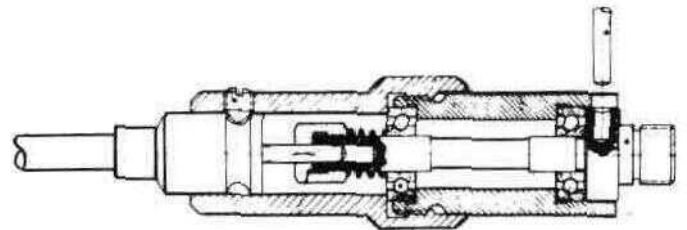
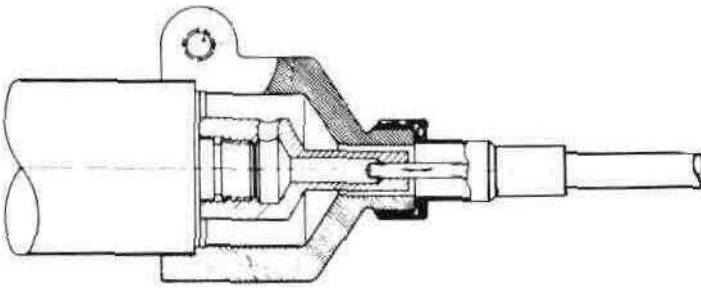


twin ball bearings in hand-piece
for precise carving, routing,
engraving, polishing...

DB 1250

FLEXIBLE SHAFT



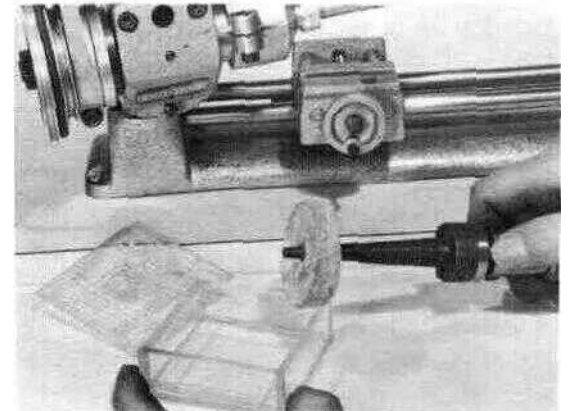
Because it is almost as flexible and easy to direct as a dental drill, the Flexible Shaft is very popular. You have the advantage of using it with all Unimat work-load speeds up to 3750 R.P.M.

The hand-piece has two ball bearings of excellent precision and the nose is equipped with the standard Unimat spindle thread, so that all chucks and accessories can be mounted on the shaft,

To install, thread the driver on the headstock and tighten with the bar supplied. Then put the shaft driving end on the headstock spindle. Revolve by hand to make sure the mating drive parts engage. Then lock the adapter housing to the headstock spindle housing.

Power is transmitted through the Flexible Shaft by means of a twisted cable. It is designed to run in the forward clockwise direction only. Overloading the shaft will ruin it. For example: if you use a large sanding disc and press too hard, the shaft will buck and shake, and the strain may damage the cable. The Unimat power drive belts will help to take up sudden overloads.

Flexible shaft does fine job buffing plastic box with DB 1030 Polishing Arbor and Felt Disc. Polishing preparations such as lemon oil, buffing wax and fine pumice are available from craft suppliers. Tooth powder works well on many jobs.

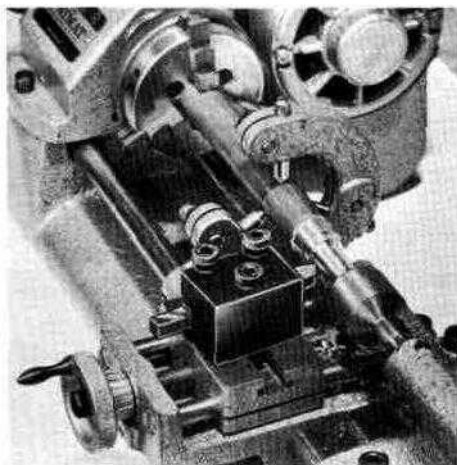


Generally, the largest size drill you can use is about 5/32-inch. Larger drills will overload the shaft, and you can do this even with small drills by feeding too fast. Never use the shaft when it is bent into a tight curve or around a sharp corner. It's best to operate with the headstock turned away from the lathe axis. Store your shaft, hanging it straight up and down on a wall rack, or laying it flat in a drawer. If the flexible shaft has been curled into a small circle in shipping or storage, it is best to lay it out flat for a

few hours to allow the cable to straighten itself.

The shaft is pre-lubricated, but in use, some of the grease will work out. After every 10 hours of use, examine the ends and add grease if necessary. The symptom of a lack of grease will be sudden heating of shaft spindle, or unusual scraping noise. Stop power immediately and check. Your warranty does not cover equipment that has been damaged thru careless use.

DB 1040 STEADY REST

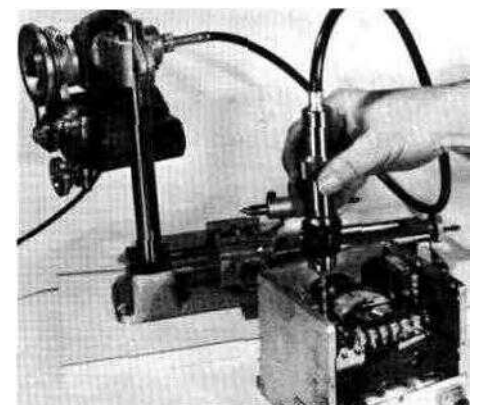


Clamped on the bed, the DB 1040 Steady Rest will take roundstock up to 1 1/2-inch diameter.

A steady rest is needed whenever you want to turn slender fragile bars, or drill into the end of long cylindrical pieces.

The quickest way to set up the rest is to support the work on lathe centers or between chuck and tailstock. Then loosen the three Allen head screws and push the brass jaws inward, until they contact the work lightly. Lock in position, and during machining use a heavy amount of oil or grease to lubricate the tips. Brass jaws are used because they cause minimum marring of the work. *Never run them dry.* At their point of contact, the workpiece must be smooth.

For super-accurate work, the Unimat owner may wish to install small contact rollers on the work. Also, a tight fitting ring can be temporarily placed in the work to provide a riding surface. Often, you may have a ball bearing of the right shaft size that can be supported between the Steady Rest jaws.



Here's how NOT to use tool. Shaft is bent sharply near neck of hand-piece and it operating in a circle which puts extra load on cable. Use of headstock on column for power drive is handy. For this job, place Unimat on shelf or box so that shaft operates in straight line.

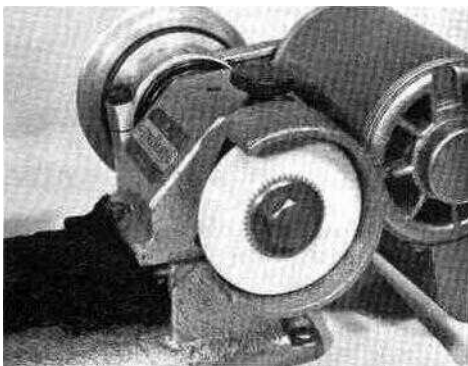
with DB 1030 POLISHING ARBOR
DB 1035 RUBBER BACKING PAD
DB 1150, 1, WIRE BRUSH WHEELS

DB 1115

GRINDING WHEEL GUARD

Even if you do grinding only rarely, this guard is a necessity. Grinding wheels are the only cutting tools that suffer invisible damage that can be really hazardous. Always store your wheels in fitted cases or cardboard boxes. Never keep them on high shelves from which they can drop. If the wheels are hung in the open on a wall rack, they can be accidentally nicked by other tools. In drawers, they can be jarred and cracked by heavy objects.

The guard is intended for use in hand



grinding or on the headstock when you use it horizontally on the drill press column as a surface grinder. It not only protects you against flying particles that can put an eye out if the wheel is defective, but also against snagging on the work. Remember it only takes a minute to put your safety goggles on, but an eye operation can take months.

DB 1160

TRUING DIAMOND

Abrasive wheels often clog up with chips particularly when you are grinding soft metals, or when the work is oily. Sometimes you can clean a wheel with solvent and a wire brush. A better way is to cut away the abrasive with this diamond-tipped dressing tool. You can use it free hand, resting the tool on your wood steady, or feed it with the lathe tool holder. ALWAYS WEAR SAFETY GLASSES and feed the diamond tool cautiously, slowly, stopping the feed frequently to avoid overheating.

These operations are the last to be described in this manual, and are the last when you finish a project. Whenever surface appearance is important your finishing technique can make the difference between an average job and a true craftsman's prize winner.

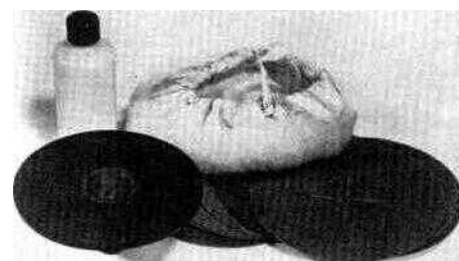
Grinding is one way of finishing flat surfaces. On iron or steel, with the right grinding wheel and feed, you can produce a finish as fine as a piece of glass. If the work is round, you can finish-turn it in the lathe with a well-honed tool, and then follow up with strips of garnet, paper and crocus cloth, cut into strips about 2 x 10 inches. Running the machine at medium speeds, and being careful to constantly move new abrasive into contact with the work, a mirror finish is possible.

On wood, start with good accurate saw cuts at the right R.P.M. Follow up with coarse sandpaper to get down close to size. Use the sanding disc described on page 29 for all flat square edge work. Rubber Backing Pad (DB 1035) shown right fits the headstock and the Flexible Shaft. This disc, made of soft rubber, flexes with the work, making it ideal for polishing or sanding curved surfaces, edges, and for rounding corners. If you use it with the flexible shaft, work very lightly. REMEMBER THIS RULE: ALWAYS LET THE SPEED DO THE WORK. HOLD YOUR TOOL SO IT BARELY CONTACTS THE SURFACE ... moving it in, constantly changing patterns to avoid cutting in. Never rush a sanding job. When you get near the end, use lower speeds. They are safer.

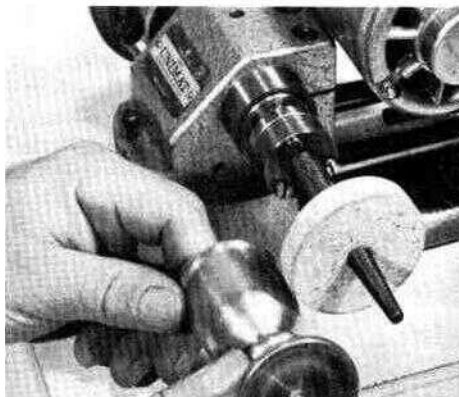
On wood that has been lacquered, it sometimes is necessary to use "wet

cloth", a special abrasive that must be liberally watered. Fasten your abrasive papers to the rubber pad with DB 1335 Sanding Disc Cement, a special adhesive that dries in a few moments. Use benzene to remove it.

Cloth buffs can be used plain, wet, or charged with abrasives. Expert cutlery polishers often work with marked sets of buffing wheels, each one previously



Bottle (above) is 3 1/2 oz quantity of special Unimat sanding disc cement. Spread thinly, it dries almost immediately. Coat both surfaces. When replacing abrasive disc, both Sanding Disc and Rubber Pad (above) must be perfectly clean of all remaining cement. Dissolve with hot water.

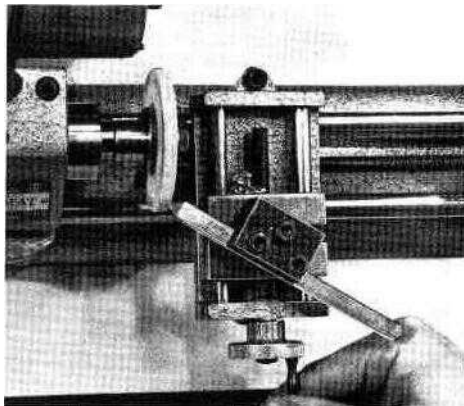


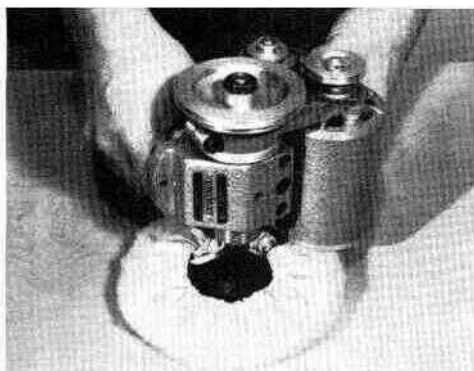
Buffing silver plate with DB 1033, 2 1/4 inch cloth wheel. Use minimum R.P.M. Press lightly, moving work constantly to avoid burning. Practise on scrap or hidden spots and use buffing compound if surface is highly tarnished.

DB 1030 Polishing Arbor has back plate which must be trued to spindle. Truing instructions are on page 18. Felt wheels are offered in 1/4, 2 and 2 1/4 inch sizes. Tapered stem of arbor takes all diameter centers from 7/32 to 9/16-inch.

loaded with abrasive liquids of varying bite.

Plastic polishing is a real art. As with all materials, never risk a finished piece of work on a buffing wheel until you practise the polish on scrap. A harmless looking cloth wheel running at high speed, or pushed too hard, can burn even the hardest, plastics, or ripple the surface. Every grade and make of plastic is different... so to be safe, write to the

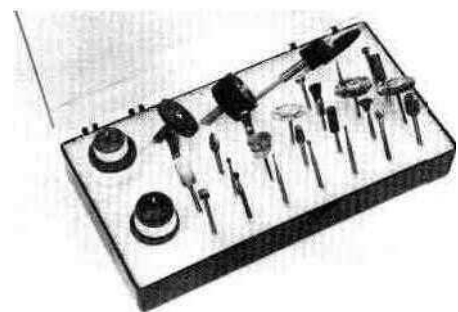




Five-inch lamb's Wool Bonnet (DB 1036) can be used on Unimat set up as hand drill to polish furniture, plastics and even your car. Buffer mounts over Backing Pad (DB 1035). Move the buff constantly, using minimum R.P.M. Waxes help to prevent scorching. Press as lightly as possible.



DB 1150 Brass Wire Brush removes spark plug corrosion.



DB 1500 sets include burs, mounted abrasives, wire and bristle brushes, for various materials. See Accessary Catalog for details on each set.

manufacturers for specifications sheets on buffing and finishing.

DB 1150 (brass) and 1151 (steel) Wire Brush Wheels can be used by hand in the grinding position, or on the Flexible Shaft. They are most useful for reaching into tight corners and rounded areas. Either tool is good for polishing out rust spots on tools and instruments. On wood, the steel brush will give you a weathered effect that enhances the realism of historic models. The brass brush is best for working on soft metals, since the harder steel wire tends to dig in. Wire brush wheels are particularly dangerous to the eyes since bits of wire constantly break off and fly into space. Wear your goggles and keep well out of the plane of rotation.

Kits of miniature wire wheels, buffs and mounted abrasive stones are available. The six sets, DB 1500, 1, 2, 3, 4, 5 give you a good selection of these tools.

Unimat Thread Sizes

Threaded Part	Thread Size	Drill Size	Tap & Drill Set Order#	Die order#
Headstock, tailstock spindles	M 12x1	10.8mm	TM 12	DM12
Leadscrew, cross-feed screw	M 8 x 1 (left)	6.7mm	TM 8	DM 8
Allen head screws	M 6x1	5.0mm	TM6	DM 6
Spindle locating screws	M 4x1	3.3mm	TM4	DM 4
Watchmaker spindle draw-bar	6.9	15/64"	TM69	DM69
Handwheels	M 5x1	4.2mm	TM 5	DM 5

ACCESSORIES

Unimat Screws

NOTE: All screws are available from stock. A useful assortment is the SC 6-6 Set of 18 Unimat Allen Head screws. All Unimat Allen head screws have a 6mm diameter. Set consists of three each of following lengths: 12, 15, 20, 25, 30 and 35 mm.

Time Saving Tips For The Unimat Owner

CLEANING SMALL PARTS. Never use water. Rust will accumulate and ruin precise surfaces. The simplest way to clean small parts is to obtain an empty coffee can, but an empty gallon paint can is better yet. Then pour kerosene into the can to a depth of about 1½-inch. Make a small basket of aluminum window screen bent to shape. Chucks, tools and machine parts covered with oil and chips can then be lowered into the liquid and allowed to soak.

CLEANING UNIMAT LATHE. Jobs in brass, wood and aluminum will throw chips that will completely cover your machine. Use a 16-inch cookie baking pan, covering the bottom with newspaper. Place Unimat in pan and brush with kerosene. The chips will collect on the paper which can then be discarded.

RUST PREVENTION. Plastic suit-covers used by dry cleaners make a fine dust-tight cover for your Unimat and tools. Be sure bed, drill press column and other exposed metal parts are clean and well oiled before you cover the machine. Otherwise entrapped moisture in the air will cause rust almost overnight.

GRINDING SAFETY. Whenever you turn on any grinding wheel, or large rotating tool, stand well away from the machine. The faster a wheel turns, the more the centrifugal force. Bits of a cracked grinding wheel can fly across the room and cause injury. Always wear safely glasses- A plastic work shield fitted to your Unimat baseboard is also a very good safety idea.

SMALL DRILLS. Always chuck small drills as close to the beginning of the spiral flutes as possible. To get maximum accuracy and prevent drill breakage. To get greatest centering accuracy with regular drills, cut them down to minimum length and carefully re-sharpen, checking with a drill gauge.

PROTECT CUTTING EDGES. Lathe tools, drills, milling cutters and chisels should never be stored loosely in a drawer or chest. Edges will soon be

nicked and dulled by contact. Protect sharp edges by wrapping tools with wax paper and frequent oiling.

SPINDLE THREADS. Every time you change chucks or mount an accessory on the Unimat, be sure the headstock spindle threads are clean. A fast wipe is not enough because tiny particles of steel, brass, etc., can cling to the bottom of the threads. When the accessory is installed over dirt, there is danger of jamming and ruining the accuracy of the part. Use an old toothbrush and kerosene to clean. Soft cotton string also is useful for cleaning threads.

USING BROKEN TOOLS. Save all broken files, saw blades, drill points and taps. The tool steel can be ground down to make special wood turning tools, chisels, scribes, and center punches.

ELECTRICAL SAFETY. IF you work on damp floors or near water pipes, ground the frame of your Unimat to prevent electrical shock in case of a short. This recommendation is a must for all portable electrical saws and drills.

KEEP RECORDS. Every time you try a new tooling technique on your Unimat, jot down the kind of metal, cutting diameter, R.P.M., and a rough sketch of the tool shape. Such notes will become very valuable in the future when you want to quickly duplicate past jobs.

OIL DISPENSERS. Medicine bottle eye droppers make handy containers for various grades of cutting oil, lubricants and solvents.

DAILY REMINDER. Get in the habit of always removing chucks, belts and loosening all locking screws when your Unimat is not in use. This simple procedure will prolong the life of the machine and the accuracy of its parts.

UNIMAT GUARANTEE. To protect your investment, be sure to complete and return Guarantee Card to officially register your warranty. If you haven't already done so, mail the Guarantee Card today.

Headstock Maintenance

The motor, intermediate pulleys, and the headstock spindle should spin freely. Avoid over-tightening the Allen head screws which hold the intermediate pulley bearings. This can cause the bearing to bind.

If your Unimat has been stored for a long time, set up a low speed and run the spindle a few minutes to recirculate the grease in the bearings.

Headstock bearings are well protected from chips and dirt, but fine abrasive dust can penetrate. If you hear unusual rough noise, or the headstock shows more friction, stop the machine immediately and check the bearings. Greasing is required after every few hundred hours of average running time. However, if you operate your Unimat continuously at high speed, more frequent greasing will be needed.

To remove bearings, place a tightening bar through the spindle locking hole, and turn the spindle nut counterclockwise. Then remove the pulley. If the nut is frozen, use a drop of penetrating oil or 'Liquid Wrench' to free it. The headstock spindle can then be removed by pulling through the headstock casting toward the tailstock. Lay the parts out on the bench so you can replace in exactly the same order, with bearing races facing in the same direction as they were.

Wash the bearings in kerosene, dry on lintless cloth or paper, and then relubricate with high quality bearing grease (EP1). Reassembly is done in much the same way as a bicycle hub. Tighten the headstock all the way until you feel tension on the bearings. Then turn the nut backwards, so the bearings just spin freely without binding and without play.

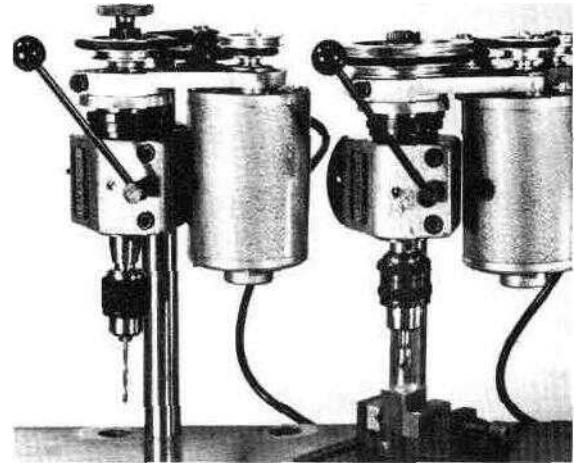
ADVANCED TECHNIQUES

Unimat at home in tool room, machine shop electronics lab,
and instrument repair shop...

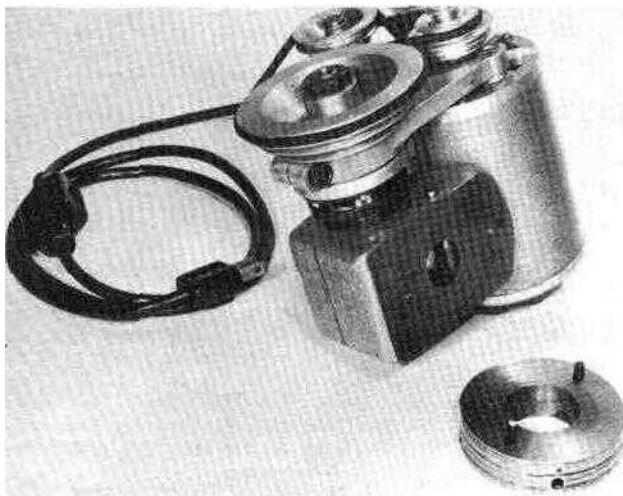
Machinists, tool makers and instrument builders all over the world own Unimats. Often you'll see a chest containing a complete Unimat and accessories right up on the shop bench along with the traditional machinist's tool case. Here are a few examples showing how shop men apply Unimat versatility to solve tough tooling and production problems.

Many times Unimat saves the cost of expensive special fixtures. The high speed spindle can do a job in precise grinding, or micro-drilling that would be impossible without investing in special machinery. By taking advantage of the unusual angular adjustments of the Unimat headstock and drill press column, you can temporarily combine your Unimat with other machines to handle jobs of unusual complexity...with surprising ease.

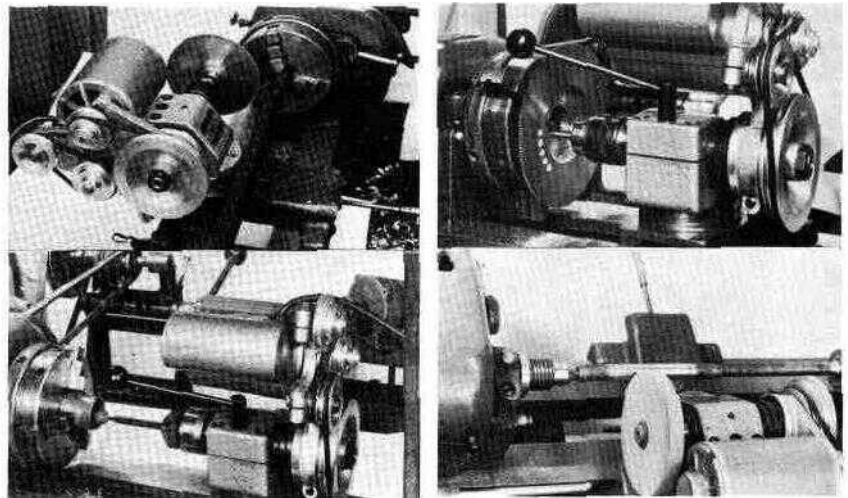
Twin Unimats for production!



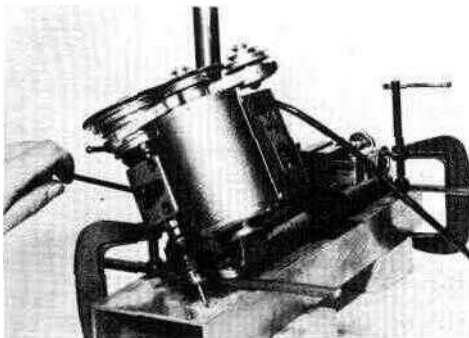
An economical idea for short run precision jobs. Steel or aluminum tooling plate (the base) is bored to mount two or more Unimat columns precisely vertical. Drill press assembly (above left) consists of DB 2600 Draw Bar tapered spindle with DB 2601 precision drill chuck; the combination very suitable for high-speed operation with minimum runout. On table is DB 1010 Machine Vise mounted to DB 1210 Milling Table... a setup just heavy enough to keep a small job in place under the drill, but not too bulky to move from one machine to the next. Drill press above at right is standard Unimat headstock spindle and drill chuck.



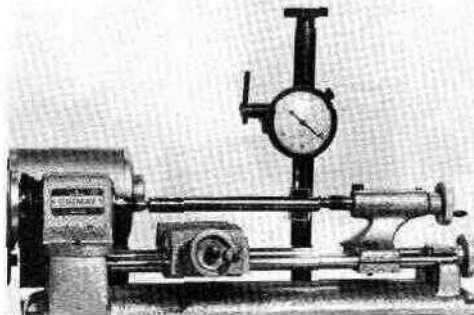
LATHE SWIVEL ADAPTER. It takes only an hour's work to make this ring to fit any lathe. This one was made for a 6-inch lathe. Diameter is $2\frac{3}{4}$ inches and thickness is critical. To fit your Unimat to larger lathe, measure from lathe center down to top of cross slide (or to tool post top on 10, 12-inch lathes). Subtract center height of Unimat headstock. Difference is thickness of adapter required to center Unimat spindle with lathe axis. Mount with two Allen head screws.



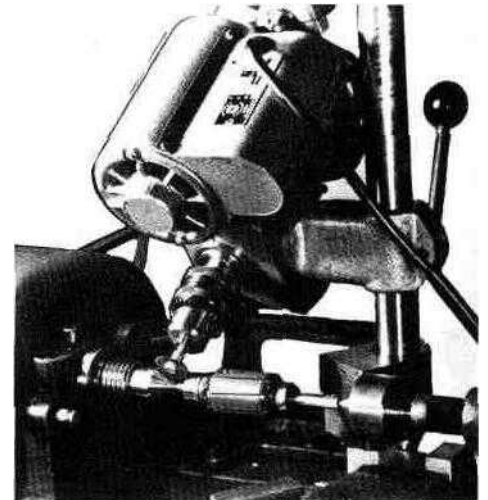
ADAPTER APPLICATIONS: Sawing plastic tubing (top left) in production. Fine toothed blade produces burr-free edge that needs no sanding or polishing. Index drilling (top right) is good setup for producing program clock discs. Internal grinding (lower left) demands high speeds of usual tool post grinder, however this setup with collet chuck is capable of precise work in emergency and can also be used with milling cutter. Polishing mandrel with rubber wheel (lower right) produces very fine accurate finish, particularly when lathe bed feed is used.



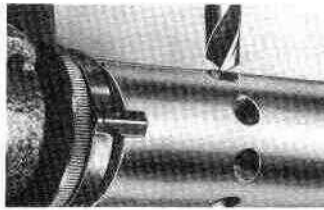
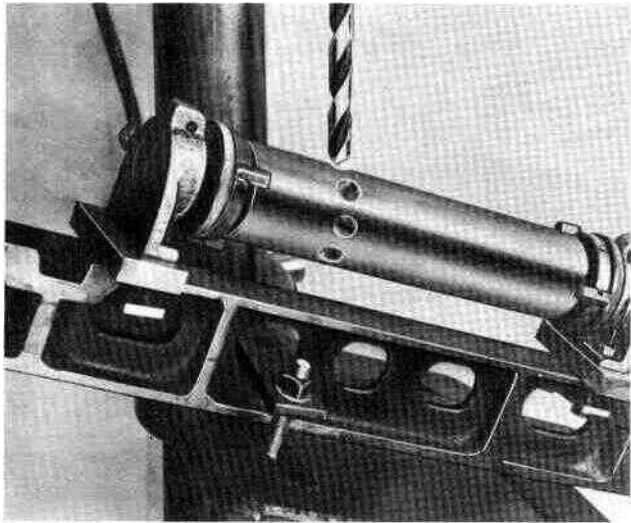
When the work is too big, take your Unimat to the job instead of bringing the work to the machine. This precise drilling job on architectural channel is done by bolting bars to base of Unimat and clamping to work at desired position. **GAGING AND INSPECTION,** (center) Support Unimat on pairs of parallel blocks above inspection plate, so dial gage



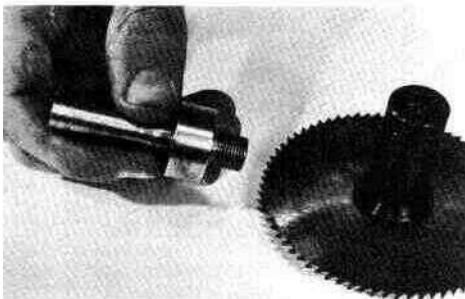
stand is free to slide beneath. Boring tool is mounted between centers. Dial indicates accuracy of cutting edges. **UNDERCUTTING MOTOR ARMATURE.** Unimat drill press column (right) is fitted to lathe carriage; supports headstock at any angle. Metal cutting saw slots rotor of small motor to preset depth.



versatile Unimat accessories in the machine shop solve tough grinding, drilling and sawing problems; do the "impossible" in minutes instead of hours,...

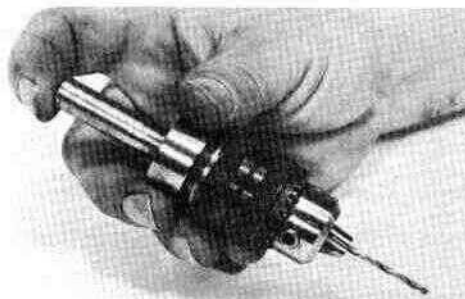


At left, two DB 1260 Indexing Attachments both equipped with DB 1001 3-Jaw Chucks, grip workpiece ($2\frac{1}{4}$ x 10-inch steel round stock) for angle index drilling under drill press of milling machine. Close-up above shows angular location of holes.

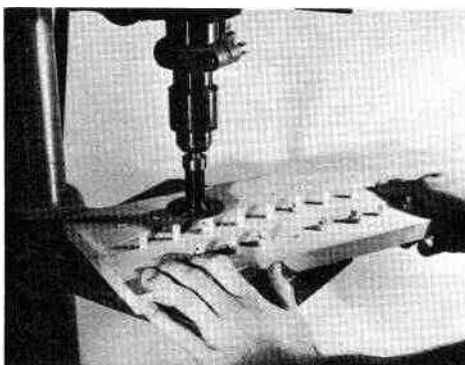


Make this stub holder and you'll find it has hundreds of uses. You'll need a piece of steel about $3\frac{1}{2}$ inches long by an inch in diameter. The threaded portion is a duplicate of your Unimat spindle nose thread, and will fit all your chucks and power attachments. Start with the metal supported between the 3-jaw chuck and tailstock center, in the lathe set-up. Reduce the thread size to .465", and the other end to about .425". Then mount between lathe centers and take a fine finishing and polishing cut driving with the lathe dog and faceplate. To make the thread, you will need threading die DM 12 (12x1mm) or the 1 millimeter thread pattern for DB 1270 Threading Attachment. Make sure your threads are dead square with the bar.

Here the stub holder solves a tough fixture building problem. The wooden coil form dowels on this electronic factory fixture had to be exactly $1\frac{1}{2}$ -inch high. Holes were drilled in the hardwood base, and the dowels fastened in place with glue. Using DB 1230/1 circular saw arbor, and the DB 1232 metal cutting blade, a perfectly level smooth cut was obtained on the shop drill press.

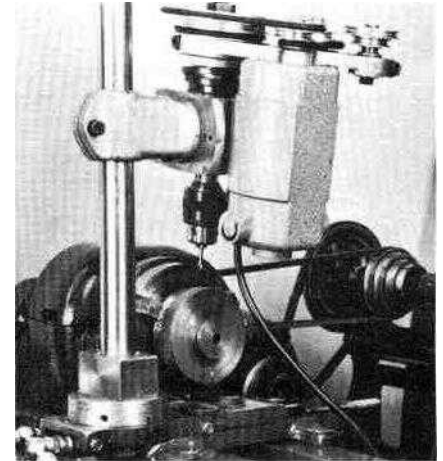


The stub holder converts your chucks into handy holders for small drills, points and carving tools. Model makers working on ships find this precision "pin vise" specially useful. In the same way the holder will grip your 3-jaw, 4-jaw, and collet chucks for accurate hand work.

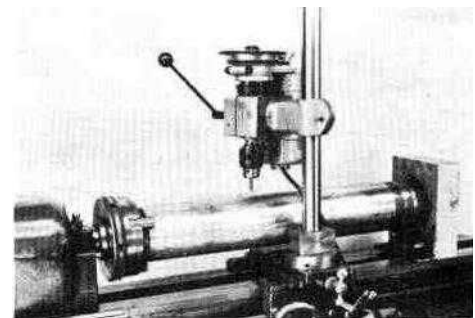


Here's another accessory you can make to adapt your Unimat to other machines. The post was turned to match the diameter of the Unimat drill press column, and a base was turned to fit the cross feed swivel plate of this 6 inch lathe.

Now the Unimat drill can be positioned anywhere over work chucked in the lathe. The job shown required a series of indexed holes to be drilled radially at an angle with very close accuracy. Inexpensive Unimat parts solved an otherwise tough problem that would have required a special drilling fixture



Using the same column for milling, the machinist produced a cut normally impossible on a lathe; the lathe feed screw is used to drive the carriage, by hand or by separate feed screw motor. The setup permits milling at angles (Page 34) as well as a variety of complex lateral and transverse cuts, and can be used equally well for grinding.



Here's how the stub holder (left photo) and DB 62 grinding arbor and DB 1121 cup grindstones solve a tough sharpening problem. The tool mounted on the 3-jaw chuck and DB 1210 Milling Table is a flycutter used for machining large holes in sheet metal. The tip dulls rapidly in production and should be sharpened to a perfect point, with a smoothly rounded back edge. By sliding the Milling Table over the drill press table a perfectly shaped ground edge was obtained.

Here's a sharpening problem that a machinist solved with Unimat parts (center photo). The milling cutter gripped in the 3-jaw chuck is a $2\frac{1}{2}$ -inch diameter face mill with teeth beveled at 60 degrees. Usually the sharpening job requires a special machine. The mill was firmly chucked on its inside diameter in the 3-jaw chuck mounted on the Indexing Attachment (DB 1260). This in turn was fastened to the Milling Table gripped in a swivel vise at the proper angle.

The drill press was used to set the depth of grind, and the cut made by slowly gliding the entire setup toward DB 1121 Cup Wheel and arbor, mounted in the stub holder.

