

CINCINNATI NO.

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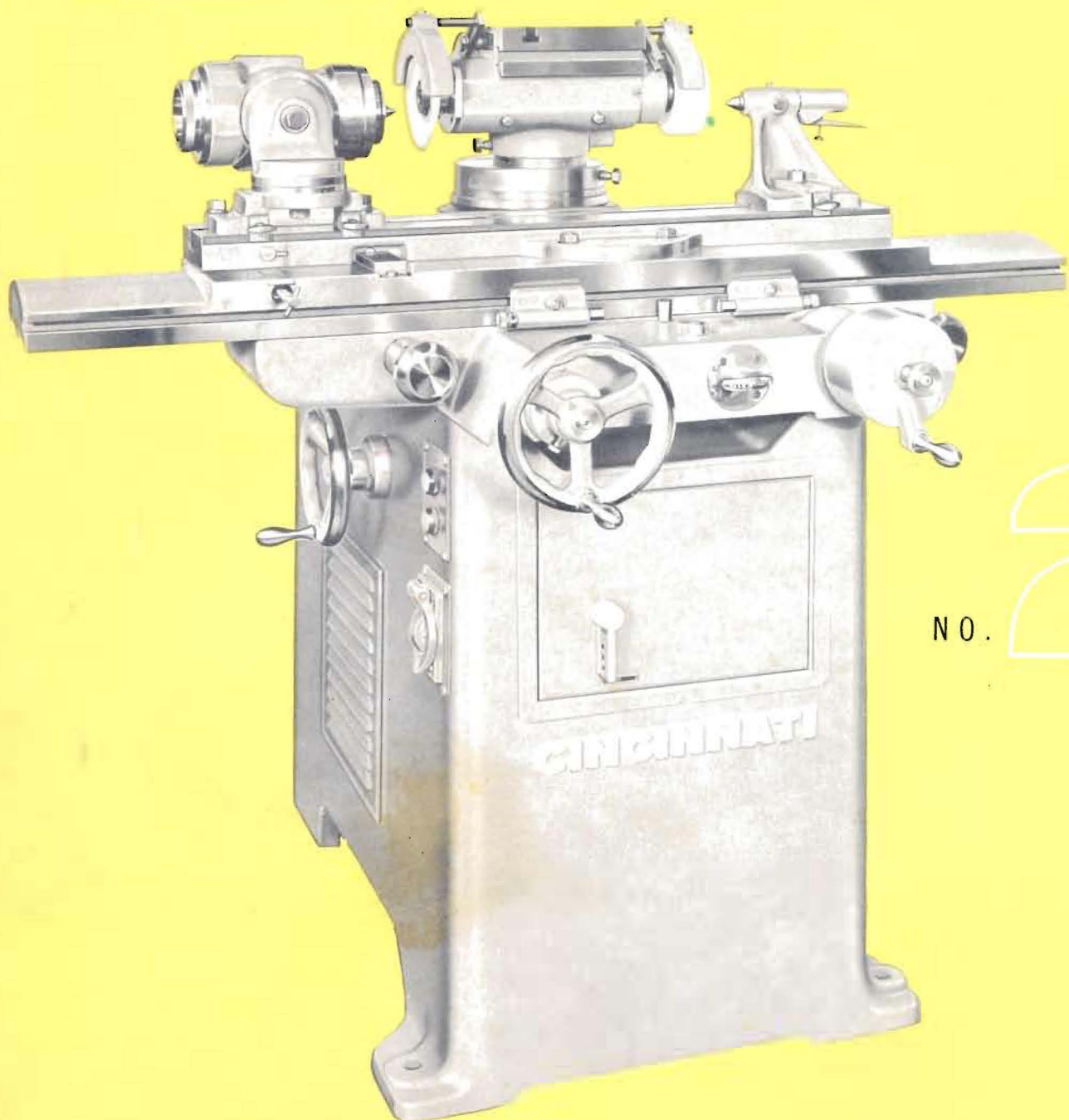
CUTTER AND TOOL GRINDER



1889

over 70 years experience

in build



NO.

2

cutter grinders

The new CINCINNATI® No. 2 Cutter and Tool Grinder represents over seventy years experience in building cutter grinders. It was in 1889, that the first Cutter Grinder was introduced to the metalworking industry by The Cincinnati Milling Machine Company. In the intervening years since its introduction numerous pioneered developments, incorporated into this machine have greatly increased its versatility to handle such precision jobs as; internal grinding, external cylindrical grinding and sharpening of gear cutters. These advance design features won for the CINCINNATI No. 2 Cutter and Tool Grinder the distinction of being the accepted standard for tool sharpening, the world over. Today the CINCINNATI No. 2 Cutter and Tool Grinder having improved spindle bearings, greater operator conveniences and increased versatility brings to the skilled operator a more precision machine. This modern machine, as in the past, keeps pace with the exacting operations required in making and sharpening the complex cutting tools of today's industrial demands.

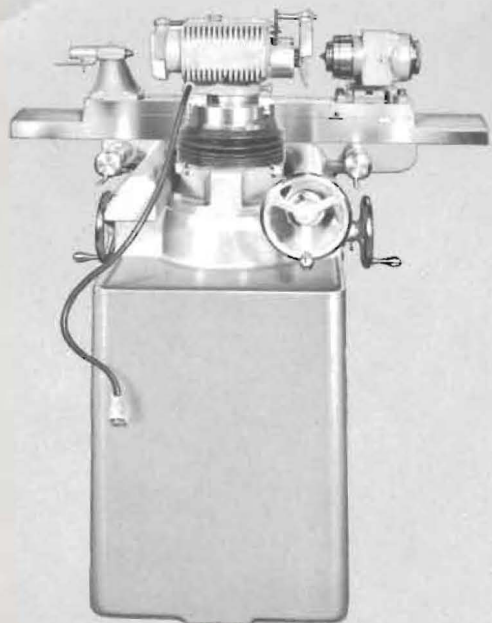
CUTTER AND TOOL GRINDER

interesting sections include:

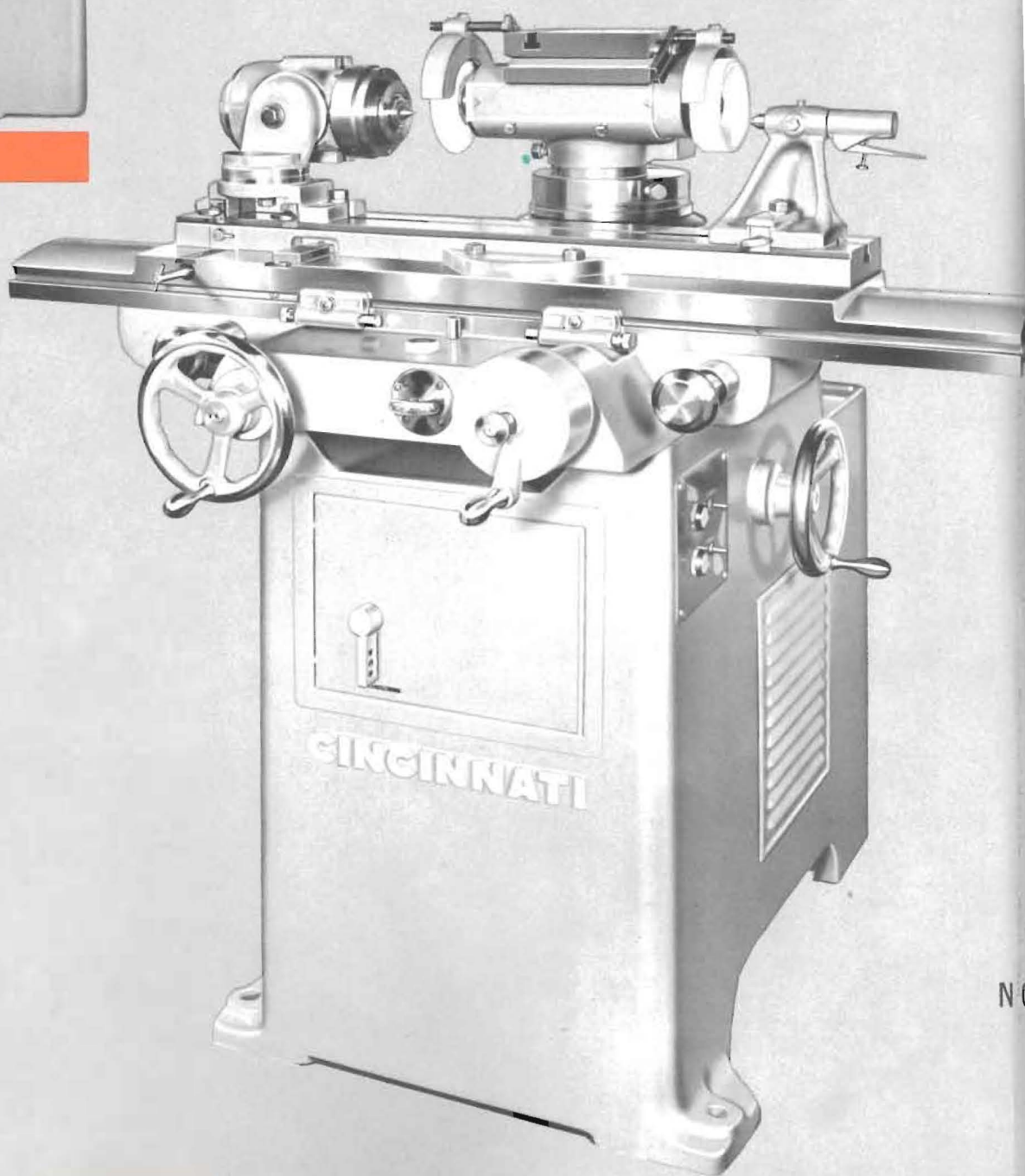
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cost reducing opportunities offered



through advanced design

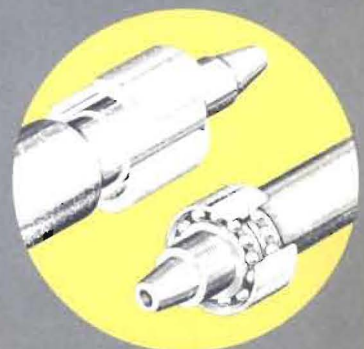
Ball Bearing Anti-Friction Table Slide
360° Eccentric Wheelhead
Duplicate Operating Controls
Anti-Friction or FILMATIC® Spindle Bearings

Through advanced engineering design, the CINCINNATI No. 2 Cutter and Tool Grinder fulfills the requirements for making and sharpening the cutting tools used on today's highly productive machines. Keeping pace with cutter sharpening techniques, the machine with its modern design offers many cost reducing opportunities. These design advantages include: anti-friction or FILMATIC spindle bearings which assure excellent finishes for longer cutter life; 360° eccentric wheelhead that provides extended range for greater flexibility; ball bearing anti-friction table slide for a reduction of operator fatigue; and duplicate controls for machine operation from any position thereby reducing set-up time. These advantages and other features presented on the following pages assure you optimum cutting tool maintenance and lower production costs with a CINCINNATI.

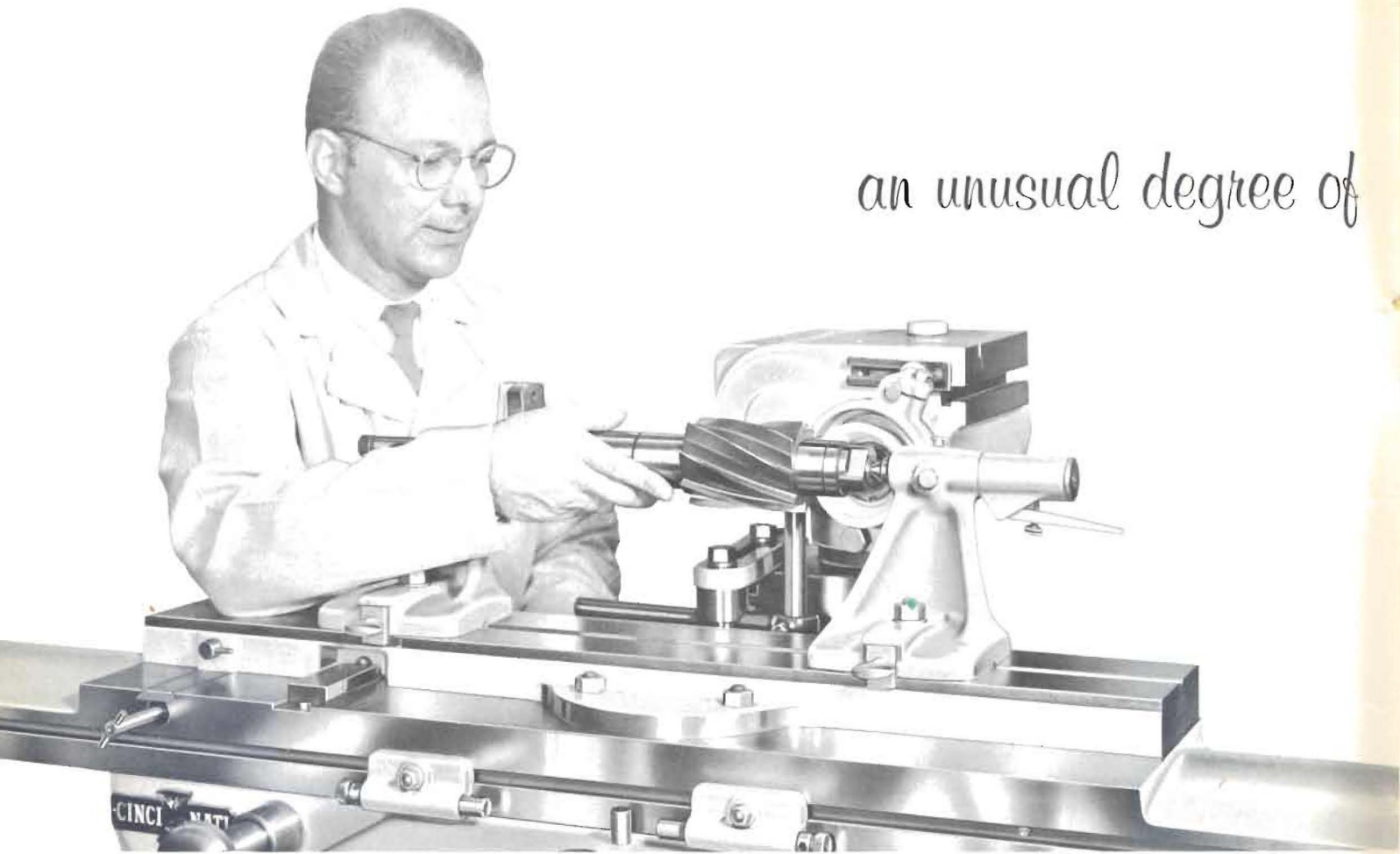
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CUTTER AND TOOL GRINDER

PATENT NOTICE—The machines and attachments illustrated and described in this booklet are protected by issued and pending United States and Foreign patents. The design and specifications of the machines and attachments illustrated herein are subject to change without notice.



an unusual degree of

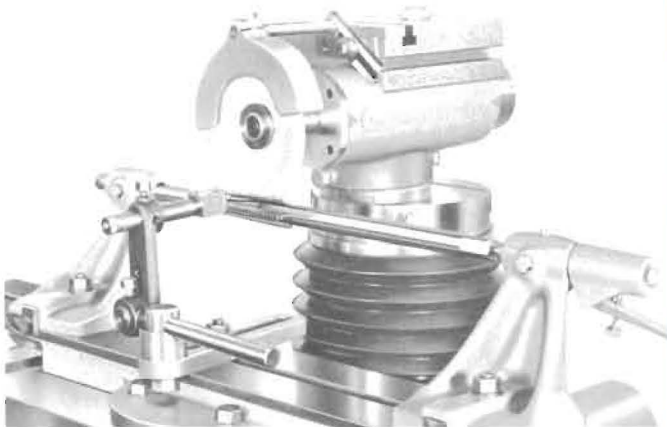


Grinding the periphery of a plain milling cutter. The operator of a CINCINNATI No. 2 Cutter and Tool Grinder always has a clear view of the work and wheel.

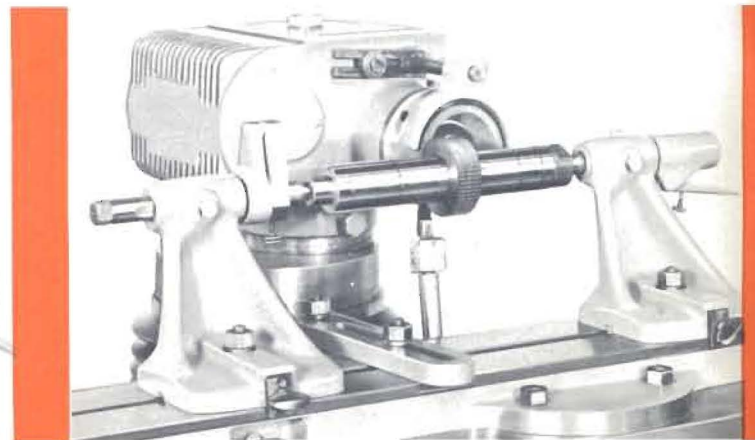
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CUTTER AND TOOL GRINDER

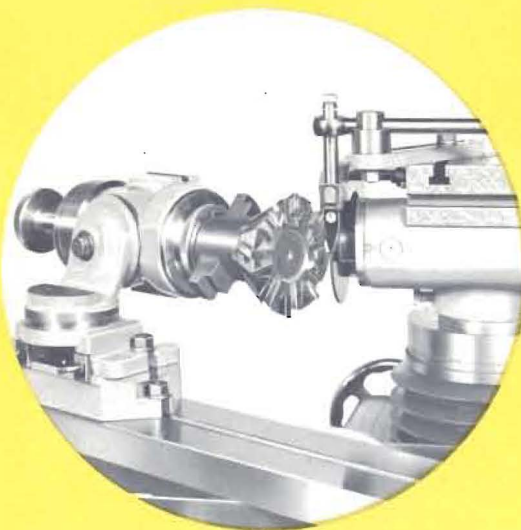
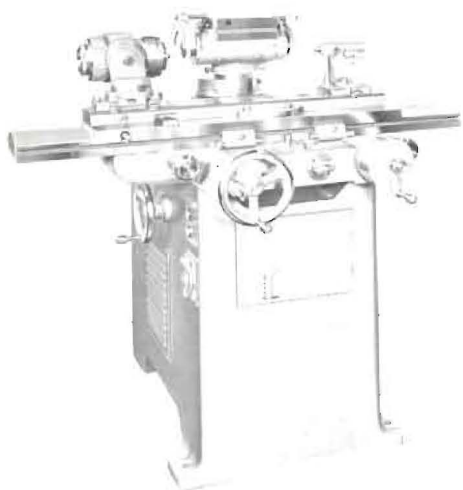


Flutes of an Acme type tap are ground with the aid of the universal toothrest mounted on the machine table.



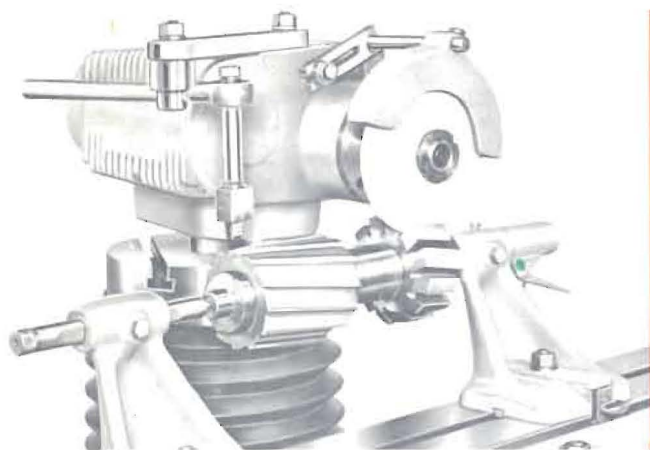
Sharpening the periphery on a number of metal slotting saws mounted on the same arbor.

desirable flexibility

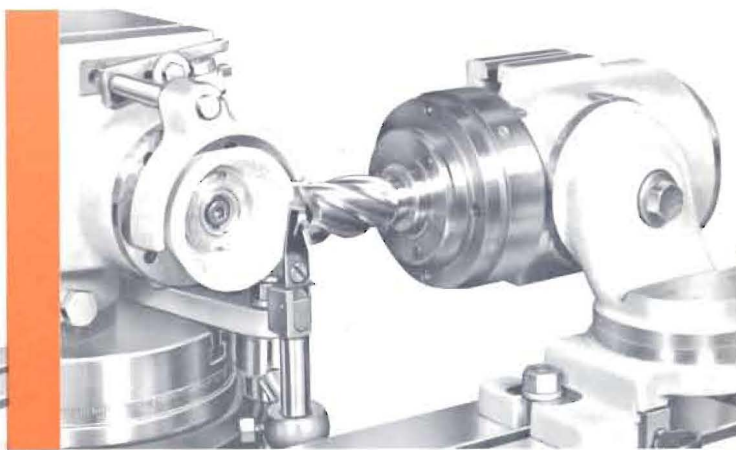


Universal workhead, swivel table and universal toothrest assembly aid in grinding a tungsten carbide dovetail cutter.

and...



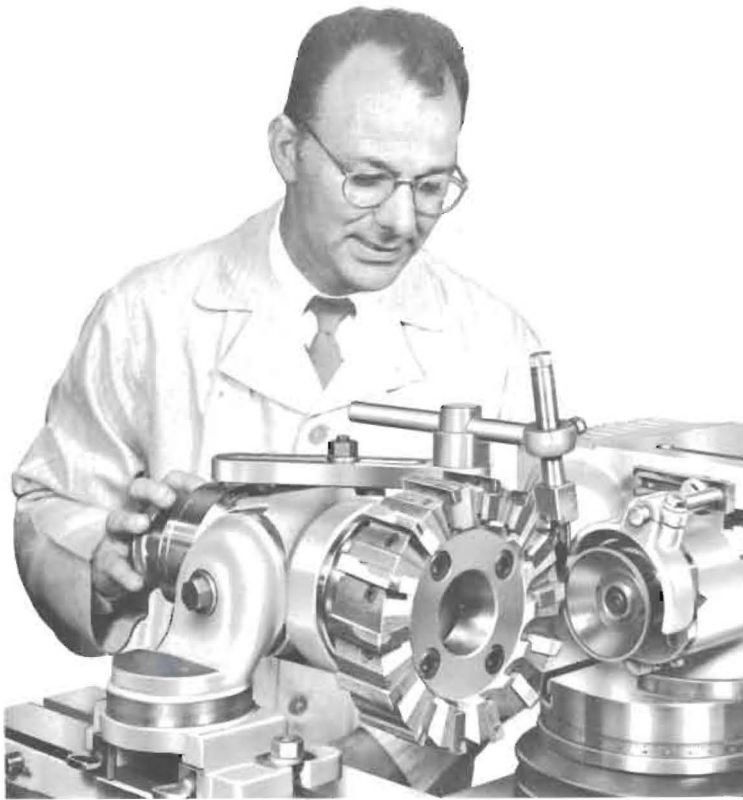
Sharpening a helically form-relieved milling cutter; master guide has exact lead and same number of teeth as cutter.



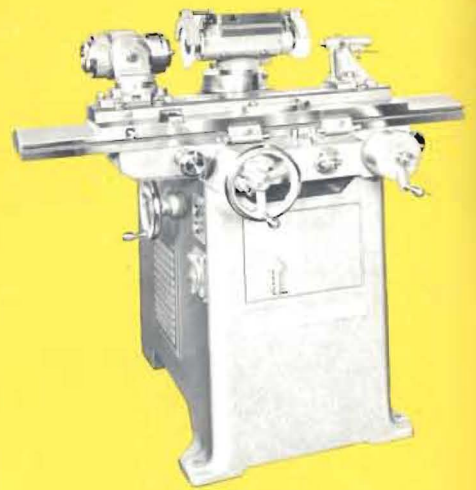
Clearance setting dial on the universal workhead is a big timesaver when sharpening taper shank milling cutters.

An unusual degree of desirable flexibility and operator conveniences has been incorporated in the design of the CINCINNATI No. 2 Cutter and Tool Grinder. The versatility of the machine is almost limitless in sharpening a wide variety of cutting tools and in handling occasional toolroom grinding operations such as cylindrical, internal, face, and surface grinding. Also many CINCINNATI attachments extend the range of this machine for sharpening miscellaneous small tools, including those of sintered carbide. Typical examples shown here and on the following pages represent some of the many day-to-day tool grinding problems that you can solve with a precision CINCINNATI.

convenience . . .



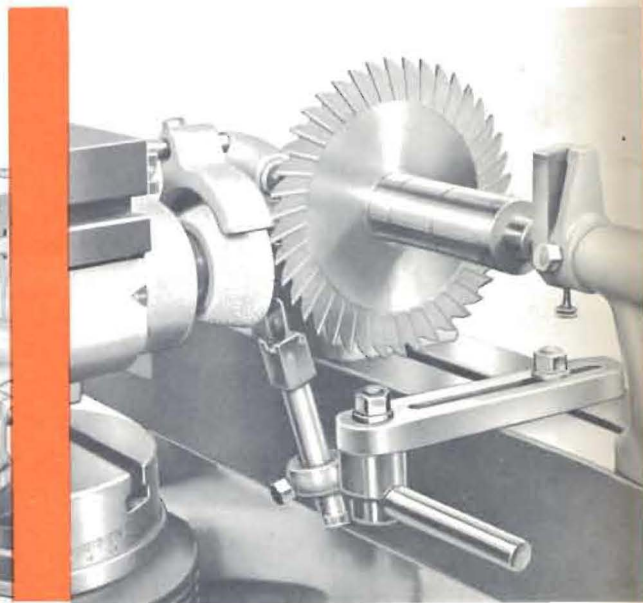
Grinding the periphery of an 8" diameter tungsten carbide face mill.



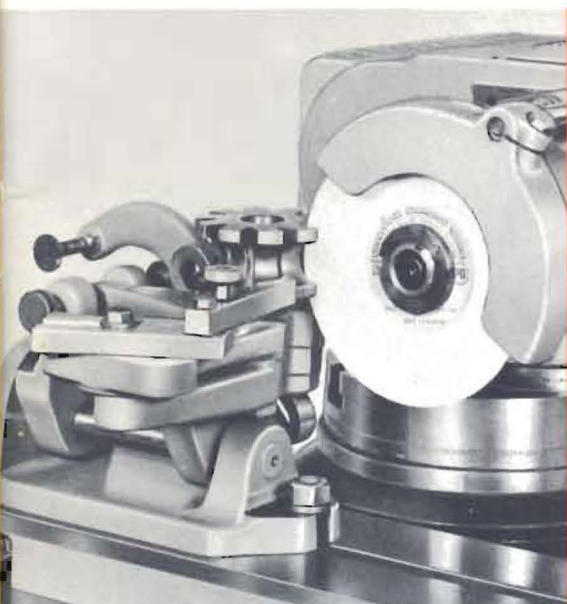
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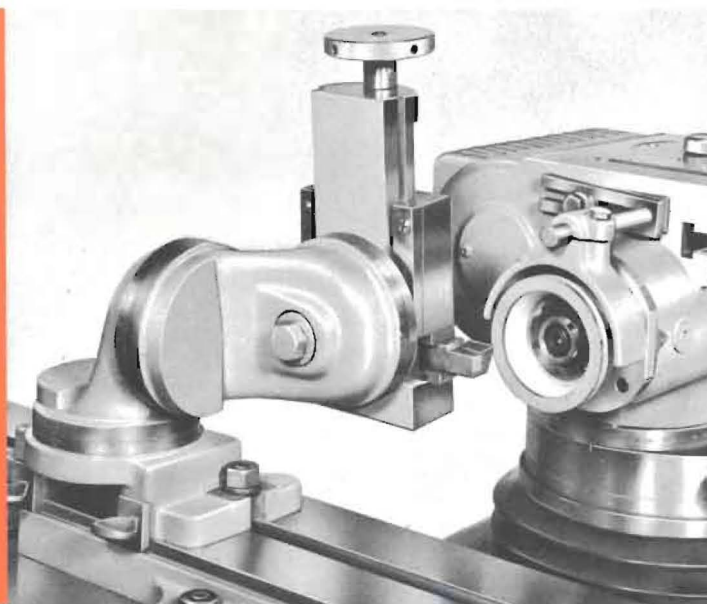
"Tange-Bar" Taper Setting Device assures accurate angles when grinding straight fluted taper reamers.



Sharpening the teeth of an 8" diameter metal slitting saw utilizing the standard tailstocks.



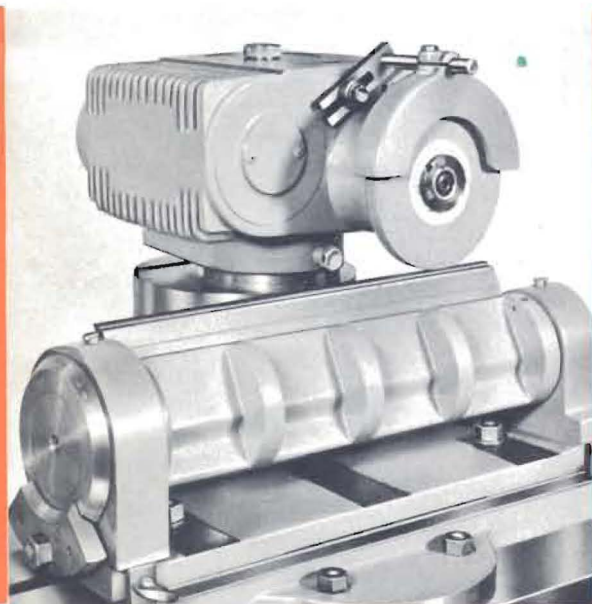
Grinding the face of the teeth of a new form-relieved cutter using the Gear Cutter Sharpening Attachment.



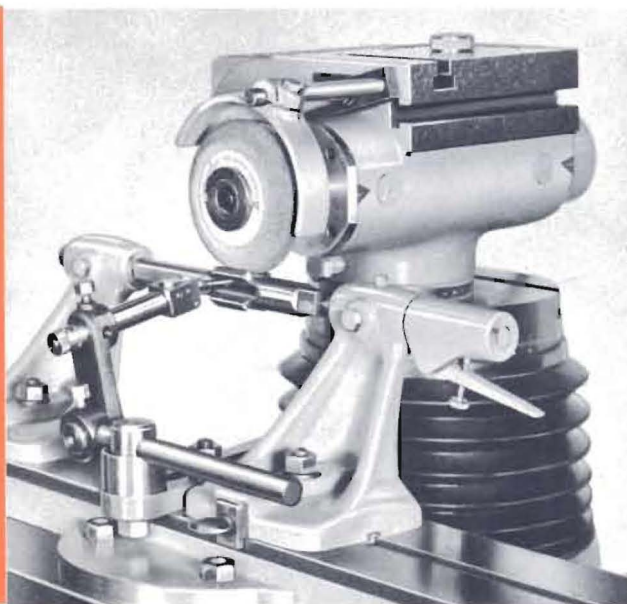
Grinding the side relief angle of a carbide lathe tool utilizing the Surface Grinding Attachment and the regular workhead support.

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conveniences which go . . .



Grinding centerless grinder workrest blades by means of the Blade Grinding Attachment.

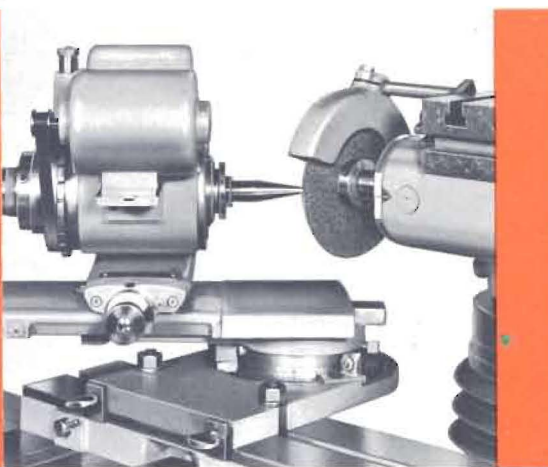


Flutes of a bottoming hand tap are being ground by means of a formed grinding wheel.

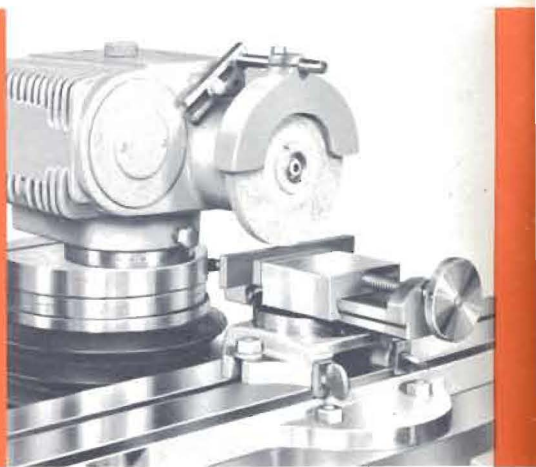
on and on...



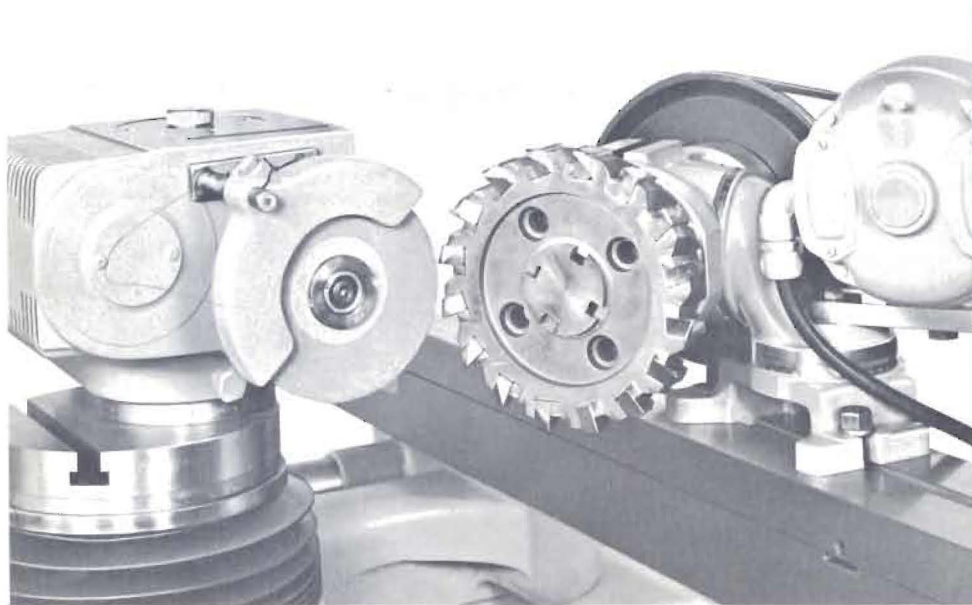
Sharpening the periphery of an 18" diameter face mill using the Face Mill Grinding Attachment.



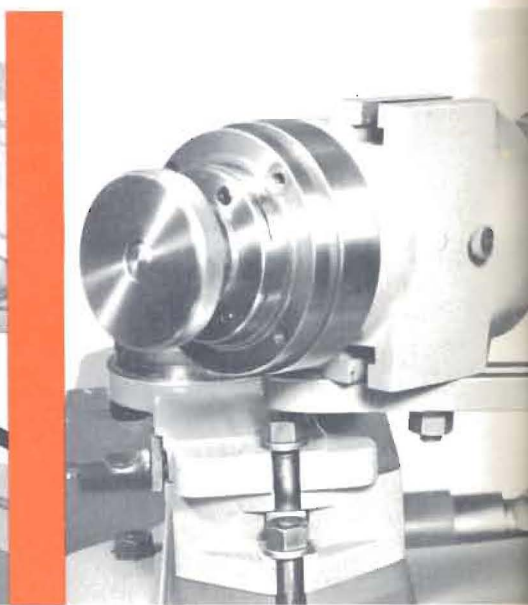
Grinding a ball point tracing finger using the No. 1 Radius Grinding Attachment.



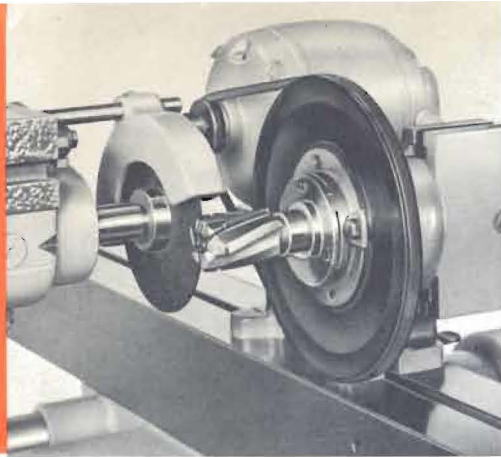
Surface grinding a small tool-room part using the Surface Grinding Attachment.



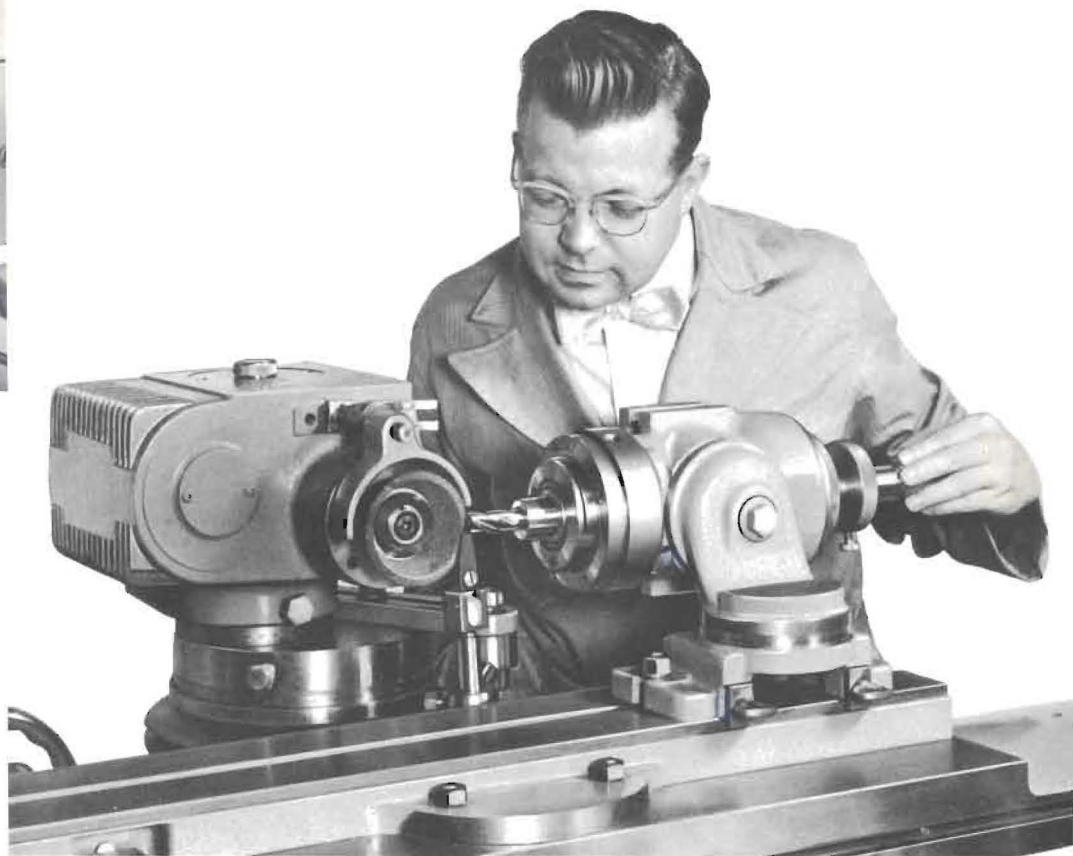
"Roughing out" the corner angle of newly inserted teeth employing the Cylindrical Grinding Attachment.



Sharpening the corner of a shell end



Salvaging a helical end mill by cutting off the damaged end with the aid of the Cylindrical Grinding Attachment.

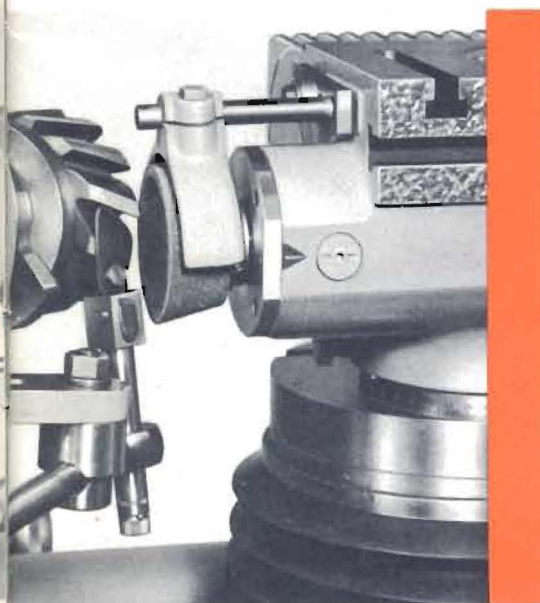


Sharpening a small end mill using the Small End Mill Grinding Attachment.

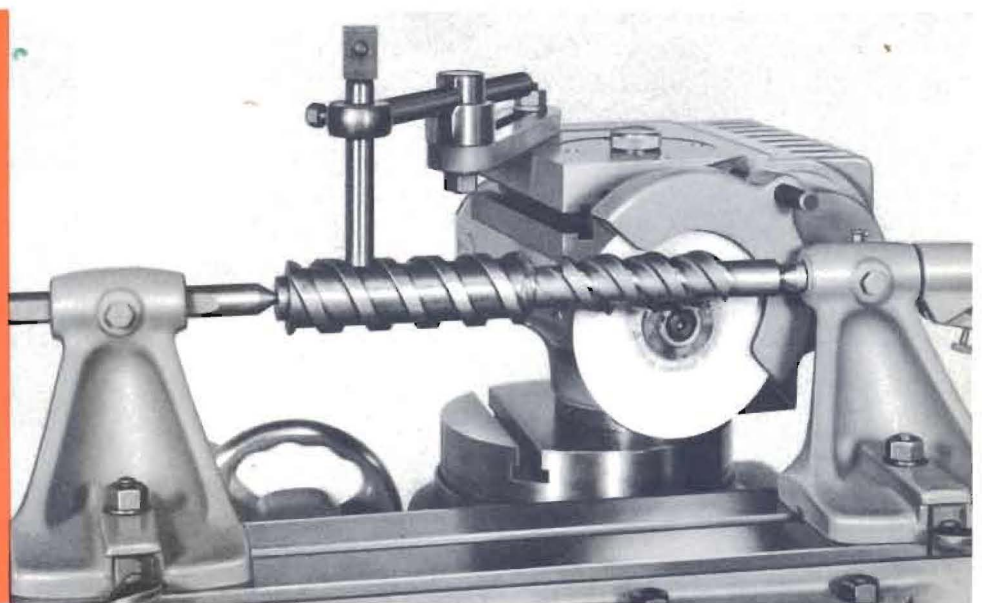
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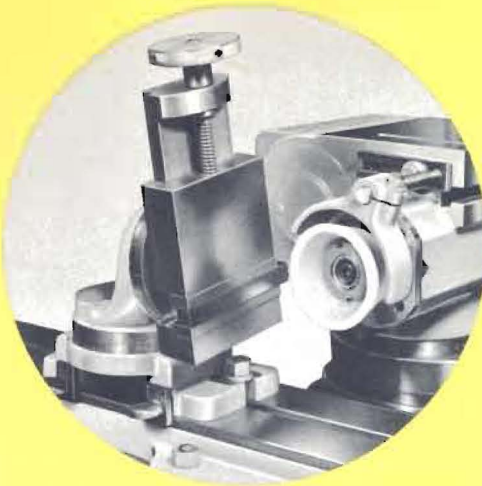


mill using the universal workhead.



Grinding the tooth face of a high helical cutter with the aid of a master and universal toothrest.

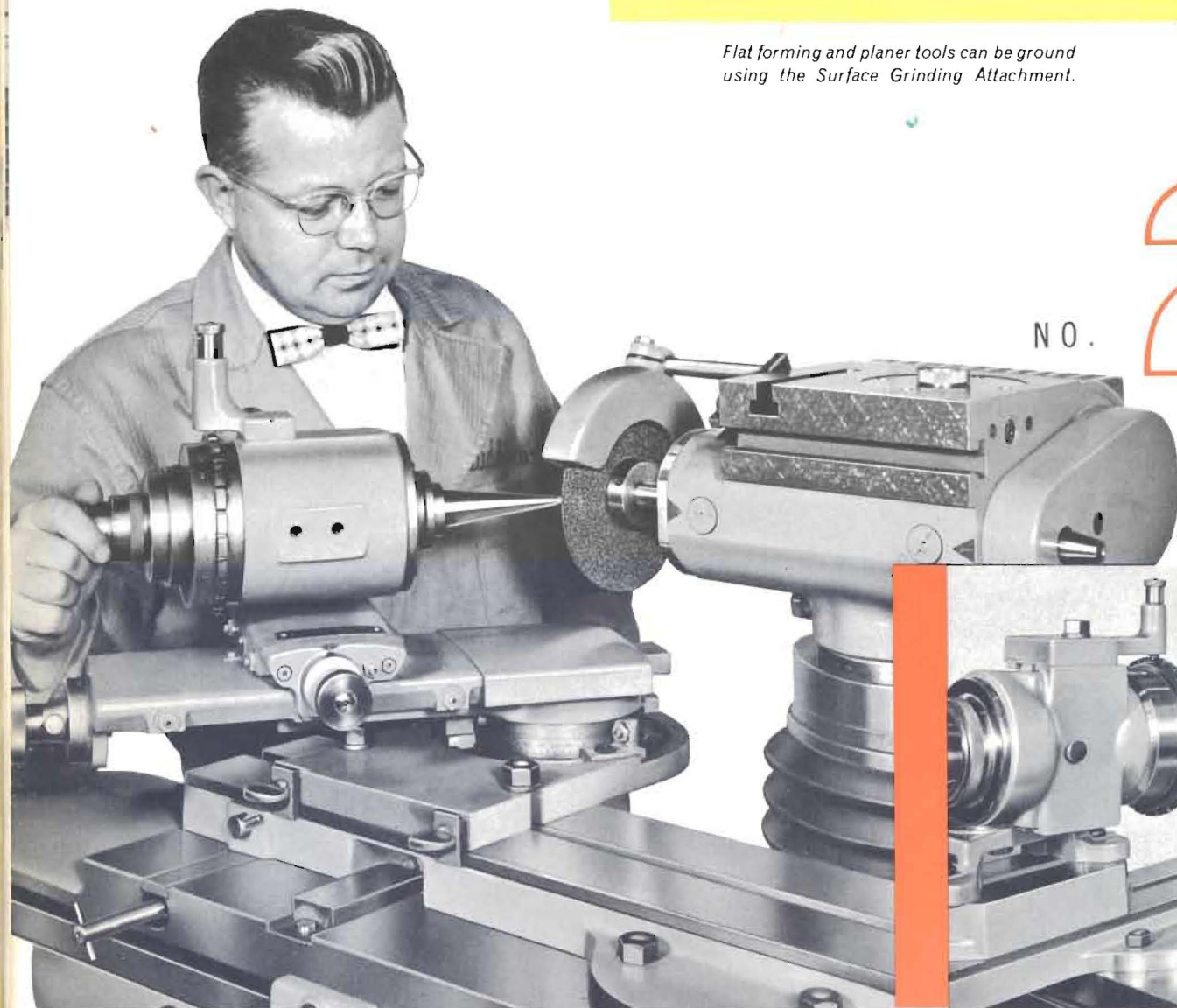
and on



Flat forming and planer tools can be ground using the Surface Grinding Attachment.

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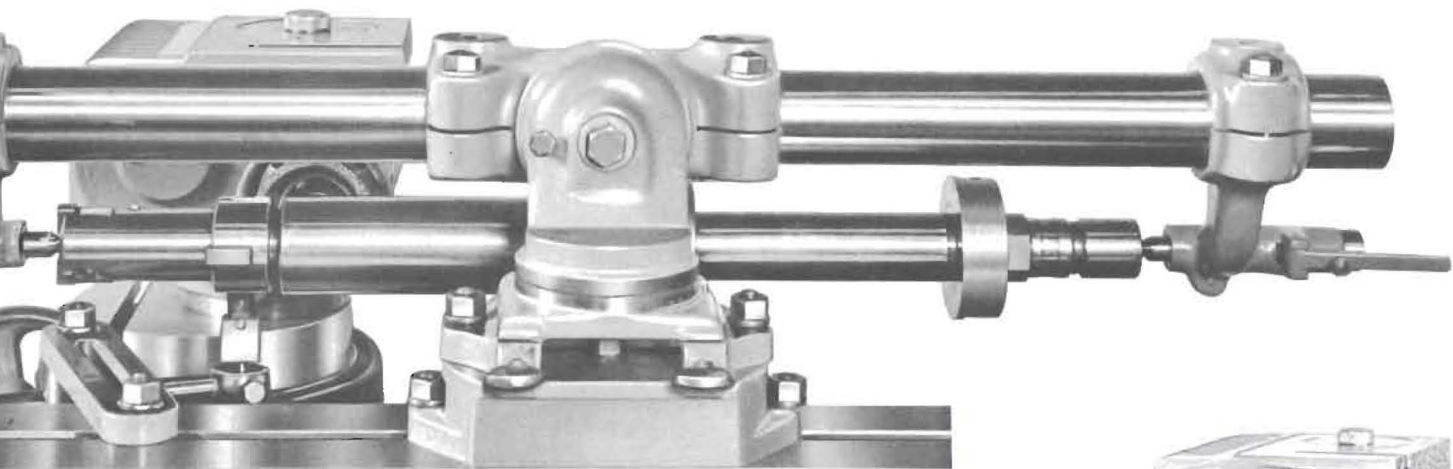
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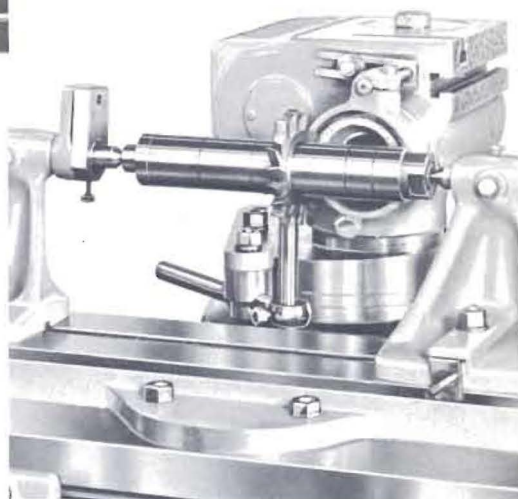
Sharpening the ball end and periphery of a diesinking cutter using the No. 1 Radius Grinding Attachment.



Universal workhead and Indexing Attachment aid in sharpening end of extra long end mill.

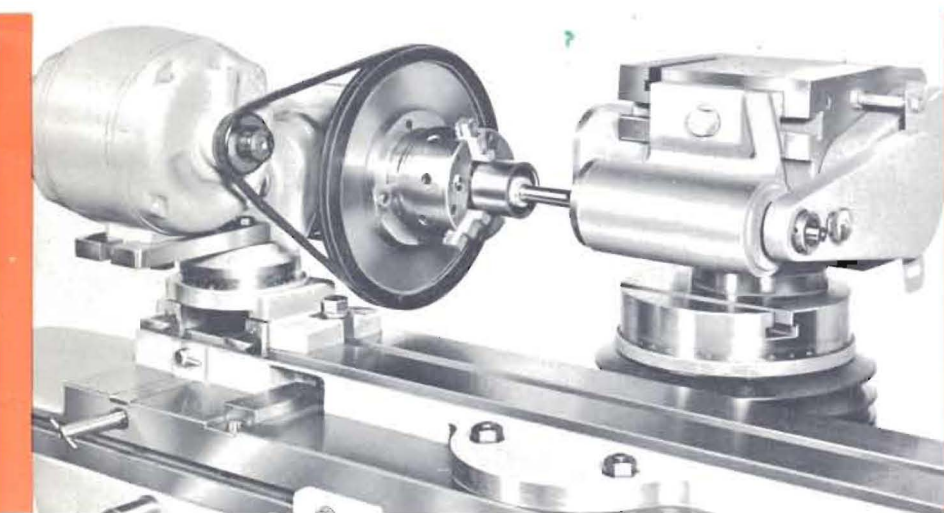


Sharpening the inserted blades of an extra long reamer by means of the Long Reamer Grinding Attachment.

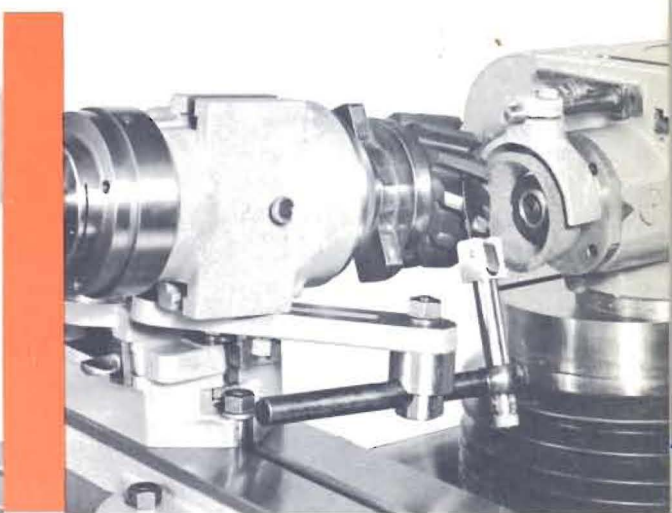


A simplified setup to grind a staggered tooth milling cutter.

CUTTER AND TOOL GRINDER

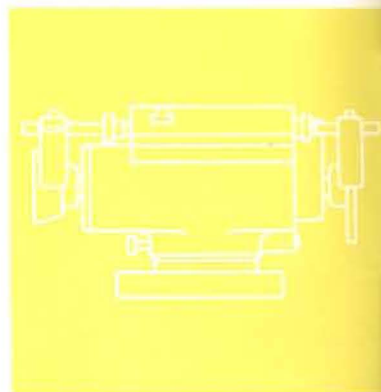


Grinding the inside diameter of an adapter using the Internal and Cylindrical Grinding Attachments.

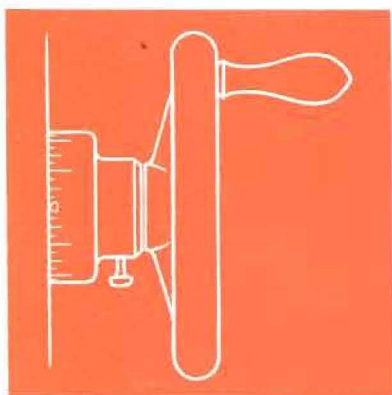


Raising block and micrometer toothrest support simplifies setup to sharpen face of shell end mill.

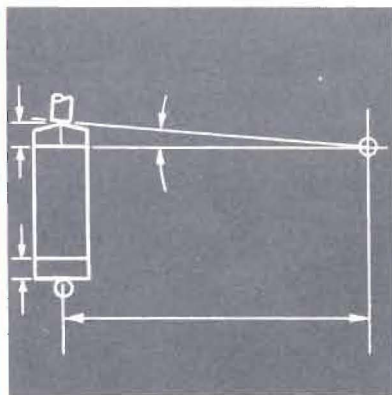
modern design with a host of new features



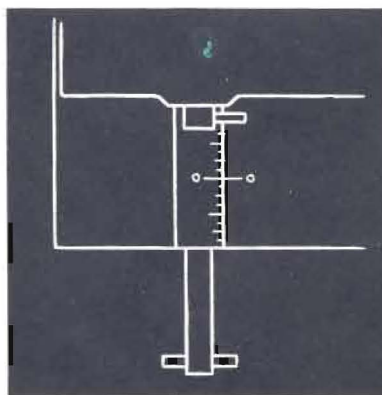
Grinding Wheel Spindle Bearings—Anti-Friction or FILMATIC... the principal element responsible for producing a high quality surface finish on the cutting edge.



Adjustable Wheelhead Pile . . . can be conveniently raised or lowered to any desired position for the setup; anti-friction bearings for vertical adjustment handwheels minimize operator's effort.



"Tange-Bar" Taper Setting Device . . . enables operator to position the swivel table quickly with great accuracy; reduces setup time and eliminates the "cut and try" method of grinding tapers.



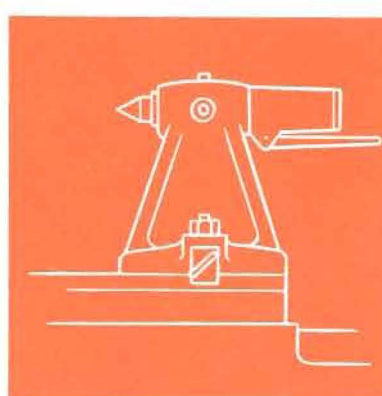
Fine Adjustment Taper Setting Device . . . angles and tapers are easily and accurately duplicated by adjusting the swivel table to the desired angle by means of an adjusting screw; saves time when making setup to grind matching tapers.



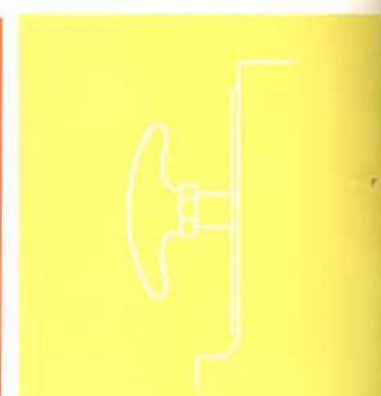
Off-Set Swivel Table Swings 180° . . . increases cross adjustment capacity and versatility when grinding large diameter cutters; adds to rigidity of setup by centering heavy loads over sliding table.



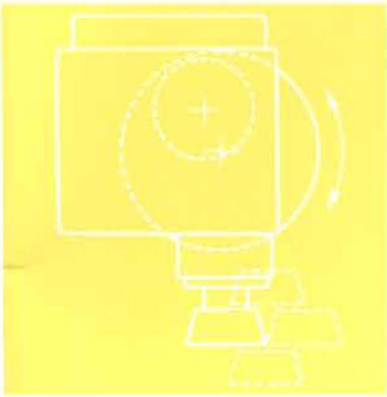
Positive Spindle Drive . . . power grip belt provides positive drive from the instantly reversible motor to the grinding wheel spindle.



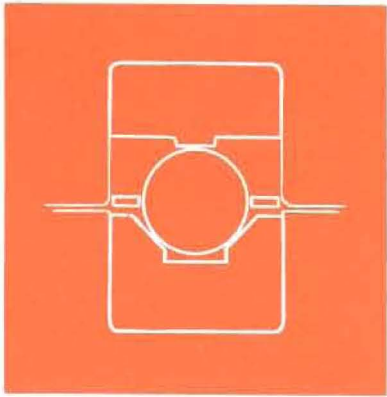
Tailstocks . . . easily positioned along the table surface; positively aligned by thumbscrew on front of tailstock; retractable center on right-hand tailstock, adjustable for tension; reduces setup time.



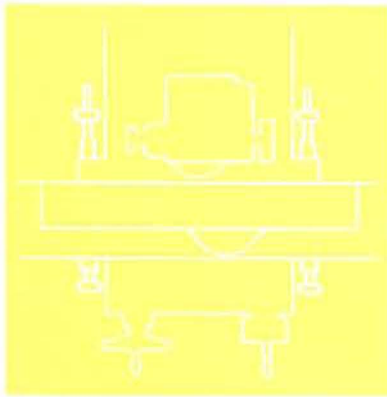
Oil-Shot Pressure Lubricating System . . . centralized lubrication system saves operator's time by reducing daily service requirements; prolongs machine life-span.



Eccentric Wheelhead . . . 360° eccentric positioning for the grinding wheelhead to suit any setup; eliminates excessive overhang; extra versatility for a wide variety of grinding jobs.



Anti-Friction Table Slide . . . super sensitive anti-friction table, traverses smoothly and accurately with a gentle push of one finger or with a twist of the wrist when using manual controls.



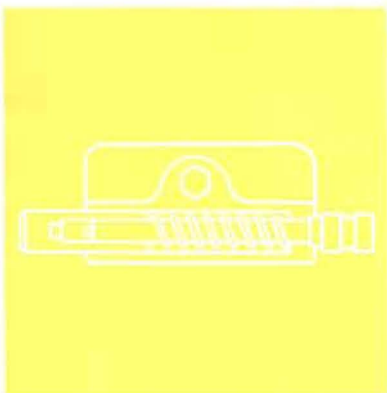
Duplicate Controls . . . located at front, right or left-hand end of table; rear right or left-hand side of column; for convenience of operating machine from any position.



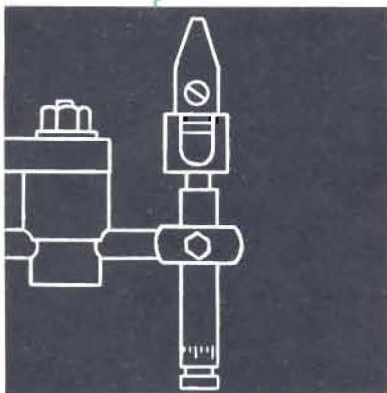
Clearance Setting Dials On Universal Workhead and Left-Hand Tailstock . . . legibly graduated for convenient and accurate setting of predetermined clearance angles.



Differential Table Traverse Unit . . . fine positive feed for cylindrical, internal and surface grinding.



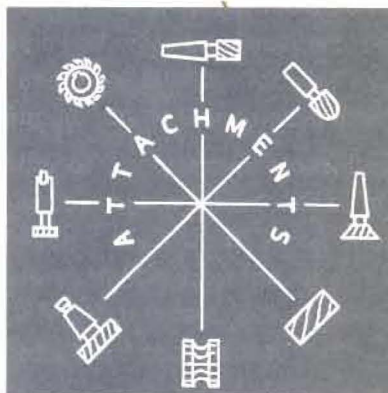
Spring Cushioning Table Dogs . . . eliminates shock at table reversal; may be reversed for fine adjustment and positive stop.



Micrometer Tooth Rest Holder . . . permits fine adjustments of blade when grinding hobs, taps and form cutters.



Slenderized Box Type Bed with Fixed Height Table . . . maintains accuracy of table traverse and enables operator to get closer to machine to observe actual grinding.



Wide Selection of Attachments . . . 37 accessory items provide increased versatility.

interested? then turn the page . . .

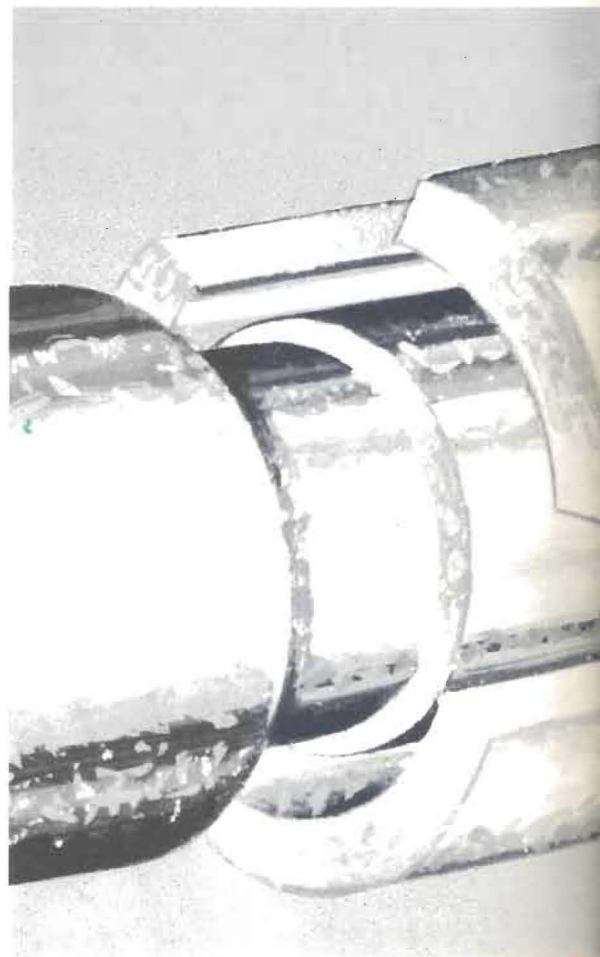
smooth, chatterless spindle rotation assures high

CINCINNATI No. 2 Cutter and Tool Grinders have incorporated into their design ANTI-FRICTION or FILMATIC spindle bearings* as standard equipment at no additional cost. Although not interchangeable, each of these spindles offer several noteworthy advantages.

The ANTI-FRICTION spindle bearings are enclosed in a cartridge type assembly lubricated for life. Exact alignment is achieved by double mountings of special pre-loaded, precision, anti-friction bearings rigidly locked in place at either end of the spindle. These special mountings reduce friction to a minimum and promote smooth rotation for a high quality surface finish on cutting tools.

The FILMATIC spindle bearing feature consists of two bearing assemblies around the grinding wheel spindle—one at either end of the spindle. These assemblies are completely submerged in oil and consist of three segments which are self-adjusting under varying grinding load conditions. A constant center of rotation is provided and bearing flutter is eliminated by the self-renewing wedge-shaped oil films. These oil films are created between the segments and spindle, by the rotation of the spindle, regardless of direction.

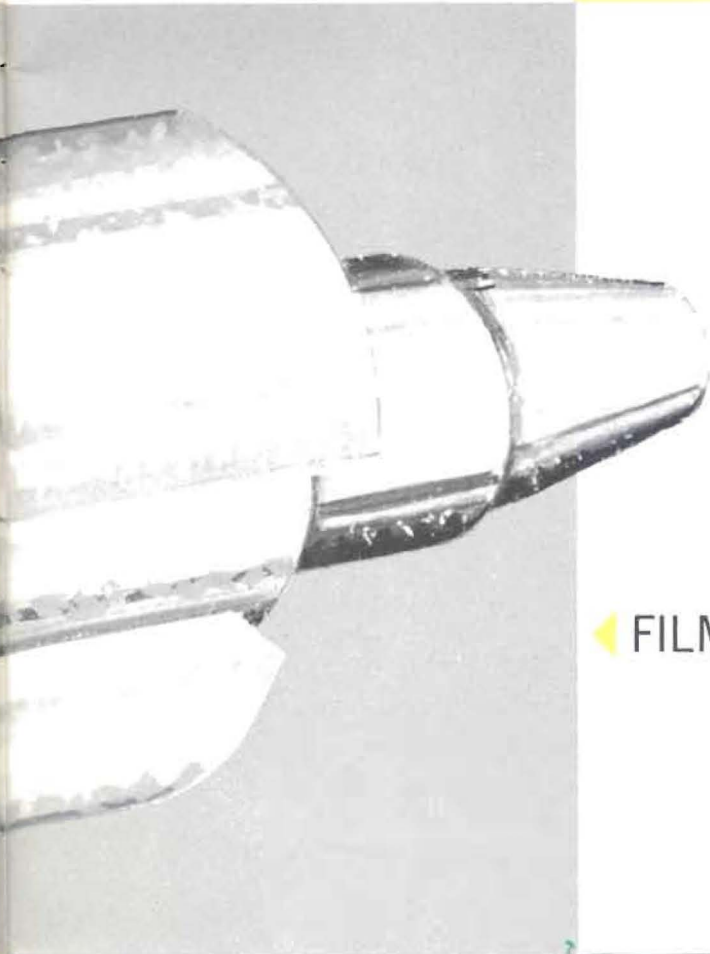
**Specify choice of spindle arrangement at time of order.*



NO. 2 CUTTER AND TOOL GRINDER

Double mounting of special pre-loaded precision anti-friction bearings provide exacting alignment.

quality surfaces

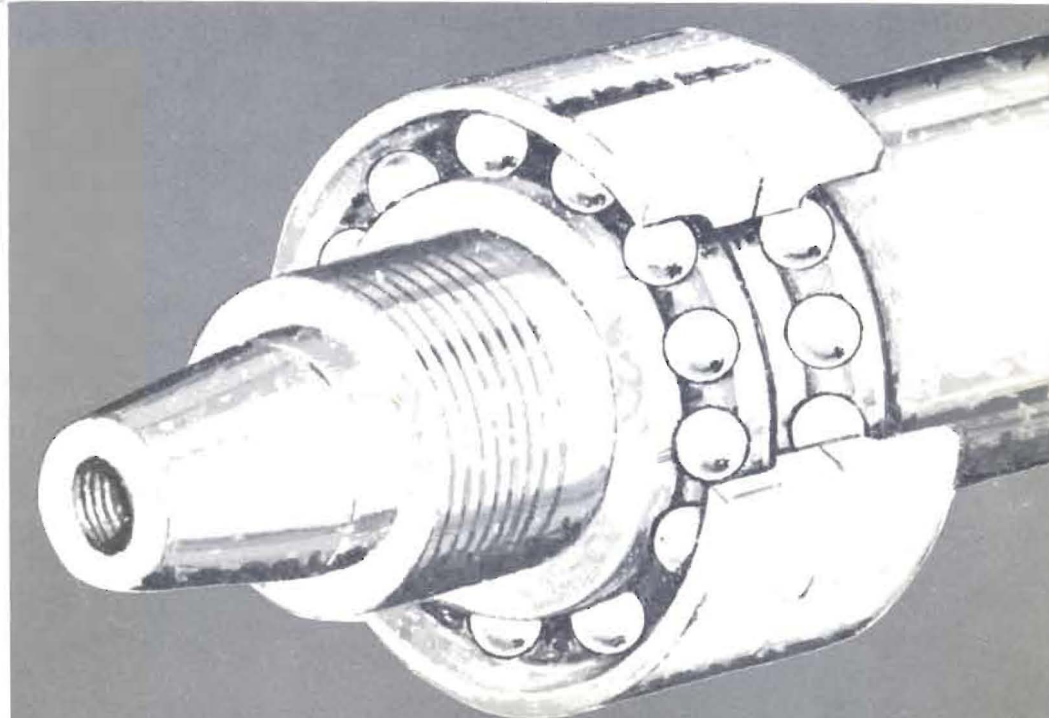


Self-renewing wedges of oil between bearing shoes and spindle mean low friction and high rigidity.

◀ FILMATIC . . .

. . . OR ANTI-FRICTION

Spindle Bearings ▶

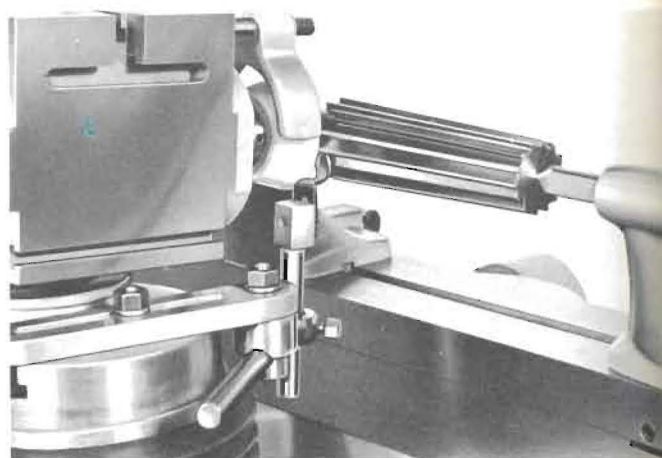




129,600 possible angular degree settings increase versatility

... Conventional Double End Spindle Machines
... Tilting Wheelhead Machines

The 360° eccentric wheelhead swivel provides 3½" of extended cross range, plus extra versatility for a wide variety of cutter sharpening operations. The wheelhead arrangement consists of two independent swivels, the eccentric wheelhead and the wheelhead column, each of which may be swiveled 360°. No trick at all for the operator to adjust the eccentric wheelhead to suit any particular grinding operation since these swivels provide an infinite number of angular adjustments. Another advantage of the wheelhead is that it gets the grinding wheel right over the table surface with no additional saddle bearing length. This means less overhang with the saddle in the extreme operating position, and in most cases eliminates the use of spindle extensions.

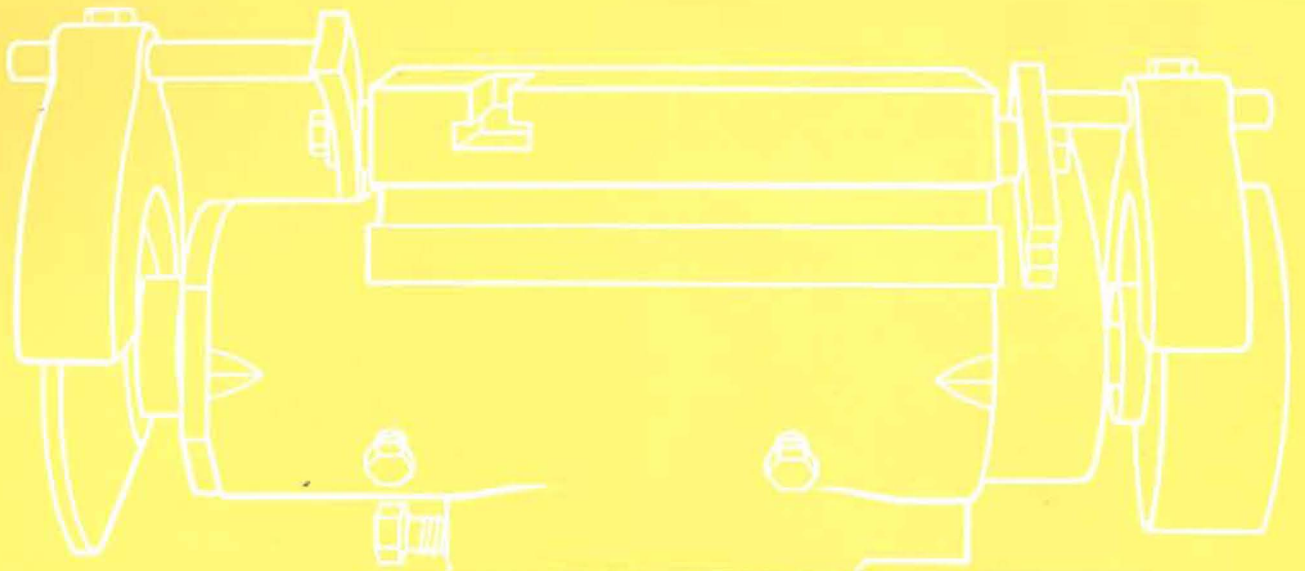


Setups for sharpening tapered reamers are simplified by the combined adjustments of the wheelhead swivels, tilting wheelhead and swivel table.

The eccentric wheelhead consists of two independent swivels, graduated in 1° index lines, that can be rotated through 360°. Since there are 360 settings for each index line on both the wheelhead column swivel and eccentric swivel, this makes possible 129600 angular degree settings for the wheelhead.

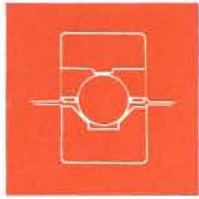
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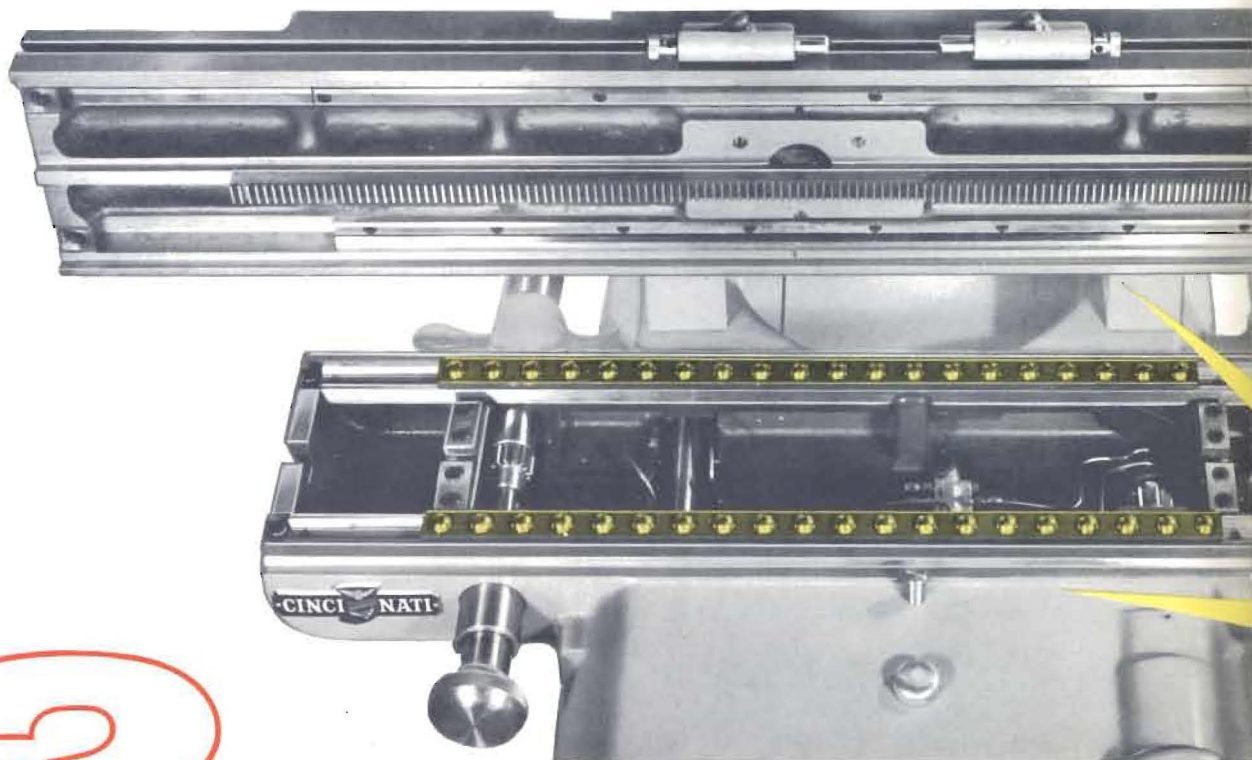
Improved surface finish on surface grinding operations are obtained by having the grinding wheel positioned directly over the work.





super sensitive sliding table provides effortless table traverse

The anti-friction table slide on the No. 2 Cutter and Tool Grinder provides effortless table traverse. Designed to reduce operator's fatigue to a minimum, the super sensitive sliding table moves on precision hardened steel balls, matched for uniformity of size, rolling in hardened steel ways. Accuracy, smooth straight line traverse and long life are other advantages offered by this construction. If for some reason after years of service these hardened steel ways must be replaced, the job can be done by your own men. Replacement ways are hardened and ground to dummy units in our shop. This means new machine accuracy may be restored inexpensively in your own shop by one man in about two hours.

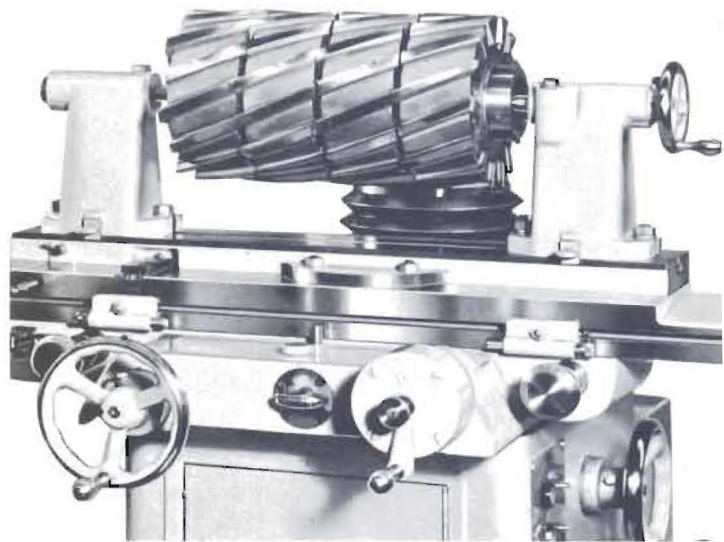


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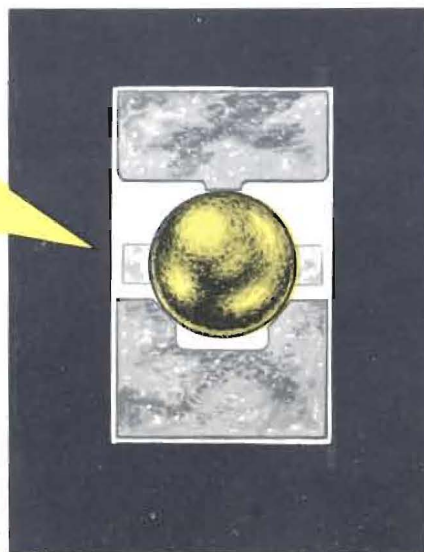
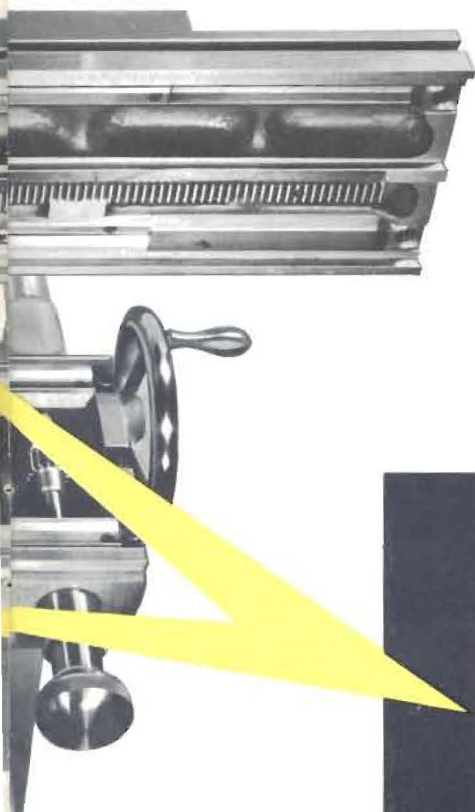
CUTTER AND TOOL GRINDER



And with the manual controls engaged, it is just as easy to traverse the table with a twist of the wrist.



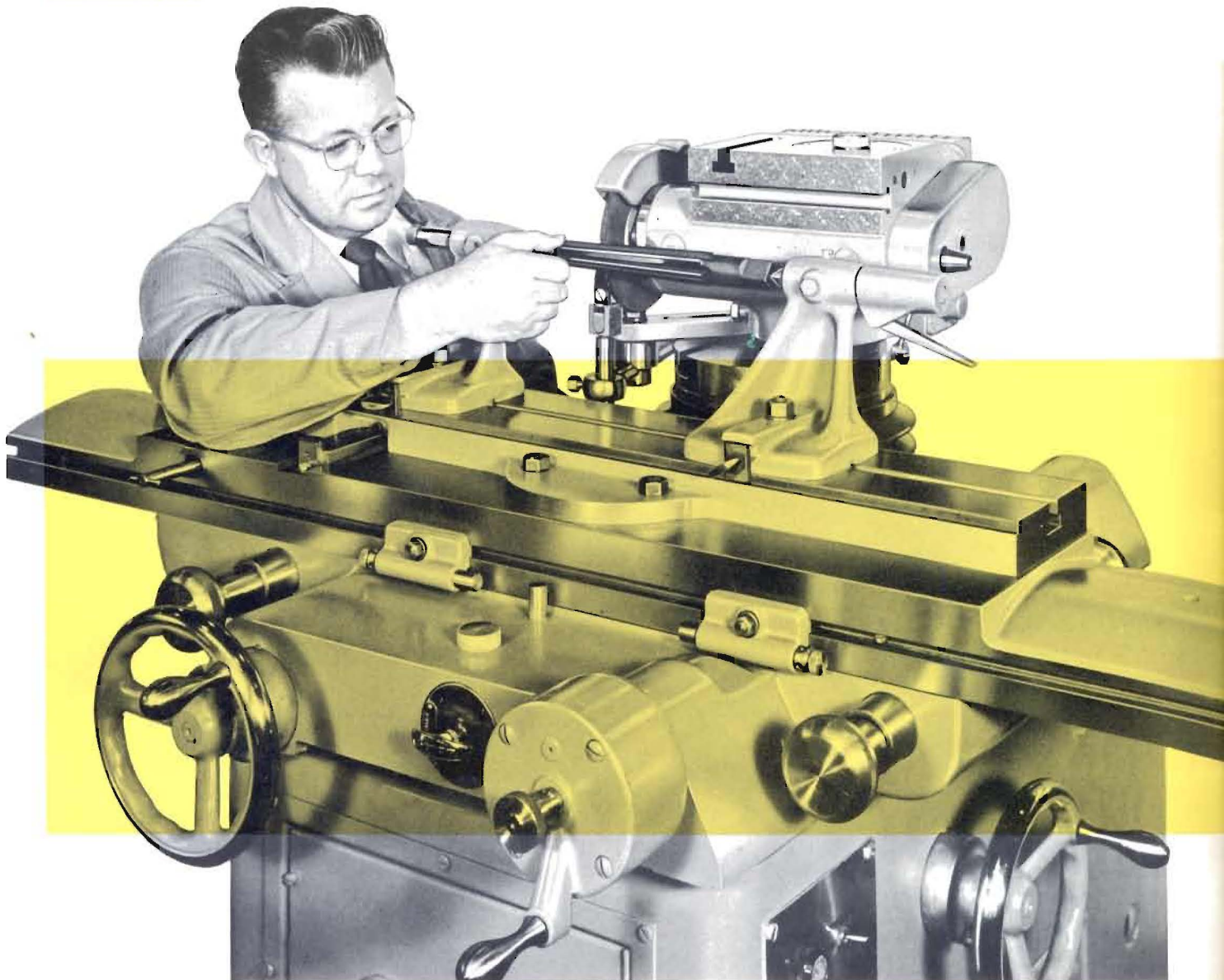
With the manual controls disengaged (just pull them out to a stop) the table, with the heaviest load of attachment and cutter, can be easily pushed with a finger.



Here's why the table traverses so easily—the sliding table moves on hardened steel balls, matched for uniformity of size.



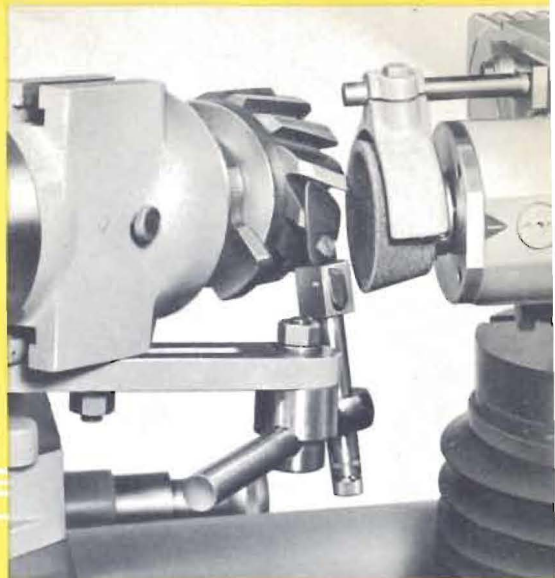
duplicate controls for convenience and ease



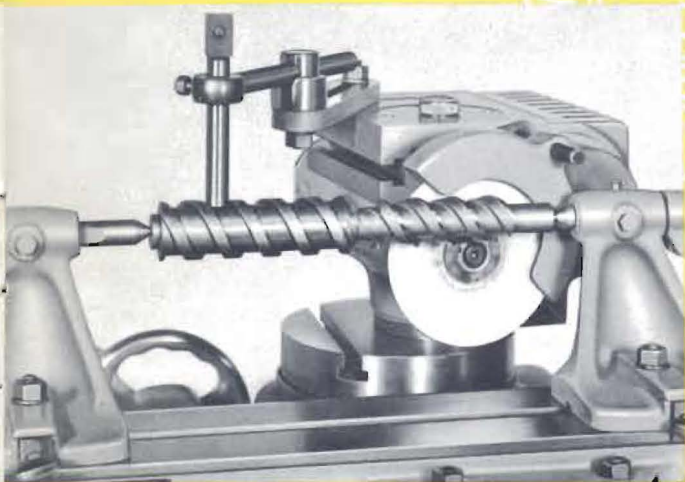
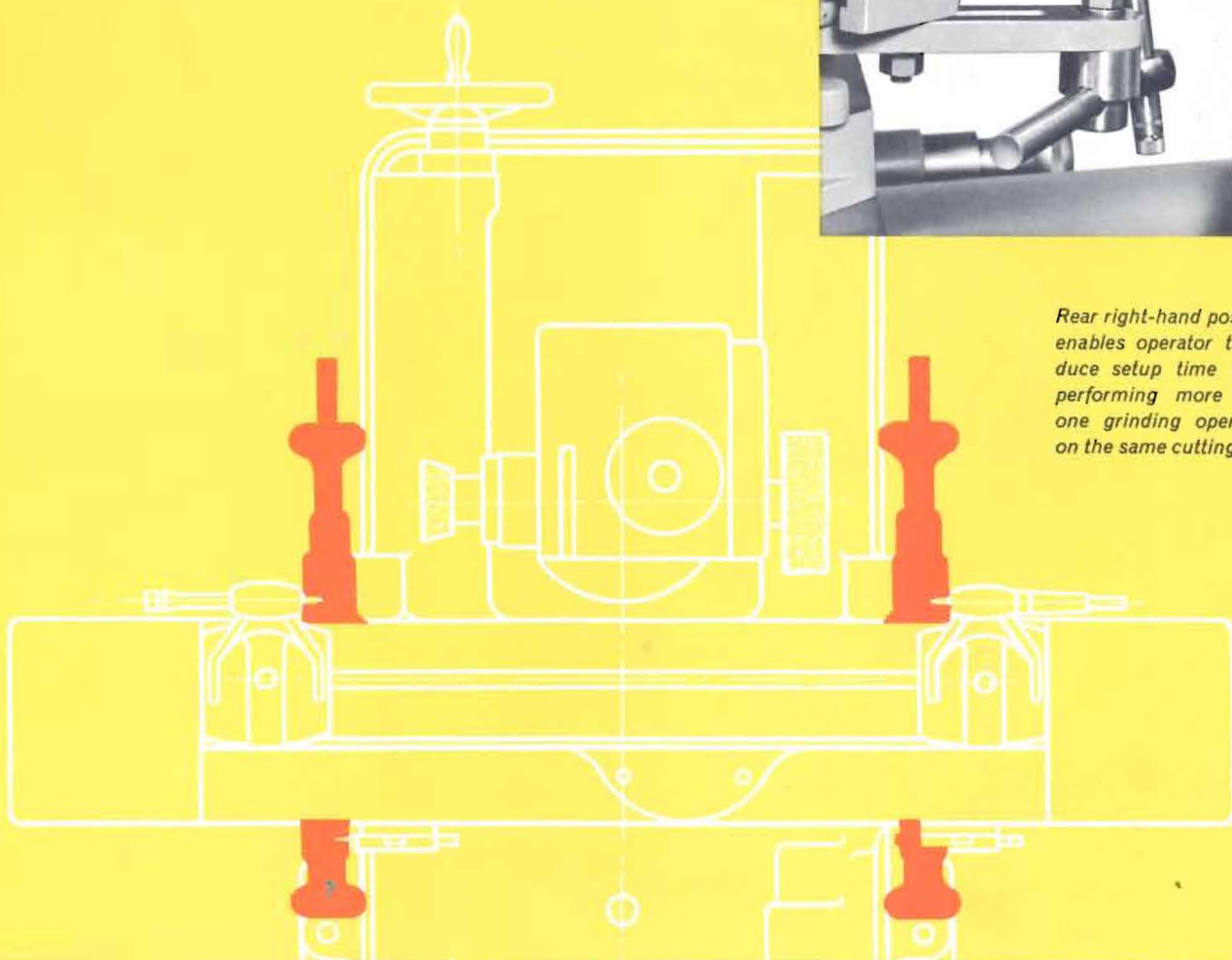
Operators find this rear left-hand position advantageous when grinding many cutters. Typical examples are taper reamers.

The CINCINNATI No. 2 Cutter and Tool Grinder, designed with the operator in mind, has duplicate controls, giving him a choice of four operating positions. They offer maximum convenience and ease of operation for the operator whether he is seated or standing to sharpen any type of cutter either right or left hand; either helical or straight tooth; either positive or negative rake angles. This unusual degree of flexibility is preferred by experienced operators.

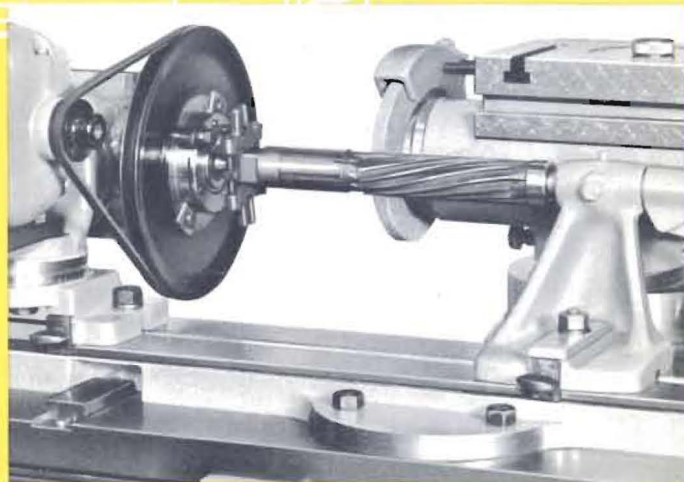
of operation



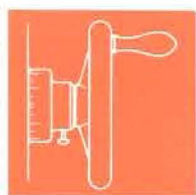
Rear right-hand position enables operator to reduce setup time when performing more than one grinding operation on the same cutting tool.



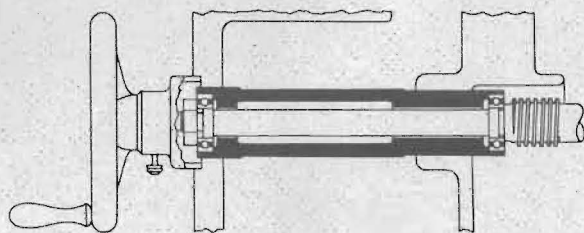
The front left-hand position provides the operator with a full view of the grinding action for unique cutters or internal grinding operations.



Operators prefer this front right-hand position for cylindrical grinding operations such as grinding spiral hand reamers.



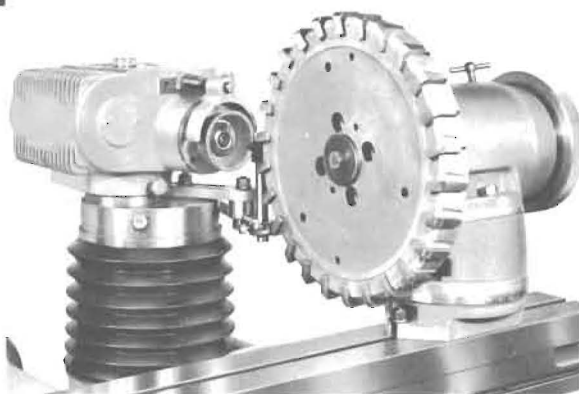
usefulness unlimited



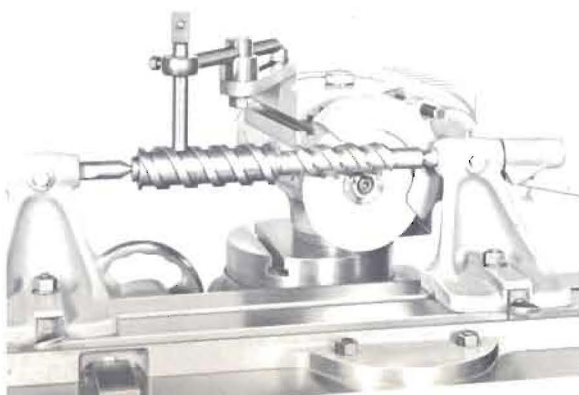
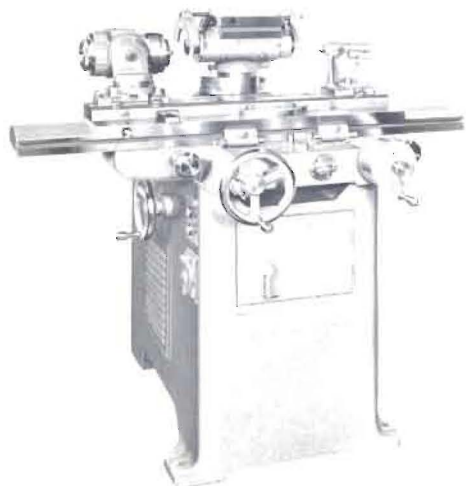
Ample vertical range, for *going up* to take care of the large diameter face mills, or for *going down* to handle those complex grinding jobs is provided by the adjustable wheelhead pile. The entire unit, consisting of the 360° eccentric wheelhead and its built-in instantly reversible motor drive and two-speed grinding wheel spindle, is raised or lowered with little effort. Duplicate controls enable the operator to work from either side of the machine when adjusting the wheelhead pile to the required height of the set-up. The adjustable wheelhead pile is protected and sealed against grit and is lubricated by the one-shot system which means longer trouble-free performance for this desirable feature.



Vertical control handwheels have anti-friction ball bearing mountings to minimize operator's effort to raise or lower the wheelhead.



Ample vertical range to accommodate the exceptionally large diameter face mills.



Lowering centerline of the grinding wheel below tailstock centerline facilitates grinding the face of helical cutters.

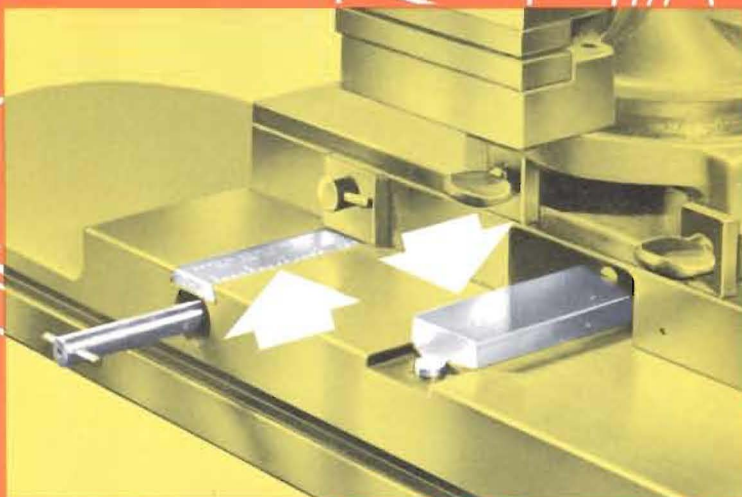
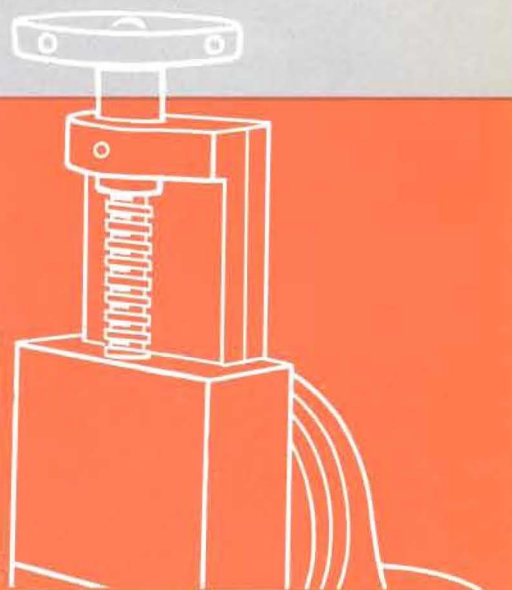
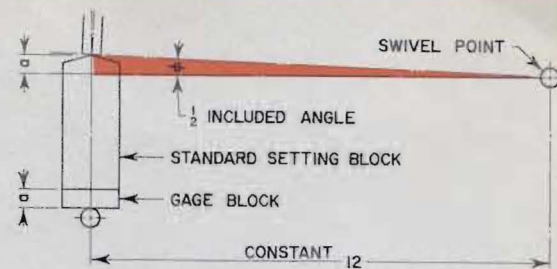


measured exactness

"Tange-Bar"

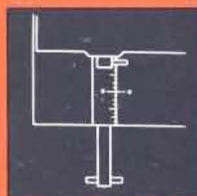
Taper Setting Device

Operator can quickly position the swivel table and obtain a higher degree of accuracy, thus eliminating the "cut and try" method when grinding angular cutters and tapered reamers. Using the trigonometric function of the tangent of the angle, the operator either multiplies the tangent of one-half the known value of the included angle by 12, or utilizes the given value of the taper per foot from the centerline, as the case may be, to obtain the correct gage block setting. After the operator replaces either of these values with corresponding precision gage blocks, the swivel table is then accurately positioned for grinding the taper.



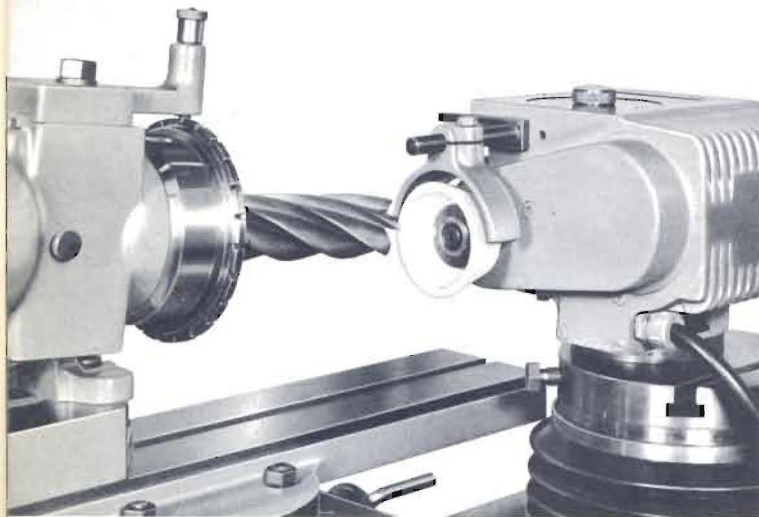
"Fine Adjustment" Taper Setting Device

Operators can easily adjust the swivel table forward or backward for tapers up to 2" per foot, indicated by a scale integral with the sliding table. These direct taper settings are made by merely turning a swivel adjusting screw. This is a desirable feature when making the very fine and very accurate settings required to obtain an exact bearing the full length of previously ground tapers and angles.





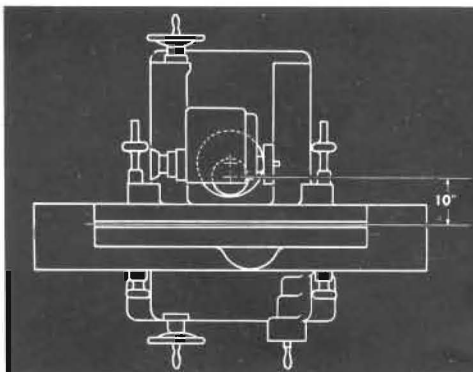
handles the long ones



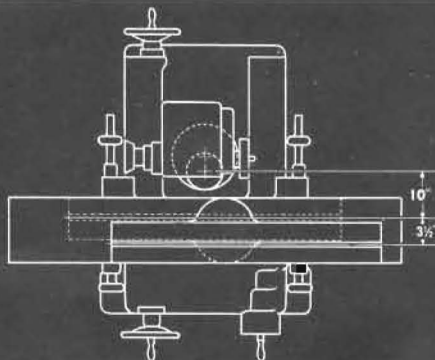
Offset swivel table and eccentric wheelhead conveniently positioned for grinding the end teeth on an extra long cutter.

The CINCINNATI No. 2 Cutter and Tool Grinder offers greater versatility and more effective cross range than found in comparable machines of its size. The normal cross range of the saddle coupled with the 360° eccentric wheelhead and offset swivel table enables operator to grind the end teeth of those extra long cutters shown in the illustration at the left. The normal cross range of the machine is 10". The offset table when swiveled 180°, extends the cross range 3½"; the eccentric wheelhead adjusted to the extreme rear position, extends the cross range an additional 3½", giving the machine 17" of extended cross range. An advantageous feature when you also consider the offset table and/or eccentric wheelhead may be clamped in any angular position to suit the desired setup.

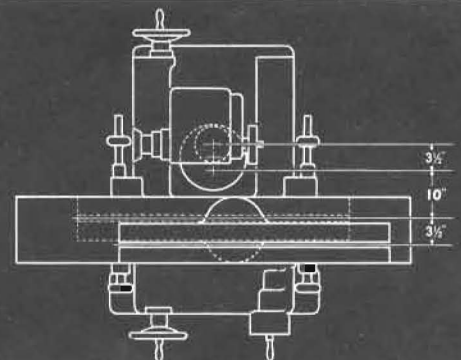
NO. 2 CUTTER AND TOOL GRINDER



10" normal cross range of the machine with saddle extended.



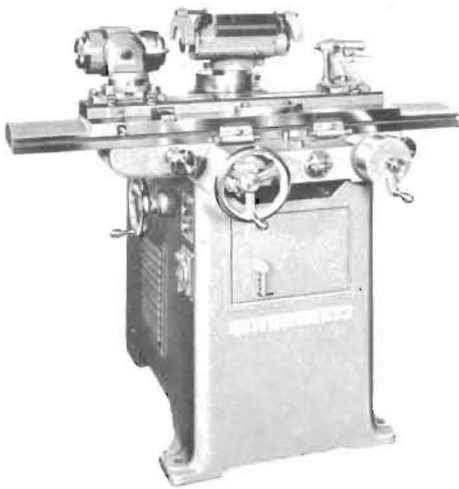
3½" extended cross range with offset table swiveled 180°.



3½" additional extended cross range with 360° eccentric wheelhead swiveled to extreme rear position.

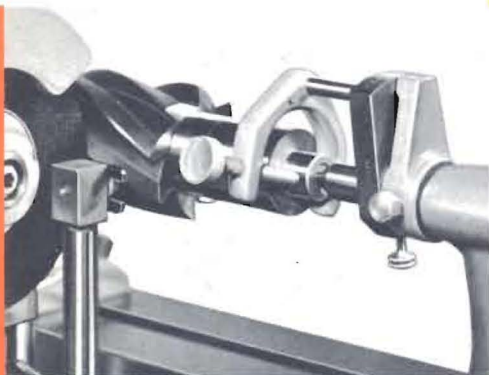


an angle to success



Clearance angles for adapter-mounted and shank-type cutters are easily obtained by the clearance setting dial on left-hand end of workhead.

Clearance angles play a most important role in obtaining good cutter performance, high cutting efficiency and the most economical number of parts per grind. Clearance setting dials on the workhead and left-hand tailstock enable the operator to set predetermined clearance angles conveniently and accurately regardless of cutter diameter and type of wheel used.

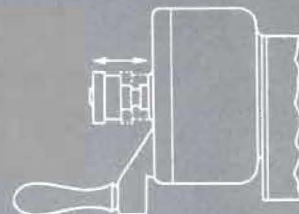
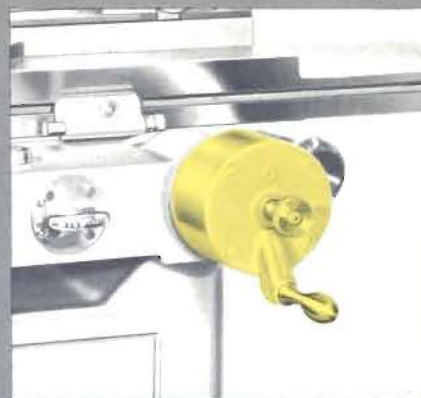


Arbor mounted cutters are quickly adjusted to the desired clearance angle by means of the clearance setting dial on the left-hand tailstock.



positively fine

The differential table traverse control assures operator of a *fine positive* feed for cylindrical, internal and surface grinding and for truing the grinding wheel. The table moves a mere $\frac{3}{8}$ " with each complete revolution of the handcrank. Front and rear table controls are locked out when the handcrank is engaged—prevents damage to cutters and injury to the operator when setting up the machine. This safety device coupled with the slow table traverse is a highly acceptable feature that assures precision tool grinding.



A slight movement of the center knob engages or disengages differential table traverse control.

NO.

2

CUTTER AND TOOL GRINDER



just right

A power grip drive belt transmits positive power to the grinding wheel spindle from the 1 hp enclosed motor that is instantly reversible. The drive belt rides on gear tooth pulleys, having fixed centers . . . a design feature that establishes a 'just right' belt tension, regardless of grinding conditions, thus eliminating slippage and unnecessary belt adjustments. The operator can easily and quickly change the drive belt on the two-step drive pulleys for either of the two available speeds. This is a big factor in obtaining long life and maximum cutting action of the grinding wheel.



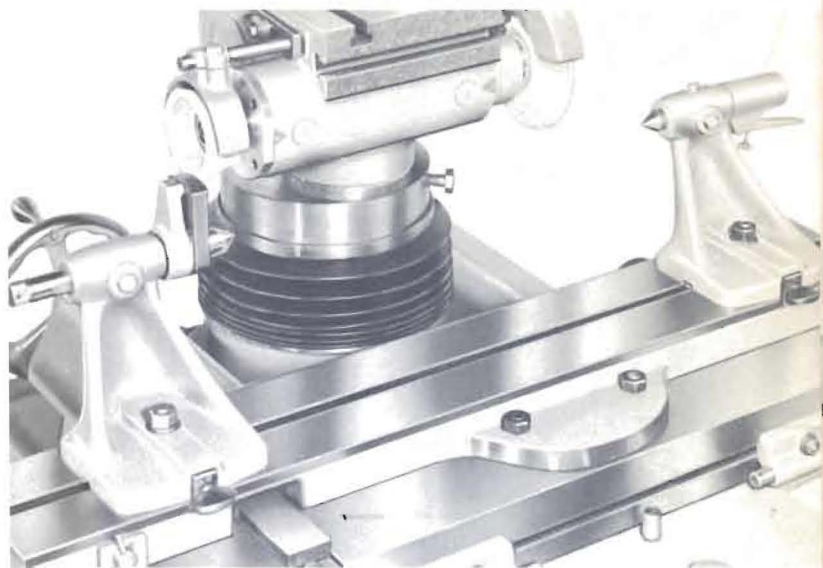
Gear tooth pulleys and power grip belt provide positive spindle drive.

SPINDLE SPEEDS		
cycle	wheel diam.	rpm
50	6"	3240
	3½"	5440
60	6"	3890
	3½"	6530

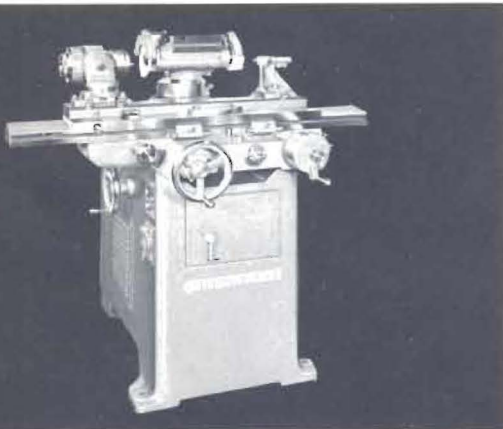


assured alignment

Tailstocks are easily positioned anywhere along the table surface. Tightening the thumbscrews before clamping the tee bolt always locates the tailstocks from the same side of the table T-slot and assures accurate positive alignment of both tailstock centers. These centers can easily be removed and reversed in the tailstocks. This enables the operator to have the retractable center or clearance setting dial center at either end of the table, convenient to the normal working position.



The retractable center, shown in the right-hand tailstock, is adjustable for tension; saves time when removing work for checking purposes.

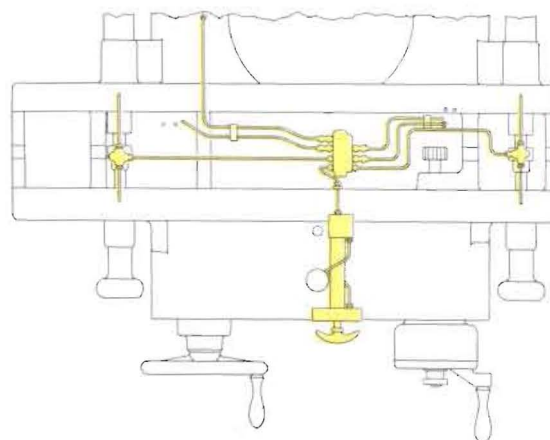


guaranteed lubrication

The oil-shot pressure lubricating system located in the cross slide lubricates the cross slide bearings, wheelhead vertical adjustment mechanism, cross feed screw and duplicate table hand controls. This efficient lubrication system, the anti-friction table slide construction, the permanently lubricated spindle bearings and sealed wheelhead column—all these features combine to give you trouble-free performance and longer machine life.



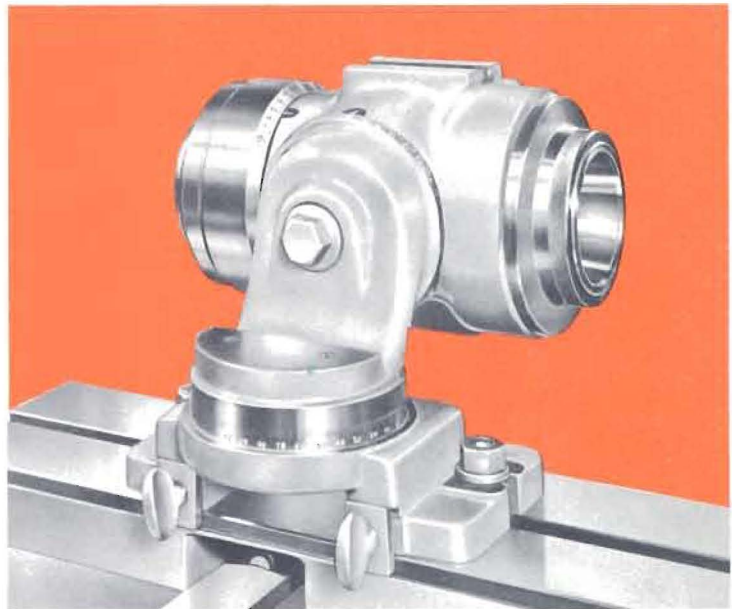
Oil-shot pressure lubrication system reduces daily service requirements.





double advantage

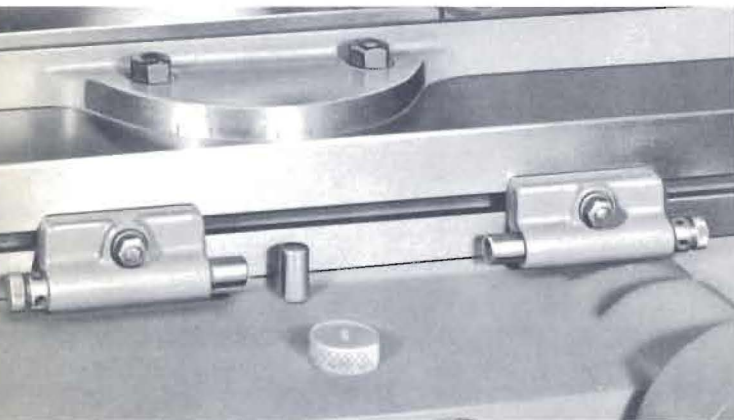
Universal workhead accommodates cutters with either the No. 12 B. & S. taper (No. 5 Morse taper optional) or the No. 50 Series National Standard taper. Its anti-friction spindle mounting insures a smooth, easy movement when rotating the spindle from one grinding position of the work to another. The base and spindle are graduated in degrees to aid in obtaining accurate swivel adjustments in the horizontal and vertical planes.



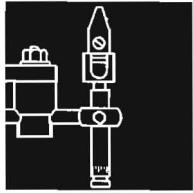
Double end spindle takes either No. 12 B. & S. or No. 50 Series National Standard taper shank cutters.



absorbs the shock



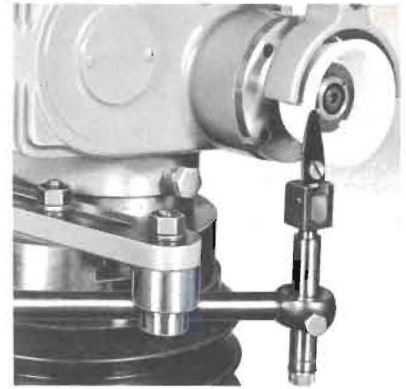
Spring cushioning table dogs not only govern the length of table traverse, but they also offer an important secondary advantage. They absorb the shock at reversal of the table movement. When the table dogs are set as shown at the left, the spring behind the plunger extending from each dog cushions the shock at the end of the stroke and smoothly reverses the direction of table motion. Dogs may be reversed if positive table stop is desired.



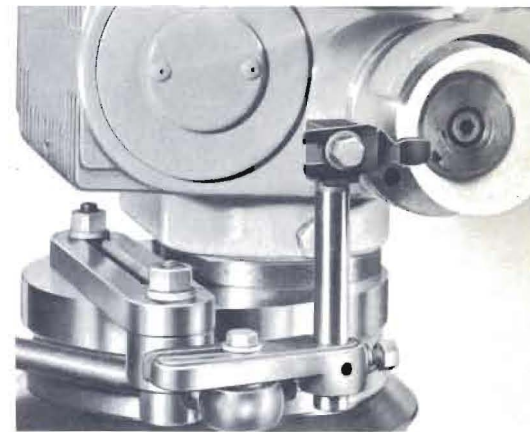
saves setup time

Toothrests and toothrest holders offer a simple solution to one of the most perplexing elements of cutter sharpening, that of quickly positioning the toothrest when setting up. The micrometer toothrest holder, accurately graduated in thousandths of an inch, permits fine adjustment of the blade. A spring actuated pivot forces the blade into its working position after each indexing.

The universal toothrest plate is not only adjustable to a variety of positions, but can be mounted on the wheelhead pile, machine table, and top or bottom of the workhead. In addition, plain or micrometer toothrest holders are interchangeable, making it possible for the operator to use either holder with the plain or universal toothrest plate.



Universal toothrest plate and micrometer holder with straight toothrest blade.



Plain toothrest plate and plain holder with offset toothrest blade.



rigid and modern

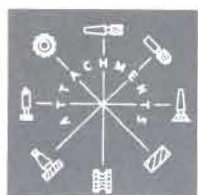


Slenderized bed enables the operator to get in close and be comfortable whether seated or standing.

The slenderized box type bed, rigid and well-proportioned, with fixed table height maintains accuracy of table traverse. Ample bearing area is provided for saddle and column.

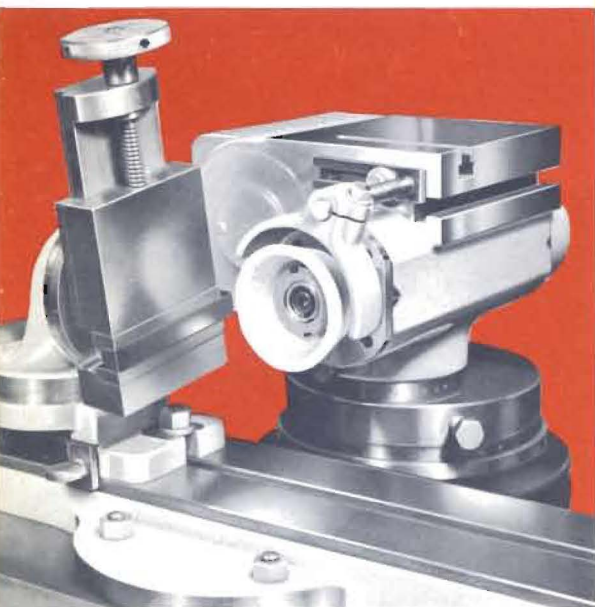
The vertical column casting with its long bearing in the bed and accordion type dust guard also contribute their share to the accuracy and long life offered by this construction. Electrical controls are built into the bed at front of the machine, where they are protected from moisture and abrasive grit. The current automatically shuts off when the compartment door is opened, protecting the operator against electrical hazards.

Notice the recessed area under the saddle unit. It enables the operator to thoroughly clean machine of harmful abrasive grit.



a wide selection of attachments

A wide selection of standard attachments are available for the CINCINNATI No. 2 Cutter and Tool Grinder. These attachments increase the versatility and usefulness of the machine to handle a wider variety of work including radius grinding, centerless grinder blade grinding, large face mill grinding, long reamer grinding and etc. Also, operational costs can be decreased by the attachments extending the normal range of the standard machine. This extended range simplifies many setups making the operator's job easier and less tiring. Illustrated and briefly described on these and the following pages are many of the attachments for the No. 2 Cutter and Tool Grinder.

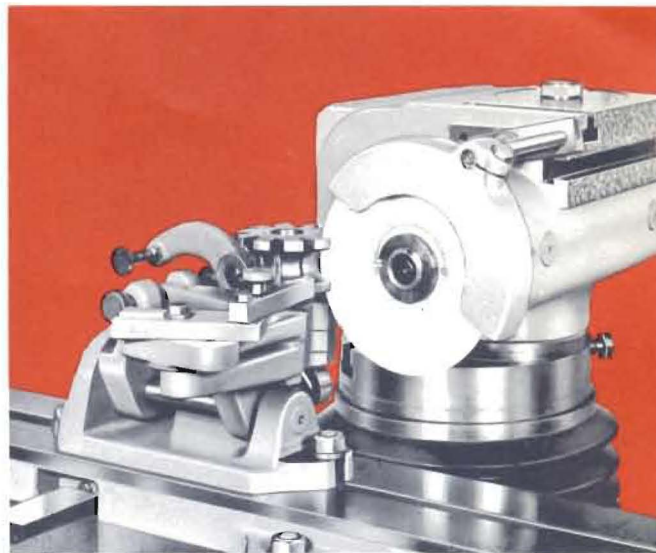


surface grinding attachment

Flat forming tools, lathe tools, planer tools, flat thread chasers, drifts, chisels and work of a similar nature may be accurately and quickly ground with the CINCINNATI Surface Grinding Attachment. The attachment consists of a swivel vise with an intermediate support between the vise and the base, which allows the vise to be swiveled 360° in both the horizontal and vertical planes. The regular workhead support may be removed and placed between the vise support and the base, making the vise adjustable in three planes. Surfaces up to 4" wide can be ground in one setting.

gear cutter sharpening attachment

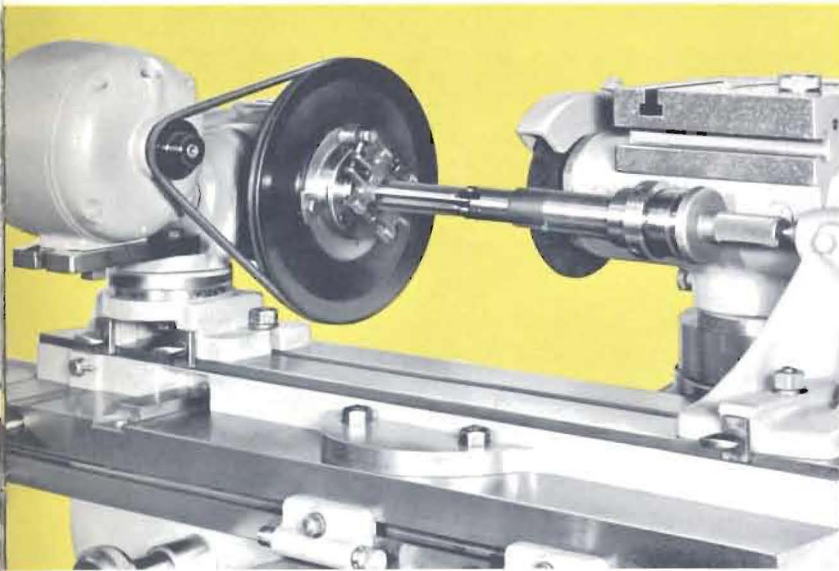
Since gear cutters and cutters of similar design are form relieved, the only correct way they can be sharpened is to grind the face of the teeth. Cutters of this type may be sharpened advantageously on the CINCINNATI Gear Cutter Sharpening Attachment. The attachment consists of a grinding bracket which pivots on a horizontal stud and permits the cutter support plate to be adjusted to the right or left corresponding to the angle of the tooth face. A spring pawl, which rests against the back of the teeth locates the tooth in grinding position. Capacity—cutters up to $8\frac{3}{4}$ " outside diameter and up to 2" hole.



cylindrical grinding attachment

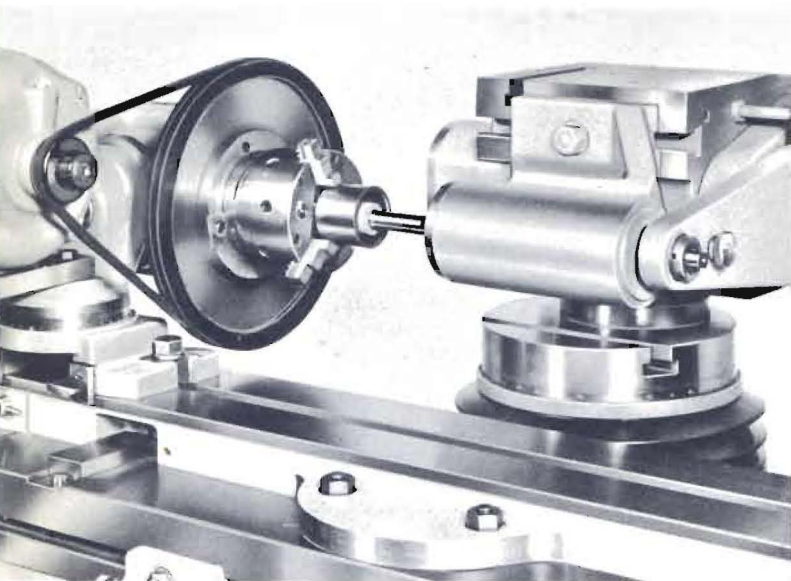
The CINCINNATI Cylindrical Grinding Attachment can be used for all types of straight or taper cylindrical grinding, such as reamers, lathe centers, mandrels, reclaiming cutters, tap or drill shanks, and for facing operations such as cutter hubs, gear shaper cutters, collars, nuts, etc.

The attachment will swing $10\frac{1}{2}$ " diameter work and is designed to rotate work in a chuck or between live or dead centers. In addition, right- or left-hand rotation may be selected as desired through a two-way switch built into the push button station at the right-hand side of the bed of universal machines.



NO. **2** CUTTER AND TOOL GRINDER

... and accessories

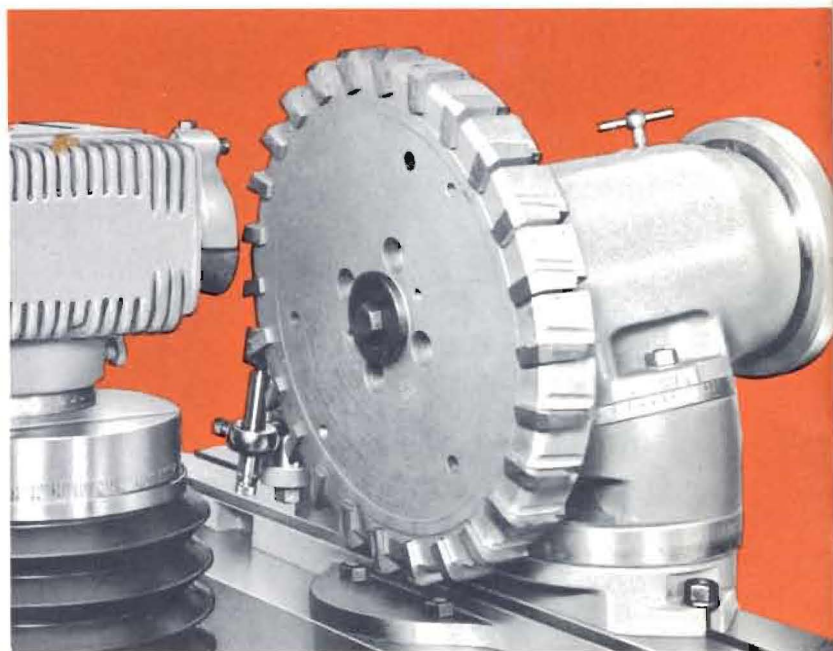


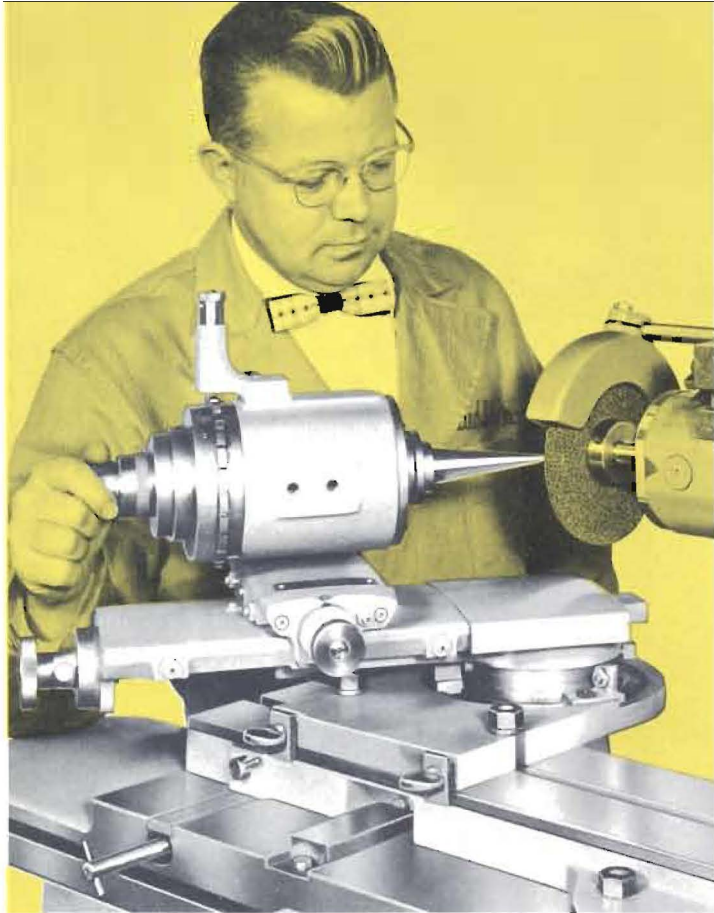
internal grinding attachment

The Internal Grinding Attachment, when setup in conjunction with the Cylindrical Grinding Attachment, can be used for grinding holes up to $3\frac{1}{2}$ " long. The attachment mounts on the face of the grinding wheelhead. It consists of an intermediate support and spindle housing which may easily be reversed enabling the operator to internal grind from either the right or left hand side of the machine. The attachment spindle is driven by a positive drive belt from a gear tooth pulley mounted on the grinding wheel spindle, providing approximately a 23,000 rpm for small internal grinding wheels. The Internal Grinding Attachment is available for machines having the conventional double end spindle or precision tilting wheelhead arrangement.

face mill grinding attachment

Face mills up to 18" diameter may be sharpened quickly, more easily and with a higher degree of accuracy by using the CINCINNATI Face Mill Grinding Attachment. The attachment with its anti-friction bearing spindle, coupled with the sensitive anti-friction table slide of the machine, provides an exceptionally desirable and easy method of grinding face mills. The attachment consists of three units: workhead, swivel plate and base. The work spindle, provided with No. 50 Series National Standard taper hole of $3\frac{1}{2}$ " per foot is mounted on anti-friction bearings at the front and rear. A knurled handwheel at the end of the spindle aids in indexing. The base and swivel block are both graduated in degree, permitting the cutter to be swiveled to the desired clearance angle.





no. 1 radius grinding attachment

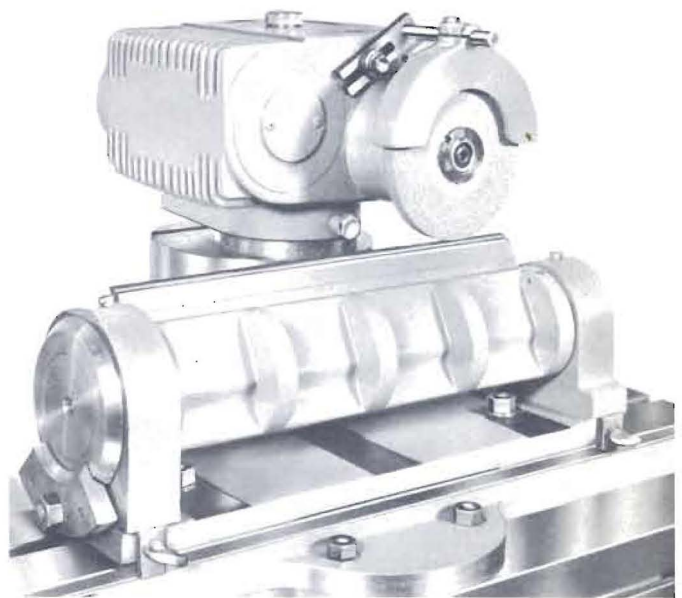
The CINCINNATI No. 1 Radius Grinding Attachment fills the need existing for equipment to quickly and accurately sharpen small ball-end cutters, double-end cutters, and die-sinking cutters having straight or helical flutes. It consists of a base plate, two slides each having a micrometer adjustment for the purpose of setting the cutter to the desired radius and a work-head, having a No. 12 B. & S. or No. 5 Morse taper hole spindle.

The index plate at the rear of the workhead permits direct indexing of straight fluted cutters, having 1, 2, 3, 4, 6, 8, 12 and 24 flutes. The capacity of the attachment is 0" to 2" radii and 4" maximum cutter diameter.

centerless grinder work support blade grinding attachment

Centerless Grinder work support blades up to 1" thick and 16½" long may be accurately and quickly reground to their original accuracy on the No. 2 Cutter and Tool Grinder with a CINCINNATI Work Support Blade Grinding Attachment.

Since the angle of a centerless work support blade varies according to the diameter of the work to be ground, the type of work, and the material, the attachment is provided with a swivel range of 45°. A large, accurate, easy-to-read dial facilitates setting the attachment to the desired blade angle.



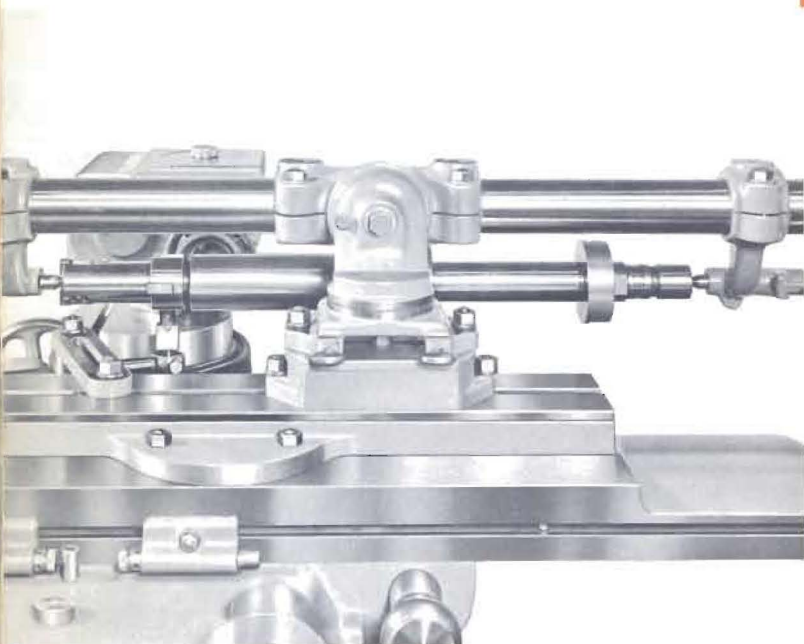
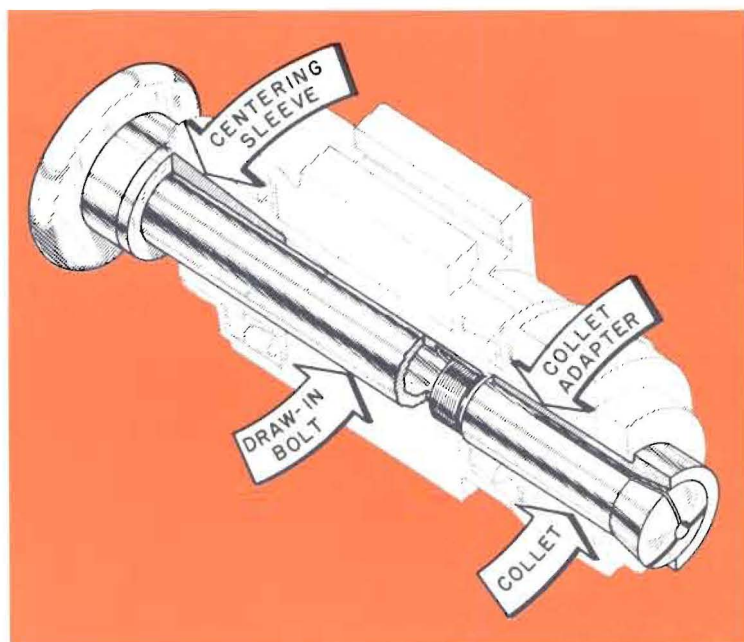
that increase . . .

... versatility

draw-in collet attachment

Small straight shank end mills, key slot cutters, counterbores, spot facers, and countersinks can be conveniently ground when the No. 2 Cutter and Tool Grinder is equipped with the CINCINNATI Draw-in Collet Attachment.

The attachment consists of an adapter that is easily fitted into the No. 12 B. & S. (or No. 5 Morse) end of the workhead spindle and a draw-in bolt which extends through the workhead and rigidly holds the straight cylindrical collets in the collet adapter. Collets (extra cost) available for the adapter are: $\frac{1}{8}$ " to $1\frac{1}{8}$ ", in increments of $\frac{1}{64}$ "; 0.125" to 1.125" in decimal increments (specify exact size); and metric sizes from 3 mm to 28 mm in increments of 1 mm.



long reamer grinding attachment

The CINCINNATI Long Reamer Grinding Attachment is useful in grinding long lining reamers, boring bars, taper reamers, extension taps and stay-bolt taps. When concentricity is important, special cutters and gages may be ground without removing them from their arbors.

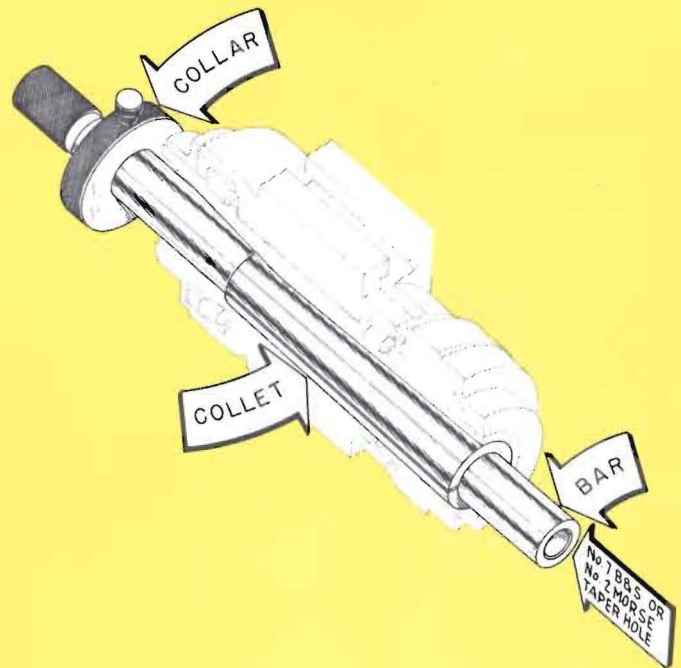
The attachment consists of an extension bar workhead plate, intermediate support and base plate. This permits angular settings in both the horizontal and vertical planes. Maximum distance between centers—34". Centers will swing work up to 6" in diameter over the supporting bracket and 7" diameter at any other portion of the bar section.

and usefulness . . .

small end mill grinding attachment

Small end mills up to 3½" flute length with No. 7 B. & S. or No. 2 Morse taper shanks can be conveniently ground with the CINCINNATI Small End Mill Grinding Attachment.

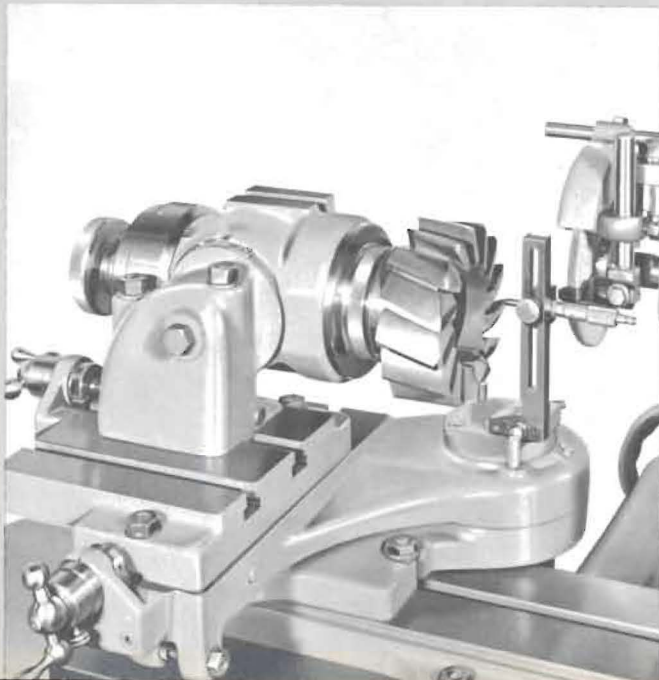
A bar, which slides in a split sleeve or bush inserted in the No. 12 B. & S. (or No. 5 Morse) taper bore of the workhead spindle, has a No. 7 B. & S. or No. 2 Morse taper bore in the front end for holding small diameter end mills. Cutters are sharpened by moving the attachment bar instead of the machine table.



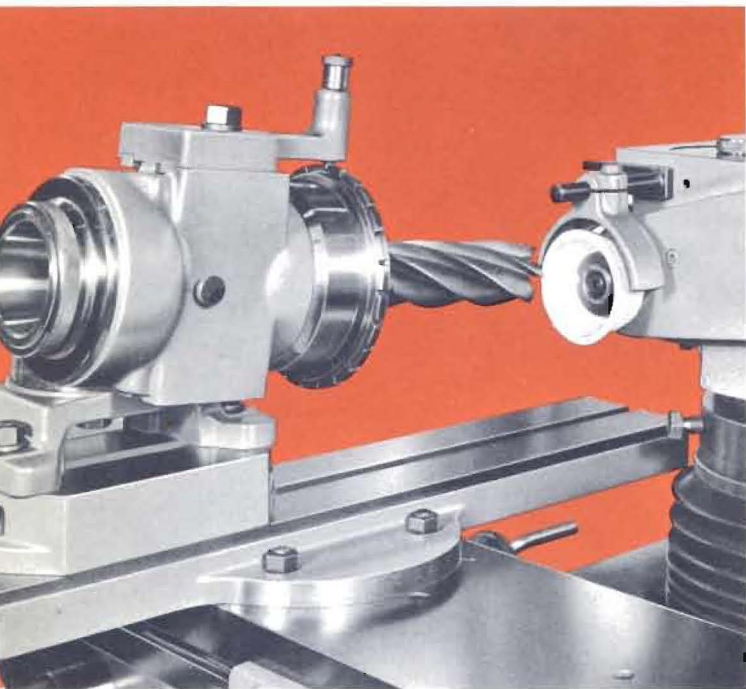
no. 2 radius grinding attachment

Medium to large-sized milling cutters requiring an accurate 90° radius on the corner of the teeth may be quickly ground with the No. 2 Radius Grinding Attachment.

The attachment consists of four principal elements: a base, swivel plate, adjustable table and workhead support. A micrometer gage is also included for accurately determining the starting position. The workhead and draw-in bolt are part of the standard machine equipment. The capacity of the attachment is 0" to 1" radii and 0" to 12" maximum cutter diameter with 3" maximum width of face.



and reduce operational cost.



workhead indexing attachment

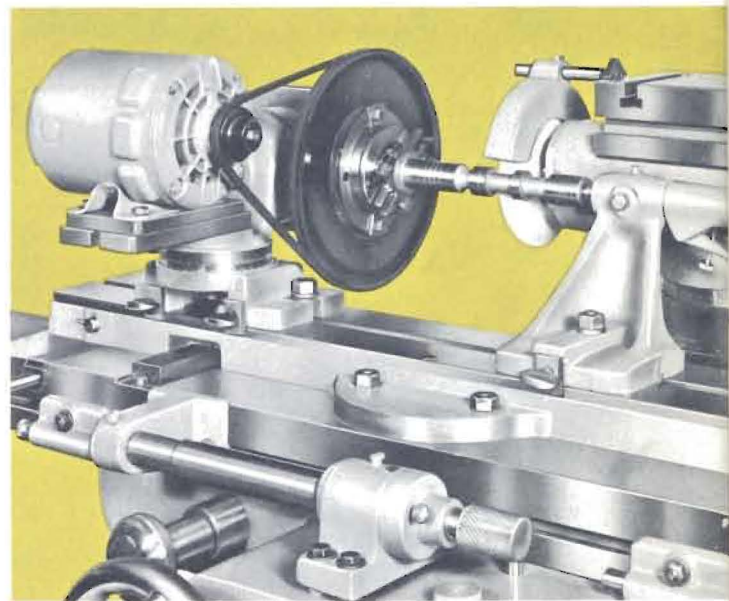
Accurate indexing when grinding straight fluted cutters or other simple indexing jobs can be accomplished quickly and easily when the standard workhead is equipped with the **CINCINNATI Workhead Indexing Attachment**.

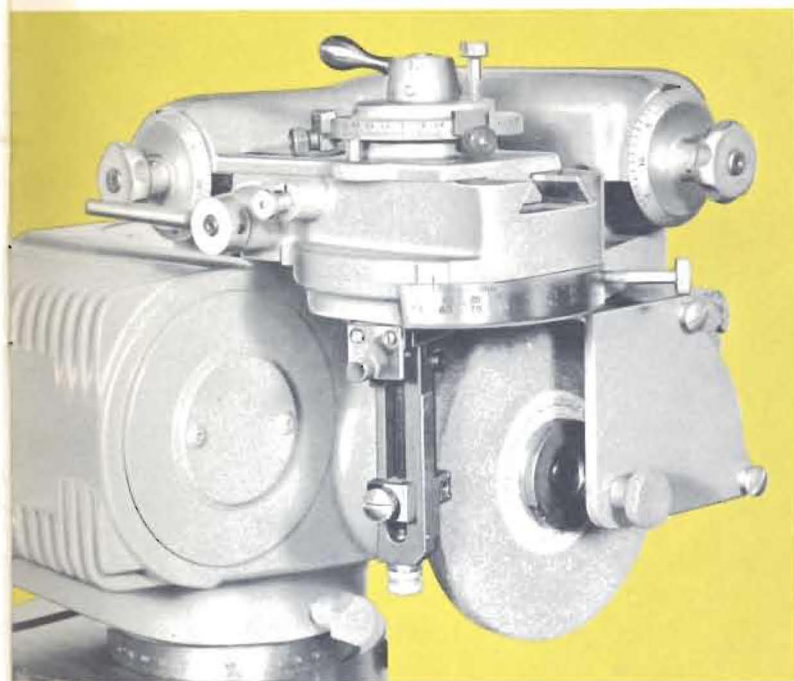
It saves time by eliminating the tooth rest ordinarily required in the setup. Consisting of twenty-four accurately spaced notches, the index plate may be readily fastened to the dial on the No. 12 B. & S. end of the workhead. Cutter shanks can be inserted in either end of the workhead spindle, just as they can without the attachment.

micrometer table positioning attachment

The **CINCINNATI Micrometer Table Positioning Attachment** offers a means of obtaining accurate spacing between ground surfaces such as those encountered in grinding grooves in plungers, combination reamers and drills, countersinks, counterbores and special tools.

The attachment is, in effect, a precision lead screw with 6" of travel for the sliding table of the machine. A gentle twist of the knurled knob moves the table past the grinding wheel. Merely loosening two hexagon nuts disconnects the attachment from the sliding table of the machine. Then the machine can be used in the conventional manner.





radius and angle tangent to radius truing attachment

The CINCINNATI Radius and Angle Tangent to Radius Truing Attachment is designed for accurately truing grinding wheels so that angles, convex and concave radii and tangents to their respective radii may be ground on lathe, shaper and screw machine form tools.

This attachment greatly simplifies and speeds up the truing of angles and radii on grinding wheels. It is available for machines having a conventional double end spindle or extended spindle. The device is suitable for truing concave radii from $\frac{1}{16}$ " to $\frac{1}{2}$ " and convex radii from 0" to $\frac{1}{2}$ ", depending upon the diamond bracket, and may be used with 4" to 6" diameter wheels up to $\frac{1}{2}$ " maximum width.

heavy duty tailstocks

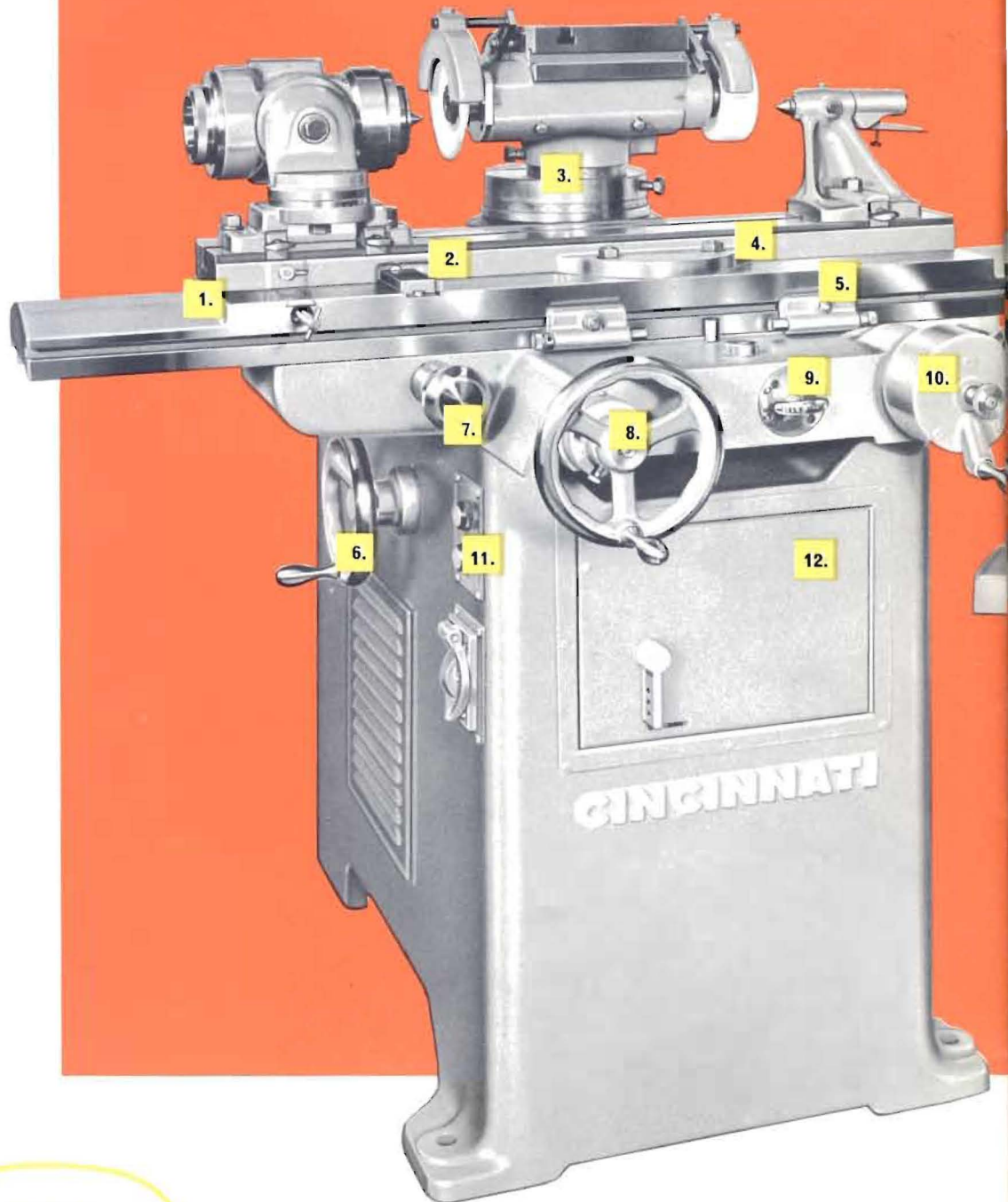
CINCINNATI Heavy Duty Tailstocks increase the swing of the work over the table and are useful in supporting heavy boring bars, reamers, mandrels and large helical milling cutters that cannot be handled on the standard tailstocks supplied with the machine. These substantially constructed tailstocks have a 16" swing and carry the work directly over the centerline of the table, thus affording rigid support during the grinding operation.

Accurate, positive alignment is assured both tailstocks because they are located from the same side of the machine table.



operating conveniences that reduce operator

1. Fine Adjustment
Taper Setting Device
2. Tange-Bar
Taper Setting Device
3. Eccentric
Swivel
4. Swivel
Table
5. Reversible
Table Dogs
6. Wheelhead Pile
Adjusting Handwheel
7. Front Table
Traverse Knob
8. Front Cross
Adjusting Handwheel
9. Oil-shot
Lubrication
10. Differential Table
Traverse Handwheel
11. Built-in
Push Buttons
12. Electrical
Control Compartment

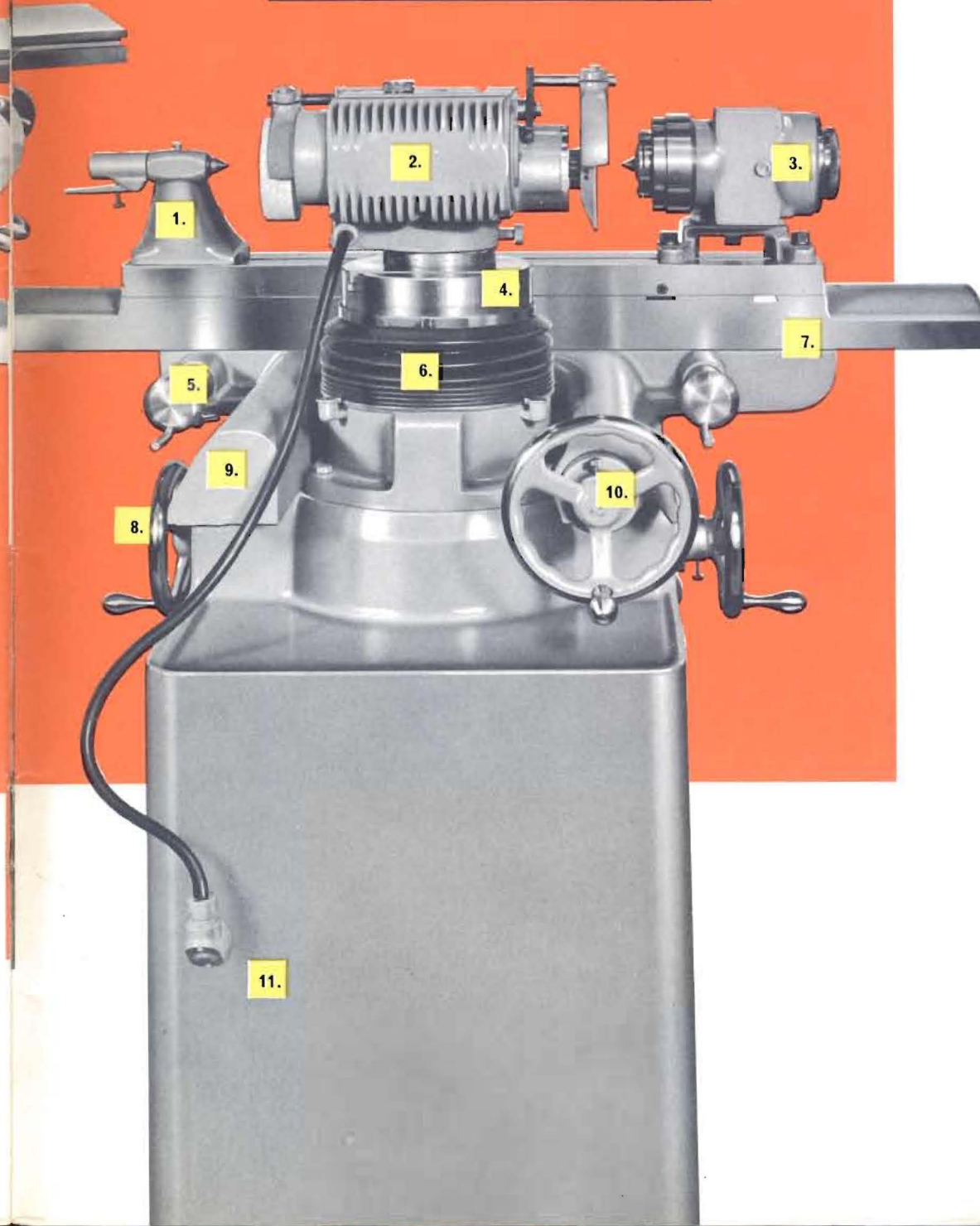
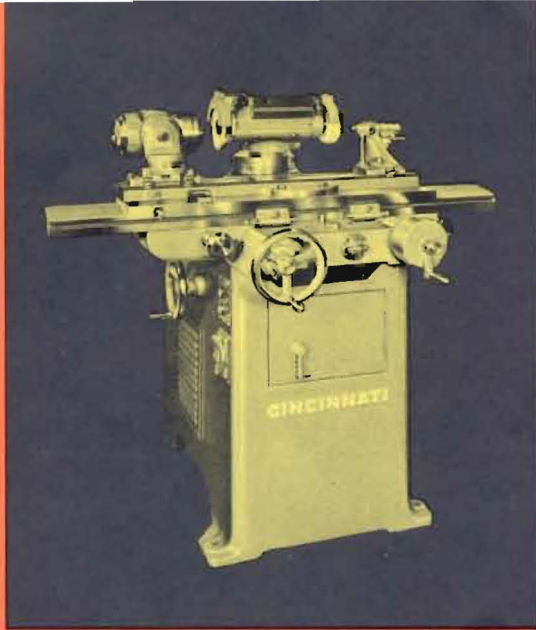


NO.

2

CUTTER AND TOOL GRINDER

fatigue



1. Retractable Center Tailstock
2. Built-in Motor Drive
3. Universal Workhead
4. Eccentric Wheelhead Lower Swivel
5. Rear Table Traverse Knob
6. Adjustable Wheelhead Pile
7. Sliding Table
8. Wheelhead Pile Adjusting Handwheel
9. Adjustable Cross Slide
10. Rear Cross Adjusting Handwheel
11. Cooling System (FILMATIC spindle machines-not shown)

general specifications

CAPACITY

Swing over Table	10½" Diameter
Length, between Right and Left-hand Tailstocks.	27"
Length, between Tailstock and Workhead	21½"
Face Mills on Workhead	10½" Diameter
Saws on Table	48" Diameter
Formed Cutters (using 6" Wheel)	5½" Diameter

TAPER HOLE IN WORKHEAD SPINDLE

One End	No. 12 B&S or No. 5 Morse
Other End	No. 50 Series National Standard

TABLE

T-Slots (Number and Size)	One .563"/.565"
Working Surface.	5¼" x 36"

RANGE

Longitudinal Movement of Table	16"
Cross Movement of Table	10"
Cross Range Gained by Wheelhead Eccentricity.	3½"
Cross Range Gained by Swivel Table	3½"
Total Extended Cross Range	17"
Table Swivels	180°
Table Graduations in Center, in degrees	90°
Swivel Table Adjustments (Taper Per Ft. on Diam.)	
Tange-Bar	Toward Wheelhead 5"
Taper Setting Device	Away from Wheelhead 5"
Fine Adjustment	Toward Wheelhead 2"
Taper Setting Device	Away from Wheelhead 2"
Vertical Movement of Grinding Wheel Spindle	10½"
Swivel Movement of Grinding Wheel Spindle	360°
Maximum Distance Centerline Spindle to Top of Table.	13⅝"

GRINDING WHEEL SPINDLE SPEEDS . . . See Table Page 46

ELECTRICAL EQUIPMENT See Table Page 46

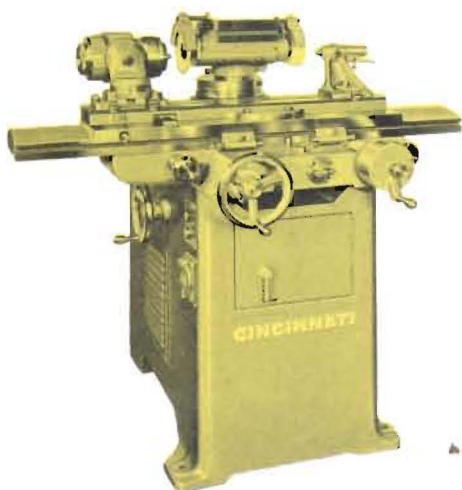
FLOOR SPACE FOR OPERATING 56½" x 68½"

SHIPPING DATA

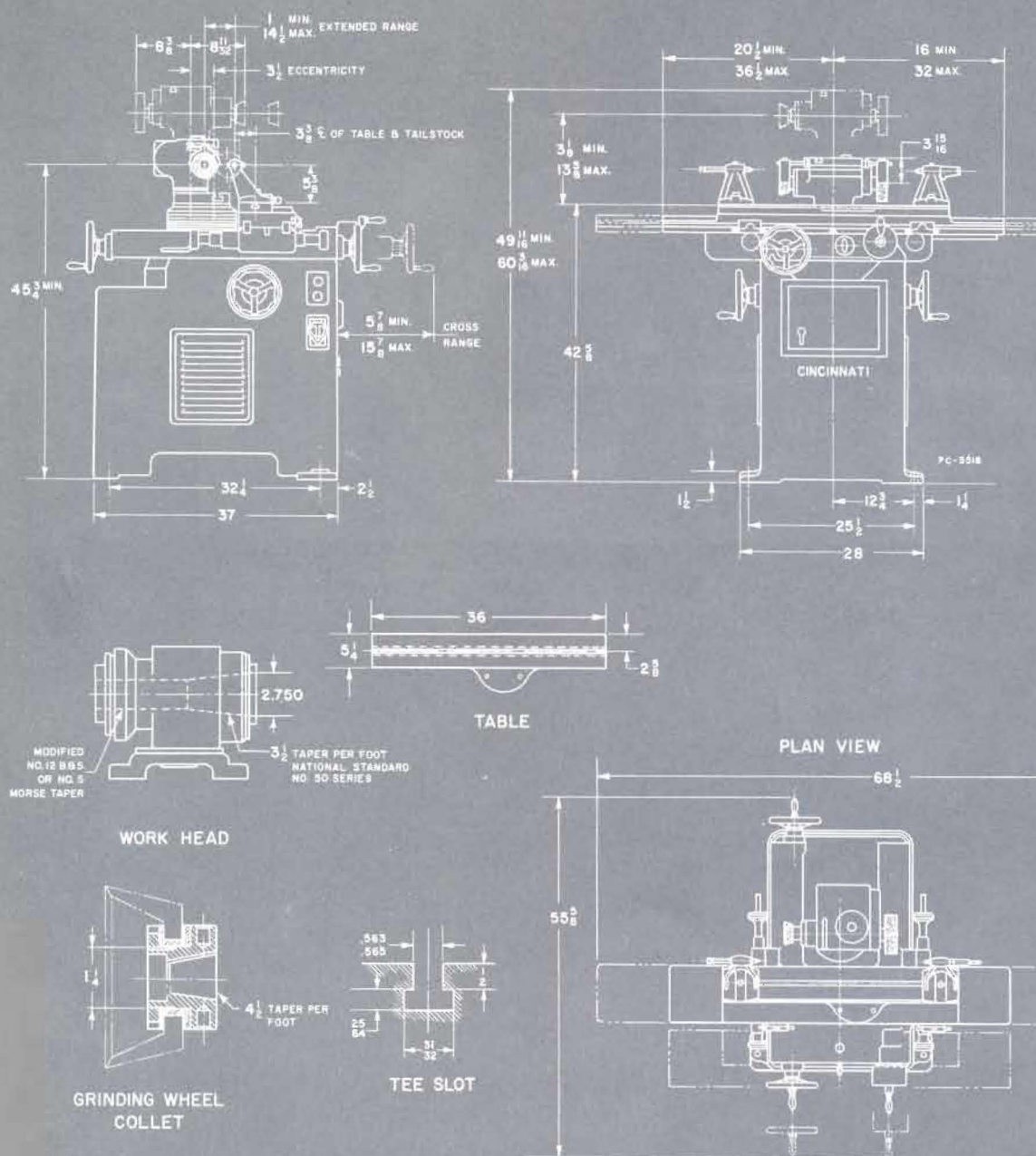
Net Weight (approximately)	Plain.	2050 lbs.
	Universal	2250 lbs.
Shipping Weight, Domestic	Plain.	2430 lbs.
	Universal	2600 lbs.
Shipping Weight, Export	Plain.	2500 lbs.
	Universal	2750 lbs.
Size of Case, Export	Plain.	65" x 57" x 60"
	Universal	66" x 72" x 60"
Volume of Case, Export		171 cu. ft.

CODE NAME	Plain	NOTWO
	Universal	NOTAU

Note: Specify "FILMATIC" or "ANTI-FRICTION" wheelhead spindle bearings at time of order.



operational range

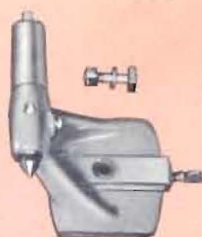


NO. **2** CUTTER AND TOOL GRINDER

increases



1 Workhead.



2 Right-hand Tailstock.
2A T-Bolt for Tailstock.



3 Left-hand Tailstock
with Clearance Setting Dial.
3A T-Bolt for Tailstock.



4 T-Bolts for
Workhead.



7B Micrometer Tooth
Rest Support with
Round Top Blade
(Item Nos. 7, 7A
and 7B constitute
Universal Tooth
Rest Plate).



5 Draw-in Bolt
and Washer.



6 Ejector Rod.



7 Extension Plate,
Eye Bolt and
Ring.



7A Blade Holder
Extension.



8 Offset Blade.
8A Plain Tooth
Rest Holder.



9 Plain Tooth
Rest Plate.



10 Nut for Attaching
Plain Tooth Rest
Plate to Universal
Tooth Rest.

10A Screw for Item 10.



11 Wheel Spindle
Extension, 2"
Long for
1/4" diameter
hole wheels.



12 *Work Center
for Workhead
Spindle.



13 *Reducing Collet—
12 to 9 B. & S. or
5 to 3 Morse Taper.

ACCESSORY ITEMS

supplied with plain and universal machines



14 *Reducing Collet—
12 to 7 B. & S. or
5 to 2 Morse Taper.



15 *Reducing Collet—
12 to 10 B. & S. or
5 to 4 Morse Taper.



16 Clearance
Angle Setting
Dog.



17 Center Gage.



18 Wrench for
Socket Head
Screw.



19 T-Wrench
for Grinding
Wheel Collet
Lock Screw.



20 Two Pin
Wrenches.



21 Collet Wrench.



22 Wheel Guard
for Wheel Print
No. 11Y-120.



23 Wheel Guard
for Wheel Print
No. 6Y-112.



24 Diamond Bracket.



25 Diamond Holder
with Diamond.



26 Double End Wrench
(1/8" and 9/16" Openings).



27 Short Holder
for Wheel Guard.



28 Wheel Guard for Wheel
Print Nos. 12Y-155
(6" x 3/4" x 1 1/4" hole),
1Y (6" x 1/2" x 1 1/4" hole)
and 1Y (6" x 1/8" x 1 1/4" hole).



29 Grinding Wheel
and Collet
Assembly. Wheel
Print No. 11Y-120
(3 1/2" x 1 1/2" x 1 1/4"
hole) Flaring Cup.



30 Grinding Wheel
and Collet
Assembly. Wheel
Print No. 6Y-112
(5" x 1 1/2" x 1 1/4"
hole) Straight Cup.



31 Grinding Wheel
and Collet
Assembly. Wheel
Print No. 1Y
(6" x 1/8" x 1 1/4"
hole) Straight.



32 Grinding Wheel
and Collet
Assembly. Wheel
Print No. 1Y
(6" x 1/2" x 1 1/4"
hole) Straight.



33 Grinding Wheel
and Collet
Assembly. Wheel
Print No. 12Y-155
(6" x 3/4" x 1 1/4"
hole) Dished.

NOTES—*(1) Your selection of taper hole in workhead spindle governs which set of reducing collets and work center are supplied. Collets, Key Nos. 13, 14, and 15 are interchangeable with the Standard Workhead. (2) Replacement wheels can be ordered through the Products Division of The Cincinnati Milling Machine Company.

convenience of operation

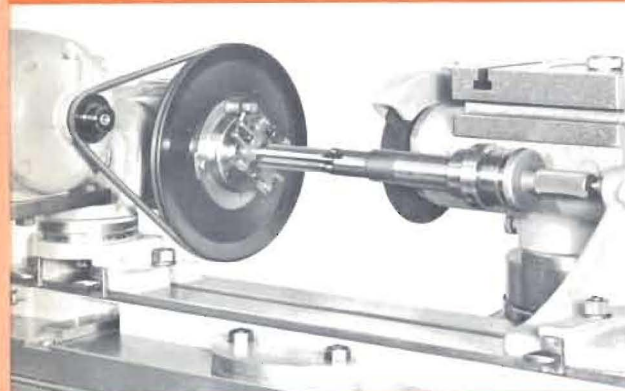
ACCESSORY ITEMS

supplied with universal machines only



The equipment supplied with Universal Machines consists of all items shown on page 44 plus the standard attachments shown here.

Surface Grinding Attachment—includes vise, intermediate support, two tee bolts and base plate. Code Name—SURAT.



Cylindrical Grinding Attachment—includes 4" 3-jaw universal chuck with 2 sets of non-reversible jaws, internal and external; chuck adapter; chuck wrench; vee belt; plate and screws for motor base; pulley fitted with two clamps, collar, and dog; universal grinding dog; and complete electrical equipment—see page 46. No. 12 B & S or No. 5 Morse depending upon workhead spindle bore. Code Name—CYLAT.



Internal Grinding Attachment—includes intermediate support; grinding wheel spindle housing fitted with spindle; two removable quills, one for $\frac{1}{4}$ ", one for $\frac{3}{8}$ " diameter hole grinding wheels; three straight internal grinding wheels; sizes, 1", $\frac{3}{4}$ ", $\frac{5}{8}$ " diameter x $\frac{1}{2}$ " long; pulley for wheel spindle; power grip belt; belt guard; brace; tee bolt; nut and washer. Can be used on either end of grinding wheel spindle and is generally used with the Cylindrical Grinding Attachment. Code Name—YUWBW.



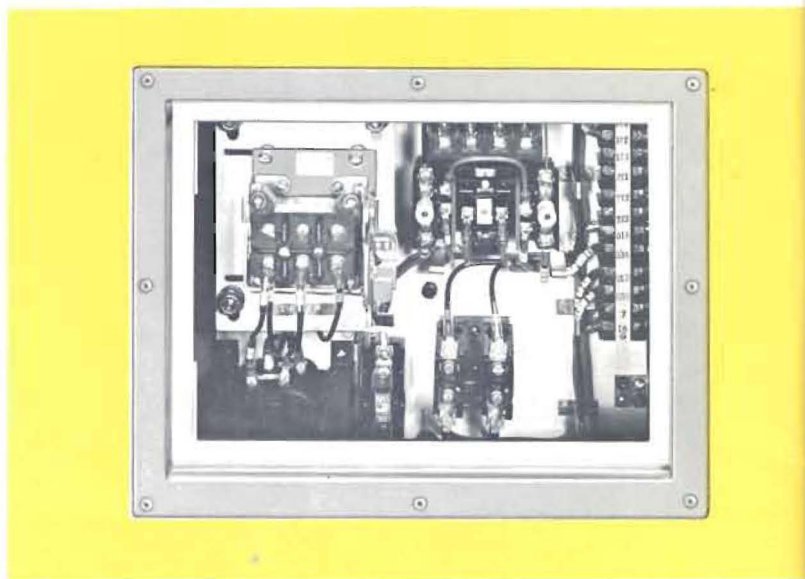
Gear Cutter Sharpening Attachment—includes gage; pawl; two tee bolts and five cutter bushings (English or Metric). Code Name—GERAT.

ENGLISH	METRIC
1" O.D. x $\frac{1}{8}$ " Bore	27 mm. O.D. x 22 mm. Bore
1 $\frac{1}{4}$ " O.D. x $\frac{1}{8}$ " Bore	32 mm. O.D. x 22 mm. Bore
1 $\frac{1}{2}$ " O.D. x $\frac{1}{8}$ " Bore	40 mm. O.D. x 22 mm. Bore
1 $\frac{3}{4}$ " O.D. x $\frac{1}{8}$ " Bore	45 mm. O.D. x 22 mm. Bore
2" O.D. x $\frac{1}{8}$ " Bore	50 mm. O.D. x 22 mm. Bore

enclosed, safe and
within easy reach

ELECTRICS SUPPLIED— plain and universal machines

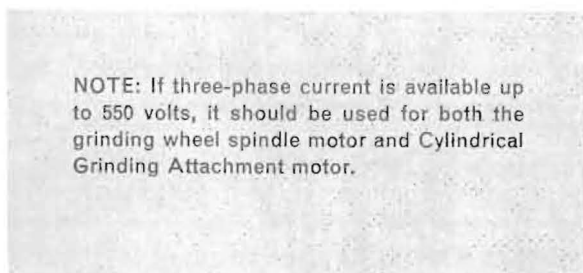
1. Grinding Wheel Spindle Motor: 1 hp totally enclosed ball bearing motor in precision dynamic balance; 220 to 550 volts, 50 or 60 cycle A.C.
2. Magnetic starter for above motor provides overload and under-voltage protection.
3. Disconnect switch built-in and mechanically interlocked with the electrical compartment door.
4. Complete electrical wiring in accordance with Machine Tool Electrical Standards.



Electrical controls are built into the base at the front of the machine. Current automatically shuts off when compartment door is opened.

universal machines (only)

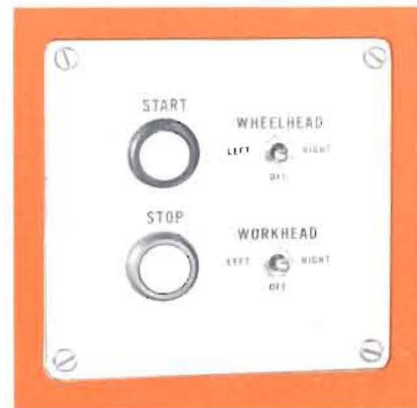
1. Cylindrical Grinding Attachment Motor: $\frac{1}{4}$ hp totally enclosed sleeve bearing; 220 to 550 volts, 50 to 60 cycle A.C.
2. Magnetic starter for above motor provides overload and under-voltage protection. Includes electrical outlet and reversing drum switch for the Cylindrical Grinding Attachment.



NOTE: If three-phase current is available up to 550 volts, it should be used for both the grinding wheel spindle motor and Cylindrical Grinding Attachment motor.



Built-in push buttons are located on both the right (shown below) and left (shown at left) sides of the base, easily within the reach of the operator.



main drive motor and grinding wheel speed data

(Small step of motor pulley is used with 6" wheel, large step with $3\frac{1}{2}$ " wheel)

MAIN DRIVE MOTOR			6" DIAMETER GRINDING WHEEL		3½" DIAMETER GRINDING WHEEL	
Rating	Cycle	Speed rpm	Speed rpm	Surface Speed fpm	Speed rpm	Surface Speed fpm
1 HP	60	3600	3890	6110	6530	5985
AC	50	3000	3240	5090	5440	4995

optional accessories

not included in price of standard (basic) machine

plain machine only. . .

1. Cylindrical Grinding Attachment—includes 4" 3-jaw universal chuck with 2 sets of non-reversible jaws, internal and external; chuck adapter; chuck wrench; vee belt; plate and screws for motor base; pulley fitted with two clamps, collar, and dog; universal grinding dog; and complete electrical equipment—see page 46. Specify taper in workhead spindle (12 B & S or No. 5 Morse). Code Name—CYLAT.
2. Surface Grinding Attachment—includes vise, intermediate support, two tee bolts, and base plate. Code Name—SURAT.
(a) For additional intermediate support for this attachment see Item 36.
3. Internal Grinding Attachment—generally used with the Cylindrical Grinding Attachment—Item 1, above. Code Name—YUWBW.
4. Gear Cutter Sharpening Attachment—for grinding straight or staggered tooth gear cutters. Includes five bushings; specify English or Metric (1", 1¼", 1½", 1¾" and 2"; or 27, 32, 40, 45, and 50 mm O.D.). Code Name—GERAT.

plain or universal machines

1. No. 1 Radius Grinding Attachment. Capacity —0" to 2" radii and 4" maximum cutter diameter. Attachment spindle has No. 12 B & S or No. 5 Morse Taper. Specify which taper is desired at time order is placed. Code Name—RAATT.
Additional Equipment for doing straight and cylindrical grinding.
(a) Motor Drive Equipment, complete. Specify current characteristics. Code Name—MOQUS.
(b) Basic parts required for grinding straight shank cutters when either item "c" or "d" is purchased. Code Name—BAPAR.
(c) Sleeve for Grinding Large Straight Shank Cutters—Item "b" above must also be purchased.
Capacity:
¾" and ⅞" diam. shanks. Code Name—SLESH.
1" and 1¼" diam. shanks. Code Name—SLECU.

(d) Sleeve and Draw-in Bolt for Draw-in Collets—Item "b" must also be purchased. See item "e" below for collets. Code Name—SLEBO.

(e) Draw-in Collets for Grinding Small Straight Shank Cutters. Sizes, ⅛", 3/16", ¼", 5/16", ⅜", 7/16", ½", 9/16", and 5/8".

(f) Collets for Grinding Taper Shank Cutters, mount into attachment spindle. Specify taper in attachment spindle. (No. 12 B & S or No. 5 Morse).

Outside Taper	Inside Taper
No. 12 B & S	Nos. 4 to 11 B & S
No. 12 B & S	Nos. 1 to 4 Morse
No. 5 Morse	Nos. 4 to 11 B & S
No. 5 Morse	Nos. 1 to 4 Morse

2. No. 2 Radius Grinding Attachment. Capacity 0" to 1" radii and 0" to 12" maximum cutter diameter with 3" maximum width of face. Attachment includes swivel housing, swivel table, top plate, workhead support, micrometer locating gage, grinding wheel Print No. 1Y, (8" diam. x ⅜" face x 1¼" hole), wheel pulley, wheel collet assembly, and wheel guard. Code Name—RAGAT.

The following parts are included with the standard machine equipment, and therefore are not included when supplying the attachment; workhead spindle housing, draw-in bolt, and three reducing collets. If face mills are to be ground it will be necessary to purchase a Face Mill Adapter, Item 29.

3. Long Reamer Grinding Attachment. Capacity —6" diam., 34" between centers. Code Name—TENEX.
4. Face Mill Grinding Attachment. Capacity—18" diam. cutters. Includes motor pulleys, wheelguard and collet assembly for 8" diam. wheel. Code Name—RIFZ.
(a) Adapter Plate, 8" diameter with 5⅞" bore. Used for grinding face milling cutters. Code Name—ADPLA.
(b) Adapter Bushing, 2" O.D. with 1½" bore. Code Name—ADTOO.
(c) Adapter Bushing, 2½" O.D. with 1½" bore. Code Name—ADBUS.

5. Indexing Attachment for Workhead—includes one 24-notched index plate. Extra Index Plates—specify number of notches desired. Code Name—RECBC.

6. Micrometer Table Positioning Attachment—operated by an accurate lead screw. Code Name—RECBF.

optional accessories

7. Heavy Duty Tailstocks—16" swing, 19" between centers. Code Name—RECBA.
8. Attachment for Truing Radii and Angles Tangent to Radii—Diamond truing type. Range $\frac{1}{16}$ " to $\frac{1}{2}$ " concave, 0" to $\frac{1}{2}$ " convex.
Style A (Model "LL" Machines)—Code Name—RECCI.
Style B (Model "OM" Machines)—Code Name—YUWDE.
9. 2" Extended FILMATIC or ANTI-FRICTION Grinding Wheel Spindle.
10. 4" Extended ANTI-FRICTION Grinding Wheel Spindle.
11. Spindle Extension, 2" and 4" length. $1\frac{1}{4}$ " diameter at wheel section.
12. Grinding Wheel Collets and collet parts. Specify if collets are for 8" diam. wheels.
13. Wheel Pulley—for 8" diameter grinding wheels.
14. Wheel Guard—for 8" diameter grinding wheels. Code Name—NOSAB.
15. Standard Grinding Wheels without grinding wheel collet, wheel collet nut, wheel collet

- (d) Wheel Print No. 1Y straight—6" diam. x $\frac{1}{2}$ " x $1\frac{1}{4}$ " hole. Code Name—WHEIX.
- (e) Wheel Print No. 1Y straight—1" diam. x $\frac{1}{2}$ " x $\frac{3}{8}$ " hole. Code Name—LASSO.
- (f) Wheel Print No. 1Y straight—8" diam. x $\frac{3}{8}$ " x $1\frac{1}{4}$ " hole. Code Name—ATWHE.
- (g) Wheel Print No. 1Y straight—6" diam. x $\frac{1}{8}$ " x $1\frac{1}{4}$ " hole. Code Name—WHESI.
- (h) Wheel Print No. 1Y straight— $\frac{5}{8}$ " diam. x $\frac{1}{2}$ " x $\frac{1}{4}$ " hole. Code Name—WHENY.
- (i) Wheel Print No. 1Y straight—8" diam. x $\frac{1}{16}$ " x $1\frac{1}{4}$ " hole (used for cutting off tubing, etc.). Code Name—WHEZA.
- (j) Wheel Print No. 1Y straight— $\frac{3}{4}$ " diam. x $\frac{1}{2}$ " x $\frac{1}{4}$ " hole. Code Name—WHEAS.

Note: When ordering grinding wheels specify wheel print number and size. To duplicate previously purchased wheels, which through use have worn out, include also the old wheel marking.

16. Reducing Collets:
No. 12 B & S to Nos. 4 to 11 B & S (inclusive)
No. 12 B & S to Nos. 1 to 4 Morse (inclusive)
No. 5 Morse to Nos. 1 to 4 Morse (inclusive)
No. 5 Morse to No. 4 to 11 B & S (inclusive)
No. 50 Series to No. 40 Series (National Standard taper)

NO. 2 CUTTER AND TOOL GRINDER

lock washer, or spacing collar. Standard Plain Machine includes one set of wheels, consisting of a, b, c, d, and g below. Universal machine includes one set of wheels consisting of a, b, c, d, e, g, h and j below.

- (a) Wheel Print No. 12Y-155 dished—6" diam. x $\frac{3}{4}$ " x $1\frac{1}{4}$ " hole. Code Name—WEDIS.
- (b) Wheel Print No. 11Y-120 flaring cup— $3\frac{1}{2}$ " diam. x $1\frac{1}{2}$ " x $1\frac{1}{4}$ " hole. Code Name—WHECU.
- (c) Wheel Print No. 6Y-112 straight cup—5" diam. x $1\frac{1}{2}$ " x $1\frac{1}{4}$ " hole. Code Name—WEFIV.

Draw-in Bolt for 50 Series to 40 Series National Standard taper reducing collet.

17. Dust Exhaust System. Available for machines having 50 or 60 cycle current. Specify at time of order.
18. Draw-in Collet Attachment—specify 6H or 5C collets for 12 B & S or No. 5 Morse (See Item 19 for collets). Code Name—RECB D.
19. Straight Cylindrical Collets—6H or 5C collets for Draw-in Collet Attachment.
(a) Inch sizes from $\frac{1}{8}$ " to $1\frac{1}{8}$ " in increments of $\frac{1}{64}$ ".
(b) Decimal sizes from .125" to 1.125". Specify

exact size.

- (c) Metric sizes from 3 mm to 28 mm in increments of 1 mm.

20. Centerless Grinder Work Support Blade Grinding Attachment—for blades up to 1" thick and 16½" long. Code Name—ATBLA.

21. Spring Chuck and Spring Collets. Chuck mounts directly into workhead spindle. Provides a quick and accurate method of holding straight shank cutters. Collet range: ⅛", 3/16", ¼", 5/16", 3/8", 7/16", ½", 5/8", ¾", 7/8", 1".

22. Small End Mill Grinding Attachment—complete, including three of the following items: "a" or "b" (not both), "c," and "d" or "e" (not both). Code Name—SMETT.

- (a) Bar for End Mill Grinding Attachment with No. 7 B & S taper hole. Code Name—BEGA.

- (b) Bar for End Mill Grinding Attachment with No. 2 Morse taper hole. Code Name—BAGGA.

- (c) Collar for End Mill Grinding Attachment. Code Name—CEMRA.

- (d) Sleeve for End Mill Grinding Attachment, No. 12 B & S taper outside. Code Name—SLEMG.

- (e) Sleeve for End Mill Grinding Attachment No. 5 Morse taper outside. Code Name—SLEEG.

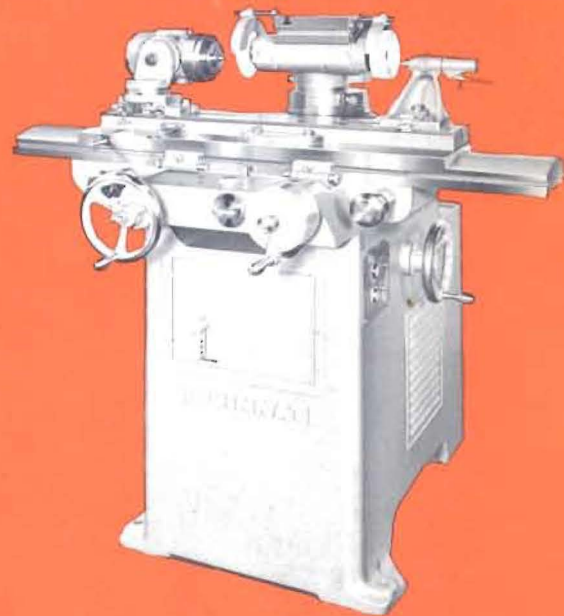
23. Saw Grinding Attachment (Face Chuck), complete. Code Name—FACHU.

The Saw Grinding Attachment consists of the following parts and they may be purchased separately as replacements.

- (a) Stem for Saw Grinding Attachment. Code Name—SAWAT.

- (b) Plate for Saw Grinding Attachment. Code Name—PLATA.

- (c) Bushing for Saw Grinding Attachment. Code Name—BUSGA.



24. Stud for Holding Saws and Side Milling Cutters. Code Name—STUHO.

Capacity: Side Milling Cutters— $\frac{5}{8}$ " maximum width with $\frac{7}{8}$ " hole. Saws— $\frac{3}{8}$ " maximum width with $\frac{7}{8}$ " or 1" hole. This attachment consists of the following parts and they may be purchased separately as replacements.

(a) Stud for Side Milling Cutters. Code Name—STUSC.

(b) Washer for Side Milling Cutters. Code Name—WAMCU.

(c) Collar for Saws. Code Name—COMCU.

25. Diamond Truing Rod—with diamond. Code Name—RECBH.

26. Tooth Rests:

(a) Universal Tooth Rest—complete assembly including plate and item "b".

(b) Micrometer Adjustable Blade Holder with two blades—for Universal Tooth Rest.

(c) Plain Tooth Rest—complete assembly including plate and item "d."

(d) Plain Blade Holder with offset blade for Plain Tooth Rest.

27. Tooth Rest Blades:

(a) Flat Top

(b) Round Top

(c) Off-Set (For Plain Tooth Rest Only).

28. Hand Rest. Code Name—HANRE.

29. Face Mill Adapter. For grinding face mills on either the standard Workhead or No. 2 Radius Grinding Attachment. Code Name—MILAD.

30. 4" 3-Jaw Universal Chuck. Mounts in standard workhead spindle. Includes two sets of non-

reversible jaws, internal and external. Chuck is fitted with No. 5 Morse or No. 12 B & S taper shank only. Specify which taper desired. (Standard Equipment on Universal Machines). Code Name—CHUGG.

31. 4" 4-Jaw Independent Chuck. Mounts in standard workhead spindle. Reversible jaws. Specify taper hole in spindle (12 B & S or 5 Morse). Code Name—RECB1.

32. Raising Block, 2" used with Workhead, Surface Grinding Attachment and Face Mill Grinding Attachment—includes long tee bolts. Code Name—RABLO.

33. Belt, Main Drive. Code Name—NOBEL.

34. Wrenches

(a) Double end— $\frac{7}{8}$ " and $\frac{9}{16}$ " opening.

(b) Collet nut wrench.

(c) T-wrench for wheel collet lock screw.

35. Cutter Sharpening Arbors—includes set of collars and nut:

(a) $\frac{7}{8}$ " diam. x $8\frac{3}{16}$ " usable cutter length.

(b) 1" diam. x $8\frac{3}{16}$ " usable cutter length.

(c) $1\frac{1}{4}$ " diam. x $8\frac{3}{4}$ " usable cutter length.

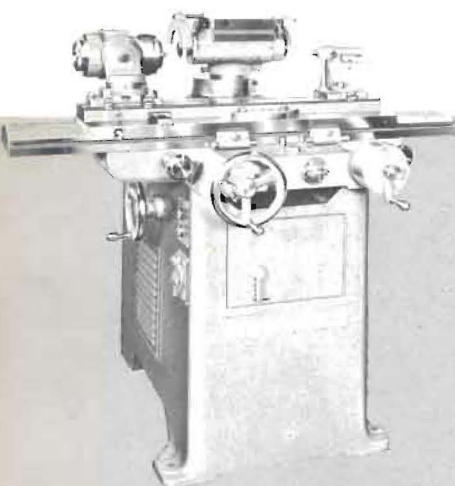
(d) $1\frac{1}{2}$ " diam. x $8\frac{3}{4}$ " usable cutter length.

(e) 2" diam. x $8\frac{3}{4}$ " usable cutter length.

36. Intermediate Support for Vise Body—includes bolt and washer. Code Name—RECBK.

37. Precision Motorized Tilting Wheelhead—available in two styles: Standard Length Double End Anti-Friction Spindle. Code Name—RECFA.

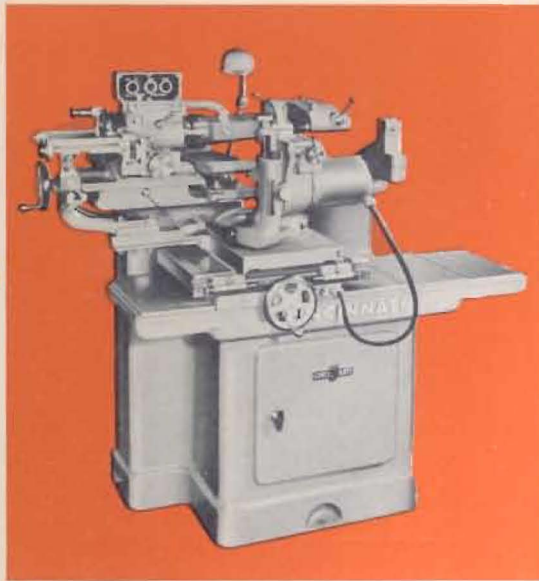
Double End 4" Extended Anti-Friction Spindle. Code Name—RECHB.



MILLING MACHINE DIVISION

THE CINCINNATI MILLING MACHINE CO., Cincinnati 9, Ohio, U. S. A.

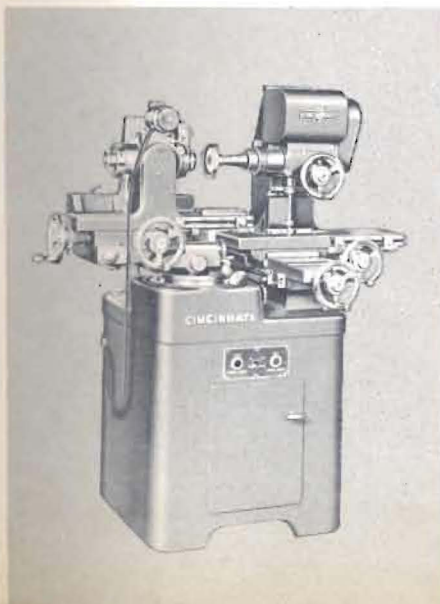
complementary machines



Contour Cutter Sharpening Machine

Form milling cutters can be sharpened on the periphery of the cutting edge by following the profile of the master template on the Contour Cutter Sharpening Machine.

To fulfill your cutter and tool grinding requirements, CINCINNATI offers a complete line of cutter and tool grinding machines. These machines offer desirable flexibility in grinding and reconditioning a wide variety of cutting tools, and in handling related diversified tool-room grinding operations.



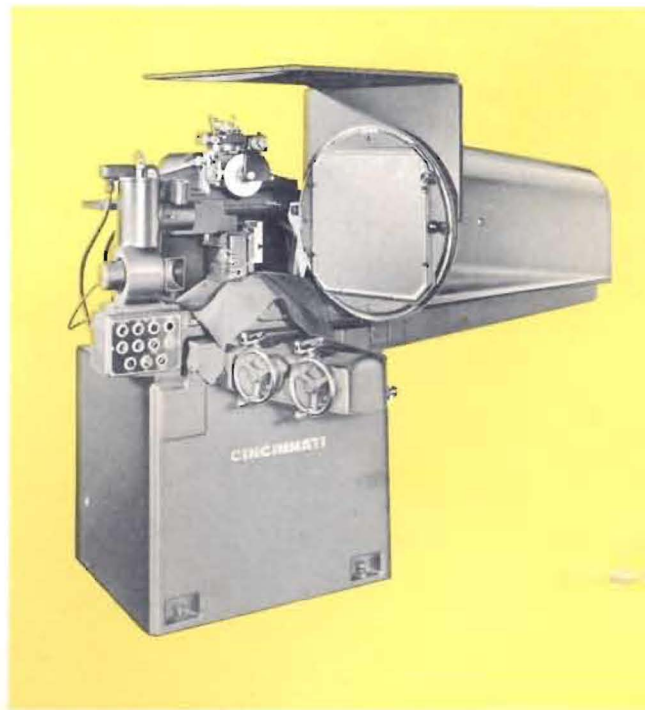
Monoset Cutter and Tool Grinder

Sharpening, repairing and making small cutters including those required for die sinking are operations best handled on the Monoset Cutter and Tool Grinder.



No. 1 Cutter and Tool Grinder

Miscellaneous small tools and cutters can be sharpened and reconditioned efficiently on the smaller No. 1 Cutter and Tool Grinder.



Projecto-Form Grinding Machine

Small accurate profile shapes on flat form cutters, lamination die parts and similar components can be effectively ground on Projecto-Form Grinding Machines.



MILLING MACHINE DIVISION

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9 OHIO



HORIZONTAL
KNEE & COLUMN



VERTICAL
KNEE & COLUMN

MILLING MACHINES



HORIZONTAL &
VERTICAL BED TYPE



RISE & FALL AND
TRACER CON-
TROLLED BED TYPE

Products of the Milling Machine Division of The Cincinnati Milling Machine Co. are listed and symbolized here.

Products of The Cincinnati Milling Machine Co.'s other divisions include a complete line of centertype grinding machines, centerless grinding machines, roll grinding machines, surface grinding machines, chucking grinding machines, micro-centric grinding machines, special grinding machines, heat treating machines, metal forming machines, broaching machines, special machine tools and complete production lines, special machinery, cutting fluids and precision grinding wheels.

DIE SINKING MACHINES



VERTICAL



HORIZONTAL

CUTTER SHARPENING MACHINES



NOS. 1 & 2
MONOSET



CONTOUR-
OPTICAL