

DUAL DRIVE MANUAL No. 4

An instruction manual describing the construction, operation and maintenance of the modern gear-timing belt drive engine lathe — the LeBlond Dual Drive.

with sectional and exploded parts section for greater ease and speed in ordering repair parts.

1st Edition

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The R. K. LeBlond Machine Tool Company

Cincinnati 8, Ohio, U. S. A.

Largest Manufacturer of a Complete Line of Lathes

Price \$2.00

Printed in U. S. A.

YOUR NEW LeBLOND LATHE

This Manual is intended to serve as a source of information on the fundamentals of operation and service of your Dual Drive Lathe. By following specific instructions, your Dual Drive will give you a long life of precision production with a minimum of maintenance.

When parts are needed, the Parts Section makes it easy for you to locate the correct piece by showing parts in sectional or exploded views. Each unit of the Lathe is illustrated and each part is listed by name, number and quantity required. Your repair order will be facilitated if you will include the key number, the part name, and the quantity required. Always include in a Parts Order, the serial number of your Dual Drive. The serial number will be found on the front flat way of the bed at the tailstock end.

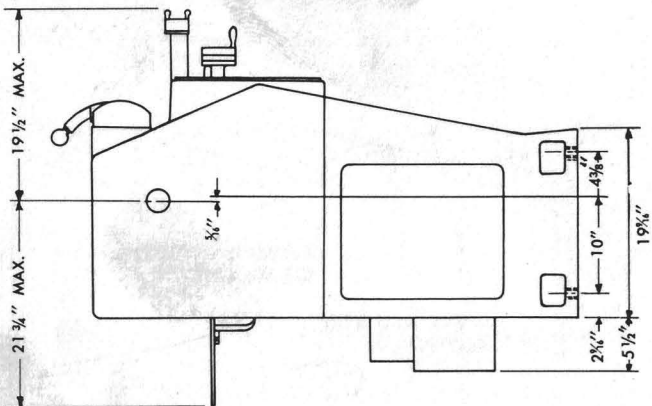
Your Dual Drive Lathe may differ slightly from the one illustrated here. This means that engineering changes have been made to improve your lathe - a result of our continual striving to give you the best and most modern lathe for your turning requirements.

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SPECIFICATIONS	
L _E BLOND 15" DUAL DRIVE LATHE	L _E BLOND 15" DUAL DRIVE LATHE
<p>CAPACITY</p> <p>Swing over bed and carriage wings 15-1/2"</p> <p>Swing over compound rest 9-1/2"</p> <p>Distance between centers, base length 30"</p> <p>Size of tool - forged 1/2" x 1"</p> <p>Size of tool holder 1/2" x 1-1/8"</p> <p>Steady rest capacity 1/2" to 4"</p> <p>Follow rest capacity 3/8" to 2-3/4"</p> <p>Face plate, small, diameter 8"</p> <p>Face plate, large, diameter 15"</p>	<p>CARRIAGE</p> <p>Length on bed 18-3/8"</p> <p>Bearing surface, square inches 62"</p> <p>Bridge width 6-1/4"</p> <p>Cross slide travel without taper attachment 8-7/8"</p> <p>Cross slide travel with taper attachment 7-7/8"</p> <p>Compound rest travel 4"</p>
<p>HEADSTOCK</p> <p>Spindle speeds, number 16</p> <p>Spindle speed range, RPM: Gear Drive - 31, 41, 56, 75, 97, 135, 183, 246, 320, 420, 570 and 765</p> <p>Belt Drive - 1000, 1300, 1780 and 2400</p> <p>Spindle, size of hole, straight 1-17/32"</p> <p>Spindle size of center, Morse taper No. 4</p> <p>Spindle nose, taper key drive, size LO</p> <p>Headstock length on bed 18-1/4"</p>	<p>FEED - THREADS</p> <p>Feed changes, gear or belt drive 48</p> <p>Feed ranges: Gear drive0021 to .120 Belt drive0007 to .038 Thread changes, gear drive only 48 Threads per inch, range 4 to 224 Leadscrew diameter and threads per inch 1", 6</p>
<p>BED</p> <p>Length, standard 5' 8-1/2"</p> <p>Width 12-3/16"</p> <p>Depth 10-1/2"</p>	<p>TAILSTOCK</p> <p>Spindle diameter 2-3/16"</p> <p>Center, Morse No. 4</p> <p>Spindle travel and set over right or left 8", 1"</p> <p>Length on bed 10-3/4"</p>
<p>MOTOR RECOMMENDED</p> <p>Horsepower and speed, RPM 5, 1800</p> <p>Frame size, N. E. M. A. 215</p>	<p>TAPER ATTACHMENT</p> <p>Maximum taper per foot 3-1/2"</p> <p>Turns at one setting 10"</p>



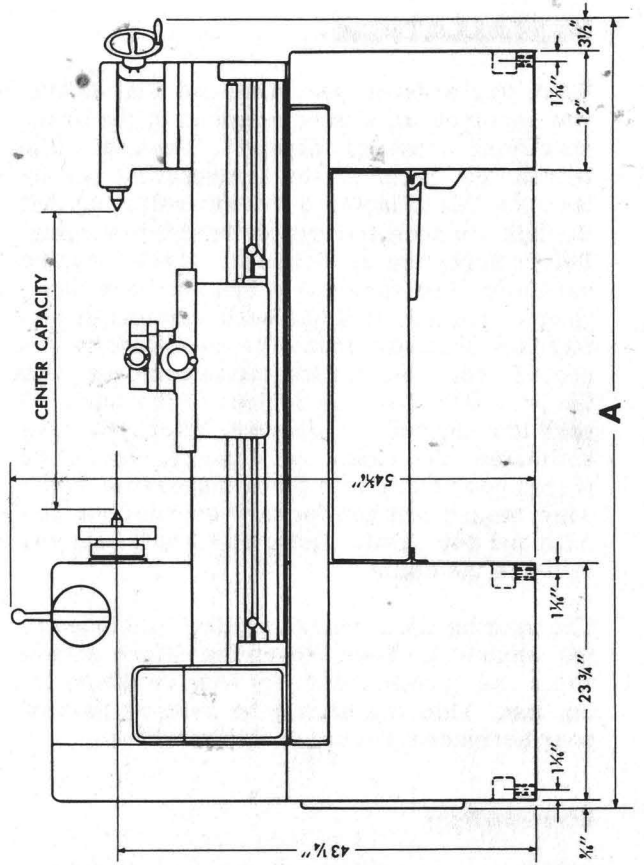
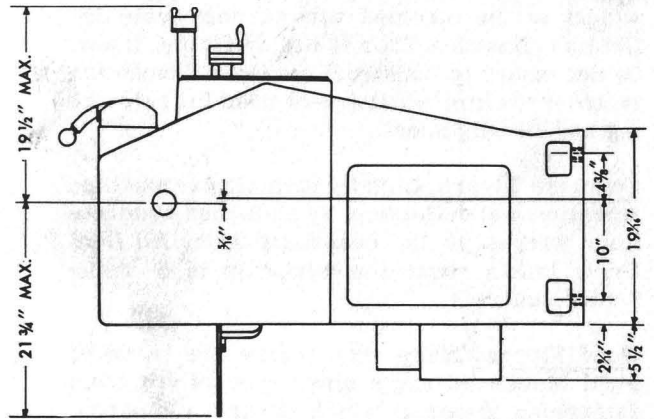
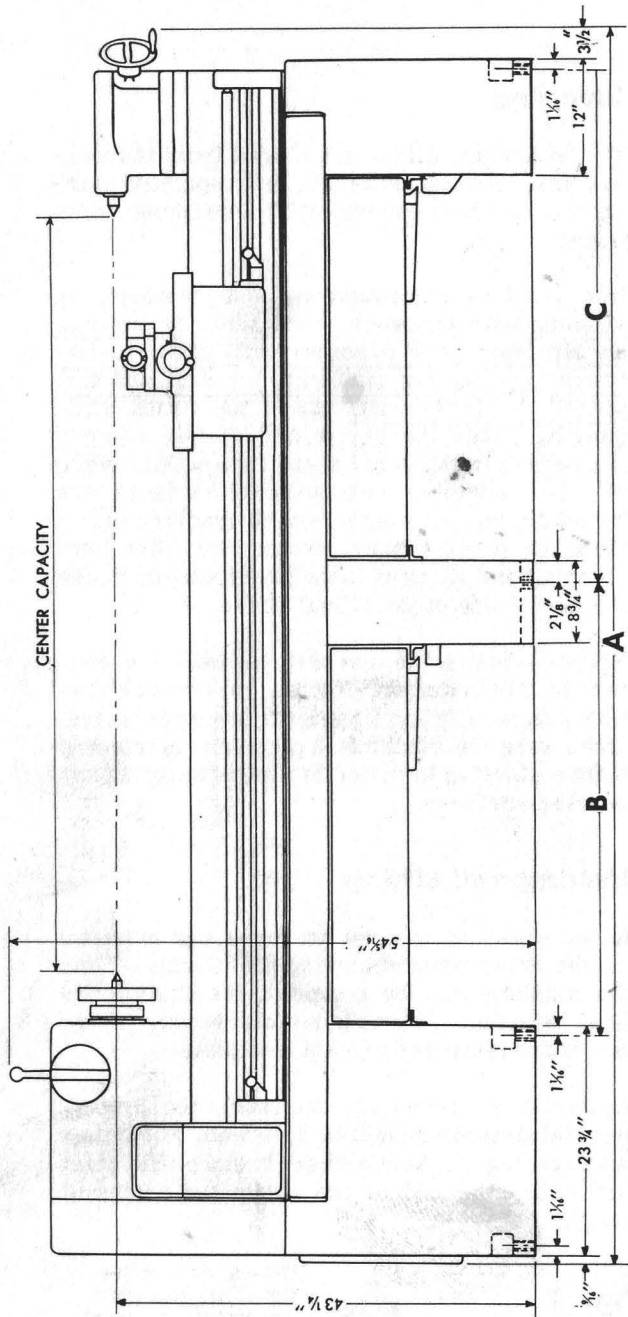


**15" DUAL DRIVE LATHE
(WITH CENTER LEG)**

DIMENSIONS			
CENTER CAPACITY	BED LENGTH	A	B C
78"	9' - 8 1/2"	127 5/8"	47 1/8" 52 1/8"
90"	10' - 8 1/2"	139 5/8"	53 1/8" 58 1/8"
102"	11' - 8 1/2"	151 5/8"	59 1/8" 64 1/8"
114"	12' - 8 1/2"	163 5/8"	65 1/8" 70 1/8"
126"	13' - 8 1/2"	175 5/8"	71 1/8" 76 1/8"

15" DUAL DRIVE LATHE

DIMENSIONS	
CENTER CAPACITY	A
30"	5' - 8 1/2" 79 5/8"
42"	6' - 8 1/2" 91 5/8"
54"	7' - 8 1/2" 103 5/8"
66"	8' - 8 1/2" 115 5/8"



INSTALLATION

When you ordered your LeBlond Dual Drive, you received an acknowledgment of the order specifying a date of shipment. When the lathe leaves our factory, the transporting agency issues a bill of lading, a receipt indicating that the lathe is accepted in good order for shipping. Before accepting the shipment, check the lathe carefully to be sure that it has not been damaged in transit. If it has been damaged in any way, the shipment should be conditionally accepted from the transportation company with the provision that it is subject to thorough inspection. In case of damage, after you have estimated the extent of damage, and have placed your claim with the transportation company, we ask that you forward us complete details and our Traffic Department will help you expedite the claim.

The packing list itemizes all parts included in the shipment. Your Receiving Clerk should check and account for every item on the packing list. This list should be kept as part of your permanent record of this machine.

Foundation

The floor upon which your lathe is to be set should be flat and heavy enough to support the weight of the machine without noticeable deflection. If such a floor is not available, it may be necessary to construct a special foundation in order to eliminate frequent need for releveling and re-alignment.

Concrete Floors. In order to minimize machine vibration and deflection, a reinforced concrete floor serves as the best foundation. All Dual Drive lathes require a minimum of 6" reinforced concrete.

Wood Floors. Many shop floors are made of wood blocks or some other type of vibration dampening material which covers a concrete sub-floor. This material should be taken up and the area filled in with concrete to the floor level.

In case the floor is of timber construction, the usual practice is to cut a hole in the floor and build up with concrete from the ground.

Second Floor. Your Dual Drive should always be located over a pillar or supporting beams. If no such support is available, one or more pillars should be installed if your lathe is to remain accurate and level.

Cleaning

For shipment, all oil was drawn from the reservoirs, and all polished and unpainted surfaces were well covered with a slushing compound.

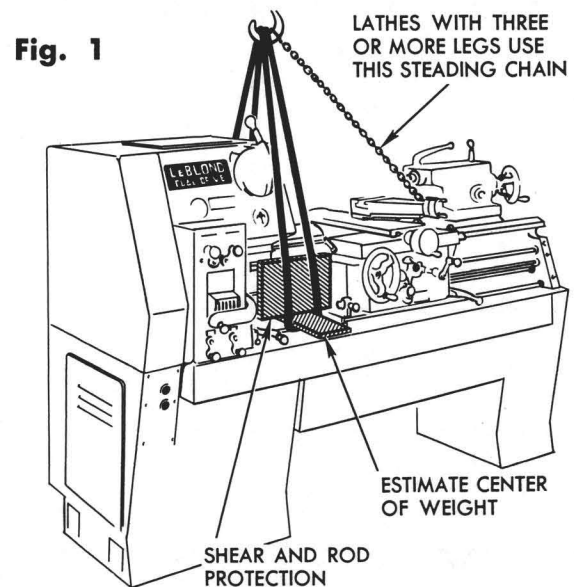
The slushing compound is best removed by washing with kerosene or benzene. Do not use an air hose. Air pressure will drive in between the bearing surfaces any grit and dirt picked up in transit. Raise the cross slide guards, clean the screw and slides, remove the bedway wipers and clean thoroughly. When all the unpainted and polished surfaces are wiped clean, put a light coat of machine oil on them to protect them from rust. Frequent cleaning and oiling of these parts will increase the useful life of your Dual Drive.

Before starting the machine, consult the section on "Lubrication" for the proper lubrication points and the fillers for the reservoirs. Make sure the machine is properly lubricated before starting in order to avoid damaging any bearing surfaces.

Moving and Lifting

It is usually convenient to leave the machine on the skids when removing the crating. Thus the machine can be moved on the skids to its final location. This is particularly true where the crane facilities are not available.

However, if cranes are available, the following instructions should be followed. For lathes with two legs, insert a heavy board or flat steel bar under the bed at the estimated center of weight.



Sling on each end of the board or bar using another board to protect the control rods. Raise the machine slightly to assure proper balance before continuing. (See Figure 1). For lathes with three or more legs, follow the same procedure but add a chain from the crane hook to a cross girth at the tail end of the lathe. This will help steady the set-up.

NOTE: Make sure the carriage clamp screw is loosened before moving the carriage. The carriage and tailstock may be moved to help balance the lathe for moving by crane.

Electrical Connections

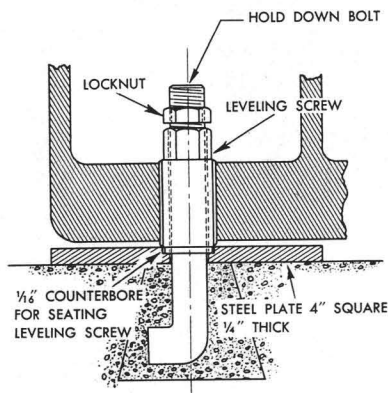
It is important that the voltage and other specifications of the motor are the same as those of your service lines. The name plate on the motor specifies the operating voltage and whether the current should be direct (D.C.) or alternating (A.C.). If alternating current is specified, the voltage, frequently (cycles and number of phases) are shown. If there is any doubt about the current and voltage, call your local power and light company and verify the supply. If there is a difference, advise us before connecting, and avoid burning out or otherwise damaging the motor.

Leveling

Your Dual Drive Lathe was aligned and accurately checked with the lathe in perfect level. In order to reproduce this accuracy in your shop, it is essential that your lathe be leveled properly. Too much emphasis cannot be placed on the importance of proper leveling.

In order to hold the level and prevent the leveling screws from digging into a concrete floor, a smooth steel plate, approximately 4" square, 1/4" thick, and countersunk 1/16" of an inch deep for seating the leveling screws, should be surfaced against the concrete. If necessary, chip the concrete before placing

Fig. 2



these plates under the leveling screws. See Figure (2). Never use a resilient type of vibration dampening device, such as rubber under the leveling screws. These devices make it difficult, if not impossible to maintain accurate level.

If hold-down bolts are used, set the lathe in position, mark and then drill. It is impracticable to lay off holes in advance from the dimensional drawings.

Next, level the lathe by means of leveling screws provided using a precision level. An ordinary carpenter's level or combination square level is not sensitive enough. See figure (3).

Proceed as follows: Level across the bedways at both the head and the tail-end, using parallel blocks on the front flat and the rear hardened way.

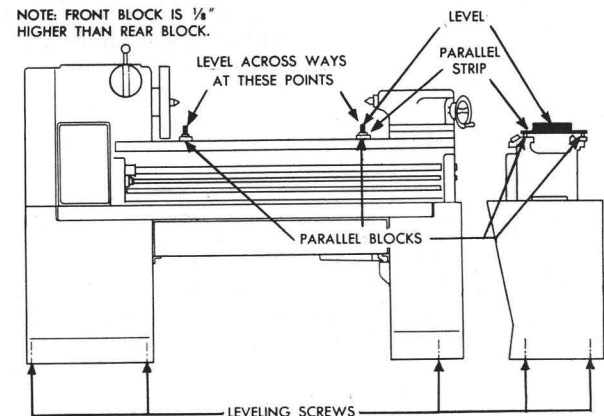
NOTE: The rear way of your Dual Drive is .0625" higher than the front flat. Use gauge blocks to make up the difference. Leveling is accomplished by adjusting the leveling screws until the bubble is in the center of the glass bowl. If the bed of your machine has one or more center legs, level across them also. The reading must be exactly the same in all positions. Then, level lengthwise on the rearway at the head and tail ends and at each center leg.

If the hold-down bolts are used, draw them to light contact after leveling. Do not tighten bolts excessively as this may twist the bed of the lathe out of level.

CAUTION: You should always recheck your level after tightening the hold-down bolts. Never bed the legs of your Dual Drive in concrete as this will preclude any re-leveling of the machine.

Fig. 3

NOTE: FRONT BLOCK IS 1/4" HIGHER THAN REAR BLOCK.



IF LATHE HAS MIDDLE LEG, LEVEL ACROSS WAYS DIRECTLY ABOVE LEGS.

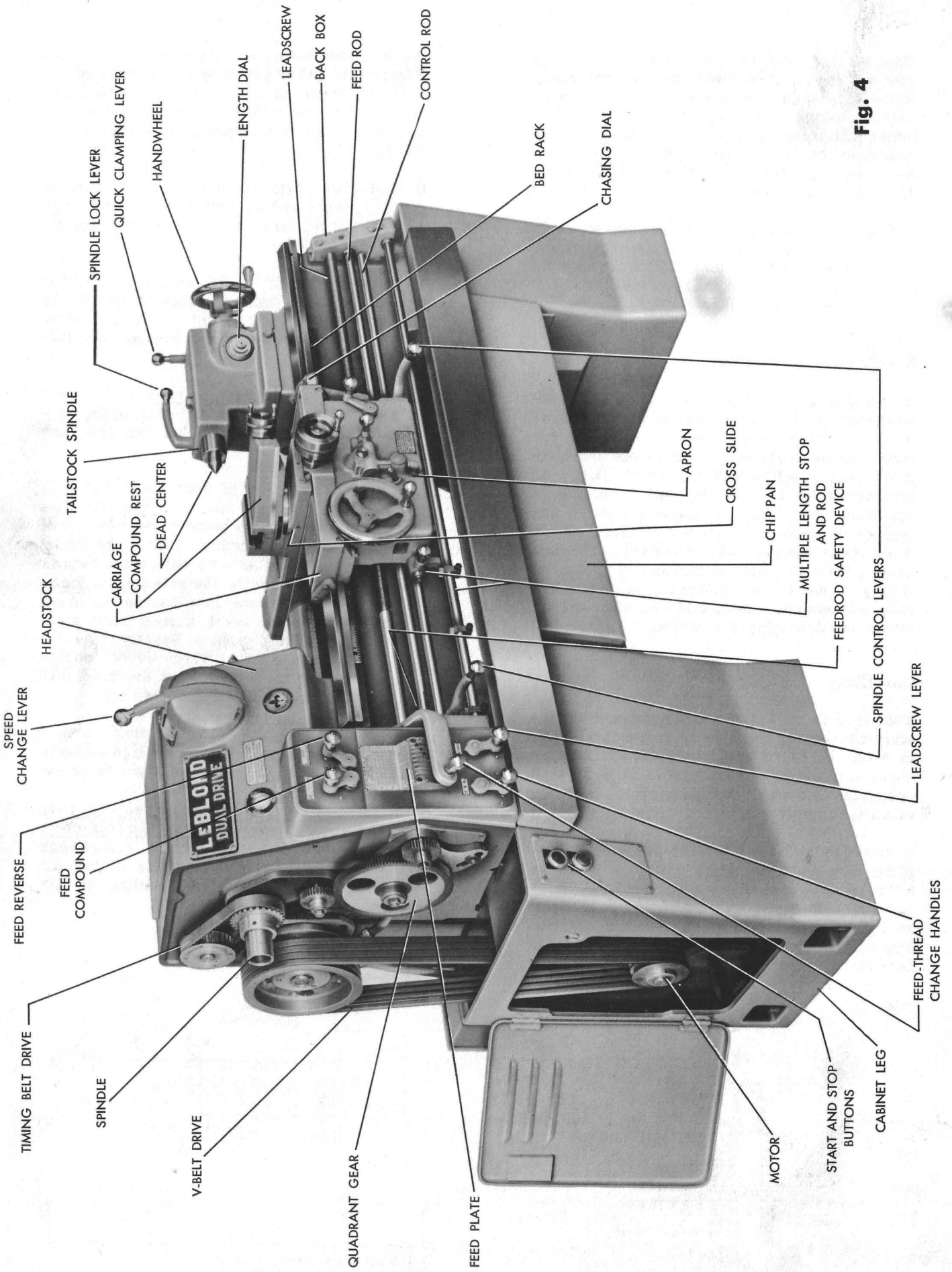


Fig. 4

OPERATING INSTRUCTIONS AND NOMENCLATURE

To help you understand your new Dual Drive, you will find the following a general description, and operational procedure for each of the major units that make up your lathe. To receive the most benefits from your Dual Drive, you should be thoroughly acquainted with these units, and with the specifications of your particular lathe. Refer to these operating instructions frequently.

Headstock (Fig. 5)

The Dual Drive Headstock provides twelve gear driven speeds and four belt driven speeds to the spindle for efficient operation.

All speeds are selected by a single shifter handle (A), with a direct reading point indicator (B). The spindle is supported by two roller (Timken) bearings, and one ball (rear) bearing. Drive shafts are supported by anti-friction bearings. All gears are made of alloy steel and hardened. The Spindle Nose is an American Standard Type "LO" taper key drive. Small shifter lever (C) reverses the speed and lead-screw, and lever (D) provides fine or coarse feeds or threads.

Horsepower meter (E) is located to the right of the feed reverse and feed compound levers. This meter reads in per cent of total horsepower consumed. For example: if two and one-half horsepower was being used (this being one-half of the total five horsepower available), the meter will show 50%. Built in accordance with the NMTBA Electrical Code, the electrical panel, Figure (6), for the Dual Drive is

mounted on the rear of the head end leg. Overload protection is provided by magnetic starters and fuses. For safety, only 110 volts are used in all electrical controlled circuits. This is supplied through a transformer. Also included in the electrical panel is the electric brake power pack. Rheostat (F) is a convenient adjustment of braking power. A five position drum switch has been provided, controlled by two spindle control handles. One is below the headstock and to the right of the quick change box.

The other is located to the right of the apron below the chasing dial. The central position of the spindle control handle applies the brake. A neutral position on each side of the center or brake position allows the spindle to coast for moving the spindle by hand, jogging, or shifting gears. The extreme down position of the handle revolves the spindle forward. The spindle will revolve in reverse when the handle is in the upper most position.

Fig. 6

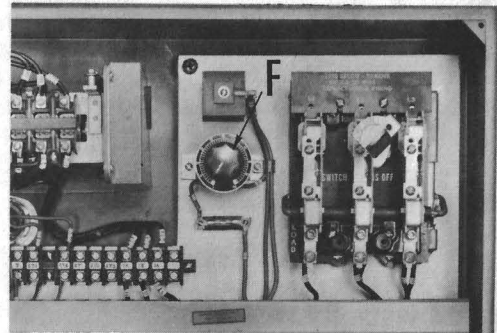
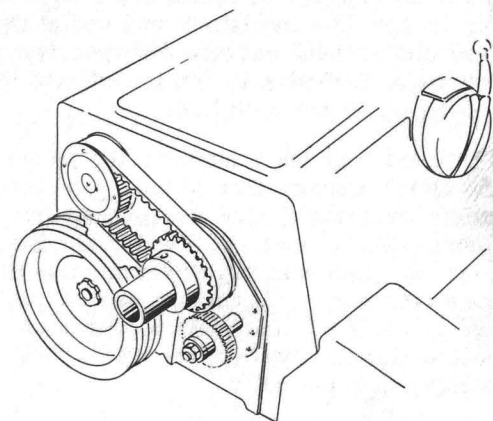
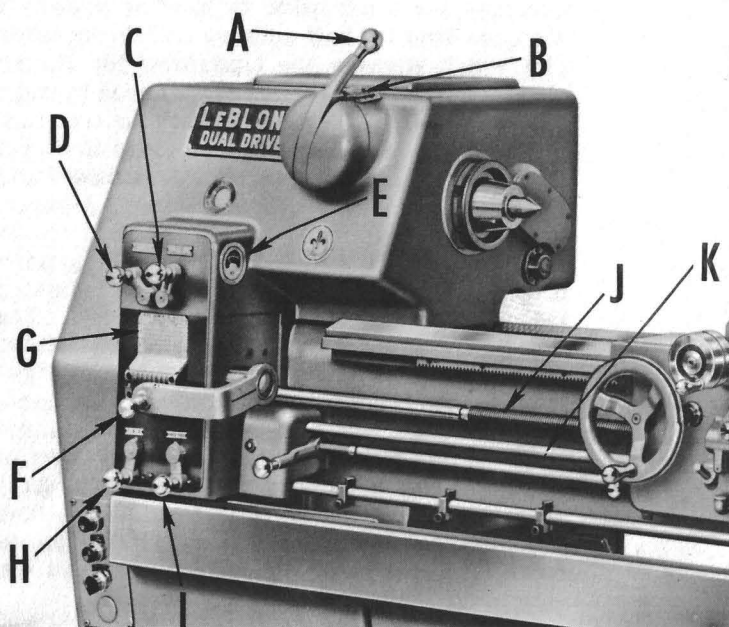


Fig. 5



Gilmore Belt Drive

Quick Change Box (Fig. 5)

The Quick Change Box provides forty-eight feeds or threads through an eight position tumbler, a three position compound in the Quick Change Box and a two position compound located in the Headstock. Metric or special feeds and threads are available through use of translating pick off gears which form the feed drive from the Headstock to the Quick Change Box. The pick off gears are readily accessible by removing the end cover of the Headstock. Individual feeds or threads as indicated on the index plate are obtained by pulling out and depressing the tumbler handle (F) to disengage the tumbler gear; slide the tumbler along the sleeve to the desired location. Lift the tumbler handle and allow the plunger in the handle to lock in place. The series of slots milled in the shifter lock plate and the plunger pin engaging the slots prevent the tumbler gears from engaging two gears at the same time.

Located directly above the tumbler handle and shifter lock plate, the direct reading index plate (G) lines up with the slots milled in the shifter lock plate. The numbers on the plate refer to threads and leads that will be provided when the tumbler is engaged directly under the number. "E" and "F" refer to the position of the left hand feed compound lever (D) located on the headstock just above the index plate. The letters "C", "B" and "A" refer to the positions of the compound change lever (H) located to the left just below the tumbler handle.

Leadscrew and Feed Rod (Fig. 5)

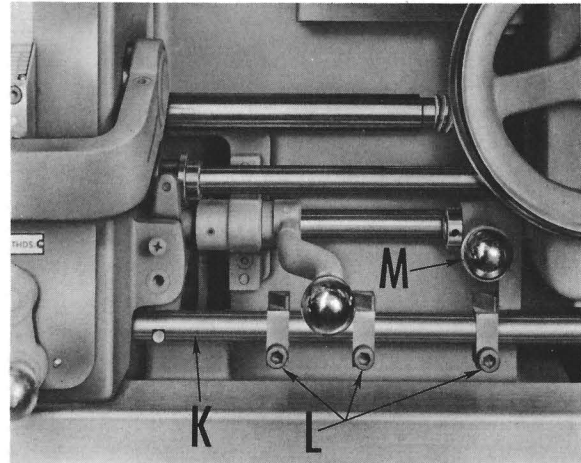
Located on the Quick Change Box to the immediate right of compound change lever, Figure (5), lever (I) engages or disengages the leadscrew by moving a sliding gear in the Quick Change Box. The leadscrew (J) is used only for cutting threads and should be disengaged when not in use. The leadscrew runs in a bushing in both the headstock end and at the back box; and is held endwise between two thrust bearings. End-play is eliminated with the adjusting nut at the back box.

The Feed Rod (K) transmits the power from the Quick Change Box to the Apron through a safety overload device located at the Quick Change Box end of the Feed Rod. Should the carriage meet with any obstruction on the bed, the safety device will release and prevent damage to the feed mechanism. As soon as the obstruction is removed, the feed safety device engages automatically.

Multiple Automatic Length Stop (Fig. 7)

The Multiple Automatic Length Stops provide a positive stop for cutting specific lengths on

Fig. 7



similar work pieces. The spring-loaded length stop rod (K) carries a number of stops (L) which can be set for various lengths. Stop lever (M), located on the apron, swivels down so that contact can be made with the stops. When contact is made, the apron moves the stop rod which operates a shifter disengaging a positive jaw clutch located on the feed rod next to the quick change box. When the feed rod clutch is disengaged, the apron stops. When stop lever (M) is lifted to clear the stop a spring automatically re-engages the clutch. With the stop lever (M) in the down position, a detent is held in place to prevent the half nut from engaging during the feeding operation.

Apron (Fig. 8)

The Dual Drive Apron is a double-walled one piece casting in which all shafts and gears are supported on both ends. This unit is bolted securely to the carriage and contains the controls, gears, and other mechanisms for feeding the carriage and cross slide by hand or power. It also contains the half nuts controlled by lever (N) which engages the leadscrew for thread chasing. Power is supplied to the apron through the bevel pinion which is keyed to the feed rod. Positive jaw clutches are employed to direct the power to the rack pinion for length feed and the cross feed screw for crossfeed. A single lever (O) is employed to engage both length and cross feeds. An instruction plate mounted to the left of the feed control lever indicates the position for cross and length feed. The feed is reversed by a lever on the headstock. An interference device prevents the engagement of the half nuts and the feed at the same time. Do not attempt to force the feed control lever or the half nut lever when the other is engaged. The large hand wheel (P), through a gear reduction, revolves a rack pinion thus providing hand feed to the carriage. The apron spindle control lever (Q) will be found on the right side of the apron.

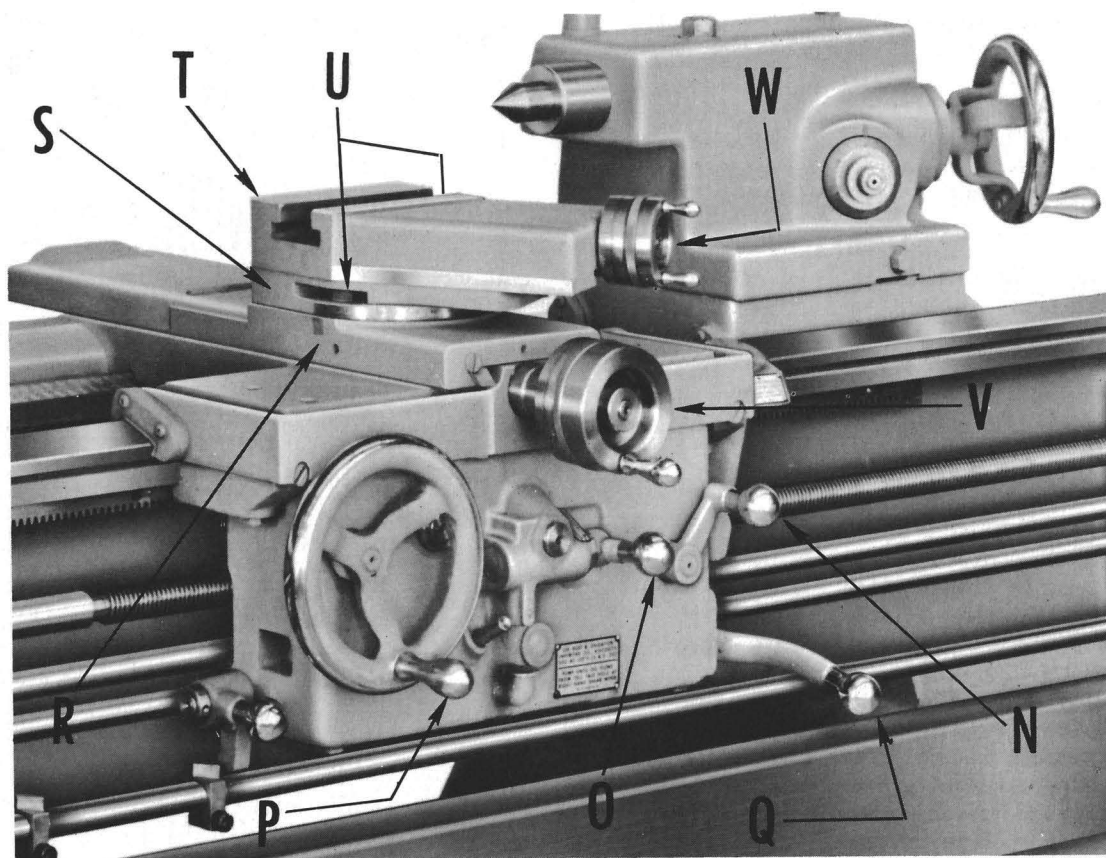


Fig. 8

Carriage and Compound Rest (Fig. 8)

The carriage, an H-shaped casting, is fitted to and slides on the bedways; thus providing longitudinal movement to the tool by hand or power.

The cross-slide, often referred to as the bottom slide (R) provides cross motion to the tool by hand or power.

The swivel (S) and the top slide (T) provide angular hand feed. The Dual Drive top slide is engineered with a thirty degree angle built into the casting. This eliminates interference when chasing threads. To adjust the angle of the top slide, loosen nuts (U), swivel the unit to the desired angle as indicated by the graduations on the swivel and retighten nuts (U). When the top slide screw is used for length measurement during facing operations, swivel the top slide sixty degrees. This will compensate for the built-in angle of the top slide casting, and position the top slide screw perpendicular to the surface to be faced. Both the cross feed dial (V) and the top slide dial (W) read in diameter reduction. .010" on the cross feed dial advances or retracts the slide .005" thus reducing or increasing a given diameter by .010".

It is generally considered good practice to use a cross slide adjustment for sizing. Remember

that when the top slide is used for facing, the advance of the tool will be one-half that shown on the dial.

It should be pointed out that the top slide dial is graduated in diameter reduction for use in sizing when the taper attachment (optional equipment) is in use. The taper attachment bottom slide draw bar, Figure (15) in its locked position, prevents the bottom slide from being moved.

CAUTION: The lathe operator should adjust the top slide flush with the cross slide for maximum tool support whenever possible. Needless over-hand of the top slide will very often result in chatter.

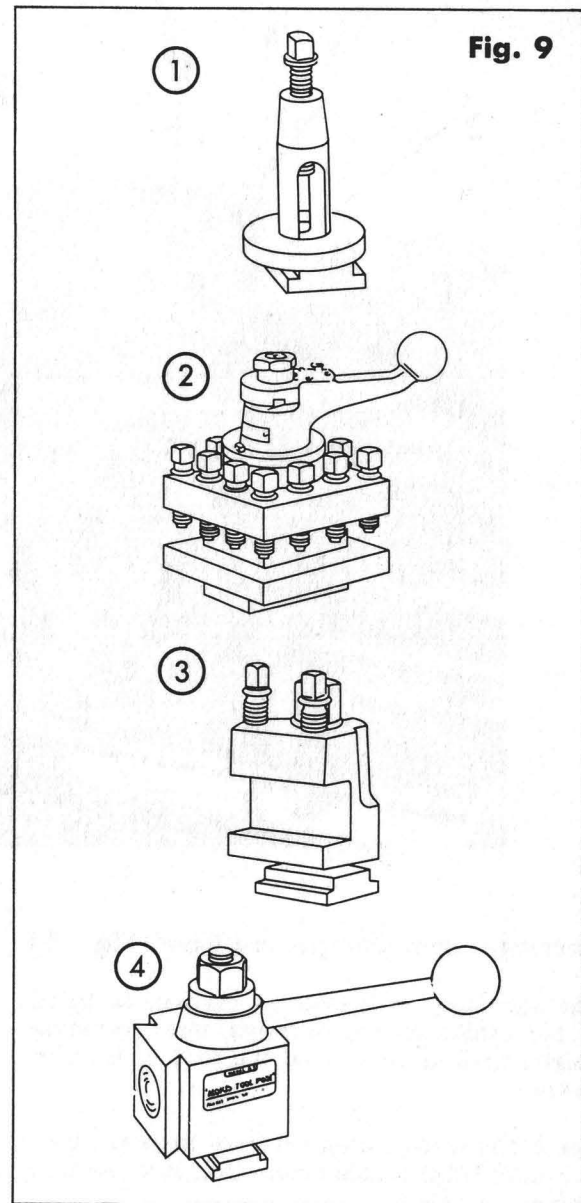
Tool Holders (Fig. 9)

The function of the tool holder is to hold the tool rigidly in position for cutting operations. For the correct tool position, locate the cutting edge of the tool on the lathe center line. Because tool shanks vary in size, shims are often used to locate the tool cutting edge on the center line. Proper tool position is necessary

to avoid chatter, excessive tool wear and tool breakage.

Be sure the tool does not extend out of the tool holder more than is necessary. Otherwise, chatter may result. Do not use a long wrench to clamp the tool holder; use the wrench provided.

1. The Tool Post is comprised of the post, screw, washer, collar and rocker. The washer fits the top slide T-slot; the collar and rocker elevate or lower the point of the tool; and the screw clamps the whole assembly to the top slide. Make sure the T-slot is clear of chips in order to secure a firm foundation for the tool.
2. Turret Tool Blocks are comprised of a swiveling block in which the tools are clamped; a clamping lever which clamps or releases the block for swiveling; and a screw arrangement for clamping the unit to the top slide T-slot. Turret blocks hold more than one tool. Within the capacity of the block, all tools for one set-up (for example: sizing, radius, cut-off, knurling tools) are available when needed. All that is necessary to swivel tools is to release the clamp lever, swivel the correct tool into position and clamp. The tool is then set for the next operation.
3. European or Open Side Type Tool Blocks hold only one tool at a time and are comprised of a T-slot clamp; a "C" shaped block; and two tool clamping screws. Because this unit is very rigid, it is especially useful for heavy cuts.
4. Quick Change Type Tool Holders hold only one tool at a time and are comprised of a top slide T-slot clamp; block; and a tool clamping lever to lock each tool in place.



Tailstock (Fig. 10)

The tailstock unit is used to support one end of the workpiece and to hold drills, reamers, taps, etc. This unit can be moved on the bedways to accommodate workpieces of different length within the capacity of the lathe. The tailstock consists of a top, bottom, clamp, spindle and handwheel. The tailstock top is fitted to the bottom and held in position with a cross tongue. A side adjustment is provided to keep the center in line with the head, and for turning shallow tapers by offsetting the spindle in relation to the head.

Pulling quick clamping lever (A) toward the operator provides a quick, convenient method

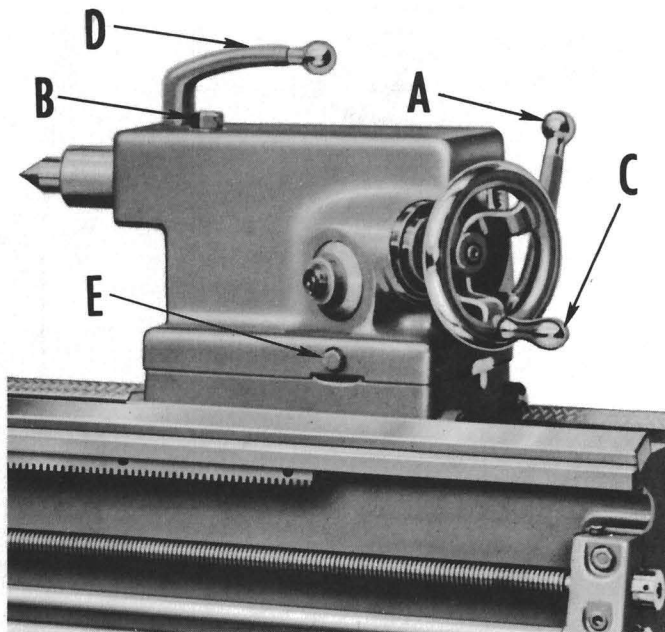
for clamping the tailstock to the bed when taking light cuts, chasing threads, etc. Working on an eccentric, lever (A) pulls the tailstock clamp tight against the underside of the bedways. (The tightness of the clamp can be adjusted, see "Adjustments"). In addition to the quick clamping lever, nut (B) can be tightened for more clamping power when heavy cuts are performed. Be sure both nut (B) and quick clamping lever (A) are loose before attempting to move the tailstock along the bedways.

Set at a convenient angle, handwheel (C) moves the tailstock spindle in and out of the tailstock by revolving a pinion which meshes with a rack

located on the tailstock spindle. This construction provides a positive lock against thrust forces.

Inherent to this design is a hole throughout the length of the tailstock spindle, with the

Fig. 10



spindle fully supported for longer travel. A direct reading length dial provides the operator with an easy method of measuring the depth of cut when drilling, boring, reaming, etc. Pulling the spindle clamping lever (D) toward the operator operates the spindle clamping mechanism. A special key keeps the tailstock spindle from rotating during cutting. The front end of the spindle is bored and reamed to a Morse No. 4 taper. Centers can be removed by inserting a knockout bar through the spindle hole. Before placing a center in the tailstock, carefully wipe out the spindle hole and clean the center. Chips and dirt may score the spindle hole. If centers, drills, drill chucks, reamers, etc. are not tight in the spindle hole, they may revolve and cause scoring or burrs to occur.

Alignment of Centers (Fig. 11)

When zero marks are in line on the tailstock's top and bottom, centers are approximately in line. But due to the fact that an error of a .001" misalignment cannot be seen, a more sensitive test must be used for perfect straight turning.

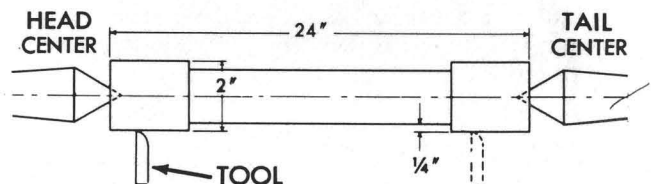
A test bar should be made with centered barstock; 2" diameter, 24" long and with a 1/4"

undercut in the center. By taking a light cut at both ends and measuring with a micrometer, you can determine if the cut is straight or tapered.

If your lathe is cutting shallow tapers, the alignment of the tailstock center with the headstock is out of position. If the diameter is larger at the headstock, the tailstock top must be moved to the back of the lathe. If the diameter is larger at the tailstock, the tailstock top must be moved toward the front of the lathe.

NOTE: Do not attempt to adjust side movement with the bed clamp locked in position; this allows the top to move on the bottom. Always loosen the adjusting screw (E) on the side of the tailstock in the direction you wish to move before turning the other screw to move the tailstock top. When you have moved it to the desired position, retighten the original screw. These adjusting screws only locate the top on the bottom and should only be tightened to a snug fit.

Fig. 11



Bed (Fig. 12)

The bed is the foundation of the lathe. It supports the functioning units and provides an accurate guideway for the units which move on it. Rigid in construction, it has been scientifically designed with heavy girths to minimize deflection.

The ways are constructed of hardened and ground graphite steel. Wear is kept to a minimum with the graphite acting as a lubricant, and a hardness of 62-64 Rockwell C (600 Brinell). These ways are replaceable in event of accidental damage but with ordinary care will outlast the lathe. LeBlond bedways are built to the Compensating V-way principle to provide longer wearing qualities by taking the tool thrust properly.

The forces, Figure (13) generated by cutting action are a downward thrust and an outward thrust. The downward thrust is greater than that of the outward thrust. To compensate for these factors, the front way is at a 20° angle to the carriage and has a greater width than thickness. This construction gives ample bearing surface to the carriage where it is needed most. Figure (14) shows the tailstock end leg arranged for coolant. If your lathe was not equipped with coolant it may be easily installed in the field.

Fig. 12

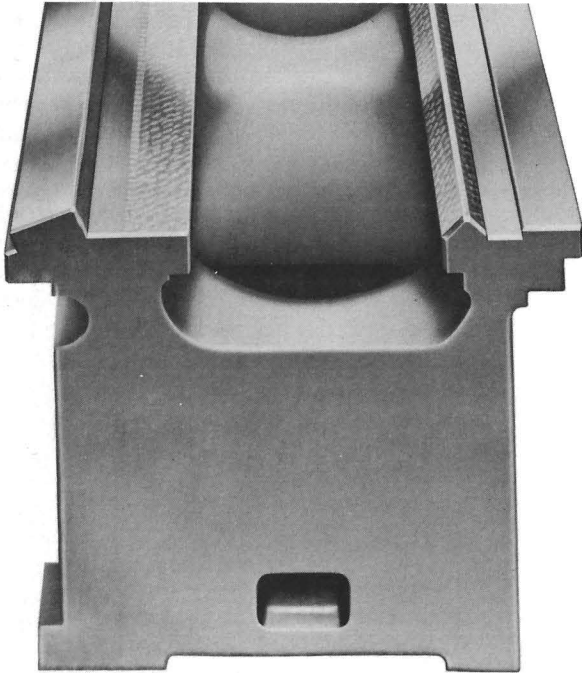


Fig. 14

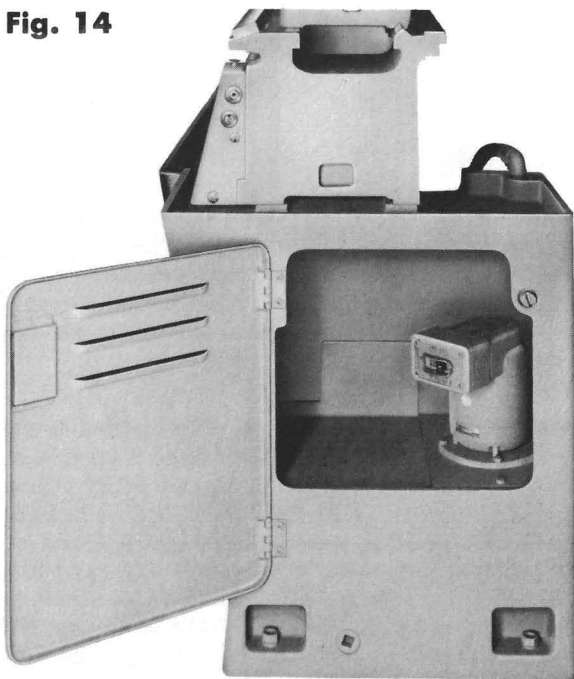
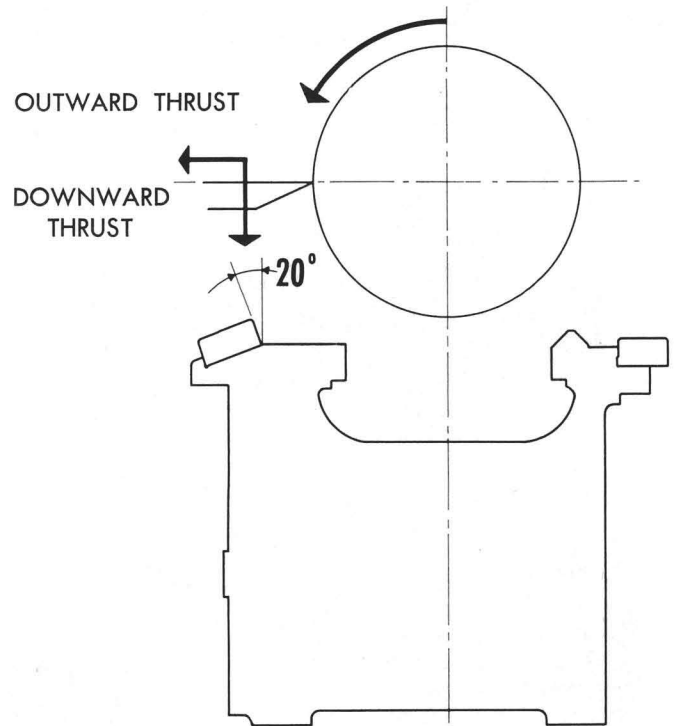


Fig. 13



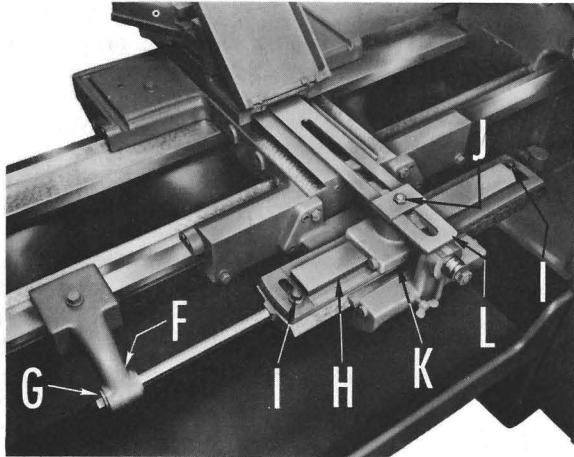
Taper Attachment (Fig. 15)

The Dual Drive telescopic taper attachment is ruggedly constructed, accurately machined and simple to operate. Capacity on the Dual Drive is 3-1/2" maximum taper per foot and will turn 10" at one setting.

When the carriage is brought into position for taper turning, the bed bracket (F) is locked on the bed ways. The slide rod draw bar is then locked by nut (G). The swivel guide bar (H) is adjusted to the desired taper by loosening nuts (I). This guide is graduated in inches on one end and degrees on the other. With the taper bar clamp nut (J) loosened, the tool is moved into position and the nut relocked. When the carriage feed is engaged, the bed bracket and connecting rod hold the lower taper bar in a fixed position in relation to the bed and work. Movement of the carriage slides gibbed shoe (K) along the taper bar.

The taper attachment bottom slide draw bar (L) in its locked position prevents the cross slide from being moved. The compound rest dial is used in sizing for taper turning. For this reason the compound rest should be at a 30° left setting to bring the screw perpendicular to the work. Avoid unnecessary overhang of this slide to prevent chatter.

Fig. 15

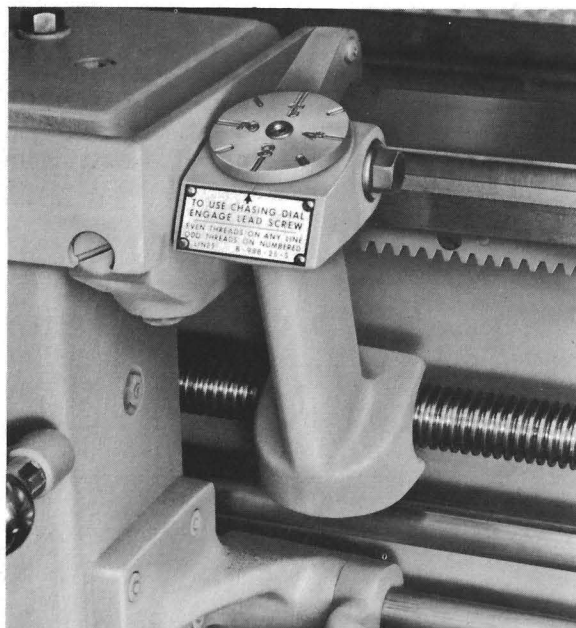


Chasing Dial (Fig. 16)

The chasing dial permits the operator to take a cut, back the tool out and return the carriage to the starting point, set the tool for the next cut, and re-engage the half nut to pick up the same lead without stopping or reversing the spindle.

The chasing or thread indicating dial consists of a worm wheel, which runs in the leadscrew, and a shaft connected to an indicating dial. When chasing even numbered threads, the half-nuts may be engaged at any line on the dial, odd numbered threads at any numbered line and half-threads at any odd numbered line.

Fig. 16

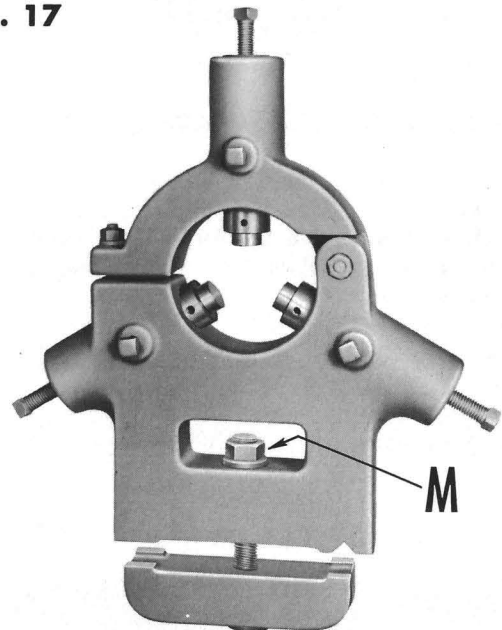


Steady Rest (Fig. 17)

The steady rest, provides a fixed support between the head and tailstock for long round work while it is being turned. The rest is also used to support one end of the work-piece when operations such as boring are used.

Steady rests are clamped in position on the bed by clamp nut (M). Proper position is generally in the center of long work-pieces for turning, and on one end for boring. Two types of jaws are generally used on steady rests, plain or bronze type and roller jaws - adjustment of these jaws should be made in the following manner. Always adjust the bottom jaws first. These jaws should be positioned to keep the work-piece running true. The top jaw is then brought into light contact with the work-piece to support the upward thrusting action that occurs when the work is revolving. Be sure to keep oil on the contact area between the jaw tips and the work. Scoring is usually caused by the top jaw being too tightly clamped and lack of oil. Chatter is generally caused by the top jaw being too loose.

Fig. 17

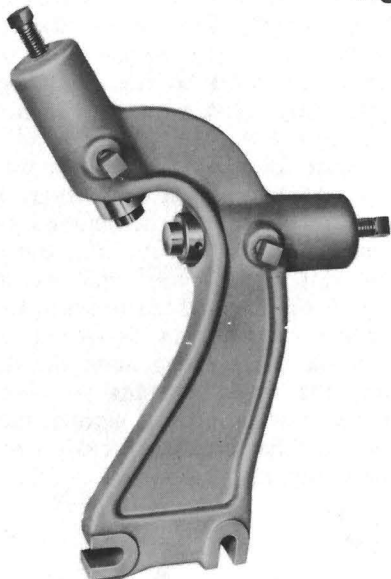


Follow Rest (Fig. 18)

The follow rest is used to support between-center work against the forces of the cut being taken. It is bolted to the carriage and moves with it. This rest is very useful in turning long small diameter work and is a necessity when chasing threads on long screws. Without a follow rest the screw would be inaccurate, due to its springing away from the tool. The follow rest is adjusted to the work-piece in the following manner. First the cut is started and turned approximately 3". The jaws are then set to the

turned diameter after which the cut can be taken across the entire length of the work. When adjusting the jaws to the work, make sure they support but do not bind or twist the work-piece. Practice will give you the proper tension for jaw adjustment.

Fig. 18

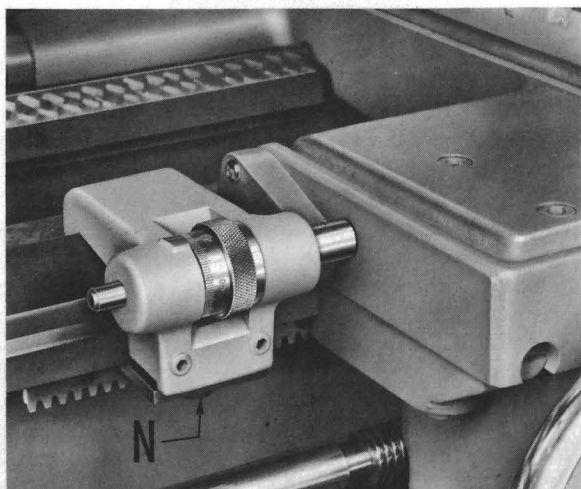


Micrometer Carriage Stop (Fig. 19)

The micrometer carriage stop permits the operator to bring the carriage to the same position accurately on the bed. It is very useful where a series of cuts are desired at accurate decimal dimensions.

The stop is clamped on the front bed way with nut (N). The design of the clamp prevents marring the hardened way while in use. A micrometer screw with hardened ends is turned by a

Fig. 19



large knurled collar which has been graduated for direct reading in thousandths of an inch. The carriage is brought up against the end of the stop by hand. Never run the carriage against the stop with power feed.

LUBRICATION

After installation has been completed, the lathe must be thoroughly lubricated and all reservoirs filled before it is put in operation. Oil levels must be checked regularly and oil cups kept well lubricated in order to get the longest life and smoothest operation from your lathe.

Lubrication points and reservoir fillers are indicated on Figure (20). Use a high grade oxidation inhibited industrial oil, equal to SAE 30, of 500 sec. 100°F.

The headstock and quick change box reservoir is filled at the rear of the headstock (1). Weekly checks should be made at the following points to insure a proper oil level and lubrication: (2) headstock oil filler, oil should be within 1/4" of top; (3) apron filler; (4) quadrant gear oiler; (5) feed rod clutch; (6) apron spindle control rod oiler.

Daily lubrication should be performed at the following points:

7. Apron pump plunger. This will oil the carriage, cross slide, bedways and apron. Before starting machine or moving carriage pump oil until it appears in the tell hole located on the front right hand shear wiper of the carriage.
8. Compound rest oilers (four) including oiler on top slide dial.
9. Tailstock oilers (two).
10. Front flat and rear V-way should always be wiped free from dirt and grit then lightly oiled when moving tailstock along bed. This protects the tailstock bottom from excessive wear thereby keeping the accuracy built into the lathe.
11. Back box oiler.

The headstock and quick change box reservoir drain (12) is located just below the filler. The apron filler and drain are found on the front and bottom of the apron.

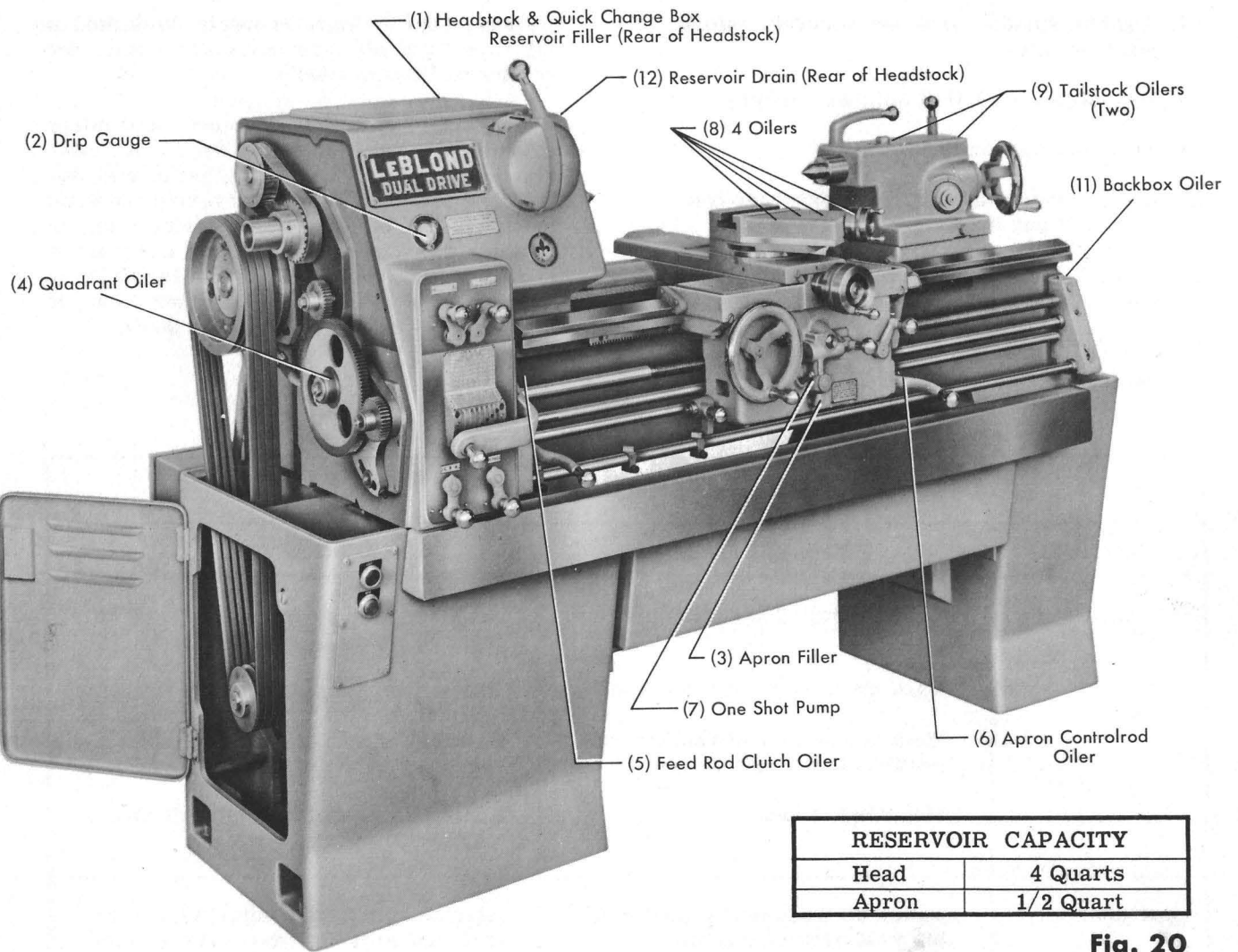


Fig. 20

MAINTENANCE AND ADJUSTMENTS

The following general rules will keep your machine in best running condition and prevent down time for maintenance and repair.

1. Keep general work area clean.
2. Do not remove guards – they are put on for safety and to keep dirt out of your lathe.
3. Make sure the tailstock has been clamped before turning between centers.
4. Don't use your lathe for a work bench. Lathes have been wrecked by a wrench lying on the ways between the carriage and head.
5. Always keep the spindle nose, face plate, chucks and centers clean and dry. Dirt and grit between a face plate and the spindle may cause run out.
6. Headstock and tailstock spindle holes as well as centers must be free from dirt before inserting centers.

7. Tighten spindle lock nut securely before starting lathe.
8. Use lubricant on dead tailstock centers.
9. Keep tool tight in tool holder.
10. Before chasing threads, wipe leadscrew free from dirt and lightly oil.
11. Check direction of feed before engaging the tool to the work-piece.
12. Always disconnect the power before leaving lathe.

Be sure your lathe is properly lubricated at all times and oil reservoirs are filled. See section on "Lubrication".

From time to time your lathe may need minor adjustments. Read the proper section for making these adjustments before performing adjusting operations. Never tear a machine down leaving a box of parts for a service man. He is experienced in trouble shooting and chances are he will save you time and money by doing this work himself. Often corrections can be made without tearing the machine down.

TROUBLE SHOOTING CHART		
TROUBLE	PROBABLE CAUSE	CORRECTION
Vibration	Loose Leveling screws. Torn or mismatched vee belts. Work or chuck out of balance operating at high spindle speeds. Motor out of balance.	Set all screws so they bear evenly on leveling plates. Renew vee belts with matched set. Balance chuck or reduce spindle speed. Contact local representative of motor manufacturer.
Chatter	Cutter bit improperly ground or too wide area of contact. Tool overhang too great. Using improper surface feet. Feed rate too high or low. Gibs of cross slide or compound rest loose. Work improperly supported. Vibration Spindle bearing loose.	Regrind cutter bit or adjust tool holder so that area of contact between tool bit and work is decreased. Keep point of cutter bit as close as possible to tool holder. Reduce or increase spindle speed. Reduce or increase feed. Adjust gibs. Adjust tailstock center. Use steady rest or follow rest on long slender shafts. See "Vibration" trouble above. Adjust spindle bearings.
Work not turned straight	Headstock and tailstock centers not aligned.	Align tailstock center.

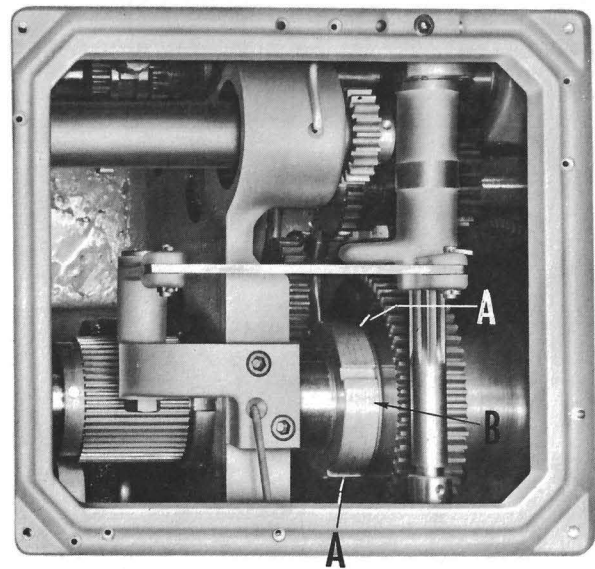
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TROUBLE SHOOTING CHART (Continued)		
TROUBLE	PROBABLE CAUSE	CORRECTION
Work not turned straight (cont'd)	Work improperly supported. Bed not level. Tool not on center when using taper attachment.	Use steady rest or follow rest. Reduce overhang from chuck. Relevel bed, using precision level. Put tool on center.
Work out of round	Work loose between centers or centers are excessively worn - work centers out of round.	Adjust tailstock center. Re grind centers. Lap work centers.
Cross slide or compound rest movement does not coincide with dial movement or respective adjusting screw.	Gib setting too tight or too loose. Work is too long and slender.	Adjust gibs. Use steady rest or follow rest.

Headstock Spindle Bearing Adjustment (Fig. 21)

When adjusting the spindle bearing, use small face plate on spindle nose. Remember that a slight drag should be felt when the bearing is adjusted correctly.

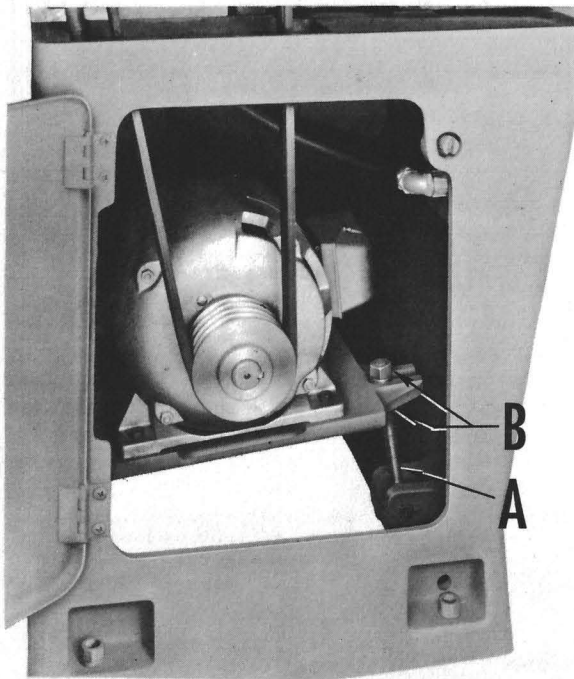
1. Remove the head cover.
2. Locate the two hex head set screws (A) on the center bearing nut. Loosen.
3. Tighten (or loosen) the center bearing nut (B). This is the adjusting nut.
4. Tighten the two hex head set screws (A) on the adjusting nut.
5. Replace the head cover and bolt firmly to prevent oil leakage.



Belt Tension Adjustment (Fig. 22)

The motor is mounted on a hinged plate in the back of the headstock leg. The hinged plate is adjusted by means of screw (A) and locknuts (B) in the leg to regulate the tension on the three V-belts. Belts should have approximately 1/2" spring to provide enough tension to take the cuts without slipping. Too much tension on the belts will cause a strain on the motor and drive shaft bearings, causing excessive wear. Oil on the belt will cause slippage.

Fig. 22



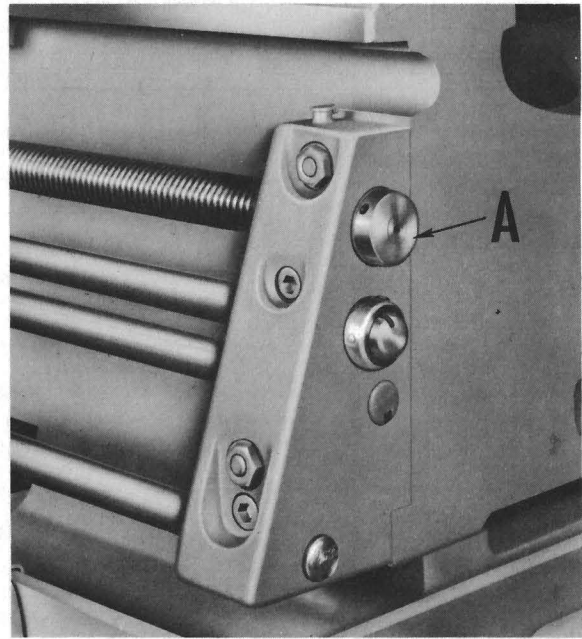
Leadscrew Adjustment (Fig. 23)

The leadscrew has been properly adjusted before the machine has been shipped. With normal care, no adjustment will be necessary for many years.

NOTE: The leadscrew is used only for chasing on Dual Drive lathes. Under all other operations, it does not revolve. Excessive wear to the leadscrew and half nut take place when the leadscrew is not cleaned before chasing if it has not been used for some time. Always wipe leadscrew with an oily rag to remove dirt and grit under these conditions.

To eliminate end play in the leadscrew, tighten nut (A).

Fig. 23

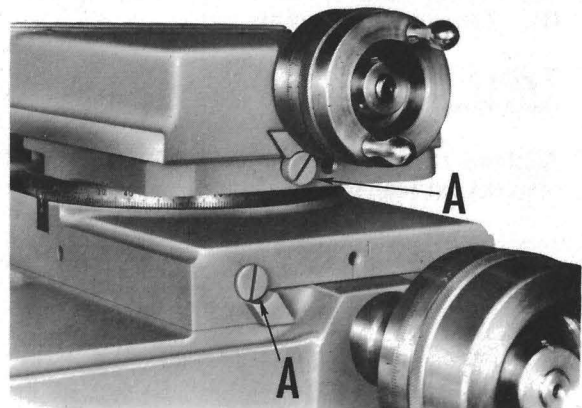


Cross Slide and Top Slide Gib Adjustment (Fig. 24)

If the gibs on the cross slide and top slide are loose, the compound rest will wobble slightly causing inaccurate work. To adjust these gibs follow this procedure:

1. Loosen the gib screw at the small end of the gib.
2. Tighten adjusting screw (A) at the large end of the gib, until a slight drag is felt when the slide is moved. Retighten screw at small end of gib.

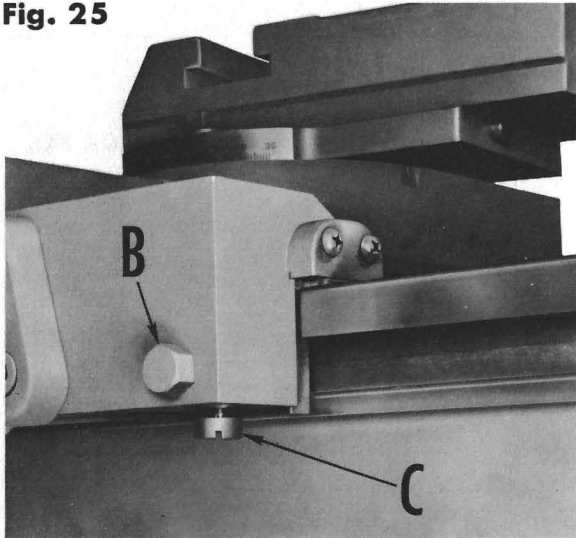
Fig. 24



Carriage Rear Gib Adjustment (Fig. 25)

The carriage rear gib is adjusted by moving it vertically upward. To adjust the gib, loosen head screw (B) which holds the gib against the rear wall of the carriage. Tighten screw (C) that moves the gib vertically upwards until a slight drag is felt as the carriage is moved along the bed. Tighten the hex screws. Repeat with other rear gib.

Fig. 25



Carriage Front Gib Adjustment (Fig. 26)

There are two gibs located at both sides of the carriage front. Nuts (D) hold the gib bracket to the carriage from underneath. The gib adjusting screw (E) is found at the front edge of the carriage. When adjusting the front carriage gibs:

1. Loosen two gib bracket nuts (D).

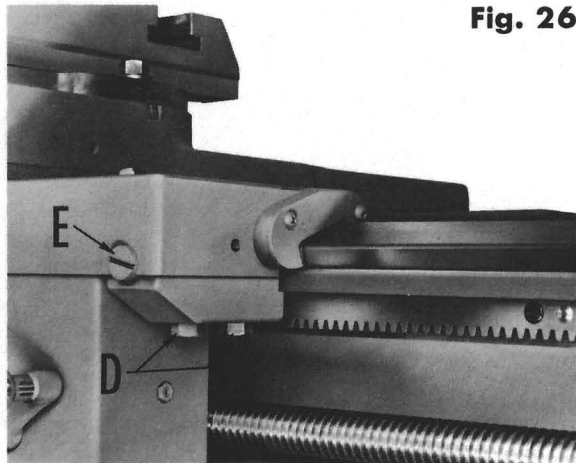


Fig. 26

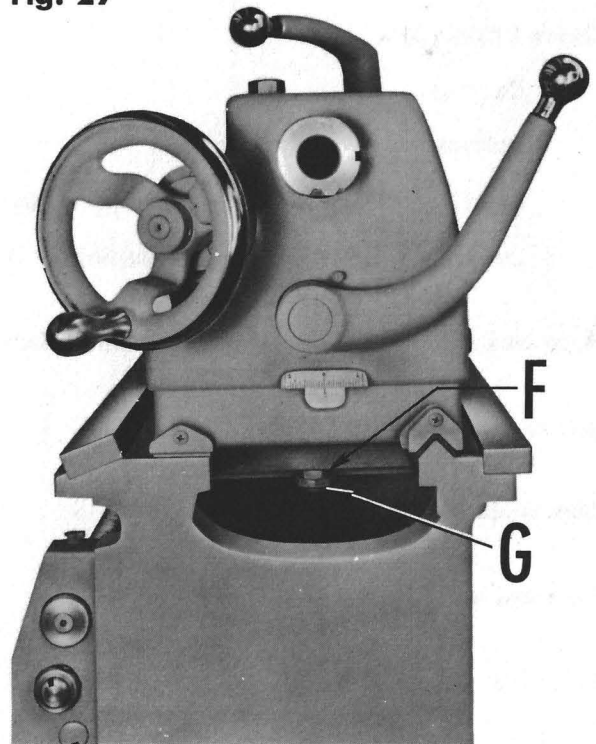
2. Adjust gib adjusting screw (E) until there is a slight drag when the carriage is moved along the bed.
3. Tighten gib bracket nuts (D).
4. Repeat with other front gib.

Tailstock Quick Clamping Lever Adjustment (Fig. 27)

Beneath the Tailstock Bed clamp are two nuts, an adjusting nut (F) and a locking nut (G). To tighten the quick clamp lever, draw up the adjusting nut (F) so that the desired tightness of the clamp is achieved.

Lock the adjusting nut with the lock nut (G). If the quick clamp is too tight, first loosen the lock nut and back off the adjusting nut until the correct tightness is achieved. Lock the adjusting nut with the lock nut.

Fig. 27



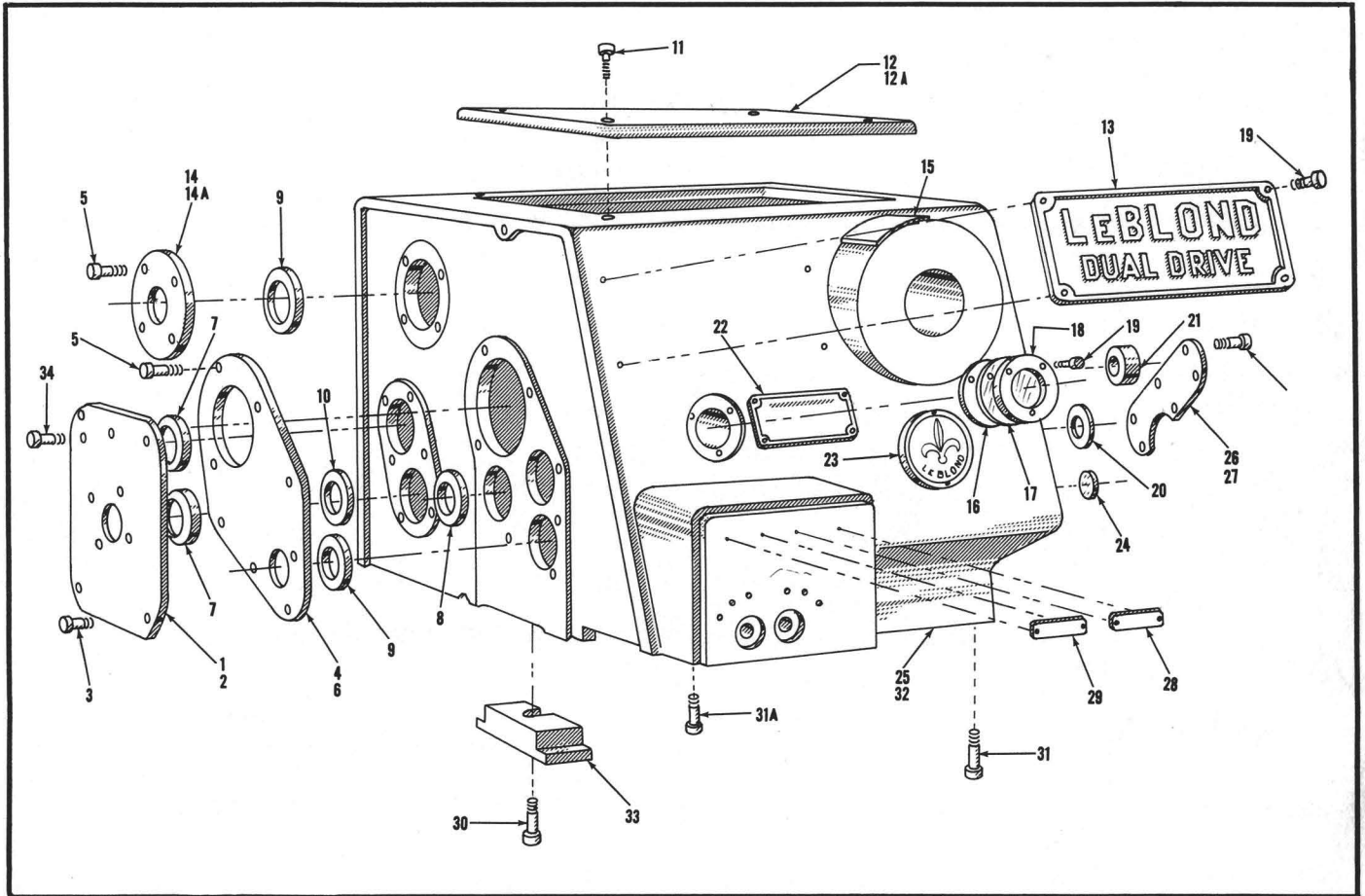
INSTRUCTIONS FOR ORDERING PARTS

When ordering repair parts, the following information must be given for best service.

1. Serial number of the lathe. This can be found on the front flat at the tailstock end of the bed.
2. The name of the part, the key number of the part, and the page number on which the part appears in the book.

REPAIR PARTS INDEX

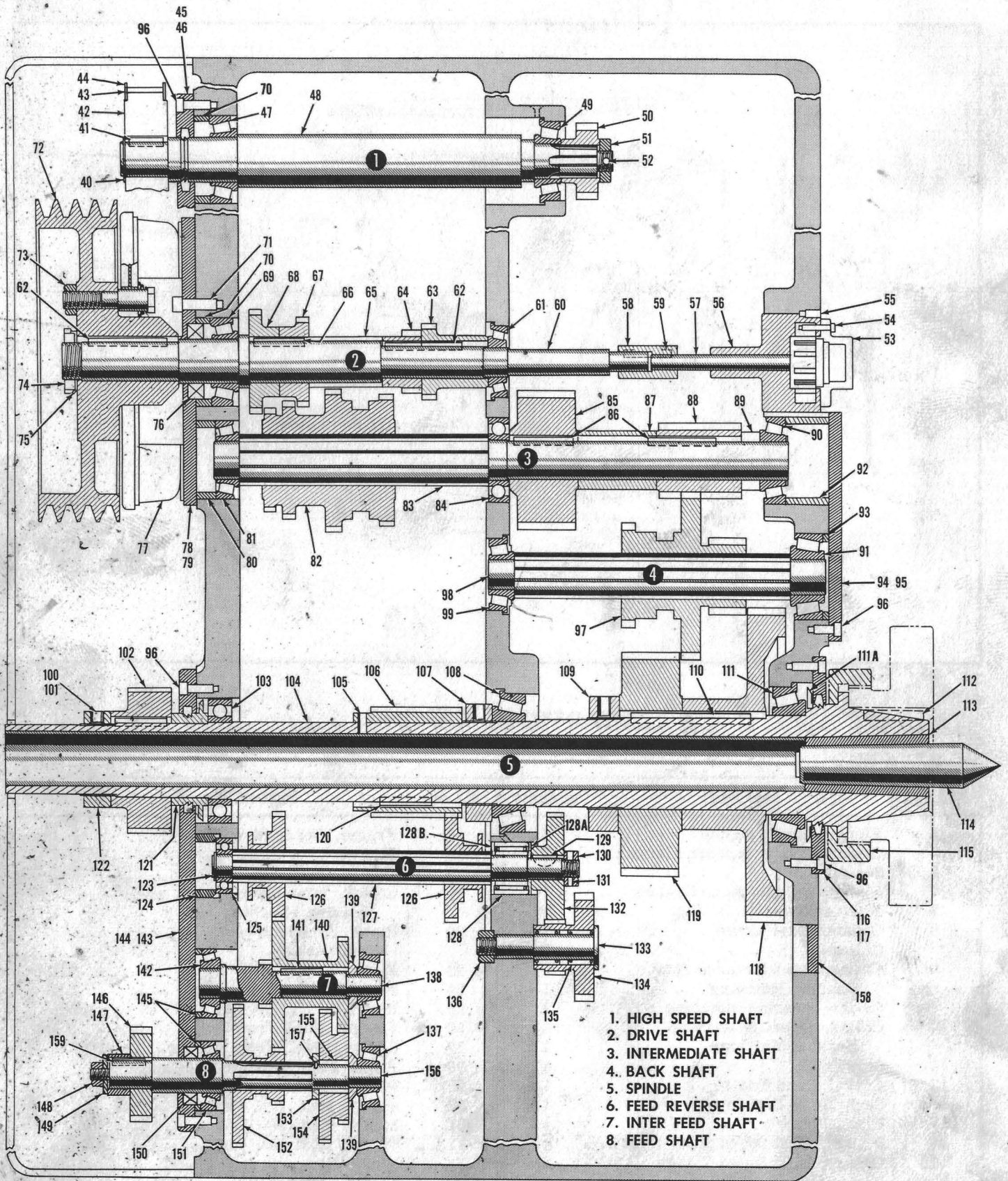
DRAWING	PAGE NO.
Headstock	
Casting	23
Rollout	24-25
Head Shifters	26-27
Quick Change Box	
Casting	28
Rollout	29
Lead Screw - Feed Rod - Feed Spline Shaft - Cone Shaft	30
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Back Box - Electric Control Multiple Auto. Length Stop	32-33
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Carriage and Chasing Dial Bracket	37
Tailstock	38-39
Bed, Pan, Legs, Head End Cover, Coolant Pump with Piping	40-41
Motor Drive and Motor Mounting Assembly	42
Taper Attachment	43



HEADSTOCK CASTING

KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
1	Flange, Brake Support	1	18	Frame, Oil Sight Window	1
2	Gasket, Brake Support Flange	1	19	Screws	7
3	Screws	4	20	Collar, Back Gear	1
4	Flange, Spindle Rear Bearing	1	21	Collar, Inter. Shaft Front Bearing Matching	1
5	Screws, Sock. H. D. Cap	22	22	Plate, Spindle Speed Instruction	1
6	Gasket, Rear Cover	1	23	Plate	1
7	Collar	2	24	Plug, Steel	1
8	Collar, Feed Reverse Shaft Bearing Matching	1	25	Head	1
9	Collar, Bearing Matching	2	26	Flange, Head Front	1
10	Collar, Inter. Shaft Rear Bearing Matching	1	27	Gasket, Head Front Flange	1
11	Screws	4	28	Plate, Feed Reverse	1
12	Cover, Head Top	1	29	Plate, Feed Compound	1
12A	Seal, Head Top Cover	1	30	Screw, Hex. Hd. Cap	1
13	Plate, Name	1	31	Screw, Hex. Hd. Cap	1
14	Flange, High Speed Shaft	1	31A	Screw, Hex. Hd. Cap	1
14A	Gasket, High Speed Flange	1	32	Plug, Pipe	2
15	Plate, Spindle Speed	1	33	Clamp, Head to Bed	1
16	Gasket	2	34	Screw, Sock. Hd. Cap	6
17	Window, Oil Sight	1			

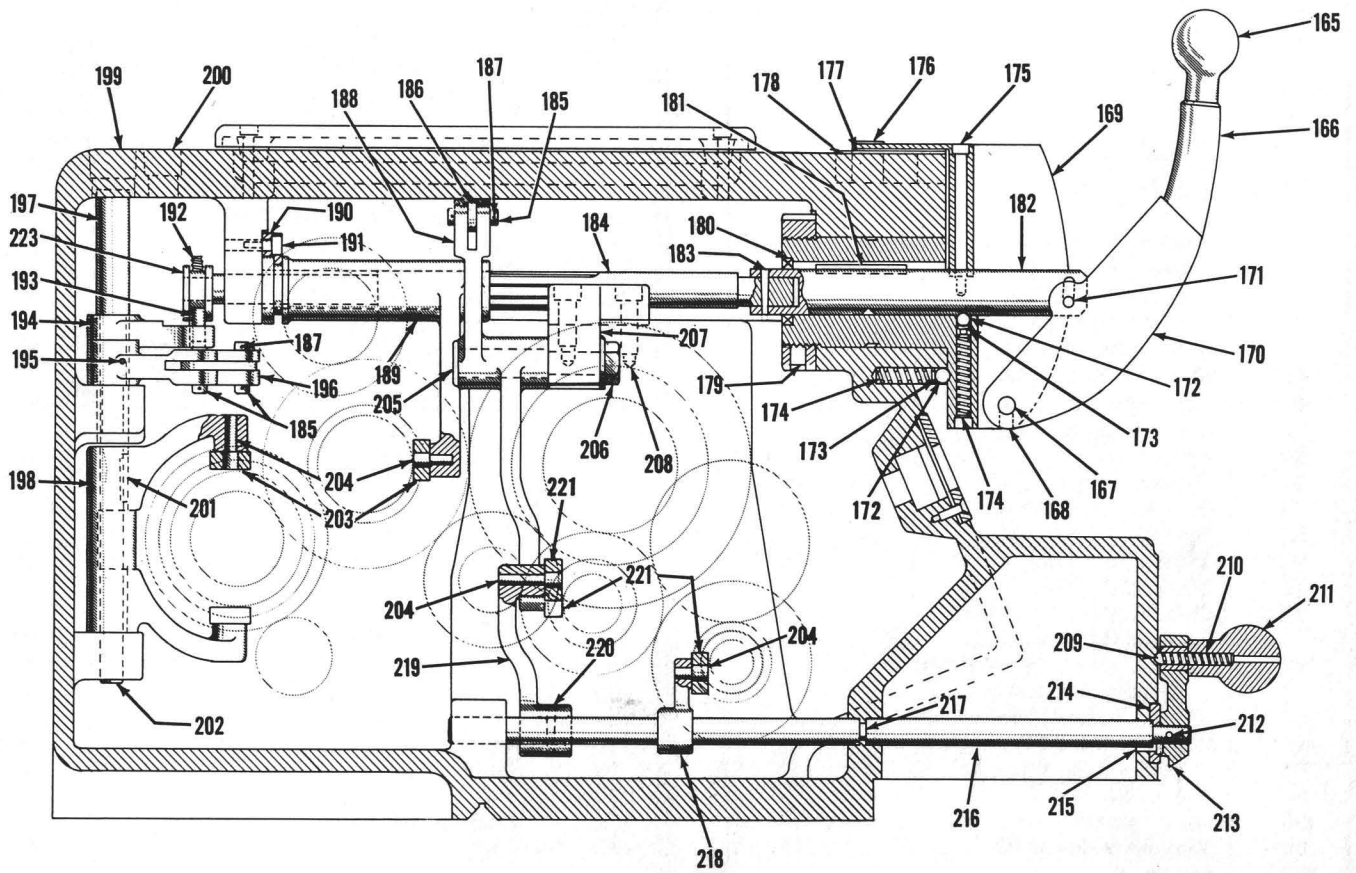
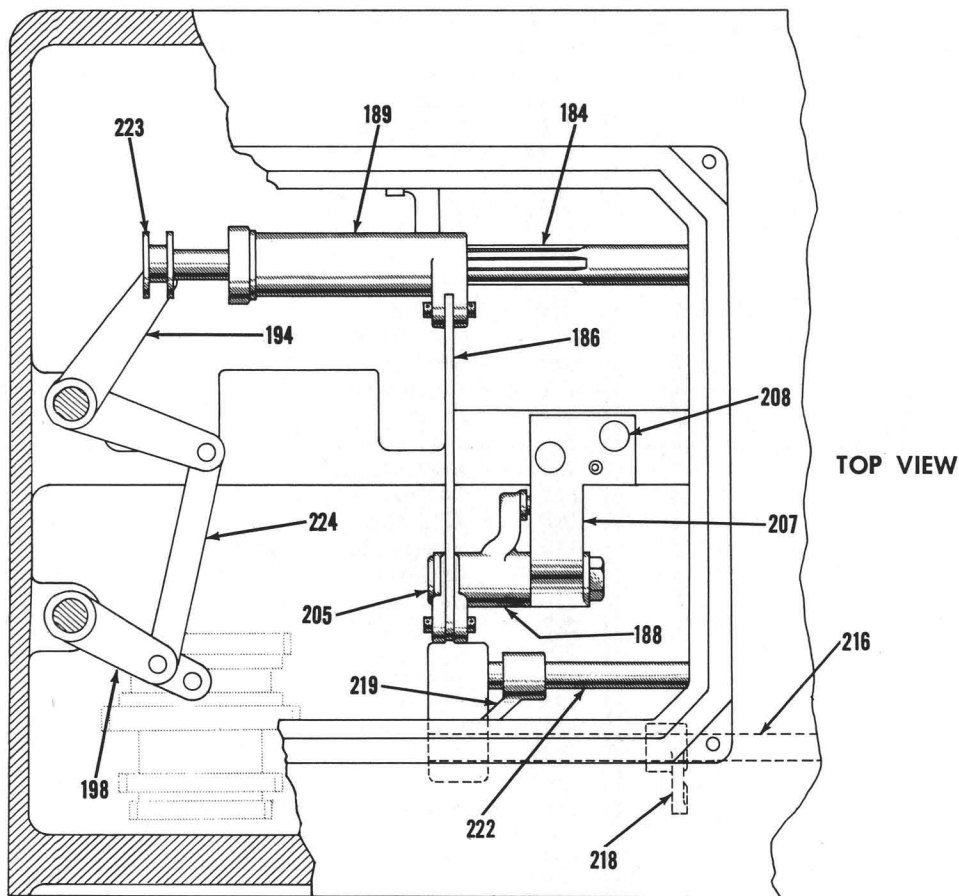
IMPORTANT—Include serial number of your lathe when ordering repair parts.



HEADSTOCK ROLLOUT

KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
40	Snap, Ring	1	101	Plug	2
41	Key	1	102	Pulley, Spindle High Speed	1
42	Pulley	1	102A	Timing Belt	1
43	Screws	8	103	Ball Bearing	1
44	Flanges for Pulley	2	104	Spindle	1
45	Flange, High Speed Shaft	1	105	Pin, Spindle Feed Gear	1
46	Gasket, High Speed Shaft Flange	1	106	Gear, Spindle Feed Drive	1
47	Timken, Bearing #2	1	107	Nut, Spindle Adjusting	1
48	Shaft, High Speed	1	108	Timken Bearing #3	1
49	Timken Bearing #2	1	109	Nut, Spindle	1
50	Pinion	1	110	Key, Spindle Face Gear	1
51	Nut	1	111	Timken Bearing #3	1
52	Pin, Taper	1	111A	Slinger, Spindle Front Oil	1
53	Tuthill Pump (Stripped Model)	1	112	Key, For Spindle Nose	1
54	Screw	6	113	Bushing, Spindle Center	1
55	Screw, Set	1	114	Center, Spindle	1
56	Adapter, Pump	1	115	Nut, Draw	1
57	Shaft	1	116	Flange, Spindle Front	1
58	Coupling, Drive Shaft Pump	1	117	Gasket, Spindle Front Flange	1
59	Key, Coupling Feather	1	118	Gear, Spindle Face	1
60	Shaft, Drive	1	119	Gear, Spindle High Speed	1
61	Timken Bearing #2	1	120	Key	2
62	Key	2	121	Slinger, Spindle Rear Oil	1
63	Gear, Drive Shaft 3rd.	1	122	Nut, Spindle Rear	1
64	Pinion, Drive Shaft	1	123	Snap Ring	1
65	Spacer, Drive Shaft Gear	1	124	Collar, Feed Reverse Shaft Bearing Matching	1
66	Key	1	125	Bearing, Feed Reverse Shaft Ball Matching	2
67	Gear, Drive Shaft 2nd	1	126	Gear, Feed Reverse Sliding	2
68	Gear, Drive Shaft Large	1	127	Shaft, Feed Reverse	1
69	Timken Bearing #2	1	128	Bearing, Feed Reverse Shaft	1
70	Collar, Bearing Matching	2	128A	Collar	1
71	Screw, Soc. Hd. Cap	6	128B	Collar	1
72	Pulley, Drive	1	129	Key, Feed Reverse Shaft	1
73	Nut	3	130	Collar	1
74	Locknut	1	131	Pin, Feed Reverse Shaft Taper	1
75	Lockwasher	1	132	Gear, Feed Reverse Shaft	1
76	Seal (Victoprene)	1	133	Stud, Idler Gear	1
77	Warner Electric Brake (Outside Mounting)	1	134	Gear Idler	1
78	Flange, Brake Support	1	135	Bearing, Idler Gear Needle	2
78A	Screws	4	136	Nut, Idler Gear Stud	1
79	Gasket, Brake Support Flange	1	137	Timken Bearing	1
80	Collar, Inter. Shaft Rear Bearing Matching	1	138	Shaft, Inter. Feed	1
81	Timken Bearing #2	1	139	Collar, Spacing	1
82	Gear, Cluster	1	140	Gear	1
83	Shaft, Intermediate	1	141	Key	1
84	Ball Bearing	1	142	Timken Bearing	1
85	Gear, High Speed	1	143	Flange, Spindle Rear Bearing	1
86	Key	1	144	Gasket, Rear Cover	1
87	Spacer Collar, Long	1	145	Collar	2
88	Pinion, Low Speed	1	146	Gear, Feed Change	1
89	Spacer, Collar, Short	1	147	Collar, Change Gear	1
90	Timken Bearing #2	1	148	Nut	1
91	Timken Bearing #2	1	149	Washer	1
92	Collar, Back Gear Front Bearing Matching	1	150	Seal, Victoprene	1
93	Collar, Inter. Shaft Front Bearing Matching	1	151	Timken Bearing #2	1
94	Flange, Head Front Flange	1	152	Gear, Feed Shaft Sliding	1
95	Gasket, Head Front Cover	1	153	Collar, Idler Gear Thrust	1
96	Screw, Sock. Hd. Cap	22	154	Gear, Feed Reverse Idler	1
97	Gear, Sliding	1	155	Bushing, Reverse Idler Gear	1
98	Shaft, Back Gear	1	156	Shaft, Feed	1
99	Timken Bearing #2	1	157	Pin	1
100	Screw	2	158	Plug, Steel	1
			159	Key	1

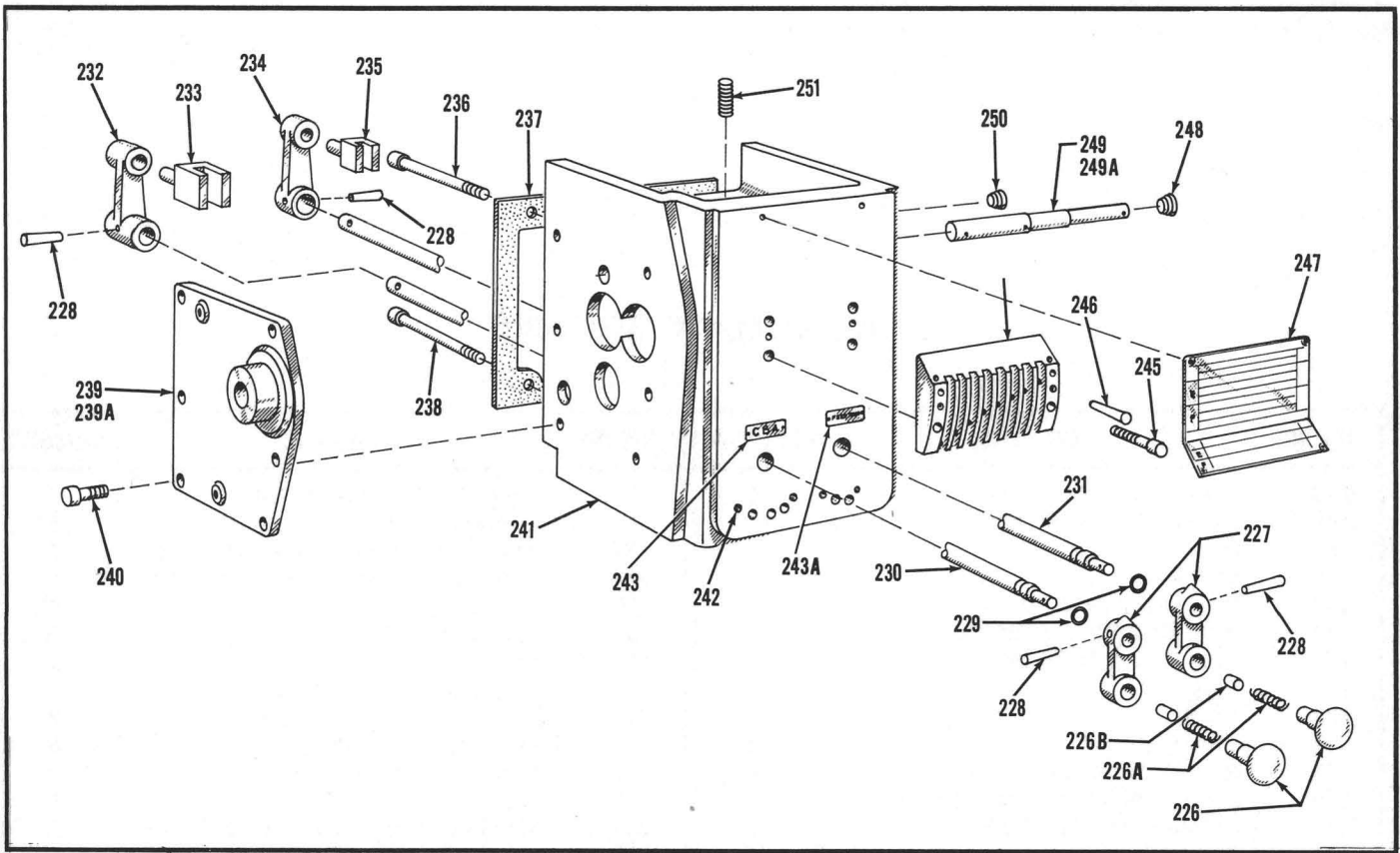
IMPORTANT—Include serial number of your lathe when ordering repair parts.



HEADSTOCK SHIFTERS

KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
165	Knob, Shifter Handle	1	196	Arm, Inter. Shaft Cluster	
166	Lever, Speed Change	1		Gear Shifter	1
167	Pin	1	197	Stud, Shifter Shaft Rocker	1
168	Screw, Set	1	198	Yoke, Inter. Shaft Cluster Gear	1
169	Bracket, Speed Change	1	199	Pipe Plugs	2
170	Pin, Bracket Lever Hinge	1	200	Pipe Plug	1
171	Pin, Lever Index Shaft	1	201	Key	1
172	Ball	2	202	Pin, Shifter Yoke Hinge	1
173	Plunger	2	203	Shoe, Inter. Shaft Cluster	2
174	Spring	2	204	Pin, Shafter Yoke Shoe	5
175	Screw, Sock. Hd. Cap 1/4"x3"	1	205	Stud, Shifter Bracket	1
176	Arrow, Speed Change Position	1	206	Nut	1
177	Pointer, Speed Change	1	207	Bracket, Feed Gear Drive Shifter	1
178	Plate, Speed		208	Screw, Socket Head Cap	2
179	Nut	1	209	Plunger, Shifter Handle	1
180	Oil Seal, Victoprene	1	210	Spring	1
181	Key	1	211	Knob, Shifter Handle	1
182	Shaft, Speed Change Index	1	212	Pin, Taper	2
183	Pin, Taper	1	213	Handle, Shifter Shaft	1
184	Shaft, Speed Change Shifter	1	214	Plate, Shifter Shaft Retainer	1
185	Pin, Tie Link	4	215	Screw	4
186	Link, Feed Gear Shifter Tie	1	216	Shaft, Shifter	1
187	Pin, Cotter	8	217	O-Ring	2
188	Shifter, Feed Gear Drive	1	218	Shifter Arm	1
189	Yoke, Back Gear Shifter	1	219	Shifter Arm, Feed Reverse	1
190	Plate, Shifter Yoke Retainer	1	220	Pin, Taper	2
191	Screw, Sock. Hd. Cap	2	221	Shoe, Shifter Arm	3
192	Pin, Taper Draw	1	222	Shaft, Feed Reverse Shifter	1
193	Pin, Shoulder	1	223	Spool, Speed Change Shaft	1
194	Arm, Shifter Shaft Rocker	1	224	Link, Rocker & Shifter Arm Tie	1
195	Pin, Taper	1			

IMPORTANT—Include serial number of your lathe when ordering repair parts.



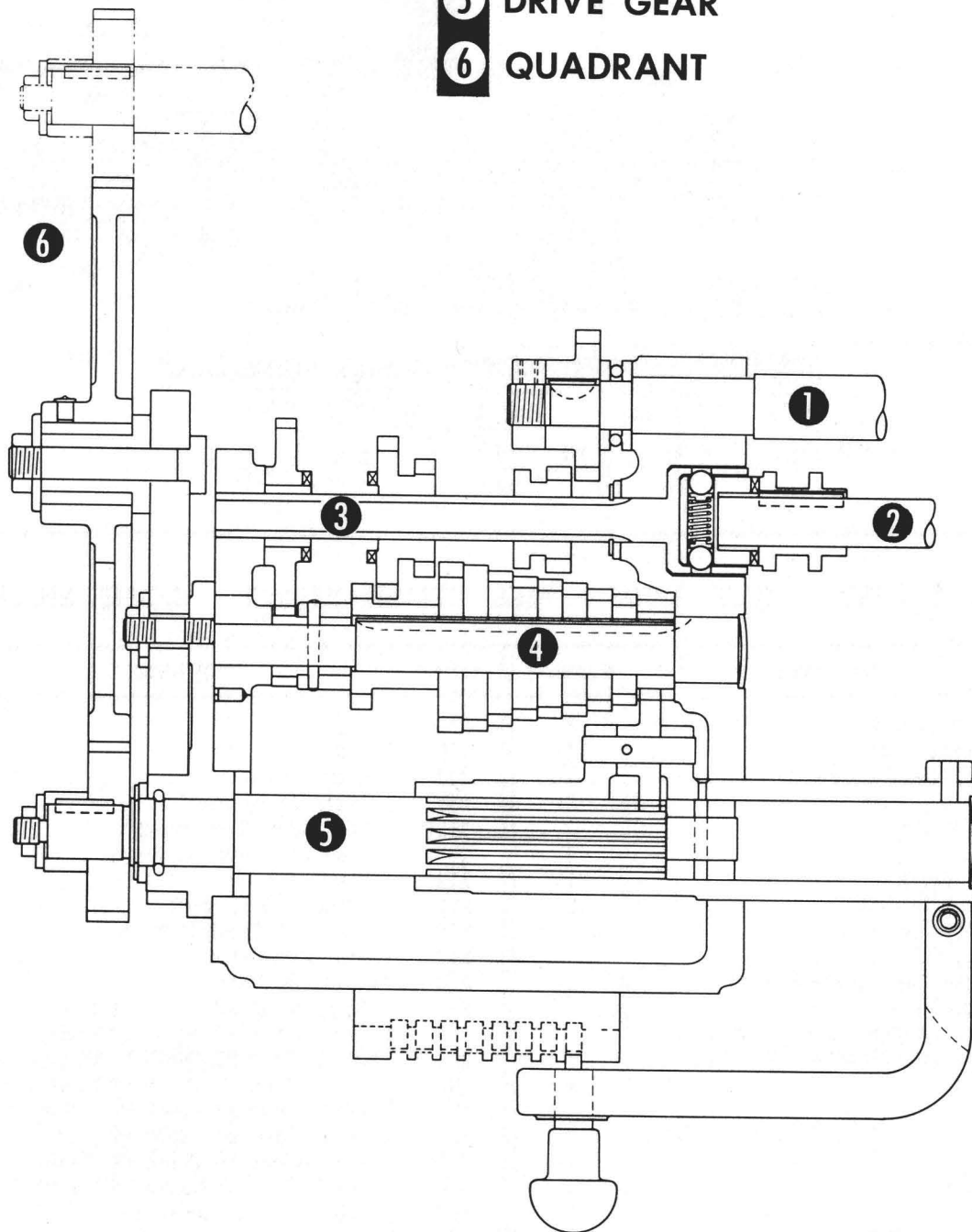
QUICK CHANGE BOX CASTING

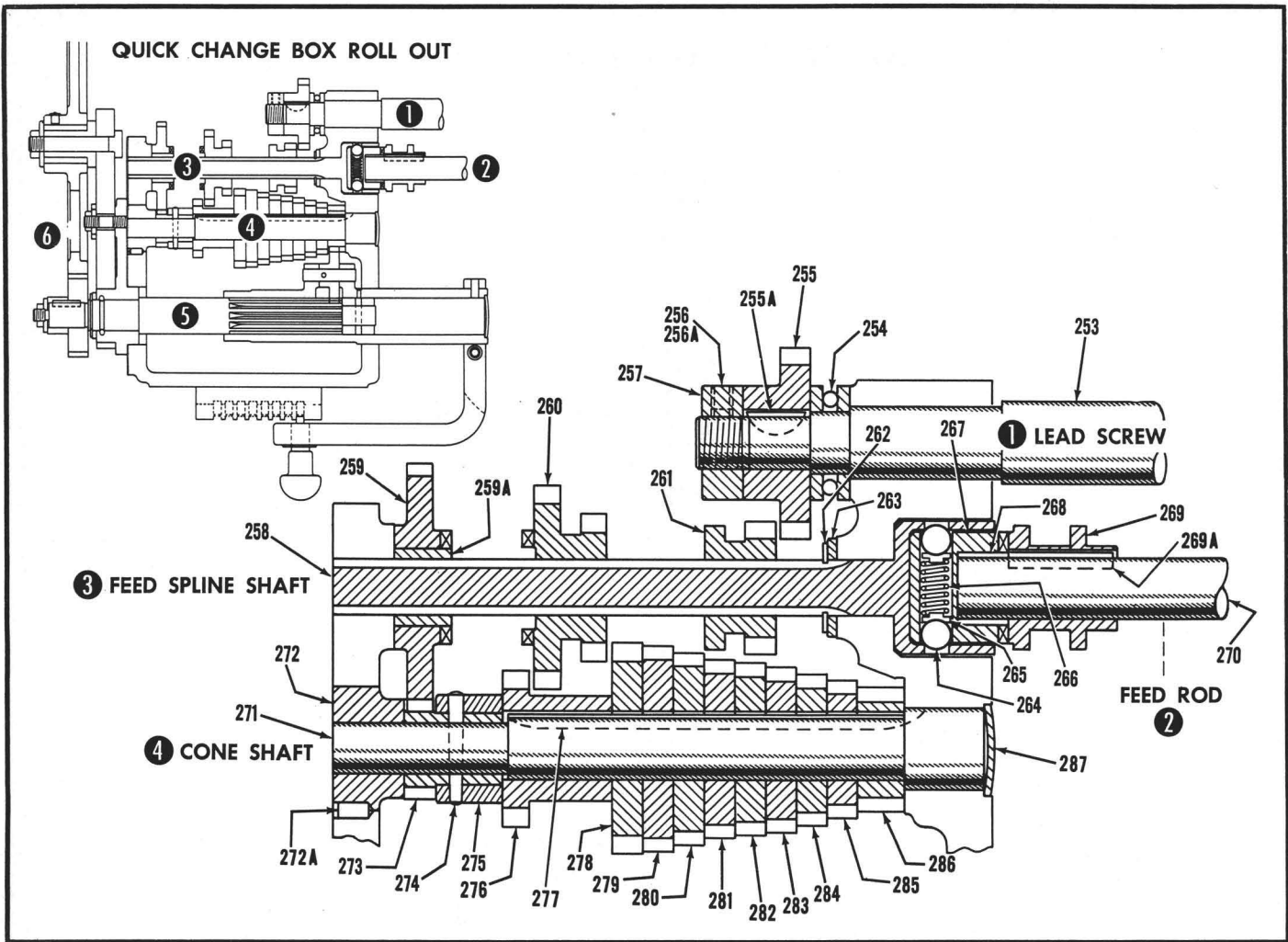
KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
226	Knob	2	239A	Gasket, Quick Change Box Bush .	1
226A	Spring (Alter to Suit)	2	240	Screw	6
226B	Plunger, Shifter Handle	2	241	Box, Quick Change	1
227	Handle, Shifter	2	242	Pin (not shown)	4
228	Pin	4	243	Plate, Speed Change	1
229	Ring "O"	2	243A	Plate, Feed and Thread	1
230	Shaft, Feed Shifter	1	244	Plate, Shifter Arm Locating . . .	1
231	Shaft, Screw Shifter	1	245	Screw	4
232	Lever, Shifter	1	246	Pin, Taper	2
233	Shoe, Shifter	1	247	Plate, Index	1
234	Lever, Shifter	1	248	Plug	1
235	Shoe, Shifter	1	249	Pipe, Oil Distributor	1
236	Screw, Soc. Hd. Cap	2	249A	Plug, Distributor Pipe	2
237	Gasket, Quick Change Box	1	250	Plug	1
238	Screw, Soc. Hd. Cap.	2	251	Screw, Set	1
239	Bush, Quick Change Box	1			

IMPORTANT—Include serial number of your lathe when ordering repair parts.

QUICK CHANGE BOX ROLLOUT

- ① LEAD SCREW
- ② FEED ROD
- ③ FEED SPLINE SHAFT
- ④ CONE SHAFT
- ⑤ DRIVE GEAR
- ⑥ QUADRANT



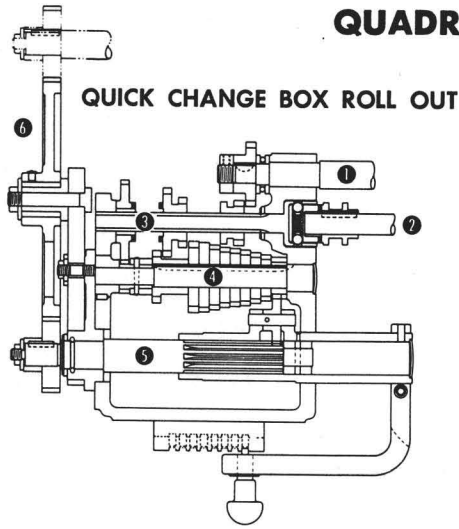


LEAD SCREW — FEED ROD — FEED SPLINE SHAFT — CONE SHAFT

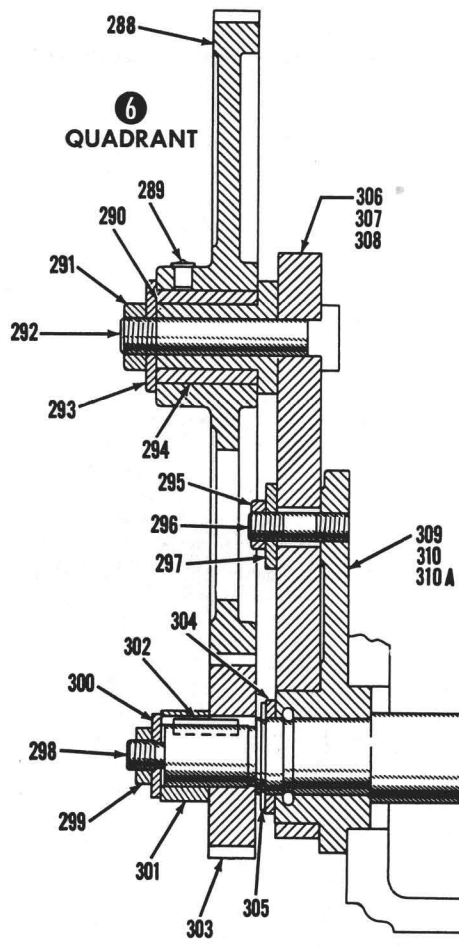
KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
253	Screw, Lead	1	269A	Key	1
254	Bearing, Thrust	1	270	Rod, Feed	1
255	Gear, Lead Screw	1	271	Shaft, Cone	1
255A	Key	1	272	Bush, Cone Shaft	1
256	Screw, Set	2	272A	Pin, Cone Shaft Bush	1
256A	Plug	2	273	Gear, 15 Teeth 14 Pitch	1
257	Nut, Block	1	274	Pin	1
258	Shaft, Feed Spline	1	275	Collar, Cone Shaft	1
259	Gear, Clutch	1	276	Gear, 15 Teeth 9 Pitch	1
259A	Bush, Clutch Gear	1	277	Key, Cone Shaft	1
	Use Casting (B-8A-66)	1	278	Gear, 21 Teeth 9 Pitch	1
260	Gear, Sliding	1	279	Gear, Cone 28 Teeth 12 Pitch	1
261	Gear, Lead Screw Sliding	1	280	Gear, Cone 26 Teeth 12 Pitch	1
262	Ring, Snap Truarc	1	281	Gear, Cone 24 Teeth 12 Pitch	1
263	Collar	1	282	Gear, Cone 23 Teeth 12 Pitch	1
264	Ball	2	283	Gear, Cone 22 Teeth 12 Pitch	1
265	Plug	2	284	Gear, Cone 20 Teeth 12 Pitch	1
266	Spring	1	285	Gear, Cone 18 Teeth 12 Pitch	1
267	Clutch	1	286	Gear, Cone 16 Teeth 12 Pitch	1
268	Bush, Oilite	1	287	Plug	1
269	Clutch, Length Stop	1			

IMPORTANT—Include serial number of your lathe when ordering repair parts.

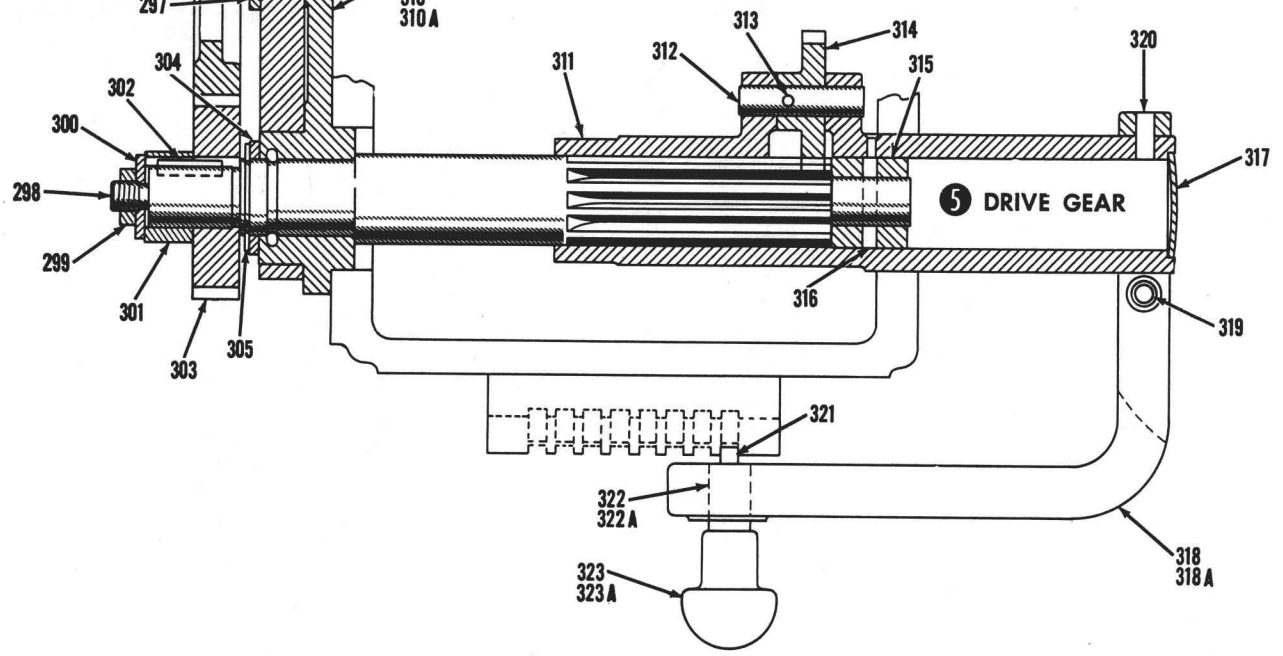
QUADRANT — DRIVE GEAR AND YOKE SHIFTER ARM

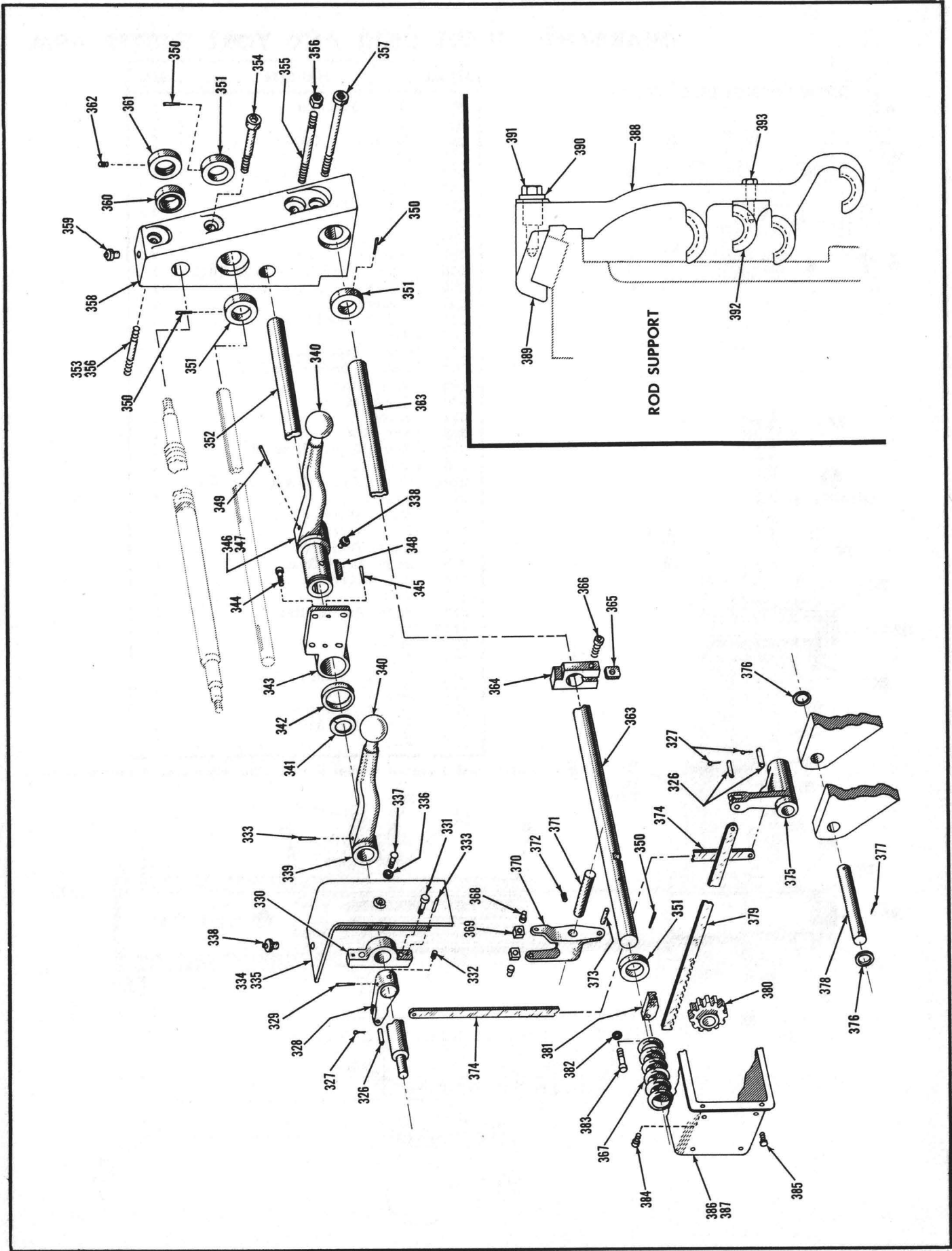


KEY NO.	PART NAME	QTY.
288	Gear, Quadrant	1
289	Oiler	1
290	Bush, Gear Oilite	1
291	Nut	1
292	Bolt, Quadrant Gear	1
293	Washer	1
294	Bush, Quadrant Gear	1
295	Nut	2
296	Stud	2
297	Washer	2
298	Gear, Drive 12 Teeth 12 Pitch	1
299	Nut, Hex	1
300	Washer	1
301	Collar, Feed Gear	1
302	Key	1
303	Gear, Feed	1
304	Collar, Drive Gear Shaft	1
305	Ring, Snap	1
306	Quadrant	1
307	Screw	1
308	Nut, Hex	1
309	Bush, Quick Change Box	1
310	Screw	6
310A	Gasket, Quick Change Box Bush	1
311	Yoke	1
312	Shaft, Tumbler Gear	1
313	Pin, Taper	1
314	Gear, Tumbler	1
315	Bush, Drive Gear	1
316	Pin, Taper	1
317	Plug	1
318	Arm, Yoke Shifter	1
318A	Pin	1
319	Screw	1
320	Pin	1
321	Plunger, Knob	1
322	Sleeve, Knob	1
322A	Spring, (Cut to Suit)	1
323	Knob, Yoke Shifter	1
323A	Pin	1



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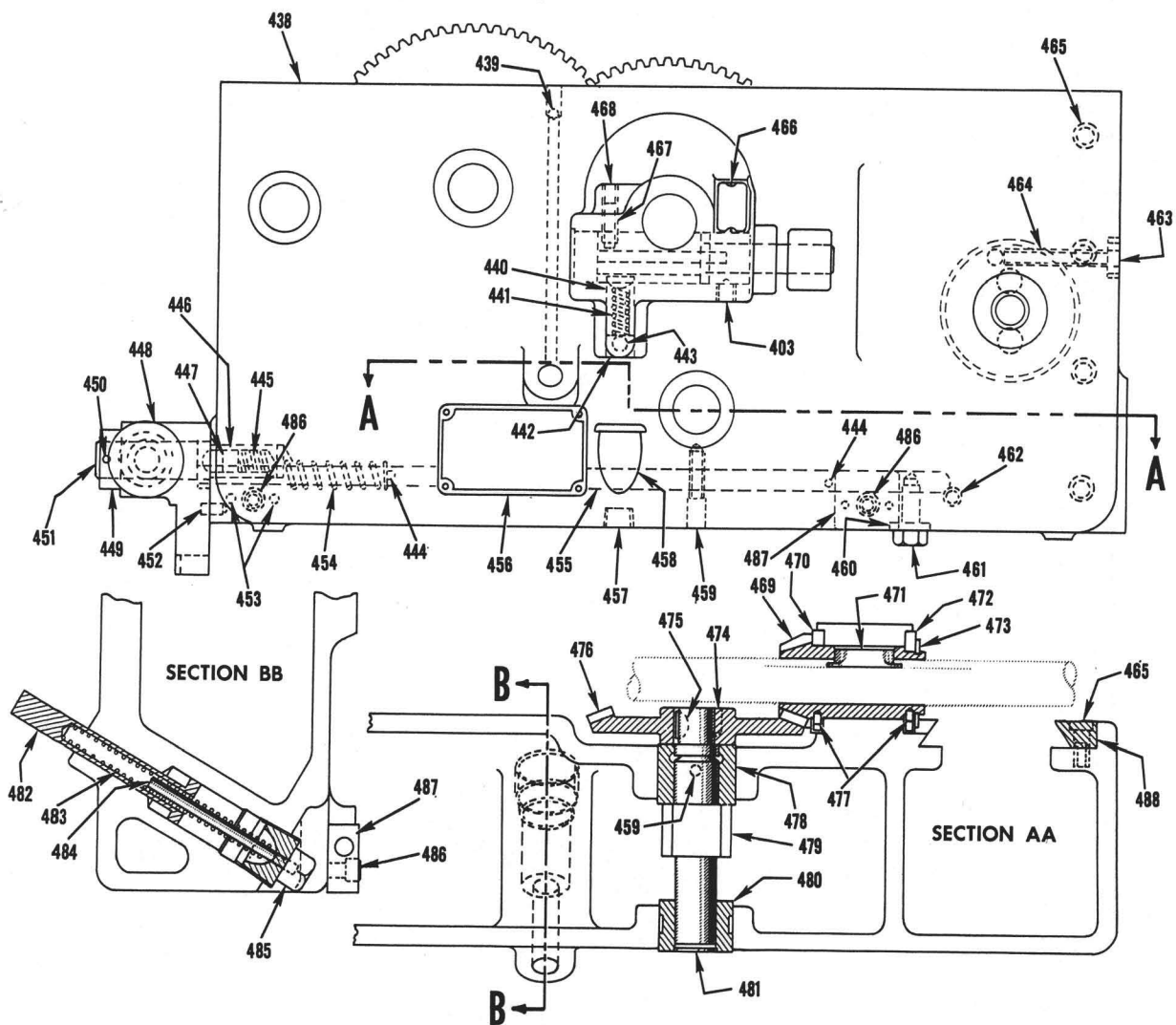
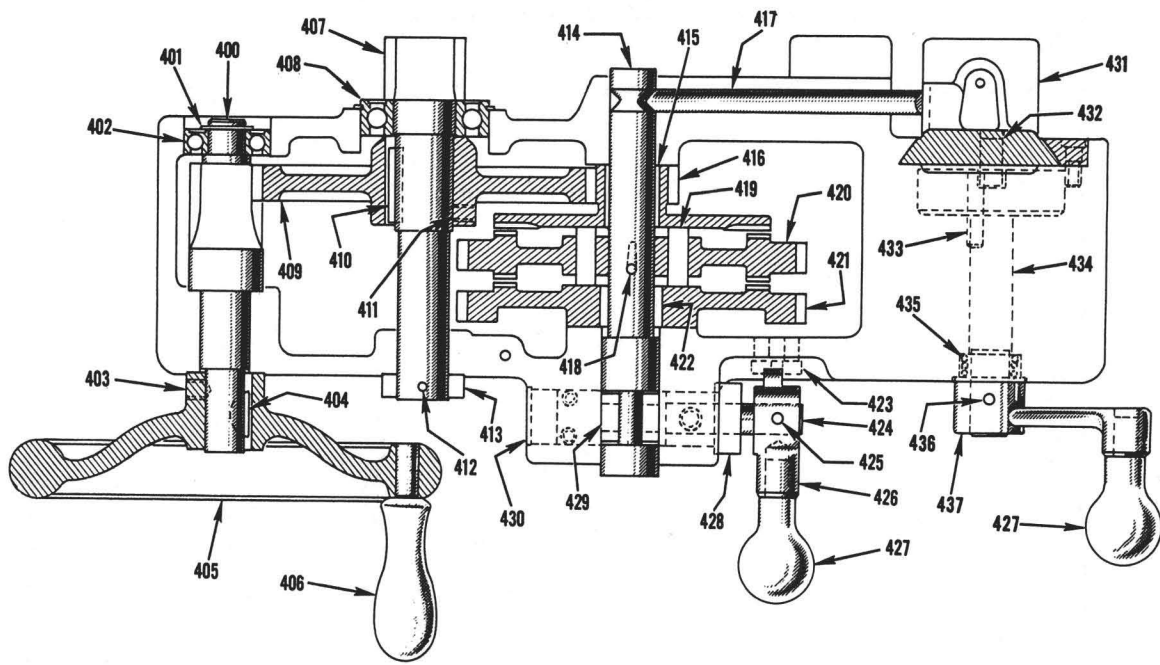




BACK BOX — ELECTRIC CONTROL MULTIPLE AUTO. LENGTH STOP

KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
326	Pin, Drill Link	3	360	Bearing Thrust	1
327	Pin, Cotter	6	361	Nut, Block	1
328	Link, Shifter	1	362	Screw, Set	1
329	Pin, Taper	2	363	Shaft, Length Stop	1
330	Bracket, Control Rod Support	1	364	Dog, Trip	3
331	Screw, Socket Head	2	365	Key, Trip Dog	3
332	Screw, Set	1	366	Screw	3
333	Pin, Straight	2	367	Spring	1
334	Cover, Top	1	368	Pin, Shoulder	2
335	Screw, Set	1	369	Shoes, Shifter	2
336	Washer, Lock	1	370	Yoke, Clutch Throw Out	1
337	Screw	1	371	Pin, Yoke	1
338	Oiler	2	372	Screw, Dog Point	1
339	Lever, Head Control	1	373	Pin	1
340	Ball Handles	2	374	Link, Bell Crank	1
341	Ring, Snap (Truarc)	1	375	Bell Crank, Switch Control	1
342	Collar	1	376	Washer	2
343	Bracket, Control Rod Apron	1	377	Pin, Cotter	2
344	Screw, Socket Head	4	378	Pin, Bell Crank	1
345	Pin, Straight	2	379	Rack, Switch Control	1
346	Lever, Apron Control	1	380	Pinion, Switch Control	1
347	Sleeve	1	381	Guide, Rack	1
348	Key, Feather	1	382	Nut, Hex	2
349	Pin	1	383	Screw, Socket Head	2
350	Pin, Taper	2	384	Screw	2
351	Collar	2	385	Screw	4
352	Rod, Control (Specify Bed Length)	1	386	Cover	1
353	Pin, Draw	1	387	Gasket, Cover	1
354	Screw	1	388	Support, Lead Screw	1
355	Pin, Draw	1	389	Block, Lead Screw Support	1
356	Nut	2	390	Washer	1
357	Screw	1	391	Screw	1
358	Box, Back	1	392	Bracket, Feed Rod Support	1
359	Oiler	1	393	Screw	1

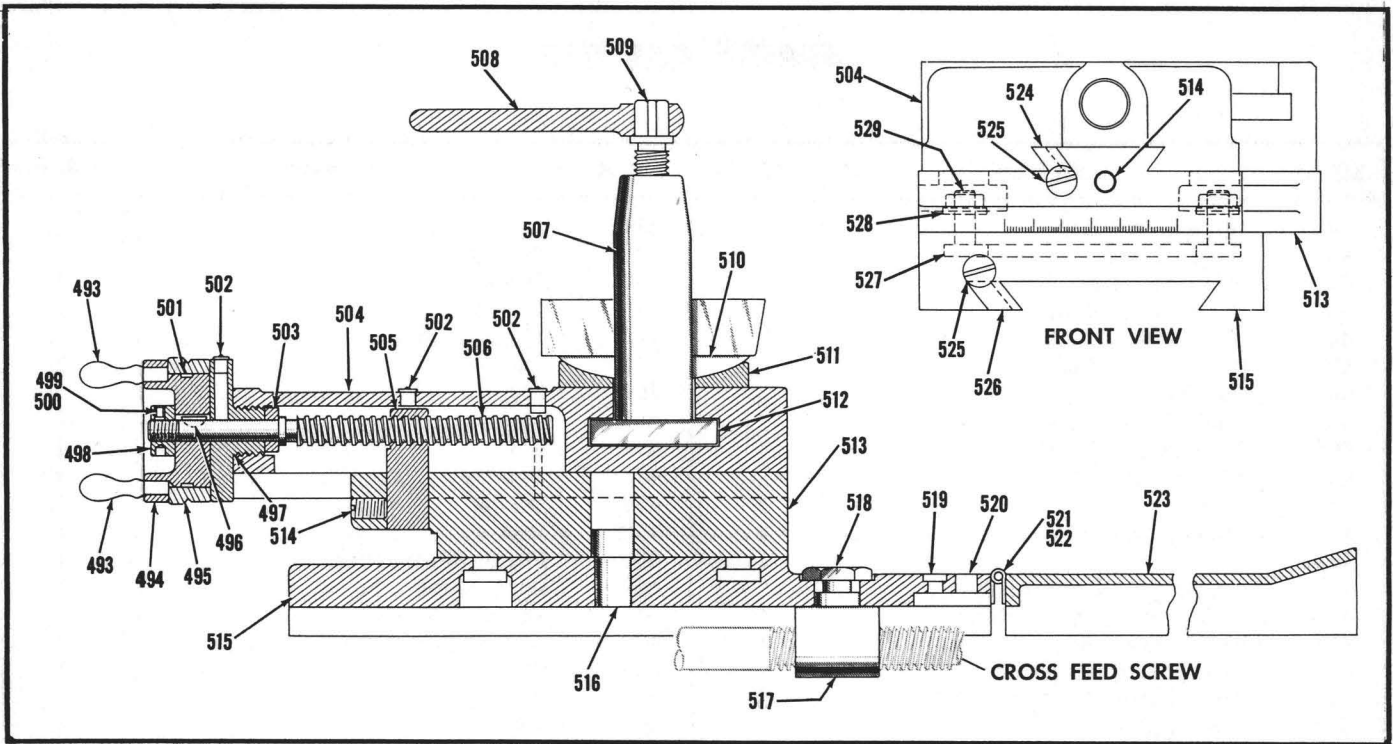
IMPORTANT—Include serial number of your lathe when ordering repair parts.



APRON CASTING

KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
400	Apron, 1st Stud	1	444	Pin	2
401	Ring, Truarc	1	445	Spring	1
402	Bearing, N.D. Ball	1	446	Bush	1
403	Screw, Headless	2	447	Plunger	1
404	Key, Woodruff	1	448	Handle, Trip	1
405	Handwheel (3 spoke)	1	449	Collar	1
406	Handle	1	450	Pin	1
407	Stud, Rack Wheel	1	451	Stud	1
408	Bearing, N.D. Ball	1	452	Pin	1
409	Wheel, Rack	1	453	Pin	4
410	Key	1	454	Spring	1
411	Screw, Headless	1	455	Rod	1
412	Pin	1	456	Plate, Instruction	1
413	Collar, Rack Wheel Stud	1	457	Plug, Pipe	1
414	Shaft, Rack Wheel Gear	1	458	Oiler, Gits	1
415	Bush, Long Fd. C1. Gr.	1	459	Screw, Headless	1
416	Gear, Long Cross Fd.	1	460	Washer	1
417	Pin, Shifter Interference	1	461	Screw, Hex Head	1
418	Pin, Taper	1	462	Pin	1
419	Pin, Gear Spacing	4	463	Nut	1
420	Gear, Sliding Inter.	1	464	Screw, Headless	1
421	Gear, Cross Feed Clutch	1	465	Screw, Socket Head	4
422	Bush, Cross Fd. Gear	1	466	Plate, Feed Direction	1
423	Pin, Clutch Shifter Handle Stop	1	467	Screw, Set	2
424	Shaft, Clutch Shifter	1	468	Screw, Set	2
425	Pin, Taper	1	469	Pinion, Bevel	1
426	Handle, Clutch Shifter	1	470	Collar, Bevel Pinion Thrust	1
427	Handle, Ball	2	471	Key, Feather	1
428	Bush, Clutch Shifter Shaft	1	472	Collar, Bevel Pinion	1
429	Shoe, Clutch Shifter	1	473	Ring, Truarc	1
430	Plug, Welch	1	474	Screw, Headless	1
431	Box, Nut (English)	1	475	Key, Woodruff	1
	Box, Nut (Metric)	1	476	Gear, Bevel	1
432	Pin	2	477	Pin, Straight	2
433	Pin, Straight	1	478	Bush, Bevel Gear Shaft Rear	1
434	Cam, Nut Box	1	479	Shaft, Bevel Gear	1
435	Spring (Cut to Suit)	1	480	Bush, Bevel Gear Shaft Front	1
436	Pin, Taper	1	481	Plug, Welch	1
437	Handle, Half Nut	1	482	Plunger, Oil	1
438	Apron	1	483	Spring, Oil Plunger	1
439	Ball, Steel	1	484	Rod, Oil Cylinder Spring Guide	1
440	Plunger, Clutch Shifter	1	485	Plug, Oil Cylinder Pipe	1
441	Spring	1	486	Screw, Socket Head Cap	2
442	Screw, Headless	1	487	Block, Bearing	2
443	Screw, Headless	1	488	Gib	1

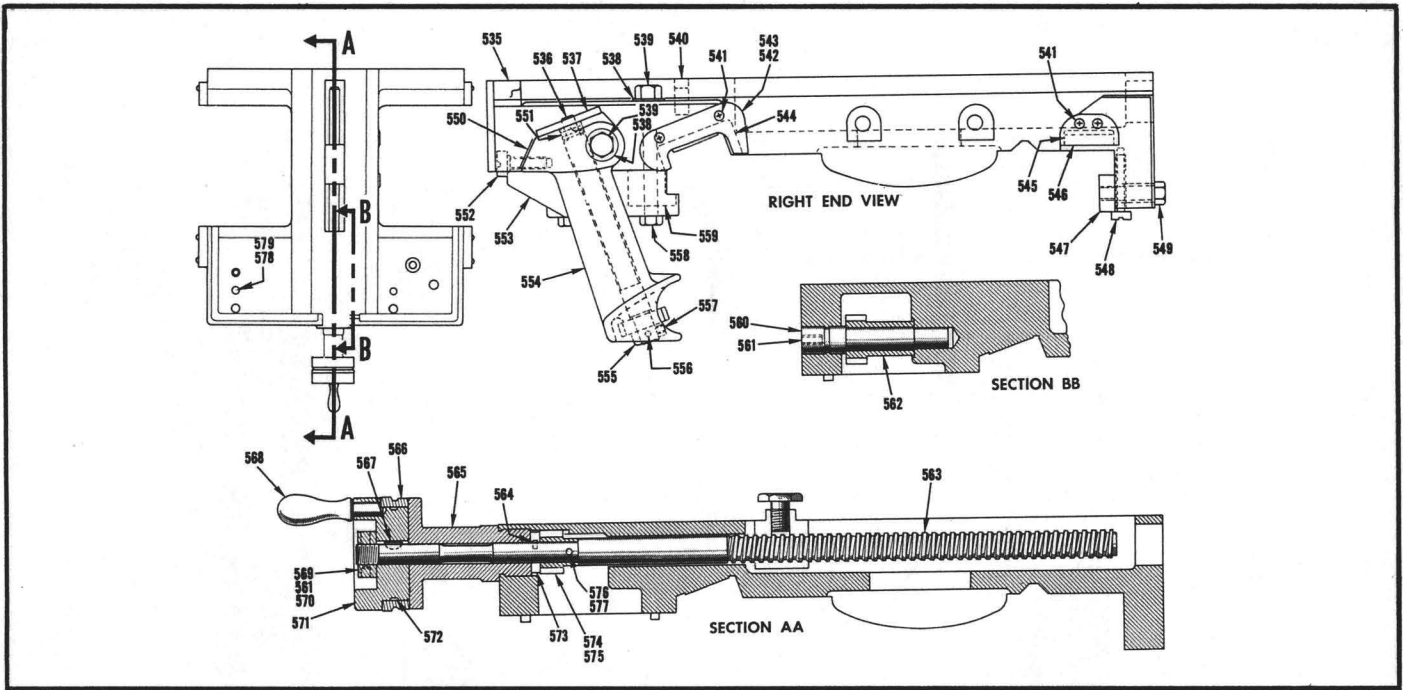
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COMPOUND REST — TOOL POST

KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
493	Handles, Ball	2	513	Slide, Swivel	1
494	Hub, Graduated Collar	1	514	Screw, Set	1
495	Collar Graduated	1	515	Slide, Bottom	1
496	Key	1	516	Pin, Shoulder	1
497	Bush, Top Slide Screw	1	517	Nut, Cross Feed (English)	1
498	Nut, Top Slide Screw	1		Nut, Cross Feed (Metric)	1
499	Screw, Top Slide Nut	1	518	Screw, Cross Feed Nut	1
500	Plug, Top Slide Nut	1	519	Plug	
501	Spring	2		(Not used on Taper Attach.)	1
502	Oiler	2	520	Plug	
503	Collar, Top Slide Screw	1		(Not used on Taper Attach.)	1
504	Slide, Top	4	521	Hinge, Dirt Guard	1
505	Nut, Top Slide (1-2)	1	522	Screw	4
506	Screw, Top Slide	1	523	Guard, Dirt	1
507	Post, Tool	1	524	Gib, Top Slide	1
508	Wrench	1	525	Screw, Gib	4
509	Screw, Tool Post	1	526	Gib, Bottom Slide	1
510	Wedge	1	527	Bolt, T-Slot	2
511	Collar, Tool Post	1	528	Washer	2
512	Washer, Tool Post Square	1	529	Nut, Hex	2

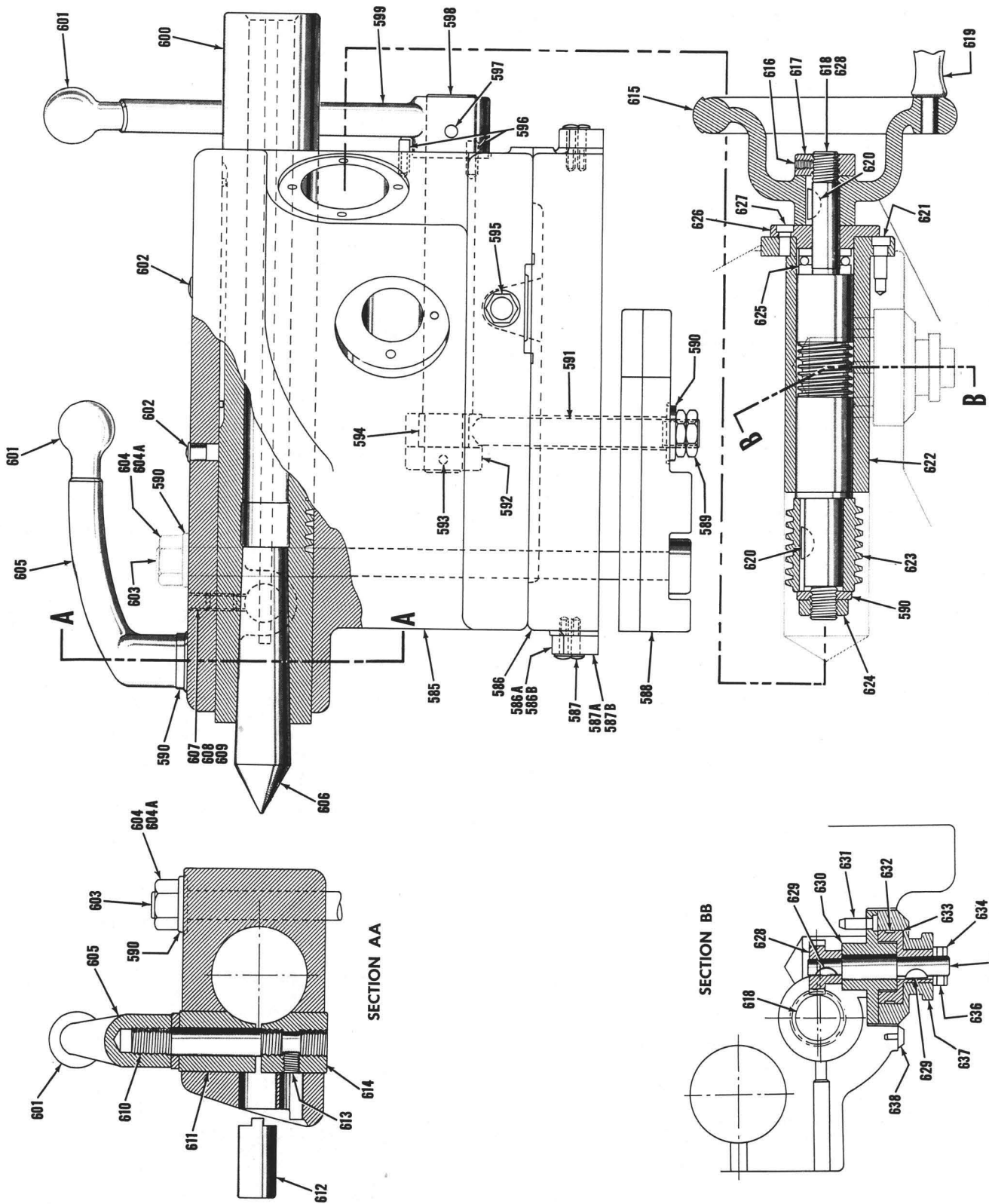
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CARRIAGE AND CHASING DIAL BRACKET

KEY NO.	PART NAME	QTY.	KEY NO.	PART NAME	QTY.
535	Carriage	1		(With Taper Attach. English or Metric Without Hydra Trace)	1
536	Shaft, Bracket	1		(Without Taper Attach. English or Metric With Hydra Trace)	1
537	Dial	1		(With Taper Attach. English or Metric With Hydra Trace)	1
538	Washer	1		(Without Taper Attach. Metric, Without Hydra Trace)	1
539	Screw, Hex Cap	2		(With or Without Taper Attach. English, With Hydra Trace)	1
540	Plug	1		(With or Without Taper Attach. Metric, With Hydra Trace)	1
541	Screw, Round Head Machine	8	566	Collar, Graduated	1
542	Wiper, Shear Front Right Hand	1		(With or Without Taper Attach. English, Without Hydra Trace)	1
543	Wiper, Shear Front Left Hand	1		(With or Without Taper Attach. Metric, Without Hydra Trace)	1
544	Neoprene Strip 1-1	2		(With or Without Taper Attach. English, With Hydra Trace)	1
545	Neoprene Strip 1-20 (Cut to Suit)	2		(With or Without Taper Attach. Metric, With Hydra Trace)	1
546	Wiper, Shear Rear	2		Key	1
547	Gib, Carriage Rear	1	567	Handle, Ball	1
548	Screw, Gib	2	568	Nut	1
549	Screw, Hex Cap	2	569	Plug	2
550	Plate, Chasing Dial Instruction	1	570	Hub, Graduated	1
551	Pin, Taper	1		(With or Without Taper Attach. English or Metric, Without Hydra Trace)	1
552	Screw, Gib	2		(With or Without Taper Attach. English or Metric, With Hydra Trace)	1
553	Gib, Carriage Front	2	571	Spring	1
554	Bracket, Dial	1		(With or Without Taper Attach. English or Metric Without Hydra Trace)	1
555	Wheel, Chasing Dial Worm	1	572	Collar, Thrust	1
556	Pin, Taper	1		(Not used with Taper Attachment)	1
557	Screw, Set	1	573	Pinion, Cross Feed Screw	1
558	Screw, Hex Cap	4		(Not used with Taper Attachment)	1
559	Clamp, Carriage 1-20	1	574	Sleeve, Cross Feed Pinion	1
560	Stud, Idler Pinion	1		(With Taper Attach. English or Metric Without Hydra Trace)	1
561	Screw, Set	3		(With Taper Attach. English or Metric With Hydra Trace)	1
562	Pinion, Idler	1	575	Pin, Taper	1
563	Screw, Cross Feed	1		(Not used with Taper Attachment)	1
	(Without Taper Attach. Without Hydra Trace- English)	1	576	Key, Feather	1
	(Without Taper Attach. Without Hydra Trace Metric)	1		(Used on Pinion Sleeve with Taper Attach.)	1
	(With Taper Attach. English, With or Without Hydra Trace)	1	577	Pin	2
	(With Taper Attach. Metric, With or Without Hydra Trace)	1	578	Plug	2
	(Without Taper Attach. English, With Hydra Trace)	1			
	(Without Taper Attach. Metric, With Hydra Trace)	1			
564	Pin, Straight	1			
565	Bush, Cross Feed	1			
	(Without Taper Attach. Without Hydra Trace English or Metric)	1			

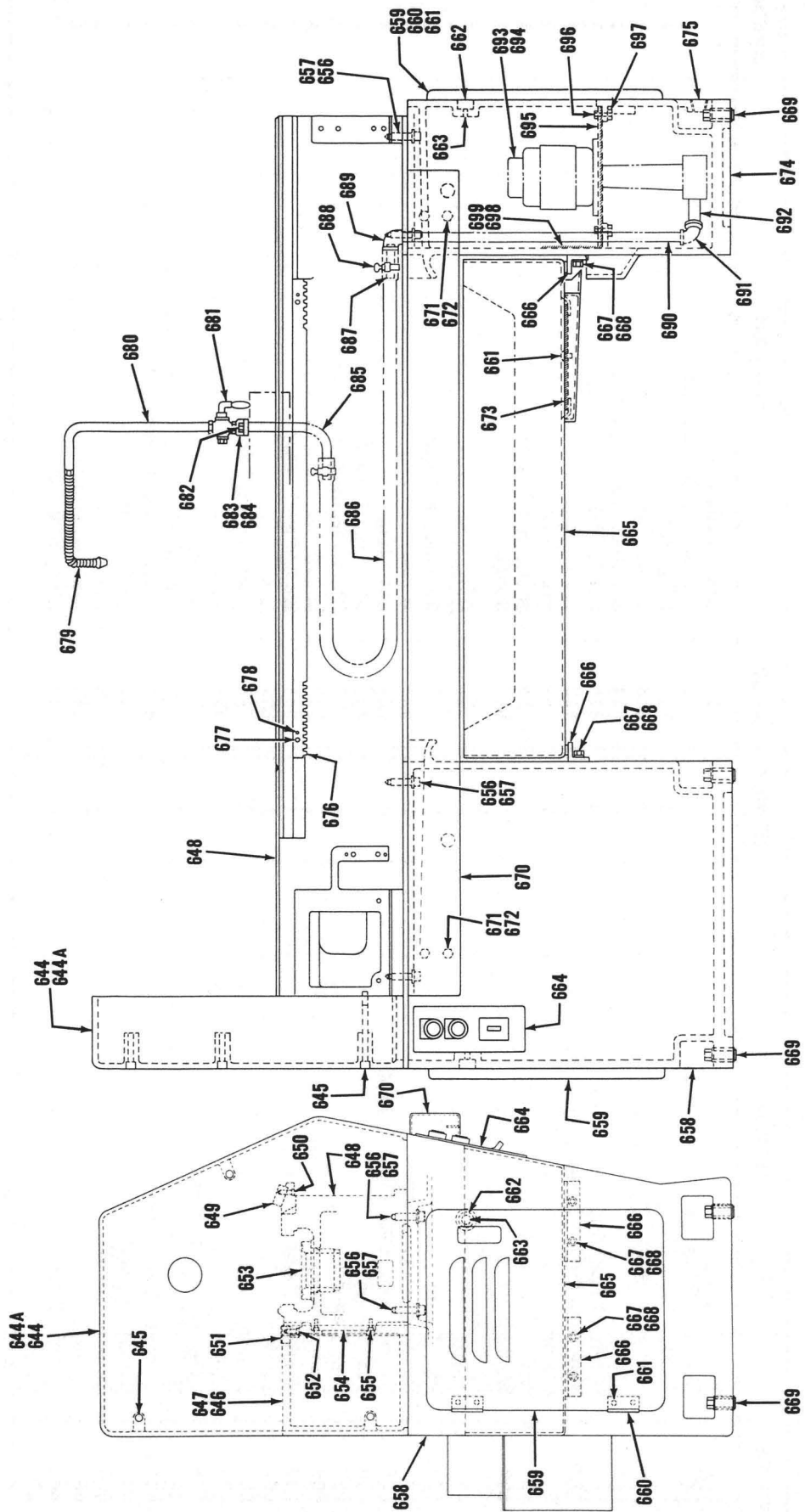
IMPORTANT—Include serial number of your lathe when ordering repair parts.



TAILSTOCK

KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
585	Top, Tailstock.	1	610	Stud, Tailstock	1
586	Bottom, Tailstock	1	611	Bushing, Upper Binder	1
586A	Wiper, Rear Shear	2	612	Plug, Key	1
586B	Neoprene Strip (Cut to Suit)	2	613	Screw, Set	1
587	Screw	4	614	Bushing, Lower Binder	1
587A	Wiper, Front Shear	2	615	Handwheel	1
587B	Neoprene Strip (Cut to Suit)	2	616	Screw, Set	1
588	Clamp	1	617	Nut, Lock	1
589	Nut	2	618	Shaft, Handwheel	1
590	Washer	4	619	Handle	1
591	Eyebolt, Clamp	1	620	Key	2
592	Collar	1	621	Screw	4
593	Pin, Taper	1	622	Bushing, Eccentric	1
594	Bearing, Oilite Plain	1	623	Worm	1
595	Screw, Hex, Cap (3-3/4" long)	2	624	Nut, Jam	1
596	Pin, Straight	2	625	Bearing, Thrust	1
597	Pin, Taper	1	626	Plate, Bushing Eccentric	1
598	Shaft, Clamp	1	627	Screw	4
599	Handle, Clamp	1	628	Wormwheel, Dial	1
600	Spindle	1	629	Key	2
601	Handle, Ball	2	630	Bushing, Dial Shaft	1
602	Oiler	2	631	Screws	3
603	Bolt, Rough Sq. Head	1	632	Spring	1
604	Nut	1	633	Hub, Dial	1
604A	Wrench, Hex. Box	1	634	Collar, Dial Retaining	1
605	Handle, Binder	1	635	Shaft, Dial	1
606	Center, Spindle	1	636	Pin, Taper	1
607	Screw, Set	1	637	Dial, Graduated	1
608	Screw, Set	1	638	Line, Indicator	1
609	Plug	1			

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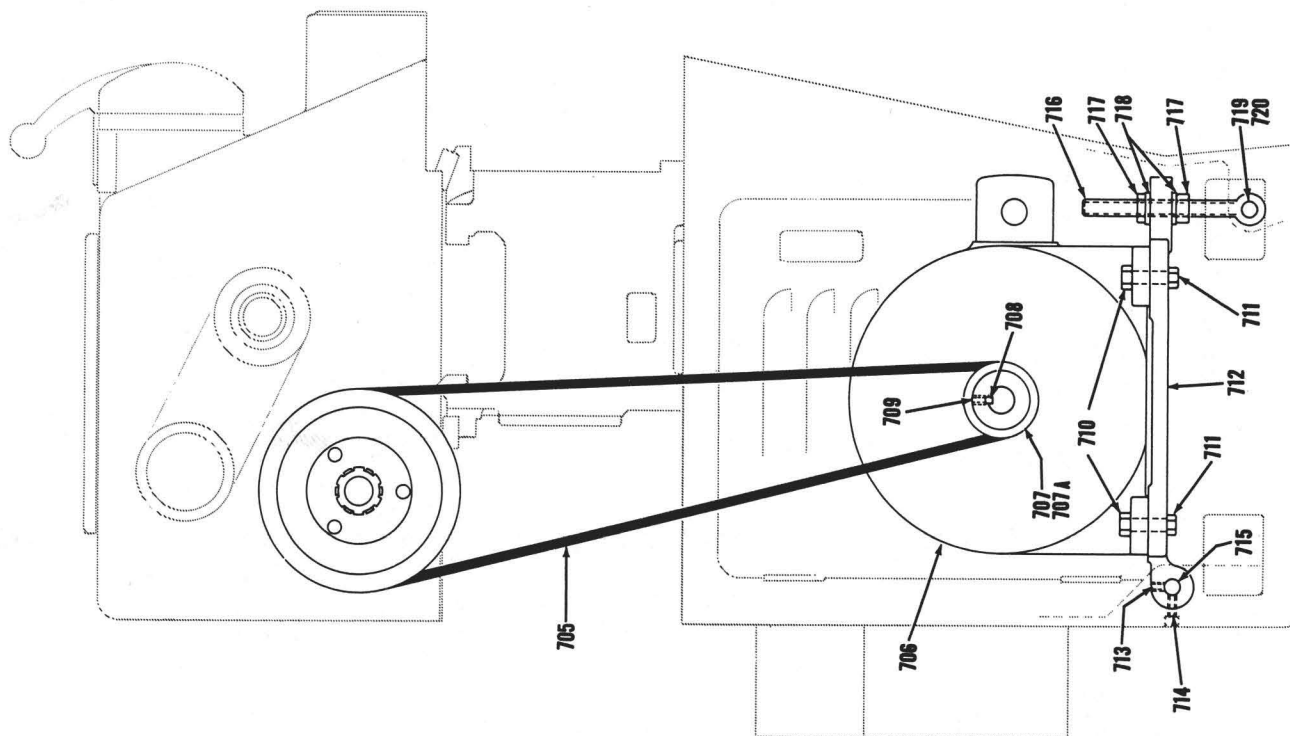


BED, PAN, LEGS, HEAD END COVER, COOLANT PUMP WITH PIPING

KEY NO.	PART NAME	QUANTITY	KEY NO.	PART NAME	QUANTITY
644	Cover, Head and Feed Gear	1	672	Washer	4
644A	Plate, Oil Instruction	1	673	Screen, Strainer (Furnish one with each pan)	1
645	Screw	3	674	Leg, Tail End Cabinet	1
646	Bracket, Bed	1	675	Plug, Pipe	1
647	Screw, Bracket to Bed	2	676	Rack (Specify Center Capacity of Lathe)	Var. No.
648	Bed (Specify Length)	1	677	Screw	Var. No.
649	Shear, Front (Specify Center Cap)	1	678	Pin, Taper	Var. No.
650	Screw, (10 for 30" centers add 2 for each additional ft. of Bed)	10	679	Spout, "Stay out" Flexible Coolant 1/4" I.D. x 12" Lg. N.P.T. Male Connector	1
651	Shear, Rear (Specify Center Cap.)	1	680	Pipe, Distributor	1
652	Screw, (10 for 30" centers add 2 for each additional ft. of Bed)	10	681	Cock, Stop	1
653	Tube, Oil	1	682	Screw, Hex Hd. Cap.	1
654	Cover, Oil Reservoir	1	683	Bracket (Use Casting B-31A-15)	1
655	Screw for Oil Reservoir Cover	8	684	Screw, Thumb	1
656	Screw, Leg to Bed (4 for each Leg)	8	685	Pipe, Distributor	1
657	Washer, Leg to Bed Screw	8	686	Hose, Rubber (Length Spec. to Order)	1
658	Leg, Head End	1	687	Nipple	2
659	Door	2	688	Clamp, Hose	1
660	Hinge, Door	4	689	Elbow, 90 deg. 3/8 N.P.T.	1
661	Screw	10	690	Pipe, 3/8 Nom.	1
662	Magnet, Alnico	2	691	Elbow, 90 deg. Reducing	1
663	Screw, Flat Head Brass Machine (3/4" long)	2	692	Nipple	1
664	Motor Start-Stop	1	693	Pump, Ruthman 1/10 H. P. (Specify Voltage & Cycle to Suit Order)	1
665	Pan, Specify Center Cap.	1	694	Screw, Hex Hd. Cap (Pump to Plate)	4
666	Support, Pan	4	695	Plate, Pump Support	1
667	Screw for Pan Supports	8	696	Screw, Hex Hd. Cap.	2
668	Washer	8	697	Clamp, Pump Plate	2
669	Screw, Leveling	6	698	Cover, Reservoir Hole (Use when pump is used)	1
670	Guard, Pan (specify bed length)	1	699	Cover, Reservoir Hole (Use when pump is omitted)	1
671	Screw	4			

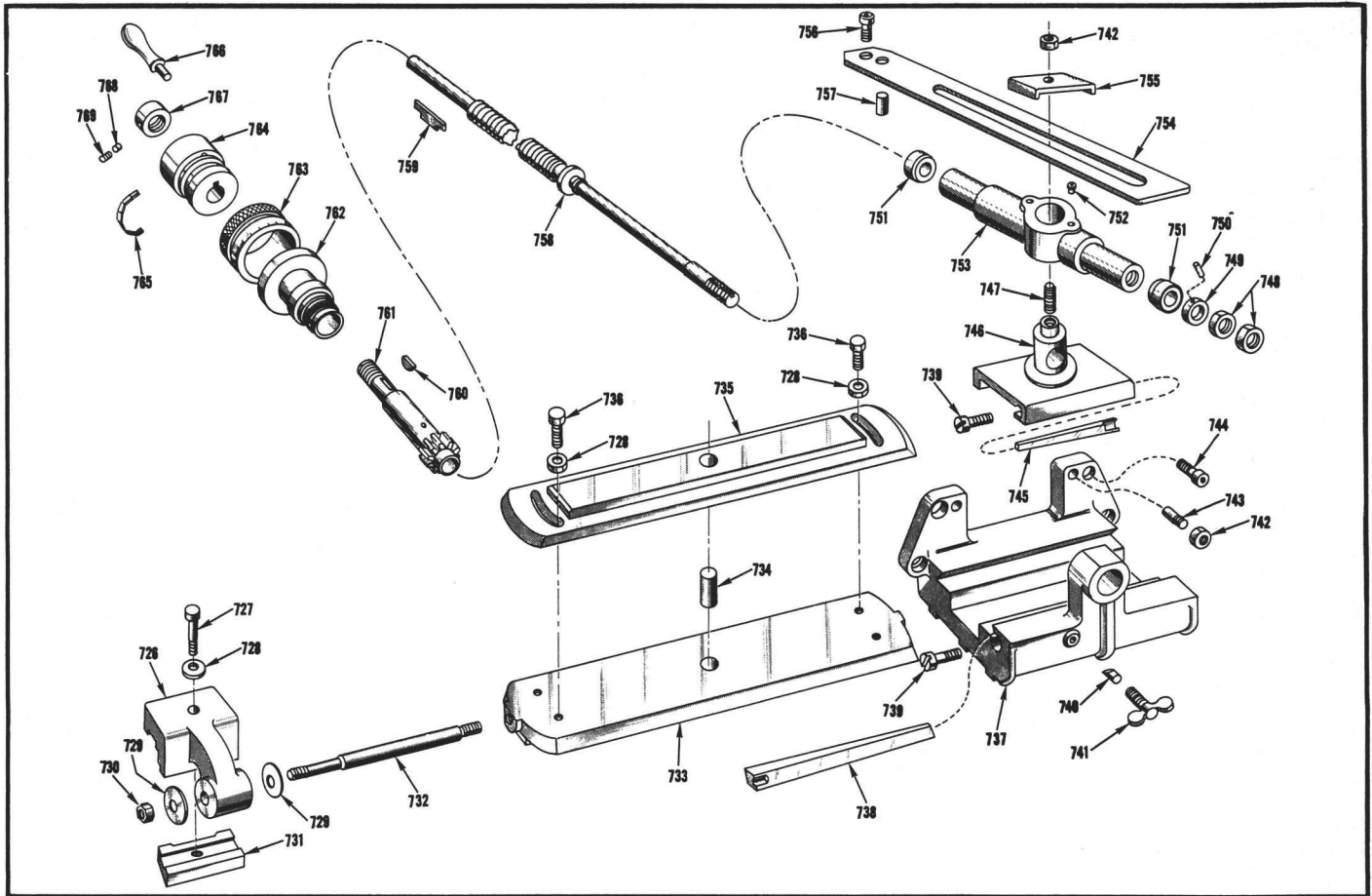
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MOTOR DRIVE and MOTOR MOUNTING ASSEMBLY



KEY NO.	PART NAME	QUANTITY
705	Belt, Browning	4
706	Motor, Frame 254	1
707	Motor, Frame 215	1
707A	Pulley, Motor (60 Cycle)	1
708	Pulley, Motor (50 Cycle)	1
709	Key (for Motor Pulley)	1
710	Screw, Set (for Motor Pulley)	1
711	Nut, Hex (Motor to Plate)	4
712	Motor to Plate Screws	4
713	Plate, Motor (For Motor Frame 254 or 215)	1
714	Screw, Allen	1
715	Screw, Allen (Dog Point)	1
716	Shaft, Plate to Leg	1
717	Eyebolt	1
718	Nut, Hex	2
719	Washer	2
720	Pin	1
	Pin, Cotter	2

IMPORTANT—Include serial number of your lathe when ordering repair parts.



TAPER ATTACHMENT

KEY NO.	PART NAME	QTY.	KEY NO.	PART NAME	QTY.
726	Bracket, Bed	1	757	Pin	1
727	Screw, Hex Hd. Cap	1	758	Screw, Cross Feed	1
728	Washer	3		(English, With or Without Hydra Trace)	1
729	Washer	2		(Metric, With or Without Hydra Trace)	1
730	Nut, Hex	1	759	Key, Feather	1
731	Clamp, Bed Bracket	1	760	Key	1
732	Rod, Bed Bracket Clamp	1	761	Sleeve, Cross Feed Pinion	1
733	Slide, Taper Attachment	1		(English or Metric, Without Hydra Trace)	1
734	Plug, Guide Bar Swivel	1		(English or Metric, With Hydra Trace)	1
735	Bar, Guide (English)	1	762	Bush, Cross Feed Screw	1
	Bar, Guide (Metric)	1		(English or Metric, Without Hydra Trace)	1
	Alter Fin. Detail HC-76A-5	1		(English or Metric, With Hydra Trace)	1
736	Screw, Hex Cap	2	763	Collar, Graduated	1
737	Bracket	1		(English, Without Hydra Trace)	1
738	Gib, Slide	1		(Metric, Without Hydra Trace)	1
739	Screw, Gib	4		(English, With Hydra Trace)	1
740	Plug, Slide Gib 1-2	1		(Metric, With Hydra Trace)	1
741	Screw, Thumb	1	763	Collar, Graduated	1
742	Nut, Hex	3		(English, Without Hydra Trace)	1
743	Pin, Draw	2		(Metric, Without Hydra Trace)	1
744	Screw, Socket Hd. Cap	4		(English, With Hydra Trace)	1
745	Gib, Guide Bar Shoe	1		(Metric, With Hydra Trace)	1
746	Shoe, Guide Bar	1	764	Hub, Graduated Collar	1
747	Stud, Carriage Shoe	1		(English or Metric Without Hydra Trace)	1
748	Nut, Hexlock	2		(English or Metric With Hydra Trace)	1
749	Collar	1	765	Spring (Without Hydra Trace)	1
750	Pin	1		(With Hydra Trace)	1
751	Bearing, Ball Thrust	2	766	Handle, Ball (Without Hydra Trace)	1
752	Oiler	2		(With Hydra Trace)	1
753	Shoe, Carriage	1	767	Nut	1
754	Bar, Taper Attachment Draw	1	768	Plug	2
755	Plate, Guide Bar Clamp 1-4	1	769	Screw, Set	2
756	Screw, Sock. Hd. Cap	1			

IMPORTANT—Include serial number of your lathe when ordering repair parts.



CHAPTER 12

The first part of the chapter discusses the importance of maintaining accurate records of all transactions. It emphasizes the need for a systematic approach to bookkeeping, starting with the identification of the business's accounting cycle. The text then moves on to describe the various methods used to record transactions, including the double-entry system and the use of journals and ledgers. It also covers the process of adjusting entries and the preparation of financial statements, such as the balance sheet and the income statement. The chapter concludes by discussing the role of the accountant in providing financial information to management and other stakeholders.