Pumping Station One: Clausing Lathe Authorization Outline

DISCLAIMER:

I am giving this instruction for free. It is not a comprehensive treatment of the subject matter being discussed. Although I do my best to be as accurate and complete as possible, I may leave out important safety information, and I may mistakenly say things that aren't correct. Nevertheless, I believe the content is complete and accurate enough to help PS:1 members work safely in the shop. Shop work carries a number of risks. People who use this information or the demos that go with it assume all risks themselves. Attending this authorization does not guarantee that you will be authorized to use the machine. The user must demonstrate understanding and ability during the hands-on portion to be authorized.

Lathe Authorization: (*Authorization will take 2.5- 3 hours, depending on the person) 1 1/2 hours of demo. 1- 1 1/2 hours of hands-on.*

The purpose of this lathe authorization is to show people how to use the machine safely and how not to hurt themselves. This is not an instructional guide to being a machinist. For skill development in using tools in fabrication, you should take a class of some kind and practice, practice, practice. In this authorization, you will be shown only the basic operation of the tools. The purpose of these minimal illustrations of technique is so that you might have some idea of the types of things the tools are capable of. Authorization gives you permission to use the tools. Authorization to use the tools is not a certification of your competence.

Safety first: Do not operate machine tools under the influence of drugs (prescription or otherwise) and alcohol. When using a lathe, you should be aware of your person. Long hair must be tied back, jewelry or anything hanging from the wrist and neck must be removed. Short sleeves are preferred. Loose sleeves must be rolled up. Anything that potential can get pulled in by the running machine must be removed. Goggles must be worn at all times. Please try not to talk to people when you are running the machine. Do not run the machine if your attention is divided. Let other people know when they are in proximity to the machine to stay within a good distance from the running machine. For safe operation of the machine, please stay on the right side of the saddle. Never walk away from the machine when it is running.

(PLEASE TAKE NOTES. EMPTY SPACE IS PROVIDED BETWEEN SECTIONS)

A. Introduction to the metal lathe, what it is, and what it is for*. (can skip if one already has previous experience.)*

B. Begin

- Drop cover should be removed and placed somewhere it does not get wet.
- How to turn on the machine. Make sure all three power cords of the machine are plugged in. Turn the toggle switch in the back of the machine on. Pull the lighted emergency stop on the machine to the ON position

C. User interface box:

- Emergency stop
- Fault light. (Provide instances of how you can fault the machine)
- Fault reset (must return the drum switch to the stop position)

- Speed Dial (Speed dial is adjustable from 20%to 100%)
- Speed Dial Light (Lights up when the machine is up to speed)

D: Feeds and Speeds

- Explanation of what speed and feed are. Feed and speed are dictated by the material hardness.
- How to adjust the speed of the spindle. Motor and pulley. Speed chart on the machine. (back gear and open belt speeds) How to use and read the variable control on the user interface box. (20%-100% of current belt)
- How to change the belts.
-DO NOT SET THE SPEED TO 1700 RPM. THIS SPEED SHOULD ONLY BE USED FOR COLLETS ONLY!

E. How to change the chuck

- pin for open belt. (Do not pull out completely.) Explanation of the back gear and direct drive. (Note color dots on settings: red dot DO NOT change when the machine is running. Green can be adjusted when the machine is running.
- Make sure you engage the e-stop before making any attempts to change attachments (chucks) on the spindle, so the machine doesn't turn on accidentally.
- How to lock the spindle.
- Ways must be covered by a piece of wood before removal.
- How to loosen the chuck from the spindle for removal. Never pound on the machine in an attempt to remove the chuck. Be aware that the chuck may be heavy; never drop the chuck on the lathe.
- Spindle accessories for Clausing. (four jaw chuck, faceplate, collet chuck *currently not in service*)
- Size capacity. (The size capacity of the 3-jaw is 2.5", four jaws can be larger, 3"- 4")
- Jaw flipping of the step jaw of a 4-jaw chuck.
- Always make sure the spindle thread and mating thread on the accessories are free of chips; otherwise, there may be problems with attaching the accessory to the spindle of the chuck. Chips can prevent the attachment from being seated properly on the nose and can cause the accessory to unthread from the nose when the machine is rotating.

F. Types of cutter (Users are responsible for getting their own cutting bits. But some bits are provided. A set of indexable bars is available. Users must buy their own carbide inserts. The maximum size of bits is ½" shank for Clausing.

- HHS steel blanks (grinding your bits, tool grinder is a separate authorization)
- Cemented carbide bit
- Index carbide bits. (explain rake angles, relief angles, angle of the cutter)
- Attaching cutting tools to holders. The cutting bit should have a fair amount sticking out (about ½") but not too much, since the bit can deflect and cause errors in cutting or cause serious vibration and chattering on the cutting tool.

G. Attaching the cutting tool to the tool post.

- Location of compound rest. The tool post must be well supported under the compound rest. Should not be cantilevered. (You will need to back the compound so the front is flush with the base of the compound.)

-Centering cutting tool.

H. How to chuck up your stock on the lathe.

- Always engage the e-stop when attaching anything to the chuck so as to ensure that the machine does not turn on accidentally.
- Correct way of chucking materials
- When chucking your stock, you need to use the maximum surface area of the jaws to hold the work. Otherwise, damage can occur on the chuck.
- DO NOT over-tighten jaws (This can also damage the chuck. Jaws that are splayed can not accurately hold stock.)
- Do not leave the chuck key in the chuck when you are finished with clamping your work. Otherwise, injury or damage to the machine can happen.

I. Saddle.

- Compound rest can be adjusted using the provided wrench to adjust your angles. (Compound should not be canter levered out.)
- Cross slide axis. (Do not run the cross slide past the dovetail in the direction of the operator, as this can cause the cross slide to come off the cross slide nut and disengage from the leadscrew.)
- Longitude feed axis

J. OPERATIONS: (refer to diagram on lathe on wall) *For safe operation of the lathe, please stay on the right side of the machine when the machine is running. NEVER LEAVE THE MACHINE UNATTENDED WHEN IT IS RUNNING!*

1. Facing

- Turning on the motor using the drum switch.
- Facing your stock (used as your reference)
- Explanation of manual machining and roughing cuts (no more than 3/16 “ for only on soft materials like machining plastics) on ½” cutters, depending on the type of materials.

-Locking the saddle (only when you are facing). The saddle lock prevents any lateral movement when using the cross slide.

-Address the micrometer dial on the axis. Backlash must be run out before zeroing and locking the collar.

- Back out using the compound rest, so when you move the cross slide axis across your cut, you do not mar your surface.
- Finishing passes. Finishing cuts should be shallow (less than .0050”).
- Settings for threading and automatic feed (NOTE COLOR DOTS):

Explanation of the thread chart

Slide gearbox

Thread and feed selector handle (always seat the selector in the position of the notches. If the selector is a little above or below the position, it can cause the gears to grind. If you hear a grinding sound, stop and readjust the selector handle.)

Lead screw direction

Selector Knob (Please do not force the selector knob to a position if it is difficult to set. You should be able to feel the detents when it is in position. **If it is hard to position, you can rotate the lead screw by hand while turning the knob. Rocking the knob gently, turning a little clockwise and counterclockwise gently can position the selector. DO NOT turn the knob past its detents; otherwise, the gear will make a grinding sound, and it will damage the gears.)**

- Engaging cross slide lever for automatic feed. Top lever. (Note the position of the lever when the feed is not engaged. **If the feed does not engage, adjust the hand wheel until you can engage the feed.**) When finished with finishing pass., 1. Disengage feed. 2. Back out of the cut. 3. Turn off the motor. Unlock the saddle.

-If the saddle is hard to move, **do not force the machine**. Feed may be engaged, or the saddle is locked

2. Turning

- **Make sure the saddle lock is unlocked** whenever you are using the longitudinal axis.
- Adjust the compound rest for the angle of your cutter**.**
- The user should check that their setup will not interfere with the chuck. Make sure the work, chuck, will not collide with the cutter or the DRO scale in front of the saddle.
- Note the mechanical stop. (This will not prevent damage to the machine or DRO. It is just a reminder. The user should visually inspect the maximum allowed travel before starting the machine. **Scoring your work can help provide a visual clue to allow the user to know that the maximum travel is getting close**.
- Locate the automatic feed longitude feed. (Third on the bottom. The default not engaged position is pointing down.
- Illustrate the difference in cuts (make three cuts: Hand turning, automatic feed, and automatic feed with coolant)
- Clearing chips and using coolant must be done on the right side of the saddle.

3. Half nut (what is it for)

K. Tail Stock (Attachments for the tail stock: live center, dead center, drill chuck.)

- How to chuck up attachment to the tailstock (If your attachment starts to rotate in the tailstock sleeve, you must stop the machine and back out of your work and reattach the attachment. If the attachment continues to slip in the tailstock, there will be damage to the tailstock sleeve. Anyone who damages the sleeve will have to pay $269 for the replacement of the sleeve.)

- Adjustment on the tailstock: ram lock, locking lever, hand wheel
- Maximum travel for the tailstock is 2 ½" (do not exceed travel, otherwise the ram will pop out)

1. Demo of using drilling:

- Use of center bits

- **Maximum size of drill bits for the tailstock is ½"**. If you need a larger hole, you must bore it out using a boring bar.

2. Using live center to support work.

L. HANDS-ON PORTION. (User must demonstrate what they have seen and the ability to be able to be authorized to use the machine. The authorizer will use this to decide at the end of the hands-on portion of the authorization.

1. Face end until it is flat. This may take multiple passes. Finishing pass with auto feed.
2. Introduce DRO. Use reference end to zero for x. Use the uncut side to zero for y.
3. User will turn the stock to a measured length (1" from the end using the dro.) Make 4 passes at a total of.030" deep. Two roughing passes, and two finishing passes. (finishing passes tend to be shallow .005" or less)

M. Importance of Clean-up.

- Cleaning up
- Shutting down the machine.
- Cover machine

N. Problems with the machine.

If you experience problems with the machine, please contact Ed. Emails are on the machine.

Helpful websites videos

https://www.youtube.com/@mrpete222/videos

Supplier for raw material and cutting tools:

Mcmaster Carr (http://www.mcmaster.com)
Msc Industrial Supply (http://www.mscdirect.com)
Shars (http://www.shars.com)

Book references:

Machinist Handbook
Machine Shop Practice, Vol. 1, 2

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