Table of Contents

TURNING WORK BETWEEN CENTERS

Lesson One

Lathe Setup and Workpiece Preparation

TPC Training Systems

32401

Lesson

1 Lathe Setup and Workpiece Preparation

TOPICS

Checking the Lathe
The Workpiece
Selecting the Work Mounting Method
Setting Up the Lathe
Installing the Faceplate
Installing the Lathe Dog
Live and Dead Centers
Alternate Methods for Holding the Workpiece
Facing the Workpiece Ends
Test Running
Tool Selection
Mounting the Facing Tool
Speed and Feed Selection
Facing the End
Facing the Opposite End

OBJECTIVES

After studying this lesson, you should be able to…

- Describe how to select a work mounting method.
- Install a faceplate and lathe dog in a lathe.
- Select and mount a cutting tool for facing the ends of a workpiece.
- Explain how the optimum speed and feed are selected.
- Face the ends of the workpiece.

KEY TECHNICAL TERMS

Faceplate 1.22 transmits the spindle's rotation to the workpiece by its connection to the lathe dog
Lathe dog 1.24 device clamped or screwed to the workpiece and fitted into the faceplate slot
Half-center 1.28 provides clearance for the cutting tool during facing
Tool post 1.44 holds the tool holder and cutter assembly secure during the cutting operation
Hand cross feed 1.50 uses a hand crank to move the cutting tool toward or away from the center hole in a cylindrical workpiece
Power cross feed 1.53 a power device that is used instead of the hand cross feed crank for convenience and greater accuracy when facing large work

Correct preparation of the workpiece and the lathe and proper mounting of the work in the machine are important initial steps in any lathe operation. This lesson shows you how to select the proper lathe setup tools, cutting tools, and correct feeds and speeds for turning work between centers.

You will be provided with a full working drawing of a plug gauge (see Fig. 1-1). This lesson will explain to you how to set up the rough stock in the lathe and how to perform the first machining operation-facing the workpiece ends.

After completing the operations described in this lesson, the workpiece (plug gauge) will be ready for rough and finish turning on its outside diameter.

Checking the Lathe

1.01 An engine lathe is a precision machine. As such, the condition of its individual parts affects its overall operating efficiency. Furthermore, the condition of the lathe's surroundings and mountings can add to or detract from the quality of work produced on the lathe. Always inspect the lathe before beginning a job.

1.02 Be sure that all mechanisms on the lathe are free to move, and that all hold-down and anchor bolts are tight. Check to see that no part of the lathe is cracked or broken.

1.03 **Checking the bed and ways.** The lathe bed is the very foundation of the machine. The bed supports the ways, tailstock, saddle, and other important parts during operation of the lathe. The bed must be perfectly level at all times.

1.04 An unlevel lathe bed will create uneven weight distribution over other parts. This causes the bed to twist, throwing the headstock out of line with the ways. Misalignment of the headstock and ways causes the lathe to make tapered surfaces during straight turning or boring work.

1.05 Check the levelness of the bed by using a level that is at least 12 in. long. Take readings across the bed at both the headstock and the tailstock ends.

1.06 The ways of a lathe are precision-machined V-shaped surfaces. They must be free from dirt, nicks, cracks, or other flaws which could interfere with the movement of the tailstock, saddle, or other lathe parts mounted on them. Apply a light coat of machine oil to the ways. This helps case movement of parts on these surfaces. Be sure that no chips, filings, abrasive dust, or other foreign matter has collected on the finished surfaces of the ways.

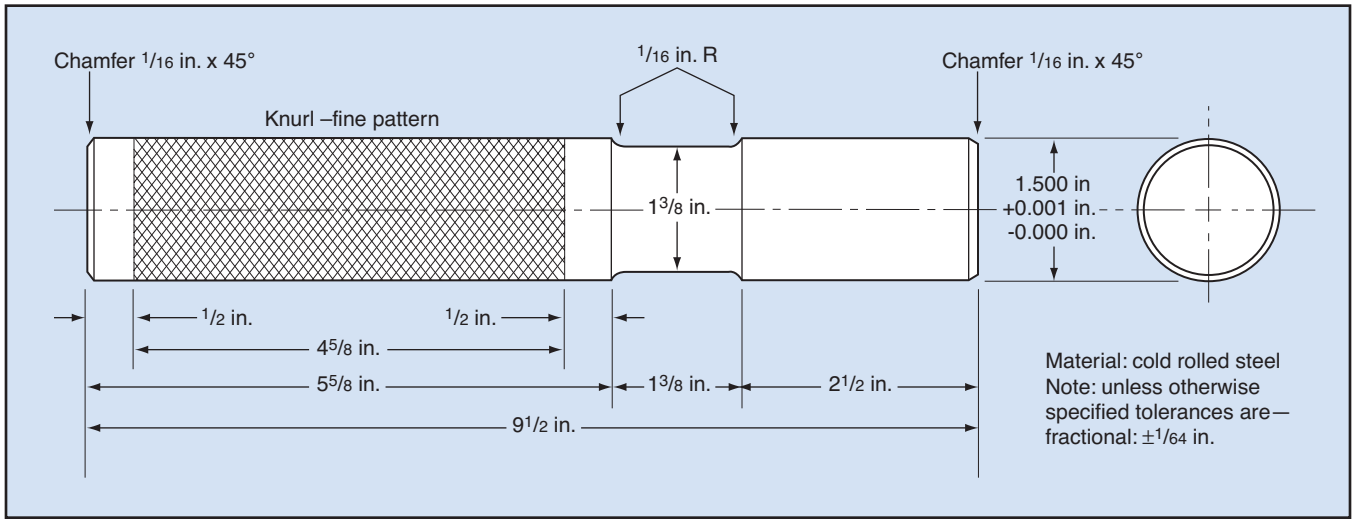
1.07 **Checking lathe center mountings and alignment**. Lathe centers are actually bearings used to hold the workpiece in alignment during many lathe operations. The centers must be in good working order. Centers must be mounted properly in the headstock and tailstock, and aligned perfectly with one another.

1.08 Check the tapered bores in both the headstock and the tailstock spindles. Clean them thoroughly by wiping the bores with a clean cloth wrapped on a stick. Be sure that the bores are free of dirt, chips, or congealed oil. The live and dead centers themselves should be inspected and cleaned thoroughly before they are installed in the lathe. Line up the centers by running the tailstock toward the headstock center until the points just touch one another.

1.09 **Checking the drive mechanism**. Most modern engine lathes are driven by an electric motor. A gear transmission drives the lathe spindle. Spindle speed changes are made by shifting the gearing to one of the many available gear drive ratios. You should acquaint yourself thoroughly with the type of speed selection used on the lathe in your shop. Also, learn where the speed controls are on the machine.

1.10 Be sure that the motor and gear transmission are in good working order. Make sure the oil level in the gear box is at the lathe manufacturer's recommended level. You can practice running the lathe without a workpiece setup to get the feel of the controls.

Fig 1-1. Plug gauge

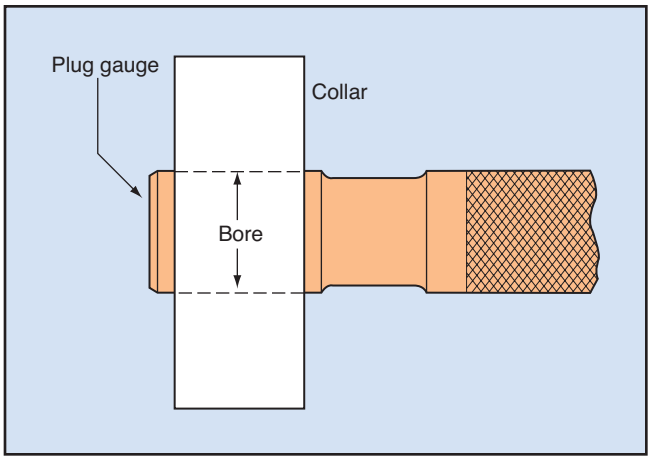


The Workpiece

1.11 Refer to the drawing in Fig. 1-1 and study it carefully. The plug gauge shown in the drawing is a common inspection tool used to check the inside diameter, or bore, of a machine part. Plug gages are made in many sizes and several different shapes. Figure 1-2 shows how a plug gauge is used to check the bore of a collar.

1.12 Making the gauge in the drawing will involve several lathe operations on a piece of cold rolled steel stock. This type of stock has a smooth, bright finish without any scale. It machines fairly easily and has average to good heat-treatability.

Fig. 1-2. Plug gauge checking the bore of a collar



1.13 Before starting any lathe job, always consider the workpiece material specifications. Different materials require different speeds and feeds for the lathe cutting tools. The workpiece stock must be machinable to the required finished dimensions.

1.14 The tightest (closest tolerance) dimension shown for the plug gauge is 1.5 00 in. + 0.001 in. - 0.000 in. This is on the diameter of the gaging surface. To obtain this relatively close tolerance, you must take a roughing cut on the outside diameter, followed by a finishing cut. The general tolerance notes on a shop drawing (shown in the lower left comer of Fig. 1-1) usually define tolerances for all other decimal and fractional dimensions.

1.15 **Selecting the stock**. When a project requires both a roughing cut and a finishing cut, select workpiece raw stock that has enough material for performing both operations. Although this project uses cold rolled steel, castings also provide for this excess material, because foundries usually allow for cleanup and shrinkage.

1.16 When making the plug gauge as shown in Fig. 1-1, select a 1 5/8 in. diameter bar of cold rolled steel. Cut it off to a length of 9 5/8 in. This provides approximately 1/8 in. excess stock on the diameter and on the length. The rough turning operation on the diameter will reduce the 1 5/8 in. to 1 17/32 in. The ends of the workpiece may be faced off until the total length is 9 1/2 in. ± 1/64 in.

Selecting the Work Mounting Method

1.17 There are several methods used to hold a workpiece in a lathe. Mount shorter pieces such as flanges, collars, etc. in a chuck. Mount pieces of moderate to longer length between centers, or hold them in a collet supported by a steady rest or follower rest.

1.18 The decision on which holding method to use is governed by the shape and size of the workpiece as well as by the capacity of the lathe. Sometimes, more than one choice is possible for a given job. To make the plug gauge shown in the drawing, you will mount the workpiece between the lathe centers.

1.19 **Drilling the center holes**. Before the workpiece can be mounted in the lathe, you must first drill holes in the ends of the workpiece to accept the lathe centers. Do this carefully. Use an approved method of laying out, marking, and drilling the holes. Be sure to align the center holes with one another. The top of the hole must have the correct 60 degree countersink to the required depth.

Setting Up the Lathe

1.20 The setup of any lathe will vary with the job and the general size and shape of the workpiece. You should always avoid making any more setups than absolutely necessary for a given job. This is because each change, besides requiring more work, increases the chance for errors in measurement, or tool and work alignment. Errors in any of these can lead to mistakes in the final dimensions on the machined part.

1.21 The plug gauge shown in Fig. 1-1 will require several different lathe operations. Study the drawing closely. You can see that all the required operations can be done with the workpiece mounted between centers on the lathe. This requires only one setup of the work in the lathe. Although cutting tool changes and other adjustments will be required, the entire job can be done in this same setup between centers.

Installing the Faceplate

1.22 Lathe *faceplates* are designated by their overall diameter. The most commonly used sizes are 5 in., 7 in., 9 in., 11 in., and up to 24 in. in diameter. Some special lathe projects may require larger faceplates. Handle the faceplate very carefully. Do not strike it with a tool or other metal object or let it drop on the lathe bed or floor.

1.23 Select a faceplate with a 7 in. diameter for mounting the 1⅝ in.-diameter workpiece. Clean the internal threads in the faceplate using a wire tool such as the one shown in Fig. 1-3. Be sure there is no dried oil or chips in the threads. Next, clean the lathe spindle nose threads and apply a light coating of oil to them.

1.24 Hold the faceplate in front of the spindle nose at right angles to the lathe bed. Slowly thread the faceplate onto the spindle. Never turn the power "on" to install a faceplate on the lathe spindle. This could cause it to lock too tightly. When the faceplate is threaded securely in place on the spindle nose, install the *lathe dog*.

Installing the Lathe Dog

1.25 The bent-tail lathe dog, shown in Fig. 1-4, on the following page, is commonly used for turning work between centers. Do not select a lathe dog that is larger than necessary to accept the workpiece diameter. The tail of an oversize dog could be too far from the faceplate center, which would cause excessive

1.26 Put the lathe dog on the workpiece, as shown in Fig. 1-5, on the following page. Be sure to extend the tail over the work end far enough to engage the slot in the faceplate. Next, tighten the lathe dog setscrew on the workpiece's O.D. (outside diameter).

Fig. 1-3. Thread cleaning tool

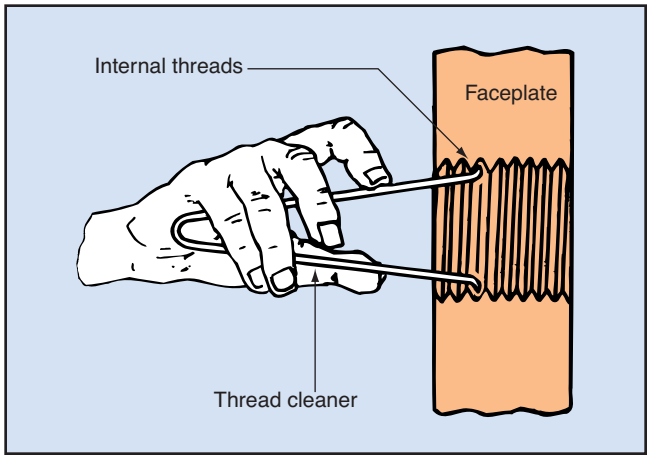


Fig. 1-4. Lathe dogs

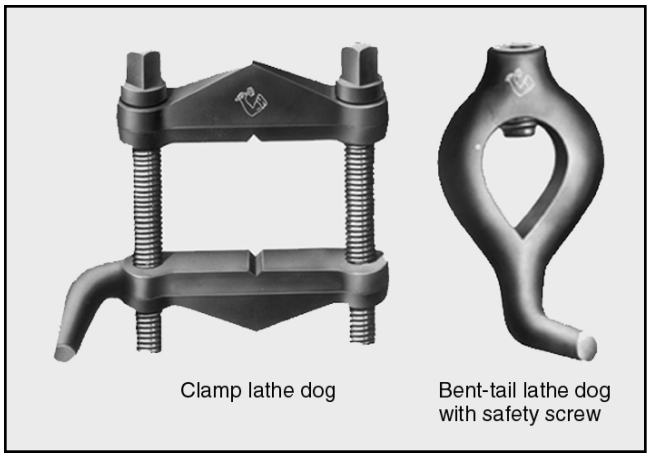
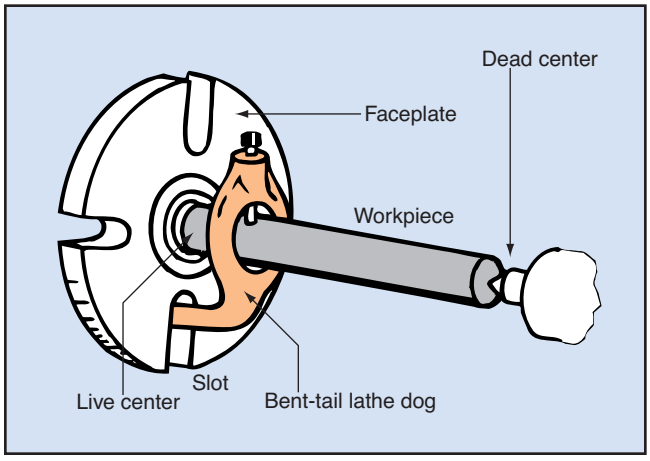


Fig. 1-5. Installing the lathe dog



Live and Dead Centers

1.27 Your first operation in turning raw stock between centers is to face the ends of the workpiece. Both ends of the 1⅝ x 9⅝ in. plug gauge workpiece will be faced at the tailstock end of the lathe. This is because the lathe dog will be at the headstock end. Facing the ends of the work ensures that both the ends, and the workpiece axis, are square. Facing also brings the work to the required length.

1.28 Tailstock centers (often called dead centers) come in several shapes and types. To provide clearance for the facing tool, use a *half-center* at the dead center location. Use a standard 60-degree center in the lathe spindle. Mount both centers in the lathe, and be sure they are locked firmly in position. The tapered shanks of the centers should fit securely into the spindle and tailstock. Apply white lead (or an approved commercial lathe center lubricant) to the nose of the half-center in the tail-stock or in the drilled center hole of the workpiece. This lubricates the dead center as the work rotates. vibration.

Alternate Methods for Holding the Workpiece

1.29 **Collets.** Although you will not need to use a *collet* on this particular job, collets are often used to hold work in a lathe. Collets are made in a wide range of sizes. Their use is limited to smaller diameter, production-type operations. They are used mostly for precision-type projects. A collet closes around the workpiece much like a chuck.

1.30 **Steady rest.** You will not need to use a steady rest when machining a plug gauge, because of its relatively short length and ample diameter. However, the steady rest is necessary for some jobs. When machining long, slender work between centers, there is a tendency for the work to spring away from the cutting tool as the tool exerts pressure. To avoid this, you will install a steady rest just past the center of the workpiece toward the headstock.

1.31 Carefully adjust the jaws of the steady rest for a running fit with the workpiece O.D. Turn the work up to the steady rest jaws. Next, reverse the work end for end, and repeat the turning operation. Adjust the steady rest jaws to the finished O.D. size.

1.32 Before adjusting the jaws, clamp the steady rest firmly to the lathe bed. Although most steady rests have soft metal jaws, you should protect finished work surfaces from the jaws by using plenty of lubricant in that area. You may also insert a soft metal sleeve between the jaws and work surface.

1.33 **Follower rest.** A follower rest is another lathe accessory used to support long, slender work during turning. It is also not needed to make a plug gauge, but is often used in other jobs. Unlike the steady rest, which is held stationary on the lathe bed, a follower rest is mounted on the lathe carriage. It travels with the cutting tool supporting the work close to the tool contact area.

1.34 Be sure that the base of the follower rest is clean and free from chips. Also, clean the follower

rest mounting surfaces on the lathe carriage. Set the jaws of the follower rest so they will just clear the workpiece.

The Programmed Exercises on the following page will tell you how well you understand the material you have just read. Before starting the exercises, remove the REVEAL KEY from the back of your Book. Read the instructions printed on the Reveal Key. Follow these instructions as you work through the Programmed Exercises.

1-1. The foundation of a lathe is called the lathe _____.	1-1. BED Ref: 1.03
1-2. Misalignment of a lathe head stock and ways will cause straight turning to come out _____,	1-2. TAPERED Ref: 1.04
1-3. A clean cloth wrapped on a stick can be used to clean out the headstock and tailstock spindle _____.	1-3. BORES Ref: 1.08
1-4. Casting cannot be turned in a lathe because they do not have enough excess stock for a finishing cut. True or False?	1-4. FALSE Ref: 1.15
1-5. Lathe faceplates are usually designated by the size of their overall _____.	1-5. DIAMETER Ref: 1.22
1-6. You should install the faceplate on the lathe by turning the power “on”. True or False?	1-6. FALSE Ref: 1.24
1-7. Work is most often held for turning between centers by using a(n) _____ lathe dog.	1-7. BENT-TAIL Ref: 1.25
1-8. Clearance for the entry of a facing tool at the work center is provided by using a(n) _____.	1-8. HALF-CENTER Ref: 1.28

Facing the Workpiece Ends

1.35 With the lathe dog mounted on one end of the work, and the faceplate installed on the spindle nose, you now put the workpiece into the lathe. To mount the 9 5/8 in. workpiece (plug gauge), first unclamp the tailstock so that it can slide freely on the bed and ways. Next, move the tailstock toward the spindle so that the distance between the centers' points is approximately 10 1/2 in., as shown in Fig. 1-6. Clamp the tailstock in this position.

1.36 Once the tailstock is in position, place the dog end of the workpiece on the live center. At the same time, insert the tail of the dog into a faceplate slot. Next, use your right hand to turn the tailstock handwheel to move the dead center into the center hole at the tailstock end of the work. Use your left hand to hold the workpiece until the dead center is seated in the hole.

1.37 Be sure the tail of the dog does not sit on the bottom of the faceplate slot. The tail must fit freely in the center of the slot so that no binding occurs between the dog and faceplate. Figure 1-7 shows where you must allow clearance between the tail and the bottom of the faceplate slot. The completed mounting should look like the arrangement in Fig. 1-8.

1.38 Next, inspect the fit between both the live and the dead centers and their mating center holes in the workpiece. The live and dead center points should bear completely in the holes. Use your left hand to slowly rotate the workpiece first in one direction, then in the other. With your right hand, turn the tailstock handwheel until the work can just be turned slightly with your left. At that point, tighten the tailstock spindle clamp. Rotate the lathe spindle by hand. Make sure that the workpiece, faceplate, and lathe dog do not strike any part of the lathe.

Test Running

1.39 Remove all jewelry and loose clothing, such as ties, scarves, etc. Put on safety glasses, and start the lathe. Run it at a low speed with the cross feed and carriage disengaged. Listen for any unusual noises. If the lathe dog tail clanks against the faceplate slot, the dead center does not fit tightly enough in the

Fig. 1-7. Correct mounting of lathe dog in faceplate

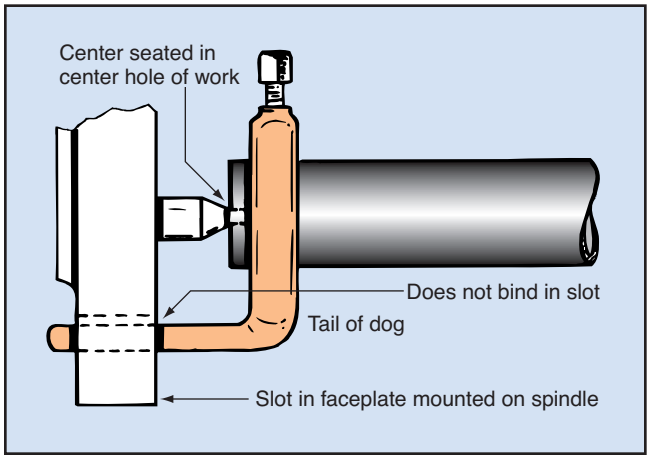


Fig. 1-6. Distance between the centers' points

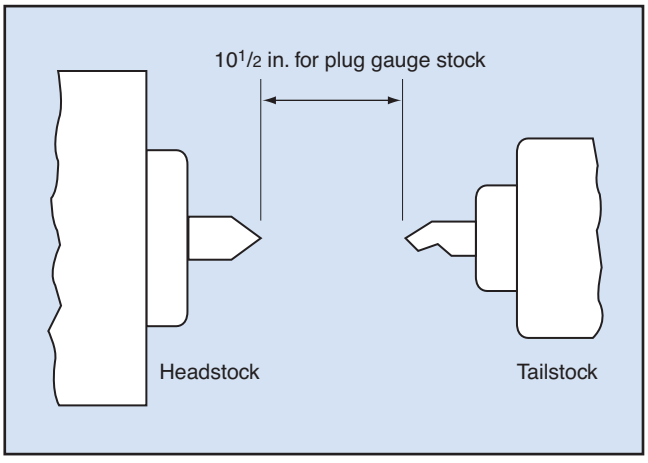


Fig. 1-8. Properly mounted workpiece between centers

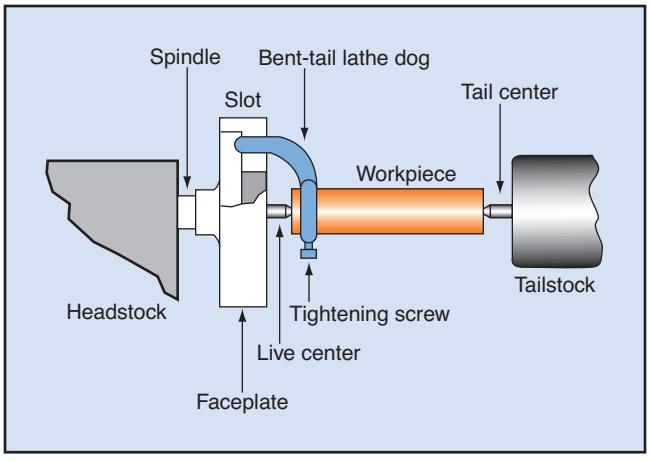


Fig. 1-9. Half-center mounted in dead center

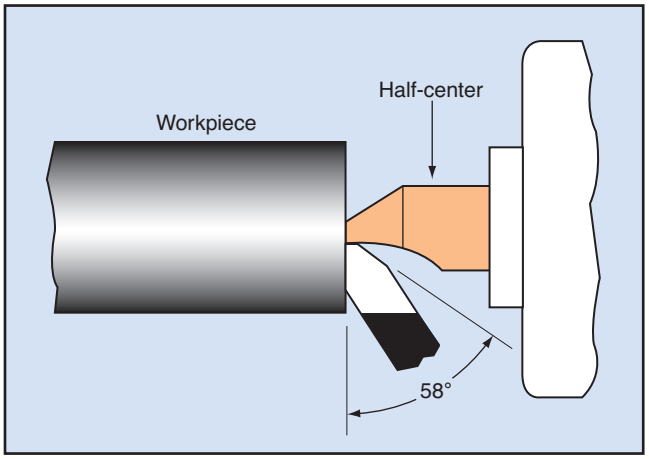
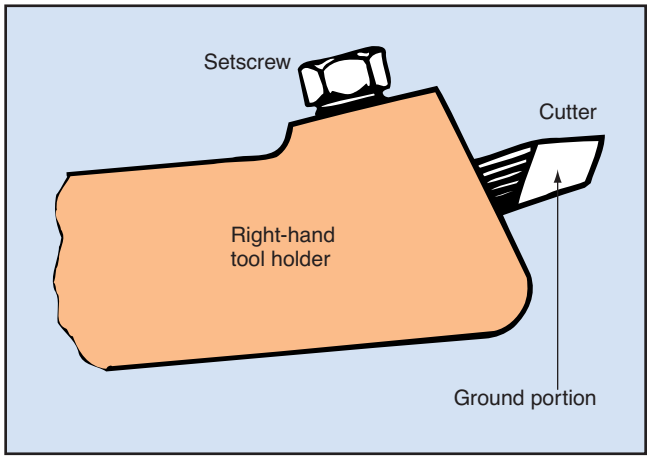


Fig. 1-10. Facing tool mounted in holder



work. If this occurs, stop the lathe and tighten the dead center in the work using the tailstock handwheel. If you can't rotate the workpiece by hand, the work is held too tightly between the centers. Stop the lathe and back the dead center out slightly. After all necessary adjustments are made, retighten the tailstock spindle clamp.

Tool Selection

1.40 There are several kinds and grades of materials used for lathe cutting tools. The correct selection depends on the workpiece material and the rates of cutting speeds and feeds to be used on a job. The use of lubricants also affects tool selection. You should always analyze the job at hand and be guided by cutting tool manufacturers' published charts and tables when selecting a tool for a given project.

1.41 To face the ends of the workpiece mounted in the lathe, a cutting tool made of high-speed steel should be used. The workpiece stock is cold rolled steel, which will permit a moderate cutting speed using a high-speed steel cutter. The area to be machined is relatively small, and the expense of more exotic cutter materials would be impractical. No lubricant will be used for this small work area, since heat will be low.

1.42 Select a high-speed steel right-hand facing tool with a nose angle of 58°. This will permit the cutting edge of the tool to enter the work beneath the dead half-center, as shown in Fig. 1-9.

Mounting the Facing Tool

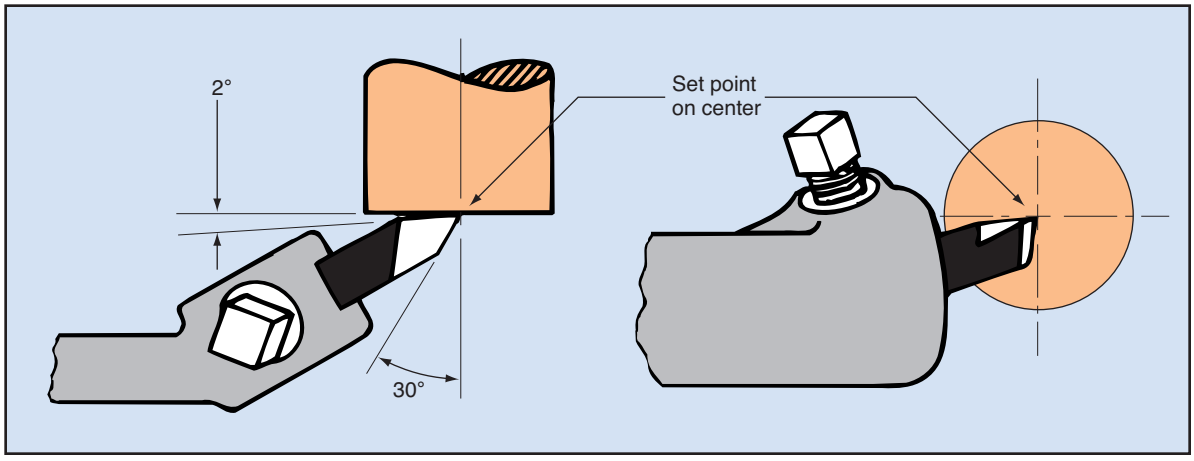
1.43 Mount the facing tool that you have selected in a right-hand tool holder. Be sure to allow the cutting end to extend outward just past the ground portion, as shown in Fig. 1-10. However, be aware that too much tool overhang can cause the tool to snap off during machining. Once the cutter is properly positioned, tighten the tool holder setscrew down on the cutter.

1.44 Next, insert the tool holder and cutter assembly in the lathe's *tool post*. Be sure that it is seated well back into the post. Using the dead center as a reference point, adjust the tool holder in the post so that the tool point is aligned with the workpiece center, as shown in Fig. 1-11. Tighten the tool post screw down onto the tool holder. Be sure the tool does not spring downward as you do this. Lock the compound rest and lathe carriage in this position.

Speed and Feed Selection

1.45 The cutting speed of a lathe is expressed in surface feet per minute (sfpm). It is the distance in inches that a point on the circumference of a workpiece moves past the cutter point in one minute. To become a good lathe operator, you must learn how to balance the cutting speed with the feed. The ideal is to get the best finish possible without overloading the machine. This comes with experience. There are many tables and charts provided by various lathe manufacturers showing cutting speeds and feeds for machining different metals. Table 1-1 shows a sampling of such a tabulation.

Fig. 1-11. Tool point aligned with workpiece center



1.46 You must convert sfpm to rpm (revolutions per minute), in order to set the lathe speed controls. For example, using Table 1-1, the recommended cutting speed for cold rolled steel (the plug gauge material) is 100 to 110 sfpm. To convert this to spindle rpm, use the formula:

rpm = (sfpm x 4) ÷ work diameter

(The term 4 in the formula is a constant.)

1.47 The approximate cutting speed, in rpm, needed to face the ends of the plug gauge blank when using a high-speed steel cutter is:

rpm = (100 sfpm x 4) ÷ 12 = 33.3 rpm

You can now set the lathe spindle to turn at approximately this value.

1.48 Lathe feeds are set using similar methods and formulas. When facing the ends of the plug gauge blank, use a hand feed, because of the relatively small area to be machined.

Facing the End

1.49 When the correct cutting tool has been properly mounted and aligned, you will face the ends of the workpiece and bring it to its final length. The finished length of the plug gauge must be 9 1/2 in. ± 1/64 in. The rough stock mounted in the lathe is 9 5/8 in. long. You must face off 1/16 in. from each end of the work.

1.50 First, loosen the carriage locking nut so that the carriage can be moved on the ways. Use the *hand cross feed* handle and carriage crank to move the cutter point as close as possible to the workpiece center hole. Be careful not to strike the dead center or the cutter edges against one another, or against the workpiece.

1.51 Start the lathe and take a light cut 3/64 in. deep. Use the cross feed handle to move the cutter toward you and away from the work center. This is a distance of about 3/8 in. (as shown in Fig. 1-12, on the following page). Stop the lathe and inspect the cut for smoothness and general appearance.

1.52 Make any necessary adjustments to the cutter or tool holder and then move the cutter point back into the center of the work. Restart the lathe. Take the full 1/16 in. cut. Adjust the depth using the hand longi-

Table 1-1. Recommended cutting speeds using high-speed steel cutters

Material	SAE No.	sfpm
Cold-rolled steel	1010	100 to 110
Machine steel	1015	100 to 110
High-carbon steel	1095	60 to 70
High-speed steel	71660	50 to 60
Nickel chromium	3250	50 to 60
Cast iron		55 to 60
Aluminum		200 to 250
Copper		200 to 250
Bronze		200 to 250

Fig. 1-12. Trial facing cut

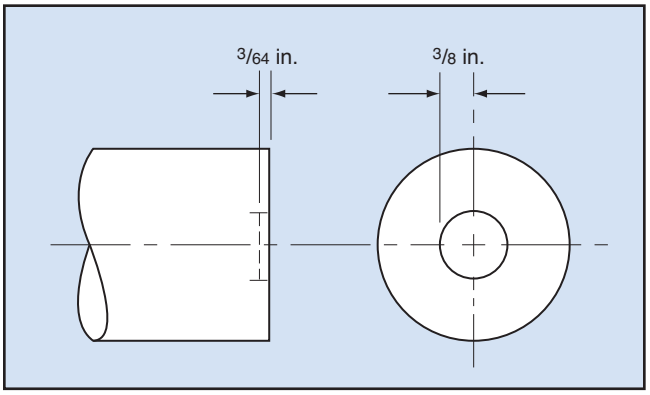
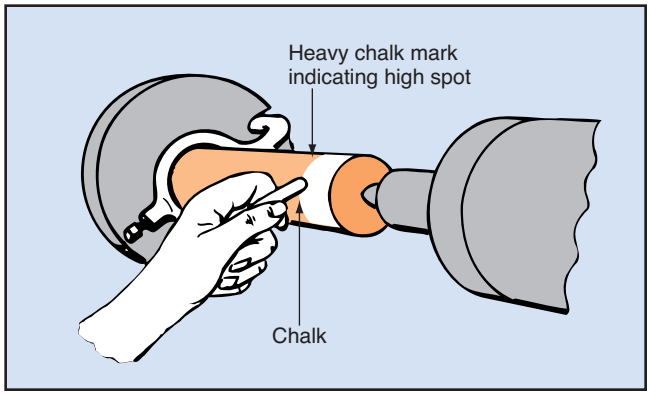


Fig. 1-13. Unfaced end marked with chalk



tudinal-feed handwheel or crank. Stop the lathe and tighten the carriage on the ways.

1.53 Restart the lathe and turn the cross feed handle to face off the work from the center outward. Control the feed by adjusting your cross feed. On larger workpieces, the lathe's *power cross feed* is used for convenience and greater accuracy. When facing larger work, it is sometimes necessary to reduce the feed rate as the tool progresses outward from the work center. This is because the effective diameter of the work is changing. This change, in turn, causes the feed in sfpm to change, as shown in the formulas.

Facing the Opposite End

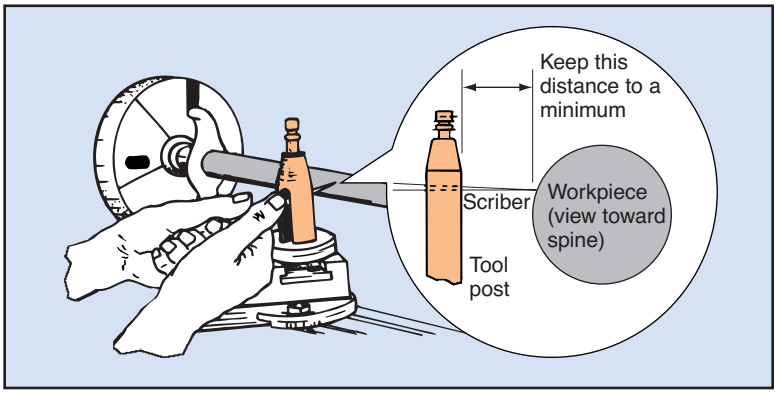
1.54 When one end of the workpiece has been faced, you will have a flat and true surface to use as a reference. The length of the workpiece for making the plug gauge has now been reduced to 9 9/16 in. This allows for another 1/16 in. to be removed in facing the opposite end of the work, which is now held in the live center.

1.55 You must now accurately lay off (measure) the finished length using the faced end as a reference measuring point. Remove the workpiece from the lathe and remove the lathe dog from the work. Apply chalk or marking dye to the unfaced end diameter, as shown in Fig. 1-13.

1.56 Use a scale to accurately measure 9 1/2 in. from the faced end. Mark this point with a scriber. An alternate method is to set a hermaphrodite caliper to 9 1/2 in. and use its point to mark the dyed or chalked area.

1.57 After laying off the desired length on the work, install the lathe dog on the faced end. Mount the workpiece back in the lathe between centers. Remember to relubricate the dead center nose. Be sure the work is firmly held in both centers.

Fig. 1-14. Scriber braced against tool post



1.58 With the carriage and compound rest moved out of your way, hold the scriber point against the work at the length mark on the chalked or scribed area. You can brace the scriber by holding it against the tool post, as shown in Fig. 1-14. Be sure to hold the scriber firmly so that it does not move as the work turns against it. Start the lathe very slowly in reverse, making a scribed mark around the circumference of the workpiece.

1.59 Pay close attention to any specified tolerances on your working drawing. The finished length of the plug gauge may be between $9\,^{33}/_{64}$ in. and $9\,^{31}/_{64}$ in. Based on the measurement taken with the workpiece out of the lathe, you can compute the depth of cut needed to stay within this range. Using the same procedures for tool alignment, etc., start the lathe and face the end of the work to the required length.

1.60 Some lathe end facing jobs are done to change the length of an existing machine part for a better fit. Other end facing projects are done merely to square the ends of cut-off bar stock. The facing operation performed in this lesson was done primarily to prepare the workpiece for the future operations that will complete it. The facing also finished the workpiece to a specific length.

1-9. When clamping the tailstock into position, the distance between the lathe centers should be slightly _____ than the workpiece.	1-9. LONGER Ref: 1.35
1-10. The dead center is moved into the work center hole by turning the tailstock _____.	1-10. HANDWHEEL Ref: 1.36
1-11. Be sure there is no binding between the lathe dog tail and the _____.	1-11. FACEPLATE Ref: 1.37
1-12. If the lathe dog clanks against the faceplace slot, it usually indicates that the dead center is too _____.	1-12. LOOSE Ref: 1.39
1-13. When facing cold rolled steel, a cutting tool of _____ should be used.	1-13. HIGH-SPEED STEEL Ref: 1.41
1-14. When adjusting the tool holder in the tool post, the point of the cutter should be aligned with the workpiece _____.	1-14. CENTER Ref: 1.44
1-15. The cutting speed of a lathe is expressed in _____ per minute.	1-15. SURFACE FEET Ref: 1.45
1-16. For increased accuracy and convenience, larger diameter work may be faced by using the lathe _____.	1-16. POWER CROSS FEED Ref: 1.53

Answer the following questions by marking an "X" in the box next to the best answer.

1-1. Misalignment of headstock and ways causes work to be

- ☐ a. straight
- ☐ b. tapered
- ☐ c. shouldered
- ☐ d. faced

1-2. Different speeds and feeds for lathe cutting tools are controlled mostly by

- ☐ a. workpiece material
- ☐ b. lathe setup
- ☐ c. operator choice
- ☐ d. type of lathe

1-3. The decision on which holding method to use on a workpiece is governed by the

- ☐ a. shape of the workpiece
- ☐ b. size of the workpiece
- ☐ c. capacity of the lathe
- ☐ d. all of the above

1-4. Using an overside lathe dog can cause excessive

- ☐ a. chip formation
- ☐ b. overload
- ☐ c. vibration
- ☐ d. misalignment

1-5. The lathe dog is placed on the work at the

- ☐ a. center
- ☐ b. tailstock end
- ☐ c. compound rest
- ☐ d. headstock end

1-6. When holding work that must be faced between centers, you should use a(n)

- ☐ a. half-center
- ☐ b. live center
- ☐ c. crotch center
- ☐ d. drill pad

1-7. When turning or facing work between centers, you must lubricate the

- ☐ a. faceplate
- ☐ b. live center
- ☐ c. dead center
- ☐ d. tool holder

1-8. A steady rest or a follower rest are often used when machining

- ☐ a. irregularly shaped work
- ☐ b. soft metals
- ☐ c. long, slender work
- ☐ d. all of the above

1-9. A workpiece will not rotate by hand if it is

- ☐ a. not round
- ☐ b. held too tightly
- ☐ c. held too loosely
- ☐ d. too heavy

1-10. No lubricant is needed when facing the workpiece because

- ☐ a. white lead is already on the dead center
- ☐ b. the area is small and heat is low
- ☐ c. cold rolled steel needs no lubrication
- ☐ d. a low cutting speed is used

SUMMARY

The correct setup for a workpiece for machining between lathe centers is important for good end results. You should select proper setup tools and lathe accessories.

Analyze the drawing, or other job specifications, and establish a logical sequence for performing individual operations. This lesson has taught you how to face off the ends of work so that future operations in making a plug gauge can flow more easily.

You have also used layout and measuring techniques from your other lessons in a practical way. Future lessons in this Course will show you how to perform other lathe operations on the plug gauge in order to bring the workpiece to completion.

Mount a steady rest of the lathe bed. Mount a follower rest on the carriage of the lathe. How are these two holding devices similar? How do they differ in application?

Answers to Self-Check Quiz

1-1. b. Tapered. Ref: 1.04

1-2. a. Workpiece material. Ref: 1.13

1-3. d. All of the above. Ref: 1.18

1-4. c. Vibration. Ref: 1.25

1-5. d. Headstock end. Ref: 1.27

1-6. a. Half-center. Ref: 1.28

1-7. c. Dead center. Ref: 1.28

1-8. c. Long, slender work. Ref: 1.30-1.33

1-9. b. Held too tightly. Ref: 1.39

1-10. b. The area is small and heat is low. Ref: 1.41