MONARCH Lathes

Lodge & Shipley Lathes
Olofsson Lathes

Operators Manual

Model A

Lathe No. 38412

MONARCH Lathes, L.P.

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SAFETY

There are many factors involved in the use of this lathe that could lead to or cause a personal injury accident. We at Monarch cannot anticipate and address all these factors, but we are providing some general safety considerations on this Safety sheet.

You must strive to eliminate factors that may contribute to an accident by strictly adhering to the following safety recommendations:

CAUTION Before operating this lathe, you must be familiar with the features, controls, and corresponding lathe movements that they produce. For more information, please consult the Programming and Operator's manuals.

CAUTION Always wear safety glasses and snug-fitting clothing when operating or standing near the lathe. Use extreme caution to keep hair, jewelry, and anything that may get caught, away from the spindle, workholding device, workpiece, or any other moving elements. Never operate this lathe if you are fatigued, ill, or under the influence of any medications or chemicals. Never operate this lathe if it is malfunctioning in any way.

CAUTION Metal-cutting machines use sharp tools and incorporate high-speed moving elements. Therefore, you must remain safety conscious at all times to avoid accidents that could result in crippling or fatal injury to anyone nearby.

CAUTION The cutting operation produces considerable heat and sharp edges on any part and any removed metal. You must never touch or reach past the workpiece while it is rotating.

CAUTION Maintain a clear area surrounding the lathe. Make sure that no obstructions exist to impede your movement and that no slippery spots exist on the floor.

CAUTION Do not stand on the machine elements. Keep all tools or other items clear of the machine surfaces.

CAUTION If the crank handle that is used to move the tailstock is removable, remove it after the tailstock has been relocated—before starting the next machining operation.

CAUTION While you are operating the lathe, minimize the possibility of distraction by keeping all observers a minimum of six feet away.

CAUTION Avoid any pinch points created by the movement of the carriage and slides.

CAUTION This lathe is powered by lethal voltage levels. Only authorized electricians may correct electrical component failures or perform electrical maintenance on this lathe.

CAUTION Ensure that all shields, covers, and doors are in place, closed and latched, while operating this lathe.

CAUTION Cutting tools and their associated holders must be securely fastened before attempting a cut.

CAUTION Use a work-loading assist to help load heavy parts. Before starting the lathe, be certain that the assist is fully clear of the lathe elements.

CAUTION

Before running a part:

- Determine that the workholding device (chuck or collet) is securely fastened to the spindle nose.
- Ensure that the workpiece is secured within the workholding device and is stabilized with the tailstock and/or steady rest(s), if used.
- Remove the knockout bar and all wrenches from the spindle and/or chuck before running.
- If you are using a rotating cylinder for power chucking, be certain that the chucking pressure is adequate and the speed does not exceed the rating for the particular chuck that is being used.

CAUTION Do not open the chuck or unclamp the tailstock while the workpiece is rotating.

CAUTION

This lathe is designed to be operated by one person at a time. Use the following precautions if a situation or condition exists where you are being assisted by another person:

- Depress the CONTROL OFF pushbutton before changing the workpiece and/or tools.
- During maintenance work or while cleaning the lathe, remove power from the lathe by placing and padlocking the main power disconnect switch in the OFF position.

CAUTION Improper setup, programming, and/or operation may result in an accident when sufficient clearance is not provided between high-speed rotating and stationary elements. Rotating elements consist of, but are not limited to, the following: chucks, chuck jaws, fixture plate clamps, and drivers. Cutting tools, turret(s), slides, tailstock cut-off slide, and other lathe accessories are examples of stationary or near-stationary elements that must be considered.

CAUTION All tools must be moved away from the rotating components to provide acceptable clearance before indexing to a new tool for another cutting operation.

CAUTION Never defeat or bypass safety interlocks.

CAUTION Bending or whipping material can cause serious injury. Material extending from the spindle or spindle-mounted device can bend or whip. Fully support, capture, and cover any material extending from the rear of the spindle or spindle-mounted device. Do not use wedges at the rear of the spindle, spindle-mounted device, or material support device. Their use can cause material to bend or whip.

LOCKOUT/TAGOUT

This section covers the Lockout/Tagout safety procedures mandated by OSHA 1910.147. These procedures are for disabling machinery and equipment to prevent the release of hazardous energy. These procedures are necessary to protect anyone working on the equipment from injury or even death. There are many types of energy to be concerned with, such as electrical, hydraulic, and pneumatic, just to name a few. We cannot possibly cover the entire OSHA standard as written. Instead we do encourage the customer to obtain a copy of the standard to use when developing or enforcing compliance procedures.

- The term Lockout refers to the physical removing and locking out of energy or power to the equipment.

- The term Tagout refers to the placement of approved tags or signs on equipment. This alerts others that machine service or maintenance is being performed.

Monarch designed this lathe to be operated by one person at a time. The machine must be made safe before maintenance can be performed. Most servicing and/or maintenance requires system shutdown. Perform the following Lockout/Tagout procedures to make the lathe safe for maintenance:

1. Position the main power switch on the power cabinet to the OFF position.

2. Padlock the switch.

   NOTE: Allow up to eight minutes for electrical energy to bleed down from servo drives, spindle drives, etc.

3. Bleed off any hydraulic and/or pneumatic systems energy.

4. Padlock or tag the control valves.

5. Install safety blocks if required. (Example: Vertical slide support during disassembly or vertical servo brake maintenance.)

If these procedures cover all the potential energy hazards present on your machine, then the machine should be safe.

Some service and/or maintenance procedures may require machine power. The Customer Safety Committee must establish a Tagout procedure or some other measures that will give effective protection to the employee while performing maintenance or servicing machinery with power applied.

Read and become familiar with all the safety precautions in this manual and the safety signs or placards affixed to the equipment.

OPERATOR'S MANUAL

FOR

MODEL A LODGE & SHIPLEY LATHES

Lodge and Shipley Lathes
Made By
Monarch Lathes, L.P.
Sidney, Ohio 45365

CLEANING, ERECTING AND LEVELING

For full and complete information on the above, see bulletin entitled "Preparing Lodge & Shipley Lathes for Action."

CONNECTING ELECTRICAL EQUIPMENT

After connecting main line wires, check the direction of pulley rotation with indicating arrow on face of pulley and make sure motor is running in proper direction.

LUBRICATION

Ample and proper lubrication is essential to insure good results and lasting accuracy. Lubrication of the lathe should start as soon as it has been cleaned and before any of the mechanisms are operated or any sliding units are moved. A full and complete lubrication chart will be found on pages 18 and 19. Refer to this frequently and follow the instructions carefully.

It is false economy to use any but the best lubricating oil. We recommend a high-grade straight mineral oil, rich enough to lubricate the bearings thoroughly, with body enough to last a reasonable length of time and entirely free of acids and alkali. For operation in temperatures, like those usually found in the Central portion of the United States, we suggest the following specifications:

For Lathes operated at standard spindle speeds:

Baume Gravity	24
Flash	430
Fire	495
Viscosity	300″ at 100° F.

For Lathes operated at twice standard spindle speeds:

Baume Gravity	25
Flash	375
Fire	425
Viscosity	200″ at 100° F.

TIPS TO INSURE ACCURATE WORK

If difficulty is experienced in maintaining turning, facing and boring operations to within standard limits, the chances are this is caused by the lathe being out of level. Experience gained in hundreds of cases on complaints of this nature enables us to make this statement authoritatively. The first thing to do is to re-level the lathe carefully using a good sensitive machinist's level.

For work held between centers, it is important to make sure that the centers line up with each other. Remember, that if a long piece is turned without steady or follow rest support, the work itself will spring away from the tool to some extent.

While misalignment may have been caused due to rough handling in shipment, these cases are so extremely rare that all other possibilities should be exhausted before requesting a factory service call.

IF THE LATHE CHATTERS, IT MAY BE DUE TO QUITE A FEW CAUSES:

Improper leveling; correct as above.

One or more leveling screws not resting solidly on steel plates set in foundation.

Work extending too far from chuck; change method of chucking or support outer end in steady rest.

Too great distance between centers without support; use steady rest.

Oil, grease or dirt between bore of chuck or driving fixture and spindle nose; both spindle nose and taper bore of chuck should be thoroughly clean and dry.

Nicks in taper bore of chuck or on spindle nose.

Keyway in chuck or driving fixture riding on top of driving key in spindle nose; file keyway for slight clearance. (Do not change dimensions of key in spindle nose.)

NOTE: If chuck, face plate or fixture loosens on spindle nose during service, the trouble will be caused by one of these three things.

Improperly fitted adapter plate or looseness between adapter and chuck or driving fixture, if adapter plate type utilized.

End play in spindle. (See instructions for adjusting spindle bearings.)

Improperly adjusted Compound Rest Top Slide and Base Gibs; adjust carefully. This is frequent cause of trouble.

Cutting edge of tool below center.

Dirt between center and workpiece, center and tailstock spindle bore, center and headstock center collet, or headstock center collet and headstock spindle bore.

Tool too weak or having too much overhang.

Tool not securely clamped in Tool Post.

If using tool holder with inserted cutter bit, set screw holding cutter bit may not be tight.

Machine may be thrown out of balance by addition of special chucking fixtures or by work of irregular shape or weight.

Improper selection of cutting speed and feed.

Too weak a foundation, or vibration caused by heavy presses, etc. working adjacent to lathe.

CAUTION: When placing chucks, face plates or special drivers on spindle nose, thoroughly clean taper bore of chuck, face plate or fixture and spindle nose, wiping both dry and clean from all oil and grease. Oil or grease prevents drawing chucks, face plates or fixtures, home on spindle nose. When mounting face plates or chucks, the spindle should be stopped with the key on top, since the key aligns face plate or chuck on spindle nose.

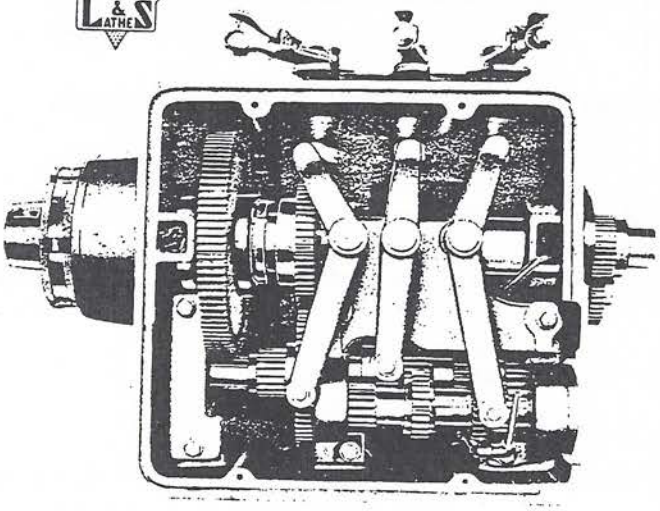


Fig. 1 — Headstock

HEADSTOCK

Be sure to fill with proper amount of oil and keep filled to level on oil gauge. Check oil pump detector window at rear of headstock to be sure headstock oil pump is operating. The oil should be occasionally drained off, the headstock flushed and cleaned thoroughly with benzine or kerosene, and filled again with fresh oil. The frequency with which this is done depends on the amount of service given the lathe, but it should be done at least every six months.

SPINDLE BEARINGS

The spindle bearings are carefully adjusted before the lathe is shipped from the factory for the spindle speed range at which the lathe is to be operated, and this adjustment should not be tampered with unless absolutely necessary.

When spindle bearings are readjusted, great care should be taken to prevent dropping any foreign objects into the headstock. Proceed as follows:

Remove the small cover on top of the headstock directly above the front spindle bearings and rotate spindle by hand until the lock screw or screws (depending on type of locking arrangement used for your headstock) holding the adjusting nut in position, can be loosened. Tighten or loosen the adjusting nut, as the case may be, until the bearings are free of all end play with the spindle still revolving smoothly; then, tighten the lock screw or screws and replace cover on headstock. Avoid adjusting the bearings too tightly, since this will cause excessive heating and subsequent destruction of bearings. The maximum temperature at top spindle speed should not exceed 130 to 140 degrees Fahrenheit.

The above method takes up all radial and end play of the bearings. There is no adjustment for the rear spindle bearing, which is a straight roller bearing permitting horizontal movement of the spindle to compensate for expansion or contraction caused by temperature changes.

CAUTION: When lathe is arranged for higher than standard spindle speeds, care must be exercised when engaging the top speeds in the high range. These should not be immediately engaged when starting up the lathe. The lathe should be run for awhile in one of the lower speeds to warm up the mechanism gradually, giving all elements a chance to expand proportionally. Otherwise, the spindle bearings will seize on the spindle.

FRICTION CLUTCH WITH BRAKE OR REVERSE

The Friction Clutch and Brake or Reverse is operated by either of two Mechanical Apron Control Levers on the front of the machine. The one at the headstock end is convenient when changing speeds, threads or feeds. The one at the carriage and apron, and traveling with these units, is convenient for the operator's normal working position.

On lathes equipped with Friction Clutch and Brake (regularly supplied, unless otherwise ordered) the lathe is started by pulling either lever "Up" as far as it will go, thus engaging the driving friction. To stop the lathe, push either lever "Down" as far as it will go, thus engaging the brake.

NOTE: When engaging the friction, pull the lever up quickly to avoid unnecessary wear on the clutch mechanism. In some cases, when a heavy chuck is being used or the work-piece is quite heavy or if extremely high speeds are in use, this may not be feasible since some time must be allowed for the clutch to pick up the load.

When specially ordered, the lathe can be supplied with Friction Clutch and Reverse (Reverse in Pulley) instead of Friction Clutch and Brake. When this is furnished, the upward position engages the friction clutch, the central position is neutral and the downward position engages the reverse. On lathes equipped with Reverse in Pulley, the brake mechanism is eliminated since the reverse mechanism takes its place in the friction clutch housing. The reverse can be used, however, to stop the spindle by proper manipulation of the Mechanical Control Levers at Headstock or Apron.

NOTE: When the friction clutch is engaged (control lever in upward position), the spindle should turn toward the operator. Use this as a check to make sure the motor has been properly connected to main line wires with pulley running in the proper direction, as shown by indicating arrow on pulley face.

Don't forget to fill friction clutch housing with oil. This must be filled separately from headstock. Keep oil to proper level shown on oil gauge for friction clutch housing. Drain oil occasionally, flush and clean mechanism with benzine or kerosene and refill, doing this at least every six months.

ADJUSTING FRICTION CLUTCH

To adjust driving friction, loosen lock screw "A" in nut "B", see Figure 2. Raise control lever to highest position, turn nut to the right until reasonably tight, re-tighten set screw. Release friction and engage again. If lever slips into place and becomes locked, adjustment has been properly made.

The brake mechanism and reverse friction are self-adjusting.

NOTE: If it should be necessary to remove the headstock cover or friction pulley, care should be taken that no dirt, grit or foreign objects drop into the headstock or pulley. Care must also be taken to have all parts thoroughly clean when assembling.

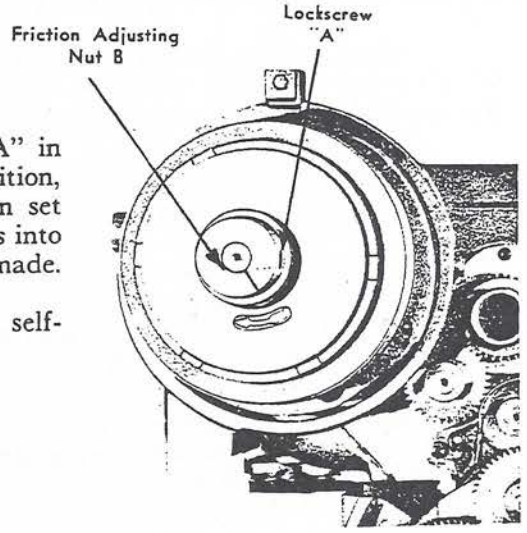


Fig. 2 — Adjusting Friction Clutch

CHANGING SPINDLE SPEEDS

Spindle speeds are selected with the three speed change levers on the front of the headstock, locating these as shown on Spindle Speed Index Plate. Any desired speed can be instantly selected without having to go through other speeds. To change spindle speeds, DISENGAGE THE FRICTION AND STOP THE SPINDLE, shift the levers to proper positions and re-engage friction. If, when changing speeds, the gears do not mesh instantly, engage friction just enough to revolve gears and slip them into mesh.

When the right hand speed change lever is in the center hole, the spindle is in a neutral position and can be revolved freely for changing work in chuck, adjusting chuck jaws, etc.

CAUTION: Do not change spindle speeds with spindle revolving any faster than is required to mesh gears properly. Doing this will clash gears and nick them. If a click is heard in headstock gearing, this is probably what happened, and this can be corrected by locating nick and stoning down raised portion on gear tooth.

MICROMETER BALL STOP

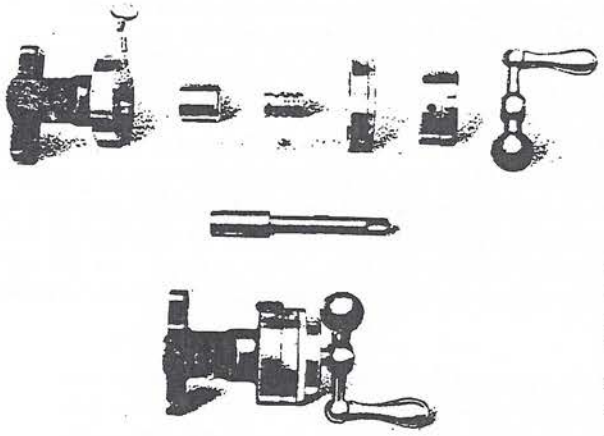


Fig. 3 — Micrometer Ball Stop

The Micrometer Ball Stop is an exclusive Lodge & Shipley feature. It greatly simplifies threading operations by providing an adjustable depth stop. This device is mounted on the cross feed screw and, when not in use, in no way affects the ordinary operation of the screw.

The design of this attachment is extremely simple and trouble-proof. It consists of a friction arrangement, which is controlled by a thumb screw and acts as a stop for the cross feed screw. The friction can be tightened to form a positive stop or can be adjusted to form a halting stop, which can be slipped by increased pressure on the cross feed screw handle. By an ingenious arrangement of a ball travelling in the straight groove of the micrometer sleeve and the spiral groove of the micrometer bush, the tool can be withdrawn from the work up to three revolutions of the cross feed screw and run in again to the stop, which brings the tool back to the bottom of the preceding cut without changing the micrometer reading.

When chasing threads by feeding the tool straight into the work, the friction is adjusted for a halting stop after the tool is set for the first cut and the graduated dial is brought to zero. For successive cuts, the friction is slipped to advance the tool.

When chasing threads by feeding the tool in on an angle, the friction is tightened to form a positive stop and the tool is advanced for successive cuts with the compound rest top slide screw.

In either case, appreciable time savings are effected since no time is lost feeling the way, because the tool can be quickly returned to the bottom of the last cut by running against the stop. Each successive cut can be accurately measured on the cross feed or top slide screw graduated dial, a valuable provision in precision thread chasing.

The stop works both backward and forward and can be used on internal as well as external thread chasing. It can also be employed as a positive single diameter stop in turning or boring operations to duplicate diameters.

CARRIAGE, COMPOUND REST AND APRON

These lathes are equipped with automatic lubrication to bed and carriage ways by means of a pump mounted in the apron. The apron casting is the oil reservoir. It should be filled to proper level indicated on oil gauge and oil should be added daily as required. The oil is delivered under forced feed to all surfaces where the carriage takes its bearing on the bed and to the carriage cross slide ways, where the compound rest base takes its bearing. The same system delivers oil to all apron bearings. The pump is automatically operated by both hand and power longitudinal feed and power cross feed mechanisms. In addition, a lever on the front of the apron is provided for hand operation of the pump.

NOTE: Before moving carriage or cross slide when first starting up machine or after the lathe has been idle long enough for the oil to drain back into the reservoir, the pump should be operated by hand to carry oil to all bearing surfaces. When operating carriage over short distances for long periods, the carriage should be moved periodically for a longer distance to distribute oil delivered to bed ways over the full bearing surface of the carriage.

Check the oiling diagram on pages 18 and 19 for complete lubrication of these units as some manual lubrication is required.

The shear wipers should have the Neoprene section bearing on the bed, but not the outer cage. Care should be taken to see that a 0.0015″ feeler can be inserted between outer cage and bed way to prevent scoring of bed way. For most efficient use remove shear wipers occasionally and clean them thoroughly.

Both carriage and compound rest are fitted with adjustable gibs, which should be kept snug to provide smooth, even movement of all sliding surfaces.

Many of the operating features of the lathe are controlled from the apron. These controls are within easy reach of the operator in his normal working position.

The carriage has both hand and power longitudinal feeds and the compound rest base has both hand and power cross feeds. The compound rest top slide has hand traverse only. Hand traverse of carriage is operated with the handwheel on the front of the apron. Hand cross feed of the compound rest base is operated with the cross feed screw handle. Hand traverse of the compound rest top slide is operated by the top slide screw handle.

In the event any play or back lash develops between the cross feed screw and the cross feed and compensating nut, this can be taken up by loosening screw "I" slightly (See Figure 5, Page No. 9), then tightening screw "J" and re-tightening "I". Play or looseness of the ball bearing end thrusts for the cross feed screw can be corrected by tightening nut "M".

The compound rest base is graduated in degrees and the top slide can be swiveled to any angle within a complete circle, except on lathes equipped with Universal Relieving Attachment on which the relieving attachment mechanism reduces this range slightly. Four bolts in the swivel lock the compound rest top slide at any desired angle.

Both longitudinal and cross power feeds are operated by separate levers on the front of the apron. To engage frictions, raise lever to extreme height; to disengage, push lever down. The surface "C" coming in sharp contact with "D" disengages the friction. To adjust friction, raise lever to engaged position and loosen screw "A" in nut "B" inside the lever (See Figure 4). Turn nut "B" to obtain desired adjustment and again tighten set screw "A".

Old oil will "gum up" the frictions. Drain apron oiling system at least every six months, wash out mechanism with clean benzine or kerosene and refill with fresh oil.

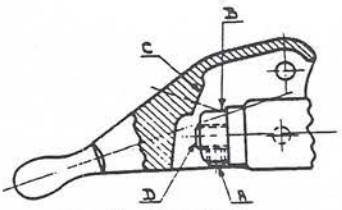


Fig. 5. Diagram of Apron Friction

Fig. 4 — Adjusting Apron Friction

An interlock is provided in the apron to prevent engaging longitudinal power feed and thread chasing mechanism at same time. If difficulty is experienced in engaging power longitudinal feed, check half nut operating lever and make sure it is in completely disengaged position against stop pin on apron front plate. If half nut lever cannot be engaged, make sure longitudinal feed lever is in neutral position.

LEADSCREW AND FEED ROD CLUTCHES

Levers "E" and "F" (see Figure No. 8, Page No. 16) are used to engage or disengage the feed rod and leadscrew from their source of power. Raising lever "E" disengages the feed rod clutch, lowering it engages the clutch. The same thing applies to lever "F", which controls the leadscrew clutch. The operator should stop rotation of feed rod, when using the leadscrew, and vice versa.

QUICK CHANGE GEARING

The entire quick change gear unit and end gearing are lubricated by the "One Shot Pump" mounted on the quick change gear box. This should be used at least several times daily or oftener if the lathe is given constant service to insure adequate lubrication to all bearings. Full information for ranges of threads and feeds, setting up machine, etc. will be found on succeeding pages.

THREAD INDICATOR

The thread indicator, furnished only on lathes equipped with English leadscrew, is attached to the right-hand side of the carriage and travels with it. It can be used for picking up all even, uneven, one-half or one-quarter English threads. It cannot be used for leads, unless the lead is convertible to one of the threads per inch mentioned above. The thread or lead must, however, be obtained through the standard quick change gearing or by means of pick-off gears added to the standard gearing.

For even threads (2, 4, 6, etc.), close the half nuts at any line on the dial. For uneven threads (3, 5, 7, etc.), close half nuts at any numbered line. For half threads (5½, 6½, 11½, etc.), close half nuts at any one-quarter revolution. For quarter threads (2¼, 2¾, 3¼, etc.), close the half nuts at any one-half revolution.

The thread indicator gear can be left engaged with the leadscrew at all times, even when the leadscrew is not revolving.

TAILSTOCK

On lathes equipped with dead tailstock center, the center can be removed from the spindle by running the spindle back until the end of the tailstock screw hits the end of the center.

Taper turning is possible by setting the tailstock top off center. The base is graduated for setover each side of center. The tailstock spindle is graduated with a scale in $\frac{1}{16}$" graduations for its entire usable length of travel for convenience in drilling operations.

A built-in revolving tailstock center arrangement can be supplied if desired. Instructions for changeover are supplied with order or on request. Replacement of the anti-friction bearings for the revolving center arrangement should not be attempted without reference to special instructions sent with all replacement bearings or obtainable on request.

Lubrication of the tailstock bearing ways on the bed is automatic from a reservoir in the base, which must be kept filled to proper level indicated on oil level gauge. Refer to oiling diagram for lubrication of balance of tailstock mechanism.

The tailstock is equipped with shear wipers, which should occasionally be removed and thoroughly cleaned. The outer cage of the shear wiper should never bear on the bedway. It should be possible to insert a 0.0015" feeler between the outer cage and bedway.

TAPER ATTACHMENT

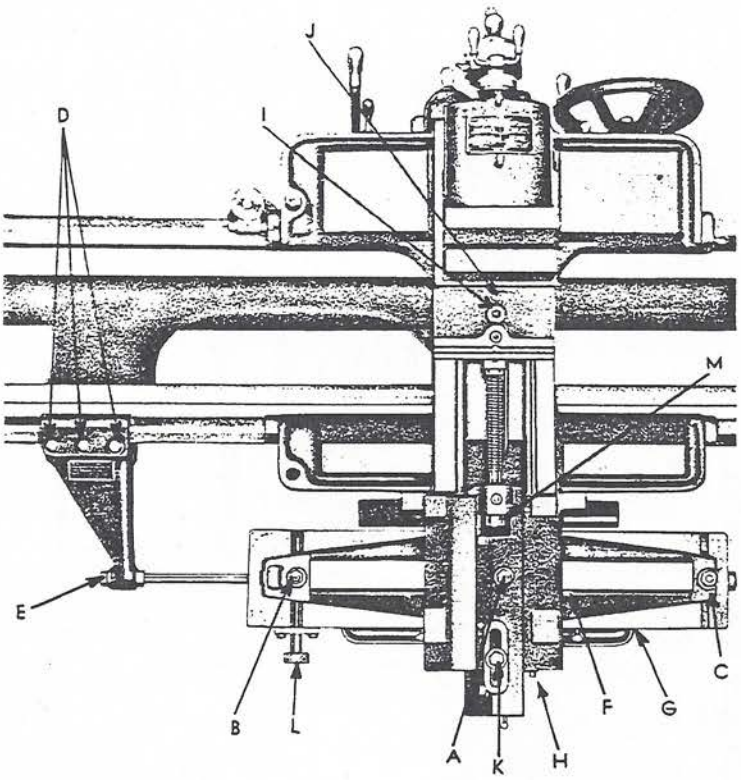


Fig. 5 — Taper Attachment

The taper attachment is furnished as an extra and only when ordered. It is a self-contained unit bolted to the back of the carriage and traveling with it. However, all carriages are machined and jig drilled for application of taper attachment, so this can be ordered at a later date and installed on a machine already in service, by the customer, quite easily.

The taper attachment scale is graduated for both "inches" per foot and "degrees" of taper, both readings being on the same scale and indicated by the same pointer.

To set the attachment for any desired taper, loosen nut "A" (See Figure 5), holding the guide plate to the sliding shoe, and nuts "B" and "C" at the ends of the swiveling bar. Set the swiveling bar to the desired taper as determined by the scale, using the adjusting screw "L" and tighten the nuts mentioned above. Except, when setting the taper. these nuts should always be tight, even when the attachment is not in use.

CAUTION: Make sure nuts "B" and "C" are loose when using adjusting screw "L" to prevent springing swiveling bar.

To engage the taper attachment, loosen clamp screw "K" and tighten nuts "D" When taper attachment is not in use, clamp screw "K" must be tight, and nuts "D" must be loose. Nut "E" should be tight at all times. If taper attachment is not in regular or frequent service, the locking arm should be removed from the bed to reduce wear on the bedway. Be sure to have tool on center line when taper turning.

If the taper attachment is used consistently on one job, it is advisable to shift the sliding bar occasionally to more equally distribute wear on the swiveling bar.

The compound rest and taper attachment slides should move freely, but there should be no looseness or play. If chatter or non-uniform taper occurs, this is usually the result of looseness and can be corrected by adjusting the compound rest base and top slide gibs, and gibs "F", "G" and "H" on the taper attachment slides. Too tight an adjustment of the gibs can cause a binding action, which, when taper turning, will cause slides to jump instead of moving smoothly and has been known to cause rather equally divided marks on the workpiece, sometimes incorrectly attributed to gear marks.

Should any looseness or back-lash develop between the cross feed screw and nuts, this can be eliminated by loosening screw "I" and tightening screw "J", then re-tightening screw "I". Looseness or play in the cross feed screw end thrust bearings can be taken up by adjusting nut "M".

By the addition of a few parts, the taper attachment can be converted to a form-turning attachment.

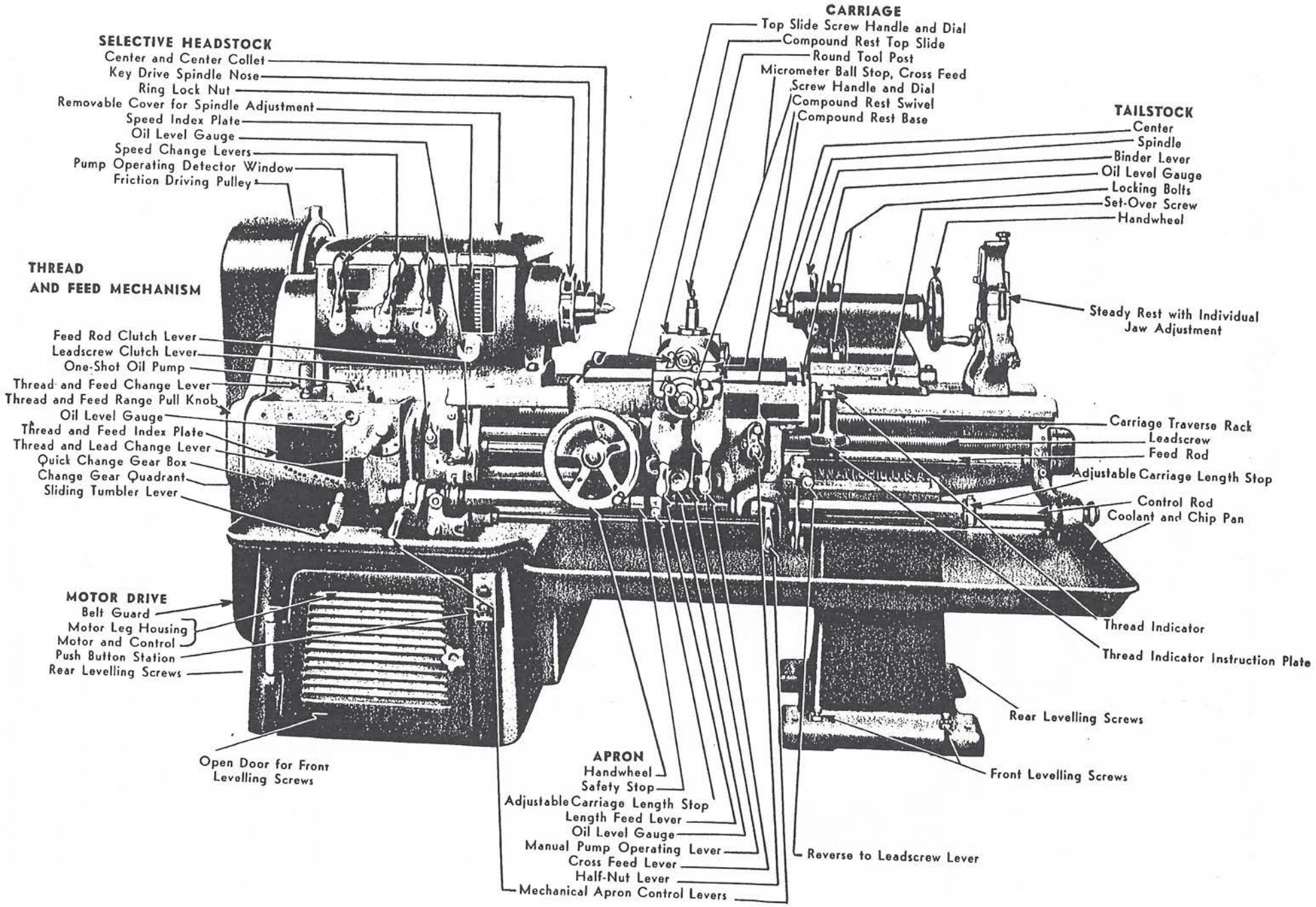


Fig. 6 — Selective Head Lathe With Reverse To Leadscrew

LATHES EQUIPPED WITH REVERSE TO LEADSCREW

Reverse to Leadscrew is considered standard equipment for Tool Room Lathes, but can be omitted if not desired. It can also be supplied for engine lathes when ordered for same.

It is operated by the "Reverse to Leadscrew Lever" mounted on the extreme right-hand side of the apron. This lever actuates the lowest rod mounted on the front of the bed, thus shifting a double-sided single tooth clutch mechanism mounted in the thread and feed gear train, controlling the direction of rotation of leadscrew and feed rod.

During thread chasing operations, changing from right-hand to left-hand threads and leads is accomplished in this manner. During feeding operations, forward or reverse feeds are obtained the same way.

With the headstock spindle running in the normal forward direction, when the Reverse to Leadscrew Lever is in the lower position, the carriage moves toward the headstock and the compound rest feeds "IN" to center. The central position is neutral. When the lever is in the upper position, the carriage travels toward the tailstock and the compound rest feeds "OUT" from center.

Since the clutches are single tooth type, register between the lead of the leadscrew and the workpiece is not lost when the clutch is shifted, as long as the workpiece is being driven directly by the headstock spindle and the regular spindle gear drive is used to power the leadscrew. This permits using the reverse to leadscrew feature for regular thread chasing or for cutting special threads or leads that cannot be picked up with the thread indicator.

The reverse to leadscrew feature cannot be used, however, for threads or leads obtained when using either the Coarse Threading Attachment or a Spindle Nose Speed Reducer. The use of either of these two attachments breaks the direct connection between the workpiece and the leadscrew, necessary for maintaining register through the reverse to leadscrew mechanism. The reverse to spindle (Reverse in Pulley) is required for this type of thread chasing and the carriage is reversed with the half nuts closed by reversing the entire machine.

CAUTION: Reverse to Leadscrew should not be operated at spindle speeds higher than approximately 300 R.P.M.

ADJUSTABLE AUTOMATIC LENGTH STOPS

Two adjustable automatic length stop dogs are provided mounted on the control rod, one for each direction of carriage travel. They can be set for any desired length of travel.

On lathes equipped with Reverse to Leadscrew, these stops can be used for both feeding and thread chasing operations. During threading operations, the carriage coming against the stop dog disengages the single tooth clutch in the thread and feed gear train, stopping the carriage and shifting the Reverse to Leadscrew Lever into neutral. The clutch is re-engaged by reversing the carriage travel with the Reverse to Leadscrew Lever. During feeding operations, the Feed Rod Clutch in the trip box at the head end of the machine is disengaged. This clutch may be re-engaged by moving the carriage in the opposite direction with the Apron Handwheel. The Feed Control Lever should be disengaged before moving carriage.

CAUTION: During thread chasing operations, the stop dogs can only be used when spindle is running in normal "Forward" direction. When spindle is running in "Reverse" direction, the stop dogs must be loose on the control rod. The single positive stop at head end is also inoperable during thread chasing operations when spindle is running in "Reverse". For feeding operations the stop dogs can be used with headstock spindle running in "Forward" or "Reverse" directions.

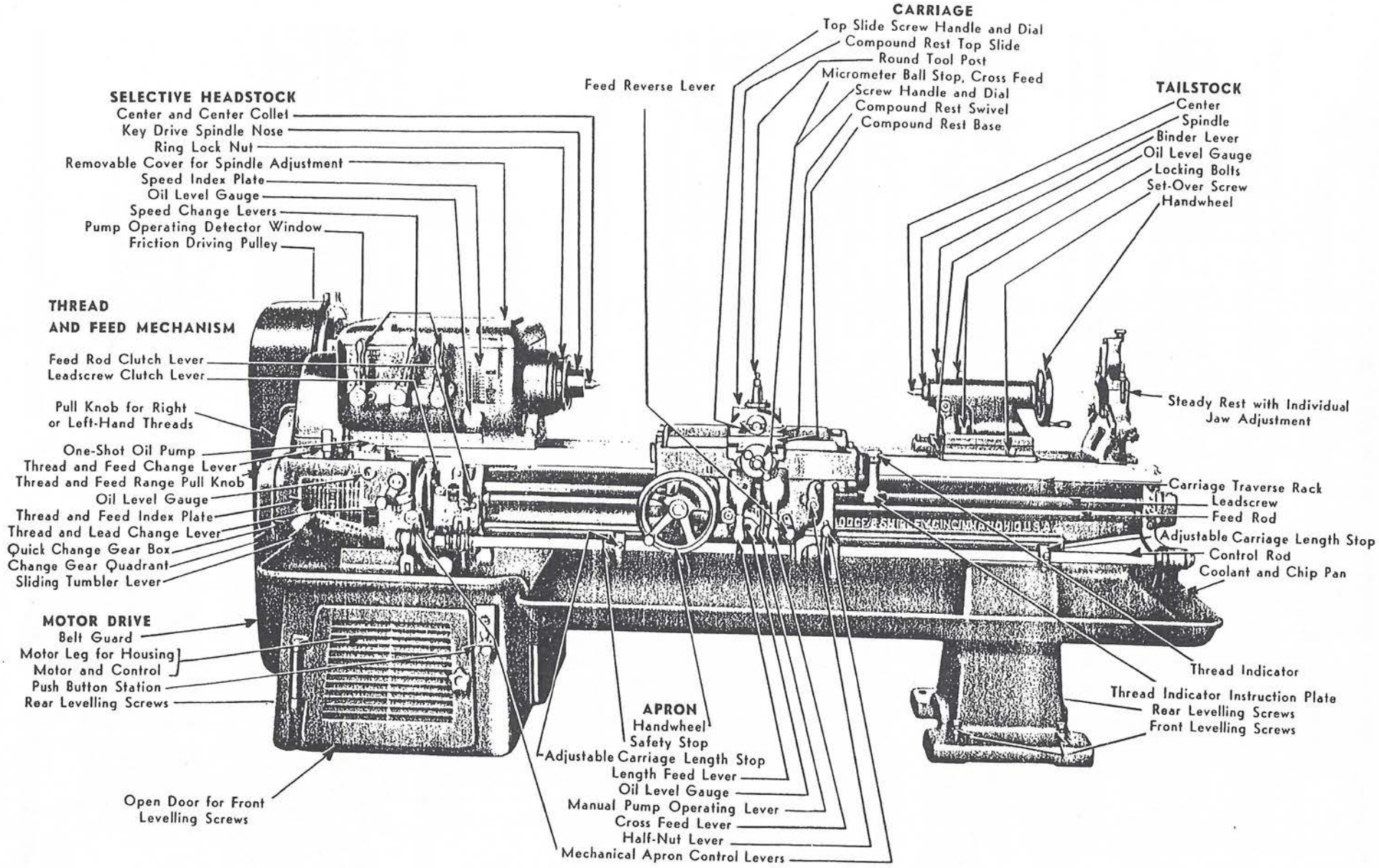


Fig. 7 — Selective Head Lathe Without Reverse To Leadscrew

LATHES NOT EQUIPPED WITH REVERSE TO LEADSCREW

On lathes not equipped with Reverse to Leadscrew, the direction of feed, both cross and longitudinal, is controlled by the Feed Reverse Lever mounted on the front of the Apron. This shifts a double bevel gear arrangement in the Apron.

Right and left-hand threads are chased on lathes, not equipped with Reverse to Leadscrew, by controlling the direction of carriage travel with the "Pull Knob For Right or Left-Hand Threads" mounted at the head end of the machine. This shifts a multi-tooth clutch in the thread and feed gear train, thus controlling the direction of rotation of the leadscrew. When the headstock spindle is running in the normal "Forward" direction, the "IN" position of the Pull Knob produces left-hand threads, the "OUT" position — right-hand threads.

The Pull Knob also controls direction of rotation of the feed rod and will affect the direction of travel of carriage and cross slide during feeding operations. If the direction of travel of these units during feeding operations is incorrect for the job being done with any given setting of the Pull Knob, this can be quickly changed by shifting the Feed Reverse Lever on the front of the Apron.

ADJUSTABLE AUTOMATIC LENGTH STOPS

Two adjustable automatic length stop dogs are provided mounted on the control rod, one for each direction of carriage travel. They can be set for any desired length of travel.

On lathes not equipped with Reverse to Leadscrew, these stops can only be used during feeding operations. They are not operable when thread chasing.

During feeding operations, the carriage coming against the stop dog imparts an end movement to the control rod, disengaging the Feed Rod Clutch in the trip box at the head end of the machine and stopping the carriage. This clutch is re-engaged by moving the carriage in the opposite direction with the Apron Handwheel. The Feed Control Lever should be disengaged before the carriage is moved.

CAUTION: On lathes not equipped with Reverse to Leadscrew, these stop dogs cannot be used during thread chasing operations and must be loose on the control rod. The single positive stop at the head end of the control rod is also inoperable when thread chasing.

THREAD AND FEED MECHANISM

These lathes are furnished with English Leadscrew, unless specifically ordered with Metric Leadscrew. In either case, however, translating gears can be ordered for obtaining the alternate range of threads or leads, as the case may be, and this translation is accurate. An exceptionally wide range of threads, leads and feeds is obtained with the standard quick change gearing, but provision is made for the easy application of special change or pick-off gears to obtain odd ranges of threads, leads and feeds.

A Coarse Threading Attachment can also be supplied, (it is regularly furnished on all lathes equipped with Universal Relieving Attachment), which makes it possible to obtain coarse leads eight times coarser than standard. Figure 11, Page 16 shows a lathe equipped with Coarse Threading Attachment, which becomes an integral part of the machine for which it is supplied.

The Coarse Thread Drive Gear mounted on center "P" gets its power from one of the back gears inside the headstock, which is always revolving eight times faster than the spindle and, when used to power the leadscrew or feed rod in place of the regular spindle drive gear, speeds up these units eight times faster than standard with relation to the spindle speed, thus producing coarse leads and feeds.

Pull Knob "X" is used to disengage the spindle gear drive and engage the coarse thread drive or vice versa. The "IN" position engages the spindle gear drive, the "OUT" position — the coarse thread drive.

A Spindle Nose Speed Reducer (sometimes used in place of a two-speed Motor to obtain the slower speeds used for relieving work) can also be used for obtaining coarse leads. This reduces the R.P.M. of the workpiece in relation to the R.P.M. of the leadscrew, thus producing coarse leads. The standard spindle nose speed reducer has a 4 to 1 ratio producing leads four times coarser than standard. All coarse lead tables, shown in this manual, show the ranges obtainable with the Coarse Threading Attachment, not the Spindle Nose Speed Reducer.

CHASING THREADS USING THE THREAD INDICATOR

When chasing threads using the Thread Indicator, the operator sets up the lathe for the particular thread selected; moves the carriage into position for the start of the cut; runs the tool into proper depth for the first cut; and engages the Half Nuts at the proper line on the Thread Indicator Dial for the thread to be chased.

At the end of the first cut, he disengages the Half Nuts; withdraws the tool; runs the carriage back to the starting point with the Apron handwheel and repeats the process.

CHASING THREADS USING REVERSE TO LEADSCREW

On lathes equipped with Reverse to Leadscrew, this feature can be used to return the carriage under power with the Half Nuts closed. The operator pays no attention to the Thread Indicator; he controls the movement of the carriage with the Reverse to Leadscrew Lever.

CHASING THREADS USING REVERSE IN PULLEY

The mechanical reverse to spindle, obtained with the Reverse in Pulley, reverses the entire machine and can be used for returning the carriage under power with the Half Nuts closed during thread chasing operations without reference to the Thread Indicator.

NOTE: The Thread Indicator can be and usually is used for thread chasing operations within its range on lathes equipped with Reverse in Pulley or Reverse to Leadscrew.

SPECIAL NOTES

The Thread Indicator is only usable on English Leadscrew Lathes for picking up even, uneven, one-half or one-quarter English Threads per inch or leads translatable into one of these threads per inch, when this thread or lead is obtained through the standard quick change gearing or by means of pick-off gears added to the standard gearing.

Lathes, equipped with English Leadscrew and special gears to get Odd, Metric or Module Leads or Diametral Pitches, and Metric Leadscrew Lathes, with or without special gearing, must be equipped with Reverse to Leadscrew or Reverse in Pulley, and this reverse used to return the carriage under power with the Half Nuts closed.

Lathes, equipped with Coarse Threading Attachment or Spindle Nose Speed Reducer, must be equipped with Reverse in Pulley, since Reverse to Leadscrew cannot be used for Coarse Thread Chasing.

Lathes, equipped with Coarse Threading Attachment, must be equipped with a Two-speed Constant Torque, Single Winding Motor, providing half standard and standard spindle speeds — the slower range being used for coarse threading work.

One of the six back gear speeds must always be used when the Coarse Threading Attachment is in use, since it is powered from the back gears.

In describing the set-up for obtaining coarse English, Metric and Module Leads and Diametral Pitches using the Coarse Threading Attachment, reference is always made to the applicable Coarse Lead Index Plate furnished with the machine and listing the more usable coarse leads. If the operator prefers to calculate his coarse leads, he can set up the machine for any of the threads, leads or feeds shown in the standard Thread and Feed Index Plate or standard Metric or Module Lead or Diametral Pitch Index Plates and with Pull Knob "X" in outer position a Thread, Lead or Feed eight times coarser than shown on Index Plate will be obtained. If a Spindle Nose Speed Reducer is used for driving the work to obtain coarse leads, the operator sets up the machine per the standard or special corresponding index plate and a lead four times coarser than shown on index plate will be obtained.

Once the machine has been set up for a specific range of threads, leads or feeds, as described in the following pages, the full range shown on the index plate for this particular set up, can then be obtained through the Quick Change Method by positioning Sliding Tumbler Lever "C", Thread and Feed Range Lever "B" and Pull Knob "A" without changing pick-off gears.

While no specific reference is made in the following pages on thread chasing to selecting right or left-hand threads or leads, the operator must, naturally, do this. On lathes not equipped with Reverse to Leadscrew, this is controlled by Pull Knob "G" (See Cut No. 8 and 9), which controls the direction of rotation of Leadscrew and Feed Rod. On lathes equipped with Reverse to Leadscrew, this is controlled by the Reverse to Leadscrew Lever, which controls the direction of rotation of Leadscrew and Feed Rod.

Figure No. 9 shows the end gearing and Figure No. 8 shows the Levers and Pull Knobs controlling the Quick Change Gear Mechanism supplied on lathes not equipped with Reverse to Leadscrew.

Figure No. 11 shows the end gearing and Figure No. 10 shows the Levers and Pull Knobs supplied on lathes equipped with Reverse to Leadscrew. These illustrations, also, show the Coarse Threading Attachment Gearing and Pull Knob and (in phantom) the end gearing for Universal Relieving Attachment.

It will be noted that the only difference in the end gearing (discounting the Coarse Threading Attachment and Universal Relieving Attachment) is the addition of Pull Knob "G" in Figure No. 8 and 9, which is used for obtaining right or left-hand threads or leads on lathes not equipped with Reverse to Leadscrew. Coarse Threading Attachment and Universal Relieving Attachment can be supplied for lathes not equipped with Reverse to Leadscrew, in which event the End Gearing and Head End Views are the same as Figures 10 and 11 with the addition of Pull Knob "G".

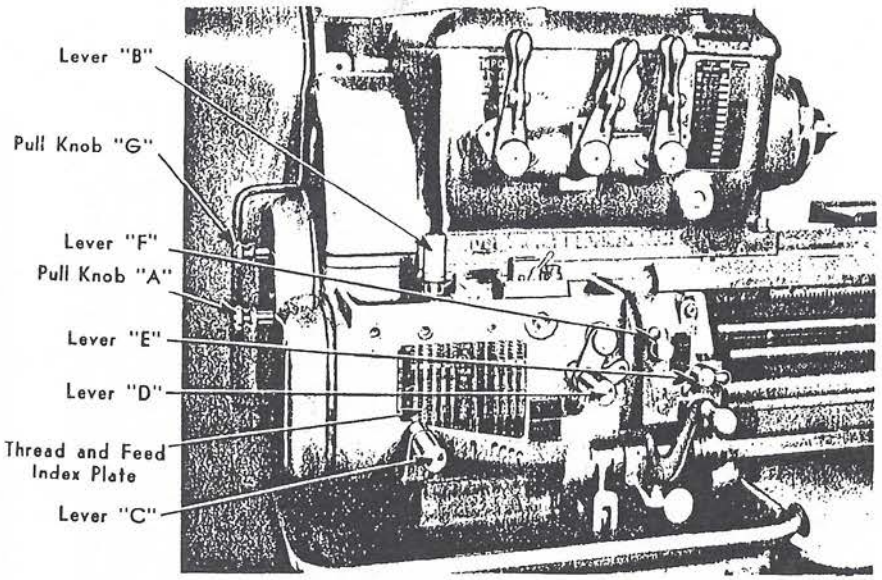


Fig. 8 — Head End View of Lathe Not Equipped With Reverse To Leadscrew

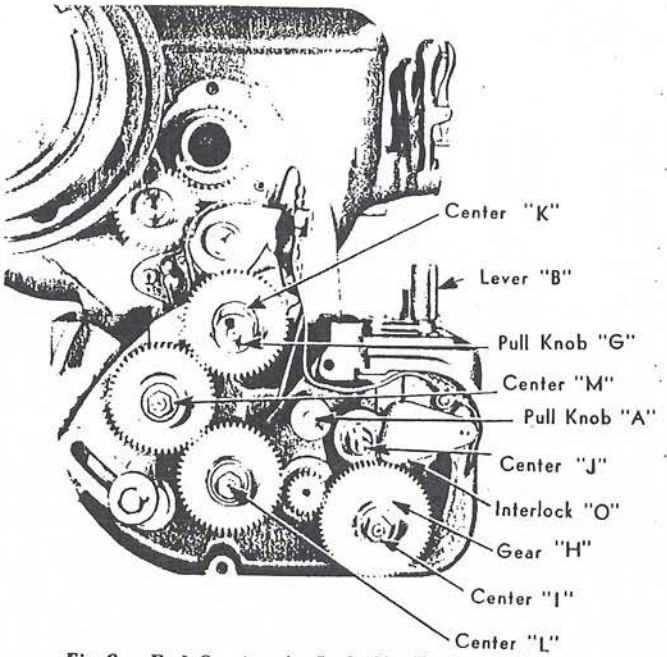


Fig. 9 — End Gearing for Lathe Not Equipped With Reverse To Leadscrew

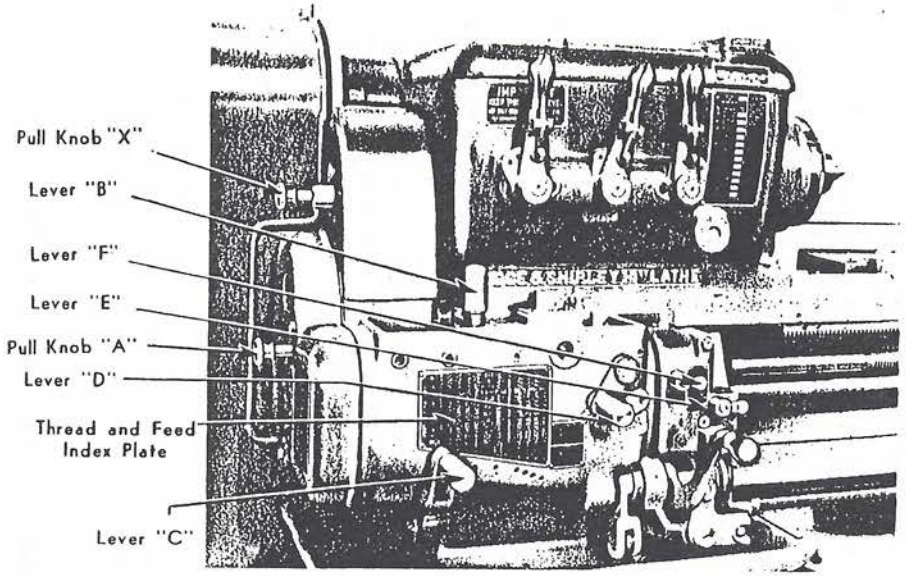


Fig. 10 — Head End View of Lathe Equipped With Reverse To Leadscrew and Coarse Threading Attachment

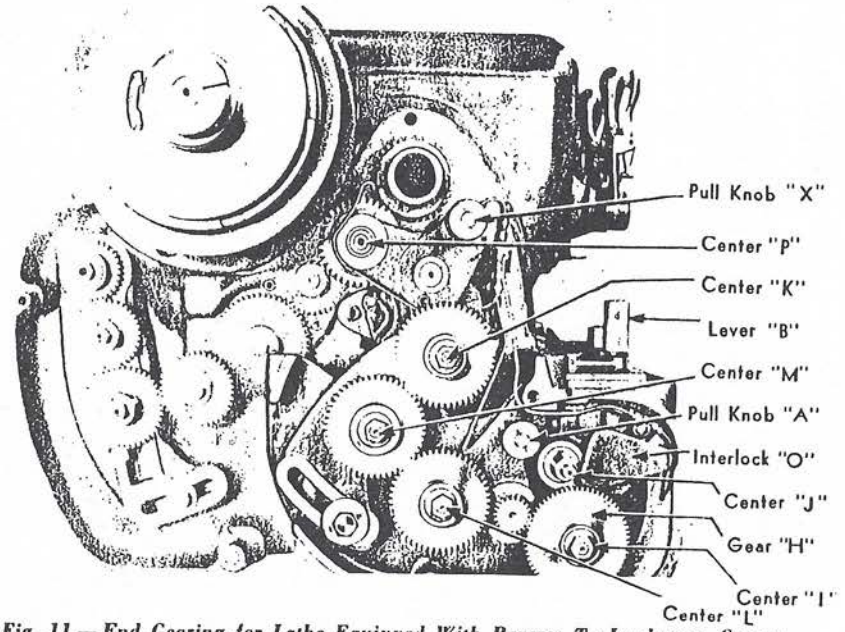


Fig. 11 — End Gearing for Lathe Equipped With Reverse To Leadscrew, Coarse Threading Attachment and (in phantom) Universal Relieving Attachment Gearing

RANGES OF THREADS, LEADS AND FEEDS FOR ENGLISH LEADSCREW LATHES

STANDARD RANGE

PULL KNOB "A"													
OUT	1/64	9/512	5/256	11/512	23/1024	LEAD IN INCHES	3/128	B	13/512	7/256	15/512	1/32
	1/32	9/256	5/128	11/256	23/512		3/64	C	13/256	7/128	15/256	1/16
IN	1/16	9/128	5/64	11/128	23/256		3/32	A	13/128	7/64	15/128	1/8
	1/8	9/64	5/32	11/64	23/128		3/16	B	13/64	7/32	15/64	1/4
	1/4	9/32	5/16	11/32	23/64		3/8	C	13/32	7/16	15/32	1/2
IN	2	2 1/4	2 1/2	2 3/4	2 7/8	THREADS PER INCH	3	A	3 1/4	3 1/2	3 3/4	4
	4	4 1/2	5	5 1/2	5 3/4		6	B	6 1/2	7	7 1/2	8
	8	9	10	11	11 1/2		12	C	13	14	15	16
OUT	16	18	20	22	23		24	A	26	28	30	32
	32	36	40	44	46		48	B	52	56	60	64
	64	72	80	88	92		96	C	104	112	120	128
IN	90	81	73	66	63	FEEDS IN THOUS. PER REV.	60	A	56	52	48	45
	45	40	36	33	32		30	B	28	26	24	23
	23	20	18	17	16		15	C	14	13	12	11
OUT	11	10	9	8.3	8		7.5	A	7.0	6.5	6.0	5.7
	5.7	5.0	4.5	4.1	4		3.8	B	3.5	3.2	3.0	2.8
	2.8	2.5	2.3	2.1	2		1.9	C	1.7	1.6	1.5	1.4

Table No. 1

Table No. 1 shows the range of threads, leads and feeds obtainable on a standard Engine or Tool Room Lathe without supplementary gearing. 50-T gears are mounted on centers "K" and "L" with a suitable idler gear on center "M". For chasing "Threads per Inch" or for obtaining "Feeds", Lever "D" must be in "Threads" position and gear "H" on center "I". For chasing "Leads in Inches" Lever "D" must be in "Leads" position and gear "H" on center "J". If machine is equipped with Coarse Threading Attachment, Pull Knob "X" must be "IN".

NOTE: Lever "D" cannot be shifted until gear "H" is removed. Shifting this lever automatically shifts interlock "O" and permits mounting gear "H" on the proper center.

THREADS PER INCH

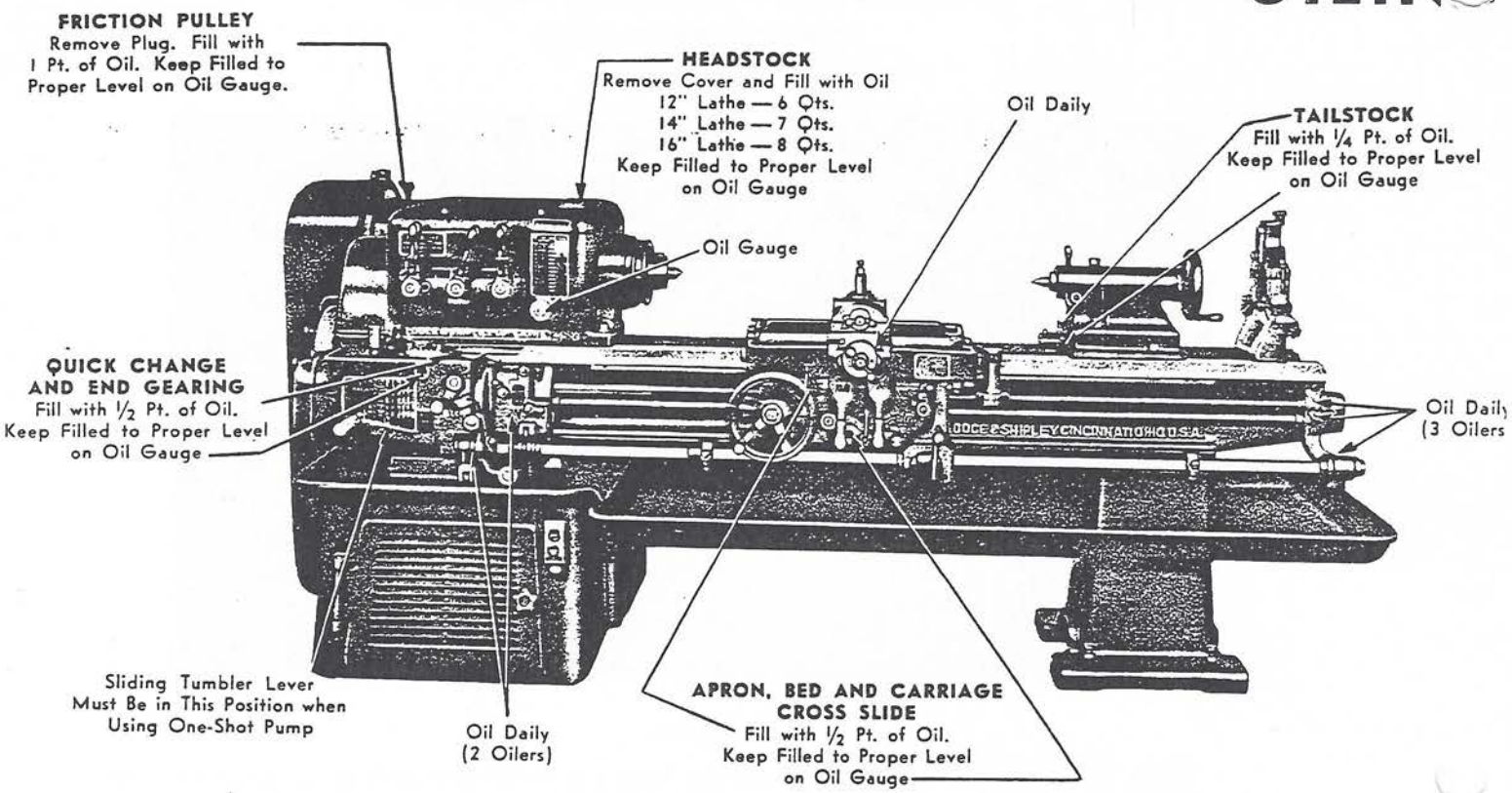
Example: Required to chase 9 threads per inch. Find 9 on standard Index Plate (Table 1) in division marked "Threads per Inch" and move Tumbler "C" to position directly underneath the column in which the Thread appears. In the same horizontal column find letter "C" which denotes position of Lever "B". The Pull Knob "A" must be moved to the "IN" position, as indicated at extreme left of Index Plate. Lever 'D" must be in "Threads" position and gear "H" must be on center 'I".

FEEDS IN THOUSANDTHS PER RPM OF SPINDLE

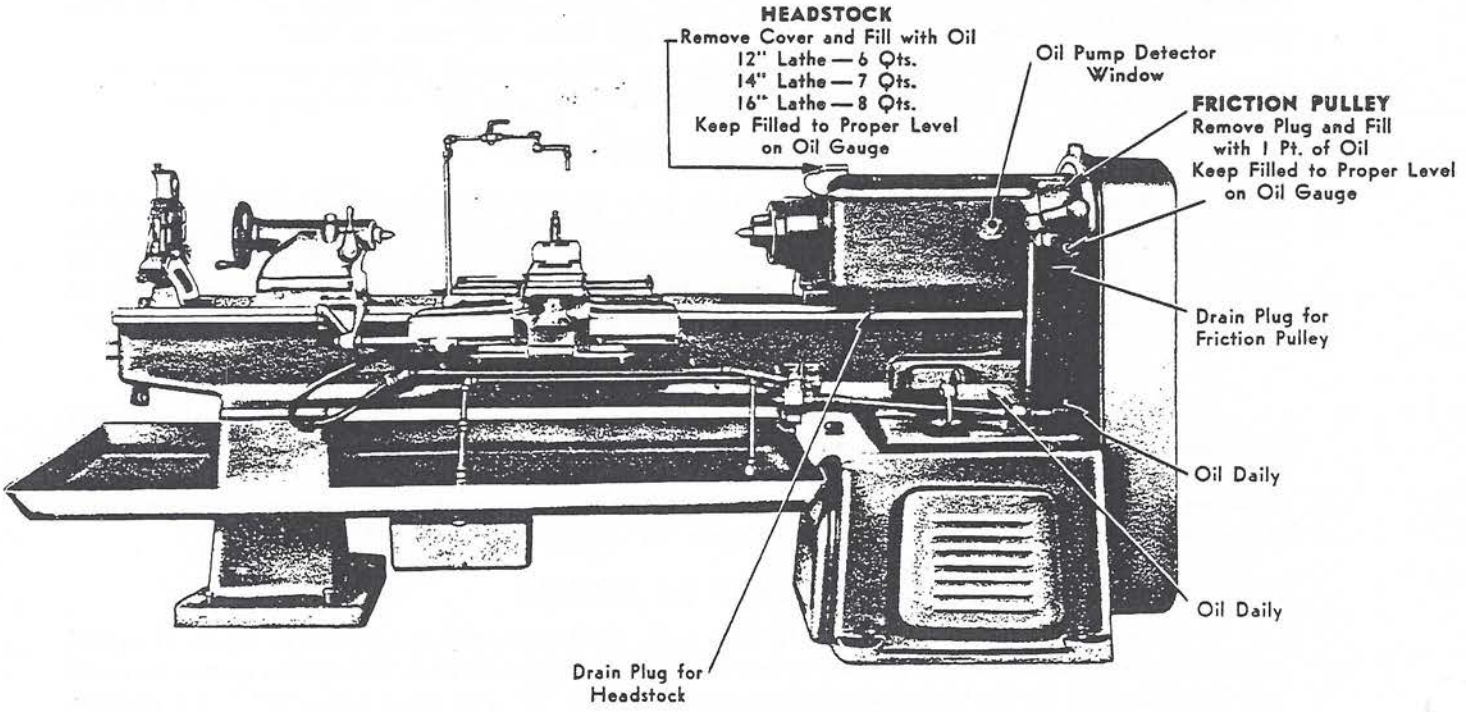
Example: Required, a Feed .010". Find 10 on Index Plate (Table 1) in division marked "Feeds in Thousandths per Revolution" and move Tumbler "C" to position directly beneath the column in which the Feed appears. In the same horizontal column find letter "A" and move Lever "B" to this position. Pull Knob "A" must be located in "OUT" position, as noted at extreme left of Index Plate. Lever 'D" must be in "Threads" position and gear "H" must be on center "I".

LEADS IN INCHES

Example: Required to cut a 3/16 inch lead. Final 3/16 inch on Index Plate (Table 1) in division marked "Leads in Inches" and move Tumbler "C" to position directly beneath the column in which the Lead appears. In the same horizontal column find letter "B" and move Lever "B" to this position. The Pull Knob "A" must be moved to the "IN" position, as indicated at the extreme left of Index Plate. Lever "D" must be in "Leads" position and gear "H" must be on center "J".

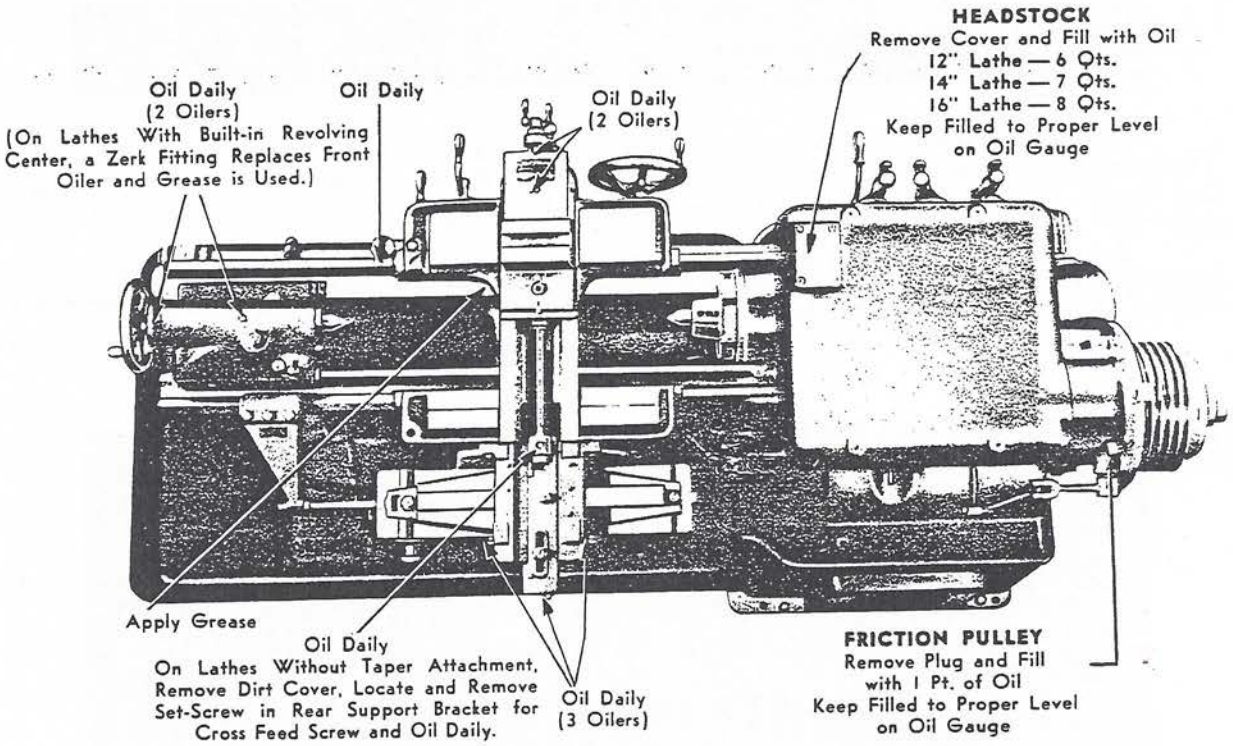


Front View of Standard Lathe

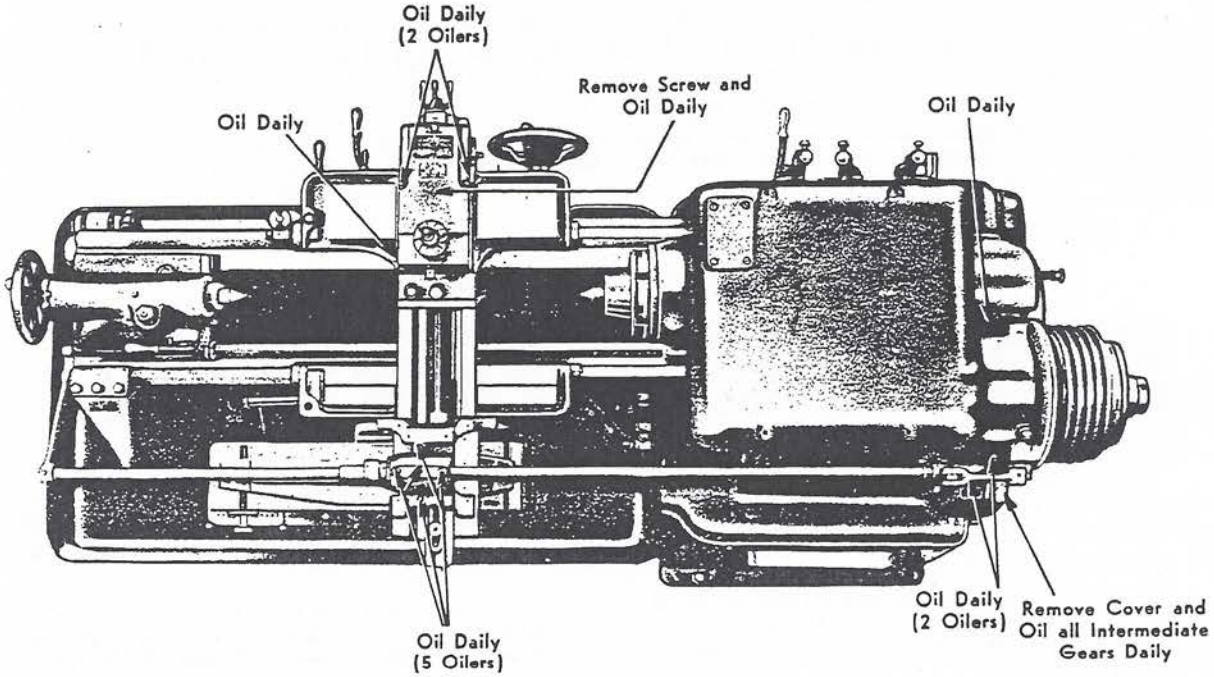


Rear View of Standard Lathe

ıAGRAM



Top View of Standard Lathe



Top View Showing Universal Relieving Attachment

LEADS OBTAINED WITH SPECIAL GEARING ON ENGLISH LEADSCREW LATHES

COARSE THREADING ATTACHMENT

KNOB IN						LEAD IN INCHES						
	1/2	9/16	5/8	11/16	23/32		3/4	A	13/16	7/8	15/16	1
	1	1 1/8	1 1/4	1 3/8	1 7/16		1 1/2	B	1 5/8	1 3/4	1 7/8	2
	2	2 1/4	2 1/2	2 3/4	2 7/8		3	C	3 1/4	3 1/2	3 3/4	4

Table No. 2

Table No. 2 shows the standard range of Coarse Leads in Inches obtained with the Coarse Threading Attachment. Pull Knob "X", see Figure No. 10 and 11, must be in "OUT" position. Pull Knob "A" should be "IN" for the full range. Lever "D" must be in "Lead" position and gear "H" on center "J".

Example: Required to cut a 2¼" Lead. Find 2¼" on Coarse Lead Index Plate (Table 2) and move Tumbler "C" directly underneath the column in which the Lead appears. In the same horizontal column, find letter "C" and move Lever "B" to this position.

METRIC LEADS

PULL KNOB "A"							LEAD IN M/M						
OUT		.25	.281	.312	.344	.359		.375	A	.406	.437	.469	.5
		.50	.562	.625	.687	.719		.750	B	.812	.875	.937	1
		1	1.125	1.25	1.375	1.437		1.50	C	1.625	1.75	1.875	2
IN		2	2.25	2.50	2.75	2.875		3	A	3.25	3.50	3.75	4
		4	4.50	5	5.50	5.75		6	B	6.50	7	7.50	8
		8	9	10	11	11.50		12	C	13	14	15	16
OUT		.036	.040	.045	.050	.052	FEED IN M/M	.054	A	.059	.063	.068	.072
		.072	.081	.090	.099	.10		.11	B	.12	.13	.14	.15
		.15	.16	.18	.20	.21		.22	C	.23	.25	.27	.29
IN		.29	.32	.36	.40	.41		.43	A	.47	.50	.54	.58
		.58	.65	.72	.79	.83		.86	B	.94	1.00	1.08	1.15
		1.15	1.30	1.44	1.58	1.66		1.73	C	1.87	2.00	2.16	2.30

Table No. 3

Table No. 3 shows the range of Metric Leads and Feeds obtained with Metric Translating Gears. The gears must be compounded, as shown in Diagram No. 2 on Page 25.

A 56-T gear is mounted on center "K", a 42-T gear on the inner plane of center "M", a 120-T gear on the outer plane of center "M" meshing with a 127-T gear on center "L". Lever "D" must be in "Lead" position and gear "H" on center "J". If lathe is equipped with Coarse Threading Attachment, Pull Knob "X" must be "IN".

Example: Required to cut a lead of 5 m/m. Find 5 on Table 3 in division marked "Leads in M/M" and move Tumbler "C" to position directly beneath the column in which the Lead appears. In the same horizontal column, find letter "B" and move Lever "B" to this position. Move Pull Knob "A" to "IN" position, as indicated at extreme left of Index Plate.

A similar sequence of adjustments is followed to obtain Metric Feeds.

COARSE METRIC LEADS

KNOB IN						LEAD IN M/M						
	16	18	20	22	23		24	A	26	28	30	32
	32	36	40	44	46		48	B	52	56	60	64
	64	72	80	88	92		96	C	104			

Table No. 4

Table No. 4 shows the standard range of Coarse Metric Leads obtainable with Metric Translating Gears and Coarse Threading Attachment. The gearing and levers are arranged as described under "Metric Leads", except that Pull Knob "A" is "IN" for the full range. Pull Knob "X" must be pulled "OUT".

Example: Required to cut a Lead of 36 M/M. Find 36 on Coarse Metric Lead Index Plate (Table 4) in division marked "Leads in M/M" and move Sliding Tumbler "C" to position directly underneath the column in which the Lead appears. In the same horizontal column, find letter "B" and move Lever "B" to this position.

DIAMETRAL PITCHES

The diametral pitch is the ratio of the number of teeth to the number of inches of pitch diameter in a gear and equals the number of gear teeth to each inch of pitch diameter. Diametral pitches are, therefore, numbered from 1 up.

As an example, a gear having 40 teeth and 4 inches pitch diameter, the diametral pitch equals 40/4 or 10 diametral pitch. If it is required to cut a worm or chase the lead of a hob for 10 diametral pitch, the lathe end gearing is set up in accordance with the following tables. To find the circular pitch corresponding to the diametral pitches given in the table, divide 3.1416 by the diametral pitch.

PULL KNOB "A"							DIAMETRAL PITCHES						
	IN	8	9	10	11	11½		12	A	13	14	15	16
		16	18	20	22	23		24	B	26	28	30	32
		32	36	40	44	46		48	C	52	56	60	64
	OUT	64	72	80	88	92		96	A	104	112	120	128

Table No. 5

Table No. 5 shows the range of Diametral Pitches that can be obtained with standard Diametral Pitch Gearing, which must be compounded as shown in Diagram No. 2, Page No. 25.

A 51-T gear is mounted on center "K", a 50-T gear on the inner plane of center "M", a 77-T gear on the outer plane of center "M" meshing with a 100-T gear on center "L". Lever "D" must be in"Thread"position and gear "H" must be on center "I". If lathe is equipped with Coarse Threading Attachment, Pull Knob "X" must be "IN".

Example: Required to cut a 10 Diametral Pitch. Find 10 on the Index Plate (Table 5) and move Tumbler "C" to position directly underneath the column in which the Pitch appears. In the same horizontal column, find letter "A" and move Lever "B" to this position. Pull Knob "A" must be in "IN" position.

COARSE DIAMETRAL PITCHES

KNOB IN						DIAMETRAL PITCHES						
	1	1⅛	1¼	1⅜	1 7/16		1½	A	1⅝	1¾	1⅞	2
	2	2¼	2½	2¾	2⅞		3	B	3¼	3½	3¾	4
	4	4½	5	5½	5¾		6	C	6½	7	7½	8

Table No. 6

Table No. 6 shows the range of Coarse Diametral Pitches obtainable on a Lathe equipped with Coarse Threading Attachment and Diametral Pitch Gearing. The gearing and levers are set up as described under "Diametral Pitches", except that Pull Knob "A" must be "IN" for the full range. Pull Knob "X" must be pulled "OUT".

Example: Required to cut a 1 Diametral Pitch. Find 1 on Index Plate (Table 6) and move Sliding Tumbler "C" to the position directly underneath the column in which the required Pitch appears. In the same horizontal column, find the letter "A", then move Lever "B" to this position.

MODULE LEADS

The Diametral Pitch is not used in the Metric System. Instead, the dimensions of the gear are expressed by reference to the Module of the gear. The module is equal to the Pitch Diameter in millimeters divided by the number of teeth. The Module is, also, equal to the circular pitch in millimeters divided by 3.1416.

PULL KNOB "A"							MODULE LEADS						
	OUT	1/8	9/64	5/32	11/64	23/128		3/16	B	13/64	7/32	15/64	1/4
		1/4	9/32	5/16	11/32	23/64		3/8	C	13/32	7/16	15/32	1/2
	IN	1/2	9/16	5/8	11/16	23/32		3/4	A	13/16	7/8	15/16	1
		1	1⅛	1¼	1⅜	1 7/16		1½	B	1⅝	1¾	1⅞	2
		2	2¼	2½	2¾	2⅞		3	C	3¼	3½	3¾	4

Table No. 7

Table No. 7 shows the range of Module Leads that can be obtained with standard Module Lead Gearing, which must be compounded as shown in Diagram No. 2, Page No. 25.

A 50-T gear is mounted on center "K", a 50-T gear on the inner plane of center "M", a 94-T gear on the outer plane of center "M" meshing with a 95-T gear on center "L". Lever "D" must be in the "Lead" position and gear "H" must be on center "J". If lathe is equipped with Coarse Threading Attachment, Pull Knob "X" must be "IN".

Example: Required to cut a 2 Module Lead. Find 2 on Module Lead Index Plate (Table 7) and move Sliding Tumbler "C" to position directly underneath the column in which the Lead appears. In the same horizontal column, find the letter "C" and move Lever "B" to this position. Move Pull Knob "A" to "IN" position.

COARSE MODULE LEADS

KNOB IN						MODULE LEADS						
	4	4½	5	5½	5¾		6	A	6½	7	7½	8
	8	9	10	11	11½		12	B	13	14	15	16
	16	18	20	22	23		24	C	26	28	30	32

Table No. 8

Table No. 8 shows the range of Coarse Module Leads obtained on a lathe equipped with Coarse Threading Attachment and Module Lead Gearing. The gearing and levers are set up as described under "Module Leads", except that Pull Knob "A" must be "IN" for the full range. Pull Knob "X" must be pulled "OUT".

Example: Required to cut a 24 Module Lead. Find 24 on the Coarse Module Lead Index Plate (Table 8) and move Sliding Tumbler "C" to position directly underneath the column in which the Lead appears. In the same horizontal column, find letter "C" and move Lever "B" to this position.

RANGES OF LEADS, THREADS AND FEEDS FOR METRIC LEADSCREW LATHE

STANDARD RANGE

Table No. 3 shows the range of Metric Leads and Feeds obtainable on a standard Engine or Tool Room Lathe without supplementary gearing. 50-T gears are mounted on centers "K" and "L" with a suitable idler gear on center "M". Lever "D" must be in "Lead" position and gear "H" on center "J".

NOTE: Lever "D" cannot be shifted until gear "H" is removed. Shifting this lever automatically shifts interlock "O" and permits mounting gear "H" on the proper center.

Metric Leads -- Example: Required to cut a .750 M/M lead. Find .750 on Table No. 3 in division marked "Leads in M/M" and move Tumbler "C" to position directly beneath column in which this Lead appears. In the same horizontal column, find letter "B" and move Lever "B" to this position. Move Pull Knob "A" to "OUT" position.

A similar sequence of adjustments is followed to obtain Metric Feeds.

LEADS OBTAINED WITH SPECIAL GEARING ON METRIC LEADSCREW LATHES

COARSE METRIC LEADS

Table No. 4 shows the range of Coarse Metric Leads obtained with the Coarse Threading Attachment. Pull Knob "X", see Figure No. 10 and 11, must be "OUT". Pull Knob "A" must be "IN" for the full range. Lever "D" must be in "Lead" position and gear "H" on center "J".

Example: Required a Lead to 40 M/M. Find 40 on the Coarse Lead Index Plate (Table 4) and move Tumbler "C" to position directly beneath column in which the Lead appears. In the same horizontal column, find the letter "B" and move Lever "B" to this position.

ENGLISH THREADS, LEADS AND FEEDS

Table No. 1 shows the range of English Threads, Leads and Feeds obtainable on a standard lathe with English Translating Gears.

The gears must be compounded as shown in Diagram No. 2 on Page No. 25.

A 42-T gear is mounted on center "K", a 56-T gear on the inner plane of center "M" a 127-T gear on the outer plane of center "M" meshing with a 120-T gear on center "L". For chasing "Threads per Inch" or obtaining "Feeds", Lever "D" must be in "Threads" position and gear "H" on Center "I". For chasing "Leads in Inches", Lever "D" must be in "Lead" position and gear "H" on Center "J". If machine is equipped with Coarse Threading Attachment, Pull Knob "X" must be "IN".

See examples under "Standard Range" for lathes with English Leadscrew for selection of any desired Thread, Lead or Feed.

COARSE ENGLISH LEADS

Table No. 2 shows the range of Coarse English Leads obtainable with English Translating Gears and Coarse Threading Attachment. The gears and levers are arranged as described under "English Threads, Leads and Feeds" with Lever "D" in "Lead" position and gear "H" on Center "J". Pull Knob "A" is "IN" for full range. Pull Knob "X" must be "OUT".

See example under "Coarse Leads" for lathe with English Leadscrew for selection of any desired lead.

DIAMETRAL PITCHES

Table No. 5 shows the range of Diametral Pitches obtainable with standard Diametral Pitch Gearing.

The gears must be compounded as shown in Diagram No. 2, Page No. 25.

A 49-T gear is mounted on center "K", a 51-T gear on the inner plane of center "M", an 85-T gear on the outer plane of center "M" meshing with a 131-T gear on center "L". Lever "D" must be in "Thread" position and gear "H" on center "I". If lathe is equipped with Coarse Threading Attachment, Pull Knob "X" must be "IN".

See example under "Diametral Pitches" for English Leadscrew Lathe for selection of any desired diametral pitch.

COARSE DIAMETRAL PITCHES

Table No. 6 shows the range of Coarse Diametral Pitches obtainable with Diametral Pitch Gearing and Coarse Threading Attachment. The gearing and levers are arranged as described for "Diametral Pitches". Pull Knob "X" must be "OUT". Pull Knob "A" is "IN" for the full range.

See example under "Coarse Diametral Pitches" for English Leadscrew lathe for selection of any desired diametral pitch.

MODULE LEADS

Table No. 7 shows the range of Module Leads obtainable with standard "Module Lead Gearing".

Gears must be compounded as shown in Diagram No. 2, Page No. 25.

A 51-T gear is mounted on center "K", a 50-T gear on the inner plane of center "M", a 77-T gear on the outer plane of center "M" meshing with a 100-T gear on center "L". Lever "D" must be in "Lead" position and gear "H" on center "J". If the lathe is equipped with Coarse Threading Attachment, Pull Knob "X" must be "IN".

See example under "Module Leads" for English Leadscrew Lathes for selection of any desired "Module Lead".

COARSE MODULE LEADS

Table No. 8 shows the range of Coarse Module Leads obtainable with Module Lead Gearing and Coarse Threading Attachment. The gears and levers are set up as described under "Module Leads". Pull Knob "X" must be "OUT". Pull Knob "A" is "IN" for the full range.

See example under "Coarse Module Leads" for English Leadscrew Lathe for selection of any desired lead.

HOW TO OBTAIN LEADS NOT ON INDEX PLATES TABLES 1 TO 8

When it is required to cut a lead, which is not listed on the Standard Index Plate (Table 1) or Special Index Plates (Tables 2 to 8), it is necessary to use Special Gears on Centers "K", "L" and "M".

To obtain the new Gear Ratio, it is usual to select a Lead by trial from the Table of Leads, Threads and Decimal Equivalents (Table 9) for Standard Lathes, and convert the ratio by the following formula:

$$\frac{\text{Drivers}}{\text{Driven}} = \frac{\text{Lead Required}}{\text{Lead Selected from Table 9.}}$$

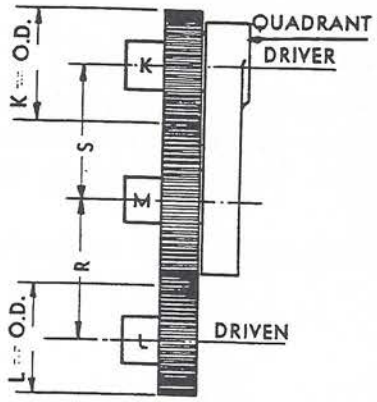
No rule can be given for selecting a trial lead from the table. It should, however, be near the required Lead and preferably a whole number.

EXAMPLE — GEARS NOT COMPOUNDED

Required to cut a $\frac{5}{9}$ inch lead. Select $\frac{1}{2}$ from the Table.

Then: $\frac{\text{Drivers}}{\text{Driven}} = \frac{\frac{5}{9}}{\frac{1}{2}} = \frac{5}{9} \times \frac{2}{1} = \frac{10}{9} = \frac{30}{27}$ = Ratio of Gears Required.

Therefore, Gears having 30-T and 27-T would be used on Centers "K" and "L" respectively, with a suitable Intermediate Gear on Center "M".



SIZE OF LATHE	12"	14"	16"
K — Maximum O.D.	3¾"	5"	4½"
L — Maximum O.D.	4⅝"	4⅝"	4⅝"
S — Center Distance	3.571"	4.166"	4.166"
R — Minimum Center Distance	3⅛"	3⅛"	3½"
R — Maximum Center Distance	4¾"	4½"	5"
MINIMUM PITCH DIAMETERS OF GEARS IS 2"			

Diagram No. 1 — Gears Not Compounded

EXAMPLE — GEARS COMPOUNDED

Required to cut .0272 inch lead.

Select .0312 from Table No. 9, page 25.

Then: $\frac{\text{Drivers}}{\text{Driven}} = \frac{.0272}{.0312} = \frac{272}{312}$ = Ratio of Gears Required.

Gears of these diameters cannot be used. It, therefore, becomes necessary to use compound gears.

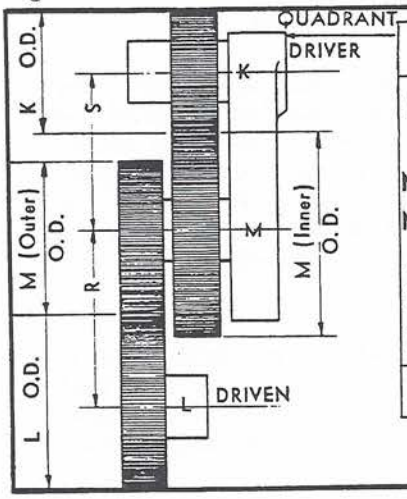
By factoring: $\frac{272}{312} = \frac{4 \times 68}{8 \times 39} = \frac{4 \times 34}{4 \times 39} = \frac{50}{50} \times \frac{34}{39}$

Therefore, by using 50-T and 34-T gears as drivers, and 50-T and 39-T, as driven, the correct gear ratio is obtained.

Gear	K	M(inner)	M(outer)	L
Number of teeth	50	50	34	39
Pitch for 12" lathe	14	14	10	10
Pitch diameter for 12" lathe	3.571	3.571	3.400	3.900
Pitch for 14" and 16" lathe	12	12	10	10
Pitch diameter for 14" and 16" lathe	4.166	4.166	3.400	3.900

Determine O.D. of above gears, check same against Diagram No. 2 and they will be found to be within prescribed limits.

In Compound Gearing K plus M (inner) minus 2" must be greater than M (outer); also, L plus M (outer) minus 2" must be greater than M (inner). This is necessary to clear hubs of gears K and L.



SIZE OF LATHE	12"	14"	16"
K — Maximum O.D.	3¾"	5"	4½"
L — Maximum O.D.	4⅝"	4⅝"	4⅝"
M (inner) — Maximum O.D.	5¼"	6⅜"	6⅜"
M (outer) — Maximum O.D.	5¼"	6⅜"	6⅜"
S — Center Distance	3.571"	4.166"	4.166"
R — Minimum Center Distance	3⅛"	3⅛"	3½"
R — Maximum Center Distance	4¾"	4½"	5"
MINIMUM PITCH DIAMETERS OF GEARS IS 2"			

Diagram No. 2 — Gears Compounded

DECIMAL EQUIVALENTS FOR LEADS AND THREADS

Leads	Thds. per Inch	Decimal Equiv. of Leads	Leads	Thds. per Inch	Decimal Equiv. of Leads	Leads	Thds. per Inch	Decimal Equiv. of Leads	Leads	Thds. per Inch	Decimal Equiv. of Leads
1/128	128	.0078	1/32	32	.0312	23/256	11-3/23	.0898	4/15	3-3/4	.2666
1/120	120	.0083	1/30	30	.0333	1/11	11	.0909	9/32	3-5/9	.2812
1/112	112	.0089	9/256	28-4/9	.0351	3/32	10-2/3	.0937	2/7	3-1/2	.2857
1/104	104	.0096	1/28	28	.0357	1/10	10	.1000	4/13	3-1/4	.3077
1/96	96	.0104	1/26	26	.0385	13/128	9-11/13	.1015	5/16	3-1/5	.3125
1/92	92	.0109	5/128	25-3/5	.0391	7/64	9-1/7	.1093	1/3	3	.3333
1/88	88	.0114	1/24	24	.0417	1/9	9	.1111	11/32	2-10/11	.3437
1/80	80	.0125	11/256	23-3/11	.0429	15/128	8-8/15	.1172	8/23	2-7/8	.3478
1/72	72	.0139	1/23	23	.0435	1/8	8	.1250	23/64	2-18/23	.3594
1/64	64	.0156	23/512	22-6/23	.0449	2/15	7-1/2	.1333	4/11	2-3/4	.3636
1/60	60	.0167	1/22	22	.0455	9/64	7-1/9	.1406	3/8	2-2/3	.3750
9/512	56-8/9	.0176	3/64	21-1/3	.0469	1/7	7	.1428	2/5	2-1/2	.4000
1/56	56	.0178	1/20	20	.0500	2/13	6-1/2	.1538	13/32	2-6/13	.4062
1/52	52	.0192	13/256	19-9/13	.0507	5/32	6-2/5	.1562	7/16	2-2/7	.4375
5/256	51-1/5	.0195	7/128	18-2/7	.0547	1/6	6	.1666	4/9	2-1/4	.4444
1/48	48	.0208	1/18	18	.0555	11/64	5-9/11	.1719	15/32	2-2/15	.4687
11/512	46-6/11	.0215	15/256	17-1/15	.0585	4/23	5-3/4	.1739	1/2	2	.5000
1/46	46	.0217	1/16	16	.0625	23/128	5-13/23	.1797	9/16	1-7/9	.5625
23/1024	44-12/23	.0225	1/15	15	.0666	2/11	5-1/2	.1818	5/8	1-3/5	.6250
1/44	44	.0227	9/128	14-2/9	.0703	3/16	5-1/3	.1875	11/16	1-5/11	.6875
3/128	42-2/3	.0234	1/14	14	.0714	1/5	5	.2000	23/32	1-9/23	.7187
1/40	40	.0250	1/13	13	.0769	13/64	4-12/13	.2031	3/4	1-1/3	.7500
13/512	39-5/13	.0254	5/64	12-4/5	.0781	7/32	4-4/7	.2187	13/16	1-3/13	.8125
7/256	36-4/7	.0273	1/12	12	.0833	2/9	4-1/2	.2222	7/8	1-1/7	.8750
1/36	36	.0277	11/128	11-7/11	.0859	15/64	4-4/15	.2344	15/16	1-1/15	.9375
15/512	34-2/15	.0293	2/23	11-1/2	.0869	1/4	4	.2500	1	1	1.000

Table No. 9

UNIVERSAL RELIEVING ATTACHMENT

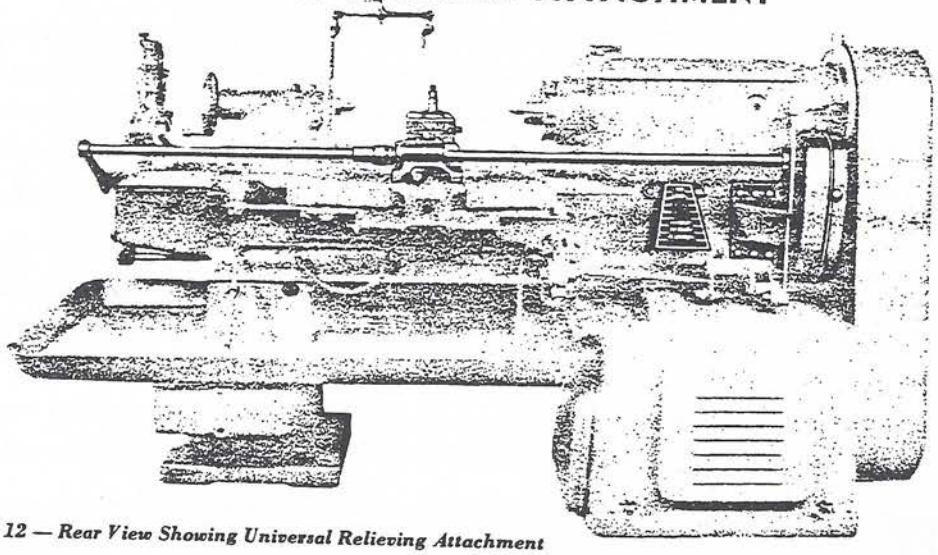


Fig. 12 — Rear View Showing Universal Relieving Attachment

The Lodge & Shipley Universal Relieving Attachment can be used with equal facility for all types of relieving work, plain, angular, end, internal and external, right-hand or left-hand and spiral. The range of spiral relieving is limited with the standard change gears. So many combinations are possible that additional gears are obtained by the user, depending on the requirements of his work. The attachment becomes an integral part of the machine for which it is supplied and does not require adding or removing units when in or out of service. It is easy to engage or disengage and does not interfere with normal operation of the lathe when not in use.

LUBRICATION

Adequate and proper lubrication for the Universal Relieving Attachment mechanism is just as essential as for the rest of the machine. Check the view showing the various parts that must be lubricated (See Oiling Diagram, Pages 18 and 19) and apply oil each time before starting the lathe up on relieving work or daily if it is used for long periods on this class of work.

SPINDLE SPEEDS

CAUTION: Since the Relieving Attachment gets its power from the back gearing in the headstock, one of the six lower back gear spindle speeds must be used for all relieving jobs to maintain register between the speed of the workpiece and the reciprocations of the slide.

The proper spindle speed to use for any particular relieving job is governed by the number of flutes on the workpiece and the cutting speed required to obtain the finish and accuracy desired. However, the reciprocations of the compound rest top slide should not exceed 216 per minute to allow sufficient time for the mechanisms to function properly. Since the number of reciprocations of the slide is the product of the number of flutes times the R.P.M. of the workpiece, it is apparent that slower speeds than standard are required for lathes equipped with Universal Relieving Attachment.

From experience gained over many years, it has been determined that spindle speeds, approximately one-half standard, are slow enough for most relieving work; consequently, most Relieving Attachment Lathes are equipped with Two-speed Motors to provide half-standard speeds for relieving work and standard speeds for regular lathe work.

For some relieving work, particularly work using wide forming tools, even slower speeds are needed and some machines are equipped with a 4 to 1 Spindle Nose Speed Reducer in place of the Two-speed Motor. When the Spindle Nose Speed Reducer is supplied, it is necessary to add into the Relieving Attachment Drive a 4 to 1 gear reduction unit, (see Figure No. 13), to maintain register between the speed of the workpiece and the reciprocations of the slide.

CAUTION: When using Spindle Nose Speed Reducer, the lead obtained is four times coarser than shown on Index Plate. Care must be taken to shift the 4 to 1 Gear Reduction Unit, shown in Figure No. 13, depending on whether the work is driven by regular lathe spindle or Spindle Nose Speed Reducer.

ADJUSTMENT FOR RELIEF

The amount of relief obtainable can be varied from 0 to $\frac{3}{16}$" on 12" and 14" Lathes and from 0 to $\frac{5}{16}$" on 16" Lathes for external relieving, and from 0 to $\frac{1}{8}$" on 12" and 14" Lathes and 0 to $\frac{3}{16}$" on 16" Lathes for internal relieving.

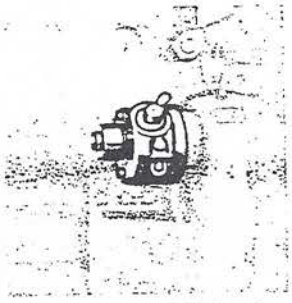


Fig. 13 — 4 to 1 Reduction Unit

To make the proper adjustment for amount of relief desired, release Lock Screw "B" (Figure No. 14) and set adjusting shaft "A" at left-hand side of Compound Rest to the required depth of relief. This shaft is graduated for that purpose. For right-hand external relief and left-hand internal relief, turn shaft towards "LEFT". In this case the relief will be toward center of lathe or axis of work as on form cutters, angle surface cutters, end mills, etc. This set-up is used in a majority of cases.

For left-hand external and right-hand internal, turn shaft toward "RIGHT". In this case, relief will be away from center of lathe or axis of work, as in case of threading dies and hollow mills.

After making adjustment for depth of relief, tighten lock screw.

TOOL SETTING

Unscrew Lock Collar "D" (Figure No. 14) by turning in left-hand direction. Withdraw Adjusting Sleeve "C" by sliding along Drive Shaft. Start lathe to take up all slack. Set tool up to work and centerline of lathe. Tool should be set with relation to work in flute and ready to start on its cut at high point of next land. Revolve Clutch "E" in direction away from bed, stopping at moment of reciprocation of slide. Slide Adjusting Sleeve "C" forward and engage in nearest tooth. Bring Lock Collar "D" forward and tighten. Start lathe and check reciprocations with respect to work. Final adjustments can be made by resetting Adjusting Sleeve "C" one tooth in either direction. The depth of cut is governed by the Cross Feed Screw. (Not shown in Figure No. 14.)

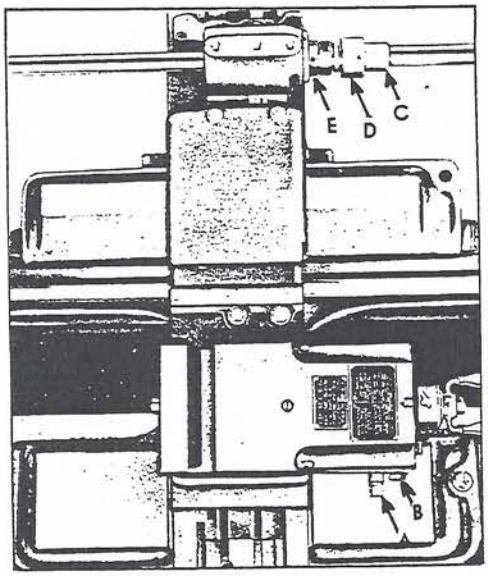


Fig. 14 — Close-up view of Universal Relieving Attachment, Compound Rest Mechanism

Angular and end relieving is accomplished by swiveling the Compound Rest to the required angle and clamping in position.

Illustrations show typical set-ups for relieving various classes of work. The method of setting up for Spiral Fluted Hobs is shown, relief on these pieces being toward the center of Lathe or axis of work.

A set-up, showing internal relieving as performed on a right-hand Threading Die, is also illustrated. In this case, relieving is away from the center of Lathe or axis of work.

SPECIAL NOTE. Arrangement is provided on Relieving Attachment Lathes to lock the top slide screw against accidental rotation due to reciprocating action of top slide. This is controlled by the Wing Nut on the Top Slide Screw Micrometer Dial Assembly, which should be locked tight during Relieving operations.

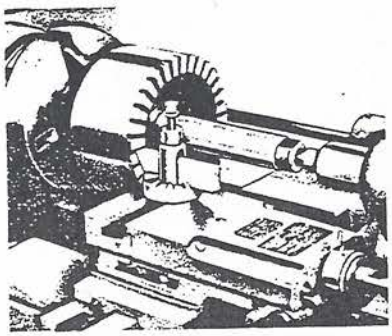


Fig. 15 — End Relieving

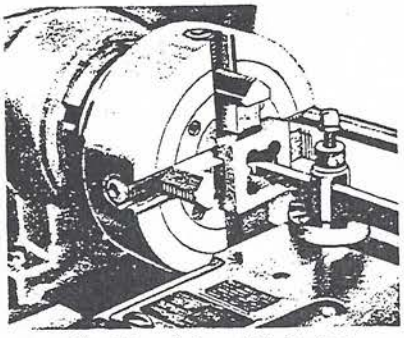


Fig. 16 — Internal Relieving

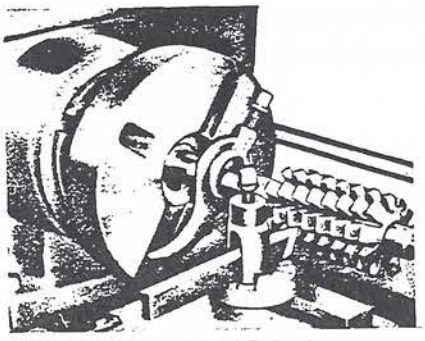


Fig. 17 — Helical Relieving

GEARING

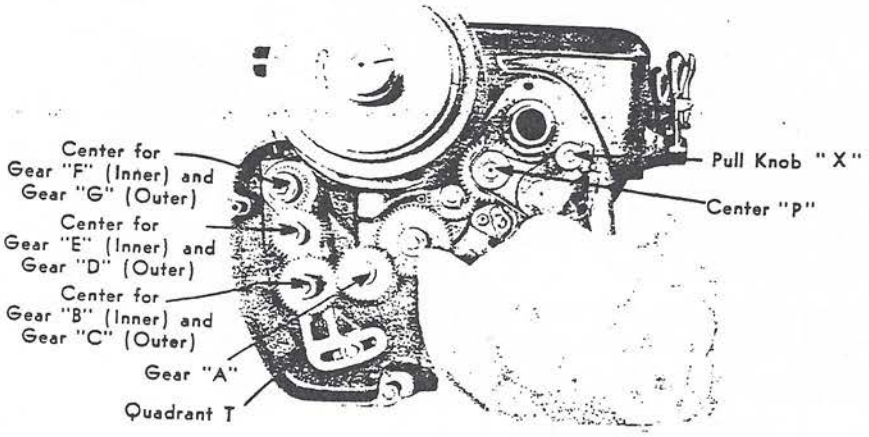


Fig. 18 — Gearing

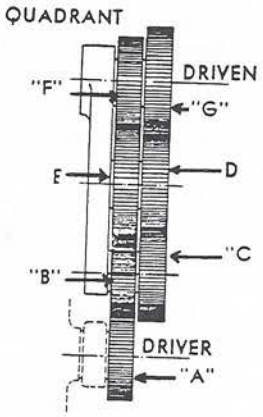


Diagram No. 3

Figure No. 18 and Diagram No. 3 shows the arrangement of the gearing. Table No. 10 lists the standard change gears regularly supplied and the proper set-up of same for the required number of flutes on all straight fluted work. This table is not applicable to spiral relieving work. The proper gearing for spiral fluted work must be calculated as outlined in succeeding pages.

After selecting and setting up the gearing on the proper centers, shown in Figure No. 18 and Diagram No. 3 in accordance with Table No. 10, the proper feed must be selected (for non-threaded jobs) or the proper thread or lead selected (for threaded jobs) and the regular quick change gearing set up, as described in previous pages for selecting threads, feeds and leads.

CAUTION: When Spindle Nose Speed Reducer is used, the lead or feed obtained is four times coarser than shown on Index Plate.

ENGAGING RELIEVING ATTACHMENT

Figure No. 18 shows the arrangement of the gearing, which powers the Relieving Attachment. To disengage the attachment, release stud holding Quadrant "T" in position, and swing quadrant to the left until gears "A" and "B" are disengaged; then tighten stud to hold quadrant in disengaged position. To engage the Relieving Attachment, reverse the above operation.

Flutes	A	B	C	D	E	F	G
2	28	56	24	52			48
3	24	56	28	52			32
4	24	52			28	48	
5	24	48	40	36			32
6	36	40			28	48	
7	28	44			36	32	
8	48	32	24	40			36
9	36	40			44	32	
10	40	36			44	32	
11	44	28			40	32	
12	48	28			40	32	
13	52	28			40	32	
14	56	28			36	32	
15	40	32	36	44			24
16	56	32			40	28	
18	48	24	36	40			32
20	48	24	40	36			32
22	48	24	44	36			32
24	56	28	48	36			32

Table No. 10—Change Gear Combinations for Relieving Threaded Parts With Straight Flutes

USING RELIEVING ATTACHMENT ON THREADED WORK

All lathes, equipped with Universal Relieving Attachment, should be equipped with Reverse in Pulley, so that it is possible to reverse the entire machine including thread chasing mechanism and relieving attachment mechanism at the same time, thus maintaining register between lead of workpiece, leadscrew and reciprocations of top slide. This is essential for all odd leads, coarse leads, metric leads, diametral pitches or spiral flutes and is desirable on all threaded jobs.

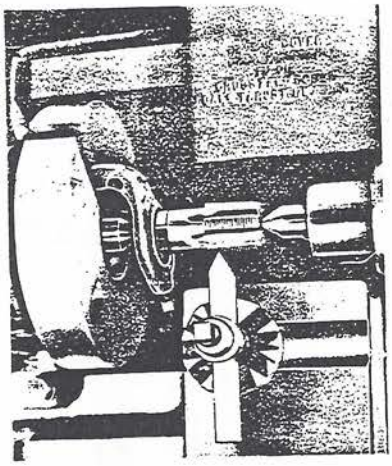


Fig. 19

At the end of the first cut, the operator does not open the half nuts; instead, he engages the Reverse in Pulley with the Mechanical Apron Control Lever and returns the Carriage to the starting point with the half nuts closed.

RELIEVING LEFT-HAND TAPS

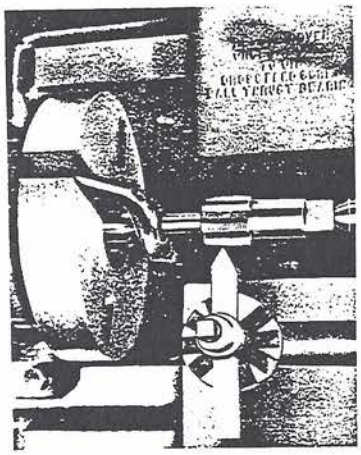


Fig. 20

Left-hand taps can be relieved in two different ways. As shown in Figure No. 19, relieving is done away from center of lathe or by relieving up to the cutting edge. This method has the disadvantage of leaving a burr at the cutting edge, which necessitates an extra operation to remove. The alternate method, shown in Figure No. 20, is to allow sufficient stock on the tap to accommodate a suitable driver on the bottom end. In this case, relieving is toward center of work or away from the cutting edge. The driver extension can be removed after relieving, if desired.

TAPER OR FORM RELIEVING WORK

In relieving taps or other tapered work, the Taper Attachment is used in connection with the Relieving Attachment in the same manner as it is used for ordinary taper turning.

If lathe is equipped with Form Turning Attachment, this can also be used for relieving formed cutters.

RELIEVING SPIRAL FLUTED HOBS AND TAPS

For relieving Spiral Fluted parts it is necessary to calculate the gears required to drive the attachment and the ratio of these gears is determined by the following formula:

$$\frac{\text{Product of Driving Gears}}{\text{Product of Driven Gears}} = \frac{N\ (L+P)}{8\ L}$$

Where: N = Number of Flutes
P = Lead of Thread
L = Lead of Spiral

GEARS FOR RELIEVING SPIRAL FLUTED HOBS AND TAPS, WHEN LEAD OF THE SPIRAL FLUTE IS KNOWN

To determine the ration of gears necessary, use the following formula:

$$\frac{\text{Product of Driving Gears}}{\text{Product of Driven Gears}} = \frac{N\ (L+P)}{8\ L}$$

Where: N = Number of Flutes.
P = Lead of Thread.
L = Lead of Spiral.

Example: Hob with 12 Flutes.
Lead of Thread = .5
Lead of Spiral = 14.5

By formula:

$$\frac{\text{Product of Driving Gears}}{\text{Product of Driven Gears}} = \frac{12\ \ (14.5\ +\ .5)}{8 \times 14.5} = \frac{180}{116}$$

Decimals in the product may be dropped for convenience.

Factoring: $\frac{180}{116} = \frac{4 \times 9 \times 5}{2 \times 2 \times 29} = \frac{36 \times 5}{4 \times 29} = \frac{36 \times 40}{32 \times 29}$

To complete the gear train, an intermediate gear is necessary. Diagram No. 4 shows the arrangement of the gears, in which case a 44-T intermediate gear was selected.

CAUTION: When using the Spindle Nose Speed Reducer, the resultant lead is *four times coarser* than that selected by the above method.

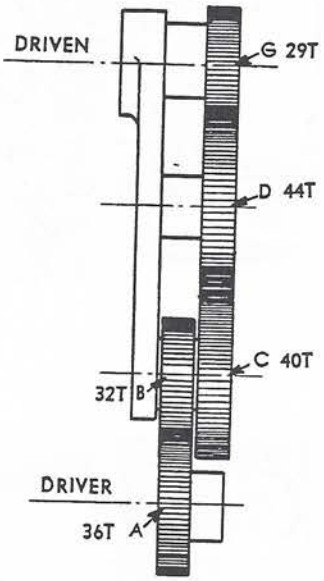


Diagram No. 4

GEARS FOR RELIEVING SPIRAL FLUTED HOBS AND TAPS, WHEN LEAD OF SPIRAL FLUTE IS NOT KNOWN

If the lead of the spiral is not known, this must first be determined. When the angle of the spiral flute is normal or at right angles to the thread this is determined by the following formula:

$$L = 9.87\frac{D^2}{P}$$

Where: L = Lead of Spiral.
D = Pitch Diameter of Screw.
P = Lead of Thread.

Then to determine the ratio of gears required, use the following formula:

$$\frac{\text{Product of Driving Gears}}{\text{Product of Driven Gears}} = \frac{N\ (L+P)}{8\ L} = \frac{N\ [(9.87\frac{D^2}{P}) + P]}{8\ (9.87\frac{D^2}{P})} = \frac{N\ [(9.87\ D^2) + P^2]}{9.87\ D^2 \times 8}$$

Where: N = Number of Flutes
P = Lead of Thread
D = Pitch Diameter of Screw
L = Lead of Spiral

Some variation in the Lead of Spiral can be allowed without sacrificing measurable accuracy. so that in factoring out the ratio, slight deviations from exact figures are permissible. This is well to remember when selecting gears in order to use such as are on hand, and also such as will mesh properly without interference. On any two adjacent centers, the sum of the teeth in the meshing gears should exceed by five or more the sum of the teeth in non-meshing gears.

Example: Hob with 12 Flutes.
Pitch Diameter = 1.623
Lead of Thread = .5

By formula above:

$$\frac{\text{Product of Driving Gears}}{\text{Product of Driven Gears}} = \frac{12 \mid (9.87 \times 1.623^2) + .5^2 \mid}{78.96 \times 1.623^2} = \frac{314.9}{207.9}$$

The decimals may be dropped for convenience, so that the ratio will be $\frac{315}{208}$

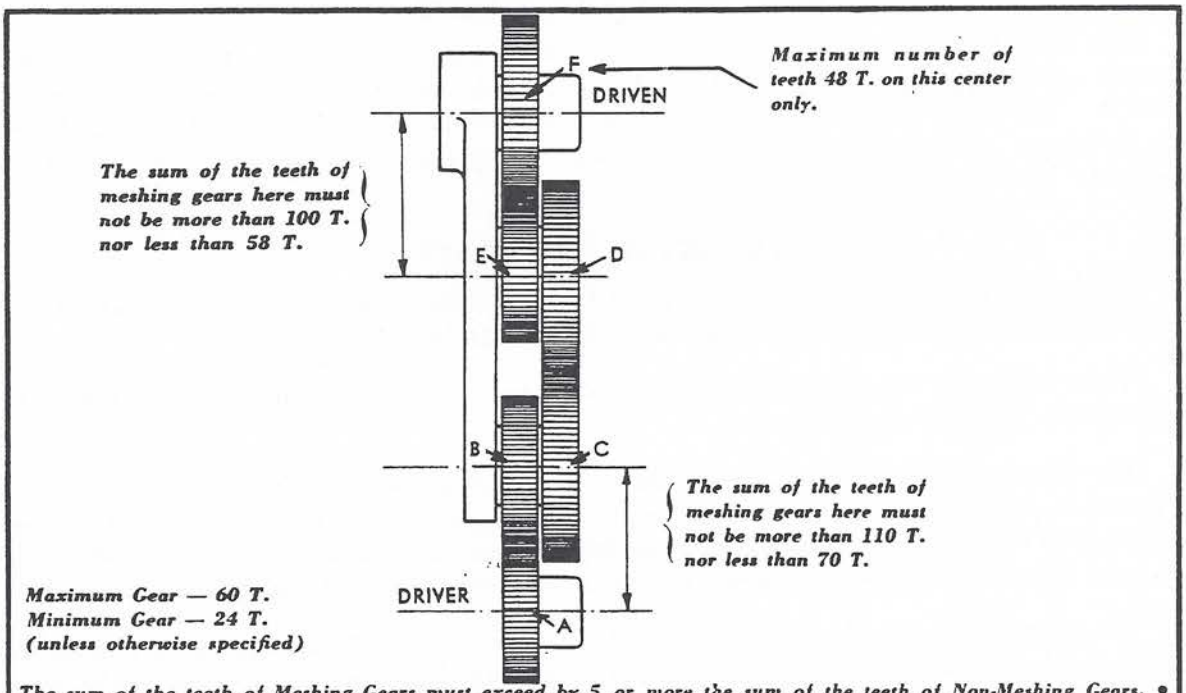
To obtain the proper change gears:

$$\text{Factoring: } \frac{315}{208} = \frac{9 \times 5 \times 7}{4 \times 4 \times 13} = \frac{36 \times 40 \times 56}{32 \times 32 \times 52} = \frac{\text{Drivers}}{\text{Driven}}$$

In arranging a gear train, it should be noted that the Drivers and Driven Gears can be placed on any of the centers, provided that the Drivers remain Driving Gears and the Driven remain Driven Gears. This is of advantage in selecting gears which will properly clear on their respective centers, as there are certain limitations which must be observed. After figuring a set of gears a comparison with the Limitation Chart will determine whether the gears will mesh properly without interference.

CAUTION: When using the Spindle Nose Speed Reducer, the lead obtained is *four times coarser* than that selected by the above method.

LIMITATION CHART OF GEAR SIZES FOR RELIEVING ATTACHMENT



The sum of the teeth of Meshing Gears must exceed by 5 or more the sum of the teeth of Non-Meshing Gears. • The sum of the teeth of Meshing Gears must exceed the number of teeth in the Non-Meshing Gear by at least 24 teeth to clear hub on center which carries only one gear. • The sum of the teeth in all the gears must not be more than 294 T. nor less than 216 T. In totalling the number of teeth, if an intermediate or idler gear is used, multiply the number of teeth in such a gear by two and include in the total. • It is absolutely necessary to provide gears for each center; therefore it may be found that in order to complete the train, intermediate or idler gears must be used on some of the centers.

Diagram No. 5

THE MANUFACTURING LATHE

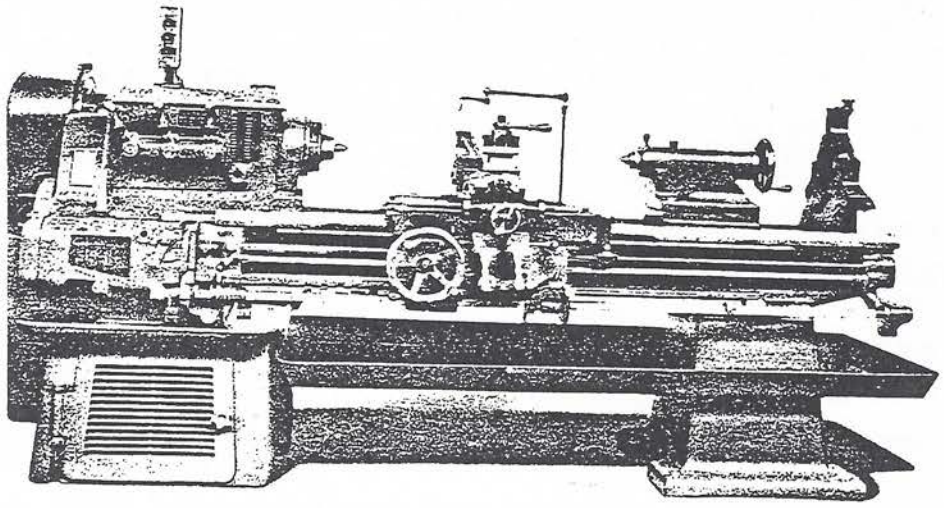


Fig. 21

The Lodge & Shipley Manufacturing Lathe is a standard Engine Lathe, supplied with extra attachments making it semi-automatic in operation, the use of which results in considerable time savings on quantity lots of workpieces. The lathe need never be idle, since these attachments do not interfere with the use of the lathe as a regular Engine Lathe on single-piece jobs.

PAN, PUMP AND TUBING

The use of cutting lubricant on many production jobs is so general that these attachments are, naturally, included in Manufacturing Lathe Equipment. The Pan gives full length protection. The Pump is the mechanical type driven by means of flat belt from hub of Driving Pulley on Lathe. A hand-operated valve is furnished in the line to control the flow of cutting lubricant.

CONNECTED REAR REST

The toolholding capacity provided by the Connected Rear Rest and the Compound Rest is such that the operator seldom has to change tools, except for regrinding.

These units and the tool blocks supplied for them are made so that the tool block is interchangeable on front or rear rest.

The Connected Rear Rest Base is coupled to the Compound Rest Base in such a manner that it can be readily removed. The cross feed screw moves both front and rear rests at the same time, the front feeding in to center while the rear feeds away, and vice versa. Suitable gib is provided that can be adjusted to take up wear between rear rest base and carriage cross slide.

The plain rest is mounted on the Connected Rear Rest Base in T-slots and locked in position by T-slot bolts. This is adjustable forward and back for proper positioning in relation to the compound rest top slide to reduce tool overhang and travel of the slides to a minimum. The High Duty or Four-Way Tool Blocks are adjustable horizontally in the plain rest for proper positioning of the tools. Quite frequently for various operations requiring the Four-Way Tool Block on the front and more than one tool on the rear, comparatively simple tool blocks are made by the operator for a multi-tool set up on the rear.

HIGH DUTY TOOL BLOCK

The High Duty Tool Block provides a heavy duty tool holder, equipped with two screws for clamping the tool securely in position. It can be swiveled to any desired angle and is then locked in position on the rear rest or top slide with a single screw.

FOUR-WAY TOOL BLOCK

The Four-Way Tool Block, as its name implies, provides capacity for holding four tools, any of which can be brought into cutting position as required.

It can be indexed in any of 12 positions equally spaced. To index the tool block loosen clamping lever, revolve the block to bring the tool into position and clamp the block by pulling back the clamping lever. The proper position of the block can be felt by the action of a ball in the tool block, actuated by a spring, dropping into position in recesses in a ring on the post, which correspond with the locking position on the index ring.

MULTIPLE DIAMETER STOPS

While the Multiple Diameter Stops are not automatic and cannot be used with the power feed, they produce remarkable time savings on small or large quantity lots of work, when used in conjunction with the Multiple Length Stops for semi-automatic lathe operation. The Diameter Stop Mechanism is mounted on the cross feed screw and replaces the regular Micrometer Ball Stop which is not supplied for lathes equipped with Multiple Diameter Stops.

Six adjustable stop screws are provided for the front tools and six for the rear tools. The barrel carrying these stop screws is easily rotated by hand to bring the stops into successive operation to suit the various diameters on the workpiece. The stop mechanism is engaged by inward pressure on the micrometer collar, while same is rotated to locate the clutch teeth and is disengaged by withdrawing the collar. When disengaged, the stop mechanism does not restrict the full travel of the cross feed screw.

If different tools are used in conjunction with the same stop, each tool must be set in relation to the tool used for the setting of the stop. Likewise, care must be exercised in replacing tools after regrinding.

The accuracy of the diameters, produced through the use of these stops, depends on the ability of the operator to bring the same amount of pressure against the stop at the bottom of each cut. This takes a bit of practice and some operators develop a fine "touch" or "feel" which results in producing remarkably accurate duplicate diameters.

MULTIPLE LENGTH STOPS

The Multiple Length Stop mechanism consists principally of Stop Bar "U" on which are mounted a set of five stop dogs. These stop dogs can be positioned on the bar at different places to provide five separate shoulders on the workpiece, when turning toward the headstock. The dogs are telescoped so that they can be set close together for comparatively short shoulders. The

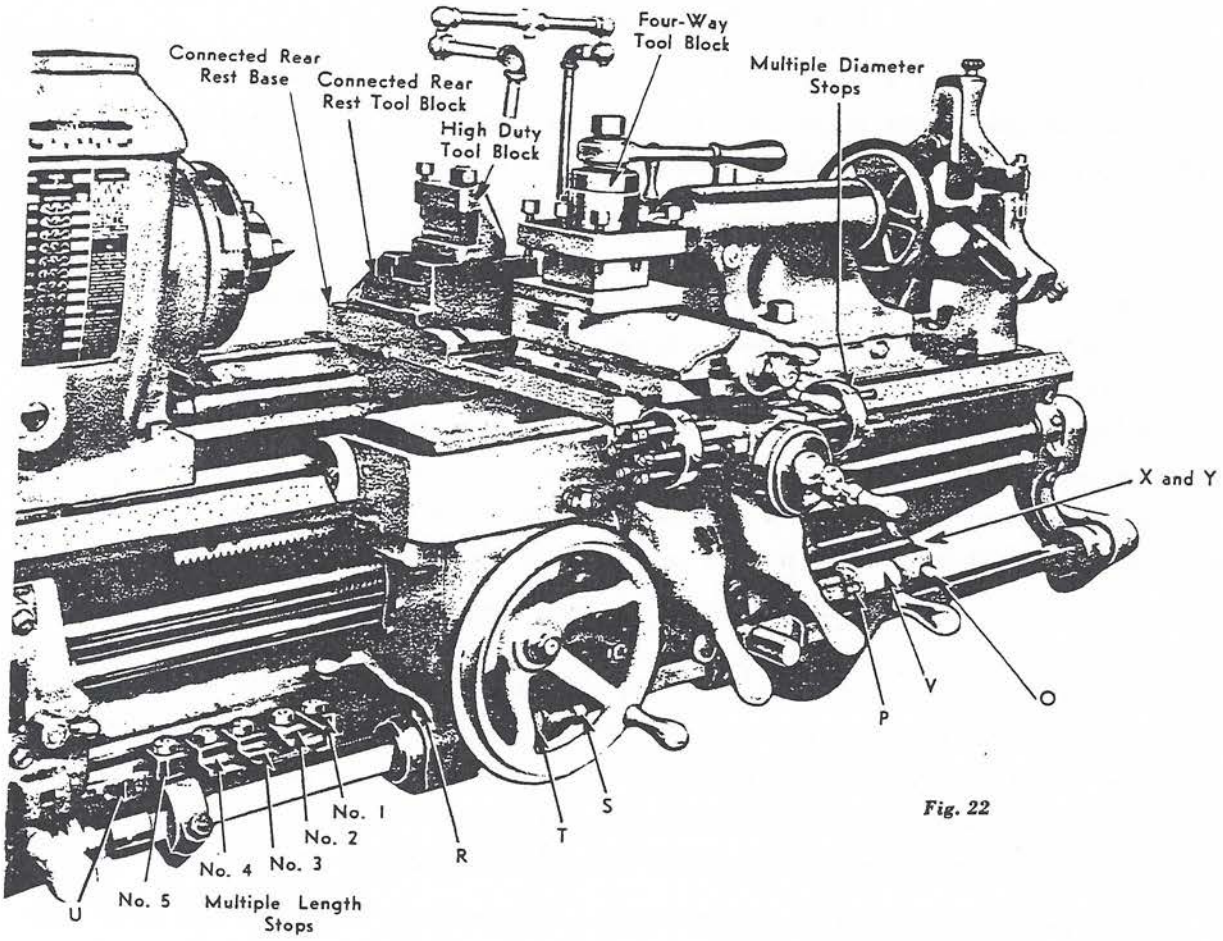


Fig. 22

action of the Trip Lever "R", coming in contact with the stop dog, moves Stop Bar "U" toward the headstock and disengages the Feed Rod Clutch, automatically stopping the Carriage.

The accuracy of these stops is limited and to insure accuracy of the shoulders, an additional positive stop is provided, which is engaged by a slight extra hand movement of the carriage with the Apron handwheel. Just as in the case of Multiple Diameter Stops, the accuracy of the shoulders produced on repetitive work depends on the ability of the operator to use the same amount of pressure each time he engages this positive stop.

For most work which is machined using Multiple Length Stops, it is possible to cut the workpiece to the same length and center the ends to the same depth, and this is an extremely important factor for satisfactory performance. For some jobs this is impossible, as when locating from some variable face or shoulder on the workpiece and an adjustment is provided to compensate for this as described later.

TO SET UP THE MULTIPLE LENGTH STOPS PROCEED AS FOLLOWS:

Place workpiece in lathe, choosing a definite locating method in relation to the Headstock Spindle for repetitive work.

With facing or turning tool in position, face off or turn to the first shoulder to be controlled by the stop dog.

With the Carriage in this position, drop the Trip Lever "R" which brings it in position to contact the stop dog.

Turn Eccentric "O" one-half turn to the left, jamming and locking the Stop Bar "U" against the positive stop.

Bring the first stop dog against Trip Lever "R" (which should be in the lower or engaged position) and lock the stop dog on the Stop Bar "U". All successive Stop Dogs for the remaining shoulders are positioned and clamped on Stop Bar "U" by measurement from the tripping face of the first dog to the tripping face of the dog being set according to the dimensions of the workpiece.

Next release Stop Bar "U" by turning Eccentric "O" one-half turn to the right. This positions the Stop Bar so that the feed is disengaged before the proper length shoulder is turned or faced and permits about .010 extra movement of the Carriage by hand to the positive stop after the power feed has been tripped.

After the power feed has been tripped and the tool brought against the positive stop, raising Trip Lever "R" permits the Stop Bar "U" to move to the right, re-engaging the Feed Clutch and Trip Lever "R" is then dropped to bring it into position for engaging the next stop.

If it has been impossible to provide workpieces cut to exactly the same lengths and centered to the same depth, this can be compensated by advancing or retracting Trip Lever "R" in relation to the Carriage. This does not affect the spacing of the various shoulders; it merely affects the location of the shoulders on the workpiece. To do this, release Lock Screw "S" and turn Knurled Nut "T" either by hand or with a Tommy Pin. Trip Lever "R" is advanced by an upward turn of Nut, "T" or retracted by a downward turn. This Nut is threaded with a 1/8" Right-Hand Lead, so a full turn of Nut "T" will move Trip Lever "R" 1/8". After setting, relock by tightening Screw "S".

After the dogs have been set up, it is customary to check the setting. For safety, Trip Lever "R" should be advanced slightly, as described above, to disengage the power feed sooner than required, so that the workpiece will not be spoiled if the stop dog has been incorrectly set to turn too long a shoulder. The workpiece is then turned to the next shoulder and carriage brought against the positive stop as described above. The setting of each dog can be checked in this manner, but the operator must take into consideration, when measuring the result, the amount he had advanced Trip Lever "R". If dogs have been properly set up or after re-setting of dog, Trip Lever "R" should be returned to its original setting.

Don't overlook using the Positive Stop for accurate duplication of shoulders. This positive stop is adjusted and locked in position at the factory; however, re-adjustment may be necessary at some time. To do this, loosen Lock Screw "V" and with screw driver advance or retract Screw "P" to suit and relock Screw "V". Each time this adjustment is made, it becomes necessary to readjust Eccentric "O". With the eccentric turned to the left or high point, loosen Lock Nut "X", and adjust Screw "Y" until resistance is felt, then relock Nut "X". Please note in this position that the Stop Bar "U" should be to the left and the Feed Clutch disengaged at least .015" to .020", which normally allows for approximately .010" extra movement of the Carriage to bring the tool to the positive stop by hand after the power feed has been tripped.

When more than one tool is used in machining the workpiece, each tool must be set in relation to the original tool or length stops. Likewise, care must be exercised in replacing tools after regrinding.

THE WORLD TURNS BEST ON LODGE & SHIPLEY LATHES

Publication No. 624-FL-345

Printed in U.S.A.

REPAIR PARTS

Model A 12″-14″-16″ Lathes

MODEL A Lathe Serial Numbers run from about 29,700 and up. The serial number will have five numerals in it, no letters or other symbols and, unless you locate the correct serial number with five numerals in it from 29,700 up, it is useless to send anything as the serial number of your machine because you have either picked out the incorrect number as the serial number of your lathe or you have an earlier model lathe than the one covered by this Repair Parts Booklet.

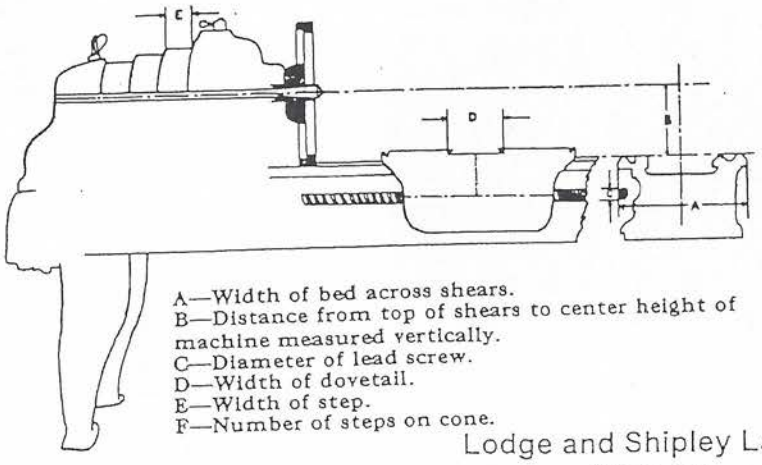
Lodge & Shipley stamp their serial numbers in two locations on the beds of their lathes as shown in the illustration. The one location is at the Tailstock end of the bed, and very close to this end, and the number is stamped on the flat *horizontal* surface between the two inverted vee ways on the rear bedway. The other is also on the rear bedway but on the outer *vertical* surface up at the headstock end and fairly close to the spindle nose end of the headstock. The same number is stamped in both locations.

Unless a bed has been replaned it is generally possible to locate the correct serial number in either or both of the above locations. If, however, it has been removed or defaced, then give us the dimensions A, B, C, D, E and F (if applicable) measured very carefully on the machine. This gives us a starting point to attempt to identify the correct replacements without the correct lathe serial number.

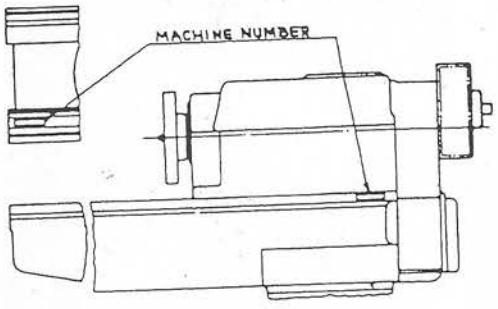
In all cases also specify the size of lathe you have by its nominal size rating which is generally cast on the front of the headstock.

Don't attempt to order replacements without giving us the size of lathe and serial number and/or the A, B, C, D, E and F dimensions. We will have to write you for same unless they accompany your inquiry or order.

The following pages show disassembled views of various units on Model A 12″, 14″ and 16″ Lathes. Please order the parts you need by Part Number *and* by Name to avoid any errors in interpretation. Your attention to the above will be greatly appreciated. It will enable us to give you better service and save both of us unnecessary delay and correspondence.



A—Width of bed across shears.
B—Distance from top of shears to center height of machine measured vertically.
C—Diameter of lead screw.
D—Width of dovetail.
E—Width of step.
F—Number of steps on cone.



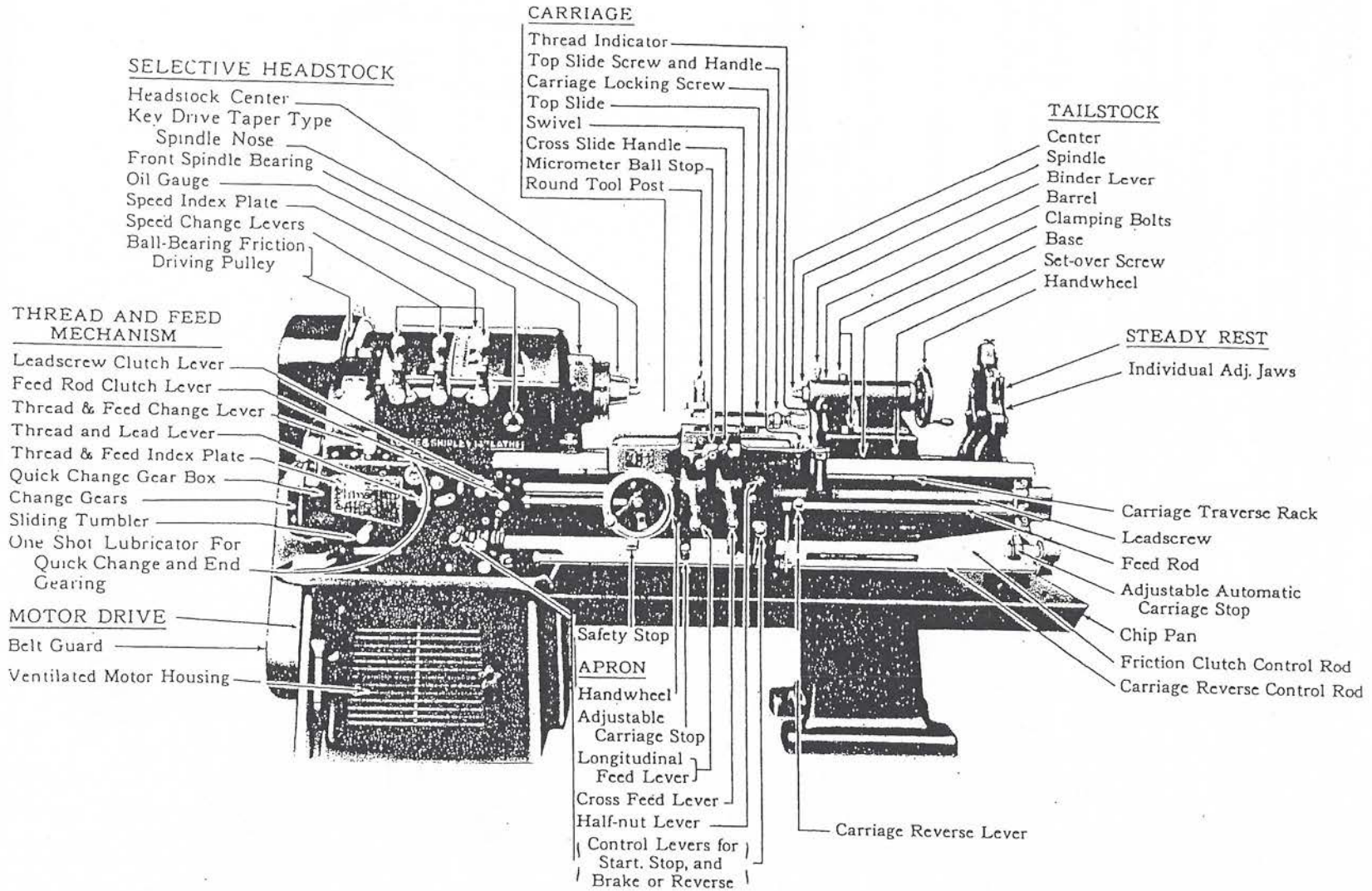
Location of Serial Number

Lodge and Shipley Lathes
Made By

MONARCH lathes

MONARCH LATHES, L.P.
SIDNEY, OHIO 45365 USA

BULLETIN No. 452R--IRI-488

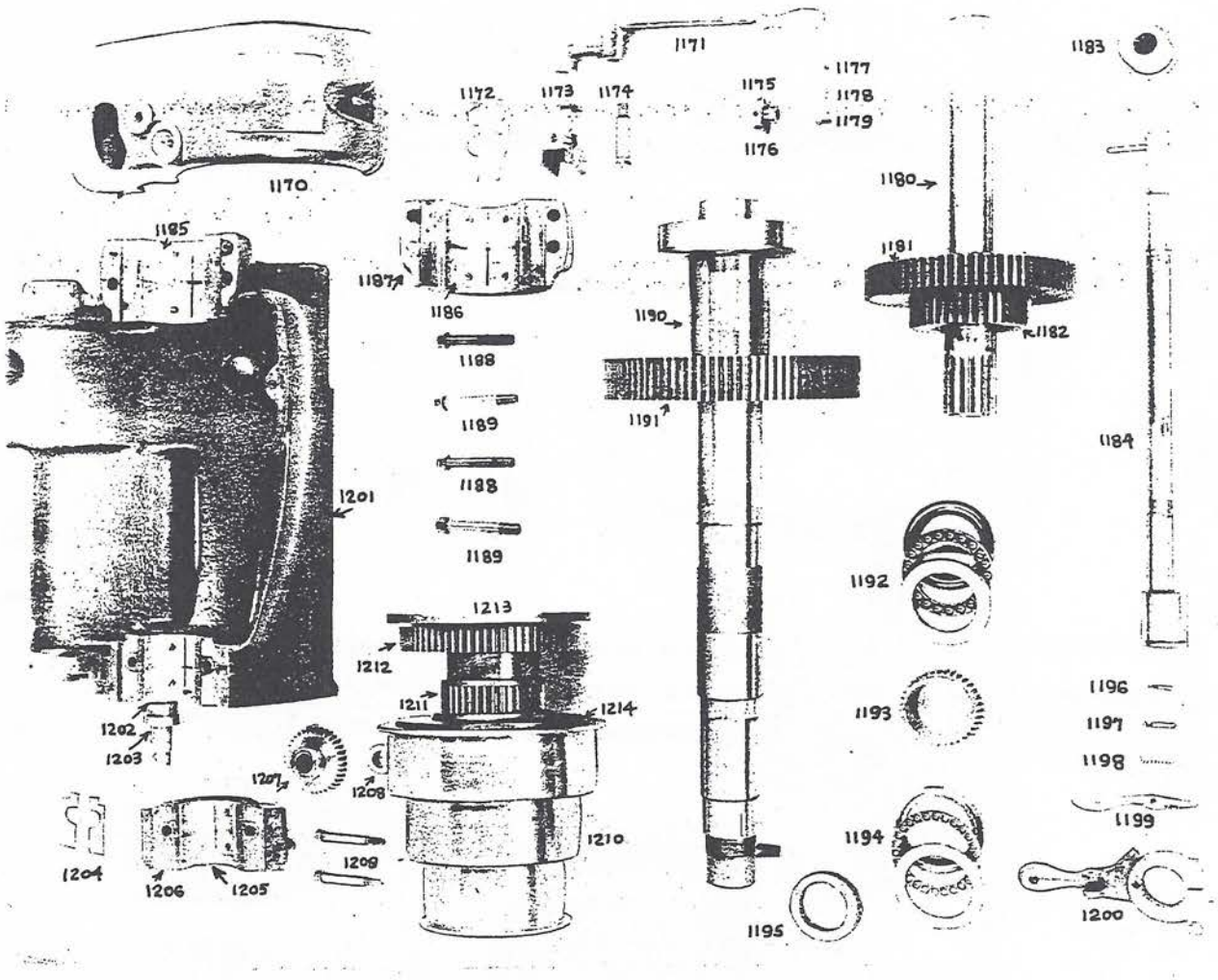


THE LODGE & SHIPLEY TOOL ROOM LATHE

Made By

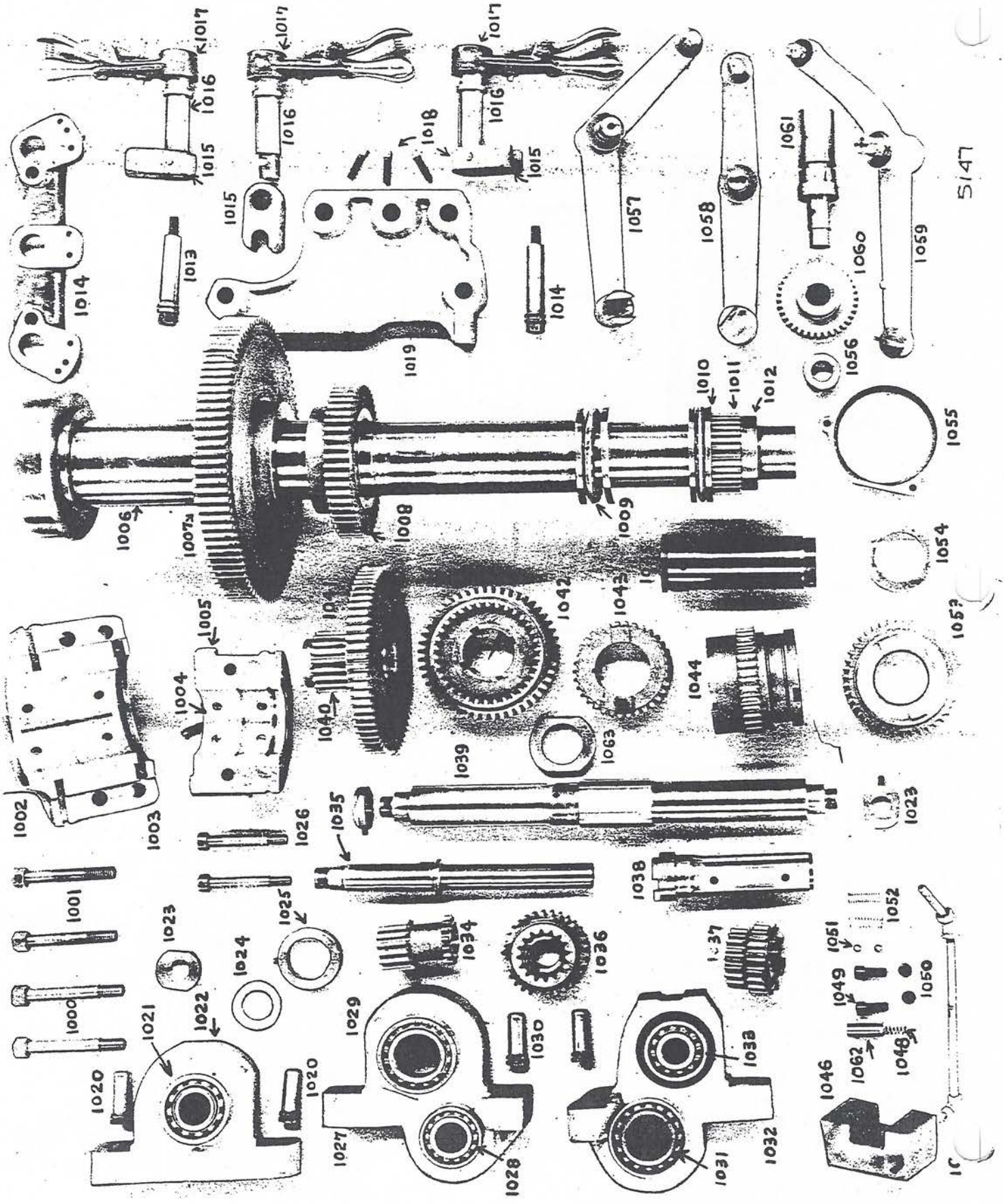
MONARCH lathes

MONARCH LATHES, L.P.
SIDNEY, OHIO 4 'SA



THREE STEP CONE DOUBLE BACK GEARED HEADSTOCK

1170 - Cover
1171 - Back Gear Shifting Lever
1172 - Front Bearing Shims
1173 - Back Gear Shifter Fork
1174 - Back Gear Shifter Stud
1175 - Face Gear Latch Pin
1176 - Latch Pin Sleeve
1177 - Ball for Latch Pin
1178 - Spring for Latch Pin
1179 - Latch Pin Screw
1180 - Back Gear Pinion and Sleeve
1181 - Large Back Gear
1182 - Pulley Hub Pinion
1183 - Back Gear Rear Bushing
1184 - Back Gear Shaft
1185 - Front Box - Lower Half
1186 - Front Box - Upper Half
1187 - Front Cap
1188 - Front Cap Screws
1189 - Front Cap Body Fit Screws
1190 - Spindle
1191 - Face Gear
1192 - Thrust Bearing, Inner
1193 - Spindle Gear
1194 - Thrust Bearing, Outer
1195 - Spindle Adjusting Nut
1196 - Latch Screw
1197 - Latch Pin
1198 - Latch Lever Spring
1199 - Latch Lever
1200 - Back Gear Lever
1201 - Headstock
1202 - Rear Box, Lower Half
1203 - Idler Gear Stud
1204 - Rear Bearing Shims
1205 - Rear Box, Upper Half
1206 - Rear Cap
1207 - Idler Gear
1208 - Idler Gear Collar
1209 - Rear Cap Bolts
1210 - Cone Pulley
1211 - Pulley Hub Pinion
1212 - Spindle Sleeve Gear
1213 - Spindle Driving Sleeve
1214 - Pulley Hub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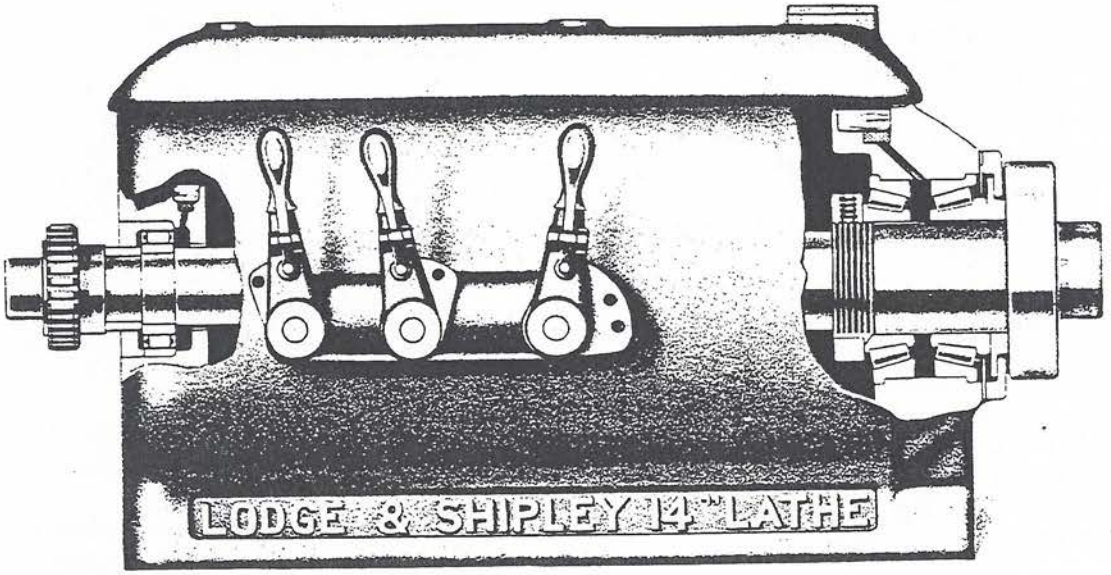
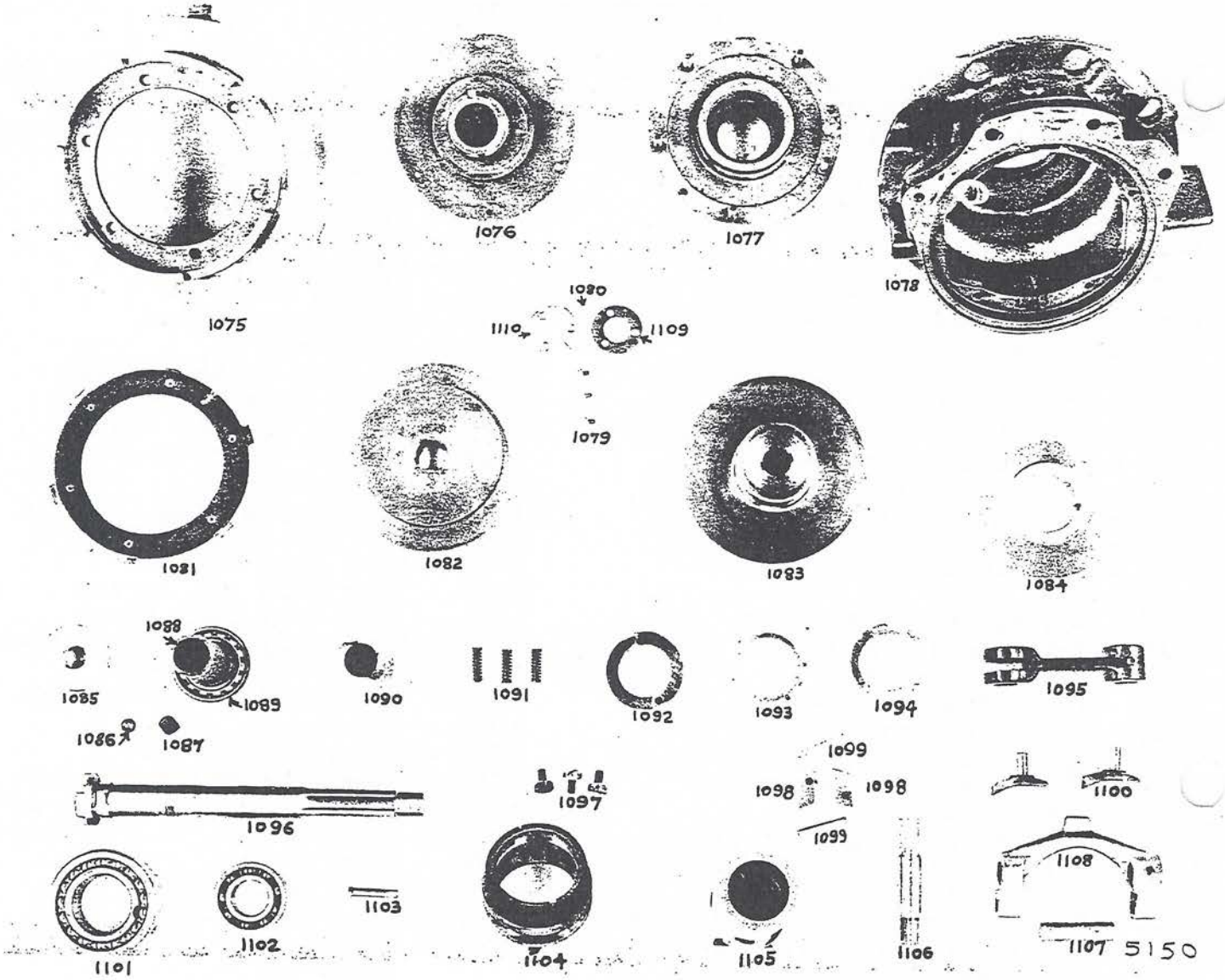
SELECTIVE HEADSTOCK

1000 - Body Fit Front Bearing Screws
1001 - Front Bearing Cap Screws
1002 - Front Bearing, Upper
1003 - Front Cap
1004 - Rear Bearing, Upper
1005 - Rear Cap
1006 - Spindle
1007 - Face Gear
1008 - High Speed Spindle Gear
1009 - Thrust Bearing, Inner
1010 - Thrust Bearing, Outer
1011 - Spindle Gear
1012 - Spindle Nut
1013 - Long Locating Bush and Screw
1014 - Hand Lever Plate
1015 - Ball Pin Lever
1016 - Hand Lever Shaft
1017 - Hand Lever
1018 - Shifter Lever Bracket Set Screw
1019 - Shifter Lever Bracket
1020 - Short Locating Bush, Front Bracket
1021 - Front Bracket Bearing
1022 - Front Bracket
1023 - Lock Nut, Reducing Gear Shaft
1024 - Thrust Washer, Driven Gear Shaft
1025 - Collar, Sliding Gear Sleeve
1026 - Rear Bearing Body Fit Screws
1027 - Middle Bracket
1028 - Middle Bracket Small Bearing
1029 - Middle Bracket Large Bearing
1030 - Short Locating Bush, Rear and Middle Bracket
1031 - Rear Bracket Large Bearing
1032 - Rear Bracket
1033 - Rear Bracket Small Bearing
1034 - Reducing Pinion
1035 - Reducing Gear Shaft
1036 - Reducing Gear
1037 - Sliding Double Gear
1038 - Sliding Gear Sleeve
1039 - Driven Gear Shaft
1040 - Back Gear Pinion
1041 - Back Gear
1042 - Sliding Reducing Gear
1043 - Small Cluster Gear
1044 - Middle Cluster Gear
1045 - Cluster Gear Sleeve
1046 - Oil Pump Body
1047 - Oil Pump Piping
1048 - Oil Pump Plunger Spring
1049 - Pump Body Screws
1050 - Pump Body Set Screws
1051 - Pump Body Ball Check
1052 - Pump Body Ball Check Spring
1053 - Large Cluster Gear
1054 - Cluster Gear Sleeve Nut
1055 - Oil Catch
1056 - Idler Gear Collar
1057 - Back Gear Shifter Lever
1058 - Reducing Gear Shifter Lever
1059 - Sliding Gear Shifter Lever
1060 - Idler Gear
1061 - Idler Gear Stud
1062 - Oil Pump Plunger
1063 - Driven Gear Shaft Middle Lock Nut

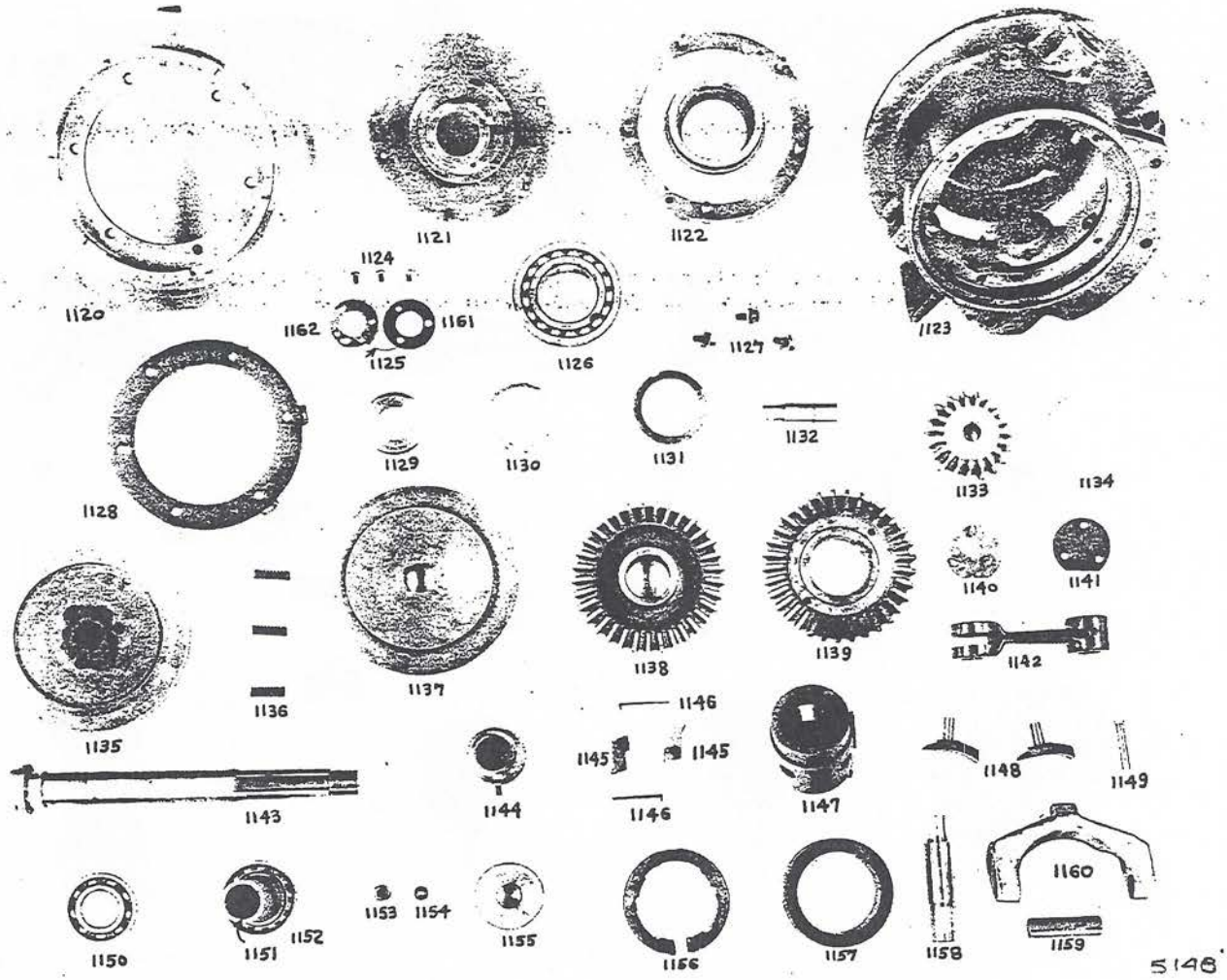


ROLLER BEARING SPINDLE MOUNTING



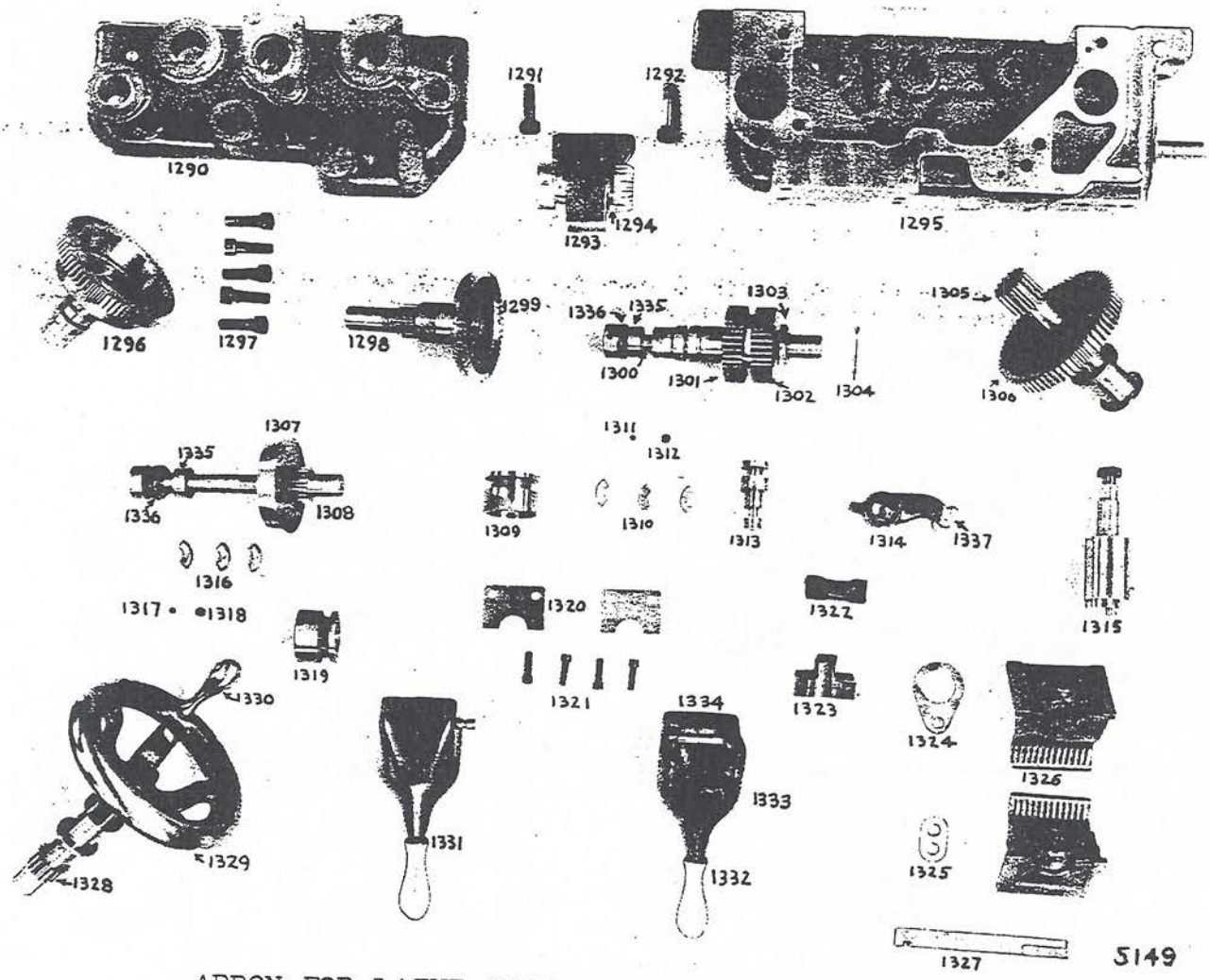
BRAKE PULLEY

1075 - Pulley
1076 - Pulley Hub
1077 - Pulley Bearing Base
1078 - Pulley Bearing
1079 - Oil Window Screws
1080 - Oil Window, Celluloid
1081 - Clutch Driving Disc.
1082 - Friction Driving Plate
1083 - Friction Adjusting Plate
1084 - Oil Slinger
1085 - Adjusting Nut
1086 - Adjusting Nut Brass Plug
1087 - Adjusting Nut Set Screw
1088 - Clutch Operating Sleeve
1089 - Ball Bearing #209
1090 - Abutment Collar
1091 - Friction Adjusting Plate Springs
1092 - Bearing Base Nut
1093 - Lock Washer
1094 - Lock Nut
1095 - Yoke Lever Arm
1096 - Driving Shaft
1097 - Pulley Bearing Screws
1098 - Friction Toggle
1099 - Friction Toggle Pin
1100 - Yoke Lever Shoe
1101 - Pulley Hub Bearing #5213
1102 - Driving Shaft Bearing #208G
1103 - Shoulder Pin
1104 - Friction Spool
1105 - Toggle Body
1106 - Yoke Lever Shaft
1107 - Yoke Lever Stud
1108 - Yoke Lever
1109 - Oil Window Gasket
1110 - Oil Window Frame



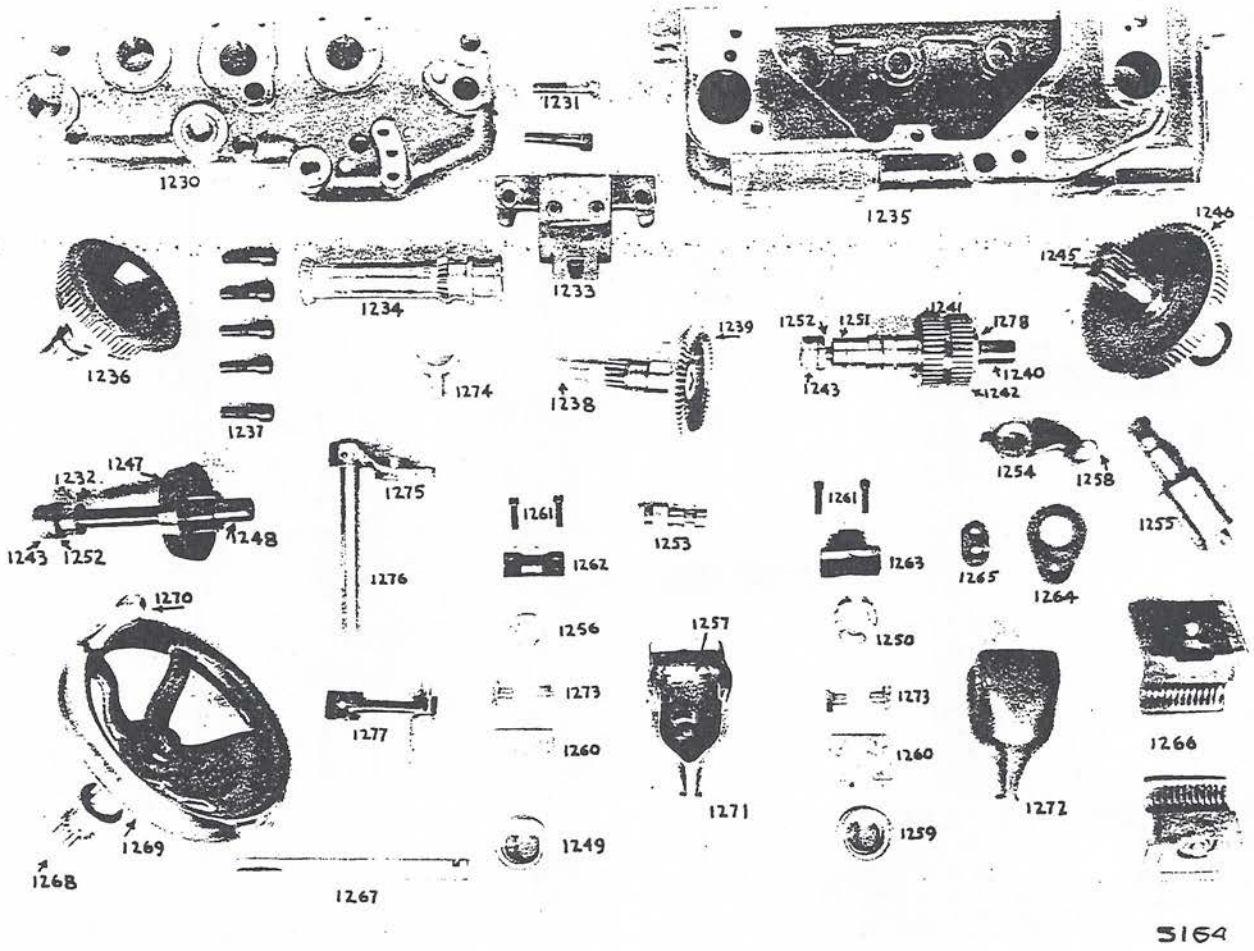
REVERSE IN PULLEY

1120 - Pulley
1121 - Pulley Hub
1122 - Pulley Bearing Base
1123 - Pulley Bearing
1124 - Oil Window Screws
1125 - Oil Window
1126 - Pulley Hub Ball Bearing #5213
1127 - Pulley Bearing Screws
1128 - Clutch Driving Disc.
1129 - Bearing Collar
1130 - Lock Washer
1131 - Lock Nut
1132 - Idler Gear Stud
1133 - Idler Bevel Gear
1134 - Bearing Base Nut
1135 - Friction Adjusting Plate
1136 - Friction Adjusting Plate Springs
1137 - Friction Driving Plate
1138 - Driven Bevel Gear
1139 - Driving Bevel Gear
1140 - Gear Stud Cover
1141 - Gear Stud Cover Gasket
1142 - Yoke Lever Arm
1143 - Driving Shaft
1144 - Gear Bearing
1145 - Friction Toggles
1146 - Friction Toggle Pin
1147 - Toggle Body
1148 - Yoke Lever Shoes
1149 - Shoulder Pin
1150 - Driving Shaft Bearing #208C
1151 - Clutch Operating Sleeve
1152 - Clutch Sleeve Bearing #209
1153 - Adjusting Nut Set Screw
1154 - Brass Plug for Adjusting Nut
1155 - Adjusting Nut
1156 - Reverse Friction Ring
1157 - Friction Spool
1158 - Yoke Lever Shaft
1159 - Yoke Lever Stud
1160 - Yoke Lever
1161 - Oil Window Gasket
1162 - Oil Window Frame



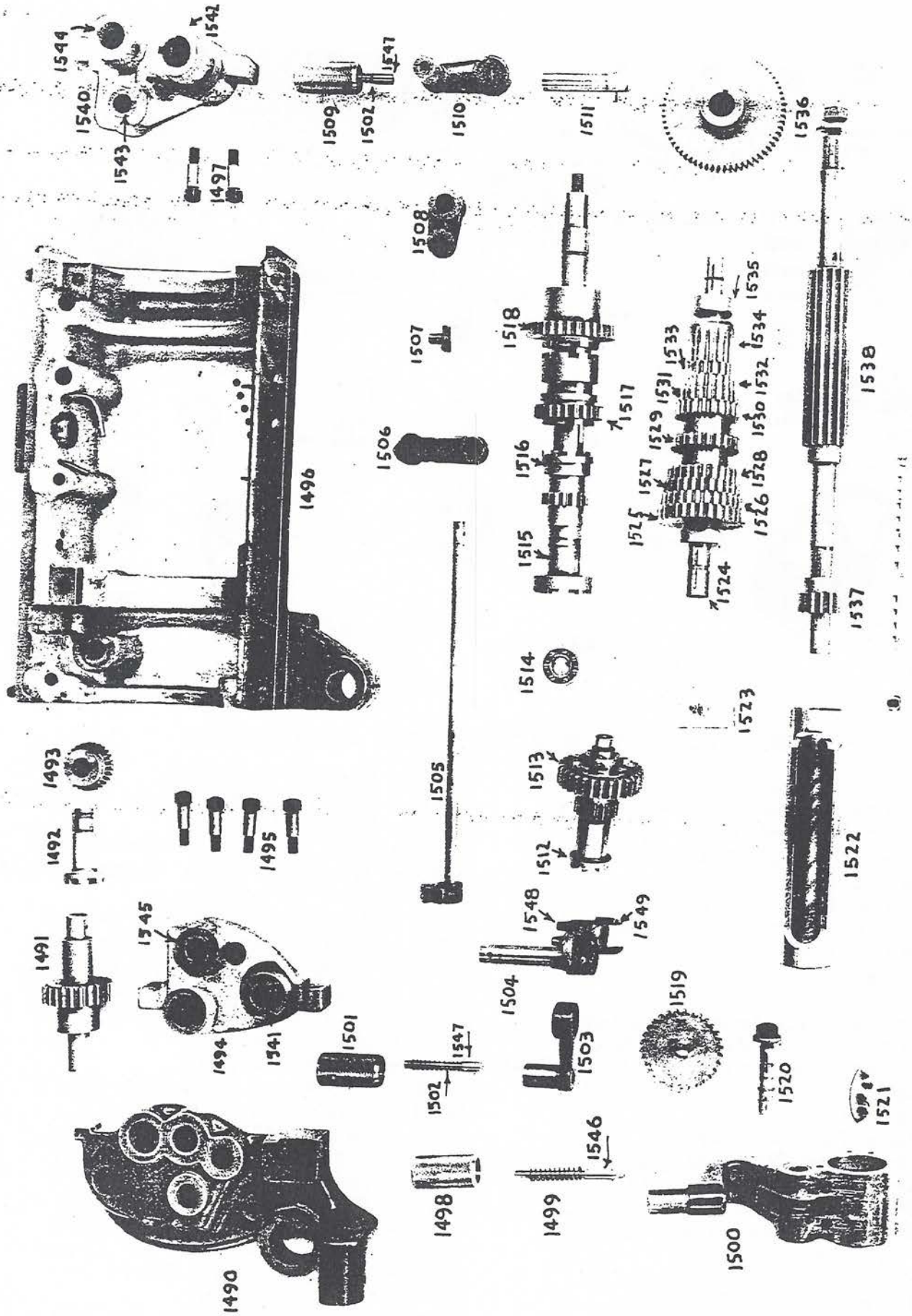
APRON FOR LATHE WITH REVERSE TO LEADSCREW

1290 - Front Plate
1291 - Bevel Pinion Bracket Screw
1292 - Body Fit Screw
1293 - Bevel Pinion Bracket
1294 - Bevel Pinion
1295 - Apron Back Plate
1296 - Traverse Friction Gear
1297 - Front Plate Screws
1298 - Bevel Gear Shaft
1299 - Bevel Gear
1300 - Cross Feed Friction Stem
1301 - Cross Feed Friction Gear
1302 - Cross Feed Friction Disc Gear
1303 - Cross Feed Friction Stem Nut
1304 - Cross Feed Stem Cotter Pin
1305 - Rack Pinion
1306 - Rack Pinion Gear
1307 - Traverse Friction Disc
1308 - Traverse Friction Stem
1309 - Friction Spool
1310 - Wedge Blocks - Cross Feed
1311 - Friction Stem Nut Brass Plug
1312 - Friction Stem Nut Set Screw
1313 - Interlock Stud
1314 - Half Nut Lever
1315 - Eccentric Shaft
1316 - Wedge Blocks - Traverse
1317 - Friction Stem Nut Brass Plug
1318 - Friction Stem Nut Set Screw
1319 - Friction Spool
1320 - Gear Retainer
1321 - Gear Retainer Screws
1322 - Cross Feed Lever Bracket
1323 - Traverse Lever Bracket
1324 - Eccentric Link, Large
1325 - Eccentric Link, Small
1326 - Half Nuts
1327 - Interlock Bar
1328 - Handwheel Pinion & Shaft
1329 - Handwheel
1330 - Handwheel Handle
1331 - Traverse Friction Lever
1332 - Cross Feed Friction Lever
1333 - Friction Lever Shoe
1334 - Pivot Pin
1335 - Friction Wedge
1336 - Wedge Block Collar
1337 - Half Nut Lever Handle



APRON FOR LATHE WITHOUT REVERSE TO LEADSCREW

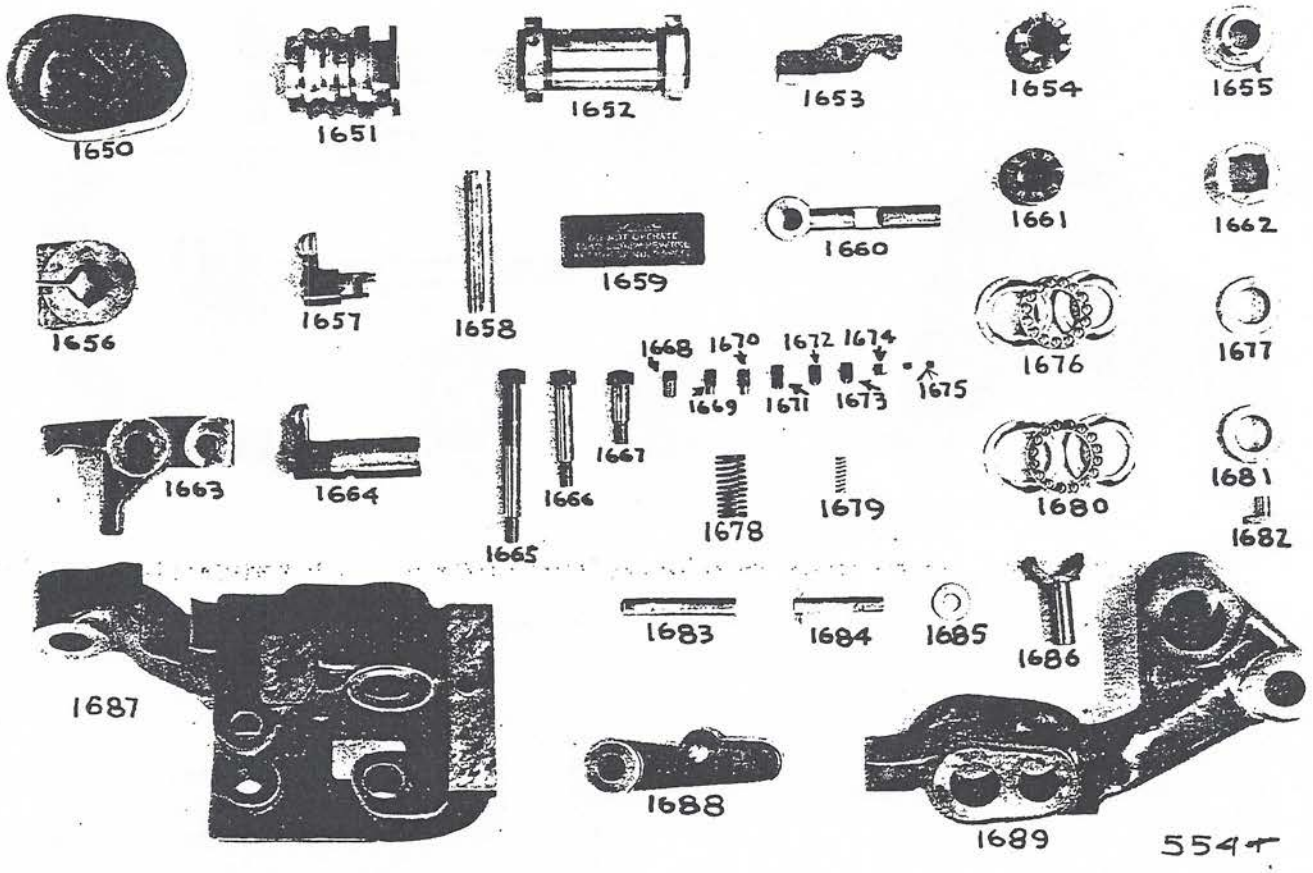
1230 - Front Plate
1231 - Bevel Pinion Bracket Screws
1232 - Friction Wedge
1233 - Bevel Pinion Bracket
1234 - Bevel Pinion
1235 - Apron Back Plate
1236 - Traverse Friction Gear
1237 - Front Plate Screws
1238 - Bevel Gear Shaft
1239 - Bevel Gear
1240 - Cross Feed Friction Stem
1241 - Cross Feed Friction Gear
1242 - Cross Feed Friction Disc Gear
1243 - Cross Feed Friction Stem Nut
1245 - Rack Pinion
1246 - Rack Pinion Gear
1247 - Traverse Friction Disc
1248 - Traverse Friction Stem
1249 - Friction Spool (same as 1259)
1250 - Wedge Blocks (same as 1256)
1251 - Friction Wedge
1252 - Wedge Block Collar
1253 - Interlock Stud
1254 - Half Nut Lever
1255 - Eccentric Shaft
1256 - Wedge Blocks (same as 1250)
1257 - Pivot Pin
1258 - Half Nut Lever Handle
1259 - Friction Spool (same as 1249)
1260 - Gear Retainer
1261 - Gear Retainer Screws
1262 - Lever Bracket, Traverse
1263 - Lever Bracket Cr. Fd.
1264 - Eccentric Link, Large
1265 - Eccentric Link, Small
1266 - Half Nuts
1267 - Interlock Bar
1268 - Handwheel Pinion & Shaft
1269 - Handwheel
1270 - Handwheel Handle
1271 - Friction Lever) Same
1272 - Friction Lever)
1273 - Friction Lever Shoe
1274 - Bevel Gear Shifter Shoe
1275 - Bevel Gear Shifter Lever
1276 - Reverse Lever Shaft
1277 - Reverse Lever
1278 - Cross Feed Stem Hex Nut



QUICK CH GEAR BOX

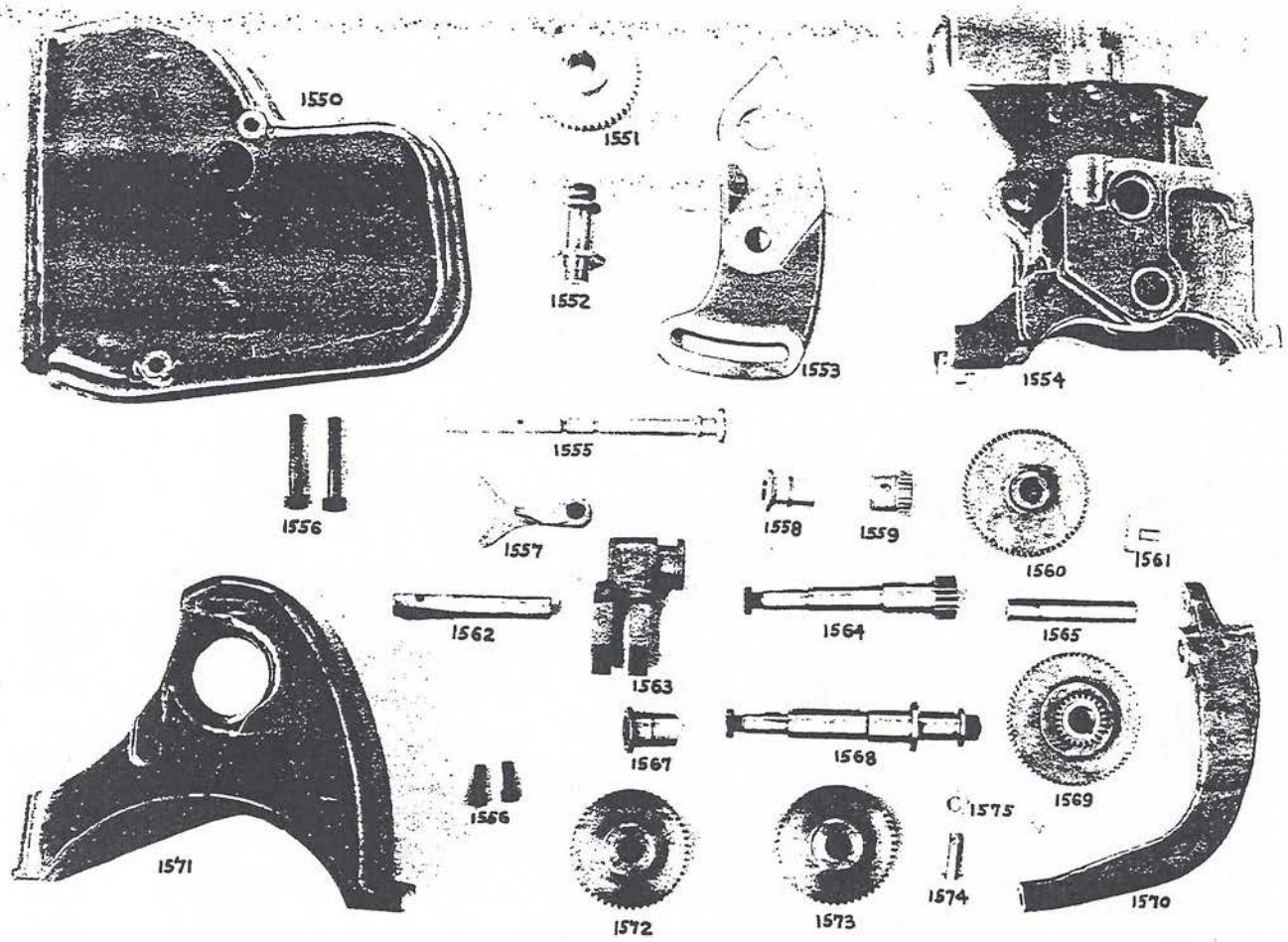
QUICK CHANGE GEAR BOX

1490 - End Bracket
1491 - Idler Gear Shaft
1492 - Feed Rod Clutch Shaft
1493 - Feed Driven Gear
1494 - Right Hand Bracket
1495 - Bracket Screws
1496 - Quick Change Gear Box
1497 - Body Fit Bracket Screws
1498 - Sliding Tumbler Plunger Knob
1499 - Sliding Tumbler Plunger Spring
1500 - Sliding Tumbler
1501 - Latch Pin Knob
1502 - Latch Lever Pin Spring
1503 - Hand Shifter Lever
1504 - Gear Shifter Shaft
1505 - Interlock Lock Rod
1506 - Interlock Arm
1507 - Shifter Shoe
1508 - Clutch Gear Lever
1509 - Latch Pin Knob
1510 - Hand Shifter Lever
1511 - Clutch Gear Shifter Shaft
1512 - Leadscrew Clutch Shaft and Pinion
1513 - Sliding Clutch Gear
1514 - Clutch Ball Bearing
1515 - Clutch
1516 - Small Clutch Gear
1517 - Sliding Clutch Gear
1518 - Large Clutch Gear
1519 - Tumbler Intermediate Gear
1520 - Intermediate Gear Shaft
1521 - Tumbler Guide Plate
1522 - Sliding Tumbler Bearing
1523 - Tumbler Bearing Rocker
1524 - Change Gear Shaft
1525 - 32 Tooth Change Gear
1526 - 30 Tooth Change Gear
1527 - 28 Tooth Change Gear
1528 - 26 Tooth Change Gear
1529 - 24 Tooth Change Gear
1530 - 23 Tooth Change Gear
1531 - 22 Tooth Change Gear
1532 - 20 Tooth Change Gear
1533 - 18 Tooth Change Gear
1534 - 16 Tooth Change Gear
1535 - Collar
1536 - 63 Tooth Change Gear
1537 - Tumbler Shaft Pinion
1538 - Sliding Tumbler Shaft
1539 - Guide Bar
1540 - Left Hand Bracket
1541 - Tumbler Shaft Bearing, Right
1542 - Tumbler Shaft Bearing, Left
1543 - L. H. Bracket Middle Bushing
1544 - L. H. Bracket Upper Bushing
1545 - R. H. Bracket Middle Bushing
1546 - Sliding Tumbler Plunger
1547 - Latch Lever Pin
1548 - Clutch Gear Lever
1549 - Gear Shifter Shoe



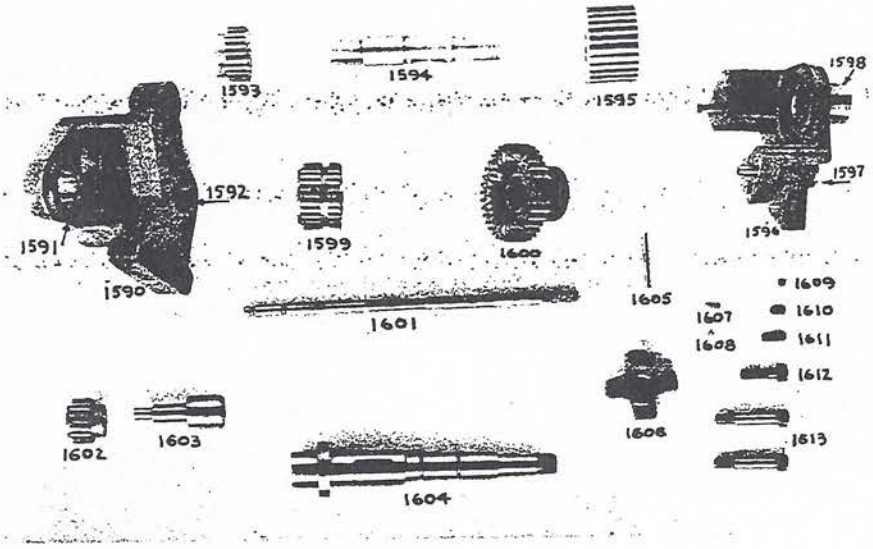
HEADSTOCK AND TAILSTOCK END BRACKETS

1650 - Tail End Cover
1651 - Shifter Collar
1652 - Control Rod End Bearing
1653 - Rocker Arm
1654 - Feed Rod Clutch
1655 - Leadscrew Tail Collar
1656 - Stop Dog
1657 - Latch Lever for Feed Rod
1658 - Head End Bracket Stud
1659 - Instruction Plate
1660 - Latch Eye Bolt
1661 - Leadscrew Clutch
1662 - Control Rod Bearing
1663 - Clutch Shifter Lever
1664 - Clutch Latch Lever
1665 - Head End Bracket Screw
1666 - Tail End Bracket Screw-long
1667 - Tail End Bracket Screw-short
1668 - Shifter Collar Set Screw
1669 - Leadscrew Shifter Set Screw
1670 - Feed Rod Shifter Set Screw
1671 - Leadscrew Shifter Set Screw
1672 - Hd. End Brckt Stud Set Screw
1673 - Control Rod Bearing Set Screw
1674 - Clutch Latch Lever Set Screw
1675 - Reverse Stop Lever Set Screw
1676 - Thrust Bearing - tail end
1677 - Feed Rod Collar
1678 - Latch Eye Bolt Spring
1679 - Rocker Arm Spring
1680 - Thrust Bearing - head end
1681 - Feed Rod Collar
1682 - Shifter Shoe
1683 - Rocker Arm Shaft
1684 - Shifter Link Pin
1685 - Shifter Link Pin Washer
1686 - Clutch Shifter Fork
1687 - Head End Bracket
1688 - Reverse Stop Lever
1689 - Tail end Bracket



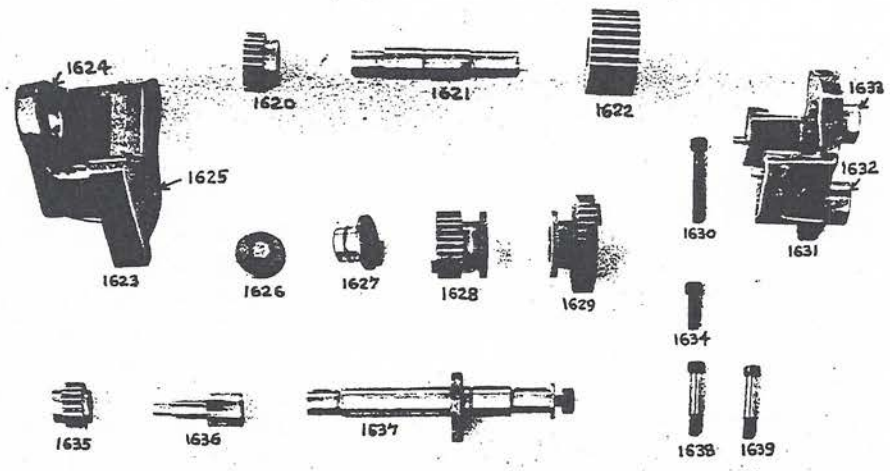
QUICK CHANGE GEARING

1550 - Gear Box Cover
1551 - Intermediate Gear
1552 - Intermediate Gear Stud
1553 - Quadrant
1554 - Gear Box
1555 - Slip Gear Rod
1556 - Box Cover Screws
1557 - Shifter Fork
1558 - Reducing Gear Shaft Sleeve
1559 - Reducing Pinion
1560 - Feed Reducing Gear
1561 - Yoke Lever Shoe
1562 - Reverse Fork Stud
1563 - Reverse Fork
1564 - Reducing Gear Shaft
1565 - Reverse Lever Stud
1566 - Reverse Gear Cover Screws
1567 - Slip Gear Shaft Sleeve
1568 - Slip Gear Shaft
1569 - Slip Gear and Pinion
1570 - Reverse Lever
1571 - Reverse Gear Cover
1572 - Change Gear, Driver
1573 - Change Gear, Driven
1574 - Reverse Lever Link Pin
1575 - Reverse Lever Link Pin Washer



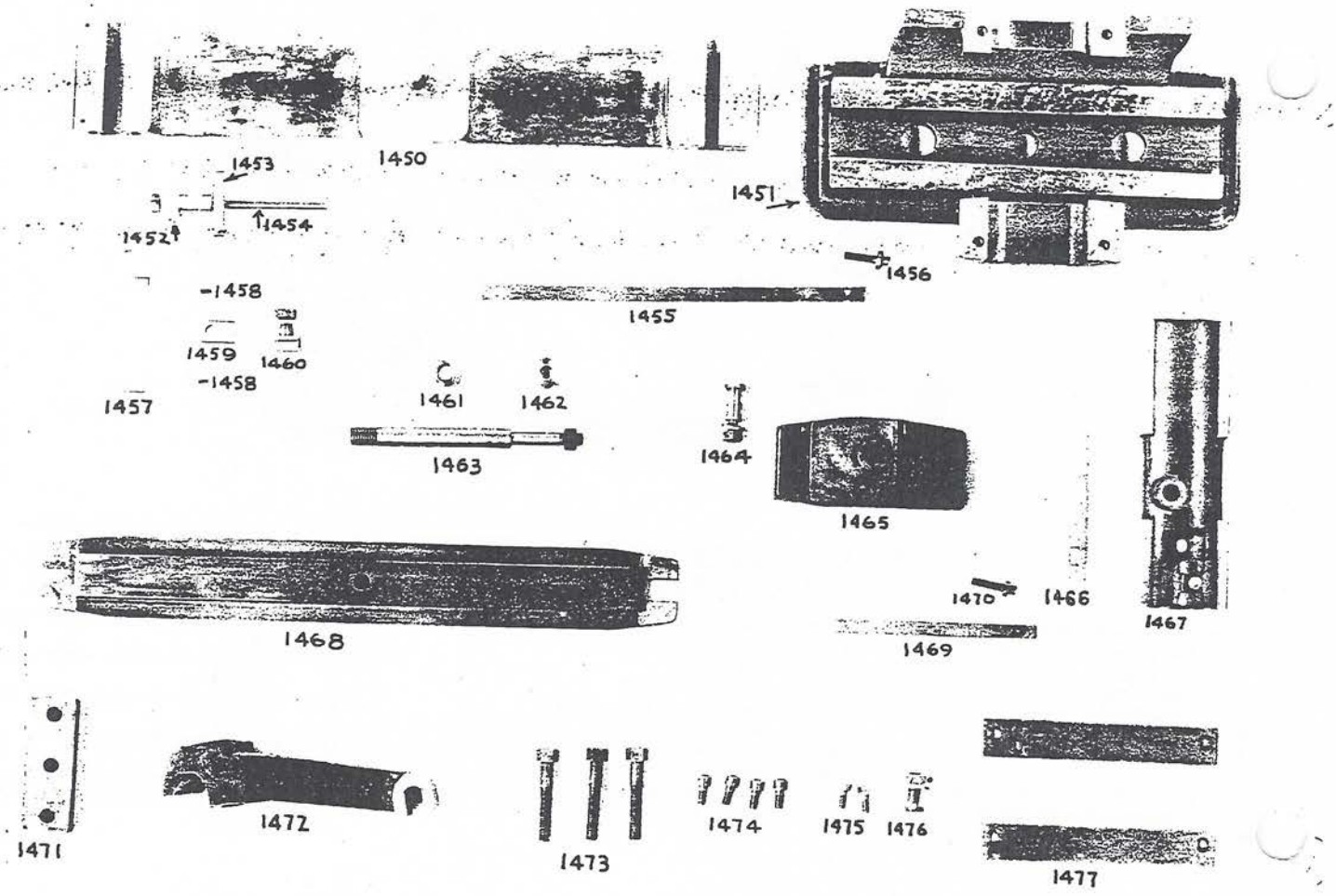
INTERMEDIATE GEAR BRACKET FOR LATHE WITHOUT REVERSE TO LEADSCREW

1590 - Feed Gear Bracket
1591 - Feed Gear Bracket Bush (large)
1592 - Feed Gear Bracket Bush (small)
1593 - Reverse Drive Gear
1594 - Intermediate Shaft
1595 - Feed Shaft Gear
1596 - Feed Gear Bracket Cover
1597 - Bracket Cover Bush (large)
1598 - Bracket Cover Bush (small)
1599 - Sliding Reverse Gear
1600 - Feed Clutch Gear
1601 - Pull Pin
1602 - Reverse Gear
1603 - Reverse Gear Stud
1604 - Sliding Reverse Gear Shaft
1605 - Sliding Reverse Gear Taper Pin
1606 - Gear Retainer Nut
1607 - Sliding Reverse Gear Shaft Spring
1608 - Sliding Reverse Gear Shaft Ball
1609 - Sliding Reverse Gear Shaft Set Screw
1610 - Feed Gear Bracket Set Screw - (short)
1611 - Feed Gear Bracket Set Screw - (long)
1612 - Feed Gear Bracket Cover Screw
1613 - Feed Gear Bracket Body Fit Screw



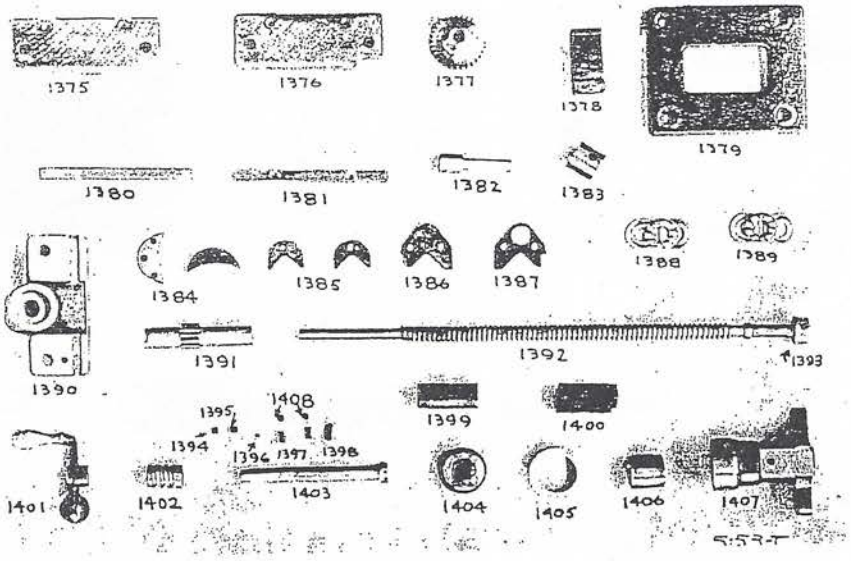
INTERMEDIATE GEAR BRACKET FOR LATHE WITH REVERSE TO LEADSCREW

1620 - Reverse Drive Gear
1621 - Intermediate Shaft
1622 - Feed Shaft Gear
1623 - Feed Gear Bracket
1624 - Feed Gear Bracket Bush - large
1625 - Feed Gear Bracket Bush - small
1626 - Thrust Washer
1627 - Reverse Clutch
1628 - Reverse Clutch Gear
1629 - Feed Clutch Gear
1630 - Hex. Head Screw - long
1631 - Feed Gear Bracket Cover
1632 - Bracket Cover Bush - large
1633 - Bracket Cover Bush - small
1634 - Hex. Head Screw - short
1635 - Reverse Gear
1636 - Reverse Gear Stud
1637 - Clutch Gear Shaft
1638 - Gear Bracket Body Fit Screw
1639 - Gear Bracket Body Fit Screw



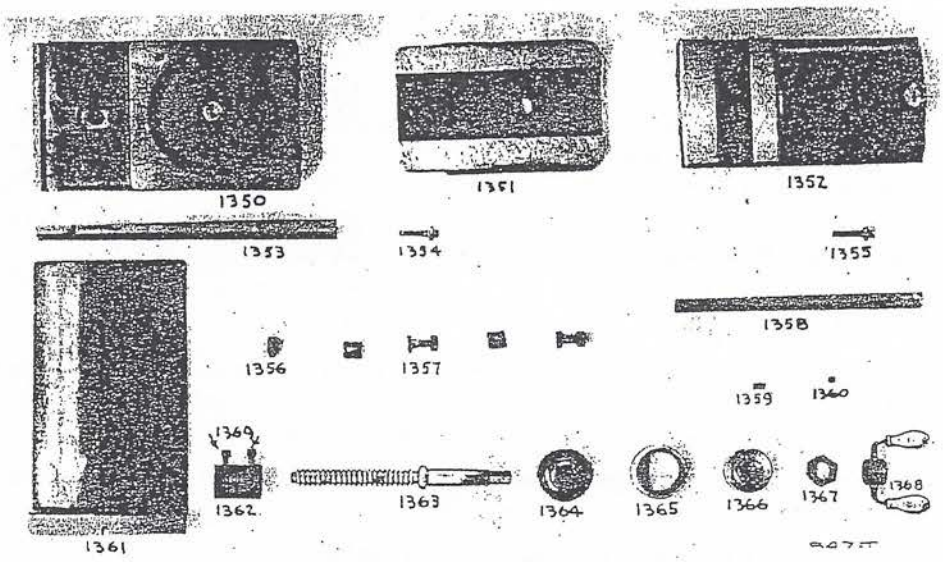
TAPER ATTACHMENT

1450 - Sliding Bar
1451 - Bracket
1452 - Adjusting Screw Knob
1453 - Adjusting Screw Bearing Plate
1454 - Swivel Adjusting Screw
1455 - Bracket Gib
1456 - Bracket Gib Screw
1457 - Graduated Scale
1458 - Scale Screws
1459 - Pointer
1460 - Tee Slot Adjusting Bolt
1461 - Draw Bar Washer
1462 - Draw Bar Collar
1463 - Draw Bar
1464 - Shoe Binding Stud
1465 - Shoe
1466 - Guide Plate Gib
1467 - Guide Plate
1468 - Swivel Bar
1469 - Shoe Gib
1470 - Shoe Gib Screw
1471 - Locking Arm Plate
1472 - Locking Arm
1473 - Locking Arm Screws
1474 - Guide Plate Gib Screws
1475 - Bracket Screws
1476 - Tee Bolt
1477 - Guide Plate Gib



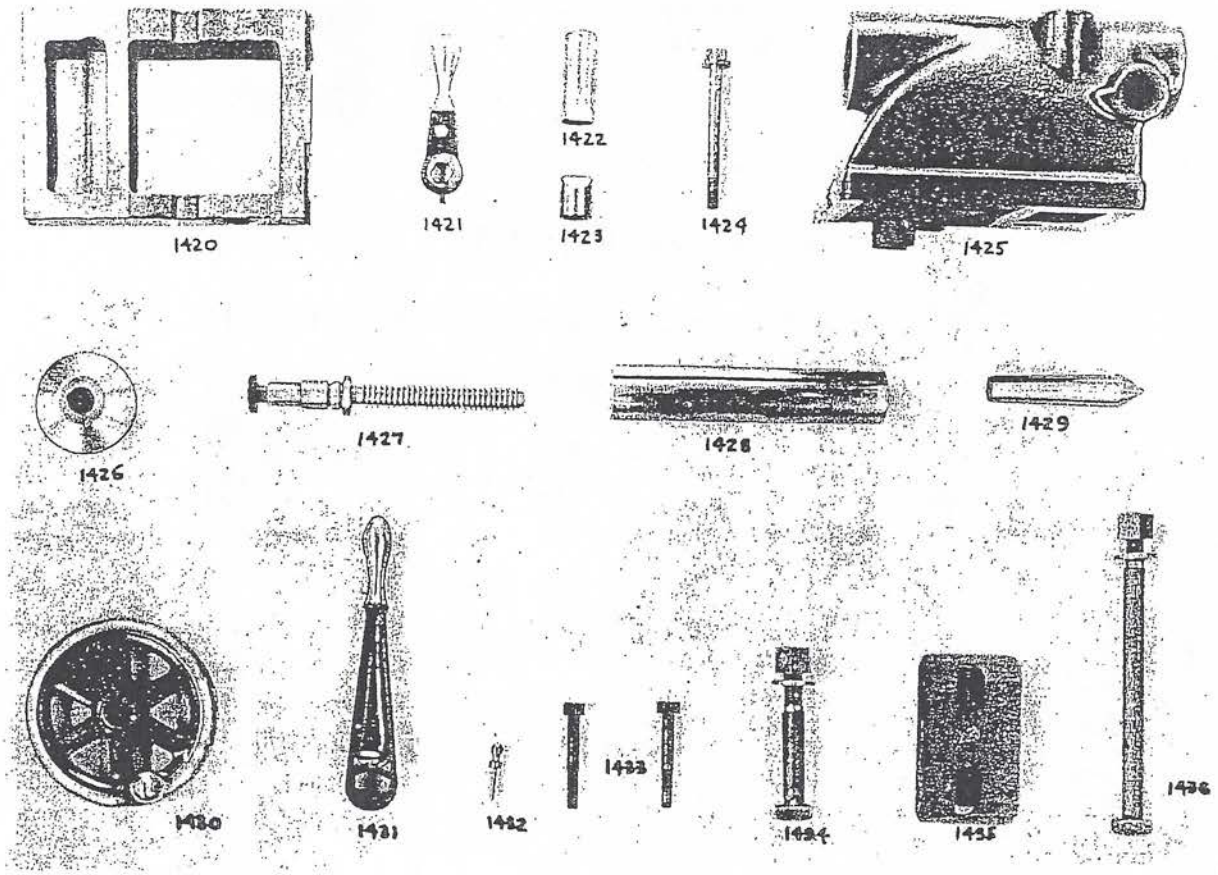
CROSS FEED SCREW AND CARRIAGE PARTS

1375 - Rear Clamp
1376 - Rear Clamp
1377 - Idler Gear
1378 - Locking Clamp
1379 - Center Clamp
1380 - Rear Clamp Gib
1381 - Rear Clamp Gib
1382 - Idler Gear Stud
1383 - Cross Feed Pinion Sleeve
- Flat Shear Wiper
- Rear Shear Wiper
- Front Shear Wiper, Head End
1387 - Front Shear Wiper, Tail End
1388 - Cross Feed Screw Bearing, Outer
1389 - Cross Feed Screw Bearing, Inner
1390 - Cross Feed Screw Rear Bearing
1391 - Cross Feed Screw Pinion
1392 - Cross Feed Screw
1393 - Lock Nut
1394 - Lock Nut Set Screw
1395 - Front Bracket Set Screw
1396 - Ball Stop Ball
1397 - Flat Shear Wiper Spring
1398 - Micrometer Bush Set Screw
1399 - Cross Feed Screw Nut
1400 - Compensating Nut
1401 - Ball Crank
1402 - Ball Stop Bush
1403 - Ball Crank Shaft
1404 - Micrometer Bush
1405 - Micrometer Dial
1406 - Front Bracket Bush
1407 - Front Bracket
1408 - Copper Plug



COMPOUND REST

1350 - Base
[illegible]1 - Swivel
[illegible]2 - Top Slide
[illegible]3 - Base Gib
1354 - Base Gib Screw
1355 - Top Slide Gib Screw
1356 - Compensating Screw
1357 - Tee Slot Bolt
1358 - Top Slide Gib
1359 - Micrometer Bush Spring
1360 - Copper Plug
1361 - Cross Feed Screw Cover
1362 - Top Slide Nut
1363 - Top Slide Screw
1364 - Top Slide Screw Sleeve
1365 - Micrometer Dial
1366 - Micrometer Bush
1367 - Top Slide Screw Nut
1368 - Top Slide Handle
1369 - Top Slide Nut Screw



TAILSTOCK

1420 - Base
1421 - Binder Lever
1422 - Back Binder Jaw
1423 - Front Binder Jaw
1424 - Binder Jaw Screw
1425 - Top
1426 - Tailstock Plug
1427 - Tailstock Screw
1428 - Spindle
1429 - Center
1430 - Handwheel
1431 - Tailstock Wrench
1432 - Center Oiler
1433 - Top Adjusting Screw
1434 - Clamping Bolt, short
1435 - Clamp
1436 - Clamping Bolt, long

In this bulletin we have attempted to show parts which, when marked, will aid us in filling your order. If the piece to be replaced is not shown, we suggest that the old part be sent to us as a sample. If this cannot be conveniently done, please send a dimensioned sketch of just what you want.

Above all make sure you have concise, accurate information before sending your order, as this helps to eliminate a lot of unnecessary correspondence.

Whenever possible, order by name as well as number.

We will send another copy of this bulletin on request.