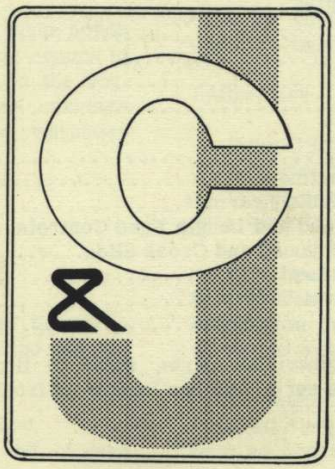
Operation and Maintenance Manual



C&J MASTER MODEL
GH
ENGINE LATHE

THE CARROLL-JAMIESON MACHINE TOOL CO.

BATAVIA, OHIO

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NOTE: For ordering replacement parts, refer to illustrated parts list for this model lathe. Give lathe serial number located on front bedways at tailstock end.

These instructions do not attempt to cover all details, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance of this equipment. Should particular problems arise which are not covered sufficiently for user's purposes, machinery dealer or factory should be contacted.

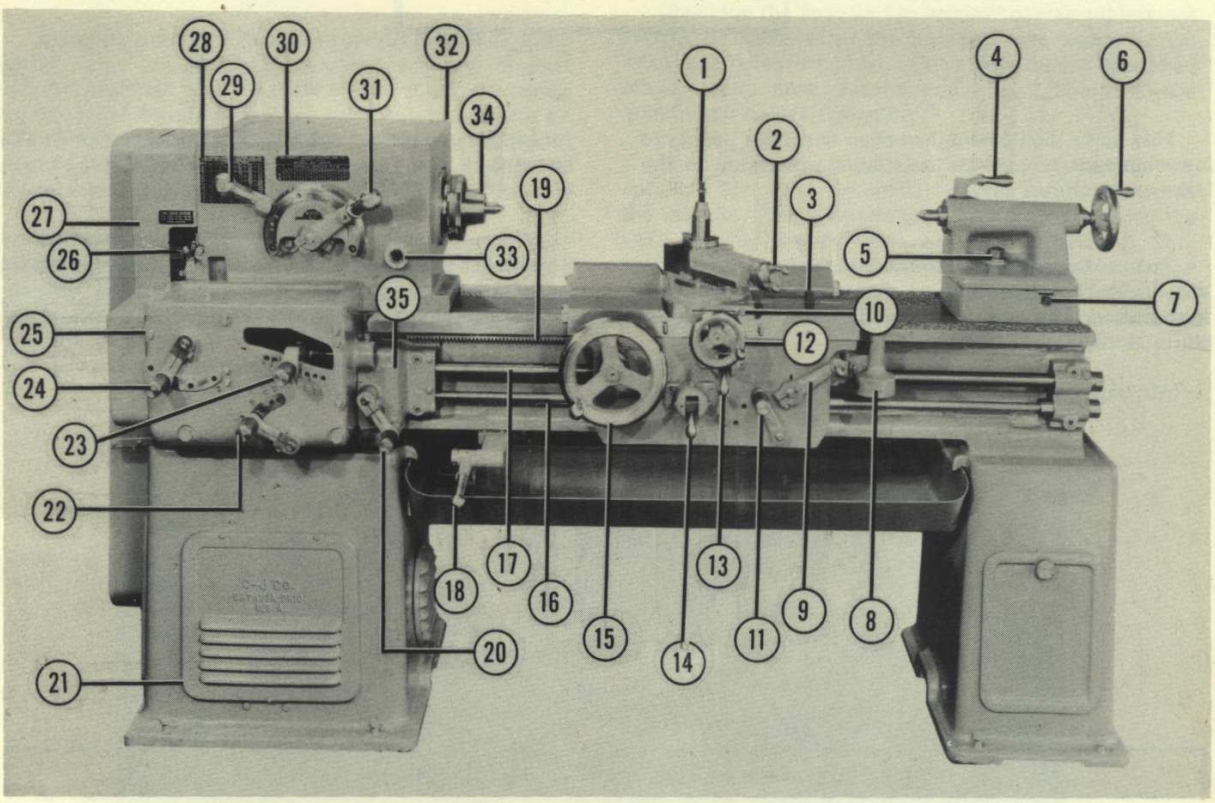


Figure 1. The C & J Master Model "GH" Engine Lathe

1. Tool Post
2. Compound Rest Handle
3. Carriage Tightener Bolt
4. Tailstock Binder Lever
5. Tailstock Bolt
6. Tailstock Handwheel
7. Tailstock Side Screws
8. Thread Indicator
9. Lead Screw Half Nut Lever
10. Gib Adjusting Screw
11. Feed Reverse Lever
12. Cross Feed Handwheel
13. Cross Feed Control Handle
14. Length Feed Control Handle
15. Apron Handwheel
16. Feed Rod
17. Lead Screw
18. Main Drive Clutch Control Handle
19. Bed Rack
20. Clutch Box Handle
21. Head Cabinet Leg Door
22. ABCD Handle
23. Sliding Arm Handle
24. XYZ Handle
25. Gear Box
26. Lead Screw Reverse Quadrant
27. Guard
28. Thread and Feed Plate
29. B Handle
30. Spindle Speed Plate
31. A Handle
32. Headstock
33. Window Indicator
34. Spindle
35. Clutch Box

GENERAL INFORMATION

This lathe equipment has been carefully prepared for shipment to provide maximum protection to the lathe and included parts.

In preparing the lathe for installation, the equipment should be moved on the skids to vicinity of installation. The lathe is normally more easily moved while skidded.

All unpainted machined surfaces are covered with protective grease for shipping. These surfaces should be wiped clean with soft cloth and a light coat of lubricating oil should be spread on these surfaces.

The wooden box attached to the skids contains standard and extra equipment items. This box should be unpacked carefully and contents checked with included packing list. Since many small items are packed in this box such as centers, wrenches, screws, etc., the entire box should be checked to prevent any piece being overlooked.

ACCURACY TESTS

Each lathe is lined and tested to these tolerances to assure maximum performance:

TEST	STANDARD TOLERANCE
1. Spindle center runout	0 to .0005"
2. Spindle nose runout LO taper nose spindle	0 to .0005"
3. Headstock alignment - vertical	0 to .001" high at end of 12" test bar
4. Headstock alignment - horizontal	0 to .0005" to front end of 12" test bar
5. Tailstock spindle alignment - horizontal	0 to .0008" forward at end of spindle when fully extended
6. Tailstock spindle alignment - vertical	0 to .0008" high at end of spindle when fully extended
7. Vertical alignment of head and tail centers	0 to .001" high at tail stock
8. Cross slide alignment	0 to .001" hollow face in 12"
9. Spindle taper runout	0 to .0006" at end of 12" test bar

LUBRICATION
(See Figures 2A and 2B.)

Oiling points that should receive daily oil application.

Points starred should be oiled every forty hours of operation.

The headstock and all oiling points except the gear box should be oiled with a fully inhibited turbine type oil, approximately 556SSU at 100°F., Standard Oil Company of Ohio SOHIVIS 65 or equivalent. A good grade of SAE 30 oil (non-detergent motor oil) could be used if changed often since SAE 30 oil would not have the oxidation life that the turbine oil would have.

The gear box should be lubricated with a multi-purpose lithium base grease, grade 2, Standard Oil of Ohio SOHITRAN 2, or equivalent.

1. Vee pulley bushing on drive shaft. (Remove set screw marked "oil".)
2. End gears, 22T and 25T directly under spindle (Oil holes in ends of stud shafts), 96T intermediate gear . (Oil hole in gear hub)
   Swing cover into open position for access.
3. Lead screw reverse quadrant. (Oiler adjacent to quadrant on headstock.)
4. Gear box. Direct oiling points and reservoir for shaft bearings. Heavy grease should occasionally be applied to gear box gears. (Eight oilers on front and one oiler in shaft bearing on right side of box.)
5. *Sliding arm handle. (Slot on top of handle)
6. Clutch box. (Two oilers)
7. Carriage vee wipers. (Oil holes)
8. Carriage vee ways. (Remove set screws)
9. Cross feed nut cap screw. (Remove set screw.)
10. Compound rest bushing and dial. (Oil hole in front of handle)
11. Cross feed bushings and dial. (Oil holes on dial and on bushing between dial and carriage.)
12. Tailstock spindle, screw and hand wheel. (Oil direct to spindle, oil hole in bell in front of hand wheel, oil set screw by binder handle.)
13. *Thread indicator. (Oil hole in center of dial.)
14. Lead screw and feed rod bearings. (Oilers)
15. Reservoirs for apron mechanism. (Oilers on front side of carriage.)
16. Cross feed and length feed controls. (Oilers on cross feed and length feed control housing on front of apron.)
17. Lead screw nut lever. (Oil hole above lever hub.)
18. Maintain oil in lathe headstock at window indicator level. During operation oil will drop below this level. When necessary to add oil, remove plug in elbow fitting located on back side of headstock.

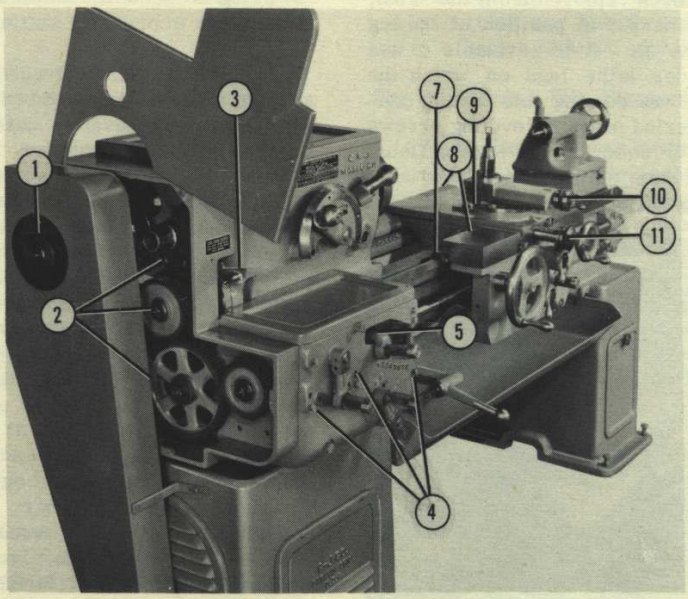


Figure 2A. Lubrication Points on the Lathe

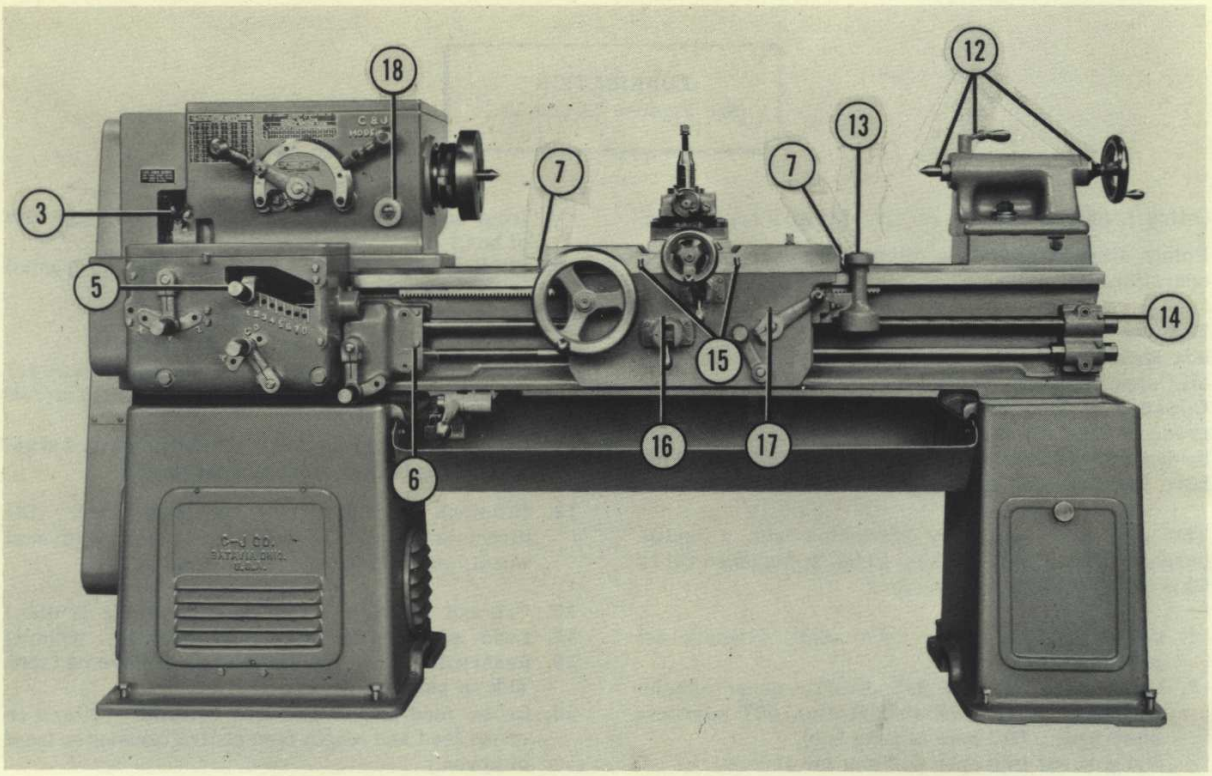


Figure 2B. Lubrication Points on the Lathe

SETTING UP THE LATHE

When the lathe has been removed from the skids, leveling screws should be put in position at the leg screw locations (Figure 3). It is advisable to use small metal plates under lathe legs on which the screws can set rather than coming into direct contact with floor. Over period of time, leveling screws would tend to dig in to concrete or wooden floor. User may desire to use shim plates alone under lathe legs rather than utilizing the screws.

Figure 3. Adjusting the Leveling Screws

Using a good machinists precision level, follow these steps in properly setting tool in place:

1. Place the level across surface of vee ways at right angle to length of bed at headstock end (Figure 4). Bring the level to zero reading or as close as practicable by adjustment of the leveling screws.

2. Move level to tailstock end of bed, approximately ten inches from end and repeat this procedure (Figure 5). The reading at this point must correspond to reading at headstock end. For a properly leveled lathe, these readings must be identical. Floor should be solid and as free from vibration as possible.

To provide a further check for proper leveling of the tool, once the lathe is operating, turn a test bar in a chuck. Bar should be at least 2'' in diameter and extend 10 to 12 inches out of chuck. After bar is aligned take light test cut on length of bar. With lathe properly leveled, the bar, after test cut has been made, should indicate same micrometer reading at both ends or throughout length. A tapering cut will normally indicate that further leveling adjustment is necessary.

High grade triple vee belts are provided and must be mounted by first removing belt guard on end of lathe. Lathes in which motors have been mounted at the factory are ready to receive the belts. The motor plate on which motor is mounted is adjustable. By removing head cabinet leg door (Figure 6), the adjusting screw is available. Motors mounted at factory are adjusted at proper height for proper belt tension. Belts should run with some slack and definitely should not operate "drum" tight.

Before operating the lathe, special attention should be given lubricating chart and all points should be oiled prior to running the tool.

Lead in wiring should be brought to control box normally located on rear side of head cabinet leg. The control switch or station is usually positioned on front side directly below gear box readily accessible to operator (Figure 8).

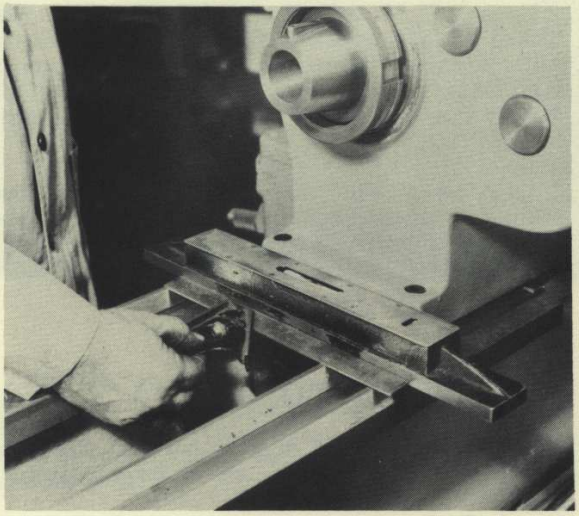


Figure 4. Leveling the Headstock End

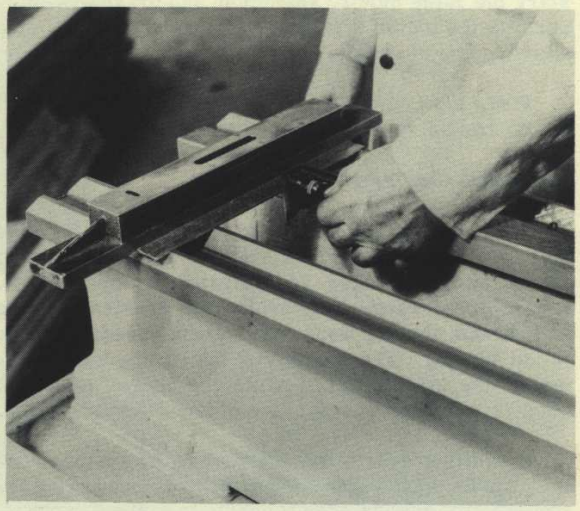


Figure 5. Leveling the Tailstock End

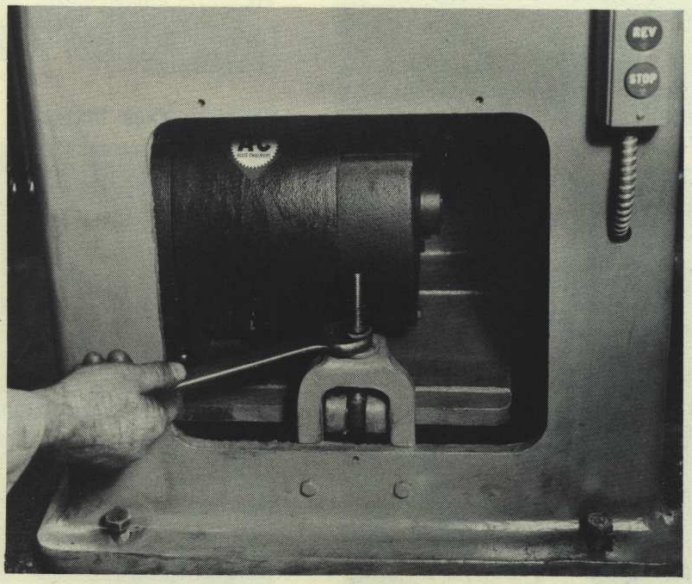


Figure 6. Adjusting the Motor Vee Belts

OPERATION

Starting the Lathe (See Figure 7.)

With clutch control handle in up or brake position start the lathe motor. The clutch and brake assembly permits the motor to be run continuously with starting and stopping of spindle controlled thru control handle.

Push down on the handle to engage the clutch. Pull up on handle to disengage clutch and engage brake.

Headstock (See Figure 7.)

The geared headstock is provided with twelve spindle speeds with speed changes made by shifting the A and B handles as indicated on speed plate. Lower speed range is provided for heaviest turning and thread chasing work with highest speed range for finish turning. The capacity of the cutting tool determines the spindle speed while the geared head will provide ample power for use of any reasonable feed.

In shifting gears, jog the gearing by pushing control handle up and down, engaging and disengaging the clutch while moving A or B handle to desired position. For this shifting operation the operator uses right hand to manipulate clutch control handle and left hand to shift the A and B handles.

Speed changes should not be made without slowing or jogging gearing.

In short time operator will become acquainted with speed handle positions to extent that he will seldom find it necessary to refer to speed chart.

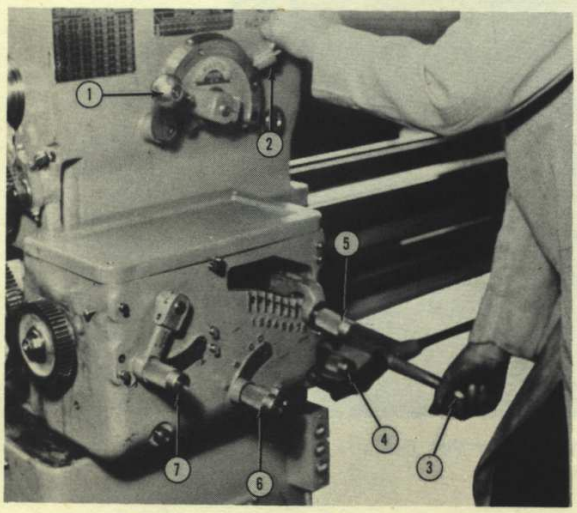


Figure 7. Disengaging the Main Drive Clutch

Gear Box (See Figure 8.)

Two shifter handles and sliding arm handle provide positions for 48 separate thread and feed changes. Handle at left has XYZ positions; handle at center ABCD positions. The sliding arm handle has positions 1 thru 8. Operator can check the gear box chart for desired longitudinal feed and set the handles accordingly.

In order to shift any of the handles from one position to another it is necessary for the lathe to be operating or for the gearing to be turning over. Shifting should not take place while gearing is under pressure of heavy cut.

Clutch Box (See Figure 8.)

At immediate right of gear box the clutch box handle can be placed in one of three positions:

1. To the right for engagement of the feed rod.
2. To the left for engagement of the lead screw.
3. Center position for neutral with both lead screw and feed rod disengaged.

In positioning handle, plunger pin should be fully seated in hole position to provide full clutch or gear engagement.

Mounting Face Plates or Chucks on LO Spindle (See Figure 9.)

Figure 7. Key

1. A Handle
2. B Handle
3. Main Drive Clutch Control Handle
4. Clutch Box Handle
5. Sliding Arm Handle
6. ABCD Handle
7. XYZ Handle

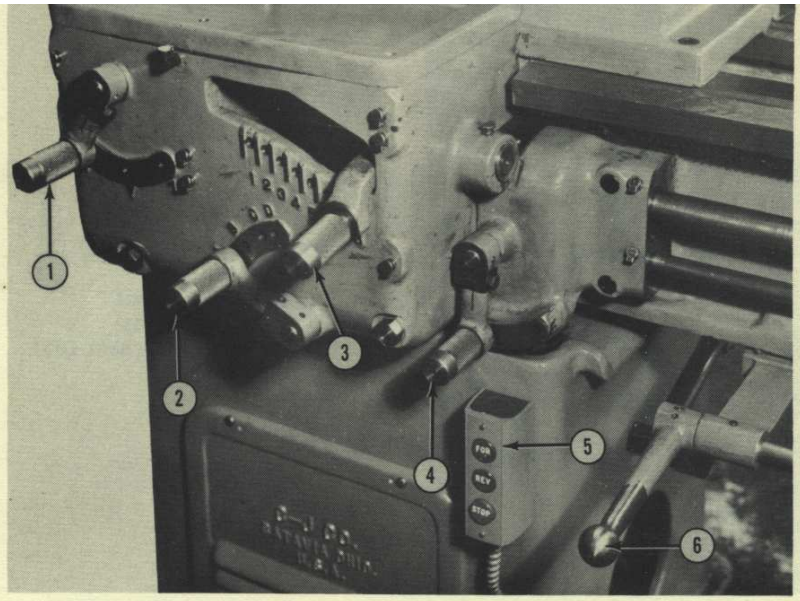


Figure 8. Gear Box and Clutch Box

Figure 8. Key

1. XYZ Handle
2. ABCD Handle
3. Sliding Arm Handle
4. Clutch Box Handle
5. Control Box
6. Main Drive Clutch Control Handle

Align the keyway in chuck or face plate with spindle nose key. Slide on spindle nose until engaged with draw nut threads. Tighten draw nut as much as possible by hand. Fully tighten by using LO spanner wrench.

Apron (See Figure 10.)

Individual length feed and cross feed controls are provided. Lever handles actuate positive type clutches --upper handle for cross feed, lower handle for length feed. Instantaneous disengagement of automatic feed results when handle is pushed down from engaged position.

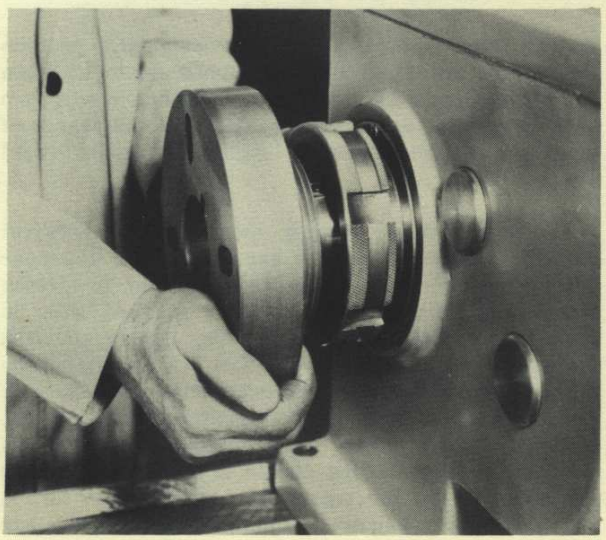


Figure 9. Mounting Face Plates or Chucks on LO Spindle

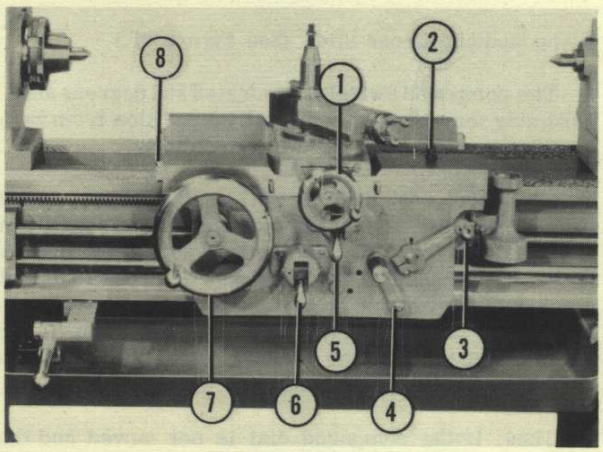


Figure 10. Apron

Figure 10. Key

1. Cross Feed Handwheel
2. Carriage Tightner Bolt
3. Lead Screw Half Nut Lever
4. Feed Reverse Lever
5. Cross Feed Control Handle
6. Length Feed Control Handle
7. Apron Handwheel
8. Shear Wipers

The feed reverse lever provides two directional length and cross feeds as well as neutral position. The lever must be in neutral position before the lead screw half nuts can be engaged for thread chasing.

Lead screw half nut lever is located at far right side of apron.

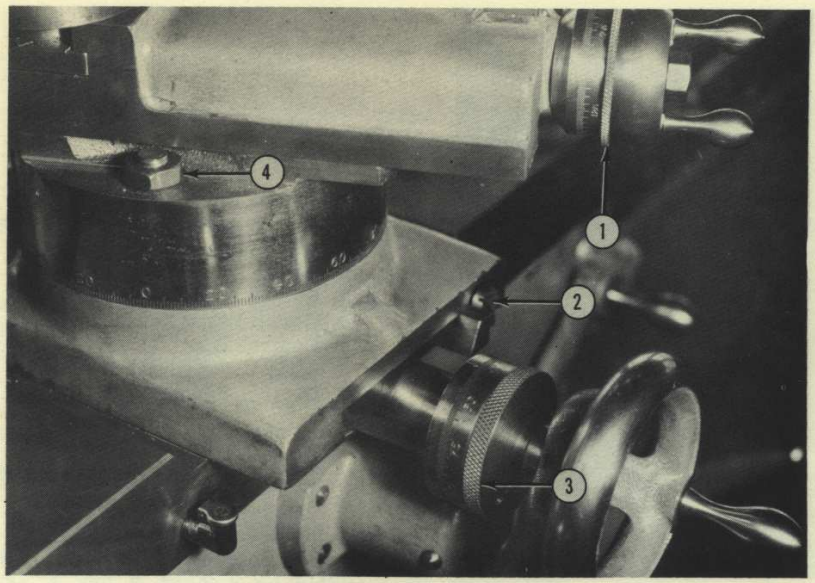


Figure 11. Key

1. Compound Rest Dial
2. Gib Adjusting Screw
3. Cross Feed Handwheel Dial
4. Swivel Bolts

Figure 11. Compound and Cross Slide

Compound and Cross Slide (See Figure 11.)

The compound swivel is graduated 360 degrees and assembly may be turned to desired position from zero marking by loosening the two swivel bolts.

Compound rest dial as well as larger cross feed hand wheel dial at front of carriage are graduated in half thousandths. By tightening, set screw dial is fixed to the shaft of the compound or cross feed and amount of movement from zero point can thus be determined. One complete clockwise revolution of the dial or 250 thousandths actually moves the compound or cross slide 125 thousandths or 1/8 of an inch.

Thus, if the compound dial is not moved and the cross feed turned one revolution or 250 thousandths, the cutting tool is moved 1/8 inch toward center providing for metal removal of 1/8 inch on the side or 250 thousandths on diameter. In this manner, operator determines the amount he will remove from the diameter of work by the dial setting.

Care must be taken in assuring that screw backlash is taken up in determining dial setting.

Carriage (See Figure 10.)

For facing operations tightener bolt at right front is provided for holding carriage in position for this operation. Tool post wrench is used on this bolt. Be sure to loosen this bolt when resuming length feed operation.

Shear wipers on headstock and tailstock sides of carriage deter dirt and chips from working under vees of carriage.

Tailstock

The tailstock spindle or sleeve is moved in and out of housing by the turning of the handwheel. When in proper position, the spindle is locked by turning binder handle at top. Lathe center seated in the spindle may easily be removed by moving the spindle back into the housing. Tailstock screw striking end of center dislodges the center from tapered hole.

Set over screws on either side of tailstock base provide for swiveling tailstock to right or left of center for taper turning.

Taper Attachment (See Figures 12 and 13.)

The lathe taper attachment is designed to provide for turning any taper up to 4 inches per foot. When set for turning maximum taper, attachment will turn $15\frac{1}{2}$'' length at one setting. The less the degree of taper setting, the longer the length that may be turned at one setting.

To set for taper turning operation, loosen swivel bolts at either end of guide bar. Adjust bar to proper setting by turning adjusting screw handle. Headstock end of attachment (Figure 12) is marked with 35 graduations to right and left of zero. Each graduation indicates 1/8 inch taper per foot. Thus, lining the mark on guide bar with 24th graduation would be setting for 3 inches taper per foot right or left of center. Naturally, taper setting as indicated is approximate and more exact setting should be derived following original cuts on the taper, checking the taper turned and making any required adjustment of the guide bar to give exact taper. Opposite end of guide bar is graduated in $\frac{1}{2}$ degree increments.

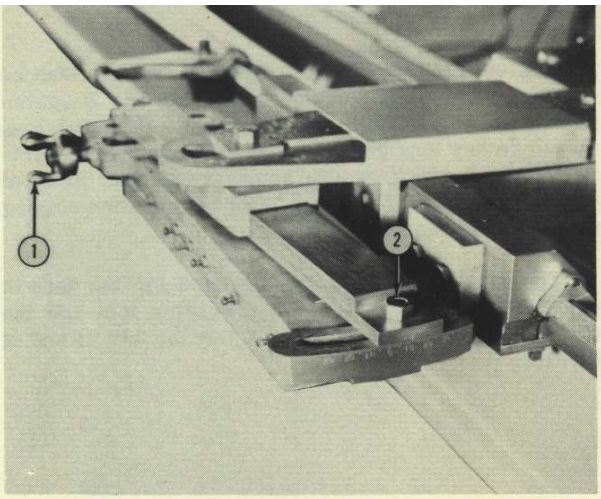


Figure 12. Taper Attachment , Headstock End

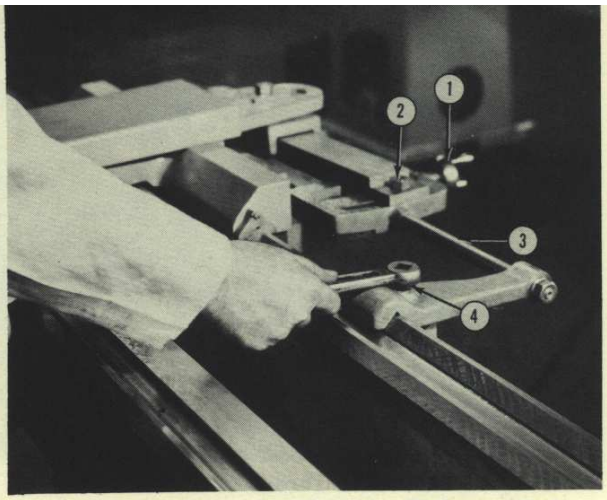


Figure 13. Taper Attachment , Tailstock End

Figure 12. Key

1. Adjusting Screw Handle
2. Swivel Bolt

Figure 13. Key

1. Adjusting Screw Handle
2. Swivel Bolt
3. Connecting Rod
4. Bed Dog Bolt

With guide bar in position, tighten the two swivel bolts. The connecting rod bed bracket at tailstock end of attachment should then be clamped to bed by tightening bed dog bolt (Figure 13).

With the bed bracket clamped in position, the cross slide movement is guided as carriage moves longtitudinally. The cross slide moves in conformance with the movement of the guide bar shoe sliding on the stationary guide bar.

Lathes can be equipped with either the standard or the telescopic type taper attachment. With the standard taper attachment it is necessary to first disconnect the cross feed nut from the cross slide located at rear of cross slide. The cross slide is then free to follow the movement of shoe along guide bar.

The telescopic attachment does not require the disconnection of the cross feed nut to put it into operation as a telescoping type cross feed screw is employed. In using, the lost motion in the cross feed screw must be taken up to provide immediate response of the cross slide to the guide bar on engagement of the feed.

Additional points to check in using taper attachment:

1. Check dog on lathe bed vee to be sure it is not twisting or jamming the connecting bar or rod to guide bar. This dog should be tightened on bed before tightening nut at end of connecting bar.
2. Be sure dog is free of dirt where it contacts bed vee.
3. In setting top guide bar over to cut taper, bolts must be loose so as not to cause any drag on the bar as it is being adjusted to taper position, then drawn up tight.
4. Try taper attachment by hand to make sure guide bar and swivel slide will slide freely back and forth with bed dog loose.

Thread Chasing (See Figure 14.)

The thread indicator located on right side of apron is arranged to swivel to engage the lead screw. Lathe lead screw is 1-3/16" diameter, 6 TPI Acme right hand. Engage the thread indicator worm gear with the lead screw, place feed reverse handle in neutral position. Set up gear box handles in positions required for desired thread per index plate.

To engage the lead screw half nuts, push the lead screw nut lever down. Pull up for immediate disengagement.

Even number threads per inch -

In utilizing the thread indicator, when chasing an even number of threads, half nuts can be engaged on either long or short graduations, that is, when either graduation is in conjunction with starting point as marked on top of indicator.

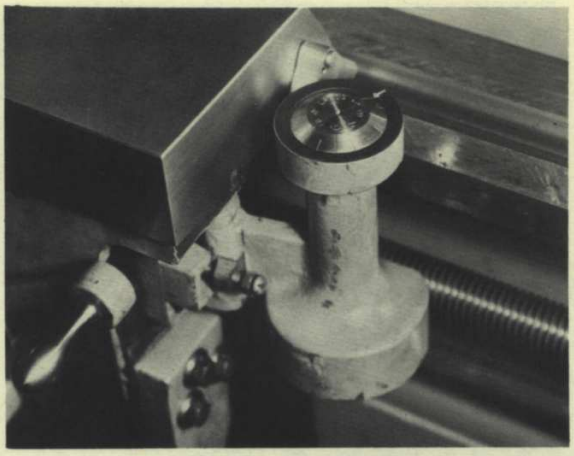


Figure 14. Thread Indicator

Odd number threads per inch -

For cutting odd number threads, threads must be caught on either long or short graduations. If operator starts with long mark he must continue catching thread on any long graduation coming even with starting point. If starting with short graduation, he must continue catching thread on short graduation coming even with the starting point.

The compound rest can be used for the feed in determining depth of cut for threading tool and the cross feed screw used to back out the tool at end of thread.

MAINTENANCE

Vee Pulley Clutch Adjustment (See Figure 15.)

To adjust the friction clutch for proper tension, place clutch in disengaged position. Release the locking pin located in yoke cover assembly by pulling out and either tighten or loosen clutch by turning the yoke cover assembly. Turn the assembly clockwise to tighten and counter clockwise to loosen.

It is not necessary to adjust clutch to extremely tight position to obtain maximum pull. The operating cone should not have to be jabbed in. Proper adjustment will permit operating cone to go into engagement with few pounds of pressure.

Should drive shaft tend to creep or run with the vee pulley with the clutch disengaged, it is indication that vee pulley bushing at end of drive shaft is not sufficiently lubricated. Oil applied at this point will ordinarily correct this condition.

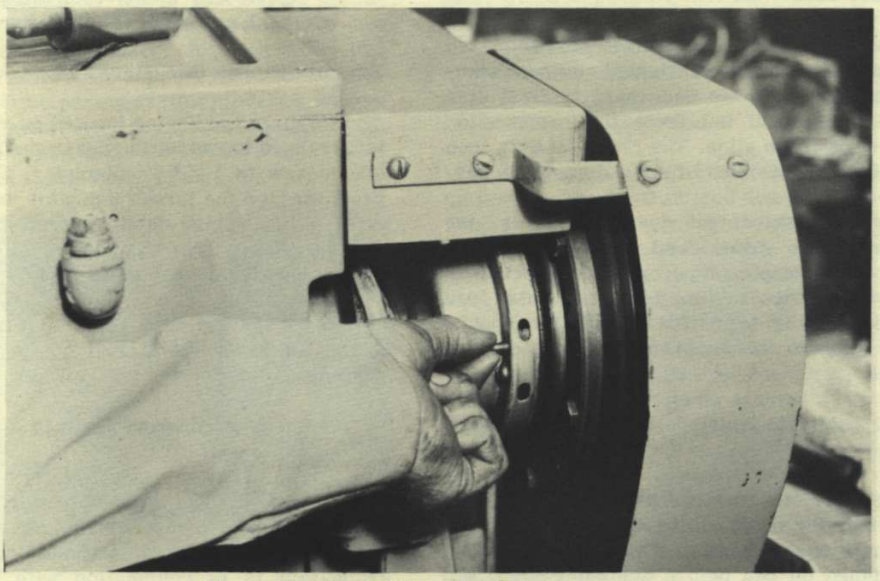


Figure 15. Vee Pulley Clutch Adjustment

Adjustment of Main Spindle Bearings (See Figure 16.)

The headstock spindle is mounted in precision Timken taper roller bearings which are properly adjusted before lathe is shipped from factory. After the lathe is placed in operation, a periodic check should be made to see that the proper adjustment is maintained.

When the headstock has been operating in the higher speed range for 30 to 60 minutes, properly adjusted spindle bearings will get quite warm. If the headstock at the front bearing location does not feel warm or even hot to the touch after about 60 minutes of higher speed operation, the bearing adjustment is indicated to be too loose.

To ascertain spindle adjustment, disengage all gears on spindle. Loosen set screws in nut or collar on rear end of spindle. Turn this spindle nut slightly and try for adjustment by wrapping a cord around nose of spindle and pulling spindle over with a small spring scale attached to cord. Approximately 30 to 32 lbs. pull on the scale, required to turn the spindle, shows a good adjustment. Care should be taken not to get adjustment too tight. Should this occur, bearings can be loosened by placing a block of wood against end of spindle and tapping with a hammer.

Checking the spindle for proper bearing adjustment should be done when the bearings are warm or the head has been running. Once adjustment has been made, make sure set screws are tightened in the spindle nut before operating.

The large or front bearing is pressed on the spindle. The rear or small bearing can be moved on the spindle. The adjustment is made by drawing the rear bearing toward the large or front bearing. This is accomplished by tightening the threaded collar or nut on the rear end of the spindle as previously indicated.

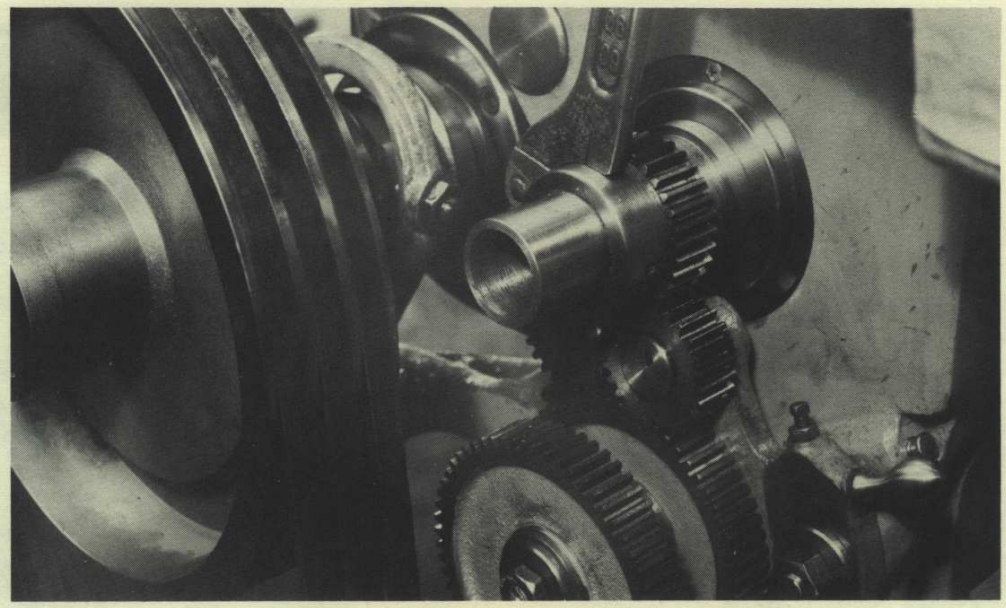


Figure 16. Adjustment of Main Spindle Bearings

Adjustment of Cross Feed and Length Feed Controls (See Figure 17.)

Remove control housing from apron. Loosen set screw in adjustment nut by inserting set screw wrench through spring coils. Turn nut slightly and check position of thrust bearing against cam when housing is in position. Tighten set screw and nut before operating lathe.

CAUTION

When necessary to remove adjustment nut from stud, care should be exercised when unscrewing the nut as heavy coil spring is held under tension by the nut.

Gib Adjustment for Compound and Cross Slide (See Figure 11.)

Both the compound rest and the cross slide have gib adjustment screws at front and rear. Tapered gibs provide for proper sliding fit along the dove tail on both the compound and cross slide.

Proper adjustment provides for smooth feeding of these assemblies on bearing surfaces with no play to affect tool under pressure of heavy cut. The compound and the cross slide are properly adjusted at the factory.

After approximately three months of normal lathe operation, it is advisable to check both assemblies for sliding fit. If any play is noticeable in either assembly, slight adjustment of gib screws will snug slide to dove tail bearing.

Gib adjustment screws are located at front and rear of each assembly. To tighten slide adjustment, loosen rear gib screw and tighten front screw. This forces tapered gib to rear along dove tail, thus tightening the sliding assembly. Very slight adjustment is normally required, 1/8 to 1/4 turn of adjusting screw usually being all that is required.

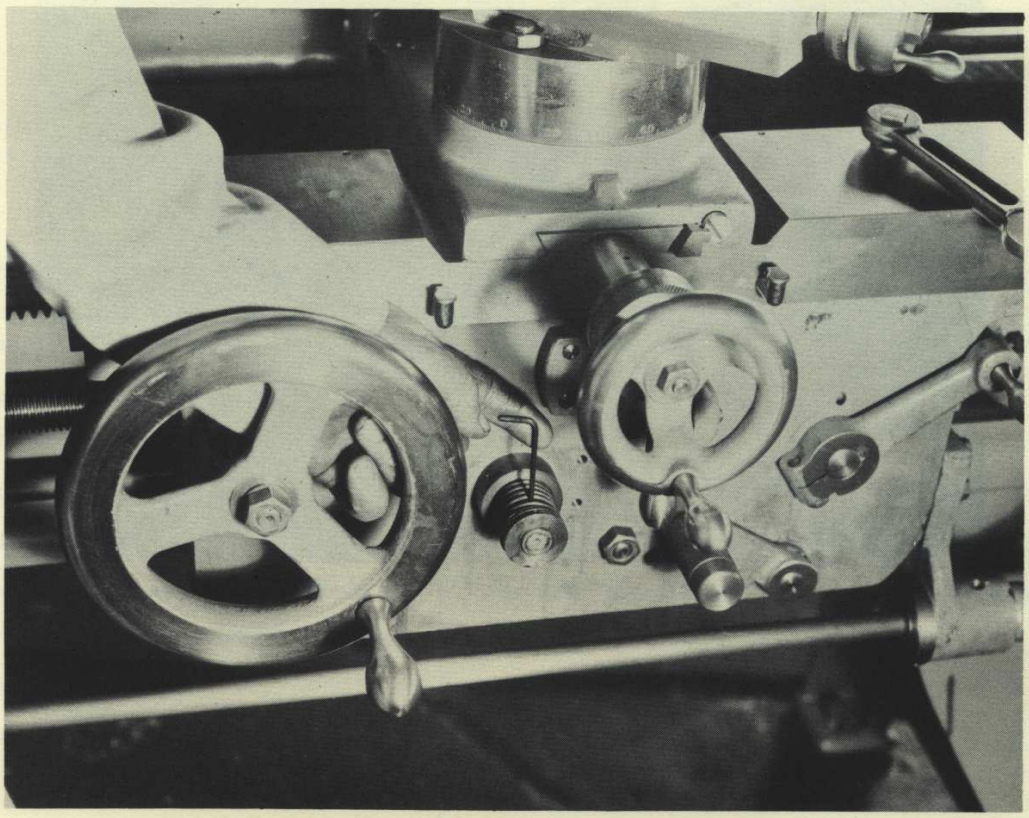


Figure 17. Adjustment of Cross Feed and Length Feed Controls

Adjustment can be made too tight causing cross feed hand wheel or compound rest handle to turn with some difficulty. With proper adjustment the slides will be snug yet handwheels will turn freely or with no drag. Gib screw at rear should be tightened against end of tapered gib to hold it snug in position.

Following initial checking and adjustment, normally an annual check for adjustment of the slides is all that is necessary to maintain lathe in good operating condition for precision turning.

Carriage Clamp Adjustment

Clamps under the rear side of the carriage and under the left front corner of the carriage can be tightened or loosend by adjustment of the set screws and jam nuts on the rear clamps and the one bolt under the left front corner. Periodically the carriage should be checked by applying pressure to underside of carriage and lifting to check for play between carriage and bed veeways.

In tightening the clamps care must be taken not to draw clamps so tight to the bed that drag occurs in longitudinal movement of the carriage on the bed. Properly adjusted clamps allow for free carriage movement with carriage held firmly to bed even under pressure of heaviest turning operations.

Apron Assembly Removal

Should it become necessary to remove the apron for adjustment or replacement of parts in the assembly, this procedure should be followed:

1. Position carriage near center of bed.
2. Remove collar and nuts from end of lead screw and feed rod, remove two screws from journal or bearing block at same end.
3. Throw clutch box handle to extreme right position and remove screws from clutch box.
4. Engage half nuts in lead screw and move carriage toward tailstock until clutch box slides off and clears bed key.
5. Slide clutch box toward apron until lead screw clutch and feed rod gear are clear. Knock out pins holding lead screw clutch and feed rod collar (Figure 18). Remove clutch and gears and slide off clutch box.
6. Disengage half nuts and pull lead screw and feed rod clear of apron.
7. Remove two screws at each end of apron on underside to free it from carriage. It is advisable to block up under apron to prevent assembly from dropping.

In assembly, after clutch and gears are in place on lead screw and feed rod, replace tapered pins in clutch and collar. Throw clutch box handle to extreme left engaging lead screw clutch. Line up keyed shaft in gear box with keyway in clutch gear. Slide clutch box into position.

Check lead screw after end nuts are in place. With clutch and half nuts disengaged, the screw should turn over by hand to indicate no drag due to nuts being drawn to tight.

Lathe Care

Your C & J Master Model GH lathe is designed and built to give lasting precision performance. However, as in the case with any fine tool, it must be treated with care to give the long service life expected of it.

The most important factor in keeping your lathe in first class operating condition is following a proper lubrication procedure. Refer to LUBRICATION, page 5 of this manual.

Cleanliness is also important. This is particularly true with regard to the bed ways. Keep the ways as free as possible of dirt and chips and keep them well oiled. Do not lay tools directly on the ways. When grinding or polishing with emery cloth, protect the ways from abrasive dust by covering with cloth or paper.

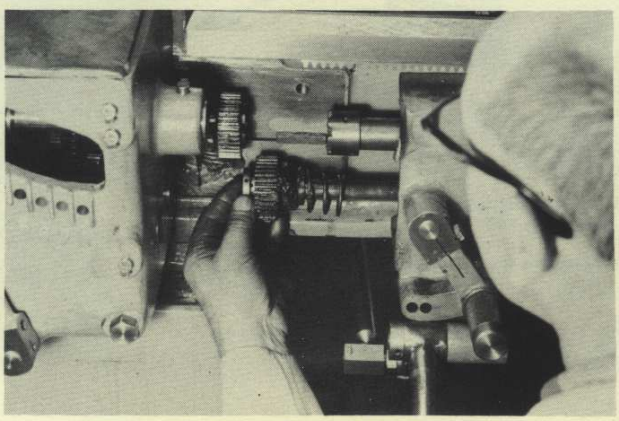
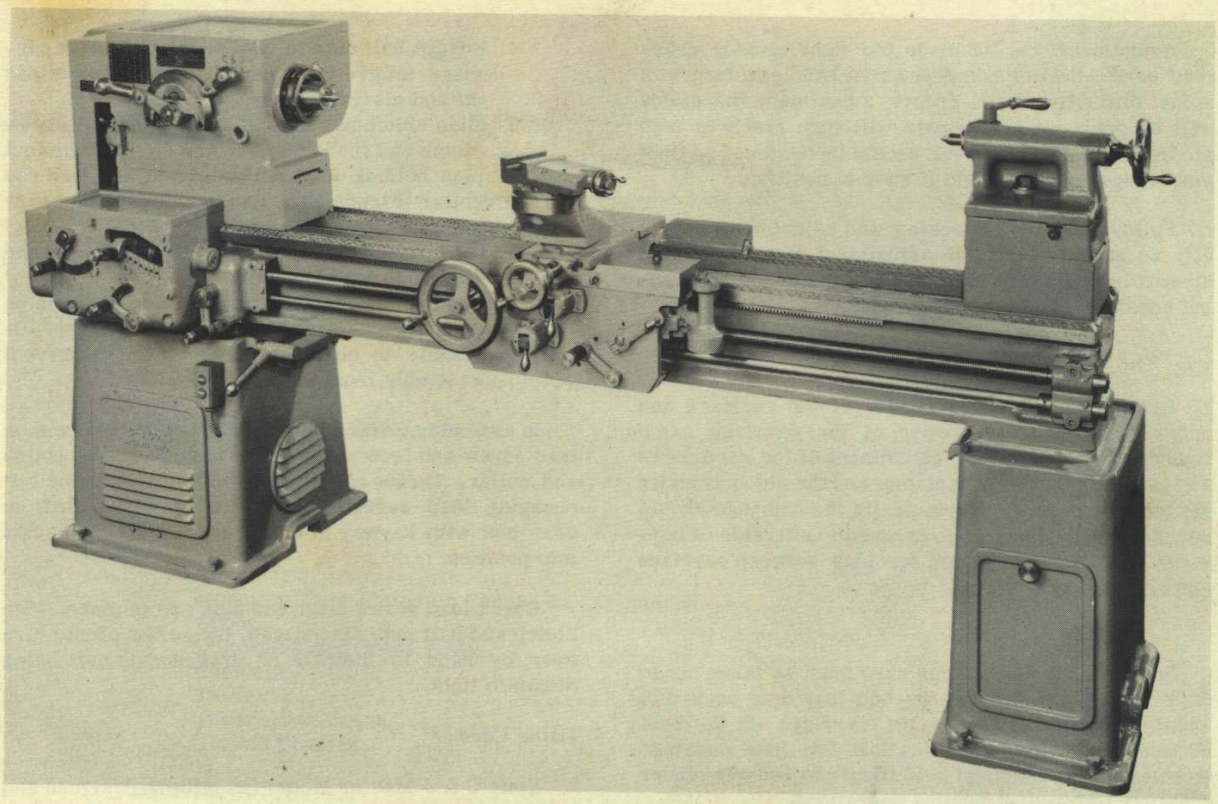
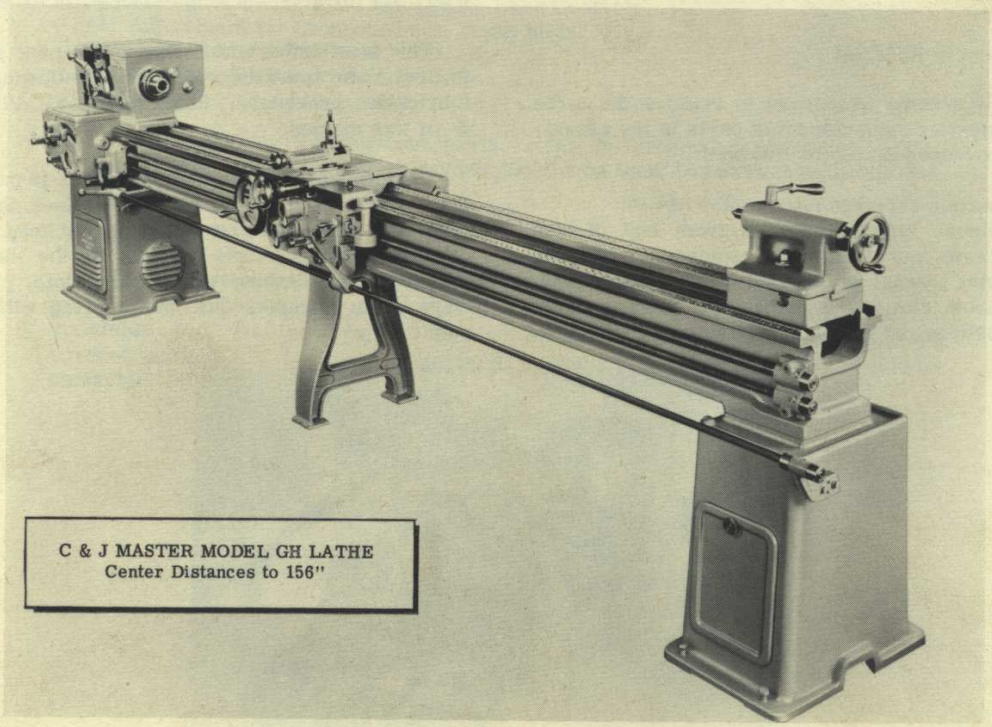


Figure 18. Apron Assembly Removal



C & J 16 - 25" MASTER MODEL GH LATHE, 20" Swing Over Cross Slide



C & J MASTER MODEL GH LATHE
Center Distances to 156"

THE CARROLL-JAMIESON MACHINE TOOL CO., BATAVIA, OHIO