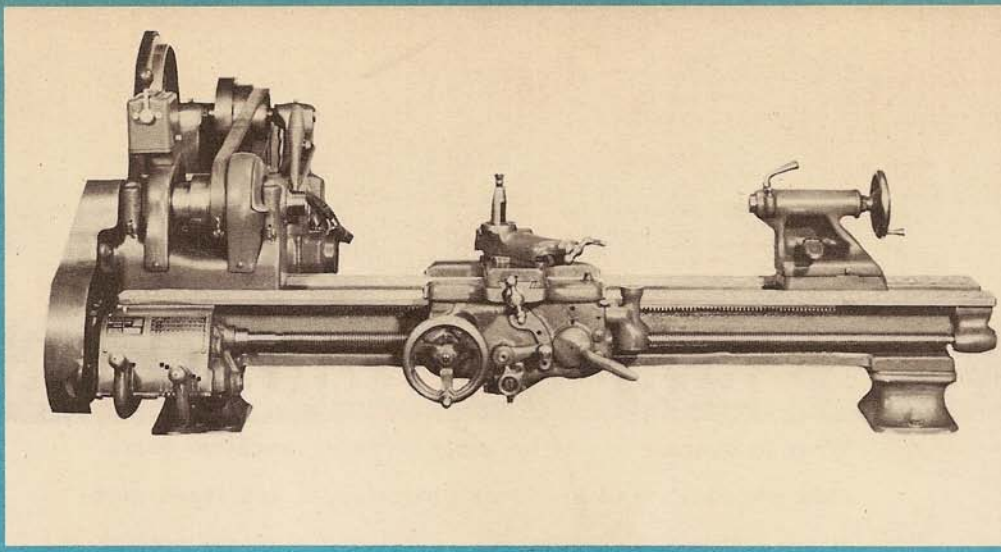
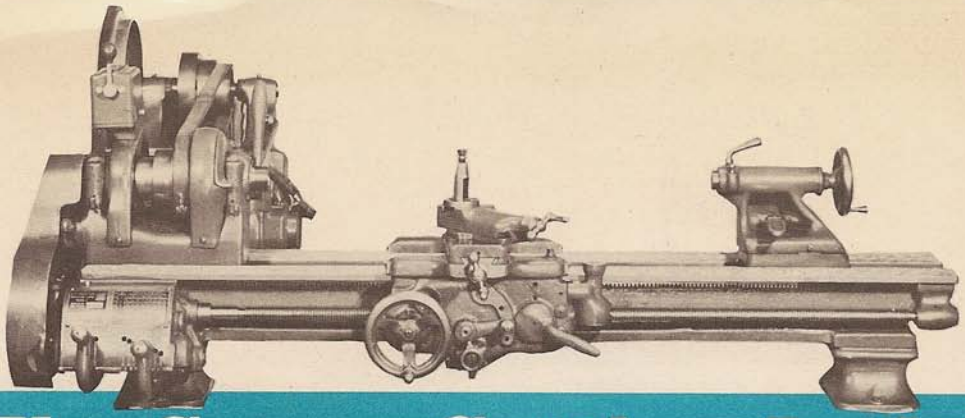


HOW TO USE THE SCREW-CUTTING LATHE

Reprinted from . . .

SOUTH BEND LATHE WORKS

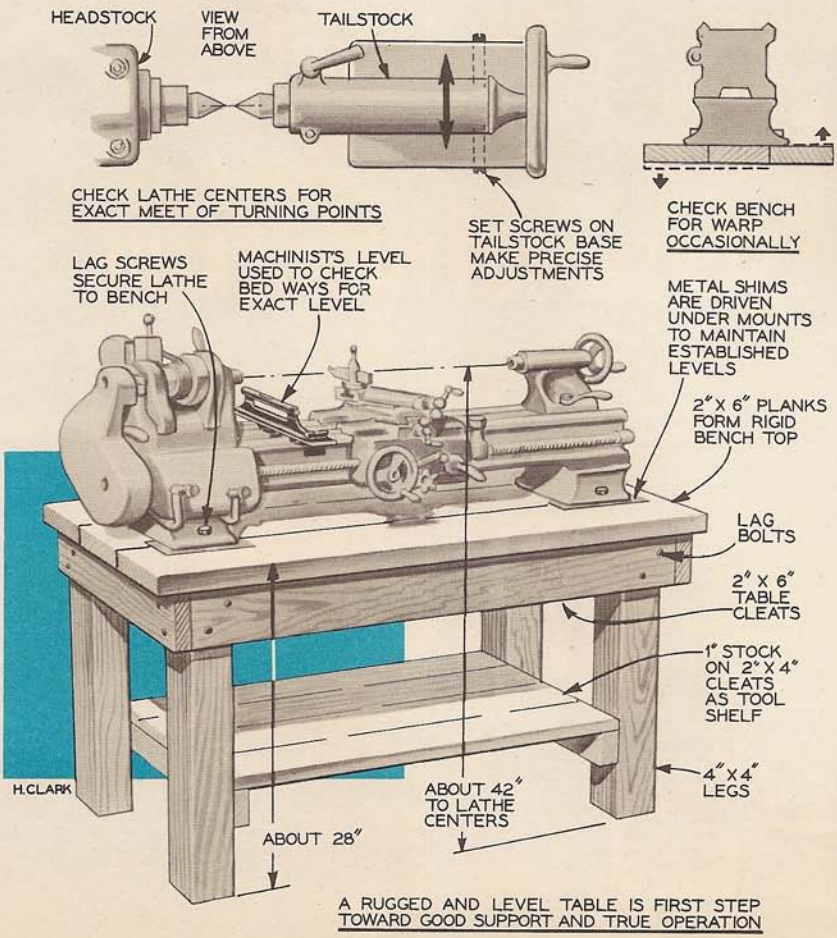
TRADE MARK SOUTH BEND TWINS ENGINE LATHES



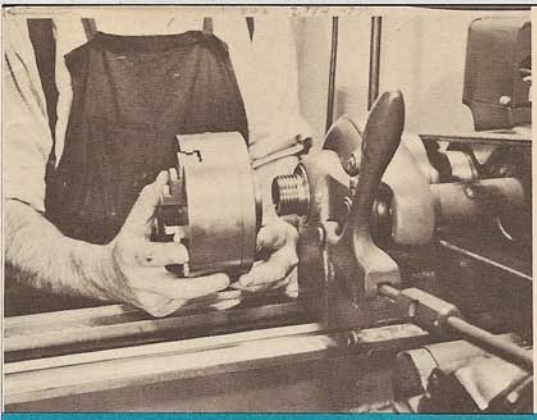
The Screw-Cutting Lathe

Want to operate one of the most versatile machines going? Then put on an apron, roll up your sleeves and stand next to our author as he undertakes a simple but thorough project.

By Robert Hertzberg



A RUGGED AND LEVEL TABLE IS FIRST STEP TOWARD GOOD SUPPORT AND TRUE OPERATION



Ends of the brass rod for the upright will have to be squared off and drilled for center holes. The rod will be gripped in this three-jaw chuck.

Supporting free end of candle holder rod, tighten chuck. Jaws are self-centering so that they all move simultaneously when key is turned.

"KING of the machine tools" is what happy owners call the back-geared screw-cutting lathe. It well deserves the title because of its almost endless applications in home and industrial shops of every conceivable nature. Using the identical lathe, a hobbyist makes camera accessories and wheels for model locomotives; an auto repair man resizes pistons and smoothes down commutators; a factory hand turns out gun barrels and airplane fittings. Although the screw-cutting lathe has existed for more than 200 years, new uses for it are cropping up every day!

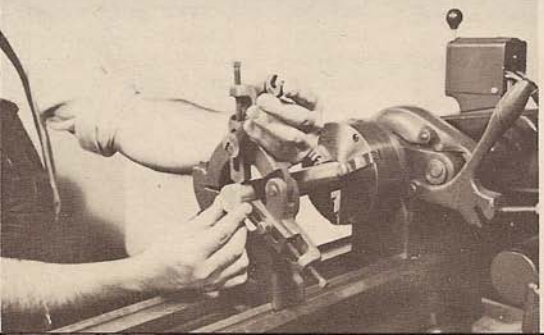
For home and small machine shops, the most popular lathe sizes are 9 and 10 in. These figures represent the maximum diameter of work that can be accommodated. Actually the practical limit for turning between centers is less because the tool carriage has to slide under the work while the latter is revolving. This means limits of approximately 5 and 6 in. The length of the work that can be handled depends on the over-all length of the machine, which runs from 3 to about 5 ft. A good compromise size is 4 ft., which takes work 28 in. between centers.

An electrical rather than a mechanical consideration fixes the "small shop" lathe at 9 or 10 in. In these sizes the machine works satisfactorily with a ⅓ or better yet a ½-hp motor, which is about the most powerful motor that can be run safely on an ordinary house power line. Larger lathes require larger motors, which in turn may require special power lines.

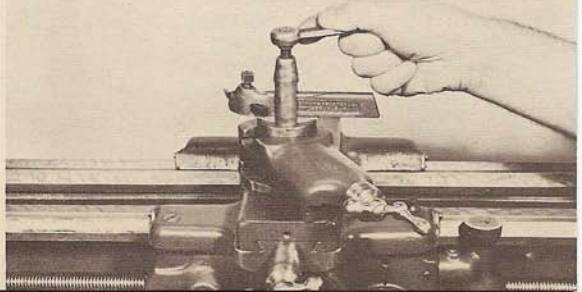
The back-geared lathe is intended primarily for machining metal. It has also proved to be highly successful on plastics. However, it shouldn't be used for wood turning except as a matter of sheer necessity. You won't find this bit of advice in any of the standard lathe instruction books, but every experienced operator will agree with it heartily. The clouds of shavings produced during a wood-turning job form a sticky, messy combination with the oil and grease on the bearings and gears. Removing it all is a time-consuming chore, and you'll find that wood had better be left to the machine for which it was intended.

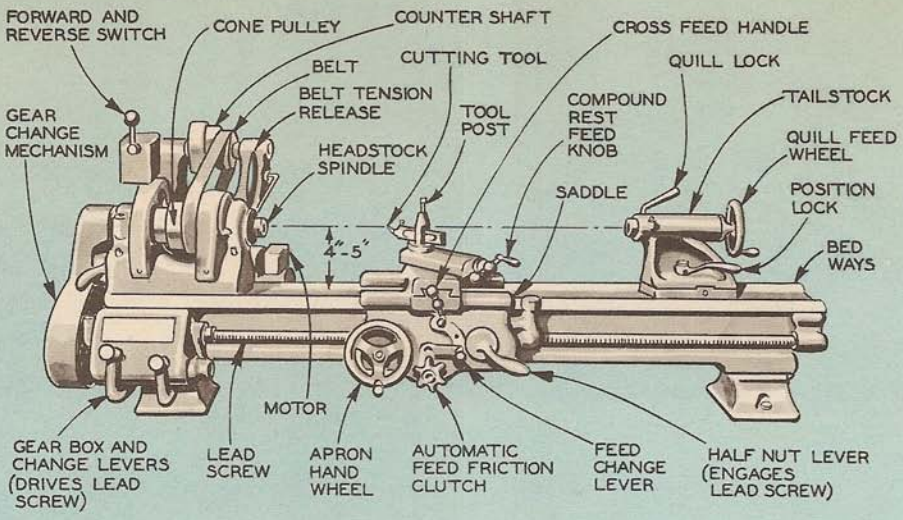
Any intelligent person can learn to use a back-geared lathe by himself. If your first impression is that the machine is complicated, compare the controls or adjustments on it with those on an ordinary car. On my South Bend 9-in. lathe, pictured on page 110, I count 16 handles,

End of rod is retained by this steady rest, which has individually adjusted jaws. After jaws are positioned by end screws, tighten bolts as shown.

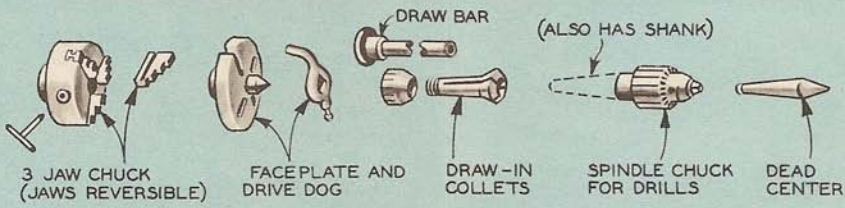


Since tool holder takes force of revolving work it must be well tightened. Side-facing bit is in holder preparatory to facing end of the rod.

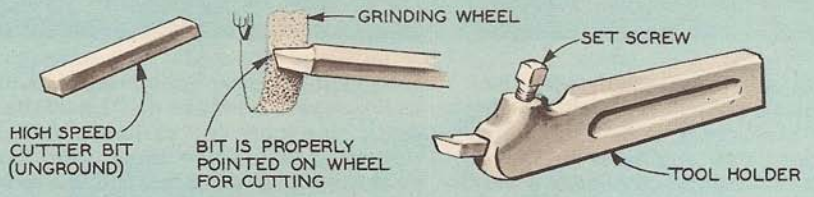


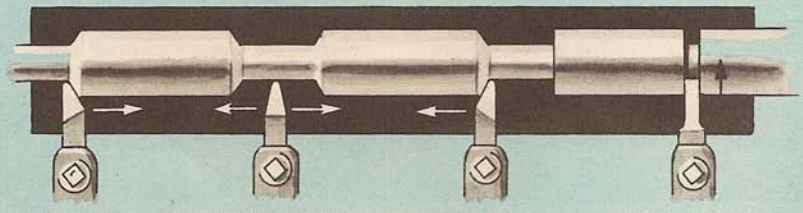


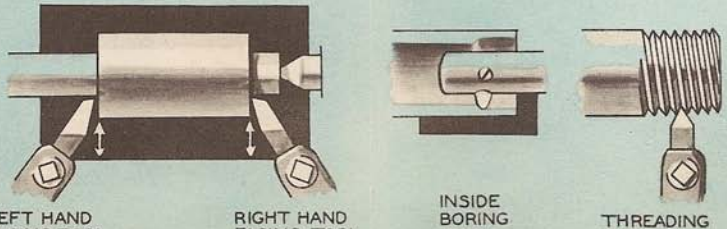
CONTROL UNITS ON SMALL WORKSHOP METAL SCREW LATHE



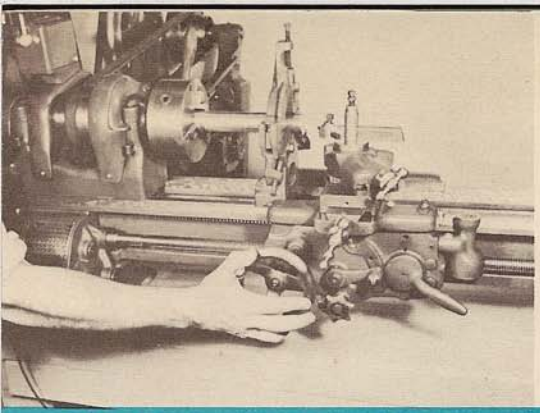
AN ASSORTMENT OF DRIVE UNITS FOR USE ON THE HEADSTOCK



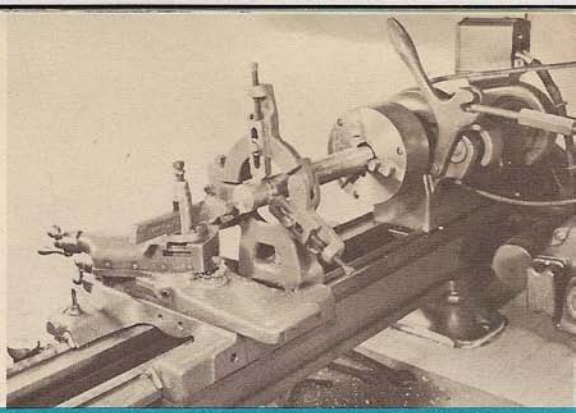




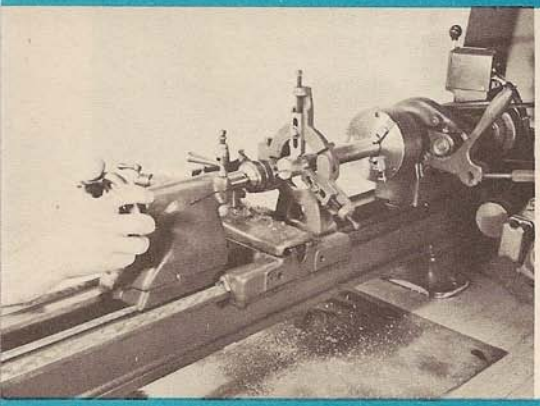
A FEW OF THE MOST POPULAR TOOL BITS AND THEIR CUTS



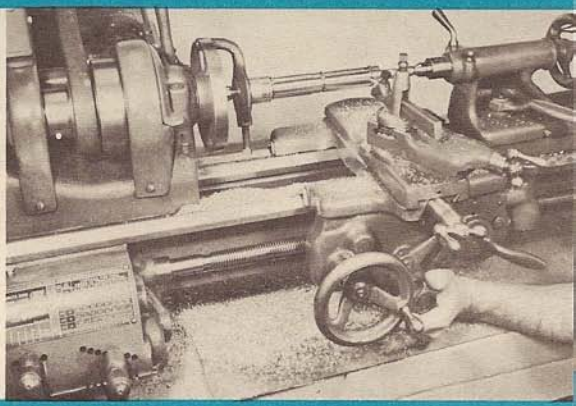
With holder properly adjusted, the carriage is moved to the left by means of the apron hand wheel until the cutter bit just touches the metal.



Squaring rod ends. Carriage is locked and tool is advanced, then faced across rod with cross feed knob. Later turning removes score markings.



Combination drill-countersink in tailstock chuck is used to make holes. The drill is advanced into the brass as tailstock wheel revolves slowly.



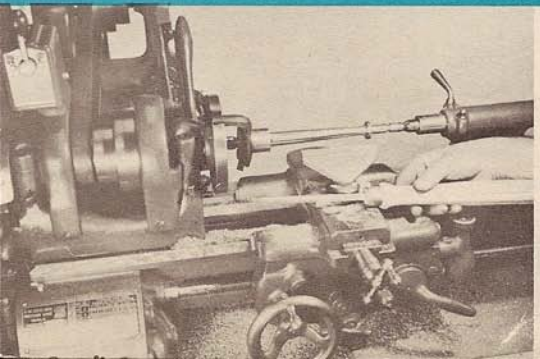
In turning, rod is held between centers, tool is automatically moved from right to left by the lead screw. The bed is swept clean periodically.

wheels, levers, etc., that can be moved or turned. On my Ford there are 25 controls of one sort or another on the instrument panel, and four more on the floor board. The lathe is anchored to the cellar floor; the car moves at speeds up to 90 mph. Frankly, I think a metal-turning lathe is easier to use than a wood-turning machine.

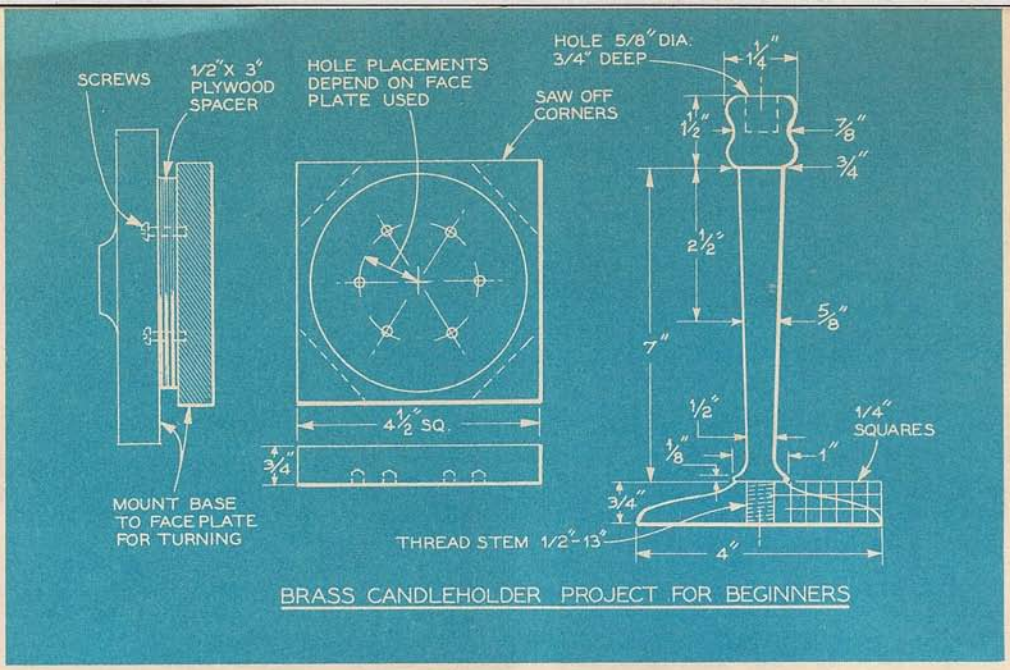
In the former, the cutting tools are securely clamped into position and for the most part are moved in the desired direction by the gear trains actuated by the headstock spindle. Straight turning and threading operations are virtually automatic.

To give you an idea of what metal lathe technique is like, let's put the machine

Compound rest is replaced by T rest. Long taper was made with ¼-in. carbide-tipped chisel. Soft brass has no noticeable dulling effect on edge.



Bead at lower end of candlestick is formed by rolling sharp file over brass while lathe turns at high speed. Light strokes will prevent clogging.



Cutting off corners on the candlestick base will make it easier to trim. Base is attached to faceplate with ½-20 screws driven into threaded holes.

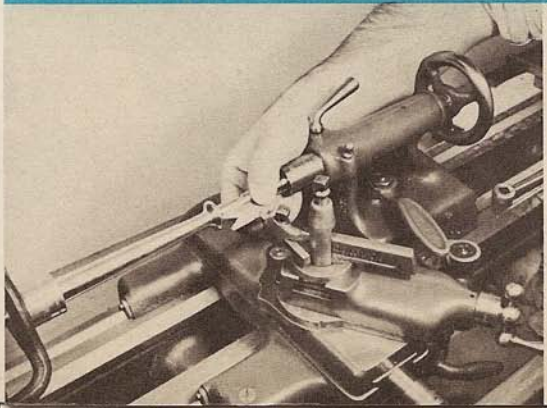
through a few of its paces. A good project is a solid brass candle holder. Brass is nice stuff because it turns readily, looks really beautiful as the cutting tool exposes a new surface and is easily obtainable in round and flat forms. For the upright we'll want a rod about 1¼ in. in diameter and 9 in long. The base is formed from a flat piece about ¾ in. thick and 4½ in. square. We'll do the upright first, then the base, and finally assemble them by screwing the two pieces together. The finished unit appears on page 116.

The following operations will be performed: facing, drilling, boring, turning, tapering, shaping to a curve, threading, polishing and cutting off. Standard accessories and tools will be employed throughout. Follow the step-by-step pictures and you'll finish with a pretty good idea of basic lathe work.

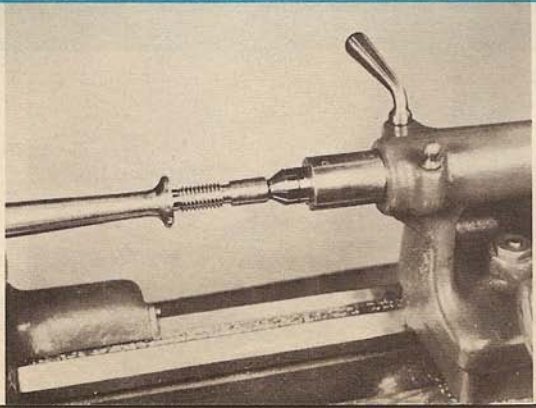
Making straight cuts is easy. The cutting tools can be adjusted to shave off metal along the length of the work or parallel to its face. With the compound rest, short cutting at angles between 0 and 90 degrees is likewise simple. The real problems are making straight *tapered* cuts and curved forms.

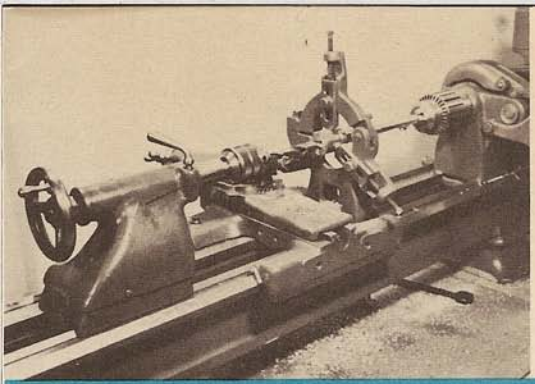
The instruction books tell you to offset the tailstock to make a long taper. Machinists cry "Don't!"—for it's very difficult to get the tailstock back on exact dead center. The voice of experience is right again. If accurate taper turning is to be done, the lathe carriage should be fitted with a taper attachment. This controls the depth of bite of the cutting tool without

Secret of clean, sharp threads is proper setting of 60° cutting tool square onto work at dead center. The gauge shown below is indispensable.

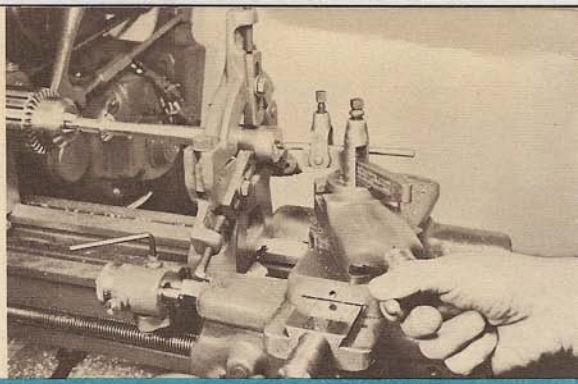


Note slightly undercut sections on both sides of threads. Extension at right will be cut off so that candle holder can be screwed to the base.

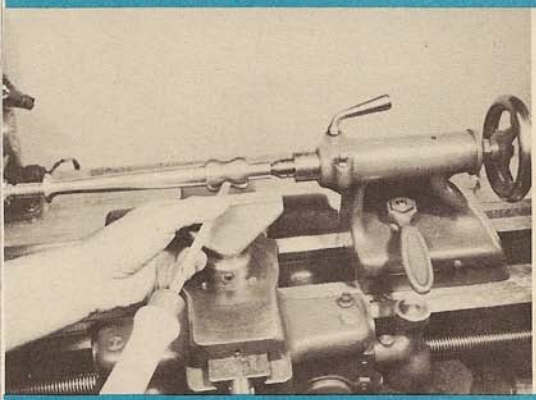




Free end beyond threads is fastened into chuck and unfinished end is held by steady rest. A ½-in. drill is fed to depth of ¾ in. to hold candle.



Since ½ in. is not quite wide enough for most candles, hole must be bored out to about ⅝ in. with this short boring bar, using light cuts.



Carbide-tipped chisel carves curves as bored end of holder is supported by tailstock dead center with a brass plug turned to fit the hole snugly.

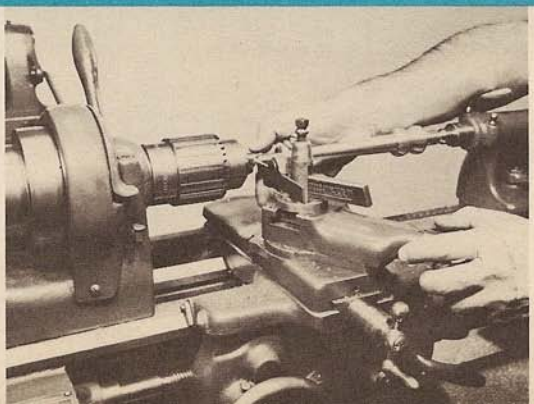
Strips of progressively finer emery cloth provide smooth finish. Use highest spindle speed and slowly move the cloth back and forth across work.

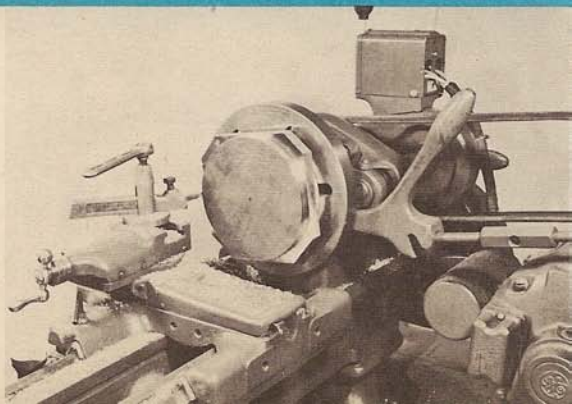
requiring any offset of the tailstock. For our demonstration purposes, we'll do the tapering by hand, with some of the new carbide-tipped hand tools with long handles, just like those found on regular wood-turning chisels. We'll use these same tools for making the curves of the candle holder and of the round base. On the market only a relatively short time, carbide-tipped tools are a real boon to the craftsman. Brass, aluminum and various plastics give way to them like so much hard butter. Even iron and steel can be shaped into delicate curves with them if light cuts are taken.

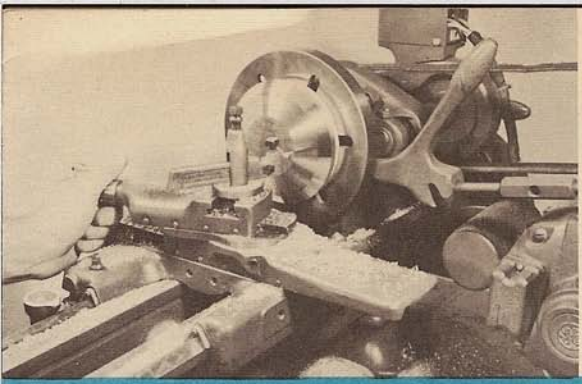
For these hand-forming steps, the com-

Dead stock below threaded end is now removed with a parting tool. Hand is held under rod to catch it as it falls. Touch up end with a file.

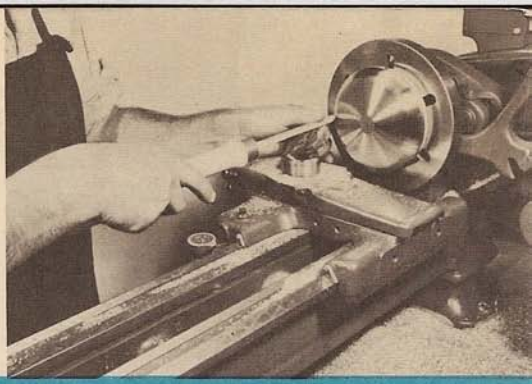
Now for the base. To the faceplate attach flat stock with corners cut to ease turning. Plywood spacer protects plate from possible tool damage.





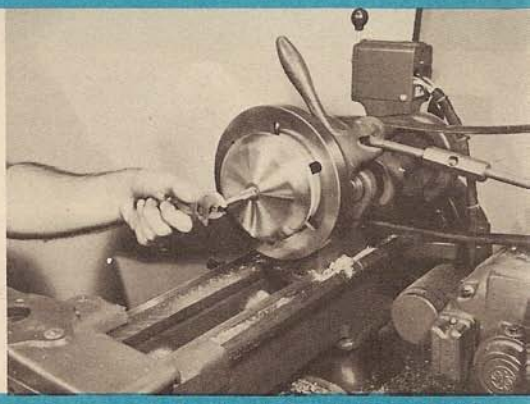


After base is rounded off, compound rest is set and base is roughly tapered. Although operation could be done with hand tool, this saves time.



Final rounding of base to shape is done with ¼-in. round-nose carbide-tipped chisel supported on T rest. Note tool angle and position of left thumb.

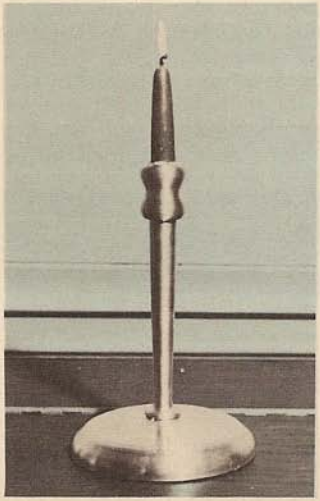
The center hole in the base is now made, but it must be tapped with a ½-13 tap to accept the threaded end of the upright element of the unit.



Back gears lock headstock. Tap is inserted with a wrench. After polishing with emery cloth, remove base, screw units together—and that's it!

pound rest is removed and replaced by a T rest, intended for wood turning. The point of the tool is merely pushed straight into the brass at dead center. It is important of course to keep the body of the tool firmly on the T rest. This is done with the fingers of the left hand, while the right hand adjusts the cut.

In order to make concave or convex shapes with conventional tool bits clamped in the tool post of the compound rest, it is necessary to manipulate the apron hand wheel, the cross feed knob and the compound rest knob, sometimes all simultaneously. This is a good trick—if you can do it at all. But with only a little practice on the carbide tools, you can form delicate curves, beads, indentations, grooves, etc. Lathe owners who use these tools for the first time usually go slightly overboard and put too many curlicues into their work, but that's a pardonable weakness.



You will find that it's not necessary to work on ornate or complicated plans to achieve good-looking results. The project covered here proves that. Although this candlestick was kept simple in both design and construction detail, you'll agree that it's an attractive accessory for any table or mantelpiece. •