting wedge between weak rings.

Leaves a biscuit in your chuck and the blank in the rafters.

In the Flesh

Tangential

Quartersawn

Ideal Waste Blocks (or Glue Blocks), continued

- Bone dry
- Not splitty (Prefer interlocked grain or slow growth/tight)
- Not soft—like pine, hemlock, spruce, cypress, cedar
- Diffuse porous (e.g. maple) better than ring porous species (e.g. oak & ash)
- Zero defects
- Flat
- As large a contact area for glue as feasible
- Thick enough (>1”) to make a deep tenon

Modern Plywood: *Not for Blocks!*

Gaps & fraying in glue contact

Weathered = risky

Paper thin hardwood veneer peels off

Delaminate and let fly

Calamity Voids

Standard Wood Glue is Fine

- Surfaces must match flat-to-flat. Otherwise glue only holds in limited rings, and that's frail & potentially dangerous
- PVA is fine, Elmer's, Titebond, etc., but must hold in clamps until well cured (overnight). Longer if it's cold. Do not try in temps <55 degrees F, as glue joint prone to failure.
- Epoxy, sure, but the benefits are neutral for wood-to-wood bonds, and the nuisance & cost not really worth it.
- Can use tailstock pressure, but that inactivates the lathe for hours

Two Ways for Jed to Clampett

CA Glue

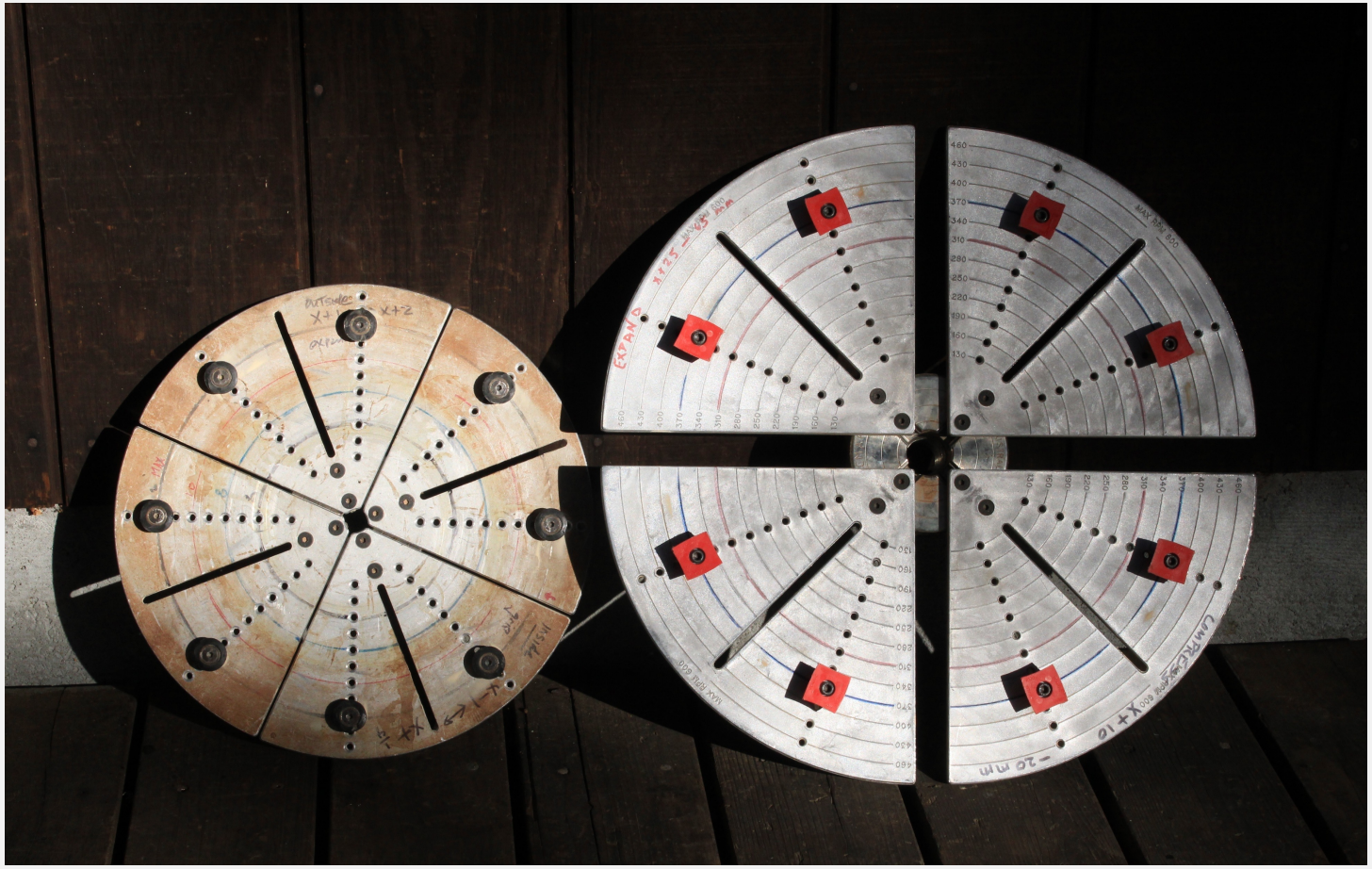
- Medium CA glue w accelerator works
- Can usually turn blank in <10 minutes
- But *only if joint is mechanically sound*.

CA glue in thickness can be brittle

Shatter with a catch and let fly

Adjustable Large Jaws

Immense Versatility, But Not for Everybody



Work great in compression mode for conical shapes

So easy!

Work well in expansion mode for undercut bowl & platter rims

Can grip a very large platter with adjustable jaws in expansion mode

Not too convenient to make jam chucks this size

Key is to use the ergonomic undercut rim to grip

Limits are the max diameter of the lathe “swing” as well as the size of the chuck jaws

Positives for Adjustable Jaws

- Fast...***if*** you have a dedicated chuck
- Use in both compression and expansion modes—versatile!
- Wide range—3” to 20”. (Make a formula!)
- Accommodates multiple concurrent projects
- Easy on and off. Keeps true center.
- Makes it easy to finish bottoms w gouge and sanding, but light cuts necessary
- Need to use tailstock until very end of process

Shortcomings

- Expensive ($250+ for chuck, $150+ for jaws)
- Tedious if you need to change out chuck jaws and mount expandable jaws each time.
- Small hassle to move 8 pegs to change diameter (Takes <90 seconds with battery screwdriver)
- Contact surface must be true plane...not workable for warped, natural edge, or irregulars
- Pegs are not rigid, on purpose, to avoid marring. Won't hold cylindrical shapes reliably unless tailstock engaged. Won't hold incurved shapes at all if gripped in compression.

“Chucking 201”
A Conversation Piece

High altitude Piñon coil rescued from a Southern Utah firewood pile

Faceplate first. Shimmed

End grain
Old dry wood
Not too secure!
8 long screws

Make a bottom tenon in sound wood

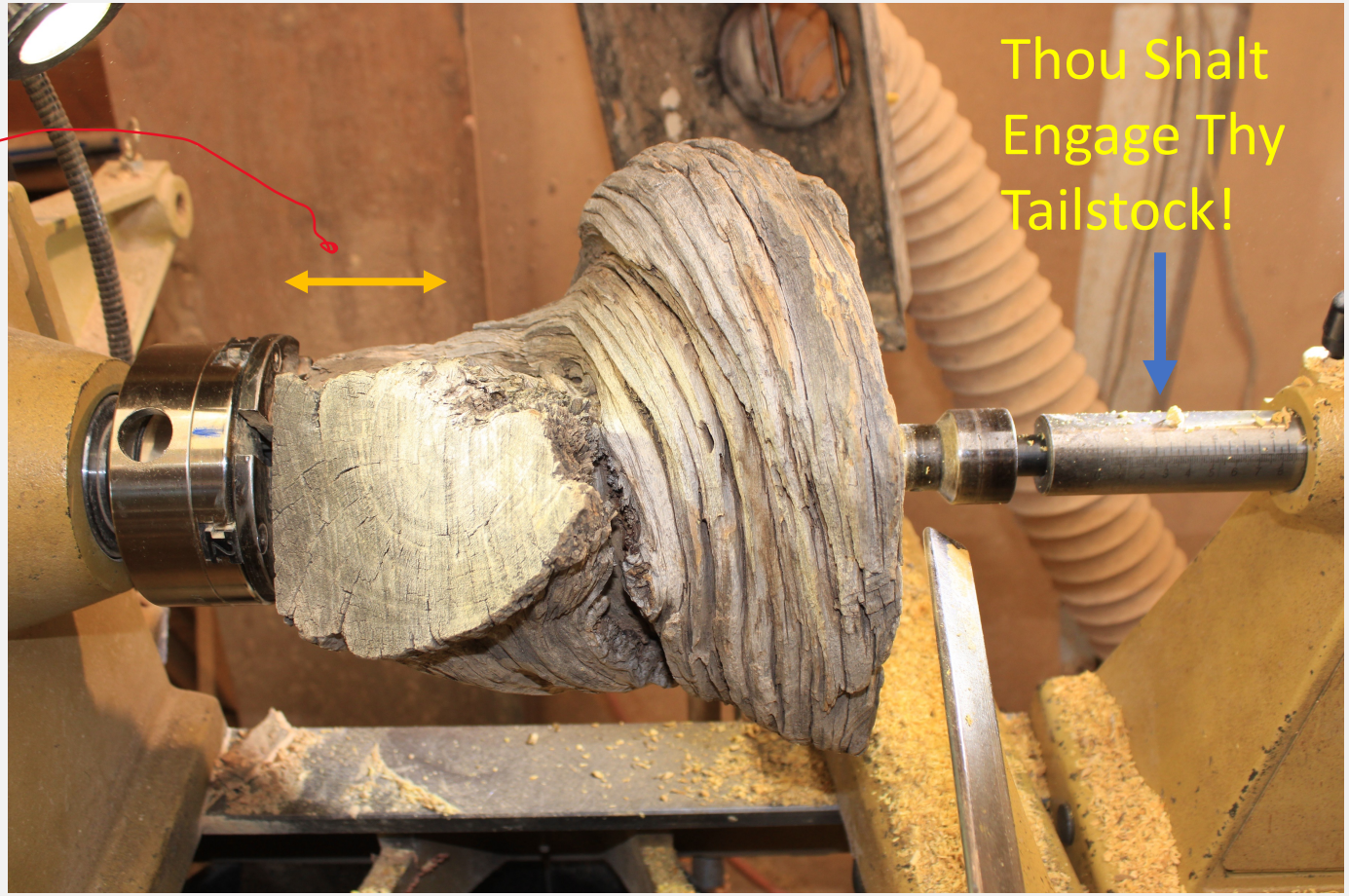
This tenon is temporary

Needs to be mechanically *perfect*, and as large as the blank will accommodate

Allows work on the top after the faceplate is removed

Grip That Tenon and Work the Top

Eventually this section will be deleted



Start hollowing the top

Deepen the depression in the top

Take your time!

Make a deep (temporary) mortise in the top to fit to large steel jaws

Essential that this mortise have a perfect fit.

Deeper than the mortise on a platter! (3/8”)

Lots of stress!

Flip it over, engage mortise on top w chuck. Pare away bottom until base is solid and flat. Make deep mortise in bottom in hard, dry wood. Engage tailstock as long as possible.

Using your new grip on the bottom, deepen the hollow on the top

Late cuts take out the temporary mortise as you expand the diameter of the opening

Tailstock not engaged

Slow RPM

Very light cuts

Sand, Rub out with Abrasive Wax

Done

Side View

Words to the Wise

Checking the Chucking

Don’t Rush

Get advice

Talk it over

Obey John’s *Law of Wells:*

Know when to stop

Craig Wargon and the Manzanita Challenge

Remember your PPE
Before you turn that lathe on!

Photo by Bill Hopkins

Enjoy Safely!

Specialty Demos by SCW Stalwarts... All current or past board officers, all current artists, constant teachers

Linda Anderson

Roy Holmberg

John Wells

Larry Dubia

Jam Chuck for
Undercut Bowl
Roy Holmberg

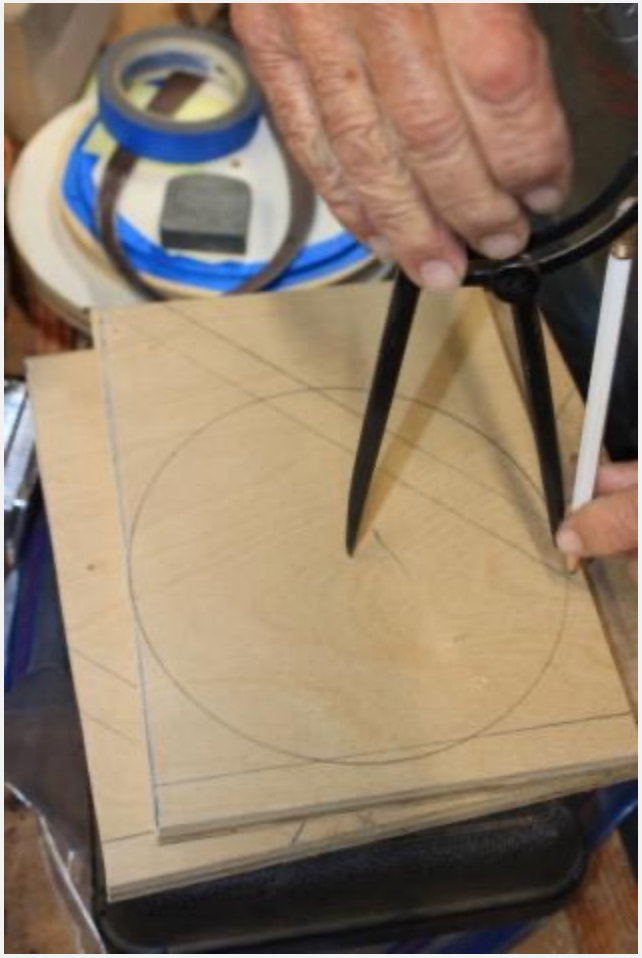
This shallow, undercut hard rock maple bowl has...

...a waste block with a finely crafted tenon on the bottom. It needs to go.

Measure diameter of the opening to be grasped

Actually, Roy used a ruler

Let’s make a jam chuck to fit snugly in the bowl mouth while removing the tenon



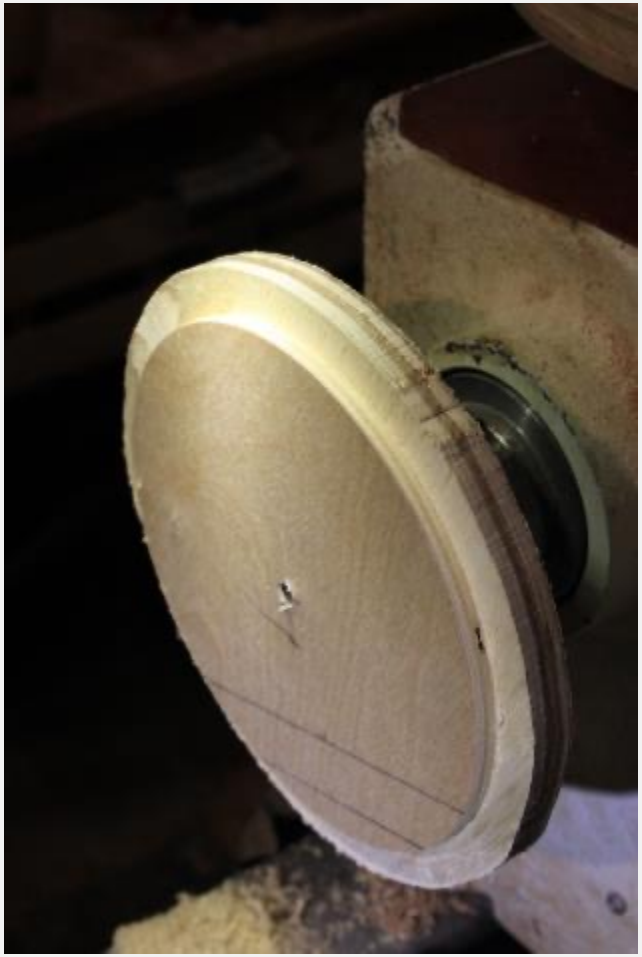
Cut out jam chuck blank ¾” ply About ½” oversize

Vertical pilot hole for screw chuck

Jam chuck has a penetrating member and flange—mark carefully, then refine

Approaching diameter for jam chuck
Use parting tool for square corner

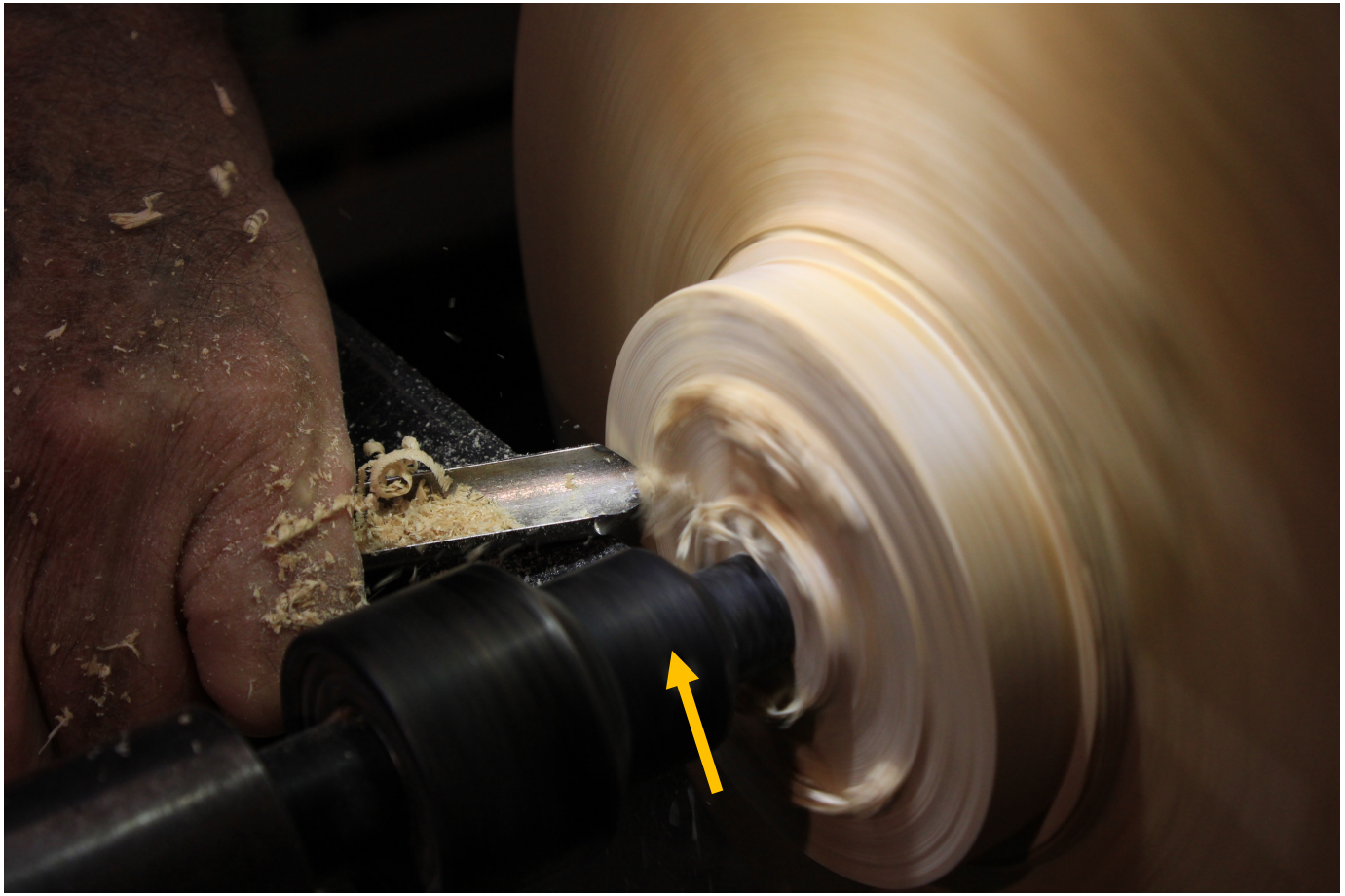
Jam chuck done



Tape edges to avoid scuffing bowl

Ready to receive the mouth of the bowl

Bowl secure on jam chuck with tailstock engaged. Take down the tenon



Refine bottom
Make a subtle rim for the foot

Going after the nub—
All that's left of the tenon

Tape blank to jam chuck after tailstock removed. Need security to delete nub without dismount.

Roy used shipping box tape

Another option

Tailstock retracted. Now work down the nub with a spindle gouge

Sand foot while it’s easy to access

Sand foot while it’s easy to access

3” disc fits inside the rim
No accident!

Ready for dismount

John Wells: Vacuum Chuck

The rig

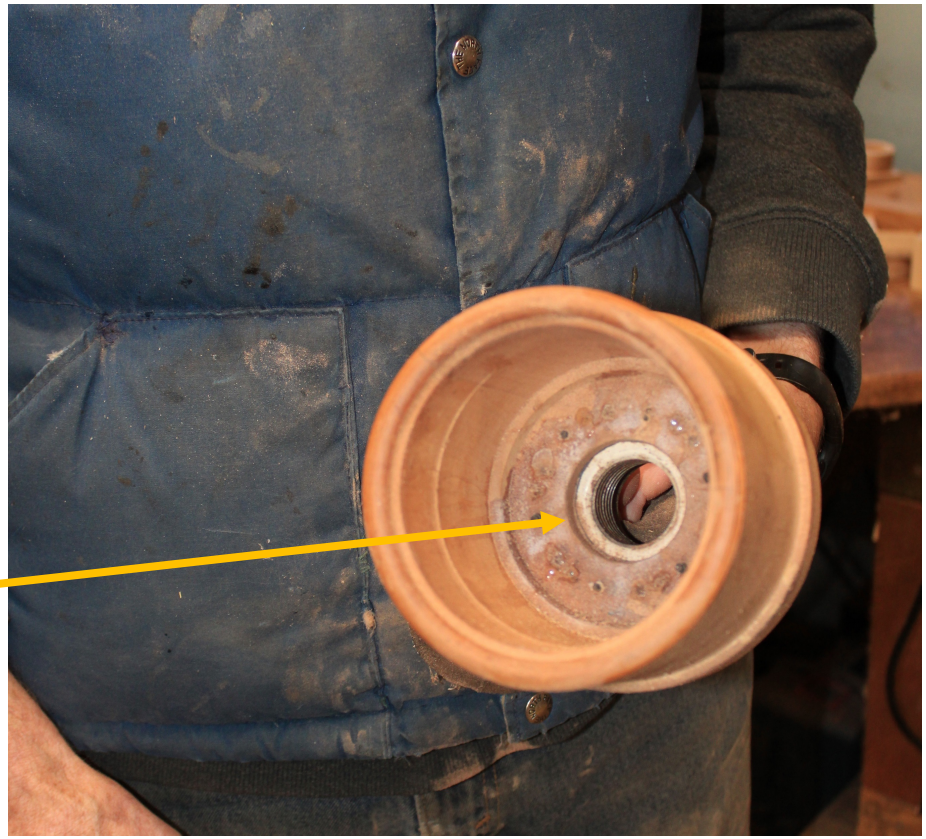
Hollow shaft fits inside headstock

Vacuum seated in headstock

Vacuum connector on shaft outboard from headstock

Quick-Connect hose attached

Shop made vacuum receptacle

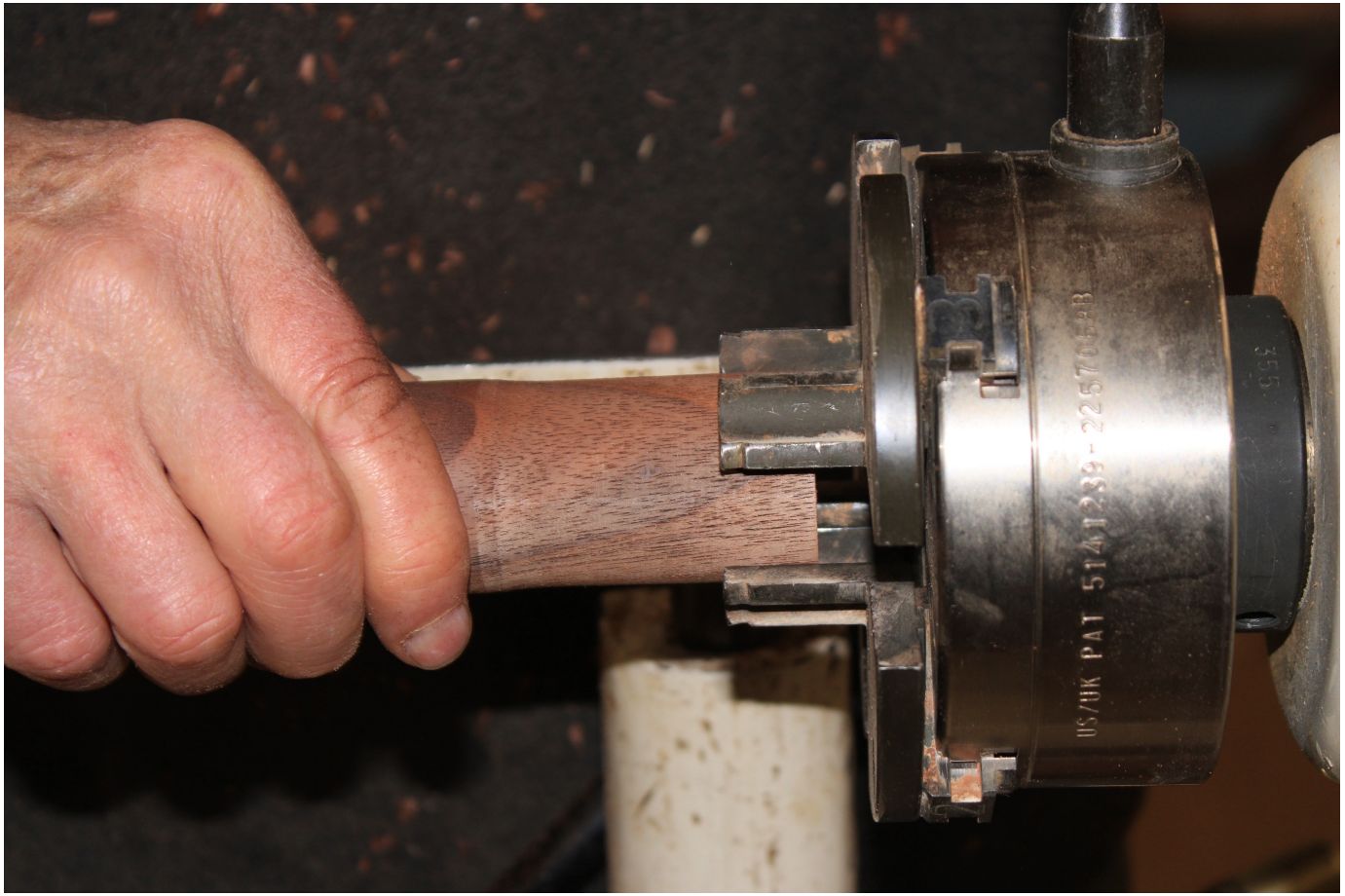


Receptacle ready for action

Compressible gasket for tight seal on inside of bowl

Bowl seated

Bonus chucking topic: Spindles



Check out:

making_tool_handles_demo_6-19-2021_final_comp.pdf (scwoodturners.org)

Clean Your Chuck: Larry Dubia

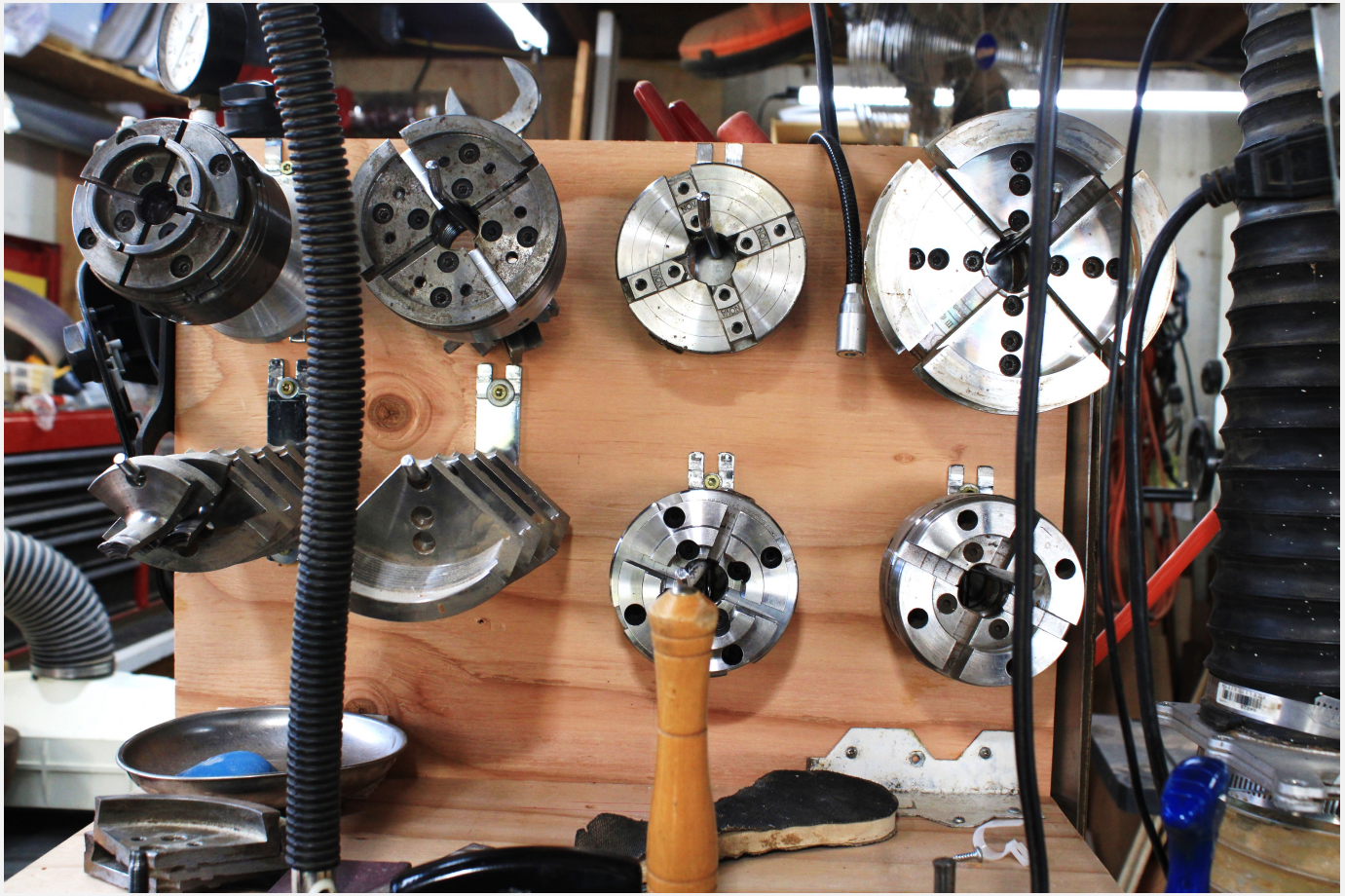
Happiness is...

...a warm shop!

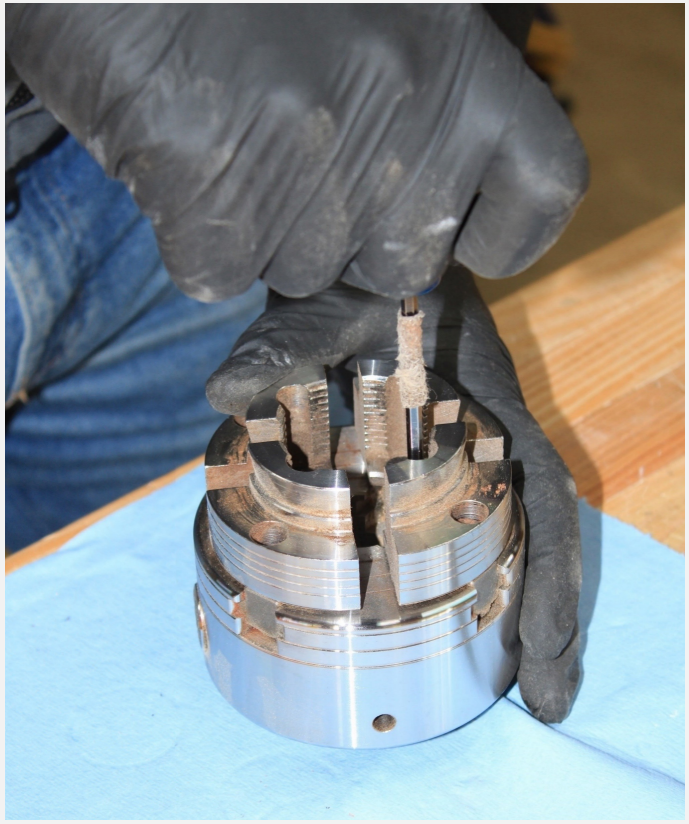
...and a clean chuck

Larry Dubia

Target Rich Environment



Remove the jaws
This is the easy part



Gunge apparent after 4 months There's more of that inside...

Remove retaining ring set screw and shaft thread adapter

Use split ring pliers to remove the retaining ring

Retaining ring out. Remove cap. Inner structures & gears now visible

Remove screw drive gears. It's disassembled, and…

…and full of crud

Drive gears in sequence—important! Ready to clean parts!

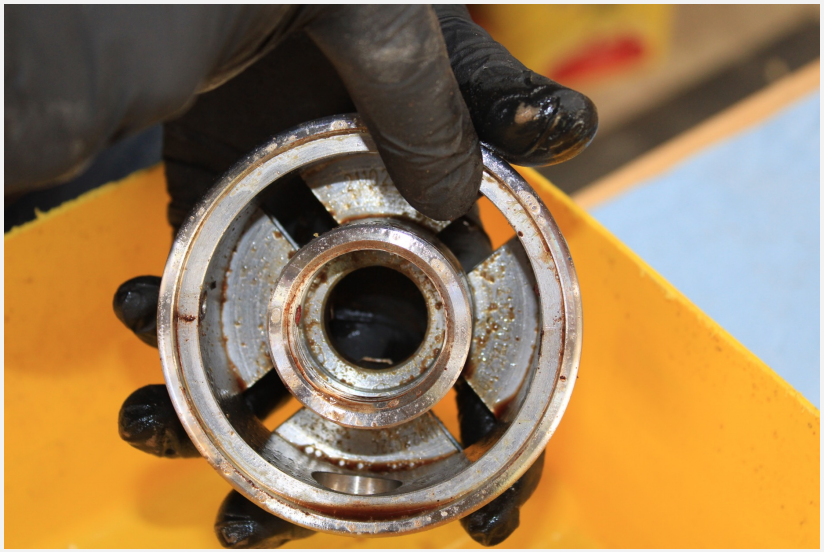
Degreaser/Solvent to scrub every surface. Lots of them!

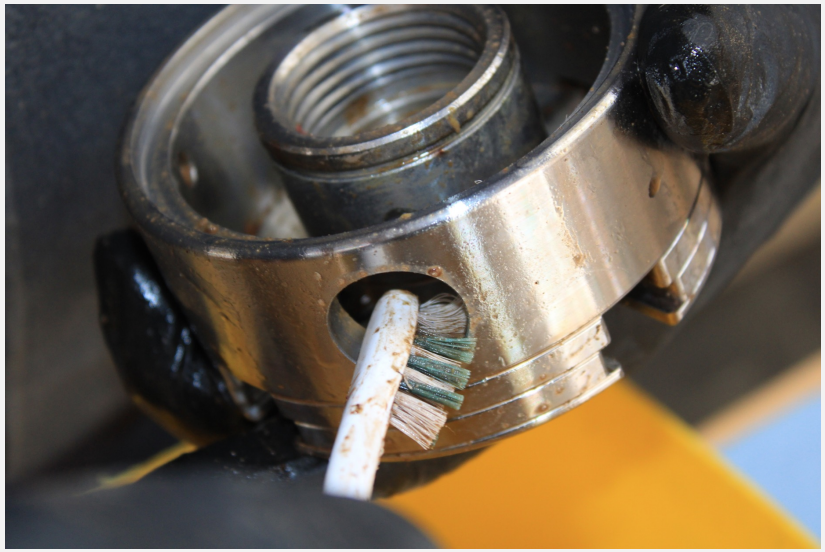
You can see why Larry likes this stuff!

So many nooks & crannies

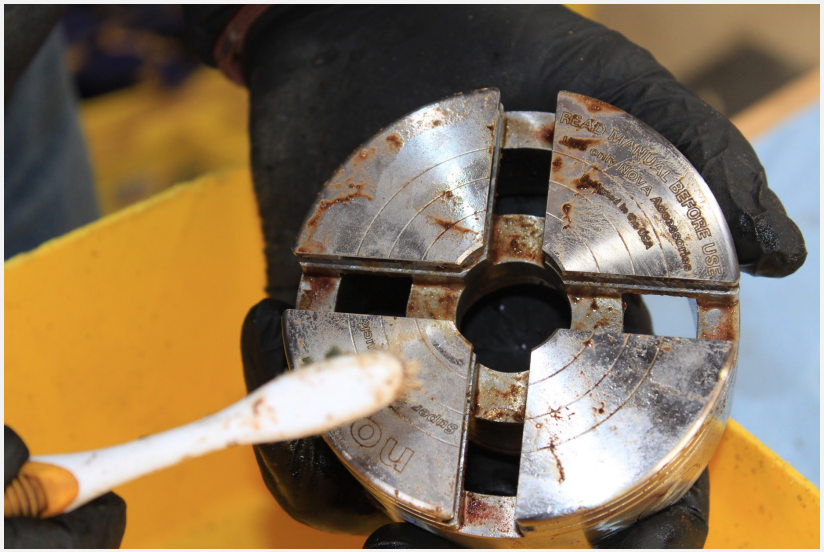
Patience and Persistence

Gunge is everywhere





Home stretch



Clean the slides & the sliders

Clean slider

Dirty

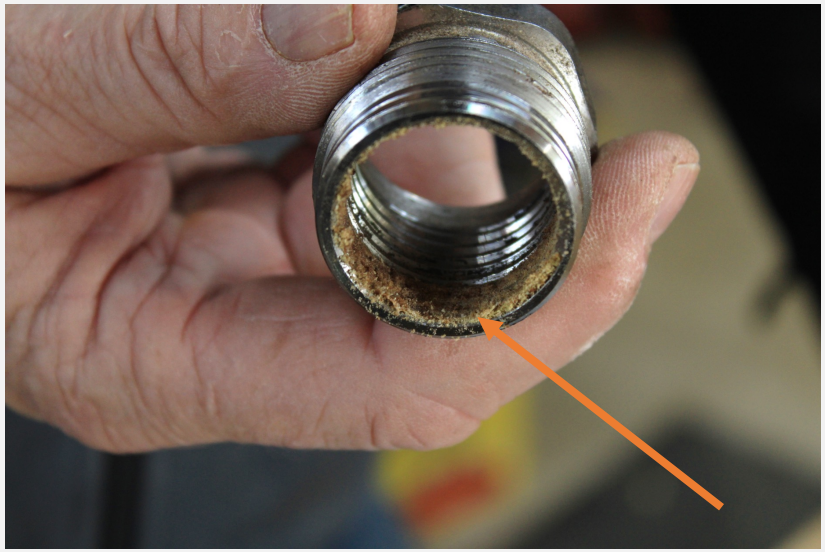
This is our standard

Put the sliders in place in order
Should meet perfectly in the middle

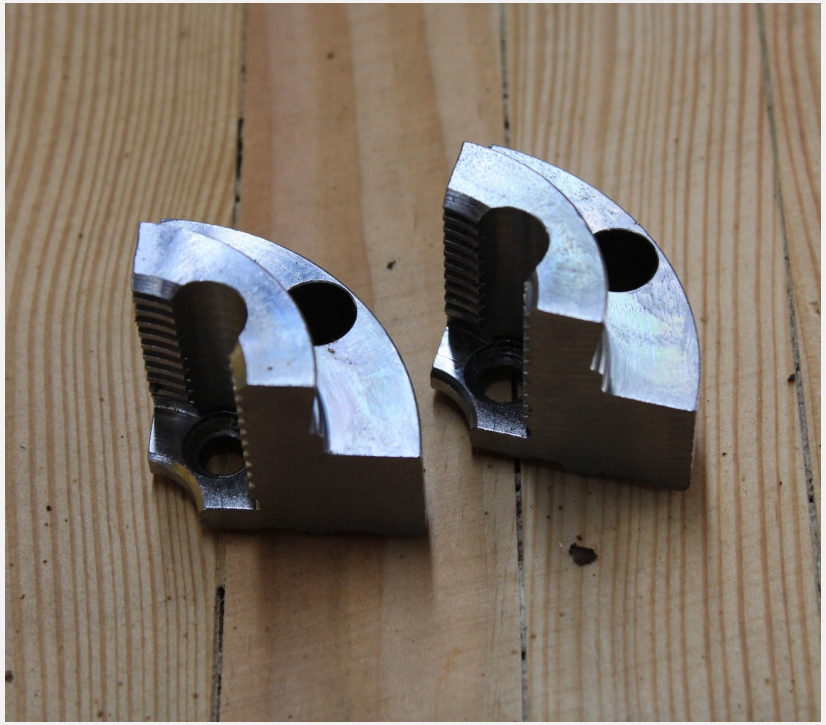
Secret lubrication material!

Drive gears back in & lubed
Plastic retaining cap returned

Replace the retaining set screw…
And remember the thread adapter!



Clean those gripping jaws and leave them sparkling!



Reattach the jaws. Watch ‘em shine!
PPE advice: Wear shades!

That’s it for today, Chuck!

This demo brought to you by Santa Cruz Woodturners

Wells Shoemaker

And special demonstrators

Linda Anderson
Larry Dubia
Roy Holmberg
John Wells