

ID # 2938

	1	2	3	4	6	7	8	9	5	10	11
A C	2 .0841	2 1/4 .0748	2 3/8 .0706	2 1/2 .0673	2 3/4 .0642	2 7/8 .0585	3 .0561	3 1/4 .0517	3 3/8 .0496	3 1/2 .0460	3 3/4 .0448
A D	4 .0420	4 1/2 .0374	4 3/4 .0353	5 .0336	5 1/2 .0306	5 3/4 .0292	6 .0280	6 1/2 .0258	6 3/4 .0248	7 .0240	7 1/2 .0224
A E	8 .0210	9 .0187	9 1/2 .0176	10 .0168	11 .0159	11 1/2 .0146	12 .0140	13 .0129	13 1/2 .0124	14 .0120	15 .0112
B C	16 .0105	18 .0093	19 .0088	20 .0084	22 .0076	23 .0073	24 .0070	26 .0064	27 .0062	28 .0060	30 .0056
B D	32 .0052	36 .0046	38 .0044	40 .0042	44 .0038	46 .0036	48 .0035	52 .0032	54 .0031	56 .0030	60 .0028
B E	64 .0026	72 .0023	76 .0022	80 .0021	88 .0019	92 .0018	96 .0017	104 .0016	108 .0015	112 .0015	120 .0014

25  
75  
50



THREADS - PER - INCH  
FEEDS - IN - THOUSANDTHS

*Monarch*

ENGINE AND  
TOOLMAKERS  
LATHES

*Series 61*





## *Research.. Design*

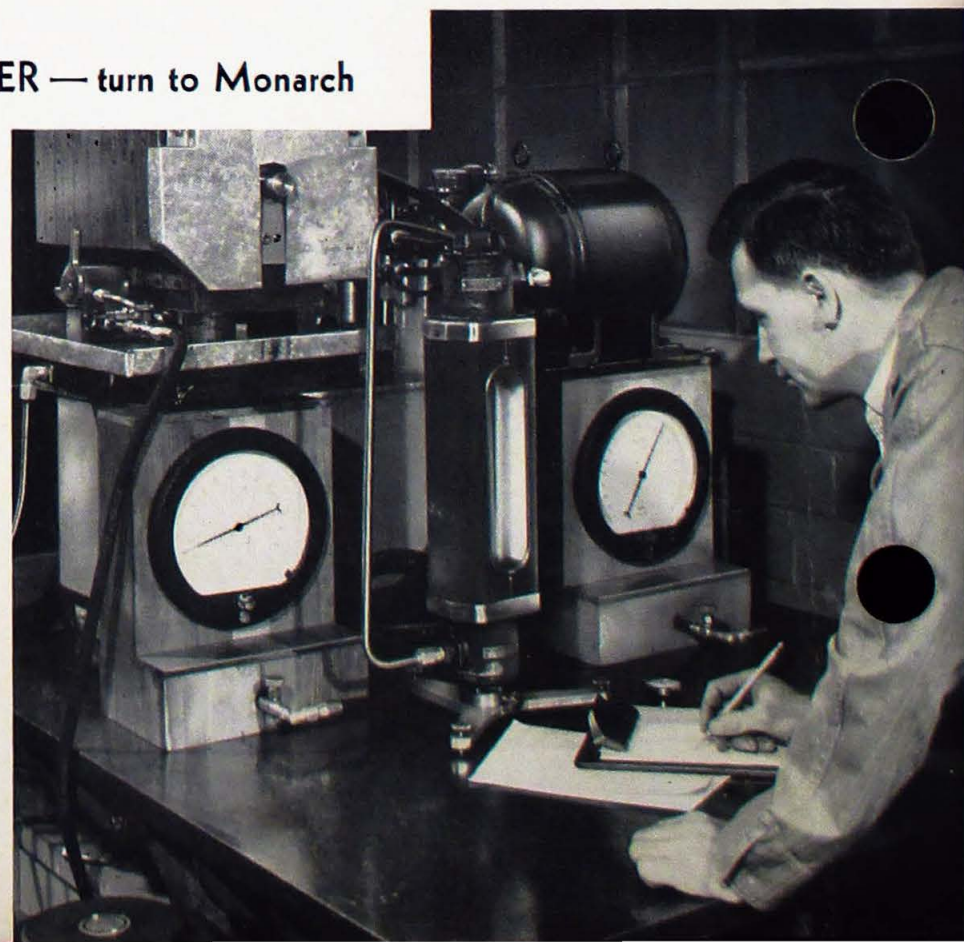
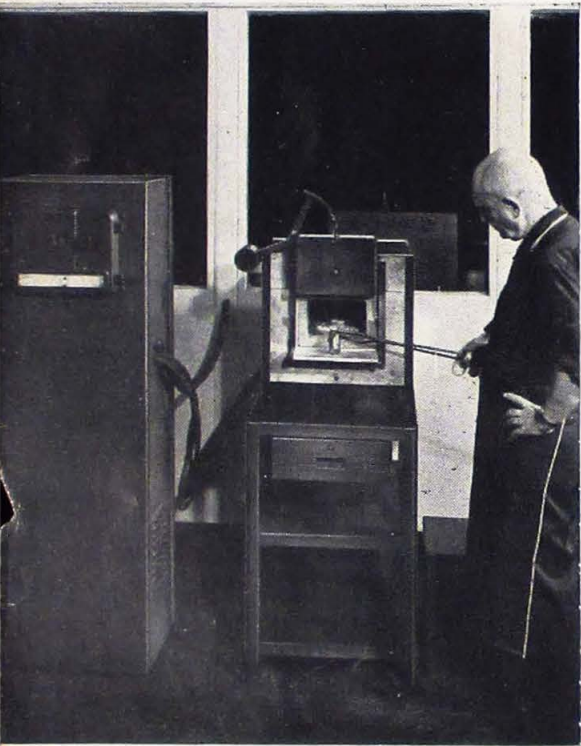
### **MEAN BETTER MONARCH LATHES FOR YOU**

For over 45 years, Monarch has operated on one principle . . . a determination to design and build the finest lathes possible. This singular dedication has brought about many innovations and "firsts" in lathe production.

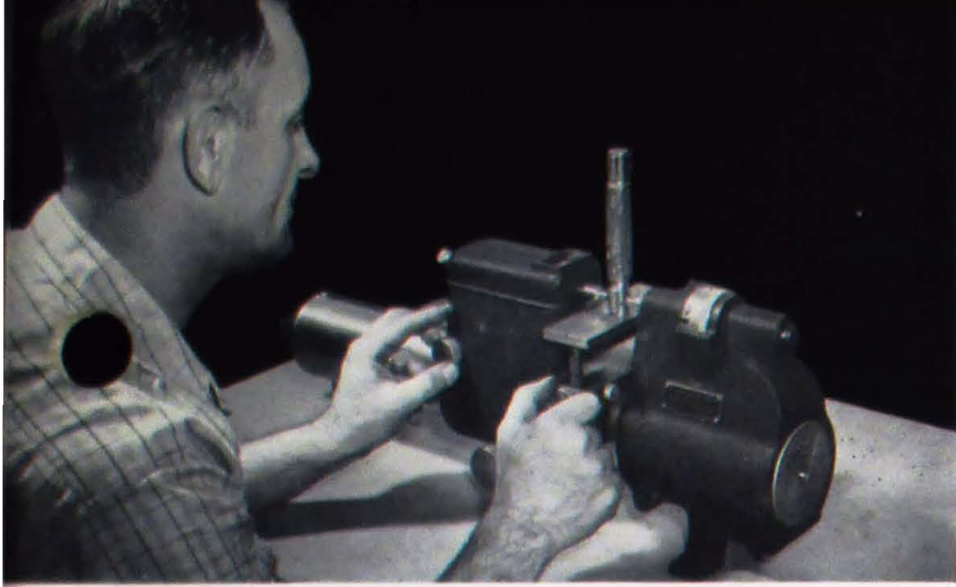
These developments have made Monarch lathes the most versatile machine tools in the world, and a constant program of down-to-earth research and design continues to create machines and techniques that are well in advance of modern precision and production requirements.

The illustrations on this page show some of the many phases of a program that can provide you with precisely the type of turning machine best suited to your needs.

**For a good turn FASTER — turn to Monarch**







# Quality Control

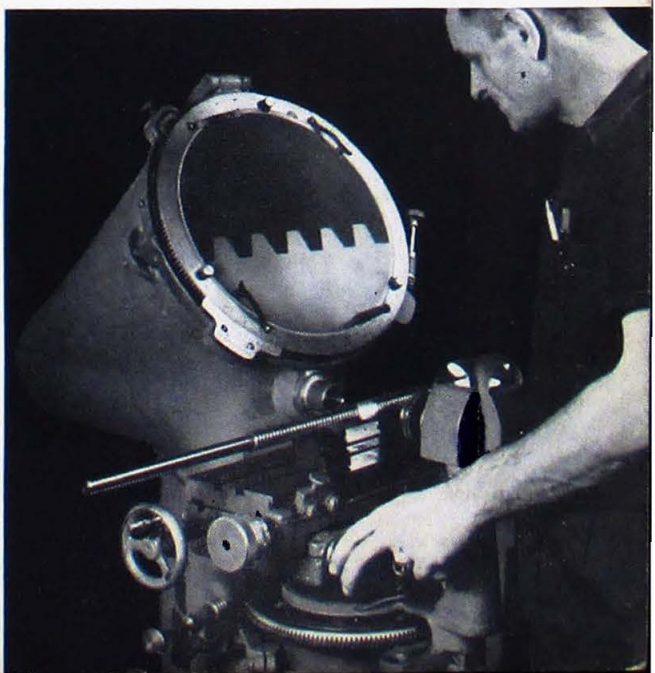
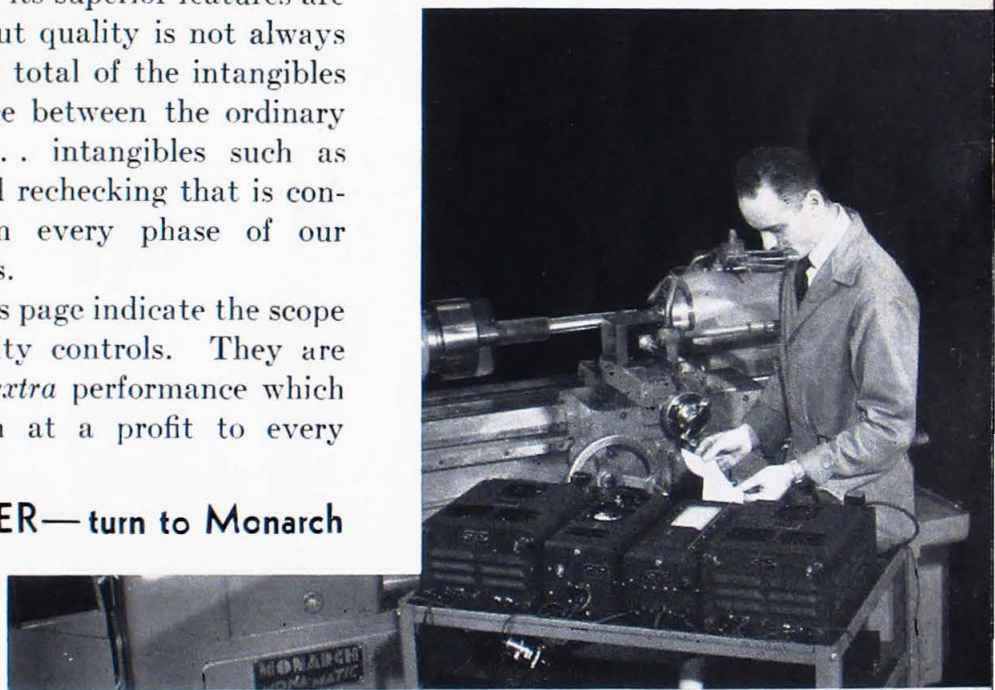
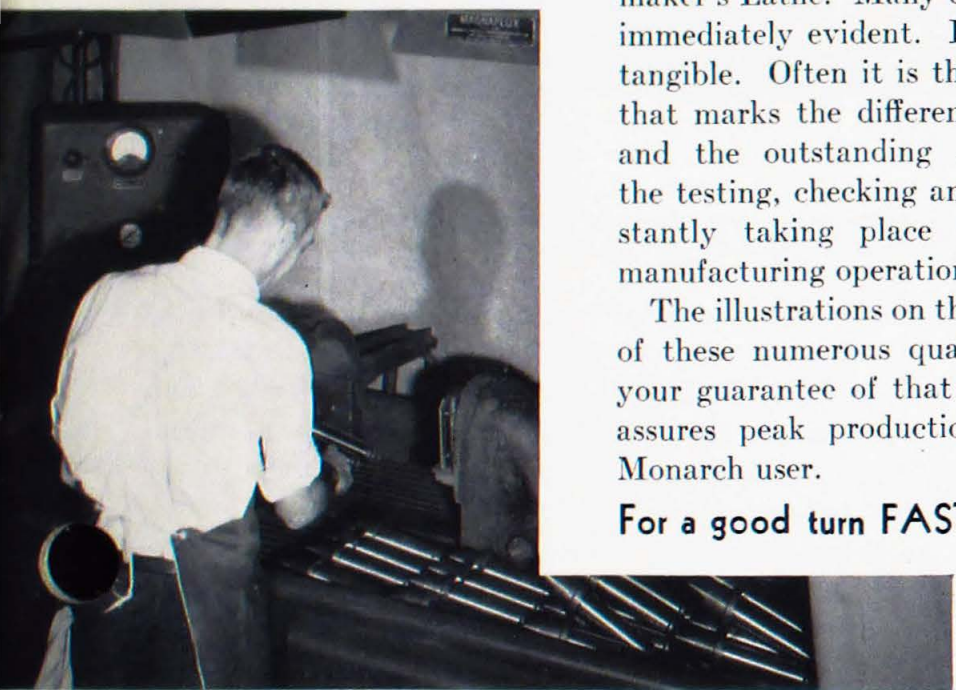
## MEANS BETTER MONARCH LATHES FOR YOU

The name Monarch has always stood for the finest in metal turning equipment.

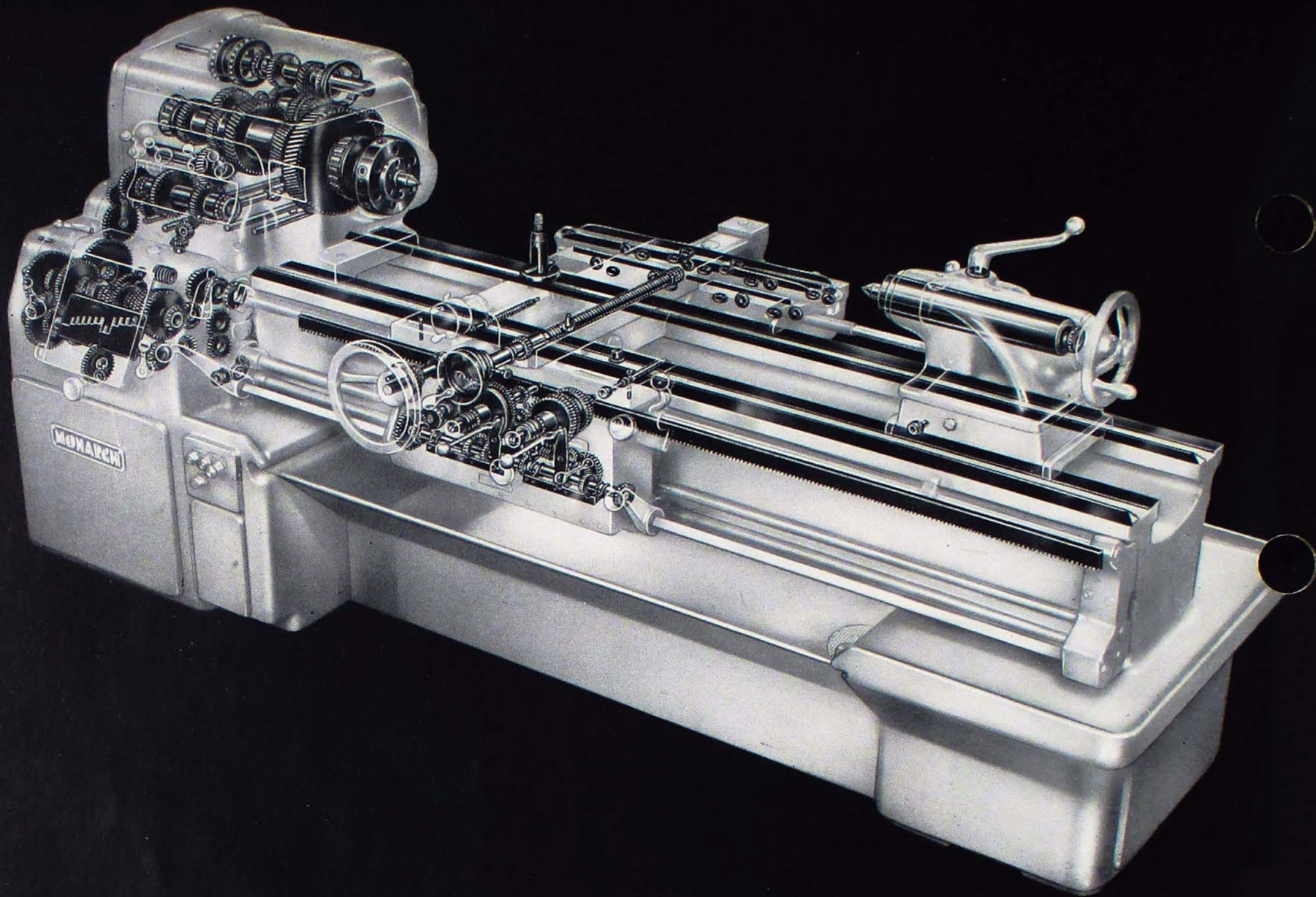
Just look at any Series 61 Engine or Toolmaker's Lathe. Many of its superior features are immediately evident. But quality is not always tangible. Often it is the total of the intangibles that marks the difference between the ordinary and the outstanding . . . intangibles such as the testing, checking and rechecking that is constantly taking place in every phase of our manufacturing operations.

The illustrations on this page indicate the scope of these numerous quality controls. They are your guarantee of that *extra* performance which assures peak production at a profit to every Monarch user.

**For a good turn FASTER—turn to Monarch**







# Monarch . . . THE HARDENED STRUCTURE LATHE

The mere act of building accuracy and productivity into a lathe is not sufficient in itself. You, the user, judge the machine on the basis of its year in and year out performance in your plant. That is the test as to whether you have made a good investment.

Years ago, Monarch set the pace by first introducing the *hardened structure* lathe. As is clearly indicated in the illustration above, all parts subject to wear are

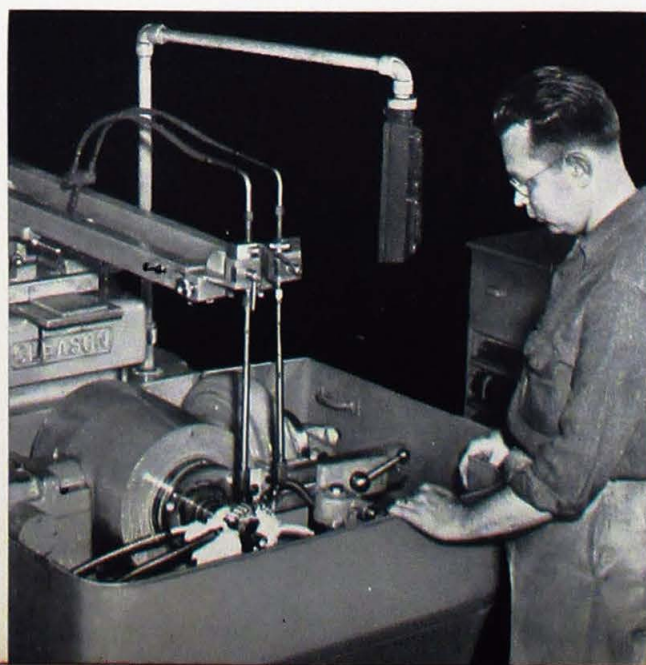
hardened. This is done in our highly specialized heat treating department. Here, all accepted heat treating methods are used, each process being selected and regulated to do the job for which it is best suited. Every process is skilfully applied and controlled to assure the ultimate in performance from every Monarch lathe and to *keep* it there for continuing peak production at a profit.

4

*Below. Induction hardening the cross-feed screw for a Series 61 lathe.*



*Below. Flame-hardening the teeth of one of the many vital gears of a Series 61.*

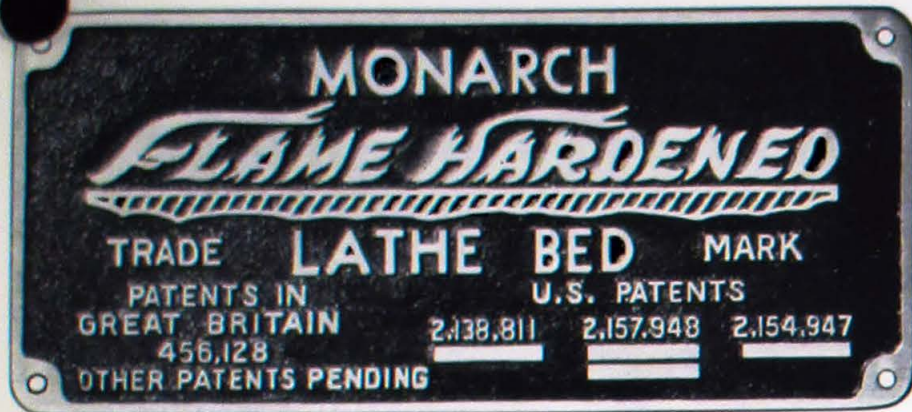


*Below. Lathe spindles being lowered into a modern electric furnace.*





# Flame Hardened AND GROUND BED WAYS FOR YEARS OF TROUBLE-FREE SERVICE



## ◀ Your Proof of Protection For Longer Lathe Life

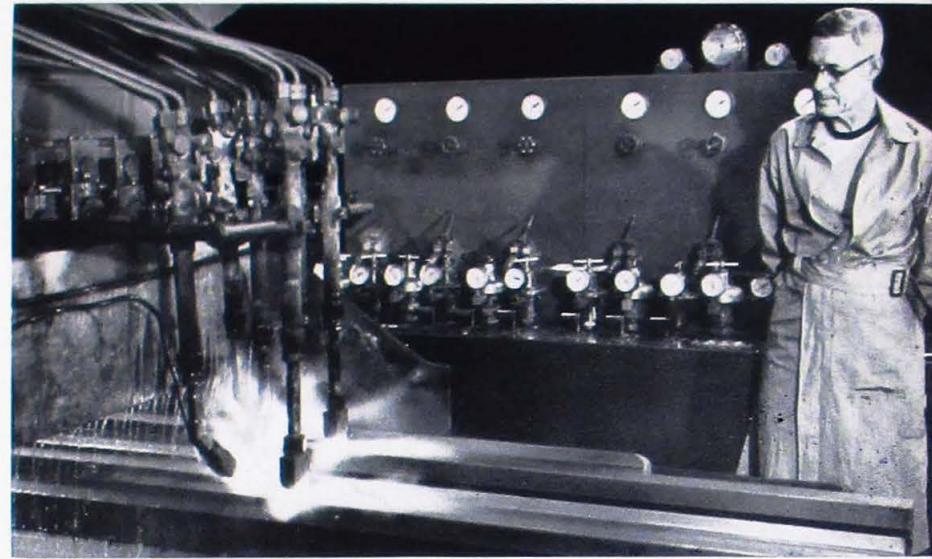
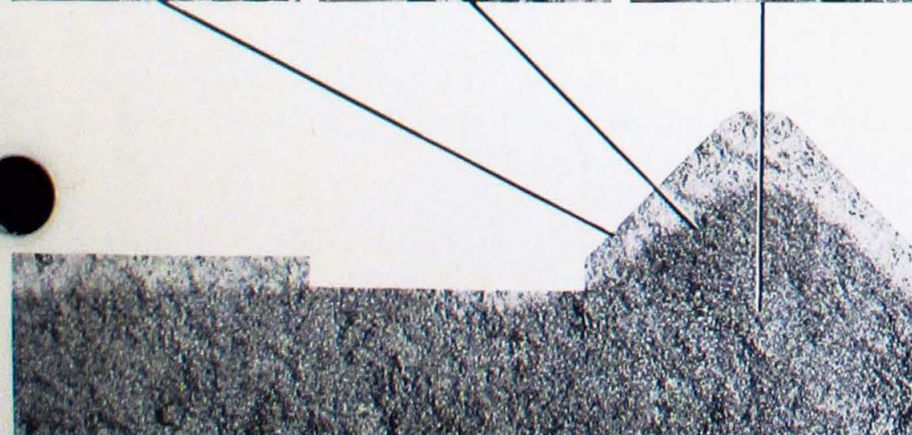
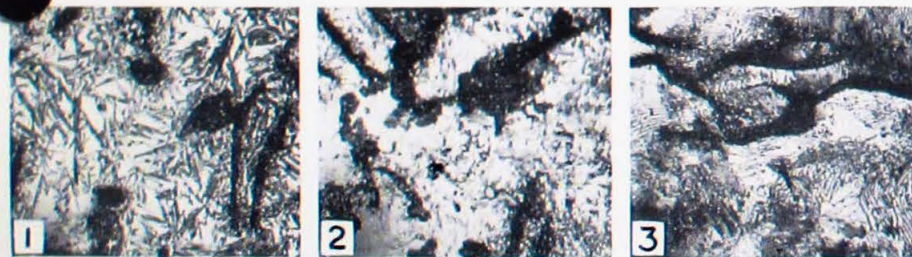
*This identifying plate represents assurance to every Monarch user that the bed ways of his lathe will remain "factory fresh" even after years of severe service.*

With Monarch lathes you get bed castings of strong, dense, wear-resistant chromium-alloy cast iron. Bed ways are flame-hardened to a depth of  $\frac{1}{8}$ " plus, to a Scleroscope reading of 70 to 72 Shore. This is followed by grinding to .0005" (overall).

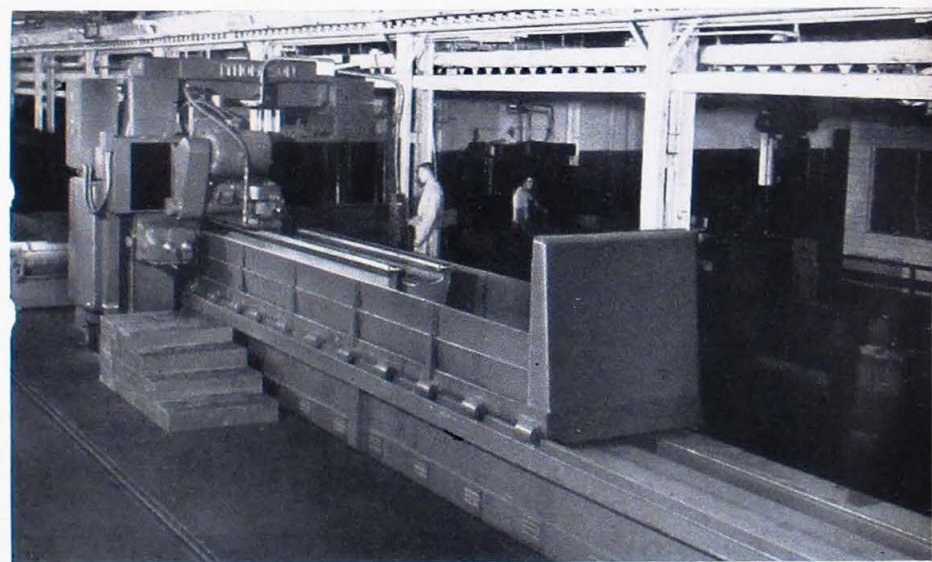
That gives you a lathe with bed ways as hard as hardened steel but with Martensitic structure blended into the tough, fine Pearlitic iron underbody with its retained graphitic carbon. This provides a multitude of microscopic reservoirs that retain lubricant on the ground way surfaces. As a result the film adheres longer and more tenaciously than is possible on a hardened steel surface. With Monarch flame-hardened bed ways there are no worries about uneven wear of loosened steel strips, different coefficients of expansion, lost bed rigidity as the result of cutting and drilling for inserts. . . no worries about bed way abrasion.

Pioneer and developer of this patented technique in lathe manufacturing, Monarch applies the process to all models and sizes of its complete line of turning equipment. For these reasons, Monarch users are benefiting from a maintenance of original bed accuracy not ordinarily associated with machine tools of any kind.

*Below. Unretouched photograph of fracture of Monarch bed way after flame-hardening. (1) Wear-resisting surface. (2) Transition zone. (3) Base metal structure. Micro-photographs show how Monarch bed way flame-hardening produces a natural and continuous metallurgical bond between the hardened surface and the softer core metal that makes it one continuous composition. These tough, resilient chromium-alloy cast iron castings dampen vibration much more than steel and present far better bearing qualities.*



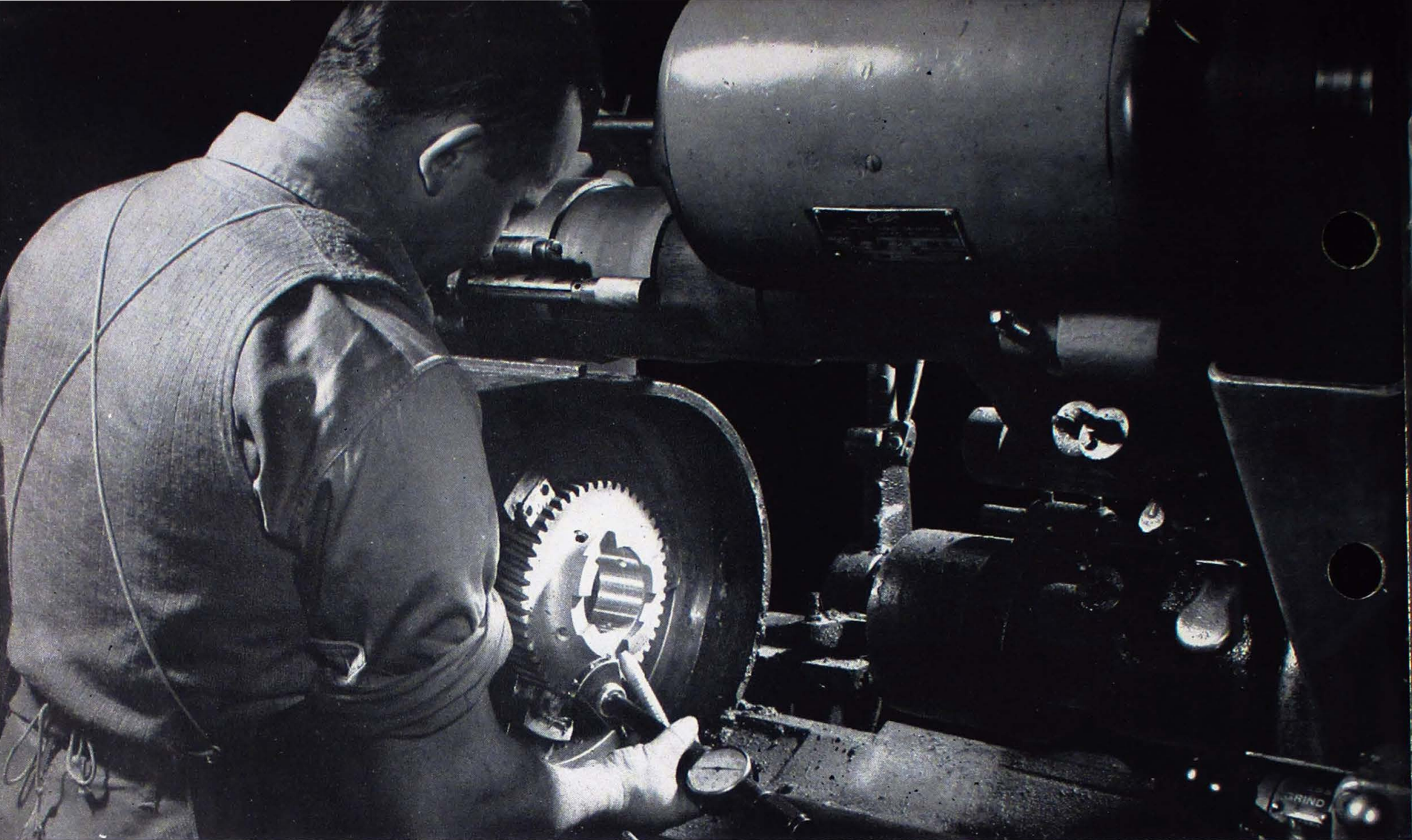
*Above. The highly specialized Monarch bed way flame-hardening machine.*



*Above. Bed ways are ground to a tolerance of .0005 of an inch overall. Below. Bed ways are as hard as hardened steel—70 to 72 Shore.*



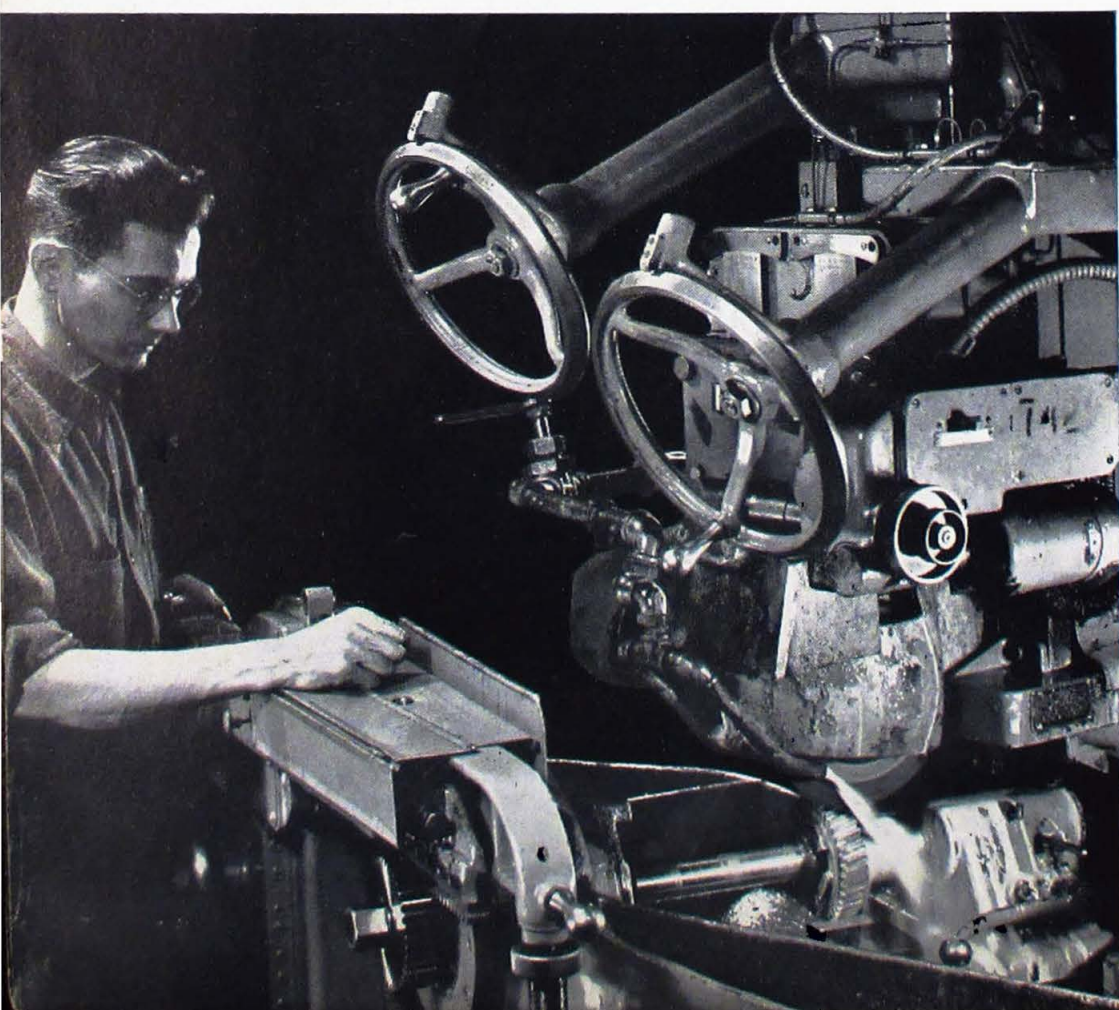




*Above. Grinding the bore of a helical headstock gear within a tolerance limit of .0008".*

## *Precision Made Gears*

**ASSURE SMOOTHNESS, LONGER LIFE AND BETTER WORK**



The deep rooted reputation of Monarch helical geared headstock design is due, in no small measure, to the precision of the gears.

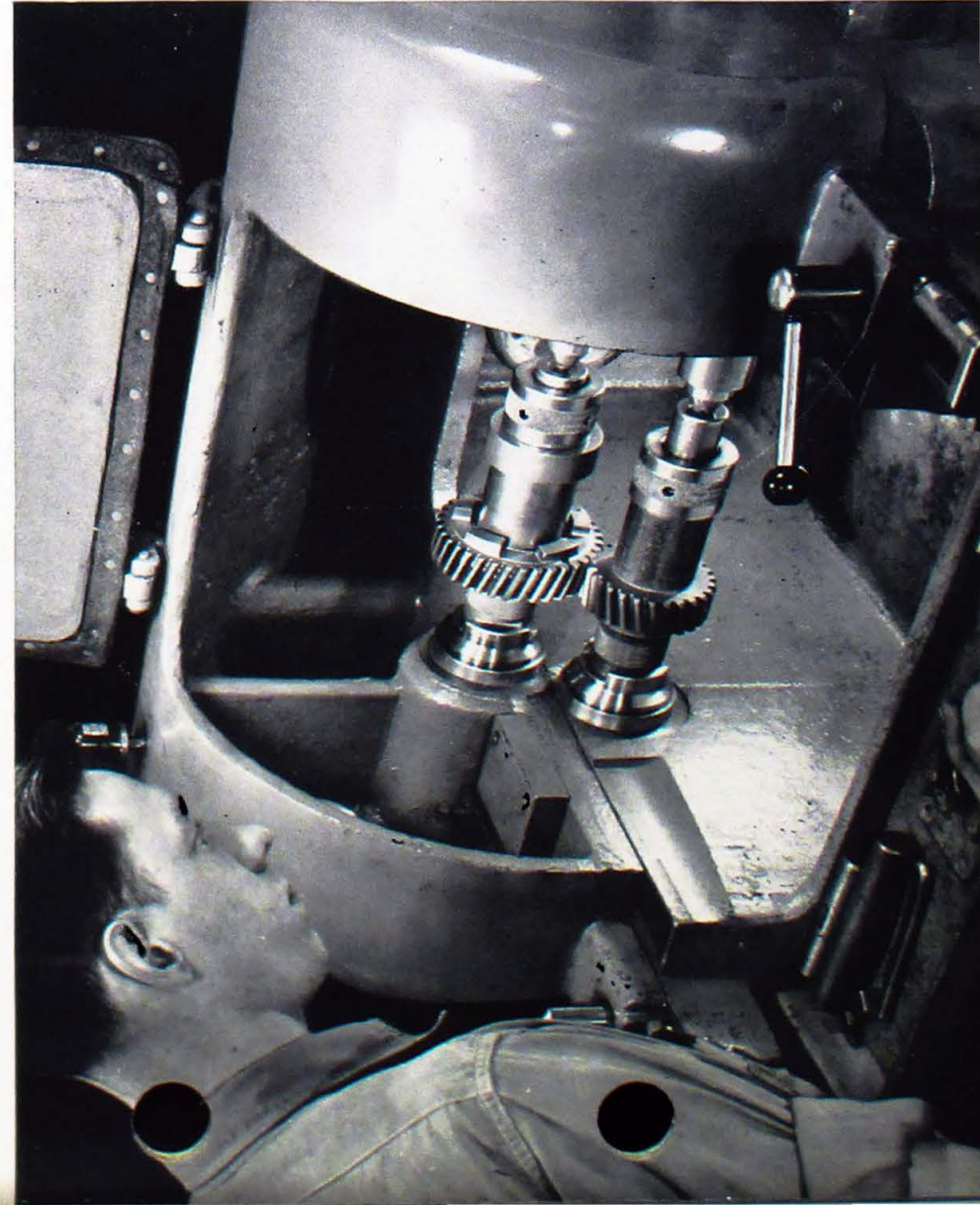
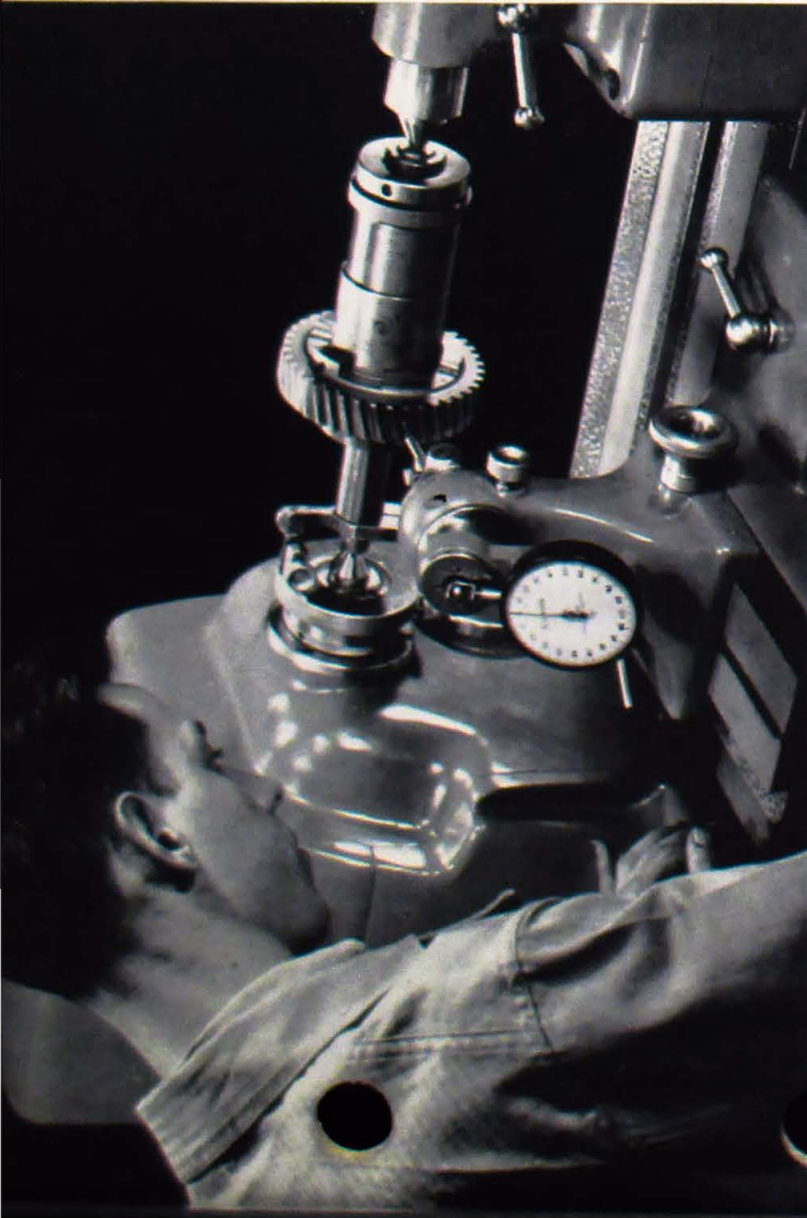
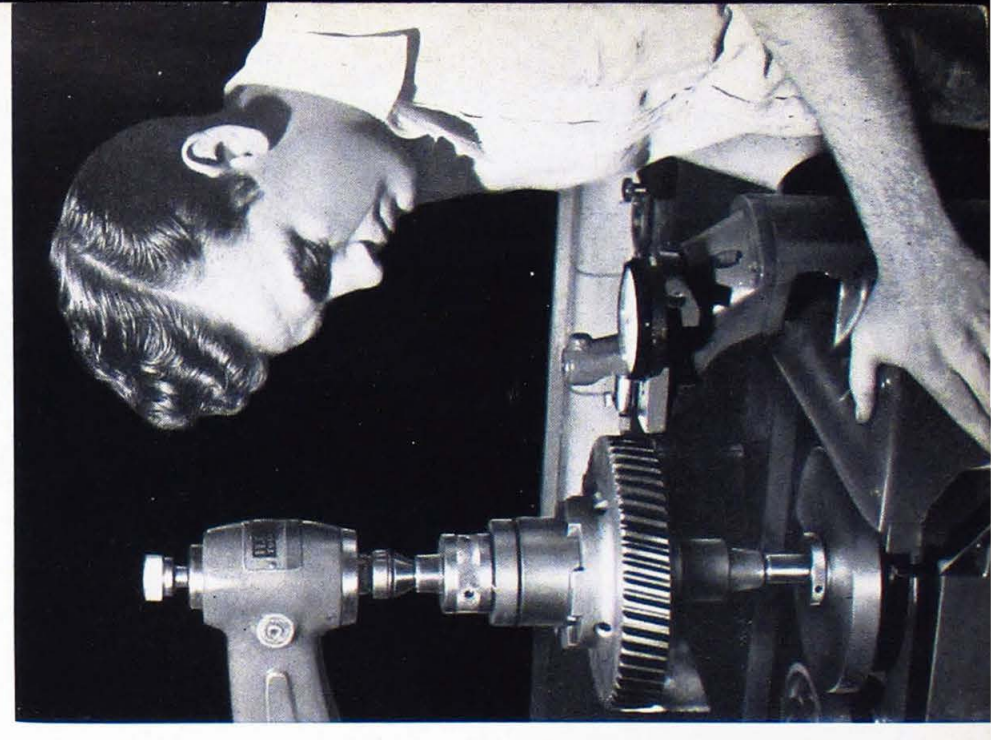
Power flows through them smoothly, quietly and without transmittal of gear tooth marks to the work. Such is the service which can be expected from every Monarch Series 61 lathe.

On the opposite page is visual evidence of the thoroughness with which Monarch proves each step in accurate gear making. These include the helix lead angle check, the tooth contour check, the test for noise and bearing, checks for accuracy of bore diameter and pitch diameter and the tooth spacing check.

These are not isolated examples. Every gear which goes into a Monarch lathe is subjected to such painstaking tests.

*Left. Grinding helical headstock gear teeth. On this operation the tolerance limit is .0002" but on the average seldom exceeds .0001".*







# Spindle-spection...

## ANOTHER MONARCH PLUS



It has often been said that the headstock spindle is the heart of any lathe. Recognizing the truth of this, Monarch Series 61 spindles are made to the most exacting tolerance limits.

Following this, they must pass spindle-spection. That's our way of referring to spindle inspection but the methods used are so modern, so thorough and so accurate that they deserve this special designation.

The bore is checked by means of Sheffield Precisionaire gauges, as illustrated above. Limit for bore size is  $.0005''$  and for accuracy of taper,  $.000''$ . The center illustration to the right is the check for draw, the limit being  $.0003''$  to  $.0005''$ . Below to the right is illustrated the test for bearing and gear bearing seat sizes. A separate indicator snap gauge is used for each diameter. Bearing sizes are held within a limit of  $.0002''$ , all gear bearing seat diameters within a limit of  $.0005''$ .

There are still other checks. One determines whether the spindle nose is within the prescribed limits for size and runout. Another severe check is for runout on a test bar inserted in the spindle and at a point  $14''$  out from the spindle nose. Bearing and gear bearing seat runout is also checked.

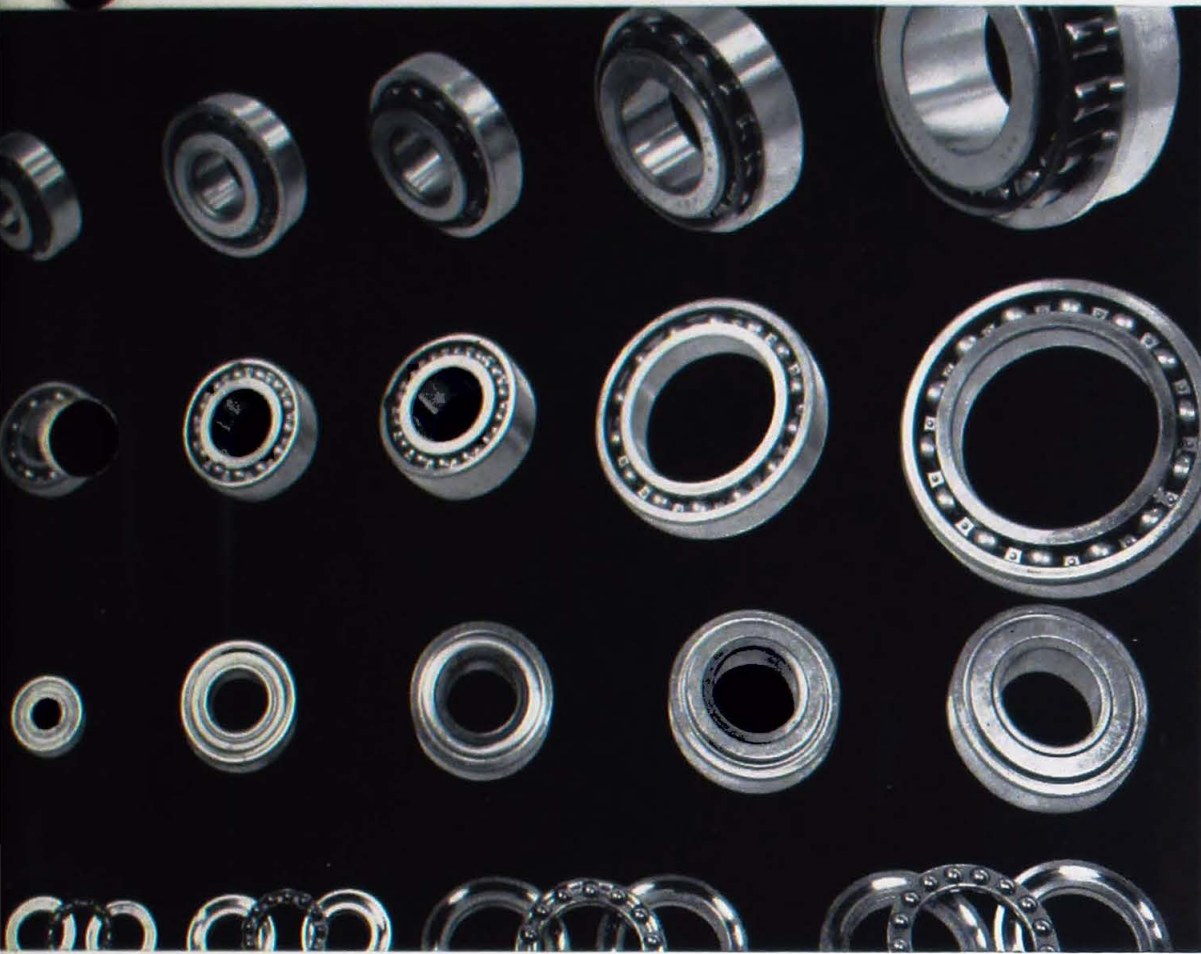
With the realization of what such thoroughness means it can be better understood why users always associate accuracy of performance with Monarch turning equipment.





# *Anti-Friction Bearings . . .*

**PLENTY OF THEM FOR THE SMOOTH, QUIET  
DELIVERY OF MORE POWER**



The liberal use of anti-friction bearings has long identified one of the major design features of Monarch turning equipment.

Their advantages are so well known that an extended discussion here is unnecessary. Summed up it might be said that a 100 per cent anti-friction bearing lathe is assurance that it will deliver more power with greater smoothness and with a minimum of maintenance worries.

The Monarch Series 61 lathes are complete anti-friction bearing equipped in the headstock, the end gear train, the gear box, the apron, the tailstock and the cross-feed screw. For the ultimate in economical operation, every lathe you purchase must be so constructed.

## **LONG LIFE FROM** *Broached Keys*

9

The use of internal broached keys in Series 61 lathes is typical of the Monarch approach to all engineering and manufacturing problems. Illustrated are a few typical examples.

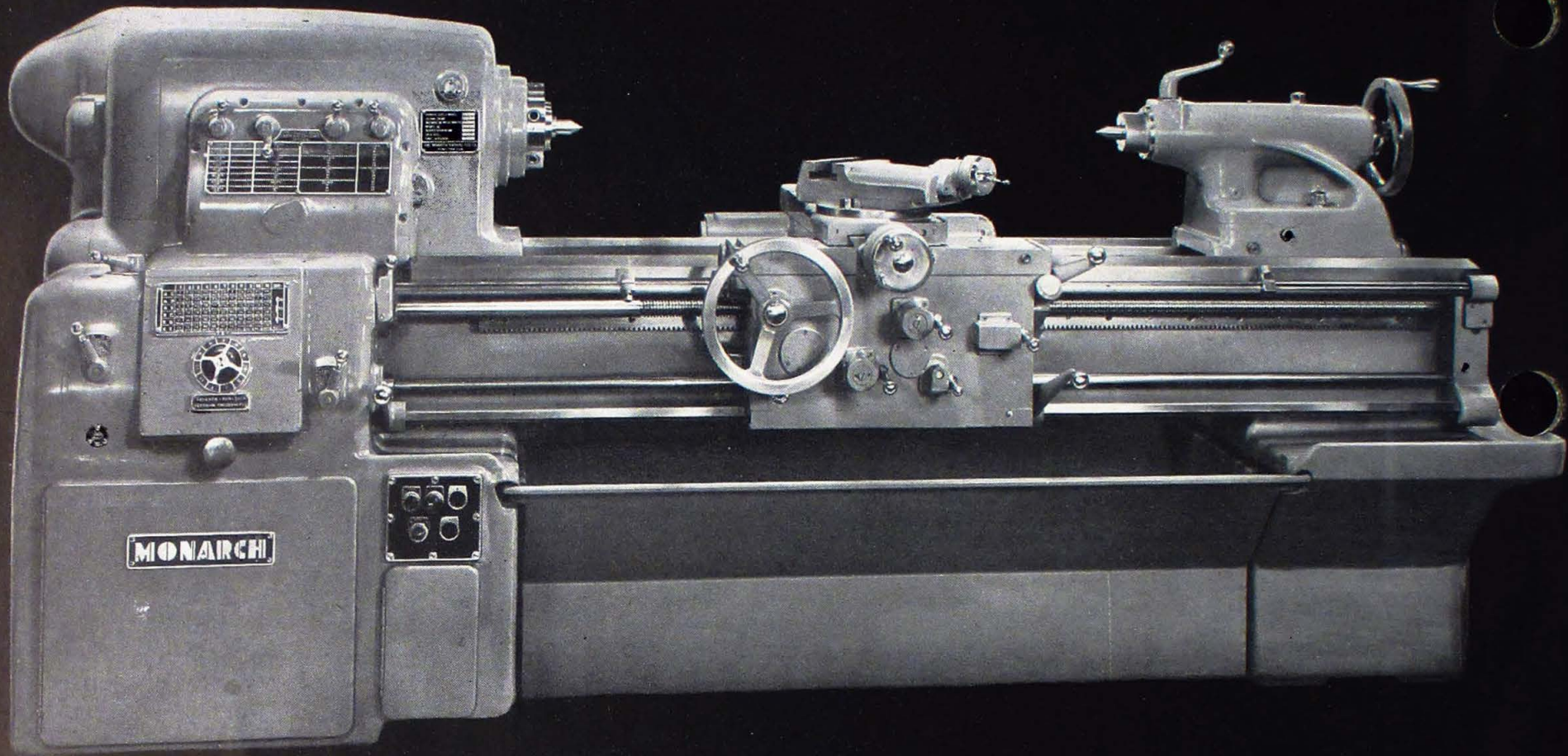
This method is used in preference to inserted keys wherever possible because experience has shown that this element of design makes a considerable contribution to more trouble-free operation.

In addition, these parts are made of the finest alloy steel, carefully hardened.



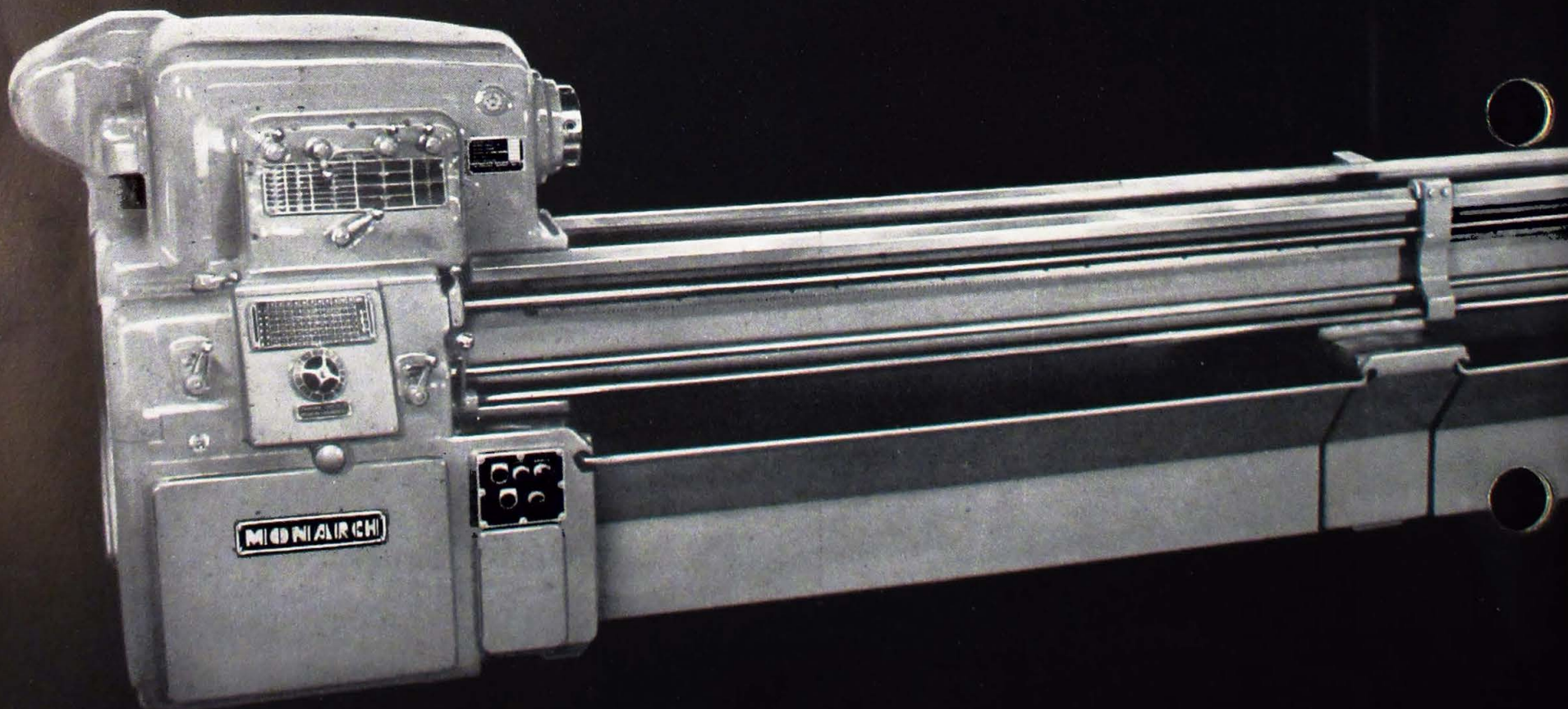


# Monarch ENGINE AND TOOLMAKER'S



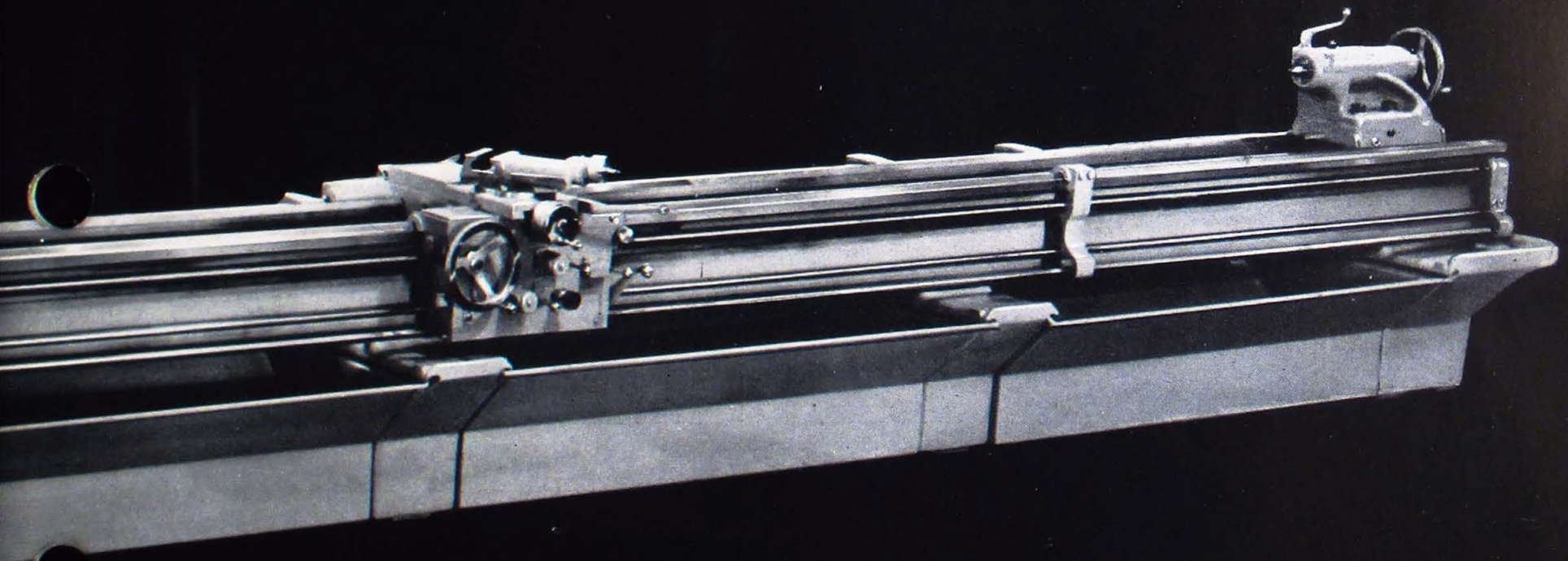
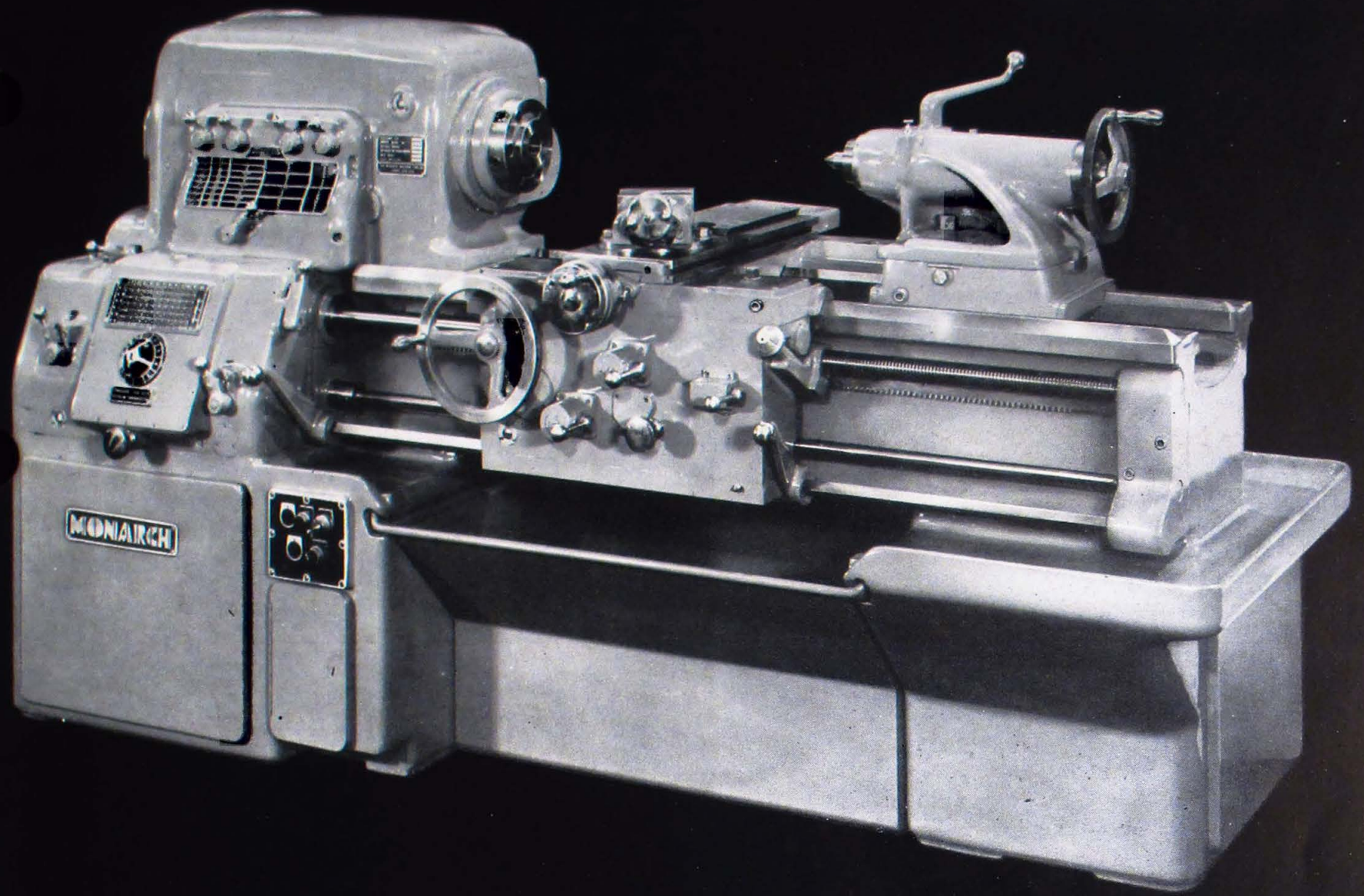
**Toolmaker's Lathes.** Offered in 13", 16" and 20" swings; each swing in a variety of lengths. Pictured above is a 20" size machine. See pages 45 and 46 for complete specifications covering either the toolmaker's or the engine lathes.

10



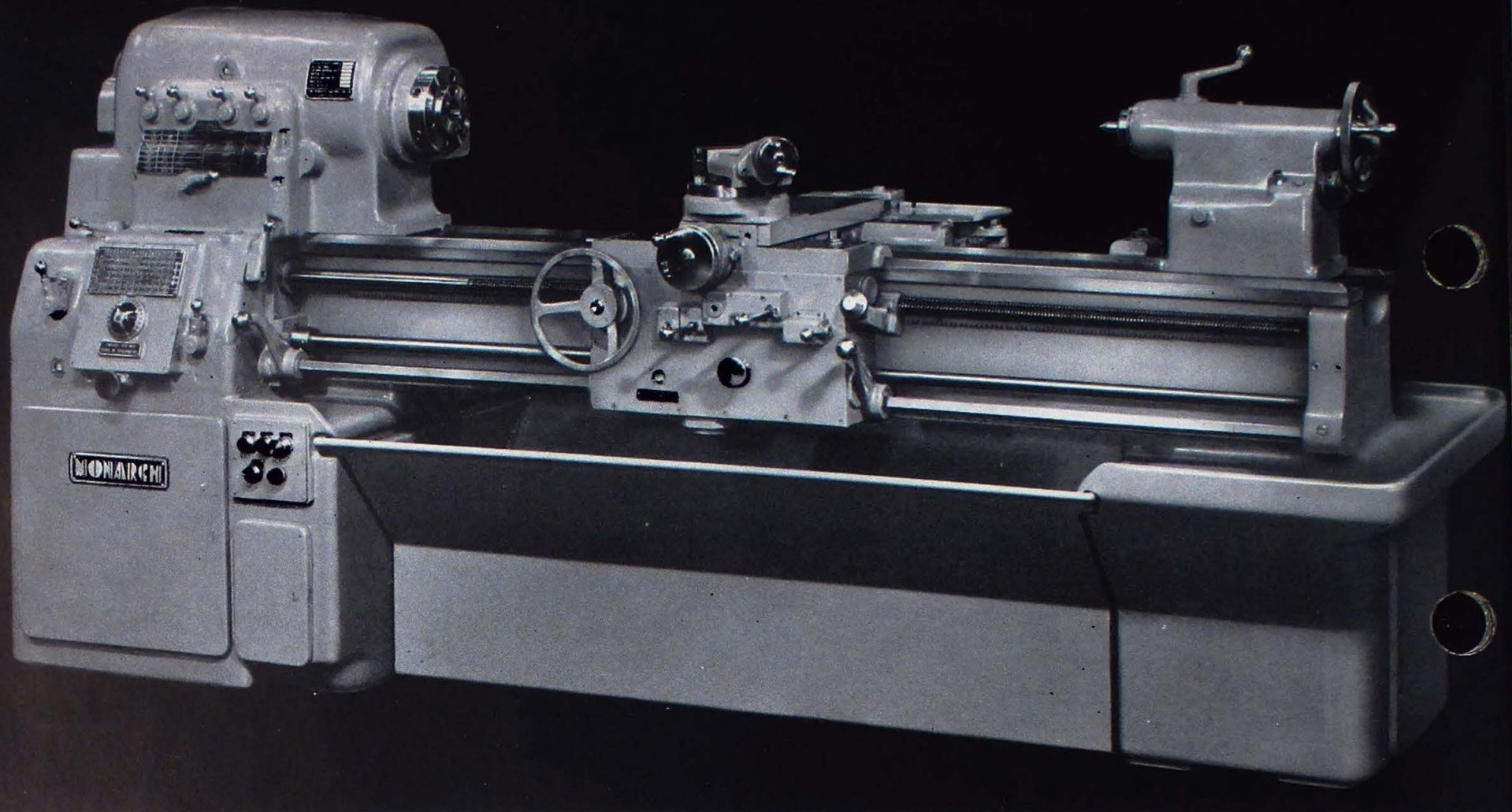


# LATHES . . . *Series 61*



**Engine Lathes.** Available in 13", 16" and 20" swings; each swing in a variety of lengths. At the top of the page is illustrated a 16" machine while extending across the bottom of this spread is a 20" x 312" size.





## FOR PLUS-SWING . . . ECONOMICALLY

Many lathe users occasionally require more swing than is provided by a standard machine yet find it impractical to purchase a larger standard machine because of the increased investment in capacity not ordinarily required.

Monarch plus-swing lathes provide added swing economically. They are completely satisfactory for turning an occasional large part, for shafts with a previously machined large diameter section, for light cuts on large diameters.

Monarch builds its standard machines with the exceptionally sturdy beds and more than ample proportions to give plus-swing without sacrificing precision operation. All plus-swing castings are machined in standard jigs and fixtures, this being further assurance of the same accurate performance for which standard Monarch lathes are famous.

All sizes of Series 61 lathes, either engine or tool-maker's, are available with plus-swing. See the listings below for specifications covering swing over the bed and swing over the cross slide.

### 13" Machine

	Swing Over Bed	Swing Over Cross Slide
No. 1	18½"	11½"
No. 2	20½"	13½"

### 16" Machine

	Swing Over Bed	Swing Over Cross Slide
No. 1	20"	12½"
No. 2	22"	14½"
No. 3	24"	16½"

*Monarch plus-swing lathes are available in a considerable range of capacities. The listings above and to the right show the swing over the bed and the swing over the cross slide. When referring to a plus-swing machine, it will be of assistance to designate it by the number also appearing in the listing.*

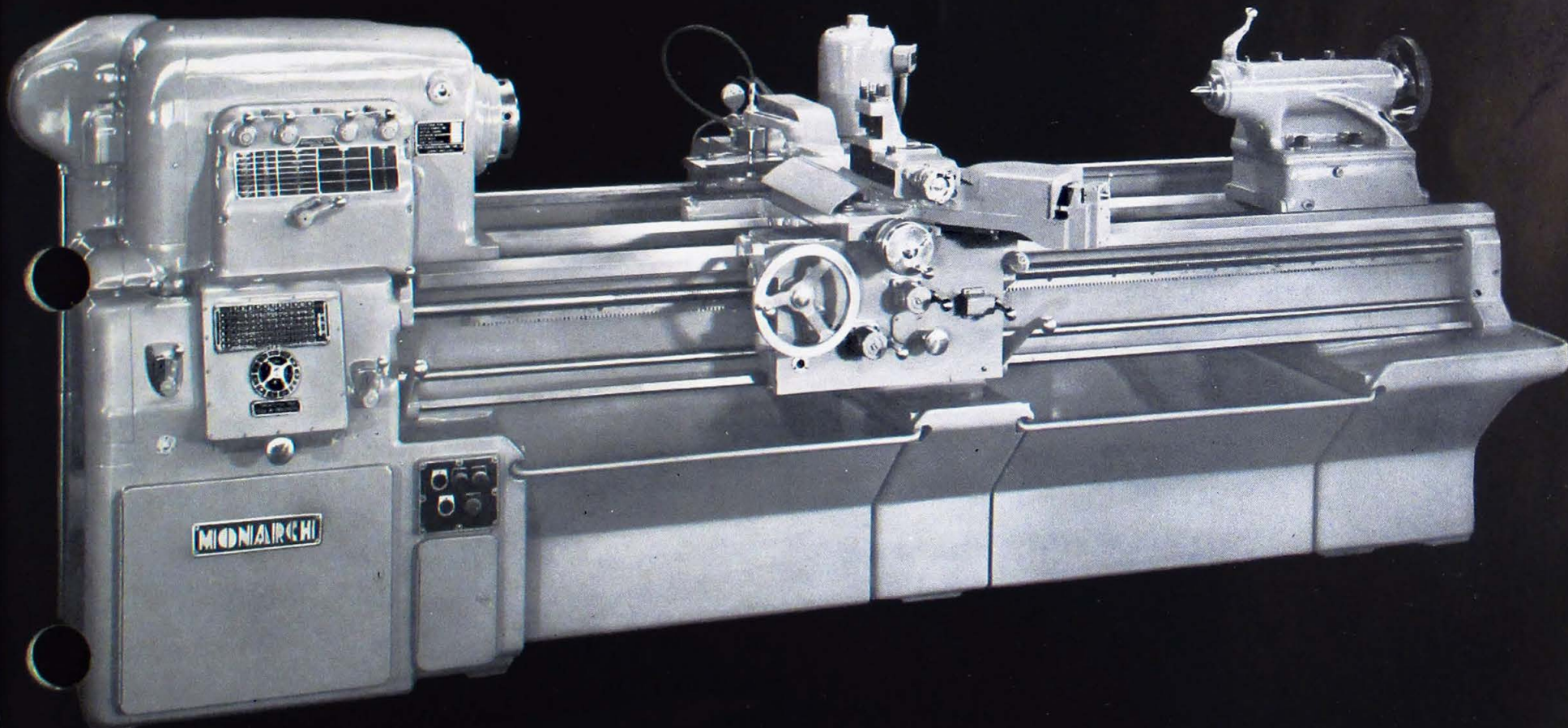
### 20" Machine

	Swing Over Bed	Swing Over Cross Slide
No. 1	24"	15¾"
No. 2	26"	17¾"
No. 3	28"	19"

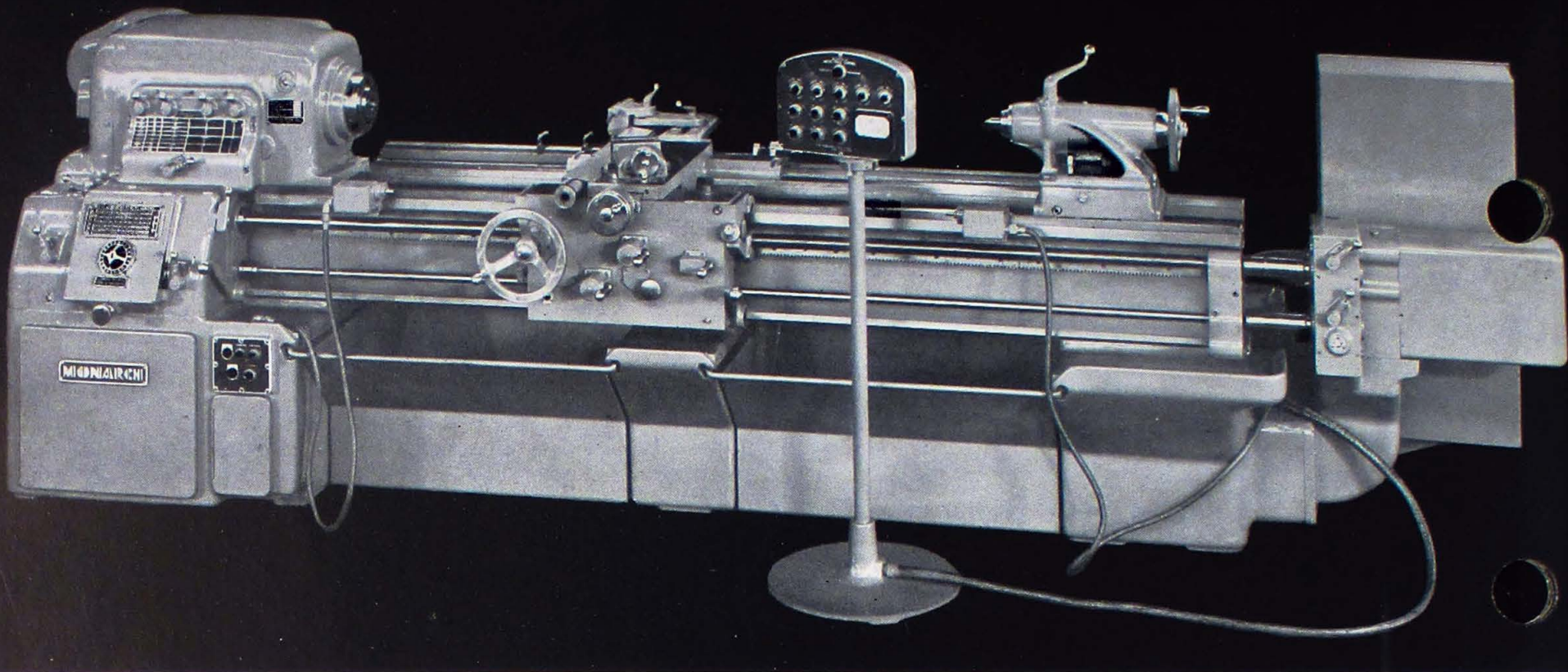


## THE MONARCH "AIR-GAGE TRACER"

- A versatile, cost-reducing production method for turning multiple diameter shafts and turning, boring or facing contours.
- Adapted to a wide variety of manufacturing operations where it is not uncommon for an "Air-Gage Tracer" equipped Monarch lathe to produce eight to ten times as much work as on a manually operated machine of modern design.
- Imparts a smooth, stepless finish because of the continuous, single tool cut.
- Provides automatic sizing.
- Eliminates the necessity for repetitive measurements.
- Has the sensitivity of air gaging combined with the ease of control of hydraulic power.
- Generally reduces by half the amount of stock left for grinding.
- Often eliminates hand polishing or grinding because of the fine finish imparted to the work.
- Produces more accurate work than any other duplicating device. Movement of slide to control point repeats itself within a limit of .0001".
- Eliminates the need for expensive forming tools and the cost of multiple tool setups.
- Allows a complete setup change in ten to fifteen minutes or less; tool change in one minute or less.
- Permits the machining of practically any combination of diameters, tapers, bevels, forms, grooves, undercuts, shoulders, necks, radii and chamfers in a single continuous cut.
- Reduces the chance of human error, thereby practically eliminating spoiled work.
- Often saves time and money and provides better finish and accuracy than machining by multiple tool methods.
- Completely described in separate booklet which may be had upon request.

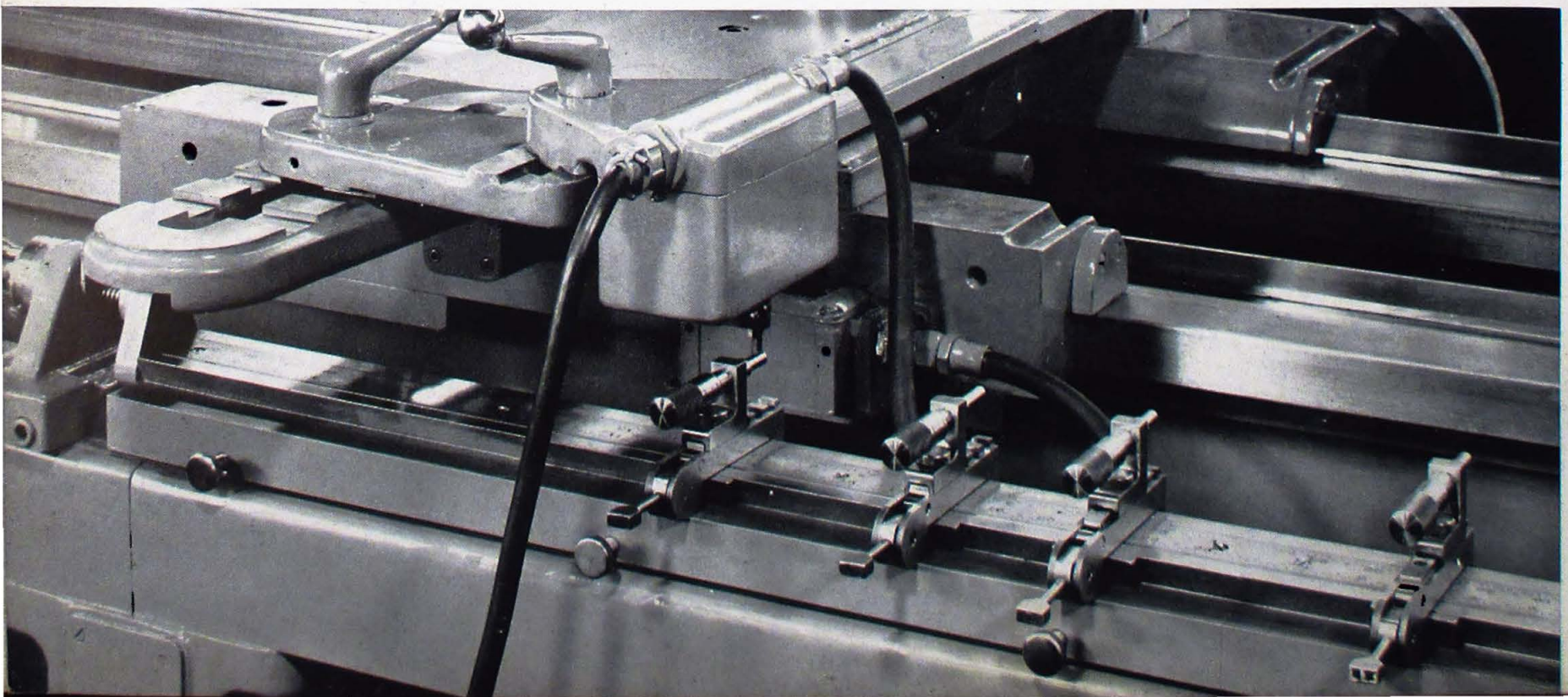






## THE MONARCH "MOTOR-TRACE"

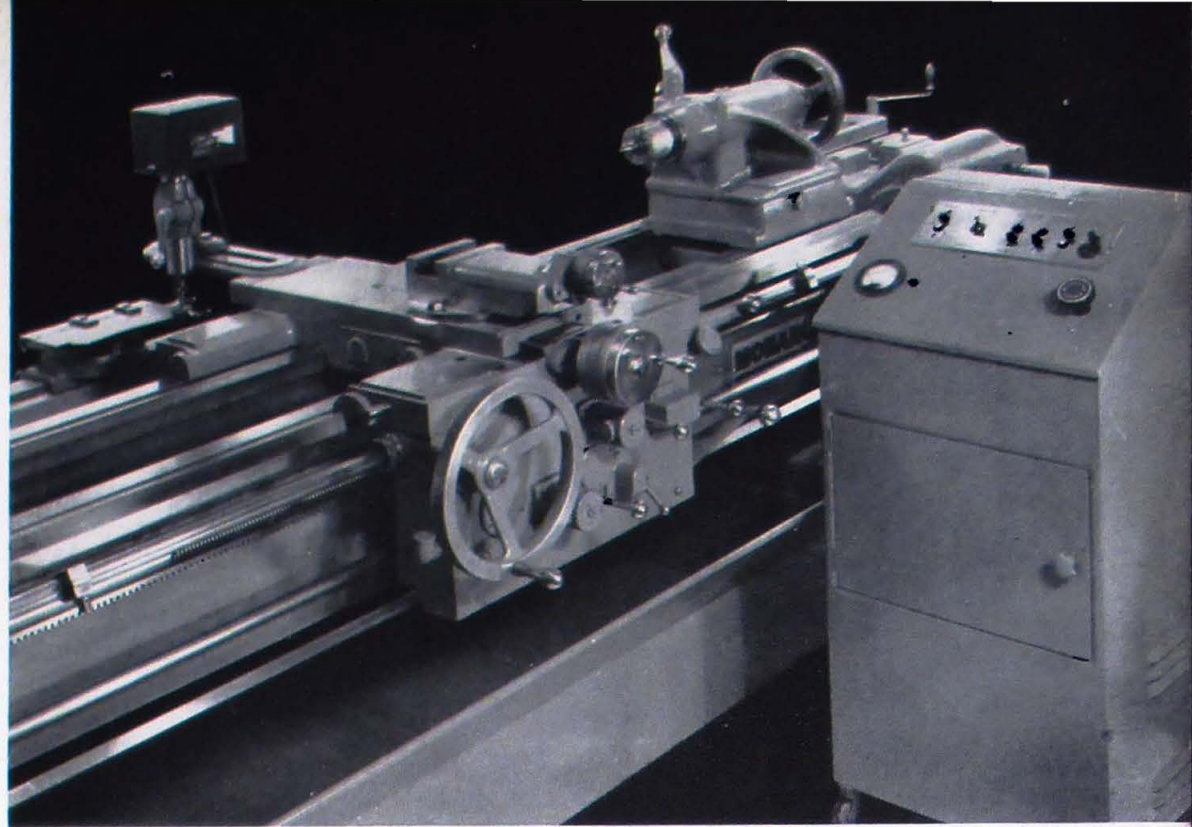
- An electric motor operated, electric tracer controlled duplicating attachment which makes a Monarch engine lathe an automatic cycle machine for producing parts economically in quantities of two or three pieces and up.
- Tracing is either from micrometer heads, gage blocks or a template.
- Micrometer heads or gage blocks provide exceptionally short setup time on straight multiple diameter shaft work for which the "Motor-Trace" is particularly recommended.
- May also be used for step boring and step facing and when tracing from a template, tapers, contours, radii or chamfers may be machined.
- Makes it possible to convert a Monarch engine lathe from manual operation to automatic operation in less than one-half minute.
- Enables one operator to handle two machines on most work with less fatigue than one manually operated lathe.
- Permits the preselection and automatic use of the correct feed for maximum cutting efficiency on each diameter, utilizing the electronic features of the control to maintain feeds substantially as set regardless of variation in amount of stock removal.
- Provides complete electric control from the point most convenient to the operator.
- May be applied on new 16" and 20" machines at factory or lathes may be arranged for addition of the "Motor-Trace" later on in user's plant.



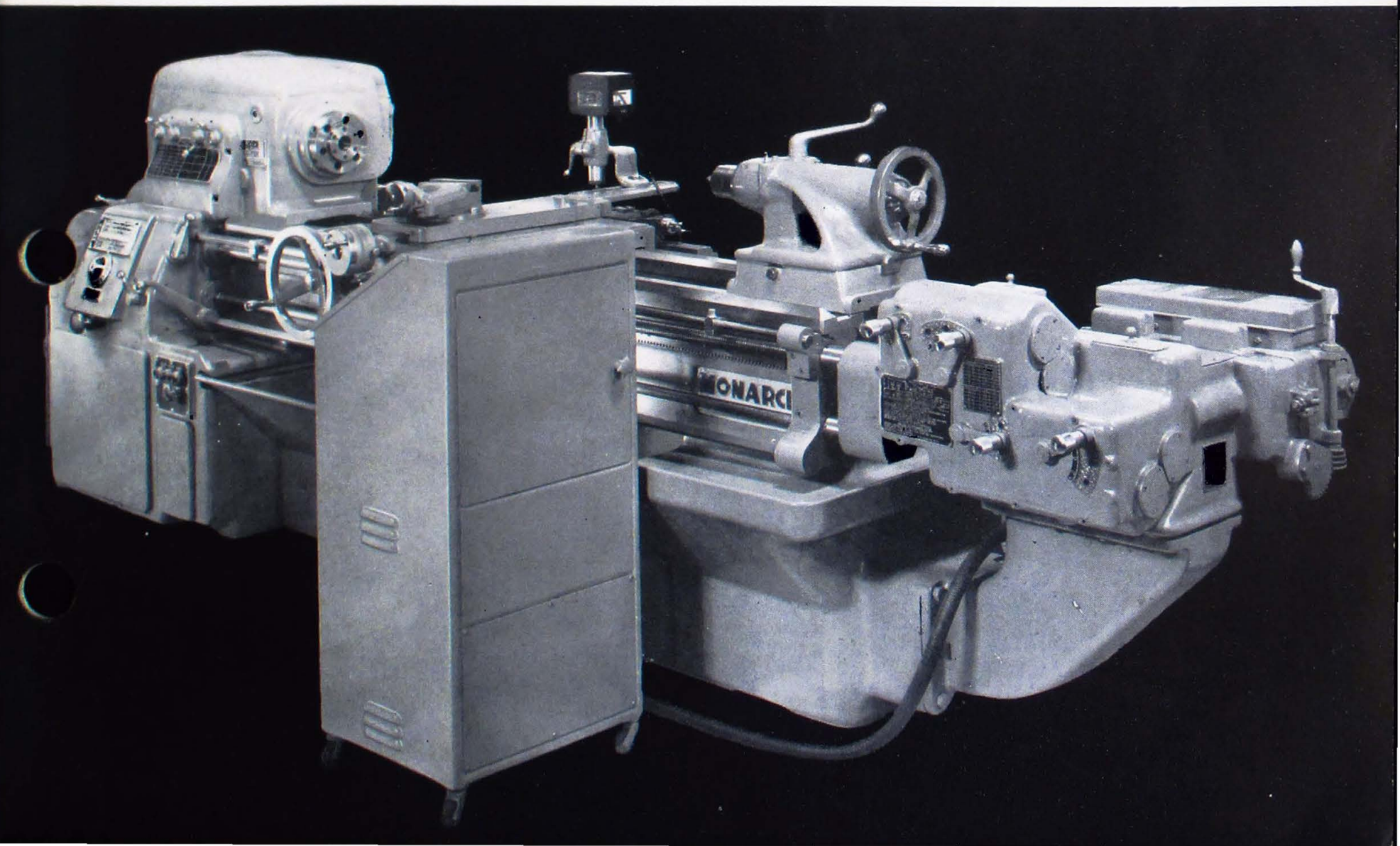


## KELLER CONTROLS

- Typical uses are for form turning and boring such work as molds, punches, dies, form rolls and spinning chucks. Used extensively for quantity production of many intricately shaped parts.
- Consists of magnetic clutch drive and feed change box at right hand end of bed, tracer mechanism at rear of bed and push button controlled from electrical control stand which may be located convenient to operator.
- Stylus of tracer mechanism has three positions determined by very slight pressure changes against template. One position creates feed toward; another, feed parallel to and the third, feed away from center line of machine.
- As variations in template contour change pressure of stylus against template, magnetic clutches are energized thereby actuating cross and longitudinal screws in their rotary motion.
- Magnetic clutches from one direction to the other energized or de-energized in 1/125 of a second, meaning that their response to change in template contour shape is practically instantaneous.



- Range and metal removing capacity not limited by use of controls.
- Controls may be disconnected in an instant, making machine available for regular lathe work under manual control.
- This feature may be applied to 16" and 20" machines at the factory before shipment or, at small additional cost, new lathes are prepared to receive Keller controls which may be attached at some future time by a Monarch serviceman.
- Over 1200 Monarch Keller-controlled lathes are in use.



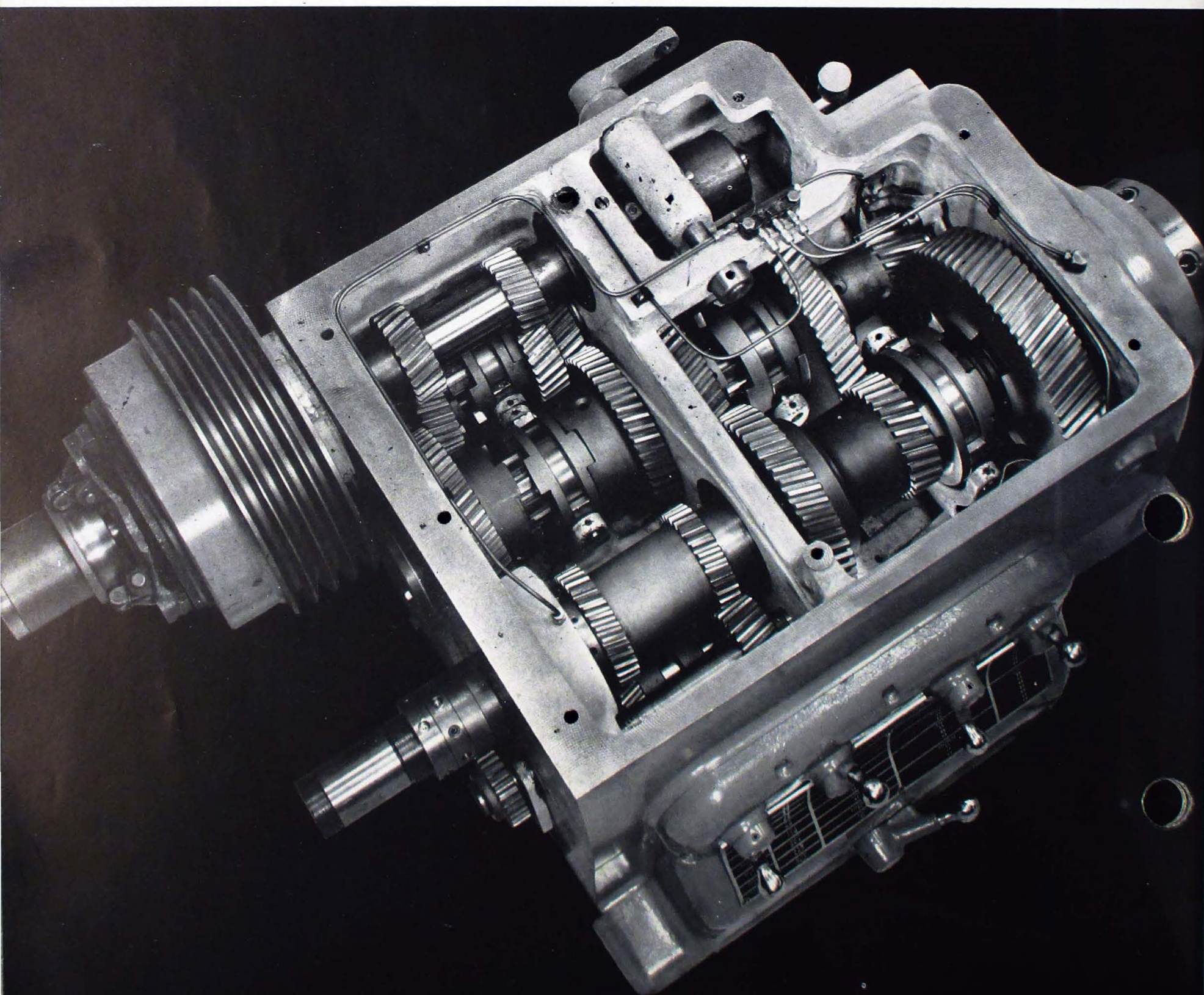


# *The Headstock . . .*

## HELICAL GEARED FOR SUPERIOR PERFORMANCE

- Helical gears used throughout.
- All gears hardened and ground.
- Spindle and long intermediate shaft have center bearing support.
- Spindle and all shafts are hardened, have ground threads and integral milled and ground splines.
- Alloy steel used for spindle, shafts and all other steel parts.
- Spindle and all shafts rotate on anti-friction bearings.
- Spindle speed changes made by sliding heavy-sided jaw clutches. With gears in constant mesh, their accuracy is not impaired by this method of speed change.
- Combined pump and splash lubrication with filtered, metered oil to each bearing.
- No pockets on inside to trap foreign matter when oil is drained for lubrication change.

16





DRIFT CLUTCH WHEN  
CHANGING TO HIGHER  
SPEEDS

DOWN UP	17 23	DOWN "	DOWN "	DOWN "
DOWN UP	28 37	UP "	" "	" "
DOWN UP	45 59	DOWN "	UP "	" "
DOWN UP	74 98	UP "	" "	" "
DOWN UP	121 158	DOWN "	DOWN "	UP "
DOWN UP	200 264	UP "	" "	" "
DOWN UP	319 420	DOWN "	UP "	" "
DOWN UP	532 700	UP "	" "	" "

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## QUICK AND POSITIVE SPINDLE SPEED CHANGE

- Spindle speed changes are positive and made with half the effort normally required.
- "Down" movement of each lever selects the lowest speed in its range, "up" movement of each lever selects the highest speed in its range.
- Standing at carriage, operator can determine the spindle speed quickly by the lever positions. This is possible only because of the use of multiple levers whose positions have a logical relationship to high and low speeds.
- Speed change plate on front of head instantly shows operator the position of the levers for any of the sixteen speeds.
- On 13" machines, speed range is from 19 to 800 R. P. M. with the regular 1800 R. P. M. motor. Other ranges are available—21 to 900 R. P. M. or 24 to 1000 R. P. M. with the 1800 R. P. M. motor, 28 to 1200 R. P. M. or 36 to 1500 R. P. M. with a 3600 R. P. M. motor, 14 to 600 or 17 to 700 R. P. M. with a 1200 R. P. M. motor.
- On 16" and 20" machines speed range is from 17 to 700 R. P. M. with the regular 1800 R. P. M. motor. Other speed ranges are available—19 to 800 R. P. M. or 21 to 900 R. P. M. or 24 to 1000 R. P. M. with the 1800 R. P. M. motor, 12 to 487 R. P. M. or 14 to 600 R. P. M. with a 1200 R. P. M. motor. Higher speeds available upon application.

*Below. Making spindle runout test during final inspection of machine. Test bar is checked 12" out from spindle nose and at three points 120° apart. Runout may never exceed .0006".*



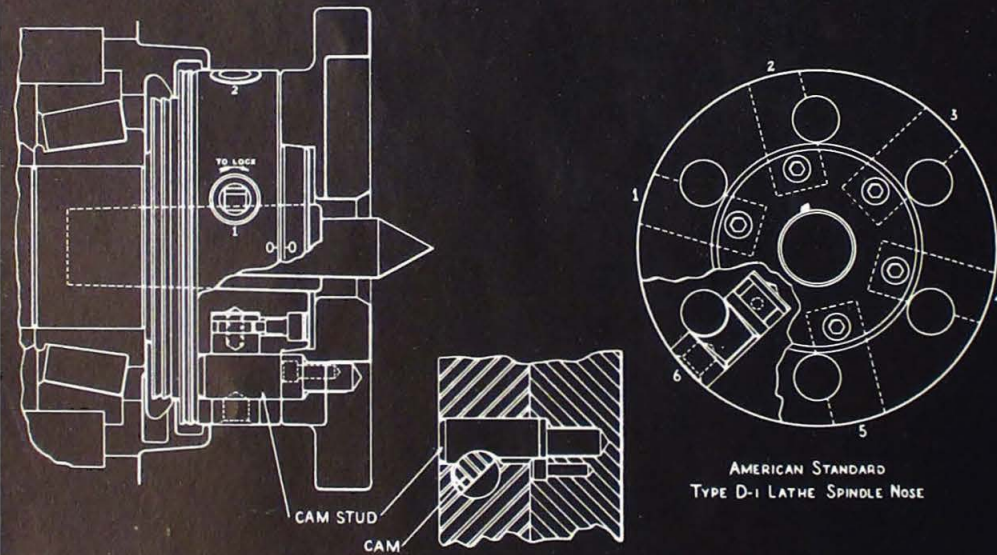


AMERICAN STANDARD

# Camlock Spindle Nose

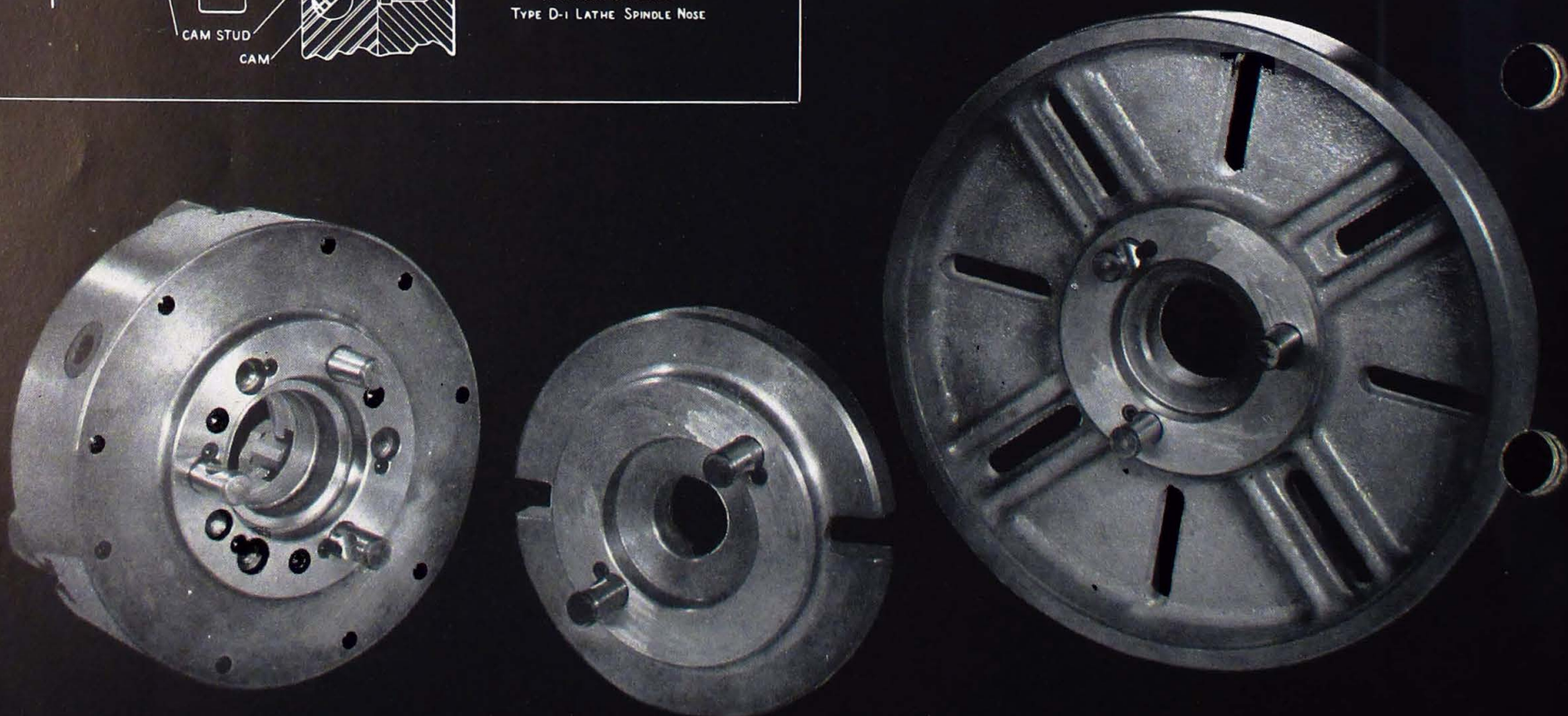
## FOR ACCURACY AND QUICK CHANGEABILITY

- Official "American Standard" spindle nose approved by the American Standards Association.
- Large diameter ground locating surface insures accurate chuck, plate and fixture alignment.
- Faster removal and attaching of chucks, plates and fixtures than any other type.
- Less overhang than with spindle nose of other designs.
- Chucks, plates and fixtures fit directly on spindle nose without adapter plates.
- Provides the most rigid means known of holding chucks, plates and fixtures to spindle.
- Chucks, plates and fixtures cannot possibly come loose under the most severe operating conditions.
- Spindle nose of same dimensions as used on many makes of turret lathes and other equipment, making for standardization and interchangeability.
- Chucks, plates and fixtures readily interchangeable from one Monarch lathe to another.
- Insures close duplication of mounting, so important when turning work within the limits frequently demanded.



18

*Below. Chuck, dog plate and face plate for Camlock spindle.*



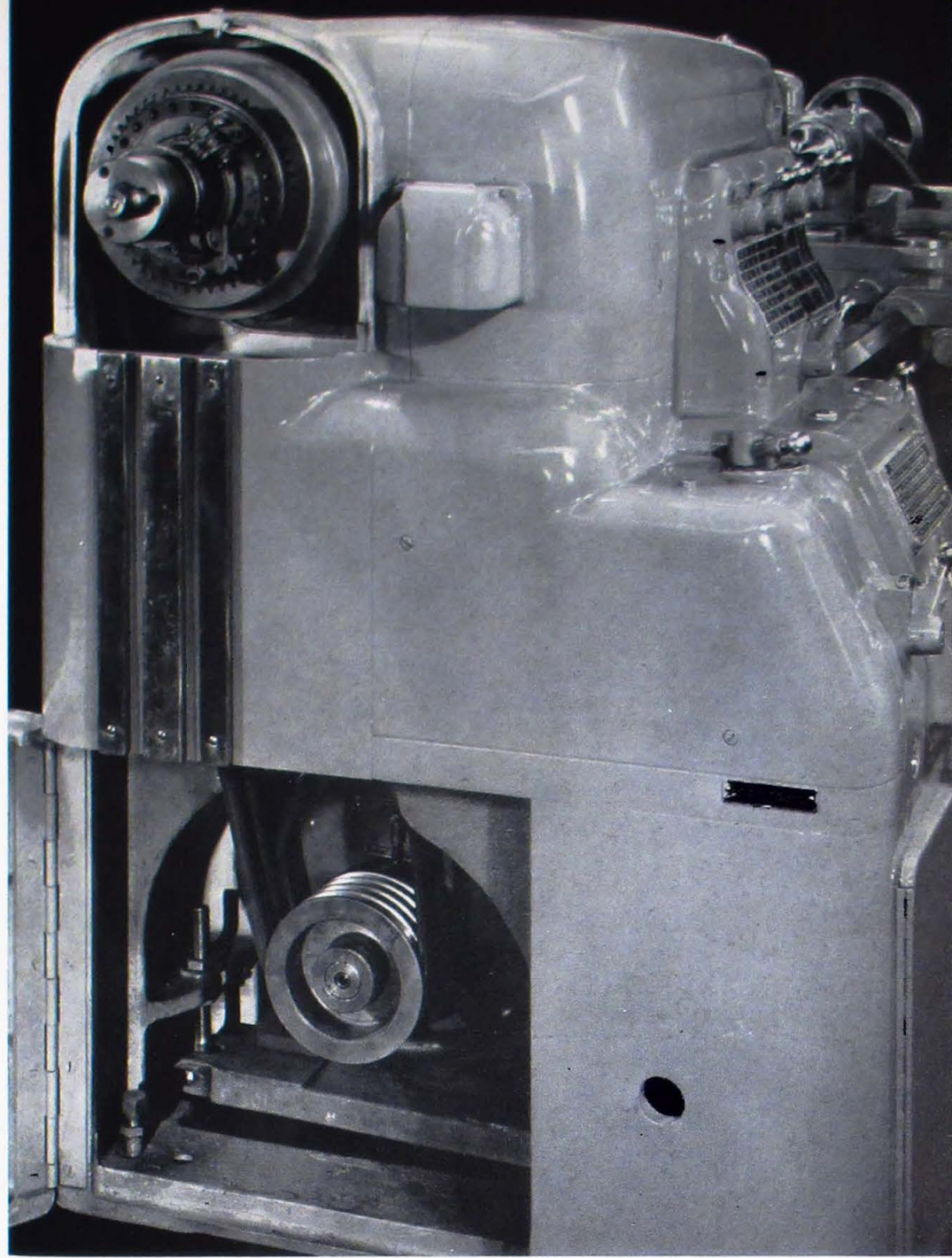


# The Main Drive

## SMOOTH AND POWERFUL THROUGH MULTIPLE "V" BELTS

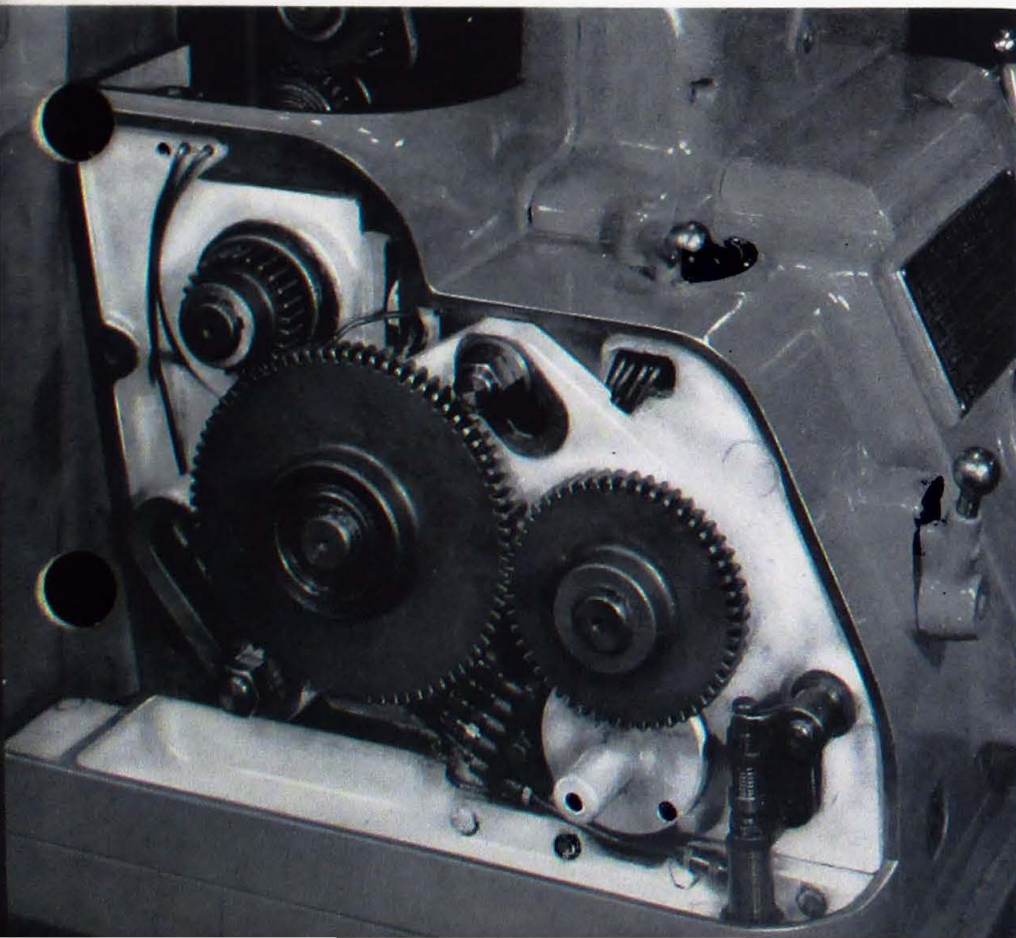
- Main drive motor inside cabinet leg and mounted on hinged plate which may be adjusted readily to change tension on driving belts.
- Drive is through wire core, balanced, multiple "V" belts.
- Drive clutch, mounted on its own support, operates in conjunction with pulley shaft which runs on ball bearings.
- Driving clutch and multiple disc brake fingertip controlled by dual levers; one at left hand end of bed, one at apron. As control lever is pulled upward through a short arc, it passes from clutch to neutral to brake position.
- Method of control permits instant stopping, gradual stopping with modified braking or drifting to a stop without braking. With lever in brake position, spindle is automatically locked against rotation to facilitate operation of collet chucks.

*Right. Closeup view at left hand end of Series 61 machine with upper cover removed and lower door opened to show the multiple "V" belt main drive. Also clearly illustrated is the main drive clutch.*



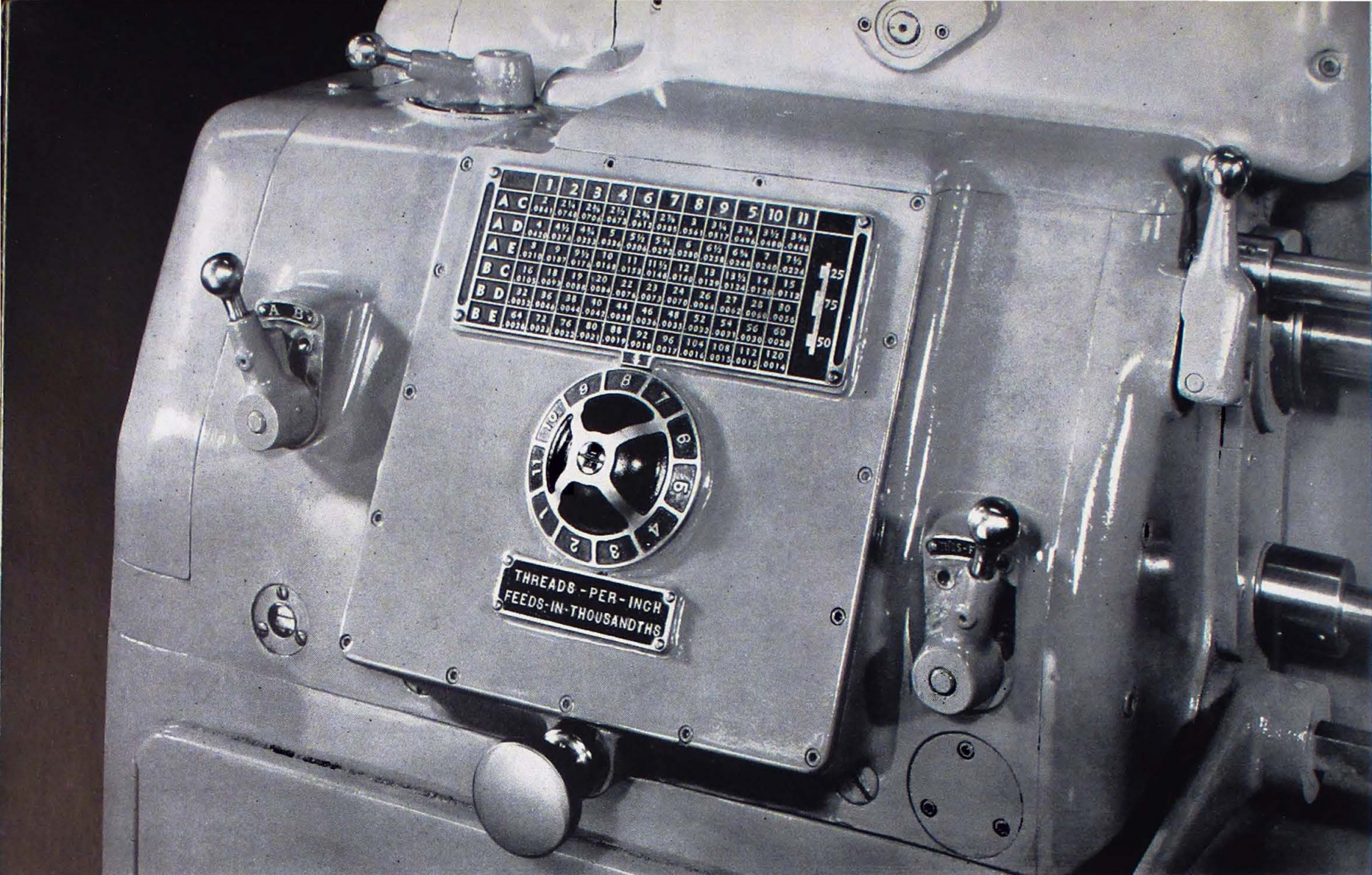
## THE COMPLETELY ENCLOSED

## End Gear Train



- End gearing completely enclosed to prevent entry of foreign matter.
- Individual pressure lubrication system supplies oil to all gears in end gear train as well as all operating parts such as bearings and gears in the totally enclosed gear box.
- Anti-friction bearings employed throughout.
- Gears made of hardened alloy steel with tooth contours ground or shaved.
- Gears on quadrant have fixed centers permitting changes of gearing for chasing odd leads or for the substitution of Metric transposing gears, with only one quadrant adjustment necessary.
- End gears held in place by Tru-Arc rings, eliminating the conventional threaded studs.





## THE TOTALLY ENCLOSED *Gear Box*

- Fully enclosed and automatically lubricated for continuous and attention-free performance.
- All gears made of hardened alloy steel with tooth contours ground or shaved.
- Anti-friction bearings used throughout.
- Overall range of the 66 threads either 1 to 60 or 2 to 120, the latter being furnished unless other range specified. See top illustration to the left for all threads in the 2 to 120 range.
- On the 13" machines, with the regular 2 to 120 thread range, the 66 feeds are from .0017" to .103". With the 1 to 60 thread range, the feeds are from .0034" to .206". On the 16" and 20" machines, with the regular 2 to 120 thread range, the 66 feeds are from .0014" to .084". With the 1 to 60 thread range, the feeds are from .0028" to .168".
- Metric transposing gears may be supplied for use in connection with the regular English gear box in which case pitch is in millimeters and feed in inches. Pitch range is .2 to 13 on all Series 61 machines. Feed range is .0016" to .1055" on the 13" machines, .0013" to .0859" on the 16" and 20" machines.

20

	1	2	3	4	6	7	8	9	5	10	11
A C	2 .0841	2 1/4 .0748	2 1/2 .0706	2 3/4 .0673	3 .0642	3 1/4 .0585	3 1/2 .0561	3 3/4 .0517	4 .0490	4 1/2 .0480	5 .0448
A D	4 .0420	4 1/2 .0374	5 .0353	5 1/2 .0336	6 .0306	6 1/2 .0292	7 .0280	7 1/2 .0258	8 .0248	9 .0240	10 .0224
A E	8 .0210	9 .0187	9 1/2 .0176	10 .0168	11 .0153	11 1/2 .0146	12 .0140	13 .0129	13 1/2 .0124	14 .0120	15 .0112
B C	16 .0105	18 .0093	19 .0088	20 .0084	22 .0076	23 .0073	24 .0070	26 .0064	27 .0062	28 .0060	30 .0056
B D	32 .0052	36 .0046	38 .0044	40 .0042	44 .0038	46 .0036	48 .0035	52 .0032	54 .0031	56 .0030	60 .0028
B E	64 .0026	72 .0023	76 .0022	80 .0021	88 .0019	92 .0018	96 .0017	104 .0016	108 .0015	112 .0015	120 .0014

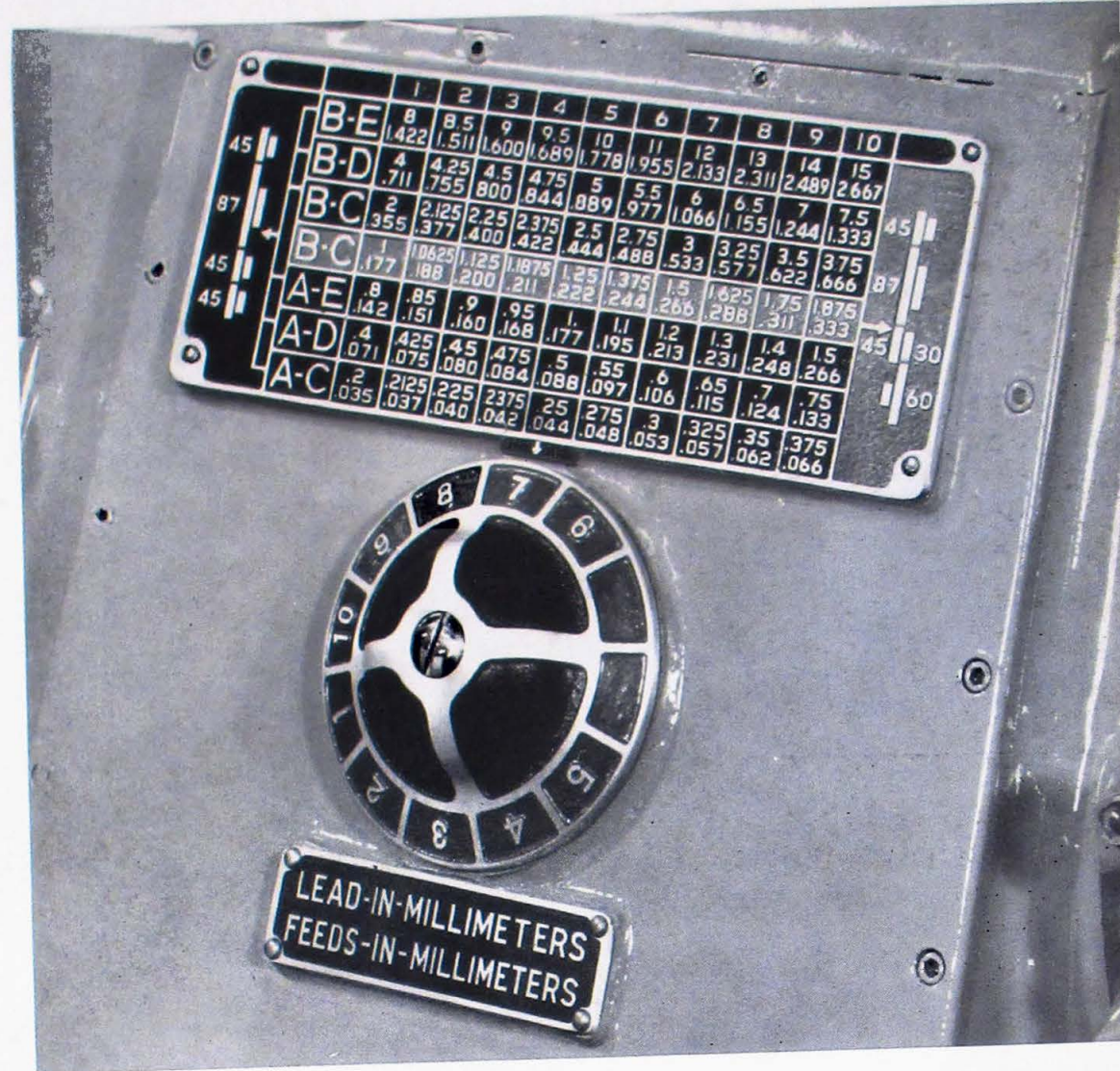
	11	8	11	8	11	8	4	8	8	8	8	4	8
BE	2 .0013	2.187 .0014	2.25 .0014	2.5 .0016	2.75 .0018	3 .0019	3.125 .0020	3.25 .0021	3.437 .0022	3.5 .0023	3.75 .0024	4.062 .0026	
BD	4 .0026	4.375 .0028	4.5 .0029	5 .0033	5.5 .0036	6 .0037	6.25 .0039	6.5 .0041	6.875 .0042	7 .0045	7.5 .0046	8.125 .0049	
BC	8 .0052	8.75 .0057	9 .0059	10 .0066	11 .0072	11.25 .0074	12 .0079	12.5 .0082	13 .0085	13.75 .0090	14 .0092	15 .0099	16.25 .0107
AE	16 .0105	1.75 .0115	1.8 .0119	2 .0132	2.2 .0145	2.25 .0148	2.4 .0158	2.5 .0165	2.6 .0171	2.75 .0181	2.8 .0185	3 .0198	3.25 .0214
AD	3.2 .0211	3.5 .0231	3.6 .0238	4 .0264	4.4 .0291	4.5 .0297	4.8 .0317	5 .0330	5.2 .0343	5.5 .0363	5.6 .0370	6 .0396	6.5 .0429
AC	6.4 .0423	7 .0462	7.2 .0476	8 .0529	8.8 .0582	9 .0595	9.6 .0634	10 .0661	10.4 .0687	11 .0727	11.2 .0740	12 .0793	13 .0859

Left above. Thread and feed plate for 16" and 20" machines with the regular 2 to 120 thread range. Left. Thread and feed plate for the 16" and 20" machines with the regular 2 to 120 thread range and with Metric transposing gears.



# THE SERIES 61 WITH *Metric Feeds and Threads*

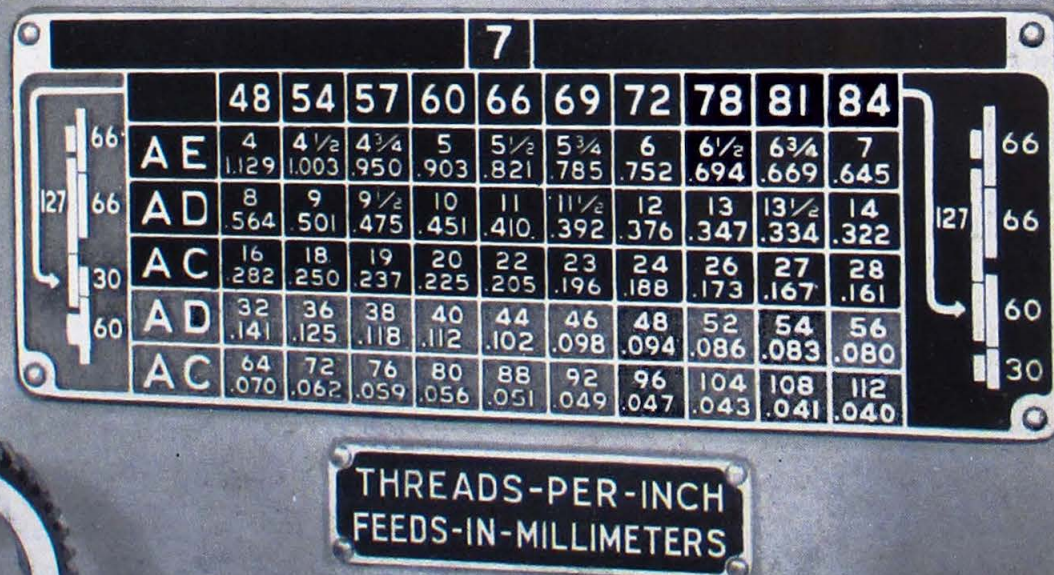
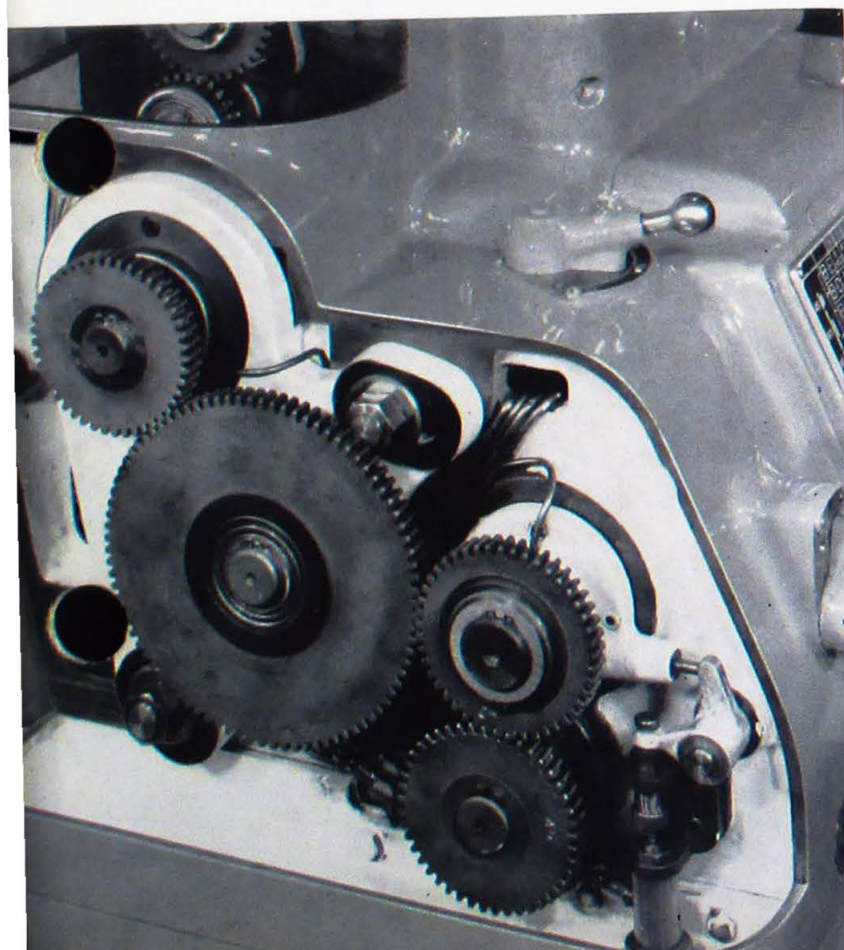
- The Series 61 is an ideal machine for those whose work is based on the Metric system of measurement. On the opposite page reference is made to the availability of Metric transposing gears for use with the regular English box.
- All these lathes may be supplied on order with a Metric gear box which provides an exceedingly wide range of pitches in millimeters and feeds in millimeters.
- To further increase the range of usefulness, English transposing gears may be had for use with the Metric gear box. In such a case threads are in inches and feeds in millimeters.
- On all Series 61 machines pitch range in millimeters with the Metric gear box is .2 to 15. Feed range in millimeters on the 13" machines is .044 to 3.272; on the 16" and 20" machines, .035 to 2.667.
- English transposing gears used in connection with the Metric gear box provide 4 to 112 threads per inch on all sizes. Feed range in millimeters on the 13" machines is .049 to 1.385 and on the 16" and 20" machines is .040 to 1.129.
- Module transposing gears may be used with the Metric gear box. Thread and feed ranges supplied upon application.



Above. Front closeup view of Metric gear box. The thread and feed plate applies to the 16" and 20" machines.

Left. View of end gearing (cover removed) on the Series 61 equipped with a Metric gear box.

Below. Thread and feed plate applying to 16" and 20" machines with Metric gear box and English transposing gears.

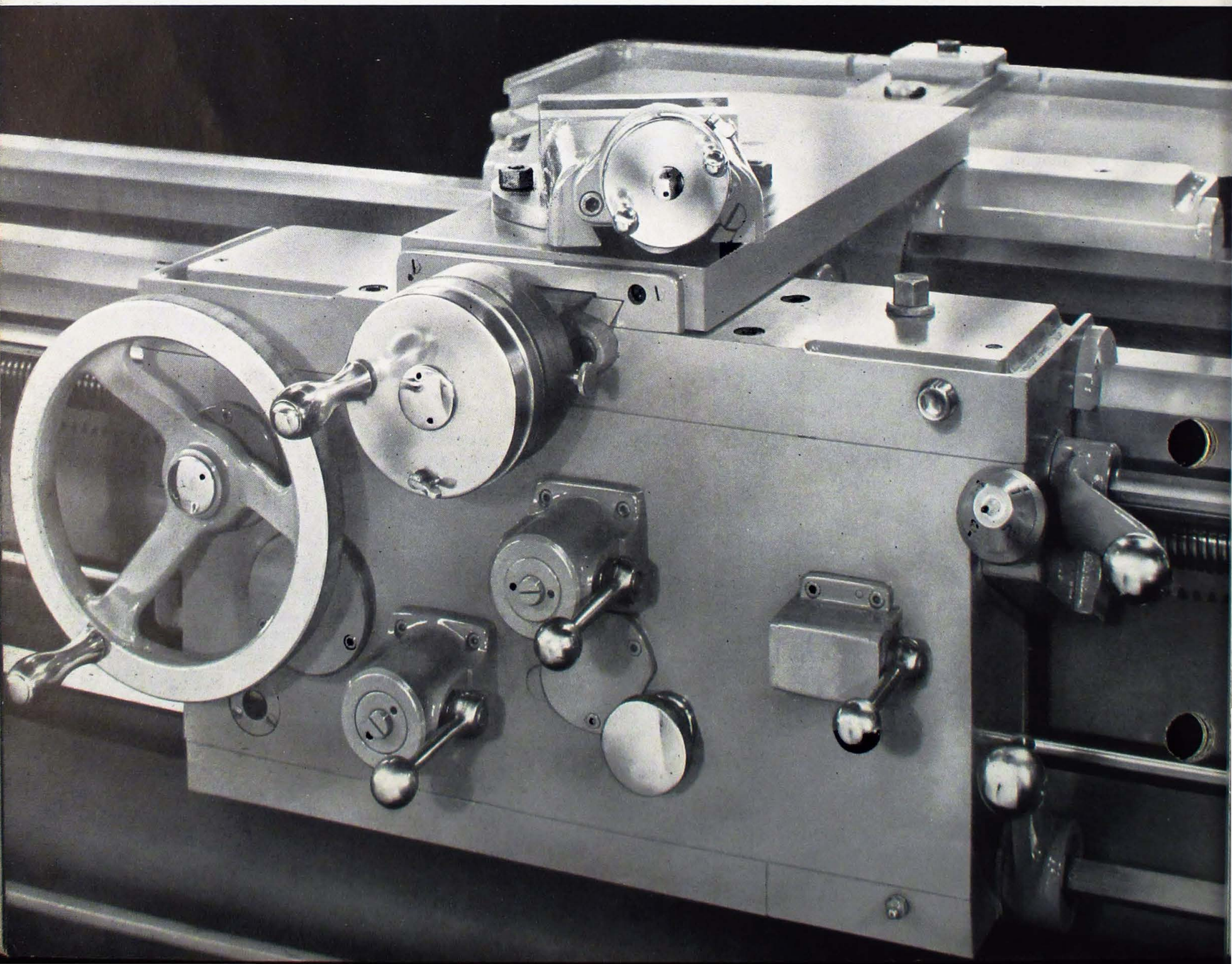




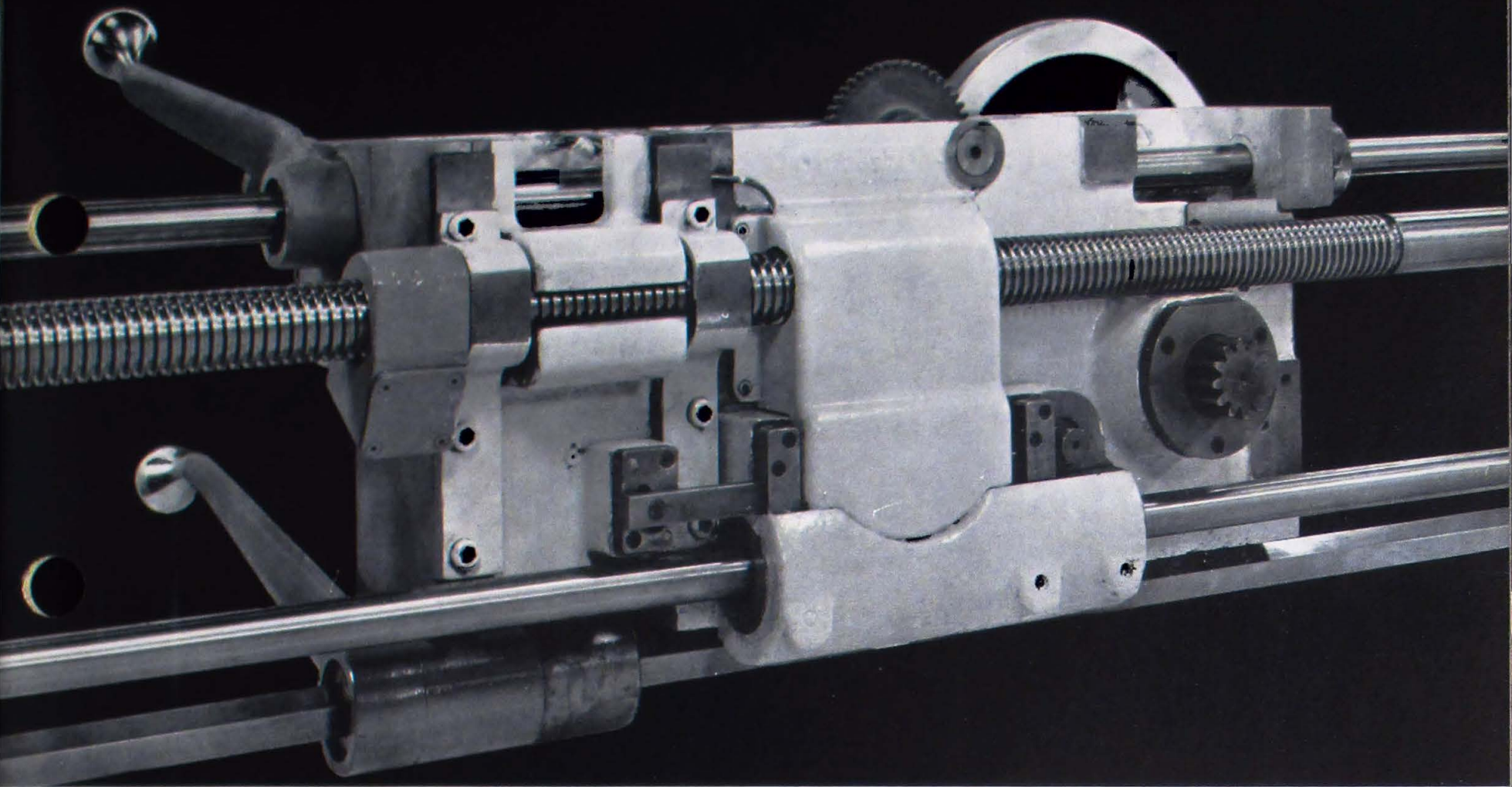
# The Apron . . .

## CONVENIENT, COMPACT AND EFFICIENT

- Fast, fingertip controls for longitudinal feed, cross-feed, half nut and feed reverse.
- Same natural downward motion of their respective control levers engages cross-feed, longitudinal feed and half nut; same upward motion disengages any one of them. Feed reverse knob controlled at front of apron.
- Large chasing dial tells operator at a glance the exact instant at which to engage the half nut.
- Cross-feed and longitudinal feed drive through worm and worm gear unit to large, efficient frictions.
- On toolmaker's lathes, leadscrew reverse operated by lever at right hand side of apron. Stops on reverse rod provide close control in both directions of carriage travel, either when threading or feeding.
- All revolving shafts ball bearing mounted.
- On engine lathes, leadscrew reverse operated by lever at front of headstock.
- All gears made of hardened alloy steel with tooth contours either ground or shaved.
- Pressure pump, within apron and automatically driven, supplies metered lubrication to all moving parts in apron, to carriage bearings on bed and to compound rest bottom slide bearings on carriage.
- Lubrication system operates continuously whether carriage is traversed by power or hand and also during power cross-feed.
- As oil feed lines are kept full at all times, lubrication is supplied immediately to bearing surfaces even though lathe has been idle for some time.







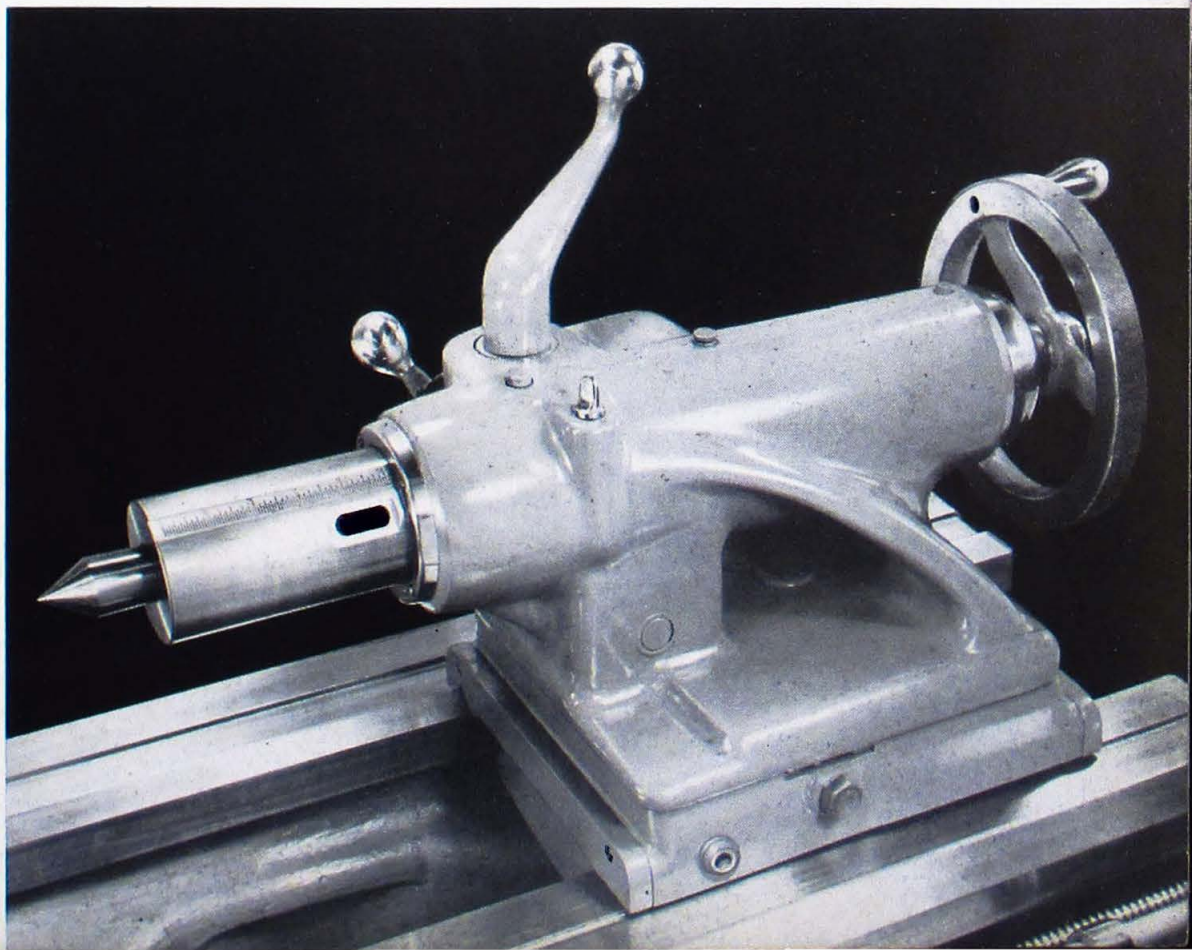
*Above. Rear view of a Series 61 Toolmaker's Lathe apron. Leadscrew is used only when threading. Longitudinal friction cannot be engaged when leadscrew half nut is engaged or vice-versa.*

## The Tailstock . . .

### QUICK CLAMPING ON TOOLMAKER'S LATHES

- Quick clamping type tailstock furnished as regular equipment on toolmaker's lathes and on 13" engine lathes only. All other features immediately following common to both toolmaker's and engine lathe tailstocks.
- Hardened and ground alloy steel spindle provided with tang slot to facilitate ejection of drill and reamer sockets. Scale on spindle graduated in sixteenths.
- Spindle anchored rigidly and accurately by a large flange back key with laminated shim adjustment for removal of rotating play.
- Stop on spindle prevents use with a partial bearing of the tailstock screw and nut.
- Tailstock screw takes thrust against ball thrust bearing.
- Reservoir in base feeds oil to hardened bed ways. Efficient wipers prevent entry of foreign matter under the base as tailstock is moved along top of bed.
- On all 16" and 20" machines, plunger pin in right front carriage wing may be engaged in tailstock base to reposition tailstock on bed by means of apron handwheel.

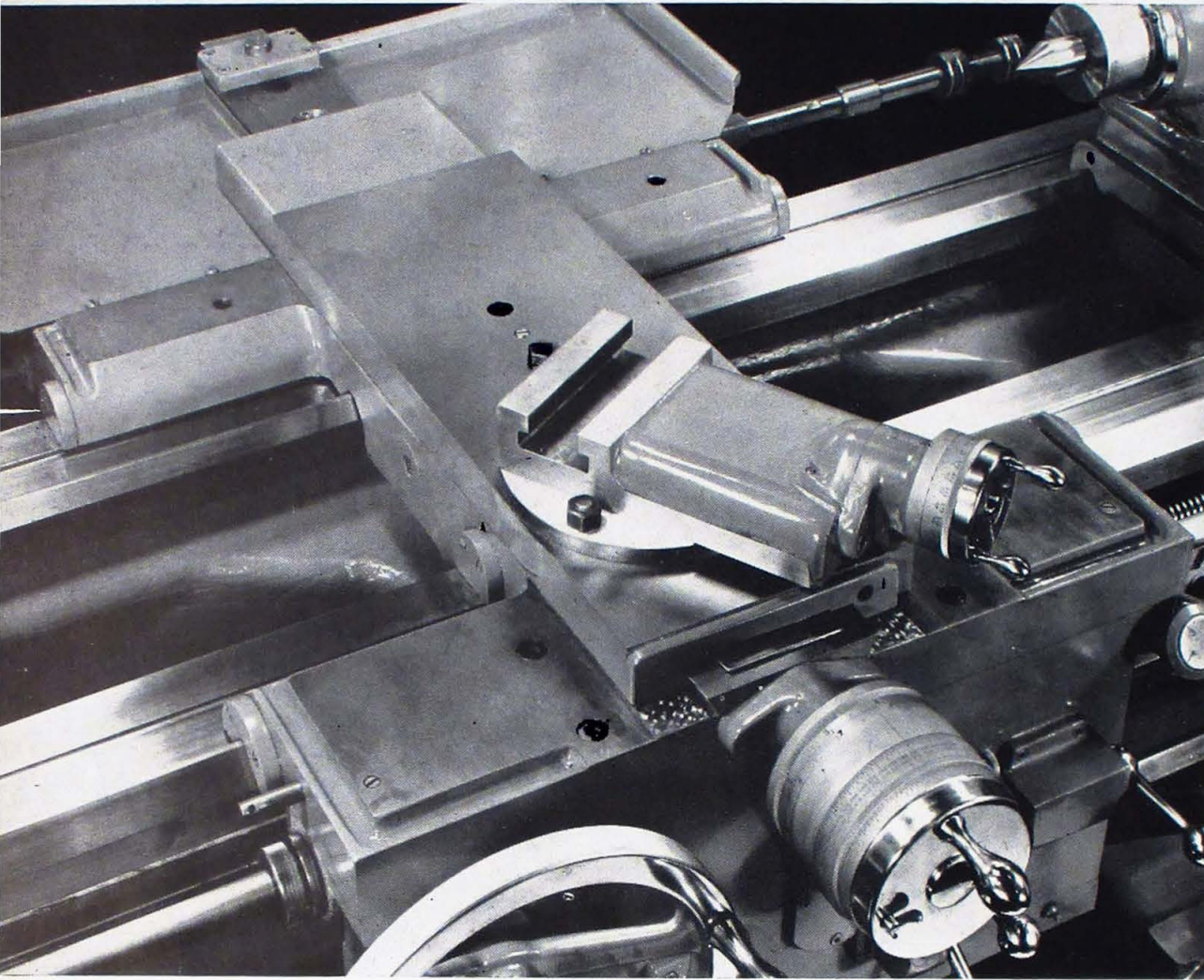
*Below. Closeup view of the sturdy Monarch Series 61 Toolmaker's Lathe tailstock. Tailstock bed ways are flame hardened and ground, a feature not ordinarily found on engine and toolmaker's lathes.*





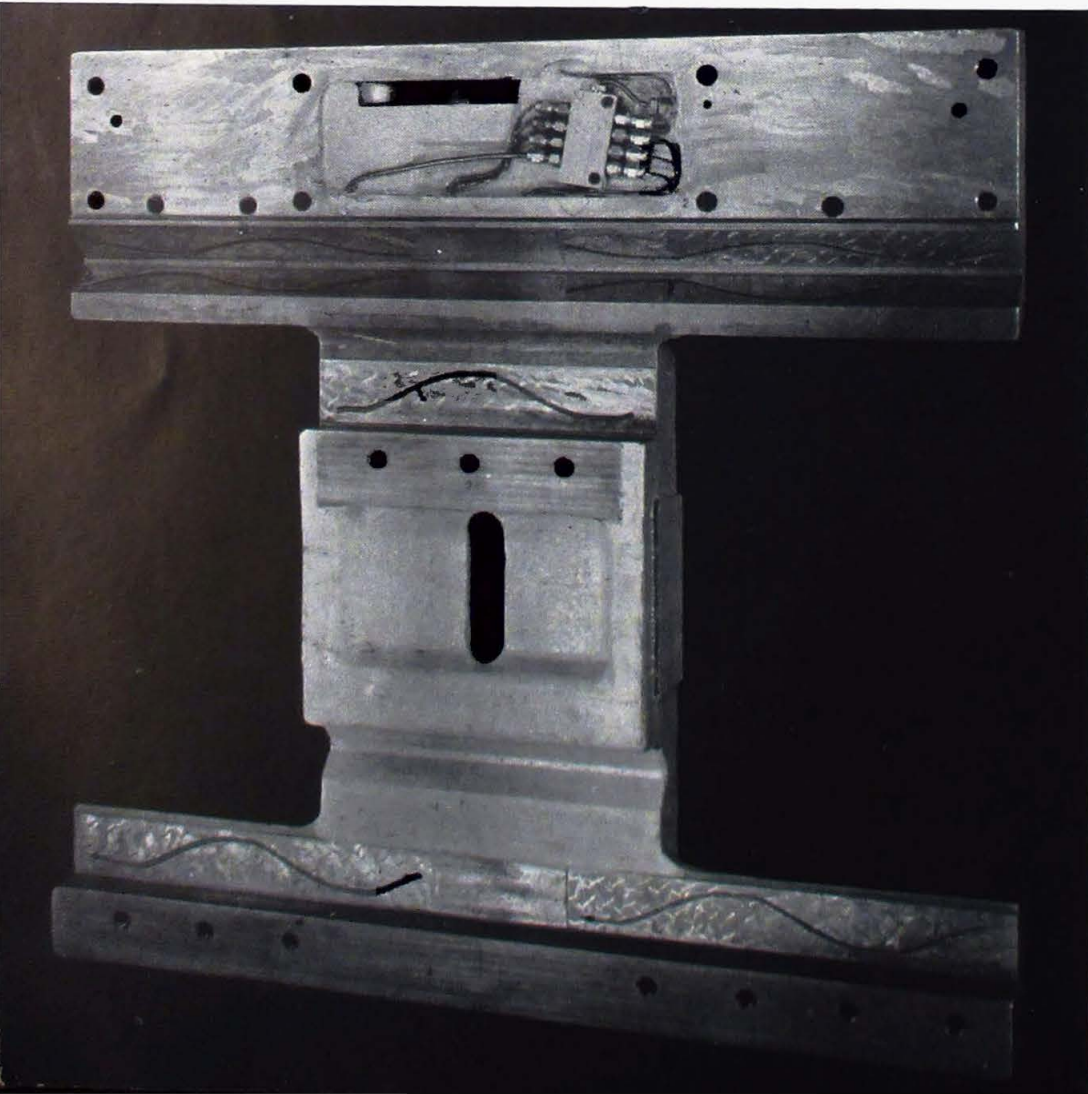
# The Carriage and Compound Rest

## FURNISH RUGGED TOOL SUPPORT



- Both cross-feed screw and compound screw hardened and ground.
- Cross-feed screw thrust taken at rear of carriage. Screw is in tension instead of compression, assuring more accurate performance.
- Large diameter cross-feed and compound micrometer dials, graduated in thousandths to read in diameter; satin finish, chrome plated with dark lines and figures.
- Swivel graduated 180° both sides of center.
- Adjustable thread chasing stop permits tool repositioning for finishing of thread without disturbing original setup.

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- Carriage way surfaces carefully hand scraped to flame hardened and ground bed ways.
- Automatic force feed pump located in apron provides complete lubrication under all operating conditions.
- Carriage casting of unusually sturdy design gives more than ample tool support.

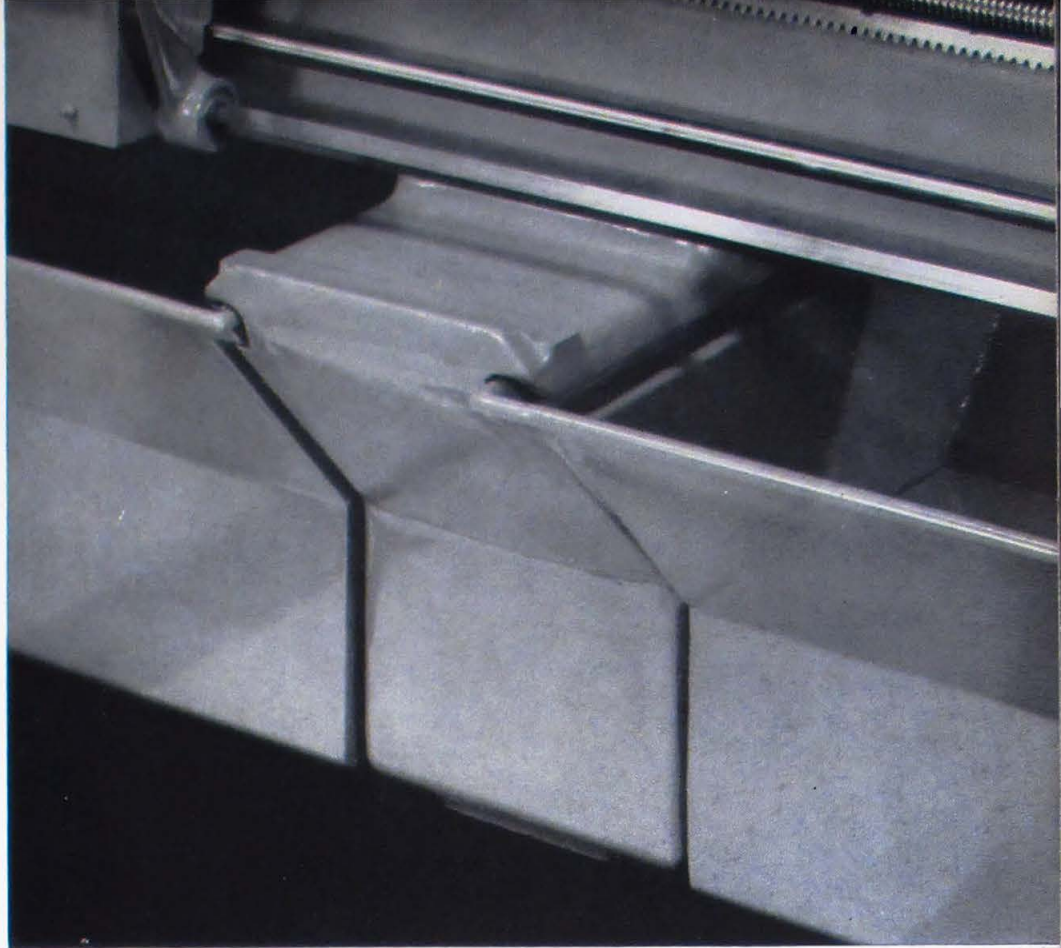
*Left. View of underside of carriage. Manner in which way surfaces are lubricated is clearly shown.*



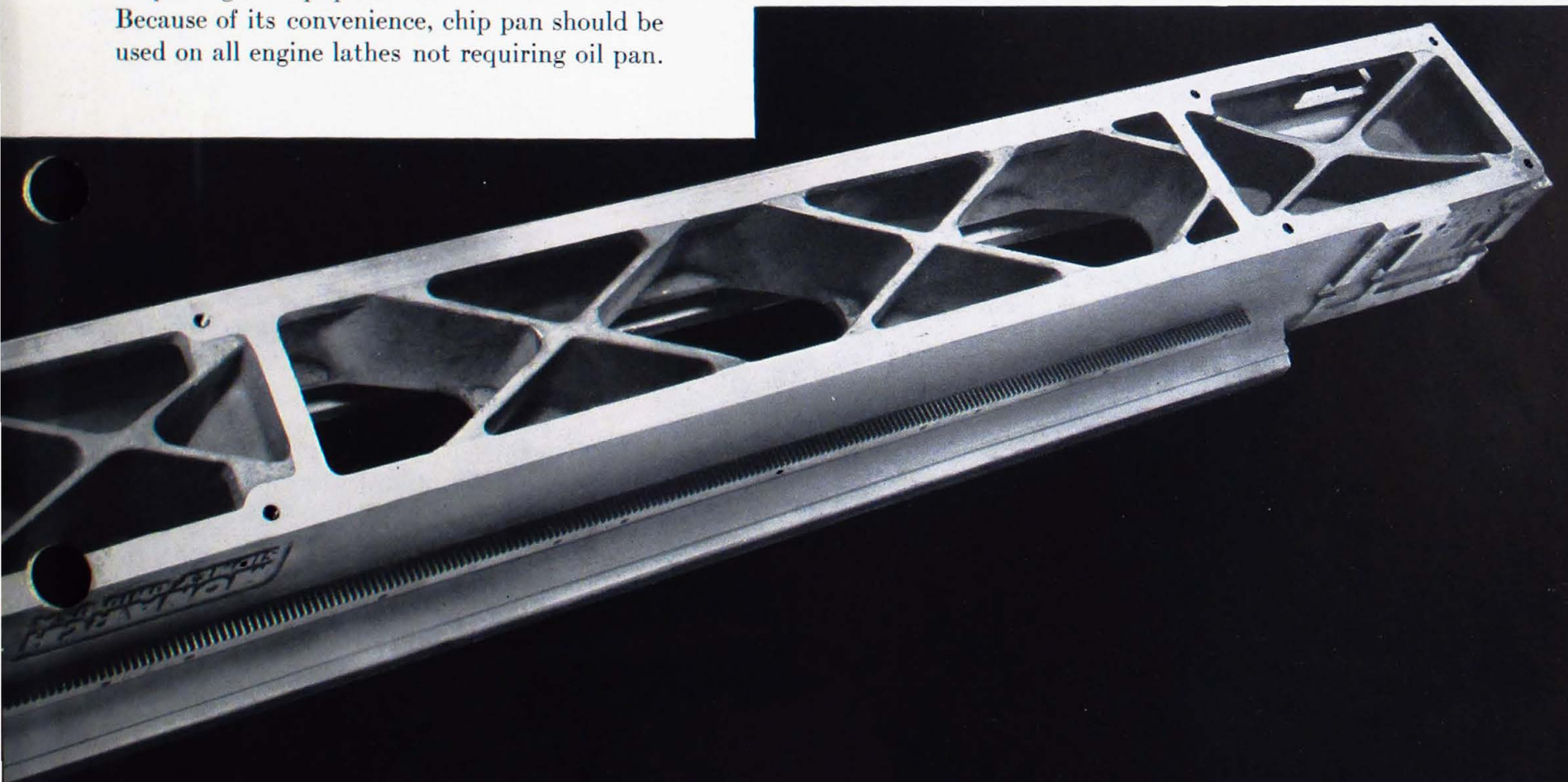
# The Bed and Cabinet Legs

## THE SOLID FOUNDATION OF A SUPERB MACHINE

- Heavy bed casting has triangular bridge type girth throughout entire center section, giving it twice the ordinary rigidity. See illustration below.
- Bed ways for both carriage and tailstock flame hardened by the exclusive Monarch process and precision ground.
- Motor and starting equipment housed in front cabinet leg. Rear cabinet leg provided with compartment for storage of tools and accessories.
- Leveling screws located within cabinet legs.
- Cabinet legs slotted to receive oil pan or chip pan. Chip pan may be moved out partially for cleaning or completely removed without dismantling any part of machine.
- Oil pan made of heavy material with rolled edges, will slide to front or rear and extends to floor, thereby eliminating accumulation of chips and dust underneath machine.
- Ample size of pan makes cleaning out of chips a less frequent operation and provides generous coolant capacity.
- Oil pan regular equipment on toolmaker's lathes. Because of its convenience, chip pan should be used on all engine lathes not requiring oil pan.



- One or more center cabinet legs supplied beginning with the 78" center distance on 13" and 16" machines and with the 72" center distance on 20" machines.
- Center cabinet legs of heavy box type construction for rigid bed support. See illustration above.
- Coolant pump, when supplied, mounted inside oil pan at headstock end. On lathes with center cabinet legs each individual pan drains through center legs to pan at headstock end. Baffle plates in pans remove sediment from coolant.





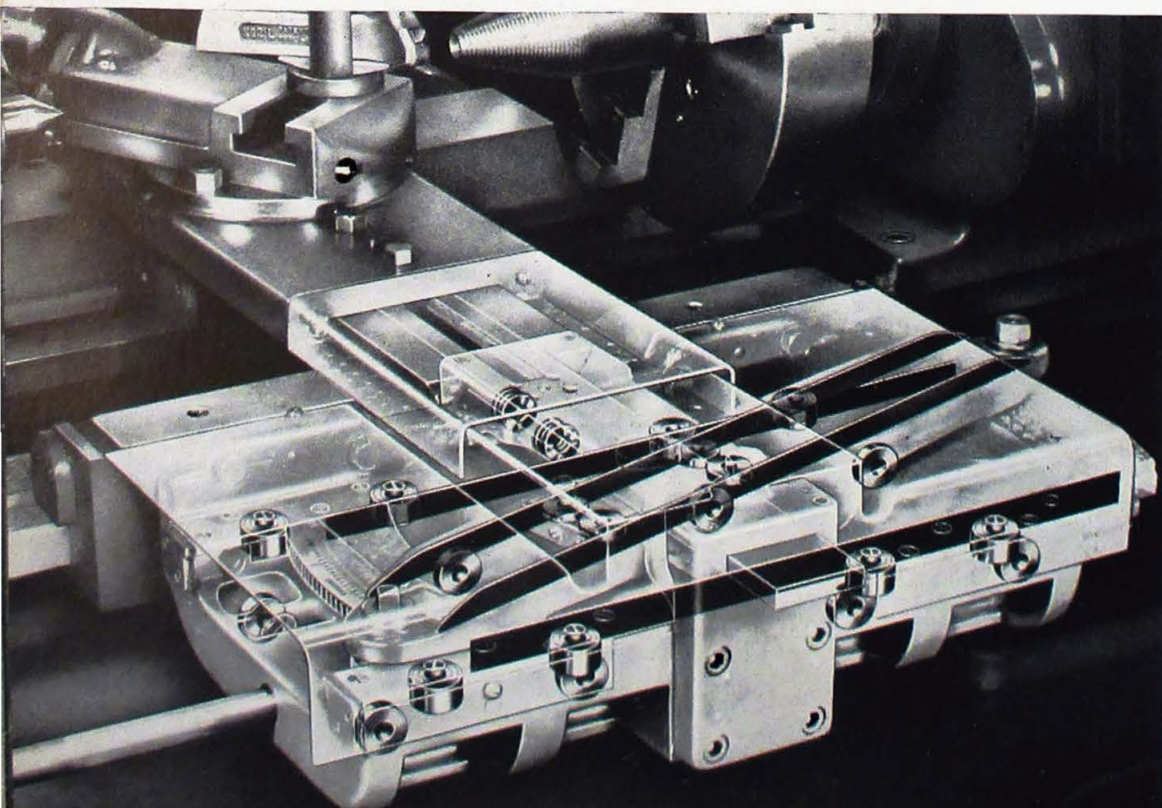
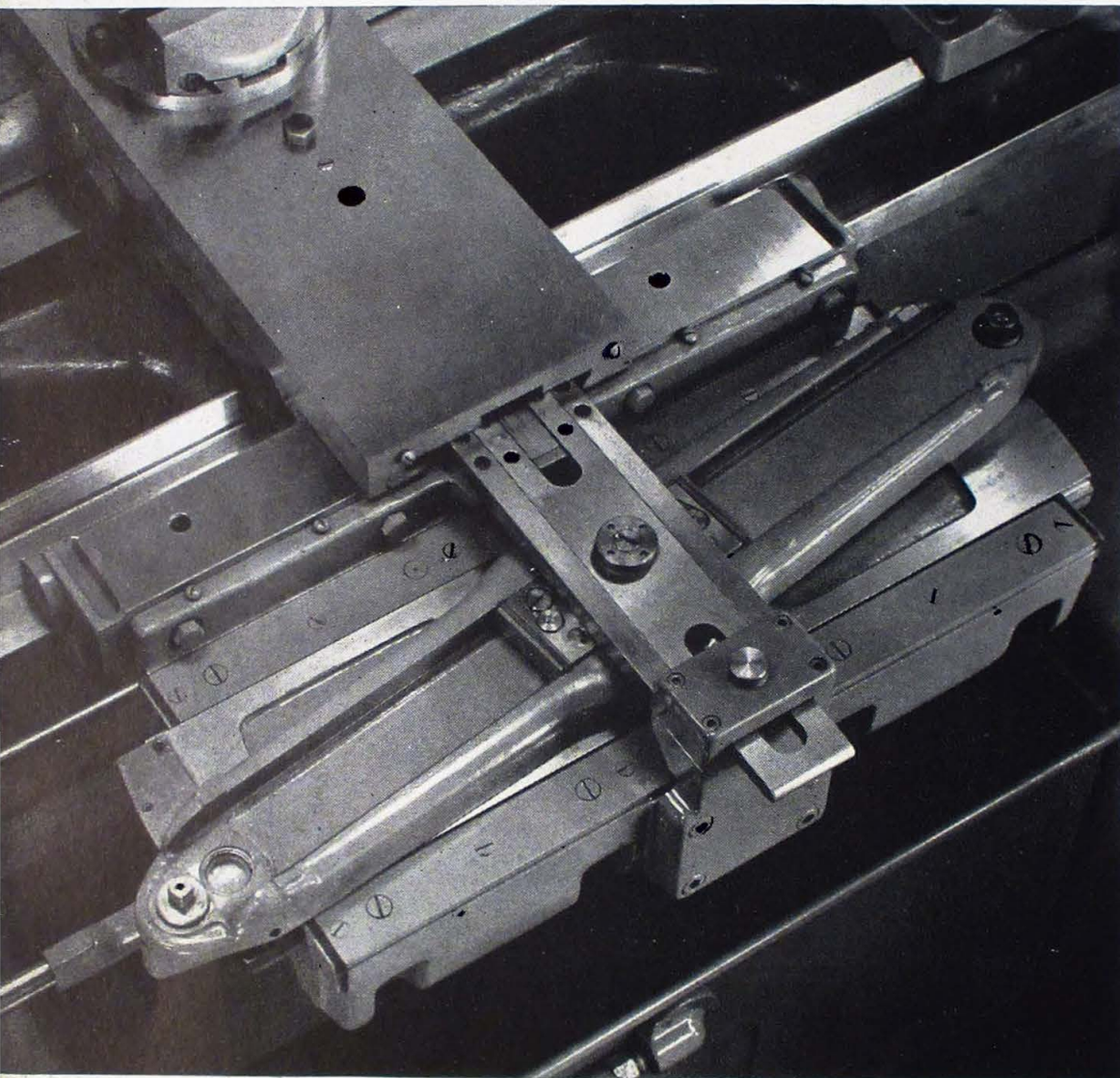
# Series 61 Accessories

Monarch accessories cut turning costs by saving operator's time and increasing production.

On the pages which follow many of the more commonly used Series 61 accessories are illustrated and briefly described. It will pay to study their possibilities whether you are considering the purchase of new turn-

ing equipment or considering means of increasing the output of the Monarch lathes now in your plant.

Still other accessories are available for numerous special requirements. Ask any Monarch representative for further information relative to supplementary equipment which you might have in mind.

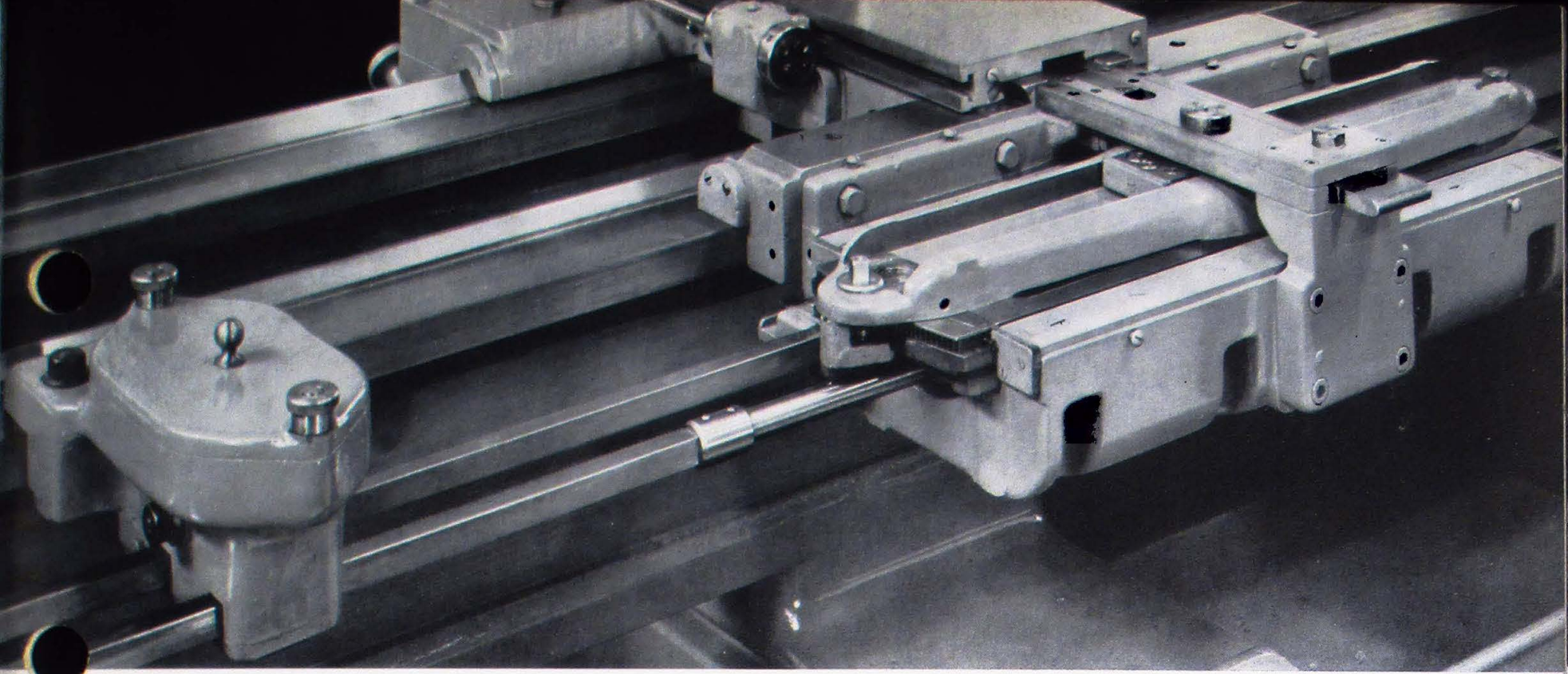


## THE ANTI-FRICTION BEARING TAPER ATTACHMENT

- Smooth, accurate tapers consistently turned or bored due to use of ball bearings with permanent, sealed in lubrication. No bearing surfaces to clean after a period of non-operation.
- Use of ball bearings practically eliminates lost motion, backlash and friction.
- Bearings mounted on eccentric studs which provide adjustment, should it ever be required.
- All bearing surfaces against which ball bearings take a bearing are flame hardened and precision ground.
- Construction permits the taking of exceptionally heavy cuts even when boring or turning acute angles without sacrifice of accuracy.
- Attachment slides have scales graduated both in degrees and in inches taper per foot. Swivel has magnifying glass for more accurate setting.
- Taper turning capacity on all sizes Series 61 engine and toolmaker's lathes is 4" maximum taper per foot, the maximum included angle being 18°. Maximum length at one setting is 14" on 13" machines, 18" on 16" and 20" machines.
- Taper attachment can be furnished with variator which is pictured and described on pages 27 and 28 and with still other features for a wide variety of form turning and form boring operations.

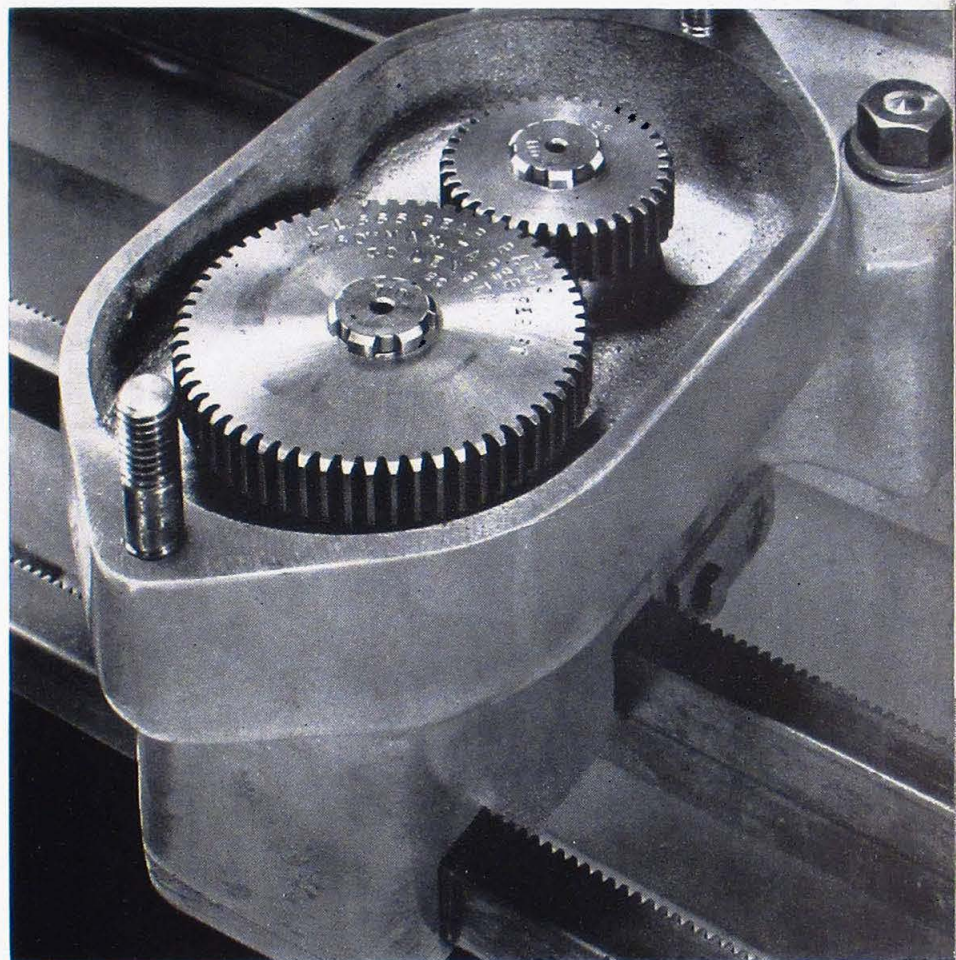
*Left. Phantom view of Monarch Series 61 taper attachment showing the generous use of ball bearings. Note also the darker strips which indicate the flame hardened and ground bearing surfaces.*





## TAPER ATTACHMENT VARIATOR

- Versatility of anti-friction bearing taper attachment extended by addition of taper attachment variator which consists of a single gear box with pick-off gears and a rack to control motion of taper attachment slide.
- Variator increases degree of taper which can be turned or bored, increases length taper turning capacity at one setting to length capacity of machine and provides a pantographing means for contour turning and boring from a master template.
- Variator can be used on work having up to a maximum length of 30'' or on any section of a longer work piece not exceeding this 30'' top limit.
- Can be applied to new Monarch lathes at the factory or to machines already in use.
- Table below lists capacities of the regular type variator on all Series 61 lathes. In this connection it must be remembered that when the variator is engaged the taper attachment setting is changed and this change varies according to the gear ratio employed. With a gear ratio of 1 to 1 the taper attachment setting provides the taper indicated, with the 2 to 1 gear ratio the setting provides three times the taper indicated and with the 3 to 1 gear ratio four times the indicated taper is provided.

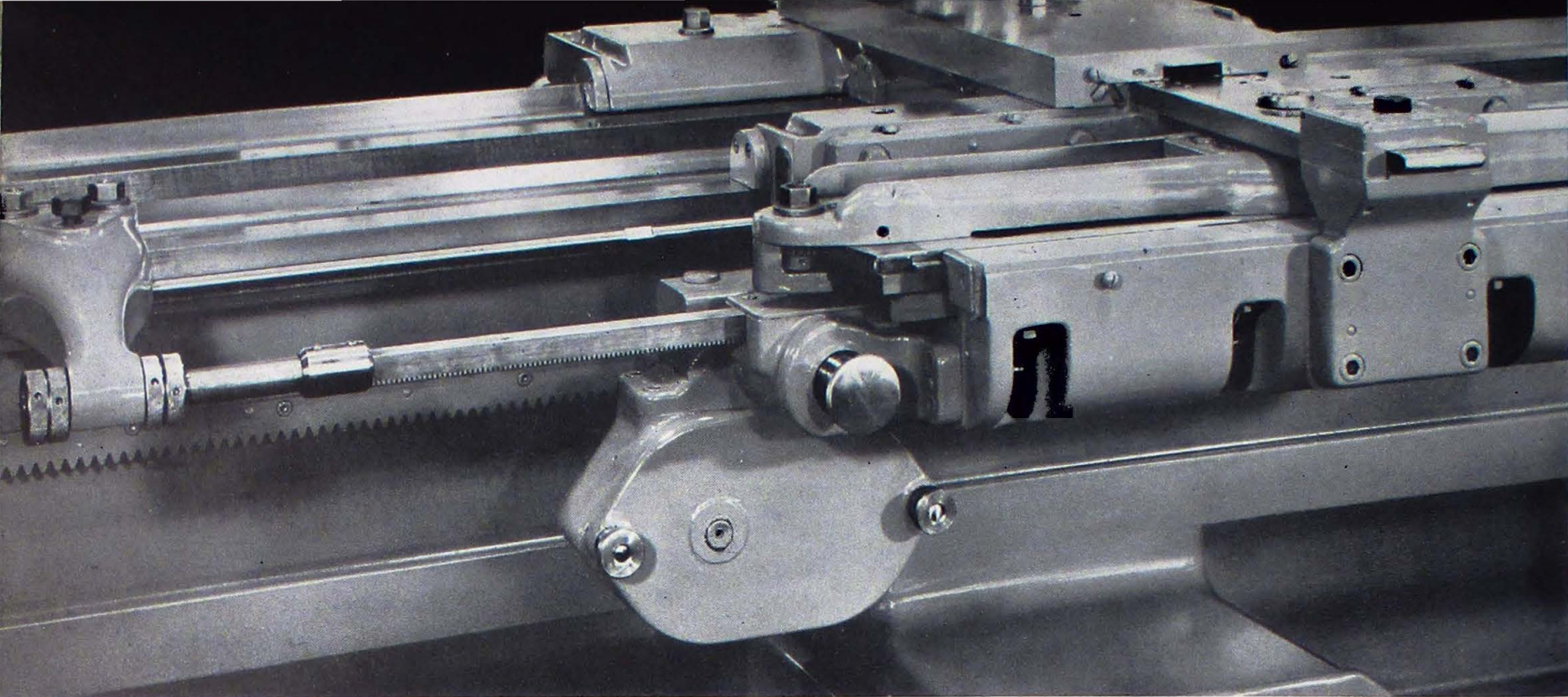


Above. Taper attachment variator gear box (with cover removed) mounted on rear of bed. This clearly shows how easy it is to change the gear ratio.

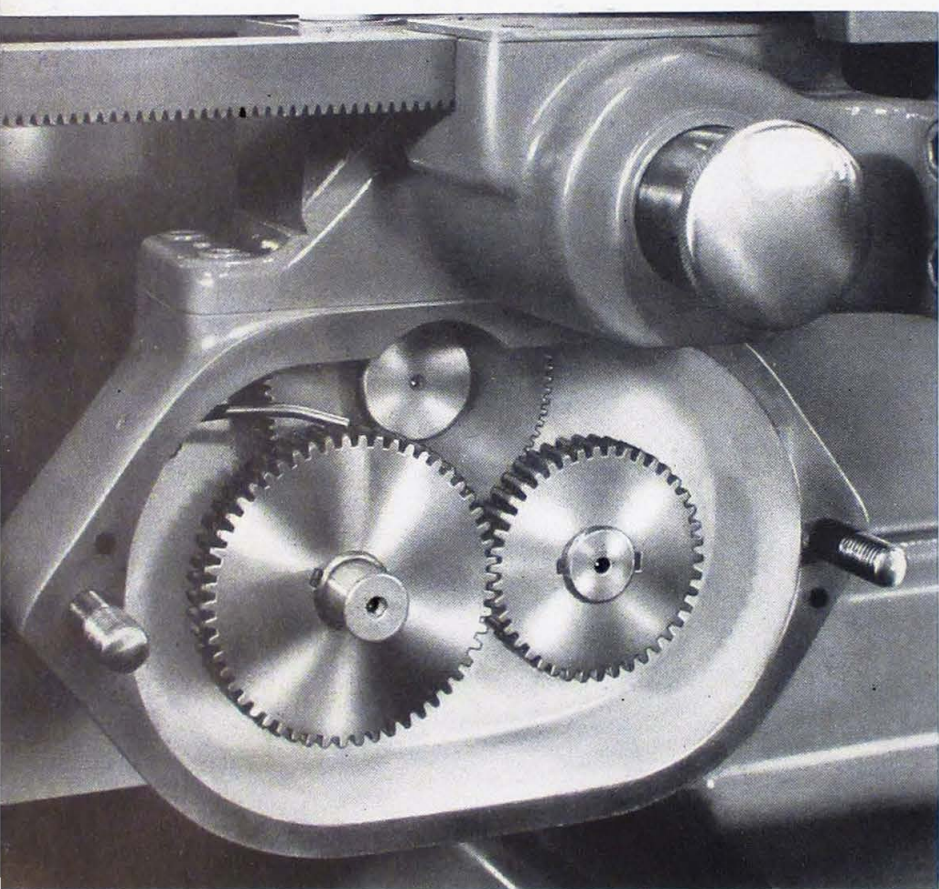
## CAPACITIES WITH REGULAR TAPER ATTACHMENT VARIATOR

Size	TAPER TURNING CAPACITY			
	Change Gear Ratio	Maximum Length	Maximum Taper Per Foot	Maximum Included Angle
13'' Series 61	1 to 1	6''	8''	37°
	2 to 1	4''	12''	53°
	3 to 1	3''	16''	67°
16'' - 20'' Series 61	1 to 1	9''	8''	37°
	2 to 1	6''	12''	53°
	3 to 1	4.5''	16''	67°





*Above. The long taper, or bed type taper attachment variator.  
Left. Long taper attachment variator gear box (with cover removed)  
shows accessibility for easy gear changing.*



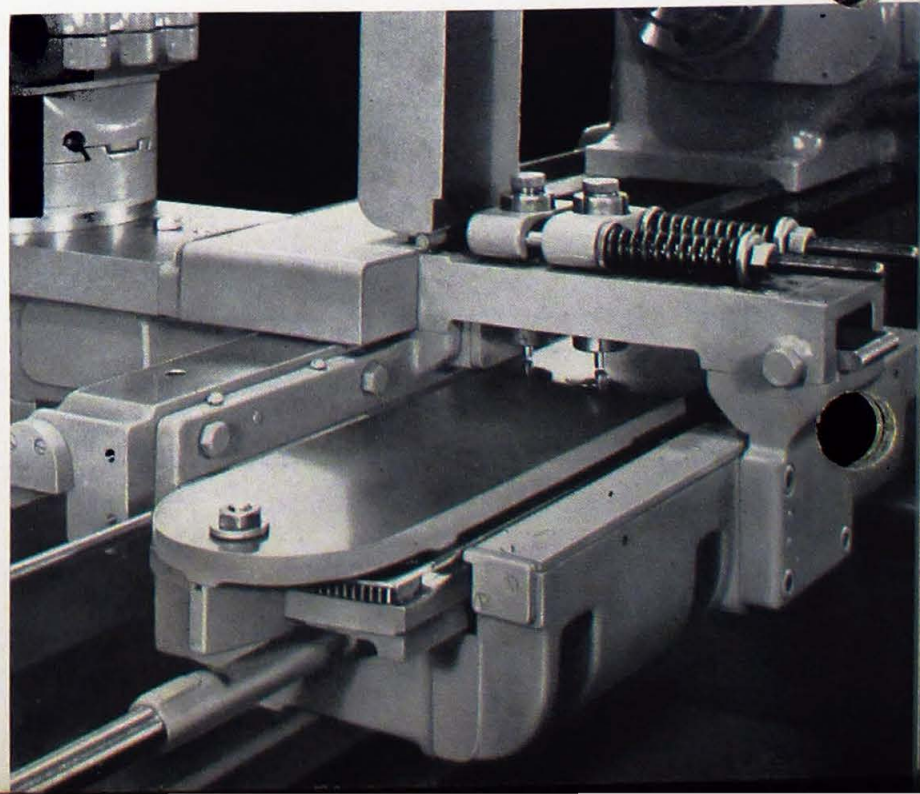
### **CAPACITIES WITH LONG TAPER VARIATOR (Bed Type)**

**(Available on 16" and 20" Models only)**

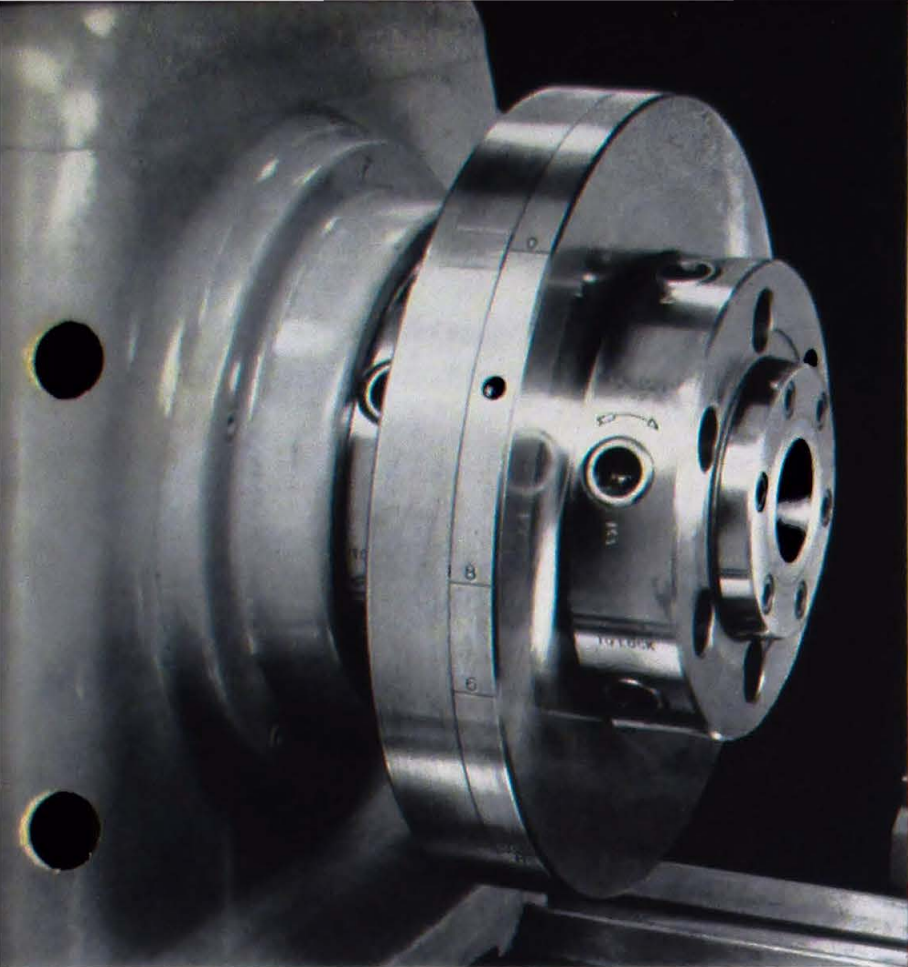
- As the name implies, this unit is designed for turning tapers on longer work.
- Maximum ratio of change gears that can be used with long taper variator is 3 to 1.
- Maximum taper per foot (using 3 to 1 ratio change gears) is 3.4285" per foot on a 20.9978" length of taper.
- Maximum length of taper that can be turned with above gears is 188.9994" with .3809" maximum taper per foot.
- When ordering variator or change gears contact factory for full specifications to suit your individual requirements.

### **FORM TURNING ATTACHMENT**

- For reproducing various types of contour work, the spring-loaded type form turning attachment is particularly valuable whenever extreme accuracy in form turning is required.
- Attachment makes use of a single cam with the follower held against the cam surface by a spring-loaded arrangement.
- Can be used in conjunction with a variator to give additional flexibility in handling long contours.
- Will reproduce contours where the inside contour radius is equal to or more than the roller follower, and where the actual pressure angle does not exceed 21 degrees.

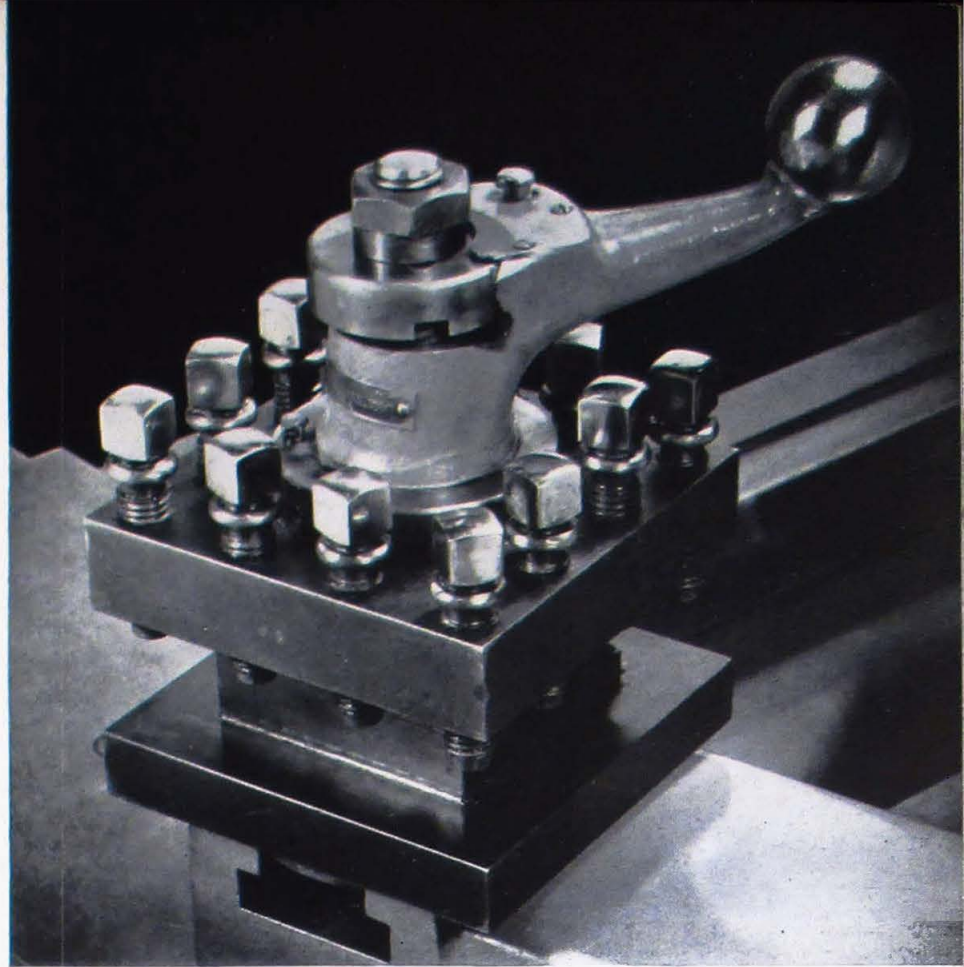






### MULTIPLE INDEXING FACE PLATE

- Used principally on toolmaker's lathes for the chasing of multiple start threads.
- Mounts on Camlock spindle nose. Front plate of attachment has the same Camlock nose, permitting plates and chucks to be interchanged.
- Indexing plate provided with graduations for engaging teeth of index gear for 2, 3, 4, 6 and 8 multiple start threads.

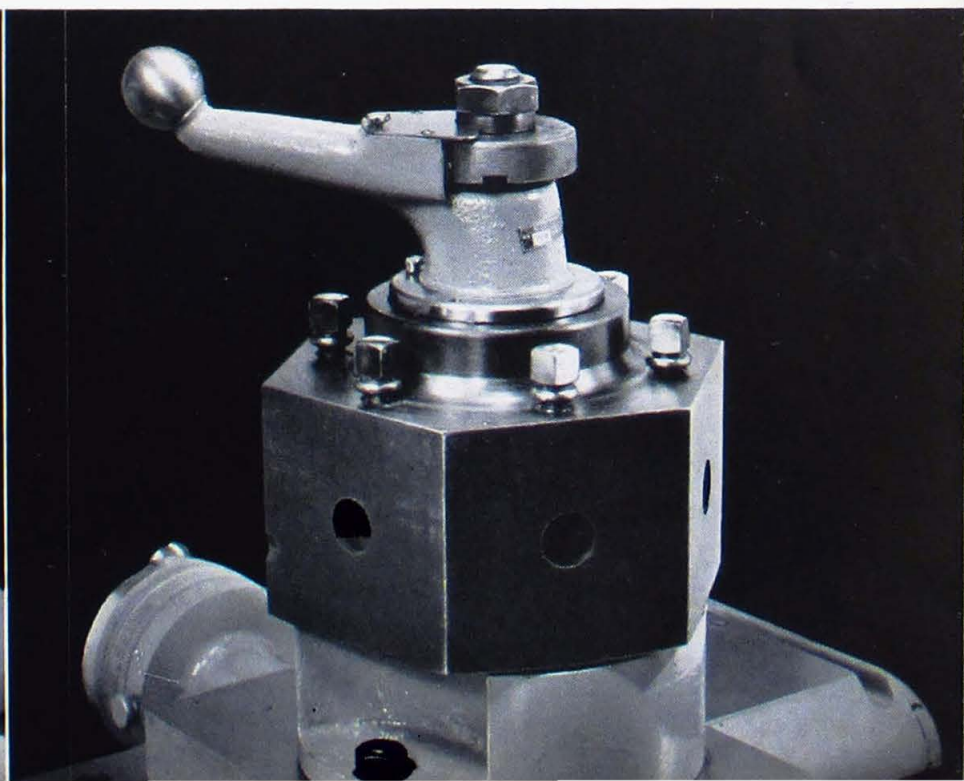
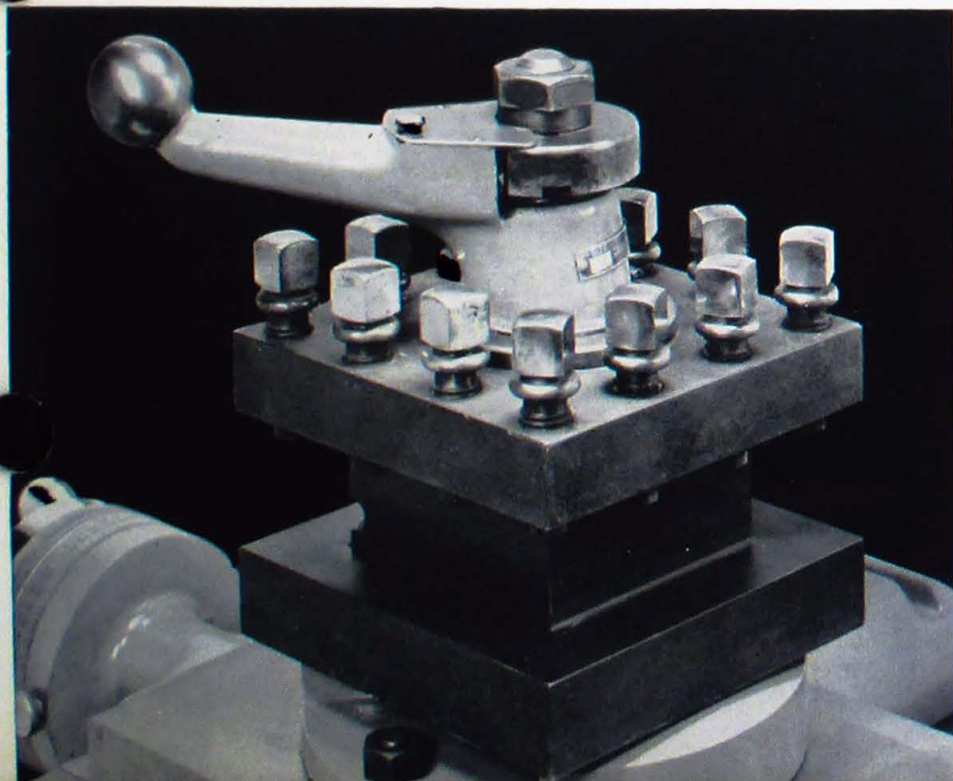


### TURRETS

- Style "O" (illustrated above) for intermittent use. Indexes accurately in twelve positions and fits directly to compound rest.
- Style "OL" (illustrated below left) for continuous use. Fits directly to bolt circle of regular bottom slide.
- Style "R" (illustrated below right) has six positions and mounts directly on bolt circle of regular bottom slide.

### DIMENSIONS OF TURRETS

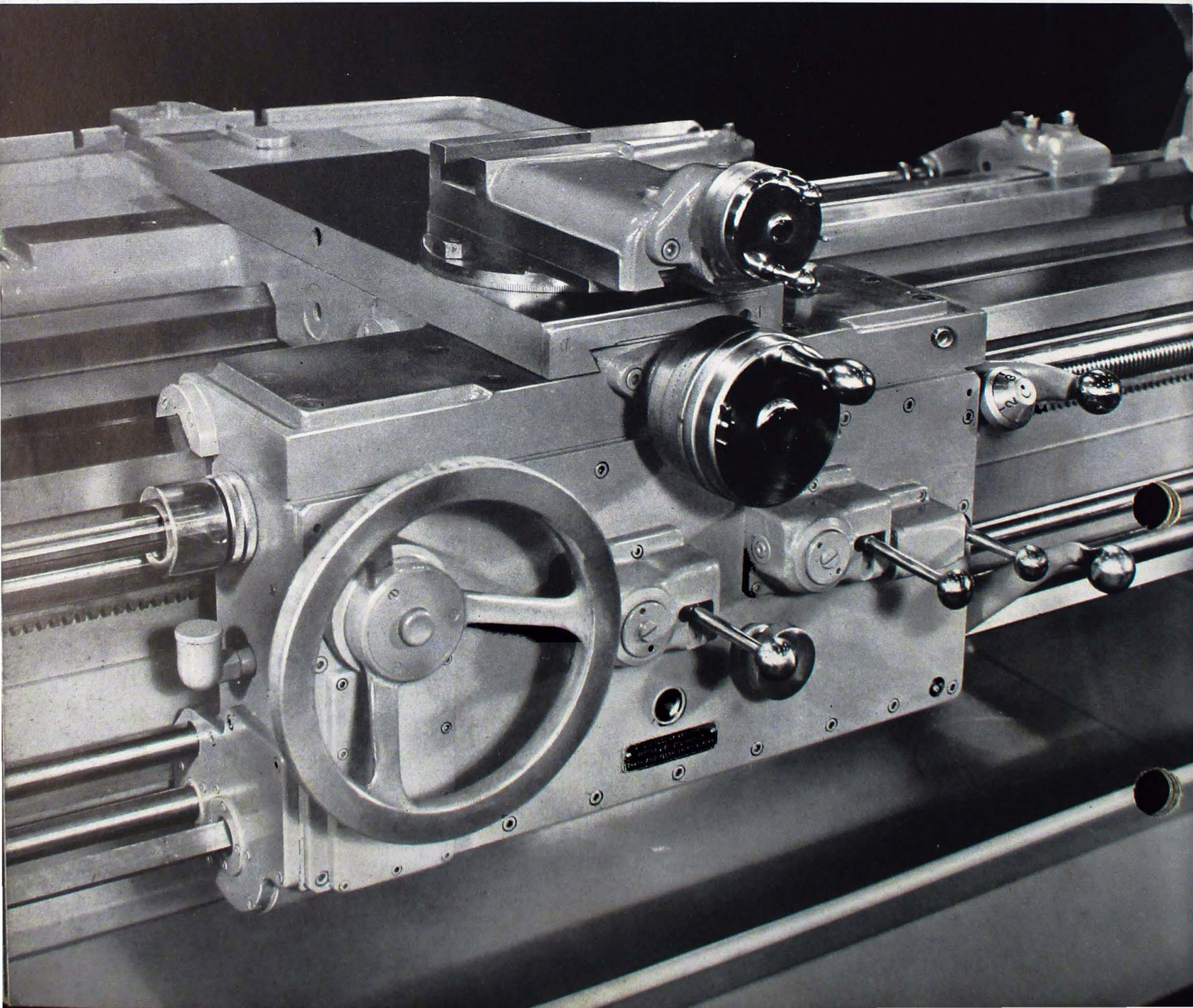
Size of Lathe	STYLE "O"		STYLE "OL"		STYLE "R"	
	Size Square	Maximum Tool Size	Size Square	Maximum Tool Size	Across Flats	Maximum Diameter Hole
13" Series 61	5½"	1⅜" x ¾"	5½"	1¼" x 1"	7"	1¼"
16" Series 61	5½"	1⅜" x 1"	7"	1¾" x 1¼"	8"	1½"
20" Series 61	5½"	1⅜" x 1"	7"	1¾" x 1¼"	9"	1¾"



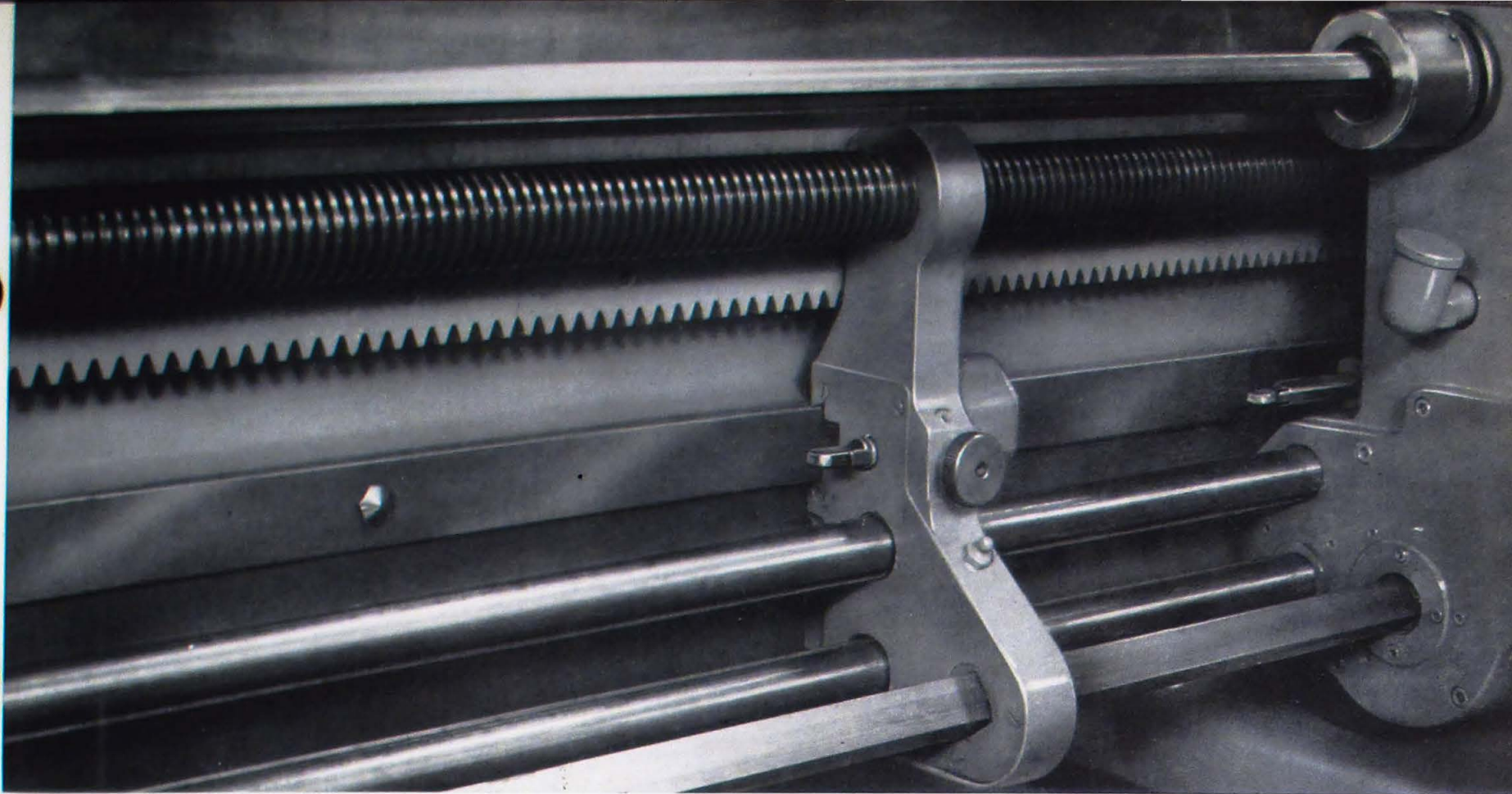


## THE APRON . . . WITH FOUR-WAY POWER RAPID TRAVERSE

- Power rapid traverse to carriage and cross slide. Rapid tool positioning, quick tool retraction, fast carriage return. Tool adjust time is cut as much as 50% depending on type of work.
- Fast, fingertip controls. Power rapid traverse is controlled through longitudinal and cross-feed friction levers. Moving longitudinal friction lever to right traverses carriage right, moving lever left traverses left, downward push engages feed. Traverse in or out and cross-feed are secured in similar manner by movement of cross-feed friction lever.
- Safety clutch, for all traverse movements, disengages automatically in case of accidental jamming.
- Built-in positive type direct length reading dial. Dial graduated in .005" readings. Carriage movement 1" for each rotation. Quick release button at front of handwheel hub for fast adjustment.
- Large chasing dial tells operator at a glance the exact instant at which to engage the half nut.
- Cross-feed and longitudinal feed drive through worm and worm gear unit to large, efficient frictions.
- On toolmaker's lathes, leadscrew reverse operated by lever at right hand side of apron. Stops on







*Above. A closeup view of an automatic traveling rod carrier. This is an exclusive feature of Monarch Series 61 longer bed machines.*

reverse rod provide close control in both directions of carriage travel, either when threading or feeding. On engine lathes, leadscrew reverse operated by lever at front of headstock.

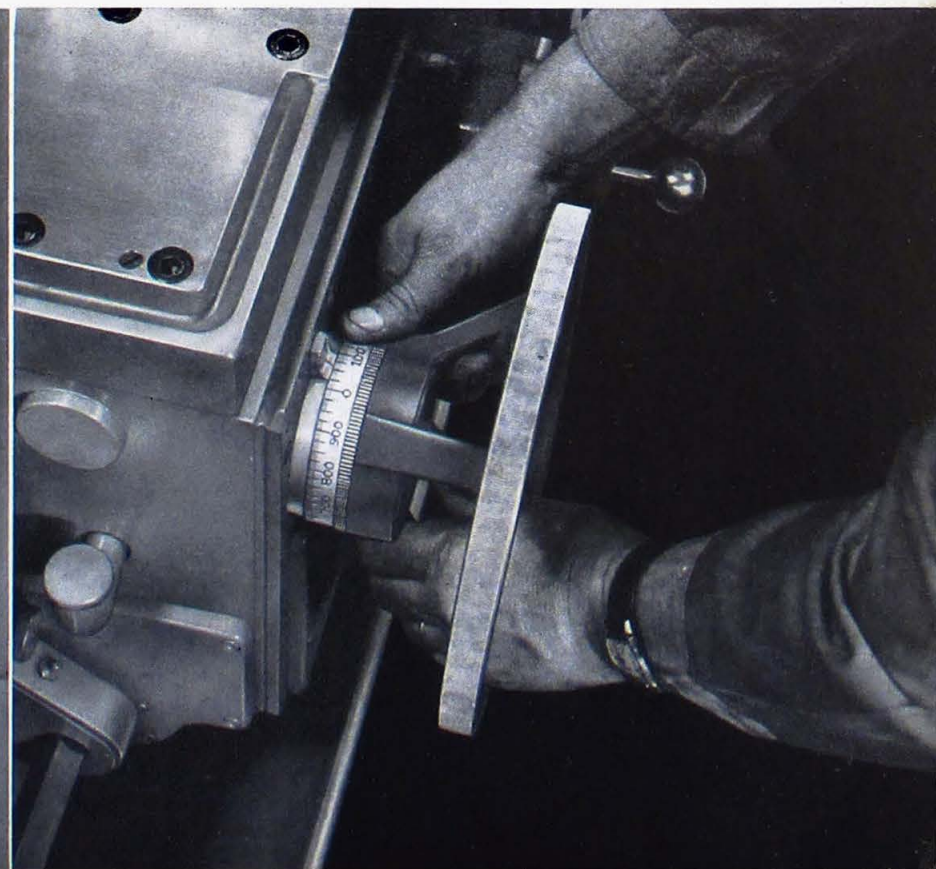
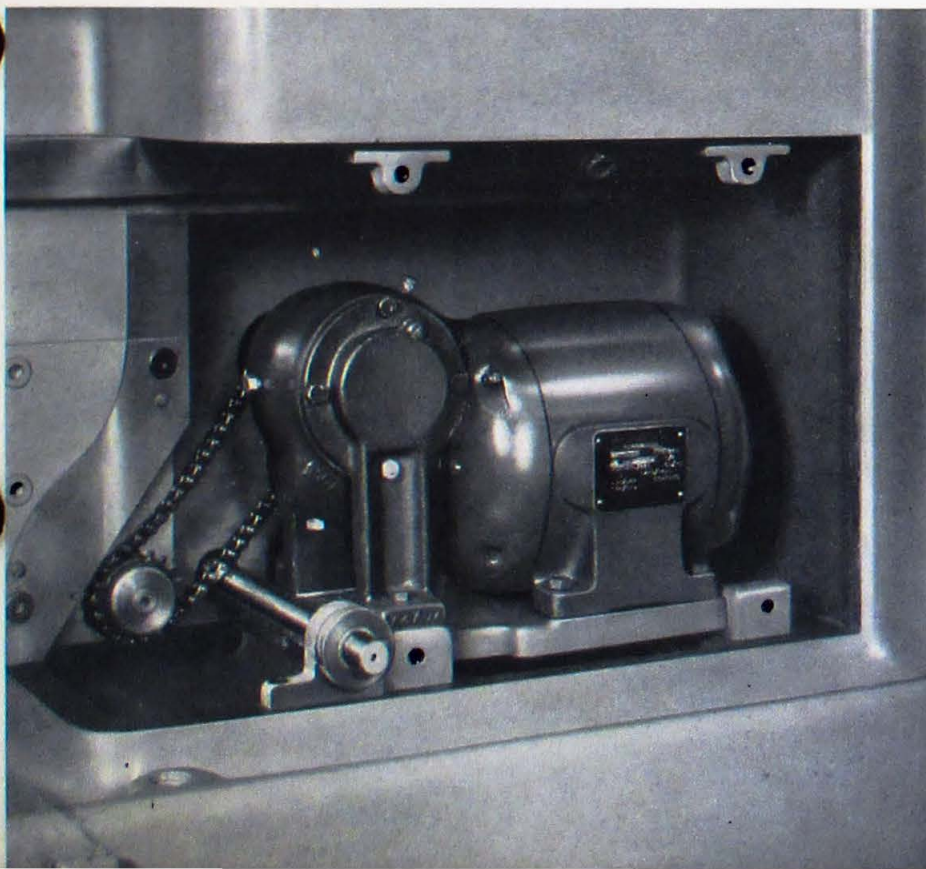
- All revolving shafts ball bearing mounted.
- All gears made of hardened alloy steel with tooth contours either ground or shaved.
- All 13'' and 16'' Series 61 lathes, 78'' between centers and longer, and 20'' Series 61 lathes 72'' and longer are equipped with automatic traveling rod carriers.

These are automatically picked up and dropped off by the apron. There is never any need to position them by hand.

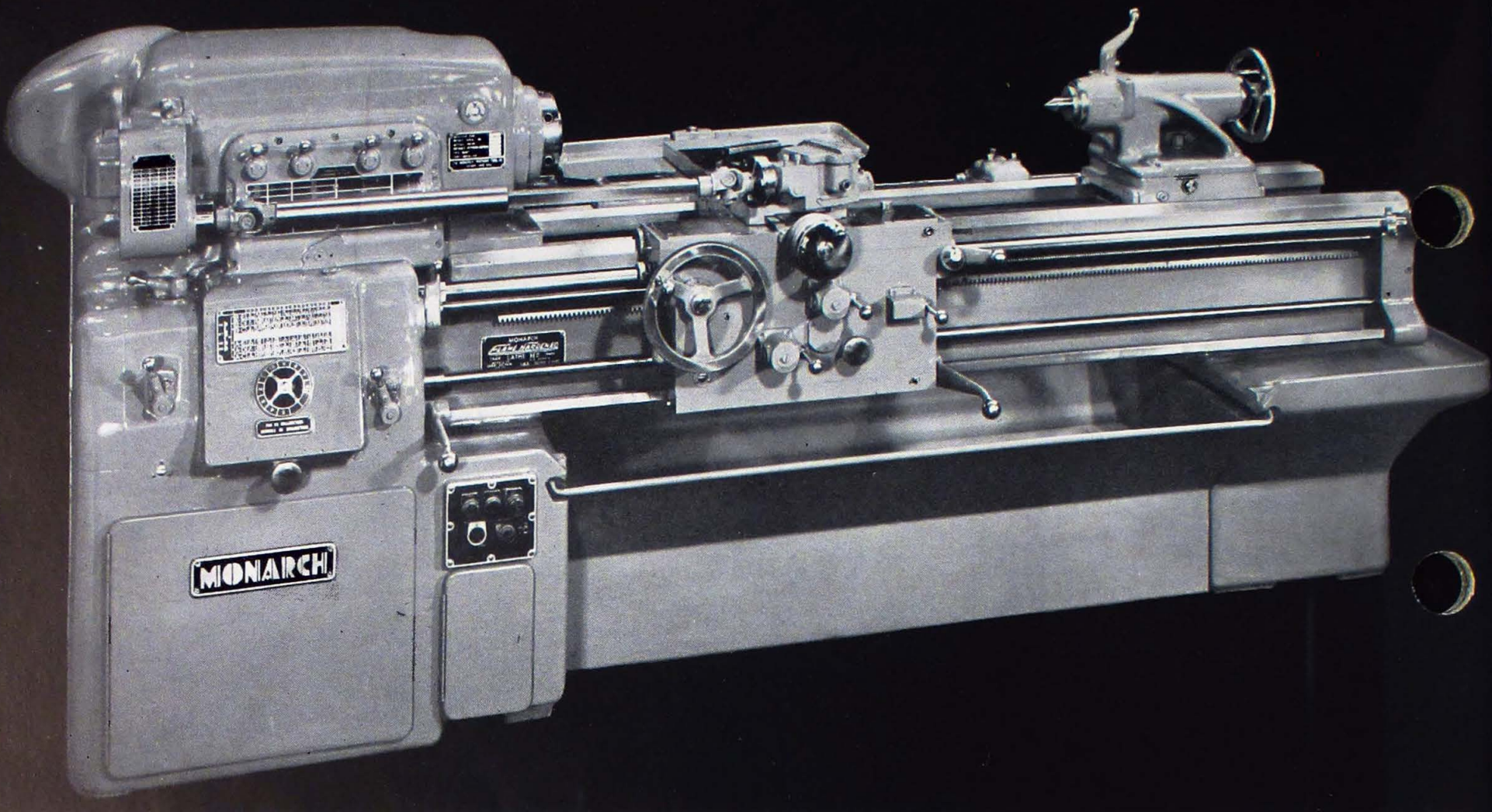
- Filtered and metered automatic force feed lubrication to all apron parts, carriage bearing, and to compound rest bottom slide bearing on carriage. Oil pump functions continuously, providing ample lubrication under all operating conditions. As oil feed lines are kept full at all times, lubrication is supplied immediately to bearing surfaces even though lathe has been idle for some time.

*Below. The self-contained power drive unit for Series 61 four-way power rapid traverse.*

*Below. A closeup view of the direct length reading dial which is included on all Series 61 machines as standard equipment.*





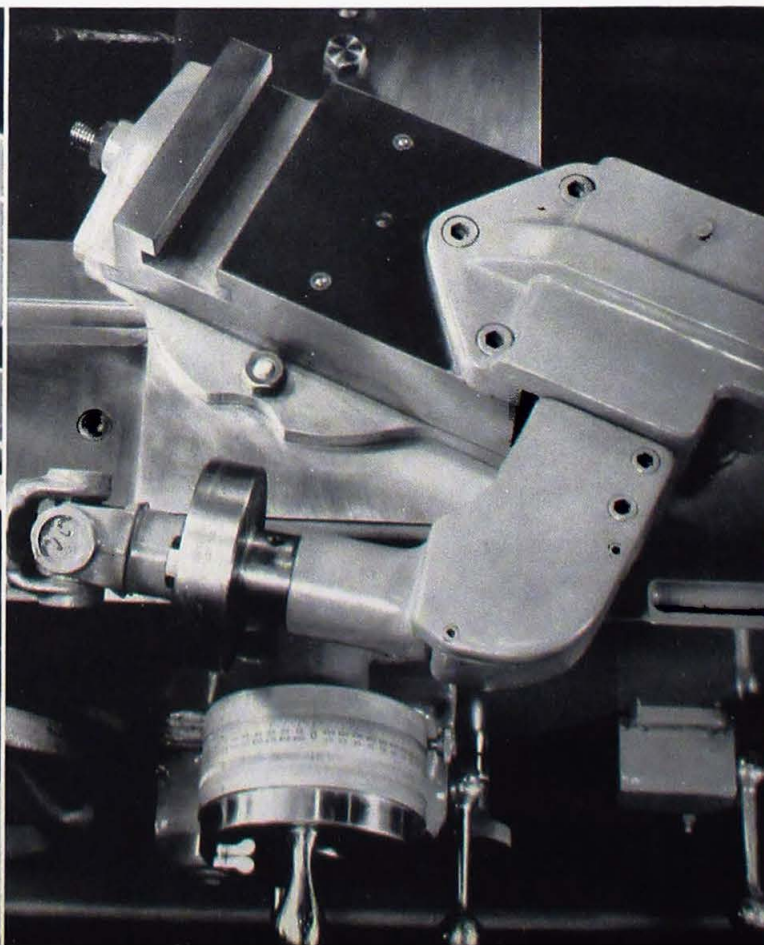
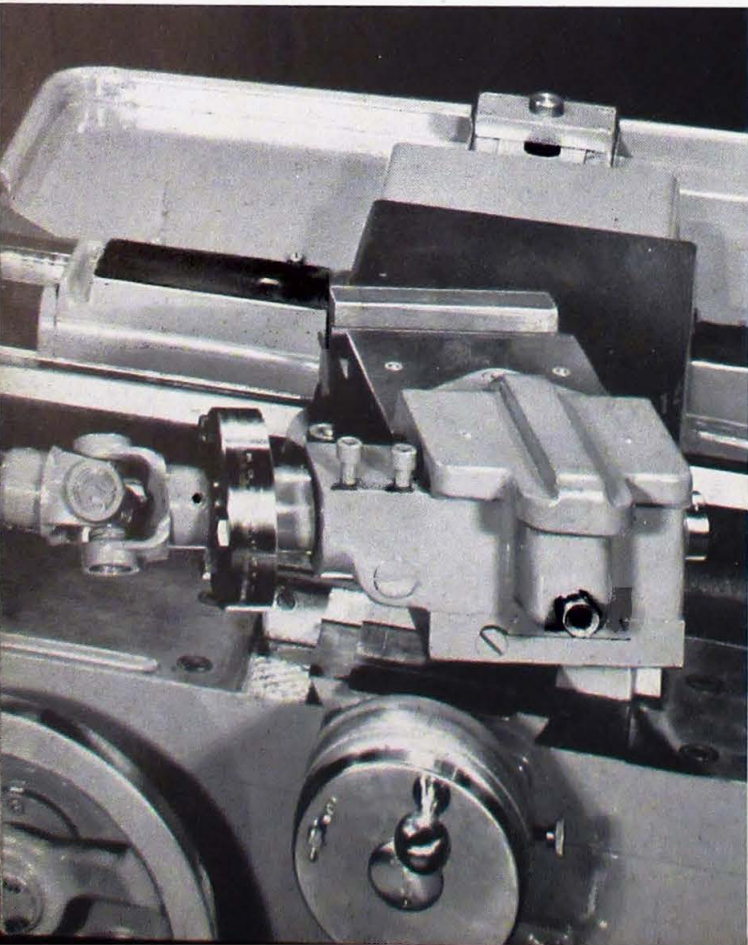


## THE UNIVERSAL RELIEVING ATTACHMENT

(Furnished only on Toolmaker's Lathes)

- A highly efficient attachment for external, internal and end relieving operations.
- May be attached on any machine at factory or after machine has been in use in the field.
- Drive housing, containing change gear mechanism, attached to end of headstock where it can remain permanently. May be readily disconnected when not required.
- Relieving tool slide mounts on regular cross slide of machine. Can be swiveled for angular or end relieving.
- Universal joints provide smooth, positive drive to cam at all slide positions.

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*Far left. Relieving attachment arranged to produce either external or internal reliefs.*

*Left. Relieving attachment arranged to produce end reliefs. Change over from one to the other is a quick and simple procedure.*



## RELIEVING ATTACHMENT CAPACITIES

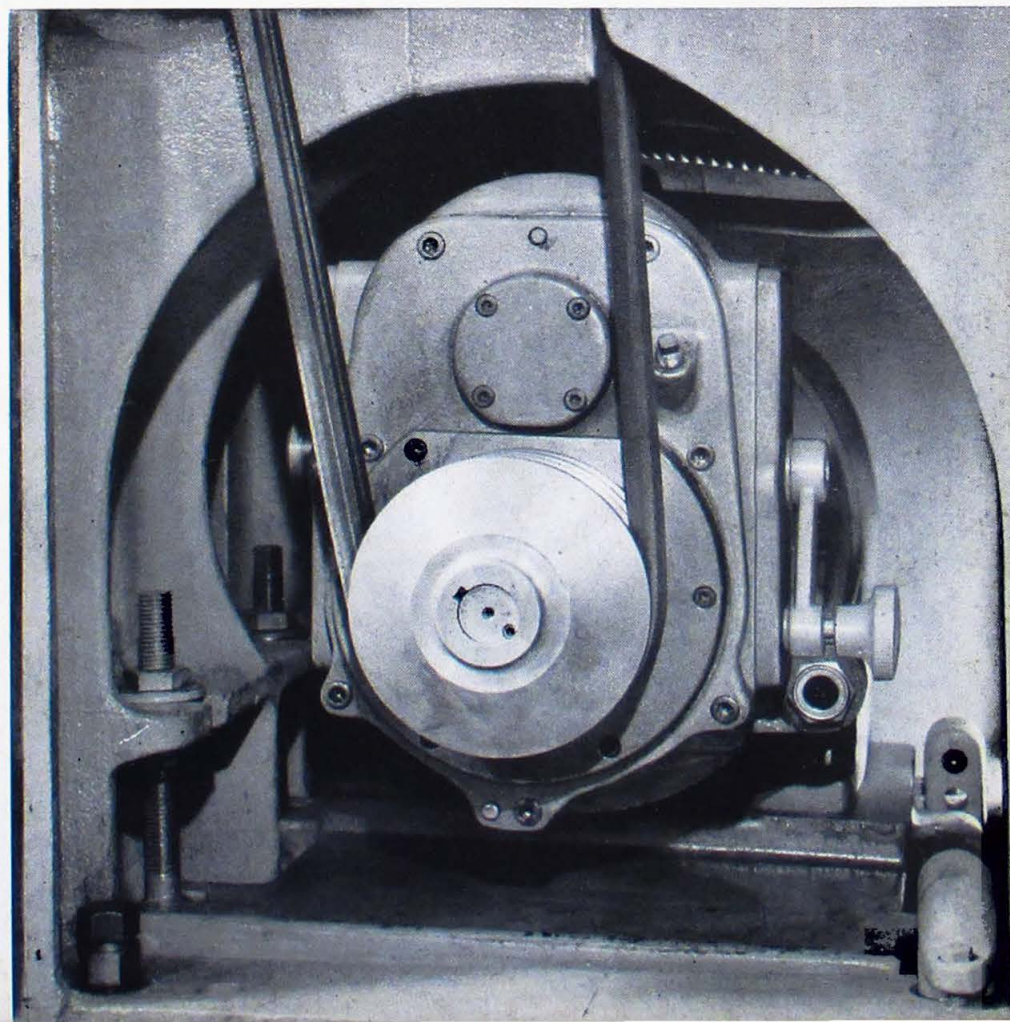
	13" Series 61	16" - 20" Series 61
Number of Flutes with Single Throw Cams	2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 16	2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 16
Maximum Diameter Work for External Relief	6	8
Relief Provided by Standard Cams	$\frac{1}{16}$ ", $\frac{1}{8}$ ", $\frac{3}{16}$ "	$\frac{1}{16}$ ", $\frac{1}{8}$ ", $\frac{3}{16}$ ", $\frac{1}{4}$ "

- Cam in oscillating tool slide has large, graduated timer to facilitate accurately setting the correct relation between the cam and the work.
- Regular cams create a mathematically uniform relief but special cams can be furnished for various other relief forms.
- Double throw cams may be had for work with a larger number of flutes than produced by single throw cams.
- With special gears in the end gear train, spiral relieving can be accomplished.
- When ordering special gears for spiral relieving give the lead, number of flutes and state whether right hand or left hand. For spiral tap relieving it is necessary that the number of threads per inch be given in addition to the foregoing.

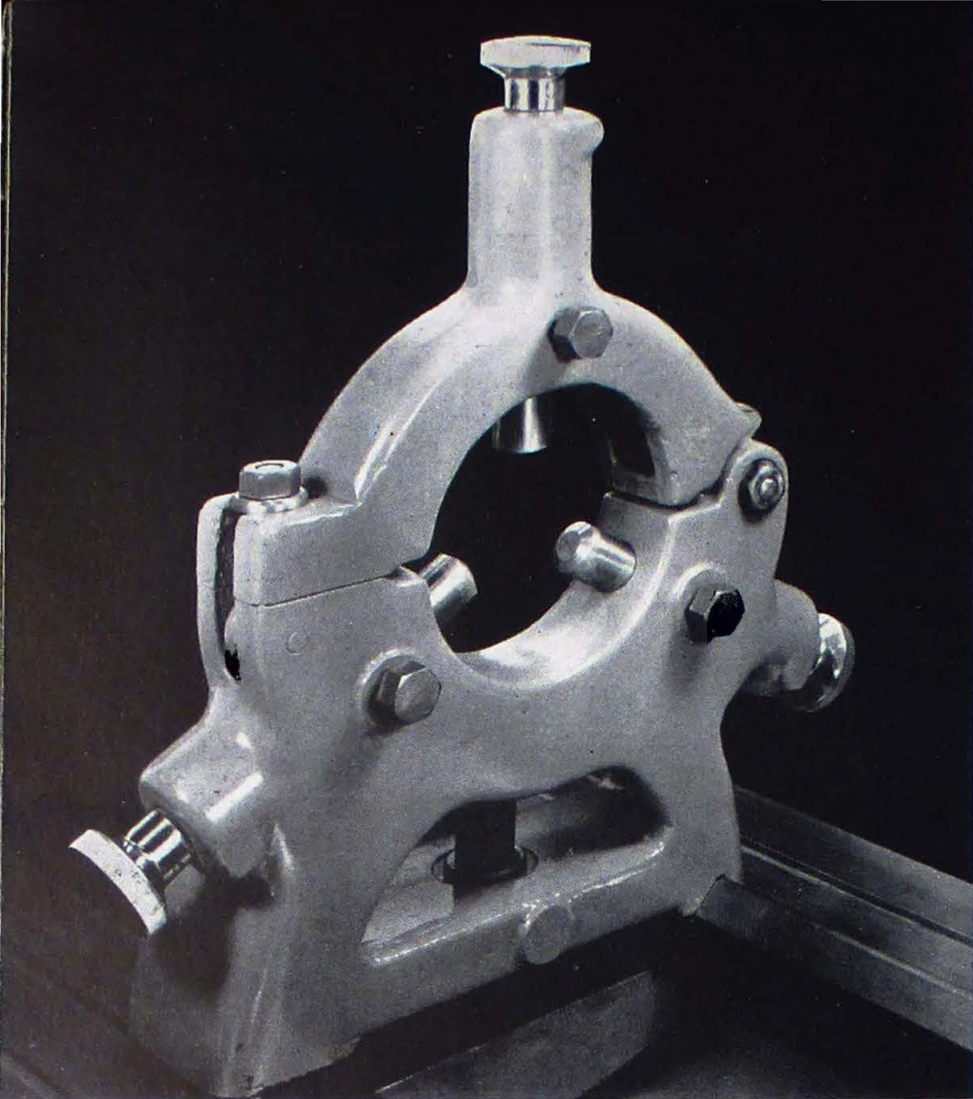
## SPINDLE SPEED REDUCER FOR RELIEVING ATTACHMENT

- Required in connection with relieving attachment for relieving multi-fluted work pieces.
- Six to one reduction unit bolted directly to a flange type main drive motor.
- Design permits changing of belts readily without disassembly of any portion of the unit.
- Engaging lever inside door at side of cabinet leg. When regular range of spindle speeds is used, driving sheave is directly connected to motor shaft.
- Speed range provided on 13" machines with the necessary 1800 R. P. M. motor is 3.5 to 145 R. P. M. The regular speed range of the machine (with speed reducer disconnected) varies slightly from the range secured with the 1800 R. P. M. motor normally used. Speeds secured are 21, 28, 36, 48, 57, 75, 96, 126, 164, 205, 258, 339, 409, 540, 685 and 900 R. P. M.
- Speed range provided on 16" and 20" machines with the necessary 1800 R. P. M. motor is 3 to 116 R. P. M. Regular speed range of the machine (with speed reducer disconnected) is the same as the range secured with the 1800 R. P. M. motor normally supplied, that is, 17 to 700 R. P. M.
- On all Series 61 machines a two speed constant torque motor can be furnished for special applications when a lower speed for relieving larger numbers of flutes is needed.

*Right. Cover removed at left hand end of cabinet leg to show mounting of spindle speed reducer, generally required in connection with relieving attachment.*







## STANDARD STEADY RESTS

- Exceptionally sturdy design for maximum work support.
- All jaws have renewable tips.
- Capacities are as follows:

Size of Lathe	Minimum	Maximum
13''	1/2''	4 1/2''
16''	1/2''	5''
20''	1/2''	6''

## OVERSIZE STEADY RESTS

- Design similar to standard steady rests with capacities as follows:

Size of Lathe	Minimum	Maximum
13''	4 1/2''	8''
16''	5''	8''
16''	6''	12''
20''	6''	12''

## ROLLER JAW STEADY RESTS

*(Anti-Friction Bearing)*

- Recommended for all operations requiring the higher work speeds. Capacities are as follows:

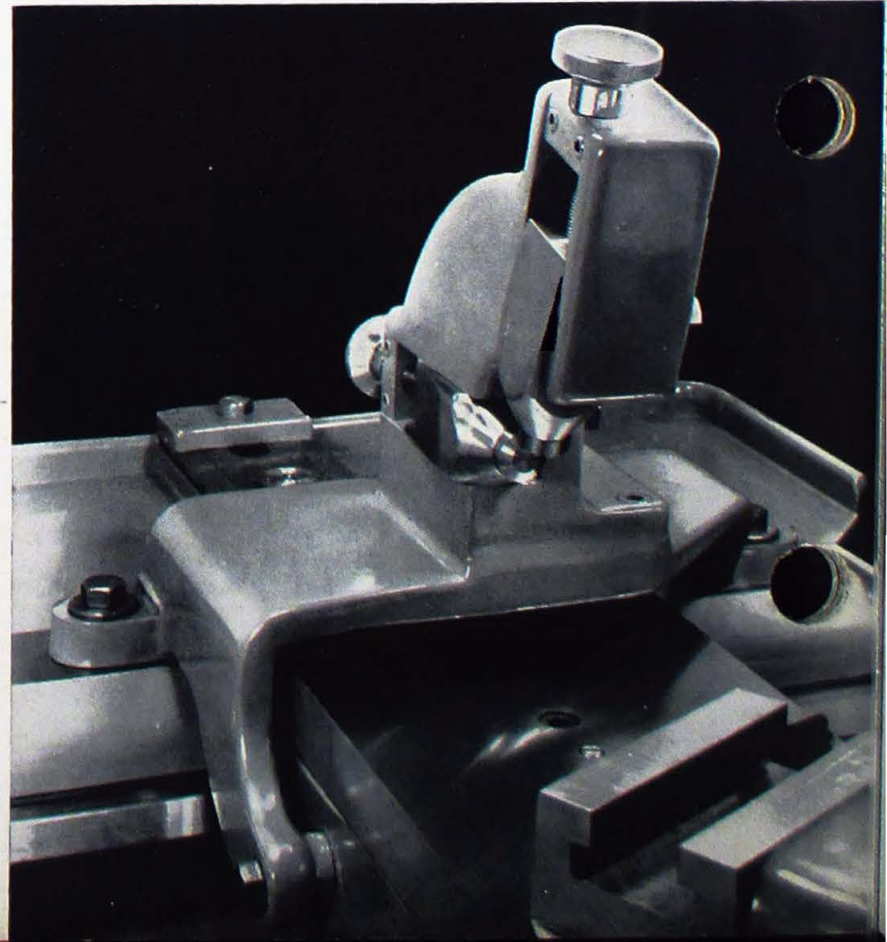
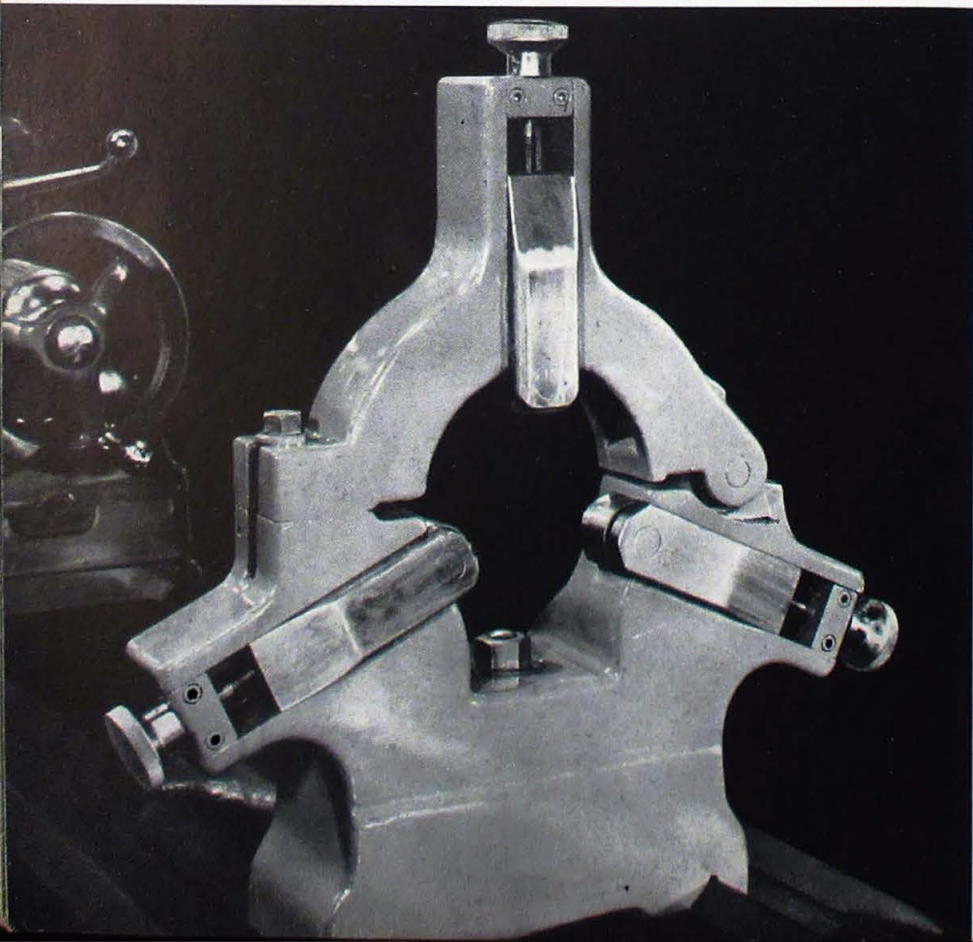
Size of Lathe	Minimum	Maximum
13''	1/2''	4 1/2''
16''	1/2''	5''
20''	1/2''	6''

- Above steady rest available in oversize type for 16'' and 20'' machines. For both, minimum capacity is 6'', maximum capacity 12''.

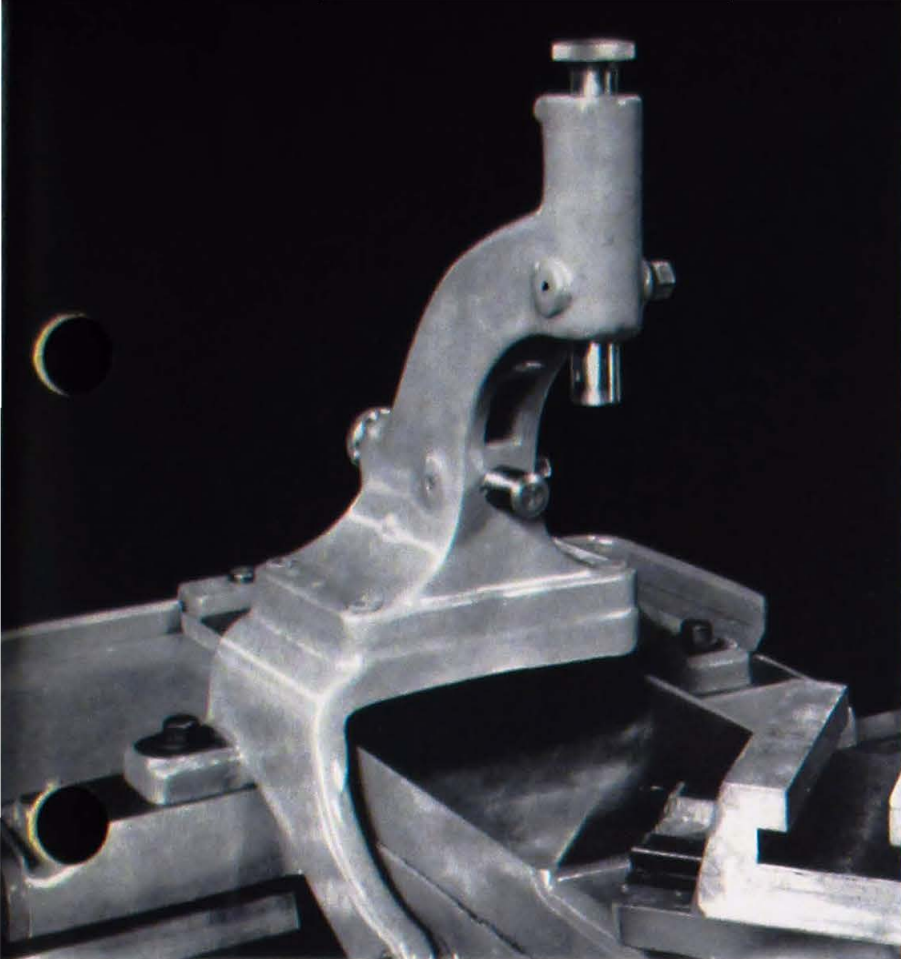
## FLAT JAW TYPE FOLLOW RESTS

- Jaws have renewable tips.
- Available in the following capacities:

Size of Lathe	Minimum	Maximum
13''	1/2''	3 1/2''
16''	1/2''	3 1/2''







## TUBULAR JAW TYPE FOLLOW RESTS

- A rugged accessory which gives solid support under severe operating conditions.
- Jaws have renewable tips.
- Available in the following capacity:

Size of Lathe	Minimum	Maximum
20"	1"	6"

- Oversize tubular jaw type follow rests also available. They are similar in design to standard follow rests and have capacities as follows:

Size of Lathe	Minimum	Maximum
16"	3"	9"
20"	3"	9"

## MULTIPLE AUTOMATIC LENGTH FEED STOPS

*(For Standard Machines Only)*

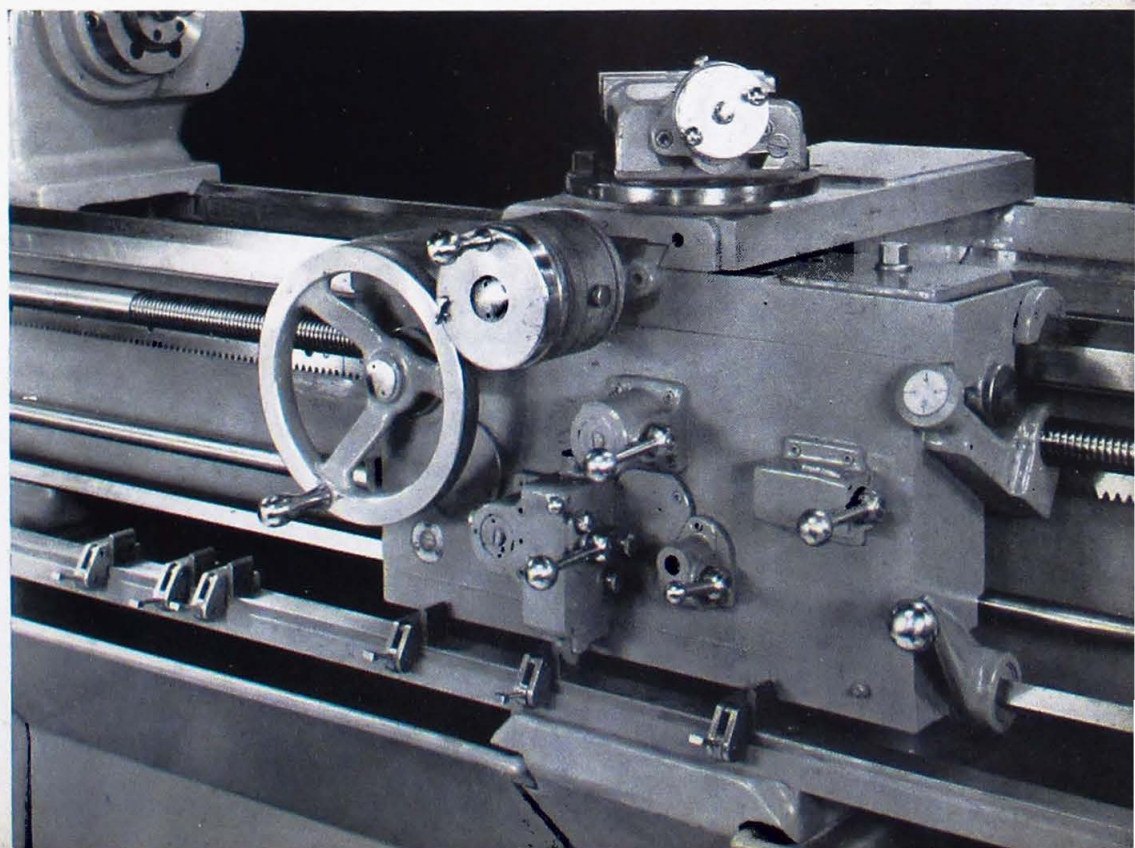
- Saves time on the small lot production of many multiple diameter shafts.
- Consists of a rail extending along front of machine immediately below apron, a set of six stop dogs and a stop plunger controlled from the front of the apron.
- Stops may be moved quickly to any desired position along rail and clamped rigidly in place.
- When disengaged, control lever functions in same manner as regular longitudinal feed lever.

## ROLLER JAW TYPE FOLLOW RESTS

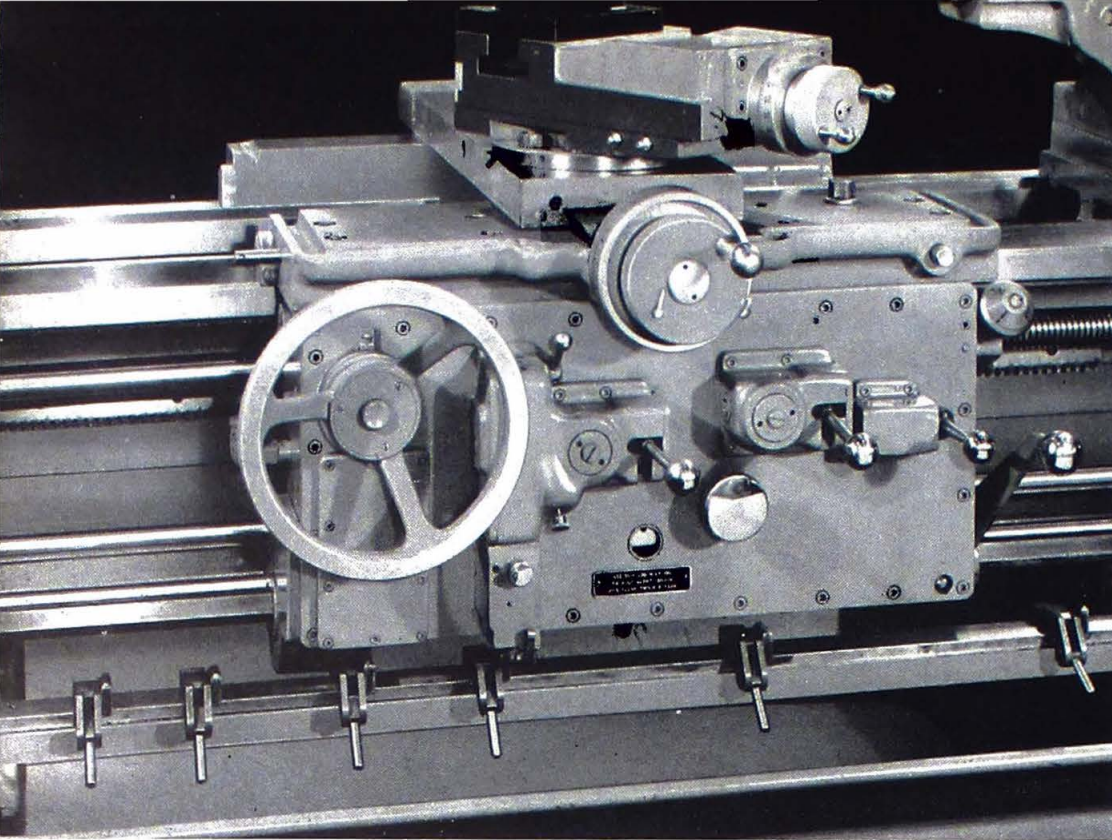
*(Ball Bearing)*

- Recommended for the higher speeds required when turning with carbide tools.
- Supplied in the following capacities:

Size of Lathe	Minimum	Maximum
13"	1/2"	3 1/2"
16"	1/2"	3 1/2"
20"	1"	4"



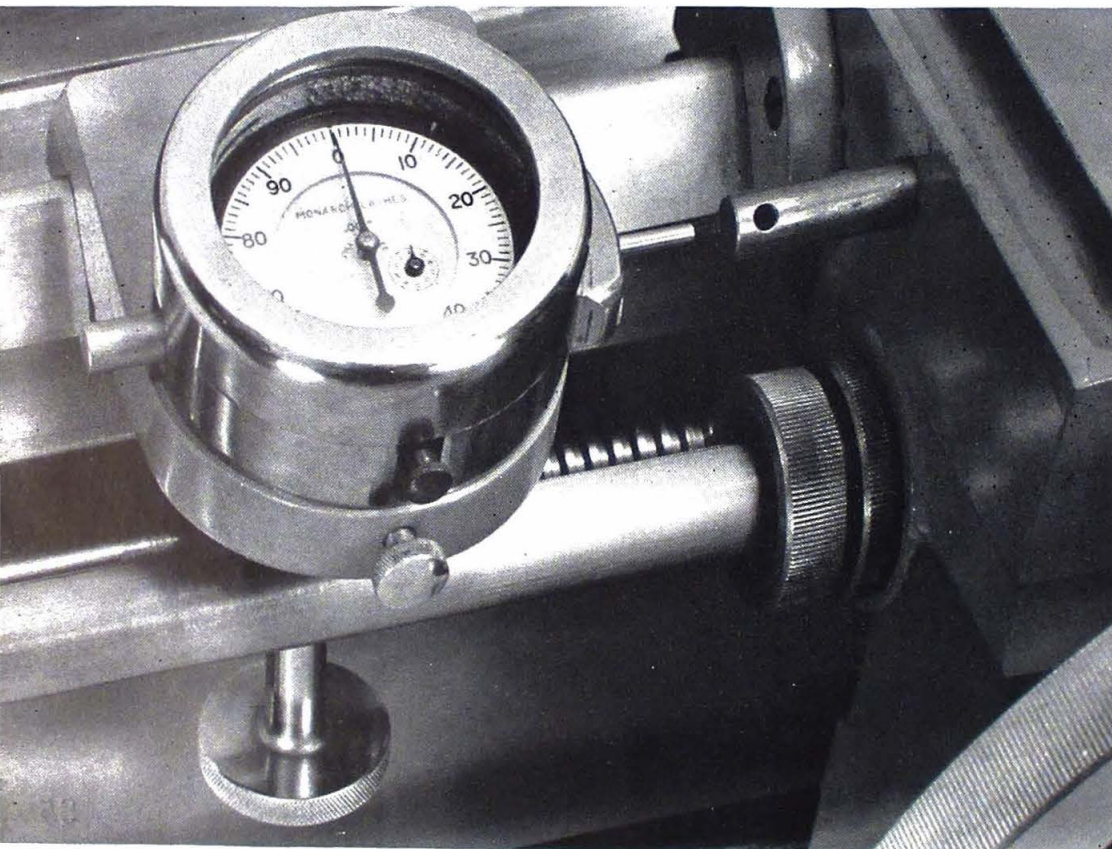




## MULTIPLE AUTOMATIC LENGTH FEED STOPS

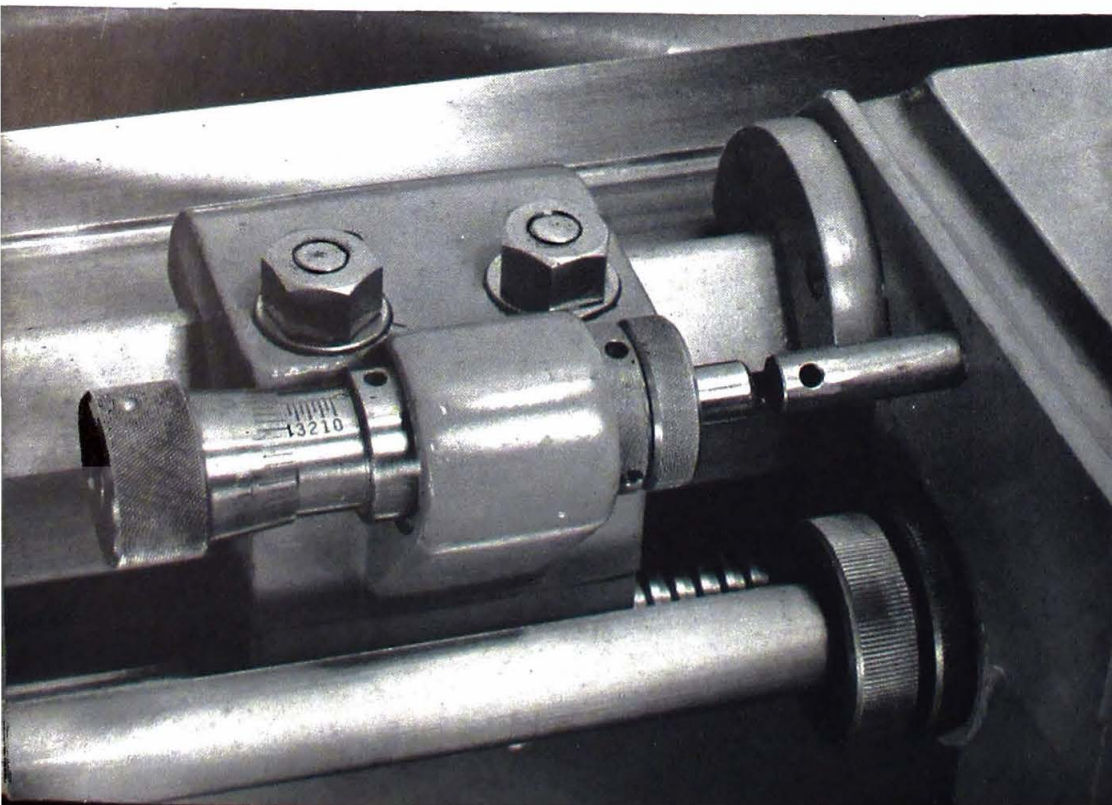
*(For Four Way Power Rapid Traverse Machines Only)*

- Saves time on the small lot production of many multiple diameter shafts.
- Consists of a rail extending along front of machine immediately below apron, a set of six stop dogs and a load and fire plunger mechanism which is used in conjunction with the longitudinal feed lever.
- Stops may be moved quickly to any desired position and clamped rigidly in place.
- When disengaged, control lever functions as regular longitudinal feed lever.



## DIAL INDICATOR TYPE CARRIAGE STOP

- Recommended when a facing or shoulder cut must be held within an exceedingly close limit.
- Precision dial indicator graduated in thousandths and encased for protection. Indicator stem has up to 1" travel.
- Stop bracket may be clamped at any desired position along front bed "V".



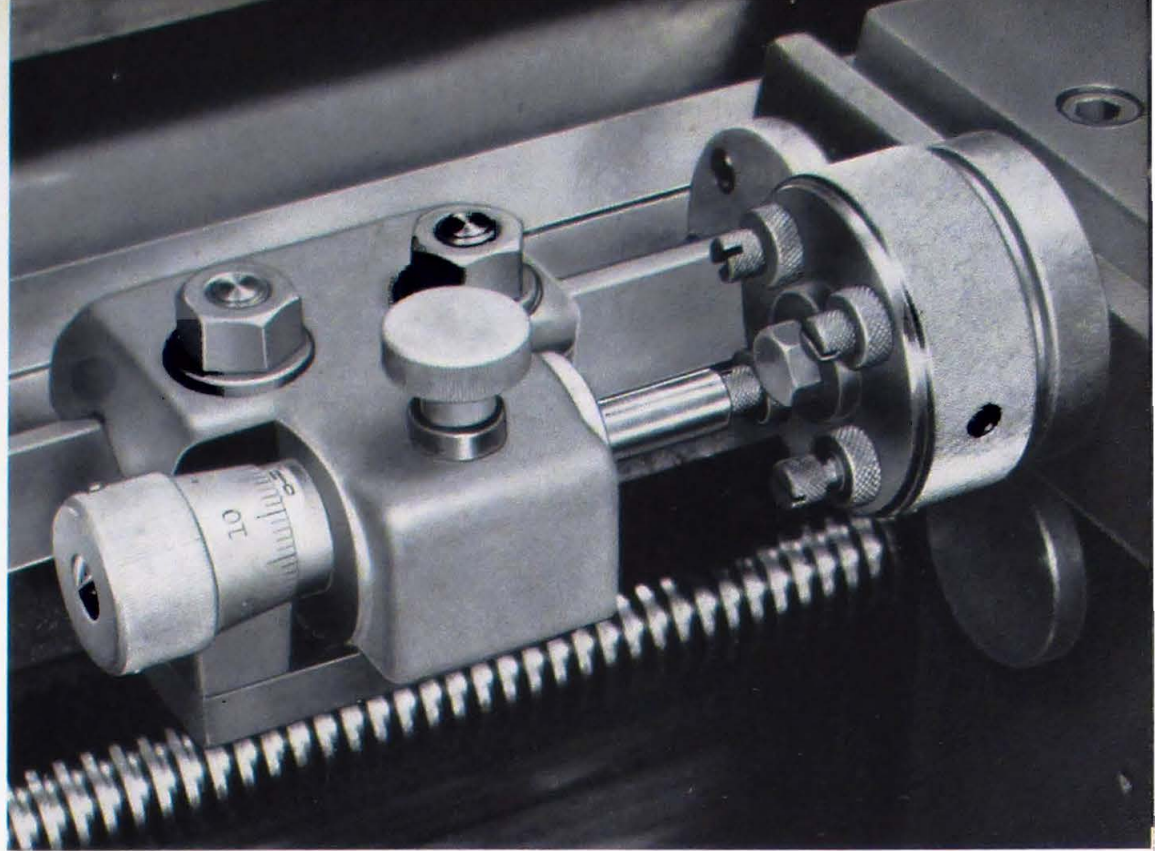
## MICROMETER CARRIAGE STOP

- A quick means for accurately performing a facing or shoulder cut on a work piece.
- Micrometer screw made of induction hardened alloy steel with precision ground threads. Indications are in thousandths.
- Stop bracket may be positioned and clamped at any point on front bed "V".



## MULTIPLE POSITIVE CARRIAGE STOP

- Speeds production when performing multiple shoulder operations.
- Indexing cylinder having four or more adjustable stop screws attached to left hand wing of carriage. Detent plunger positively stops each screw at proper position for engaging stop pin.
- Micrometer screw made of induction hardened alloy steel with precision ground threads.
- Stop bracket may be positioned and clamped at any point on front bed "V".



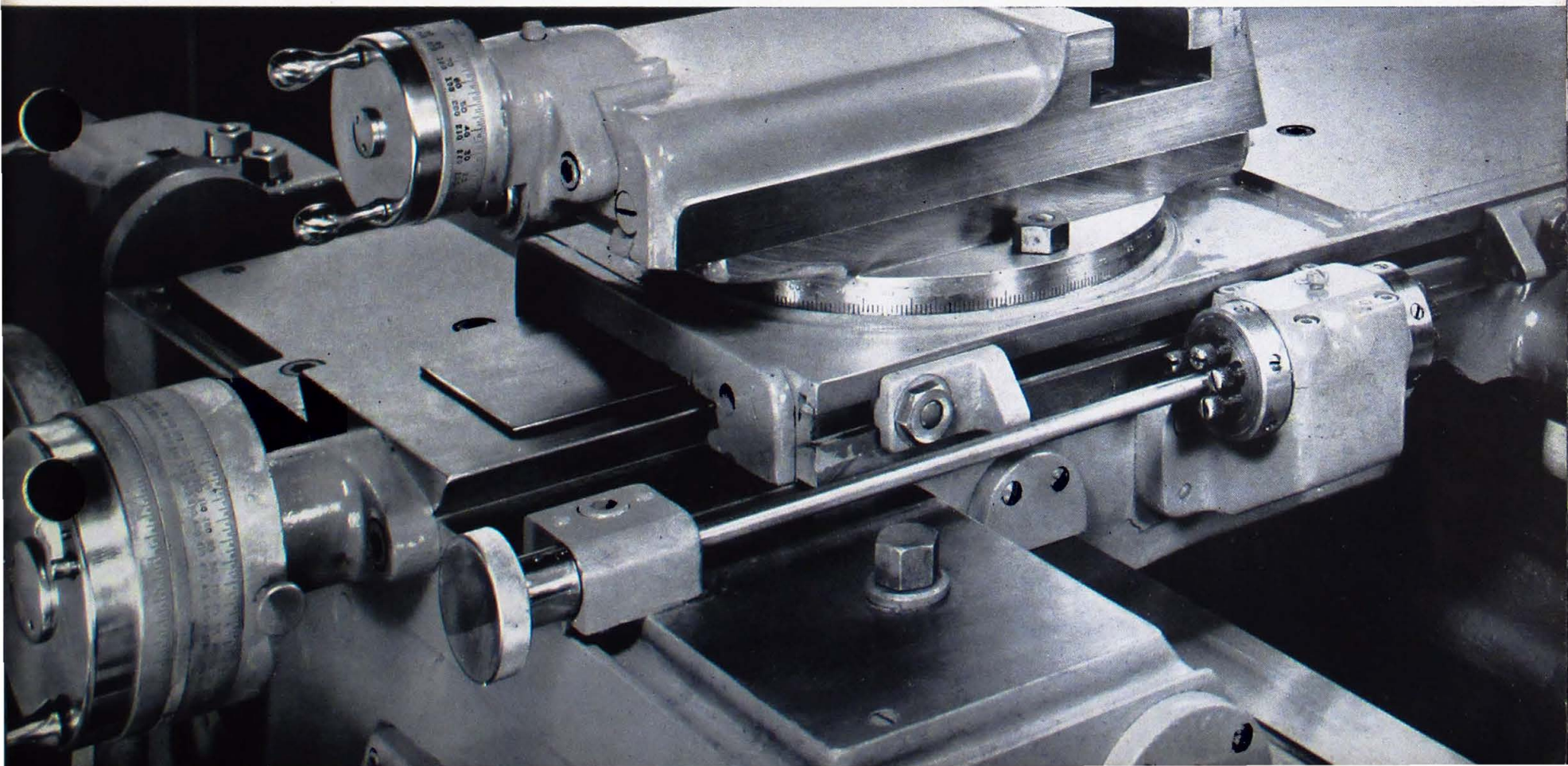
## AUTOMATIC CROSS-FEED STOP

*(Not Illustrated)*

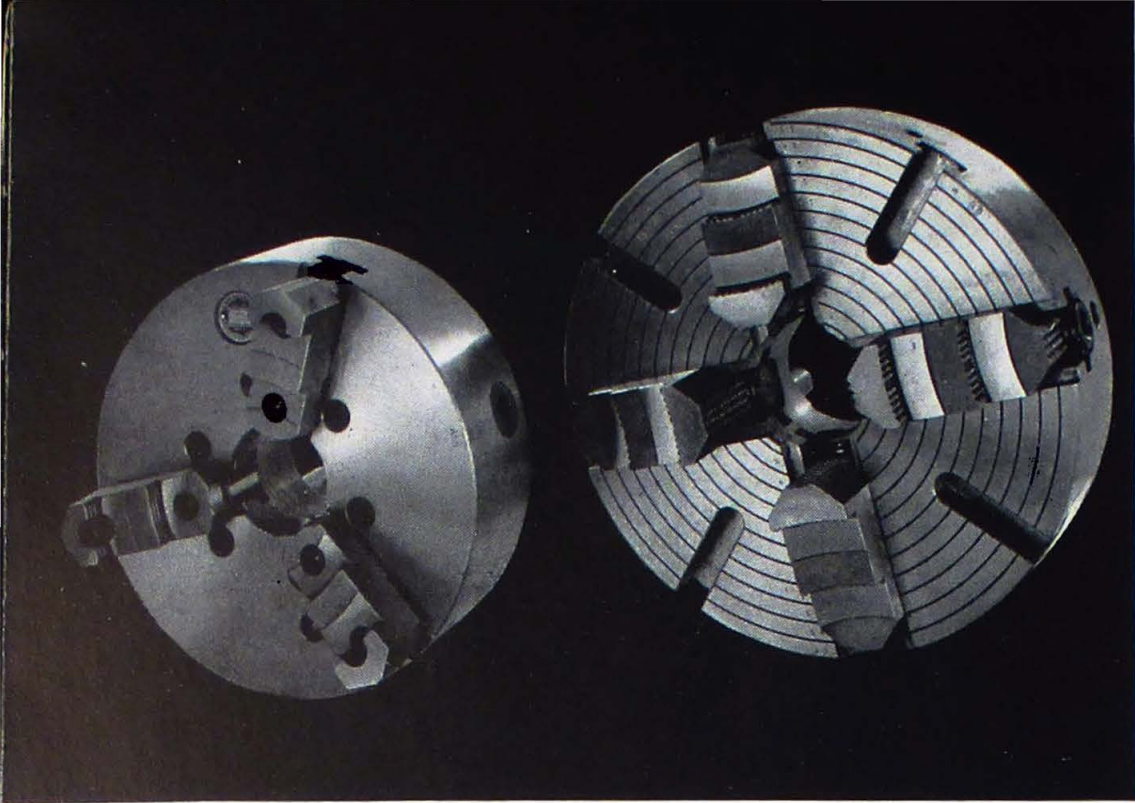
- Sometimes used to advantage when facing on a production run.
- After being engaged and set, operates automatically without further attention.
- Accurately disengages cross feed with tool slide traveling either in or out, at any predetermined diameter.

## MULTIPLE POSITIVE CROSS-FEED STOPS

- Recommended for production operations on multiple diameter work.
- Provides four diameter stops which may be indexed conveniently by knob at front of carriage.
- Frequently used in connection with a rear adjustable tool block in which case four additional diameter stops are also provided to control its forward feed. (As illustrated below).
- Adjustable stop dog (or dogs) mounted in "T" slot at side of bottom slide.

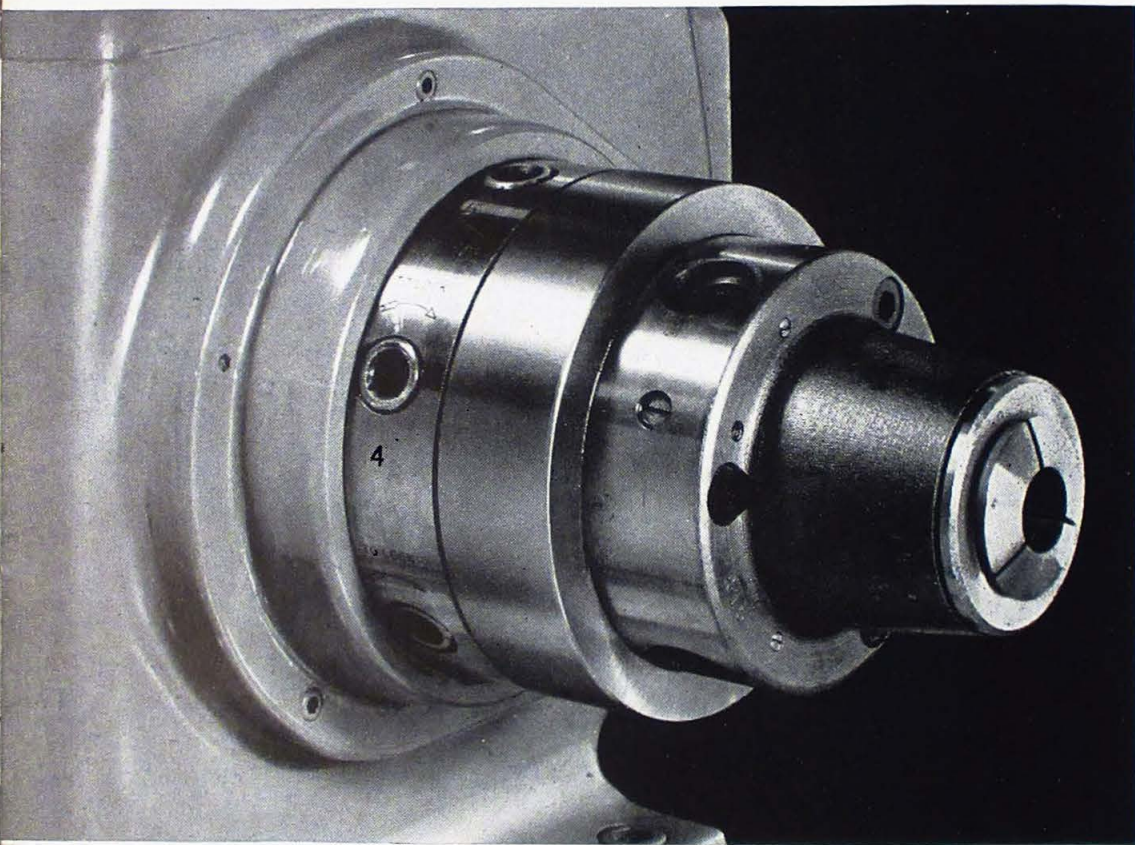






## JAW CHUCKS

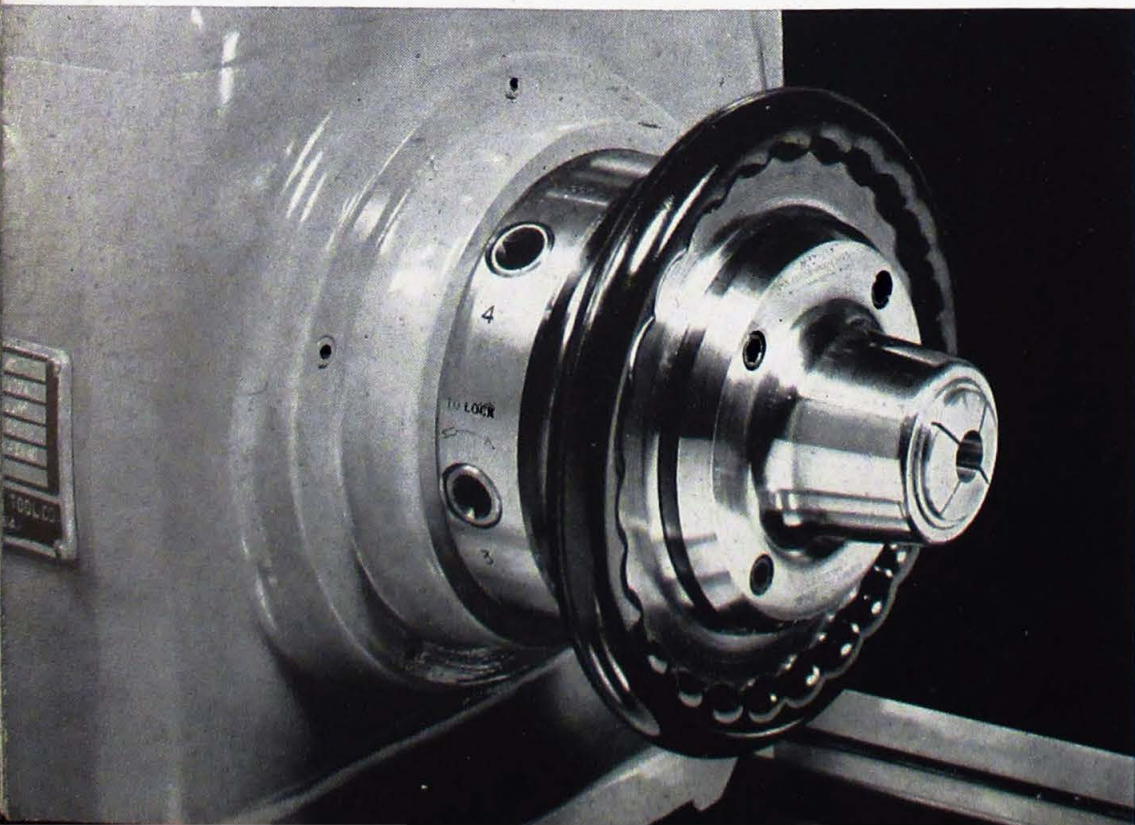
- Three jaw, universal, steel body chucks with two piece reversible jaws available as follows:  
 13" machines—6", 8", 10".  
 16" machines—6", 8", 10", 12".  
 20" machines—8", 10", 12", 15".
- Four jaw, independent, steel body chucks, with reversible jaws available as follows:  
 13" machines—6", 8", 10", 12".  
 16" machines—8", 10", 12".  
 20" machines—10", 12", 15", 18".



## CUSHMAN SPINDLE NOSE TYPE COLLET CHUCK

- For collet chuck operations requiring a wide range of collet capacities.
- Any piece of stock that will pass through lathe spindle can be held in collet because chuck offers no obstruction.
- Chuck is attached to intermediate plate with cam studs for mounting on Camlock spindle nose. Same wrench used to attach chuck and operate collets.
- Available in the following three sizes:

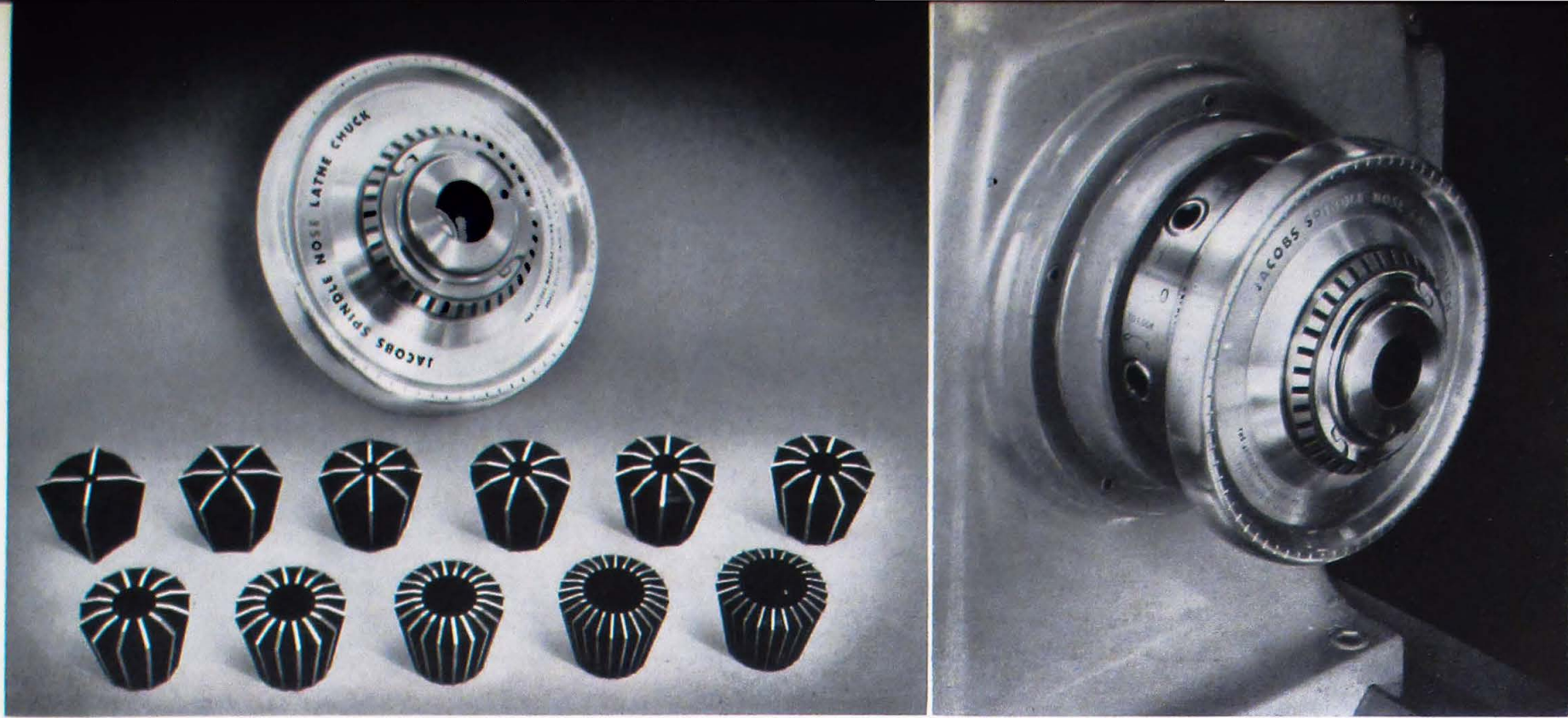
Chuck Size	Reference No.	Collet Capacity
5"	115	1/8" to 1 1/8"
5 3/4"	215	1/8" to 1 3/4"
8 1/4"	315	1" to 3 1/4"



## SJOGREN SPINDLE NOSE TYPE COLLET CHUCK

- A wrenchless chuck which fits directly on the Camlock spindle nose.
- Provides faster operation than any other type of collet chuck. Clockwise movement of handwheel securely tightens collet while counter-clockwise movement releases it.
- Takes a range of collets having 1/8" to 1 3/8" capacity.





## JACOBS SPINDLE NOSE CHUCK AND RUBBER-FLEX COLLETS

- Jacobs spindle nose lathe collet chuck using Jacobs Rubber-Flex collets is a handwheel type which mounts directly on Camlock spindle nose.
- Each collet handles a wide range of work diameters. Standard set includes eleven collets taking all diameters from  $\frac{1}{16}$ " through  $1\frac{3}{8}$ ". No need to stock a huge number of collets in decimal or millimeter sizes. Following are the model numbers of the collets in the standard set and the capacity of each:

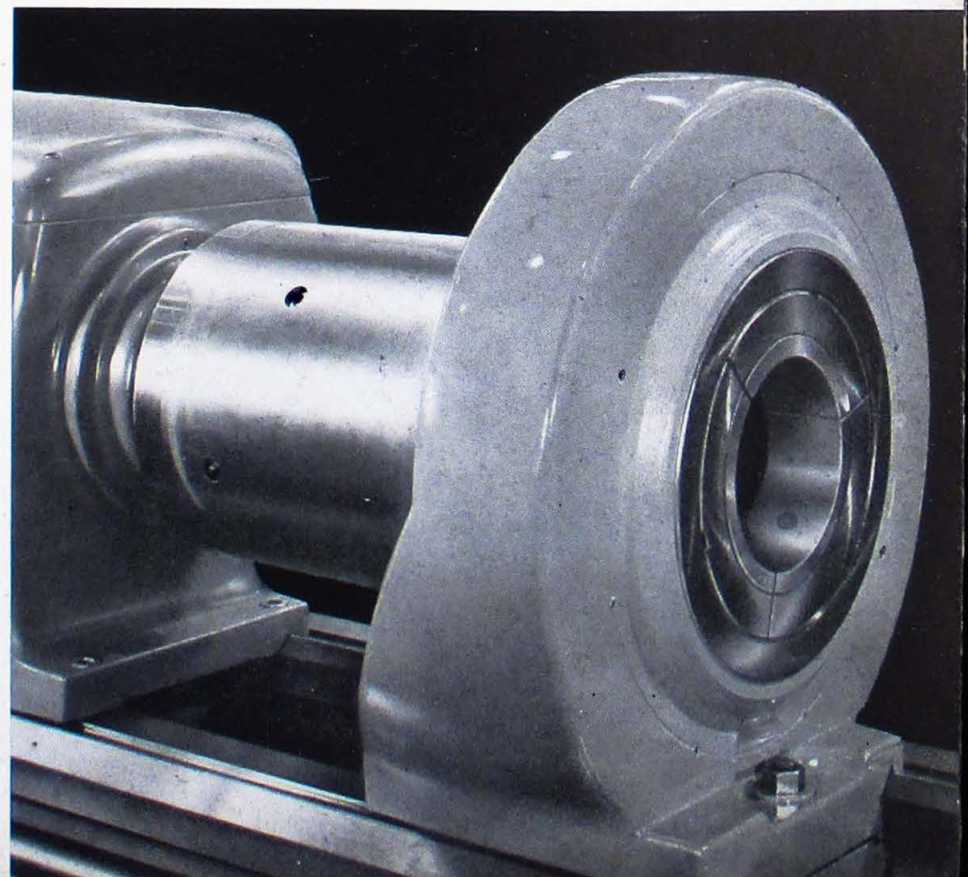
No. J-910..... $\frac{1}{16}$ — $\frac{1}{8}$ "	No. J-913..... $\frac{3}{8}$ — $\frac{1}{2}$ "
No. J-911..... $\frac{1}{8}$ — $\frac{1}{4}$ "	No. J-914..... $\frac{1}{2}$ — $\frac{5}{8}$ "
No. J-912..... $\frac{1}{4}$ — $\frac{3}{8}$ "	No. J-915..... $\frac{5}{8}$ — $\frac{3}{4}$ "

No. J-916.... $\frac{3}{4}$ — $\frac{7}{8}$ "	No. J-919.... $1\frac{1}{8}$ — $1\frac{1}{4}$ "
No. J-917.... $\frac{7}{8}$ — $1$ "	No. J-920.... $1\frac{1}{4}$ — $1\frac{3}{8}$ "
No. J-918.... $1$ — $1\frac{1}{8}$ "	

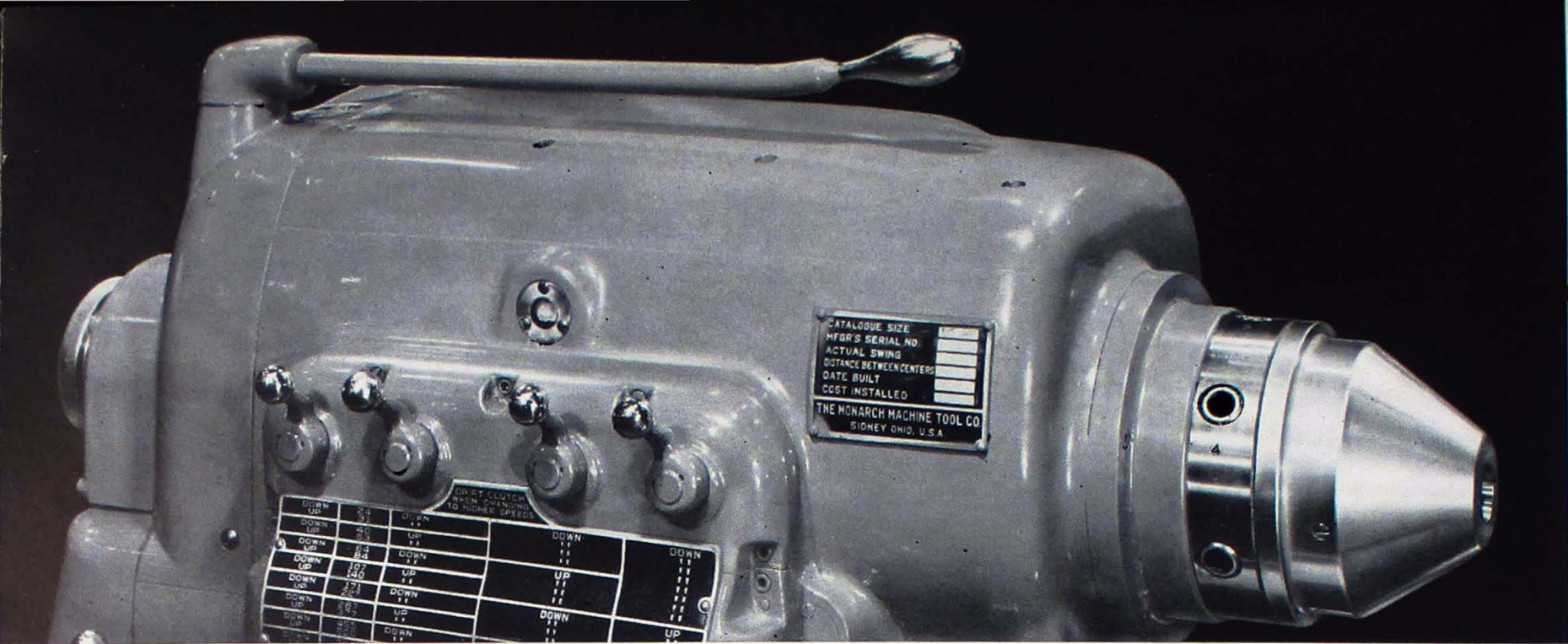
- Set of eleven standard collets packed in durable, compact, moisture proof, plastic boxes. Individual collets furnished in moisture proof containers.
- Tremendous gripping power and close accuracy of each collet maintained throughout its entire range. All collet jaws made from hardened nickel molybdenum alloy steel for greater resistance to wear.
- Impact tightening clamps work firmly with little effort and permits secure closing on a free spindle.

## AIR EXPANDING COLLET

- Available on special order, in the particular size and length required, for holding work pieces which lend themselves to handling in this manner.
- A heavy duty out-board support is used on applications with considerable overhang, as illustrated at right.
- Air expanding arbors also available on special order as required.







### LEVER OPERATED COLLET ATTACHMENT

- Recommended to save time when a collet attachment is used in manufacturing operations. Installed only on new machines at factory.
- Accommodates up to  $\frac{7}{8}$ " round bar stock on 13" machines and up to  $1\frac{1}{8}$ " round bar stock on 16" and 20" machines.
- May be used for draw-in or pusher type collets.

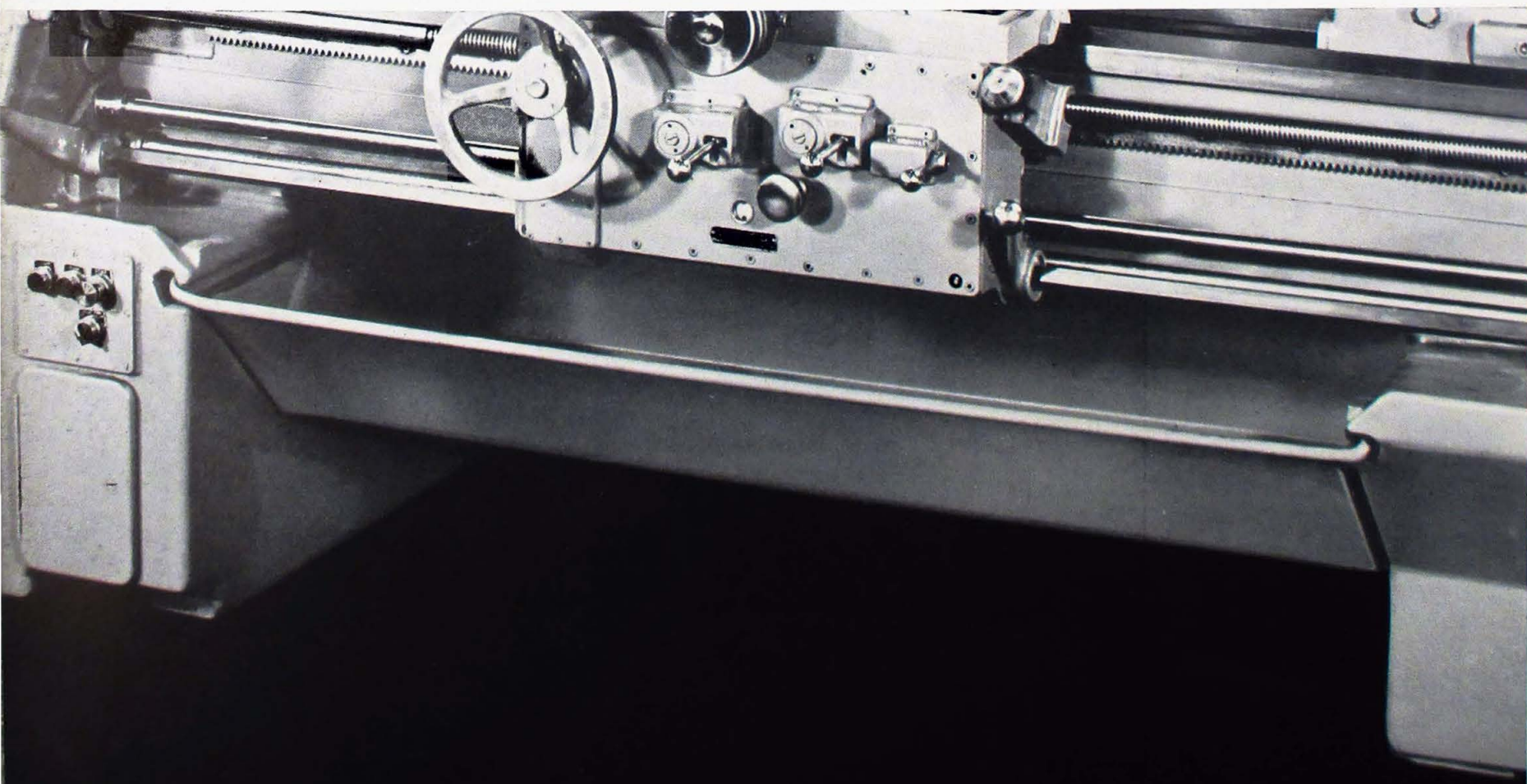
Conversion from one type of collet to the other is simple as only the drawbar and the spindle nose adapter need be changed.

- Operating lever, extending up over top of headstock positioned conveniently to the operator. Relation between attachment and collet itself adjusted readily from exterior of machine.

### THE CHIP PAN

- Cabinet legs slotted to receive chip pan which is made of heavy material with rolled edges. It will slide to front or rear and eliminates accumulation of chips underneath machine.

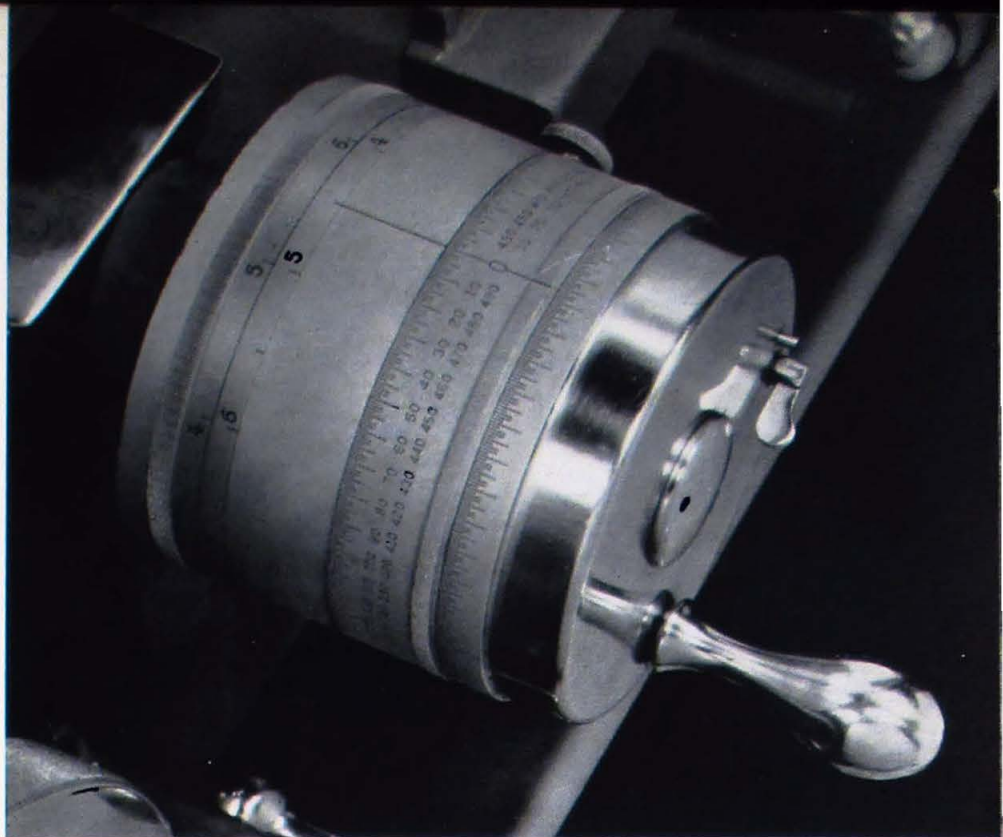
- Chip pan not required on Toolmaker's Lathes. Although not regular equipment on Engine Lathes, it should, because of its convenience, be used on all such machines not supplied with an oil pan.





## MICRO-GAUGING DIAL

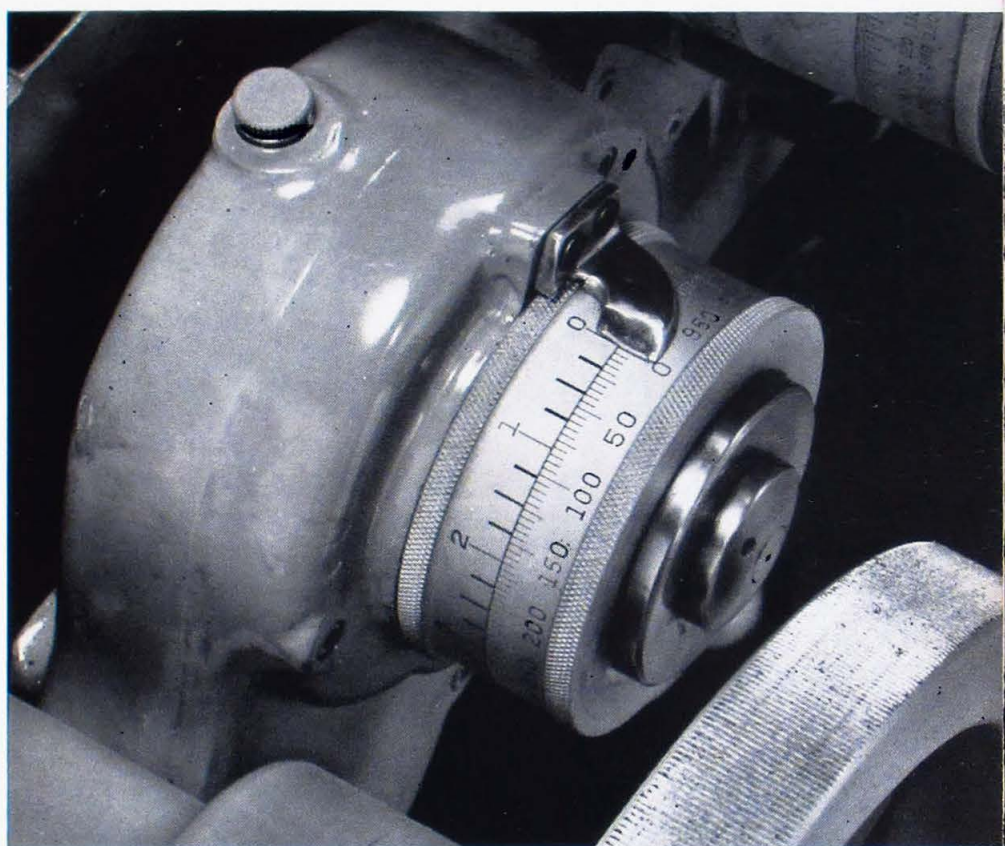
- Used to facilitate multiple diameter turning or boring.
- Mounted on cross-feed screw. Consists of large diameter cross-feed dial with graduations reading in thousandths of diameter and an inner dial graduated in inches.
- Dials geared to each other and both may quickly be set to zero.
- Outer dial has two sets of numbers; one for turning, the other for boring. Direct diameter therefore may be read without calculation.
- Includes regular adjustable thread chasing stop. The graduated dial immediately back of the hand-wheel permits tool repositioning for finishing of thread without disturbing original setup.



## DIRECT LENGTH READING DIAL

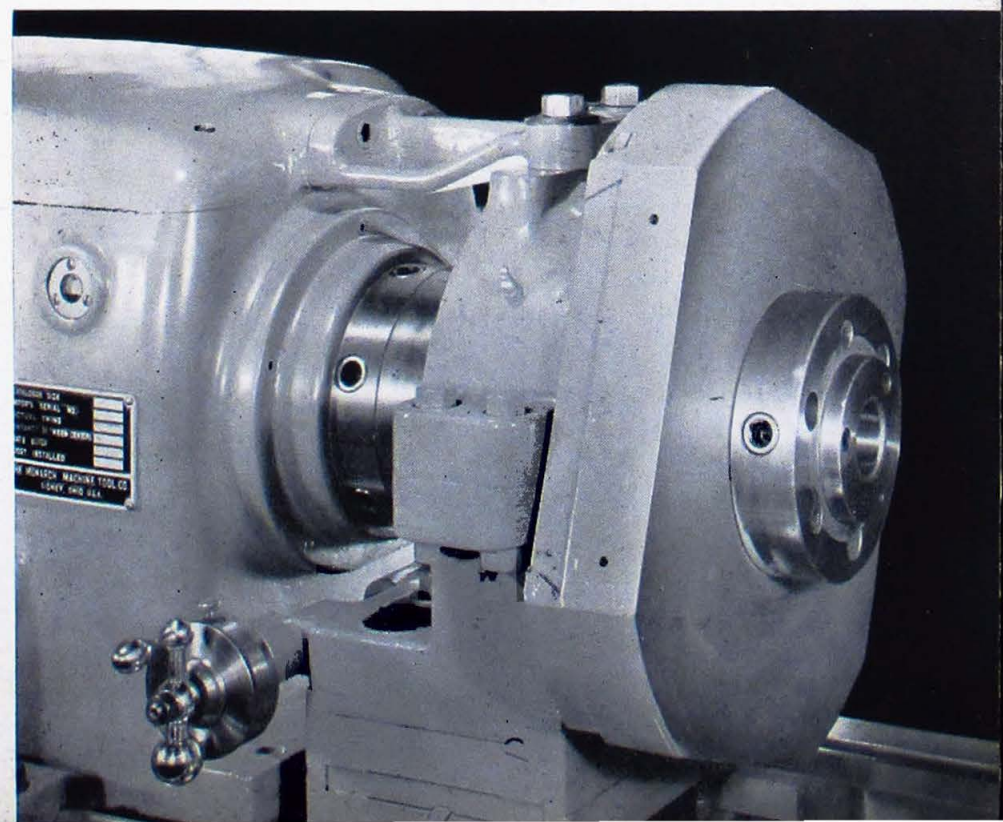
*(For Standard Machines Only)*

- For multiple diameter turning or boring. Especially valuable when boring blind holes.
- Through gearing in dial mechanism housing, one foot of length carriage travel results in one complete revolution of inner dial. One inch of carriage travel equivalent to one revolution of outer dial which is graduated in .005" readings.
- Both dials can be reset quickly to zero so that successive length measurements can be made quickly and read directly on the dials.

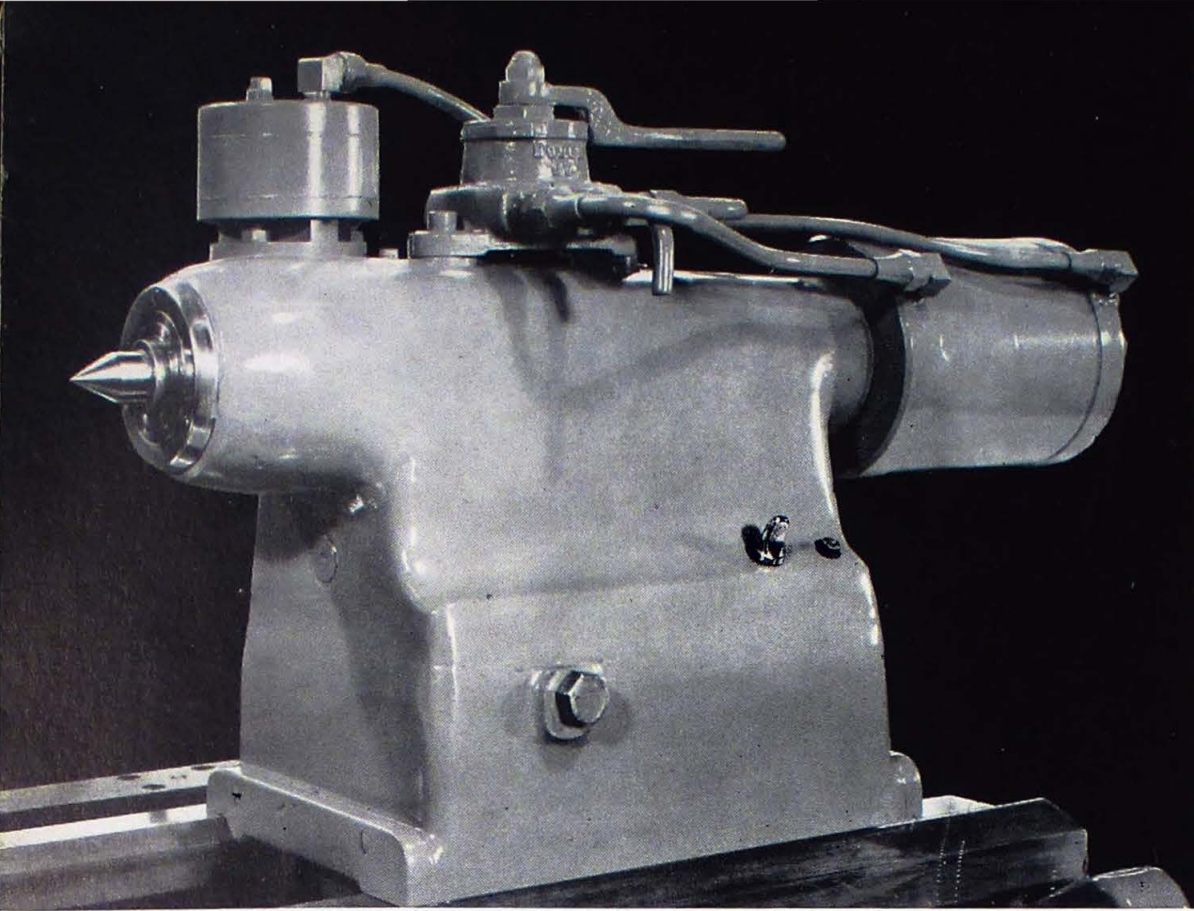


## OVAL CHUCK

- For straight contour work having ellipses of varying major and minor axis which may be turned or bored, each change in the setting of the chuck producing a different shape.
- So equipped, a standard lathe may be used for such work as oval shaped molds, dies and punches or spinning chucks for oval silverware and hollow ware.
- A very rigid mounting for this chuck is provided by the Camlock spindle nose. Also bolted with a bracket to the headstock cover plate for still greater rigidity.
- Face of oval chuck provided with a 6" type D-1 Camlock mounting so that chucks and fixtures will interchange between the headstock proper and the oval chuck.
- On 16" machines the maximum difference between major and minor axis is  $2\frac{1}{4}$ ". On 20" machines as well as 16" with plus-swing No. 1, maximum difference between major and minor axis is 4".

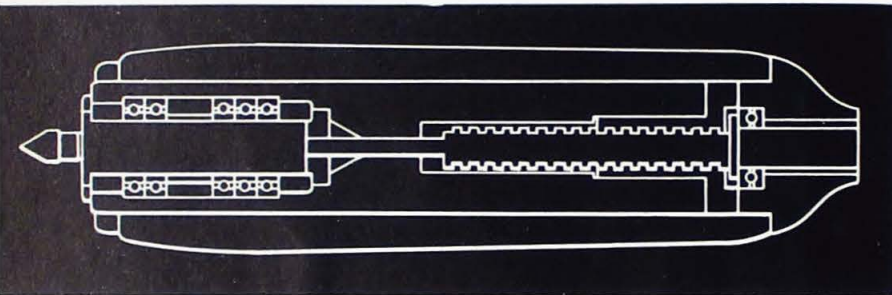






## AIR OPERATED TAILSTOCK

- A valuable production aid for quickly advancing and retracting the tailstock center on machines such as those equipped with the "Air-Gage Tracer".
- Hardened and ground spindle houses anti-friction center which is supported by preloaded, precision ball bearings.
- Air pressure may be regulated to vary pressure of center against work as required.
- After positioning, spindle is air clamped by final motion of control valve lever.
- Spindle movement is  $3\frac{5}{8}$ " on 13" machines, 6" on 16" and 20" machines.



## IN-BUILT BALL BEARING TAILSTOCK CENTER

- A "must" on production operations employing the higher speeds.
- Saves time by eliminating the need for oiling the tailstock center.

## CONNECTED COMPOUND AND PLAIN BLOCK REAR REST

- Generally used for turning operations performed by tool on front rest and necking, facing or forming operations by tool on rear rest.
- Both compound rest and rear tool block mounted on same bottom slide. Rear tool block adjustable in or out from center.

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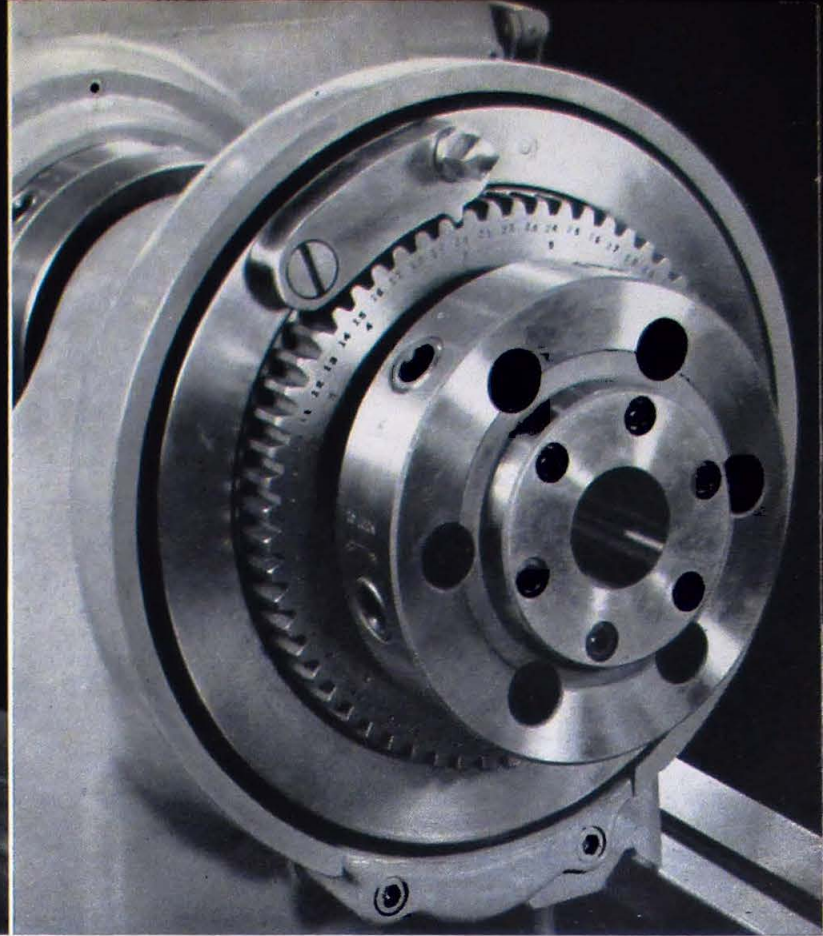
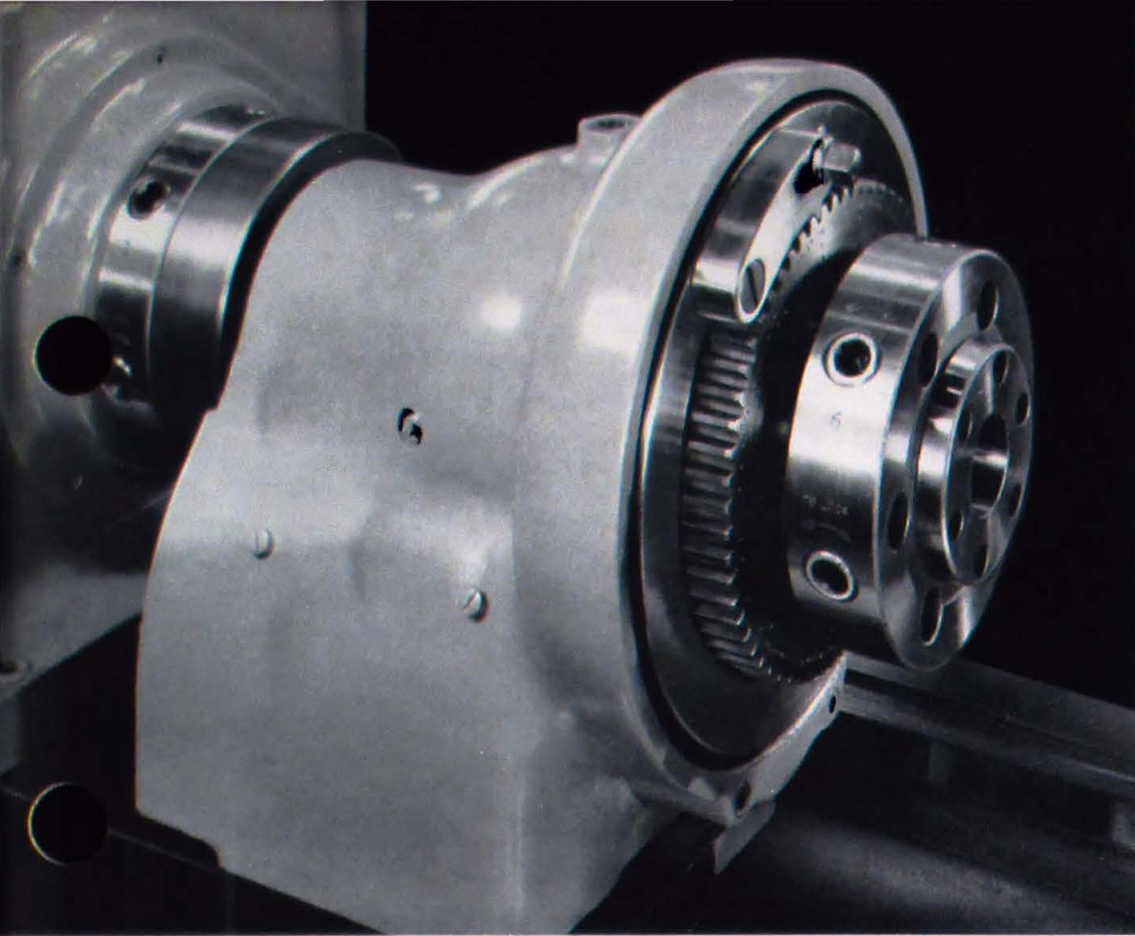


## TOOL CABINET

- Especially designed to provide proper storage space for various accessory units normally used with a toolmaker's lathe.
- Space provided for orderly storage of collets.
- Generous shelf storage space for such accessories as chucks, steady rests, follow rests and face plate.
- Top of cabinet serves as convenient place for operator's personal tool box.







## THE MONARCH SUB-HEADSTOCK

- A popular accessory which provides a means for chasing both extremely coarse leads and multiple threads.
- Bolted to bed directly in front of headstock and driven by headstock spindle.
- Reduction gearing provides a 6 to 1 spindle speed reduction without reducing speed of carriage travel. This increases distance traveled by carriage per revolution to six times normal rate shown on gear box index plate.
- Spindle is precision roller bearing mounted, attaches

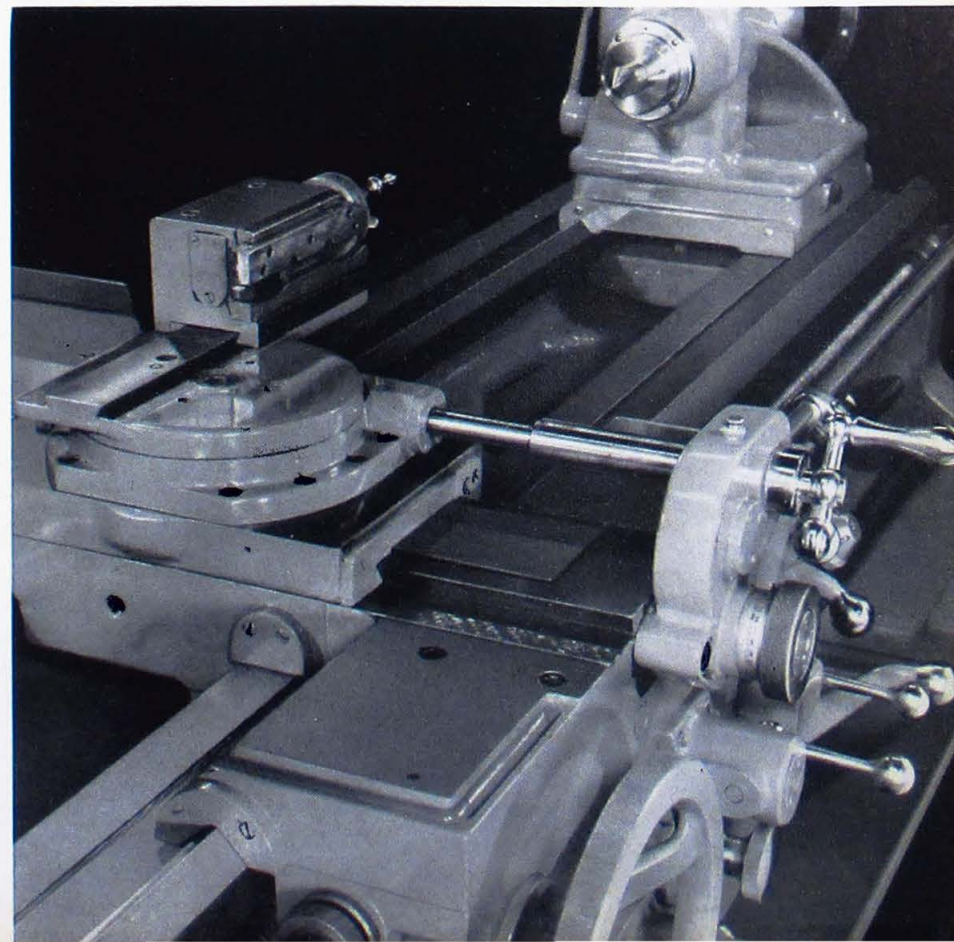
to headstock spindle Camlock nose and has a similar nose so that chucks, face plates and fixtures can be interchanged.

- Multiple thread indexing plate, on front of unit, provided with graduations for engaging teeth of index gear for 2, 3, 4, 5 and 6 multiple start threads.
- Unit can be mounted readily in customer's plant on lathes already in use.
- Any lead up to maximum of 3" may be chased on machines with regular 2 to 120 thread range. Maximum is 6" on machine with 1 to 60 thread range.

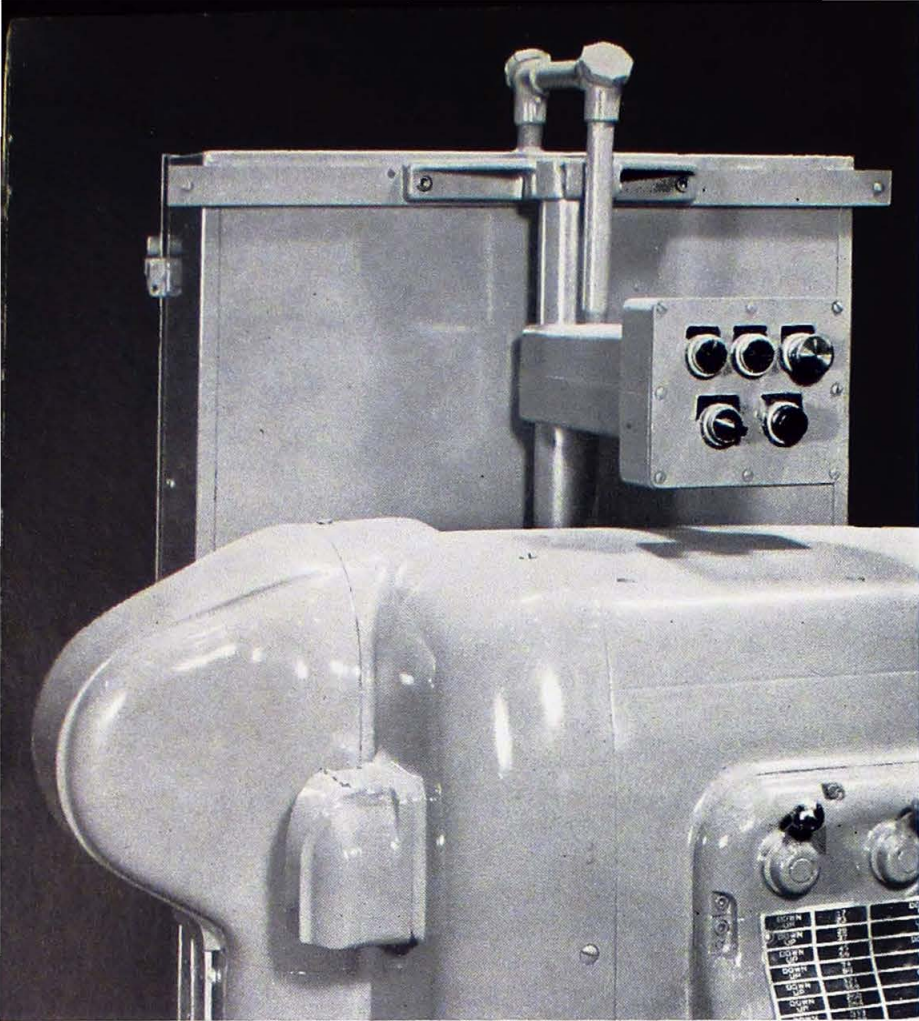
## BALL TURNING REST

Designed to simplify spherical machining operations on 16" and 20" lathes. Application is a simple, quick procedure.

- Regular bottom slide may be positioned on center for ball turning (illustrated to right), for spherical boring and out of alignment with the spindle center for spherical radius turning.
- Size of work controlled accurately by micrometer dial which adjusts bottom slide in or out. Circular motion of tool slide imparted either by hand or through power cross feed.
- Maximum ball diameter that can be turned is  $5\frac{3}{4}$ " on 16" machines, 6" on 20" machines. On plus-swing 16" lathe No. 1, maximum ball diameter is  $7\frac{5}{8}$ ".
- Spherical bores up to 4" diameter may be handled on 16" machines, up to 6" diameter on 20" machines. On some classes of work, concave spherical surfaces with radii up to 12" can be handled.





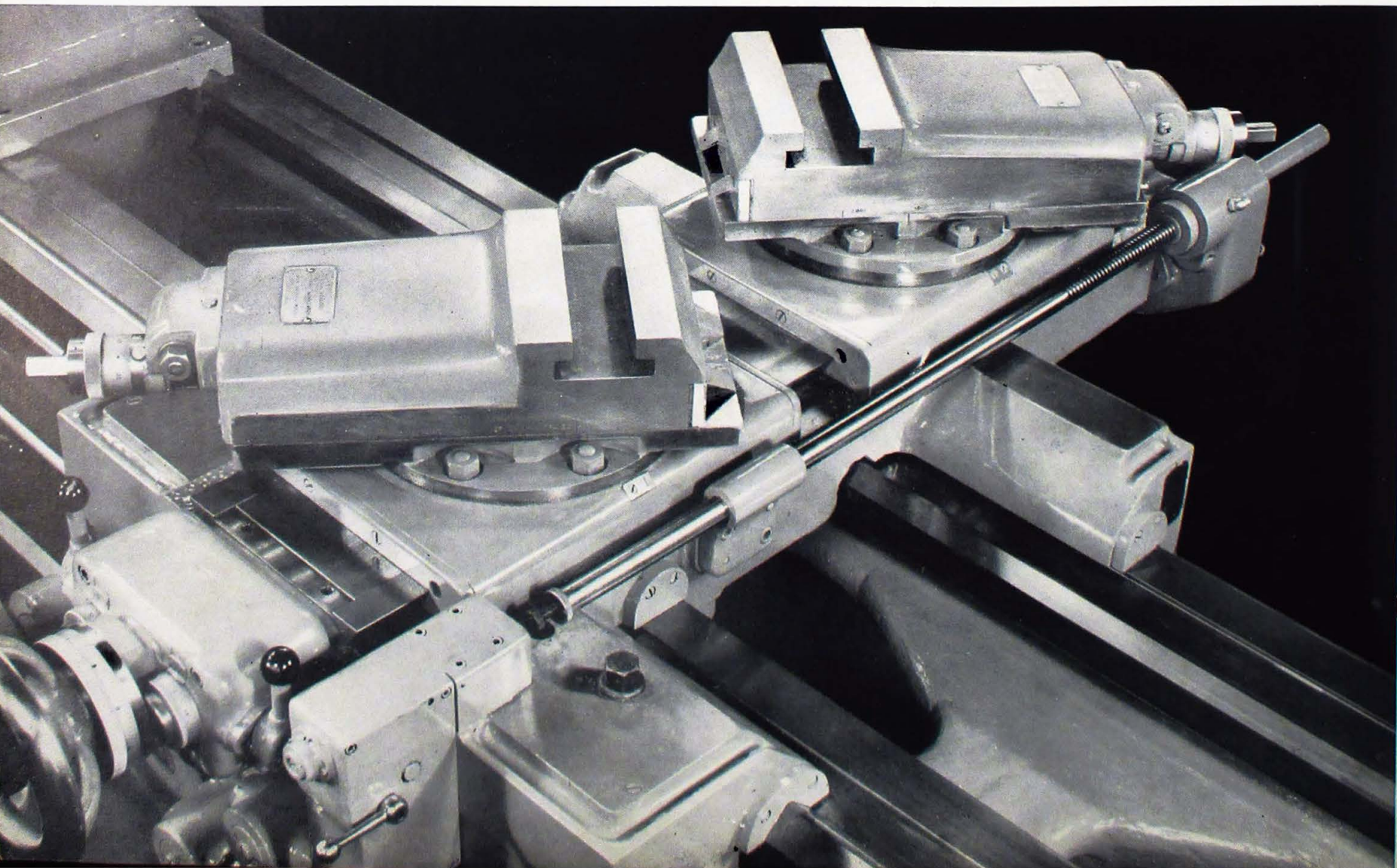


## JOINT INDUSTRY CONFERENCES STANDARDS

- Electrical equipment in accordance with J.I.C. standards supplied on special order. When so furnished, motors are of the totally enclosed, fan cooled, ball bearing type.
- Standard Monarch J.I.C. controls include non-reversing or reversing A.C. combination magnetic starter, line voltage type, with or without coolant pump control, with non-fusible or fusible or air circuit breaker disconnect switch, thermal overload relays, dual voltage primary and fused secondary protection, transformer for 110 volt control circuit and 100 watt machine light. These units are placed in NEMA type XII enclosure. Oil-tight push button station, separately mounted, also included.
- For complete specifications on any J.I.C. standard lathe or for specialized adaptations, contact The Monarch Machine Tool Co., Sidney, Ohio.

## DOUBLE POWER ANGULAR FEED COMPOUND RESTS

- For simultaneously machining both angles of bevel gears and many other classes of angular work.
- Either compound rest can be positioned independently of the other and either rest can be used as a regular compound rest without power angular feed.
- Power angular feed can be applied to both rests in or out simultaneously or to either one independently of the other.
- For perfect duplication of work a stop mechanism is provided to disengage automatically the feed of both slides at any predetermined point.





**SPECIFICATIONS—ENGINE LATHES**

	13''	16''	20''
<b>GENERAL.</b> Swing over bed.....	15 $\frac{1}{2}$ ''	18 $\frac{1}{2}$ ''	22 $\frac{1}{2}$ ''
Swing over cross slide.....	9 $\frac{3}{4}$ ''	10 $\frac{1}{2}$ ''	13 $\frac{3}{4}$ ''
Takes between centers, tailstock flush, base length.....	30''	30''	48''
Length between centers.....	30'', 54'', 78'', 102'' and 126''	30'', 54'', 78'', 102'', 126'', 150'' and 174''	48'', 72'', 96'', 120'', 144'', 168'', 192'' and 216''
Distance, spindle center to floor.....	43''	43''	45''
Floor space, base length.....	41''W x 98''L	44''W x 98''L	44''W x 122''L
<b>HEADSTOCK.</b> Hole through spindle.....	1 $\frac{5}{16}$ ''	1 $\frac{9}{16}$ ''	1 $\frac{9}{16}$ ''
Centers Morse taper.....	No. 3	No. 4	No. 4
Spindle bearings, tapered roller.....	Precision	Precision	Precision
American standard Camlock spindle nose.....	6''—D-1	6''—D-1	6''—D-1
Standard spindle speed range (furnished unless otherwise specified on order), 1800 R.P.M. motor.....	19, 25, 32, 42, 51, 67, 86, 112, 137, 182, 230, 301, 362, 480, 608 and 800 R.P.M.	17, 23, 28, 37, 45, 59, 74, 98, 121, 158, 200, 264, 319, 420, 532 and 700 R.P.M.	17, 23, 28, 37, 45, 59, 74, 98, 121, 158, 200, 264, 319, 420, 532 and 700 R.P.M.
Other available speed ranges, 3600 R.P.M. motor.....	28 to 1200 and 36 to 1500		
Other available speed ranges, 1800 R.P.M. motor.....	21 to 900 and 24 to 1000	19 to 800, 21 to 900 and 24 to 1000	19 to 800, 21 to 900 and 24 to 1000
Other available speed ranges, 1200 R.P.M. motor.....	14 to 600 and 17 to 700	12 to 487 and 14 to 600	12 to 487 and 14 to 600
<b>GEAR BOX.</b> Leadscrew diameter and threads per inch.....	1 $\frac{1}{4}$ ''—4 thd.	1 $\frac{1}{2}$ ''—4 thd.	1 $\frac{1}{2}$ ''—4 thd.
Range of threads per inch, quick change.....	2 to 120	2 to 120	2 to 120
Range of feeds per revolution, quick change.....	.0017''—.103''	.0014''—.084''	.0014''—.084''
Thread and feed changes, regular quick change.....	66	66	66
Actual threads cut with quick change gear box.....	2, 2 $\frac{1}{4}$ , 2 $\frac{3}{8}$ , 2 $\frac{1}{2}$ , 2 $\frac{3}{4}$ , 2 $\frac{7}{8}$ , 3, 3 $\frac{1}{4}$ , 3 $\frac{3}{8}$ , 3 $\frac{1}{2}$ , 3 $\frac{3}{4}$ , 4, 4 $\frac{1}{2}$ , 4 $\frac{3}{4}$ , 5, 5 $\frac{1}{2}$ , 5 $\frac{3}{4}$ , 6, 6 $\frac{1}{2}$ , 6 $\frac{3}{4}$ , 7, 7 $\frac{1}{2}$ , 8, 9, 9 $\frac{1}{2}$ , 10, 11, 11 $\frac{1}{2}$ , 12, 13, 13 $\frac{1}{2}$ , 14, 15, 16, 18, 19, 20, 22, 23, 24, 26, 27, 28, 30, 32, 36, 38, 40, 44, 46, 48, 52, 54, 56, 60, 64, 72, 76, 80, 88, 92, 96, 104, 108, 112 and 120		
Range of feeds per revolution when optional thread range of 1 to 60 is furnished.....	.0034''—.206''	.0028''—.168''	.0028''—.168''
<b>TAILSTOCK.</b> Spindle diameter.....	2 $\frac{7}{8}$ ''	3 $\frac{1}{8}$ ''	3 $\frac{3}{8}$ ''
Spindle travel and set-over.....	5''—1 $\frac{1}{2}$ ''	5''—1''	6 $\frac{1}{2}$ ''—1 $\frac{1}{4}$ ''
<b>CARRIAGE AND COMPOUND.</b> Carriage length.....	20 $\frac{3}{4}$ ''	25''	25''
Carriage bridge width.....	6 $\frac{1}{4}$ ''	8''	9''
Compound rest top slide travel.....	3 $\frac{1}{4}$ ''	4''	5''
Size of lathe tool.....	1 $\frac{1}{2}$ '' x 1 $\frac{1}{8}$ ''	5 $\frac{8}{8}$ '' x 1 $\frac{3}{8}$ ''	3 $\frac{4}{4}$ '' x 1 $\frac{5}{8}$ ''
<b>BED.</b> Width of bed.....	13 $\frac{3}{4}$ ''	17 $\frac{5}{8}$ ''	18 $\frac{1}{2}$ ''
Depth of bed.....	11 $\frac{1}{2}$ ''	12 $\frac{1}{4}$ ''	12 $\frac{1}{4}$ ''
<b>MOTOR DATA.</b> Motor size recommended.....	5—7 $\frac{1}{2}$ H.P.	7 $\frac{1}{2}$ —15 H.P.	10—20 H.P.
Largest motor frame size that can be used.....	NEMA 284	NEMA 326	NEMA 326
<b>SHIPPING DATA.</b> Net weight, with average accessory equipment, including all electrical equipment—base length.....	4850 lbs.	7550 lbs.	8160 lbs.
Domestic shipping weight, as above.....	5250 lbs.	8050 lbs.	8660 lbs.
Export shipping weight, as above.....	5750 lbs.	8550 lbs.	9160 lbs.
Cubic content, boxed for export, as above.....	141 cu. ft.	212 cu. ft.	258 cu. ft.
Net weight, each additional two feet.....	* 395 lbs.	** 430 lbs.	*** 490 lbs.

\* Beginning at the 78'' length, add a further 330 lbs. for the additional leg. \*\* Beginning at the 78'' length, add a further 350 lbs. for each additional leg. \*\*\* Beginning at the 72'' length, add a further 350 lbs. for each additional leg.



**SPECIFICATIONS—TOOLMAKER'S LATHES**

**13''**

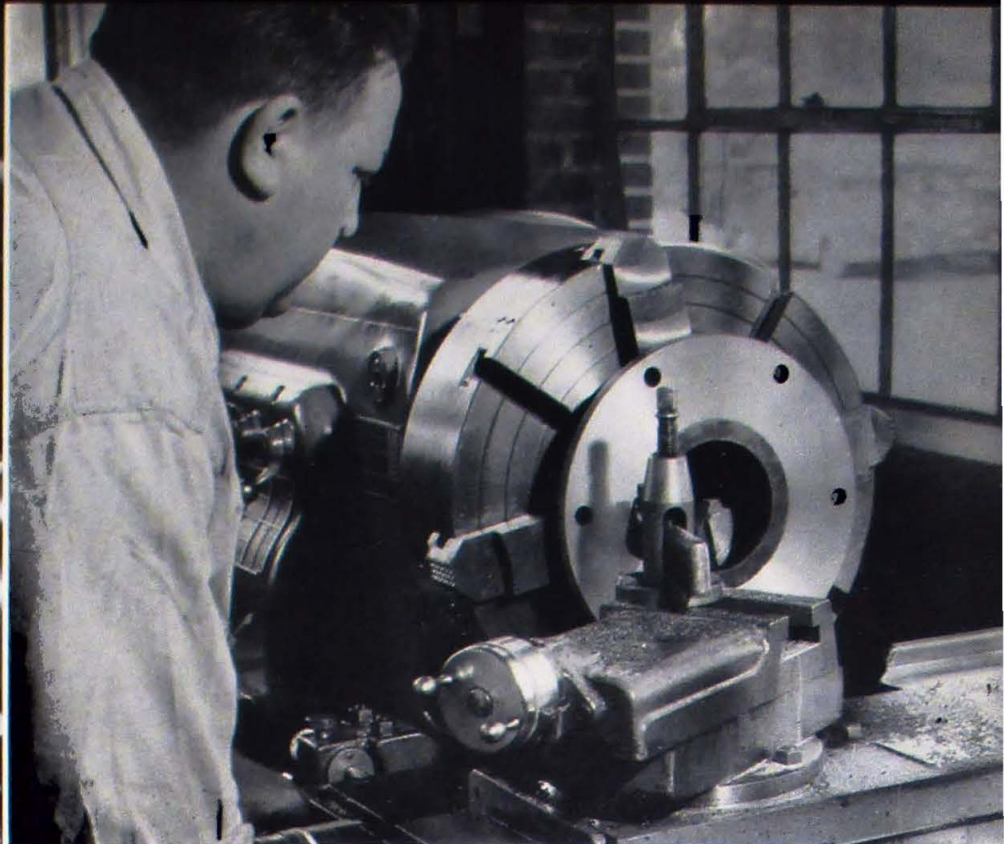
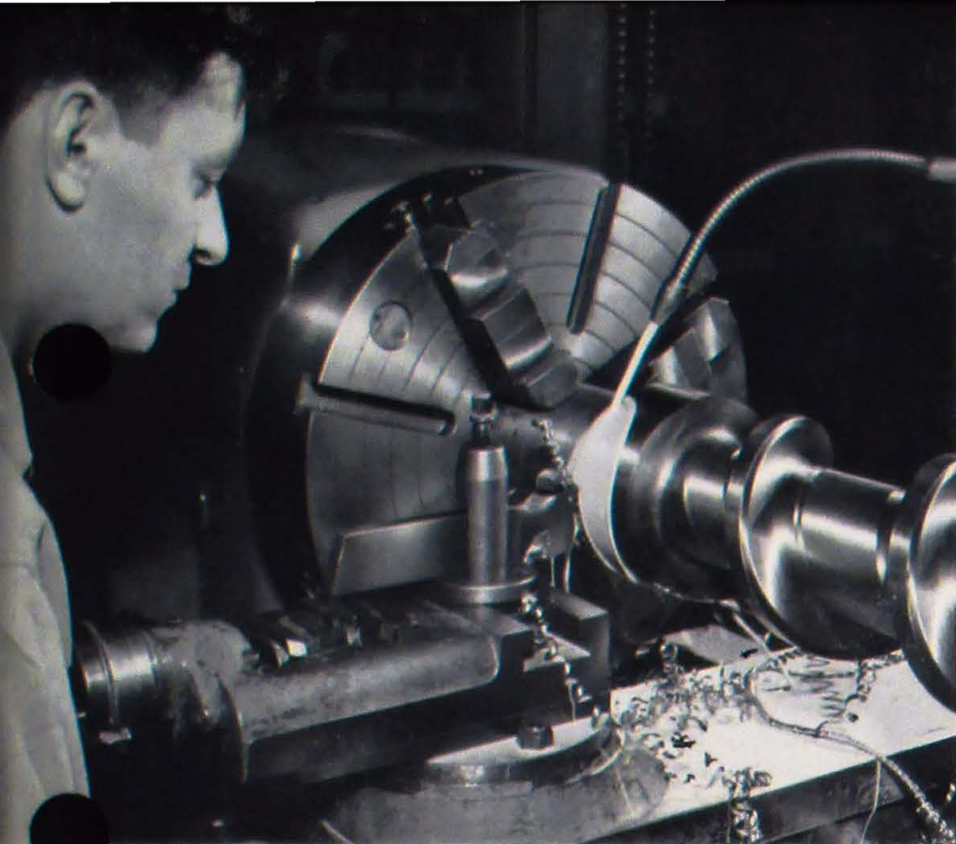
**16''**

**20''**

<b>GENERAL.</b> Swing over bed.....	15 $\frac{1}{2}$ ''	18 $\frac{1}{2}$ ''	22 $\frac{1}{2}$ ''
Swing over cross slide.....	9 $\frac{3}{4}$ ''	10 $\frac{1}{2}$ ''	13 $\frac{3}{4}$ ''
Takes between centers, tailstock flush, base length.....	30''	30''	48''
Length between centers.....	30'', 54'', 78'', 102'' and 126''	30'', 54'', 78'', 102'', 126'', 150'' and 174''	48'', 72'', 96'', 120'', 144'', 168'', 192'' and 216''
Distance, spindle center to floor.....	43''	43''	45''
Floor space, base length.....	41''W x 98''L	44''W x 98''L	44''W x 122''L
<b>HEADSTOCK.</b> Hole through spindle.....	1 $\frac{5}{16}$ ''	1 $\frac{9}{16}$ ''	1 $\frac{9}{16}$ ''
Centers Morse taper.....	No. 3	No. 4	No. 4
Spindle bearings, tapered roller.....	Precision	Precision	Precision
American standard Camlock spindle nose.....	6''—D-1	6''—D-1	6''—D-1
Standard spindle speed range (furnished unless otherwise specified on order), 1800 R.P.M. motor.....	19, 25, 32, 42, 51, 67, 86, 112, 137, 182, 230, 301, 362, 480, 608 and 800 R.P.M.	17, 23, 28, 37, 45, 59, 74, 98, 121, 158, 200, 264, 319, 420, 532 and 700 R.P.M.	17, 23, 28, 37, 45, 59, 74, 98, 121, 158, 200, 264, 319, 420, 532 and 700 R.P.M.
Other available speed ranges, 3600 R.P.M. motor.....	28 to 1200 and 36 to 1500		
Other available speed ranges, 1800 R.P.M. motor.....	21 to 900 and 24 to 1000	19 to 800, 21 to 900 and 24 to 1000	19 to 800, 21 to 900 and 24 to 1000
Other available speed ranges, 1200 R.P.M. motor.....	14 to 600 and 17 to 700	12 to 487 and 14 to 600	12 to 487 and 14 to 600
<b>GEAR BOX.</b> Leadscrew diameter and threads per inch.....	1 $\frac{1}{4}$ ''—4 thd.	1 $\frac{1}{2}$ ''—4 thd.	1 $\frac{1}{2}$ ''—4 thd.
Range of threads per inch, quick change.....	2 to 120	2 to 120	2 to 120
Range of feeds per revolution, quick change.....	.0017''—.103''	.0014''—.084''	.0014''—.084''
Thread and feed changes, regular quick change.....	66	66	66
Actual threads cut with quick change gear box.....	2, 2 $\frac{1}{4}$ , 2 $\frac{3}{8}$ , 2 $\frac{1}{2}$ , 2 $\frac{3}{4}$ , 2 $\frac{7}{8}$ , 3, 3 $\frac{1}{4}$ , 3 $\frac{3}{8}$ , 3 $\frac{1}{2}$ , 3 $\frac{3}{4}$ , 4, 4 $\frac{1}{2}$ , 4 $\frac{3}{4}$ , 5, 5 $\frac{1}{2}$ , 5 $\frac{3}{4}$ , 6, 6 $\frac{1}{2}$ , 6 $\frac{3}{4}$ , 7, 7 $\frac{1}{2}$ , 8, 9, 9 $\frac{1}{2}$ , 10, 11, 11 $\frac{1}{2}$ , 12, 13, 13 $\frac{1}{2}$ , 14, 15, 16, 18, 19, 20, 22, 23, 24, 26, 27, 28, 30, 32, 36, 38, 40, 44, 46, 48, 52, 54, 56, 60, 64, 72, 76, 80, 88, 92, 96, 104, 108, 112 and 120		
Range of feeds per revolution when optional thread range of 1 to 60 is furnished.....	.0034''—.206''	.0028''—.168''	.0028''—.168''
<b>TAILSTOCK.</b> Spindle diameter.....	2 $\frac{7}{8}$ ''	3 $\frac{1}{8}$ ''	3 $\frac{3}{8}$ ''
Spindle travel and set-over.....	5''—1 $\frac{1}{2}$ ''	5''—1''	6 $\frac{1}{2}$ ''—1 $\frac{1}{4}$ ''
<b>STEADY REST.</b> Steady rest opening, regular.....	4 $\frac{1}{2}$ ''	5''	6''
Capacity oversize steady rest.....		6'' to 12''	6'' to 12''
<b>CARRIAGE AND COMPOUND.</b> Carriage length.....	20 $\frac{3}{4}$ ''	25''	25''
Carriage bridge width.....	6 $\frac{1}{4}$ ''	8''	9''
Compound rest top slide travel.....	3 $\frac{1}{4}$ ''	4''	5''
Size of lathe tool.....	1 $\frac{1}{2}$ '' x 1 $\frac{1}{8}$ ''	5 $\frac{5}{8}$ '' x 1 $\frac{3}{8}$ ''	3 $\frac{1}{4}$ '' x 1 $\frac{5}{8}$ ''
<b>BED.</b> Width of bed.....	13 $\frac{3}{4}$ ''	17 $\frac{5}{8}$ ''	18 $\frac{1}{2}$ ''
Depth of bed.....	11 $\frac{1}{2}$ ''	12 $\frac{1}{4}$ ''	12 $\frac{1}{4}$ ''
<b>MOTOR DATA.</b> Motor size recommended.....	5—7 $\frac{1}{2}$ H.P.	7 $\frac{1}{2}$ —15 H.P.	10—20 H.P.
Largest motor frame size that can be used.....	NEMA 284	NEMA 326	NEMA 326
<b>SHIPPING DATA.</b> Net weight, with average acces- sory equipment, including all electrical equipment— base length.....	5145 lbs.	7960 lbs.	8710 lbs.
Domestic shipping weight, as above.....	5545 lbs.	8460 lbs.	9210 lbs.
Export shipping weight, as above.....	6045 lbs.	8960 lbs.	9710 lbs.
Cubic content, boxed for export, as above.....	141 cu. ft.	212 cu. ft.	258 cu. ft.
Net weight, each additional two feet.....	* 395 lbs.	** 430 lbs.	*** 490 lbs.

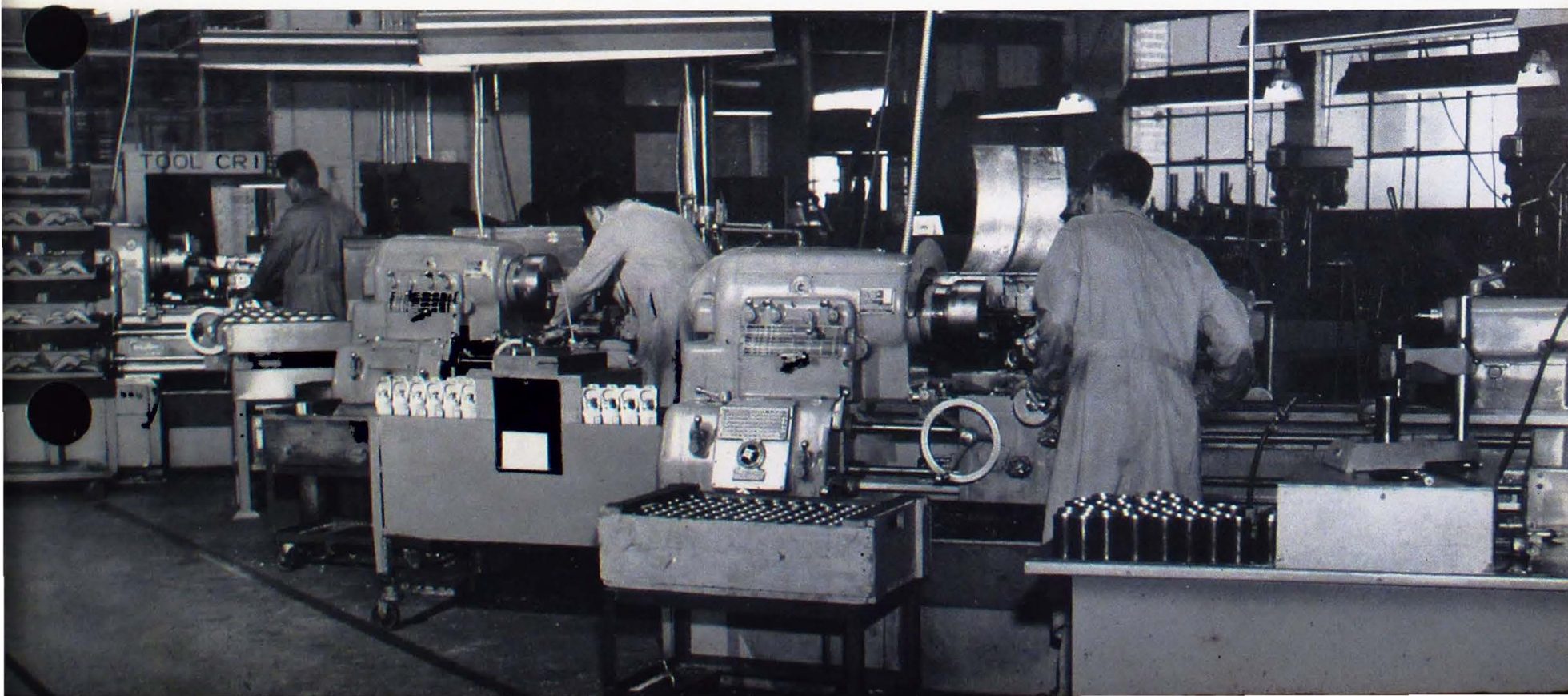
\* Beginning at the 78'' length, add a further 330 lbs. for the additional leg. \*\* Beginning at the 78'' length, add a further 350 lbs. for each additional leg. \*\*\* Beginning at the 72'' length, add a further 350 lbs. for each additional leg.





## REGULAR SERIES 61 EQUIPMENT

- *Engine Lathes.* On all sizes, regular equipment includes dog plate, compound rest, centers, thread chasing dial, chasing stop, headstock operated lead-screw reverse and wrenches.
- *Toolmaker's Lathes.* On all sizes, regular equipment includes face plate, dog plate, steady rest, compound rest, centers, thread chasing dial, chasing stop, apron controlled leadscrew reverse, oil pan and wrenches.
- The quick clamping type tailstock is furnished as regular equipment on all 13" Engine and Toolmaker's Lathes but in the case of 16" and 20" machines, this type of tailstock is supplied on Toolmaker's models only.
- A large amount of optional accessory equipment is available for use on Monarch Series 61 Lathes. The more commonly used items are illustrated and fully described in this booklet. As others are available, be sure to contact your Monarch representative in the event all your requirements may appear not to be satisfied by the equipment shown.
- When considering optional equipment, be sure not to overlook the production increasing possibilities of the four-way power rapid traverse, pictured and described fully on pages 30 and 31.
- Be sure to investigate the application of Monarch tracer controls to your turning problems.







# Monarch

TURNING MACHINES



**10" EE Toolmaker's Lathes**

**10" EE Precision Manufacturing Lathes**

**Series EE, Model 1000 Precision Lathes**

**Series 61 Engine and Toolmaker's Lathes  
in a complete range of sizes**

**Series 62 Preselector Dyna-Shift Lathes  
in a complete range of sizes**

**Models M, N and NN Heavy Duty Lathes  
in a complete range of sizes**

**Series 80 Heavy Duty Dyna-Shift Lathes  
in a complete range of sizes**

**Series 90 Heavy Duty Dyna-Shift Lathes  
in a complete range of sizes**

**The Mona-Matics  
for high production metal turning**

**The Speedi-Matic  
a fast, precision hand screw machine**

**The Hydra-Slide  
for high production chucking operations**

**Monarch-Keller Turning Machines**

**The Monarch "Motor-Trace"**

**The Monarch "Air-Gage Tracer"**

**The Monarch Roll Turning Lathes**

**Monarch 60" Right Angle Lathes**

**The Shapemaster Engraver**

**Special Turning Machines**