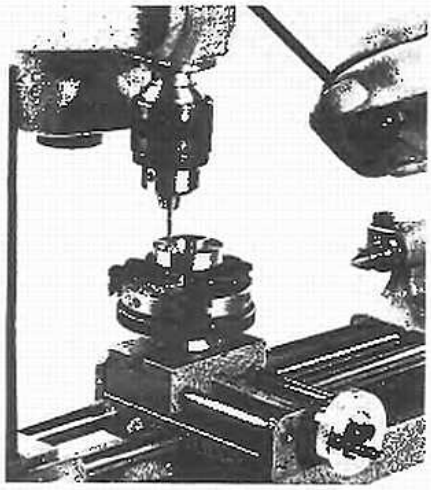
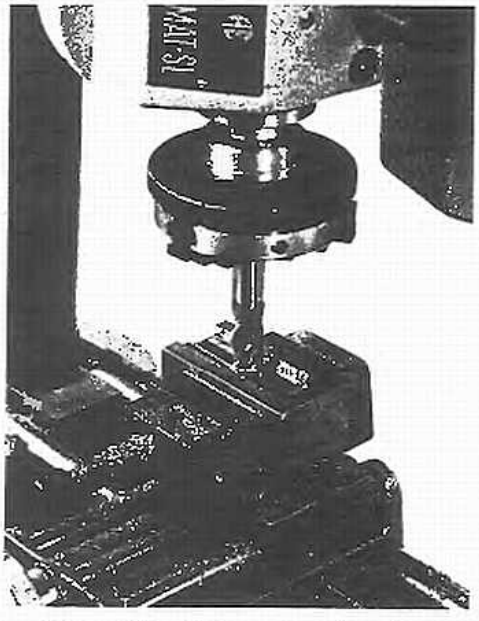


ROUND WORKPIECES can be held for drilling in the 3-Jaw or 4-Jaw chuck.



SPIRAL END MILLS are used for milling recesses. Take light cuts with even feed.

slide as a drilling table gives a more rigid set-up for drilling larger workpieces. Work can be secured on the sanding plate with 1" C-clamps. Wipe the cross slide clean before screwing the plate on the adapter stud, and after centering the plate's hole under the spindle, tighten the carriage feed tensioning screws to make the set-up rigid. Long or odd-shaped work that can't readily be mounted on a round plate can be clamped on the accessory milling table for drilling (pg. 32). A 5"x5" piece of ½"-thick hardwood plywood secured on the cross slide with bolts makes a handy table for drilling woodwork—and often metalwork, since small parts can be fixed on the table easily with wood screws.

SELECTING DRILLING SPEEDS

Twist drills can cut soft materials faster than hard materials. For each material drilled there is most efficient drilling speed, and this speed, termed "surface speed," is always expressed in surface feet per minute or sfm. Average surface speeds for drilling common materials with high-speed drills are:

Alloy or stainless steel	20-40sfm
Mild steel or cast iron	80-100sfm
Bakelite	100-150sfm
Brass or aluminum	200-300sfm
Wood	300-400sfm

The formula that relates surface speed to spindle rpms is:

$$\text{Rpms} = \frac{3.8 \times \text{desired sfm}}{\text{drill diam. in inches}}$$

Rounding off the 3.8 to 4 simplifies calculating the approximate spindle speed needed to give a required surface speed. To find the rpms needed to drill mild steel at 100sfm with a ⅛" drill, for example, you'd figure:

$$\text{Rpms} = \frac{4 \times 100\text{sfm}}{⅛"}, \text{ or } \frac{400}{.125}$$

or 3200 rpms. A machinist soon learns to solve this equation in his head without bothersome arithmetic. He'd simply reason that (in the example given) if 400 is ⅛th of the speed needed, the total rpms would be 8 times that, or 3200.

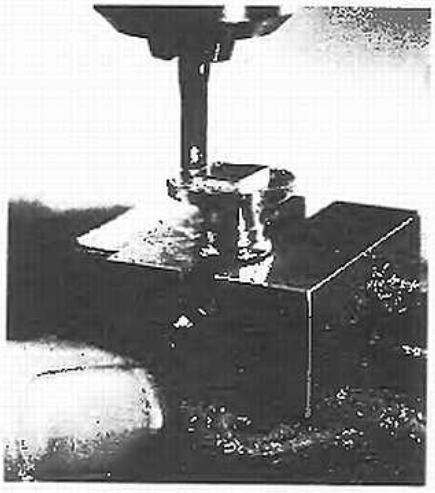
DRILLING TECHNIQUES

When a hole must be located with exact precision, lay out and accurately center-punch its center point before mounting the work in the machine. Then fix the workpiece on the cross slide with the punch-mark accurately aligned with the axis of the spindle. To do this, unscrew the drill chuck, insert a lathe center in the spindle bore, and carefully position the carriage until the point of the center seats exactly in the punchmark. Then remove the center, replace the chuck and insert the drill. Enlarging the punchmark with a centerdrill before drilling the hole insures that the drill used will start concentrically.

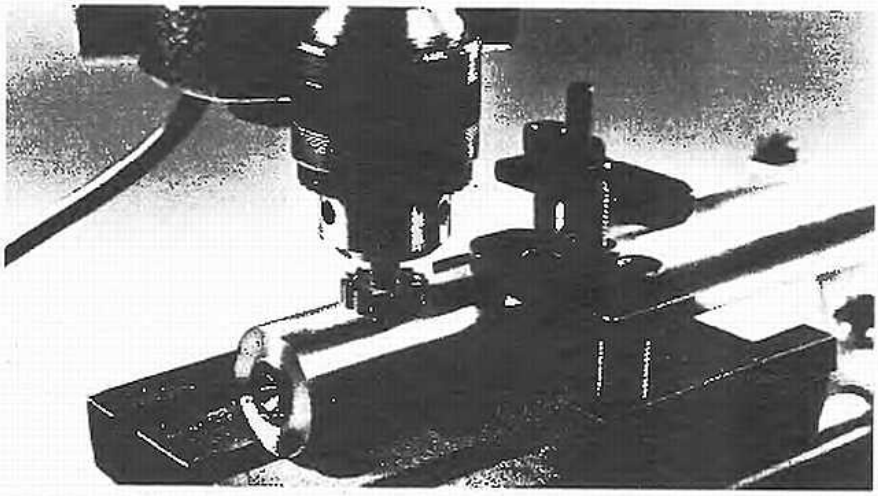
Use cutting oil liberally when drilling steel. The cutting oil functions both as coolant and lubricant. Light machine oil is the most satisfactory lubricant for drilling mild steel. Use turpentine or kerosene to drill tough alloy steel. Brass and aluminum ordinarily are drilled dry. Cast iron always should be drilled dry, since fine chips of cast iron are abrasive and when mixed with oil form a compound that laps the drill dull.

Feed the drill into the work with enough pressure to keep it cutting, but avoid excessive feed, which can chip the cutting edges or even break off the tip. A sharp drill drilling mild steel at correct feed rate produces two identical curled spiral chips.

Drilling deep holes—deeper than five times their diameter — presents special problems. When a drill cuts a shallow hole its flutes lift chips clear. But when the hole is deep the chips pack in the drill's flutes, and this makes it necessary to withdraw the drill periodically to clear the cutting edges. Most other deep-drilling problems are caused by lack of clearance. A twist drill's flute margins are ground to a very slight taper (the flutes are about a thousandth larger in diameter near the tip than near the



USE TWO-FLUTE CUTTERS like woodworking router bits but at slower speed.



MILLING TABLE supports long work for milling. Mount the work as rigidly as possible, clamping it down with T-head bolts inserted in table's T-slots.

shank) to give the drill clearance in the hole. As a drill wears, its flute margins wear more at the tip than at the shank, and clearance is soon reduced to zero. A drill with worn margins still performs perfectly well for drilling shallow holes, but when a worn drill is used for deep-hole drilling it will wedge in the hole, overheat or break. Always use new drills to drill deep holes.

Drilling large-diameter holes with the Unimat is simply a matter of working within available power. First drill a pilot hole, and then enlarge the pilot hole with progressive larger drills. Whenever required a large hole can be finish-bored to very close tolerance with a boring tool held in the 4-jaw chuck.

Drilling very tiny holes, termed "sensitive drilling", involves the same problems encountered in deep-hole drilling. In machine shops #60 drills (.040") are the smallest commonly used. But in these days of miniaturization instrument repairmen often have occasion to drill holes much smaller. Extremely small drills are long in relation to their diameter, and the small holes drilled with them are proportionately very deep. Unless tiny drills are used with very sensitive touch, breakage is certain.

To set up the Unimat for small-hole drilling, remove the spindle return spring, oil the spindle cartridge, and adjust the spindle lock screws for very smooth, easy spindle advance. Clean the drill chuck in kerosene to make sure that no chips will wedge between the jaws—or if for high-precision work you will hold the drill in a collet, clean the collet's slots. Use light-viscosity cutting lubricant when drilling small holes, either mineral oil or kerosene.

Centerpunch the work to be drilled lightly to avoid work-hardening the metal, and be sure to mount the work rigidly. As you start a tiny drill in the work, watch its tip with a jeweler's loupe to make sure it begins cutting concentrically. Drill with very light feed, letting the drill cut its own way. Withdraw the drill frequently to clear chips and flush the hole with a syringe filled with cutting oil. High spindle speeds can be used when drilling tiny holes in soft metals, but use moderate speed when drilling steel or cast iron, since excessive speed may dull the corners of the drill's cutting edges and tiny drills are very hard to resharpen.

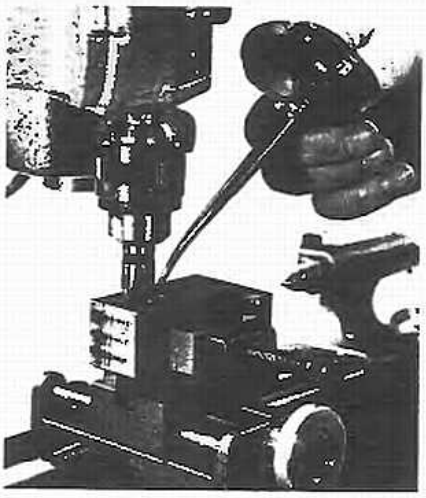
Countersinking or counterboring holes for screwheads involves no problems provided you work with light cuts to avoid chatter. When a hole you've drilled and countersunk requires tapping, start the tap before removing the work from the machine. With the tap chucked, turn it in by hand while applying light feed pressure with the pinion lever. Don't attempt to run taps in under power.

MILLING TECHNIQUES

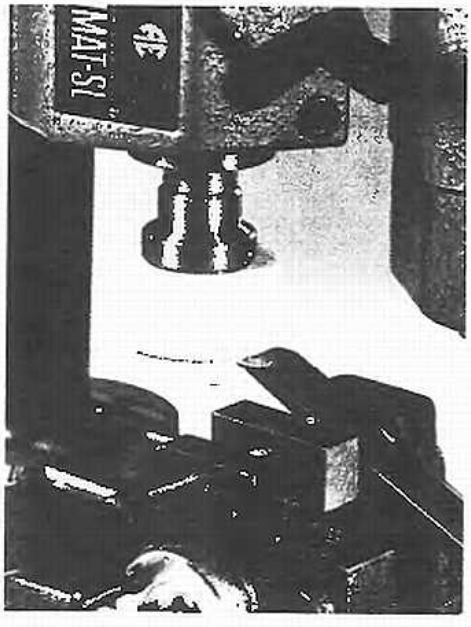
With the Unimat set up as a vertical milling machine, you can readily mill slotted or recessed parts that would be difficult to machine in any other way. Many kinds of cutters can be used for vertical milling, but three types are most common: slotting cutters, spiral end mills and rotary files.

Slotting cutters have two flutes. They can be sunk into work like drills and then fed laterally to mill slots or recesses. Spiral end mills, which have multiple spiral flutes and mutiple cutting edges, are designed to make shallow cuts sideways, with the cutter's radial end teeth scraping the work to very smooth finish. Rotary files, which have cut rather than ground teeth, are less expensive than ground cutters and come in a wider variety of shapes. Woodruff key-seat cutters and other special cutters are also available. Since the Unimat's spindle rotates clockwise (viewed from above), always use right-hand-cutters.

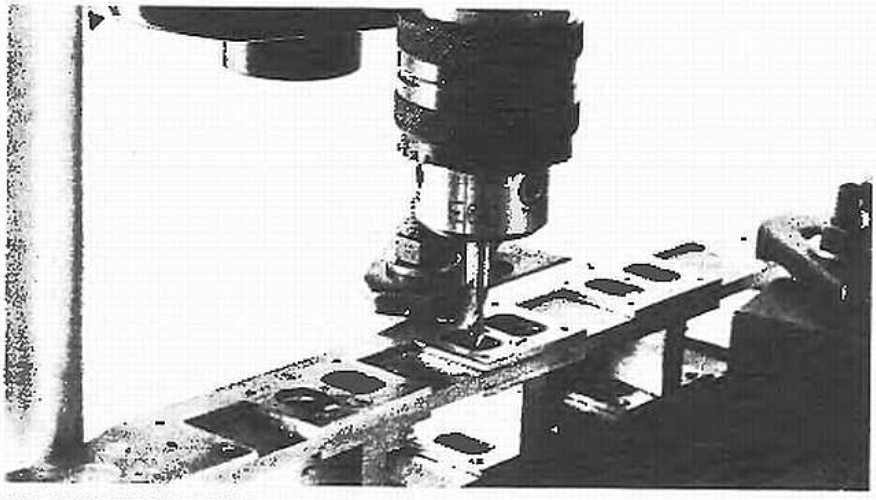
Milling cutters must be used with care in order to keep them sharp. Their cutting edges are hard and brittle, and to avoid chipping their teeth you must feed the cutters into the work slowly and evenly. Mount the workpiece to be milled on the cross slide as rigidly as possible, either in the



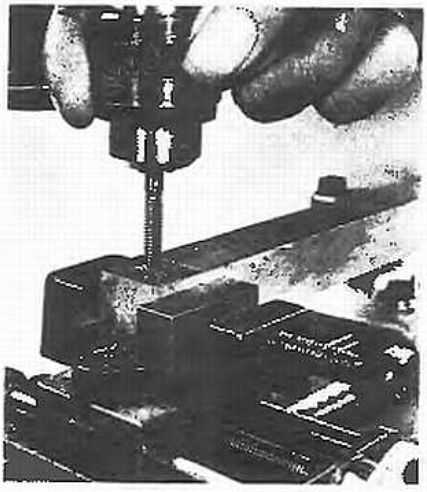
WHEN COUNTERSINKING holes use slow spindle speed to avoid chattering.



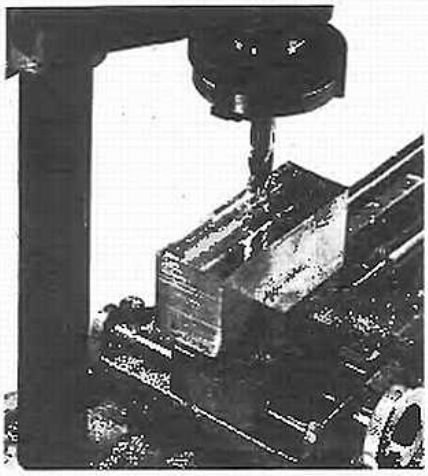
MANY TOOL-GRINDING SET-UPS are possible on the Unimat. Avoid overheating the tool.



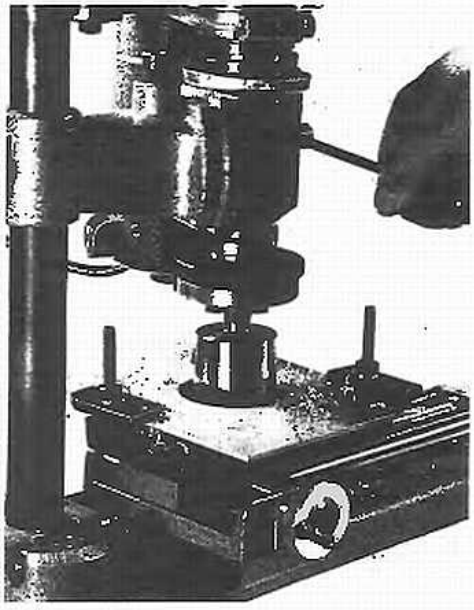
USE VERY GRADUAL FEED when milling with small cutters. Use the Unimat's longitudinal feed screw to feed the work to the cutter whenever possible.



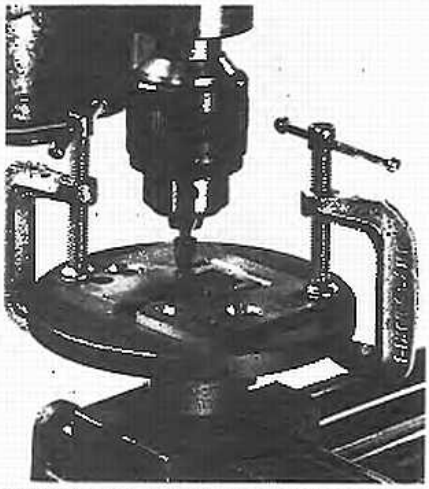
TO TAP HOLES, chuck the tap and turn it into the hole by hand—never under power.



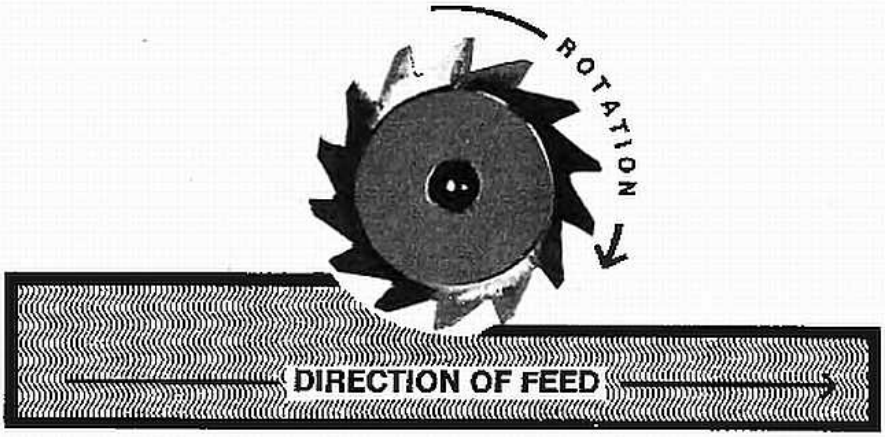
LARGE DIAMETER END MILLS used to mill flats can be held in the 3-jaw chuck.



A SMALL FLY-CUTTER cuts neat holes in aluminum or brass, take light cuts.



ROTARY FILES, available in a variety of shapes, mill grooves or recesses.



machine vise, in a spindle chuck, fixed on a workplate or clamped on the accessory milling table. Since any "give" in the work may break the cutter, mount the work solid.

The machine's feed movements should be set up quite tightly, with the longitudinal feed used whenever possible to feed the work to the cutter. It's important when making milling set-ups to orient the work for "up" milling. The cutter's teeth should always sweep forwards along the line of cut, opposing the direction of feed, and then upwards and out of the work. Never mill with the cutter's teeth sweeping downwards and back, for the teeth would then tend to pull the work under the cutter, which would cause the cutter to climb and break. Milling at moderate spindle speed greatly prolongs the cutters useful life. Flood the mill with cutting oil when milling steel. Large-diameter end mills used to mill flat surfaces should be run at slowest spindle speed.

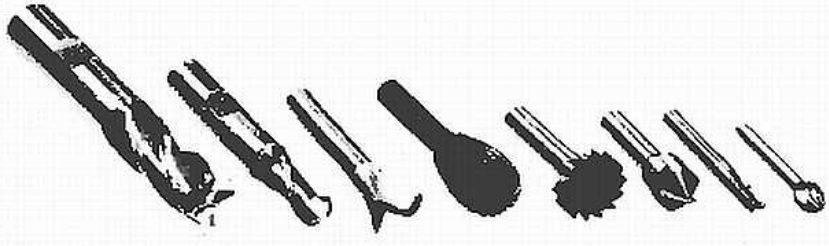
Very tiny end mills give best service when held in the collet chuck. Use very gradual feed. If you use a jeweler's loupe to mill to scribed lines, it's possible with practice and patience to make unbelievably intricate cuts with small mills.

SURFACE GRINDING TECHNIQUES

With a grinding wheel mounted on the spindle, the Unimat when set up vertically will do a beautiful job of finish-grinding small steel parts, either hardened or unhardened. Most surface-grinding jobs can be performed most satisfactorily with a cup wheel, though straight wheels can be used. Ordinarily the wheel should turn at fairly high speed, about 5000sfm. Since any grinding wheel throws swarf, remember to wear protective glasses when grinding.

Always grind with successive passes, removing no more than a few thousandth at each pass. When surface-grinding large areas, take very light cuts with gradual feed to avoid overloading the machine's motor. Be careful not to overheat the work when grinding heat-treated parts. If the grinding wheel leaves a mottled finish on the work, it's an indication that the wheel needs dressing, which is accomplished by feeding the point of a diamond dressing tool (pg. 35) across the wheel's face. Lacking a diamond dresser, you can use a piece of broken grinding wheel similarly. Dress the wheel very lightly—only enough to remove embedded metal particles and expose fresh abrasive grains.

Using the accessory indexing head (pg. 33), many cutter-regrinding set-ups can be made on the Unimat. When grinding cutting edges, grind "on" rather than "off" the edge. Start the pass beyond the edge, feed the wheel towards it, across it, then on across the edge-bevel.



MANY TYPES OF CUTTERS can be used for vertical-spindle machining. Some are shown above. Use milling cutters with care to keep them sharp.

USING UNIMAT ACCESSORIES

Several of the more commonly-used Unimat accessories are supplied with the machine, and with standard equipment the tool is uniquely versatile. The many other accessories available extend its capabilities even further. Most of these extra accessories are exactly like the accessories used on industrial machine tools but smaller. They simplify making various metal-machining set-ups. Others convert the Unimat for special work—each woodworking accessory, for example, making the machine a miniature version of a standard woodworking power tool. The extra accessories you'll want for your Unimat will depend upon the kind of work you'll do with it. Acquire basic accessories first, and then add accessories for special jobs to your outfit as you need them.

Numerous accessories are available for the Unimat, more accessories in all than are available for most larger machine tools. While several can be used in more than one way, the machine's accessories can be grouped loosely into four categories: lathe accessories; accessories for drilling, milling and grinding; watchmaker's accessories designed especially for very small ultra-high-precision work; and woodworking accessories, which are popular with modelbuilders.

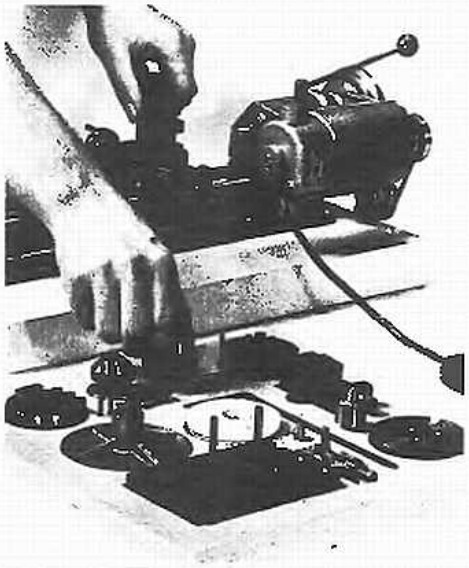
Three of the machine's accessories are so useful for so many jobs that they could be termed basic, and these are the accessories a Unimat owner should acquire first. The three are the 3-jaw universal lathe chuck, the machine vise, and a ball-bearing live tailstock center (either of the two available). The 3-jaw chuck is the single most useful device for mounting work on the lathe spindle for turning. The machine vise is by far the most convenient workholding device for mounting work to be drilled, milled or surface-ground on the machine's carriage cross slide. The ball-bearing tailstock center makes it unnecessary to continually relubricate and readjust the lathe's dead center, and a live center is strongly recommended for any turning or polishing performed at high spindle speed.

Having equipped your Unimat with these three basic accessories, you can collect other accessories as you need them over a period of time, adding them one by one to complete your outfit. Some of the tool's accessories are multi-purpose devices; others are used less frequently only for special set-ups. Remember when selecting accessories that some of them are used in combination with others. You'll need collets for the collet chuck, for example, and a mounting plate for the T-slotted fixture plate. Since ordinarily the 3-jaw universal chuck is used to mount work on the indexing and dividing head, it's advisable to have the chuck before purchasing the indexing head.

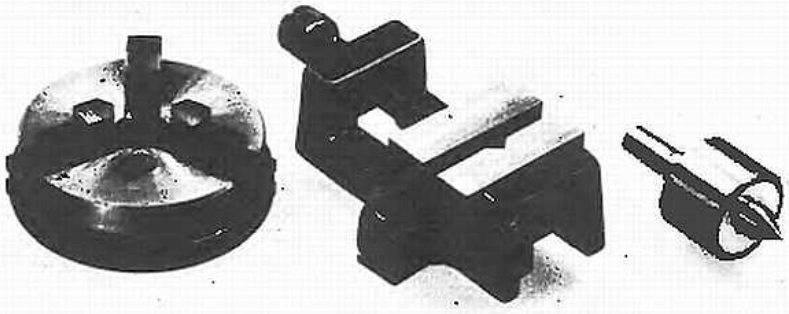
Because most of the lathe and vertical-operation accessories are designed for precision work, they are manufactured to the same close tolerances as the Unimat itself, with critical parts hardened and ground. The collet chuck in particular is finish-ground with extremely high precision. Like the machine, these precision accessories must be cleaned and oiled regularly to protect them from rust, and they should be stored in a manner that prevents loss or accidental damage.

One way to keep the Unimat's smaller accessories neatly arranged ready at hand is to store them in a tool board. To make a suitable board, lay out the accessories you have in any way you like on a piece of ¾" hardwood plywood, draw around them with a pencil, and rout a recess in the board to pocket each accessory. You can rout these recesses with the Unimat, or you can use a portable electric router. Since a board of this kind is quite easy to make, whenever you acquire new accessories you can make a larger board with additional pockets. Painting the board a light color with a spray can prevents the wood from soaking up oil and makes the board easier to wipe clean.

Since from time to time new accessories are made available for the Unimat, order accessories from an up-to-date catalog. A current issue will be mailed to you on request. Dealers in larger cities keep the full line of accessories in stock for immediate delivery.



A TOOL BOARD cut from hardwood plywood keeps small accessories ready at hand.



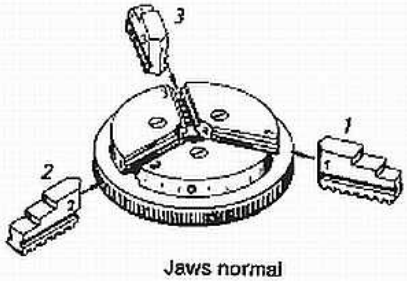
THE THREE MOST USEFUL ACCESSORIES are the 3-jaw universal lathe chuck, the machine vise, and a ball-bearing "live" tailstock center.

Lathe Accessories

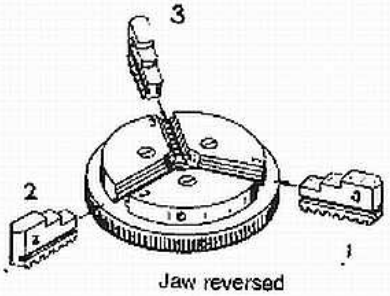
Accessories used primarily for lathework comprise the largest group of Unimat accessories. A variety of standard accessories are used on metal lathes, and the lathe accessories available for the Unimat are employed like the similar devices used on large industrial lathes.

3-JAW UNIVERSAL CHUCK

Although the self-centering 3-jaw scroll chuck is designed to grip only round or hexagonal workpieces, square or rectangular work can be chucked if the stock is first ground or filed round on one end. Large square or rectangular stock can be mounted between centers and turned round on one end for chucking. In one way or another the 3-jaw chuck can be used to hold nearly any kind of work up to 2¼" in diameter, which makes this chuck the single most useful Unimat accessory.



Jaws normal



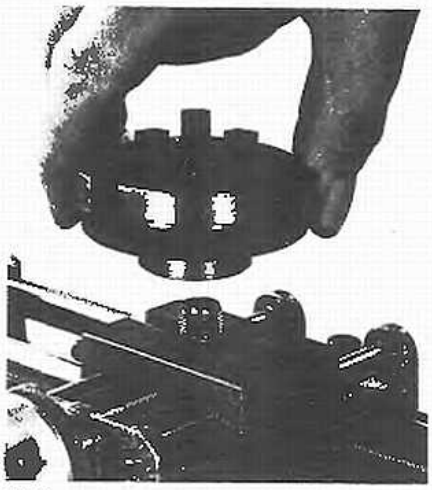
Jaw reversed

THE 3-JAW CHUCK'S JAWS can be reversed for gripping large-diameter work pieces.

The chuck's body and scroll plate are made of steel, with both the jaw slots and the spiral scroll precision-ground. The scroll plate is held on the body of the chuck with a flat snap ring, which if necessary can be removed with ring pliers. It's not necessary to remove the scroll to clean the chuck. You can clean it thoroughly simply by screwing out and removing the jaws, and then washing the body and scroll as a unit, and the jaws separately, in kerosene. After cleaning lubricate the scroll and jaw slots with light machine oil, and also oil the snap ring retaining the scroll plate. Then replace the numbered jaws in the corresponding jaw slots and turn the scroll clockwise (viewed from the front) to engage the jaws in sequence, first #1, then #2, then #3.

The jaws can be reversed to hold large-diameter workpieces by interchanging jaws #1 and #3 in their slots. First insert jaw #3 reversed in slot #1 and turn the scroll clockwise to engage the jaw. Next insert jaw #2 reversed in slot #2 and turn the scroll clockwise to engage this second jaw. Then insert jaw #1 reversed in slot #3 and turn the scroll clockwise until this last jaw engages. The lip of the spiral scroll will catch the jaws smoothly when the jaws are properly positioned. Never force the scroll.

The 3-jaw chuck comes ready-mounted on a finish-machined threaded mounting plate that screws on the lathe spindle. Take care when handling the chuck to avoid marring the mounting plate's rear face, since a nick would prevent the plate from seating squarely against the spindle's shoulder and the chuck would then run with slight wobble. Always clean and oil the spindle's threads and shoulder before screwing on the chuck. Similarly, before mounting the chuck with the adapter stud on the carriage cross slide, clean and oil the top of the slide.



THE ADAPTER STUD, supplied mounts the chuck on the carriage cross slide.

Avoid marring the narrow ground faces of the chuck's jaws when tightening the chuck on hardened work. Be sure both chuck and work are clean. Remember to clean the chuck thoroughly to remove swarf whenever you've used it to hold work for grinding.

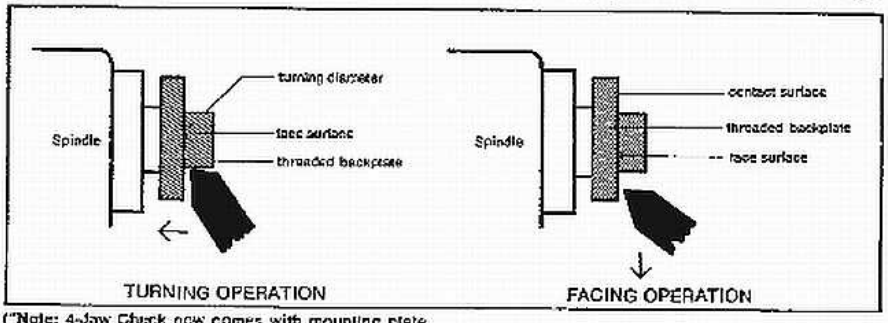
When chucking round workpieces that must be mounted with best-possible concentricity, twirl the work slowly with one hand as you close the chuck—using the two steel pins inserted in the body and scroll plate—with the other. When the jaws have gripped with square purchase, tighten the scroll only enough to hold the work firmly. Avoid overtightening the jaws, since severe overtightening can degrade the chuck's precision. Keep the screws holding the chuck on its mounting plate well tightened.

Precision built, the 3-jaw chuck centers work more accurately than larger scroll chucks—to within a thousandth or two. Use the collet chuck for work that must be centered with higher precision.

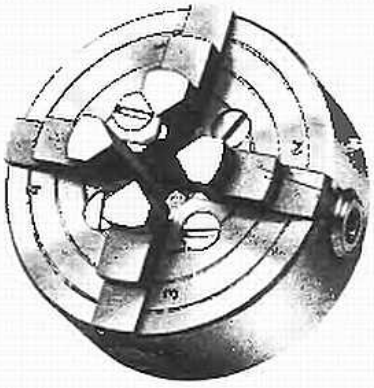
THE 4-JAW INDEPENDENT CHUCK

The 4-jaw chuck comes unmounted, with its mounting plate, which is included with the chuck, supplied slightly oversize to allow custom-fitting the chuck to the particular lathe's spindle. To mount the chuck you must accurately finish-turn the mounting plate to fit the back of the chuck's cast iron body.

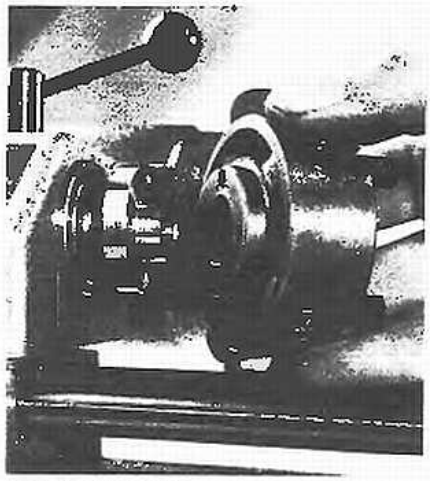
Before doing this make sure that the lathe's headstock is accurately aligned. Then very carefully clean and oil both the spindle's nose threads and the plate, and screw the plate on the spindle until it seats firmly against the shoulder. Next, taking very light cuts with a sharp-pointed bit whetted very sharp, turn the diameter of the mounting plate's tenon to the exact size required (.669") to push-fit into the chuck's bore. Work painstakingly, being very careful not to turn the tenon too small, for it must fit into the chuck with no lateral play whatever. If you lack a micrometer, turn the tenon to diameter with extremely light cuts, trying the chuck on the plate after each cut. Having turned the tenon to exact size, take a light truing cut across the plate's face to insure that the chuck will seat squarely against it. When truing the plate's face use very gradual feed and turn right



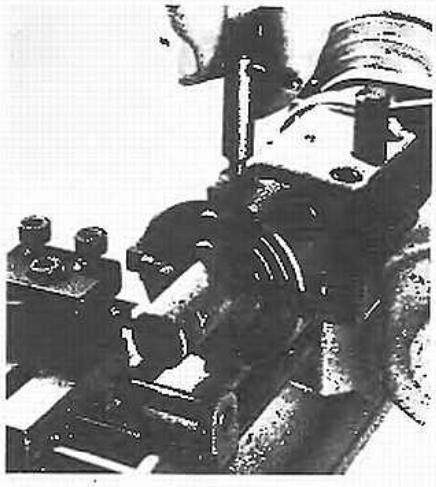
("Note: 4-Jaw Chuck now comes with mounting plate factory-machines and assembled. Use these instructions for truing other mounting plates, such as the 1020 Collet Chuck Plate — p. 27").



THE 4-JAW CHUCK'S JAWS screw-adjust separately and grip the work very tightly.



CAREFULLY FINISH-TURN the mounting plate to fit the bore in the back of the chuck body.



WORK MUST BE CENTERED in the chuck by hand by adjusting the four jaws in pairs.

across the four tapped screw holes.

With the plate finish-machined, clean and oil both the plate and the back of the chuck, and screw the chuck on the plate with the four flat-head machine screws provided. If the mounting plate has been accurately turned the chuck will now run perfectly true on the spindle.

The 4-jaw chuck holds square or rectangular work for turning, or large round work that must be centered with exact precision. Work can be centered in the chuck very precisely by adjusting the four jaws individually to shift the workpiece as needed. Setting a tool bit at the work's periphery indicates which way the work must be shifted to center it. The 4-jaw chuck's jaws can be screwed out and reversed in their slots to grip large-diameter work, but when screwed out to maximum capacity the jaws will strike the Unimat's rear way. The headstock raising block can be inserted under the headstock whenever needed to allow the chuck jaws or the corners of large square work to clear the machine's bed.

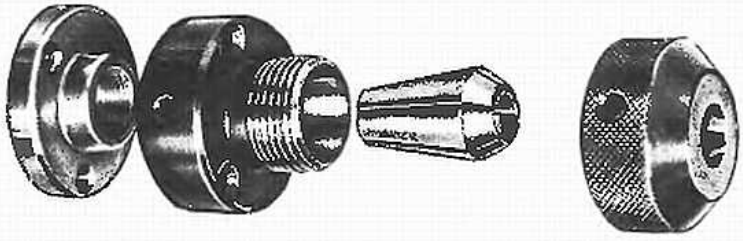
Remember when using the 4-jaw chuck that its square key screws the jaws down on the work with enormous force, and that excessive tightening can strip the threads in the cast iron body. Tighten the jaws only enough to grip the work securely. Work that overhangs the jaws more than four times its diameter should be centerdrilled and supported with the tailstock.

Keep the chuck's jaw screws well-oiled, and wash the jaws, screws and body regularly in kerosene to clean out dirt and chips. The jaws should slide smoothly in their slots without forcing. If a chip wedged in a jaw screw causes sticky operation, unscrew the jaw and remove the chip.

THE COLLET CHUCK

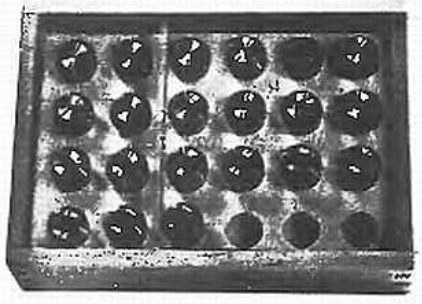
The collet chuck is also supplied with an unfinished threaded mounting plate that allows custom-fitting the chuck to the particular lathe's spindle. Although a simple device, the Unimat's collet chuck is very accurately ground, and the double-tapered spring collets used in it center small round workpieces with exceptionally close precision. To utilize this inherent precision it's necessary to mount the chuck with great care. Finish-turn the mounting plate's tenon to fit the chucks' bore snugly (if you should turn it too small, order another plate and try again). When you've trued the plate and screwed on the chuck body, test the chuck's concentricity by chucking a length of drill rod several inches long in a collet. If the chuck is accurately mounted the unsupported end of the rod will turn with very little runout.

The alternately-split collets used in this chuck, which must be purchased separately, are available in inch sizes from 1/64" through 5/16" by 64ths, and in metric sizes from 0,5mm through 8mm by half-millimeters. A special .0135" collet is available for holding tiny #80 drills, and unhardened collets that can be bored as required for special work also can be ordered.



Keep the internal tapers in the body of the chuck and in the knurled nose-piece that closes the collet wiped clean with an oiled rag, since even a small speck of grit will cause runout. Grease the threads of the chuck's nose-piece for smooth closing action. After each use oil both chuck and collets liberally to prevent rust, for even a fingerprint will rust-pit their highly-finished surfaces.

The double-tapered collets will open or close ten or fifteen thousandths, gripping tightly and evenly. To preserve their precision never close collets on work more than 1/64th undersize, on work that isn't perfectly round, or on marred tool shanks. If a collet sticks in the chuck's taper when the nosepiece is unscrewed, gently tap it out from behind with a length of brass rod.



STORE COLLETS in order of size in a case, which you can either buy or make yourself.

EDELSTAAL

Revolutionary new Pre-shaped Inserts

resharpenable over and over again . . . up to 50 times! fits low cost turning tools, boring bars, fly cutters

Turning tools . . . Boring bars . . . Cut-off tool . . . Fly cutters . . . Here's the greatest development in lathe tooling since throw-away inserts—a complete system of low-cost lathe tools using preshaped toolbit inserts that can be resharpened time after time in a matter of seconds. Try these new Edelstaal cutting tools to fully appreciate their revolutionary features:

- Tools hold Carbide, M-2, or T-15 inserts
- Inexpensive inserts resharpen in 10 seconds
- Consistently superb cutting performance
- Economical system pays for itself the first week

BENEFITS FOR LATHE OWNERS

Edelstaal turning tools, boring bars and fly cutters hold a special replaceable toolbit insert with a cross-section that forms a side cutting edge along the insert's full 2" length. With clearance, rake and chip groove preshaped, the cutting edge can be quickly resharpened simply by lightly grinding the end of the insert.

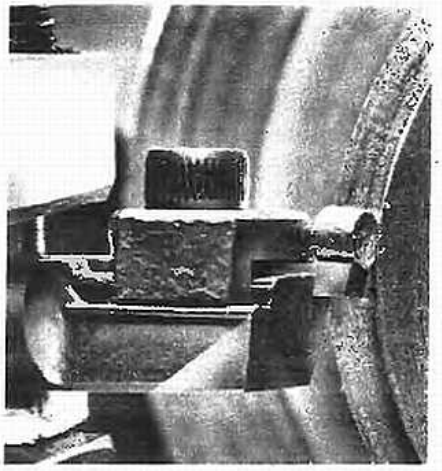
For experienced lathe operators this new tool system's primary advantage is the time it can save, a saving that quickly pays for the tools. Even a beginner can easily resharpen the preshaped tool bit inserts for optimum performance without stopping to consider cutting edge geometry.

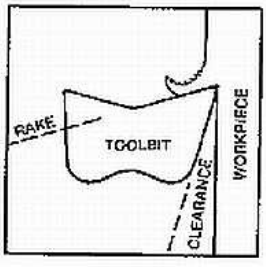
TURNING TOOLS

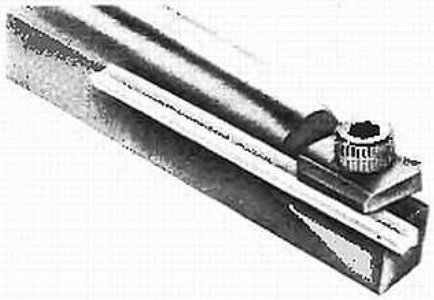
Includes right- and left-hand turning tools with ¼" shanks, holding the quick-sharpening toolbit inserts. All have hardened bridge clamps tightened with Allen head screws that grip the inserts rigidly. The tools make either cylindrical or facing cuts. They are heat-treated and have a black oxide finish.

BORING BARS

The system also includes an insert-type boring bar ¼" diam., double-ended, with the toolbit insert held at 90° at one end for throughboring and at 45° at the other end for boring to shoulders. A small V-block simplifies mounting the bars in tool blocks. The bar is heat-treated and has a black oxide finish.







CUT-OFF TOOL

The cut-off tool has a 5/16" square shank and holds a special 1/16" x ¼" T-15 HSS parting blade. It was designed expecially for parting small precision work in bench lathes. Replacement blades are available.

REPLACEMENT TOOLBIT INSERTS

Edelstaal inserts can be quickly resharpened off-hand without removing them from the holders, by first touching the end of the insert against a grinding wheel to grind 5-8° front clearance; then touching the side cutting edge lightly against the wheel and grinding only enough to true the edge and adjust side clearance to 8½°. Each 2"-long insert can be reground up to 50 times. All inserts are identical and interchangeable and available in three cutting tool materials color coded for easy identification.

Solid Carbide Inserts (bright finish) Made from a general-purpose grade of carbide (similar to C-5) suitable for machining all ordinary work at the highest possible cutting speeds with infrequent resharpening.

T-15 Super High Speed Steel inserts (red) made from a tungsten steel containing 5% cobalt. With high hot hardness and exceptional wear resistance, they permit machining work at higher cutting speeds.

M2 High Speed Steel Inserts (color-coded blue) These low-cost general-purpose inserts, made from a tungsten-molydenum steel with excellent strength and toughness, are suitable for machining steels, cast iron, brass, copper and aluminum.

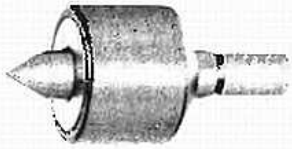
These new cutting tools are available individually or in convenient low priced sets.

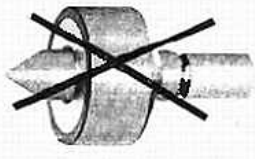
BALL-BEARING LIVE CENTERS

Two live centers are available for use in the Unimat's tailstock ram. Both are similar in design, but one has a single ball-bearing and the other has two ball-bearings. The single-bearing center is adequate for all ordinary turning and polishing. The double-bearing center is preferable for critical high-precision work, since the double bearing gives the freely-revolving center point better support and minimize runout when the bearings eventually begin to wear.

The bearings in both centers are grease-packed. Never oil them. When long use at high speed warms the center, a little grease may ooze from the bearing's front seal, which isn't cause for concern. Once every few years the bearings should be regreased by forcing a little new bearing grease through the hole in the center's shank with a small swab.

For special jobs you can remove either center's hardened point and replace it with a cup center or pipe center you machine yourself. To remove the 60° point, place the center face-down on a wood block in which you've bored a ½" hole, and gently drive the point out of the bearing with a small drift punch inserted in the shank's hole. Turn the special center from tool steel to the same diameter as the 60° point, heat it red-hot and quench it in oil. Then tap it into the live center's bearing. It should fit tightly, but not tightly enough to distort the bearing.





Single live center discontinued.

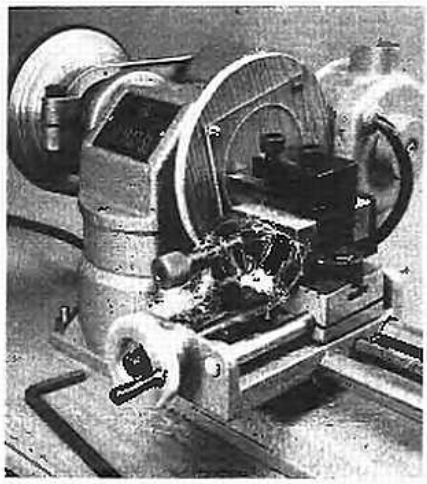
HEADSTOCK RAISING BLOCK

The die-cast headstock raising block is exactly ¾"-thick. Inserted between the Unimat's headstock and bed casting, it increases the lathe's swing by 1½" and permits turning chucked or faceplate-mounted work up to 4-7/16" in diameter. When the machine is set up for drilling or milling the block can be inserted between the headstock and the column's adapter casting to increase the spindle's reach, making it possible to drill or mill to the center of a 7⅝" circle.

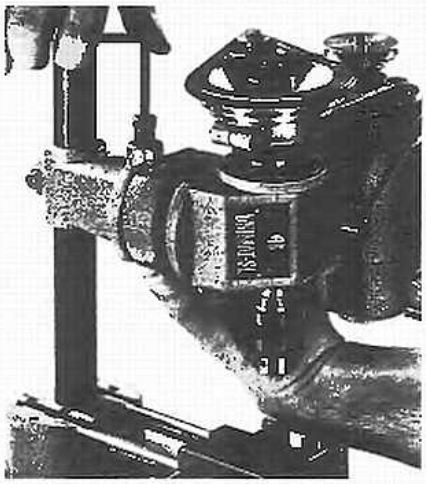
The raising block is required in order to use either the sanding plate or the large-diameter circular saw blade on the spindle, since both of these accessories require extra swing.

With the headstock raised on the block, the bed's clamping screw seats in the headstock tenon's lower chamfered groove. It simplifies accurately realigning the spindle with the ways if before mounting the headstock on the raising block you clamp a straightedge in the tool block and set its edge parallel with the face of a workplate screwed on the spindle. You can then easily realign the headstock after raising it on the block by adjusting it until the plate is again parallel with the straightedge.

Whenever the spindle is raised for turning large-diameter work it's necessary also to raise the tool block, since the lathe tool always should be set at center height. To raise the bit you can either screw the machine vise on the cross slide and clamp the tool block in the vise, or you can mount the tool block on a ¾"-thick spacer machined from scrap aluminum using a longer mounting screw. Extra Allen-head screws in assorted lengths are listed in the catalog.



RAISING BLOCK increases the lathe's swing for turning larger-diameter faceplate work.



THE BLOCK can also be used to increase the head's reach for vertical drilling or milling.

THE STEADY REST

The Unimat's steady rest is used in three ways.

First, it can be clamped wherever needed along the lathe's ways to provide intermediate support for long, limber work that otherwise would spring away from the tool's cutting edge and chatter. With the rest positioned as close to the point of cut as practicable, its three brass jaws should be adjusted to just touch the work as it revolves. The jaws then serve as bearing surfaces to prevent the workpiece from deflecting under the pressure of the cut.

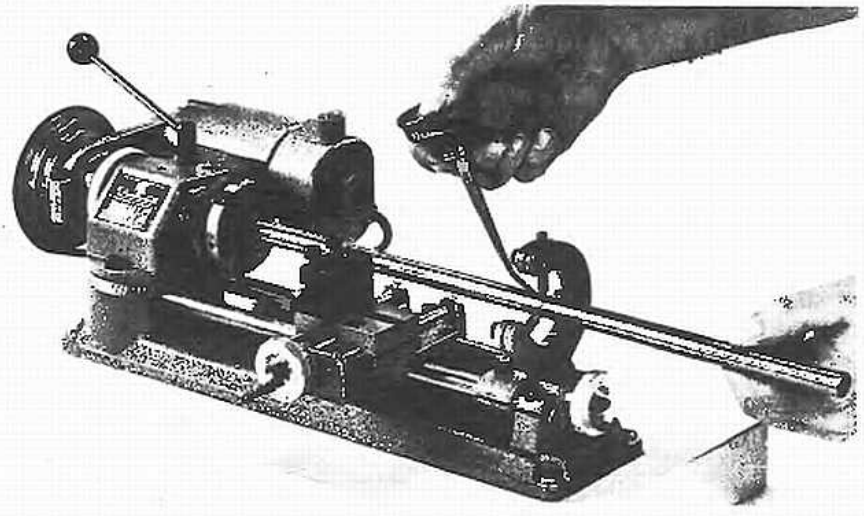
Second, the rest can be used to support the free end of workpieces that can't be supported with the tailstock—work to be faced or bored on the end, for example. Its jaws have 1½" capacity.

Third, the rest can be clamped at the end of the bed in place of the tailstock to support work that is longer than the machine.

Work supported in the rest must have a smooth, perfectly round surface for the jaws to bear on. Square stock can be supported in the rest if you press on a turned steel bushing. When using the rest to support work that has a standard diameter, slip a ball bearing on the workpiece and adjust the rest's jaws to clamp the bearing.

When the rest is used instead of the tailstock to support work longer than the bed, the jaws must center the work accurately if the lathe is to cut a true cylinder. An easy way to center the jaws is to slide the rest up to the headstock and set its jaws to correspond with the jaws of the 3-jaw chuck. The spindle end of overhanging work must either be gripped in a chuck, or if center-drilled and driven with a dog, lashed to the faceplate with a rawhide shoelace. Run overhanging work at slow spindle speed.

The rest's brass jaws must be kept well lubricated with oil or grease. When they eventually wear down you can buy replacements.



STEADY REST supports limber work, work to be machined on one end, or work that is longer than the lathe's bed. Keep the rest's three brass jaws well oiled.