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SAFETY RULES

Woodworking can be dangerous if safe and proper operating procedures are not followed. As with all machinery, there are certain hazards involved with the operation of the product. Using the machine with respect and caution will considerably lessen the possibility of personal injury. However, if normal safety precautions are overlooked or ignored, personal injury to the operator may result. Safety equipment such as guards, push sticks, hold-downs, featherboards, goggles, dust masks and hearing protection can reduce your potential for injury. But even the best guard won't make up for poor judgment, carelessness or inattention. Always use common sense and exercise caution in the workshop. If a procedure feels dangerous, don't try it. Figure out an alternative procedure that feels safer. REMEMBER: Your personal safety is your responsibility.

This machine was designed for certain applications only. Delta Machinery strongly recommends that this machine not be modified and/or used for any application other than that for which it was designed. If you have any questions relative to a particular application, DO NOT use the machine until you have first contacted Delta to determine if it can or should be performed on the product.

DELTA INTERNATIONAL MACHINERY CORP,
MANAGER OF TECHNICAL SERVICES
246 ALPHA DRIVE
PITTSBURGH, PENNSYLVANIA 15238
(IN CANADA: 644 IMPERIAL ROAD, GUELPH, ONTARIO N1H 6M7)

WARNING: FAILURE TO FOLLOW THESE RULES MAY RESULT IN SERIOUS PERSONAL INJURY

1. WARNING: DO NOT operate your lathe until it is completely assembled and installed according to the instruction manual.

2. FOR YOUR OWN SAFETY, READ INSTRUCTION MANUAL BEFORE OPERATING THE TOOL. Learn the tool’s application and limitations as well as the specific hazards peculiar to it.

3. IF YOU ARE NOT thoroughly familiar with the operation of wood lathes, obtain advice from your supervisor, instructor, or other qualified person.

4. KEEP GUARDS IN PLACE and in working order.

5. ALWAYS WEAR EYE PROTECTION AND SAFETY GLASSES. Wear safety glasses (must comply with ANSI Z87.1). Everyday eyeglasses have impact resistant lenses; they are not safety glasses. Also use face or dust mask if operation is dusty.

6. MAKE SURE wiring codes and recommended electrical connections are followed and that the machine is properly grounded.

7. REMOVE ADJUSTING KEYS AND WRENCHES. Form habit of checking to see that keys and adjusting wrenches are removed from tool before turning it “ON.”

8. WEAR PROPER APPAREL. No loose clothing, gloves, neckties, rings, bracelets, or other jewelry to get caught in moving parts. Non-slip footwear is recommended. Wear protective hair covering to contain long hair.

9. KEEP WORK AREA CLEAN. Cluttered areas invite accidents.

10. DON’T USE IN DANGEROUS ENVIRONMENT. Don’t use woodworking machinery in damp or wet locations, or expose them to rain. Keep work area well-lighted.

11. KEEP CHILDREN AND VISITORS AWAY. All children and visitors should be kept a safe distance from work area.

12. DON’T FORCE TOOL. It will do the job better and be safer at the rate for which it was designed.

13. USE RIGHT TOOL. Don’t force tool or attachment to do a job for which it was not designed.

14. DON’T OVERREACH. Keep proper footing and balance at all times.

15. MAINTAIN TOOLS IN TOP CONDITION. Keep tools sharp and clean for best and safest performance.

16. MAKE SURE the tool rest height is adjusted properly.

17. KEEP tool rest close to the work as possible.

18. NEVER adjust tool rest while work is turning.

19. REMOVE the tool rest before sanding or polishing.

20. EXAMINE set-up carefully before turning on the power.

21. ROTATE the workpiece by hand to check clearance before engaging power.

22. WHEN TURNING between centers MAKE SURE the tailstock center is snug against the workpiece and locked. Tailstock center should be lubricated if it is not a ball bearing center.

23. MAKE SURE screw fasteners do not interfere with the turning tool at the finished dimension of the workpiece when faceplate turning.

24. EXAMINE workpiece for flaws and test glue joints before placing workpiece in lathe.

25. WHEN roughing off, DO NOT jam tool into workpiece or take too big a cut.

26. CHECK AND SELECT proper speed for turning lathe “ON.”

27. NEVER drive wood into drive center when it is in headstock. Set drive center into wood with a soft mallet prior to installing it in the lathe.

28. NEVER loosen tailstock spindle while work is turning.

29. WHEN faceplate turning, be sure material is securely fastened to the faceplate and that appropriate size faceplate is used to properly support workpiece.

30. ROUGH CUT workpiece as close as possible to finished shape before installing on faceplate.

31. MAKE CERTAIN indexing mechanism is disengaged before operating the lathe.

32. TIGHTEN all clamp handles before operating.

33. USE lowest speed when starting a new workpiece.

34. DISCONNECT lathe from power source when making repairs.

35. DISCONNECT lathe from power source and clean the machine before leaving it.

36. MAKE SURE the work area is cleaned before leaving the machine.

37. SHOULD any part of your lathe be missing, damaged or fail in any way, or any electrical component fail to perform properly, shut off switch and remove plug from the power supply outlet. Replace missing, damaged or failed parts before resuming operation.

38. CAUTION: To reduce the risk of injury, ALWAYS wear safety glasses and face and head protection when operating wood lathe.

39. ADDITIONAL INFORMATION regarding the safe and proper operation of this product is available from the National Safety Council, 1121 Spring Lake Drive, Itasca, IL 60143-3201 in the Accident Prevention Manual for Industrial Operations and also in the Safety Data Sheets provided by the NSC. Please also refer to the American National Standards Institute ANSI Z119.1 Safety Requirements for Woodworking Machines and the U.S. Department of Labor OSHA 1910.213 Regulations.
UNPACKING AND CLEANING

1. Your machine is shipped complete in two containers. One container contains the lathe and the other container contains the safety shield. The following instructions pertain to the lathe only. Instructions for the safety shield are included in the safety shield container. Carefully remove the shipping crate from around the machine. Remove the protective coating from the machined surfaces of the lathe and all loose items. This protective coating may be removed with a soft cloth moistened with kerosene (do not use acetone, gasoline or lacquer thinner for this purpose). Figures 2, 3 and 4 illustrate all the items supplied with your lathe.

Figure 2
1 - Headstock, motor and stand assembly
2 - Rear door for headstock cabinet
3 - Motor cover
4 - Tailstock base
Figure 3

5 - Shelf between headstock and tailstock base
6 - Lathe bed sections (2)
7 - Foot for tailstock base
8 - 80mm long hex head screws (4) - for connecting lathe beds to each other and to headstock
9 - Special centering washers (4) - for connecting lathe beds to each other and to headstock
10 - 30mm long hex head screws (4) - for mounting foot to bottom of lathe bed
11 - M8.4 flat washers (4) - for mounting foot to bottom of lathe bed
12 - 30mm long hex head screws (2) - for mounting foot to tailstock base
13 - M10 flat washers (2) - for mounting foot to tailstock base

Figure 4

14 - Tailstock
15 - Tool rest base
16 - Spindle wrenches (2)
17 - 12mm long screws (8) - for assembling shelf to headstock and tailstock
18 - 6” Tool rest
19 - 12” Tool rest
20 - Spur center
21 - Ejector for tailstock ball bearing center
22 - Tailstock ball bearing center
23 - Knock-out bar
24 - Headstock handwheel
25 - Special spacer - needed on spindle when mounting some faceplates that do not have sufficient threading capacity on the hub
26 - 3” Faceplate
27 - 6” Faceplate
ASSEMBLING LATHE BED TO HEADSTOCK

1. Locate one of the lathe bed sections (A) Fig. 5, and line up pins (B) with matching holes on side of headstock casting (C) as shown. **WARNING:** Support outboard end of lathe bed section (A) during assembly.

2. Push bed section (A) Fig. 6, toward headstock as shown.

3. Locate two of the 80mm long hex head screws (D) Fig. 7, and special centering washers (E). Place washers (E) on screws (D) with hub of washers (E) facing out as shown.

4. Fasten bed section (A) Fig. 8, to headstock casting using the two 80mm long hex head screws (D) and washers (E), one of which is shown in Fig. 8.
5. Assemble remaining lathe bed section (F) Fig. 9, to bed section (A) in the same manner. **WARNING: A suitable support such as a roller stand (G) must be used to support bed section (F) during assembly, as shown.**

---

**ASSEMBLING TAILSTOCK BASE TO LATHE BED**

1. Fasten foot casting (H) Fig. 10, to bottom of lathe bed section (F) using the four 30mm long hex head screws (J) and flat washers (K). Hex head screws (J) are inserted up through the four holes (L) in casting (H) and threaded into the four threaded holes located underneath lathe bed section (F). Note that roller stand (G) is supporting bed section (F).

---

2. Fig. 11, illustrates the foot casting (H) assembled to bottom of bed section (F).

---

3. Position tailstock base (O) Fig. 12, underneath foot casting (H) and fasten tailstock base (O) to foot casting (H) using the two 30mm long hex head screws and flat washers, one of which is shown at (P).
ASSEMBLING SHELF TO HEADSTOCK AND TAILSTOCK BASES

1. Position shelf (A) Fig. 13, between the headstock base (B) and tailstock base (C) and fasten in place using the eight 12mm long screws, four of which are shown at (D) Fig. 14.

ASSEMBLING MOTOR COVER

1. Remove the three screws (A) Fig. 15.

2. Assemble the motor cover (B) Fig. 16, to headstock base, as shown, using the three screws (A) which were removed in STEP 1.
ASSEMBLING REAR DOOR TO HEADSTOCK

IMPORTANT: Before assembling the rear door to the headstock, remove all packing material around the motor and inside the headstock cabinet. Also adjust belt tension by referring to the instructions “BELT POSITIONING, TENSION AND SPEED CONTROL on pages 14 and 15 of this manual.

1. Insert the two pins (A) Fig. 17, located on bottom of door (B) into the two holes on bottom of headstock base (C) and assemble rear door (B) as shown in Fig. 18.

HEADSTOCK HANDWHEEL

A headstock handwheel (A) Fig. 19, is supplied with your lathe and is to be threaded onto the outboard headstock spindle as shown.
CONNECTING LATHE TO POWER SOURCE

POWER CONNECTIONS

A separate electrical circuit should be used for your machine. This circuit should not be less than #12 wire and should be protected with a 15 Amp time lag fuse or circuit breaker. If an extension cord is used, use only 3-wire extension cords which have 3-prong grounding type plugs and 3-pole receptacles which accept the tool’s plug. For distances up to 150 feet use #10 wire. Have a certified electrician replace or repair damaged or worn cord immediately. Before connecting the power cord to the electrical outlet, make sure the machine switch is in the "OFF" position and be sure that the electric current is of the same characteristics as the motor. Running on voltage other than specified will injure the motor.

GROUNDING INSTRUCTIONS

CAUTION: THIS TOOL MUST BE GROUNDED WHILE IN USE TO PROTECT THE OPERATOR FROM ELECTRIC SHOCK.

In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This tool is equipped with an electric cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances.

Do not modify the plug provided - if it will not fit the outlet, have the proper outlet installed by a qualified electrician.

Improper connection of the equipment-grounding conductor can result in risk of electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the equipment-grounding conductor. If repair or replacement of the electric cord or plug is necessary, do not connect the equipment grounding conductor to a live terminal.

Check with a qualified electrician or service personnel if the grounding instructions are not completely understood, or if in doubt as to whether the tool is properly grounded. Use only 3-wire extension cords that have 3-pronged grounding type plugs and 3-hole receptacles that accept the tool’s plug, as shown in Fig. 20.

Repair or replace damaged or worn cord immediately.

230 VOLT OPERATION

The motor on your machine is wired for 230 volts; the power cord is equipped with a plug that has two flat, current-carrying prongs in tandem, and one round or "U" shaped longer ground prong. This is used only with the proper mating 3-conductor grounding type receptacle, as shown in Fig. 20

When the 230 Volt three prong plug on your machine is plugged into a grounded 3-conductor receptacle, the long ground prong on the plug contacts first so the machine is properly grounded before electricity reaches it.

WARNING: MAKE CERTAIN THE RECEPTACLE IN QUESTION IS PROPERLY GROUNDED. IF YOU ARE NOT SURE, HAVE A CERTIFIED ELECTRICIAN CHECK THE RECEPTACLE.
ASSEMBLY AND OPERATION OF TOOL REST

1. Rotate clamp handle (A) Fig. 21, until clamp (B) is loose and slide clamp (B) into channel (C) of the lathe bed. To lock tool rest base in position on lathe bed, rotate clamp handle (A) to the right. **NOTE:** Adjustment to the clamping action of the tool rest can be made by tightening or loosening the nut located directly underneath clamp (B).

2. Two tool rests, one 12" long and one 6" long are supplied with your lathe. Decide which one you wish to use and insert post (D) Fig. 22, of tool rest into holder as shown. Tighten lock lever (E) to hold tool rest in place.

3. To position the tool rest base on the lathe bed, lift up clamp handle (A) Fig. 22, move the tool rest base to the desired position and lock in place by pushing down on handle (A). **NOTE:** Clamp handle (A) can be repositioned by pulling out and rotating the handle. To adjust the tool rest (F) for the correct height, loosen locking lever (E), move tool rest (F) up or down and tighten locking lever (E).

ASSEMBLY AND OPERATION OF TAILSTOCK

1. Rotate clamp handle (A) Fig. 23, until clamp (B), is loose and slide clamp (B) into channel (C) of the lathe bed. To lock tailstock (D) in position on lathe bed, rotate clamp handle (A). **NOTE:** Adjustment to the clamping action of the tailstock can be made by tightening or loosening the nut located directly underneath clamp (B).

2. Insert ejector (E) Fig. 24, into tailstock spindle (F) as shown. **NOTE:** The ejector (E) enables you to remove the tailstock center by unscrewing handwheel (G).
3. Your machine is supplied with a ball bearing tailstock center (H) Fig. 25, which is to be inserted into the tailstock spindle (F) as shown.

4. The tailstock (D) Fig. 26, can be moved lengthwise along the lathe bed by loosening locking lever (A), sliding tailstock (D) to the desired position on the bed, and tightening lever (A).

5. The tailstock spindle (F) Fig. 26, is moved in or out of the tailstock body by loosening locking lever (J) and turning handwheel (G). Total movement of the tailstock spindle (F) is three inches. The tailstock spindle is hollow the complete length of the tailstock enabling you to bore holes through turnings using an auger.

**FACEPLATES**

1. Two faceplates, one 3” in diameter (A) Fig. 27, and one 6” in diameter (B) are supplied with your lathe and are to be threaded onto the spindle (C). Two wrenches (D) are supplied for installing or removing the faceplates. For other model faceplates that do not have sufficient threading capacity as on the two faceplates supplied, a spacer (D) Fig. 28, is provided to put on the spindle before threading on the faceplate.
2. Fig. 29 illustrates the 6" diameter faceplate (B) threaded onto the inboard end of the headstock spindle.

3. Faceplates can also be used on the outboard end of the headstock spindle, as shown at (B) Fig. 30.

STARTING AND STOPPING THE LATHE

The start and stop buttons are conveniently located on the front of the headstock cabinet. To turn the lathe "ON" push the start button (A) Fig. 31, and to turn the lathe "OFF" push the large stop button (B).
BELT POSITIONING, TENSION AND SPEED CONTROL

Five spindle speeds of 350, 750, 1200, 2300 and 3000 RPM are available with your lathe. When the belt is on the largest step of the spindle pulley and the smallest step of the motor pulley, the spindle speed will be 350 RPM and when the belt is on the smallest step of the spindle pulley and the largest step of the motor pulley, the spindle speed will be 3000 RPM. A spindle speed RPM chart (A) Fig. 32, is conveniently provided on the headstock.

The chart shown in Fig. 33, suggests spindle speeds for wood lathe turning.

<table>
<thead>
<tr>
<th>DIAMETER OF WORK</th>
<th>ROUGHING OFF</th>
<th>GENERAL CUTTING</th>
<th>FINISHING</th>
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<tr>
<td>Under 2&quot; Dia.</td>
<td>900 to 1300 RPM</td>
<td>2400 to 2800 RPM</td>
<td>3000 to 4000 RPM</td>
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<tr>
<td>2&quot; to 4&quot; Dia.</td>
<td>600 to 1000 RPM</td>
<td>1800 to 2400 RPM</td>
<td>2400 to 3000 RPM</td>
</tr>
<tr>
<td>4&quot; to 6&quot; Dia.</td>
<td>600 to 800 RPM</td>
<td>1200 to 1800 RPM</td>
<td>1800 to 2400 RPM</td>
</tr>
<tr>
<td>6&quot; to 8&quot; Dia.</td>
<td>400 to 600 RPM</td>
<td>800 to 1200 RPM</td>
<td>1200 to 1800 RPM</td>
</tr>
<tr>
<td>8&quot; to 10&quot; Dia.</td>
<td>300 to 400 RPM</td>
<td>600 to 800 RPM</td>
<td>900 to 1200 RPM</td>
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</table>

To change speeds, proceed as follows:

1. Disconnect the lathe from the power source.

2. Open headstock cover (B) Fig. 34, by pushing it to the rear as shown. Also remove rear door from headstock cabinet.

3. Loosen hex head knob (C) Fig. 34, with wrench (H) supplied and push belt tension lever (D) to the rear as shown. This will release tension on the belt (E) Figs. 34 and 35, spindle pulley (F) Fig. 34 and motor pulley (G) Fig. 35.
4. Position belt (E) Figs. 36 and 37, on the desired steps of spindle pulley (F) Fig. 36 and motor pulley (G) Fig. 37. Pull belt tension lever (D) Fig. 36 toward the front of the headstock to apply tension on the belt. Tighten hex head knob (C) Fig. 36 with wrench (H) supplied, replace rear door on headstock cabinet and close headstock cover (B).

INDEXING PIN

The spindle pulley (A) Fig. 38, has a row of 24 holes (B) accurately spaced around the rim of the pulley and are numbered 1 to 24 as shown. This feature makes it possible to make 2, 3, 4, 6, 8 or 12 evenly spaced divisions on turnings which could be fluted, grooved, or holes drilled at these points. For example, if you wanted the turning to be divided into three equal divisions you would index at holes 8, 16 and 24; if you wanted the turning divided into six equal divisions you would index at holes 4, 8, 12, 16, 20 and 24; and if you wanted eight equal divisions, index at holes 3, 6, 9, 12, 15, 18, 21 and 24. Follow the same procedure for dividing the turning into two, four or twelve equal divisions. An indexing chart (C) Fig. 39, is provided on the top cover of the headstock for your convenience.
1. To engage the indexing pin, disconnect the machine from the power source and swing back head cover.

2. Pull out and rotate knob (D) Fig. 40, to allow pin (E) Fig. 41, to engage one of the desired indexing holes on the rim of the spindle pulley as shown.

3. To disengage the indexing pin when operating the lathe, pull out and rotate knob (D) Fig. 40, until roll pin (F) is in the horizontal position. The indexing pin will then be locked in the out position as shown.

ASSEMBLING SAFETY SHIELD

The safety shield supplied with your lathe is shipped in a separate carton along with assembly instructions for mounting to the four holes (A) Fig. 42, located on the rear of the lathe bed. Locate these instructions and mount the safety shield to your lathe.
OPERATION

The following directions will give the inexperienced operator a start on the common lathe operations. Use scrap material for practice to get the feel of the machine before attempting regular work.

LATHE TOOLS

The standard set of tools used in wood turning comprises five different shapes as shown in Fig. 43. Most important of these is the gouge, a roundnose, hollow chisel which is used for roughing cuts, cove cutting and other operations. Next in importance is the skew chisel, a double-ground, flat chisel, with the end ground to an angle instead of being square across. This tool is used for smoothing cylinders, for cutting shoulders, beads, vee-grooves, etc. The spear or diamond-point chisel and the round-nose chisel are scraping tools which are used where their shape fits the contour of the work. The parting tool is a double-ground chisel, and is used for cutting-off and for making straight incisions or sizing cuts to any required diameter.

![Fig. 43](image)

HOW TO TURN SPINDLES

Any turning which is worked between lathe centers is called a spindle turning. This is the principal type of wood turning, as typified by chair and table legs, lamp stems, etc. The turning of spindles can be done with either a scraping or cutting technique, the cutting technique by virtue of faster wood removal and a cleaner surface being almost a must for good work.

CENTERING THE WORK

Wood stock for any spindle turning should be approximately square, and the ends should be square with the sides. Two common methods of determining the center are shown in Figs. 44 and 45. In Fig. 44, a distance a little more or a little less than one-half the width of the stock is set off from each of the four sides. The small square thus set off in the center can then be used in marking the true center. The diagonal method, Fig. 45, consists of drawing lines from corner to corner, the intersection marking the center of the work.

![Fig. 44](image)

![Fig. 45](image)
After marking each end, the true center should be definitely marked with a punch awl or dividers, as shown in Fig. 46. If the stock is hardwood, the centers should be drilled to a depth of about 1/8", as shown in Fig. 47. The spur or live center is then placed against one end of the work and seated by striking with a mallet, as shown in Fig. 48. In hardwood, it is advisable to make a starting seat for the spur center, this being done by sawing on the diagonal lines, as shown in Fig. 49, and drilling a small hole at the intersection. After driving the center, it is best to hold center and work together and fit immediately to headstock spindle. If you are not using a ball bearing center, the end of work at tailstock center should be oiled, placing the lubricant on the wood either before or after it is put in the lathe (see Fig. 50). Many turners use beeswax, tallow, or a wax-and-oil mixture as a lubricant. The ideal method is to use a ball bearing center, which eliminates lubricating entirely. If the work is to be removed from the lathe before completion, an index mark should be made as a guide for recentering, as shown in Fig. 51. A permanent indexer can be made by grinding off one corner of one of the spurs.

**MOUNTING THE WORK**

Mounting the work is done by moving the tailstock up to a position about 1 or 1-1/2” from the end of the stock, and locking it in this position. Advance the tailstock center by turning the feed handle until the center cup makes contact with the work. Do not support the work on the center pin alone. Always have the rim of the center cup imbedded at least 1/8” into the work. Continue to advance the center while slowly rotating the work by hand. After it becomes difficult to turn the work, slack off on the feed about one-quarter turn and lock the tailstock spindle.

**TOOL REST POSITION**

The tool rest is now mounted, in place, about 1/8" away from the work and 1/8" above the work centerline, as shown in Fig. 52. This position may be varied to suit the work and the operator. A guide mark to show the most suitable working position can be placed on the tool rest shank as an aid to quick and accurate re-setting. Once some experience has been obtained, the setting of the tool rest will become almost second nature.
ROUGHING A CYLINDER

The large gouge is used in the first turning operation of roughing-off the sharp corners of the work. Run the lathe at low speed and hold the gouge in the manner shown in Fig. 53. The cut starts about 2 inches from the tailstock end, and continues from this point towards and off the tailstock end. A second bite is then taken about 2" or 3" to the left of the first cut, advancing again towards the tailstock to merge with the cut previously made. The procedure continues until a point about 2" from the live center is reached where the gouge is rolled in the opposite direction to carry the final cut off the live center end of the work. The roughing cut should not be carried out with one continuous movement as this tends to tear long slivers from the corners of the work; neither should the cut be started directly at the end of the stock for the same reason. The cut can be safely carried from the center of the stock toward and off either end once the first roughing cut has been made.

The position of the gouge in relation to the work involves two or three important angles. First of all, the tool may be advanced along the work either from right to left or from left to right. From left to right or from headstock towards tailstock is preferable, since this throws the chips clear of the operator. The gouge is rolled over slightly in the same direction it is advancing, as shown in Fig. 54. The tool is held well up on the work, with the bevel or grind tangent to the revolving surface, as shown in Fig. 55. In this position it will make a clean, shearing cut. When pushed straight into the work, like Fig. 56, the gouge has a scraping action, which is normally poor practice in spindle turning. The roughing cut is continued until the work approaches 1/8" of the required diameter, stepping up to second or third speed once a barely cylindrical form has been obtained.

POSITION OF HANDS

In all tool handling, the handle hand takes a natural position, being nearer or further from the end of chisel depending on the amount of leverage required. The position of the tool rest hand is more a matter of individual liking rather than any set or “proper” position. However, a palm-up grip, as illustrated with the gouge, is generally considered the best practice. In this position, the first finger acts as a guide, as shown in Fig. 57, sliding along the tool rest as the cut is made. The alternate position is a palm-down grip, which is shown in Fig. 58. In this position, the heel of the hand or the little finger serves as a guide. The palm-down position is solid and positive-excellent for roughing or heavy cutting. Most beginners start with the palm-down grip, switching later to the palm-up position for better manipulation of the chisel.

SMOOTHING A CYLINDER

This operation is done with the large skew chisel. It demands a little practice, but should be mastered thoroughly because it is one of the most important cuts in turning. Figs. 57 and 58, show how the chisel is held, using either grip as desired. The cutting point is near the center of chisel and high on the work, as shown in Fig. 59. The chisel must be supported by the tool rest at all times - in striving for a certain position in relation to the work, the beginner often overlooks this all-important point. Beginners often use the method shown in Fig. 59 to locate the proper tool position. To do this, you place the skew well over the work and riding-flat against it.
Pulling back slowly on the tool will eventually put it into position where it will bite into the wood. Raising the handle increases the depth of cut; lowering the handle makes the cut less. As with the gouge, the skew can be advanced in either direction. The part of the skew which does the actual cutting is the center position and toward the heel. It is worthwhile to stop a test cut in progress and note just how the skew cuts. You will note that the back portion of the grind or bevel supports the tool, and the handle hand controls the depth of cut by rocking the chisel on this pivot point. For this reason it is important that the skew bevel be kept perfectly flat, not a double bevel nor rounded.

**USING THE PARTING TOOL**

The parting tool is perhaps the easiest turning chisel to handle. It is a scraping tool, and is simply pushed into the work, as shown in Figs. 60, 61 and 62. A somewhat better cutting action is obtained if the handle is held low, raising gradually as the work diameter decreases, as shown in Fig. 60. The tool is frequently used with one hand, the other hand holding calipers in the groove being cut. When parting tool cuts are deep, a clearance cut should be made alongside the first cut, as shown in Fig. 61, to prevent burning the tool point.

**SQUARING AN END**

This operation can be done with a parting tool. However, the parting tool is a rough cutter, so that ultimately the skew must be used in cleaning the cut. The whole operation can be done with the skew, and this technique is illustrated by the drawings in Figs. 63, 64 and 65. The first movement is a nicking cut with the toe of the skew, as shown in Fig. 63. This cut cannot be made very deep without danger of burning the chisel, so a clearance cut is made by inclining the skew away from the first cut and again pushing the tool into the work. This procedure of side cut and clearance cut is continued as often as needed. The important point to note is that while the skew can be pushed into the wood in any direction, the cutting edge itself must be inclined a little away from this plane (see Fig. 65). Note that if the full cutting edge of skew bears against the cut surface, the tool will have a tendency to run. Now, observe the proper way to make the cut, as shown at left end of Fig. 65. The chisel is pushed straight into the work, but the cutting edge is inclined away from the cut surface - only the extreme toe cuts. This is the most important principle in skew handling, and you will run into it repeatedly in making shoulders, beads and vee cuts.
CUTTING A SHOULDER

The parting tool is first used to reduce the wood to within 1/16" of the required shoulder and diameter, as shown in Fig. 66. The waste stock is then cleaned out with the gouge, Fig. 67. Actual cutting of the shoulder is done with the skew, as shown in Fig. 68, and is a duplication of squaring an end. The horizontal cut is also made with the skew, but in a little different manner from that used in doing plain cylinder work. If the shoulder is long, the ordinary skew position can be used for the outer portion of the cut, but at the angle between the horizontal and vertical cuts, the heel of the chisel moves into a position tangent between the skew and the cylinder, as shown in Fig. 69. In this position, the handle of the chisel is raised slightly to allow it to cut as the tool moves along the rest. A very light cut should be taken in order to produce smooth work. The heel of the skew can be used for making the entire cut, if desired, but the cut, whether in this position or any other position, should not be picked up directly at the end of the stock. It is quite evident that any horizontal cut started directly from the end of the work will have a tendency to bite into the wood, often ruining the entire piece. Always run off the end and not into it. Where a very short shoulder makes this impossible, it is best to use the skew flat in a scraping position. If the cutting technique is used, engage only with the heel of skew in a very light cut.

CUTTING SMALL BEADS

Beads can be scraped or cut. The easy method of scraping is done with the spear chisel, and works to best advantage on beads separated by parting tool cuts, as shown in Fig. 70. Scraping is slower and less productive of clean work than cutting, but it has the advantage of perfect safety - you won't spoil the work with long gash runs.

Cutting beads quickly and accurately with the small skew is one of the most difficult lathe operations. Various working methods can be used, the usual system being as shown in Figs. 71, 72 and 73. The first cut is a vertical incision at the point where the two curved surfaces will eventually come together. This cut can be made with either heel or toe of skew, Fig. 74 showing the toe being used. Now, place the skew at right angles to the work and well up on the cylinder, as shown in Fig. 71. The chisel is flat on its side at the start, and is evenly rotated through the successive stages of the cut, as shown in Figs. 71, 72 and 73. At the same time, the chisel is pulled slightly backwards to maintain the cutting point. The entire cut is made with the heel of chisel. The opposite side of the bead is cut in the same manner, one cut serving to produce the full shape in each instance. Beads cut in this manner are beautifully smooth and polished, and the technique is well worth mastering.
VEE GROOVES

Cutting the vee groove demands much the same technique as the bead, except the skew is hinged straight into the work without rotation, as shown in Fig. 75. Only one-half of the vee is made at a time, and one, two or more cuts may be needed on each side to obtain the desired shape. As in all cutting with the skew, the bevel next to the cut must be used as a fulcrum, without at the same time allowing the full edge of the chisel to catch and cause a run. Vee grooves can also be made with the toe of the skew, in the manner already described for squaring an end.

LONG CUTS

Long cuts are usually either convex or straight-tapered surfaces. With a convex surface, the method used in making the finishing cut is shown in Figs. 76 and 77. The gouge is turned on the tool rest so that it will be inclined considerably in the direction in which it is about to move. The grind is tangent to the work, and the center point of the cutting edge is the contact point with the wood. As the cut progresses towards and around the end of the curve, the handle is gradually raised and swung to the right, as shown in Fig. 77, in order to maintain the tangency between the grind and the surface being cut, as shown in Fig. 78.

Figs. 79 and 80 show the cutting of a long taper. The skew is used, and the operation differs from smoothing a cylinder only as regards the start of the cut. The starting cut should be made with the heel, as shown in Fig. 80, to prevent the tool from digging into the work. As the tool runs down the work, the chisel can be pulled back to allow the center point of the cutting edge to cut. However, the full taper can be made with the heel. There will be a tendency to cut too deeply at the center of the taper which should be guarded against. The direction of cutting is always downhill.

COVE CUTS

Second to forming a perfect bead, the cove or concave cut is the most difficult to master. This cut is made with the gouge, the size of the tool depending upon the size of the cut. The size of the intended cove is first laid out, and the gouge is pushed directly into the work to remove the surplus stock, as pictured in Fig. 81. The cove cut can now be made.
The gouge is placed on edge on the tool rest in such a position that the grind of the chisel forms an approximate right angle with the work, as shown in Figs. 82 and 83. The chisel contacts the work at the center of the cutting edge, the tool being held so that the centerline of the gouge is pointing directly towards the center of the revolving stock, as shown in Fig. 84. This starting position is important; otherwise the gouge will have a tendency to run along the surface of the work.

From the starting position, the gouge is pushed into the revolving stock, and the tool is rolled on the rest. A triple action takes place here: First, the chisel is rolled to follow the shape of the cut; second, the handle is dropped slightly so that the portion already cut will force the lip of the chisel sideways; third, the chisel is pushed forward so that at the end of the cut, Fig. 85, it will be well up on the work and tangent with the cut surface. Only one-half of the cut is made at one time, then the chisel is reversed to cut the other half. The occasional turner is advised to make cove cuts with a scraping technique, using either the small gouge or round nose chisel.

**SQUARE SECTIONS**

When the turning has a square section, the stock should be jointed before turning. Good centering is essential since any error will show at the shoulder where the round meets the square. Turning of the shoulder from square to round can be done in various ways, one method being pictured in Figs. 86, 87, 88 and 89. If the parting tool is sharp, the nicking cut with skew, Fig. 86, can be omitted. The final trimming operation, Fig. 88, can be done with either the skew or spear chisels. This is a scraping operation. While the shoulder can be cut with the same technique used for cutting a bead, the simpler scraping method pictured does clean work and is easier to do.
FACEPLATE TURNING

Turnings which cannot be worked between centers must be mounted on a faceplate or other work-holding device. The greater part of this type of turning is done with the faceplate mounting, although there are a number of jobs which require special chucks. All cutting in faceplate work is done by scraping; any attempt to use a cutting technique on the edge grain of large work will result in a hogging, gouging cut which may tear the chisel out of your hands. All work should be roughly band sawed a little oversize to eliminate heavy roughing cuts in turning.

MOUNTING WORK TO FACEPLATE

Fig. 90, shows direct mounting to the 3" faceplate. Because it is easy to set up, this mounting should be used whenever the work permits. Larger pieces can be held in the same way by using the 6" faceplate. When normal screw-fastenings interfere, the work can often be mounted on a backing block, as shown in Fig. 91. When screws are not permissible at all, the work is glued to the backing block, fitting a sheet of paper at the joint to allow later separation without damaging the wood. Some work can be screwed or nailed from the face side into backing block. Work less than 3" in diameter can be mounted on the single screw center, as shown in Fig. 92.

Fig. 90

DIRECT MOUNTING ON 3-INCH FACEPLATE

Fig. 91

BACKING BLOCK

Fig. 92

ALLOW EXTRA STOCK FOR CUTTING OFF

MOUNTING ON BACKING BLOCK

MOUNTING ON SCREW CENTER
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