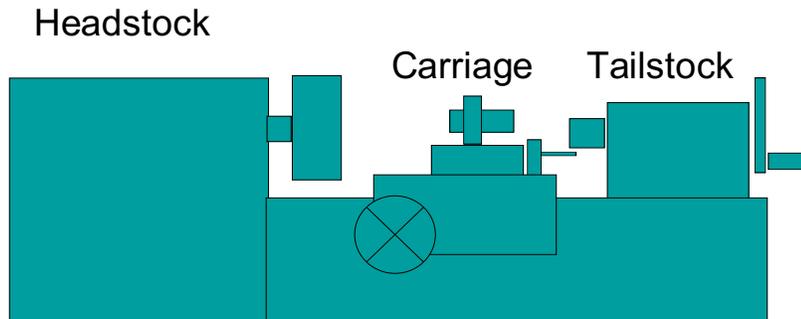


Metal Lathe

The metal lathe consists of three major parts: headstock, tailstock and carriage.



Headstock: Contains gears and bearings that enable the machine to rotate at different speeds or revolutions per minute. It also supports the primary work holding device called the lathe chuck. The jaws on the three- jaw chuck move in sequence to each other, this enables cylindrical pieces to be held accurately on the machine centre line.

Carriage: Travels along the length of the lathe bed. It supports the cross slide and the compound rest which have the tool bit holder and tool post firmly attached.

Tailstock: Slides along the length of the lathe bed and can be easily locked at any location. The tailstock is required for drilling operations and it is also helpful to support the work for some machining operations.

Lathe Operations

End Facing: This operation can be defined as the lathe operation where the cutting tool is caused to be fed at 90 degrees to the workpiece axis. The result of end facing is always a reduction in the **LENGTH** of the workpiece.

- Purpose;
1. To make the ends flat and smooth.
 2. To make the ends 90 degrees to the workpiece axis.
 3. To obtain the exact overall length.

If this operation is done correctly, it will result in an accurate reference surface from which to measure.

Setup Instructions

- a) Select a turning and end facing tool bit from the tool crib.
- b) Mount the workpiece in the three-jaw chuck. Leave two finger widths exposed.
- c) Place the tool bit into the right-hand tool holder, leaving approximately one finger width exposed.(finger tighten only)
- d) Place tool holder on top of the rocker in the tool post. Leave approximately two finger widths exposed.
- e) Adjust the rocker so that the cutting tip of the tool bit is on the lathe centre line. Use the point of the live centre to determine this centre line.
- f) Rotate the tool holder so that only the point of the tool bit will contact the work. Tighten tool bit and tool holder in place. See diagram.
- g) Set the lathe rpm at 760.(for ring project)
- h) Move the carriage hand wheel to bring the cutting tool up close to the workpiece but not touching.
- i) Turn on the lathe and bring the tool bit into contact with the workpiece.
- j) Move cross slide out so that the tool clears the work.
- k) Move the compound rest .010".
- l) Turn the cross slide which will advance the tool across the end of the workpiece. Do not let the tool bit travel past the centre of the workpiece.
- m) Move the cross slide back out to clear the workpiece diameter.
- n) Turn off the lathe and check the appearance of the workpiece end.
- o) If further machining is required then proceed to turn the compound rest another .010" and begin the end facing operation again.

Questions:

1. State how the cutting tool is set to the exact centre height.
2. What would be the result if the tool bit is set too high or too low?
3. What type of tool holder should be used for this operation?
4. Why must the cutting tool only extend approximately one finger width from the tool holder?
5. Which part of the lathe insures that the end facing operation will be exactly 90 degrees to the workpiece axis?
6. What would happen if you fed the tool bit to the far side of the centre line when end facing?

Parallel Turning: Parallel turning is that operation whereby the cutting tool is fed parallel to the workpiece axis. Turning always results in a reduction of the workpiece diameter. This operation is most important because it is the **BASIC** lathe operation and most other operations are a slight modification of parallel turning.

- Purpose;
1. To make a diameter perfectly cylindrical.
 2. To produce a specified diameter.

Generally parallel turning is performed in at least two cuts: a roughing cut and a finish cut. The graduated collar on the cross slide assist the operator to accurately remove the correct amount of material. This collar only indicates the distance the tool moves towards the work. Therefore, on machines where the work revolves (lathes, cylindrical grinders, boring mills, etc.) **the cutting tool should be set in only half the amount to be removed. Because material is being removed from the circumference of the workpiece.** The distance the tool bit advances is called the “DEPTH of CUT”

CHART COMPARING ROUGH AND FINISH TURNING

Type of turning	Rate of feed	Depth of cut	Finish	Accuracy
Rough turning	.016"/revolution	.025"/side	Rough	Approximate size
Finish turning	.005"/revolution	.005"/side	Smooth	Accurate (within .001")

Rough Turning: Is rapid removal of the surplus metal. It is performed using a high rate of feed and a deep cut.

Finish Turning: Is used to obtain an accurate size and finish. It is performed using one cut of .005"/side and a low feed rate.

Setup Instructions

- a) Select a turning and end facing tool bit from the tool crib.
- b) Mount the workpiece in the three-jaw chuck.
- c) Place the tool bit into the right-hand tool holder, leaving approximately

one finger width exposed.(finger tighten only)

d) Place tool holder on top of the rocker in the tool post. Leave approximately two finger widths exposed.

e) Adjust the rocker so that the cutting tip of the tool bit is on the lathe centre line. Use the point of the live centre to determine this centre line.

f) Rotate the tool holder so that only the point of the tool bit will contact the work. Tighten tool bit and tool holder in place. See diagram.

g) Set the lathe rpm for the workpiece diameter. $CS \times 4$ divided by the diameter.

h) Move the carriage hand wheel to bring the cutting tool up close to the workpiece but not touching.

i) Turn on the lathe and bring the tool bit into contact with the workpiece.(using the cross slide)

j) Move carriage to the end of the workpiece until it is clear of the work.

k) Adjust the cross slide graduation collar to zero.

l) Turn the cross slide dial in the proper amount. Remember to turn the dial in half of the total.

m) Set the carriage power feed at .005" for a fine cut and .016" for a rough cut.

n) Turn off the lathe and check the diameter with a micrometer.

o) If further machining is required then proceed with rough cuts until a finish cut can be used to achieved the final diameter.

Questions:

1. State two purposes for parallel turning.
2. What would be the result if all the turning was completed using only finish cuts.
3. What type of tool holder should be used for this operation?
4. Why must the cutting tool only be advanced one half of the total amount?
5. Which part of the lathe insures that the parallel operation will be parallel to the workpiece axis?
6. The distance that the tool bit advances is called the "_____ " ?