TIPS AND TRICKS

CLOCK REPAIR PHILOSOPHIES TO HELP SIMPLIFY AND ELEVATE THE QUALITY OF YOUR REPAIR

WHAT WILL BE COVERED-

- Repairing pallet faces on the deadbeat escapement
- The spring barrel
  - Opening / closing a barrel
  - Bushing a barrel without a lathe
  - The mainspring
  - Mainspring Calculations
  - Replacing teeth
  - Making a gear cutter
- Repairing the crutch on a time and strike movement
- The 400 day suspension spring
- Pulleys
- Suspension spring
- Easily changing lantern pinion wires
- Filing
- Making taps, dies, screws
- Cleaning clean pivot holes
- Square holes
- Riveting
- Reamers and drills
- Drilling round material in the lathe
- Machining fragile pieces
- French Polish
- Thread and tap clearance chart.
- Beat Book

THE SPRING BARREL

OPENING AND CLOSING A BARREL

BARRELS

- Many barrels have become almost unusable do to improper opening and closing.
- I have seen large hammer blows, pliers, "c" clamps, and vise grips to close barrels.
- Many repair people use old screwdrivers, or some sort of other pry tool, or slam then on a counter to remove the barrel cover. This not only distorts the cover, but will cause the cover bearing surface to not be in alignment with the barrel body bearing surface. This can cause the barrel not to run true on its arbor which can cause binding in the barrel or with the mating pinion.
- Improper handing of these delicate parts is the cause of many clock failures and comebacks.

TOOLS NEEDED FOR OPENING / CLOSING BARREL

ARBOR PRESS

TOOLS NEEDED FOR OPENING / CLOSING BARREL

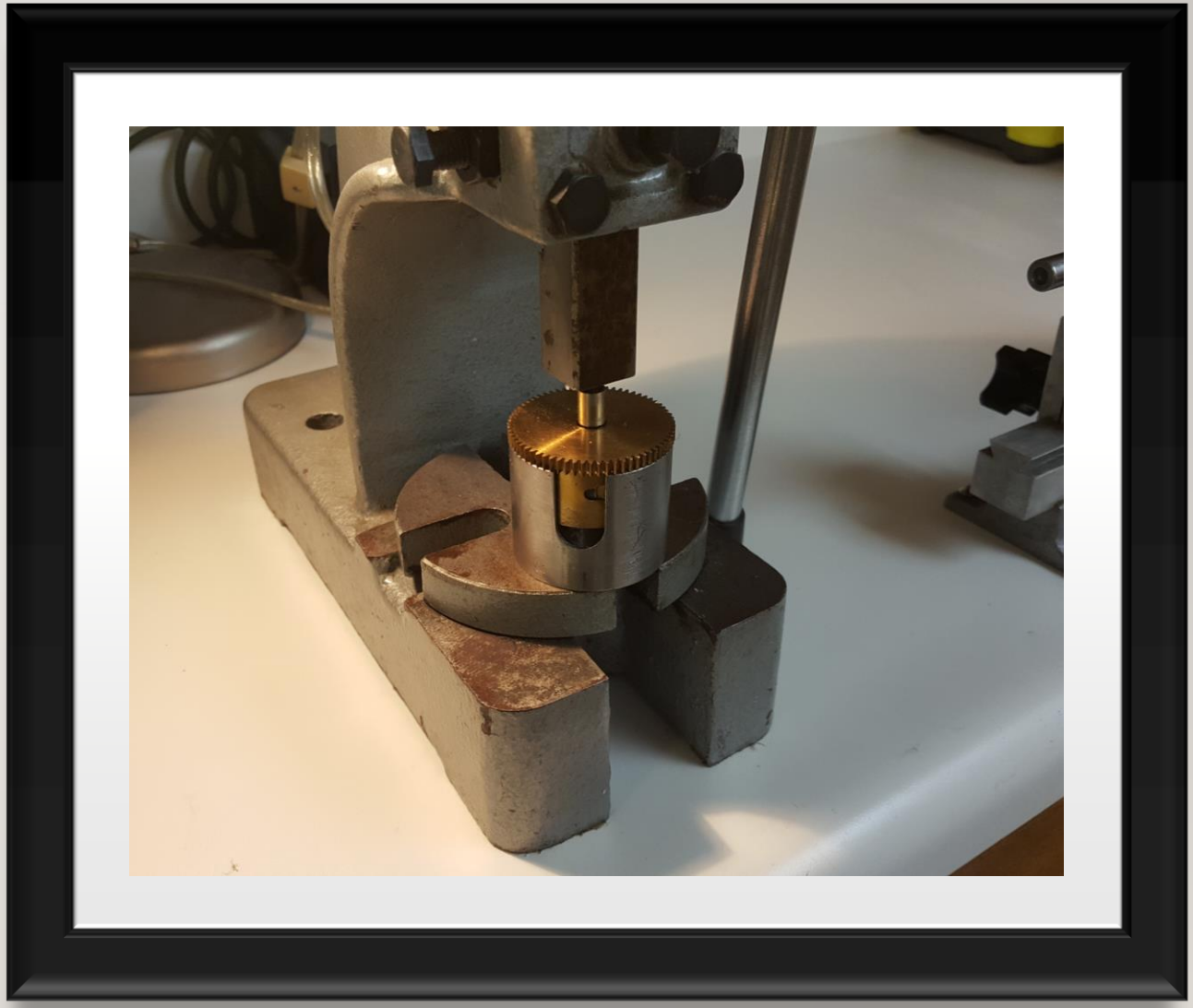
SLEEVES FROM SPRING WINDER

TOOLS NEEDED FOR OPENING / CLOSING BARREL

Closing Pipe

OPENING A BARREL

- Sleeve over the barrel and gently press the cover off.
- I like to mark the position of the cover in relation to the barrel body if the cover doesn't have a slot in it.

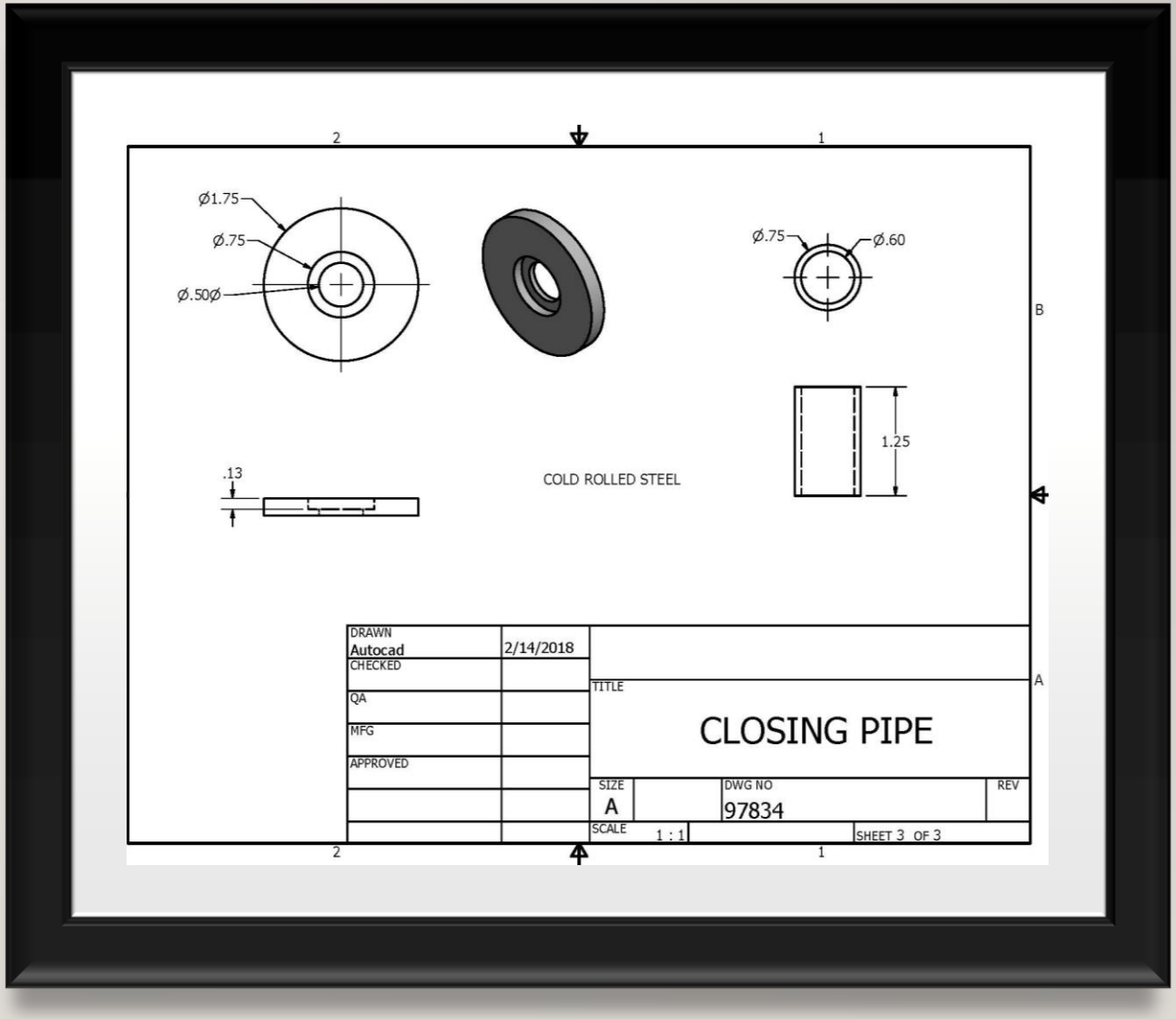


CLOSING A BARREL

- Using the closing tube, press the cover back on.
- Align the cover slot if it has one to the barrel spring hook inside the barrel.

CLOSING PIPE DRAWING

- Made from cold rolled steal.



ADJUST END-SHAKE

- Adjusting end-shake in the barrel is very important. Many of the covers are so distorted from prying that they need to be checked after assembly.
- I assemble the barrel without the mainspring and check for end-shake.
- Adjust the cover in an arbor press with a ball bearing.

THE SPRING BARREL

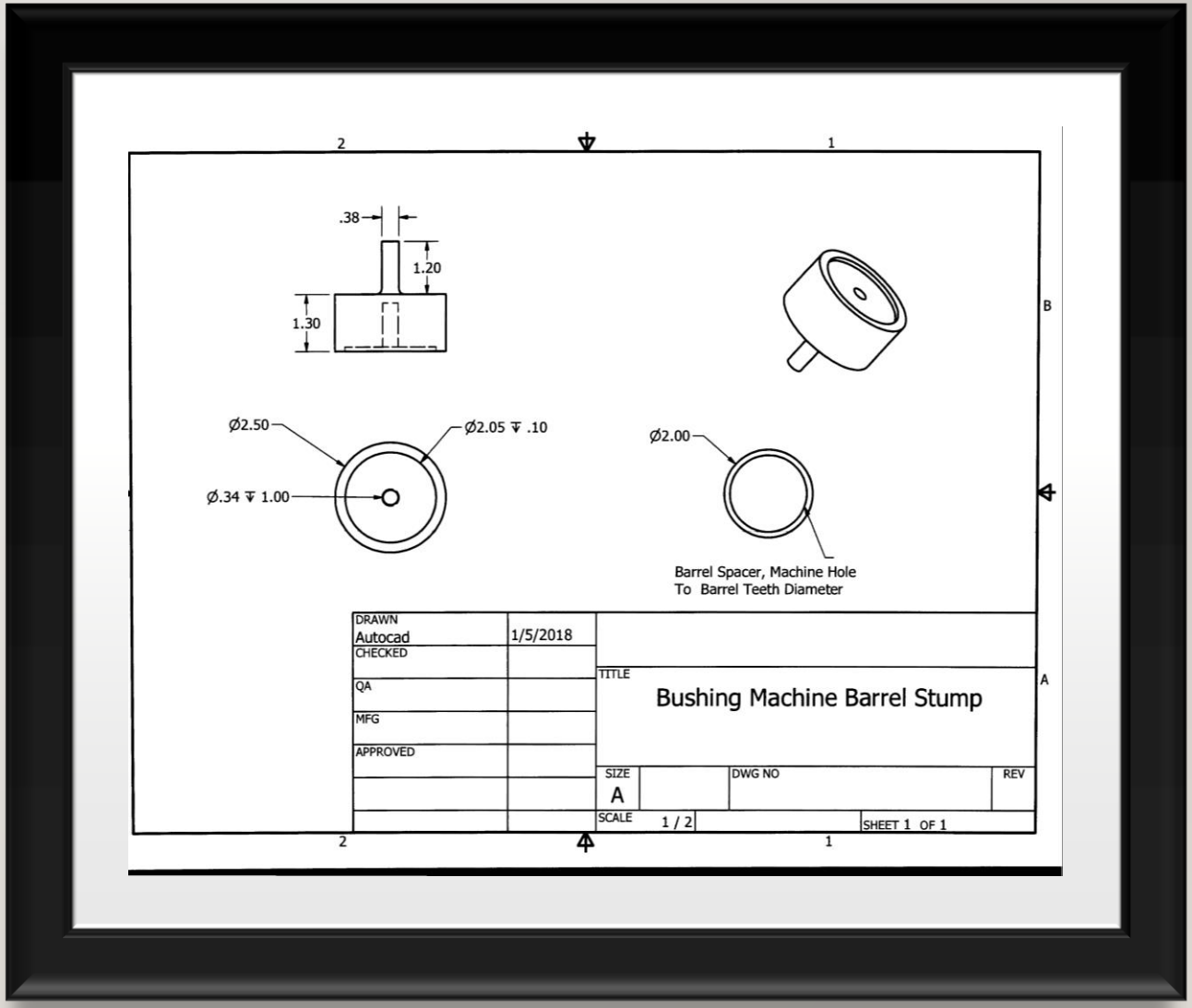
BUSHING A BARREL

DAMAGED BARREL

- This came to me from another clock shop to be made.
- It was chucked in a 6 jaw chuck and was being line bored in the lathe to true up the hole.
- The barrel spun, and ruined the teeth.
- This is why I bush my barrels in a bushing machine.

BUSHING STUMP #1

- This is made to be used with a clock bushing machine.
- This particular design is for the Bergeon bushing machine.
- The end dimension can be changed to fit any style of bushing machine.
- This tool is NOT to be used under mechanical power.



BARREL STUMP

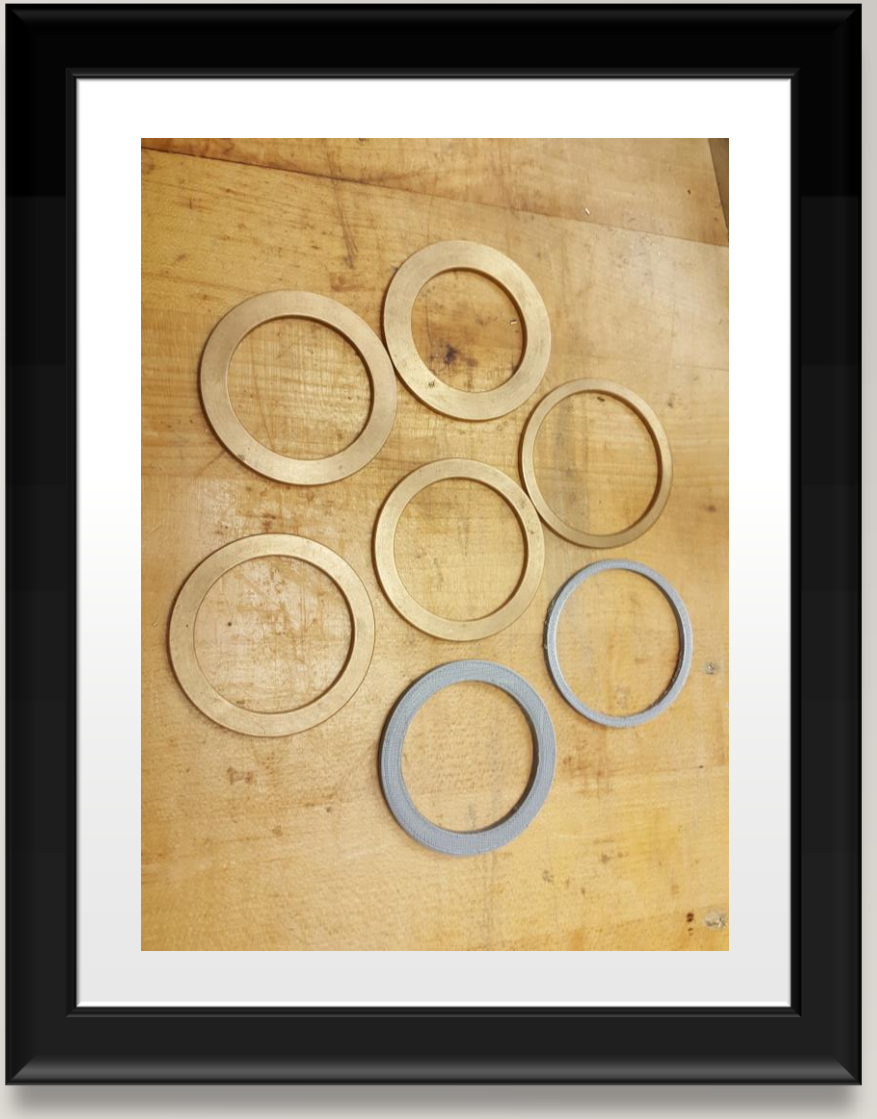
- I machined this out of brass but would suggest aluminum or 12L14 steel.

MAKING ALIGNMENT RINGS

Made of steel, brass, wood, or plastic.

I bought brass tube 2” in diameter and with 1.25” hole.

Saw off the length, true in lathe, and bore the center to the desired diameter.



ALIGNMENT RINGS

- Sheet of plastic bought at the hardware store.
- This makes perfect rings.

ALIGNMENT RINGS

- Use a hole saw to cut the circle out with a drill press.

ALIGNMENT RINGS

- Mount the ring to an arbor.

ALIGNMENT RINGS

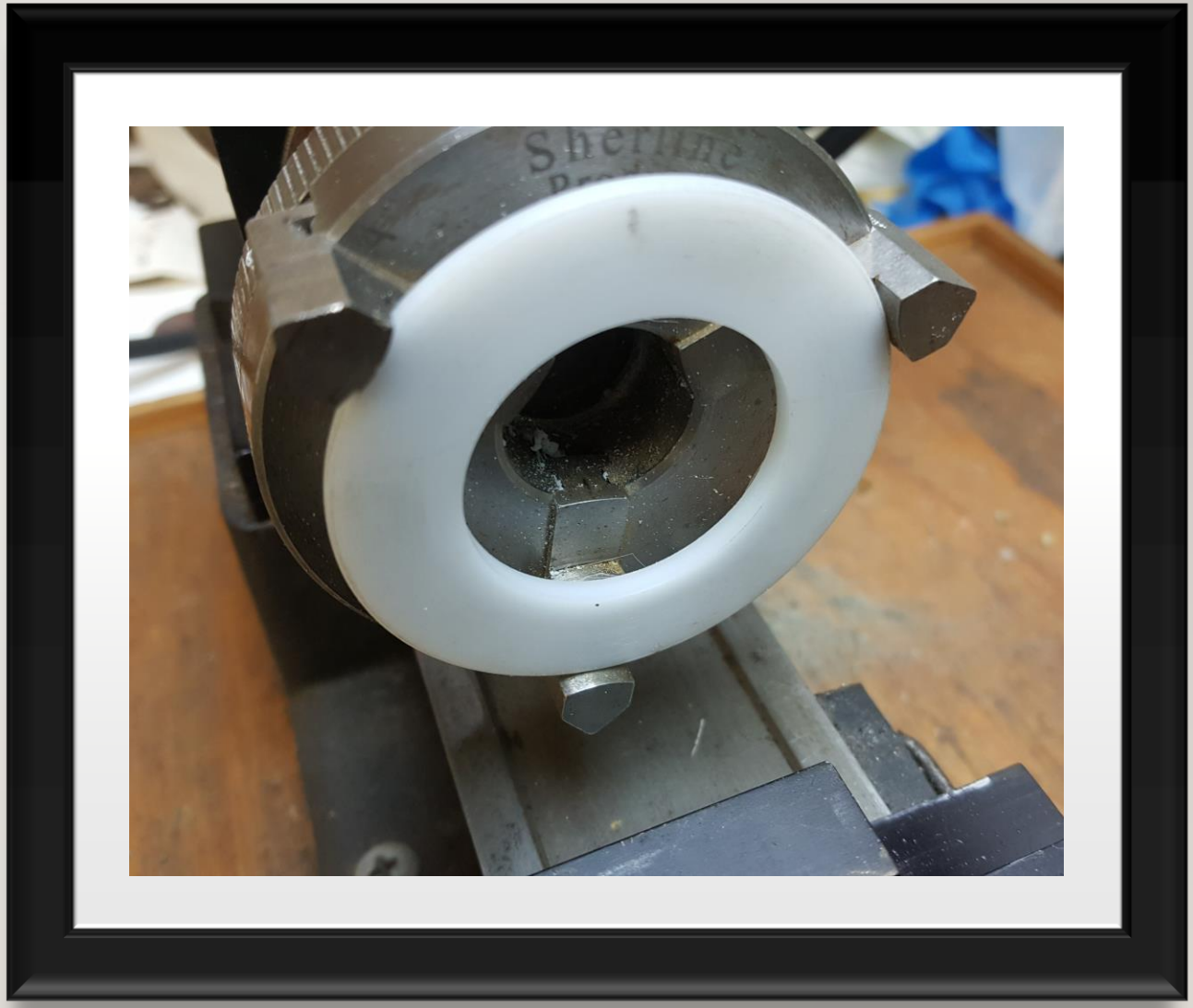
- Turn the outside diameter of the ring.

ALIGNMENT RINGS

- Mount the ring into a 3 jaw chuck.

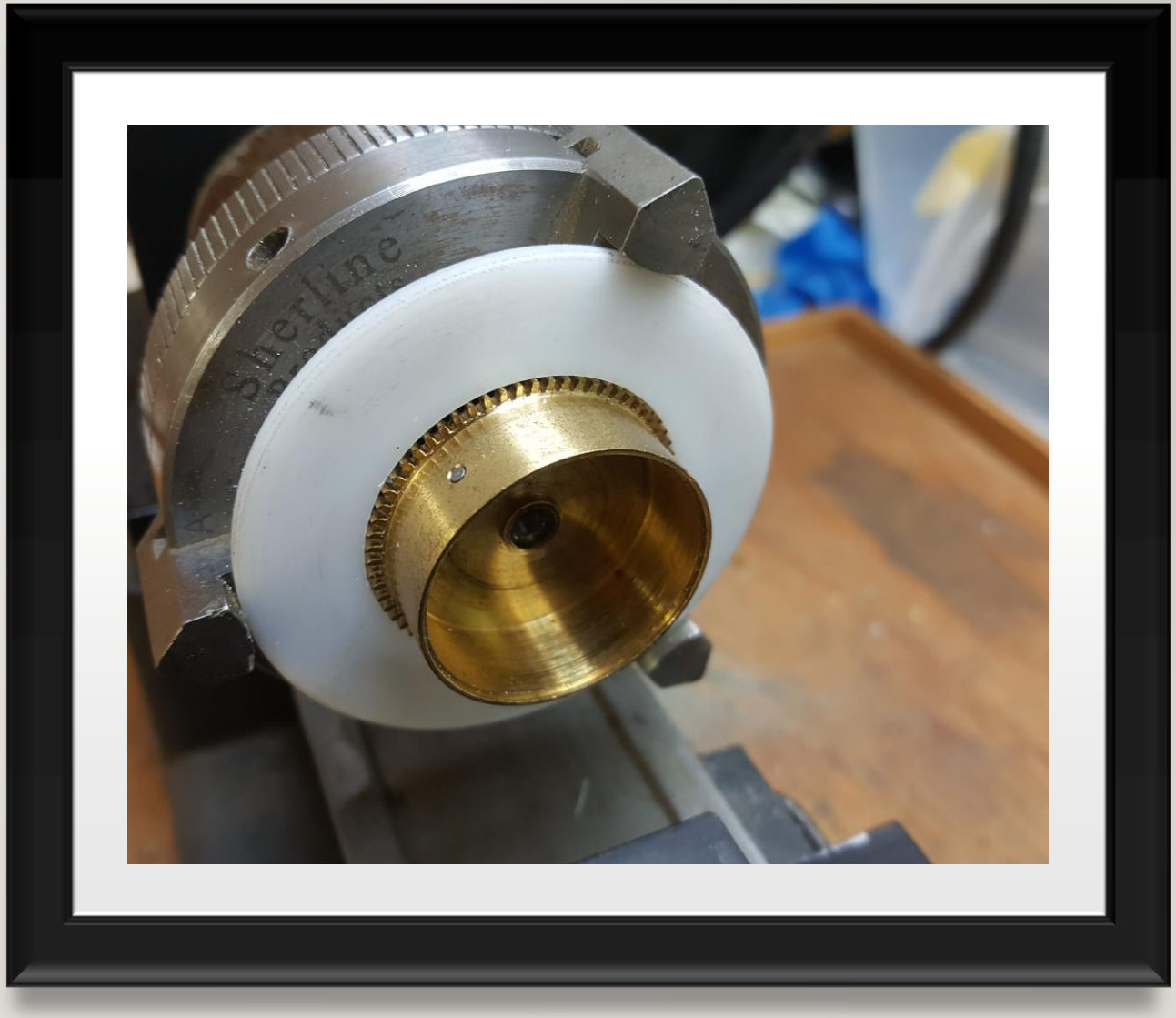
ALIGNMENT RINGS

- Bore to the inside diameter.



ALIGNMENT RINGS

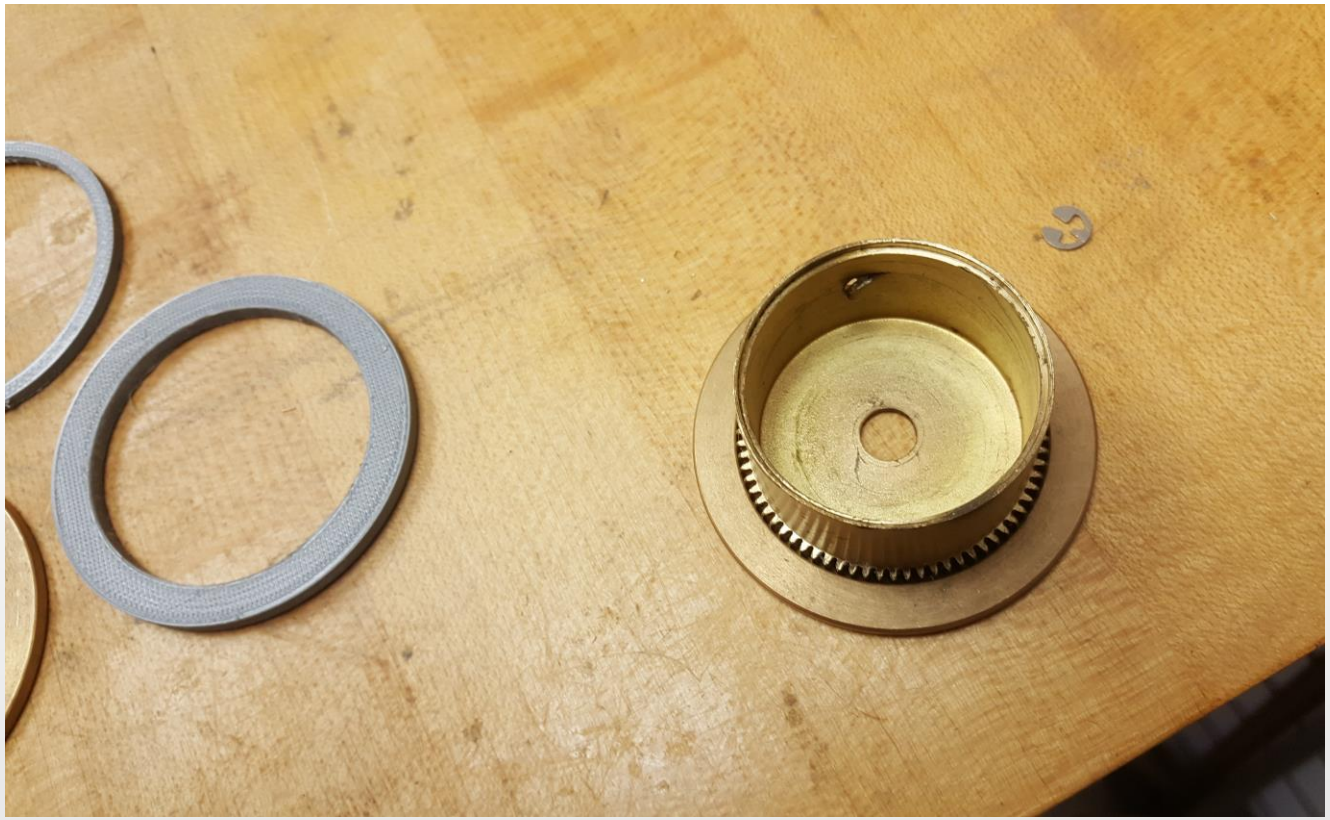
- Test fit with the barrel.



ALIGNMENT RINGS

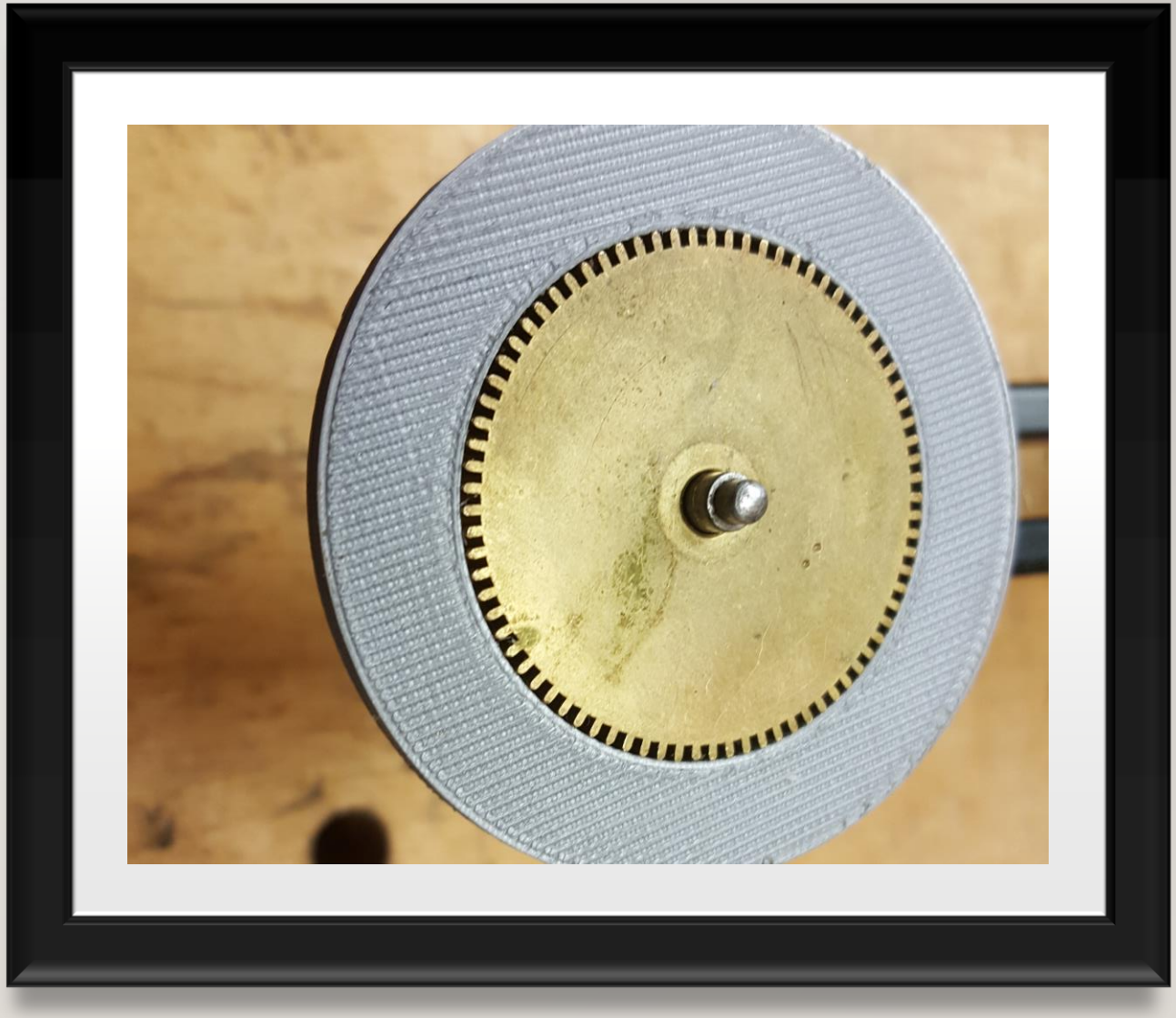
- Remember, it could seem that the rings take a long time to make.
- Once you have the ring, you have it forever.
- I "file" my rings by clock manufacture, then by the movement number.
  - Seth Thomas "124, time barrel"
  - French clocks only have 3 different sizes, so far.
  - Modern clocks have only 5 different sizes.
- An investment up front, pays off down the road.

ALIGNMENT RINGS ON BARREL



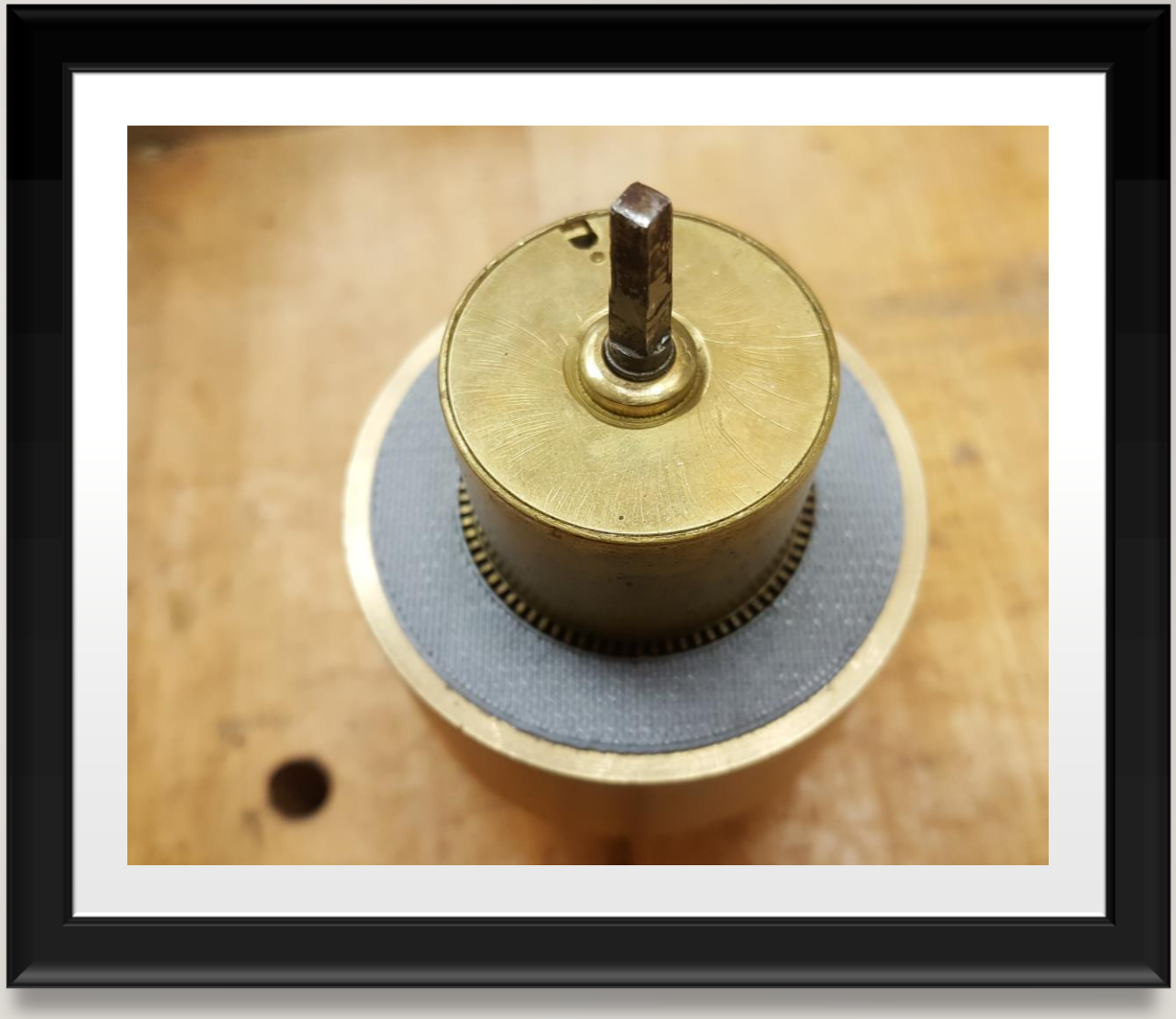
ALIGNMENT RING ON FRENCH BARREL

3D PRINTED RING FOR A FRENCH BARREL.

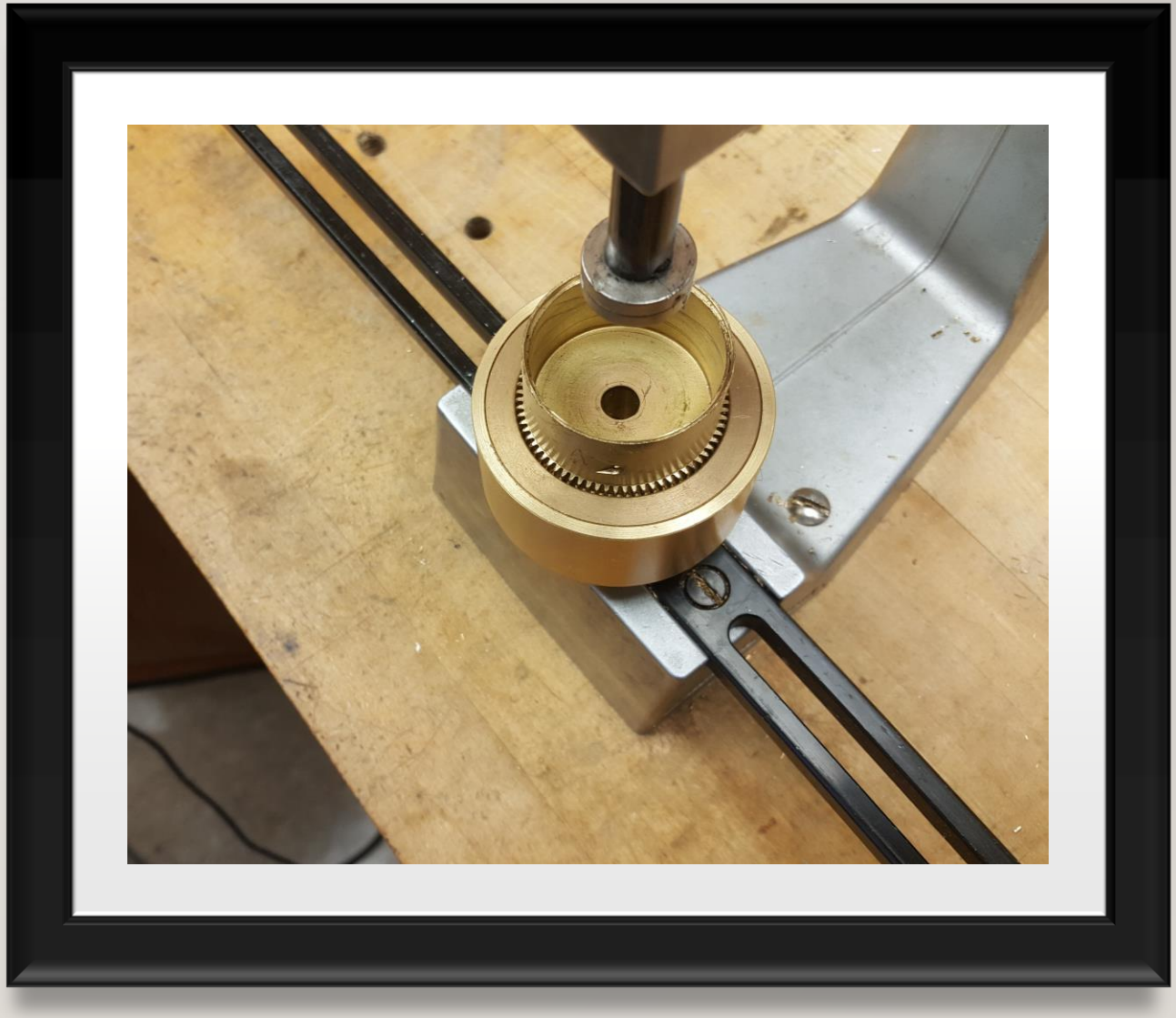


ALIGNMENT RING ON BARREL

- 3D printed ring.

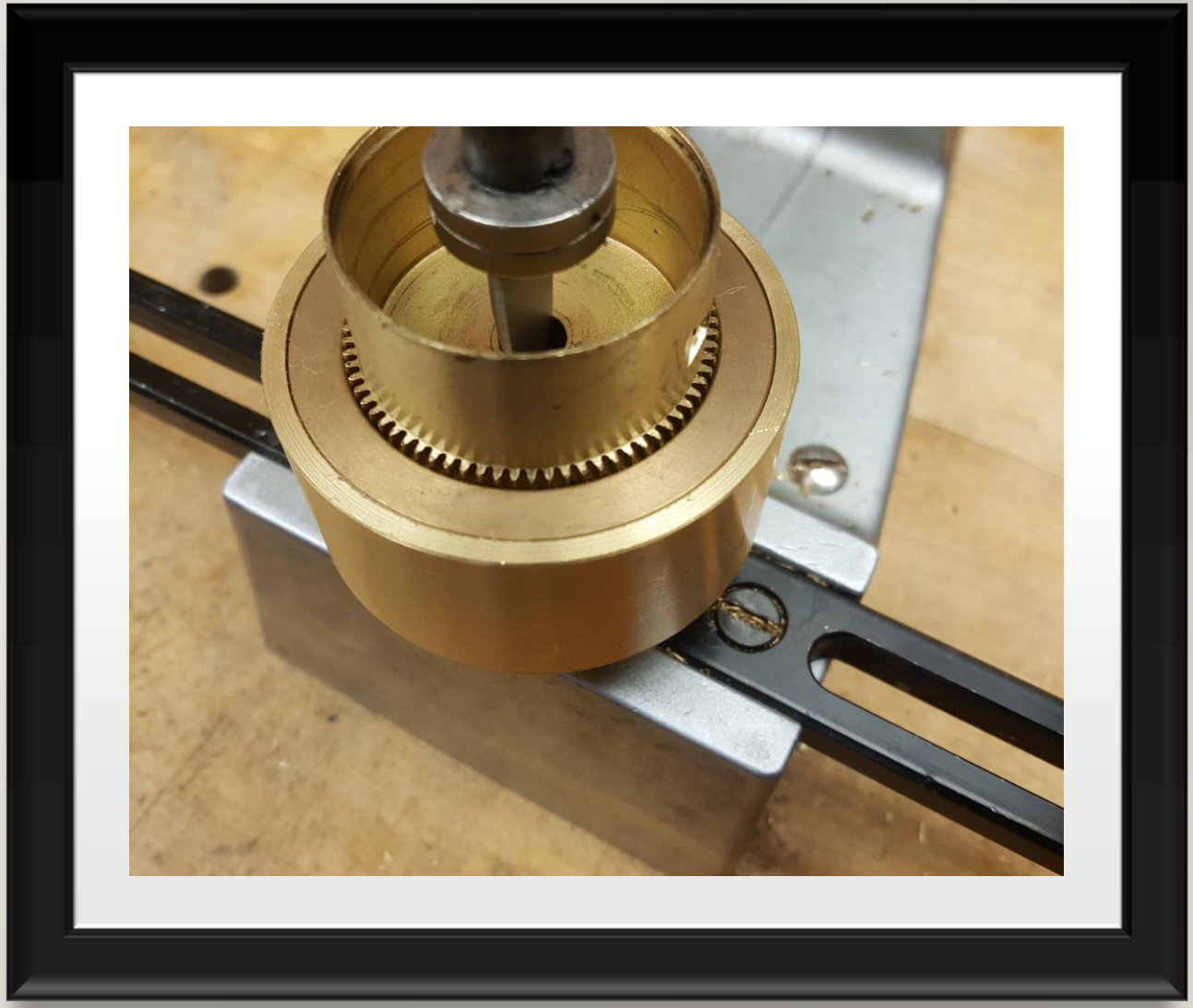


ALIGNMENT RING ON BARREL, IN FIXTURE



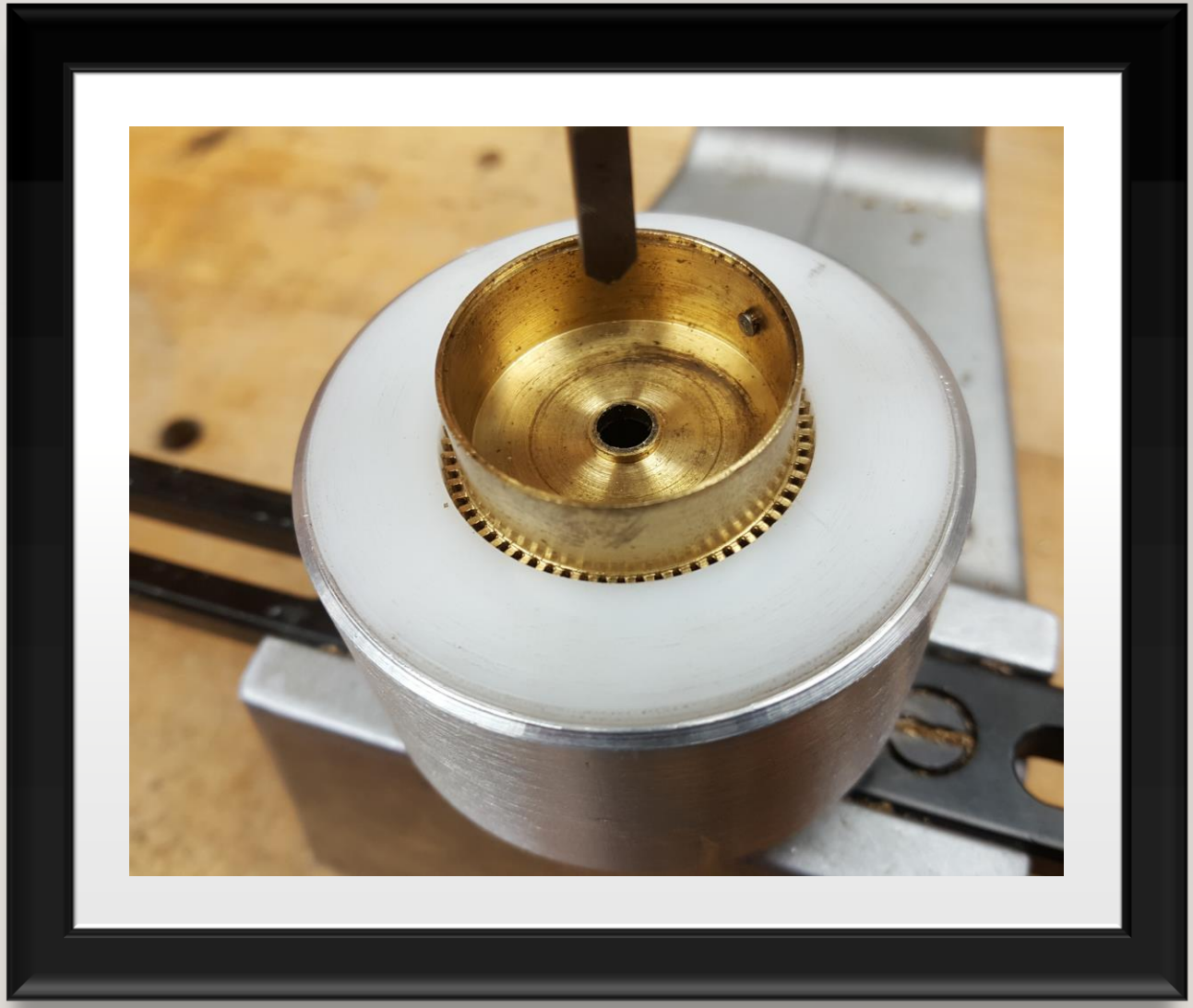
MOUNTED TO MACHINE

- With cutter truing the hole concentric with the barrel teeth.



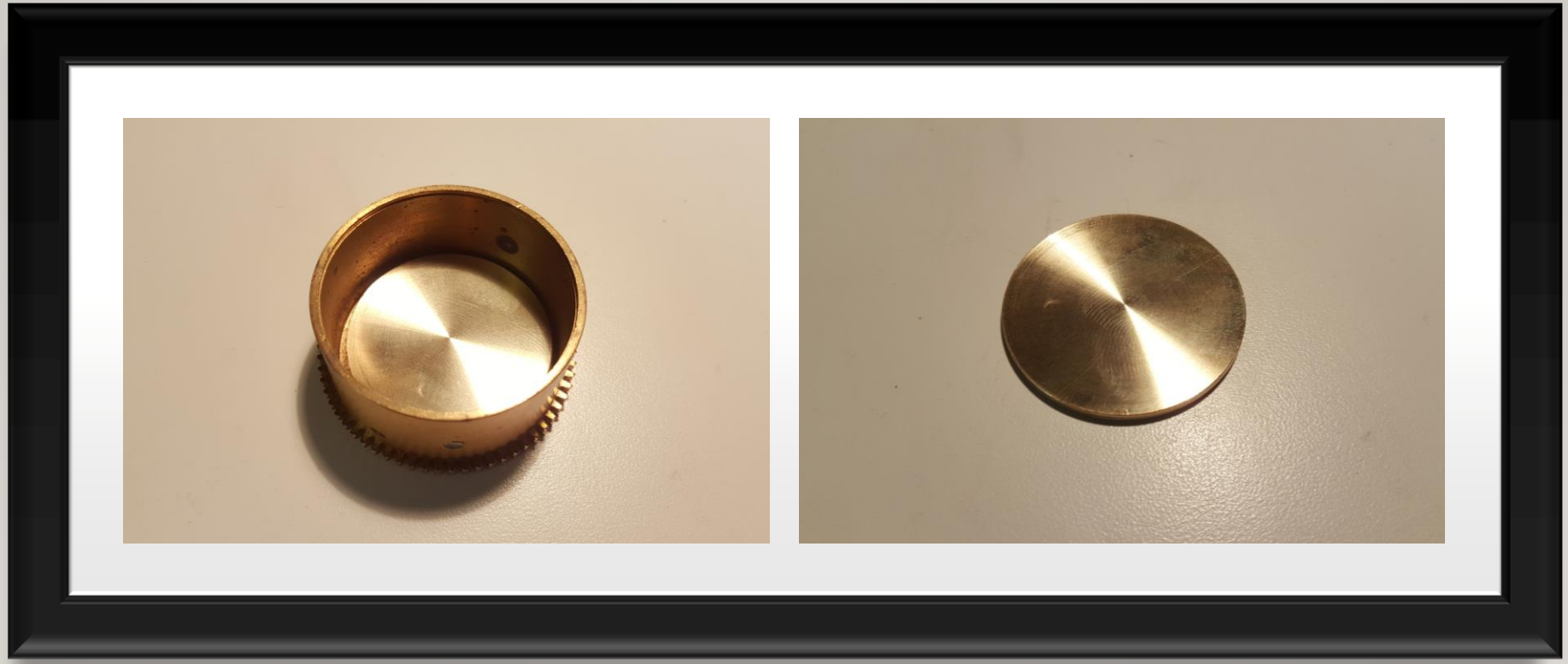
ALIGNMENT RINGS

- Ready to bush the barrel.



BUSHING AND STUMP

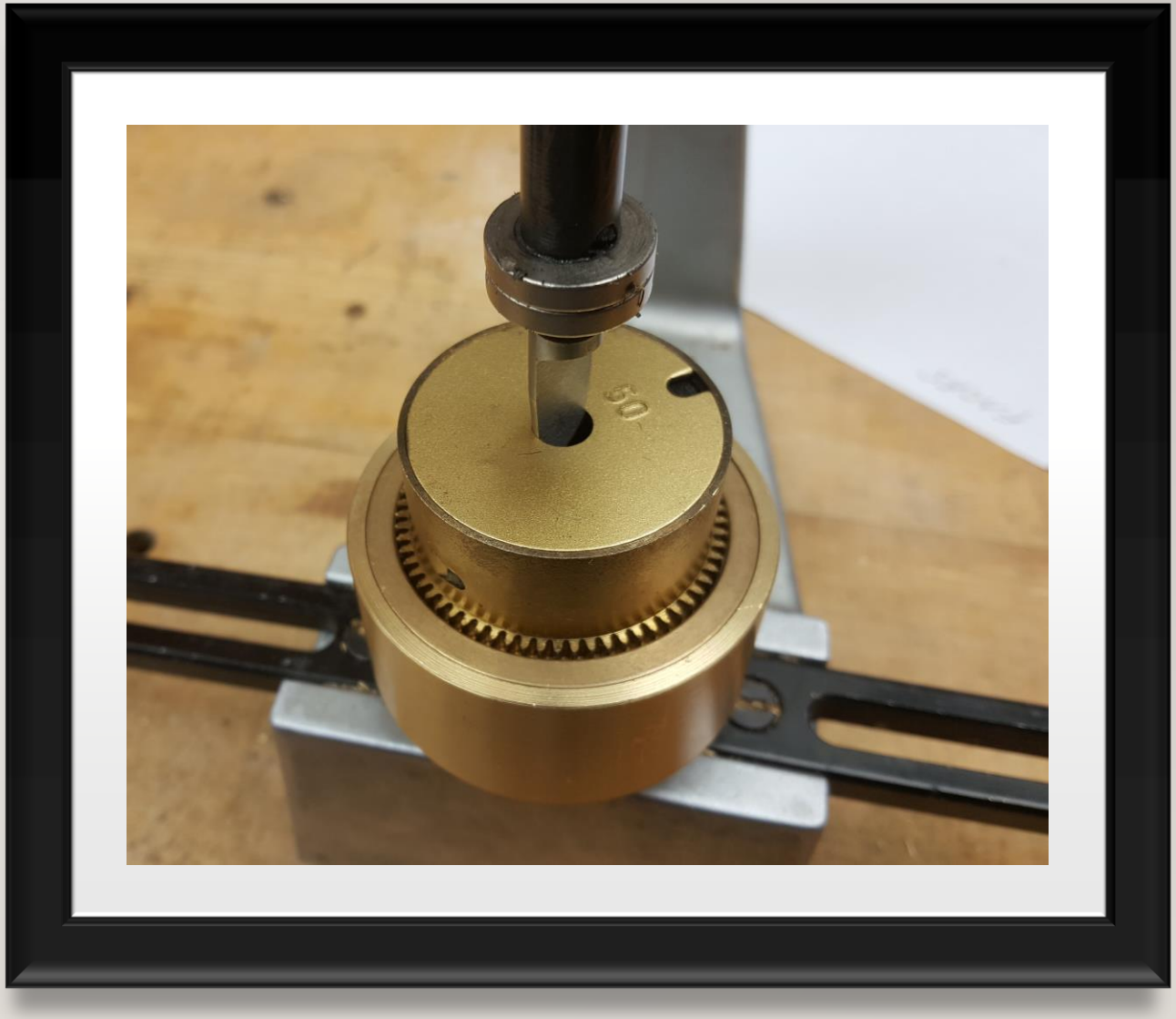
- Use an existing bushing or machine a bushing to fit the hole.
- Install bushing in barrel. Do not use the barrel stump you made. Use an existing stump.



COVER REMOVING SLUG

BUSHING THE COVER

- If you need to also bush the cover:
- Drop a slug into barrel.
- Install the cover with the arbor press and align the cover slot with the barrel spring hook.
  - In this example, the cover is 180 degrees from that location. If you chose this location, stay consistent.
- Use a brass rod through the body to press off the cover in the arbor press after the hole is cut.
- This procedure will produce 2 holes in line with each other.

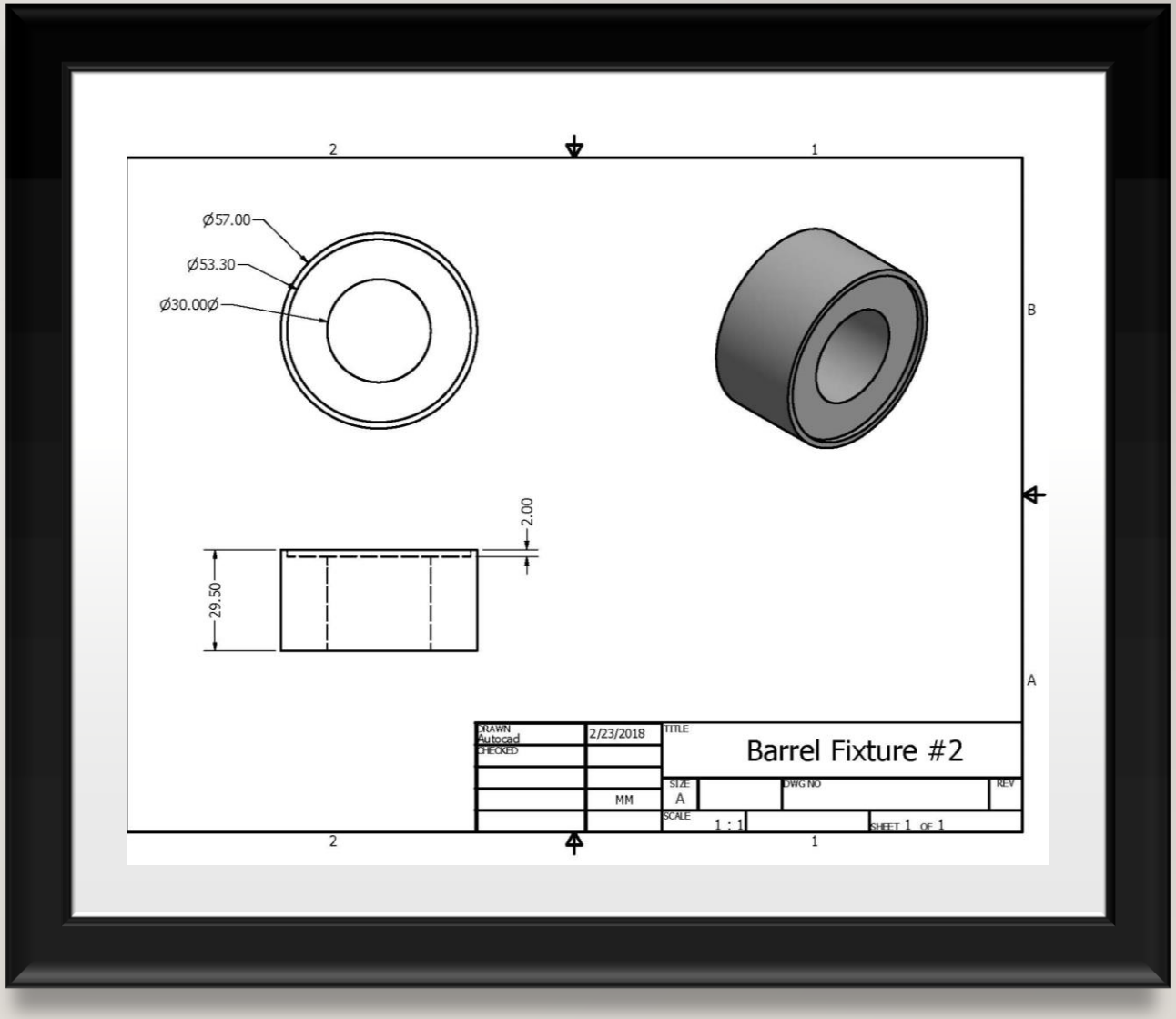


THE SPRING BARREL

BUSHING A BARREL #2

BUSHING FIXTURE #2

- This is another design of the barrel fixture.
- The drawing is in MM.

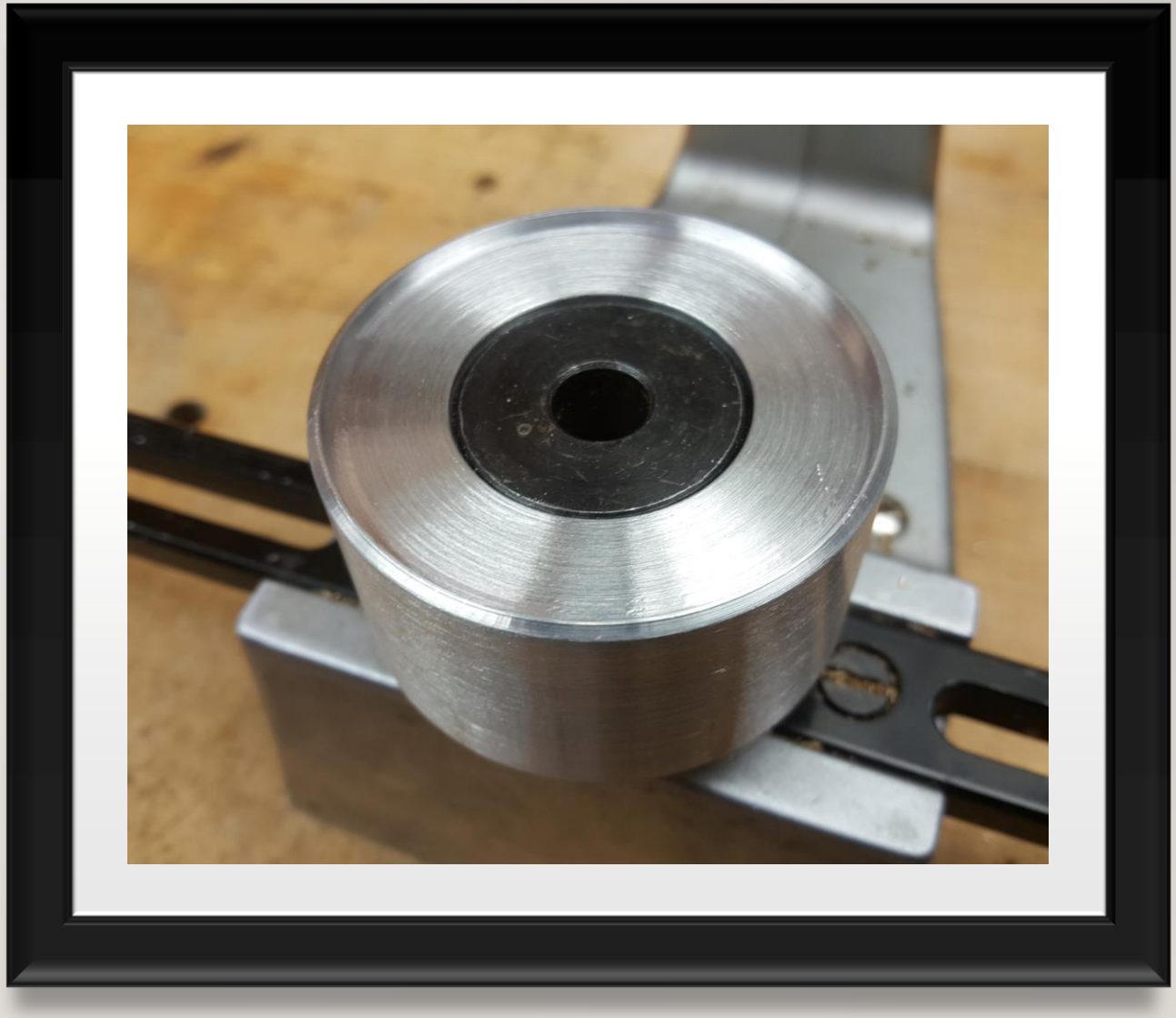


BUSHING FIXTURE #2

- Some could find this one easier to make.
- Boring the hole to size is very critical.

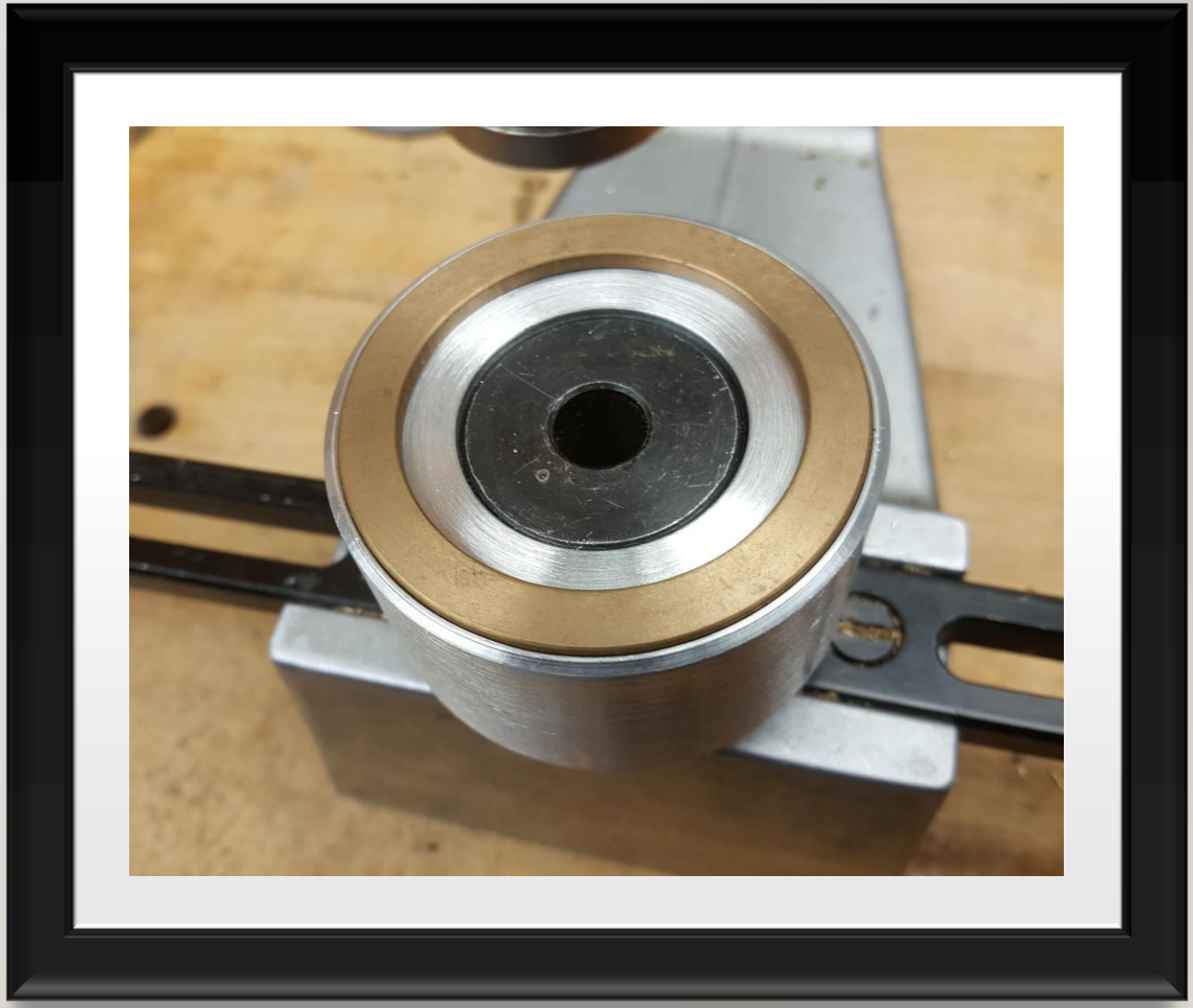
BUSHING FIXTURE #2

- This fits over one of the existing stumps in your set.



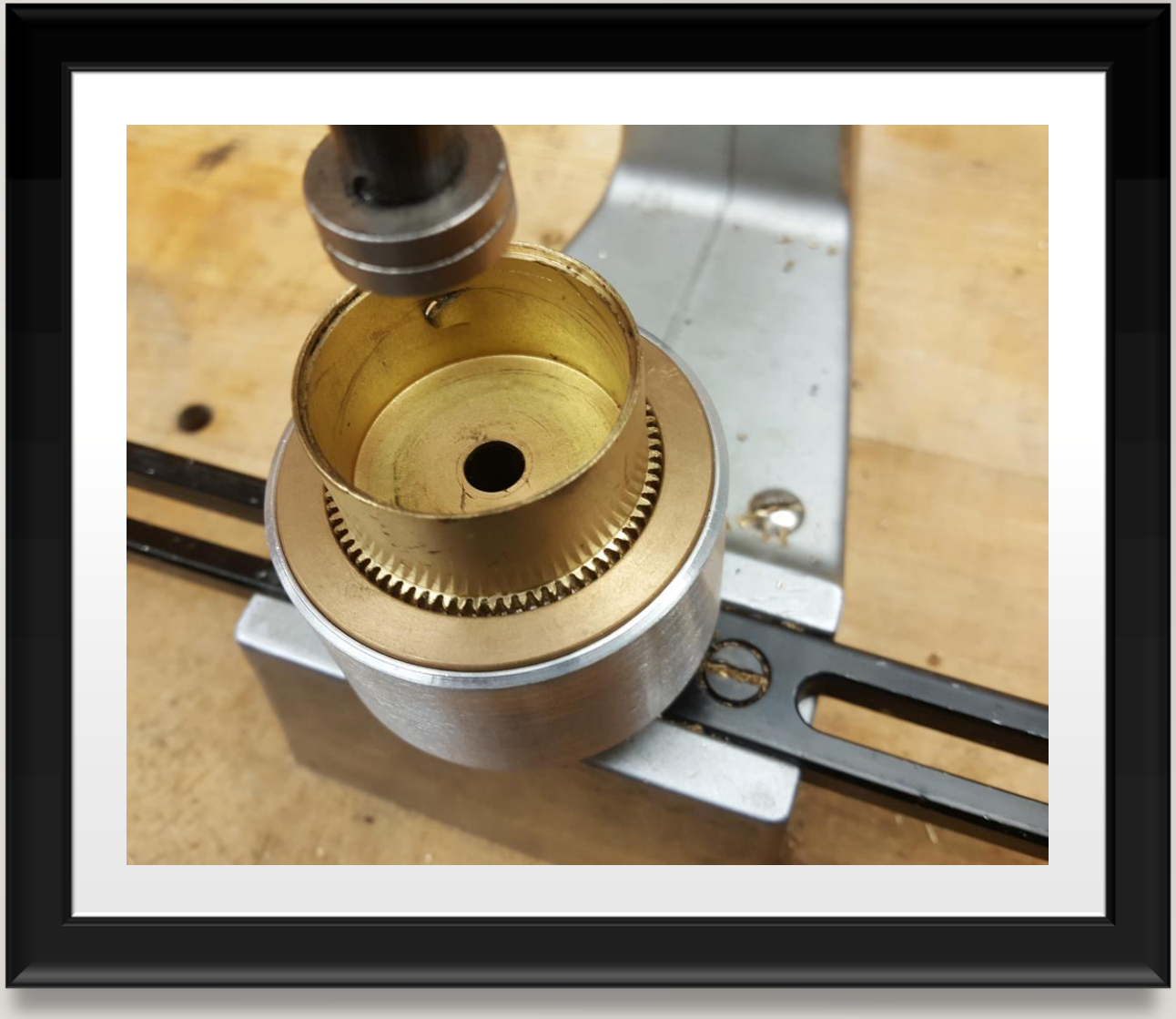
BUSHING FIXTURE #2

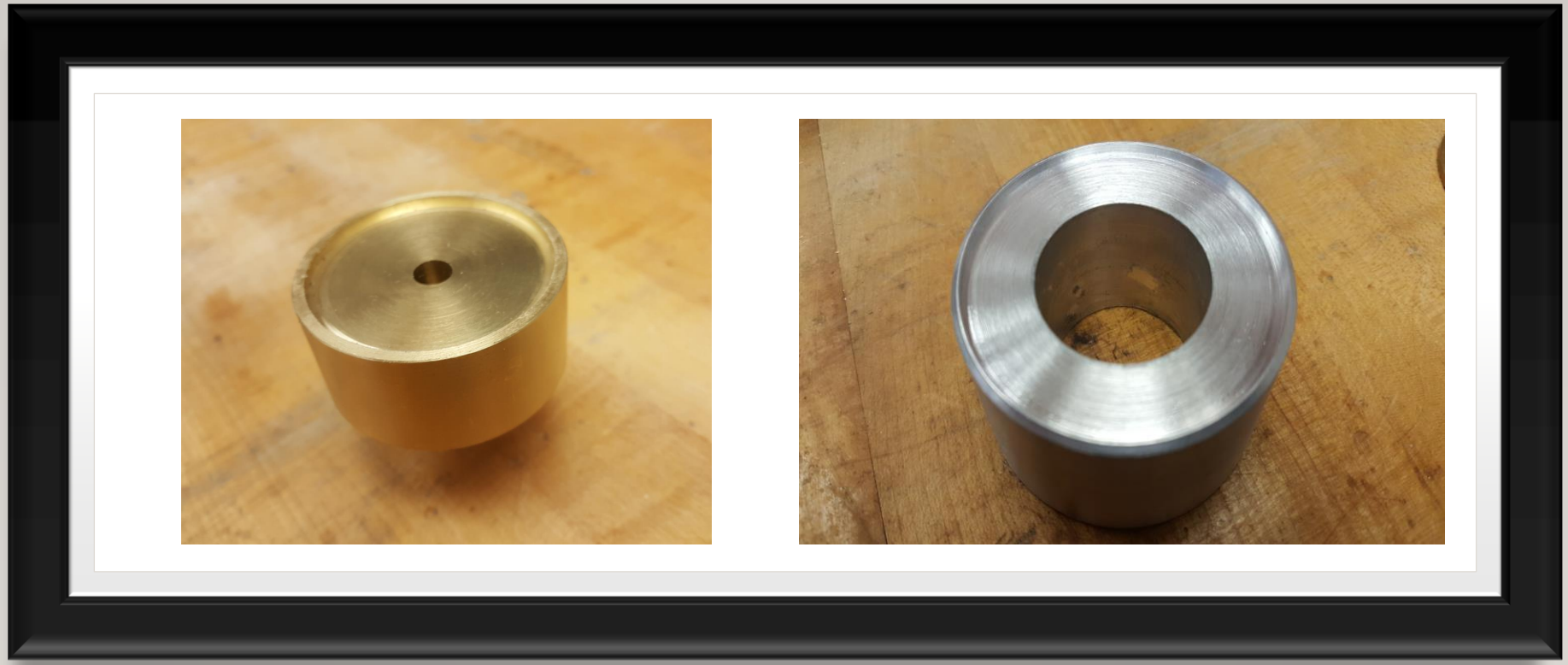
- With the alignment ring.



BUSHING FIXTURE #2

- This is the whole assembly ready for boring with one of the cutters.





BOTH BARREL FIXTURES

THE SPRING BARREL

MAINSPRINGS

MAINSPRING CLEANING

- I think its important to review the cleaning and lubricating of mainsprings.
  - I NEVER clean a spring in the ultrasonic cleaner.
    - It won't get it clean enough.
  - ALL mainsprings need to be removed from the barrel, without exception!
  - If you don't have a spring winder, take it to someone who has.
  - All springs should be cleaned by hand.
  - A dirty spring is the biggest robber of power in your clock.
  - Remember, old mainsprings material is porous, new mainspring material is not.
  - Oil is not your friend especially with new mainspring material!

MODERN MAINSPRING

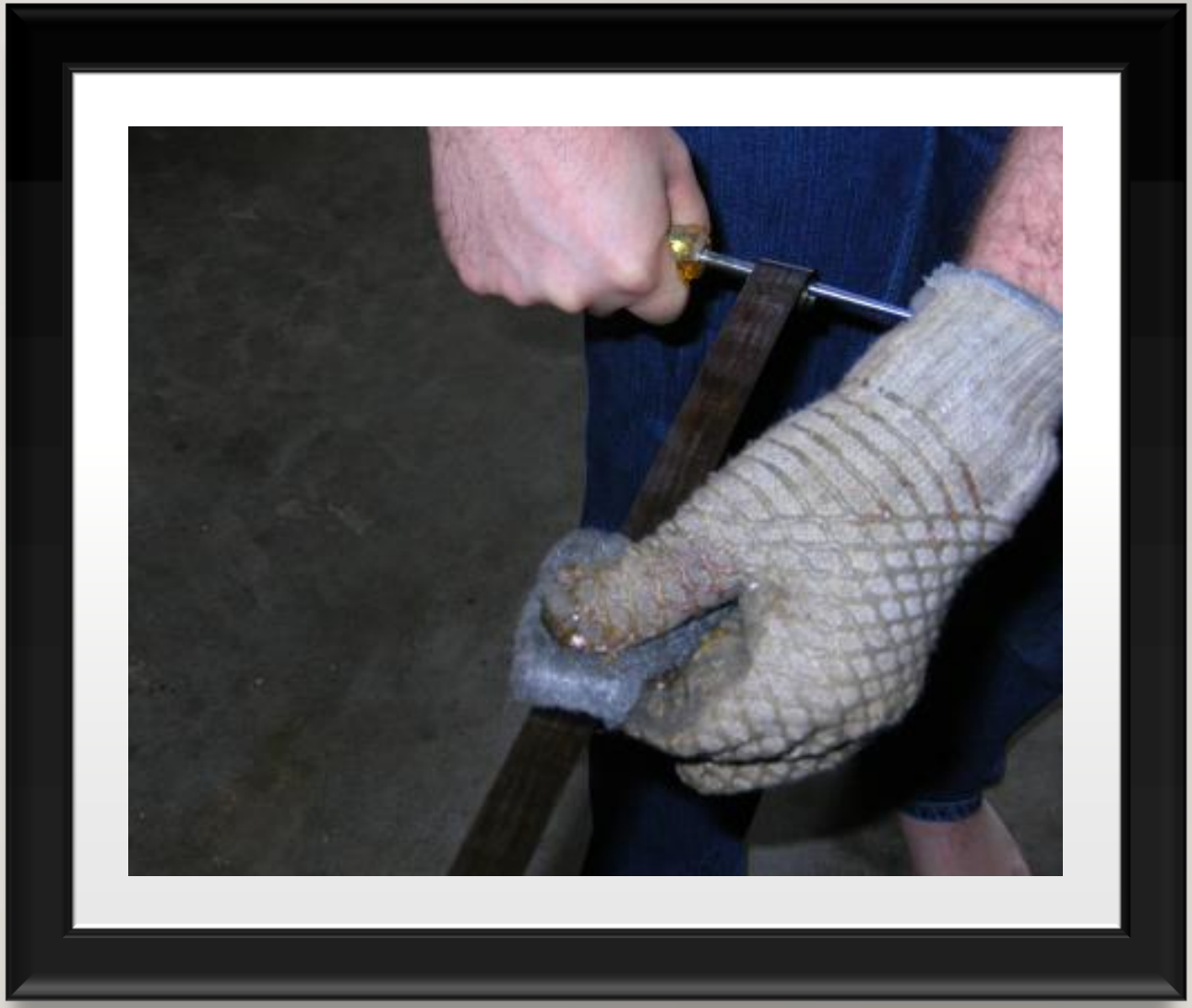
- Modern new mainsprings (barrels) are a problem in todays clock repair.
- Even though the mainspring you order measures the same, chances are it is stronger than what you had.
  - Customers complain that when they get a clock back, its hard to wind.
    - Same dimensional spring, but different material.
- These stronger springs can cause premature damage to the clock, especially the escapement, and bushings.
- I try to find a slightly "weaker modern spring".

STRETCH OUT THE SPRING

- Spring cleaning station.
- A good time to clean your spring by hand is when your movement is in the cleaner.

CLEAN

- Clean with steel wool and a chemical degreaser.
- Steel wool also helps finding imperfections in the spring.



CLEAN

A synthetic sanding pad (Scotch Brite) is also a good pad.

They last a long time!

WIPE CLEAN

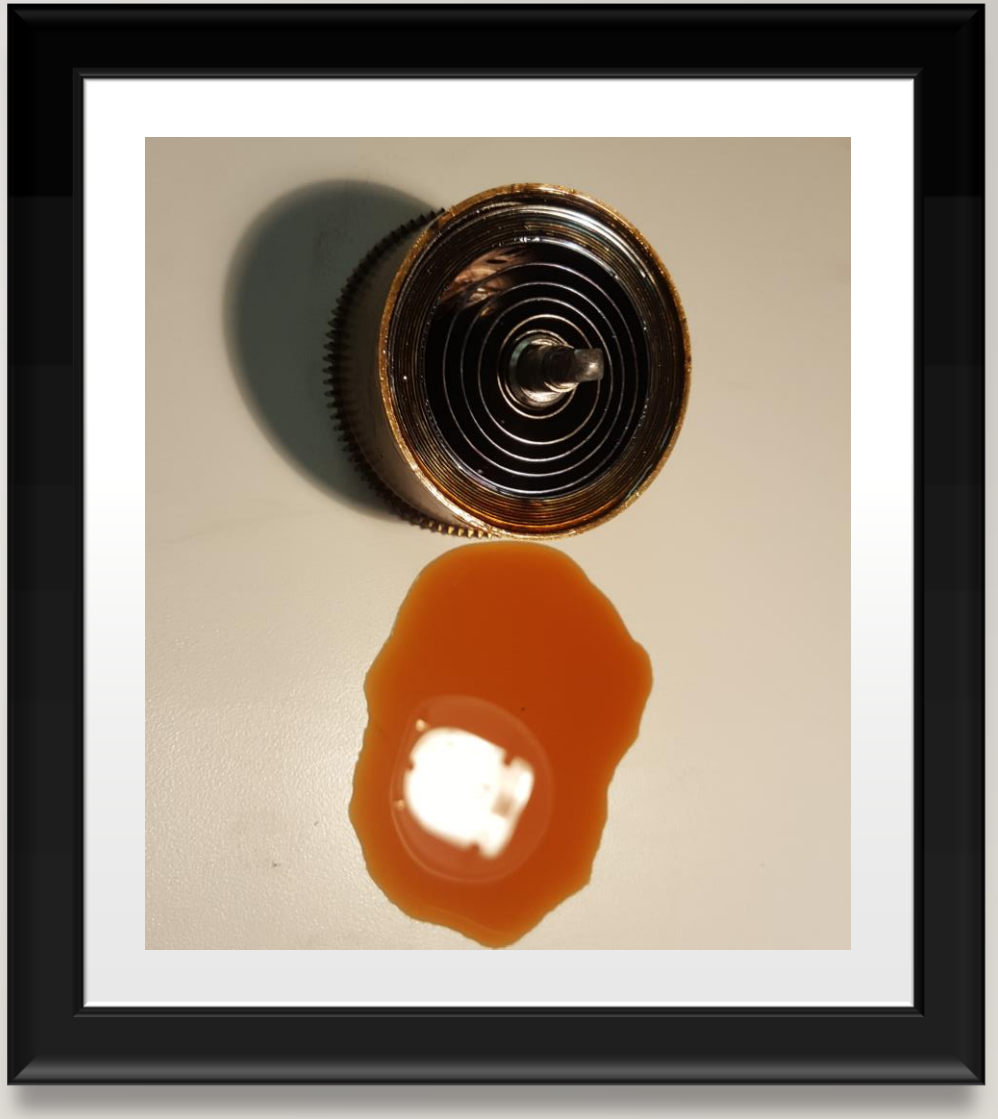
- Wipe the spring clean until no residue is detected. Continue to use a degreaser chemical.

MAINSPRING OIL

I seem to get my best results with the Keystone brand of mainspring oil.

BARREL OF CLOCK IN FOR REPAIR

- Before removing this movement from a Junghans clock, I noticed a puddle of oil in the bottom of the case.
- After removing the cover, I poured out oil from the barrel.
- Not a very good practice!
- More clock oil is not a cure for a bad clock repair!



LUBRICATION OF THE MAINSPRING

Why lubricate a spring?

- Stop corrosion on the spring surfaces.
- Somewhat aids in the reduction of friction between the coils.

An over lubricated spring will reduce the torque that the mainspring has by up to 17%.

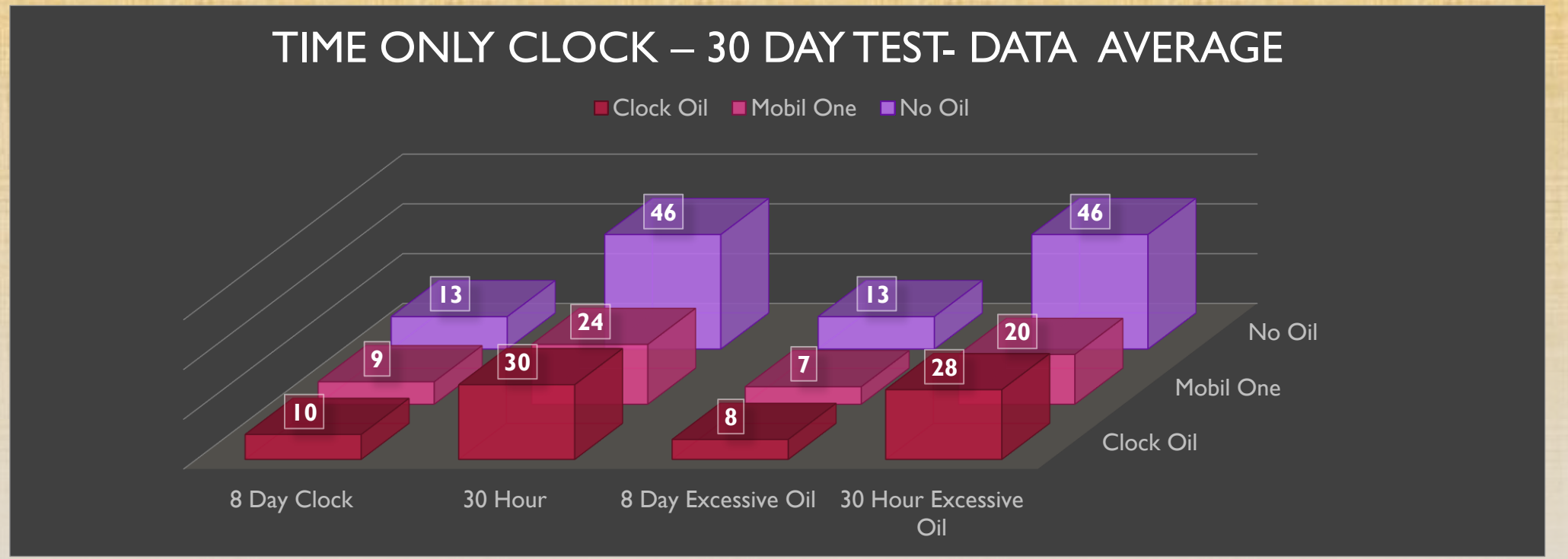
- All excessive lubrication must be removed.

Type of lubricant?

The most important part of the spring is that its "Clean" without flaws.

Always lube barrel arbors at the bearing point.

MODERN MAINSPRINGS – SAME MOVEMENT

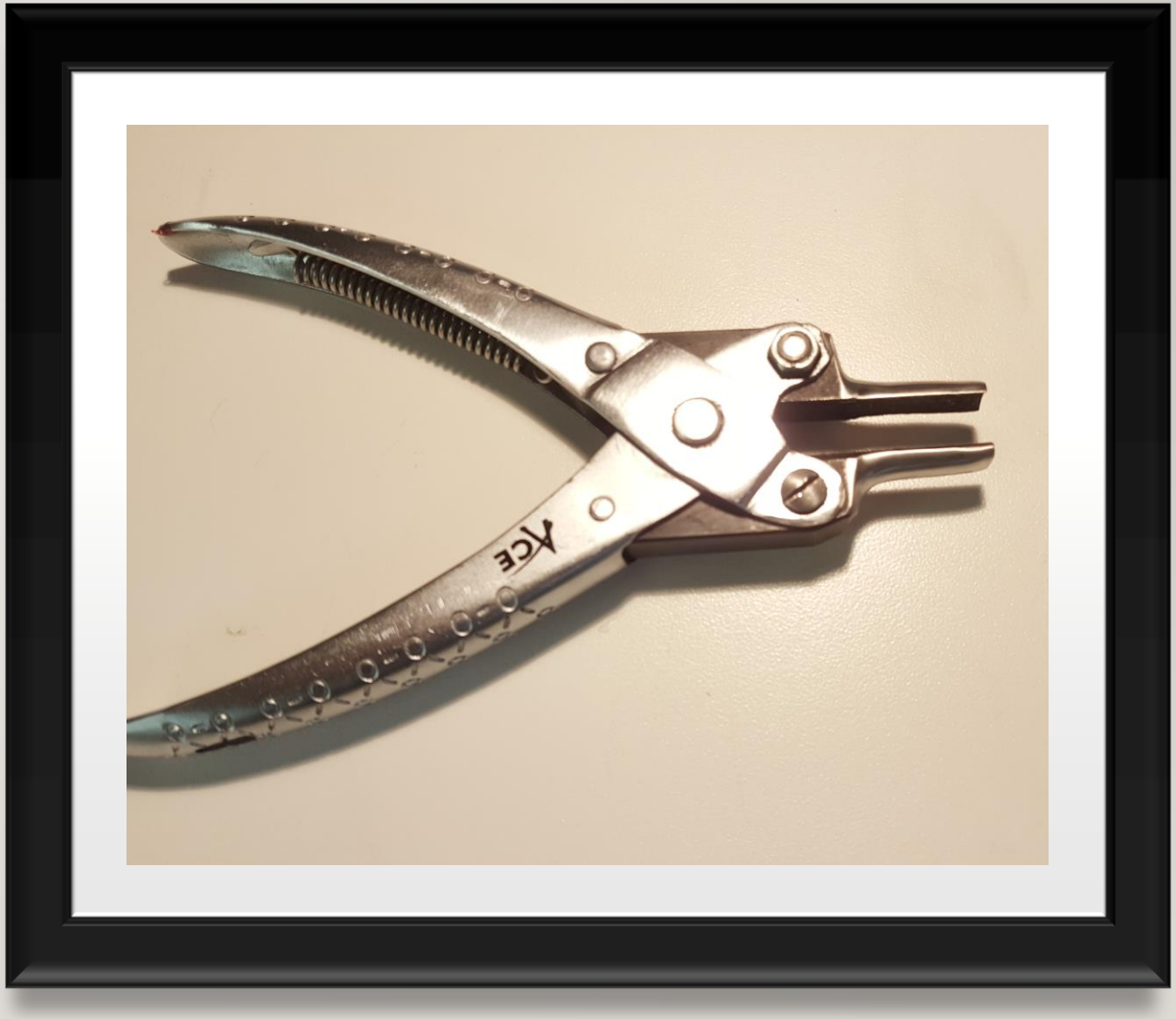


HALF ROUND PLIERS

- My mainspring pliers.

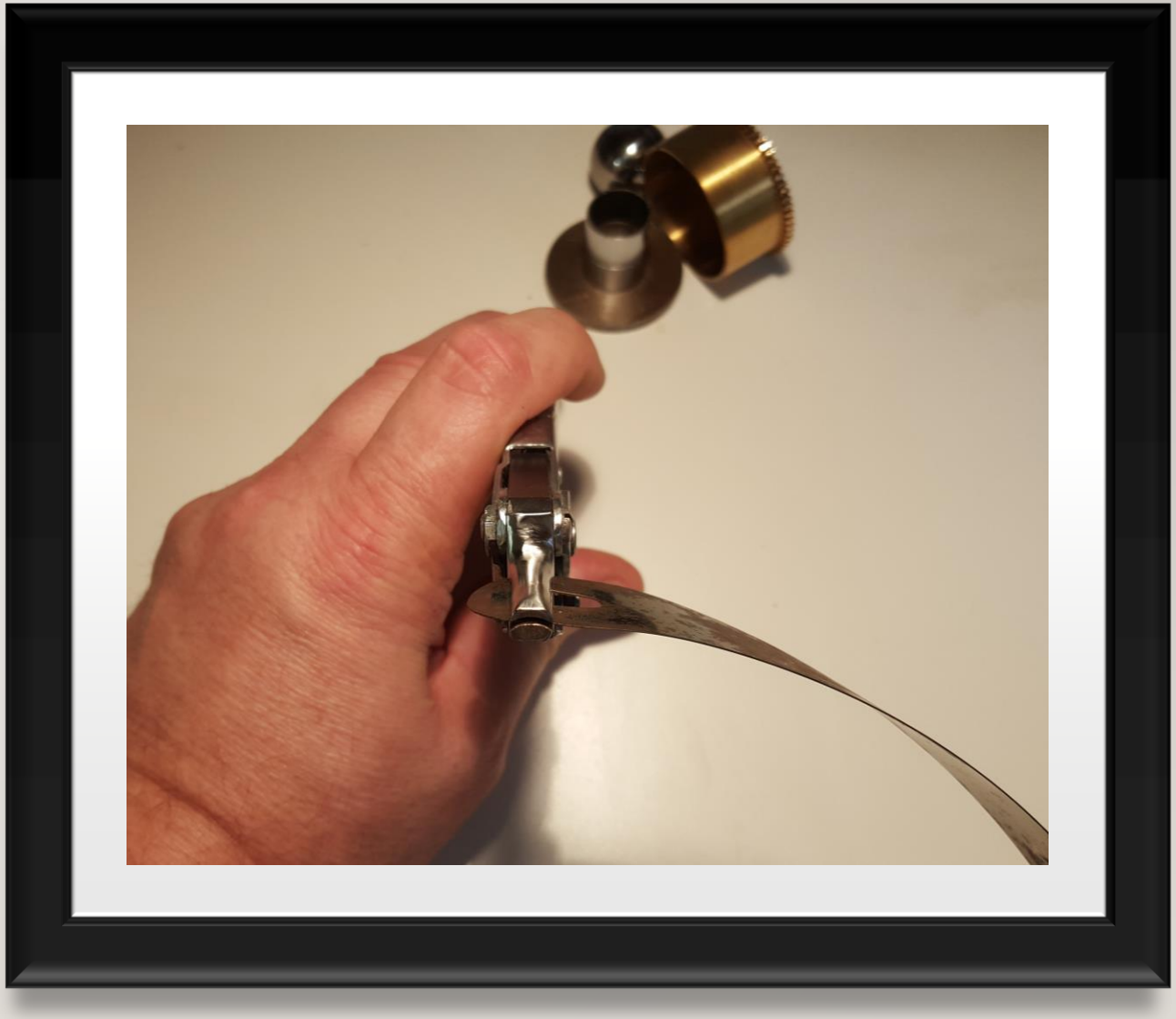
HALF ROUND PLIERS

- I have ground the jaws of this tool to aid in manipulation of the main spring.



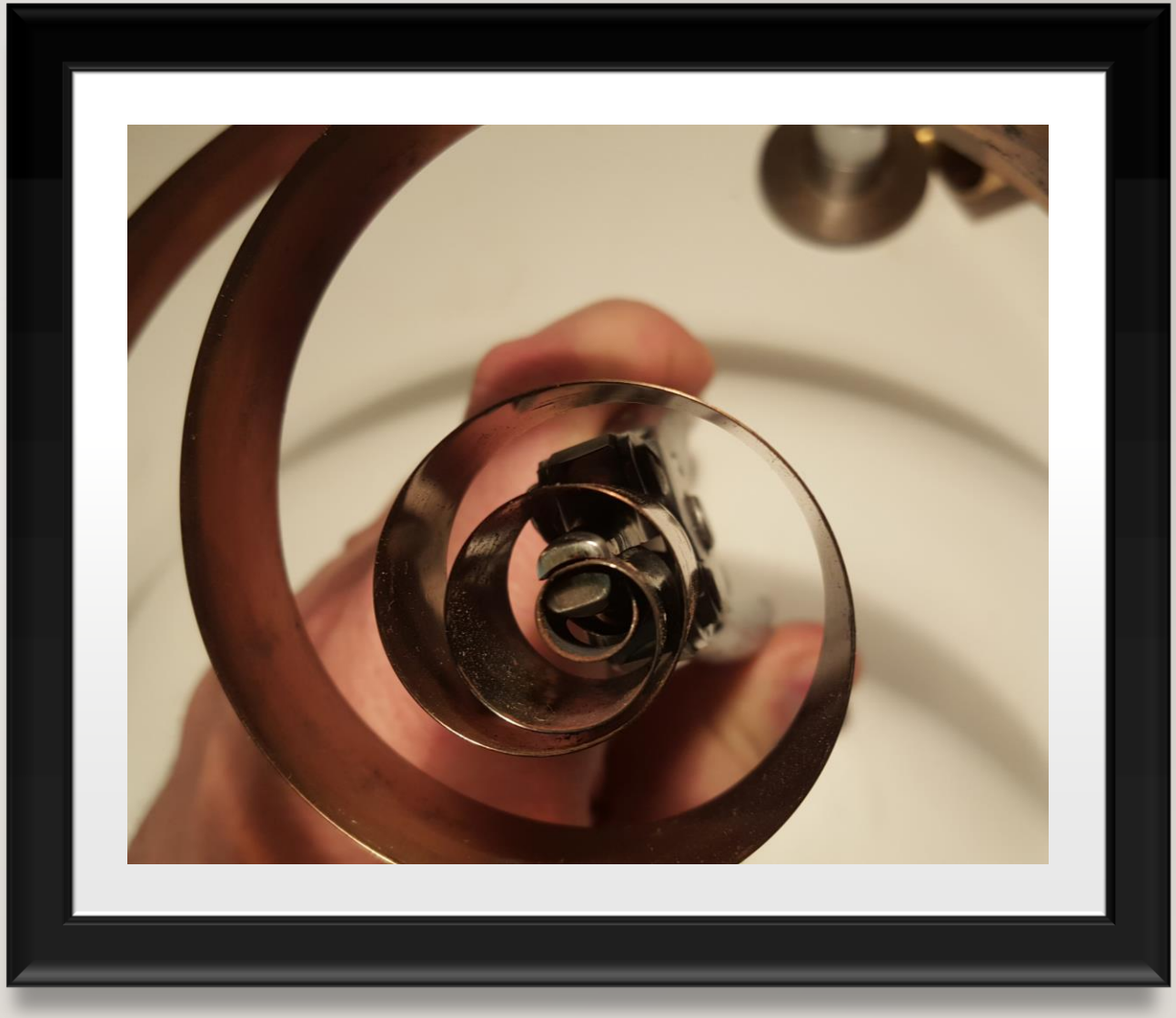
HALF ROUND PLIERS

- This will put a slight radius bend into the end of the spring so that it easily catches on the barrel hook.
- This will not produce a sharp bend or stress on the spring like a sharp bend will.



HALF ROUND PLIERS

- This will form the inner coil of your mainspring and keep the coil parallel to the other coils.
- This will help keep your spring from slipping off the arbor.



THE SPRING BARREL

CALCULATING A MAINSPRING

MAINSPRING CALCULATIONS

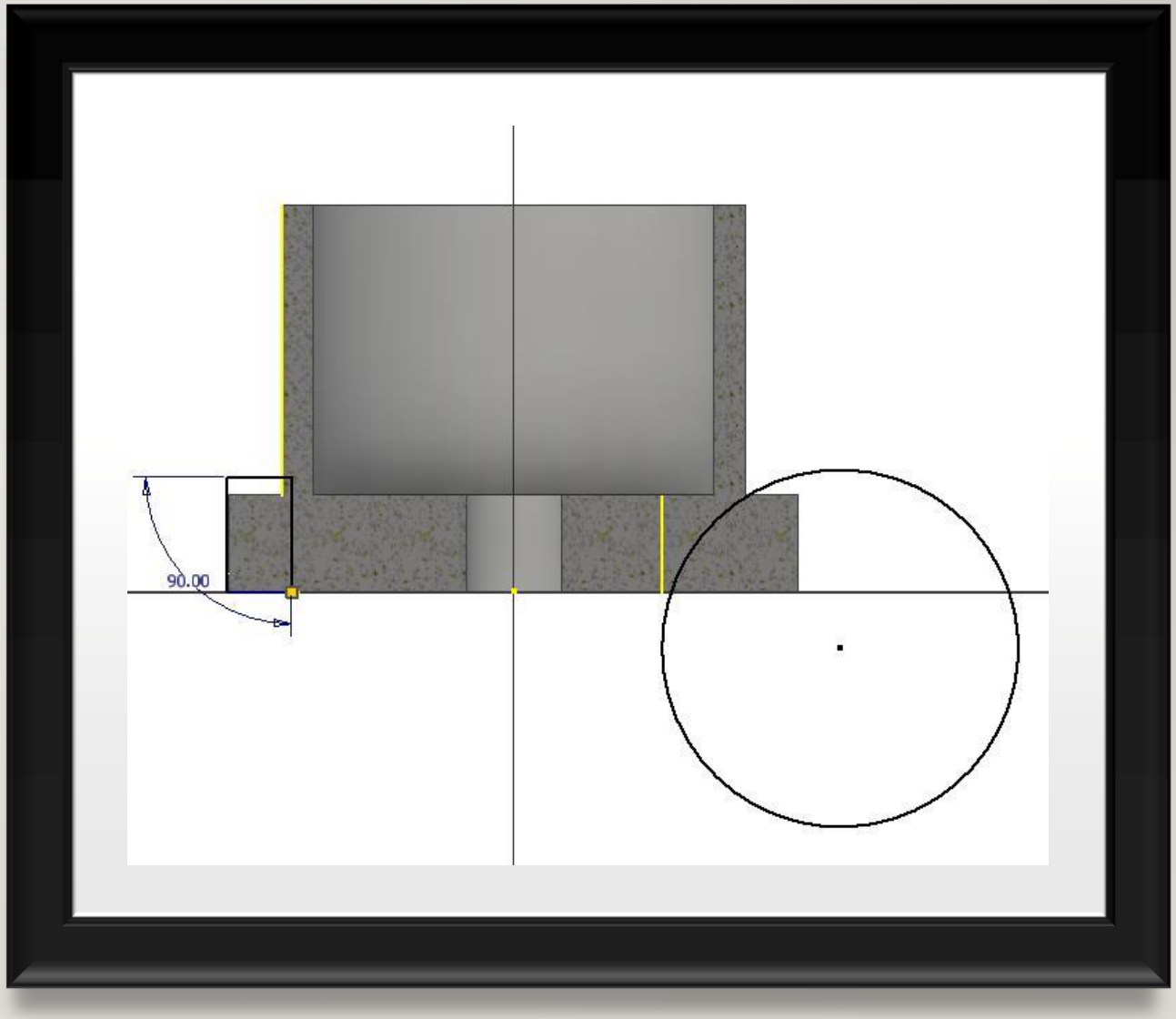
- Always calculate the proper mainspring for a clock your working on.
- About 30% of clocks repaired have the wrong mainspring.
  - This is due to the barrel not properly or bushed at all.
  - A stronger mainspring was substituted to overcome improper repair.
  - Can cause substantial wear in the escapement.
- http://www.nawcc-index.net/CalcMainspringLength.php

REPLACING TEETH

TEETH IN A BARREL

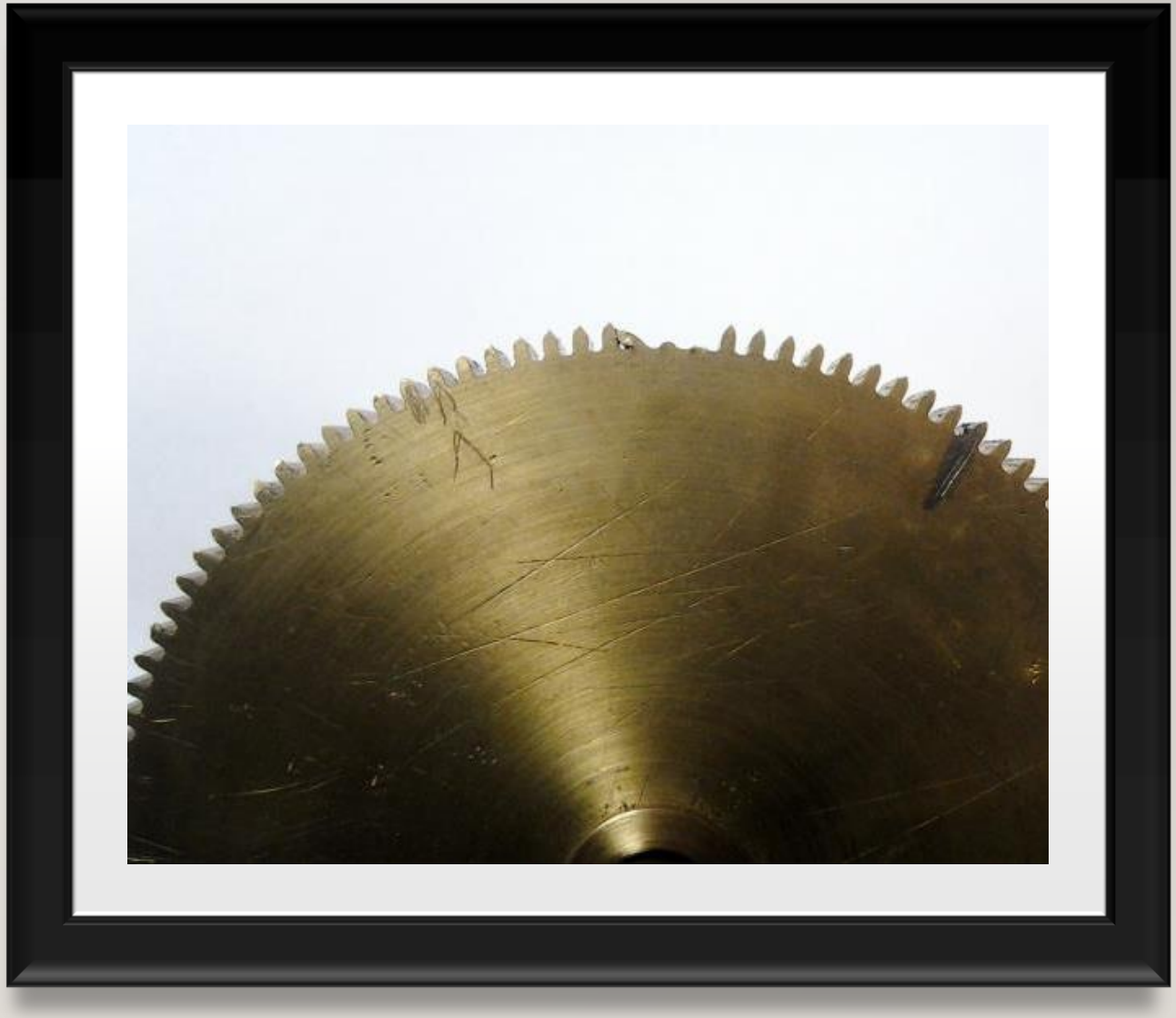
TOOTH STYLE

- The round tooth is a much stronger tooth since it implanted deeper into the gear itself.



REPLACING TEETH

- 4 things you need to fix a barrel
  - Material of the right tooth thickness
  - Some sort of indexing method
  - Cutter (circular saw blades)File
- Machine



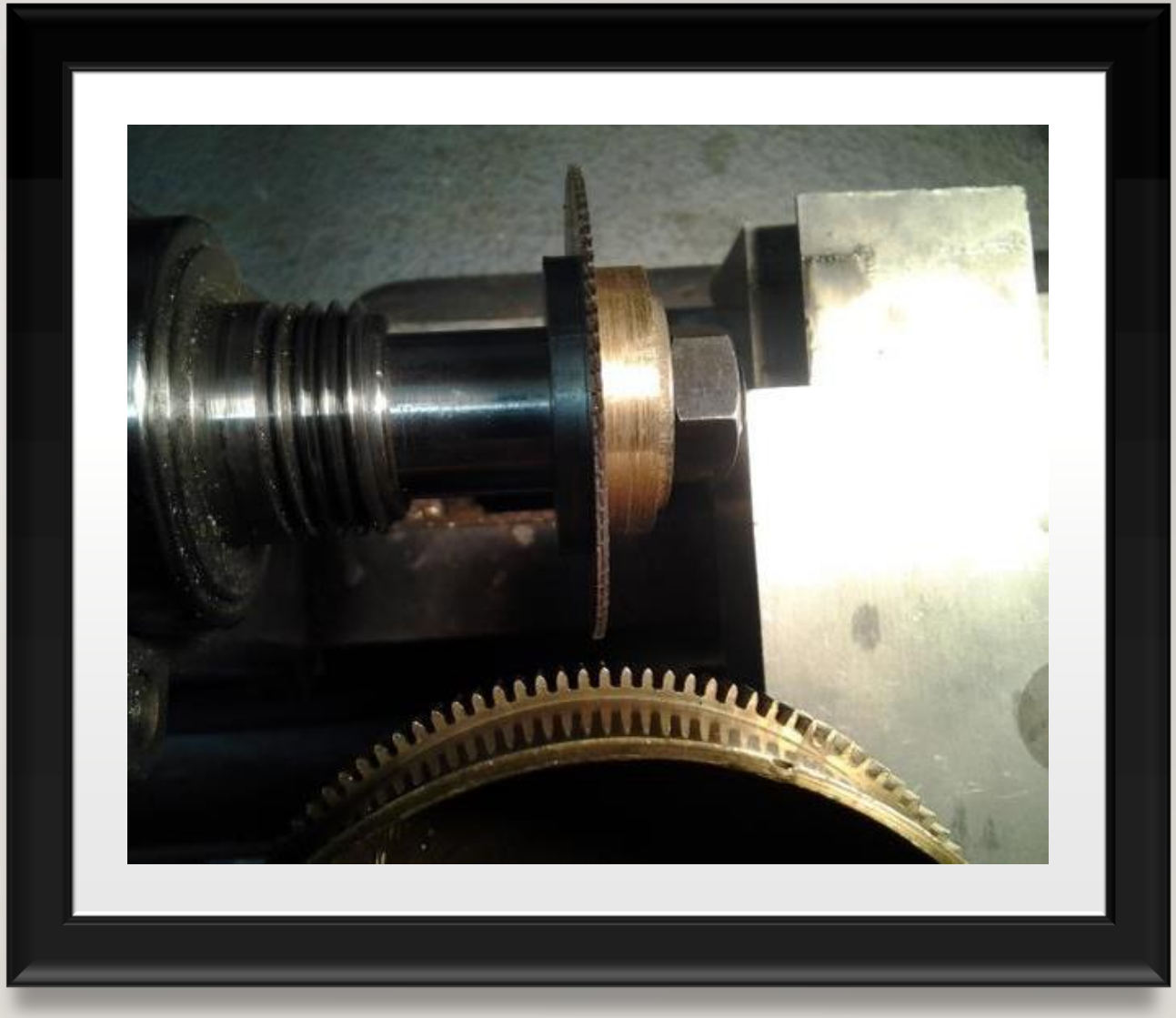
REPLACING TEETH

FILE OUT THE BROKEN TEETH.

REPLACING TEETH

- Determine the height of the barrel so that it doesn't cut into the barrel body.

- Determine the thickness of the tooth.
- Use an assortment of different thickness of blades to come to the thickness needed.
- Align the saw to a good tooth for set-up.
- Rotate to the missing tooth location.

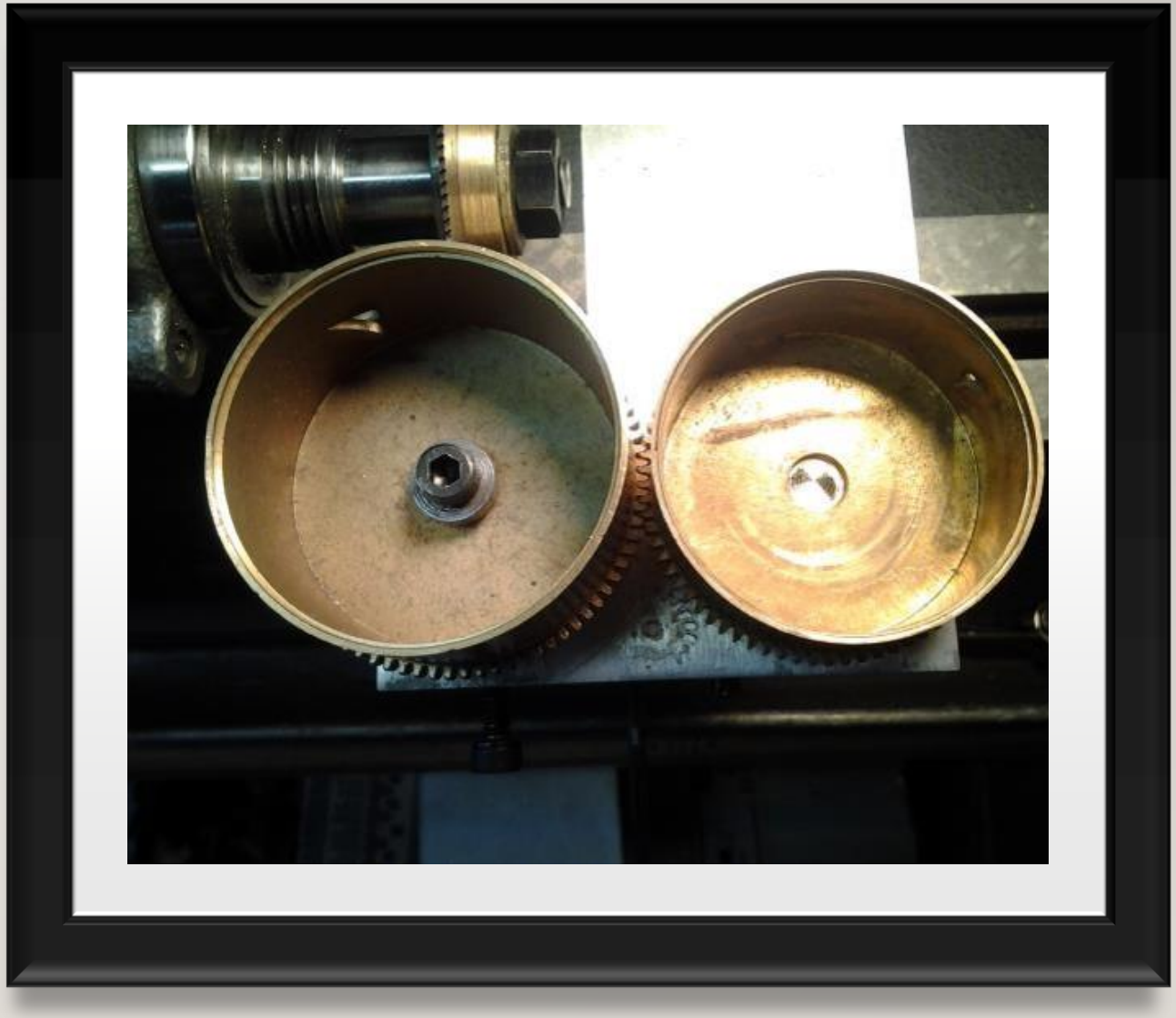


SAW BLADES

- The saw blades I use are 1.5” in diameter and have a .5” hole in them.
- I have multiple assortment of thickness.
- Stack the blades to give you the desired thickness that you need.

REPLACING TEETH

- Using a additional barrel for indexing the bad barrel.



THE BLANK

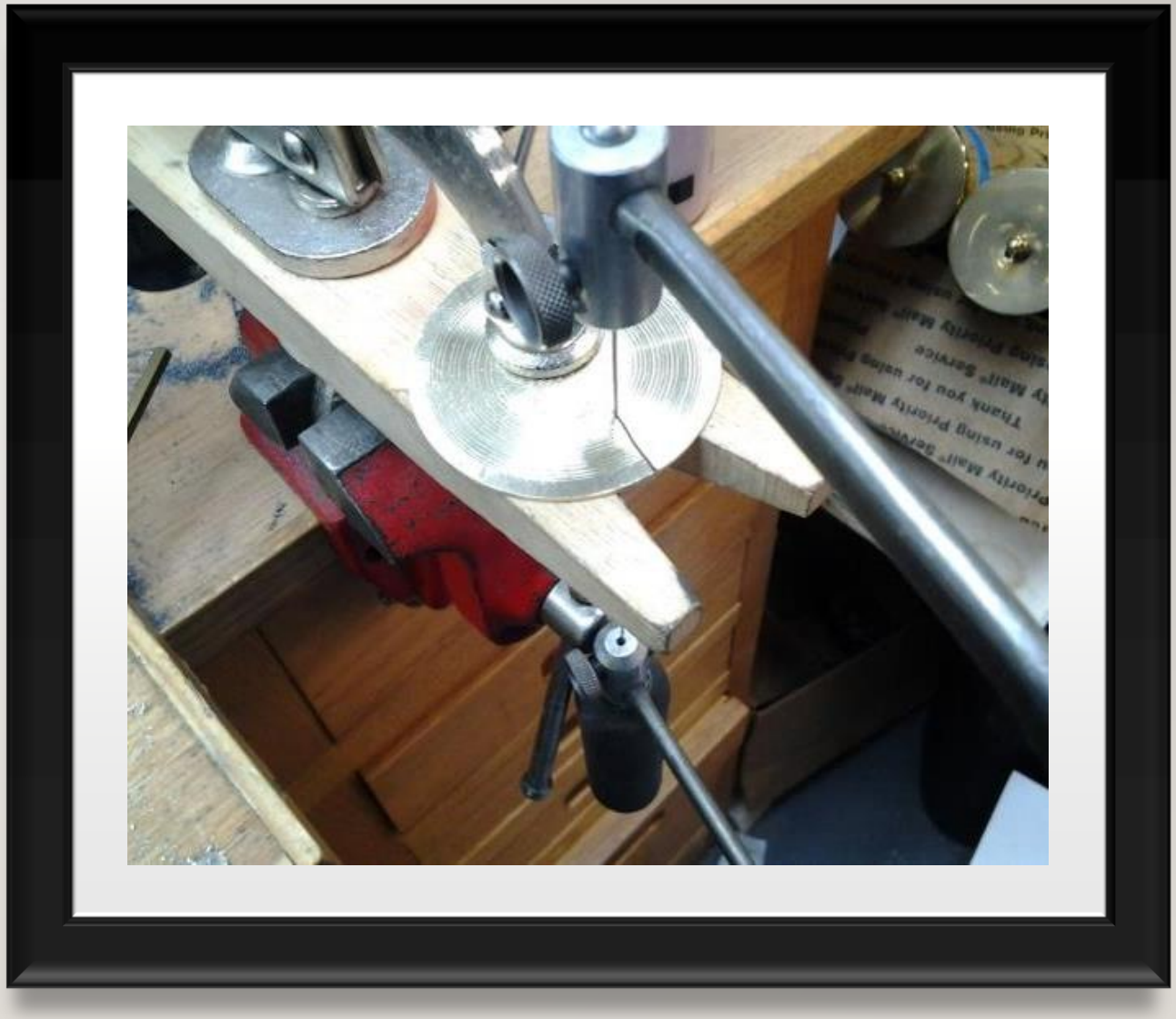
- Machine a brass blank.
  - The diameter of the saw blades.
  - The thinness of the saw blades.
  - This will insure a nice tight fit.

THE BLANK

- The blank fits very snuggly in the slot.
- This will produce a very strong tooth.

THE BLANK

- Saw the blank into the number of tooth segments you need.



THE BLANKS

- Inserted into the slots of the barrel with a nice tight fit.

FINISHING

Ultrasonically Clean the barrel, cover, and arbor.

Glue the barrel arbor into the barrel.

Glue the barrel cover bearing surface to the arbor.

Turn the barrel assembly holding the back arbor in a collet and the other end supported with a tail stock.

Soak in acetone over night and disassemble.

FINISHED BARREL

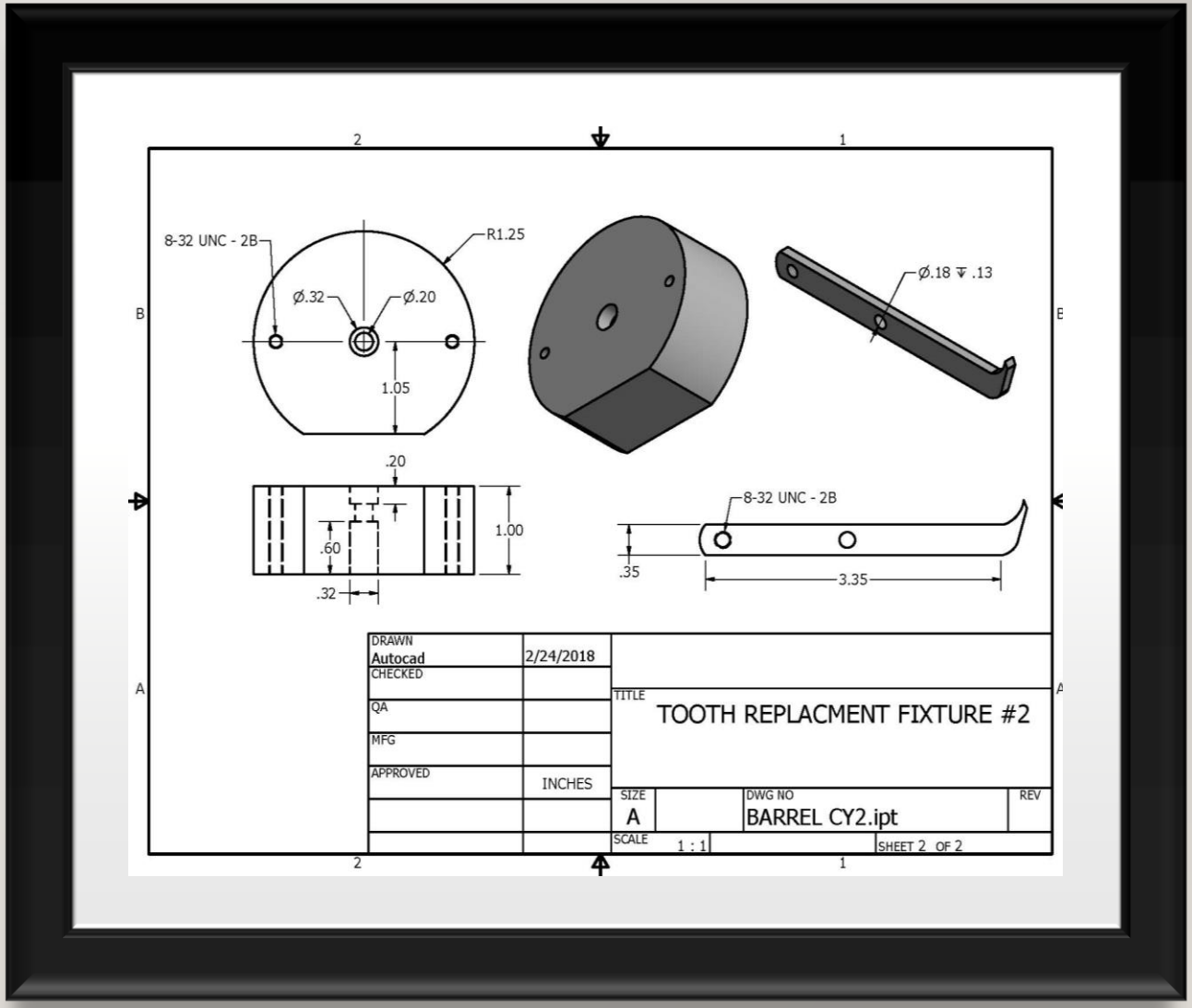
- Almost a seamless repair.

A NEW BARREL FIXTURE

FOR THE SHERLINE LATHE.

A NEW BARREL FIXTURE

- Drawing in inches.

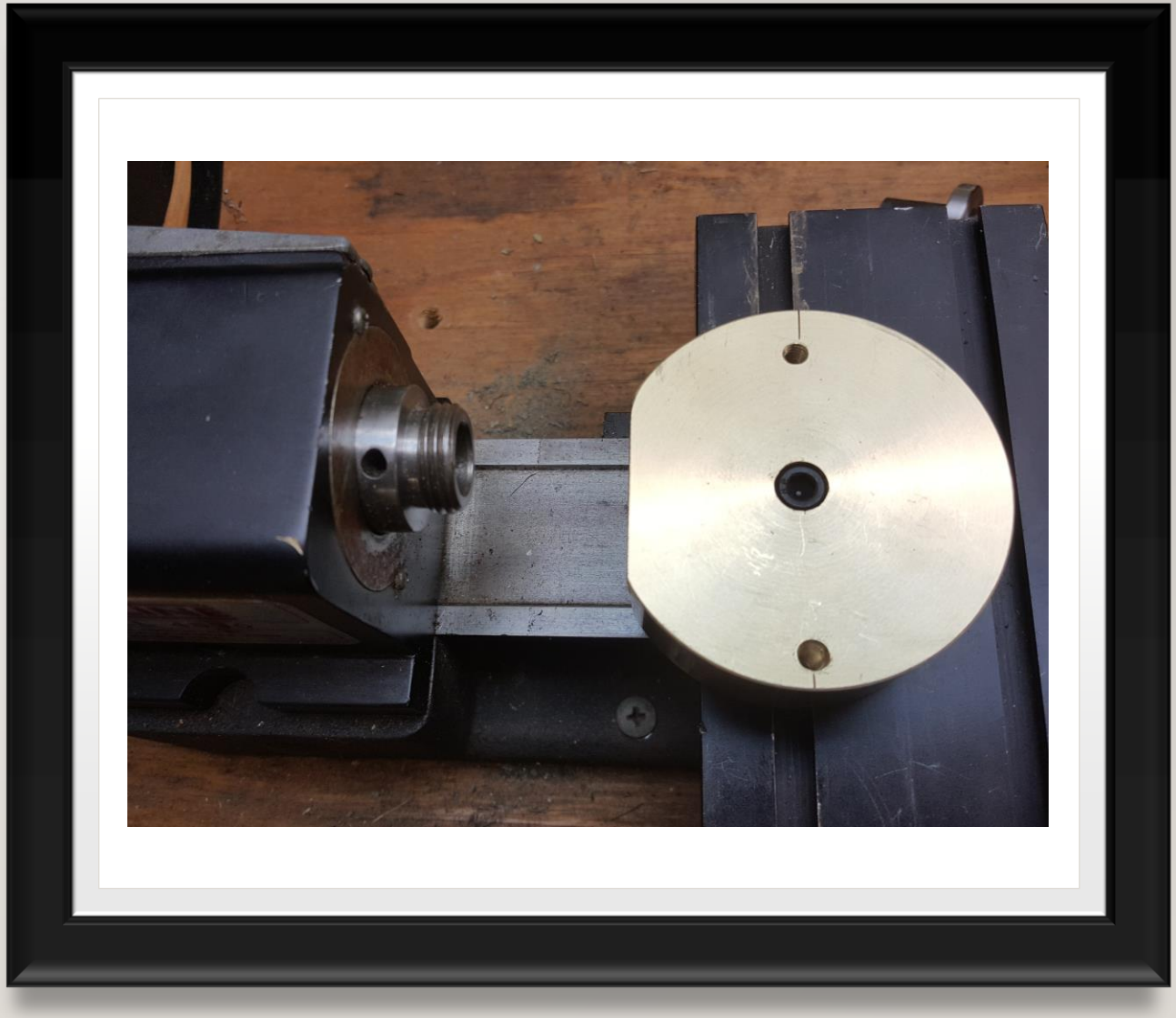


A NEW BARREL FIXTURE

- New barrel fixture for the Sherline lathe.

A NEW BARREL FIXTURE

- Mounted to the lathe.



A NEW BARREL FIXTURE

- Aligning the fixture.
  - The fixture is snugged up on the cross slide.
  - Slowly bring in the fixture so that the flat part of the fixture is flat to the lathe spindle.
  - Tighten the mounting screw.

A NEW BARREL FIXTURE

Insert the saw collet into the lathe and tighten the draw bar.

Mount the barrel.

Align the barrel with the center of a good tooth on the barrel.

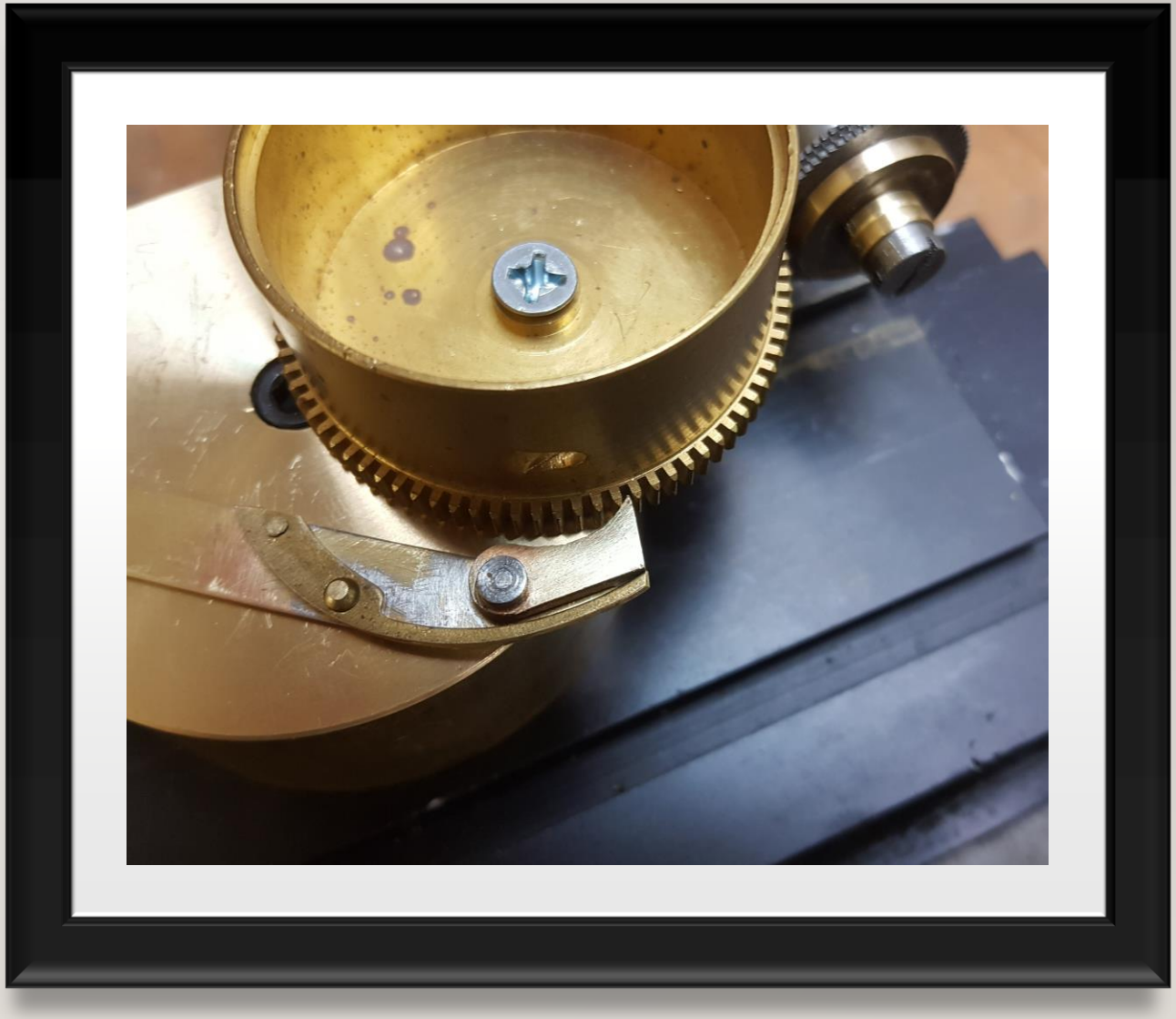
Tighten down the barrel on the fixture.

A NEW BARREL FIXTURE

- Mount the locking bar.
- Bring the edge of the bar and put it into a slot of the barrel teeth.
- Tighten the screw.

A NEW BARREL FIXTURE

- Closeup of the tip of the bar, into a tooth slot.
- Now you are ready to start cutting out your teeth.
- Loosen up the barrel screw, and rotate the barrel to the spot that has the broken teeth.
- Saw the barrel, and record how deep you cut.
- Loosen and rotate the barrel again if another tooth needs to be cut.



THE END