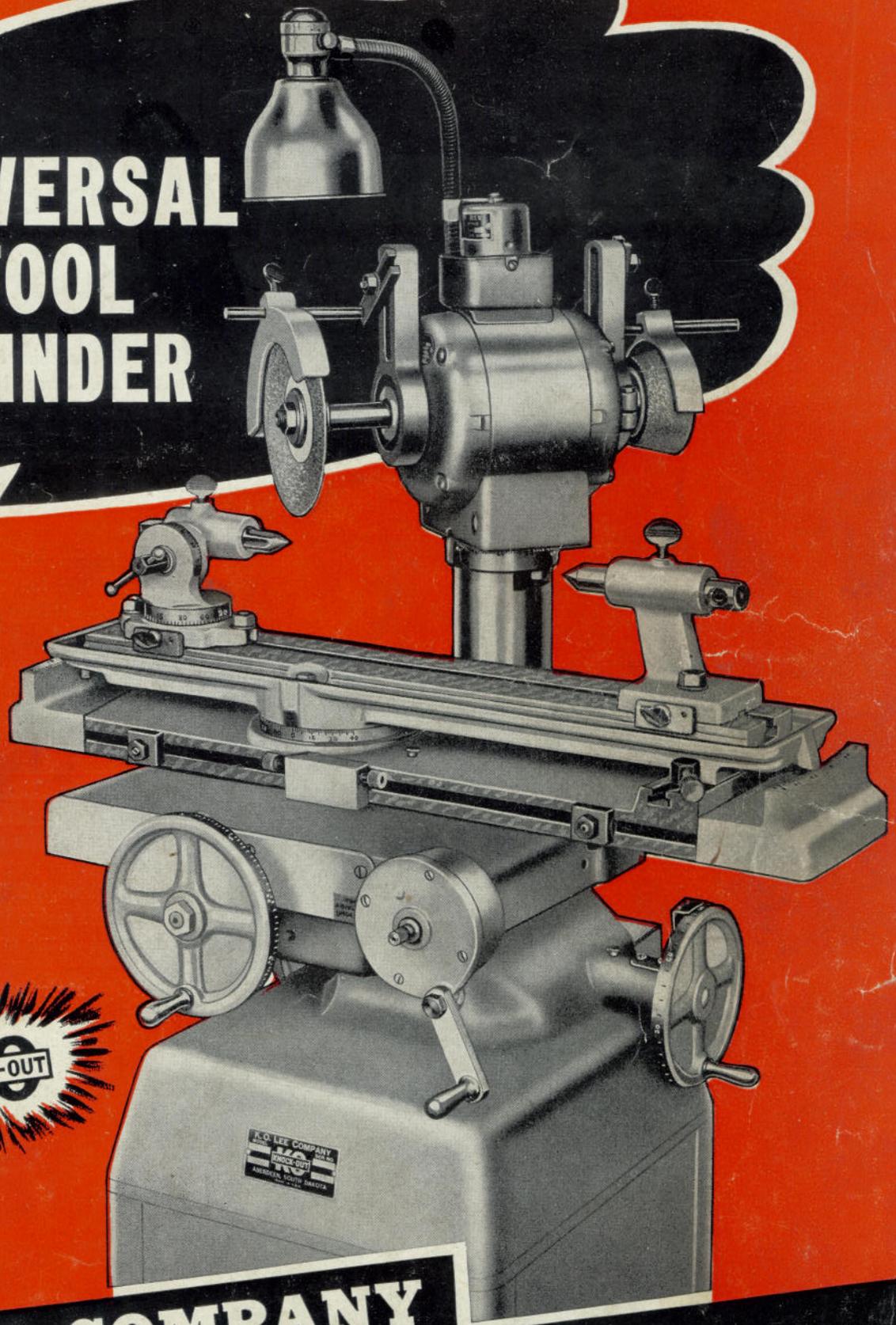


Knock-Out

**UNIVERSAL
TOOL
GRINDER**



KNOCK-OUT

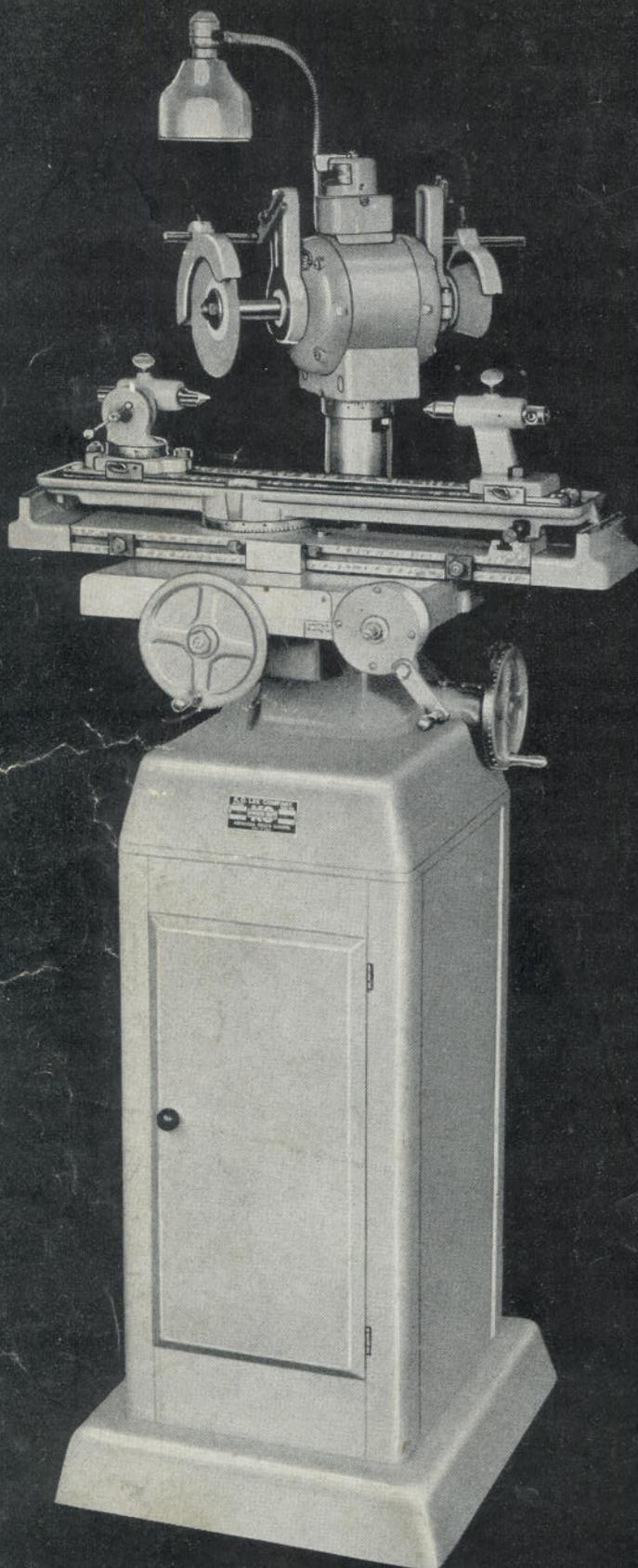
K.O. LEE COMPANY
UNIVERSAL TOOL GRINDER
ABERDEEN, SOUTH DAKOTA

K. O. LEE COMPANY
ABERDEEN, SO. DAK.

"If its made by Lee - its a Knock-Out"



"If its made by Lee - its a Knock-Out"



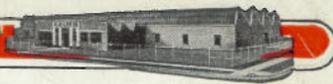
MODEL B600

MODEL B600 UNIVERSAL TOOL GRINDER

"The busiest machine in the shop" is the reputation earned by the "Knock-Out" Universal Tool Grinder. And it's easy to understand why when you see how compact it is and yet what a variety of operations can be performed on it.

Its compactness makes it easier to work on, easier to change set-ups, easier to hold accuracy, easier to turn out more work. And it has the necessary capacity to handle all the tool and cutter grinding in the average shop. It will take work up to 20" long between centers with 6 $\frac{1}{4}$ " swing that can be easily increased to 8 $\frac{1}{4}$ " with 1" raising blocks. The swivel table is graduated in degrees at the center and taper per foot at the end and has a coolant trough for wet grinding. The head turns through 360° and the reversible motor makes it easy to keep two different wheels mounted.

The "K-O" fixtures available for external and internal grinding, tap grinding, radius grinding, etc., etc., make the "Knock-Out" Universal Tool Grinders so versatile it's no wonder users call them "the busiest machine in the shop."



STANDARD EQUIPMENT *K.O.*

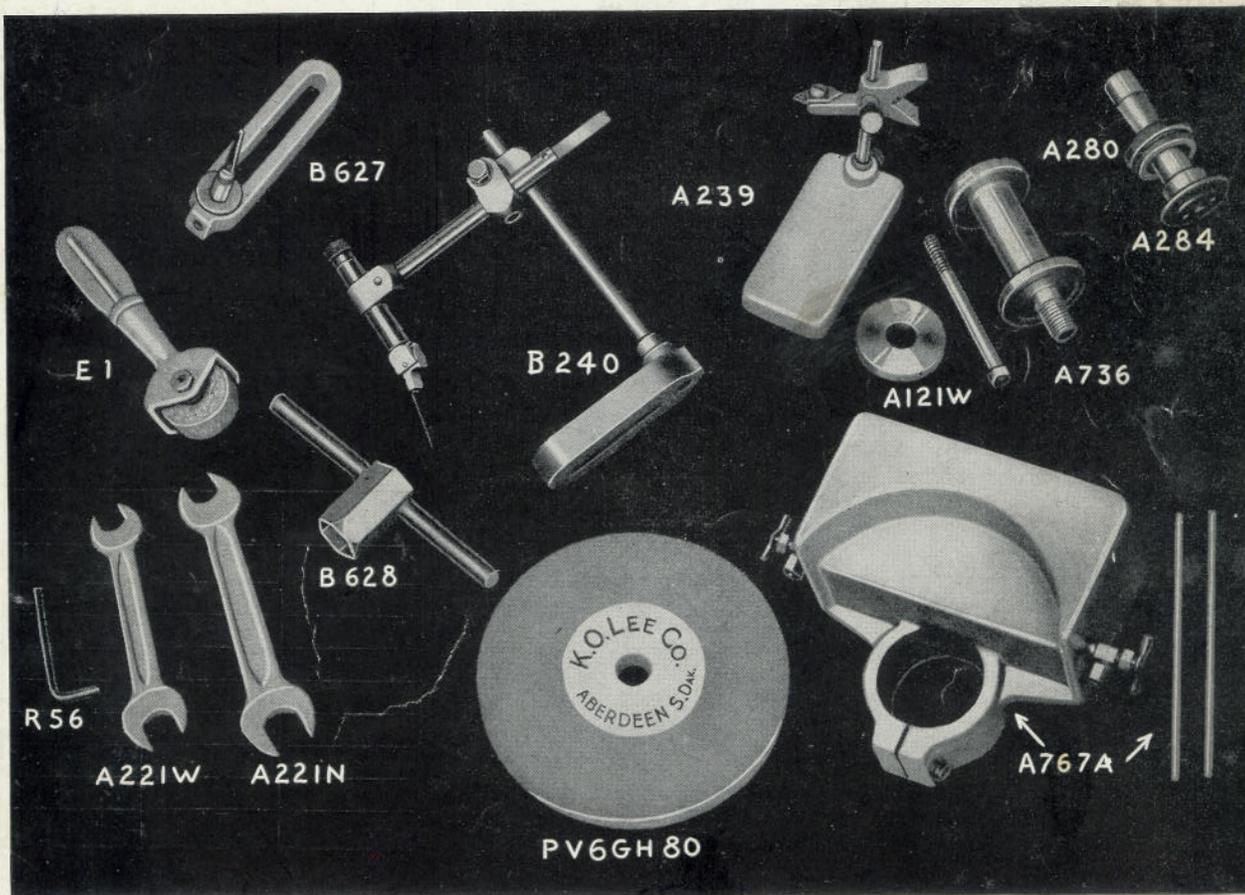
For Model B600

- A121W Spacing Collar for Thin Wheels.
- A221N Open End Wrench (9/16", 11/16").
- A221W Open End Wrench (1/2", 19/32").
- A237L Flexible Light Fixture.
- A239 Center Gauge.
- A246J 4" Wheel Guard with Bracket.
- A246K 6" Wheel Guard with Bracket.
- A280 Friction Collar for A284 Arbor.
- A284 1" Cutter Grinding Arbor.
- A290S Drum Type Reversing Switch.
- A632E 1/2 H.P. Motor, 220 Volt, Three Phase, 60/50 Cycle, 3450 RPM.
- A655 Two T-slot Bolts (5/16" x 1-3/16").
- A657 Four T-slot Bolts (3/8" x 1 3/8").
- A736 3" Shaft Extension with Draw Bolt.
- A767A Large Wet Wheel Guard with Shut-off Cocks and Tubing.

- B240 Universal Tooth Rest.
- B606 Electrical Connection Panel.
- B617 Blue Print of Clearance Angles.
- †B620 Universal Head Stock with Center.
- †B621 "Quick Release" Tail Stock with Center.
- B627 Plain Tooth Rest.
- B628 7/8" Socket Wrench.
- B665 Cabinet Stand.
- E1 Abrasive Wheel Dresser.
- CV3 1/2 NH60 3 1/2" Cup Grinding Wheel.
- PV6GH80 6" x 1/2" x 5/8" Straight Grinding Wheel.
- SV6GH60 6" Saucer Grinding Wheel.
- R56 Set Screw Wrench.

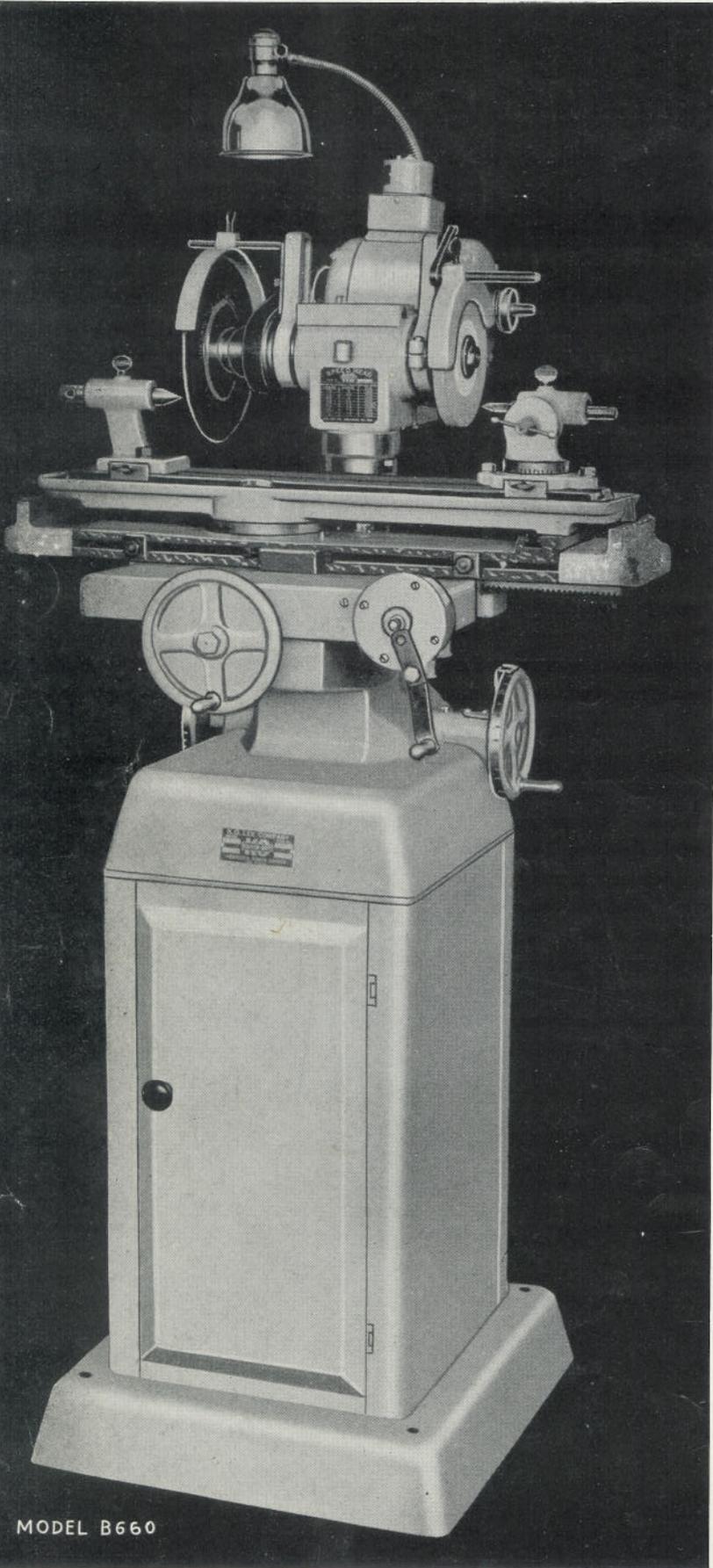
†Furnished in matched sets number B622.

PHOTOGRAPH OF STANDARD EQUIPMENT NOT SHOWN WITH MACHINE ON COVER OF BOOKLET





If its made by Lee - its a Knock-Out



MODEL B660

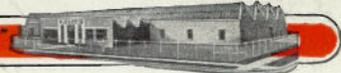
MODEL B660 UNIVERSAL TOOL GRINDER

Model B660 Universal Tool Grinder is the same machine as Model B600 except that it is equipped with a Multi Speed Head which is essential for jobs requiring small wheels. The spindle is belt driven from either side by a reversible one-half H.P. motor and permits the use of grinding wheels ranging from one to ten inches in diameter.

Plants that already possess K-O Universal Tool Grinders can increase the utility of their machines by purchasing No. B655 K-O SPEED HEAD (see price list). This head can be mounted on any K-O Grinder having a 3" column. Changing heads on any K-O Grinder is a simple and easy task involving the removing of two nuts that hold the motor head in place at the top of the column.

AVAILABLE SPEEDS WITH K-O SPEED HEAD

Motor Pulley Diameter	Quill Pulley Diameter	Spindle Speed R.P.M.
1 7/8"	6 "	1080
1 7/8"	4 1/2"	1440
3 3/8"	6 "	1940
3 3/8"	4 1/2"	2580
3 3/8"	3 3/8"	3450
4 1/2"	3 3/8"	4630
6 "	3 3/8"	6160
4 1/2"	1 7/8"	8270
6 "	1 7/8"	11020



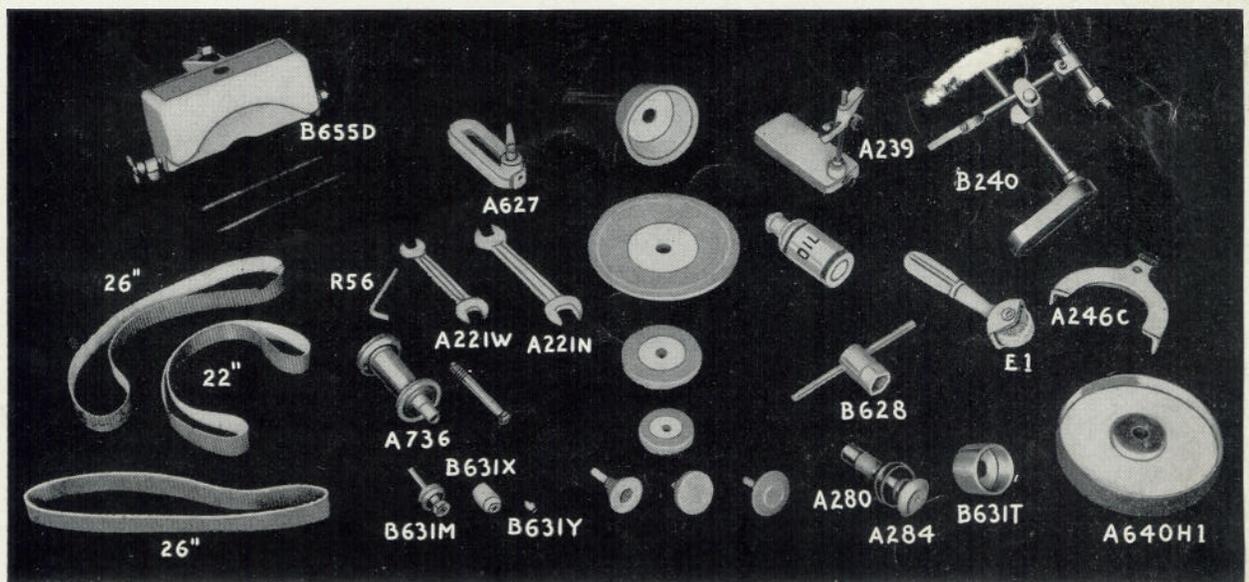
STANDARD EQUIPMENT

For Model B660

- A221N Open End Wrench (9/16", 11/16").
- A221W Open End Wrench (1/2", 19/32").
- A239 Center Gauge.
- A280 Friction Collar for A284 Arbor.
- A284 1" Cutter Grinding Arbor.
- A657 Four T-slot Bolts (3/8" x 1 3/8").
- B240 Universal Tooth Rest.
- B617 Blue Print of Clearance Angles.
- †B620 Universal Head Stock with Center.
- †B621 Tail Stock with Center.
- B627 Plain Tooth Rest.
- B655 K-O SPEED HEAD complete with the following equipment:
 - A121W Spacing Collar for Thin Wheels.
 - A221W Open End Wrench (1/2", 19/32").
 - A246E 8" Wheel Guard.
 - A246J 4" Wheel Guard with Bracket.
 - A246K 6" Wheel Guard with Bracket.
 - A294D Wheel Collet.
 - A294K Collet Washer for A294D Collet.
 - A640H1 6" Pulley.
 - A736 3" Shaft Extension with Draw Bolt.
 - B628 7/8" Socket Wrench.
 - B631 Quill Assembly.
 - B631A 4 1/2" Pulley.
 - B631B Bracket for Quill.
 - B631E 3 3/8" Pulley.
- B631M Arbor and Flange Assembly.
- B631T 1 7/8" Pulley.
- B631X Cap for B631Y Compression Sleeve.
- B631Y Compression Sleeve for Holding Mounted Wheels.
- B655D Wet Wheel Guard Assembly complete with Shut-Off Cocks and Tubing.
- B655GE 1/2 H.P. Reversible Motor.
- A31 1 3/8" x 1" x 1/4"—28 Mounted Cup Wheel.
- A36 1 5/8" x 3/8" x 1/4"—28 Mounted Special Shape Wheel.
- A235 1 1/2" x 1/4" x 1/4"—28 Mounted Straight Wheel.
- CV3 1/2 NH60 3 1/2" Cup Grinding Wheel.
- PR8AM70 8" x 3/32" x 1 1/4" Cut-off Wheel.
- PV2FF60 2" x 3/8" x 3/8" Straight Grinding Wheel.
- PV3FF60 3" x 3/8" x 3/8" Straight Grinding Wheel.
- PV6GH80 6" Straight Grinding Wheel.
- SV6GH60 6" Saucer Grinding Wheel.
- 7/32" Hex Wrench.
- Two 22" x 7/8" Hevaloid Belts.
- Two 26" x 7/8" Hevaloid Belts.
- 2 oz. bottle D.T.E. Light Socony Oil.
- B665 Cabinet Stand.
- E1 Abrasive Wheel Dresser.
- R56 Set Screw Wrench.

†Furnished in matched sets number B622.

PHOTOGRAPH OF STANDARD EQUIPMENT NOT SHOWN WITH MACHINE ON PAGE 6

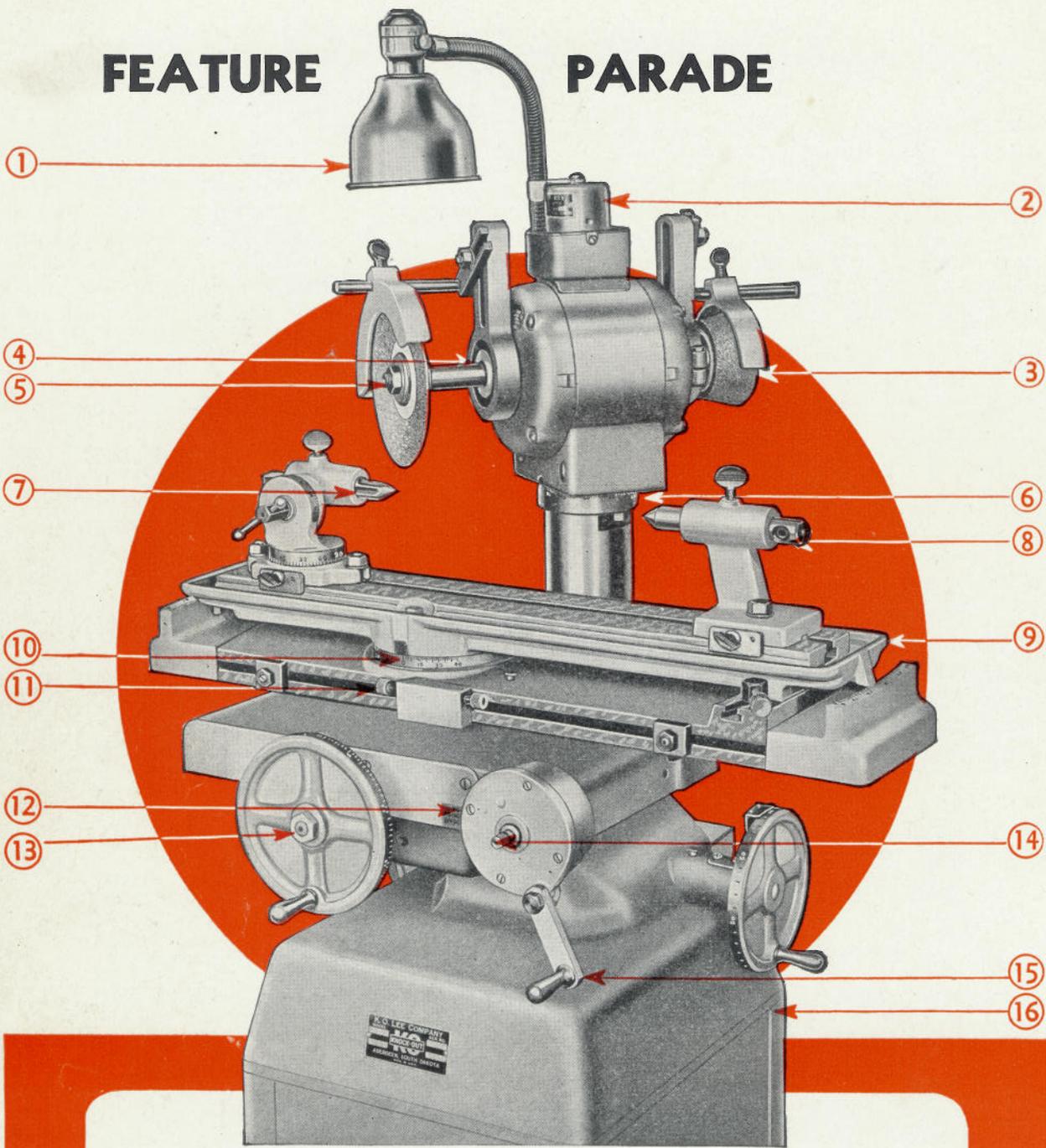




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FEATURE

PARADE



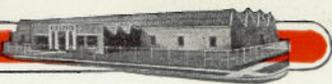
FEATURES

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Flexible light to spot-light the operator's work. 2. Reversing switch conveniently located. 3. Three-inch extension can be quickly applied to either end of motor shaft. 4. Dust and grease seal protects ball bearings. 5. Positive lock permits rotating wheel in either direction. 6. Wheel head swivels full 360°. 7. Interchangeable centers may be used for male and female grinding. 8. Center designed to hold diamond nib for dressing wheel. 9. Coolant trough around table. | <ol style="list-style-type: none"> 10. Table swivels 90°, graduated in taper per foot and degrees. 11. Self-locking adjustable table stops permit the operator to make minute settings for close and accurate work. 12. Spring lock adjusting screw for adjusting table movement on light or heavy work. 13. Ball bearing crossfeed screw. 14. Two-speed transmission allows fast or slow table traverse. 15. Handle for table traverse adjustable for short or long strokes. 16. Handy enclosed two-shelf, stream-lined cabinet base. |
|---|---|



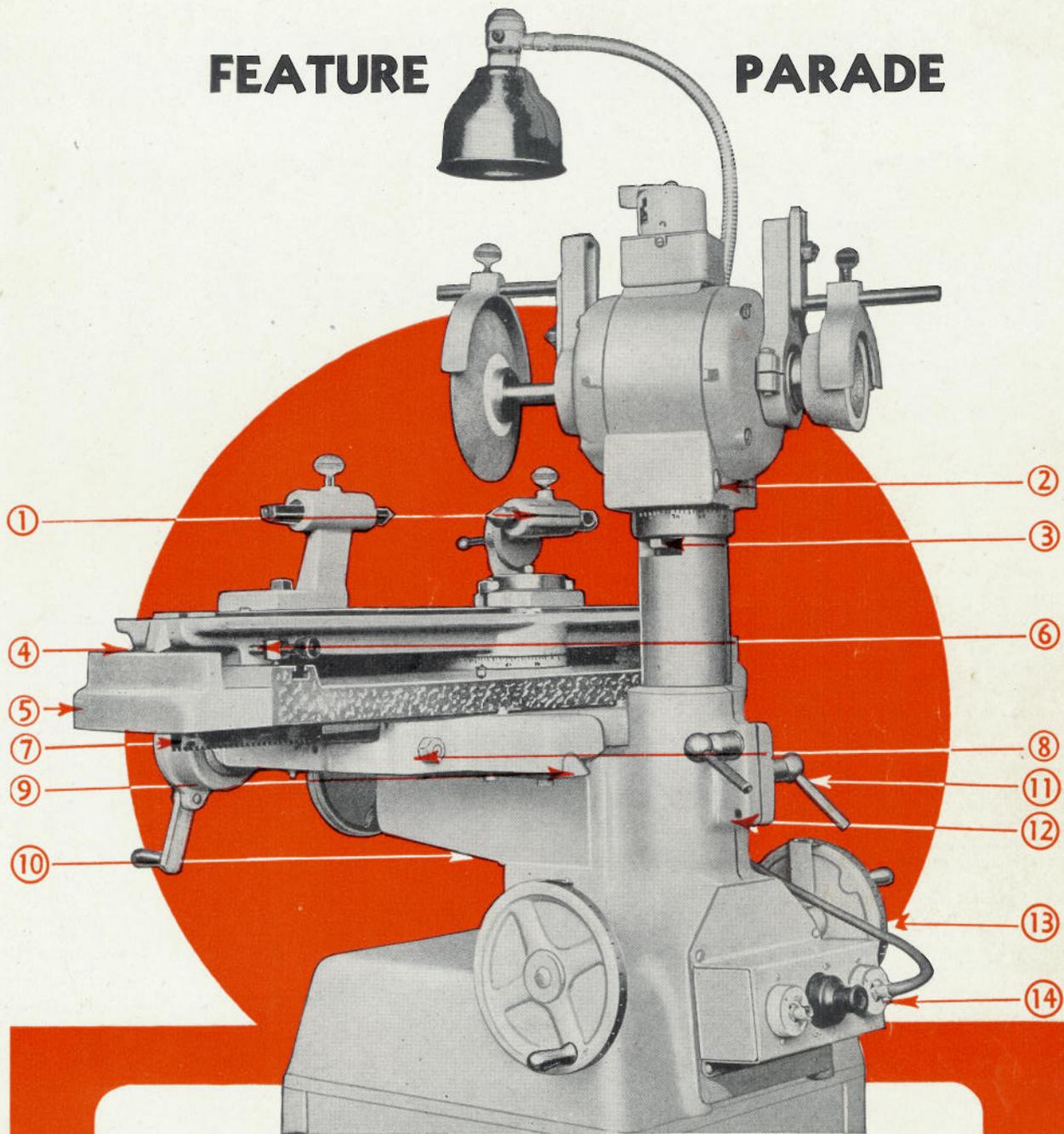
K. O. LEE CO.

ABERDEEN, SOUTH DAKOTA



FEATURE

PARADE



FEATURES

- | | |
|--|--|
| 1. Universal head stock sleeve adjustable for wear. | 9. Ways on saddle fully protected. |
| 2. Provision made for easy attaching of carbide tool grinding fixture. | 10. Massive, sturdy saddle and knee. |
| 3. Wheel head can be locked from either side. | 11. Two locking clamp screws facilitate quick and easy column lock from either side. |
| 4. Taper settings graduated on horizontal for easy reading. | 12. Column adjusting screw permits proper tension of sleeve at all times. |
| 5. Ways on table protected at all times. | 13. Two easy turning hand-wheels for raising and lowering the wheel head, permitting convenient operation from either side of machine. |
| 6. Positive adjustments for setting tapers at any point. | 14. Two-outlet electrical panel. |
| 7. Straight gear and rack on table traverse. | |
| 8. Adjustment for wear on table feed pinion. | |

FEATURE NOT SHOWN IN PICTURE

Feed screw nuts on vertical and cross-feeds are self-aligning, self-cleaning, adjustable for wear and hardened for long life.

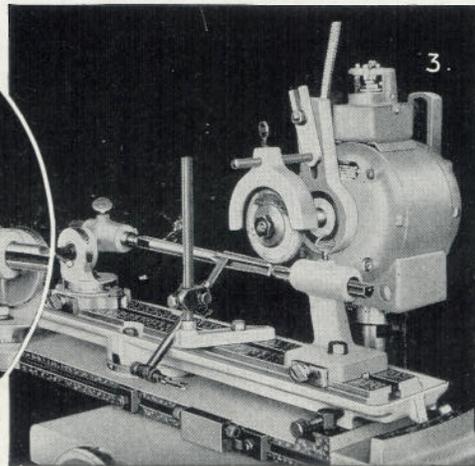
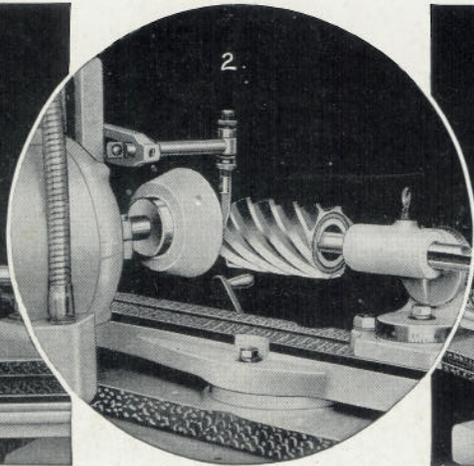
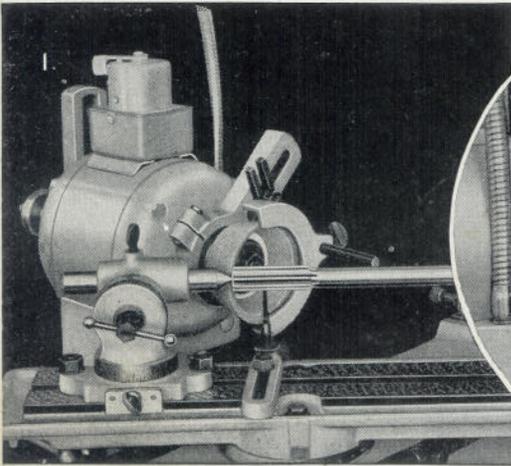




If its made by Lee - its a Knock-Out

K-O UNIVERSAL TOOL GRINDERS

At Work With Standard Equipment



1. All grinding necessary to condition most reamers can be done on a K-O Grinder with standard equipment. Above, a 45 degree cutting angle is being ground on the end of a chucking reamer while held between centers. The head and tail stock centers are reversible providing male and female centers. Indexed directly against the tooth being ground and mounted on the table is the B627 Plain Tooth Rest. A 3 1/2" fine grain cup wheel is used for this operation.

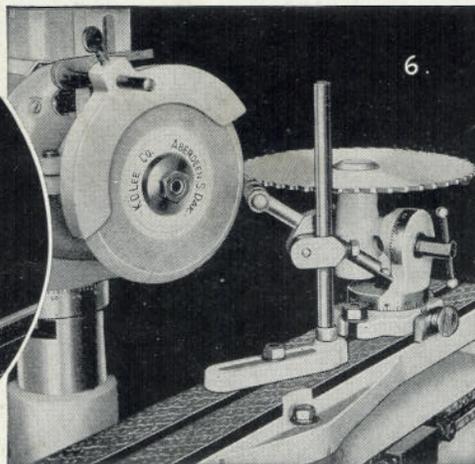
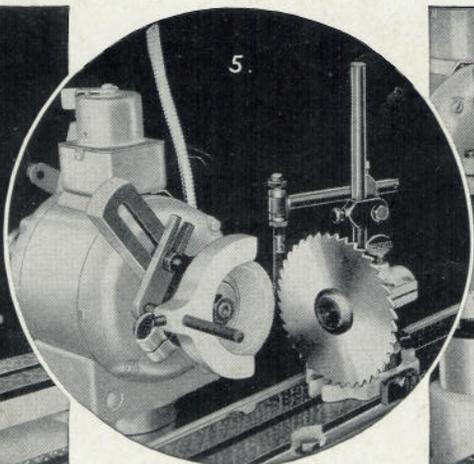
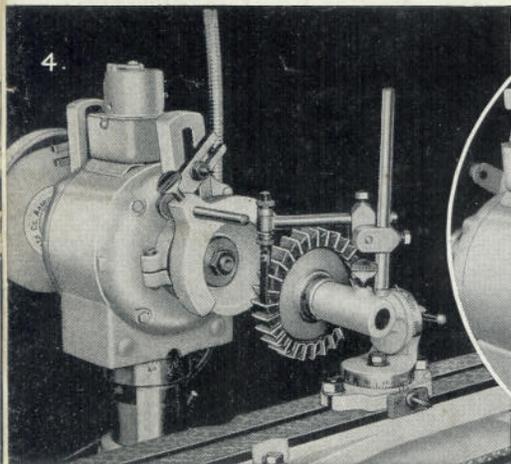
2. Above, a spiral cutter is shown held on a K-O Expanding Mandrel. This cutter could also have been held on a B648B Straight Arbor. The No. B240 Universal Tooth Rest is mounted on the wheel guard bracket and is indexed against the tooth being ground. A 3 1/2" cup wheel is used for this operation. The wheel guard is eliminated in the picture for photographic purposes.

3. The above picture shows the grinding of tap flutes. The tap is held between centers. A straight grinding wheel, formed to a convex grinding surface, is used for this operation. Wheel forming is done with the A269 Radius Wheel Dresser (see page 22). The Tooth Rest is mounted on the table and is indexed against the tooth being ground.

4. All grinding operations necessary on side mills can be done on a K-O Grinder with standard equipment. The side mill pictured below is mounted on a No. A284 Cutter Grinding Arbor held in the Head Stock. The Tooth Rest is mounted in the Head Stock and is indexed against the tooth being ground. A 3 1/2" cup wheel is used for this operation.

5. The Slitting Saw pictured below is mounted on a No. A284 Cutter Grinding Arbor. The No. A280 Friction Collar is used in conjunction with this arbor to insure firmness and stability of the cutter while being ground. The arbor is held in the Head Stock and the saw teeth are indexed by the tooth rest. A 3 1/2" cup wheel is used for this sharpening operation. The tooth rest is mounted in the head stock.

6. Metal Slitting Saws up to 24" in diameter can be sharpened on a K-O Grinder with standard equipment. When the saw exceeds 6 1/4" in diameter, the Head Stock must be swiveled to place the saw in a horizontal position. In the illustration below, a No. A284 Cutter Grinding Arbor and a No. A280 Friction Collar are used to hold the saw. Because of the size of the saw the Tooth Rest is mounted on the table. When gumming out the teeth, a straight wheel dressed to an angle with the E1 Wheel Dresser is used.





UNIVERSAL TOOL GRINDERS

MODELS B600 and B660

Specifications

Swing over table — 6¼" (with 1" raising blocks — 8¼").

Distance between centers of head and tail stocks: Models B600 and B660—18".

Surface dimensions of table:
Working surface—27⅞" x 27½".
Over-all dimensions—5⅝" x 27½".

Table graduations on right end are in taper per foot — 3" either side of center.

Table graduations at center—90° to left, 45° to right.

Table graduations on left end—15° either side of center

Wheel head swivels full 360°. Graduated in degrees.

Minimum distance—centerline of wheel shaft to top of table —2¾".

Maximum distance—centerline of wheel shaft to top of table—9¼".

Distance from floor to center of head stock—44".

Maximum height of machine with column extended—59"

Column diameter—3".

Maximum distance from column to wheel—7⅞".

Cabinet stand—18½" x 20" at base.

Vertical movement of column—6½"—.040" per revolution of hand wheel, graduated in thousandths.

Cross feed—4¾"—.100" per revolution of hand wheel, graduated in thousandths.

Table traverse—10¾".

Fast feed (direct drive)—2½" per revolution of crank.

Slow feed (5:1 ratio)—½" per revolution of crank.

Capable of sharpening saws up to 24" diameter.

Table T-slot—7/16".

Grinding wheels:
Maximum size—6" diameter.
Wheel bore—⅝" diameter.

Motor for Model B600: Reversing ½ H.P., 220 volt, three phase, 60/50 cycle, 3450 RPM.

Motor for Model B660: ½ H.P. reversible.

Shipping data: Universal Tool Grinders with standard equipment.

B600 { Net weight—345 lbs.
Shipping weight (crated)—457 lbs.

B660 { Net weight—375 lbs.
Shipping weight (crated)—497 lbs.

AVAILABLE MOTORS

FOR ALL K-O GRINDERS

- A632 ¼ HP, 110 volt, single phase, 60 cycle.
- A632AA ½ HP, 115/230 volt, single phase, 60/50 cycle.
- A632B ¼ HP, 220 volt, single phase, 60/50 cycle.
- A632D ½ HP, 220 volt, single phase, 60/50 cycle.
- A632E ½ HP, 220 volt, 3 phase, 60/50 cycle.
- A632F ¼ HP, 220/440 volt, 3 phase, 60/50 cycle.
- A632G ½ HP, 220/440 volt, 3 phase, 60/50 cycle.
- A632H ¼ HP, 110 volt, single phase, 25 cycle.
- A632L ½ HP, 220 volt, 3 phase, 25 cycle.
- A632P ¼ HP, 115 volt, direct current.
- A632R ¼ HP, 230 volt, direct current.
- A632S ½ HP, 115 volt, direct current.
- A632T ½ HP, 230 volt, direct current.
- A632U ¼ HP, 550 volt, 3 phase, 25 cycle.
- A632V ½ HP, 550 volt, 3 phase, 60/50 cycle.

FIXTURES AND ACCESSORIES

B670 FIXTURE FOR GRINDING SPIRAL AND HELICAL CUTTERS AND HOBS

1. Spiral Hobs ranging from ½" to 6" in diameter can be ground with a K-O Grinder. Below, a 2" spiral hob is being held on a No. B648B Cutter and Hob Grinding Arbor while tension against the tooth rest is maintained.

2. Below, a Taper Spiral Bridge Reamer is being held in a No. B642 Sensitive Work Head

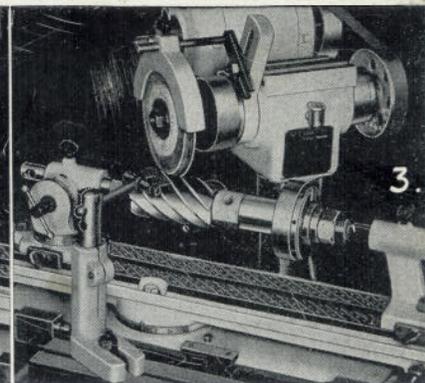
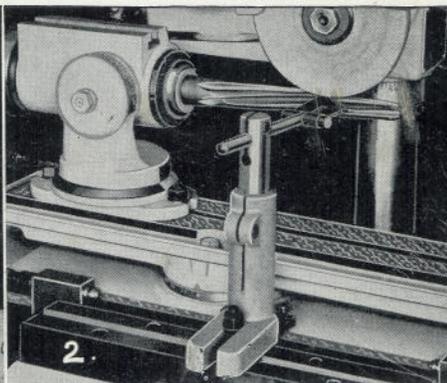
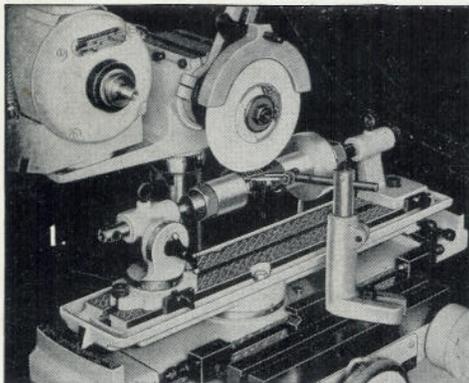
EQUIPMENT

STANDARD EQUIPMENT

- B670R Tooth Rest Assembly
- B670T Stationary T-Slot Bar
- 7/32" Hex Wrench

with B642T Taper Sleeve. The No. B670R Tooth Rest mounted on the B670T Stationary T-Slot Bar is indexed against the front of the tooth being ground.

3. A 3" Helical Cutter is pictured below being held on a No. B648B Arbor. Tension is being supplied against the No. B670R Tooth Rest.



K. O. LEE CO.

ABERDEEN, SOUTH DAKOTA

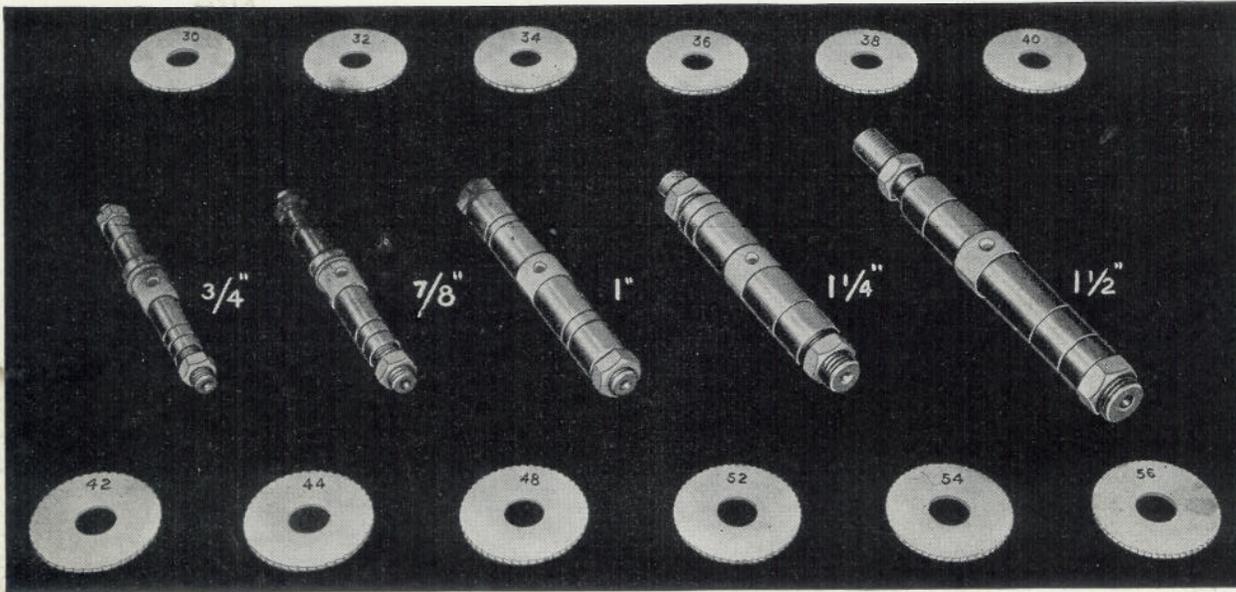




"If its made by Lee - its a Knock-Out"

CUTTER AND HOB GRINDING ARBORS

For Straight, Spiral and Helical Cutters and Hobs



EQUIPMENT

ARBOR SETS

- B648A** Set of three Cutter and Hob Grinding Arbors including:
 B650 3/8" arbor with spacer sleeves and collar for index discs.
 B651 1" arbor with spacer sleeves and collar.
 B652 1 1/4" arbor with spacer sleeves.
- B648B** Set of five Cutter and Hob Grinding Arbors includes:
 B649 3/4" arbor with spacer sleeves and collar.
 B650 7/8" arbor with spacer sleeves and collar.
 B651 1" arbor with spacer sleeves and collar.
 B652 1 1/4" arbor with spacer sleeves.
 B653 1 1/2" arbor with spacer sleeves.

SINGLE ARBORS

Any arbor may be purchased singly without penalty to the customer. Index Discs must be purchased separately. All index discs fit any arbor.

INDEX DISCS

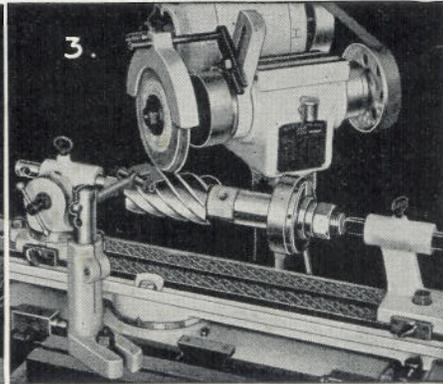
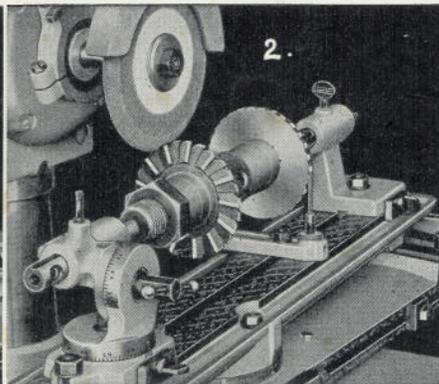
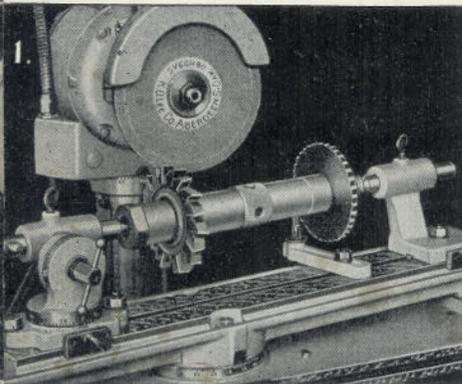
B648D Index Discs to fit all arbors. Available in 30, 32, 34, 36, 38, 40, 42, 44, 48, 52, 54, and 56 divisions.

1. Below, an alternate tooth cutter is being held on a straight arbor supported between centers while the face of each tooth is being ground. The index disc with correct number of teeth is mounted at the right of the arbor while the B627 Plain Tooth Rest is mounted on the table and indexed against the disc.

2. Straight, spiral, and helical cutters and hobs can be handled on these newly designed arbors with greater speed than by methods heretofore considered conventional. Below, an alternate tooth

cutter normally ready for discard is shown mounted on a straight arbor while being gummed out and made ready for longer life.

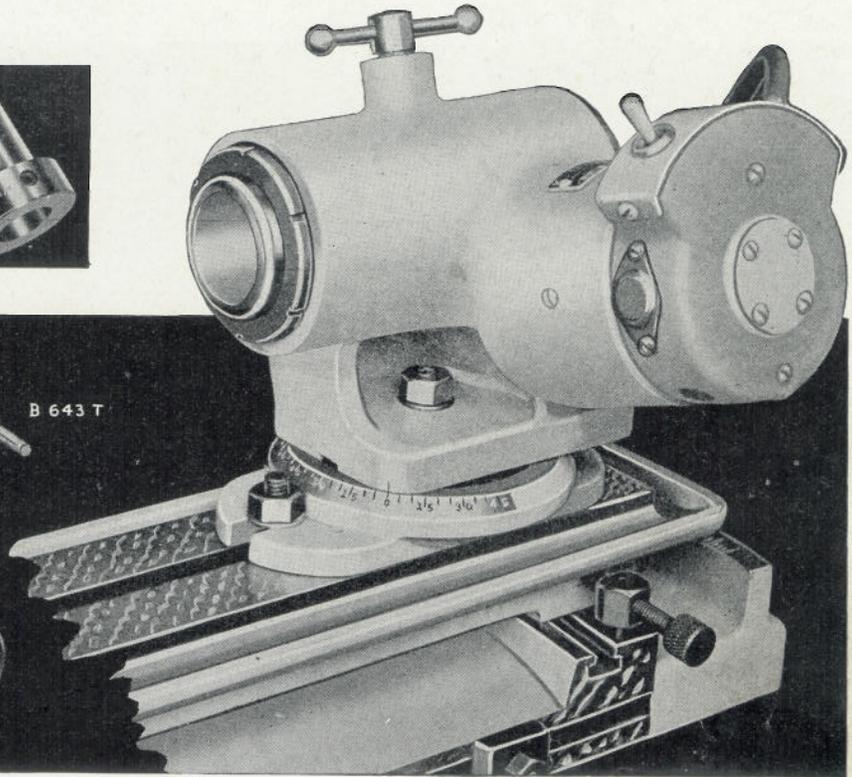
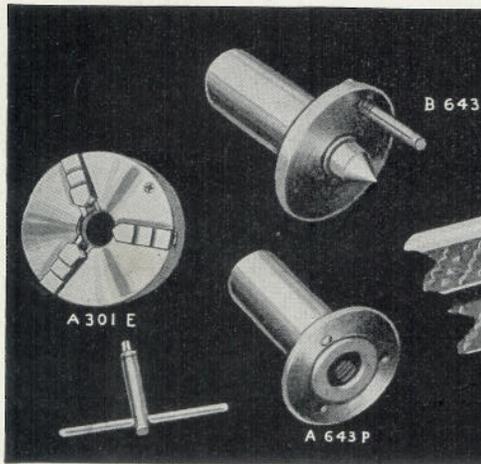
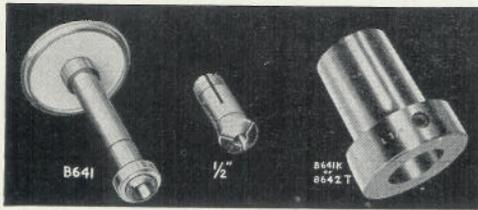
3. Below, a helical cutter is shown mounted on a straight arbor while being sharpened. Here also shown in operation is the B670 Fixture for grinding Spiral Hobs and Cutters as well as the B655 K-O "SPEED HEAD."





B693 MOTOR DRIVEN WORK HEAD

Adaptable to any make
Tool Grinder.



EQUIPMENT

STANDARD EQUIPMENT

- B693 Motor Driven Work Head with Swivel Base. B643T Driver Plate and Center Assembly.

AVAILABLE EQUIPMENT

- A301E 3" Three-jaw Universal Chuck Mounted on A643P No. 11 B & S Arbor.
 B641 Collet Fixture.
 B641C Collets for B641 Collet Fixture. Sizes Available: 3/16" to 1/2" by 64ths, 17/32" to 1" by 32nds.
 B641K Straight Sleeves. Sizes Available: 1-1/16", 1 1/8", 1-3/16", and 1 1/4".
 B642K No. 11 B & S Adapter with Standard Milling Machine Taper Socket for holding B & S Cam Lock Tapers. Available in taper Nos. 10, 20, and 30.
 B642T Taper Sleeves. Sizes Available: Morse 1, 2, 3, and 4; Brown and Sharp 5, 7, 8, 9, and 10.
 B644E 6" 4-jaw Independent Chuck mounted on No. 11 B & S Arbor.

The B693 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table.

The swivel base, which is graduated to 45° either side of center, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired.

The No. 11 B & S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers, and like equipment. Stream-lined in

design, this fixture is quickly mounted and is easy for the operator to keep clean.

The built-in special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor is fully protected from dust and from any oil entering from working parts. This power unit is easily and quickly mounted on other makes of grinders besides all K-O Grinders.

On production 24 hours a day or for tool room maintenance work, the B693 Motor Driven Work Head will prove one of the most worthwhile units in your plant.

SPECIFICATIONS

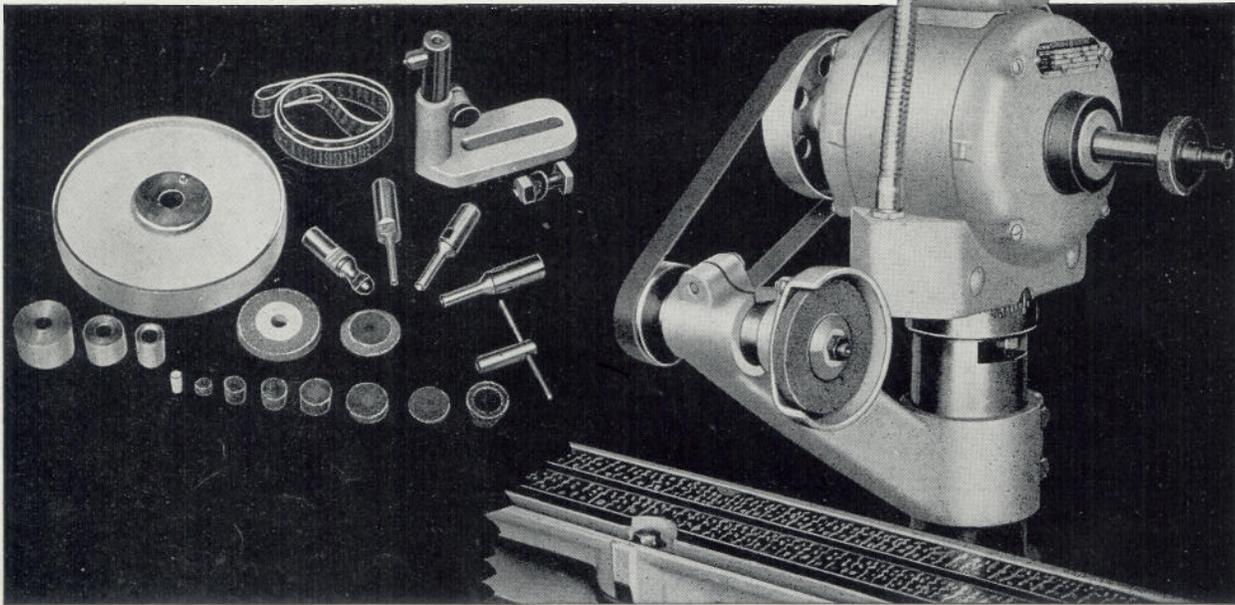
Motor: Universal Reversible Motor.
 Spindle Speed: 225 R.P.M.
 Dimensions: Width 7", length 6 1/2", height (with swivel base) 7 3/4"; Swing Over Table: 6 1/4" without swivel base; 8 1/4" with swivel base.
 Net Weight: 20 1/2 pounds.





If its made by Lee - its a Knock-Out

B640 HIGH SPEED GRINDING ATTACHMENT



EQUIPMENT

- | | | | |
|--------|---------------------------|--------|---|
| A640A | Quill | A640H6 | 3/4" Pulley for Quill |
| A640B | Bracket for Quill | A640J | Wheel Arbor with 3/8" Shank and Flanges |
| A640C | Wheel Arbor (10-32 Th'd.) | A640N | Wheel Arbor (1/8"-40 Th'd.) |
| A640E | 1 1/2" Wheel Flange | A640P | Wheel Arbor (1/4"-28 Th'd.) |
| A640F | 1/8" Collet Chuck | A640G | 3" Wheel Guard |
| B698 | 6" Pulley for Motor | B640K | Diamond Dresser with Diamond |
| B697 | 4 1/8" Pulley for Motor | B640R | Wheel Flange with 5/8" Shoulder |
| A640H3 | 2 1/2" Pulley for Quill | B640W | 1/4" Square Socket Wrench |
| A640H4 | 1 1/2" Pulley for Quill | | 7/32" Hex Wrench |
| A640H5 | 1" Pulley for Quill | | Two 3/4" x 26" Hevaloid Belts |
| | | | 11 Assorted Grinding Wheels |

The B640 High Speed Grinding Attachment is adapted to all types of cylindrical grinding, internal and external, tapered or straight. The column arm is made to clamp onto column with four bolts, thus necessitating but a minimum of set-up time.

These units are serving hundreds of plants twenty-four hours a day on vital production jobs. Six pulleys are supplied with the attachment (two for motor and four for quill), thus giving the operator eight speeds from which to select for the job at hand. Also supplied as standard equipment are eleven assorted grinding wheels. This supply permits the operator a wide selection from which to choose. The second belt

saves loss of time when the first one breaks or wears, and a replacement is ordered. A diamond dresser that can be mounted on the table for dressing the wheel without interrupting the set-up is also furnished with this attachment.

SPEED RANGE FOR B640 SPINDLE

Diam. of Wheel Can Be Used	Wheel Speed R.P.M.	Pulley Diameter on Motor 3450 R.P.M.	Pulley Diameter on Spindle
1/4 to 1/2"	25,875	6"	3/4"
5/8 to 3/4"	20,600	6"	1"
7/8 to 1"	15,500	4 1/2"	1"
1 to 1 1/4"	13,500	6"	1 1/2"
1 1/4 to 2"	10,000	4 1/2"	1 1/2"
2 1/2 to 3"	6,200	4 1/2"	2 1/2"

The rigidity of this unit when mounted insures true, fine finish on the work. When used with the B693 Motor Driven Work Head, your K-O Grinder becomes a fine, dependable, cylindrical Grinding Machine, permitting a wide scope of operations.

Maximum Work Length:
14" on Model B600 and B660 Grinders



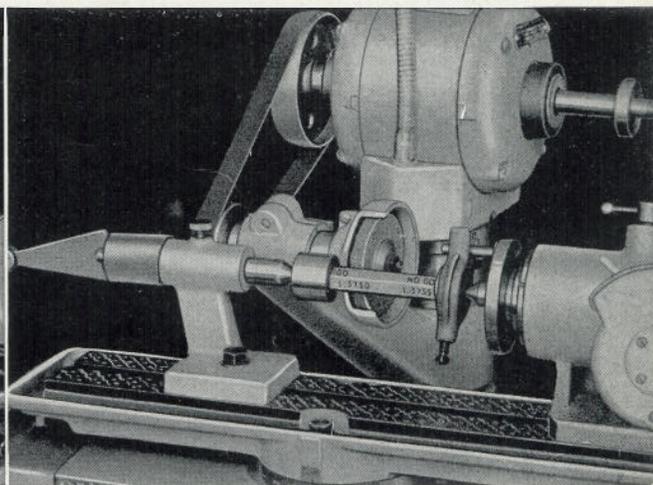
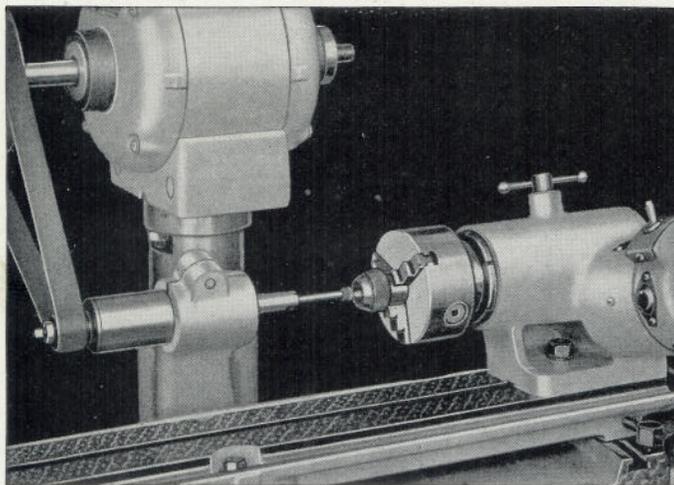
K. O. LEE CO.

ABERDEEN, SOUTH DAKOTA



B693 MOTOR DRIVEN WORK HEAD AND B640 HIGH SPEED GRINDING ATTACHMENT

Convert Your K-O Grinder Into a Fine Cylindrical Grinder



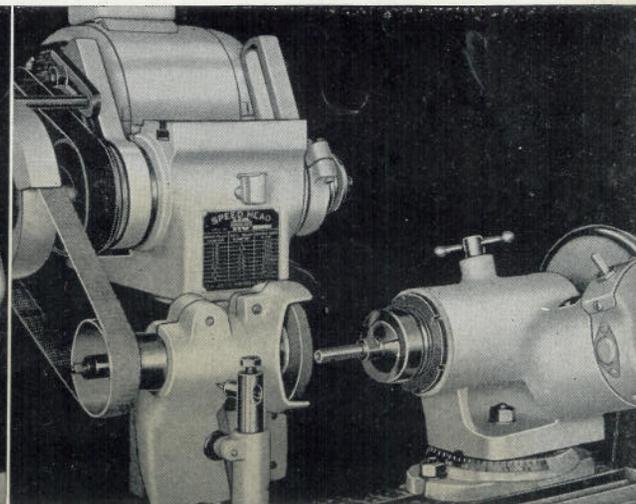
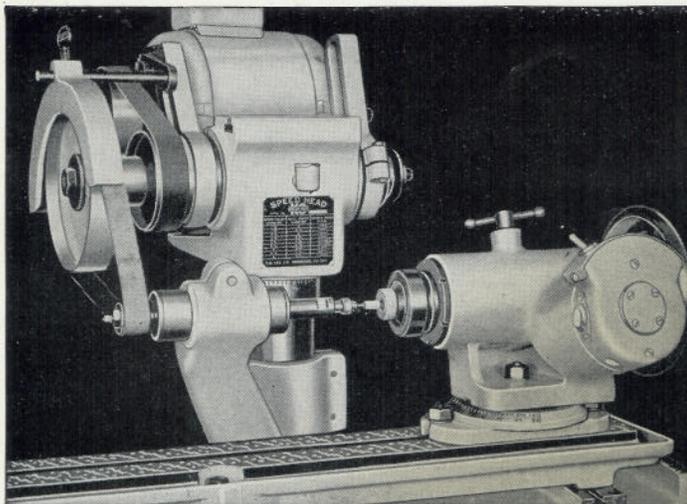
1. Internal production grinding is being done in the picture above. The work is held in a No. A301E Universal Chuck which is mounted on a No. 11 B & S Arbor. K-O Grinders are built for just such production jobs that require 24 hour per day work. The B640 High Speed Grinding Attachment, working together with the B693 Motor Driven Work Head, go to make your K-O Grinder a fine cylindrical grinding unit.

2. Above, a Plug Gauge is shown being ground while held between centers. The B643T Drive Plate and the right side while the B621 "Quick-Release" Spring Center Assembly supports and drives the gauge on Center supports the other end. This Spring Center is fast and has proven itself as a real time economizer. The set-up illustrated can be done with minimum time expenditure on K-O Grinders.



3. Below, a small internal grinding job is being done. Here we see the work piece being held in the B641 Collet Fixture which is an accessory for the B693 Motor Driven Work Head. Also in operation we find the No. B655 K-O Speed Head which permits the operator a wide selection of speeds for such operations.

4. A small external grinding operation is being done on a pilot in the picture below. Accuracy and fine finish are necessary on this item. The pilot is held in the B641 Collet Fixture which is quickly and easily mounted in the B693 Motor Driven Work Head. The No. B641K Straight Diamond Dresser is shown mounted on the table ready to dress the wheel when needed.

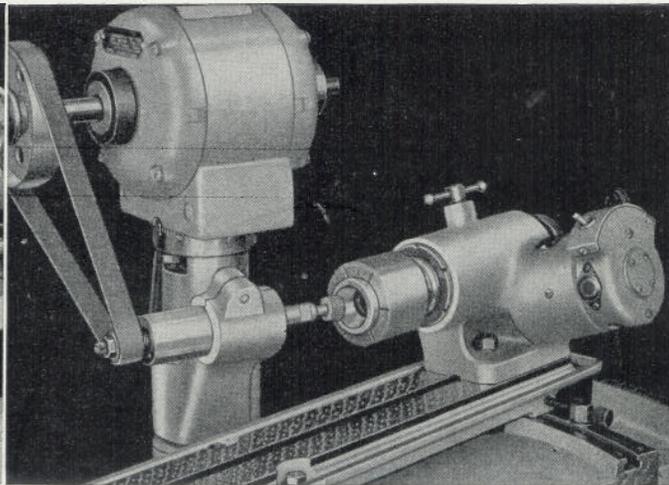
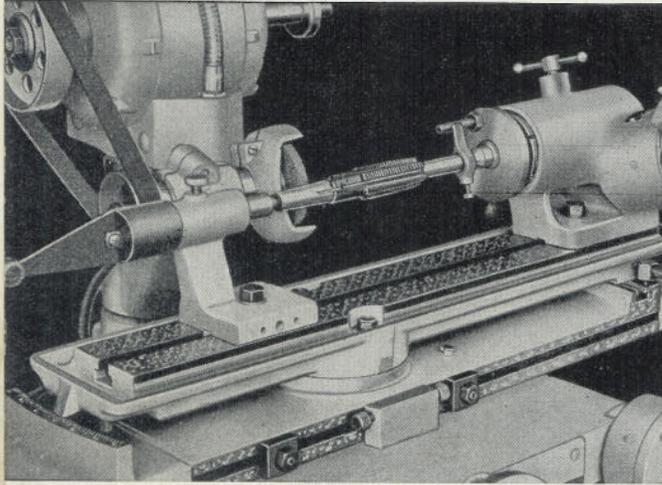




"If its made by Lee - its a Knock-Out"

B693 MOTOR DRIVEN WORK HEAD AND B640 HIGH SPEED GRINDING ATTACHMENT

Convert Your K-O Grinder Into a Fine Cylindrical Grinder



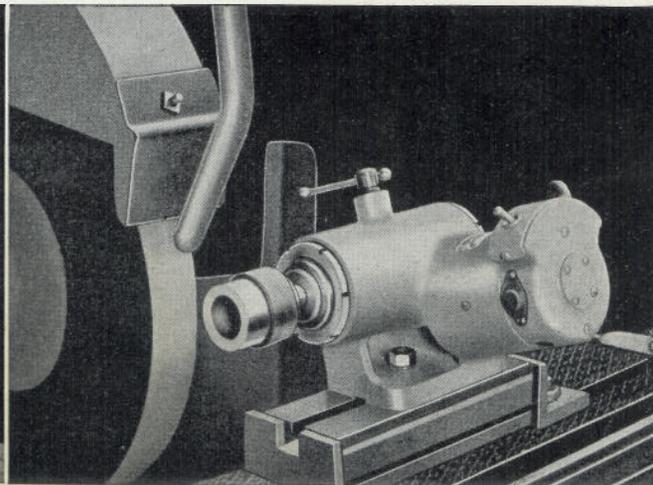
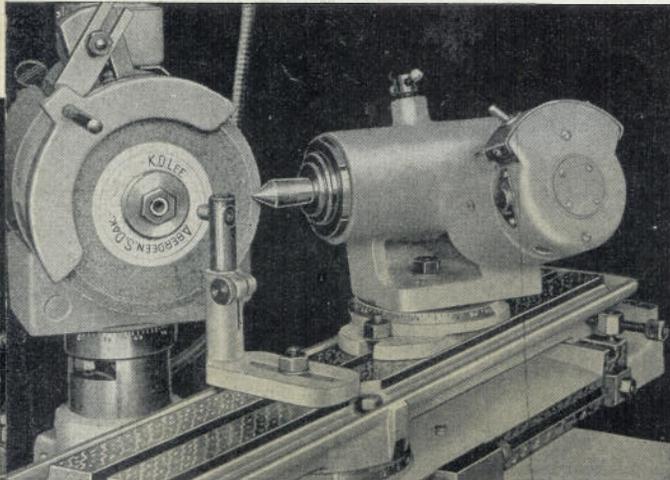
1. Cylindrical grinding on the tapered shank of a piloted tap is being accomplished in the picture above. The table is swiveled and set at the correct taper. Reversing switches on both the grinder and work head motors permit the work and wheel to rotate in either direction. All grinding operations necessary on large or small taps can be done on a K-O Grinder.

2. Internal grinding on a production job is shown above. The table is swiveled and accurately set to desired abrupt taper. The piece being ground is held in a special collet chuck. Regular collets from 3/16" to 1" can be furnished, whereas straight sleeves for work over 1" are also available for use in the B693 Motor Driven Work Head.



3. Grinding centers is a job common in every tool room. The B693 Motor Driven Work Head makes this an easy task. No. B642T Taper Adapter Sleeves are available with both Morse and B & S tapers. The No. B640K Diamond Dresser is mounted on the table in position to dress the wheel when necessary. This accessory is furnished as standard equipment with the No. B640 High Speed Grinding Fixture or, if desired, can be purchased separately.

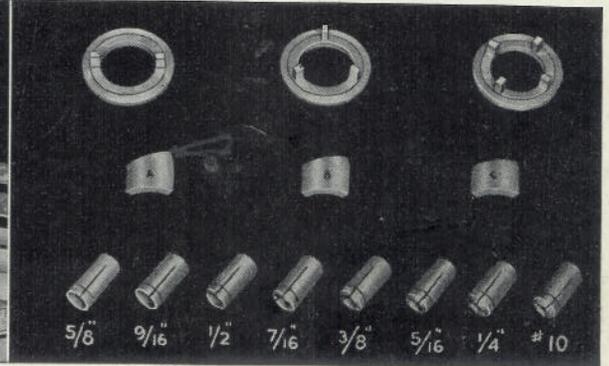
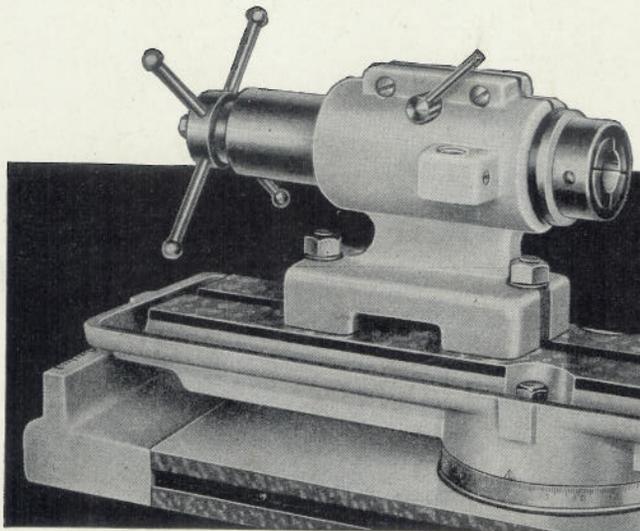
4. The B693 Motor Driven Work Head is compact and handy. It has wide usage and can be mounted on all kinds and makes of grinders, large or small. Below, this unit is shown mounted on a large 18-inch grinder where it is being used on production grinding. The work piece is held in a No. B642T Taper Sleeve. This fixture is built to "take it" on twenty-four hours per day production.





B647 TAP GRINDING FIXTURE

The B647 Tap Grinding Fixture is a sturdy, compact unit built to accommodate taps from a No. 8 size to 2 1/2" in diameter. It is easily mounted and set up for taps having two to six flutes, and is adaptable to any make of tool grinder, large or small.



EQUIPMENT

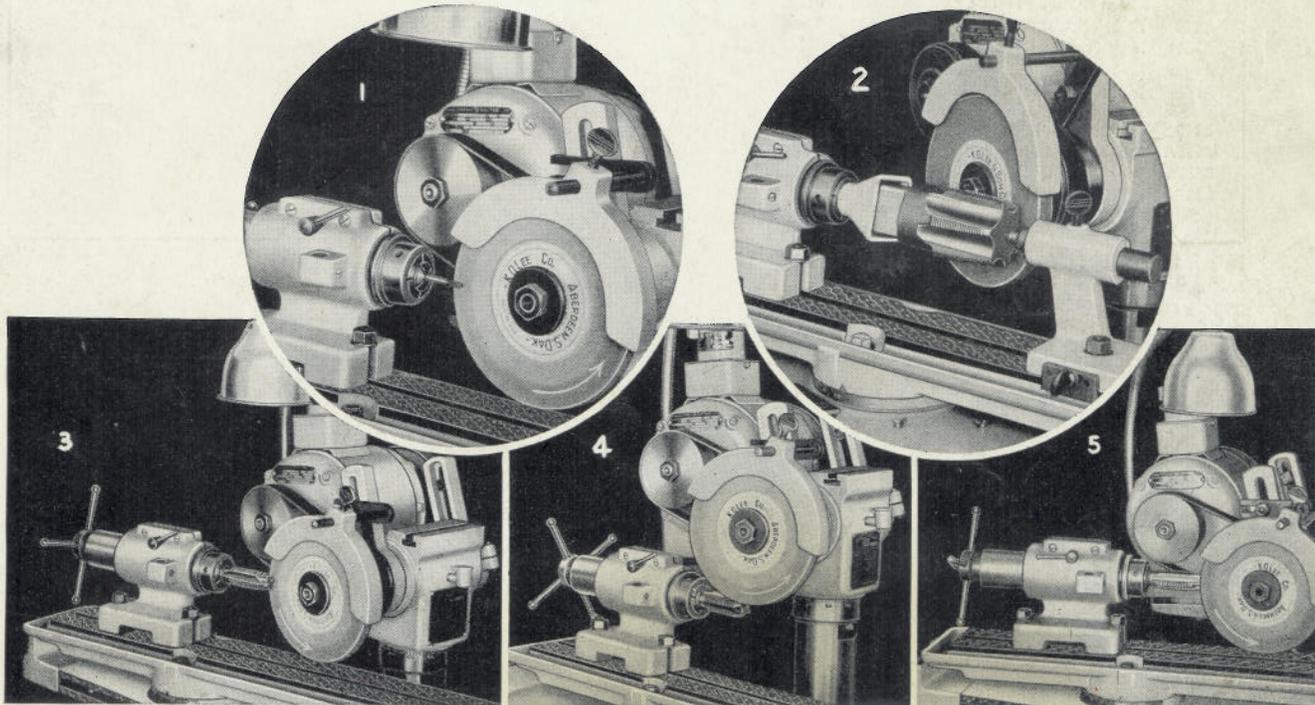
STANDARD EQUIPMENT

- B647 Tap Grinding Fixture complete with the following equipment:
- B647A 9/16" collet.
- B647B Bushings to fit Nos. 7, 8, 9, 10, 12, and sizes 1/4", 5/16", 3/8", 7/16", 1/2", and 5/8" taps.
- B647CA Cam for taps up to 3/8".
- B647CB Cam for taps from 3/8" to 3/4".
- B647CC Cam for taps over 3/4".
- B647D2 Two flute index disc.
- B647D3 Three flute index disc.
- B647D4 Four flute index disc.

AVAILABLE ACCESSORIES

- B647CS Cam, Special for 2 Flute Taps.
 - B647CSL Cam, Special for 2 Flute Taps, L.H.
 - B647CL Three sizes left hand cams.
 - B647D Five and six flute index discs.
 - B647E .800" collet to fit 1" tap.
 - B647F Bushings for B647E Collet to fit 11/16", 3/4", and 7/8" taps.
 - B647P Driver for use in grinding taps over 1".
- Note: Either A261G Spring Center (see price list) or B621 "Quick-Release" Tail Stock (see page 22) must be used with B647P Driver when grinding taps over 1" diameter.

1. Grinding the relief on a No. 10 tap.
2. Sharpening a 2 1/2" tap. The tap is supported by the B647P Driver at the left and the A261G Spring Center mounted in the tail stock at the right.
3. Sharpening a standard tap.
4. Grinding the flute of a standard tap.
5. Salvaging broken tap by grinding off broken end.



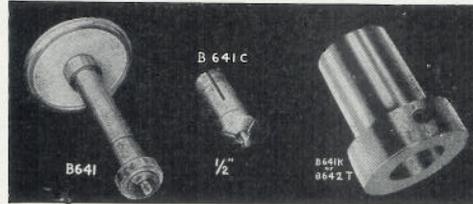
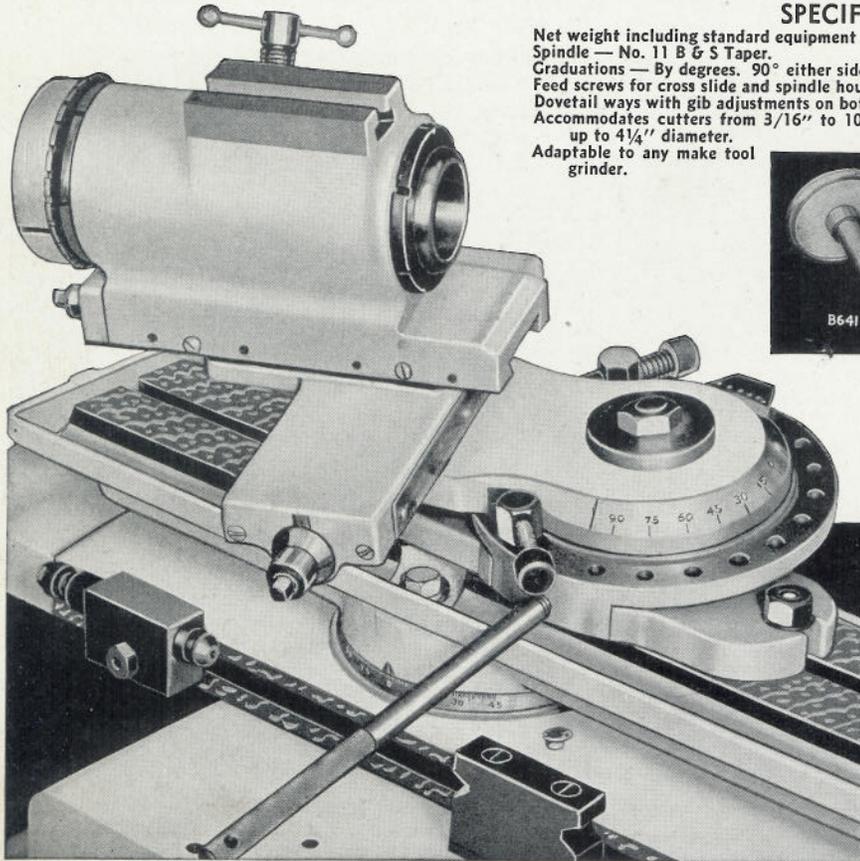


"If its made by Lee - its a Knock-Out"

B685 RADIAL GRINDING FIXTURE

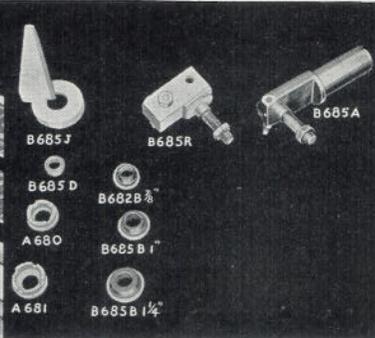
SPECIFICATIONS

Net weight including standard equipment — 40 lbs.
 Spindle — No. 11 B & S Taper.
 Graduations — By degrees. 90° either side of center.
 Feed screws for cross slide and spindle housing graduated in sixty-fourths.
 Dovetail ways with gib adjustments on both cross slide and spindle housing slide.
 Accommodates cutters from 3/16" to 10" diameter; cutters up to 1 1/2" wide; end mills up to 4 1/4" diameter.
 Adaptable to any make tool grinder.



AVAILABLE ACCESSORIES

STANDARD EQUIPMENT



EQUIPMENT

STANDARD EQUIPMENT

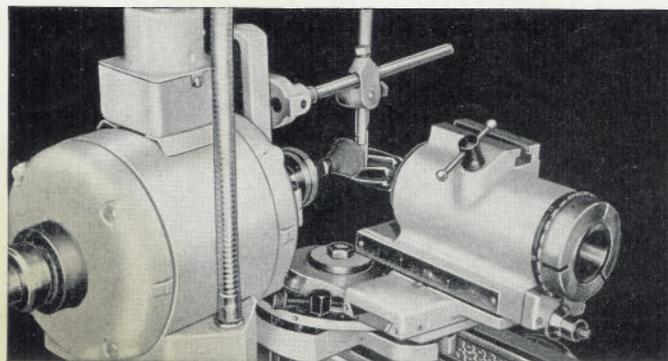
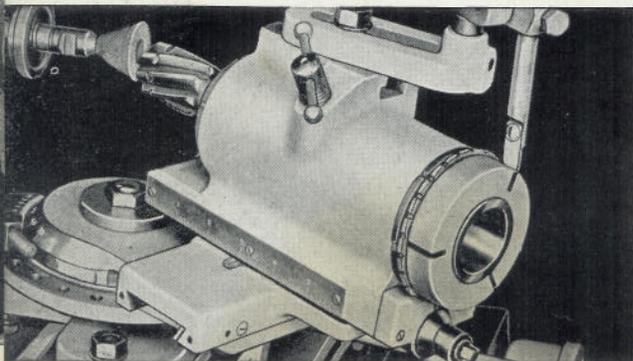
- B685 Radial Grinding Fixture complete with the following accessories:
- A280 1" Friction Collar for use on B685A and B685R.
- A281 1 1/4" Friction Collar for use on B685A and B685R.
- A642P Index Collar.
- A642R Index Disc for A642P Collar (24 divisions unless otherwise specified).
- B240 Universal Tooth Rest.
- B685A Cutter and Diamond Holding Arbor.
- B685B 3/8" Cutter Bushing.
- B685B 1" Cutter Bushing.
- B685B 1 1/4" Cutter Bushing
- B685D Guide Bushing.
- B685J Centering Gauge.
- B685R Raising Block.

AVAILABLE ACCESSORIES

- A301E 3" 3-Jaw Universal Chuck mounted on No. 11 B & S Arbor.
- A642R Index Discs for A642P Collar. 6, 8, 20, 24, 28, 32, and 36 divisions available.
- B641 Collet Fixture.
- B641C Collets for B641 Fixture. Available sizes: 3/16, 1/4, 5/16, 3/8, 7/16, 1/2, 5/8, 3/4, 7/8, and 1 inch.
- B641K Straight Sleeves. Available sizes: 1-1/16, 1 1/8, 1-3/16, and 1 1/4 inch.
- B642K No. 11 B & S Adapter with Standard Milling Machine Taper Socket for holding B & S Cam Lock Tapers. Available in taper Nos. 10, 20, and 30.
- B642T Adapter Sleeves. Available sizes: Morse 1, 2, 3, and 4; B & S 5, 7, 8, 9, and 10.
- B644E 6" 4-Jaw Independent Chuck mounted on No. 11 B & S Arbor.
- B684 Diamond Nib with lock nut for use in B685A Arbor.

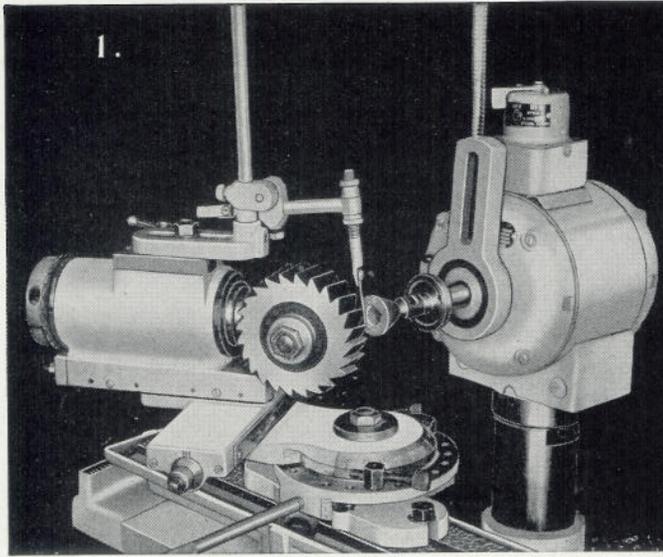
Below, a spiral end mill is held in the Radial Grinding Fixture with a No. B642T Taper Sleeve while pre-determined radii are being ground on the teeth. The tooth rest is mounted in the fixture and is indexed against the A642R Index Disc.

Operations other than grinding radii on cutters can be accomplished with this fixture. Below, we see the same cutter as is illustrated at left. This time the periphery is being ground. The spindle is set at right angles to the wheel and locked.

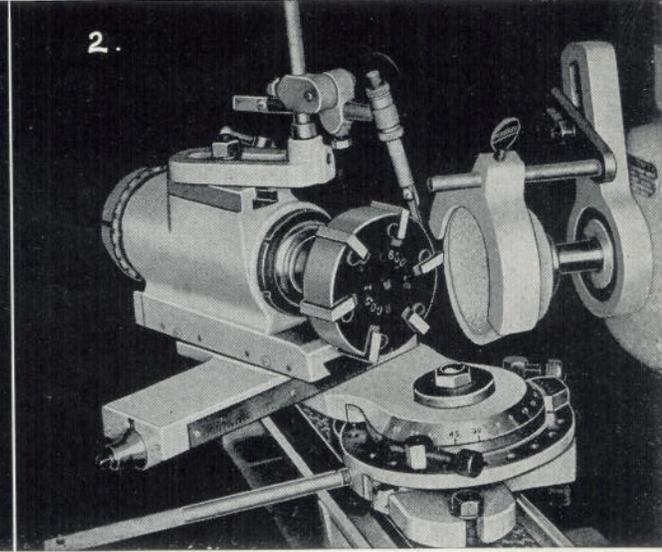




B685 RADIAL GRINDING FIXTURE AT WORK



1. The four inch milling cutter, illustrated above, is held on the No. B685A Arbor while a small pre-determined radius is being ground on each tooth. The small special shaped wheel is held on the motor shaft with a No. B631Y Compression Sleeve and B631X Cap. The spindle in the fixture is locked for this operation. Note the vertical graduations on front of swivel base for setting cutting clearance.

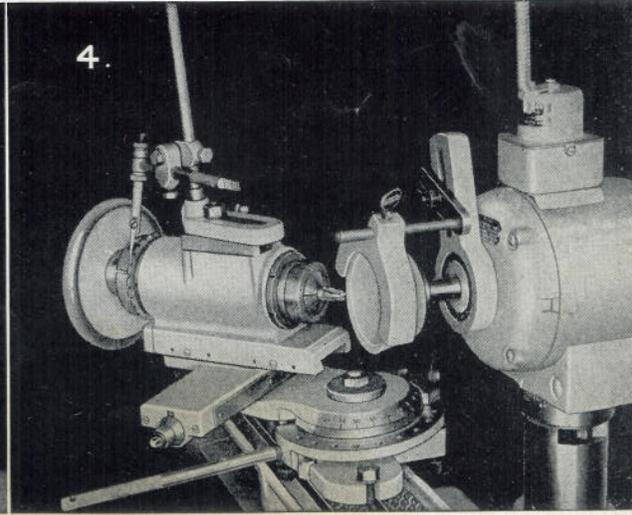
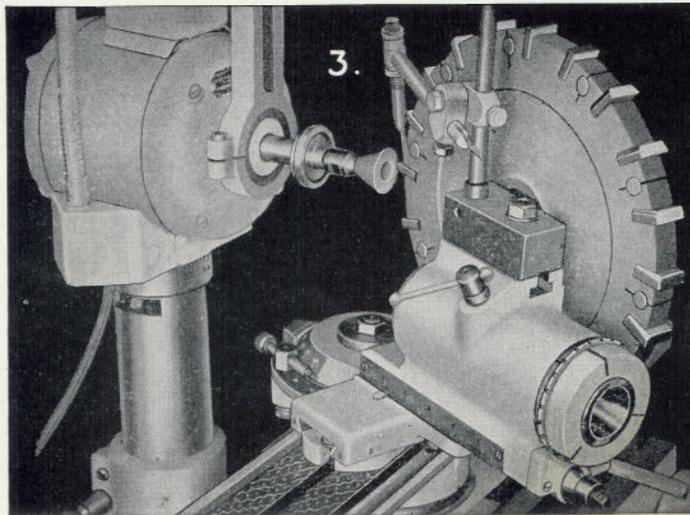


2. Above, a four inch insert tooth face mill is shown having pre-determined small radii ground on the teeth. The cutter is integral with the shaft and is therefore held in the spindle of the fixture with a B642T Adapter Sleeve. The Universal Tooth Rest is mounted in its place on the top of the spindle and indexed against the tooth being ground.



3. Ten inch cutters can be handled with ease. Below, such a cutter is shown mounted on the B685R Raising Block which is held in the T-slot on the top of the spindle. The Universal Tooth Rest is mounted in its place on the Raising Block and is indexed against the tooth being ground. While the cutter is held thus, other necessary grinding operations can be done besides grinding of radii on the teeth.

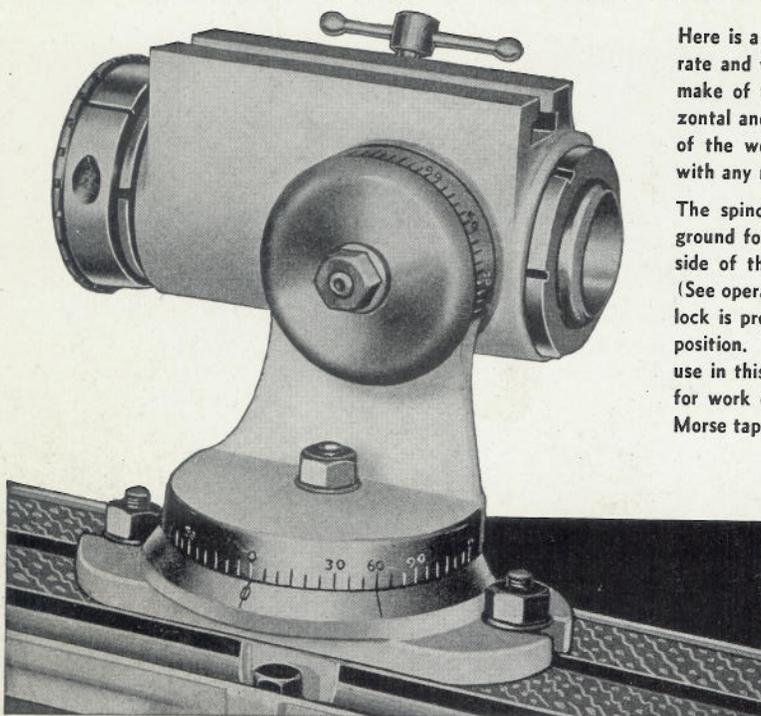
4. Below, a small 3/16 inch end mill is being held in the B641 Collet Fixture which is an available accessory for the B685 Radial Grinding Fixture. The radii on the teeth of a cutter of this size necessarily have to be small. The B685 Fixture is built to accommodate radii ranging from the smallest needed to those of sizable dimensions. For this operation the Tooth Rest is indexed against the A642P Index Disc at the back of spindle.





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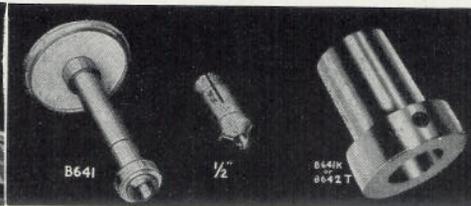
B642 LARGE SENSITIVE WORK HEAD



Here is a Sensitive Ball Bearing Work Head that is highly accurate and versatile. It is fully universal and may be used on any make of tool grinder. The head can be swiveled in both horizontal and vertical planes and is graduated in degrees. Indexing of the work is done at the back of the spindle. Index discs with any number of divisions are available for use with this unit.

The spindle is mounted in ball bearings, and is hardened and ground for accuracy and long life. It may be mounted on either side of the angle bracket for convenience in setting up work. (See operation pictures at bottom of page.) At the top, a spindle lock is provided which securely holds the spindle in any desired position. The spindle has a No. 11 B & S taper. Available for use in this fixture are collets from 3/16" to 1", straight sleeves for work over 1", Nos. 5 to 10 B & S tapers, and Nos. 1 to 4 Morse tapers.

AVAILABLE ACCESSORIES



EQUIPMENT

STANDARD EQUIPMENT

- B642 Large Sensitive Work Head including: One A642P Collar. One A642R Index Disc with 24 divisions unless otherwise specified.

AVAILABLE ACCESSORIES

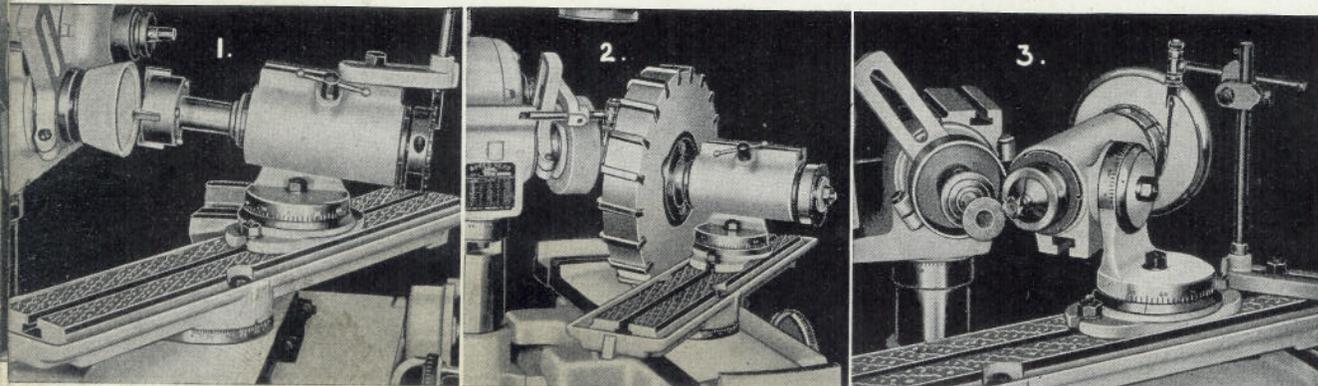
- A301E 3" 3-Jaw Universal Chuck mounted on No. 11 B & S Arbor.
- A642R Index Discs for A642P Collar. 6, 8, 20, 24, 28, 32, and 36 divisions available.
- B641 Collet Fixture.
- B641C Collets for B641 Fixture. Available sizes: 3/16" to 1/2" by 64ths, 17/32" to 1" by 32nds.
- B641K Straight Sleeves. Available sizes: 1-1/16, 1 1/8, 1-3/16, and 1 1/4 inch.
- B642K No. 11 B & S Adapter with Standard Milling Machine Taper Socket for holding B & S Cam Lock Tapers. Available in taper Nos. 10, 20, and 30.
- B642T Adapter Sleeves. Available sizes: Morse 1, 2, 3, and 4; B & S 5, 7, 8, 9, and 10.
- B644E 6" 4-Jaw Independent Chuck mounted on No. 11 B & S Arbor.

1. A 3" insert tooth end mill is shown being ground below. The cutter, integral with the arbor, is held with a No. B642T Taper Sleeve. The table is swiveled to the desired angle while the work head is tilted and set at the desired degree. Indexing is done with the B240 Universal Tooth Rest against the index disc at the back of the work head. Wheel guards are not shown for photographic purposes.

2. A 12" insert tooth face mill is shown being ground below. It is mounted on a special flange arbor and held with a tapered sleeve. The table is swiveled to a 45° angle for this operation.

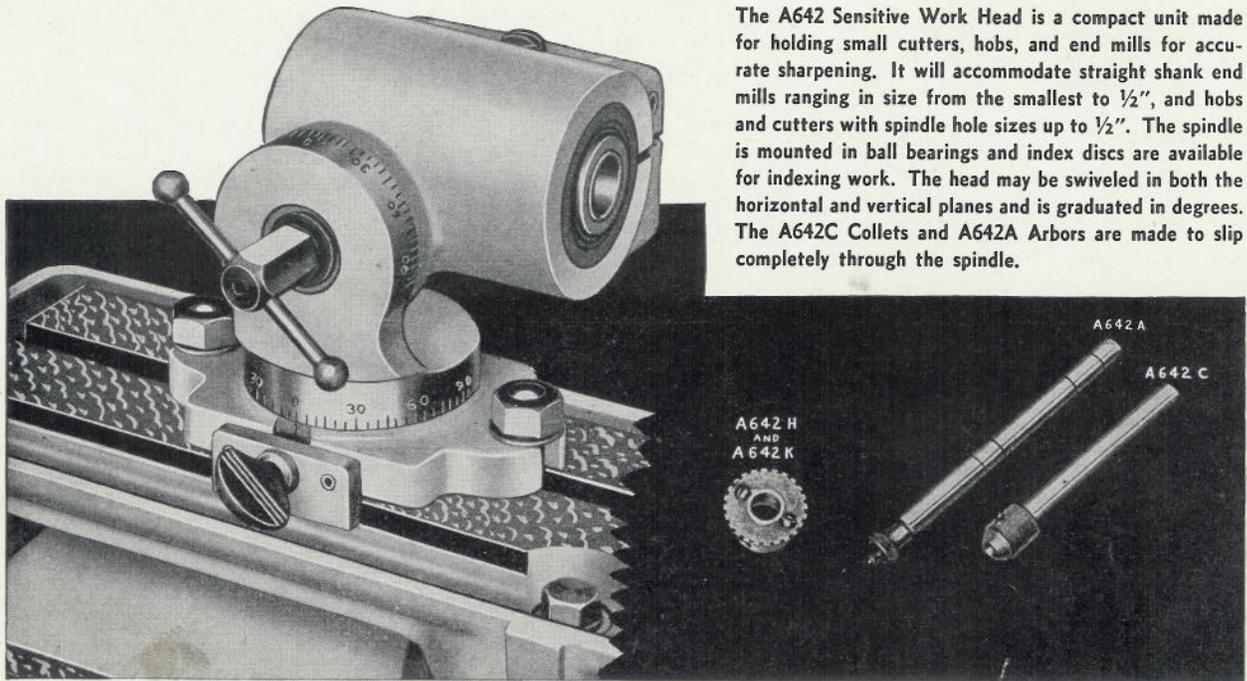
When the front of the tooth is being ground, the table is set at 0°. The tooth rest is mounted on the wheel guard bracket and is indexed against the tooth being ground. Wheel guards are left off for photographic purposes.

3. Below, a 7/16" T-slot cutter is illustrated being held in the B641 Collet Fixture which is an accessory for the B642 Sensitive Work Head. The Universal Tooth Rest is mounted on the table and is indexed against the index disc at the back of the work head. The No. B655 K-O SPEED HEAD is being employed here giving the operator correct wheel speed for this small cutter.





A642 SMALL SENSITIVE WORK HEAD



The A642 Sensitive Work Head is a compact unit made for holding small cutters, hobs, and end mills for accurate sharpening. It will accommodate straight shank end mills ranging in size from the smallest to 1/2", and hobs and cutters with spindle hole sizes up to 1/2". The spindle is mounted in ball bearings and index discs are available for indexing work. The head may be swiveled in both the horizontal and vertical planes and is graduated in degrees. The A642C Collets and A642A Arbors are made to slip completely through the spindle.

EQUIPMENT

STANDARD EQUIPMENT

- A642 Small Sensitive Work Head complete with the following equipment:
 One A642A Arbor (3/8" unless otherwise specified).
 or
 One A642C Collet (3/8" unless otherwise specified).
 One A642H Index Collar for use on A642A Arbors and A642C Collets.
 One A642K Index Disc (24 divisions unless otherwise specified).

AVAILABLE ACCESSORIES

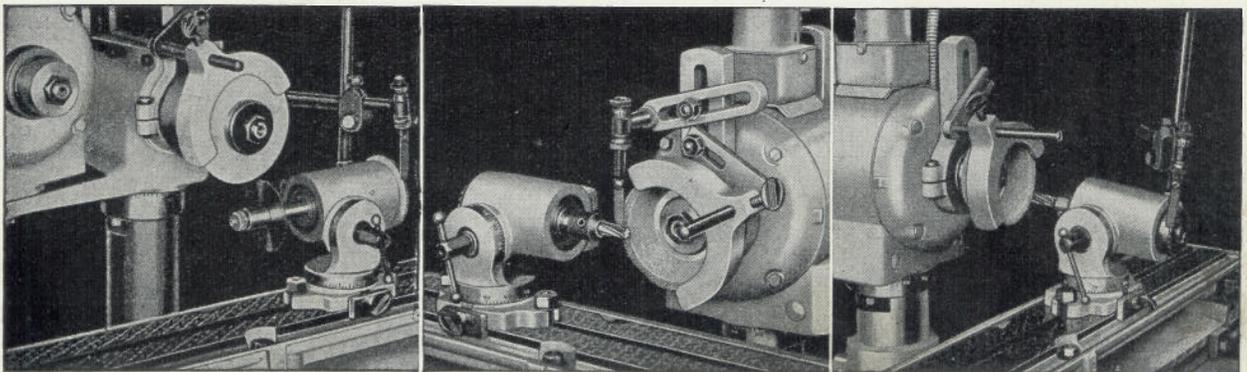
- A642A Arbors for holding small hobs and cutters (sizes 3/16, 1/4, 5/16, 3/8, and 1/2 inch).
 A642C Collets for holding small end mills with round straight shanks (sizes 3/16, 1/4, 5/16, 3/8, 7/16, and 1/2 inch).
 A642H Index Collar for A642A Arbors and A642C Collets.
 A642K Index Discs for A642H Collar (4, 6, 8, 18, 20, 24, 28, 32, and 36 divisions).

1. Below, a fine tooth key cutter is being held on a No. A642A Arbor while being ground. The wheel is dressed to a bevel for this operation. The Tooth Rest is mounted in the Work Head and is indexed against the A642K index disc which is mounted on the arbor at the back of the Work Head. Also shown in operation is the new B655 Speed Head which can be adapted to any K-O Grinder with a 3" column

2. Grinding the periphery of the small end mill which is held in an A642C Collet Chuck is shown below. Here the tooth rest is

mounted in the wheel guard bracket and indexed against the tooth being ground. A cup wheel is used for this operation. The same set-up would be retained for grinding the flutes of the end mill, except that a straight wheel dressed to an angle would be used.

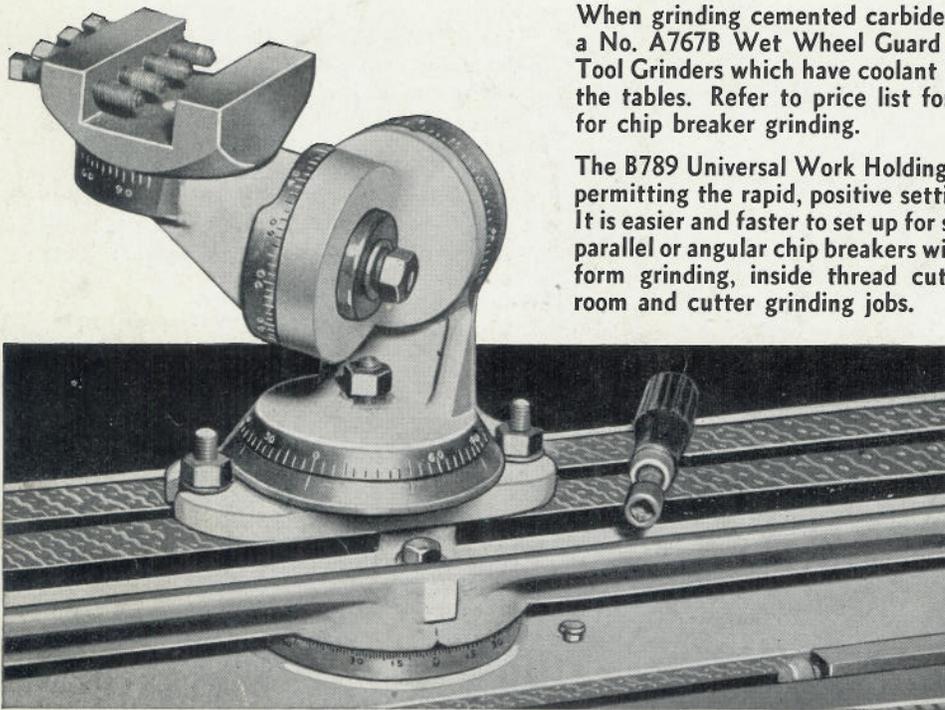
3. Clearance angles at the front of the end mill are ground by swiveling the barrel of the fixture at right angle with the wheel, and tilting the work to the desired clearance angle. The end mill is held in an A642C Collet, while the Universal Tooth Rest is mounted in the fixture and indexed against the A642K Index Disc at the back of the fixture.





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B789 UNIVERSAL WORK HOLDING FIXTURE



When grinding cemented carbide tools it is advisable to use a No. A767B Wet Wheel Guard on models B600 and B660 Tool Grinders which have coolant troughs constructed around the tables. Refer to price list for available diamond wheels for chip breaker grinding.

The B789 Universal Work Holding Fixture has four quadrants permitting the rapid, positive setting of any compound angle. It is easier and faster to set up for such grinding operations as: parallel or angular chip breakers with positive or negative rake, form grinding, inside thread cutters and many other tool room and cutter grinding jobs.

The No. A767B Wet Wheel Guard is furnished as standard equipment with grinder models B600 and B660. However, if it is desired to use other "Knock-Out" Grinder models for wet grinding operations it will be necessary to purchase this Wet Wheel Guard as an accessory. (See price list.)

EQUIPMENT

STANDARD EQUIPMENT

A264 Screw driver type socket wrench
A289B Base, swivel and quadrant assembly

B789X 1½" vise for quadrant

AVAILABLE ACCESSORIES

A268T Tool Bit Holder for tools from 3/16" to 5/16" square
A268TL Tool Bit Holder for tools from 5/16" to 1/2" square

A767B Wet Wheel Guard with shut off cocks and tubing
B789Z 2" vise

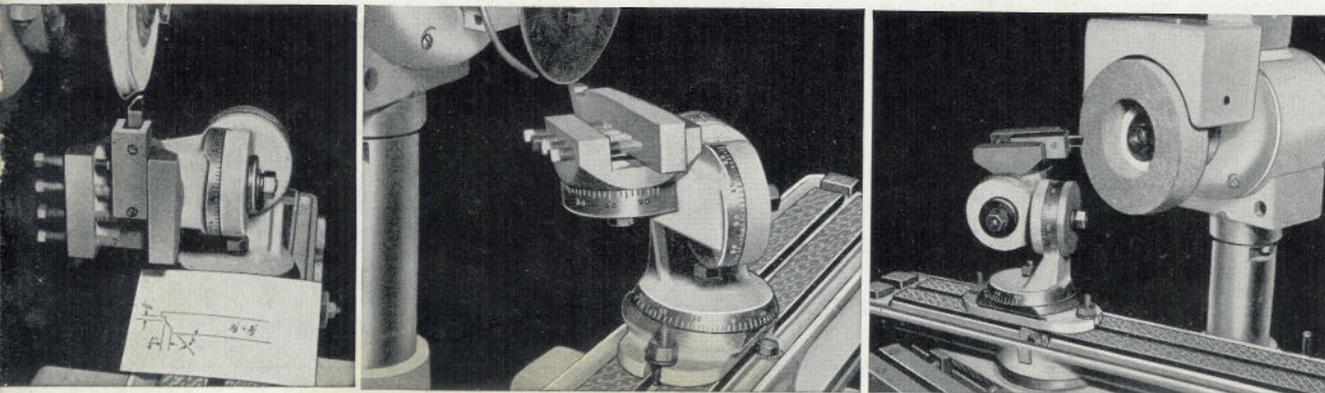
(For descriptions of available grinding wheels see price list)

1. It is easy to grind accurate cutting angles and clearances on small tool bits for such operations as chamfering, thread cutting, etc. Illustration 1 shows 1/4" tool bit inserted in A268T tool bit holder and held at correct angle and clearance in B789 work holding fixture.

2. Form grinding on a high speed tool bit is shown in illustration 2. Intricate forms and compound angles are easy to grind with the

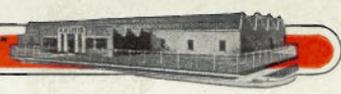
B789 universal work holding fixture because the 4 quadrants make it simple to obtain any combination of angles. Radii can be dressed on the wheel quickly and simply with the A269 Radial diamond dresser. (See page 23.)

3. Chipbreakers at any angle, with positive or negative rake, are simple to set up on the B789 Universal work holding fixture.



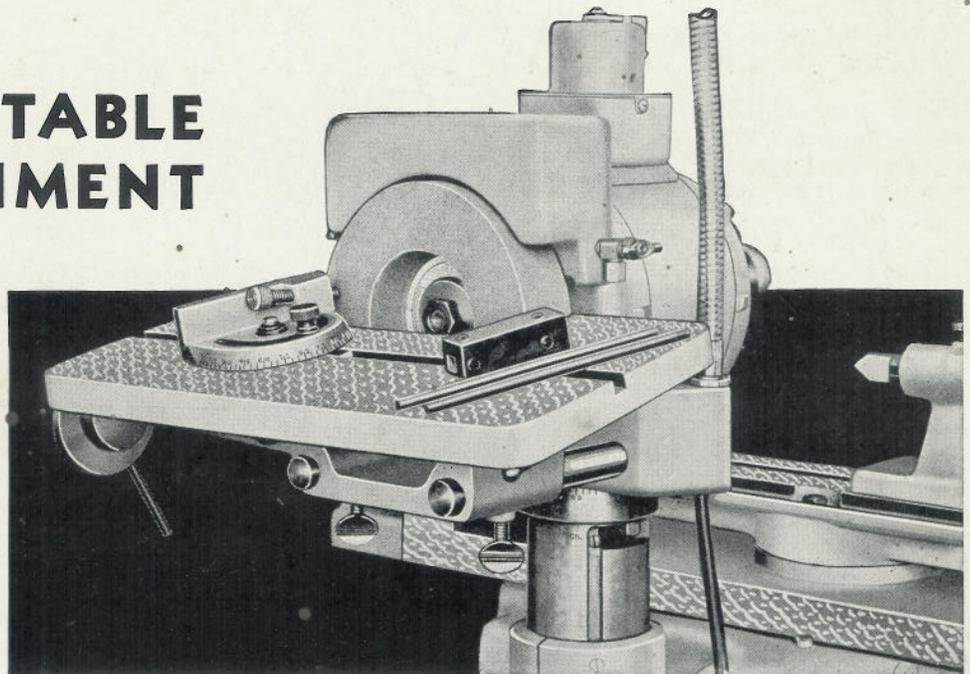
R. O. LEE CO.

ABERDEEN, SOUTH DAKOTA



A645 TILTING TABLE ATTACHMENT

The A645 Tilting Table Attachment, complete with large 10x14" Tool Rest Table, Protractor, Tool Holder, Coolant Tank, and Silicon Carbide Wheel, is built to fit all K-O grinders except Models B660 and B662. Accurate settings to any angle from horizontal to 20° below can be made with the eccentric wheel at the side. Rough and finish grinding on conventional single point, carbide tipped tools and high speed steel cutting tools is done with this attachment. Provision is made in the protractor to accommodate diamond screw for dressing wheel.



After rapidly hogging off metal by an alternate grinding procedure, accurate grinding of double angles is essential for obtaining fine finishes. All of these operations and many more can be accomplished with this attachment.

EQUIPMENT

STANDARD EQUIPMENT

- A268T Tool Bit Holder for Tools from 3/16" to 5/16" square.
- A645T Tilting Table Assembly.
- A646 Protractor.
- A767B Wet Wheel Guard with Shut-off Cocks and Tubing

6" x 1 1/2" x 5/8" Silicon Carbide Recessed Grinding Wheel.

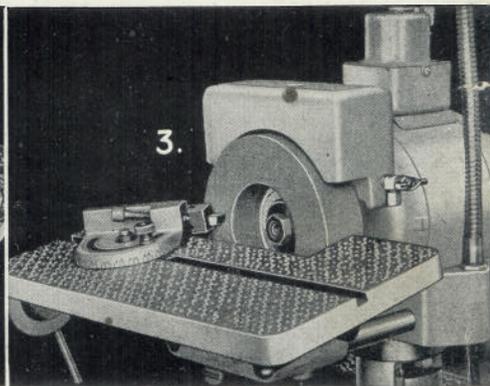
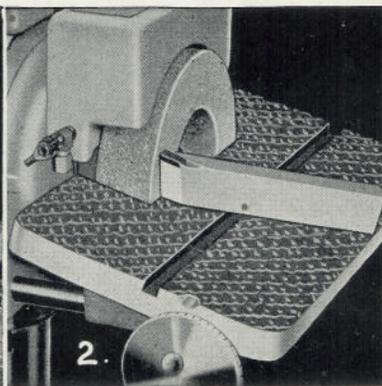
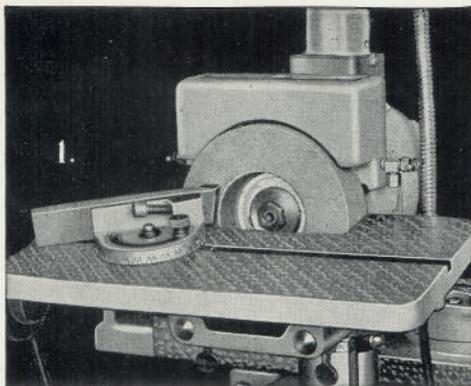
AVAILABLE EQUIPMENT

- A268TL Tool Bit Holder for Tools from 5/16" to 1/2" square.
- P176D Diamond Screw for A646 Protractor.

1. The No. A646 Protractor mounted in the key-way of the tilting table can be accurately set to any angle and used for guiding the tool across the wheel. Accurate angles with fine finish can be ground on the front or side of the carbide tipped tool. A wet wheel guard is provided for use with diamond wheels.
2. Rapid hogging off of metal can be done by the free-hand method. It is suggested that the operator grind alternately on carbide tip and steel shank. A 1/2 HP motor is recommended for this type of work.

The table can be tilted for desired cutter clearance at any angle from horizontal to 20° below.

3. Below, an inside thread cutter is shown being held in a No. A268T Tool Bit Holder while guided across the wheel at the desired cutting angle by the A646 Protractor. Note the No. P176D Diamond Screw mounted in the protractor ready to dress the wheel when needed. Also available is the No. A268TL Tool Bit Holder which is built to accommodate tools up to 1/2" square.



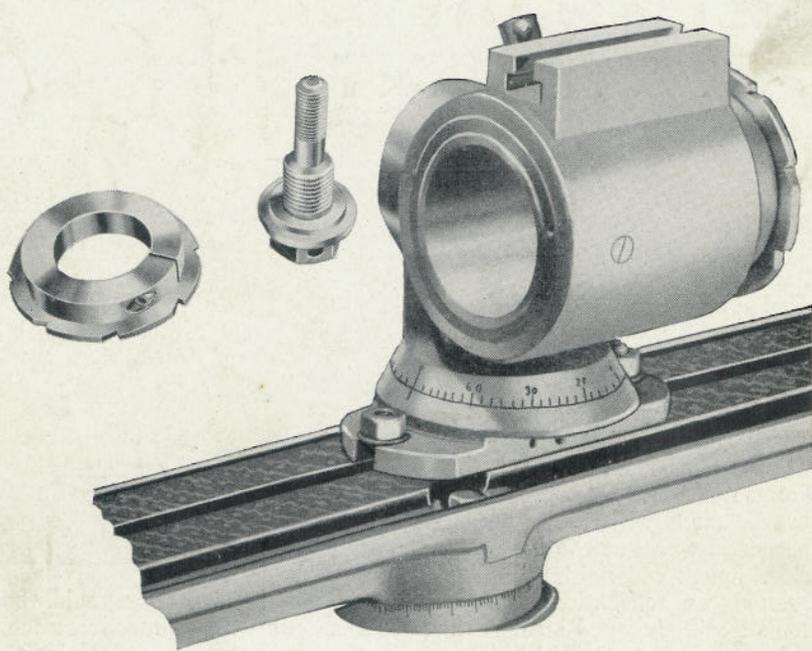


"If its made by Lee - its a Knock-Out"

B792 SENSITIVE WORK HEAD No. 50 Milling Machine Taper in Spindle

This is a rugged, but sensitive, ball bearing workhead with a No. 50 milling machine taper in the spindle to accommodate mounted and solid milling cutters of all kinds. The head can be swiveled in both horizontal and vertical planes and is graduated in degrees. Indexing may be done either directly on the cutter tooth or on an index plate mounted on the back of the spindle. Index discs with various divisions are available. (See Accessories.)

Adaptor sleeves for No. 40 milling machine taper and No. 11 B & S Taper are available. This makes possible the use of all "Knock-Out" fixtures such as collet fixture (B641), B & S and Morse taper sleeves, straight sleeves, etc., for grinding all types of tools from small end mills, keyway cutters, etc., to inserted blade cutters up to 8" diameter. A one inch raising block (A618) increases the capacity to 10 inches.



STANDARD EQUIPMENT

B792 Sensitive Workhead including: B792B Draw Bolt Assbly. B792C Collar with B792D24 index disc.

AVAILABLE ACCESSORIES

B792D Index discs, 6, 8, 20, 24, 28, 32, and 36 divisions available. B792G 50M.M. to 11 B & S taper sleeve.
B792F 50 to 40 milling machine taper sleeve. B792T Draw Sleeve for use with B641 Collet Fixture.

An 8" inserted blade milling cutter with cemented carbide blades being ground on a "Knock-Out" Universal Cutter Grinder using B792 Workhead. Greater accuracy and longer tool life are obtained by grinding cemented carbide cutters on the machine arbor. The face, corner, and O. D. can be ground on one set-up with the index finger placed either on the cutter tooth or an index disc at the back of the workhead.

Grinding a 4" diam. inserted blade cutter 14" long overall. Cutter head and shank are one piece and the long overhang necessitates a rigid fixture such as the B792 workhead. Index finger may be mounted on the table (as illustrated). "Knock-Out" fixtures can be easily adapted to ANY tool and cutter grinder by specifying "T" slot dimensions so that proper "T" slot blocks can be furnished.

