HOW TO CHECK THE LATHE

1. Check installation of lathe.

   Refer to Bulletin No. 63-151-2, Instructions for Mounting and Leveling the 6300-series Lathe.

2. Check leveling of lathe and cabinet.

   Refer to Bulletin No. 63-151-2, Instructions for Mounting and Leveling the 6300-series Lathe.

3. Check gib adjustment of the carriage saddle, cross slide, and compound rest.

   For adjustment of compound rest and cross slide gibs, refer to assembly instructions for the compound rest cross slide on page 27. For gib adjustments of the carriage saddle, refer to assembly instructions on the carriage saddle, page 31. If the gibs are adjusted too loose, then the part of the carriage which the gib adjusts should be removed and its bearing surfaces carefully checked for chips and dirt. Refer to instructions for removing the part which it is necessary to inspect for correct procedure.

4. Check backlash adjustment of the cross feed screw and compound rest feed screw.

   Refer to instructions for assembly of the carriage saddle, cross slide, and compound rest on pages 27 and 31.

5. Check for dirt, chips, rust preventives, etc.

   Carefully inspect the bearing surfaces of the lathe bed ways both on the top and on the underside of the dovetail ways of the carriage saddle, cross slide, and compound rest, the inside of the spindle taper, and the spindle nose. Also check the surface of the tailstock base, which rides on the lathe bed. Any chips, dirt, rust preventives on these surfaces will throw that part of the lathe out of alignment.

Also carefully check the lead screw threads and the keyway which goes the full length of the lead screw to make sure that these parts are clean, as chips or dirt on the lead screw thread or keyway will cause excessive wear on half nuts in threading operations.

6. Check lubrication.

   See lubrication instructions for 6300-series lathe on pages 3 and 4 of Bulletin No. 6300-1.

7. Check the action of the lathe controls.

   Refer to instructions on maintenance and controls on pages 4, 5, 6, and 7 of lathe Bulletin No. 6300-1.

8. Running tests.

   Run the lathe at all speeds both open belt and back gear with the lead screw in a neutral position. Next, engage the lead screw direction lever, and try the gear box in a few assorted threads or feeds to check its operation. Next, set the quick-change gear box for a 20-thread, and then engage the cross feed to check its operation. Then, with the gear box still set for 20-thread, engage the power longitudinal feed to check its operation. Then, disengage the power longitudinal feed, and engage the half nuts to check the operation of the half nuts and also observe the operation of the threading dial. Next, disconnect the motor belt and run the motor idle to check the motor for operation and vibration.

   If the lathe is equipped with a Varidrive unit, disengage the belts and run the unit idle. Check the Varidrive in all speeds. CAUTION: Do not attempt to change speeds on the Varidrive unless the motor is running.

   If the Varidrive is defective, call the nearest U. S. Motors sales office for service. DO NOT attempt to repair the Varidrive.

9. Check the spindle accuracy.

   (a) Dial indicate the spindle nose by clamping a dial indicator on the carriage, and place the indicator button on the small end of the spindle

nose so it will clear the key when rotating the spindle. Turn the spindle over by hand -- the indicator reading should be within .0003. Do not consider the slight variation in indicator reading when the button passes over the spindle in front of the key. This point is always about .0001 lower than the rest of the spindle. See Figure 8.

(b) Carefully wipe out the spindle taper with a clean dry rag to make sure that all chips and dirt have been removed from this surface. Chips imbedded in the taper can be removed with the point of a knife. Then carefully wipe the taper shank of the test bar, and slide the test bar into the spindle taper, moving it with a sharp push for the last two inches. A dull thud or clunk indicates a firm seating in the taper. With the dial indicator clamped to the carriage, place the button of the dial indicator on the test bar 8" out from the end of the spindle nose. See Figure 2. Rotate spindle by hand. Reading on dial indicator should be within .001. Then take a dial indicator reading on the test bar right up next to the spindle nose. This reading should be within .004. Do not remove the test bar from the lathe spindle or the dial indicator from the carriage. They'll be needed in the next test.

10. Checking the tailstock ram.

Slide the tailstock up toward the end of the test bar, and turn the ram out as far as it will go. Then slide the tailstock toward the head until the end of the ram is just a fraction of an inch away from the end of the test bar. Then lock the tailstock in place with the tailstock lock nut. Place the button of the dial indicator on top of the test bar in the lathe spindle, and note the reading on the dial - see Figure 3. Then, move the indicator over until the button rests on top of the tailstock ram, by moving the lathe carriage along the bed. Do not move the indicator itself by loosening the indicator clamp. Then note the reading when traversing the dial indicator button along the top of the tailstock ram. The ram should be no more than .001 higher than the test bar, never lower

11. Turning test.

Chuck a piece of 2" diameter stock in a three-jaw universal chuck on the lathe spindle, so that the stock extends out from the chuck at least four inches. Take a roughing cut on the full length of the stock, and then follow up with a finish cut of no more than .005. When the test cut has been completed, check the diameter at both ends of the cut with a micrometer. The difference between these two readings should be no more than .0005. (See Figure 4).

12. Facing test.

Set the gear box to get approximately a .002 feed on the cross-feed. Then mount the face plate on the lathe spindle and take a light cut across the full surface of the face plate. Then lay a 12" straight edge or accurate steel scale across the machined face, and check by placing a strip of .001 shim stock between the scale and the surface of the face plate at various points - see Figure 5. If the shim stock drags when you attempt to draw it from between the scale and the face plate, it would indicate that the lathe was facing true within tolerance. If you don't have any .001 shim stock, then use a thin strip of cellophane wrapping from a cigarette package. The lathe should face true within .001 concave, never convex.

The facing test will also be a check on the spindle bearing pre-load. If the bearings aren't preloaded enough, there will be ring marks or chatter marks on the surface of the face plate.

13. Checking headstock and tailstock centers.

The headstock and tailstock centers are checked by first placing the reducing sleeve in the spindle taper. Then insert the center in the reducing sleeve, and place the dial indicator button on the center right at the point - see Figure 6. Rotate the spindle by hand, and note the reading on the dial indicator. This should be within .001. Then remove this center, and insert the other center in the reducing sleeve. Check this in the same manner.

14. Check alignment between headstock and tailstock.

Replace the headstock and tailstock centers on the lathe. Then, mounting the test bar between centers, adjust the dial indicator so that the button rests on the side of the test bar at the headstock end - see Figure 7. Then move the dial indicator button the full length of the test bar by traversing the carriage. The dial indicator should show no variation or run-out in the reading over the full length of the test bar.

DISASSEMBLING AND REASSEMBLING LATHE UNITS

6300-SERIES

(Note: Since the carriage assembly, tailstock, and lathe bed assemblies are the same on the 4800-series and 6300 series, we will not cover them in this section of the manual)

GEAR TRAIN AND QUADRANT ASSEMBLY

TO DISASSEMBLE

1. Remove the OQ-105 spindle engage wheel by taking out the C-347 retaining ring. This retaining ring is removed by placing a screwdriver blade under point of ring, lifting it up out of the slot and then unwind the snap ring.
2. Remove the set screw in the hub of the spindle engage wheel, and then slide the wheel off the end of the spindle. Caution: Be sure to catch the spring and ball which were under the set screw.
3. Next remove the black ball, part No. C-325, from the end of the sliding selector handle, which comes out through the side of the gear guard from the quick-change gear box. This handle just screws onto the shaft.
4. Remove the gear guard OQ-198 by taking out the flat-head set screws which are on inside or righthand face of the OQ-197 inner gear guard.
5. Next remove the C-300C snap ring which holds the C-344 two-step pulley in place on the end of the spindle. This snap ring is removed with a pair of true-arc pliers, or in an emergency, a pair of long slim-nose pliers can be used.
6. Then slide the two-groove pulley C-344 off end of spindle. Along with the pulley will come a steel spacing washer, part No. OQ-104.
7. Now remove the phosphorous bronze thrust washer C-371 by sliding it off end of spindle.
8. Remove oil lines part Nos. OQ-118A and OQ-118. This is done by placing a screw driver behind the oil line and lifting it out of the end of the L-shaped oiler which projects through the inner gear guard OQ-197. Remove the other

oiler by the same procedure.

9. Next remove OQ-111 collar which holds OQ-100 quadrant on OQ-16 sleeve, which comes out of end of quick-change gear box. Collar (No. OQ-111) has several holes drilled into outside diamter and can be removed by inserting a punch into one of these holes, tapping in a counterclockwise direction.

10. Next, pry OQ-100 quadrant from OQ-16 sleeve by placing a screw driver between quadrant and inner gear guard OQ-197. At the same time the sliding gear and handle (part Nos. OQ-244 and Q-528) will come off the shaft. CAUTION: Watch out for the spring and ball which are in the drilled hole in the OQ-4 shaft, which will pop out when sliding gear handle (OQ-244) is removed.

11. To remove OQ-101 gear train bracket from OQ-100 quadrant, loosen the 1/2"-13 hex cap screw which will allow Q-540-S gear assembly and OQ-110 gear to be taken off shafts of quadrant assembly along with OQ-108 bushing which passes through the Q-540-S gear assembly.

12. Next, remove hex nut and washer which hold C-286-S gear assembly on inner gear guard directly behind end of lathe spindle.

13. Remove hex nut on stud directly below spindle so that the 18-tooth drive pinion (part No. Q-525) can be removed. Now remove the Woodruff key from shaft.

14. Slide the OQ-14 and OQ-109 gears off their shafts -- these gears are located on the inner gear guard just behind the sliding selector shaft.

15. Next remove hex jam nut from end of OQ-50 cradle lock collar housing.

16. Pry off cover No. OQ-29. Make a mark or scratch on the surface of the OQ-29 to assist in placing it back in same way when you reassemble this unit.

17. Slide collar OQ-50 complete with handle assembly from OQ-51 anchor. As the OQ-50 collar and handle assembly is removed, pull back on the plunger C-324A to withdraw plunger from OQ-50 housing.

18. Notice the overriding clutch (part No. OQ-24) inside of the OQ-25 gear. (See Figure 18) Take a good look at this over_riding clutch assembly in its proper position. The milled slots in the over-riding clutch OQ-24 should point toward

the front of the lathe or toward the operator as he stands in front of the quick-change gear box. Do not attempt to take the over-riding clutch OQ-24 out of the OQ-25 gear, as it is difficult to reassemble, and it can be very easily checked for proper operation without taking it apart.

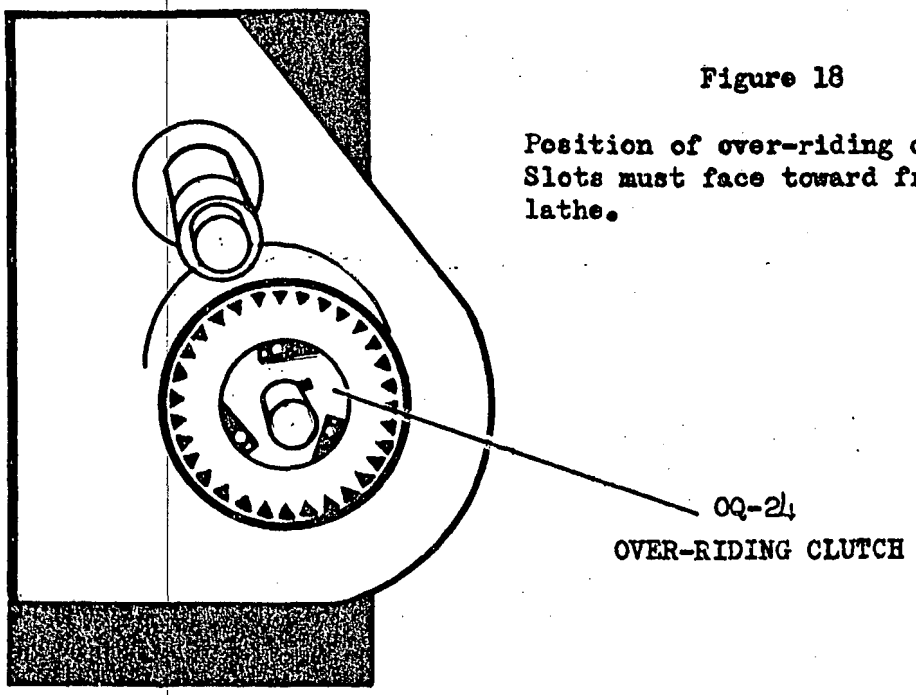


Figure 18

Position of over-riding clutch. Slots must face toward front of lathe.

19. Slide the OQ-24 over-riding clutch and the OQ-25 gear complete, off the shaft OQ-38.

20. Then holding the OQ-25 gear in one hand, with the other hand turn the over-riding clutch in the direction slots point. When turned in this direction, it should turn freely.

21. Now attempt to turn over-riding clutch in the opposite direction - it should catch against the inside bore of the OQ-25 gear. This indicates that it is operating properly. When putting this assembly back on the lathe, make sure the slots point toward the front, or the clutch won't work.

22. Next, remove the two flat head screws from inside the OQ-51 anchor, then pull

anchor off inner gear guard.

23. Now remove the oil seal holder (part No. C-299) on end of shaft C-315 that comes through the inner gear guard just below the end of the lathe spindle. This oil seal holder is a small round piece of tubing approximately 1" in diameter with an oil seal (part No. C-298) inside. (See Figure 19). To remove hex nut on end of shaft, slide off gear and remove key and then pry the C-299 oil seal holder from the shaft C-315. See Figure 20.

24. Now remove hex cap screw which holds flat strap of steel (OQ-115) to upper part of inner gear guard. When this cap screw and the flat strap of steel are removed, you can take inner gear guard (OQ-197) off the lathe.

25. To disassemble the OQ-30 cradle lock handle, remove the C-324A black plastic ball and the hex jam nut. Then loosen the set screw in the OQ-32 sleeve and turn this sleeve off the OQ-30. Now draw out plunger OQ-31 along with the two C-332A springs.

26. Do not remove the OQ-27 spring and OQ-26 spring hook from the OQ-50 cradle lock collar unless the spring is broken -- these two parts just slide out.

TO REASSEMBLE

1. Before reassembling gear train and quadrant assembly, carefully clean all parts. File all set screw marks off the shafts. Remove nicks, chips, or burrs from gear teeth. Cover all machined surfaces with a light film of oil.

2. Now fit OQ-197 inner gear guard over lefthand end of lathe, hold in place with OQ-115 flat strap and hex cap screw. Line inner gear guard up so it will not interfere with operation of any of the shafts which project out through its surface.

3. Next put Woodruff key in keyway in end of OQ-3 shaft.

4. Then slide OQ-14 gear onto OQ-3 shaft and hold gear in place by tightening hex nut. Do not put second hex nut on OQ-3 shaft, as the preload on this shaft will have to be adjusted later.

5. Place Woodruff key in end of OQ-2 shaft.

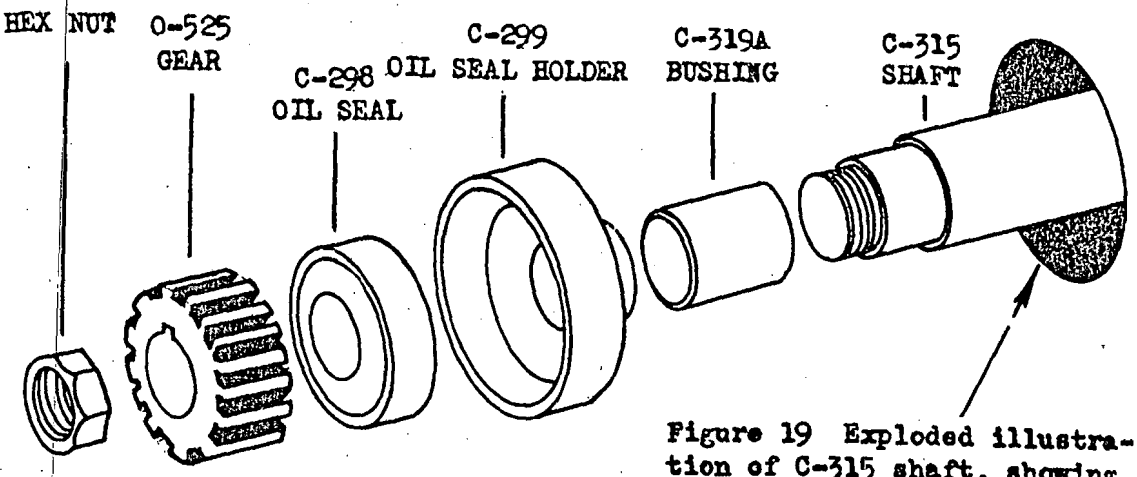


Figure 19 Exploded illustration of C-315 shaft, showing oil seal and holder.

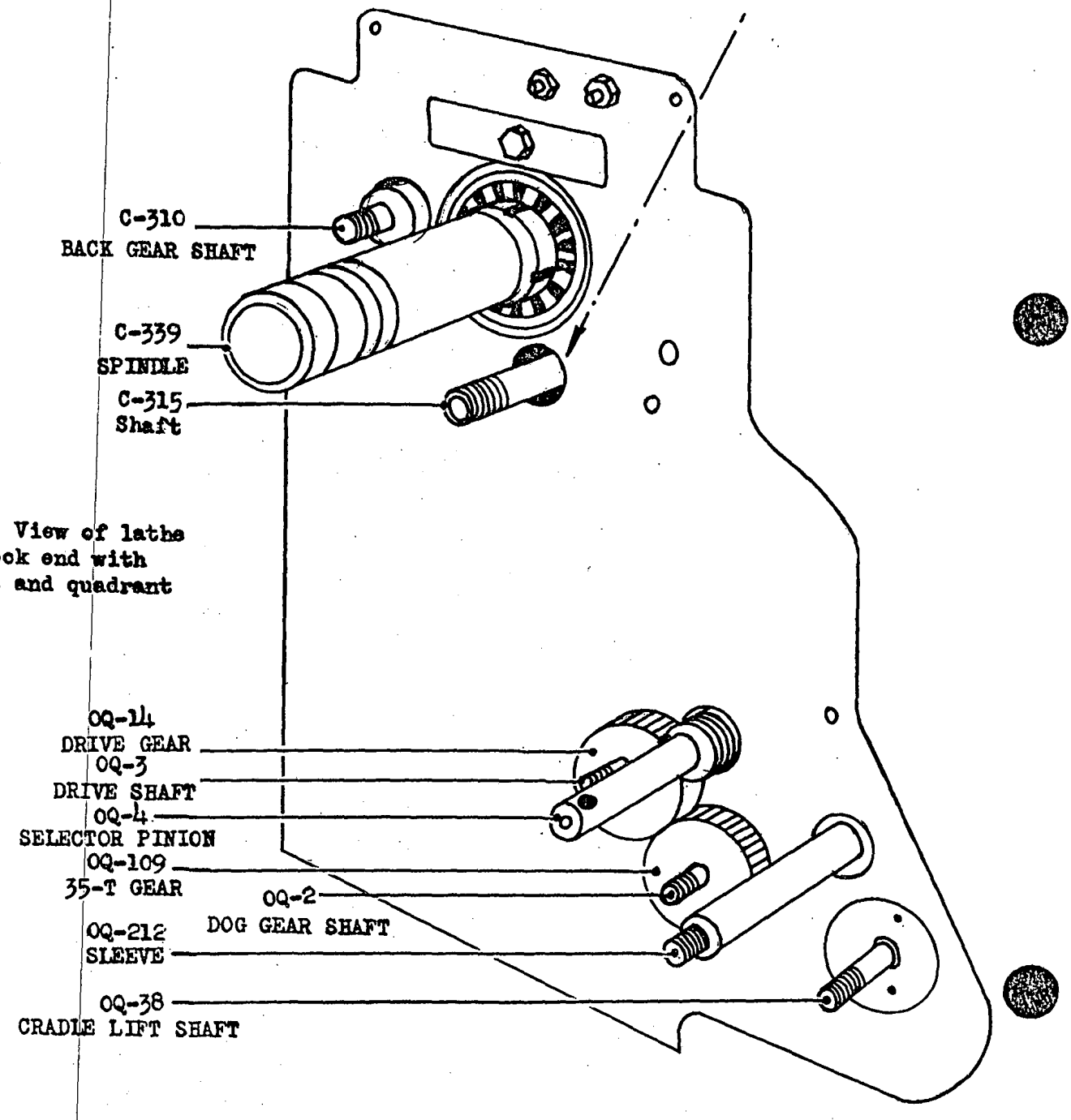


Figure 20 View of lathe at headstock end with feed gears and quadrant removed.

6. Now slide OQ-109 gear on end of OQ-102 shaft, hold gear in place by tightening down hex nut.

7. Next place C-298 oil seal inside C-299 holder, then slide oil seal and holder over end of C-315 shaft, which projects through inner gear guard below spindle. See Figure 18. Drive oil seal and holder against surface of inner gear guard.

8. Place Woodruff key in keyway on shaft C-315 and slide on Q-525 gear. Then tighten hex nut to draw gear up against shoulder on the shaft.

9. Reassemble OQ-100 quadrant by sliding Q-540-S gear assembly with OQ-108 sleeve over end of OQ-107 shaft.

10. Then slide OQ-110 gear with OQ-108A gear sleeve over OQ-106 shaft.

11. Now place OQ-101 gear train bracket over end of OQ-107 and OQ-106 shafts. Tighten the two hex nuts on these shafts to hold OQ-101 in place. Then screw 1/2" - 13 hex jam nut through OQ-101 gear train bracket and into OQ-100 quadrant.

12. Should it be necessary to replace either the OQ-106 or OQ-107 shafts, the replacement shaft should be placed in the OQ-100 quadrant so that the milled channel, or slot, is lined up with oil holes which are drilled through boss on quadrant through which these shafts pass. When shaft has been lined up with oil hole, drill and pin them in place with the groove pin just like they were pinned before.

13. Next slide OQ-100 quadrant assembly over end of sleeve OQ-16. See Figure 19. Look down through oil cup on top of quick-change gear box at lefthand side next to inner gear guard to make sure that the oil hole in the sleeve OQ-16 is lined up with the oil cup. If oil hole has been moved out of line, turn the OQ-16 sleeve until oil hole is in line with the oil cup.

14. Slide OQ-11 threaded collar over threaded end of OQ-16 sleeve and tighten collar to hold quadrant in place.

15. Place special OQ-230 key in keyway of the OQ-4 shaft.

16. Place Q-454 spring and Q-456 ball in hole drilled crosswise through OQ-4 shaft. The spring goes in first followed by the ball. Then hold spring and ball down below surface of the shaft.

17. Now slide OQ-244-0-528 sliding gear and handle assembly on OQ-4 shaft. Sliding the shaft on will take care of properly seating the OQ-230 key. Move the sliding gear assembly in and out a few times to make sure that it operates O.K. Turn gear over by hand to make sure that it doesn't bind.

18. Pin quadrant assembly in place on gear guard by driving 1/4" groove pin through the groove pin hole directly below upper bolt hole in the quadrant assembly. Seat the groove pin flush with surface of the quadrant.

19. Then bolt upper end of quadrant to inner gear guard with the 3/8" hex cap screw and lock washer.

20. Now put Woodruff key in the end of C-310-S back gear shaft, which projects through inner gear guard right in back of spindle. See Figure 19. Now slide C-286-S back gear on shaft, followed by washer C-340. Tighten hex nut on end of shaft until gear seats up against shoulder on C-310 shaft.

21. Next, attach OQ-51 anchor to inner gear guard with the two flat-head machine screws.

22. Place Woodruff key for over-riding clutch in OQ-38 shaft - key should go in rear key seat.

23. Now slide over-riding clutch OQ-24 and OQ-25 over-riding clutch gear on OQ-38 shaft as a unit, making sure milled slots in OQ-24 over-riding clutch point to front of lathe, or toward operator. See Figure 18. Figure 21 illustrates assembly to this point.

24. Now reassemble OQ-30 cradle lock assembly and OQ-50 cradle lock collar.

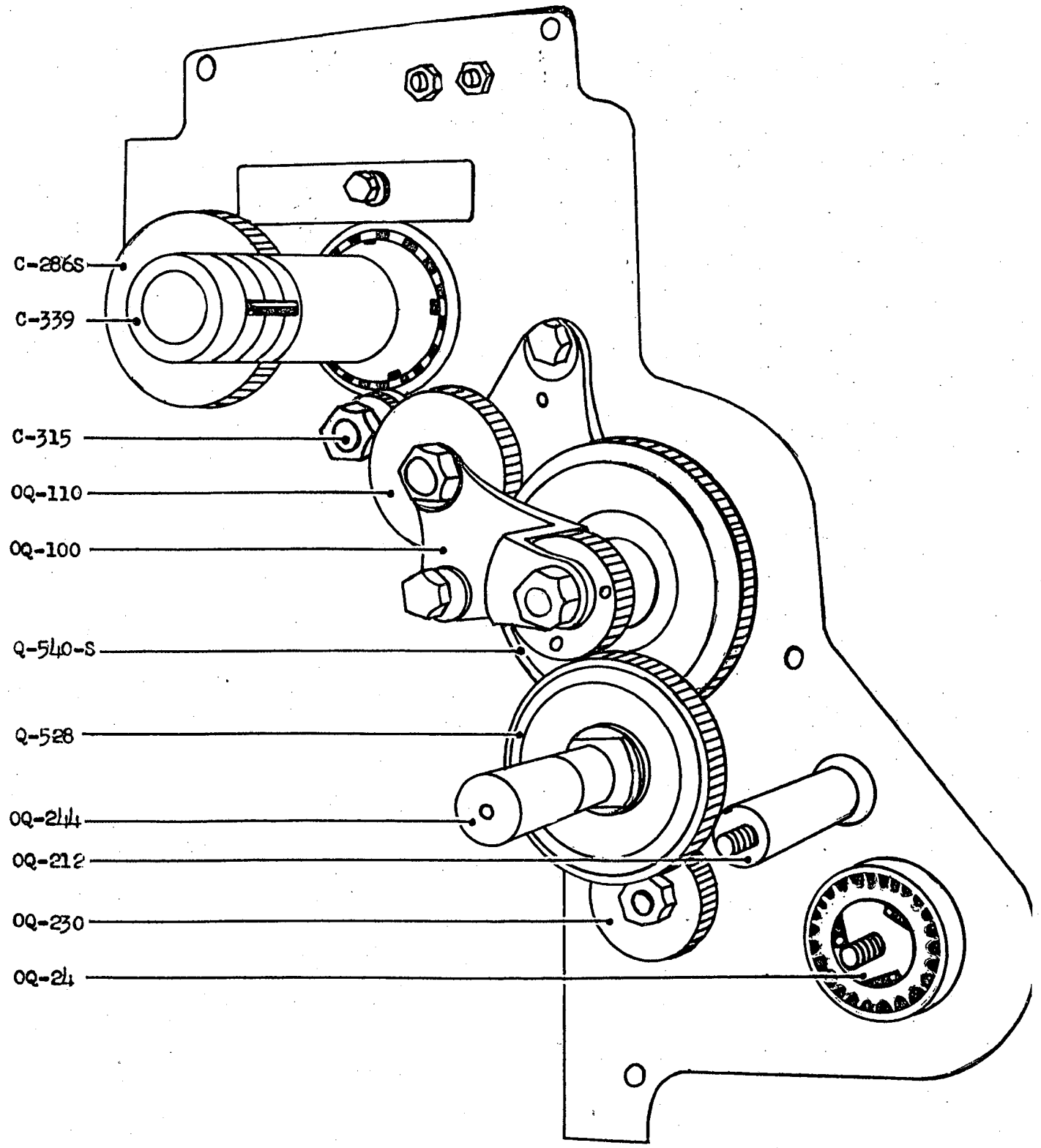
25. Slide OQ-31 plunger into OQ-30. Be sure pin which passes entirely through the OQ-31 fits into the two slots milled in threaded end of OQ-30.

26. Now slide two C-332A springs on OQ-31 plunger, followed by OQ-32 collar. Turn OQ-32 collar on thread until it is within about two turns of the end.

27. Then put hex jam nut on threaded end of OQ-31, turn it down a few turns. Next, screw on the C-324A black plastic knob.

28. Pull back on black plastic knob so OQ-31 plunger is pulled back as far as it will go. Check inside of OQ-50 housing to see if plunger projects into

Figure 21 Parts of the gear train assembly.



the inside diameter of this housing.

29. If it does, back off OQ-32 cap until plunger OQ-31 comes just slightly beneath the inside surface of the OQ-50 cradle lock collar. Then lock the OQ-32 sleeve in position with headless set screw.

30. Place Woodruff key in front keyway on OQ-38 shaft.

31. Now slide OQ-50 collar and OQ-30 handle assembly over the OQ-38 shaft and Woodruff key so OQ-26 spring hook is keyed to the shaft by the Woodruff key.

32. To adjust tension on OQ-27 spring, remove OQ-58 cover and feed chart from front of quick-change gear box. Loosen set screws in the two OQ-214 gears, which are located on OQ-38 shaft inside quick-change gear box - one on lefthand side and one on righthand side.

32-44

33. Position OQ-30 lever so it is pointing straight up.

34. Adjust a crescent wrench so it will fit over the OQ-38 shaft, and catch on the two groove pins which are part of the OQ-26 spring hook.

35. Place a socket-type set screw wrench in set screw in lefthand OQ-214 gear. This gear is to be used as a lock to hold the tension while you are adjusting the OQ-27 spring. The set screw should be loose.

36. Now turn OQ-26 spring hook in counter-clockwise direction, with the wrench, until wrench comes up against OQ-212 selector shaft handle. Then tighten set screw in the lefthand OQ-214 gear to lock tension in place while you get a new hold on the groove pins with wrench.

37. Loosen set screw in lefthand OQ-214 gear, and continue tightening spring in counter-clockwise direction. As a general rule, from the completely unwound condition, 1 1/2 turns of the OQ-38 shaft will properly tension the OQ-27 spring. Tighten spring as explained above until you have made 1 1/2 turns. Lock adjustment by tightening set screw in lefthand OQ-214 gear. Tighten set screw in other OQ-214 gear on righthand side of OQ-38 shaft inside gear box.

38. Then slide OQ-29 plate over end of OQ-38 shaft, so the two groove pins in OQ-26 will fit into the two groove pin holes in OQ-29 plate. The mark which you made on OQ-29 plate when you disassembled this unit should show when plate

is in proper position.

39. Now replace the OQ-58 gear box cover -- just fasten in place with two screws, as it may be necessary to remove the cover to complete adjustment of spring.

40. Now position sliding selector so it lines up with the column headed by four threads per inch. Push OQ-30 cradle lock lever down to the engaged position, checking to see if plunger in lever locks lever in down position. If tension on OQ-27 spring isn't tight enough, cradle OQ-65 inside of quick-change gear box will not be lifted up to engage gears in cradle with sliding selector gear. Check this by attempting to slide the sliding selector shaft back and forth. If it won't move it indicates cradle has been shifted up into its proper position. If it does move, then it will be necessary to put more tension on the spring following steps outlined above.

41. Next release OQ-30 cradle lift lever, and line up the sliding selector with the column headed by seven threads per inch. Then engage OQ-30 lever to lock cradle, and check to see if the sliding selector shaft can be shifted from this position. If it can't, this indicates that the spring tension on the OQ-27 is correct.

42. Now remove cover from quick-change gear box, and remove set screw from left-hand OQ-214 gear. Look down through the set screw hole to see if it is lined up with the drilled spot on OQ-38 shaft, in which the set screw should seat. If the set screw hole in the gear is not lined up with the drilled spot on the shaft, then it will be necessary to drill down through set screw hole with a 13/64" diameter drill, making just a slight depression in the shaft. Then turn set screw in the OQ-214 gear and tighten until it seats in spot on shaft.

43. Now remove set screw from OQ-214 gear on righthand side. If this set screw hole is not lined up with drilled spot on OQ-38 shaft, it will be necessary to drill a small spot on the shaft for this set screw, too. After this spot has been drilled, replace set screw and tighten down into drilled spot.

44. If OQ-27 spring has been tensioned too tight, it will be impossible to move

the OQ-30 lever down to the locked position. Then it will be necessary to release the spring tension just a slight bit and go through the tensioning procedure again.

45. Now replace the two oil lines OQ-118 and OQ-118A. No OQ-118 is the longest, this goes between the front L oiler on the inner gear guard down to top of boss on the quadrant for shaft OQ-107. Oil tube OQ-118, the shorter one, goes between the L-shaped oiler on inner gear guard and top of boss on quadrant where OQ-106 shaft passes through. These oilers fit into the holes drilled into quadrant.

46. Now replace two-groove pulley, spindle engage wheel, and other parts which were removed from the spindle before disassembling the quadrant. Refer to page 107 under instructions for reassembling lathe spindle for correct procedure.

47. The gear guard OQ-198 is easily replaced on the lathe - it's just held in place with six flat-head screws.

SERVICING

1. The OQ-30 cradle lock handle won't go all the way down and won't stay locked. This would be the result of a machining error -- the length of the OQ-30 is apparently too long. Should you run into this, the only remedy is to replace the OQ-30 cradle lock handle. If the OQ-31 plunger doesn't go all the way through the OQ-50 cradle lock collar, so that the end of the plunger engages in the gear teeth in the OQ-25 gear, the cradle will jump out of gear in the quick-change gear box.

QUICK-CHANGE GEAR BOX ASSEMBLY

AND LEAD SCREW

TO DISASSEMBLE

1. Before disassembling the quick-change gear box, it will be necessary to remove the gear guard, quadrant assembly, and all of the gears and controls which are attached to quick-change gear box shafts that project through the inner gear guard on the left side. For instruction on removing these parts, refer to page 84 under "Disassembling the Gear Guard and Quadrant Assembly."
2. It will be better to leave the quick-change gear box attached to the lathe bed as you work on it, because it is seldom that you will have a vise available out in the field to hold the gear box while it's being serviced.
3. First remove the four round-head screws that hold cover OQ-58 on the quick-change gear box. Along with the cover you can remove the OQ-247 thread and feed chart.
4. Now drain oil out of gear box by removing oil plug located on righthand side of gear box near the bottom. An ordinary coffee can makes a handy container to drain the oil into, as this will easily fit up under the edge of the gear box.
5. Remove OQ-248 sliding selector shaft by loosening hex jam nut which is located on righthand side of OQ-200 selector fork. Then pull sliding selector handle OQ-212 out of lefthand end of quick-change gear box.
6. To remove OQ-5 shaft, loosen set screw which is located on righthand end of quick-change gear box right at opening for the feed chart. There are two small drilled holes in this edge; the second one is the one with the set screw in it. When you've loosened the set screw, slide OQ-5 rod out of lefthand end of gear box - the hex nut will come along with it.
7. On the righthand top of gear box there are two holes - the one nearest the operator has a small headless set screw in it. Loosen this set screw, and slide out OQ-6 selector shaft, which is removed through lefthand side of gear

box. This allows OQ-200 selector fork and gear OQ-207 to be lifted out front of the quick-change gear box.

8. Now remove OQ-38 shaft by turning it over until the set screws in hubs of the two OQ-214 gears, located at the righthand end and lefthand end of the shaft, are at the top. Loosen these two set screws, and drive the shaft out through righthand side of gear box. This will free both OQ-214 gears so they can be lifted up out of the gear case and also the spacer OQ-63, which is between housing on lefthand side and lefthand OQ-214 gear.

9. On top of gear box at righthand end there are two drilled holes. In the hole nearest the bed ways, there is a headless set screw. Loosen set screw, then tap on lefthand end of OQ-4 pinion shaft with a soft hammer to drive out the OQ-15 bushing and DL-240 core plug, which are in righthand side of quick-change gear box. Then continue to drive OQ-4 shaft out through righthand side of quick-change gear box.

10. Now remove OQ-15 bushing by driving it through from lefthand side into inside of quick-change gear box.

11. Now take Woodruff key out of lefthand end of OQ-3 drive shaft, and slide shaft out through opening in righthand end of quick-change gear box. Next, remove Woodruff key in OQ-6 selector shaft, and tap shaft to right slightly, driving out core plug located in the righthand side of the quick-change gear box over right end of shaft. Then proceed to drive shaft out through right-hand end of quick-change gear box, using a brass drift or long punch.

12. This allows part No. OQ-60 slide to be removed along with OQ-8 sliding dog gear, Q-466 32-tooth dog clutch gear, and OQ-9 24-tooth dog gear. Watch for bronze spacer washers between these gears, and remember where they go.

13. Now remove OQ-11 bushing, which holds OQ-65 cradle on righthand side. Drive bushing through into inside of gear box from outside with a brass drift.

14. Next, drive out OQ-7 bushing, which supports OQ-65 cradle on lefthand side, by driving bushing through into inside of quick-change gear box.

15. Now the OQ-65 cradle complete with shaft and gears can be removed through opening in the front of quick-change gear box.

16. Next, remove the stack of gears from OQ-65 cradle, and remove snap ring C-300K from lefthand end of OQ-61 shaft. Use true-arc pliers with offset points.

17. Remove OQ-234 snap ring from righthand end of OQ-65 cradle. This snap ring seats into a groove cut into bore in cradle for the bearing.

18. Then drive shaft OQ-61 out of bearings to the right far enough to remove hex jam nut from right end of OQ-61 shaft.

19. Then drive OQ-61 shaft out of bearing on righthand end of OQ-65 cradle. This will also drive lefthand bearing out of its seat in lefthand side of cradle.

20. Next drive righthand ball bearing (part No. 50-18) out of OQ-65 cradle by placing a punch or brass drift against inner race and driving bearing out right side of OQ-65 cradle.

21. Remove bearing from lefthand end of OQ-61 shaft by placing a brass drift or punch against inner race, driving it off the end of shaft. Now take shaft and all gears out of OQ-65 cradle.

22. Slide gears off shaft one at a time. Be sure to stack them in the order in which they're on the shaft so that they can be replaced on shaft in the same manner. They are held in place on shaft by a long key Q-441.

23. To remove OQ-217 shift lever located on top of quick-change gear box, drive out groove pin which goes through side of OQ-217 pinning it to OQ-54 shaft.

24. Then lift the OQ-217 from shaft, and slide OQ-54 shaft with OQ-55 shaft arm out through the inside of quick-change gear box. The SR-39 spacer will also come out along with OQ-54 shaft.

TO REASSEMBLE

1. Carefully inspect all parts - remove any nicks, chips, burrs, or dirt. File all set screw marks off the shafts. Cover machined surfaces with a light film of oil.

2. Place the SR-39 spacer on OQ-54 shaft. Slide shaft assembly up through hole in center of quick-change gear box.

3. Insert C-332-B spring and DL-666 ball into OQ-217 lever bracket. Then slide lever bracket down over end of OQ-54 shaft, and line up groove pin holes through OQ-217 with groove pin hole in OQ-54 shaft. Pin in place with 1/8" groove pin.

4. Assemble OQ-65 cradle with OQ-61 shaft, gears OQ-414, OQ-415, OQ-416, OQ-417, DL-585, Q-420, and Q-419. These gears are held in place on the shaft with Q-441 cone gear shaft key. See Fig. 20.

5. Slide cone gears and shaft OQ-61 into OQ-65 cradle. Then seat bearing 50-18 over righthand end of OQ-61 shaft and into righthand bearing seat in OQ-65 cradle.

6. Next seat 50-18 bearing over lefthand end of OQ-61 shaft, also seating bearing into lefthand bearing seat in OQ-65 cradle.

7. Replace C-300-K snap ring on lefthand end of OQ-61 shaft.

8. Tighten hex nut on threaded end of OQ-61 shaft.

9. Seat OQ-234 snap ring into bearing bore on righthand end of OQ-65 cradle assembly.

10. Now turn gears and shaft over by hand a few times to make sure it turns free.

11. Place OQ-65 cradle assembly in gear box, fitting the OQ-52 spacer between cradle and righthand wall of gear box, in line with hole through which OQ-2 shaft passes. See Figure 22.

12. Drive bushing OQ-11 into righthand side of gear box and through hole in righthand side of OQ-65 cradle. This will leave some of the OQ-11 bushing projecting out on righthand side of gear box - this will be driven in later.

13. Now drive OQ-7 bushing through lefthand side of quick-change gear box so that it passes into the hole in OQ-65 cradle. Drive bushing in until it is flush with lefthand side of gear box.

14. Check cradle to make sure that it moves freely on the bushings.

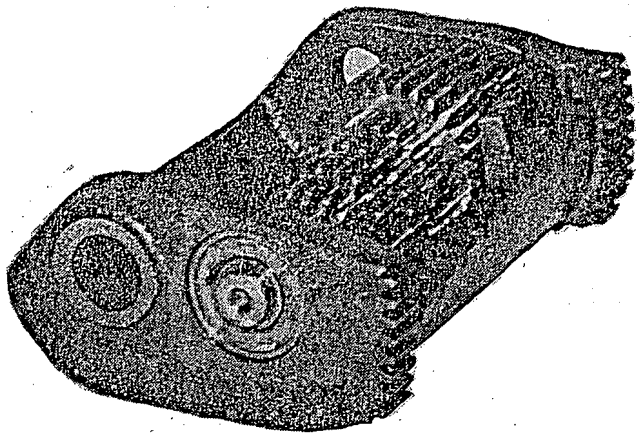


Figure 22 No. OQ-65 Cradle Assembly

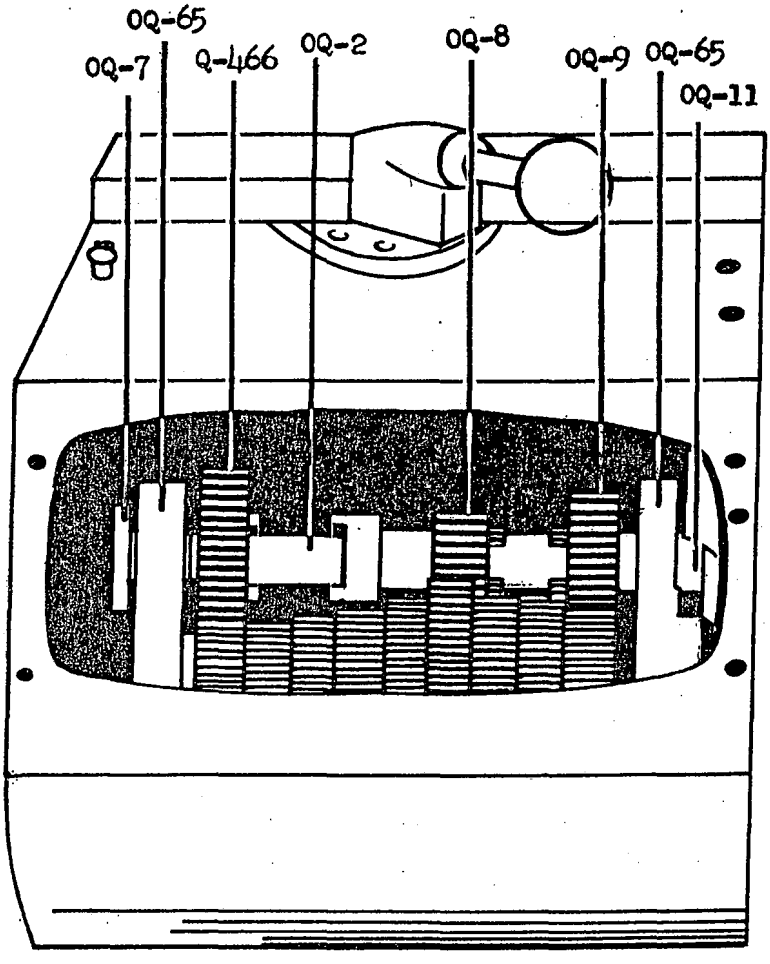


Figure 23 Illustration of the 6300 Series Lathe Gear Box showing parts on the OQ-2 Dog Gear Shaft.

15. Now slide shaft OQ-2 in through righthand end of gear box, placing OQ-12 washer and OQ-9 dog gear on shaft.

16. Then place OQ-8 16-tooth sliding dog gear on shaft. Next place OQ-60 slide in place on OQ-8 sliding dog gear. As you slide OQ-60 shifter into place, be sure to position shifter roller OQ-57 in slot or track on top of OQ-60 shifter.

17. Place the two OQ-12 washers on shaft (part No. OQ-2).

18. Next, slide on 32-tooth dog clutch gear OQ-466.

19. Now push OQ-2 shaft through into lefthand end of gear box, shouldering it up against Q-466 dog gear.

20. Now drive bushing OQ-11 the rest of the way into gear box until it pushes righthand dog gear OQ-9 in line with Q-418 gear, which is on righthand end of OQ-61 shaft in the cradle assembly. **See Figure 23.**

21. Next drive OQ-3 lead screw shaft through righthand end of gear box, passing it through OQ-60 slide. Continue driving it to lefthand side of gear box. Slide the OQ-16 bushing into lefthand side of gear box by inserting the bushing from the inside of the gear box until its shoulder is up against inner wall of lefthand side of gear box.

22. Now place washer OQ-17 on lefthand end of pinion shaft OQ-4. Slide shaft OQ-4 through righthand end of gear box and into bushing OQ-16, which is on the lefthand side of gear box.

23. Now mount OQ-15 bushing on pinion shaft OQ-4. Drive bushing into quick-change gear box until all end play of OQ-4 shaft has been removed. Check shaft by turning it over by hand to make sure it still turns freely.

24. Then lock bushing OQ-15 in place with set screw which comes down through righthand top side of gear box. Do not tighten set screw too tight - it will distort the bushing.

25. Insert sliding selector shaft (part No. OQ-5) part way into righthand side of gear box.

26. Then place OQ-207 gear in fork of OQ-200 selector fork. Then slide fork and gear on shaft OQ-5. Continue pushing shaft OQ-5 through to lefthand side of gear box, and lock in place with set screw on upper righthand side of gear box.

27. Now slide shaft OQ-38 into gear box from righthand side until it is part way in gear box.

28. Slide two OQ-214 gears on shaft OQ-38 with the hubs toward the center.

29. Now place OQ-63 spacer on end of shaft next to lefthand OQ-214 gear, and push OQ-38 shaft through to left side of gear box.

30. Position the two OQ-214 gears so one is on righthand end of shaft and other is on lefthand end of shaft. Do not tighten the set screws - this adjustment will be made later.

31. Now slide shaft OQ-5 in gear box on righthand side.

32. As you slide shaft into gear box, place the 5/8" hex jam nut over shaft, and continue moving shaft through to the lefthand side of gear box until right-hand side is flush with righthand end of gear box. Then tighten the set screw holding shaft in position.

33. Next slide OQ-212 selector handle in gear box through lefthand end so that it fits over OQ-5 shaft. Continue to move OQ-212 shaft on through OQ-200 selector fork, and tighten hex nut on threaded end of OQ-212 to hold it in place.

34. Move the selector handle back and forth a few times to see that it slides back and forth freely.

35. Do not put cover and feed chart back on quick-change gear box, as it will be necessary to adjust the tension of the OQ-27 spring in the cradle lock assembly after it has been put back on the lathe.

36. Now replace the cradle lock assembly, OQ-109 gear, OQ-14 gear, OQ-100 quadrant assembly, and the Q-528 sliding gear assemblies. For replacing and adjusting of these assemblies, refer to page 87 under the heading "Reassembly of the Quadrant and Gear Train Assembly."

37. Now mount lead screw on lathe by sliding it through half nuts and worm gear on back of carriage apron, sliding lead screw up until it is right next to end of OQ-3 shaft, which comes out of righthand side of gear box.

38. Slide OQ-220 bearing cover, DL-698 felt washer, and M6-72 dust cover over end of lead screw next to OQ-3 shaft.

39. Turn lead screw so that groove pin hole is lined up with hole through end of the OQ-3 shaft.

40. Then engage half nuts on lead screw, and with carriage hand wheel slide the lead screw up over the end of the OQ-3 shaft. If hole through lead screw and hole in OQ-3 shaft do not line up, turn lead screw half way around and slide back on OQ-3 shaft again.

41. Then insert the 1/8" groove pin to pin the shaft and lead screw together.

42. After the lead screw has been installed on the lathe, adjust bearing preload on OQ-4 shaft.

43. This can be done by tightening hex jam nut on lefthand end of OQ-4 shaft where it projects through inner gear guard on lefthand side. Tighten hex nut until all end play is removed from lead screw.

44. Check for end play by engaging half nuts with lead screw and place the fingers of left hand on lead screw right where it goes against the right-hand side of quick-change gear box. Then attempt to move the lead screw back and forth by rocking the carriage hand wheel. If there is any end play in lead screw, you can feel movement with fingers of your left hand right next to the quick-change gear box. If you detect any end play in lead screw, tighten hex jam nut on end of the OQ-4 shaft until end play is removed.

45. Turn lead screw over by hand to make sure it turns freely and is not under too much preload.

46. After the correct adjustment has been made, lock adjustment by tightening the second hex jam nut.

47. Now slide the DL-355 lead screw bearing on to the righthand end of the lead screw, and bolt the bracket in place on the lathe bed.

SERVICING

1. Sliding selector gear jumps out of mesh when the half nuts are engaged and carriage is feeding toward the headstock. To service this type complaint, check the tension on the OQ-27 spring in the cradle lock lever assembly. For correct adjustment of this spring, refer to the instructions for disassembly of gear train and quadrant on pages 84 - 87 and to the instructions for re-assembly and adjustment of the quadrant and gear train assembly on pages 87 - 92. Next, check the operation of the over-riding clutch (part No. OQ-24). Also check the OQ-200 selector fork inside of the quick-change gear box on the end of the sliding selector handle. It may be that the key on this part, that fits into the notches cut in the front of the OQ-65 cradle, is burred so that it isn't seating down deep enough into the notches in the cradle to properly mesh the gears. Refer to the instructions for disassembling and adjustment of the gear box assembly on pages 93 - 94 for instructions on how to get to this part.
2. Gear box jumps out of gear when the carriage is under power feed. To service this type complaint, check the operation of the carriage apron to make sure that some part of this assembly is not binding or putting an extra load on the lead screw. For instructions on disassembly and inspection of this unit, refer to heading "The Carriage Apron" on page 12 . After inspecting carriage apron, check the spring tension, the over riding clutch, and the OQ-200 selector fork, as explained in No. 1 above.

TO DISASSEMBLE (Do not remove headstock from the bed.)

1. Remove spindle engage wheel (part No. OQ-105) by taking out C-347 snap ring from end of spindle. Snap ring is removed by lifting up the point on the end with a screwdriver and unwinding the ring from the slot.
2. Next remove the set screw in hub of spindle engage wheel OQ-105. When sliding spindle engage wheel off end of spindle, be sure to catch spring and ball which are under the set screw.
3. Next unscrew the round black ball (part No. C-325) from end of sliding selector handle of quick-change gear box.
4. Now remove gear guard OQ-198 by taking out the six flat-head screws which are on the righthand or inside face of the OQ-197 inner gear guard.
5. Now remove the C-300-C snap ring which holds C-344 two-step pulley in place on the end of spindle. Snap ring is removed with a pair of true-arc pliers, or in an emergency, a pair of long slim-nose pliers can be used.
6. Then slide two-groove pulley (part No. C-344) from end of the spindle. Along with pulley will come a steel spacing washer, part No. OQ-104, and pulley hub and gear C-346.
7. Now remove bronze thrust washer (part No. C-371).
8. Now remove the six flat-head socket-type screws.
9. Lift the C-327 cover plate from top of headstock.
10. Now loosen set screws in OQ-103 collar on left end of spindle outside of headstock, and slide collar off spindle.
11. Loosen set screws in each of the three collars (part No. C-353) and the two set screws in gear No. C-304, which are on the reverse lever shaft (part No. C-309) inside headstock. This shaft goes across headstock at right angles to spindle.
12. Pull C-309 shaft out through headstock, watching for spring and ball which are inside of C-311 reverse lever hub. As you slide the C-309 out of the

headstock, catch the three collars C-353 and gear C-304 as they drop off shaft.

13. Lift C-305 sliding yoke, it's the half collar with the gear rack on top, from top of spindle.

14. Loosen set screws in the two collars No. C-349. These collars are located on either side of the C-308 sliding reverse gear on lathe spindle.

15. Remove C-359 spring and ball unit, which tensions the back gear lever. This spring and ball unit is located on top of back side of lathe headstock directly over the C-317 back gear control gear.

16. Slide C-317 back gear shift lever and pinion out back of headstock.

17. Turn lathe spindle over by hand until lug on C-330 washer, which is bent over into notch on the C-329 take-up nut, is at top. The C-330 washer and C-329 take-up nut are on lefthand end of spindle outside of headstock.

18. Straighten bent lug with a punch.

19. Now turn take-up nut (part No. C-329) off end of spindle. If necessary, you can lock spindle while removing C-329 take-up nut by placing a piece of wood or a flat bar in the notch on lathe face plate, then resting the piece of wood or bar on edge of lathe bed.

20. Slide C-330 washer from spindle.

21. With a long drift or punch placed against rear bearing No. C-336S on inner race, drive bearing C-350 oil seal ring, and C-341A oil seal out lefthand side of headstock. While driving this bearing out, turn spindle over a fraction of a turn from time to time, and tap in a different spot on bearing -- it will come off spindle easier that way.

22. Slide bearing, oil seal, and oil seal ring from end of spindle.

23. Next, drive collar C-349, which is on left of C-308 sliding reverse gear, off lefthand end of spindle.

24. With a fine file remove all burrs and set screw marks on the surface of spindle.

25. Next, slide gear C-308 off left end of spindle.

26. Now, drive spindle (part No. C-399) forward or toward righthand side of headstock with a heavy soft hammer or a hammer and block of hard wood, until the front of the large spindle back gear is against the inside of the front bearing housing on the headstock. Continue to drive spindle out of headstock until large spindle back gear C-326 is loose on spindle. Then slide spindle complete with front bearing, garlock oil seal, and chuck nut out through front of headstock, removing C-349 collar and C-326 large spindle back gear as they slide off end of spindle. In most cases when the spindle is driven from the headstock, the garlock oil seal (C-341A), front bearing C-335S, and chuck nut will come out along with spindle.

27. If these parts don't come out, they must be driven out of headstock, using a brass drift, and driving from inside of headstock towards the right.

28. To remove the front spindle bearing and oil seal, just drive the oil seal and bearing off over left end of spindle. If the bearing and oil seal don't come out of headstock with the spindle, you can remove the chuck nut by lifting the C-347A snap ring out of the groove of the spindle and then slide chuck nut C-342 from spindle. Should it be necessary to replace the spindle, the front spindle bearing, the chuck nut, or the oil seal, it would be best to order a complete spindle assembly from the factory, which would have the chuck nut, snap ring, oil seal and front bearing cone already installed.

29. To remove C-348 spindle nose key, just remove socket-type set screw that holds key in spindle nose.

30. Then loosen hex nut on the righthand end of the back gear shaft C-310S. With No. 2 true-arc pliers remove C-300A snap ring, which is located on righthand side of worm C-302.

31. Slide worm gear C-302 to right, and remove snap ring C-300A, which is to left of worm gear.

32. Next, drive C-307 gear from righthand end of C-310S shaft. Also remove C-355 washer.

33. Now slide C-310S shaft out lefthand end of headstock. It will be necessary to use the true-arc pliers to work snap rings off end of shaft while pulling shaft from headstock. Be sure to catch the spacers C-355, which are on either side of worm gear.

34. Loosen the two C-300A snap rings on shaft C-314. These snap rings are located on either side of gear C-313.

35. Now loosen socket-type set screw that holds C-314 shaft in headstock.

36. Drive shaft C-314 to left until set screw mark on shaft appears out of the support inside headstock. Then carefully file off set screw mark caused by set screw.

37. Next, remove C-300A snap ring and washer, or washers, C-355. Note: It's possible that there may be more than one washer No. C-355 on this side of gear.

38. Now remove gear C-313 and also C-355 washer or washers and C-300A snap ring, which were on lefthand side of gear. Then pull shaft out through the left side of headstock.

39. Next, remove C-300A snap ring from righthand end of C-315 shaft, using No. 2 true-arc pliers. This snap ring is located on righthand side of support for C-315 shaft. Also slide off C-355 washer which is next to snap ring.

40. Loosen set screw in double gear (part No. C-318).

41. Next, drive shaft out through left end of headstock just far enough so that Woodruff key is out of gear C-318 on the righthand side.

42. Now remove Woodruff key.

43. Next slide C-315 shaft out through lefthand end of headstock, removing gear as it drops off shaft.

44. Should it be necessary to replace the C-319A and C-320 bushings for C-315 shaft, just drive the C-319A bearing out of left side of headstock, using a

brass drift or punch. To remove the C-320 righthand bearing from support inside the headstock casting, loosen jam nut and set screw over bearing in center support, and then drive bearing out with brass drift or punch.

TO REASSEMBLE

1. Before reassembling the headstock, check all parts to make sure that nicks, burrs, chips, and dirt have been removed and the set screw marks have been filed from the shafts. Then cover all the machined surfaces with a light film of oil.
2. Drive the C-319A bearing into lefthand end of headstock so that it is in 1/4" from machined surface of headstock casting on left end.
3. Drive the C-320 bronze bearing into support inside headstock so that its lefthand edge is exactly 4-7/16" from outside machined surface of headstock on left end. See Fig. 24. Lock the C-320 bearing in place with set screw and lock nut. Do not tighten set screw too tight, as it will distort bearing. The hole through these two bearings should be reamed with a .7505 reamer after they have been installed in headstock.

   NOTE: Shafts, gears, and bearings referred to in steps 4 through 26 are shown in Fig. 25.
4. Now slide C-315 shaft into hole directly below spindle on lefthand end of headstock casting.
5. As you slide this shaft in, put double gear C-318 over end of shaft, sliding shaft through gear until Woodruff key slot appears between lefthand side of C-318 gear and inside wall of headstock.
6. Then insert Woodruff key and drive this shaft through gear.
7. Slide one C-355 washer over shaft so that it will rest against righthand side of C-318 gear.
8. Continue to push shaft through bearing support in center of headstock until snap ring groove in shaft appears on righthand side of bearing support. Then place a C-355 washer over this end of shaft and seat C-300A snap ring in snap ring groove.

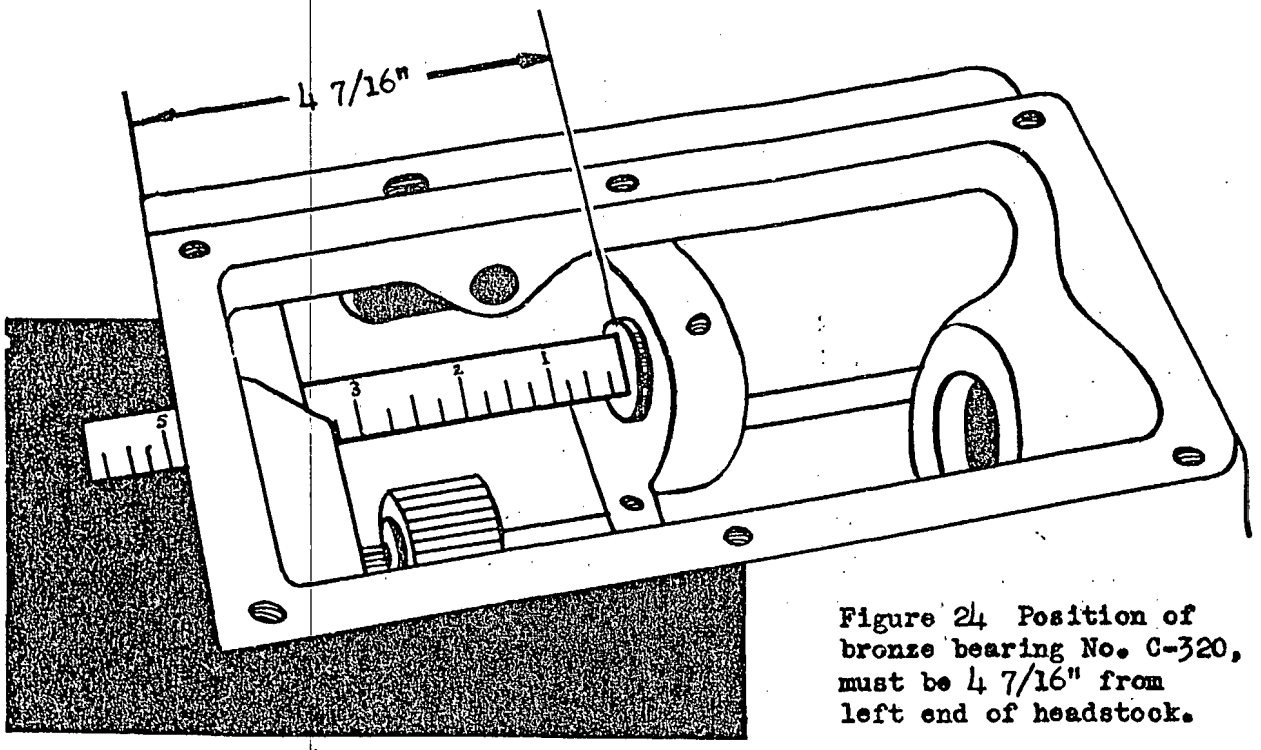


Figure 24 Position of bronze bearing No. C-320, must be 4 7/16" from left end of headstock.

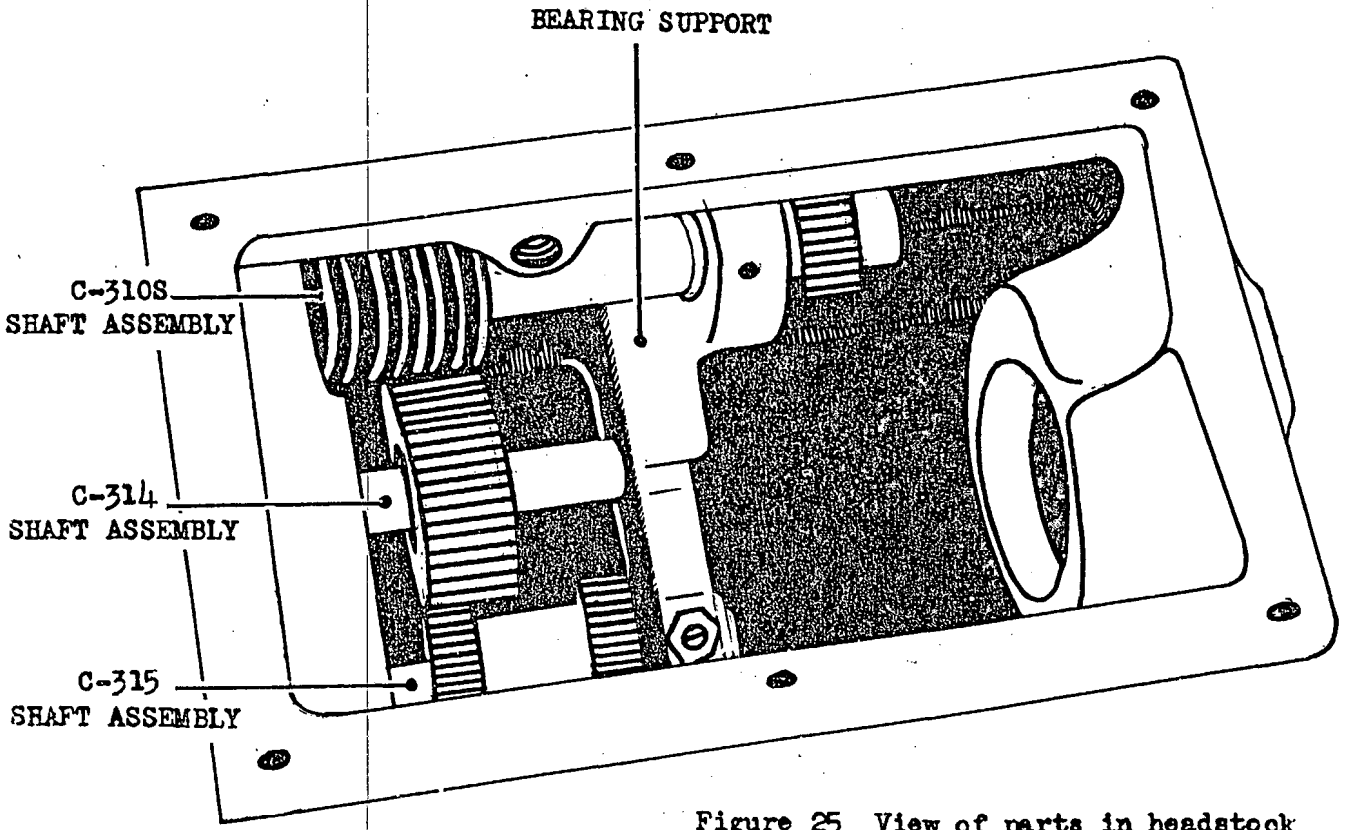


Figure 25 View of parts in headstock less the spindle assembly.

9. Then pull shaft back toward lefthand end of headstock, and at the same time put C-318 gear to right up against left side of bearing support in center of headstock. Tighten set screw in C-318 gear.

10. Check for end play in this assembly, also turn shaft over by hand to make sure that it turns free.

11. If there is end play in the C-315 shaft, loosen set screw in C-318 gear, and move gear closer to bearing support in the center of headstock. Then re-tighten set screw, again checking for end play and rotating shaft.

12. Next, slide C-314 shaft in from lefthand side of headstock through opening at rear and slightly below spindle.

13. As you slide shaft into headstock, slip on first a C-300A snap ring, then a C-355 washer, followed by C-313 gear, and then another C-355 washer, and the last C-300A snap ring.

14. Slide shaft through until righthand end goes into bearing support in center of headstock.

15. Now slip the two C-300A snap rings into grooves on either side of gear (part No. C-313).

16. Now slide shaft over so that lefthand edge of gear C-313 is in line with left-hand edge of C-318 gear on C-315 shaft.

17. Then tighten set screw which clamps C-314 shaft in bearing support in center of headstock casting.

18. Next, slide shaft C-310S through opening in lefthand end of headstock casting directly in back of spindle.

19. As you slide shaft in, place one of the C-300A snap rings and a C-355 spacer, followed by C-302 worm on shaft.

20. As soon as shaft passes through the worm, put on another C-355 spacer and a C-300A snap ring, using true-arc pliers to work snap rings along shaft as you continue to slide it in until righthand end of shaft is in bronze bearing in bearing support, which is in the center of headstock casting.

21. Then, using true-arc pliers, seat lefthand C-300A snap ring in snap ring groove on lefthand side of C-302 worm. The sharp edge on inside diameter of snap ring should be away from side of worm.

22. Then move worm and C-355 washer up against snap ring, and seat righthand C-300A snap ring on righthand side of worm, with sharp side of snap ring away from worm.

23. Continue to slide C-310-S shaft through bearing support in center of headstock casting.

24. Now slide C-340 spacer on righthand end of the shaft that projects through bearing support, moving the spacer up against shoulder on righthand end of shaft.

25. Insert Woodruff key in key slot, and slide on the C-307 gear, followed by a C-340 spacer. Note: When sliding gear on shaft, notice there is a profile side to the gear. See Figure 26, page 117. By profile side we mean the side that has the edges and tips of the teeth slightly rounded. This should be toward lefthand side of the headstock, as this is the edge of the gear that first engages with the large back gear. If the edges were sharp, it would make the gears difficult to mesh.

26. Now hold gear and spacers in place on shaft by turning on the hex nut - until it seats gear and spacer up against shoulder on shaft.

27. Slide C-342 chuck nut on C-399 headstock spindle with open or threaded side of chuck nut towards spindle nose.

28. Seat the C-347A snap ring in groove on spindle directly behind chuck nut.

29. Now slip C-341 garlock oil seal on spindle from left end with closed side of seal toward chuck nut.

30. Next, check face of inner race on the C-335S front Timken bearing to locate the little copper-colored spot, or little round discoloration, which is the mark placed on the bearing when it is selected in the Timken plant. Now line this spot up with the long keyway in the spindle, making sure that the large end of the bearing is toward the spindle nose. Then slide bearing

on spindle.

31. It will be necessary to drive the bearing approximately the last inch before it seats against shoulder on spindle, placing punch or brass drift on edge of the inner race only. Do not strike the bearing hard. Just tap it lightly, moving the punch around face of inner race, tapping at different points to evenly seat bearing on spindle. **Now slide spacing collar on spindle --** this collar goes between bearing and C-326 large spindle back gear -- correctly spacing back gear away from bearing.

32. Now start spindle in through the front bearing opening in headstock, and slide on the bull gear (part No. C-326) as the spindle comes through front bearing. The large bull gear C-326 should be placed on the spindle with the profile side of the gear teeth toward front or spindle nose end of headstock. See Figure ~~26~~ 27 **for illustration of profile side of gear.**

33. Next slide the C-349 collar, C-308 gear, and another C-349 collar over the spindle.

34. Continue to slide spindle into headstock, sliding each of the gears and collars along as you continue to move the spindle.

35. Line up keyway in C-308 sliding reverse gear with the long keyway in spindle, then slide C-308 gear toward right end of spindle.

36. Next, line up keyway in C-326 large bull gear with Woodruff key slot in spindle.

37. Next, slide rear bearing cone over lefthand end of the spindle, making sure the copper-colored spot on the face of inside race is in line with long keyway which goes the full length of spindle and that the smallest end of the bearing is toward the inside of the headstock. Tap the bearing in place on spindle by lightly tapping on edge of inside race, moving the punch around, tapping at several different points to evenly seat the bearing. Note: Before seating the rear bearing on the spindle, hold the spindle in place by sliding the carriage up to the headstock, then moving the tailstock as close

to the head as it will go. Place the end of the ram against the spindle nose, and place a small block of wood between them to prevent damage to the spindle — this will hold the spindle in place while seating the rear bearing.

38. Insert Woodruff key in spindle just to right of C-326 large bull gear.

39. Then with the lefthand side of the large back gear (part No. C-326) resting against the bearing support inside headstock casting, drive bull gear over Woodruff key by hammering on spindle nose with a soft hammer. CAUTION: Do not ever strike the spindle nose with anything but a hammer and block of wood or a soft hammer.

40. Next, slide garlock oil seal C-341A over lefthand end of spindle with closed side out away from headstock. Tap in place in bearing recess on lefthand end of headstock.

41. Next, slide on the C-350 oil seal ring, which you'll notice has a little pin in one face. This pin should go to the outside or toward left end of the spindle.

42. Then slide C-330 lock washer on to spindle, followed by C-329 take-up nut. Turn take-up nut just enough to catch first few threads to hold it in place on the spindle.

43. Now finish driving the C-326 large bull gear onto the spindle until it is up against the spacer which goes between the front bearing and bull gear.

44. Now seat garlock oil seal C-341A, which is located on spindle just to left of the chuck nut, into bearing recess in front of headstock, by hammering on spindle nose, driving the spindle further into headstock.

45. Place a punch in one of the notches in outside diameter of C-329 take-up nut on lefthand end of spindle. Tighten nut by tapping in a clockwise direction. As nut is drawn up, it may be necessary to occasionally insert punch between the lugs of the C-330 lock washer and tap bearing to seat rear bearing further on the spindle. Note: To keep the spindle from turning while you are tightening the C-329 take-up nut, it may be necessary to put the face plate on spindle nose and then place a flat piece of steel in the face plate

slot. Rest this piece of steel against the edge of bed way or some solid portion of lathe to lock spindle in place.

46. Continue to tighten C-329 spindle take-up nut until a positive drag is felt on spindle when turned over by hand. Then strike spindle a sharp blow on spindle nose end and also on the lefthand end with a soft hammer or hammer and block of wood. Then check rotation of the spindle to see if drag feeling in the rotation of the spindle has changed. If it feels like there's not as much drag on the spindle as there was at first, it will be necessary to tighten the adjustment more.

47. Tighten spindle take-up nut another fraction of a turn and again strike spindle on both ends with a rawhide hammer or hammer and block of wood. Then again check amount of drag on spindle. Continue until you feel a constant drag when turning spindle by hand and no change in the drag after driving on both ends of the spindle. Note: It's difficult to explain just what the right amount of drag is because the garlock oil seals put considerable drag on the spindle, and we cannot tell just how much -- it varies considerably. The correct preload feeling can only be recognized after considerable experience. It's possible to double-check on the preload adjustment after the spindle has been assembled enough so that the lathe can be run. If the preload is too tight, the lathe will get very hot after it's been run approximately ten minutes.

48. Next, slide C-308 sliding reverse gear over until it meshes with C-313 36-tooth reverse gear, which is below and slightly behind lathe spindle. Do not slide C-308 gear too far, as it is liable to strike on lefthand set of gear teeth on C-318 double reverse gear. If this happens, it will lock spindle and damage gears when lathe is under power.

49. When proper lefthand position for the C-308 has been determined, slide C-349 collar up against lefthand side of C-308 gear and tighten two socket-type set screws in collar.

50. Next, place C-305 sliding yoke over C-308 gear so that gear teeth on C-308 are in the cutout or relieved portion inside the C-305 sliding yoke.

51. Then slide reverse lever shaft C-309 in through opening in front of headstock.

52. As shaft starts through headstock, place two collars C-353 and then the C-304 gear on shaft. Then position C-304 gear so that it meshes with gear teeth cut into top of C-305 yoke. Then slide on last C-353 collar behind C-304 gear.

53. Next, place C-332 spring and DL-666 ball in hole drilled in face of C-311 hub.

54. Then slide C-309 shaft in opening in back of headstock, which will bring face of C-311 hub against face of C-354 bushing.

55. Next, position C-305 sliding yoke as near as possible to center between the two collars C-349 on spindle. This should bring C-281 handle and C-311 hub assembly so that the handle points approximately straight down.

56. Then lightly tighten the two socket-type set screws in C-304 gear and set screws in C-353 collars on either side of C-304 gear.

57. Then move control lever C-281 to left as far as it will go. You should feel the ball pop into the lefthand drilled hole on face of C-354 bushing, when C-305 sliding yoke has been shifted as far to left as it will go. See Fig. 27 for view of headstock assembled up to this point. If the C-281 lever will not move C-305 sliding yoke over as far as it should go, it will be necessary to reposition the C-304 gear in rack teeth on C-305 sliding yoke. Repeat this adjustment by shifting C-281 as far to right as it will go to make sure that C-305 sliding yoke will slide over to right against C-349 collar. When it is in this position, the ball in C-307 hub should drop into drilled hole in righthand side of C-354 bushing. When these adjustments have been completed, tighten set screws in No. C-304 gear and in all three of the C-353 collars.

58. Before sliding C-317 back gear engaging lever with gear in through back of headstock, shift the C-310S shaft assembly with C-302 worm as far to right

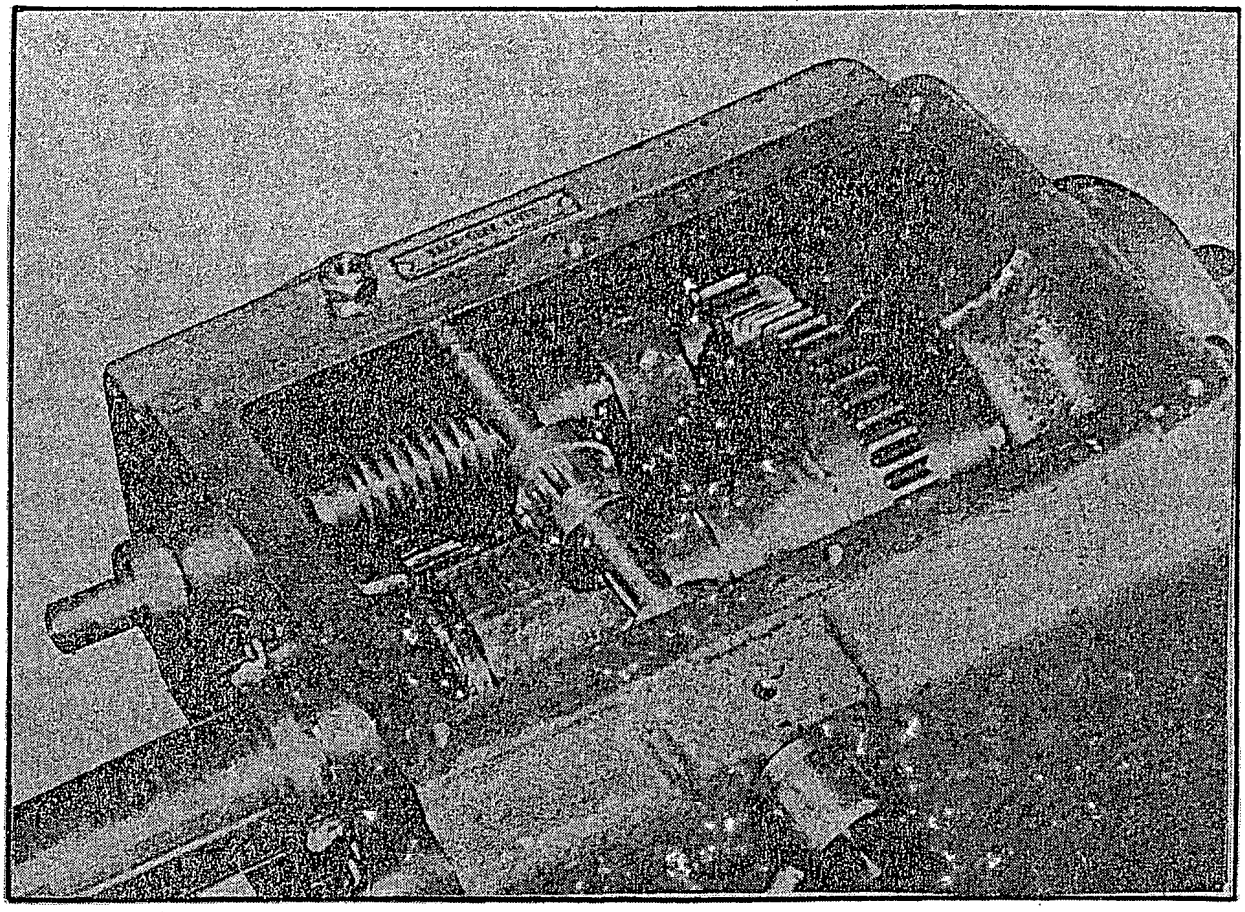


Figure 27 Illustration of headstock with cover removed showing spindle and gears.

as it will go. Then slide the C-317 shaft with gear in, making sure that one of the drilled spots on C-317 is in line with hole in top of the headstock for C-359S spring and ball assmebly. In this position the C-325 lever will point to the disengaged side of direction plate on top of the headstock.

59. Then screw in C-359S spring, ball, and screw assembly, tightening assembly until there is a good crisp index feeling as lever is shifted from the engage position to the disengage position. Then lock in place with C-361 lock nut.

60. Now slide OQ-103 collar over left end of spindle and against C-329 take-up collar.

61. Next, slide the C-371 bronze washer up against C-329 collar.

62. This collar is followed by C-346 sleeve and C-344 two-step pulley, which are pressed together as one unit. Slide the two-groove pulley and C-346 sleeve against the C-371 washer with gear tooth end of the sleeve going on first.

63. Next put on OQ-104 spacer.

64. Then slide snap ring C-300C over spindle, and seat it in snap ring groove, using true-arc pliers. The sharp edge of C-300C snap ring should be facing out away from pulley.

65. Insert DL-666 ball and C-332 spring in threaded hole in spindle engage wheel No. OQ-105. Then slide OQ-105 spindle engage wheel on spindle, lock the spring and ball in place with socket-type set screw.

66. Slide C-347 snap ring on lefthand end of spindle, and seat in snap ring groove to hold OQ-105 engage wheel on spindle.

67. Next, hook up the two spindle drive belts.

68. Fill headstock to proper level with new clean oil.

69. Run lathe for approximately ten minutes in next to lowest speed open belt, checking both front and rear bearing bosses for overheating conditions. While making this test, set the C-347 headstock cover in place over the headstock so the oil won't be thrown out. After running for approximately ten minutes at this speed, the bearing bosses on a new lathe should heat up

noticeably, yet not enough to be uncomfortable to touch.

70. After the correct preload has been determined, remove spindle engage wheel OQ-105 and two-groove pulley C-344 along with the C-346 sleeve.

71. Turn spindle over by hand to locate one of the tabs on the C-330 spindle take-up nut lock washer that will line up with one of the notches in the C-329 take-up nut. Bend this tab over into the notch in the C-329 take-up nut to lock preload adjustment.

72. Now replace pulley, snap ring, outer gear guard, spindle engage wheel, and snap ring.

73. Replace C-327 headstock cover. Hold it in place with the six flat-head socket-type screws. Note that one of the screws has a breather hole down through the center. This screw goes in the right rear corner of the C-327

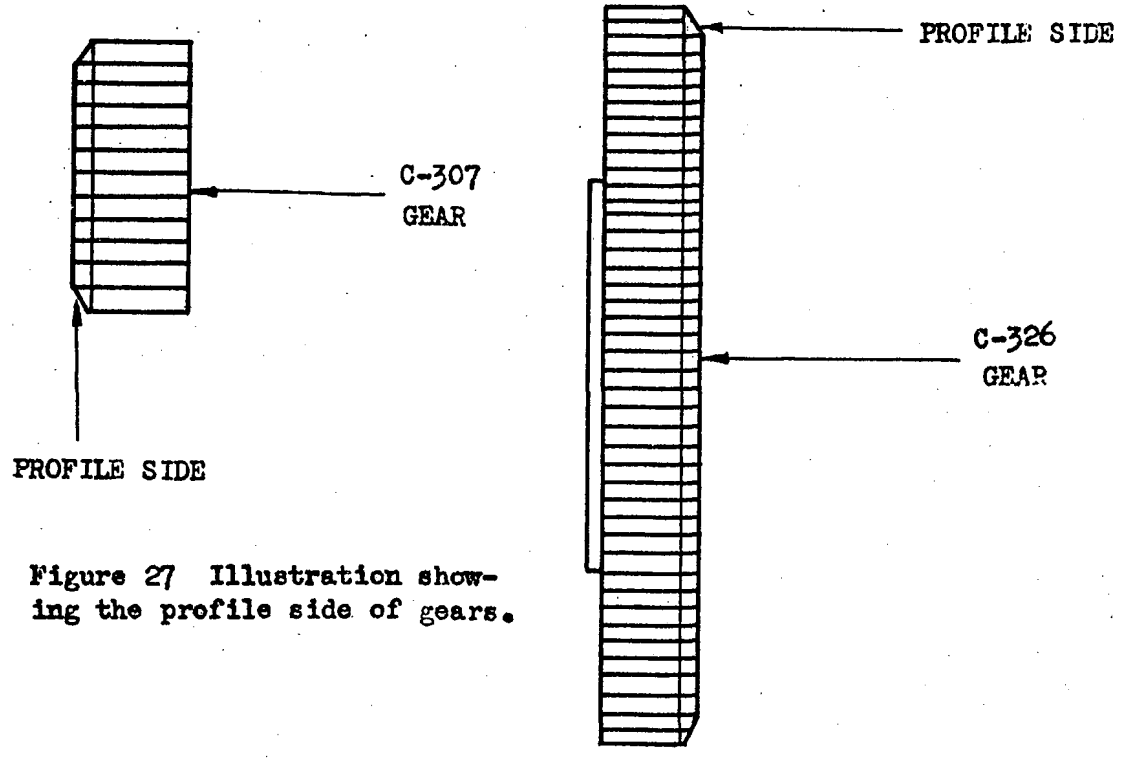


Figure 27 Illustration showing the profile side of gears.

SERVICING

1. HEADSTOCK OVERHEATING.

If headstock heats to a point where it is uncomfortable to touch, remove headstock cover (C-327) and check oil level. Then by touching the various bearing housings inside of the headstock, attempt to localize the source

of the heat. Be sure to check the C-305 sliding yoke that slides on top of the spindle, which is controlled by the lead screw direction lever. If this yoke is pressing down too tight on spindle, it will cause spindle to overheat. If the C-305 collar is hot, check the two C-353 collars located on either side of the C-304 gear. If they are pressing down too tight on the machined portion of C-305 right alongside the gear rack, the C-353 collars should be taken off and their outside diameters machined down enough so they will not bear on the C-305 yoke. If you can't localize the source of heat, it's then necessary to disassemble the headstock sufficiently to inspect the bearing surface to determine the cause of the heat.

If preload is adjusted too tight on lathe spindle bearings, they will overheat, and it will be necessary to back off the C-329 take-up nut a fraction of a turn. Refer to instructions on reassembly and adjusting the spindle on page 69 for instructions on adjusting the preload.

If lathe is running in back gear and seems to overheat, check the two drive belts to see if they are too tight. Also check lubrication of the Part No. C-344 two-groove pulley. Too much belt tension or lack of lubrication at this point can cause heat to be transmitted down through spindle, which may lead one to think that it was the headstock or spindle itself which is overheating.

2. OIL LEAKING FROM THE HEADSTOCK

If oil is leaking out the oil level screw located on front of headstock, or out of oil drain in back of headstock, check to make sure plugs are screwed in tight -- or apply Permatex over the threads on both of these plugs, and then tighten them down.

A small amount of oil seepage around the bearings is normal and a desirable feature. It indicates oil is getting into the bearings so they will be properly lubricated. Oil leaking excessively around either spindle bearing

or around the Q-525 gear on lefthand end of headstock would indicate the oil seal is bad and should be replaced.

3. SAND, CHIPS, OR GRIT IN THE HEADSTOCK CASTING.

First, drain all the oil out of headstock, then thoroughly flush headstock out with kerosene or flushing oil. This should be done several times until no more evidence of grit, or chips, is found in the flushing oil. Then refill with new, clean oil.

4. GRINDING NOISE IN THE HEADSTOCK.

Remove headstock cover to check all the gears, spacers, and collars inside of headstock, making sure they are not rubbing against each other or against sides of headstock casting, or against the bearing support cast inside headstock. The noise caused by rubbing gears or collars is sometimes thought to be bearing noise. After lathe has been run for approximately ten minutes, feel all the bearing housings to see if the bearings are overheating and causing the noise. When the noise is localized, the headstock should be disassembled to inspect the source of the noise.

5. SPINDLE RUNS OUT UNDER POWER, BUT CHECKS O.K. WHEN TURNED OVER BY HAND.

Check mounting of lathe, following the instructions in Bulletin 63-151-2 under "Mounting the 6300-series Lathe." If lathe is mounted on a full metal cabinet, open the motor compartment door, and, with a thin strip of metal, check to see if there is any space between top of channel iron which goes across the motor compartment from front to back and underside of chip pan. If there is space between top of the channel and under surface of chip pan, drive shims or wedges between channel and chip pan, then re-level lathe on cabinet. Also remove the top drawer on the righthand side to check channel and underside of chip pan at this point. If there is space between them, you should put shims between chip pan and channel at this point. Also check spindle bearing preload adjustment, as explained on page 69 under the

heading "Reassembly of the Headstock and Spindle."

6. ADAPTERS WON'T FIT THE LATHE SPINDLE NOSE.

First, inspect spindle nose to see that it's clean and free from nicks, chips, burrs, or dirt, which might cause a loose fit between the spindle nose and adapters. Also check bearing surface of adapter where it rests on spindle nose for nicks, chips, burrs, or dirt.

Carefully clean surface of the lathe spindle nose taper, and also carefully clean the bearing surface of the adapters. Then "blue" the surface of the taper on spindle nose, then fit adapter over the taper. Tighten in place with the chuck nut. Remove adapter and check bearing surface of adapter to see what sort of bearing surface it has on the spindle nose, as indicated by the blue which will come off taper onto the bearing surface of adapter. If the adapter shows that the bearing surface is not full all the way around the bearing rings, it indicates that chuck nut is drawing adapter onto the spindle crooked. The remedy for this is to replace the chuck nut. If the machine is new, the entire spindle assembly complete with chuck nut, garlock oil seal, and front bearings should be replaced. If the adapter shows that either the front or back of the spindle taper isn't seating in the adapter, then it is the taper on the spindle nose that is at fault. This should be double-checked by trying another adapter on the spindle nose to see if it indicates the same type of bearing, and to make sure that the adapter itself is not the cause of trouble. If the taper is not right on lathe spindle nose, the entire spindle assembly, which includes the chuck nut, garlock oil seal, front bearing cone, and spindle should be replaced.

7. THE SPINDLE NOSE KEY IS TOO HIGH

Remove the key and file the underside where it rests on the spindle until it is down to the correct height. When filing the underside of this key, be very

careful not to tip the file, and be sure to remove an even amount from the entire bottom surface of kay.

8. INSIDE FACE OF CHUCK NUT IS NOT TRUE WITH SPINDLE NOSE.

Refer to No. 6 above for method of testing this and the instructions for servicing.

9. BACK GEARS ARE NOISY.

First, remove cover from the headstock, checking all the gears for nicks, chips, burrs, dirt, or accumulated gummy grease in the gear teeth. Next, check back gear shaft bearings to see if they are worn, causing shafts to be loose. If the bearings are worn, they will have to be replaced. Refer to instructions on disassembly and assembly of the headstock for the correct procedure. Check the oil level; if it is low, it is possible that the gears are not getting sufficient lubrication.

Set lathe to run in back gear at a slow speed, observing operation of gears. If noise seems to be synchronized with either the 15-tooth pinion gear (part No. C-307) on the C-310-S back gear shaft or with C-386S 44-tooth back gear on lefthand end of this same shaft outside of the headstock, remove gear to check part of shaft on which gear is mounted to determine if this surface of the shaft is concentric with the outside diameter of the shaft. If the bearing surface is not concentric with the surface on which the gears are mounted, the shaft should be replaced.

10. ENGAGE WHEEL WON'T STAY IN PLACE.

This is caused by lack of tension on the spring and ball in the OQ-105 spindle engage wheel. This can be taken care of by tightening set screw which tensions this spring and ball in hub of the OQ-105 spindle engage wheel. It may be that the spring and ball have been lost out of the spindle engage wheel; if that's the case, they should be replaced.

11. SPINDLE TAPER INSIDE THE SPINDLE NOSE RUNS OUT.

To check this, refer to page 79 under the heading "How to Check the Lathe." Be sure to check the inside of the spindle taper for nicks, chips, burrs, or dirt, and if you find that the spindle is defective or if the taper socket has been damaged, the spindle should be replaced complete with chuck nut, garlock oil seal, and front bearing cone.

12. SPINDLE PULLEY C-344 WOBBLES.

Pulley can be straightened by holding chalk against side of "V" step to mark high point. Then tap high point with soft hammer or hammer and block of wood. Repeat these steps until pulley runs true.

STANDARD DRIVE ASSEMBLY COUNTERSHAFT

TO DISASSEMBLE

1. To remove countershaft assembly from lathe cabinet, loosen socket-type set screws in front of O-254 cross ties, located at lower end of righthand and lefthand vertical rails or rods.
2. Next, check top of O-251 rod to see if there is a hex cap screw in end of this rod which is tightened up against the underside of the chip pan. If there is, turn it down into the O-251 rod. Then lift countershaft assembly, complete with motor, out of cabinet.
3. Remove the C-300G snap rings, located on either end of the O-271 shaft next to the bearings.
4. Then place a punch against the inner race of the bearings, and drive them out of the countershaft hanger. The procedure for disassembling the balance of the countershaft is simply a matter of loosening set screw collars DL-259 from the motor base. The spring can be removed from the O-251 and O-256 mounting bar.

TO REASSEMBLE

1. Slide the O-267 bearing onto the lefthand end of the O-271 countershaft spindle. The lefthand end is the end of the spindle having the short hub for the two-grooved O-265 pulley.
2. Slide C-300G snap ring on spindle and seat it in the snap ring groove.
3. Slide the O-267 bearing on lefthand end of countershaft spindle, then seat bearing in lefthand bearing seat in the O-250 countershaft hanger.
4. Slide the C-300G snap ring onto the lefthand end of the spindle, and seat it in the snap ring groove.
5. Replace the O-265 and O-261A pulleys. Be sure the keys are in place in the keyways. Then tighten pulleys in place with the set screws.
6. To put countershaft assembly back in cabinet, slide the O-256 and O-251 bars in place in the O-254 cross ties and lock in place with the socket-type set screw.

7. If the O-251 long drive mount bar has a cap screw and lock nut on top, adjust cap screw so head is against underside of lathe chip pan, then lock in place with jam nut, tightening it down against end of O-251 bar.

SERVICING

1. MOTOR BELT TENSION.

To adjust spindle drive belt tension, loosen the two socket-type set screws that hold O-250 countershaft on vertical rails. Then raise or lower countershaft, whichever is necessary to get correct belt tension - so belts can be depressed from 3/8" to 1/2" with light pressure at a point midway between the two pulleys. Adjust motor by adjusting the DL-259 collars, located just below the two O-276 springs. Raise or lower these two collars and lock them in place with socket-type set screws when the adjustment is correct.

SERVICING OPERATIONAL COMPLAINTS

6300-SERIES LATHES

VIBRATION -

Generally caused by improper mounting of lathe. Recheck mounting of lathe, following procedure outlined in bulletin 63-151-2.

Open door of motor compartment in cabinet and check fit of the channel which goes across underside of chip pan. If there is any space between chip pan and top of this channel, drive shims in between chip pan and channel to take up this space, then remount and level lathe.

While lathe is running, check all of the pulleys for wobble or hop. Check tensions of all belts - belts that are too tight can cause vibration. Disconnect motor belt from motor, run motor idle to see if the motor is cause of vibration. If varidrive unit is being used, disconnect drive belts that go between varidrive and lathe spindle. Then run varidrive in its various speeds to check for vibration in the varidrive unit. If varidrive unit is the cause of vibration, contact the nearest U. S. Motors representative to have it serviced.

OIL LEAKS THROUGH HOLES IN THE CHIP PAN -

This can be taken care of by pouring Permatex into bolt holes in chip pan, then when the bolts pass through the chip pan, the Permatex will flow around them and seal the leak.

COULD NOT MAKE SUCCESSIVE CUTS ACCURATELY -

First have operator show you exactly how he does the job - have him make some of the parts if possible and show you the inaccuracy. Observe for chances of mistakes in the way the job is being machined.

Then check chuck - if it is mounted good and tight on the spindle and also on the chuck back plate, check fit chuck jaws, and check way chuck jaws grip work.

Recheck mounting of lathe, following the instructions in bulletin 63-151-2 to make sure lathe is properly mounted and leveled.

Recheck adjustment of gibs on carriage, cross slide, compound rest, mounting of tool holder in tool post, and mounting of tool bit in tool holder. For information on checking the gib adjustment on carriage, cross slide, compound rest, refer to pages 27 and 31 under the heading of "Carriage Saddle, Cross, Slide, Compound Rest."

If work being machined projects beyond chuck more than four inches and tolerances of accuracy are exacting, the work should be supported by the tailstock center, or if it is small diameter work, use a follower rest.

CHATTER ON CUT-OFF OPERATIONS -

Refer to No. 3 on page 75 under the heading "Servicing Complaints," 4800-series lathe section.

LATHE CHATTERS ON STRAIGHT TURNING -

Refer to No. 4 under the heading "Servicing Complaints", 4800-series lathe, page No. 76 .

LIGHT PRESSURE ON THE HEADSTOCK CAUSES SPINDLE TO DEFLECT -

Refer to No. 6 under the heading "Servicing Compalints on Lathe Operation", 4800-series lathe, page No. 77.

CANT'T MAKE CUTS ON THIS LATHE THAT ARE EASILY MADE ON LATHE OF OTHER MAKES -

First, have operator show you exactly what cut he claims cannot be make on the Clausing lathe that can be cut on other makes of lathes. Have him do the job by making test cuts on a piece of stock held in the Clausing lahte, then take the same piece of stock over to the other lathe. Make test cuts on this lathe, using exactly the same spindle speeds, carriage feeds, tool bits,

and a comparable chuck or other holding device for the spindle.

Recheck mounting of Clausing lathe, as explained in bulletin No. 63-151-2, "Instructions for Mounting and Leveling the 6300-lathe." Open door in motor compartment, and check channel iron which goes across underneath side of chip pan to see if there is any space between channel and underside of chip pan. If there is, drive shims between chip pan and channel. Then level lathe.

LATHE DOESN'T CUT ACCURATE THREADS -

Check for end play in lead screw by referring to page 101 under the heading "Reassembly of the Quick-Change Gear Box and Lead Screw." End play in lead screw will cause lead of thread to wander. Check tool used for threading to make sure it's properly ground. Check angle at which compound rest is set. Make sure all of gibs on carriage are properly adjusted, as explained under heading "Carriage Saddle, Cross Slide, Compound Rest" on page Nos. 27 and 31. Also check lead screw and the half nuts to see if threads are worn, nicked, or filled with accumulated chips and dirt. If lead screw threads and half-nut threads are worn, lead screw and half nuts should be replaced. If there are any nicks, chips, burrs, in the thread, the lead screw thread and the half nut thread should be cleaned.

NO. 7514 LEVER-TYPE COLLET ATTACHMENT

FOR 4800-SERIES LATHE

Note: Refer to blueprint drawing Fig. 28 to follow installation instructions.

1. Remove gear guard Q-536 from lathe by removing socket head screw that holds lower part of guard to gear box, and hex nut from stud Q-537 at upper end of guard.
2. Remove DL-239 gear from end of lathe spindle. Leave Woodruff key in spindle keyway.
3. Next, slide the special sleeve and gear (part A) furnished with collet attachment against collar DL-230 on the lathe spindle. The gear end of the sleeve should go against the collar.
4. Remove cover stud (Q-537) from left end of headstock just in back of headstock spindle.
5. Temporarily insert the complete collet attachment in the lathe spindle by sliding the draw-in tube "C" through from the lefthand end of the spindle until the clutch housing on draw-in tube is against lefthand end of spindle. Position the collet lever so that it points straight out at a right angle with the spindle, then determine which end of the stud "N" is the proper one to screw into the lefthand end of the headstock so that the collet lever will be pointing out at a right angle to the spindle when the attachment is finally mounted on the lathe.
6. After you have determined which end of the stud "N" to use, remove collet attachment from lathe spindle.
7. Now remove the two hex jam nuts "Q" that hold the link "O" on stud marked "N".
8. Now turn stud "N" into the tapped hole in left end of headstock (it's the one that the stud Q-537 came out of). Be sure that you screw the right end of the stud into the headstock, determined by the test in Step 5.