LAB #9 - MACHINING EXPERIMENT III

DRILLING, BORING AND REAMING

Objective(s): To understand the principles of drilling, boring, and reaming operations and learn to operate a semi-automatic lathe machine safely and analyze the surface finish and dimensional accuracy of the machined parts.

Equipment and materials:

1. Semi-automatic engine lathe
2. 1" micrometer.
3. telescoping gage set
4. 6-inch dial calipers, steel ruler
5. carbide tools.
6. Aluminum bar – 2 inches in diameter (previously used for facing and turning operations).

Procedure:

A. Setup.

1. Insert the work-piece (from Lab #3/4) into the chuck and tighten the jaw. You will work on the previously faced end.

B. Drilling (refer to Figure 1)

1. Extend the tailstock spindle with hand-wheel to extend approximately 1" out of housing.
2. Perform center drilling using a #4 center-drill of diameter = 0.1 inches (use 1000 rpm for the spindle speed).
3. Clean taper shank of the 1/4" dia. drill and insert it into the tailstock spindle. Note: drill should sit tight in the drill chuck (Jacob's chuck), which in turn should be locked in the tailstock. **Do not lock the tailstock spindle.**
4. Using a cutting speed of 50 ft/min and the drill diameter, compute for computation.

   RPM = V x 12 / (pi x D) =

5. Release the tailstock clamp, slowly slide tailstock forward until drill almost touches the workpiece. Tighten the clamp (i.e. lock the tail-stock movement). Note: make sure the workpiece is clear of the drill-bit before starting lathe.
6. Turn the lathe on and drill a 1.5" deep hole using hand feed (manual feeding) on tailstock**. Measure depth of the hole relative to the start of the edge of the 3/4" portion, not the tip of the drill**.
7. Remove the drill by cranking the tailstock spindle hand-wheel in until the drill is free.
8. Enlarge the hole with a 53/64" drill using a spindle speed of 275 rpm.
8. Insert the spindle plug into the tailstock

C. Boring (refer to Figure 2)

1. If necessary, remove the tool holder and insert the boring bar onto the tool post. Adjust the holder until the bar is parallel with the axis of the hole and the cutting edge is at approximate center height of the hole (slightly ABOVE center is preferable).
2. Use a cutting speed of 75 ft/min, and the diameter of the hole to compute and set RPM. You may need to change gears on the spindle speed lever – **do this with the lathe OFF.**
3. Set power feed for 0.004 in/rev. and longitudinal feed going toward headstock.
4. Bore the hole to a diameter 55/64" and depth of 1.25" (suggestion: take multiple cuts to get the desired dimension). Check the diameter with inside calipers or micrometer (use the telescoping gage).
5. Remove the boring tool from the tool post.

D. Reaming (refer to Figure 3)

1. Insert a 7/8" reamer in the tailstock. Support it and guide it into the drilled hole in the initial stage.
2. Ream the hole up to 1" deep using a **slow hand feed** and a speed of 140 rpm.
3. Remove the reamer and check the diameter.

E. Return tools to cabinet and workpiece to instructor and clean up your work area.

Results:

1. Measured diameters after drilling, boring and reaming
2. Discussion of precision of each process (your experience and comments from literature)

Table 1: Measurements

Operation	Tool used	Cutting speed (rpm)	Diameter of hole post cutting (in)	Length of hole post cutting (in)
Drilling				
Boring				
Reaming				

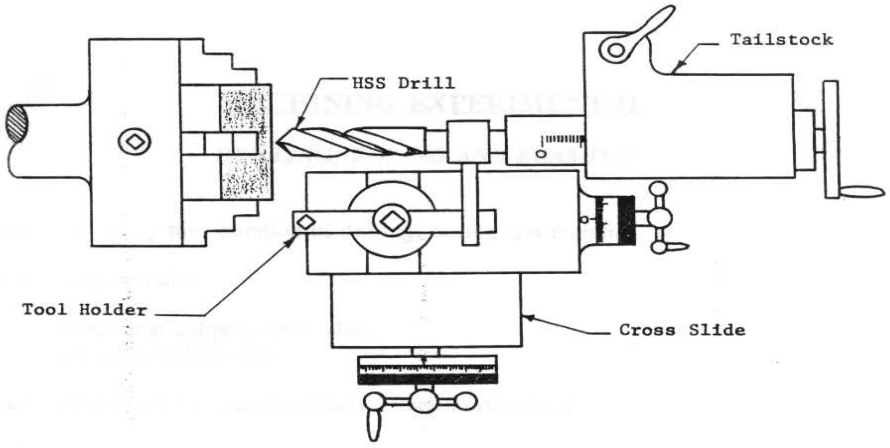

Figure 1 Drilling set up

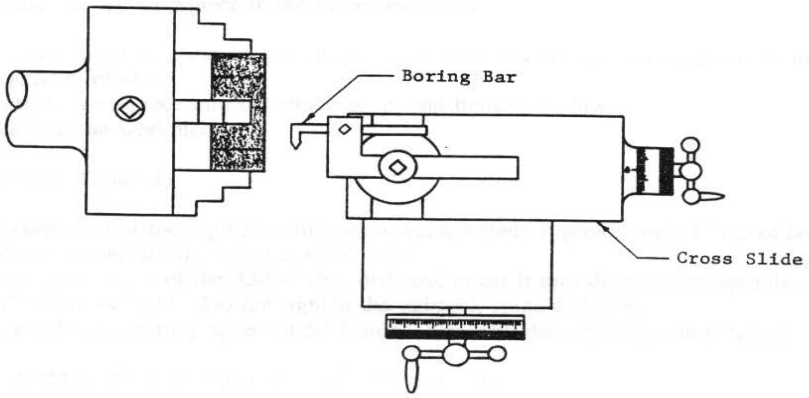

Figure 2 Boring set up

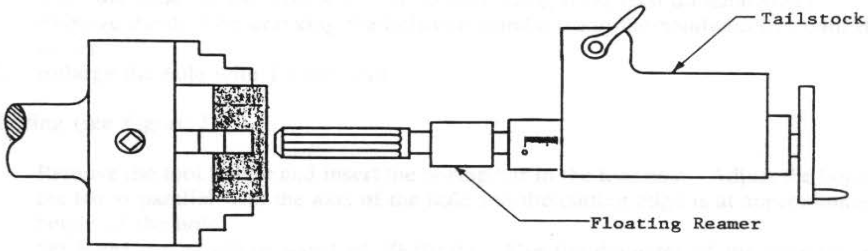

Figure 3 Reaming set up