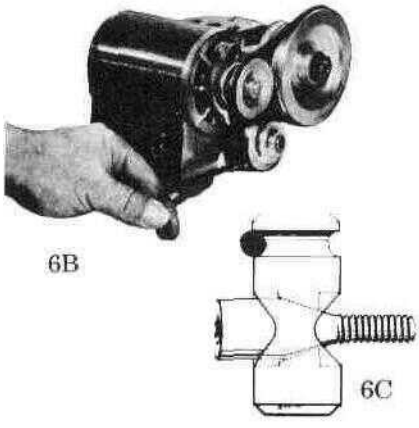
BASIC UNIMAT

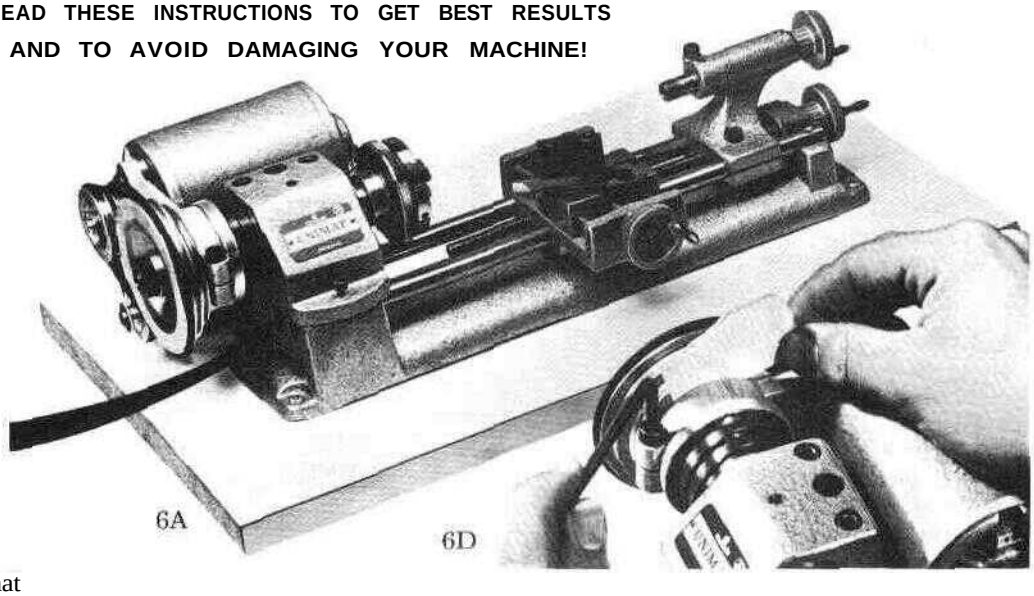
SETTING UP YOUR LATHE

READ THESE INSTRUCTIONS TO GET BEST RESULTS AND TO AVOID DAMAGING YOUR MACHINE!



6B

6C



6A

6D

Working metal parts of the Unimat are protected in shipment with a coating of rust-resistant grease. Wipe off with a cloth dipped in kerosene or benzene. Then lightly oil the lathe bed, cross slide and all exposed metal surfaces to prevent rust. Number 10 motor oil or any light grade machine oil will do the job.

Though you can use the Unimat as is, you'll find it helpful to screw the bed down to a perfectly flat board. A piece of 11 x 18 inch plywood, 3/4 or 1 inch thick makes a good working base. The board shown in the photo was made of a piece of scrap Formica counter top, a material available at most lumber yards. The white color makes small parts easy to see and the grease resistant surface is easy to clean. A complete Unimat Workcenter (DB 1400) is available as listed on the back cover.

Before you plug in the motor, check the idler pulley. It should spin freely. Make sure the protective grease hasn't hardened around the ball bearings, and that the clamping screw is not too tight. This screw should be just snug enough to keep the assembly from slipping out. Put too much tension on this screw and it will distort the ball bearing race and prevent the pulley from turning properly.

The headstock pulley must clear the motor bracket. If the cap screw on the bracket loosens, the spindle spring will push the motor bracket up against the pulley causing the spindle to stall. Use a folded piece of cardpaper (about .015" thick) between the pulley and motor bracket to set the spacing and then lighten the cap screws.

Several types of motors are illustrated in this manual. The motor supplied with your Unimat is a high torque quiet operating 1/10th HP 110 volt 60 cycle motor. Motor designs are subject to improvement, and the motor delivered with your unit may have a slightly different appearance. If your motor heats after running continuously for 5 to 10 minutes, this does not mean it is defective. Your motor is fully enclosed to protect it from chips and dust and because a lot of power is packed in a small case, there is heat build-up, which has been provided for in the design.

Unimat spindle ball bearings are factory pre-lubricated and will need no additional attention for the first 300 hours of use. After this time, follow instructions on page 33 for disassembly of the spindle and lubrication.

LATHE

3 JAW CHUCK

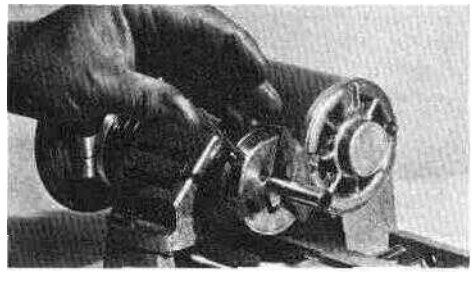
DB 1001 UNIVERSAL LATHE CHUCK CENTERS ROUND SHANK TOOLS AND WORKPIECES FROM .118" TO 2-1/64"

There are two lathe chucks available for your UNIMAT: #1001. 3-jaw Universal, and #1001a, 4-Jaw Independent chuck. *Both* accessory chucks must be 'trued' to the lathe spindle to make them run dead accurate. Before using, *machine chuck backplate* as described on page 18 under "Truing Instructions".

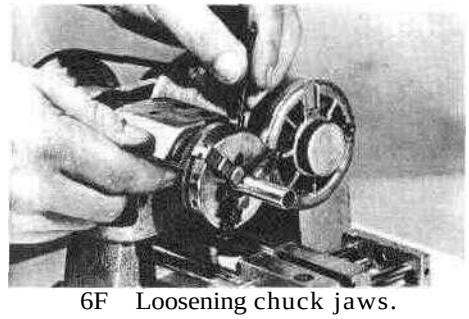
Carefully unwrap and clean the chuck. It is protected in shipment with a preservative which must be removed with solvent — kerosene, gasolene, or lighter fluid will do. Loosen the jaws by rotating the outside knurled ring counterclockwise looking at the face of the chuck.

As each jaw disengages from the scroll, it can be removed. The first jaw to release will be #3, next #2, and then #1.

Clean jaws and threads. Then oil with a light film of #10 motor oil or equivalent. To reassemble the chuck jaws in normal position, rotate the ring until the scroll 'ring' appears at a point just before slot # 1. Engage jaw # 1 by pressing inward gently. Continue turning the ring until it is next to slot #2. Install jaw #2, and then repeat for jaw #3



6E Tightening chuck jaws.



6F Loosening chuck jaws.

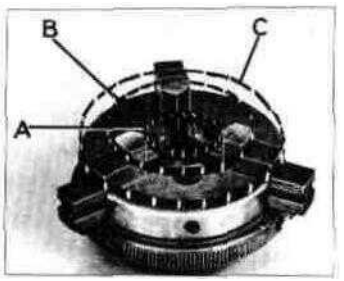
When chucks are new they require a light inward pressure to insure that they properly engage the scroll.

In normal position, the chuck jaws will take round work up to 15/16" on the inside. Or using the backs of the jaws on tubing, etc., you can handle up to a 2-5/32" diameter. By reversing the jaws, larger work can be machined up to 2-15/64" diameter. To reverse jaws, remove as explained before, but reverse each jaw and replace in the chuck in this order: jaw #3 in slot #1; jaw #2 in slot #2; and jaw #1 in slot #3.

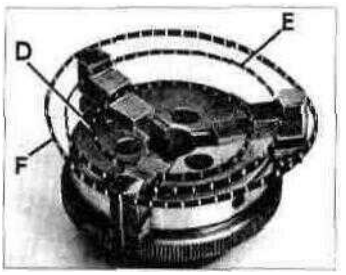
LATHE cont'd

The 3-jaw chuck fits both the headstock and the Unimat tailstock, after the lathe centers have been pulled out of the spindles. The chuck also fits the slotted screw for mounting on the cross slide. It can thus be used to hold round stock for drilling as shown in photo 13B and 13C.

Use a small piece of tubing to practice handling the chuck as in photos 6E and 6F. To tighten the jaws on the work, press bars together. To loosen the jaws grip the bars exerting gentle pressure until the workpiece is free.



JAWS **NORMAL**



JAWS REVERSED

DB 1001 3 JAW CHUCK CAPACITIES

	Setup	Decimal inches	Nearest Inch fraction	Millimeters
JAWS NORMAL	A.(Ext.)	.039-.945"	3/64-15/16"	1-24mm
	B.(Int.)	.709-1.535"	45/64-1-17/32"	18-39mm
	C.(Int.)	1.338-2.165"	1-21/64- 2-5/32"	34-55mm
JAWS REVERSED	D. (Ext.)	.945-1.653"	15/16-1-41/64"	24-42mm
	E, (Ext.)	1.575-2.244"	1-9/16-2-15/64"	40-57mm
	F,(Int.)'	2.20-3.0"'	2-13/64-3"'	56-76mm*

Note: Capacities are greater when Raising Block (DB 1310) is used, and when Chuck is mounted on cross slide or on vertical set-up.
' Indicates outside diameter of workpiece. Note that this is not intended for lathe machining, but may be useful in polishing O.D. of tubing, indexing, etc.
(Ext.) indicate* external gripping of O.D. (outside diameter) of workpiece.
(Int.) indicates internal gripping of I.D. (inside bore dia.) of workpiece

METAL TURNING TECHNIQUE

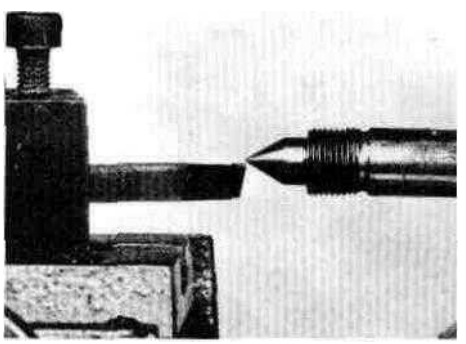
Before you start to do any serious precision work, it's best to get acquainted with the Unimat lathe by taking a few practice cuts on scrap aluminum. This metal is the best choice for practice because it's free-cutting, and won't dull your tools if you haven't. made just the right set-up. You can get a piece of $^{3}/_{4}$-inch round bar stock at most hobby or hardware stores, or if there is a screw machine shop in your neighborhood, you may be able to obtain scrap cutoffs for the asking.

Clamp the bar in a vise and use a hacksaw to cut off a piece about $1^{1}/_{2}$ inches long. Saw the end as straight as possible and then mount it (Photo 7A) in the 3-jaw chuck. If you have already tried converting your Unimat to other positions, insert the alignment pin in the headstock. This pin locates the headstock approximately on center. You may have to loosen the tapered clamping screw (Photo 7C) and move the headstock slightly until the pin seats in its hole.

Next mount the roughing tool bit in the tool post. One Allen wrench fits every locking screw on the Unimat. Put the center in the tailstock, and use it as a gauge to check the center height of the roughing tool cutting edge (Photo 7B).

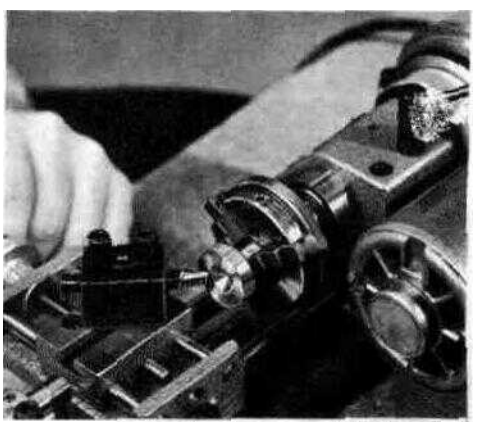
For perfect cutting, the sharp point of any lathe tool should be on dead center, or just a few thousandths beneath center. If a lathe tool is clamped above center, it will cut poorly or not at all because the edge will not contact the work properly. If the tool is too low, it will tend to dig in and cut unevenly. Use metal shims or cardboard to bring the tool up to the right working height

Now set the belts on position 11 (see speed chart on inside back cover. Feed the large belt from the outside (largest) pulley on the motor over to the large headstock pulley. This will give you a speed of about 1700 RP.M.



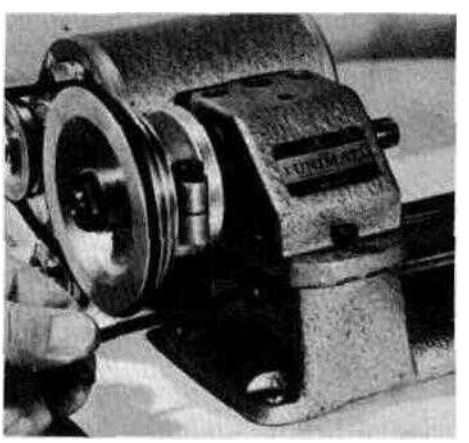
7B. Set tool bit height with tail center.

Tighten the headstock Allen screws on top, to lock the spindle in place. Revolve the spindle by hand to make sure it turns freely and that the belt is properly lined up. Then turn the feed screws to bring the tool over into position, and switch power on. ALWAYS FEED ANY METAL TOOL SLOWLY AS YOU APPROACH THE WORK. As the point of the tool bites in. it should cut a smooth even chip. If you feed too hard, you will notice that the. spindle may slow down while you are cutting. Practice making smooth even cuts. As you go in toward the center, you will be able to feed faster, since less metal is removed when the diameter decreases. Too much pressure may occasionally cause the spindle and the motor to stall. This will not damage the Unimat as long as you are working with soft metal and small work pieces, however the experienced machinist develops a feel for the material and the lathe and seldom jams the tool. If it happens, immediately switch off the power and back off the tool.



7A, Avoid overfeeding tool bit.

Now, you will want to try the other spindle speeds. The chart on the inside back cover shows you how the basic Unimat can be set up for any one of 11 different speeds. As long as you practise with soft metal, there will be little danger of damaging your roughing bit, but if you notice that the cuttings are smoking and that the tool is getting hot, your speed is too fast. The remedy is to use water, paraffin, or kerosene as a coolant.



7C. Allen wrench loosens headstock

BASIC UNIMAT LATHE cont'd

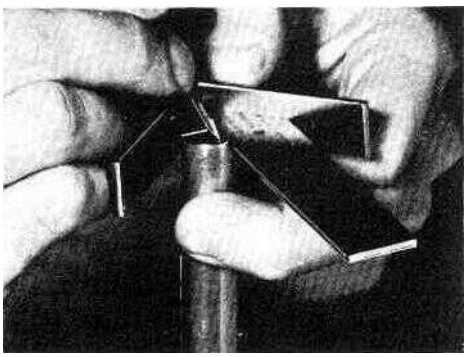
how to choose the right tool bit—center turning, roughing, facing, and machine adjustments...

If you are an experienced machinist, you will already know how to use the 6 kinds of lathe tool bits supplied in the DB 1100 set. However, we suggest that all Unimat owners, beginners and experts alike run through the following practice cuts. You'll find the skill gained will save time later on.

Start by cutting another piece of 3/4 or 1/2-inch scrap aluminum bar stock down to about 5 inches in length. The easiest way to locate centers in the bar is by means of a combination square. For Unimat miniature work, we recommend that you purchase a 4-inch junior sized combination square. Blades are 5/8-inch wide. The instrument is considerably smaller than the usual machinist's square and that makes it easier to hold on small work and thus somewhat more accurate.

8A Junior combination square (4 inch).

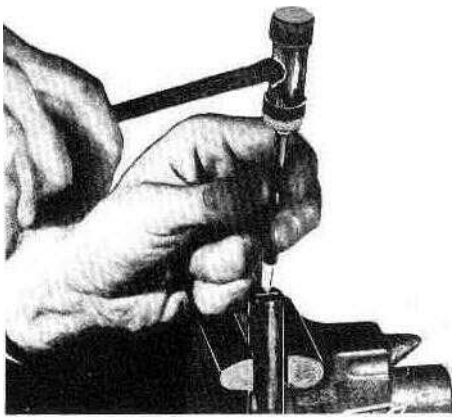
Clamp the bar in a vise and use the square to check the end of the bar. If the end has been sawed at a slight angle, you may need to true it with a hand file.



SB Scribing work center.

Now use the combination square center head to mark two intersecting lines on each end of the bar. The scriber shown in the photo is supplied with the combination set. Though you can mark the bare metal, you can save time and avoid errors by coating the metal with machinist's blueing lacquer. Quick drying model lacquers and enamels will also serve the purpose if you thin the liquid for better brushing. Before you mark, be sure that there are no burrs on the O.D. of the bar. Even a jeweler's hacksaw will leave high spots on the cut.

Next punch the center with *one* sharp blow of a small hammer. If the center punch is sharp, you will be able to find the center by "feeling" the point into the scribed marks. Mount the Jacobs-

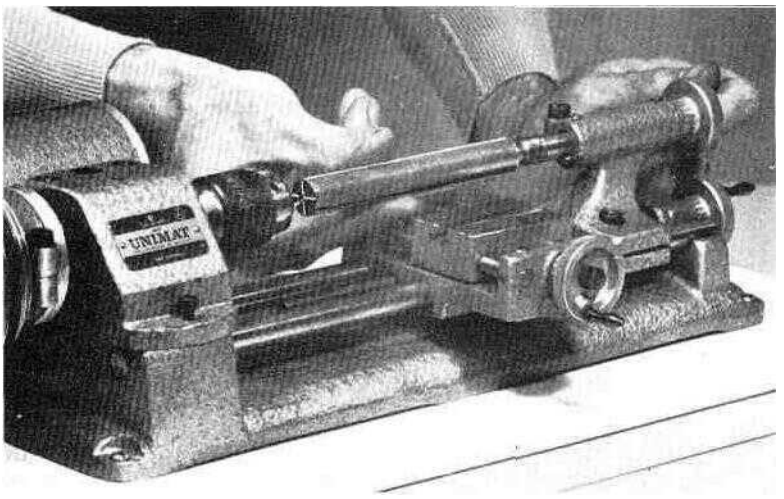


8C Center punching .

type drill chuck on the headstock, and put the lathe center in the tailstock. Support the work with one hand and line up the bar between the drill and center.

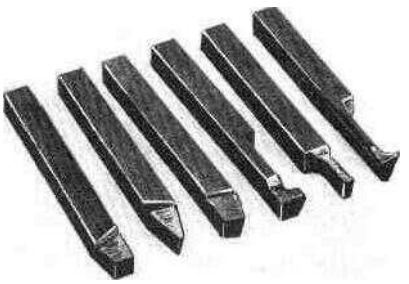
With the pulleys set at one of the lower speeds gently feed the tailstock until the edges of the drill almost *but not quite* reach the work piece. This point is very important. Too deep a center hole can cause inaccuracy. Repeat the operation on the other end of the bar.

For a practice cut, mount the bar on the lathe with the 3-jaw lathe chuck in the headstock and the lathe center in the tailstock. The triangular shaped roughing tool (included with the Basic Unit) is usually the most used tool bit of all six standard varieties. Oil the tailstock center with light machine oil. With belts set for the proper R.P.M., make the cut shown in photo 8F. As you feed the tool back and forth, you may notice a certain vibration. There are two tension



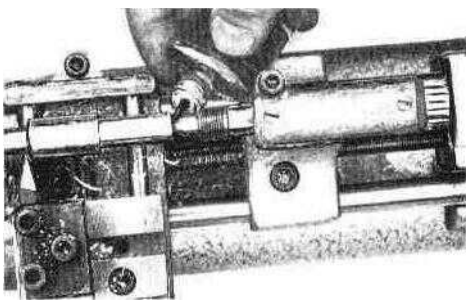
8D Drilling work center on lathe. Feed slowly and oil tailstock center frequently.

locks on the Unimat carriage (Photos 9B and 9C). These socket head screws can be tightened partially for increasing the tension on the feeds for greater accuracy, or can be used to lock the carriage at any desired position.



8E Left to right: left-hand finishing tool (DB 1103); roughing tool (DB 1101); right-hand finishing tool (DB 1102),- boring bar (DB 1105); parting off tool (DB 1104); and inside thread cutting bit (DB 1106).

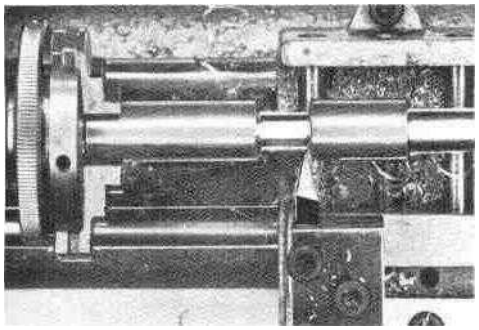
Next set up the left hand finishing tool in the tool holder as in Photo 9D. You will notice that the cutting edges are ground at less than a right angle to one another. This angle not only provides a chip clearance, but also makes it possible to face a perfectly square corner in the cut shown. One easy way to set



8F Use a small oil can or eye dropper to lubricate centers during turning.

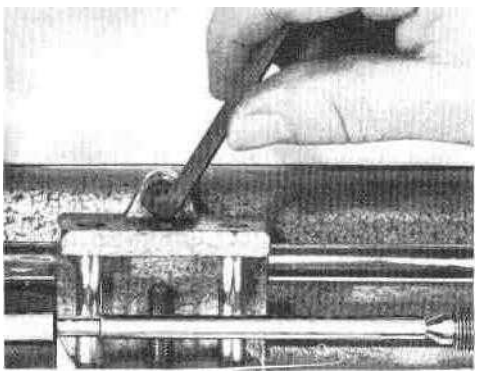
the tool at the proper angle to the work is to run it over the 3-jaw chuck and split the difference between the axes of the Unimat bed and cross feed.

LATHE cont'd



9A Use DB 1101 roughing tool bit for fast stock removal.

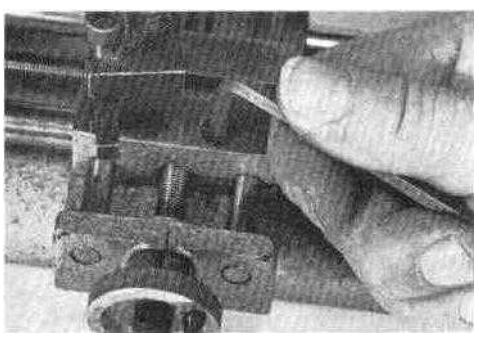
Finish the other side of the cut with the right-hand finishing bit (DB 1102). While both finishing tools will cut inward from the end of the tool as well as



9B Carriage lock tensions feed or freezes movement for facing cut-

laterally, this is not recommended. The proper tool for "digging" into a bar is the roughing tool, and the finishing tools should bo saved for final facing cuts.

If you have never worked before with a really precise lathe, running the Unimat can be an amazing experience. Small work of the type shown in Photo 9F



9C Use cross slide lock for turning long shaftsandbars,

takes shape in seconds. If you keep tools properly centered, sharp, and ground at the proper angles, you'll often find that the lathe tools produce work that looks as though it had been polished.

TURNING TO SIZE

All of the threads on Unimat, parts are metric. The long leadscrew which controls movement of the carriage from one end of the lathe bed to the other, and the cross slide screw are both 8 x 1 millimeter threads. This means that, if you turn the hand wheels one complete revolution, you get a feed of exactly 1 millimeter. The handwheel is further divided into 20 marks corresponding to a feed of .05 mm per mark.

Though most camera, optical and instrument parts are setup with metric system threads, you may prefer to work in inches. One millimeter equals .03937 inch. For all but the most exacting work, you can round off this decimal to .04". the amount of feed in one turn of the handwheel. In inches, each small mark is a feed of .002". It is important to remember that when you are cutting across the lathe bed, that you reduce both sides of the workpiece at once. Thus, turning one calibration actually removes double the feed, .004"; a complete turn of the handwheel, .08".

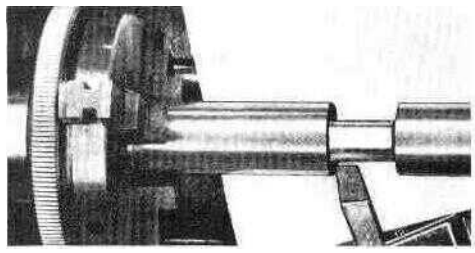
FEED ADJUSTMENTS

On most lathes, there is some backlash in the feed screws. In other words, the screw will turn slightly before the tool starts moving. To adjust this play, loosen the nut that holds the handwheel, adjust the wheel, and retighten the nut.

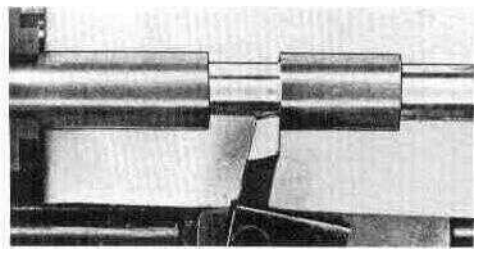
Too much tension on the feed wheels will give you a stiff slow working feed: too little tension can cause tool chatter. A loose feed is better for fast working in soft metals, wood and plastic, but you need a light feed whenever you cut cast iron, brass or steel. Practice will show you that the best, setup for any given material is a combination adjustment, of the handwheel and carriage or cross slide tension screws. The smaller the work diameter, the "tighter" the lathe should he.

It is very important to keep the feed screws clean and well lubricated with light machine oil. As chips accumulate, remove immediately with a small paint brush or use an ear syringe to blow them off. If you are working in brass or cast iron, metals that produce powdery small chips, you can protect the lathe bed and feed screws by covering with pieces of household aluminum wrapping foil. Whenever chips gather on the feed screws do not turn the handwheels since this can damage the threads. The easiest way to clean the threads is to place the Unimat in a shallow tray (a cookie baking tin will do nicely) and flush the chips loose with kerosene fed from an oil can.

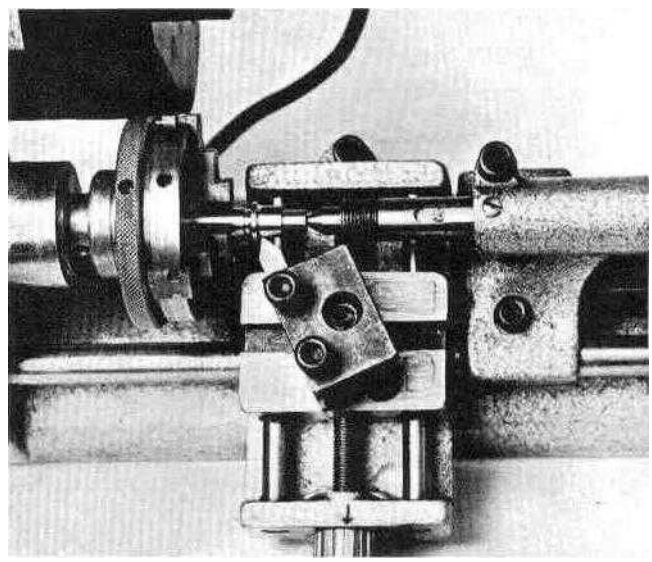
precision reaming, mandrel turning taper turning and lathe threading...



9D Right-hand finishing bit (DB 1102) turns diameter and shoulder of cut.



9E left-hand finishing tool (DB 1103) feeds toward tailstock .



9F
The smaller the diameter, the higher the RPM.
This aluminum model part was finish cut at 2,000 RPM.