PROJECT – Machinist Hammer

Foundation Skills

The Purpose…

In this activity you will fabricate a Machinist Hammer. This is a small hammer used to gently tap things straight, into position, or general light-duty uses.

The Preparation…

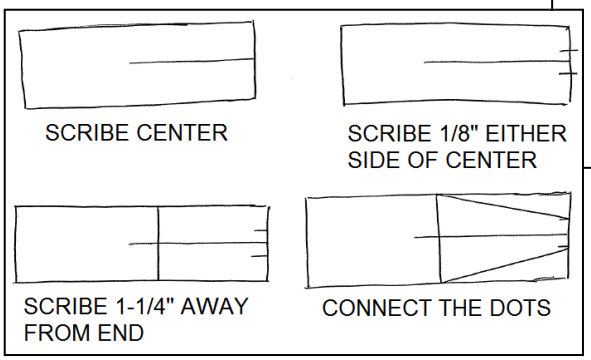
For this activity you will need the following:

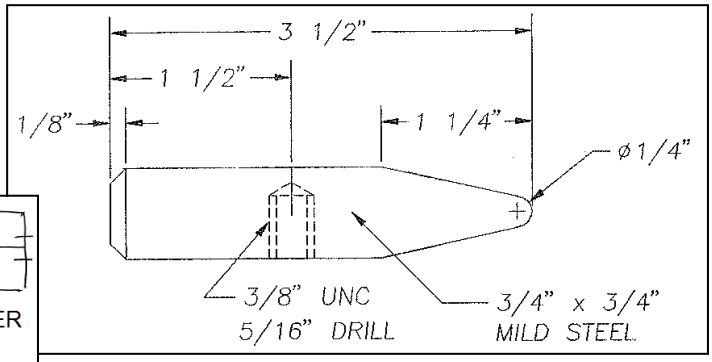
- 3/4 x 3/4" x 3-1/2 square mild steel
- 5/8" x 8" round mild steel
- Ruler, Square and Scriber
- Hacksaw & Files
- Centerpunch & Hammer
- Demonstrated safe use of Drill Press
- Demonstrated safe use of Machine Lathe
- 3/8" UNC taper tap
- 3/8" UNC bottoming tap
- 3/8" UNC die
- 5/16" Drill bit
- Vernier Caliper

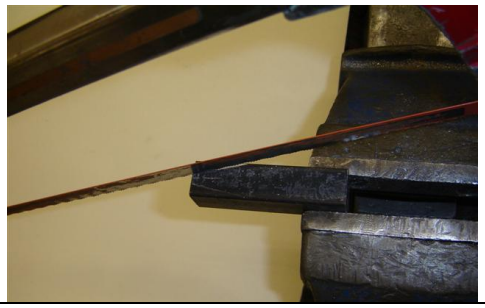
HAMMER HEAD – YOU ALWAYS START WITH LAYOUT

CROSS PIEN

- Lay it out with a ruler, square and scriber like this:







- Hacksaw at a shallow angle (look →)
- File smooth

HAMMER HEAD – THREADING

- Internal threading is done with a TAP

Tapping Demo

- Layout the location of the hole
  - 1-1/2” from the hammer end
  - 3/8” from one side
- Centerpunch
- Drill with a 5/16” bit about three-quareters of the way through
  - DON’T drill through
- Cut threads with a 3/8”-UNC tap and tapping oil from the RED can
  - Start with a TAPER tap
  - Cut half a turn, then back off 1/4 turn to break the chip off
  - Repeat with a BOTTOMING tap
  - NOTICE when you are at the bottom of the hole (breaking a tap off inside is death to your project)

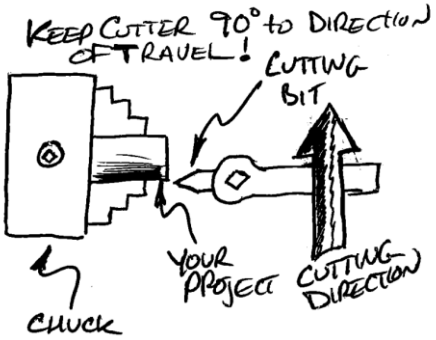
HAMMER HEAD – CHAMFERING

- Place the hammer head in the vice at a 45° angle
- File each corner flat and equally with a file
  - A flattened corner = ”chamfer”
  - A rounded outside corner = “radius”
  - A rounded inside corner = “fillet”

HAMMER HANDLE – YOU ALWAYS START WITH FACING!

- Place in LATHE CHUCK, sticking out no more than a finger width
- Set cutter to be <u>90° to direction of travel</u>
- FACE **BOTH** ends smooth
- Rocker tool holder UP or DOWN to hit the center

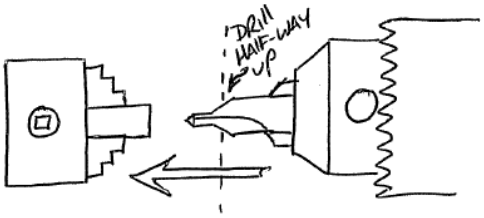
Facing Demo



HAMMER HANDLE – CENTER DRILLING

- Center-drilling is done so we can hold the ends in the tail stock.
- Drill only half-way up the Center-Drill taper.
- Do **BOTH** ends

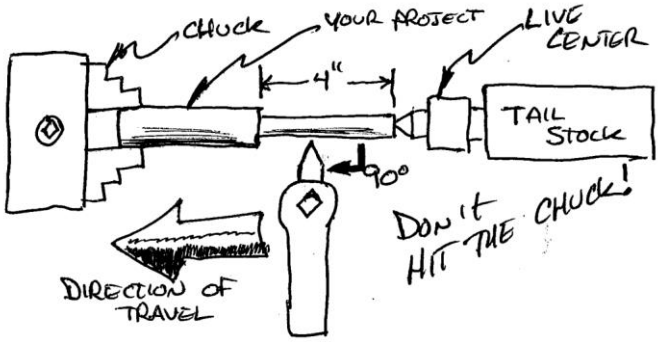
Center-Drilling Demo

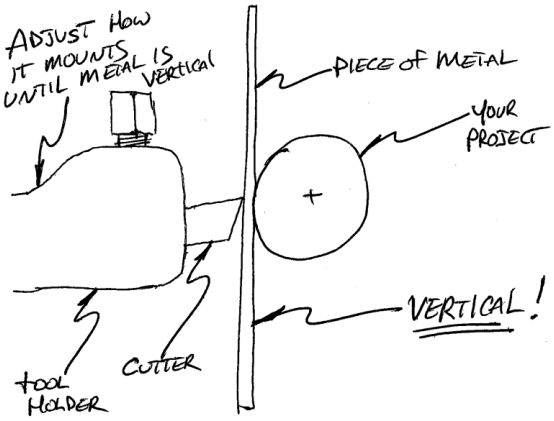


HAMMER HANDLE – TURNING

- Support the handle in the CHUCK and LIVE CENTER
- Set the cutter to correct HEIGHT, and <u>90° to the direction of travel</u>
- Turn half the handle down to 3/8” diameter
  >> Important! <<

Turning Demo

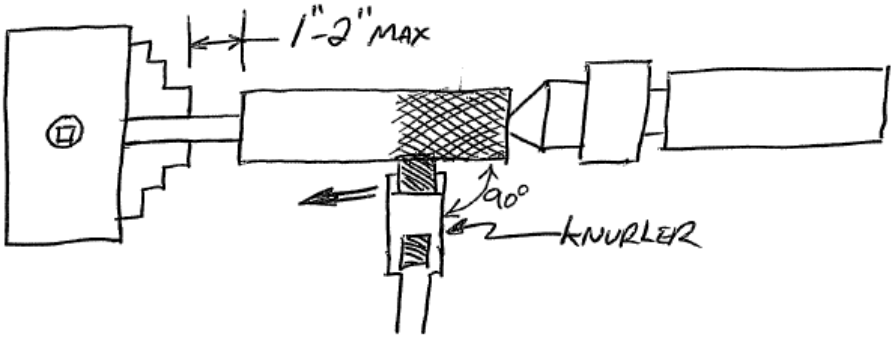




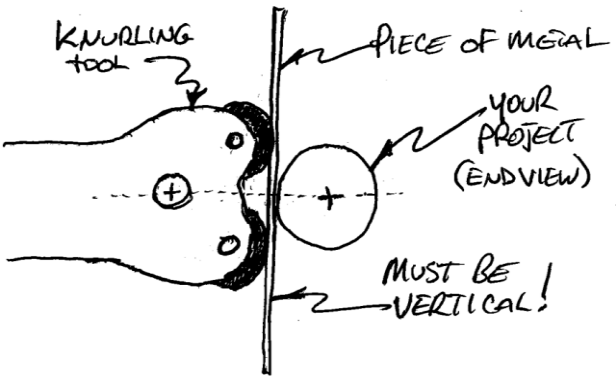
- A smart kid would learn how to use a Dial Caliper, and use the dials on the lathe to cut QUICKLY and ACCURATELY

HAMMER HANDLE – KNURLING

- Flip the handle around, and set up so that there is about 1 to 2” sticking out of the chuck before the handle part starts.



  - TOO MUCH, and the pressure from knurling will FLEX the handle at the diameter change, fatigue, and BREAK!
  - I'll laugh at you, and then show you how to make a smaller hammer with the two pieces you now have.
  - *From an engineering standpoint: An object will fail where there is a change in cross-sectional area*



- Pick the Knurl you want (Coarse, Medium, Fine)
- Set up the KNURLER exactly SQUARE, and CENTERED with the work.
- Make sure you are using TWO of the same knurls – some kids try to knurl with a Coarse and a Fine – you can see between the wheels how they've damaged the Knurler

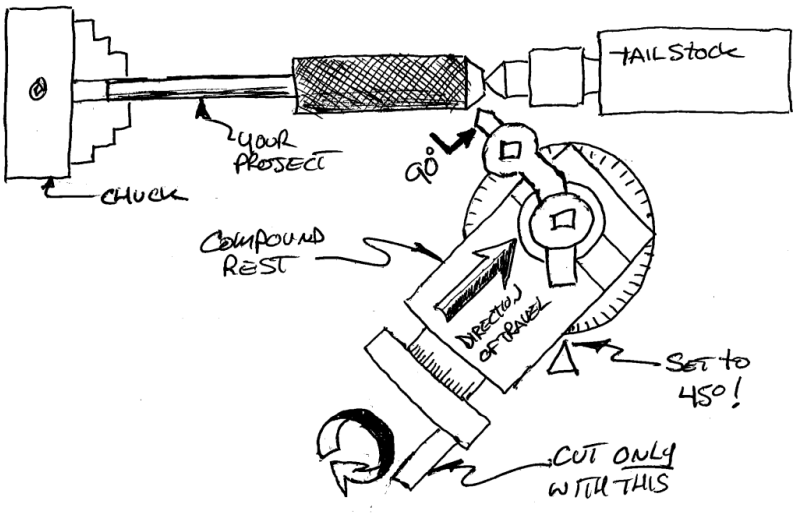
Knurling Demo

- Set the lathe speed to DEAD SLOW
- Use oil from the GREEN can (I usually use non-detergent motor oil)
- Complete one pass, then crank it in a bit more and go back. Repeat until it looks awesome
- If you take the Knurler off and want to go back and do more, see me, and I can show you how to re-engage the Knurler to keep going

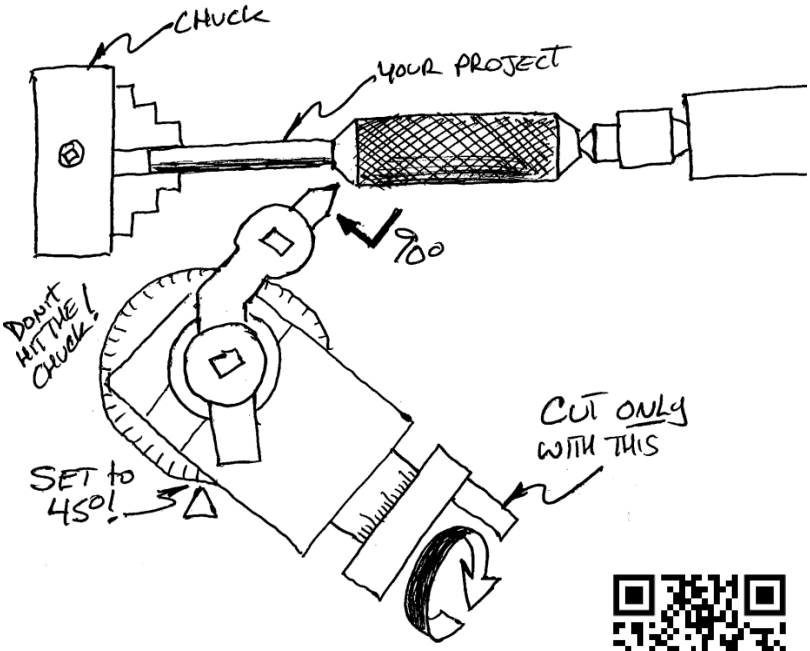
HAMMER HANDLE – CHAMFERING

- Set the COMPOUND REST to 45°

PAY ATTENTION HERE!



- **NOTICE** that the COMPOUND REST is pointed to a different 45° for each end!
- **NOTICE** that the CUTTER is 90° to the direction of travel!
- **NOTICE** that you are ONLY cutting with the TIP of the cutter, not the LONG FACE of the cutter
  - *Cutting with the Long Face will create "Chatter" which will sound nasty, and give you a nasty finish*



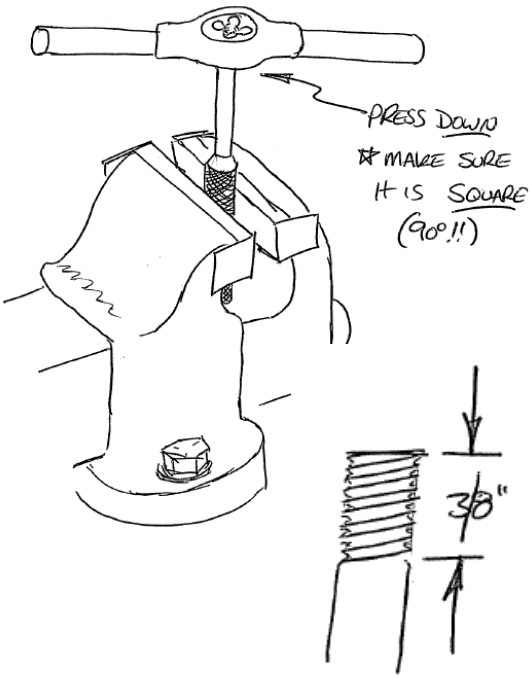
- CUT ONLY with the Compound Rest Wheel!!!!!!
- Be careful not to dig into the handle shaft, or the live center
- CUT ONLY with the Compound Rest wheel

Tapering Demo

HAMMER HANDLE – THREADING

- External Threading is done with a DIE
- **CHAMFER** the end of the handle shaft on the grinder to make it start easier

Tapping Demo



- Clamp knurled handle in a vize with SOFT JAWS
- Make sure you start the cutter STRAIGHT
- Thread down about 3/8”

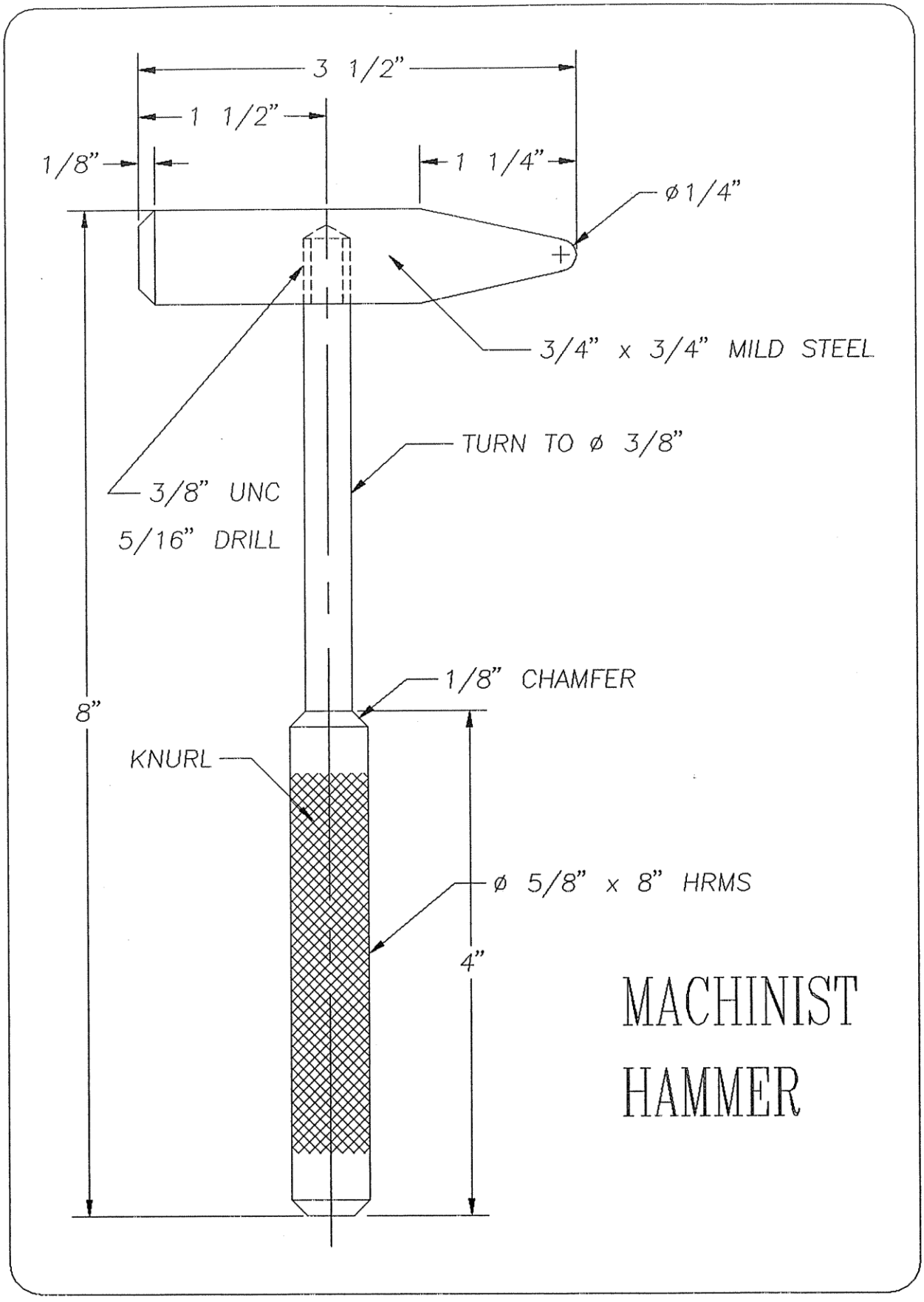
ASSEMBLY

- Thread the handle into the hammer head
- Mark your initials on the parts – theft is a reality
- Read that last one again, because you always follow instructions

COMPLETION

You are finished when you have completed an accurate, high quality Machinist Hammer that have been beautifully made, finished, and letter-stamped with your initials.

- What new skills have you developed?
- What would you have done differently?
- If you were to design a better Hammer, what would it look like?


3 1/2"
1 1/2"
1/8"
1 1/4"
ø1/4"
3/4" x 3/4" MILD STEEL
TURN TO ø 3/8"
3/8" UNC
5/16" DRILL
1/8" CHAMFER
8"
KNURL
ø 5/8" x 8" HRMS
4"
MACHINIST
HAMMER