

CINCINNATI MONOSET CUTTER and TOOL GRINDER

**THE CINCINNATI
MILLING MACHINE COMPANY • CINCINNATI 9, OHIO, U. S. A.**

Copyright 1947—The Cincinnati Milling Machine Co.

Publication No. M-1591-1

The **MONOSET** reconditions old cutters . . . or grinds new ones from the **SOLID**

The CINCINNATI Monoset Cutter and Tool Grinder is particularly useful for quickly preparing special cutters when needed.

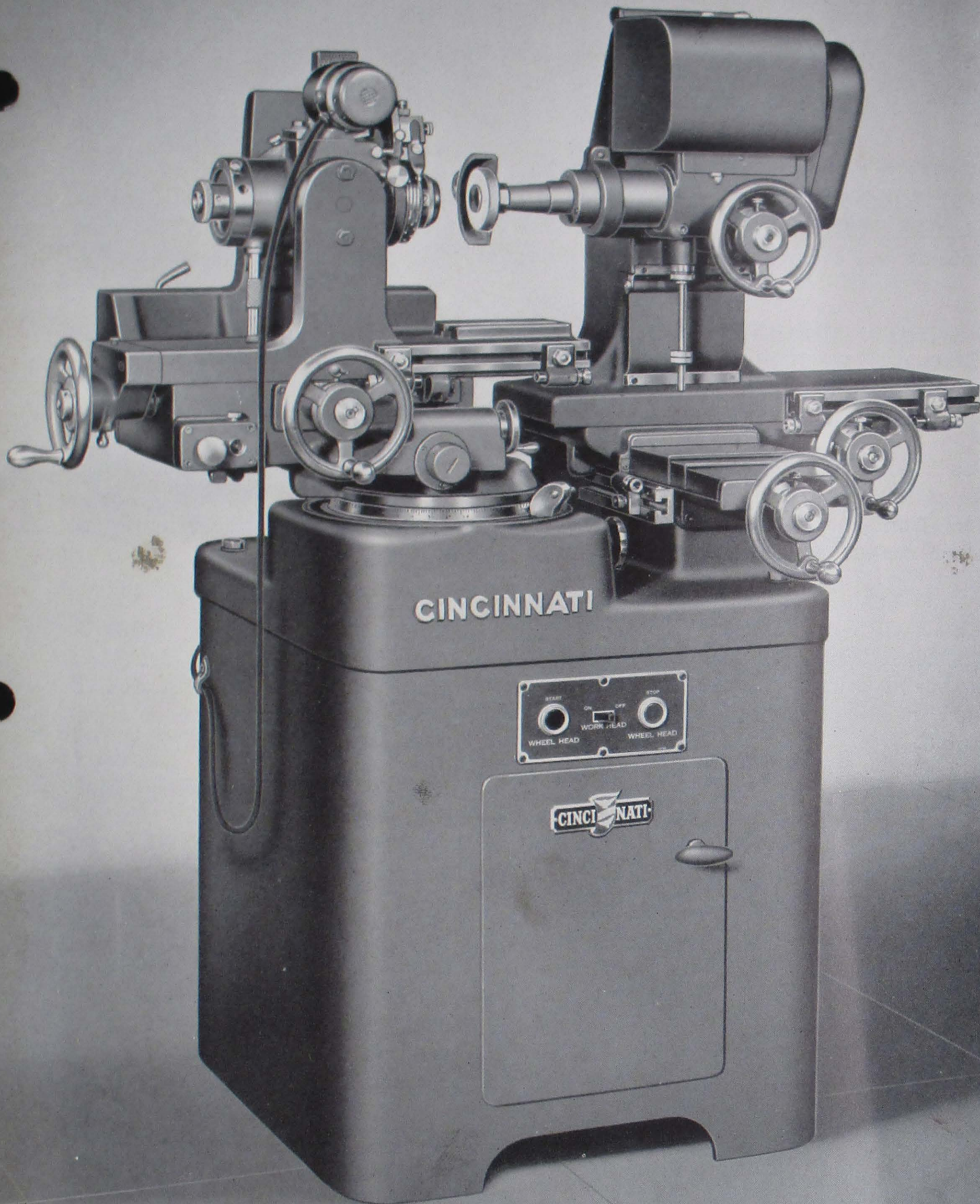
While the Monoset may be used for conventional resharpener its many built-in features eliminate the need for special attachments and make it particularly adaptable to the production of difficult "trick" or "problem" cutters and the reclamation or salvaging of worn-out cutters. All types of cutters within the range of the machine—end mills, reamers, counterbores, form cutters, etc., having straight, tapered, or spiral teeth, and involving convex or concave radii—can usually be resharpener, or even ground from the solid if necessary without the need for special attachments.

As the name "MONOSET" implies, all operations necessary in the production of most types of cutters can generally be performed with a single setting or chucking of the workpiece. This assures excellent concentricity and provides smooth cutting qualities by having all teeth carry an equal share of the cut.

A few of the outstanding features which combine to give the Monoset Cutter and Tool Grinder its unusual degree of flexibility and versatility are:

- Automatic generation of infinitely variable spiral leads.
- Workhead swivel mount for generating accurate radii.
- Micrometer dials and stops for all slides.
- Simple, accurate indexing devices.
- Wheelhead adjustable in three planes.
- Workhead motor drive for cylindrical grinding.

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.

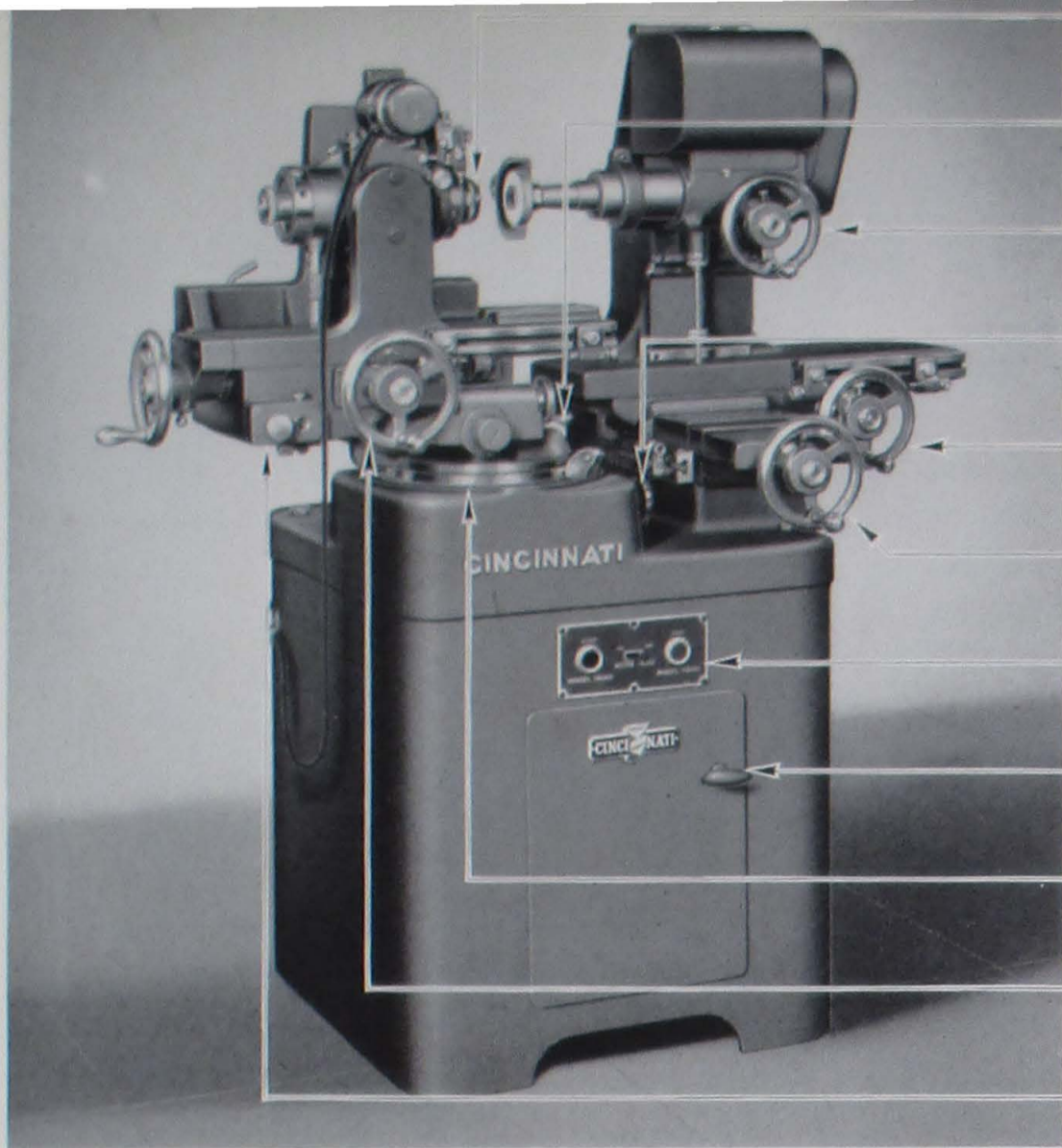


MONOSET CUTTER AND TOOL GRINDER

HIGHLIGHTS OF DESIGN and Accruing Benefits

- 1. FLEXIBILITY OF MACHINE ENABLES MOST JOBS TO BE PERFORMED WITH SINGLE CHUCKING**—eliminates multiple set-ups and assures excellent concentricity.
- 2. WORKHEAD MOUNTED ON A LARGE, SMOOTH ACTION TURNTABLE BASE**—permits swiveling the workhead through 235 degrees in a horizontal plane.
- 3. OFFSET SLIDE FOR WORKHEAD SPINDLE**—permits centerline of spindle to be offset from center of turntable for generation of convex or concave radii on workpiece.
- 4. BUILT-IN SPIRAL LEAD MECHANISM**—generates straight or tapered, right-hand or left-hand, infinitely variable spirals with a single simple adjustment; no change gears required.
- 5. SIMPLE, EASY ACTION INDEXING MECHANISM**—simplifies set-ups and indexings from tooth to tooth.
- 6. ONE-SHOT LUBRICATION SYSTEMS FOR BOTH WHEELHEAD AND WORKHEAD UNITS**—provides efficient, simplified lubrication for all points except workhead and wheelhead spindles.
- 7. THE WHEELHEAD UNIT IS CARRIED ON THREE SLIDING MEMBERS, PERMITTING LONGITUDINAL, TRANSVERSE, OR VERTICAL ADJUSTMENT**—wheel may be adjusted toward the work, or the work toward the wheel, whichever is more convenient.
- 8. ALL SLIDES EQUIPPED WITH GRADUATED DIALS OR ADJUSTABLE MICROMETER STOPS**—greatly simplifies accurate positioning of the sliding elements.
- 9. ALL CONTROLS CONVENIENTLY GROUPED WITHIN EASY REACH OF THE OPERATOR**—reduces operator fatigue.
- 10. ALL OPERATING MECHANISMS ARE FULLY ENCLOSED TO PREVENT ENTRANCE OF DIRT OR GRIT**—helps reduce maintenance and increase the useful life of the machine.
- 11. CONVENIENT, EASILY READ CLEARANCE ANGLE SCALES, GRADUATED IN DEGREES, ON BOTH VERTICAL AND TRANSVERSE WHEELHEAD SLIDES**—simplifies the selection of clearance or “back-off” angles.
- 12. WORKHEAD MAIN SLIDE MAY BE OPERATED FROM EITHER FRONT OR LEFT END**—operator may select the control most convenient for him.
- 13. MOTOR DRIVE FOR WORKHEAD SPINDLE**—for form and cylindrical grinding.
- 14. INTERNAL GRINDING ATTACHMENT, AVAILABLE AT EXTRA COST**—greatly increases the scope and usefulness of the machine.
- 15. BUILT-IN TOOL COMPARTMENT IN BASE**—an added convenience in keeping tools, collets, wheels, etc., within arm's reach of working position.





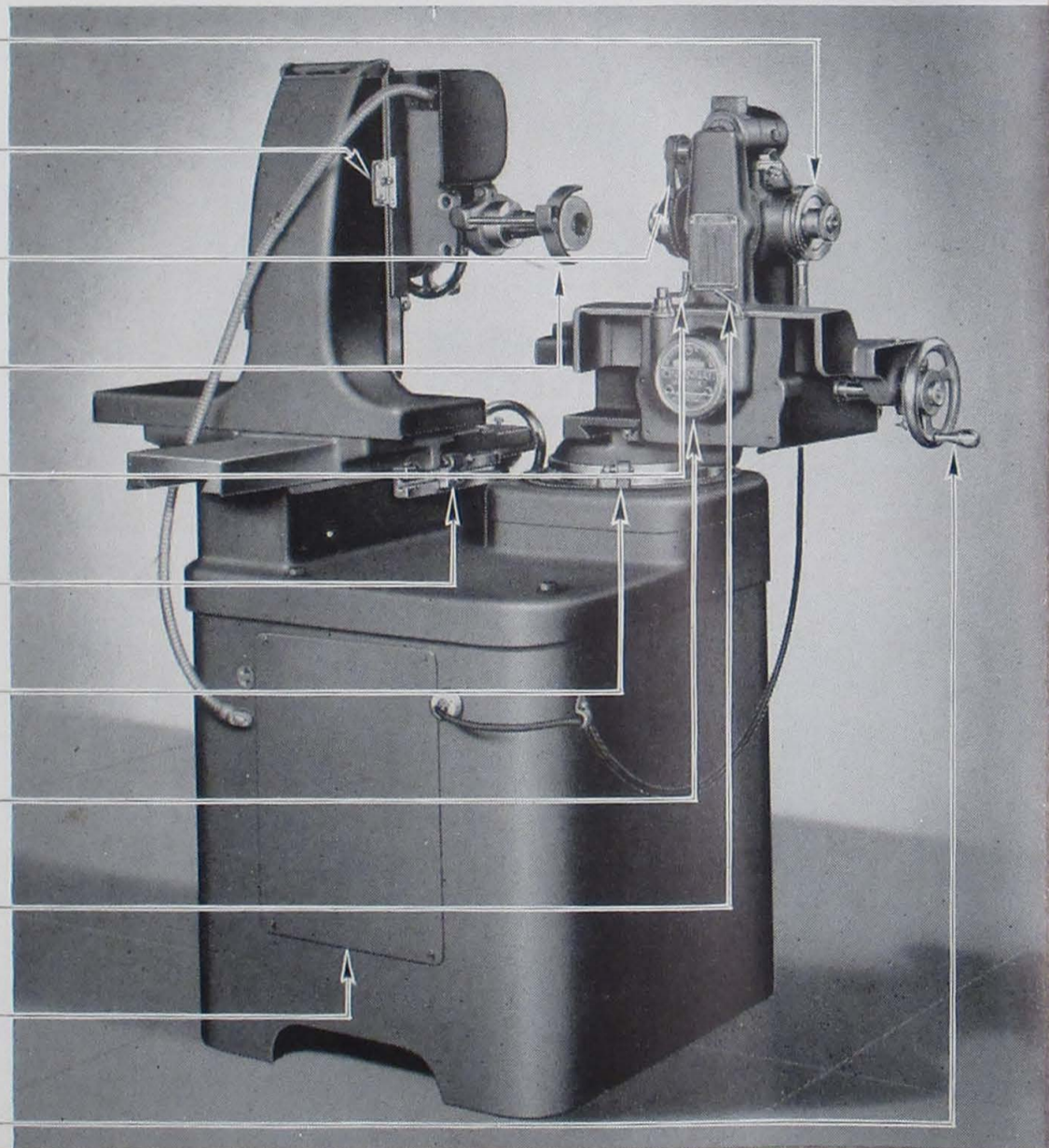
- RATCHET TYPE INDEX MECHANISM
- OFFSET SLIDE MICROMETER KNOB
- VERTICAL SLIDE HANDWHEEL
- WORKHEAD SWIVEL CLAMPING KNOB
- LONGITUDINAL SLIDE HANDWHEEL
- TRANSVERSE SLIDE HANDWHEEL
- MOTOR CONTROL SWITCHES
- TOOL COMPARTMENT IN BASE
- GRADUATED WORKHEAD SWIVEL BASE
- MAIN SLIDE HANDWHEEL
- OIL SHOT LUBRICATING SYSTEM

Front View of Machine

AN INDEX TO OPERATING CONTROLS AND CONSTRUCTION DETAILS

Rear View of Machine

- SPIRAL MECHANISM INDEXING DEVICE
- CLEARANCE ANGLE SCALE
- WORKHEAD SPINDLE MOTOR DRIVE
- ADJUSTABLE WHEEL GUARD
- SPIRAL MECHANISM ADJUSTING CRANK
- TRANSVERSE SLIDE MICROMETER STOP
- ADJUSTABLE SWIVEL STOP
- SPIRAL MECHANISM SELECTOR DIAL
- SPIRAL MECHANISM CLAMPING LEVER
- ELECTRICAL CONTROL PANEL
- MAIN SLIDE HANDWHEEL



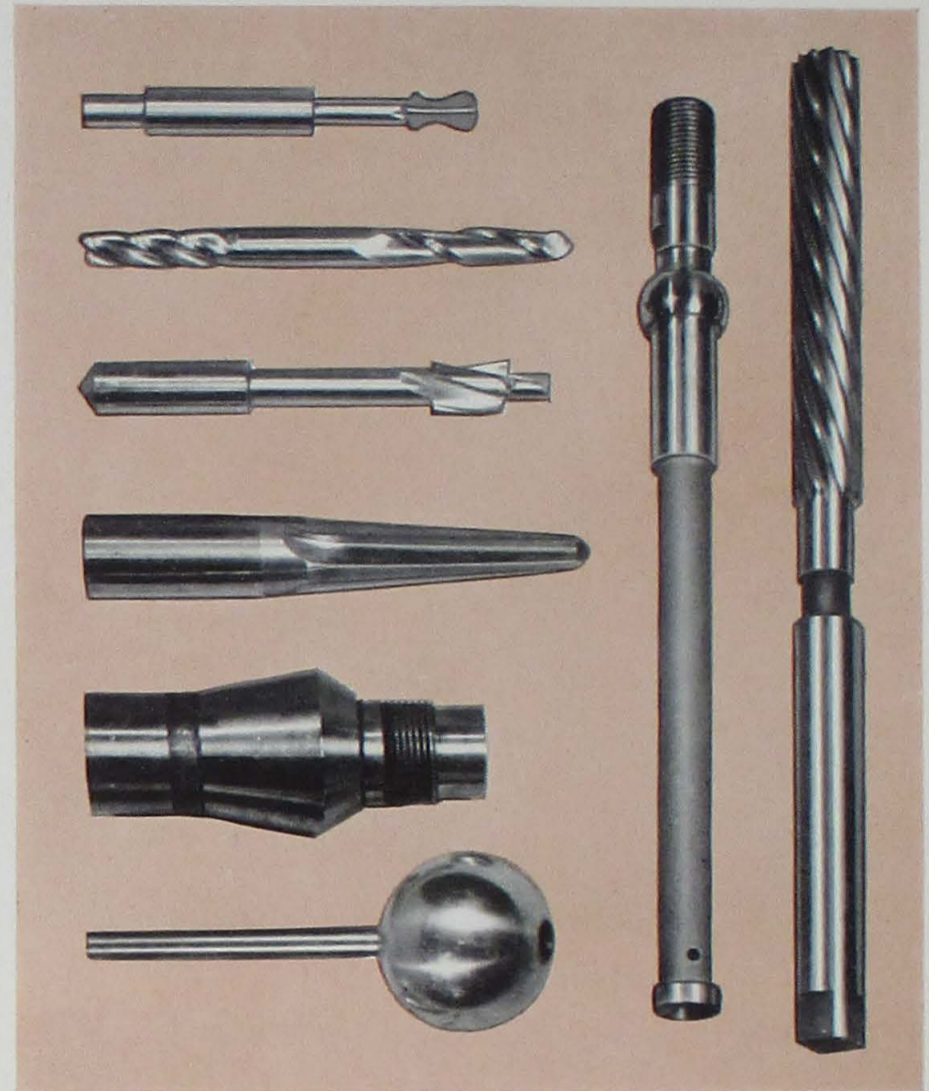
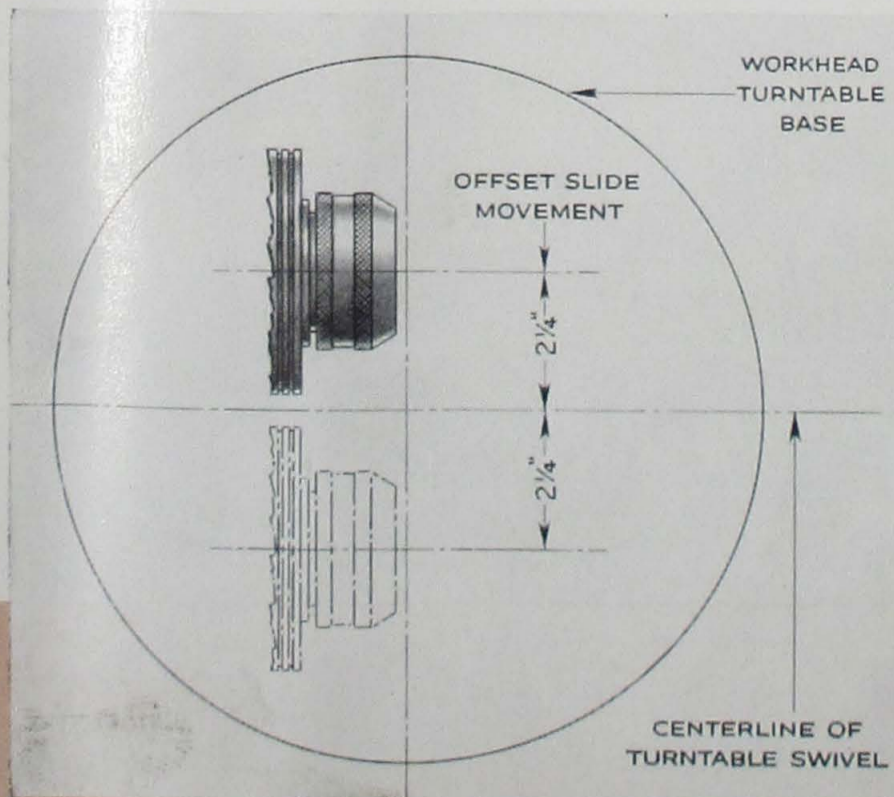
MONOSET CUTTER AND TOOL GRINDER

COMPLEX SHAPES ACCURATELY GENERATED

Accurately shaped form cutters and cylindrical parts of complex shape involving convex or concave radii are easily generated on the CINCINNATI Monoset Cutter and Tool Grinder. This is made possible by the unique swivel mounting of the workhead unit. Carried on a large, smooth acting, anti-friction bearing turntable base, the workhead may be swiveled 235 degrees in a horizontal plane.

An offset slide movement carried by the swivel base permits the workhead spindle centerline to be displaced $2\frac{1}{4}$ " on either side of the centerline of the turntable swivel. By displacing the workhead centerline in relation to the centerline of workhead swivel it is possible to generate convex or concave radii as shown on opposite page. The offset slide adjusting knob is provided with a micrometer dial, graduated in increments of .0001", thereby making it possible to locate the center of the radius with extreme accuracy.

Concave or convex radii are generated with the workhead swivel in much the same manner as drawing an arc with a compass; the axis of the workhead swivel representing the center point and the grinding face of the wheel representing the pencil point. Advancing or retracting the grinding wheel varies the arc generated



A few examples of the difficult shapes which are easily ground on the CINCINNATI Monoset Cutter and Tool Grinder—many from the solid.

in the same fashion that opening or closing the compass affects the size of the circle.

The swivel base is provided with adjustable stop dogs to accurately limit the arc of travel, and a clamping knob to lock the workhead swivel securely in any position.

Since the grinding wheel truing device is carried on the main workhead slide, the workhead swivel movement proves useful for accurately truing the grinding wheel to profile shapes. Angular, beveled, convex or concave radii and combinations of these shapes may readily be trued into the wheel face.

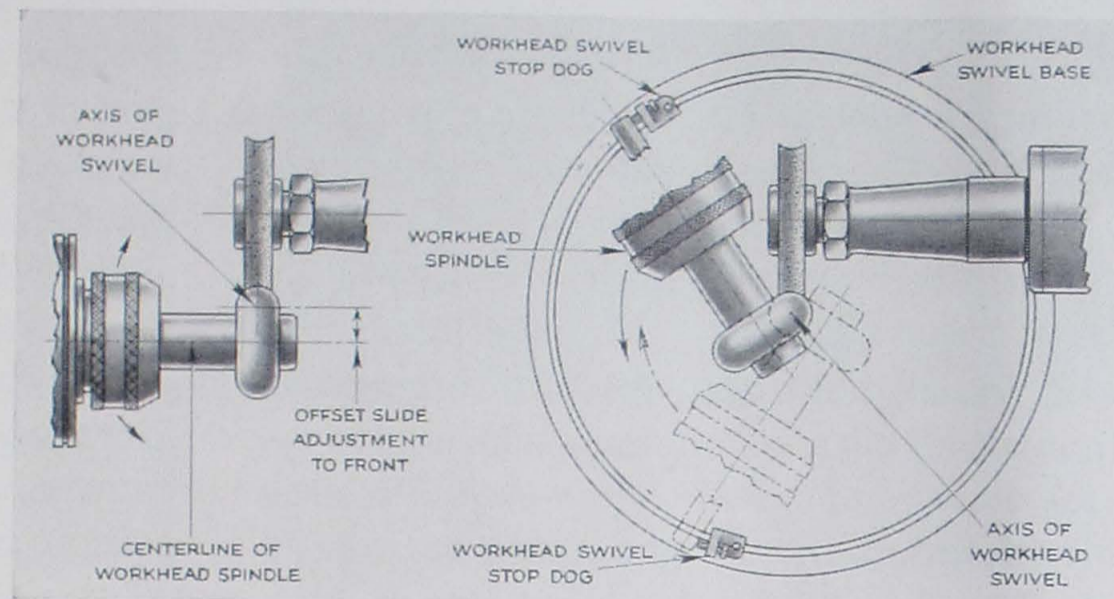
The workhead spindle housing is carried in a swivel-type mounting on main slide to permit angular positioning of spindle in a vertical plane. This feature is extremely useful when grinding shapes involving tapers, angles, bevels, etc.

The offset slide permits the centerline of the workhead spindle to be displaced a maximum of $2\frac{1}{4}$ " either side of the vertical axis of work head swivel.

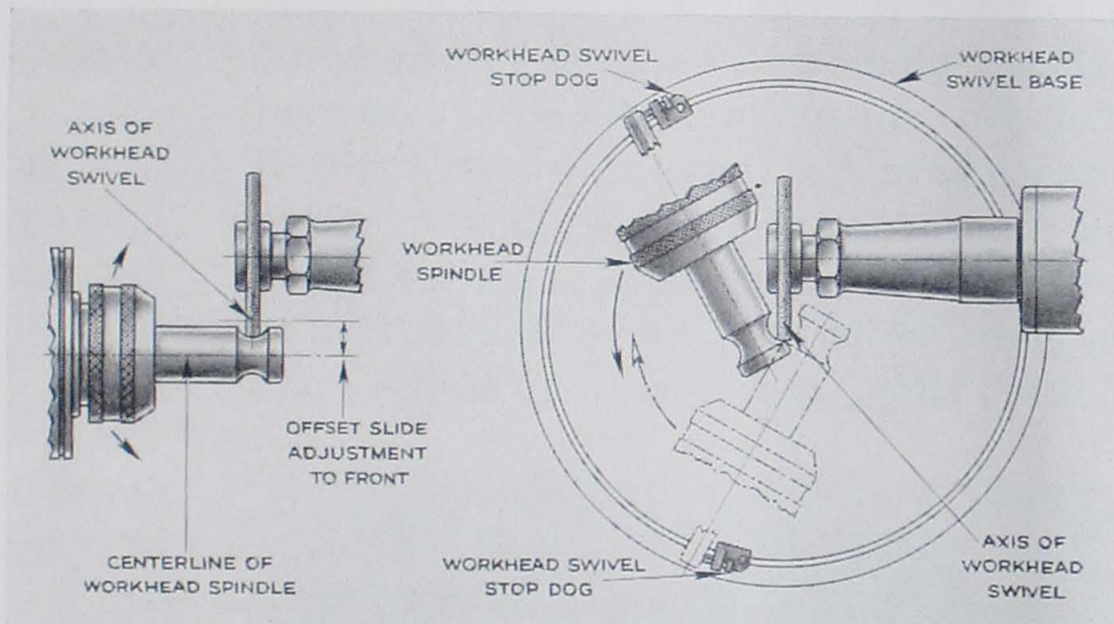
GENERATION OF CONCAVE OR CONVEX RADII

Extremely Useful for Generating Special Form Tools

Workhead turntable base provides a swiveling movement useful for generating radii on the work. Center of radius to be generated lies on axis of swivel. Here offset slide has been shifted forward to locate the center of radius in the desired position. Adjustable stop dogs accurately limit swivel movement of the workhead.

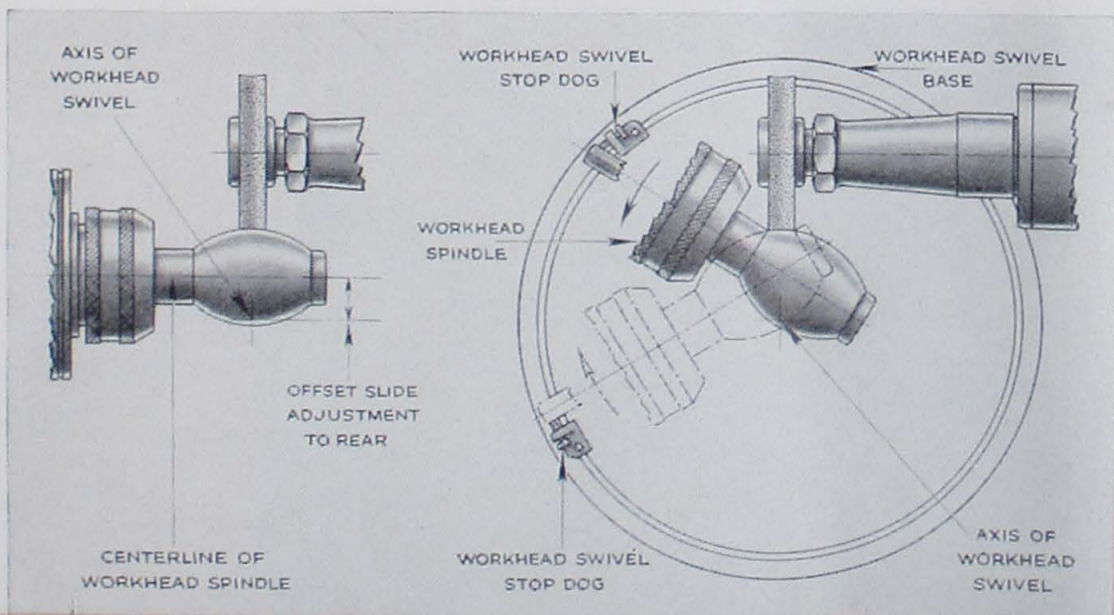


Position of grinding wheel governs shape of radius. Grinding wheel behind axis of swivel generates convex radius; grinding wheel in front of axis generates concave radius. In this illustration, axis of swivel is located in same position as above, but forward position of grinding wheel generates concave radius in workpiece.



Here location of center of radius on axis of swivel necessitates shifting offset slide to the rear.

Distance between grinding wheel face and axis of swivel determines size of radius generated. The swivel movement permits a matching radius to be trued in the wheel face if necessary.



MONOSET CUTTER AND TOOL GRINDER

SIMPLIFIED GENERATION OF ACCURATE SPIRALS . . .

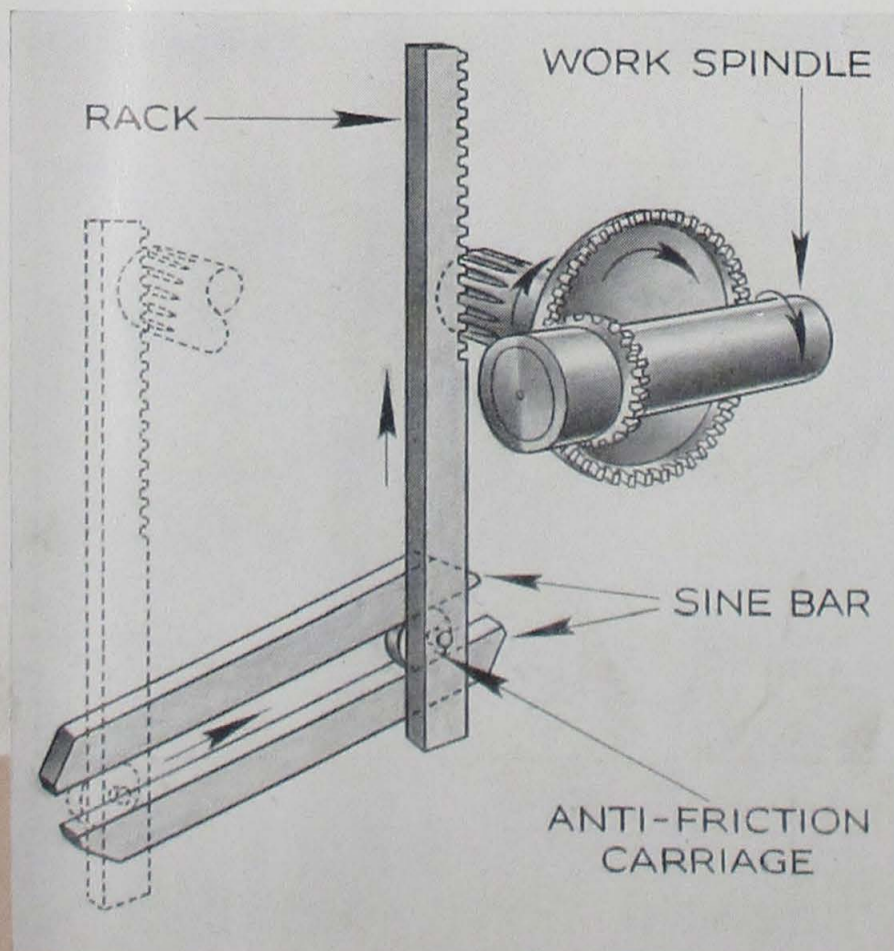
Accurate right-hand or left-hand spirals are quickly and easily generated by means of a built-in spiral lead mechanism. This feature will prove extremely useful, whether you are fabricating a special cutter or reconditioning a worn one. Spirals are selected without recourse to complicated systems of change gears; infinitely variable spiral leads, over the range of the mechanism, are quickly selected by worm and wheel adjustment of a sine bar mechanism. This mechanism, which acts to rotate the workhead spindle when the main slide is shifted, automatically generates an infinite range of spirals having leads as low as $1\frac{13}{16}$ ".

The sine bar mechanism is connected to the workhead spindle by a rack, pinion and bevel gear drive. An anti-friction carriage, carried on the lower end of the rack, travels between a pair of hardened steel strips which constitute the sine bar. Since the rack is carried by the main slide, while the sine bar is mounted in the offset slide, any movement of the main

slide causes the carriage to move along between the guiding strips of the sine bar. If the sine bar is adjusted to an angular position, the motion of the carriage between the tilted guides causes the rack to move vertically, which in turn causes rotation of the workhead spindle. With the sine bar in the horizontal position no rotation of the spindle will occur when the main slide is shifted. As the angular tilt of the sine bar is increased, the increased vertical movement of the rack causes greater rotation of the workhead spindle and consequently shorter spiral leads. At the 45° maximum angular position of the sine bar we obtain the minimum lead of $1\frac{13}{16}$ ", the shortest lead obtainable with the standard machine.

Angular positioning of the sine bar is extremely accurate, the worm and wheel adjusting mechanism being provided with a dial graduated in increments of 2 minutes.

The workhead spindle may be accurately indexed in relation to the spiral lead mechanism by means of a quick acting indexing mechanism which acts as the connecting member between the two and permits instant engagement or disengagement of the spiral lead mechanism.



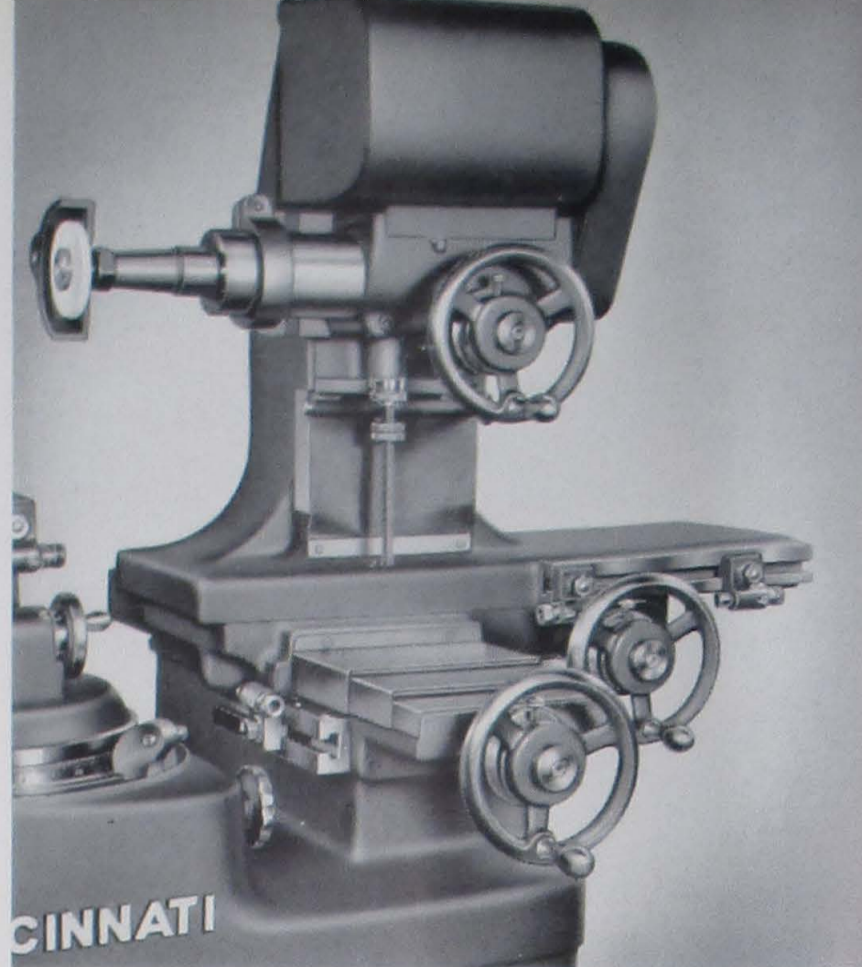
Schematic diagram of spiral lead mechanism. Carriage moves in sine bar as main slide is shifted. Vertical movement thus translated to rack causes rotation of spindle through bevel gears.

Wheelhead Slides

The grinding wheel spindle carrier is supported by three sliding members which permit the grinding wheel to be moved longitudinally, transversely, and vertically.

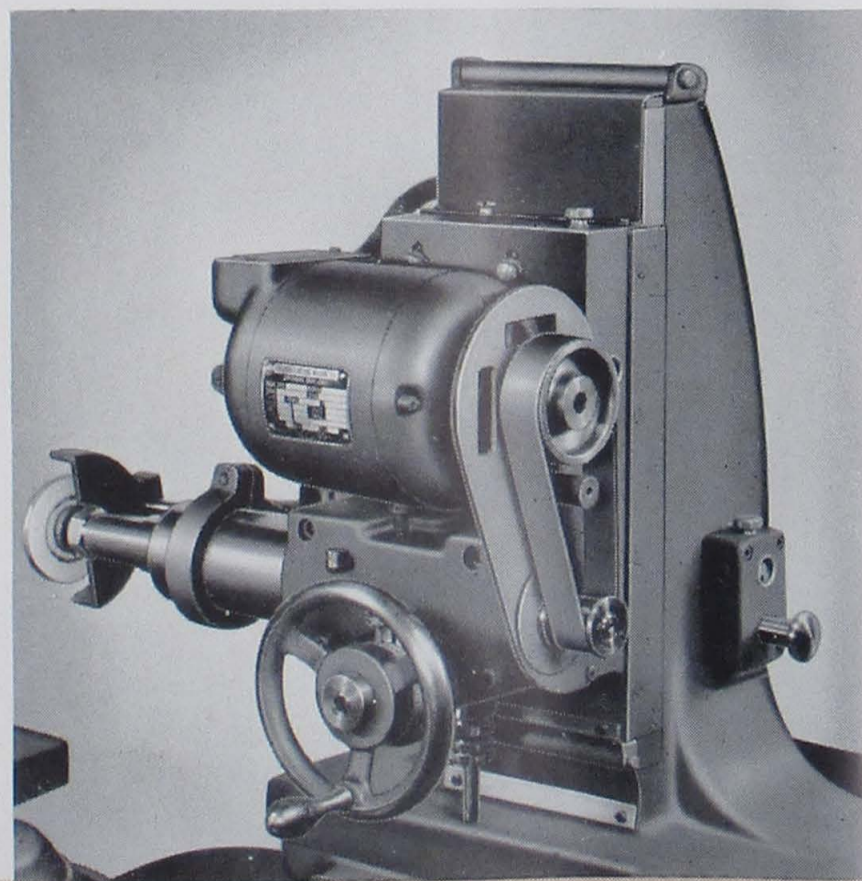
Accurate positioning of the grinding wheel in all three planes is provided by handwheels equipped with micrometer dials graduated in .001" increments. The longitudinal slide is provided with a pair of adjustable stop dogs which permit accurate limitation of stroke in either direction. The transverse slide is provided with a single dog to permit rapid accurate return to grinding position after having backed the wheel away from the work. These stop dogs are mounted in tee-slots for rough positioning, and each dog is provided with a screw adjustment and micrometer dial, graduated in thousandths of an inch, for accurate final adjustment. The vertical slide is provided with a single micrometer stop which allows the wheel to be accurately returned to grinding position after having been retracted vertically.

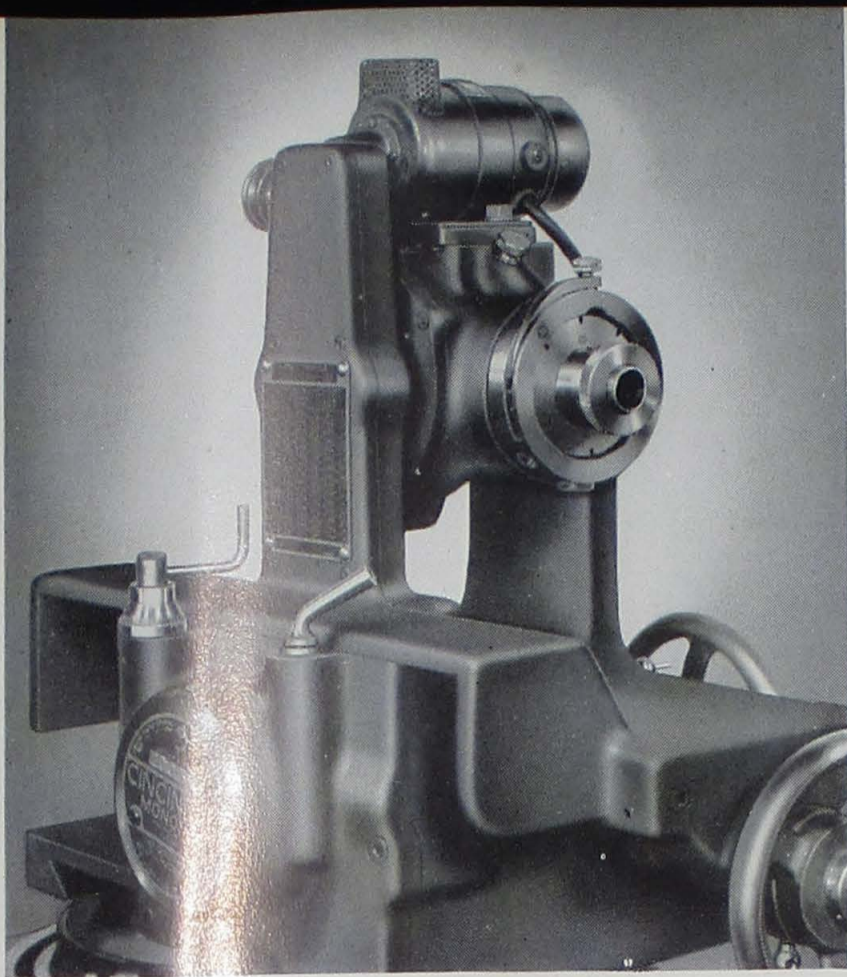
The settings required to grind the clearance, or "back-off", angles of a cutter are greatly simplified by the use of clearance angle scales. These scales, provided on both vertical and transverse slides, indicate the correct position of the grinding wheel for obtaining desired clearance angles when grinding above or behind work. Scales are graduated from 0 to 25 degrees in both directions. The pointer for the scale on the vertical slide is adjustable vertically to permit its use when grinding below the usual center position.



Wheelhead unit. Note the adjustable micrometer stops for all three slides, adjustable micrometer dials on handwheels, telescopic and cloth roller type ways guards.

Grinding wheel spindle drive with covers removed. An additional pulley and belt is supplied to provide two spindle speeds. Upper and lower bearings ways are protected by cloth roller type guards.

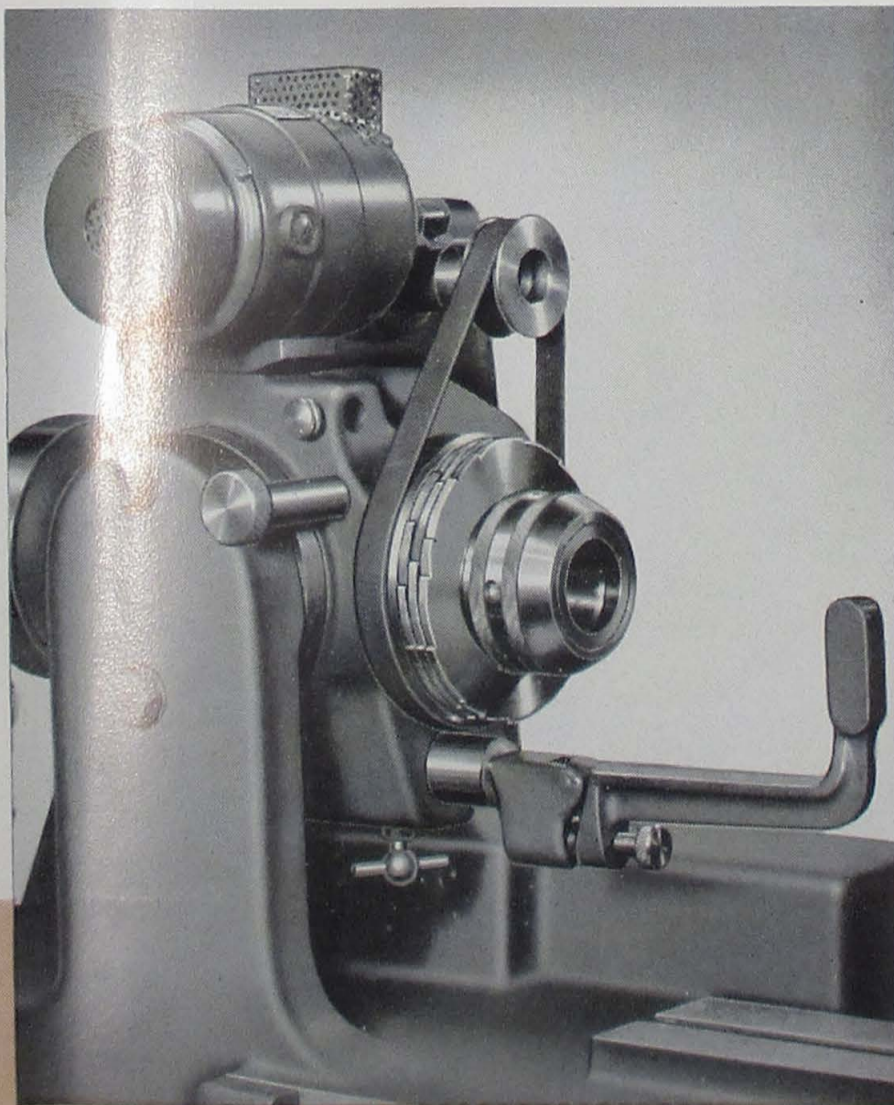




Rear view of the work head showing the spiral lead mechanism indexing device and sine bar adjusting mechanism. A table of leads with corresponding sine bar settings simplifies the setting of the sine bar.

Workhead Unit

In addition to the main turntable swivel movement and the vertical swivel of the workhead spindle, the workhead unit is provided with two sliding elements: The offset slide and the main slide. The function of the offset slide, as previously described, is to offset the centerline of the workpiece from the center of the turntable swivel in the generation



of convex or concave radii. The main slide carries the workhead spindle housing and constitutes the major source of movement of the work in relation to the grinding wheel.

An extremely convenient feature for the operator is provided by dual control of the main slide movement. A pair of handwheels, one at the front, and one at the left, allows the operator a choice of the most convenient means of shifting the main workhead slide, depending upon the nature of the job. This feature is extremely useful for jobs on which the workhead must be swiveled into an extreme position.

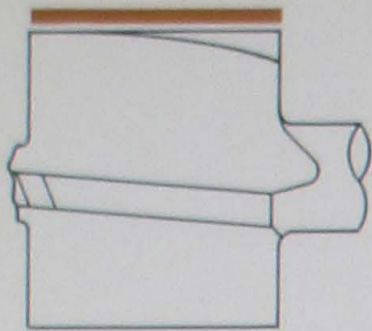
A pair of adjustable micrometer stops, carried in a dog slot on the front of the main slide, permits the movement of this slide to be accurately limited in either direction and makes possible accurate repetitive positioning of the work.

The workhead spindle housing is carried in a swivel-type mounting on the main slide to permit angular positioning of the spindle in a vertical plane. This feature is extremely useful when grinding shapes involving tapers, angles, bevels, etc.

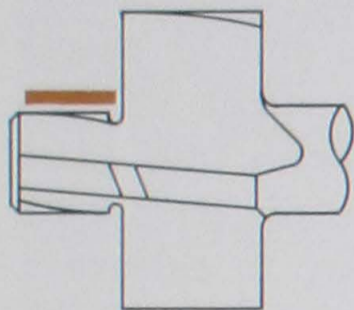
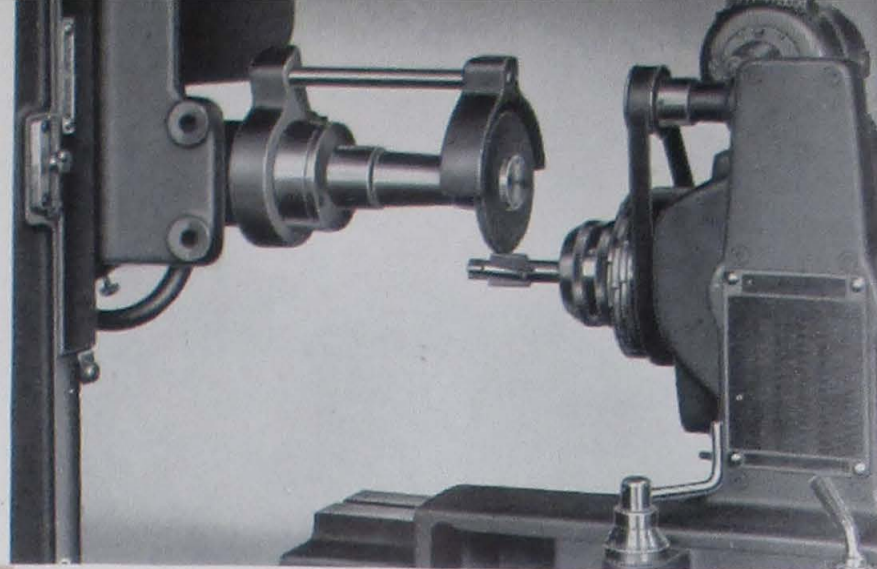
Workhead Spindle Motor Drive

A motor drive is provided for the workhead spindle for those occasions when you might require a power driven spindle for cylindrical or form grinding jobs. The 1/15 h.p., ball bearing, geared head motor is mounted on top of the spindle housing and drives the spindle by means of a short belt. The spindle rotates at 287 r.p.m. A built-in air filter of efficient design keeps grinding grit out of the motor, assuring long trouble free service.

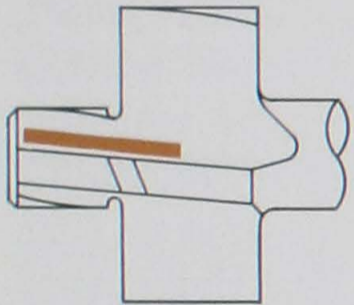
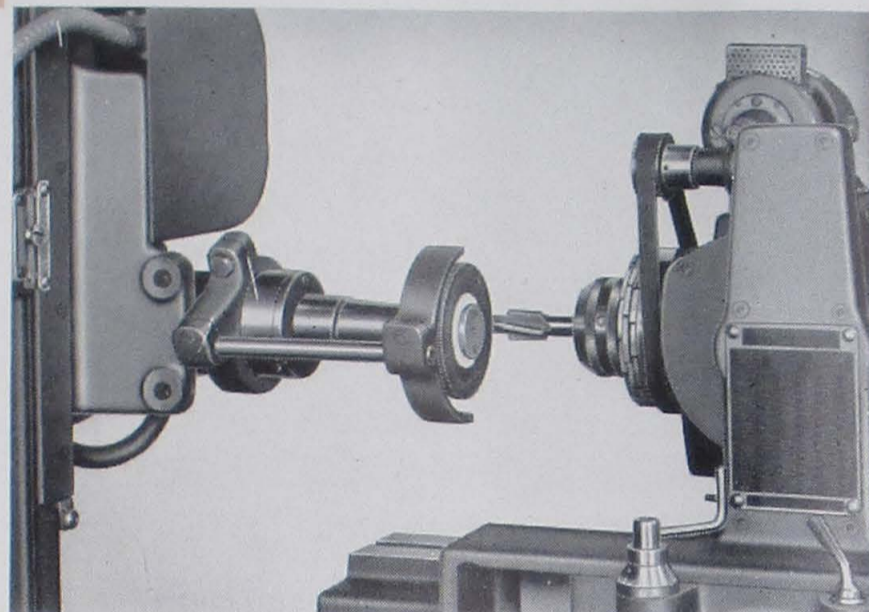
Motor drive for workhead spindle permits cylindrical grinding. The adjustable, spring tensioned stock support mounted in the workhead housing aids in supporting small diameter work when grinding with wheel above work.



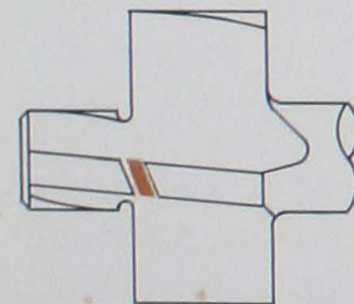
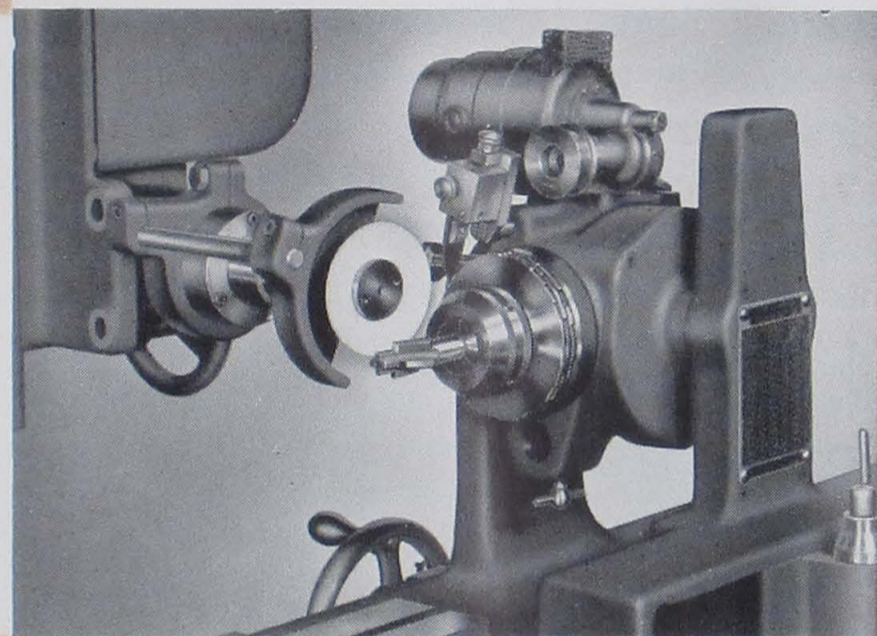
LARGE DIAMETER — Reconditioning of a counterbore is quickly accomplished on the Monoset. Here the motor drive to the workhead spindle is being utilized to cylindrical grind the large diameter. Grinding to accurate size is simplified by micrometer dial adjustments of grinding wheel.



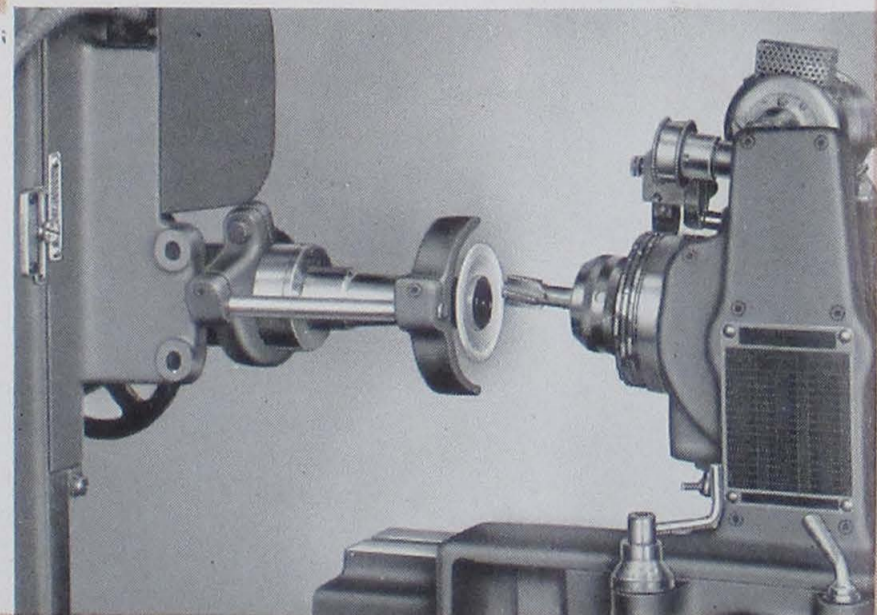
PILOT DIAMETER — Cylindrical grinding the pilot diameter. Grinding wheel may be positioned above or behind the workpiece (also see upper photo). Work may be shifted across face of wheel or wheel may be traversed along workpiece, whichever is more convenient for the job at hand.



FACE OF TOOTH—Workhead swiveled to obtain the desired axial rake angle for grinding the face of the teeth. Rapid, accurate positioning of each tooth is provided by the ratchet type indexing mechanism. Although flutes here have been previously cut, angular or spiral flutes could easily have been ground from the solid if necessary.



END CLEARANCE — Grinding the clearance angle, using side of disc wheel. The workhead spindle housing has been tilted in a vertical plane to the desired clearance angle and firmly clamped in this position. Micrometer adjustable stop on wheelhead cross slide accurately limits cross feed on each tooth.



A Typical Reconditioning Job



MONOSET CUTTER AND TOOL GRINDER

Workhead Spindle Indexing Mechanism . . .

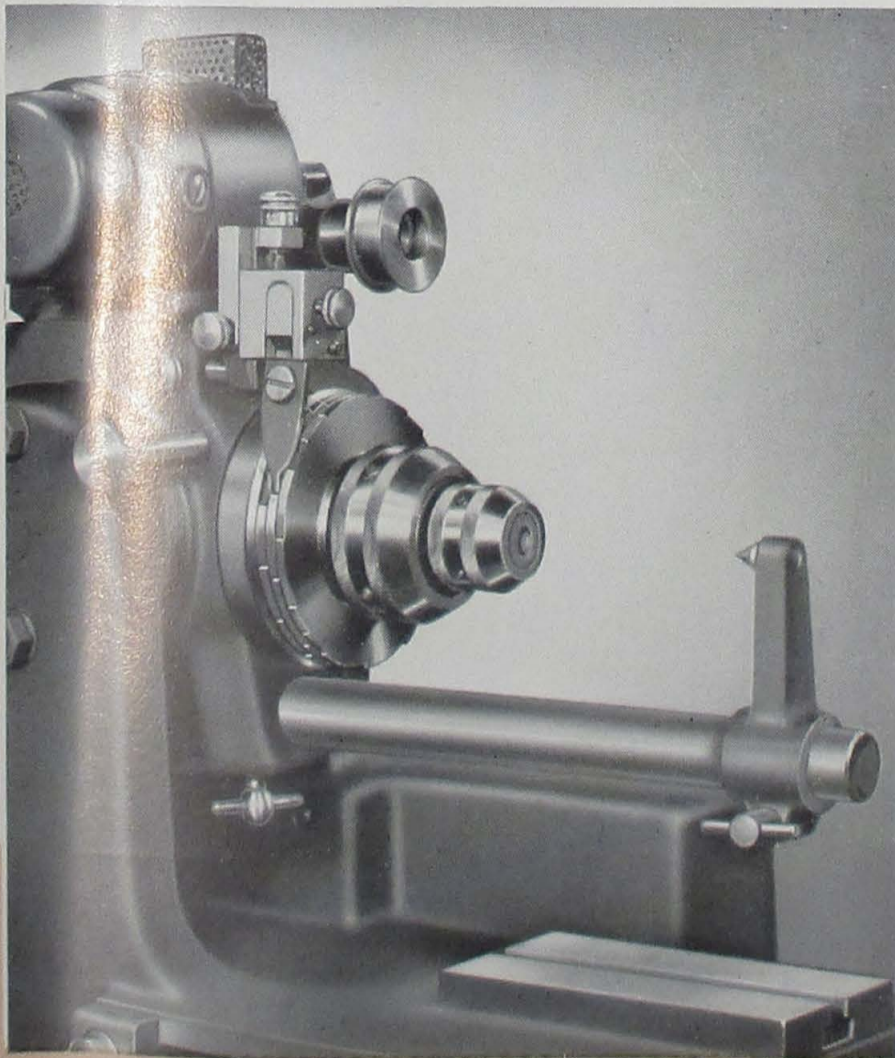
Accurate indexing of either straight or spiral fluted cutters is provided by a pair of easily operated workhead spindle indexing mechanisms.

The workhead spindle is provided with a simplified ratchet-type indexing mechanism for grinding the teeth on straight fluted cutters, or other simple indexing on jobs not requiring the use of the spiral lead mechanism. This indexing device consists of a ratchet plate, carrying three separate rows of index notches, and a spring pressed index finger which is adjustably mounted in the spindle housing to permit instant selection of the desired row of notches. The block upon which the index finger is mounted is carried in a dovetail slide provided with thumbscrew adjustment and clamping. When the index finger is engaged in one of the ratchet teeth, adjustment of this sliding element causes rotation of the ratchet plate and the spindle,

thereby permitting the cutter tooth to be correctly positioned in relation to the grinding wheel after the cutter has been firmly clamped in the collet.

The ratchet plate consists of three separate rows of index notches, actually three ratchet plates in one, having 10, 12 and 14 evenly spaced notches respectively. The twelve-notch row is also provided with four extra notches to permit indexing of eight-tooth cutters. It is only necessary to release a single clamping screw to shift the index finger from one row of notches to another.

The left-hand end of the workhead spindle is provided with an indexing device which permits accurate indexing of the spindle in relation to the spiral lead mechanism. A set of three easily interchangeable index plates, having 8, 10, and 12 equally spaced notches respectively, are supplied with the machine. Additional index plates having 15, 18, 20, 22, 24, and 28 positions are available at extra cost. The indexing pawl is carried by a ring shaped member which forms an overhanging rim to prevent dust and grit from settling in the index notches, thereby assuring the prolonged accuracy of the mechanism. Index plates are easily changed, being held in position on the spindle by a single knurled knob. The pawl may easily be operated by finger pressure, and is provided with a latch to permit disengagement of the spindle from the spiral lead mechanism.



Ratchet type indexing device, showing three rows of index notches and adjustable, spring pressed index finger. An adjustable tail-center support is mounted in spindle housing to permit its use even when spindle is tilted.

Convenient Tooth Rest

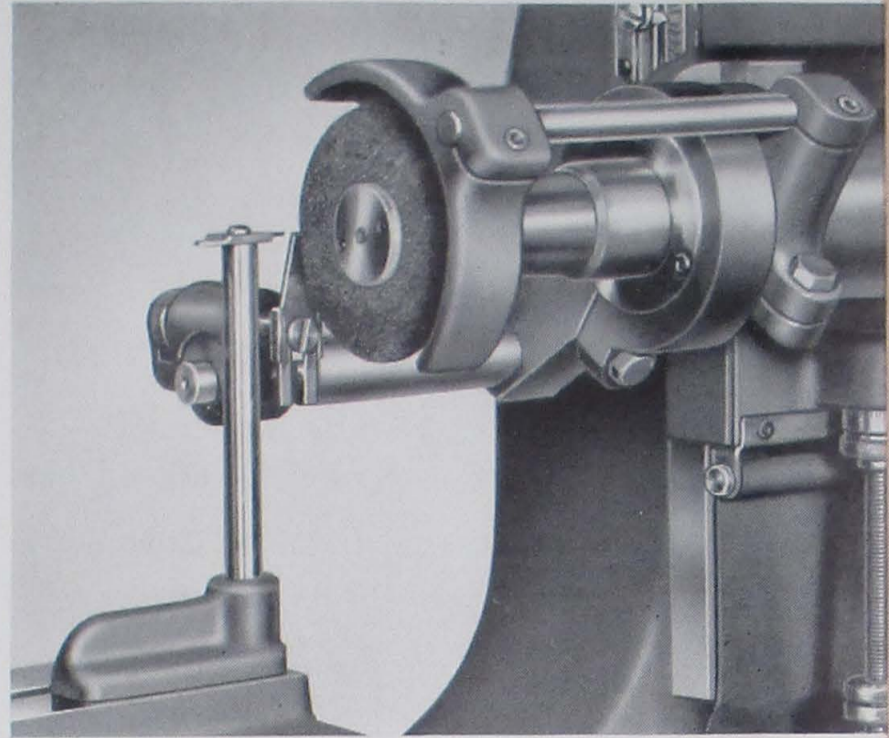
For rapid, accurate regrinding of spiral fluted cutters, without recourse to the spiral lead mechanism, a simple adjustable tooth rest is supplied with the machine. Mounting on the grinding wheel spindle housing, this mechanism consists of a round top blade quickly and easily adjustable in relation to the grinding wheel by means of a knurled knob. A gage is supplied for accurately centering blade when mounting this attachment on spindle housing.

Stock Supports

Adjustable, spring-tensioned stock supports are supplied with the machine to support the workpiece when grinding above or behind uncentered work of even very small diameters. An adjustable tail-center support, which mounts in the workhead spindle housing, provides support for centered work even when the workhead spindle has been angularly positioned by means of workhead vertical swivel.

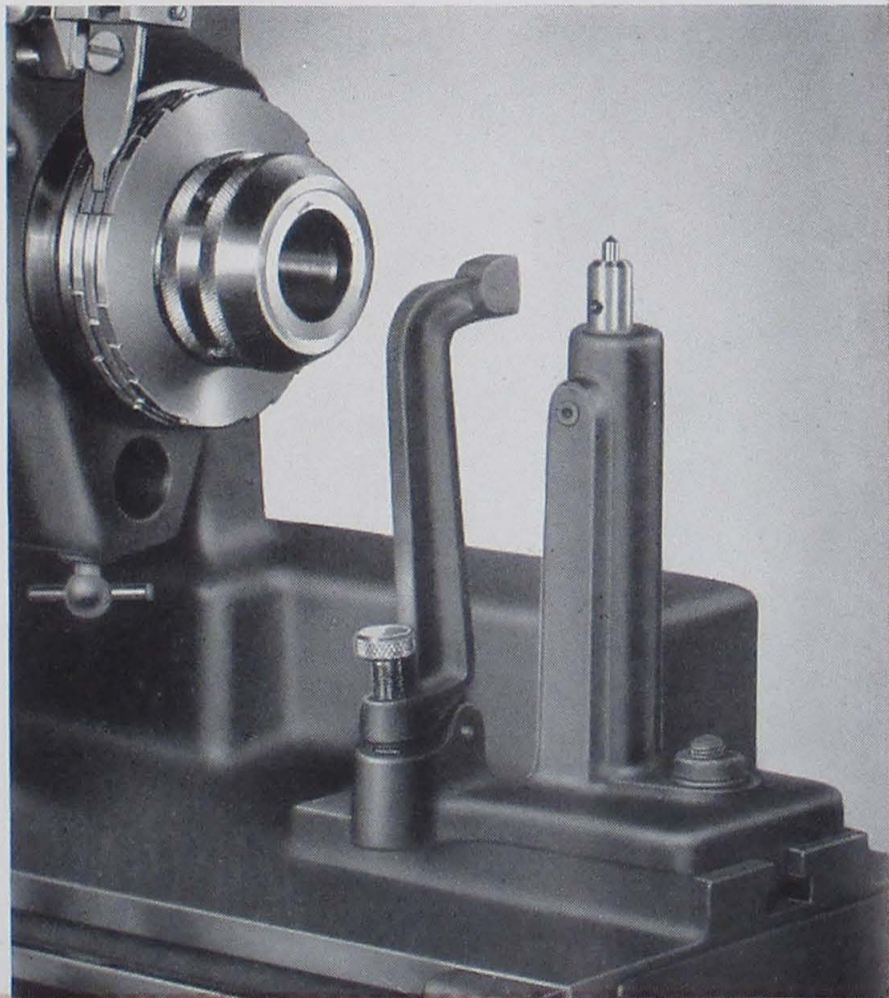
Accurate Wheel Truing

An adjustable diamond holder, complete with diamond, is combined with the front stock support to permit extremely accurate diamond truing of the grinding wheel. Mounting in a tee slot on the main slide, this device may be used in conjunction with the workhead swivel base to produce a great variety of formed shapes on the grinding wheel. Straight or angular wheel faces, convex or concave radii, or varied combinations of both may be generated quickly and easily. The diamond holder bar is provided with two diamond nib mounting holes which permit the wheel to be trued from either the front or the bottom, whichever is more convenient.



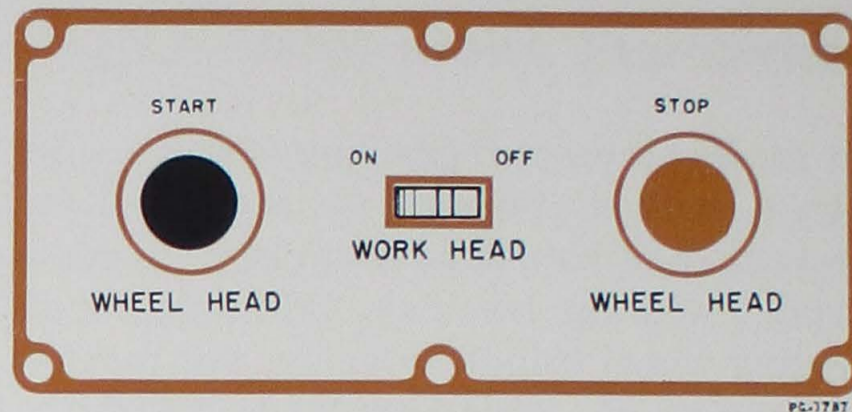
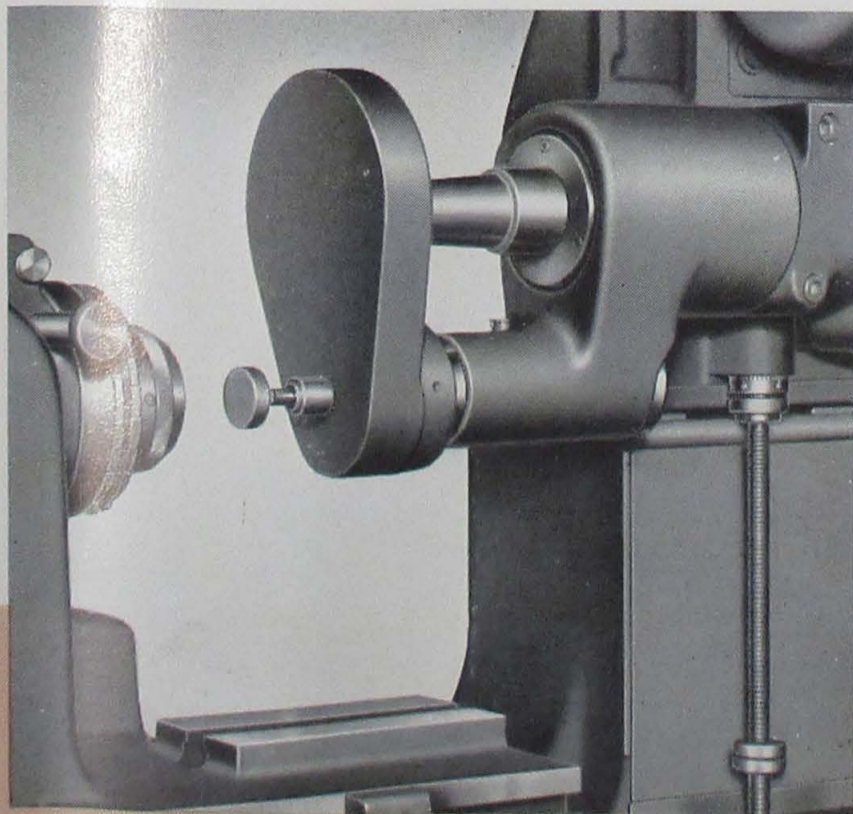
Tooth rest for regrinding of spiral fluted cutters mounts on grinding wheel spindle housing. May be used in front of, or behind, the grinding wheel. Centering gage simplifies set-up.

Diamond Holder and Front Stock Support mounts on main slide. Two-position diamond holder permits truing the grinding wheel from front or from below.



Internal Grinding Attachment (Extra Cost)

This attachment greatly increases the versatility and usefulness of the machine. The attachment mounts on the grinding wheel spindle housing and is driven by a belt from a pulley which replaces the grinding wheel on the spindle nose. The spindle rotates at 33,000 r.p.m. thereby providing the necessary speed for efficiently using small diameter wheels. While this type of attachment is generally used for the accurate internal finishing of small holes, it can be used very effectively for jobs requiring the use of small diameter wheels in conjunction with either workhead swivel or the spiral lead generating mechanism. Attachment includes five assorted mounted grinding wheels, wheel rack, collect chuck with $\frac{1}{8}$ " and $\frac{3}{16}$ " collets, one 4" universal three-jaw chuck and adapter for workhead spindle, driving pulley and belt, belt guard, and centering gage.



Simplified electrical controls mounted on front of base. Push buttons control grind-wheel drive, a toggle switch controls the work spindle drive motor.

Electrical Control

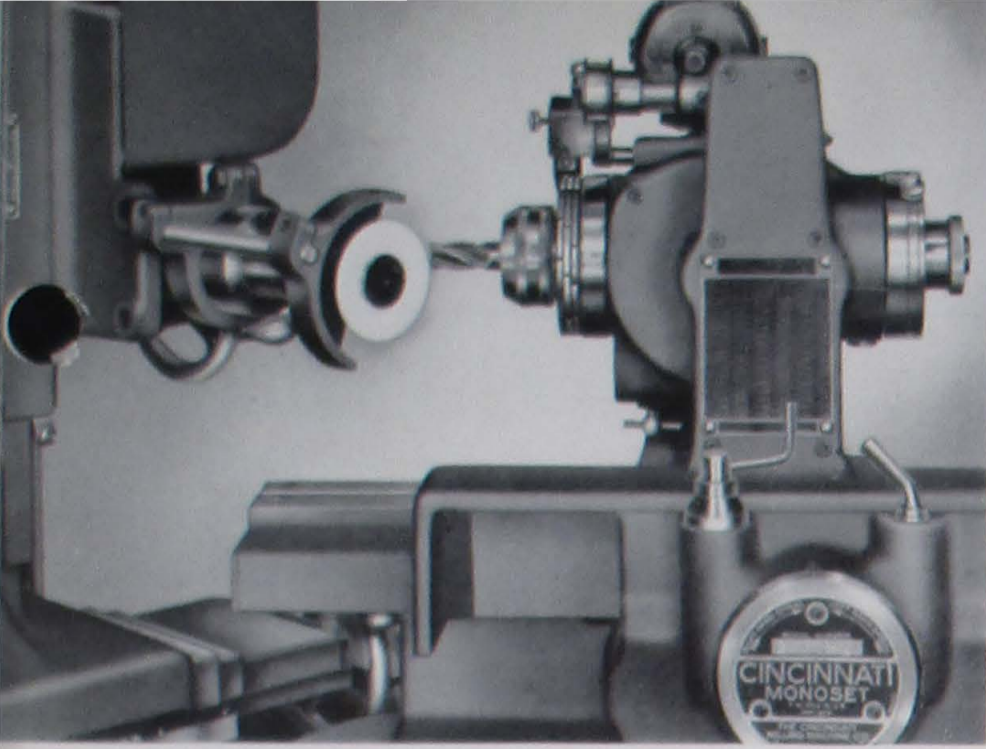
The electrical push button station, conveniently located on the front of the machine base, consists of a "Start-Stop" push button control for the wheelhead motor, and a toggle switch for the workhead motor. The line from the workhead motor plugs into a receptacle at the rear of the machine.

All electrical controls are mounted on a panel in a recess in the rear of the machine base.

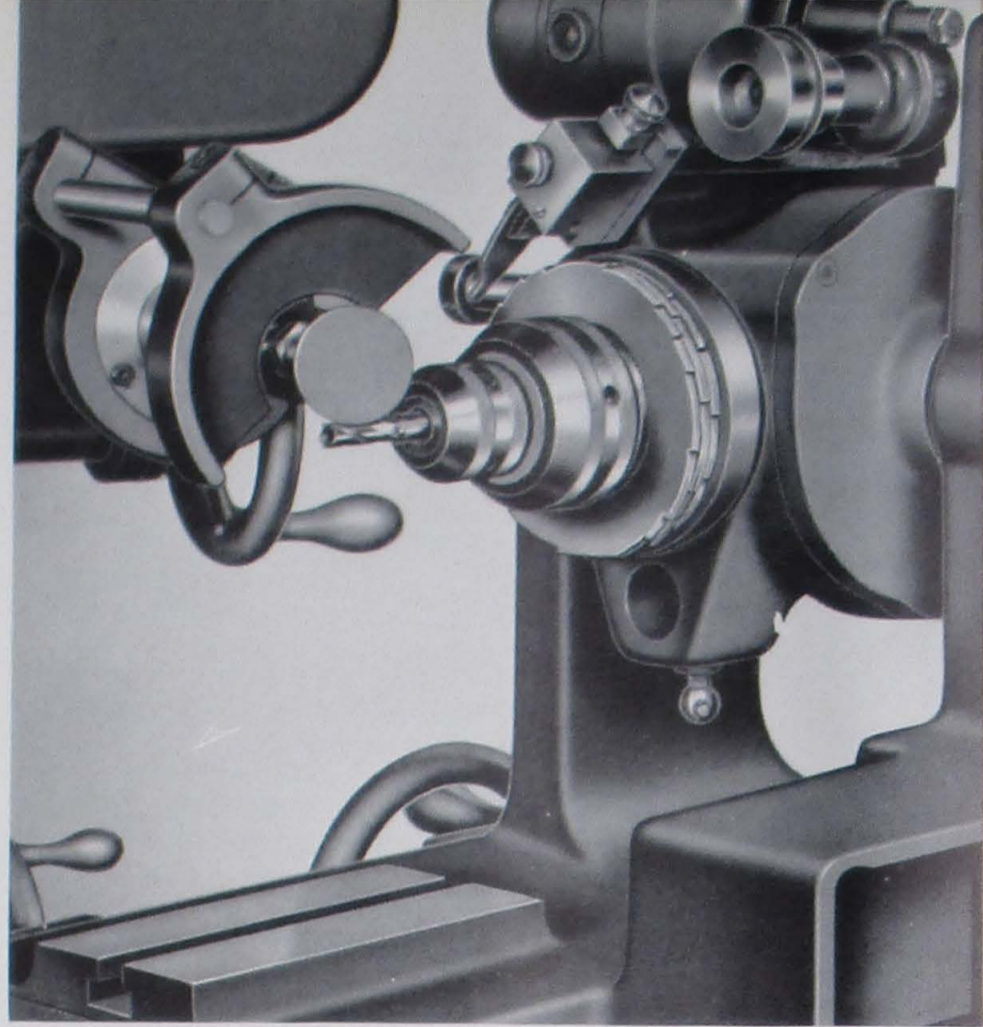
The absence of projecting control boxes enhances the general appearance and clean lines of the machine, to say nothing of the convenience it offers the operator by providing easy access to the machine from any position. An outlet is provided in the rear of the base, to provide power for a light, if desired.



Internal Grinding Attachment, available at extra cost. Extremely useful for internal finishing of holes or the grinding of shapes which require use of small wheels.



Grinding a radius on the corner of an end mill tooth. Swivel base and positive indexing assure accurately matched radii on all teeth of cutter. Clearance angle scale, shown at left, indicates position of wheel spindle to give desired clearance on the cutter.

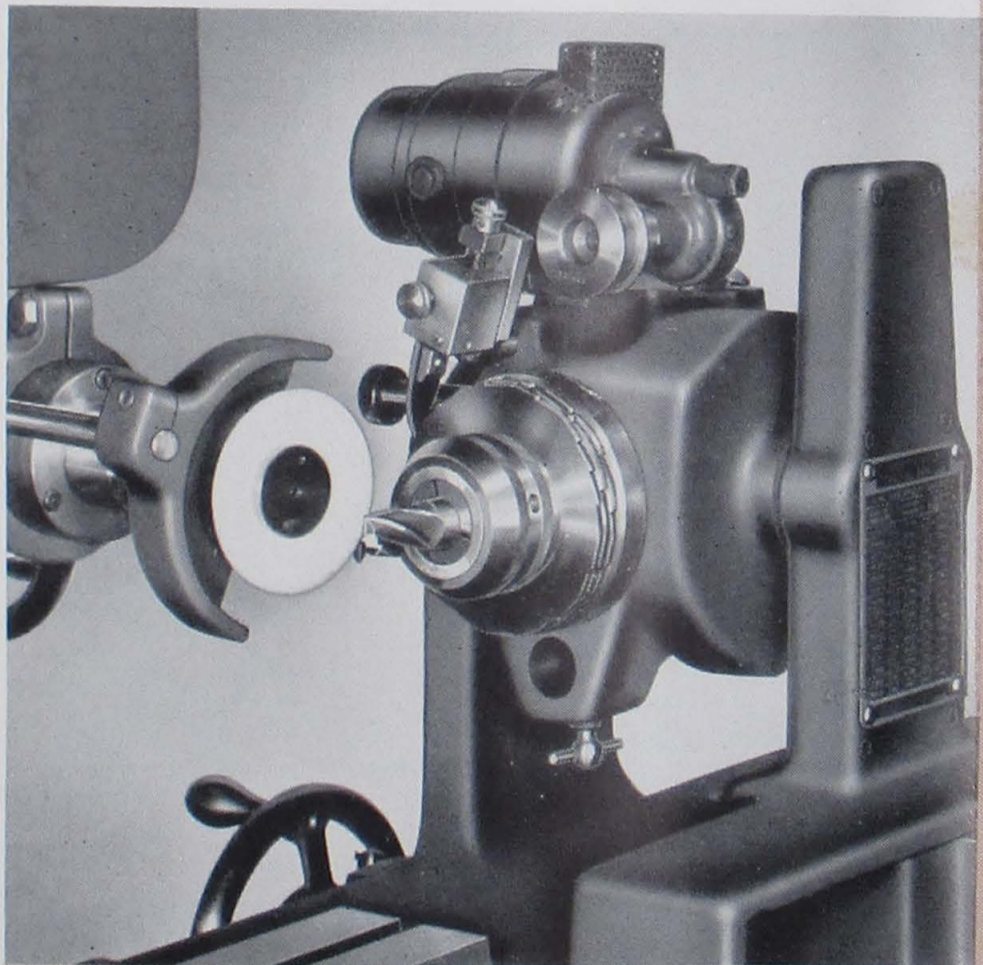
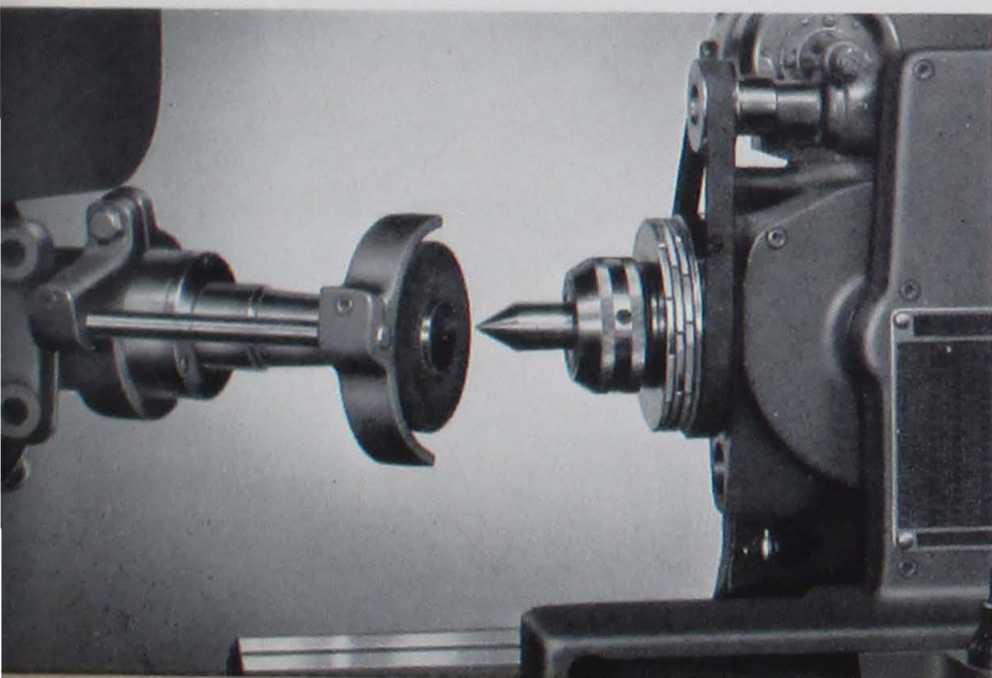


Gashing out the spiral flutes of a special cutter being ground from the solid. The workhead is swiveled to the helix angle of the flute and the wheel is formed to give the desired flute shape. Spiral is automatically generated by the spiral lead mechanism as the workhead is shifted under the grinding wheel.

OTHER TYPICAL JOBS FOR THE MONOSET

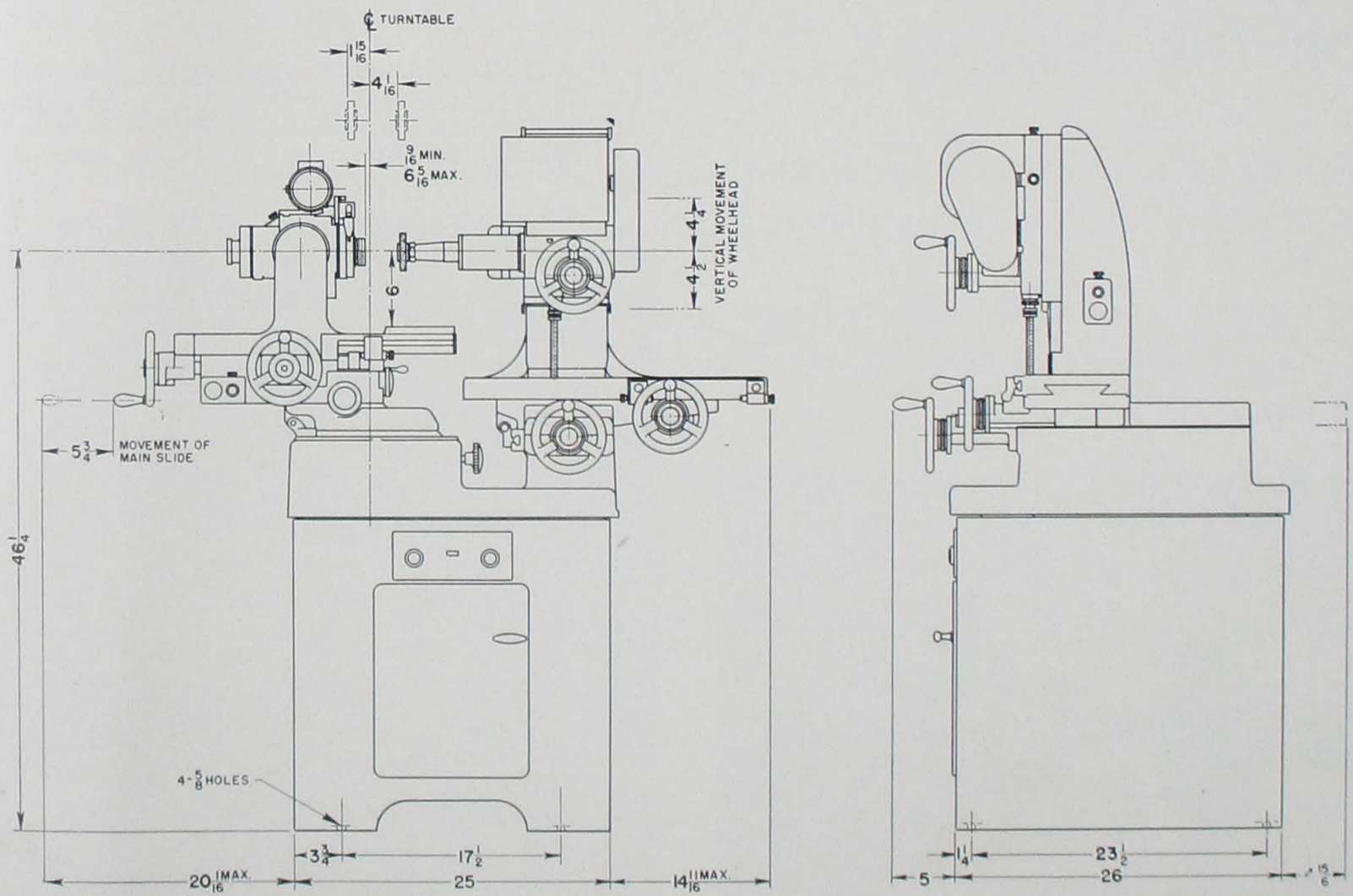
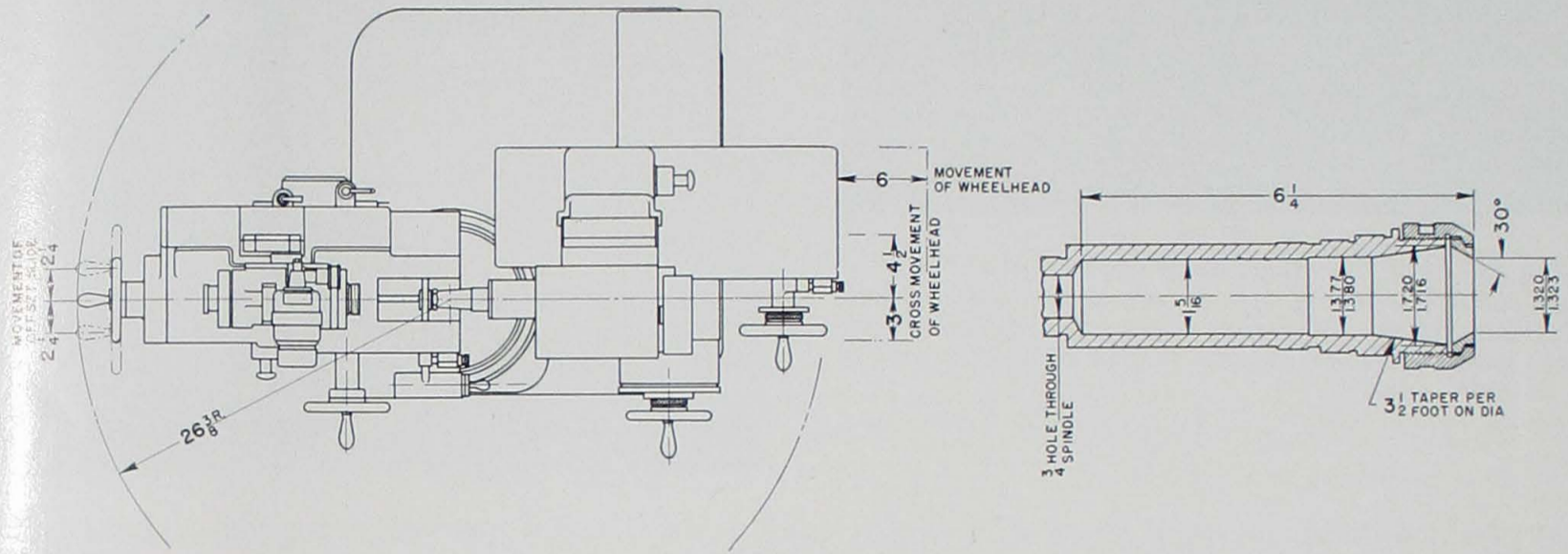
Taper collets for the workhead spindle collet chuck permit rapid, accurate regrinding of lathe or grinding machine centers. Workhead spindle motor drive is used, and workhead unit is swiveled to give desired center angle and firmly locked in position.

Gashing out the end gullets of a spiral end mill. Workhead is swiveled to present the work at the correct angle to the wheel. Cut is made by lowering wheel head spindle. Ratchet type indexing mechanism again provides rapid indexing from cut to cut.



MONOSET CUTTER AND TOOL GRINDER

DIMENSIONAL DRAWING



GENERAL SPECIFICATIONS

CAPACITY

Swing over main slide	12"
Length, between spindle nose and tail center (maximum)	6"
Maximum wheel diameter (6000 ft. per minute, approximate)	3½"
Maximum collet work diameter	1¼"
Minimum collet work diameter	⅛"
Minimum lead generated by spiral lead mechanism	1⅓/16"

RANGE

Longitudinal movement of main slide	5¾"
Offset slide movement (either side of center)	2¼"
Vertical slide travel of wheelhead	
Above center	4¼"
Below center	4½"
Transverse slide travel of wheelhead	7½"
Longitudinal slide travel of wheelhead	6"
Angular range of workhead	
In horizontal plane (workhead swivel base)	235 deg.
In vertical plane (workhead angular adjustment), above and below center position ...	40 deg.

SPEEDS

Grinding wheel spindle, two speeds (approximate)	6000 and 8000 r.p.m.
Workhead spindle	287 r.p.m.
Internal grinding attachment spindle—extra cost (approximate)	33,000 r.p.m.

PRINCIPAL DIMENSIONS

Size of base	25" x 26"
Floor space required (Including swivel and overtravel movements)	60" x 53"
Height from floor to center of workhead spindle	46¼"

SHIPPING DATA

Net weight (including motors and controls)—approximate	1350 lbs.
Gross weight—Domestic (including motors and controls)—approximate	1750 lbs.
Gross weight—Export (including motors and controls)—approximate	2050 lbs.
Approximate size of case, inches	38 x 44 x 66
Approximate volume of case, cubic feet	64

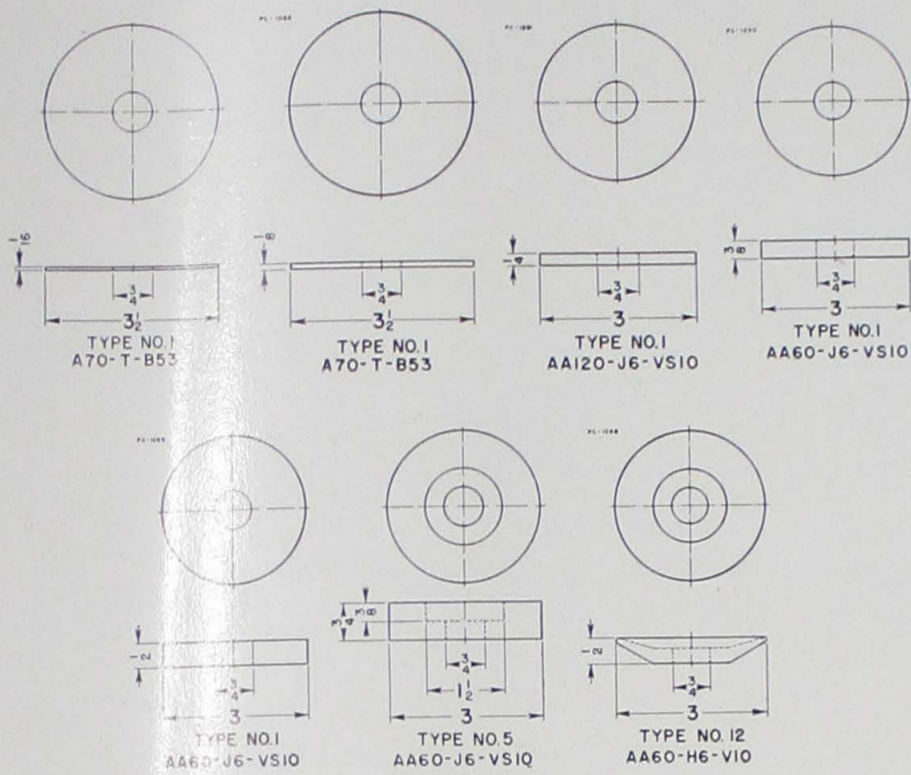
CODE NAME

MONOE



MONOSET CUTTER AND TOOL GRINDER

STANDARD EQUIPMENT... Supplied with the Machine



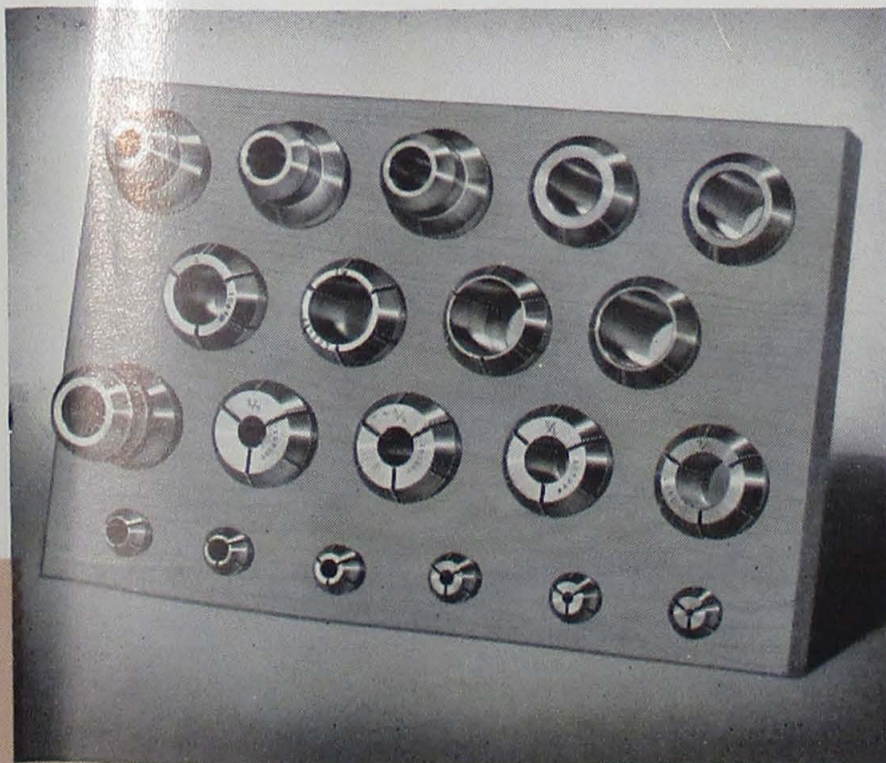
SET OF SEVEN GRINDING WHEELS shown above—suitable for a wide range of grinding requirements.

SET OF SEVEN WHEEL MANDRELS—one for each wheel supplied, plus a 1½" extension mandrel.

SET OF THIRTEEN STRAIGHT CYLINDRICAL COLLETS—1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/8", and 1 1/4". A small collet adapter is supplied for the collets smaller than 1/2" size.

SET OF SIX TAPER COLLETS—Nos. 5, 7, and 9 Brown and Sharpe, and Nos. 2, 3, and 4 Morse tapers. The wooden collet rack, shown below, holds both sets of collets.

SET OF THREE INDEX PLATES for spiral lead mechanism indexing device—8, 10, and 12 divisions.



Standard collets and wooden collet rack supplied with machine.

LOWER STOCK SUPPORT.

FRONT STOCK SUPPORT AND DIAMOND HOLDER COMBINED, including one mounted diamond.

ADJUSTABLE TAIL CENTER SUPPORT.

TWO MOTOR DRIVE PULLEYS with matching belts for two-speed grinding wheel drive.

WHEELHEAD TOOTH REST and tooth rest centering gage.

GRINDING WHEEL GUARD, FEELER BLOCK AND FINGER. Feeler block mounts on wheel guard support bar and is used for adjusting spiral lead mechanism when regrinding cutters of unknown spiral leads.

SET OF WRENCHES.

WORKHEAD SPINDLE CENTERING GAGE.

TWO WORKHEAD SPINDLE DRIVE BELTS.

OPERATING INSTRUCTIONS.

WHEELHEAD SPINDLE DRIVE MOTOR—1/3 h.p., 220 to 550 volts, 2 or 3 phase, A. C., 60 cycle—3600 r.p.m., 50 cycle—3000 r.p.m., 115 or 230 volts D. C.—1800 r.p.m., totally enclosed ball bearing, horizontal wall mounted, feet on right, conduit box opposite standard viewing shaft end. To be in dynamic balance. Holes in feet to be elongated one inch for making best possible adjustment.

WORKHEAD MOTOR—1/15 h.p., 110 volts, universal, gear type, ball bearings, fitted with air filter and circulating fan.

CONTROL PANEL. Composite controller; mounted in the rear of the machine base, containing the following:

- (a) One full voltage magnetic starter with thermal overload and undervoltage protection for 1/3 h.p. motor.
- (b) One insulating type transformer with 110 volt fused secondary to supply single phase voltage to the workhead motor, the control circuit, and 50 watts for an electric light outlet—light not included.

EQUIPMENT... Supplied at EXTRA COST

1. INTERNAL GRINDING ATTACHMENT — mounts on bracket on wheel head. Driving pulley, driving belt, belt guard, centering gage, $\frac{1}{8}$ " Collet chuck, $\frac{3}{16}$ " collet chuck, one 4" universal three-jaw chuck for workhead. Includes five assorted mounted grinding wheels listed below, and wheel holder—Code Name, MOINT.

$\frac{3}{16}$ " dia. x $\frac{1}{4}$ " wide— $\frac{1}{8}$ " dia. shank.
(AA 80-L6-V10 Aloxite AA)

$\frac{1}{4}$ " dia. x $\frac{1}{4}$ " wide— $\frac{1}{8}$ " dia. shank.
(AA 80-J + 6-V10 Aloxite AA)

$\frac{1}{2}$ " dia. x $\frac{1}{4}$ " wide— $\frac{3}{16}$ " dia. shank.
(AA 80-J + 6-V10 Aloxite AA)

$\frac{3}{4}$ " dia. x $\frac{1}{4}$ " wide— $\frac{3}{16}$ " dia. shank.
(AA 80-J + 6-V10 Aloxite AA)

$\frac{3}{4}$ " dia. dish shaped— $\frac{1}{8}$ " dia. shank.
(AA 120-R6-V10 Aloxite AA)

2. $\frac{1}{4}$ " COLLET—for internal grinding attachment collet chuck. For use with mounted wheels having $\frac{1}{4}$ " shank. Code Name, MOLET.

3. 4" UNIVERSAL THREE-JAW CHUCK FOR WORKHEAD—Not needed if Internal Grinding Attachment is ordered as this item is supplied with attachment. Includes adapter. Code Name, MONCH.

4. COLLET ADAPTER—for grinding wheel spindle. Includes $\frac{1}{4}$ " collet and mounted grinding wheel $1\frac{1}{4}$ " diameter x $\frac{1}{4}$ " wide. Code Name, MOADA.

5. GRINDING WHEEL MANDREL—for mounting grinding wheel with $\frac{1}{2}$ " hole. Code Name, MOWHE.

6. ADDITIONAL INDEX PLATES—for spiral lead mechanism indexing device on left-hand end of work spindle. Plates available with 15, 18, 20, 22, 24, and 28 equally spaced divisions. Code Name, MODEX.

7. ADDITIONAL MOUNTED DIAMOND — for grinding wheel truing device. Code Name, MONDI.

8. LARGE CUTTER RADIUS GRINDING ATTACHMENT. For radius grinding corners of teeth on side mills, slotting cutters, etc., from approximately 5" to 9" diameters and from $\frac{1}{2}$ " to 1" wide. The maximum diameter of cutter upon which such radii can be ground on the standard machine is limited by the range of the offset slide and is:

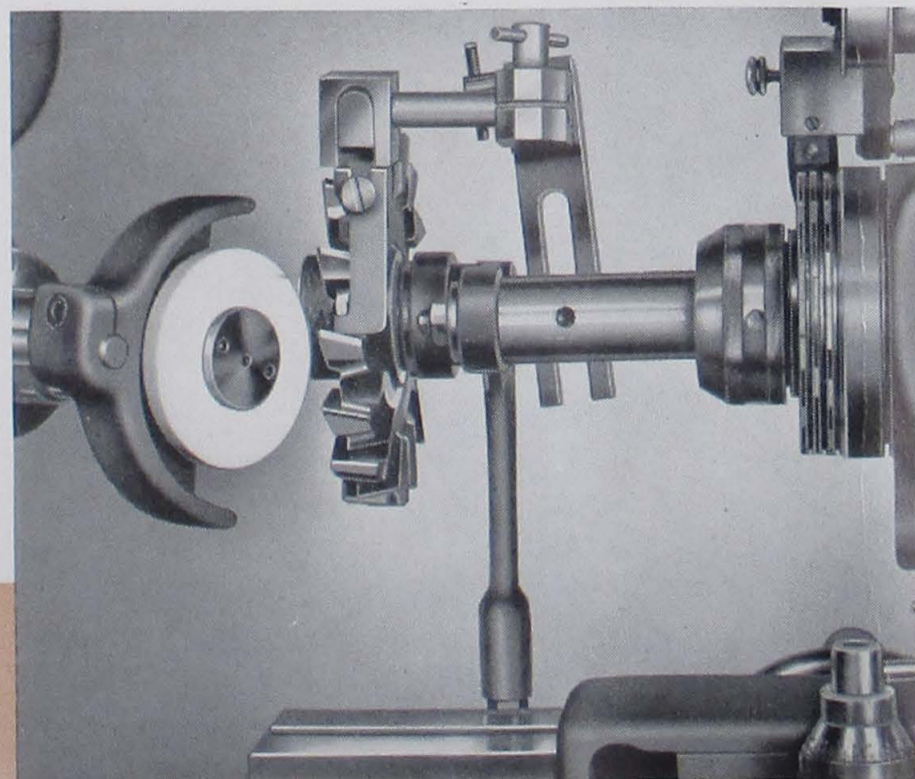
$$2 \times (\text{maximum offset}) + 2 \times (\text{desired corner radius}) \text{ or } 4\frac{1}{2}" + 2 \times (\text{corner radius desired}).$$

This attachment consists of an auxiliary arbor which permits offset mounting of the cutter in relation to the work spindle. This provides an additional offset of 2" to permit grinding these radii on cutters having diameters up to:

$$8\frac{1}{2}" + 2 \times (\text{desired corner radius}).$$

Includes bushings for cutters having $\frac{7}{8}$ ", 1", $1\frac{1}{4}$ ", and $1\frac{1}{2}$ " diameter holes. Code Name, MORAI.

9. STRAIGHT CYLINDRICAL COLLETS IN $\frac{1}{32}$ " AND MILLIMETER SIZES—for diameters from $\frac{1}{8}$ " or 3 mm. up to and including $\frac{1}{4}$ " or 12 mm.
10. STRAIGHT CYLINDRICAL COLLETS IN $\frac{1}{32}$ " AND MILLIMETER SIZES—for diameters from $\frac{17}{32}$ " or 13 mm. up to and including $1\frac{1}{4}$ " or 32 mm.



Large cutter radius grinding attachment. Adjustable spring-loaded tooth rest provides accurate indexing.



MILLING MACHINES



DIE SINKING MACHINES



BROACHING MACHINES



CUTTER SHARPENING MACHINES



**OPTICAL PROJECTION
GRINDING MACHINES**



FLAME HARDENING MACHINES



CUTTING FLUID

Direct Field Engineering Offices in the Principal Manufacturing Centers of
United States. World-wide Distribution Through Sales Representatives.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.