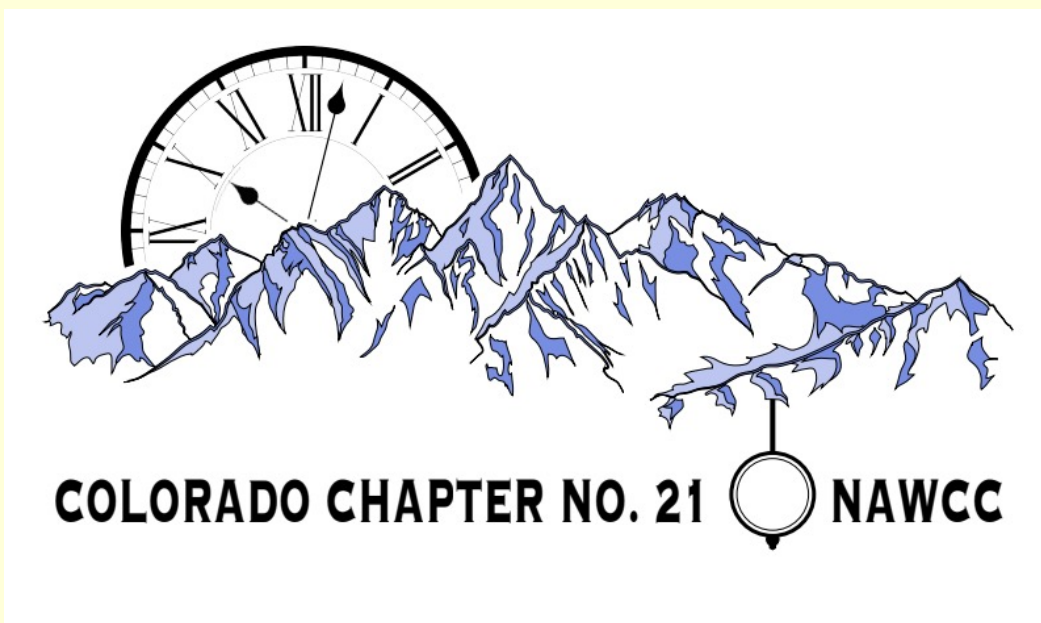


Clock Case Repair and Finishing



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NAWCC Chapter 21
May 8, 2023

Prologue

- Case repair is a week-long topic (if abbreviated)
 - We will touch on it here, but will not delve deeply
- Case Finishing and Refinishing is an art
 - Takes classroom time and practice
 - We will describe highlights today
- We will provide the basics here today
 - With illustrations and examples
 - You WILL see experiments!

Safety First!

- Many finishes and processes utilize VOCs and hazardous solvents
 - Paint removers contain Methylene Chloride
 - Lacquers contain Toluene, Xylene, Methanol
 - Acetone is a highly volatile mixture
- Exercise caution, use/wear proper protective equipment and keep materials away from sparks and flames: No Smoking!



Conserve, Restore, or Refinish?

- Conserve – Bring new life to existing finish
 - Mildly worn piece
 - 200 year old piece that's been cared for
- Restore – Salvage aspects/areas of existing finish
 - Failing finish
 - Little finish remaining
 - Finish in poor condition
- Refinish – Start over at bare wood
 - Intentional abuse in history
 - Item has little value in its current condition
 - May require making or replacing parts



Tips for Case Repair

- Use only period-original materials
 - Old wood for repair (when possible)
 - Great for making missing corner pieces, too
 - Closely matched veneer
 - Hide Glue for wood repair
 - Reversible materials for finishing or touch-up
- Patience is key
 - Sometimes it takes days to do a repair properly
 - Many steps and set time for materials used
- Supplement anything you learn here with reading
 - Extreme Restoration (Tom Temple) <http://www.xrestore.com/>
- Practice, Practice Practice



Tips for Case Repair 2

- For repair of loose joints
 - Clean old glue away for tight fit
 - Wet both sides with hide glue
 - Clamp and leave alone for 24 hours
 - “Squeeze out” can be cleaned up with a wet cloth
 - Any residue will clean up again with a wet cloth after drying

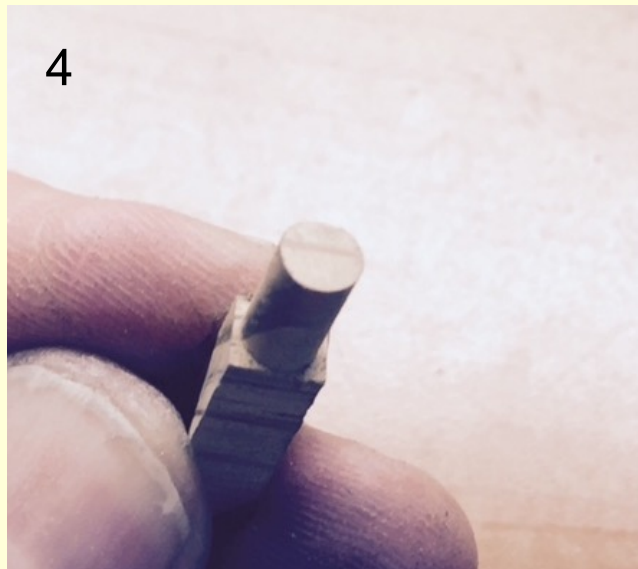
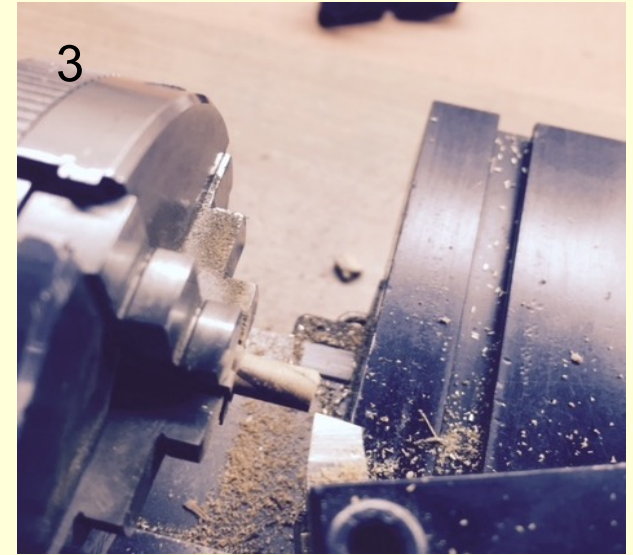


Filling Holes

- Best filler is old wood of same type you're filling
- Could use pre-made Dowels
 - Age/color/grain inappropriate!
- Easy to cut rectangular pieces
 - Then, mount in lathe and cut so grain is same as piece you're filling
 - Watch direction of grain when installing
 - Glue in with Hide Glue (leave slight protrusion)
 - Sand smooth—joint will be nearly invisible



How To: Making Plugs for Holes



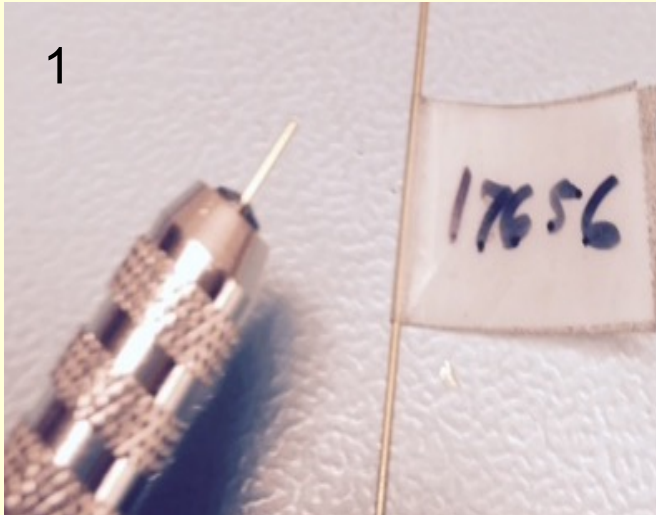
Finished Dowel: Note end grain direction!

Special Nails

- Sometimes the size nail you need isn't available
 - Or shanks are just too large for what you need
- You can make the size you need—it's easy
- Start with Timesavers Wire Assortment
 - 20302 is steel
 - 32297 is brass
- You'll need a pin vise to hold work
 - Then, a large vise to peen head



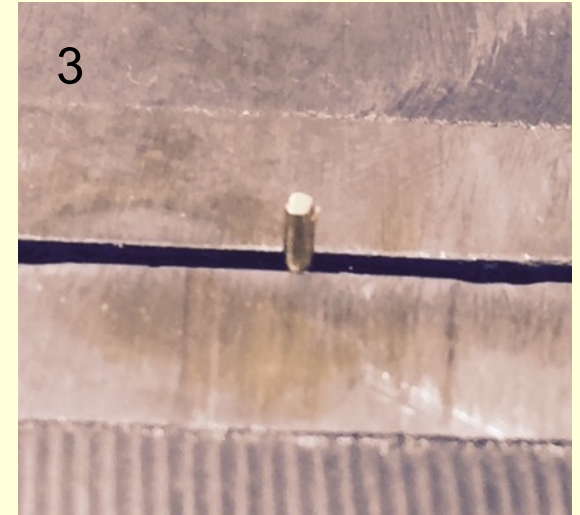
Nail Making



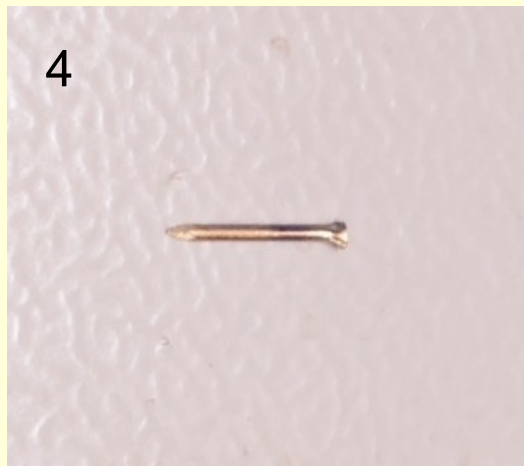
Cut Off to Desired Length $+.062''$



Present to WorkSharp; 3 sides



Protruding from Vise by $0.1''$



Finished Brass Nail $.032''$ Shank

Matching Woods

- Become adept at identifying woods
 - Procure and study samples
 - Compare samples to woods encountered
 - Also identify if case part is solid or veneered
 - <https://www.woodworkerssource.com/woodworkers-30-piece-sample-kit.html>



Some Commonly Encountered Species

from Woodworkers Source kit



Ebony (Macassar)



Elm



English Brown Oak



Hickory



Mahogany



Mahogany (Cuban)

Some Commonly Encountered Species

from Woodworkers Source kit



Maple



Maple (Birds Eye)



Maple (Burl)



Maple (Curly)



Maple (Quilted)



Red Oak

Some Commonly Encountered Species

from Woodworkers Source kit



White Oak



Pine



Poplar



Rosewood (Bolivian)



Rosewood (Brazilian)



Rosewood (E. Indian)

Some Commonly Encountered Species

from Woodworkers Source kit



Rosewood (Honduras)



Teak



Walnut



Walnut (Austrialian)



Walnut (Burl)



Walnut (French)

What about German woods?

(Indigenous)

- Spruce
- Pine
- Beech
- Oak



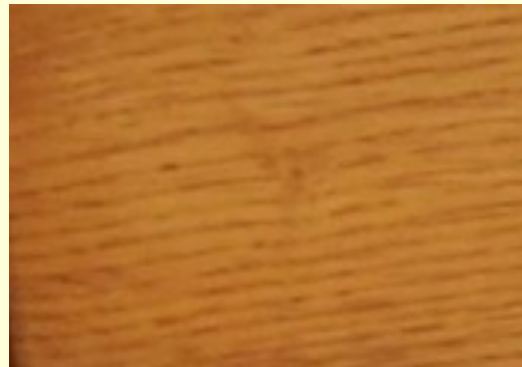
German Pine



German Beech

Many finishes were imitations
using these woods

Mahogany imported; not
indigenous to Germany

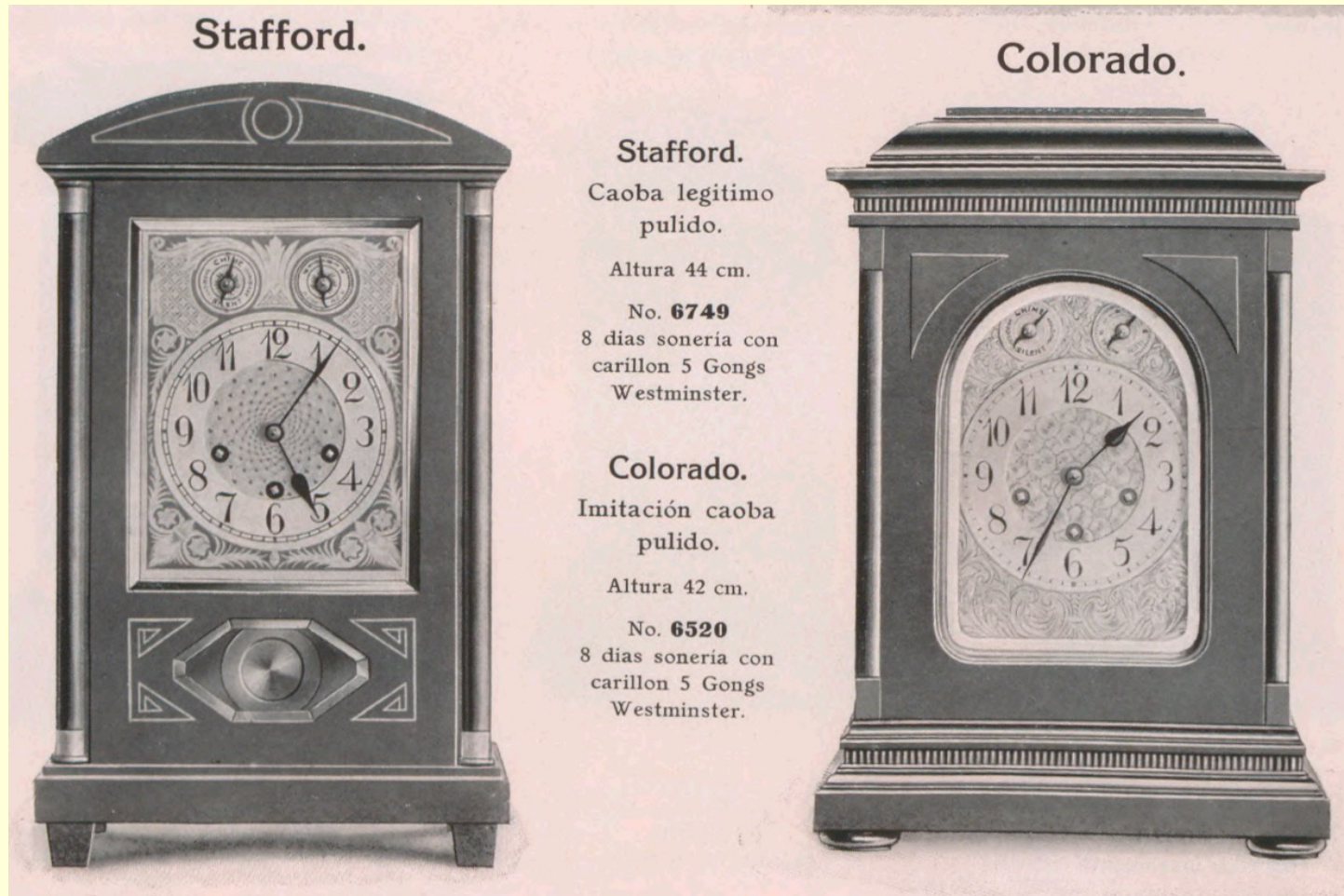


German Oak



German Spruce

Example Imitation Finish



Recent Junghans Project (pics supplied by customer)

Wood Glues

- Many “wood” glues available
 - Synthetic Vinyl based (not for clock cases)
 - Titebond Hide Glue
 - Great for quick repairs
 - Ground Hide Glue
 - Requires mixing/glue pot
 - Old Brown Glue
 - Good compromise between above
 - Keep bottle in hot tap water during use
 - Rabbit skin glue for flexibility
 - Bone glue for rigidity
- Using Hide Glue:
 - <http://oldbrown glue.com/index.php/old-brown-glue-videos>



Highland Woodworking
Homestead Finishing

Other Interesting Glues

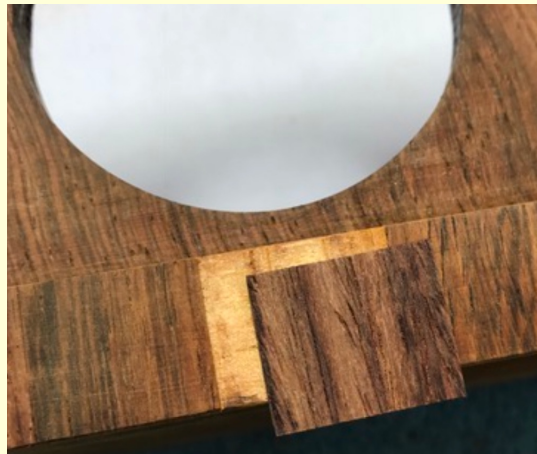
- 2P-10 Adhesive
 - Great for filling small wood blemishes instantly
 - Quick repair of small chips or loose veneer edges (again, instantly!)
- Spray Adhesive Super 77 or 90
 - Making sanding blocks (77)
 - Veneering curves (90) with backed veneers ONLY
- For repair of china cases:
 - HxTal
 - World's best optical epoxy
 - Used by museums
 - Used in English palaces
 - Expensive!



Veneer Repair

Covered in previous program (July 2019)

- Often small sections or edges of veneer is missing from clock cases
- Sometimes the entire case needs to be re-veneered
- Review material from previous program



What happens to finishes?

- UV breaks down finish/bleaches wood
- High humidity
 - Storing in basements, leaky garages etc.
- Using wrong cleaning product
 - Linseed oil sometimes softens shellac
 - Kotton Klenser removes/dulls finish
 - Water-based cleaners can get into wood
- High Heat (especially heat cycling)
 - Storing in attics
- Age or wood substrate shifts
- Veneer glue fails
- Pledge



<https://napervillehardwood.com/>

UV



<https://unsplash.com> by Sergey Lapunin

Moisture

Wood Finish Fallacies

Fiction	Fact
“Wood needs to be fed because it dries out.”	No. It is dead. It does NOT need to be fed; it needs to be protected. No woods used in clock cases (that I know of) contain any natural oils to dry out.
Grocery-store polishes like Pledge protect the finish.	They do more harm than good. Some are harsh. Many leave silicone on the surface which migrates and causes major problems later. Avoid them; use paste wax instead.
Most old clock case finishes are varnished.	The word “varnish” was used loosely for years. Today, “Varnish” generally applies to a class of autoxidizing finishes that cannot be removed with their own solvent. Most 1800-1900s clock cases were either finished with shellac or lacquer, both reversible with solvents.
Linseed oil mixed with turpentine is the best polish for antiques	Both linseed oil and turpentine will react with and soften finishes. Meanwhile, they will leave a film which attracts dirt and dust. Avoid oils other than paraffin oil.
Lemon and orange oil help preserve the wood and enrich the grain.	When applied to a finish, they never come in contact with the wood. These are acidic cleaning agents—and are not beneficial to finishes or woods. Avoid citric oils!
Tung oil was the original finish used to produce furniture and clocks in the 1800s and 1900s.	It would have taken over a week to produce a single item. Tung oil was not used for finishing production clocks.
I can get everything I need for refinishing a clock case at Big Box stores.	The only thing Big Box stores carry of value to our antique clock case restoration efforts is paint remover, solvents, BLO, and maybe brushes/containers. If a finish can be bought at Big Box, it does not belong on an antique clock case.

Restoring Finishes

- Priority should **ALWAYS** be to conserve existing finish
 - Most of the time this is possible
 - Removal is a **LAST** resort!



- If finish is crackled, alligatored, heat damaged or peeling (or not original and done poorly), then removal may be the only option
- If finish has been painted over with 3 coats of oil paint....

Conserving Finish

- Clean case with Mineral Spirits and clean cloth
- Prepare surface with 1200 wet-or-dry
 - Use Mineral Spirits as a lubricant
 - With the grain ONLY!
 - Go over entire piece
- Touch up visible scratches
 - Numerous methods
- Rub out with Mohawk Level II, Step 2, then 3
 - M730-0206, then M730-306
 - Some folks prefer 4F Pumice or Rottenstone and Paraffin Oil (very satin look)
 - A bit messy, but they work
 - But limited choices of sheens
- Apply a coat of wax with Antiquax Brown Wax



More on Mohawk Rubbing Compounds

From Mohawk Products catalog

Liquid Rubbing Compound (3-Step)

Level II (Medium to High Sheen)

STEP 1: Liquid Rubbing Compound

Used to remove overspray and wet sanding scratches on conventional and modern high tech finishes. Yields a high satin sheen. Use for hand or machine buffing.



STEP 2: Liquid Polishing Compound

Cleans and polishes while removing Step 1 Liquid Rubbing Compound scratches and swirl marks. Yields a medium gloss sheen. Use by hand or with machine buffers.

STEP 3: Liquid Finishing Compound

Removes swirl marks from Step 2 Liquid Polishing Compound and increases surface gloss. Leaves a "polished" look. Use by hand or with machine buffers.

QUART

M730-0106 Step 1 Rubbing Compound
 M730-0206 Step 2 Polishing Compound
 M730-0306 Step 3 Finishing Compound

← These are excellent choices for clock cases

Poly-Buf™ Rubbing Compound

Level III (Super High Sheen) Compounds used after Step 3 Finishing Compounds to achieve the high gloss "wet look." Start with the medium grade for initially rubbing out a refinished surface. Use the fine grade for rubbing fine scratches, and the extra fine grade for extra fine scratches and increasing the gloss.



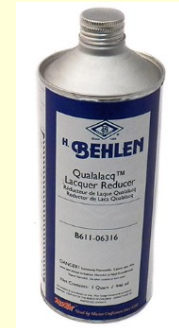
8 OZ.	GALLON	GRADE
M890-0014	M890-0017	Medium
M890-0044	M890-0047	Medium - Black
M890-0024	M890-0027	Fine
M890-0034	M890-0037	Extra - Fine

← Table tops and pianos!

Finishing Over

Applying Rubbing Coat

- Sometimes there just isn't enough finish left to rub out (or, the finish won't respond to it)
- After papering, consider a single coat of finish
 - Shellac if prior to 1920
 - Lacquer if after 1920
 - How do you know for sure?
- Evaluate finish first on inconspicuous place
 - Behkol shellac thinner (or ethanol) to test if finish is shellac
 - If no reaction, try Lacquer thinner
 - **Proper solvent will soften finish or make it sticky**



Finish Compatibility

Clean thoroughly and abrade first!

Base	Coat with	Compatible?	Comments
Old Shellac	New Shellac	One coat	Sometimes wrinkles will occur with successive coats. Somewhat better when 100% ethanol is solvent used to mix shellac
Old Shellac	Lacquer	OK	Clean surface well, then abrade with 600-800 and wipe thoroughly
New Shellac	Lacquer	OK if Dewaxed	Abrade with 400-600 and clean thoroughly. Buy and use only Dewaxed. Do NOT use flow out additives
New Shellac	New Shellac	OK if Dewaxed	Buy and use only Dewaxed. Do NOT use flow out additives
Old Lacquer	New Lacquer	OK	No problems generally but trial advised. Make sure base coat is CLEAN
New Lacquer	New Lacquer	OK	Make sure surface is clean, smooth
Lacquer	Shellac	Marginal—Not advised	Adhesion problems can sometimes result—abrade with 400-600; proceed with caution
Varnish or Poly	Lacquer	Not OK	Could lift and wrinkle depending on level of cure

Removing Finishes

- If original, finish can be removed with Acetone
 - Does not harm wood
 - Does not harm joints
 - Often leaves wood dye & original color in place!
 - WEAR GLOVES!



- Use Steel Wool on flat surfaces, toothbrushes to get into corners
- If not original e.g., someone used Polyurethane:
 - Clean with paint remover
 - Clean off residue with Acetone



Repairing Blemishes

(Holes, Nicks and Dings)

- Large holes: Wood plugs previously described
- Indentations:
 - Mix wood flour (sawdust) and 2P-10
 - Colored TimberMate
 - Stick Shellac (not preferred)
- Small nicks or dings
 - Touch-up wax sticks
 - Clear Grain filler (more later)
 - Or do nothing



+



Sandpaper

- Many Choices
 - Garnet
 - Aluminum oxide (27 different types!)
 - Silicon Carbide (Wetordry)
 - Ceramic
- Form Factor
 - Rolls, sheets, sponges, pads
- Additives
 - Stearated
- Myriad of backings
 - Cloth (X, J)
 - Paper (A, C most common weights with A being lighter)
 - Multiple scales
 - Most common in USA is CAMI
- Which type of paper do I use??

Abrasive Grading System

The most common grading systems used in North America are CAMI, FEPA and micron grading. CAMI and FEPA are similar in grades up to about 220. Beyond that, they diverge greatly.

CAMI (U.S. Std.)	FEPA (P-scale)	Micron (μ)
1200		5
1000		9
800		
600	1200	15
500	1000	
400	800	20
360	600	
320	500 400	30
280	360	40
240	320 280 240	45 50
220	220	60
180	180	
150		80
120	150	100
100	120	
80	100	150 180
60	80 60	
50	50	
40	40	
36	36	
30	30	
24		
20	24	
16	20	

The three systems grade particle size to different tolerances but by the same methods. From the coarsest grits up to about 220, particles are graded through a series of wire mesh screens. The smaller grit sizes are graded through an air- or water-flotation process that separates particles by weight.

Medium
100
Medium

CAMI-graded abrasives tolerate the widest range of particle sizes but are perfectly good for sanding wood.

P100

P-graded abrasives are to tighter tolerances than the CAMI grades.

60 μ
60 μ
60 μ

Micron-graded abrasives are most uniform in size and best for sanding finishes.

www.jamarco.com/91b_Technical/sandpaper

Choosing Sandpaper

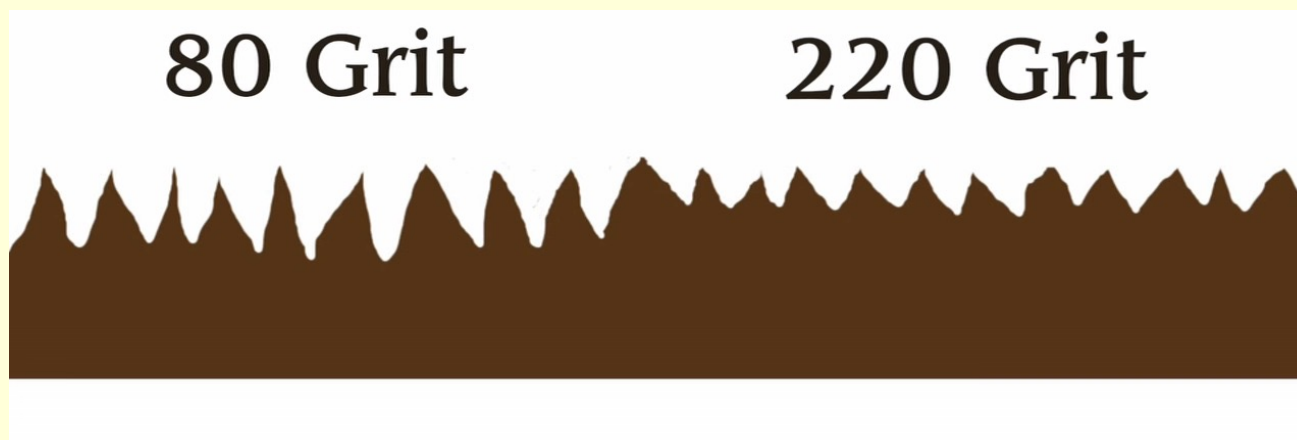
- We'll refer to them as we need them
 - Primarily by CAMI grit
 - Often by type of abrasive
 - Wetordry backings A (413Q) or C (431Q)
 - Sometimes difficult to get 413Q; but it's softer
- In general:
 - Aluminum oxide lasts longest for sanding wood
 - Garnet for blotch prone woods (when dye/stain involved)
 - And best choice with orbital sanders
 - SiC used for sanding finishes
 - Ceramic (e.g. aluminum zirconia) not used much
 - Machine removal, which we rarely do



amazon.com

Avoid Skipping Grits

- Skipping grits can leave scratches that show through in the finish
- Example: Difficult to remove 80 grit scratches with 220 grit



The Wood Whisperer: Sanding Efficiency Video

<https://www.youtube.com/watch?v=XtkluWcW3cE>

Finishes

- **Shellac:**
 - Homestead Products Orange Dewaxed
 - Orange has been difficult to procure from them
 - Shellac.net products excellent option
 - Mix with 100% Ethanol (my preference)
 - But, Bekhol is still good option with bare wood
- **Lacquer:** Mohawk or Behlen Gloss Lacquer
 - Small spray cans of Stew-Mac Guitar Lacquer for small touch ups or sealing glaze (preferred)
 - For large projects, use spray equipment and M612-25807 or M610-1407 Lacquers
- **Note:** If you can buy it at Big Box, it is NOT a finish for an antique clock



Shellac Thinners

- Recommend mixing/thinning shellac with Ethyl Alcohol (Ethanol)
 - Diesel (95% pure)
 - Everclear 200 proof (100% pure)
 - Lab Alley 200 proof (100% pure) Food Grade
- Can use Bekhol; sometimes denaturants cause issues
- DO NOT ATTEMPT TO DRINK THESE PRODUCTS!



Grain Fillers—General





Oak, Mahogany, Ash, Walnut

- Better with than without
 - Grain was usually filled on clock cases
 - Eliminating leaves unprofessional look
 - Dead giveaway of a poor refinishing job
- All grain fillers will shrink
 - Will require multiple coats over days
 - Take your time
 - Use a seal coat first
- Can use to color and accentuate grain
 - Appears that many original makers did this
 - Wash coat of shellac to prevent staining wood



Grain Fillers—Top Picks

Oak, Mahogany, Ash, Walnut

Product	Reversible?	Sandable?	Fill Ingredient	Report Card
AquaCoat 	Acetone removes it	Yes--Medium	Ethyl Cellulose Lacquer (clear)	B+ 3-4 coats needed on oak
Pumice/Shellac 	Yes	Not easy	Silica Aluminum Oxide	Depends on Application
TimberMate 	Yes	Yes—Easiest Fast drying	“Mineral Filler”	A 2 coats needed Pre-Tinted Accentuate Grain
Tinted Drywall Compound 	Yes	Yes--Easy	Silica Limestone Mica	B Tinted from white Grain size may vary

TimberMate Experiment

Deeply grained Red Oak

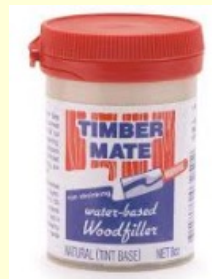
- Stack Up:
 - Pad coat of 2 lb Shellac on bare wood
 - 1 Coat of TimberMate sanded when dry
 - Pad coat of 2 lb Shellac over TimberMate
 - Additional Coat of TimberMate sanded when dry
 - 4-5 thin padded on “French Polish” coats with 2 lb shellac



Grain color is emphasized, but surface is very smooth

Grain Fill Recommendations

- First Choice: TimberMate
 - Keep on hand Natural, Ebony, Walnut, Mahogany
 - Tint if needed with analines to customize color
 - Or mix together for desired color
- Alternate (second) Choice: Aqua Coat
 - Clear fill
 - Optionally with closed grain woods to lessen finish coats
 - Use to eliminate cross grain scratches: will make them invisible



Adding Color

- Four Fundamental Approaches:
 - Stain
 - Pigments lay on top of the wood surface
 - Depend on surface “topography” to work
 - Usually contain varnish or oil based **binders**
 - Example: Minwax stains
 - **NOT RECOMMENDED FOR VINTAGE CLOCKS**
 - Dye
 - Penetrates deep into the fibers of the wood
 - Gives great depth
 - Example: Aniline powders, SolarLux, or TransTint
 - Toner
 - Lacquer colored spray finishes most common
 - Somewhat controllable (with practice)
 - Glazing
 - A color coat sandwiched in between finish coats
 - Very controllable and many special effects possible
 - Can mix your own
- A fifth method is combining above



Dye Options—For Refinishing

- **Mohawk SolarLux:** Pre-mixed and ready to go; not space-friendly. Tints shellac or lacquer well.
- **Aniline Powders:** Mix with shellac, lacquer, ethanol, Bekhol, water
- **TransTint:** Good compromise between all of the above, great color depth
 - Contain Glycol Ethers; soluble in water, alcohol (shellac), lacquers and their thinners
 - <https://www.youtube.com/watch?v=k5ygOsqYsOY>



<https://www.mohawkfinishing.com/>



<https://www.woodmagazine.com/materials-guide/finishes/aniline-dyes>



<https://www.rockler.com/transtint-dyes>

Why not stain?

- **Great products for many uses, but...**
- **We're not recommending** for vintage clocks
- Stains are pigment-based
 - Pigments catch on the wood surface
 - Color depends on surface topography
 - Could blotch 100-year old woods
 - Could react with reversible top coat finishes in a bad way
- Few if any are reversible



[amazon.com](https://www.amazon.com)



Mixing Custom Glazes

Start with base:

- 1 part Boiled Linseed oil (binder)
- 2 parts Mineral Spirits (vehicle)
- Add Japan Drier 2-5% volume; few drops (aka Cobalt Drier)

Add Color:

- Artist's Oil Colors until desired color is achieved
- For most clock projects, a 2-ounce batch is plenty
- Lamp black quickly darkens finish

A nice cherry glaze:

- 1.5 ounces of base per above (3 tablespoons)
- 2-inch long sausage of Van Dyke Brown
- 2-inch sausage of Burnt Sienna
- $\frac{3}{4}$ " sausage of Lamp Black



Van Dyke Brown: Deepest Brown
Raw Umber: Deep Brown
Burnt Umber: Red Brown
Raw Sienna: Yellow Brown
Burnt Sienna: Reddest Brown
Lamp Black: Darkens tone

*Grumbacher is a good brand
Available on Amazon & elsewhere*

Example Ingredients

Custom Glaze



amazon.com \$8.45



amazon.com \$15.47



amazon.com \$14.95

DEMONSTRATIONS:

Padding Shellac

Adding Color with Shellac

Coloring with Glaze



Some References

- Clock Case Refinishing and Restoration
 - Craig Burgess, Lone Star 124, 2006
- Spray Finishing Made Simple
 - Jeff Jewitt, Taunton Press, 2010
- Woodworkers Journal
 - Many issues; great source of ideas
- Finishing
 - Jeff Jewitt, Taunton Press, 2004
- Understanding Wood Finishing
 - Bob Flexner, Readers Digest Association, 1994
- Extreme Restoration
 - Tom Temple, www.xrestore.com, 2004
- <http://www.highlandwoodworking.com>
 - Veneering supplies and samplers, hide glues, aniline dyes (water soluble)
- <http://www.oldbrownglue.com/index.php/old-brown-glue-videos>
 - Patrick Edwards videos showing detailed veneering (marquetry) techniques using Hide Glue, veneer clamping and vacuuming