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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATION, ORGANIZATIONAL MAINTENANCE, AND ORDNANCE FIELD MAINTENANCE

BACK GEARED QUICK CHANGE GEAR BOX

40-INCH BED, 8½-INCH SWING, 3-PHASE, 60-CYCLE 220-VOLT PRECISION BENCH TYPE ENGINE LATHE, WITH EQUIPMENT

(RIVETT LATHE & GRINDER, INC. MODEL 608PC) (40-L-22)

DEPARTMENT OF THE ARMY • *JUNE 1956*

TECHNICAL MANUAL
No. 9–9068–6

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *27 June 1956*

BACK GEARED QUICK CHANGE GEAR BOX 40-INCH BED 8½-INCH SWING 3-PHASE 60-CYCLE 220-VOLT PRECISION BENCH TYPE ENGINE LATHE WITH EQUIPMENT (RIVETT LATHE AND GRINDER, INC MODEL 608PC) (40–L–22)

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual contains instructions for operation and organizational maintenance of the engine lathe by the using organization and instructions for field maintenance of the engine lathe by ordnance maintenance personnel.

b. The appendix contains a list of current references, including supply manuals, forms, technical manuals, and other available publications applicable to the engine lathe.

c. This first edition is being published in advance of complete technical review. Any errors or omissions will be brought to the attention of the Chief of Ordnance, Department of the Army, Washington 25, D. C., ATTN: ORDFM, using DA Form 468 (Unsatisfactory Equipment Report).

d. The following manufacturers' symbols are used preceding the manufacturer's part numbers when identifying items on illustrations and in tables and listings:

DAW—Dayton Wheel Co.
DAY—Dayton Rubber Co.
GE—General Electric Co.
GPC—The Garlock Packing Co.
GTS—Gits Bros. Mfg. Co.
HI—Hayes Industries, Inc.
MCC—Morse Chain Co.
RVT—Rivett Lathe & Grinder, Inc.

2. Maintenance Allocation

a. Organizational Maintenance Allocation. In general, the prescribed organizational maintenance responsibilities will apply as reflected in the allocation of equipment and maintenance parts in the appropriate column of the current Department of the Army Supply Manual ORD 7-8 SNL J-268 pertaining to this materiel and in accordance with the extent of disassembly prescribed in this technical manual for the purpose of cleaning, lubricating, or replacing authorized spare parts. In all cases where the nature of the repair, modifi-

cation, or adjustment is beyond the scope or facilities of the using organization, the supporting ordnance maintenance unit should be informed so that trained personnel with suitable tools and equipment may be provided or other instructions issued.

b. Field Maintenance Allocation. The publication herein of instructions for complete disassembly and repair is not to be construed as authority for performance by field maintenance units of those functions which are the responsibilities of depots and arsenals. In general, the prescribed maintenance responsibilities will apply as reflected in the allocation of maintenance parts listed in the field maintenance columns of the current Department of the Army Supply Manual ORD 7–8 SNL J–268 pertaining to the engine lathe. Provision of parts listed in the depot guide column of the ORD 7–8 supply manual will be made to field maintenance only when the emergency nature of the maintenance to be performed has been certified by a responsible officer of the requisitioning organization.

3. Forms, Records, and Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the type, quantity, and condition of materiel to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of materiel in the hands of troops and for delivery of materiel requiring further repair to ordnance shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the materiel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units operating or maintaining this materiel are listed in the appendix. No forms other than those approved for the Department of the Army will be used. For a current listing of forms, see DA Pam 310–2. For instructions on use of these forms, refer to FM 9–10.

c. Field Reports of Accidents. The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in SR 385–10–40. These reports are required whenever accidents involving injury to personnel or damage to materiel occur.

d. Report of Unsatisfactory Equipment, Materials, or Publications. Any suggestions for improvement in design and maintenance of equipment and spare parts, safety and efficiency of operation, or pertaining to the application of prescribed petroleum fuels, lubricants and/or preserving materials, or technical inaccuracies noted in Department of the Army publications will be reported through technical channels,

as prescribed in AR 700–38, to the Chief of Ordnance, Department of the Army, Washington 25, D. C., ATTN: ORDFM, using DA Form 468. Such suggestions are encouraged in order that other organizations may benefit.

Note. Do not report all failures or malfunctions that occur. Report only REPEATED or RECURRENT failures or malfunctions which indicate unsatisfactory design or material. However, reports will always be made in the event that exceptionally costly equipment is involved. See also AR 700–38 and the printed instructions on DA Form 468.

Section II. DESCRIPTION AND DATA

4. Description

a. General. The bench type engine lathe is a back-geared, gear box, screw cutting lathe of great accuracy and rugged construction. Its features include adjustable bronze-bearing headstock spindle, variable speed box drive, hand-scraped sliding surfaces, independent power feed, lead screw operation, power crossfeed, and adjustable tailstock. It is provided with a carriage stop and thread dial as well as numerous accessories. Tabulated data are listed in paragraph 6.

b. Accuracy. This engine lathe will turn or bore within 0.0001 inch in 6 inches work held in collets and turn between centers within 0.0001 inch in 6 inches. The lathe will face to 8 inches diameter within a limit of 0.002 inch concave, 0.0000 convex. It will cut threads within 0.0005 inch in 12 inches, or within 0.0003 inch in any 3 inches, or within 0.0002 inch in any inch of a specified piece.

5. Serial Number Information and Nameplates

a. Gear Box Nameplate. The gear box nameplate and data is mounted on the gear box just above the index lever to facilitate the proper setting of the index lever when cutting threads. This thread data is calibrated in threads-per-inch. The information on the nameplate and data is duplicated in table V. Refer to paragraph 38.

b. Speed Box Serial Number Nameplate. The speed box serial number and nameplate (fig. 1) is located on the right front of the speed box.

c. Lathe Serial Number Nameplate. The lathe serial number nameplate (fig. 2) is located on the rear of the tailstock end of the lathe bed.

6. Tabulated Data

a. Headstock.

Maximum diameter round hole in collet	1 in.
Maximum size square hole in collet	23/32 in.
Maximum size across flats, hexagonal hole in collet	7/8 in.
Maximum diameter round stock held in jaw chuck, passed through spindle	1 1/8 in.
Swing over bed, diameter	8 1/2 in.
Swing over compound swivel of slide rest, diameter	2 5/8 in.

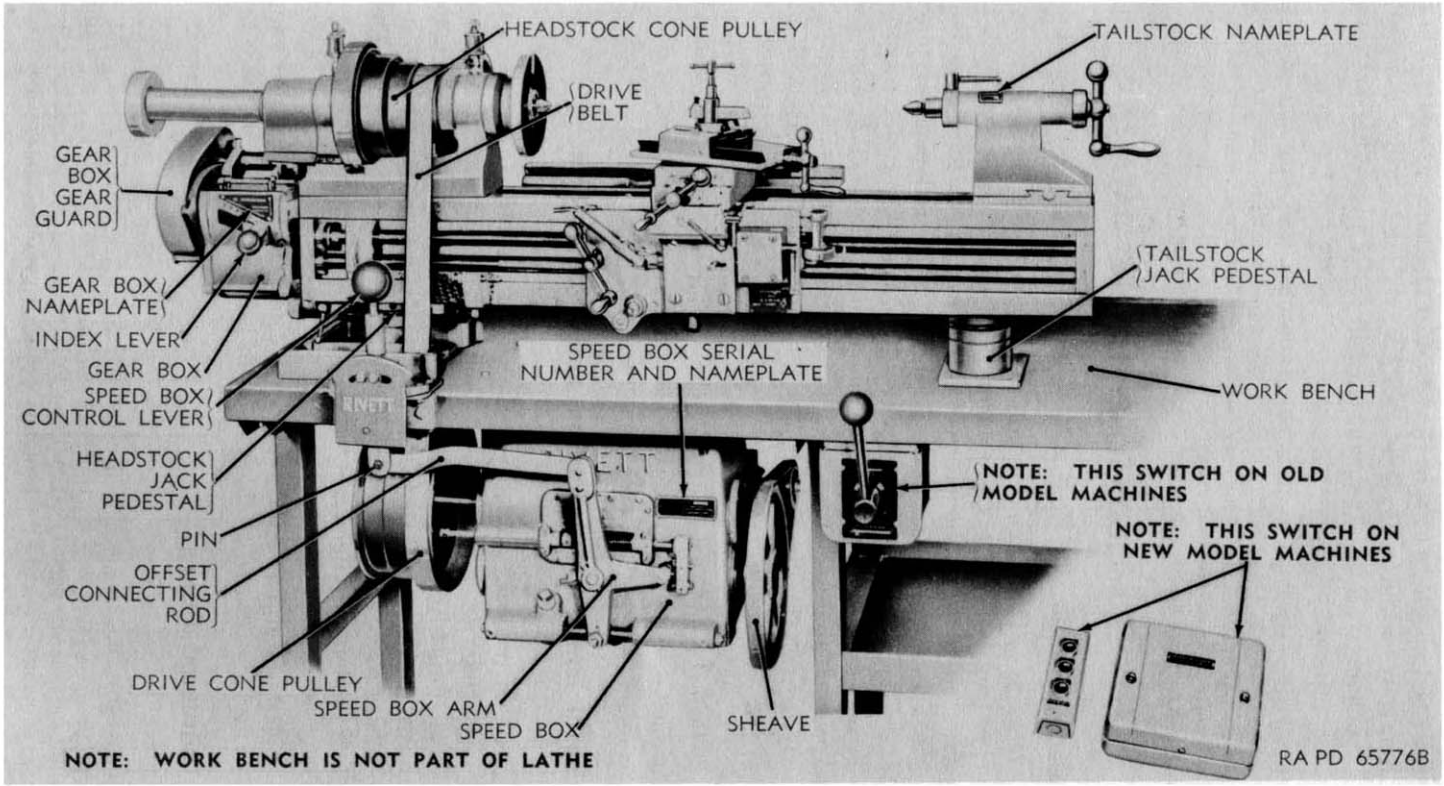


Figure 1. Bench type engine lathe.

Figure 2. Lathe serial nameplate.

Swing over bottom slide of compound slide rest, diameter	4¼ in.
Swing over carriage, diameter	7½ in.
Diameters of steps of cone pulley	3, 3¼, and 4½ in.
Width of belt	1¼ in.
Threads on spindle nose	Form U. S. OD 1¼ in pitch 10
Back gear reduction ratio	1 to 6⅔

b. Gear Box.

Range of rod feeds:	
Maximum per revolution	0.0220 in.
Minimum per revolution	0.0028 in.
Number of thread pitches:	
(Including 11½, 15, and 27)	33
Range of thread pitches	10 to 144

c. Bed.

Length of bed	40 in.
Distance between centers tailstock flush	18¼ in.
Distance between centers, tailstock overhung	21¼ in.
Width	3¾ in.
Depth	5¼ in.

d. Tailstock.

Travel of spindle	3¼ in.
Diameter of spindle	1 in.
Taper in mouth, special	3°
Diameter of hole at mouth	0.541 in.
Scale graduation, spindle	3 x 1/16 in.
Dial graduation	0.001 in.

e. Compound Slide Rest.

Travel of top slide	5¼ in.
Travel of cross slide	4½ in.
Dial graduation	0.001 in.
Size of tool post slot	½ x ⅜ in.

f. Motor.

Manufacturer	Westinghouse Electric Co.
Horsepower	¾
Volt	110–220
Phase	single
Rpm	1,725
Cycle	60

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF BENCH TYPE ENGINE LATHE

7. Purpose

a. When a new or reconditioned bench type engine lathe is first received by the using organization, it is the responsibility of the officer in charge to determine whether the materiel has been properly prepared for service by the supplying organization and to be sure it is in condition to perform its function. For this purpose, inspect all assemblies and equipment to be sure they are properly assembled, secured, cleaned, adjusted, and/or lubricated.

b. Make a record of any missing parts, tools, and/or equipment, and of any malfunctions. Correct any deficiencies as quickly as possible.

8. Services

a. Uncrating and Removing. The complete bench type engine lathe and equipment are packed in three separate crates as indicated in table I. Carefully open each crate using a nail puller to remove the covers and braces. Avoid jarring the equipment. Leave the lathe proper and speed box on the skid on which they were shipped until ready for installation. When removing and unpacking equipment from the third crate, spread them out on a bench or platform to keep dry and undamaged. Examine all wrapping paper and excelsior to make certain no parts are lost.

Table I. Uncrating Data

Crate	Dimensions (inches)	Capacity (cu ft)	Weight (lb)
1. Lathe	47½ x 18 x 18	9	300
2. Speed box and motor	24 x 20 x 18	5	230
3. Attachments and equipment	27 x 21 x 16	5	285

b. Checking Equipment. Check all parts of the equipment against tables II, IX, and figure 20 to make certain that none is missing.

Table II. Equipment Packed Inside Shipping Container

Items	Identifying number	Quantity shipped	Figure number
CENTER, female	40–C–398–100	1	14
CENTER, male, half	40–C–398–200	1	14
CENTER, male, hard	40–C–399–300	4	14
CENTER, male, soft	40–C–398–350	2	14
CENTER, solid V	40–C–415	1	14
CHUCK, drill, arbor and key	40–C–965–150	1	14
CHUCK, independent, 4 jaw, w/wrench	40–C–973–900	1	14
CHUCK, universal, 3 jaw, w/wrench	40–C–977	1	14
DOG, lathe, ¾	40–D–215	1	14
DOG, lathe, 1¼	40–D–218	1	14
PLATE, driving	40–P–811–215	1	14

c. Cleaning. Remove all protective grease from parts with cotton waste or a clean cloth partially saturated with mineral spirits paint thinner or dry-cleaning solvent. Immediately go over all polished and scraped surfaces with an oiled rag.

d. Lubrication. Lubricate in accordance with instructions contained in paragraph 72.

e. Inspection Before Installation.

(1) Inspect for cracked or broken parts. Replace if necessary.

(2) Inspect power cord, V-belt, and flat drive belt. If found frayed, torn, or broken, replace damaged part.

f. Installation Procedure.

(1) Refer to TB ORD 444–8 and TB ORD 9–1801–2 field maintenance manual.

(2) The bench type engine lathe and speed box must be mounted on a suitable bench or cabinet which is sturdy enough to support the lathe and speed box without sagging. The bench or cabinet must be level both lengthwise and crosswise and securely fastened to the floor with lag screws or bolts. Strips of ¼-inch cork or other insulating material should be inserted between the bench or cabinet and the floor.

(3) Drill mounting holes and cut belt slots in the bench top in accordance with figure 3. The bench layout should allow adequate space on either end. Center the layout crosswise to insure proper support.

(4) Mount the speed box (fig. 1) with the motor attached to the underside of the bench top. Secure the headstock and tailstock jack pedestals (fig. 4), which are packed with the accessories, to the bench top. Place the flat washer on one of the pedestal bolts (fig. 4) into the depression on the top of the tailstock jack pedestal.

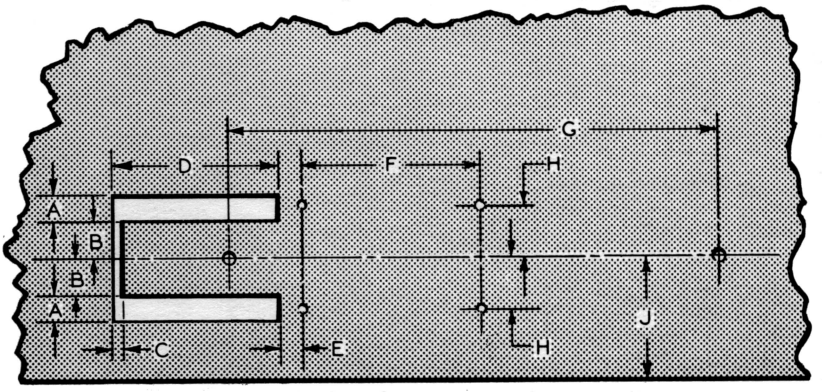


Figure 3. Bench layout.

(5) Screw the two pedestal bolts (fig. 4) into the bottom of the lathe bed. Lift the lathe onto the jack pedestals, carefully guiding the pedestal bolts into place. Use a small hoist for this purpose. If necessary, two or three men can lift the lathe into position.

Note. If a hoist is used, use rope slings. Do not use chains since they will mar the lathe.

Place each plain flat washer over the pedestal bolt and tighten the pedestal bolt hexagon nuts. Do not overtighten the pedestal bolt nuts. The flat washer on the tailstock jack pedestal and two steel balls between the lathe bed and headstock jack pedestal provide a three-point mounting and insure against any distortion.

(6) Mount the flat drive belt guard (fig. 4) to the bench top so it straddles the headstock jack pedestal. Secure the speed box control lever (fig. 4) to the front of the bench top. Fasten the offset connecting rod to the front of the bench top. Fasten the offset connecting rod to the speed box arm with the pin in the end of the arm.

g. Electrical Connections. Mount the switch box (fig. 4) and push-button switch (fig. 4) on a wall or the bench in a position convenient to the operator and electrician. Make all electrical connections in accordance with the wiring diagram (fig. 5). A copy of the wiring diagram is located on the inside top cover of the switch box.

(1) The motor, which is located on the backside of the speed box, should rotate in a clockwise direction when facing the pulley. If the direction of rotation is opposite, it can be reversed by interchanging any two of the three-phase input leads.

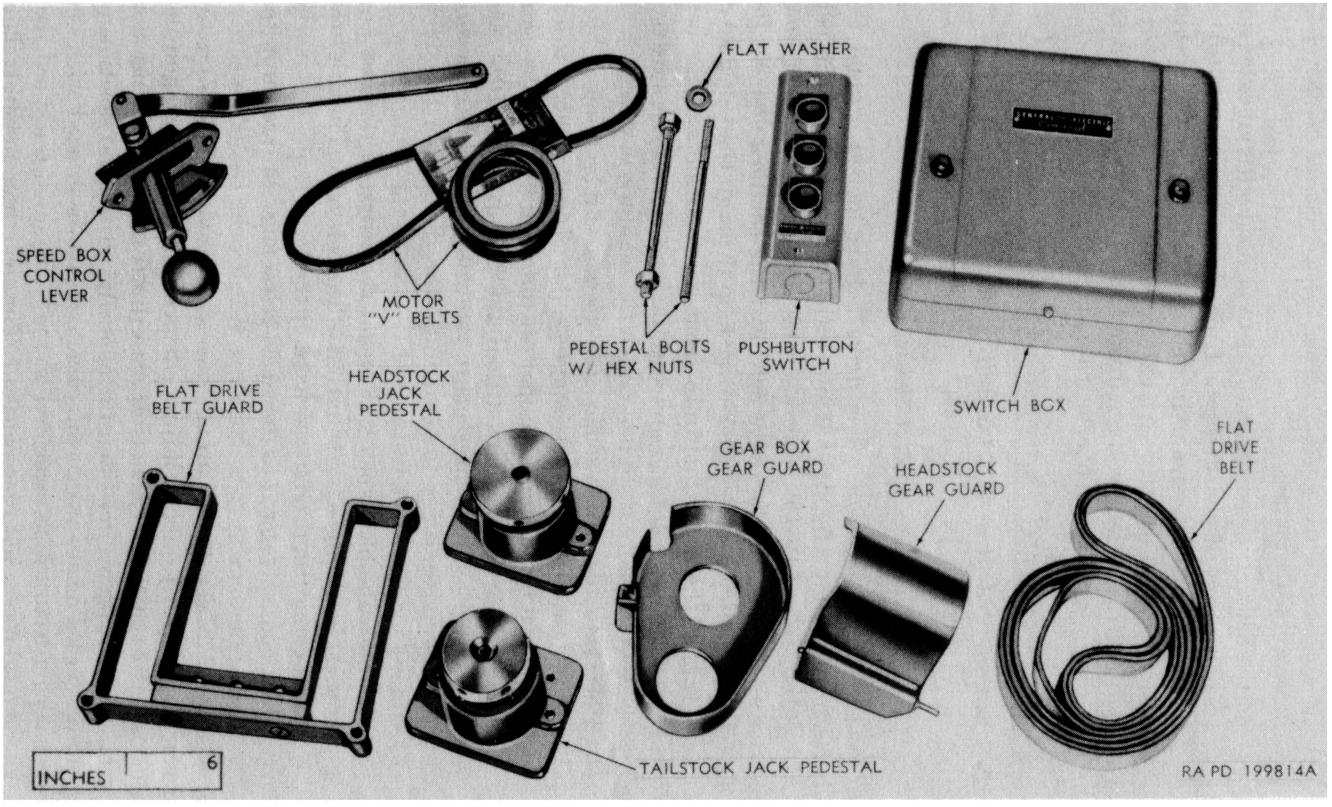


Figure 4. Equipment for installation.

Warning: It is particularly important that the ground connections be connected to a good ground when water is present in the work area. Proper grounding of the engine lathe will prevent possible injury to the operator should the internal wiring become shorted to the motor housing or to the controls.

(2) If the bench type engine lathe is to be used with an extension cord because of the distance from the power source to the work, use the cable size indicated in table III for the specific extension cord lengths. An extension cord of inadequate size will cause a serious voltage drop, loss of power, and damage to the motor through overheating.

Table III. Extension Cord Cable Size

Extension cord length, ft	25	50	75	100
Cable size, B & S gage	18	18	18	16

h. Drive Belt Installation. The drive belt is looped around the headstock cone pulley (fig. 1). Remove the tie block from the belt guard by unscrewing two flat head screws in the end of the frame. Place the upper loop of the drive belt over the smallest step on the headstock cone pulley and pass the lower loop through the belt guard. Slide each side of the lower loop into front and rear slots of the belt guard. Pull the drive belt tight and slip the lower loop over the drive cone pulley on the speedbox. Then fasten the tie block in place.

i. Drive Belt Adjustment and Bed Leveling.

(1) Loosen the jack pedestal hexagon nuts. Insert a short length of ¼-inch or 5/16-inch round stock into the holes in the jack pedestal head of each jack pedestal. To raise the bed and increase drive belt tension, turn the jack pedestal heads counterclockwise. Raise the bed until the tension on the drive belt is correct.

(2) Place a spirit level lengthwise on the ways of the bed and adjust the jack pedestals until the bed is level. Then tighten the jack pedestal hexagon nuts (par. 8*f*(5)).

j. Motor V-belt installation. Two V-belts (fig. 4) are supplied with the lathe; one is a spare. Slip the V-belt over the large sheave (fig. 1) on the lower speed box shaft and the small sheave on the motor armature shaft. Then adjust the position of the hexagon nut on each side of the motor mounting plate until the V-belt tension is correct. If the sheaves are out of alinement, adjust the position of each sheave on its respective shaft. Each sheave is secured with one hexagon socket headless setscrew.

k. Gear Box Assembly Installation. The gear box assembly (fig. 6) is mounted to the left end of the lathe bed with one hexagon head bolt with plain washer, and one T-binder bolt assembly (fig. 6). First

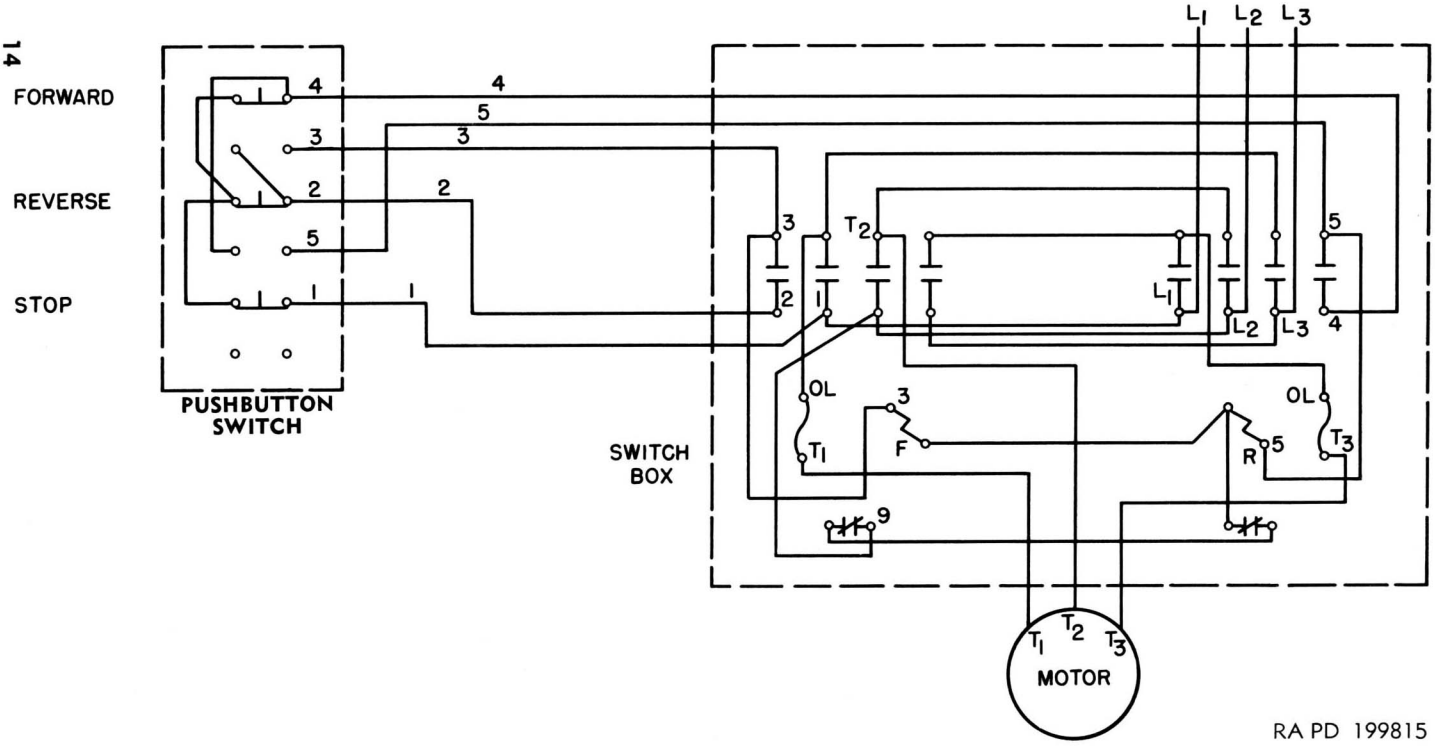


Figure 5. Wiring diagram.

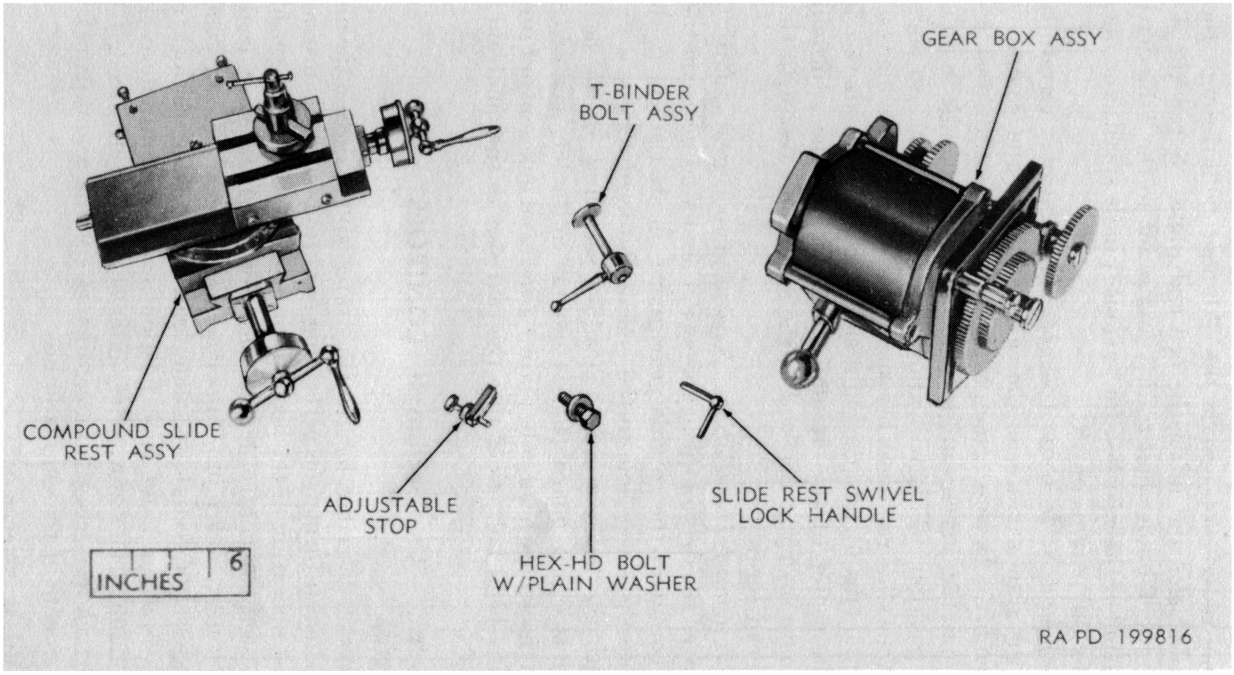


Figure 6. Gear box and compound slide rest.

locate the gear box by engaging the two driving pins on the end of the power feed rod with the corresponding holes in the cone gear shaft in the gear box. Fasten the gear box flush with the side of the end of the lathe bed with the hexagon head bolt with plain washer through the upper radial slot. Slide the T-binder bolt through the lower front radial slot and left lathe bed end plate. Screw the T-binder nut onto the T-binder bolt tightly and screw in the T-binder handle. The position of the gear box for various spindle speeds and operations is discussed in paragraph 38.

l. Compound Slide Rest Assembly Installation. Carefully clean and oil the slide surface on the carriage angle and compound slide rest assembly. Before attempting to slide the slide rest assembly (fig. 6) onto the carriage angle, place the binder handle in an upright vertical position. This will allow the T-binder stud to engage the T-slot in the slide rest assembly (par. 30). Screw the slide rest swivel lock handle (fig. 6) into the right side of the lower slide rest just opposite the center of the circular scale. Fasten the adjustable stop (fig. 6) onto the right rear end of the lower slide rest with the single fillister-head screw.

m. Gear Guard Installation. The headstock gear guard (fig. 4) mounts over the driving gear and switch and stud gears on the headstock. To mount the spindle gear guard, insert the pin in the gear guard into the lower hole in the end of the headstock and secure in place with the hexagon socket headless set screw in the headstock. The gear box gear guard (fig. 1) mounts to the left side of the gear box with the square head bolt, plain washer, and hexagon nut provided. The square head bolt slides into the rear slot in the quadrant on the gear box.

Section II. CONTROLS

9. General

This section describes, locates, illustrates, and furnishes the operator with sufficient information pertaining to various controls provided for the proper operation of the bench type engine lathe. The pushbutton station, speed box control lever, index lever, driving gear, lead screw gear, back gear, index pin, upper compound gears, lower compound gears, upper slide feed, lower slide feed, slide rest swivel lock, adjustable stop, carriage hand feed, friction lever, intermediate rack gear, carriage clamp, lead screw, safety interlock, power crossfeed, T-binder stud, tailstock feed screw handle, tailstock spindle, and tailstock binder are components of the engine lathe.

10. Pushbutton Switch

(fig. 4)

The pushbutton switch is the electrical power control for the lathe. Three pushbuttons enable the operator to start, reverse, and stop the

motor and consequently all operation. The top button starts the motor, the center button reverses motor rotation, and the bottom button stops the motor. The motor should be stopped before the reverse button is pushed and then started again. The pushbutton switch can be located in any place convenient to the operator.

11. Speed Box Control Lever

(fig. 1)

The speed box delivers two speeds of rotation to the drive cone pulley on the lower speed box shaft by means of a double clutch arrangement in the speed box. The speed box control lever selects either of these pulley speeds or a neutral (no speed) position. These three speed conditions correspond to three slots in the quadrant. The left indented position is low speed, center indented position is neutral, and right indented position is high speed. An automatic brake is applied to the drive cone pulley with the control level in neutral but is disengaged in either operating position. The high and low speeds are in a 3 to 1 ratio.

12. Index Lever

(fig. 7)

The index lever on the front of the gear box enables the operator to select anyone of seven groups of thread pitches. The position of the index lever determines the position of the gears in the gear box. To move the index lever, pull the round knob to disengage the index pin and slide up or down to engage the desired hole in the front of the gear box. These holes correspond to the pitches indicated on the nameplate and data (par. 5*a*).

13. Spindle Gear

(fig. 7)

The spindle gear enables the operator to engage or disengage the gear box. The spindle gear is keyed to the headstock spindle and drives the gear box through switch and stud gears on the headstock. By means of the knurled knob, this spindle gear can be moved to three positions. In the right position, the spindle gear engages the switch gear through the small intermediate gear which through the gear box moves the carriage to the right. In center position, the spindle gear is out of mesh and all speed gearing is stopped. In left position, the spindle gear directly engages the stud gear which through the gear box moves the carriage to the left.

14. Lead Screw Gear

(fig. 7)

The lead screw gear is used to engage or disengage the lead screw from the feed rod. The lead screw gear is keyed to the lead screw and

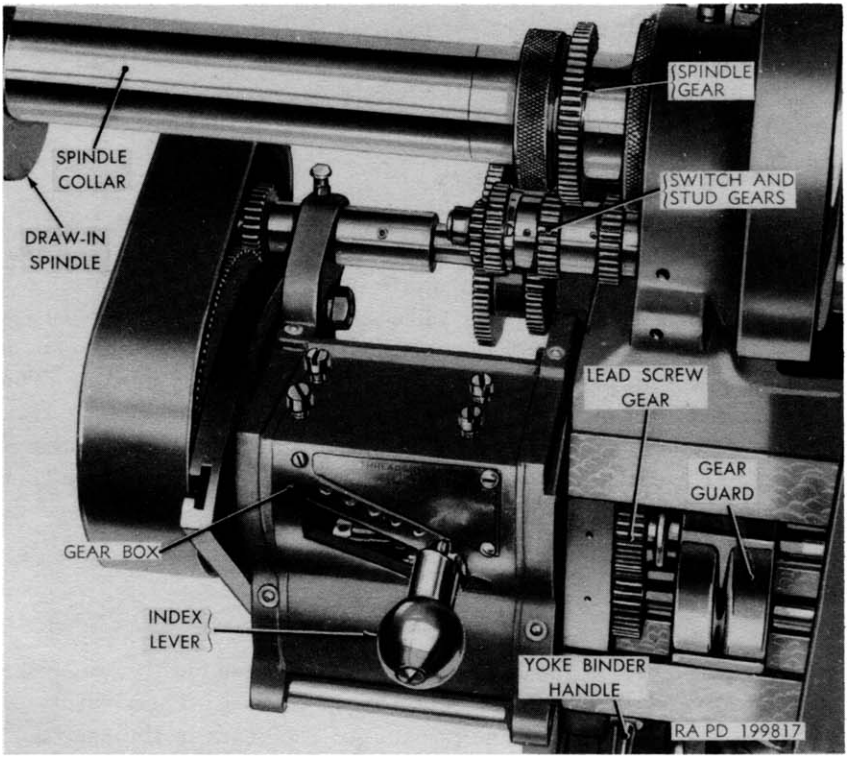


Figure 7. Gear box and headstock gears.

slides left or right on the lead screw. The gear guard normally covers the lead screw gear and feed rod gear but easily slides along the bed out of the way.

15. Back Gear

(fig. 8)

a. Gear Shaft Lever. The gear shaft lever throws the back gear in and out of mesh with the headstock driving and pulley gears. In the vertical position, the gear shaft lever turns an eccentric shaft to move the gears into mesh. To disengage the back gear, push the gear shaft lever to a horizontal position.

b. Drive Pin. The knurled head drive pin locks the headstock driving gear to the headstock cone pulley. When the back gear is in mesh, the drive pin must be pulled out to release the headstock driving gear so it will turn freely within the headstock cone pulley. When the back gear is out of mesh, the drive pin must be pushed in so the headstock cone pulley will drive the headstock driving gear directly.

Caution: The drive pin must be placed in the correct position before operation or serious damage may result.

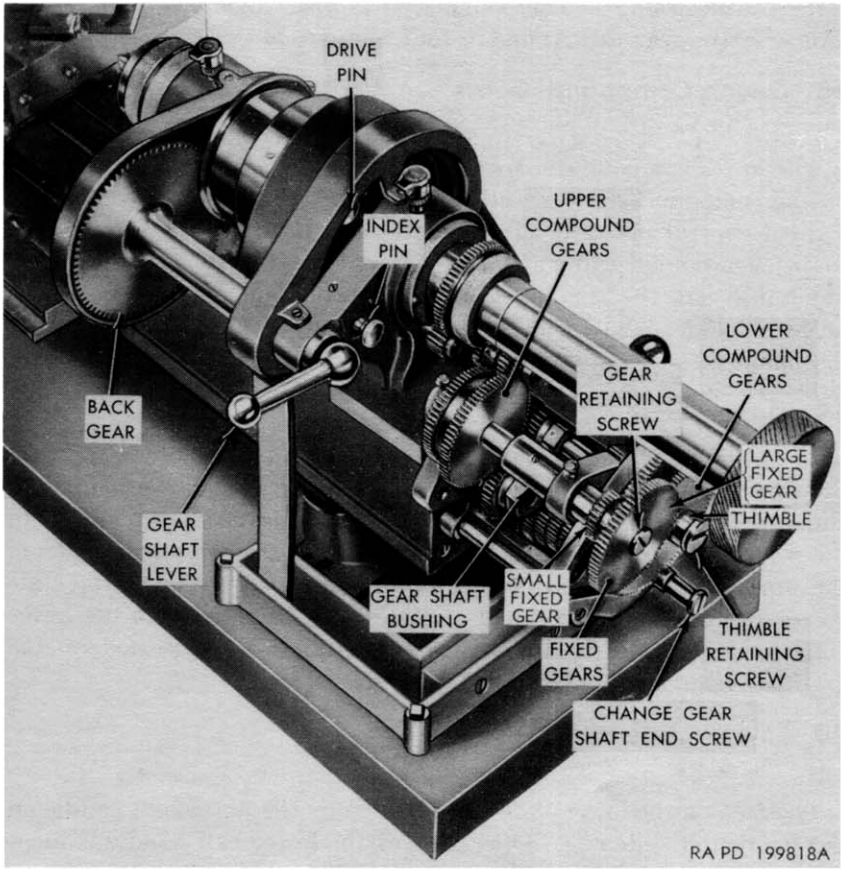


Figure 8. Back gear.

16. Index Pin

(fig. 8)

The index pin locks the headstock driving gear to the headstock. When the index pin is pushed into one of the holes in the headstock driving gear, the headstock spindle is locked in place. The index pin is engaged only in operations where the spindle is stationary. The headstock driving gear has 60 holes around its circumference; each hole corresponds to one degree of rotation.

17. Upper Compound Gears

(fig. 8)

The upper compound gears engage the stud gear in either of two positions and disengages in a third neutral position. In the right-hand position, the larger (72 tooth) compound gear engages the smaller (18 tooth) stud gear. In center position, the smaller (60 tooth) compound gear engages the larger (30 tooth) stud gear. In

left-hand position, the compound gear is disengaged. This provides two selective gear ratios: one to four and one to two.

18. Lower Compound Gears

(fig. 8)

The lower compound gears engage the large and small fixed gears on the compound shaft in either of two positions and disengages in a third neutral position. In the left-hand position, the larger (112 tooth) compound gear engages the small fixed gear. In the right-hand position, the smaller (70 tooth) compound gear engages the large fixed gear. In the center position, the compound gears are disengaged.

19. Upper Slide

(fig. 9)

Upper slide is controlled by the upper ball handle on the compound slide rest. Turning the ball handle clockwise moves the top slide into the work and turning counterclockwise moves the top slide out from the work. The graduated dial is calibrated in 0.001 inch of top slide travel. In addition, the upper slide rest can be rotated on the lower slide to the desired feeding angle. This angle is indicated on the graduated dial mounted on the lower slide rest.

20. Lower Slide

(fig. 9)

The feed on the lower slide is controlled by the lower ball handle on the compound slide rest. Operation of the lower ball handle is identical to the upper ball handle (par. 19). The lower slide rest moves directly across the lathe bed and cannot be rotated in any direction. The friction lever can also be used to move the lower slide (par. 24).

21. Slide Rest Swivel Lock

(fig. 9)

The slide rest swivel lock is located on the right side of the lower slide opposite the center of the graduated dial. By pulling the swivel lock handle up, the upper slide is locked to the lower slide (par. 19).

22. Adjustable Carriage Stop

(fig. 9)

The adjustable carriage stop limits the extent that the lower slide will feed by adjusting the adjustable stop screw. It is used where duplicate parts are being machined and manual slide feed is used. It is never used with power crossfeed.

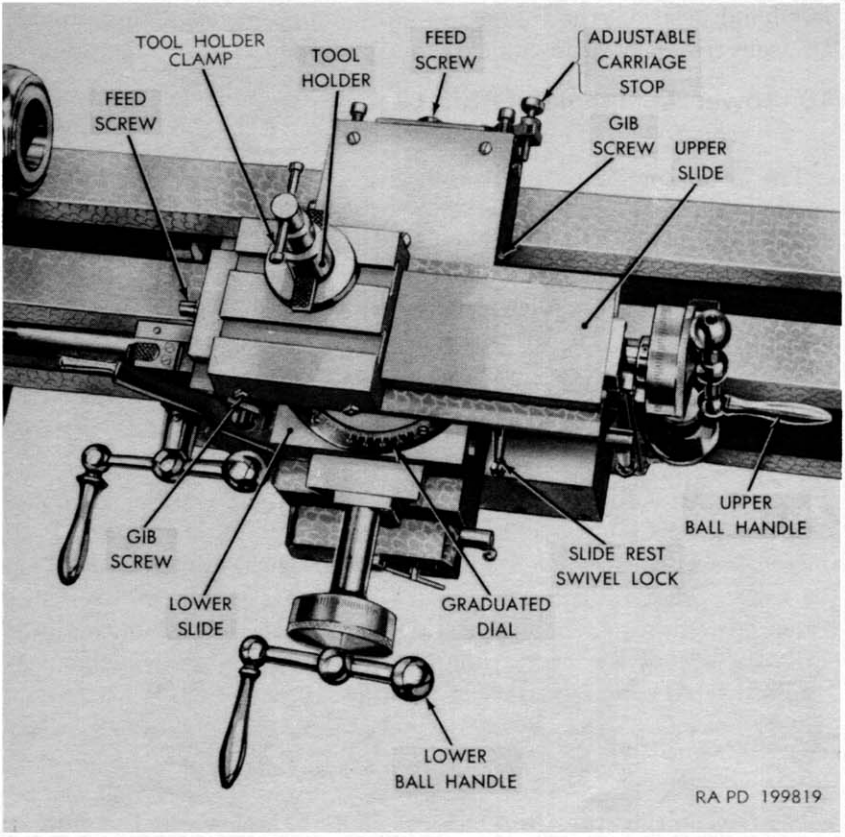


Figure 9. Compound slide rest.

23. Carriage Hand Feed

(fig. 10)

The carriage hand feed moves the carriage along the lathe bed. Rotating the hand feed clockwise moves the carriage to the right and rotating it counterclockwise moves the carriage to the left. The carriage hand feed is used to position quickly the carriage with the friction lever and lead screw disengaged.

24. Friction Lever

(fig. 10)

The Friction lever engages the feed rod to move the carriage longitudinally on power feed along the lathe bed. By pulling outward on the friction lever, the feed rod is engaged through a gear train and friction clutch arrangement. The friction lever is disengaged by pressing down on the stop level. This releases the friction lever so it snaps back into neutral position.

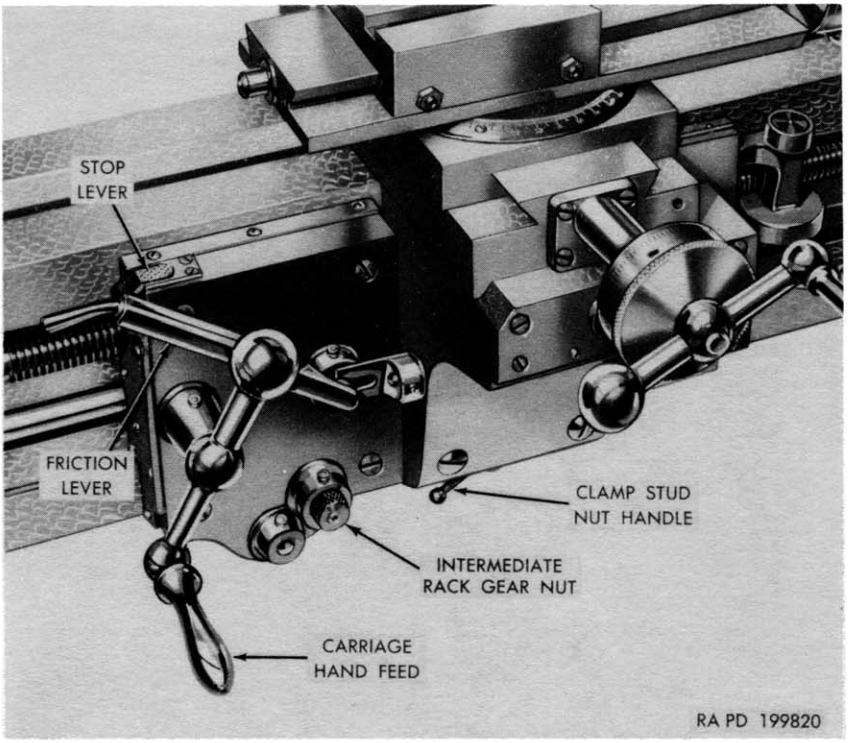


Figure 10. Carriage and compound slide rest.

25. Intermediate Rack Gear Nut

(fig. 10)

The intermediate rack gear is one of the gears in the power feed gear train. The position of the intermediate rack gear is controlled by the intermediate rack gear nut. By pulling out the nut, the intermediate rack gear is removed from the gear train. This saves wear on the power feed gear train and eliminates their drag when cutting threads by means of the lead screw. By pushing in on the nut, the powerfeed is again operative.

26. Carriage Clamp

The carriage clamp locks the carriage to the lathe bed. By pulling the clamp stud nut handle (fig. 10) clockwise, the carriage is locked. The carriage can be released by pushing the clamp stud nut handle counterclockwise.

27. Lead Screw

Power for longitudinal travel is applied from the lead screw to the carriage through the lead screw nut. To mesh the lead screw nut with the lead screw, pull the ball lever handle (fig. 11) to its upright

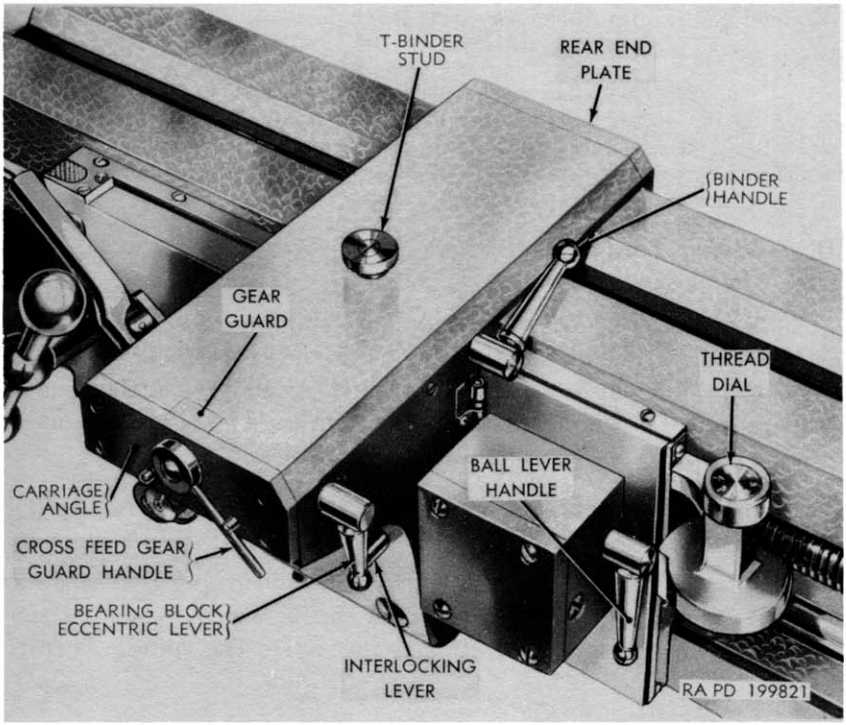


Figure 11. Carriage.

vertical position. To unmesh the lead screw nut, pull the ball handle lever down to its vertical position.

28. Interlocking Lever

(fig. 11)

The interlocking lever prevents the simultaneous engagement of both friction lever and lead screw. When the interlocking lever is moved to the left, the lead screw can be engaged. When the interlocking lever is moved to the right, the friction lever can be engaged.

29. Crossfeed

Crossfeed for the compound slide rest assembly is obtained from the feed rod and transmitted through a cam-mounted crossfeed gear in the front top of the carriage angle. The crossfeed gear is protected by a gear guard which is opened and closed by the crossfeed gear guard handle (fig. 11). With the crossfeed gear guard handle in left position, the crossfeed gear is exposed; with the guard handle in right position, the crossfeed gear is covered. The bearing block eccentric lever raises the crossfeed gear through the opened gear guard. Pull the eccentric lever to its upright vertical position to raise the

crossfeed gear and pull the eccentric lever down to lower the crossfeed gear.

Note. The compound slide rest assembly must be located almost flush with the edge of the carriage angle to use the power crossfeed so that the crossfeed gear will engage the intermediate lower feed screw gear on the underside of the compound slide rest assembly. Do not attempt to raise the crossfeed gear unless the compound slide rest assembly is located correctly.

30. T-Binder Stud

(fig. 11)

The T-binder stud locks the compound slide rest assembly on the carriage angle. The binder stud is raised when the binder handle is pulled to its upright vertical position and lowered when the binder handle is pulled down. This allows the compound slide rest assembly to be locked in any position on the carriage angle.

31. Tailstock Feed Screw Handle

(fig. 12)

The tailstock spindle is turned in and out by turning the tailstock feed screw handle. Duplicate settings can be made by noting the graduations of the spindle itself and the dial. The spindle is cali-

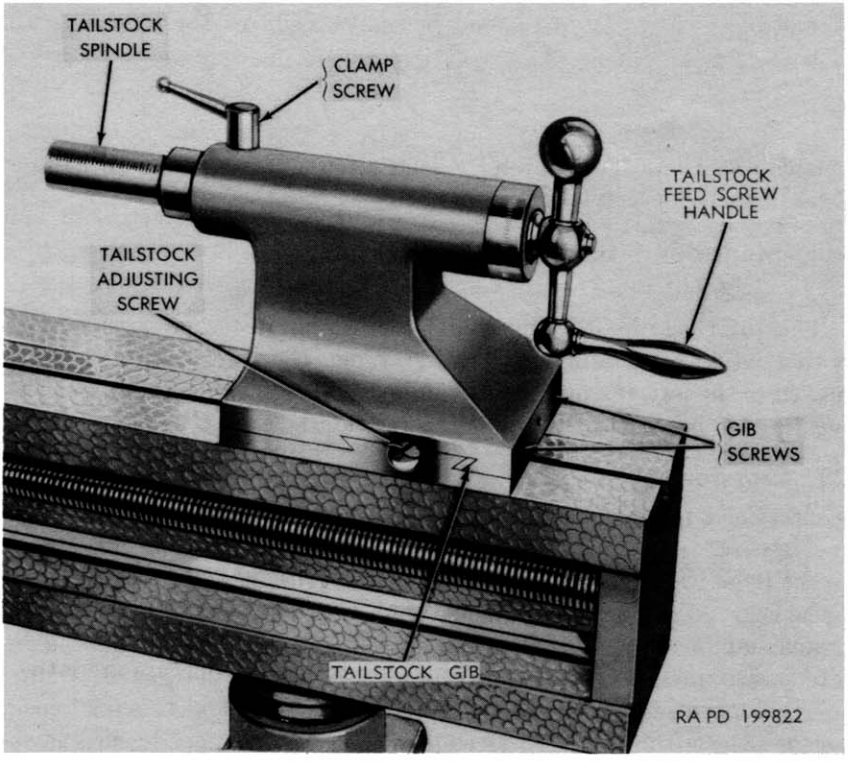


Figure 12. Tailstock.

brated in $\frac{1}{16}$-inch divisions; the dial is calibrated in 0.001-inch divisions. Centers are ejected when the tailstock spindle is drawn all the way into the tailstock.

32. Tailstock Spindle
(fig. 12)

The tailstock spindle is locked in place by turning the clamp screw clockwise and unlocked by turning the clamp screw counterclockwise.

33. Tailstock Binder

The tailstock is locked in position by the tailstock binder on the rear of the tailstock. When the tailstock binder handle is pulled vertically, the tailstock is locked; when it is horizontal, the tailstock is free to slide on the lathe bed.

Section III. OPERATION UNDER USUAL CONDITIONS

34. General

This section contains instructions for the operation of the bench type engine lathe under conditions of moderate temperatures and humidity. Every organization equipped with this engine lathe must thoroughly train its personnel in the procedures for operating this item. For operation under unusual conditions, refer to section V of this chapter.

35. Preparation for Operation

A number of important factors must be considered and decided before the engine lathe can be properly set up. These factors include: the machining materials required, available stock, size and shape of the work, accuracy requirements, time limitations, and the sequence of machining operations. In addition, work must be measured accurately and laid out properly with suitable tools.

36. Spindle Speeds

Twelve spindle speeds are available as indicated in table IV. Each spindle speed is determined by the position of the back gear (par. 15), speed box control lever (par. 11), and drive belt. First, place the drive belt on its proper cone on the headstock cone pulley (fig. 1) and drive cone pulley. Then engage or disengage the back gear as desired. The lathe is then ready for actual operation with the speed box control lever. After setting up the work and starting the motor only, the speed box control lever should be used to operate the lathe.

Table IV. Spindle Speeds (rpm)

Back gear	Speed box control lever	Headstock cone pulley		
		Large	Medium	Small
In	Right	45	60	85
In	Left	100	140	195
Out	Right	300	405	565
Out	Left	680	935	1290

37. Drive Belt Shifting

Always stop the lathe before shifting the drive belt to select a different spindle speed. Then slide the drive belt onto the desired cones on the headstock cone pulley and drive cone pulley by rotating the pulleys by hand.

38. Gear Box

For screw cutting and power feed machining operations, the gear box must be set up to provide the correct amount of carriage travel per headstock spindle revolution. This gearing is always changed when no power is applied to the headstock by means of the index lever (par. 12), spindle gear (par. 13), upper compound gears (fig. 8), and lower compound gears (fig. 8). Table V indicates the proper relationship of these controls for any given English thread or pitch. Refer to paragraphs 53 and 54 for use of special accessory gears.

Table V. English Thread Cutting

Number of threads per inch left-position of index lever-right							Upper compound gear		Lower compound gear	
							Driver	Driven	Driver	Driven
10	11	12	13	14	16	18	30	60	70	70
20	22	24	26	28	32	36	18	72	70	70
40	44	48	52	56	64	72	30	60	28	112
80	88	96	104	112	128	144	18	72	28	112
Swing Gear Box to Engage 18T Gear						30	18	60	70	70
on Stud with 60T Sliding Gear						120	18	60	28	112

39. Carriage

Movement of the carriage may be either manually controlled or power driven. The carriage hand feed (fig. 10) is used for manual control. The carriage is power driven through either the feed rod (par. 24) or lead screw (par. 27). When feed rod is used, disengage the lead screw gear (par. 14) and engage the intermediate rack gear (par. 25). This eliminates wear on the lead screw. When the lead screw is used, engage the lead screw gear and disengage intermediate

rack gear. The interlocking lever prevents simultaneous use of feed rod and lead screw. Where no movement of the carriage is desired, such as facing operations, lock the carriage in position with the clamp stud nut handle (fig. 10).

40. Tailstock

a. Controls. The tailstock should be locked on the lathe bed in its approximate location with the tailstock binder handle on the rear of the tailstock. Small adjustments in centering work can be made by moving the tailstock spindle (fig. 12) and locking it in place with the clamp screw (fig. 12). To remove centers or drill chuck, back the tailstock spindle into the tailstock until the center or drill chuck is forced out of the spindle.

b. Setover. External tapers can be machined on work between centers by "setting over" the tailstock. To do this, back out one tailstock adjusting screw (fig. 12). Then turn the opposite adjusting screw until the tailstock moves across the bed the required setover. The amount of setover should be measured at the tailstock center. Make sure both adjusting screws are tight after final adjustment.

41. Compound Slide Rest Assembly

a. Upper Slide. Movement of the upper slide is controlled with the upper ball handle (fig. 9). In addition, the upper slide can be rotated to the desired feeding angle by first releasing the slide rest swivel lock (fig. 9). Always lock the position of the upper slide with the swivel lock before feeding the tool into the work.

b. Lower Slide. Lower slide movement is controlled with the lower ball handle (fig. 9). The lower slide can be locked in place with the T-binder stud (fig. 11).

Note. The T-binder stud must be locked before actual machining.

c. Tool Holder. The tool holder (fig. 9) secures all tools with holders to the upper slide. It is easily removed from the upper slide. The tool holder clamp (fig. 9) will secure tools tightly without the use of wrenches.

Note. Do not overtighten tools in the tool holder.

d. Mounting and Dismounting. The compound slide rest assembly can be removed when necessary as in cases where measurements are to be made or a setup checked. Simply release the T-binder stud (fig. 11) and slide off the complete slide rest. When remounting the slide rest, make sure the sliding surfaces are clean.

42. Thread Dial

(fig. 11)

The thread dial provides a ready reference to pick up threads without reversing the lathe. It is geared to the lead screw and is calibrated

in eight equal divisions which are numbered for easy identification. On the first threading cut, engage the lead screw nut when any radial division mark comes in line with the oilhole. For each successive cut, disengage the lead screw nut and run the carriage back manually. With the carriage again in starting position, engage the lead screw nut when the same radial division mark comes in line with the oilhole.

Note. The thread dial cannot be used for metric pitches.

Section IV. OPERATION OF EQUIPMENT USED IN CONJUNCTION WITH THE BENCH TYPE ENGINE LATHE

43. General

This section contains information for the installation and operation of various lathe attachments supplied for specific machining operations. These accessories are tabulated in table II and illustrated in this section.

44. Lathe Draw-in Chuck Bar

The lathe draw-in chuck bar (fig. 13) is used in operations where collets, the center and center chuck, step chuck blanks, and indexing attachment are used. The draw-in chuck bar collar (fig. 13) and draw-in chuck bar sleeve (fig. 13) slip over the lathe draw-in chuck bar in that order. For installation, slip the lathe draw-in chuck bar through the spindle so the draw-in chuck bar sleeve is flush with the end of the headstock spindle as shown in figure 7. Then, thread a collet, center and center chuck, or step chuck blank (fig. 13), into the lathe draw-in chuck bar on the drive end of the headstock as required. For removal, unscrew the collet, center and center chuck, or step chuck blank, and slide out the lathe draw-in chuck bar.

45. Step Chuck Blanks and Spring Collet (fig. 13)

Step chuck blanks are supplied in the following sizes: one 2-inch, two 3-inch, one 4-inch, and one 5-inch. All step chuck blanks have a $\frac{9}{16}$-inch concentric hole to be bored to the desired diameter. The 2-inch step chuck blank threads into the end of the lathe draw-in chuck bar and closes as it is drawn into the headstock spindle mouth by turning the knurled knob on the lathe draw-in chuck bar. The 3-inch, 4-inch, and 5-inch step chuck blanks require a closing ring. The two small closing rings are used with the 3-inch and 4-inch sizes; the large closing ring is used with the 5-inch size. The closing rings thread onto the headstock spindle and the larger step chuck blanks thread into the lathe draw-in chuck bar. The spring collet is installed in the same way as the 2-inch step chuck blank.

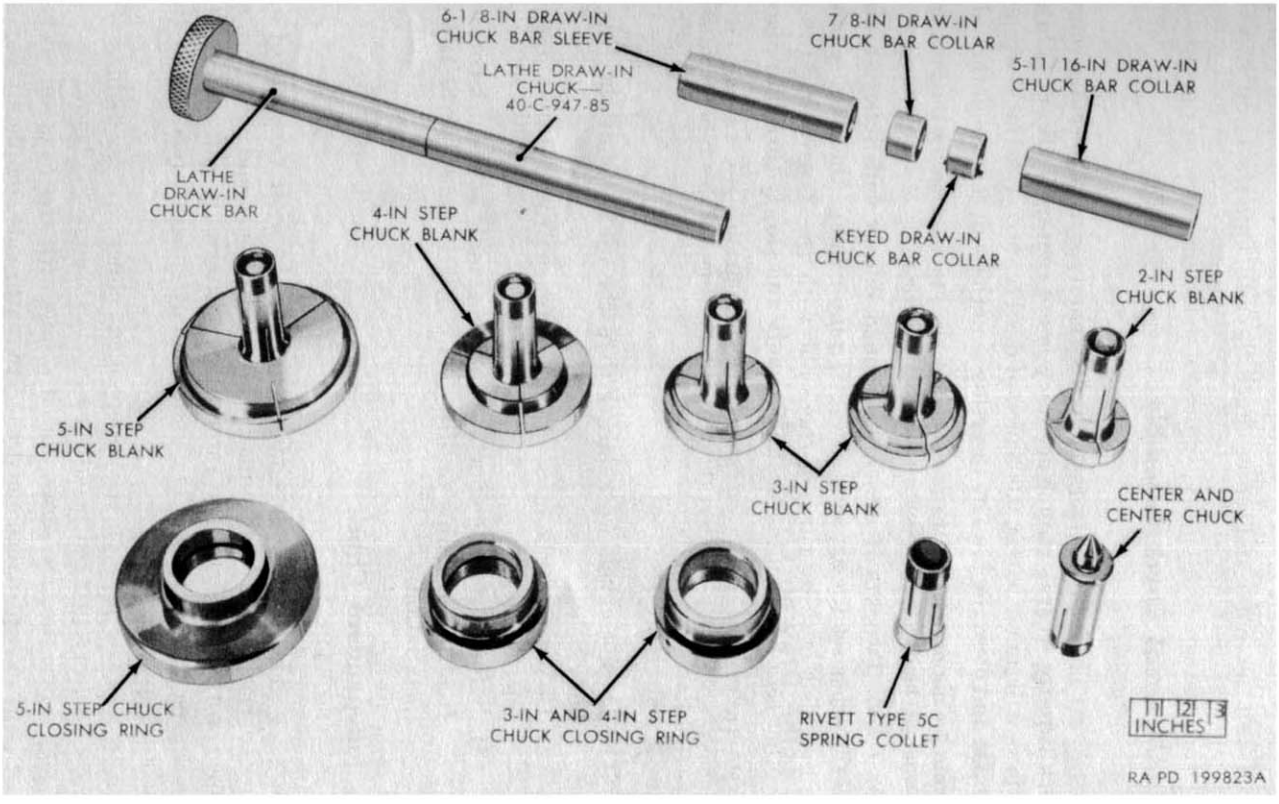


Figure 13. Equipment.

46. Center and Center Chuck

The center and center chuck consists of a soft male center taper fitted into the center chuck. The center chuck carries all forms of centers. To install the center and center chuck thread it into the lathe draw-in chuck bar.

47. Universal Chuck Assembly

(fig. 14)

a. Use. The 3-jaw universal chuck assembly is used to center round work rapidly where extreme accuracy is not required. Work held in its jaws will center within 0.003 inch of dead center. Use the T-wrench to open and close the jaws by inserting it in the square hole on the side.

Note. Do not overtighten the jaws on work since this will spring the jaws and internal mechanism which results in impaired accuracy.

b. Jaws. Two sets of jaws are provided, one set with internal jaws and the other set for external jaws. To interchange the jaws, remove the installed jaws by turning them out with the T-wrench. Insert the other set of jaws into the chuck evenly and slowly turn into place.

Note. The two sets of jaws are matched. Each individual jaw is stamped with a number. Be certain to insert the jaw with the same number into its position in the chuck.

c. Operating Precautions.

(1) Do not chuck work larger than the diameter of the chuck body.
(2) Do not force the jaws. Use the wrench provided for tightening the jaws.
(3) Before installing chucks, wipe the spindle and chuck threads free of any chips or dirt. Oil the threads lightly before installation.

48. Independent Chuck

(fig. 14)

a. Use. The 4-jaw independent chuck is the most versatile of all chucks. Each jaw is individually adjusted so that odd or irregular shaped work can be chucked internally or externally and centered to any degree of accuracy. The independent chuck threads onto the headstock spindle.

b. Jaws. The jaws on the independent chuck are reversible. To reverse the jaws, proceed as outlined in (1) through (5) below.

(1) Turn the jaw screw for any jaw with the hexagon socket wrench provided until the jaw unthreads completely out of the chuck body.
(2) Make sure the jaw, jaw slot, and jaw screw are free from dirt.
(3) Reverse the jaw and insert it into the jaw slot.

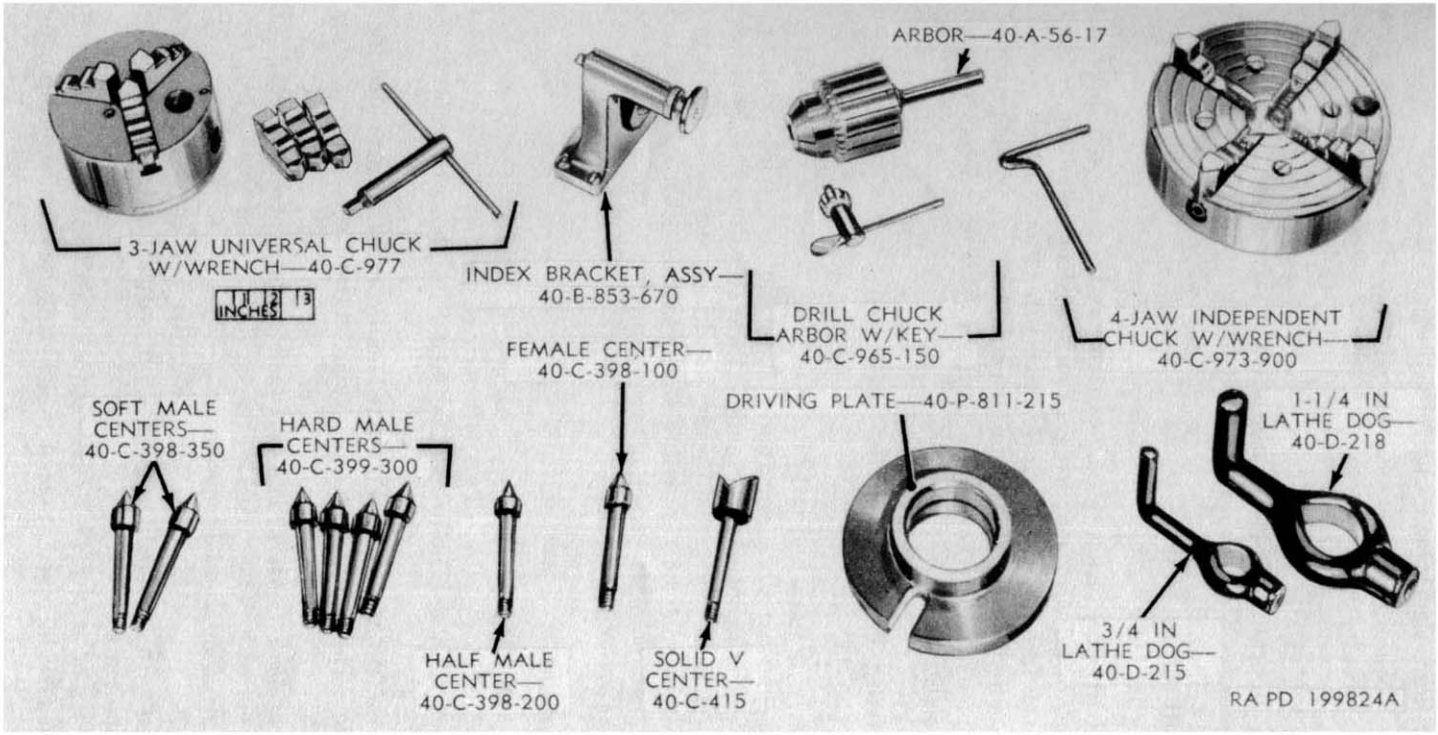


Figure 14. Equipment.

(4) Turn the jaw screw until the threads engage.

Note. Hold down the inside end of the jaw screw until three or four threads are engaged; this will keep the screw from tipping up which will cause the threads to bind or the bearing to cut the neck of the screw.

(5) Repeat the process with the other three jaws.

c. Operating Precautions. Refer to paragraph 47*c*.

49. Drill Chuck

(fig. 14)

The drill chuck has a ½-inch capacity and the arbor is tapered for headstock or tailstock mounting. For headstock operation, insert the drill chuck into the center chuck (par. 46). For tailstock operation, insert the drill chuck into the tailstock spindle. A key is provided to tighten or remove drills from the drill chuck. For tailstock operation, refer to paragraph 40.

50. Driving Plate and Lathe Dogs

(fig. 14)

The driving plate and lathe dogs are used together to prevent rotation of round bar stock when mounted on centers. The driving plate threads onto the headstock spindle. Two lathe dogs are provided for varying sizes of work. To use the lathe dog, secure the work in the mouth of the dog by tightening the hexagon socket setscrew in the head. Then mount the work between centers with the leg of the lathe dog in the driving plate slot.

51. Centers

(fig. 14)

a. Soft Male Centers. Two soft male centers are furnished for the headstock. These centers must be used with the center chuck (par. 46).

b. Hard Male Centers. Four hard male centers are provided for the tailstock. These centers simply taper-fit into the tailstock spindle (par. 40).

c. Half Male Center. The half male center has a hard head. The head is cut away to provide clearance for turning tools when facing ends or grinding small diameters.

d. Solid V-Center. The solid V-center has a 1 1/16-inch diameter soft head with a 90° included angle. It is used for drilling operations on tubular work.

e. Female Center. The female center has a hard head with a center hole and a 60° included internal angle. It is used for centering pointed work.

52. Indexing Attachment

a. Use. The complete indexing attachment consists of the index bracket assembly (fig. 14), the keyed draw-in chuck bar collar, the 6⅛-inch draw-in chuck bar sleeve (fig. 13), and one set of eight index plates (fig. 16). Each index plate can be identified by the number stamped on its face. The indexing attachment divides work held in the headstock spindle.

b. Installation (fig. 15).

(1) Mount the index bracket assembly to the top of the gear box with the four fillister-head screws. These screws are normally screwed into the gear box and should be left there when the indexing attachment is not being used.

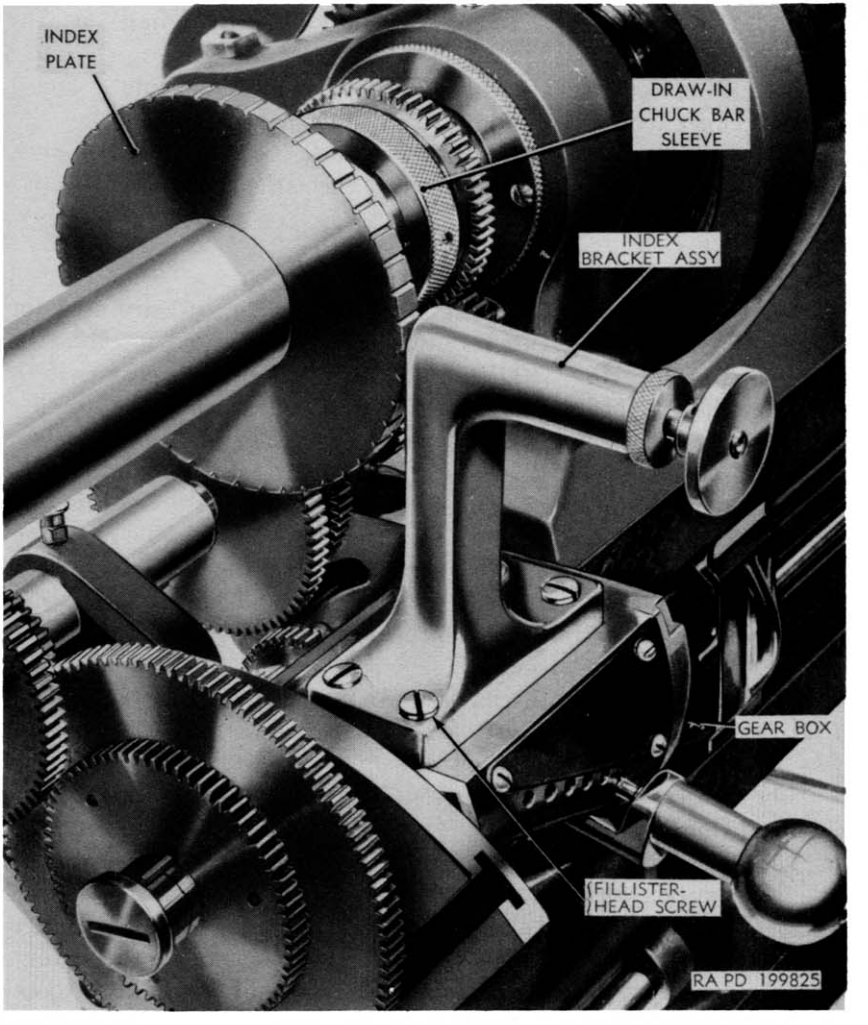


Figure 15. Indexing attachment installed.

(2) Remove the lathe draw-in chuck bar (fig. 13), sleeve, and collar (par. 44). Slide the $5^{11}/_{16}$-inch draw-in chuck bar collar (fig. 13) over the lathe draw-in chuck bar.

(3) Then slide the desired index plate (fig. 16) over the chuck bar followed by the keyed draw-in chuck bar collar. The single key on the collar should fit into the slot in the index plate.

(4) Slip the lathe draw-in chuck bar into the headstock spindle and thread on the desired collet or chuck (par. 44).

c. Operation. The index bracket plunger lever will not engage each division in the index plate. To rotate the index plate, pull the flat knob on the index bracket. After setting the position of the index plate, release the knob. Spring tension holds the index plate in place.

d. Removal.

(1) Remove the chuck or collet being used with the index attachment (par. 44).

(2) Slide out the lathe draw-in chuck bar, index plate, keyed chuck bar collar, and $6^1/_8$-inch chuck bar sleeve.

(3) Install the $6^1/_8$-inch draw-in chuck bar sleeve and $^7/_8$-inch draw-in chuck bar collar with the lathe draw-in chuck bar (fig. 13).

53. Standard English Change Gears

a. Use. The standard English change gears (fig. 16) are used for cutting three additional pitches of threads as indicated in table VI. Five gears are provided. The number of teeth on each gear is indicated by the number stamped on its face. Gears may be further identified by holes, pins, and keyways for use in their installation.

b. Installation.

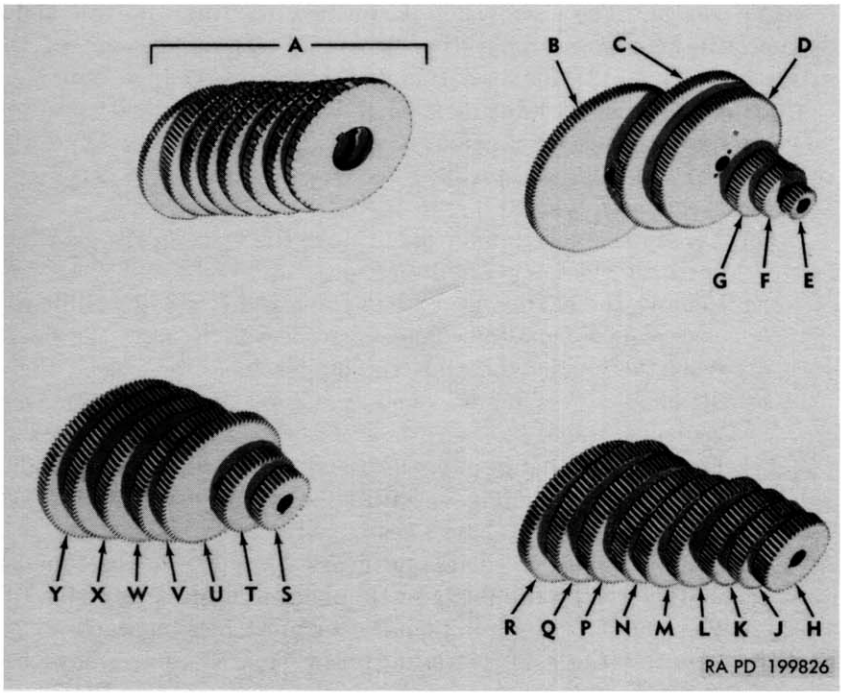
(1) Remove the lower compound gear (par. 18) and large and small fixed gears (fig. 8) by unscrewing the thimble retaining screw and gear retaining screw. Pull off the thimble.

(2) Place the 48-tooth gear with keyway and holes on the compound shaft in place of the fixed gears. Secure with the gear retaining screw.

(3) Slide the 90-tooth change gear with keyway and holes over the change gear shaft and key. Secure with the change gear shaft end screw (fig. 8).

(4) Loosen the yoke binder handle (fig. 7) so the yoke is free to move.

(5) The plain 90-tooth gear must be mounted to the yoke on the gear box with the complete change gear binder nut, including the bushings, and sleeve (fig. 18). Place the complete change gear binder into the rear slot in the yoke. Slide the change gear sleeve over the protruding binder and the plain 90-tooth gear over the sleeve. Secure the 90-tooth gear with the



A—Attachmant, lathe, index, one set of eight with 45, 56, 60, 64, 72, 80, 84, and 100 teeth—40–A–155
B—Gear, translating, metric, 127-tooth with pins
C—Gear, translating, metric, 120-tooth with holes
D—Gear, translating, metric, 105-tooth with holes
E—Gear, translating, metric, 24-tooth with keyway
F—Gear, translating, metric, 40-tooth with keyway
G—Gear, translating, English, 48-tooth with keyway and holes
H—Gear, translating, metric, 48-tooth with keyway
J—Gear, translating, metric, 54-tooth with keyway
K—Gear, translating, metric, 60-tooth with keyway and holes
L—Gear, translating, English, 69-tooth with keyway and holes
M—Gear, translating, metric, 70-tooth with holes
N—Gear, translating, metric, 72-tooth with keyway and holes
P—Gear, translating, metric, 81-tooth
Q—Gear, translating, English, 90-tooth with keyway and holes
R—Gear translating, metric, 90-tooth with keyway and holes
S—Gear, translating, metric, 36-tooth with keyway
T—Gear, translating, metric, 50-tooth with keyway
U—Gear, translating, English, 81-tooth with keyway and holes
V—Gear, translating, metric, 81-tooth with keyway
W—Gear, translating, English, 90-tooth, plain
X—Gear, translating, metric, 96-tooth with keyway
Y—Gear, translating, metric, 100-tooth with keyway and holes

Figure 16. Index plates and translating gears.

change gear nut and one of the bushings. Select the change gear bushing which will properly take up the space between the plain 90-tooth gear and nut so that there is no sideplay or binding action.

(6) Move the yoke until the change gears mesh properly. It may be necessary to slide the plain 90-tooth gear up or down. Then lock the yoke by tightening the yoke binder nut.

c. Operation. The installation performed in paragraph 53 *b* above is the only necessary preparation except the disengagement of the index lever (par. 12) for operation of the English change gears.

Caution: The index lever must be in disengaged (neutral) position when changing gears or translating gears. This does not affect the operation of other lathe controls.

d. Removal for Regular Operation.

(1) Loosen the yoke binder nut. Move the yoke on the gear box until the change gears disengage.

(2) Remove the change gear binder nut and bushing. Slide the change gear from the change gear sleeve. Remove the sleeve from the binder and slide the binder from the yoke. Place the change gear binder parts in a convenient place for convenient storage.

(3) Unscrew the change gear shaft end screw (fig. 8) and remove the 90-tooth change gear with keyway and holes. Screw the end screw into the change gear shaft.

(4) Fasten the lower compound gears (par. 18) to the tumbler shaft with the thimble and thimble retaining screw (fig. 8). The smaller lower compound gear must face outward.

(5) Unscrew the gear retaining screw (fig. 8) and remove the 48-tooth change gear with keyway and holes. Place the large and small fixed gears (fig. 8) on this compound shaft and secure with the gear retaining screw. The large fixed gear should face outward.

Table VI. English Change Gears

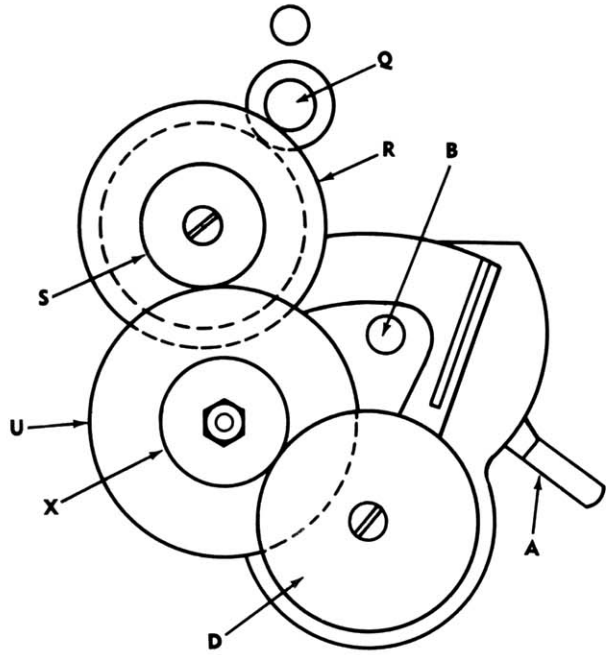
Threads per inch	Stud gear		S Driver	T Connecting	D Lead screw
	Q Driver	R Driven			
11½	30	60	48	90	69
15	30	60	48	90	90
27	18	72	48	90	81

Note. Gear T is single gear but functions the same as gears U and X for metric threads (fig. 17).
Formula for special setup using 90-tooth connecting gear T:

$$N=\frac{PQS}{4R}$$

and where:

N=number of teeth in gear D
P=number of threads per inch
S=number of teeth in gear S
R=number of teeth in gear R
Q=number of teeth in gear Q



A — INDEX LEVER
D — LEAD SCREW GEAR
Q — STUD GEAR, DRIVER
R — STUD GEAR, DRIVEN
S — FIXED GEAR, DRIVER
U — COMPOUND GEAR, DRIVEN
X — COMPOUND GEAR, DRIVER

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Figure 17. Gearing diagram.

54. Metric Translating Gears

a. Use. Two sets of metric translating gears are provided for cutting metric threads. One set of nine translating gears is used to connect the gear box for metric pitches. The other set of seven gears is used for special metric pitches with the index lever disengaged. The translating gears (fig. 16) can be identified by the number stamped on their faces which indicates number of teeth. Each gear can be further identified by pins, holes, and keyways used in assembly of the gears.

b. Installation for Operation Through Gear Box.

(1) Remove the lower compound gear (par. 18) and large and small fixed gears (fig. 8) by unscrewing the thimble retaining screw and gear retaining screw. Pull off the thimble.

(2) Select the translating gears to be used with aid of table VII and figure 16.

(3) Secure the proper fixed gear to the compound shaft with the gear retaining screw.

(4) Secure the desired driven gear to the tumbler shaft with the thimble retaining screw. This gear replaces the lower compound gear (par. 18) when cutting metric threads.

(5) Loosen the yoke binder handle (fig. 7) so the yoke is free to move.

(6) Assemble the proper driver and driven gears to form the compound gear. Mount and fasten the position of the compound gear (par. 53) with the complete change gear binder (fig. 18).

c. Installation for Direct Feed Rod Gearing.

(1) Remove the lower compound gear and large and small fixed gears (fig. 8) by unscrewing the thimble retaining screw and gear retaining screw (fig. 8). Pull off the thimble.

(2) Select the translating gears to be used with the aid of table VIII and figure 16.

(3) Fasten the proper fixed gear to the compound shaft with the gear retaining screw.

(4) Fasten the desired lead screw gear to the change gear shaft with the shaft end screw (fig. 8).

(5) Loosen the yoke binder handle (fig. 7) so the yoke is free to move.

(6) Assemble the proper driver and driven gears to form the compound gear. Install these gears with the change gear binder as described in paragraph 53*b*(5) and (6).

d. Operation. When the translating gears are connected to drive through the gear box, the index lever (fig. 7) is used to select the metric pitch as indicated in table VII. The index lever must be disengaged when special metric threads are being cut as indicated in table VIII. All other controls are operated normally.

e. Removal for Regular Operation.

(1) Loosen the yoke binder nut. Rotate the yoke until the translating gears disengage.

(2) Remove the change gear binder nut and bushing. Slide the translating gears from the change gear sleeve. Remove the change gear sleeve and binder from the yoke. Place the binder parts in a safe place for convenient storage.

(3) Remove the translating gear from the tumbler shaft or change gear shaft as the case may be.

(4) Remove the fixed gear from the compound shaft.

(5) Fasten the lower compound gears to the tumbler shaft with the thimble and thimble retaining screws (fig. 8).

(6) Place the large and small fixed gears on the compound shaft and secure with the gear retaining screw (fig. 8).

Table VII. Metric Translating Gear Threads

Threads cut through regular gear box

Millimeters pitch left-position of index lever-right							Stud gear		Fixed gear	Compound gear		Tumbler shaft
							Q Driver	R Driven	S Driver	U Driven	X Driver	B Driven
2. 00	1. 82	1. 67	1. 54	1. 43	1. 25	1. 11	30	60	40	127	120	48
1. 00	0. 91	0. 83	0. 77	0. 71	0. 625	0. 56	18	72	40	127	120	48
0. 50	0. 45	0. 42	0. 38	0. 36	0. 31	0. 28	18	72	36	127	100	72
0. 25	0. 23	0. 21	0. 19	0. 18	0. 156	0. 14	18	72	40	127	60	96
Swing gear box to engage 18-T-gear on stud						0. 67	18	60	40	127	120	48
with 60-T sliding gear						0. 17	18	60	36	127	100	72

Lathe Screw Constant=4
Lead Screw=8 threads per inch.

Table VIII. Special Metric Translating Gear Threads

Pitch MM	Stud gear		Fixed gear	Compound gear		Lead screw
	Q Driver	R Driven	S Driver	U Driven	X Driver	D
2.50	30	60	81	127	100	81
1.75	30	60	36	127	105	54
1.50	30	60	40	127	90	60
0.90	30	60	36	127	90	90
0.81	30	60	40	127	81	100
0.75	18	72	40	127	90	60
0.48	18	72	48	127	72	90
0.35	18	72	40	127	70	100
0.15	18	72	24	127	50	100

Formula for special setup where U is 127-tooth gear:

$$M=\frac{SQX}{20RD}$$

and where:

M=Millimeters linear pitch
S=number of teeth in gear S
Q=number of teeth in gear Q
X=number of teeth in gear X
R=number of teeth in gear R
D=number of teeth in gear D

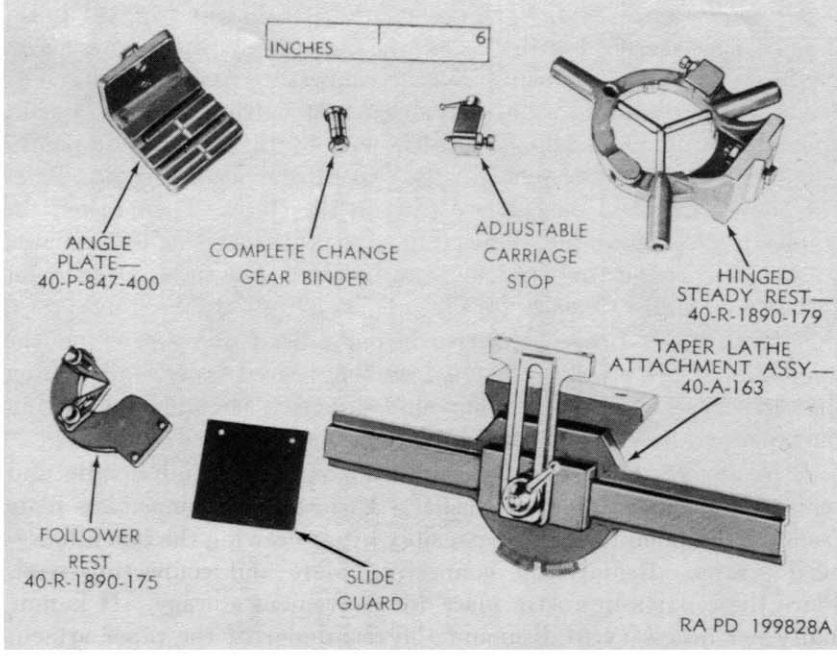


Figure 18. Attachments.

55. Carriage Stop

a. Use. The adjustable carriage stop (fig. 18) is used to stop the carriage automatically when being moved to the left with the friction lever. This eliminates the necessity of releasing the friction lever at the end of a cut.

b. Installation. Manually move the carriage to the position where you wish it to stop. Lock the carriage stop to the lower V on the front of the lathe bed with the binder handle on the carriage stop. The pointed end of the adjusting screw should just enter the countersunk hole in the stop lever (fig. 10). Then turn the adjusting screw in the carriage stop until it just releases the stop lever. Mak a test run with the friction lever power feed engaged to check the carriage stop adjustment.

c. Removal. Loosen the binder handle and slip the carriage stop from the dovetailed guideway.

56. Taper Lathe Attachment

a. Use. The taper lathe attachment (fig. 18) is used for taper turning and boring with the friction lever. It affords the only accurate means for cutting taper threads. The dovetailed guide bar swivels to set the desired taper. Tapers may be cut up to 10 degrees or 4 inches per foot in either direction up to a maximum of 13 inches in length.

b. Installation. Secure the taper lathe attachment (fig. 18) to the rear of the lathe bed with the two hexagon-head cap screws. This mounting can be permanent since the connecting plate and attaching parts can be removed separately when not cutting tapers. Fasten the connecting plate (fig. 19) to the end of the lower slide on the compound slide rest assembly with two fillister-head screws. Place the connecting stud on the two pins in the slide. Then fasten the connecting plate to the connecting stud with the connecting stud washer, and connecting stud nut and handle. The taper attachment is shown on figure 19 ready for use.

c. Operation. Loosen the two hexagon-head cap screws on the underside of the bracket (fig. 19), set the desired taper, and tighten the cap screws. Locate the compound slide rest assembly for cutting the taper and lock the connecting plate in place.

d. Removal. Unscrew the connecting stud nut and handle and remove the connecting stud washer. Unfasten the connecting plate from the compound slide rest assembly by unscrewing the two fillister-head screws. Remove the connecting plate and connecting stud. Place these parts in a safe place for convenient storage. It is normally not necessary to dismount the remainder of the taper attachment from the lathe.

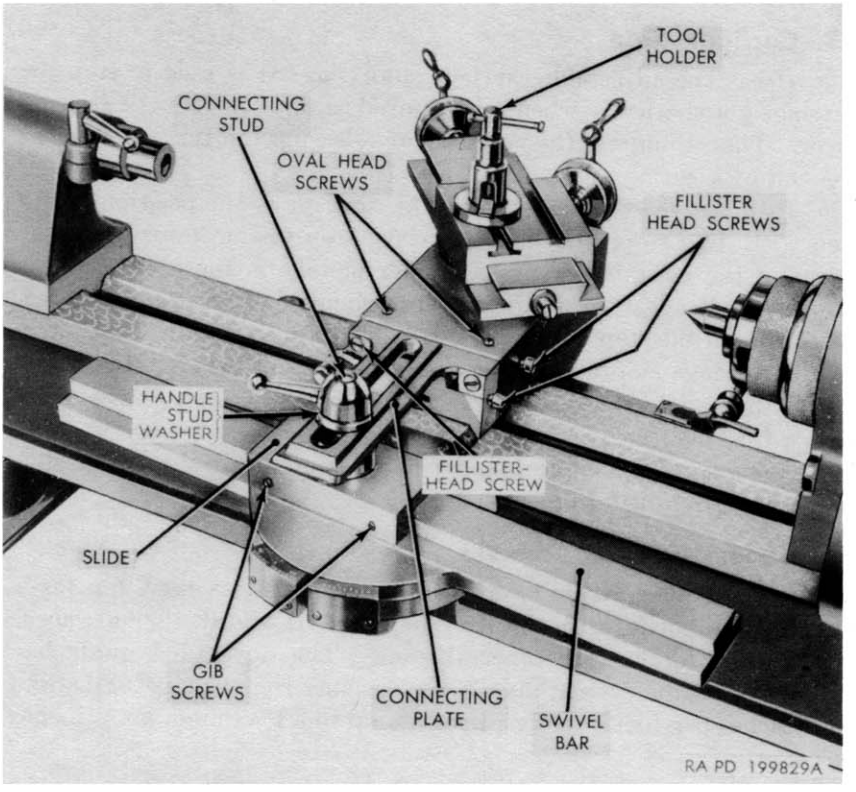


Figure 19. Taper lathe attachment.

57. Hinged Steady Rest

a. Use. The hinged steady rest (fig. 18) is used to support long round work between centers. It may be used to support chucked work but for fine accurate work the headstock and tailstock centers are used. It is hinged for convenient mounting of work. Work is centered with three brass jaws to a capacity of 4 inches.

b. Installation and Operation. Remove the tailstock and slide the hinged steady rest onto the lathe bed. Place the tailstock on the lathe bed. Open the hinged steady rest and center the work on the headstock and tailstock center. Adjust the two lower brass jaws with the lock screws and adjusting screws. The adjusting screws are located in the jaw barrels. The locking screws are located in the ring. Close and secure the hinged steady rest. Then adjust the top brass jaw to eliminate any play.

Note. This adjustment must be made carefully as the work revolves in the jaws.

c. Removal. Open the hinged steady rest and remove the work from the lathe centers. Release and remove the tailstock. Then slide

off the hinged steady rest. Place the tailstock on the lathe bed and lock in position.

58. Follower Rest

a. Use. The follower rest (fig. 18) is used to support work which tends to spring away from the cutting tool. This is particularly true with small-diameter work. The follower rest has two adjustable brass jaws for centering work which bear directly on the finished surface. The follower rest has a 3-inch capacity. On long small-diameter work, the follower rest and hinged steady rest are both used. The centering of work must be very carefully adjusted in this case.

b. Installation and Operation. Mount the follower rest to the side of the slide rest base with the two fillister-head screws (fig. 19). Adjust the brass jaws with their adjusting screws to center the work.

c. Removal. Release any tension on the work by loosening the brass jaws. Unscrew the two fillister-head screws (fig. 19) in the side of the carriage angle to remove the follower rest.

59. Angle Plate

The angle plate (fig. 18) is used on the compound slide rest assembly for holding work. There are T-slots and vee grooves in the angle plate for mounting. To mount the angle plate, first loosen the two flat head screws in the angle plate. Slide the angle plate into the T-slots in the top slide and tighten the flat head screws.

60. Slide Guard

The bottom slide guard (fig. 18) is used to protect the lower slide on the compound slide rest assembly. It is easily fastened to the lower slide with the two oval head screws (fig. 19) provided. The lips on the slide guard should face downward.

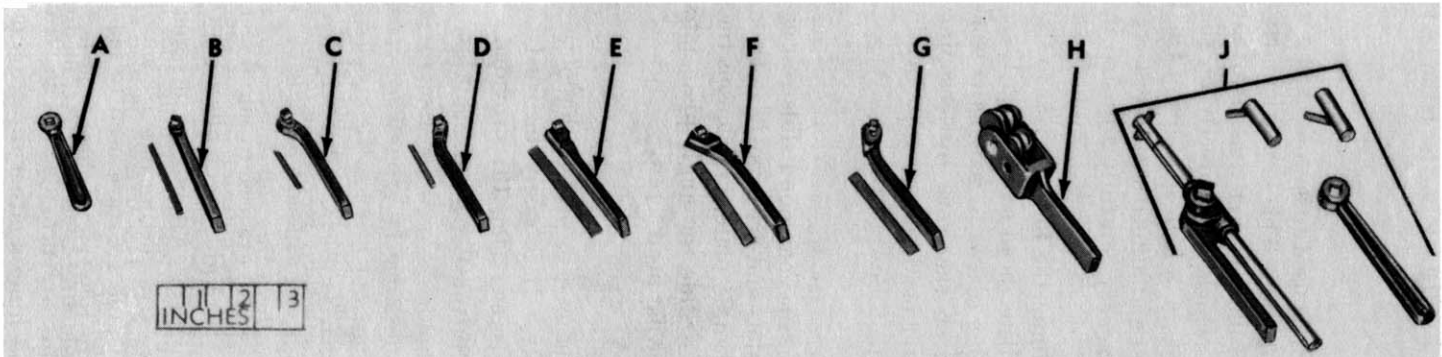
61. Tools

(fig. 20)

a. Cutting Tool Holder Wrench. The cutting tool holder wrench is used to tighten the various tool bits in their respective tool holders (table IX).

b. Cutting Bits. Cutting bits (table IX) are used to cut off sections of work such as starting shoulders. Straight, right offset, and left offset cutting-off tool holders are provided. All cutting bits must be ground for a specific operation. Six extra cutting bits are supplied.

c. Turning Tools. Turning bits (table IX) are used to machine work down to a desired diameter. Straight, right offset, and left offset cutting tool holders with tool bits are provided. The straight cutting tool holder can be used to machine in either direction or for cutting threads depending on how the tool bit is ground. The left



A—WRENCH, CUTTING TOOL HOLDER, SQ, 1/4-IN—41-W-639-760
B—HOLDER, CUTTING TOOL, TURNING, STGHT, (W/TURNING BIT)—40-H-708
C—HOLDER, CUTTING TOOL, TURNING, LEFT-OFFSET, (W/TURNING BIT)—40-H-690-25
D—HOLDER, CUTTING TOOL, TURNING, RIGHT-OFFSET, (W/TURNING BIT)—40-H-699
E—HOLDER, CUTTING TOOL, STGHT, (W/CUTTING BIT)—40-H-622-75
F—HOLDER, CUTTING TOOL, LEFT-OFFSET, (W/CUTTING BIT)—40-H-610
G—HOLDER, CUTTING TOOL, RIGHT-OFFSET (W/CUTTING BIT)—40-H-617
H—HOLDER, TOOL KNURLING, (W/FINE, MEDIUM, AND COARSE KNURLS)—40-H-635
J—HOLDER, TOOL, BORING BAR (W/30 DEG, 45 DEG, AND 90 DEG END CAPS, BITS AND WRENCH)—40-H-600

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Figure 20. Tools and equipment.

Table IX. Equipment for Operation and Organizational Maintenance

Item	Identifying number	References		Use
		Fig	Par	
HOLDER, cutting tool, turning, stght, w/turning bit.	40–H–708	B, fig. 20	41	Secures tools to upper slide.
HOLDER, cutting tool, turning, left offset, w/turning bit.	40–H–690–25	C, fig. 20	41	Secures tools to upper slide.
HOLDER, cutting tool, turning, right offset, w/turning bit.	40–H–699	D, fig. 20	41	Secures tools to upper slide.
HOLDER, cutting tool, stght, w/cutting bit.	40–H–622–75	E, fig. 20	41	Secures tools to upper slide.
HOLDER, cutting tool, left offset, w/cutting bit.	40–H–610	F, fig. 20	41	Secures tools to upper slide.
HOLDER, cutting tool, right offset, w/cutting bit.	40–H–617	G, fig. 20	41	Secures tools to upper slide.
HOLDER, cutting tool, w/boring bar, 30, 45, and 90 deg end caps, cutters, and wrench, 5/16 x 3/4 in. shank, 1/2 in. bar diam.	40–H–600	J, fig. 20	41	Secures cutting tool to upper slide.
HOLDER, tool, knurling, w/fine, medium, and coarse knurls.	40–H–635	H, fig. 20	41	For knurling operations.
WRENCH, cutting tool holder, sq, 1/4 in.	41–W–639–760	A, fig. 20	----	To secure cutting tool draw-in in tool holder.

offset cutting tool holder is used for facing left-hand shoulders and faces. The right offset cutting tool holder is used for facing right-hand shoulders and faces. Cutting bits must be ground for specific application. Twenty-five spare cutting tool bits are furnished.

d. Boring Bar Tool. The boring bar is used for boring, threading, and facing work internally. Three end caps are provided. The 90-degree end cap and tool bit is for threading, 60-degree end cap and tool bit for boring, and 45-degree end cap and tool bit for facing. Each tool bit must be ground for specific application. Ten extra tool bits are supplied. These tool bits are identical to turning tool bits except they are usually shorter. A boring bar wrench is also supplied to tighten the boring bar in its holder.

e. Knurling Tool. One complete knurling tool with fine, medium, and coarse knurls is provided.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

62. General

In addition to normal operating procedures described in paragraphs 76 through 78, special instructions for operating under unusual conditions are contained herein. In addition to the normal preventive maintenance services (pars. 76–78), special care in cleaning and lubrication must be observed where extremes of temperature, humidity, and atmospheric conditions are present. Proper cleaning, lubrication, and storage and handling of lubricants not only insure proper operation and functioning, but also guard against excessive wear of the working parts and deterioration of the materiel.

63. Operation in Extreme Hot-Weather Conditions

The engine lathe may be operated in extreme temperatures provided proper lubrication is observed (par. 72). High spindle speeds (par. 36) and heavy cuts should be avoided in such instances but care should be taken not to overload the lathe since this may overheat the motor.

64. Operation Under Dusty or Sandy Conditions

The engine lathe will function normally in dusty conditions. However, the external surfaces should be wiped clean with a dry rag before and after use, taking care to keep the crevices around the pulleys, gear box, speed box, switch, and motor as clean as possible. With lathe running, frequently blow dry compressed air through all ventilator slots. This will prevent particles of dust or dirt from accumulating on the stator windings and moving parts, which, if not removed, may cause electrical groundings and/or extreme wear to parts. Keep covered when not in use.

65. Operation in Extreme Cold-Weather Conditions

The engine lathe will function in such temperature and atmospheric conditions to permit the flow of fuel voltage from the power source.

66. Operation in High Humidity

The engine lathe will function normally in high humidity. However, prior to operating in humid weather, a warmup period of from 4 to 5 minutes should be undertaken to dispel condensed moisture.

Warning: When placed in operation, condensation within the motor can result in internal short circuits which can transmit a severe shock to the operator. Therefore, check ground connection (par. 8) prior to operation.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SPARE PARTS, TOOLS, AND EQUIPMENT FOR OPERATION AND ORGANIZATIONAL MAINTENANCE

67. General

Spare parts, tools, and equipment are issued to the using organization for operating and maintaining the bench type engine lathe. Tools and equipment should not be used for purposes other than prescribed and, when not in use, should be properly stored.

68. Spare Parts

Spare parts are supplied to the using organization for replacement of those parts most likely to become worn, broken, or otherwise unserviceable providing replacement of these parts is within the scope of organizational maintenance functions. Spare parts supplied with the engine lathe are listed in Department of the Army Supply Manual ORD 7–8 SNL J–268 which is the authority for requisitioning replacements.

69. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this materiel are authorized for issue to first echelon by Department of the Army Supply Manual ORD 7–8– SNL J–268. Common tools and equipment for second echelon are listed in ORD 6 SNL J–10, Section 4 and are authorized for issue by TA and TOE.

70. Equipment

Certain equipment specifically designed for operation, organizational maintenance, repair, and general use with the material are listed in table IX for information only. This list is not to be used for requisitioning replacements.

71. Organizational Maintenance Responsibility

Organizational maintenance is limited by the availability of spare parts, tools and equipment for the materiel. Maintenance operations beyond the scope or facilities of the using organization are the responsibility of the supporting ordnance maintenance unit (par. 2).

Section II. LUBRICATION AND PAINTING

72. Lubrication Chart

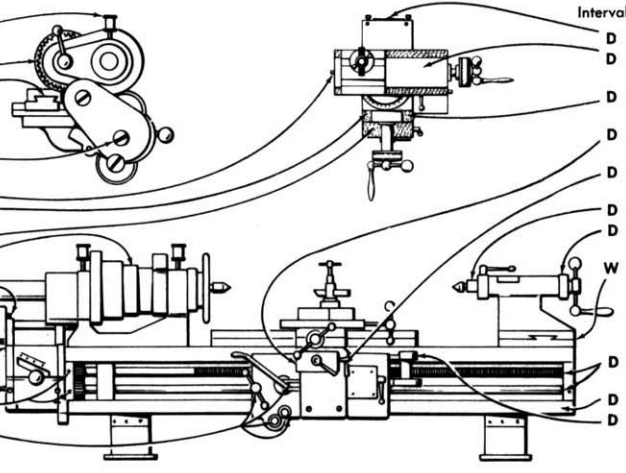
Lubrication chart (fig. 21) prescribes cleaning and lubricating procedures as to locations, intervals, and proper materials for the bench type engine lathe. Lubrication which is to be performed by ordnance maintenance personnel is listed on the lubrication chart in NOTES.

LUBRICATION CHART

BACK GEARED QUICK CHANGE GEAR BOX 40-INCH BED 8-1/2 INCH SWING 3 PH 60 CYCLE 220 VOLT PRECISION BENCH TYPE ENGINE LATHE, (RIVETT LATHE AND GRINDER INC-MODEL 608-PC) (40-L-22)

Intervals are based on normal 8-day operation. Reduce intervals to compensate for abnormal conditions, or activities. During inactive periods, intervals may be extended to commensurate with adequate preservation.

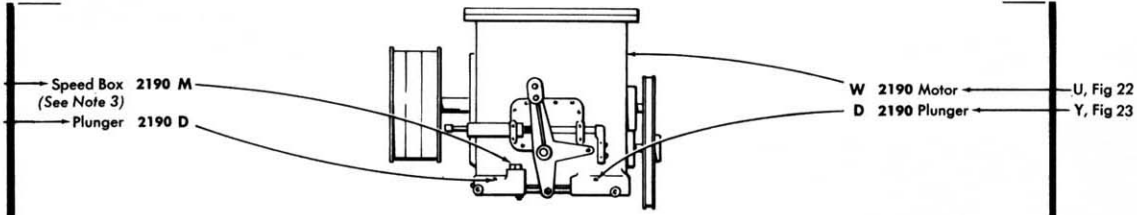
Clean surface around lubrication points before lubricating the unit. Clean parts, mineral spirits paint thinner, or dry cleaning solvent. Dry before lubricating.



Lubricant-Interval				Interval-Lubricant			
E, Fig 22	Headstock Bearings	2190	D	D	2190	Feed Screw	AA, Fig 23
F, Fig 22	Back Gear	2190	D	D	2190	Slide Rest *(See Note 4)*	K, Fig 22
Z, Fig 23	Taper Attachment *(See Note 4)*	2190	D	D	2190	Carriage Angle *(See Note 4)*	L, Fig 22
G, Fig 22	Tumbler Shaft and Bushing	2190	D	D	2190	Carriage Bearings	H, Fig 22
AA, Fig 23	Feed Screw	2190	D	D	2190	Carriage Bearings	P, Fig 22
K, Fig 22	Slide Rest *(See Note 4)*	2190	D	D	2190	Tailstock Spindle	V, Fig 23
M & N, Fig 22	Carriage Angle *(See Note 1)*	2190	D	D	2190	Tailstock Bearing	W, Fig 23
D, Fig 22	Pulley Gear *(See Note 6)*	2190	D	W	2190	Tailstock Base *(See Note 5)*	Y, Fig 23
A, Fig 22	Compound Shaft	2190	D				
B, Fig 22	Gear Box Bearings	2190	D	D	2190	Head Screw and Feed Rod	X, Fig 23
C, Fig 22	Lead Screw and Feed Rod	2190	D	D	2190	Bedways	Q, Fig 22
J, Fig 22	Carriage Bearings	2190	D	D	2190	Threading Dial	R, Fig 22

FOLD

FOLD



— NOTES —

1. CARRIAGE ANGLE — Every day dismount slide rest. Apply several drops of oil to ball covered holes in top of carriage angle. Remove oil screws, apply several drops of oil to oil hole and replace oil screw. Mount slide rest.
2. OIL CUPS — Check oil level in headstock and compound shaft oil cups daily. Fill oil cups as necessary.
3. SPEED BOX — Every month remove drain plug under speed box and drain all oil. Replace drain plug. Remove refill plug and fill speed box with oil to level of the plug. Replace refill plug.
4. SLIDING SURFACES — Apply a light uniform film of oil to the bed ways and sliding surfaces of the slide rest and carriage angle with a small clean brush daily. Taper attachment should be lubricated in same way whether it is mounted or not.
5. TAILSTOCK BASE — Every week set-over the tailstock and apply a light uniform film of oil to the tailstock base.
6. PULLEY GEAR — Every day remove oil screw in drive pulley and apply several drops of oil to oil holes. Replace oil screw.
7. OIL CAN POINTS — Every day apply several drops of oil to all oil holes, open or ball covered.
8. Every day, wipe unpainted metal with an oil soaked cloth.

— KEY —

LUBRICANTS	EXPECTED TEMPERATURES			INTERVALS
	above 32° F.	+ 40° F to - 10° F	0° F to - 65° F	
2190 — Oil, lubricating, general purpose.	**2190**	**2190**	**2075**	**D** — Daily **W** — Weekly **M** — Monthly
2075—Oil, lubricating, general purpose				

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Figure 21. Lubrication chart.

73. General Lubrication Instructions

a. Usual Conditions. Lubrication service intervals specified on the lubrication chart are for normal operation and where moderate temperature and humidity previal.

b. Points of Application.

(1) Lubrication fittings, grease cups, and oilholes are shown in figures 22 and 23 and are keyed to facilitate referencing in the lubrication chart (fig. 21). Wipe these devices and the surrounding surfaces clean before applying lubricant.

(2) A ¾-inch red circle should be painted around all lubricating fittings and oilholes.

c. Reports and Records. Report unsatisfactory performance of materiel or effect of prescribed lubricants and preserving materials, using DA Form 468.

74. Lubrication Under Unusual Conditions

a. Unusual Conditions. Reduce lubrication service intervals specified on the lubrication chart to compensate for abnormal operation and extreme conditions, such as high or low temperatures, prolonged periods of high-speed operation, continued operation in sand or dust, or exposure to moisture, any one of which may quickly destroy the protective qualities of the lubricant. Lubrication intervals may be extended during inactive periods.

b. Changing Grade of Lubricants. Lubricants are prescribed in the "Key" in accordance with three temperature ranges: above +32° F., from +40° to −10° F., and from 0° to −65° F. When to change grade of lubricants is determined by maintaining a close check on operation of the engine lathe during the approach to changeover periods in accordance with weather forecast data. Ordinarily, it will be necessary to change grade of lubricants only when air temperatures are consistently in the next higher or lower range.

75. Painting

No painting is required on the engine lathe.

Section III. PREVENTIVE MAINTENANCE SERVICES

76. General

a. Responsibility and Intervals. The primary function of preventive maintenance is to prevent breakdowns and, therefore, the need for repair. Preventive maintenance services are the responsibility of the using organization. These services consist generally of before-operation, during-operation, and after-operation services performed by the operator and the scheduled services to be performed at designated intervals by the organization mechanic. Intervals are based on normal operations. Reduce intervals for abnormal operations or severe conditions. Intervals during inactive periods may be extended accordingly.

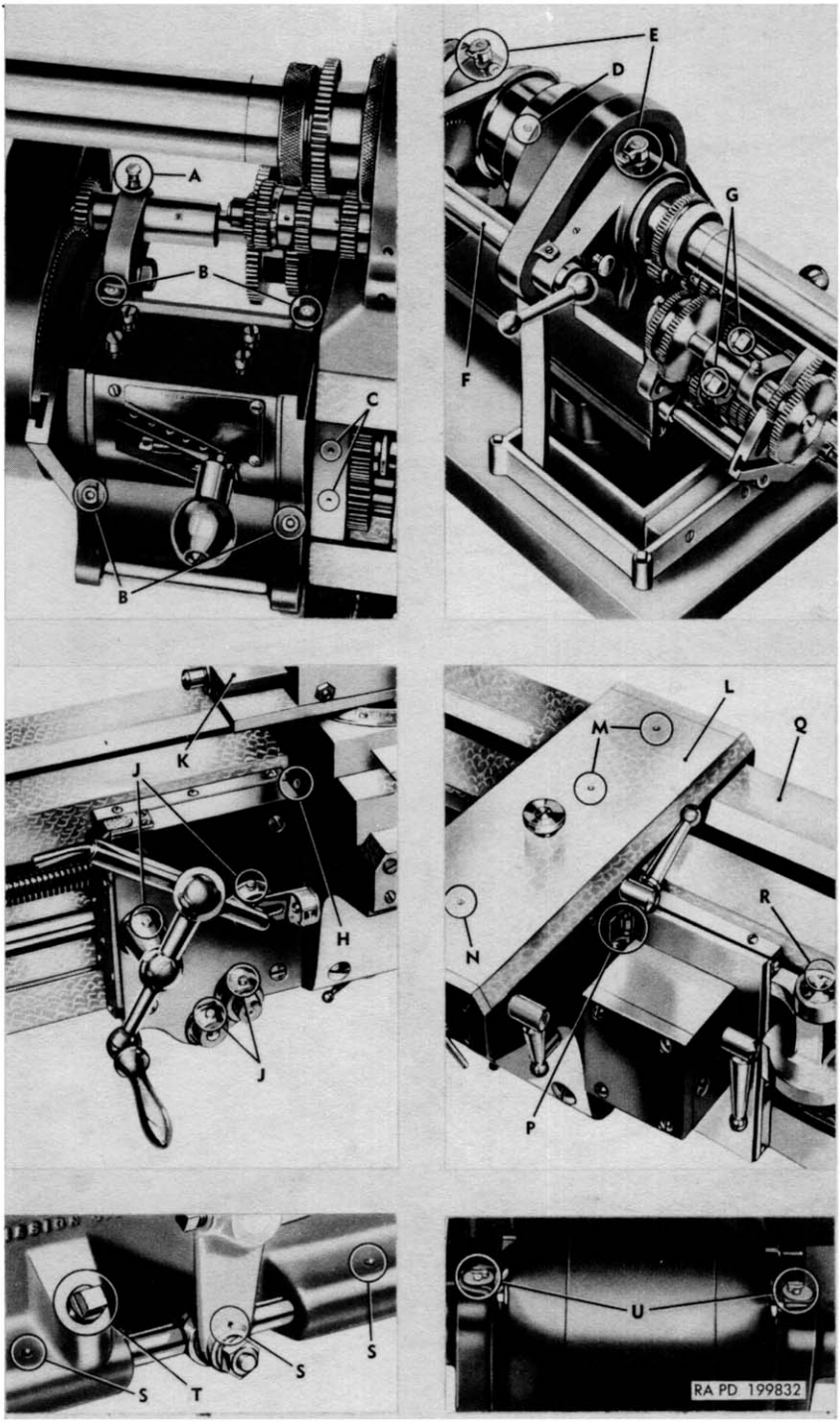


Figure 22. Localized lubrication points (A through U).

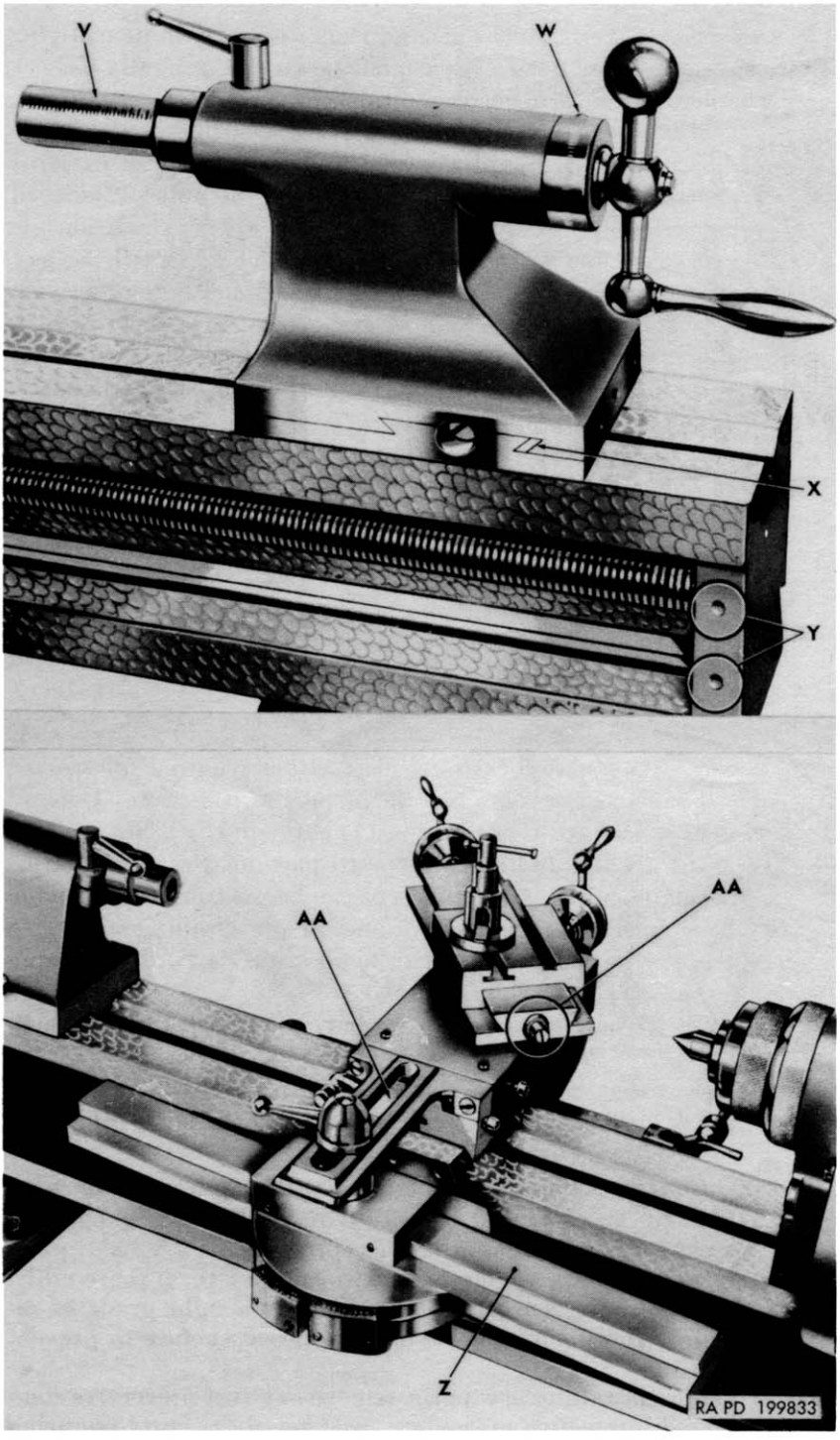


Figure 23. Localized lubrication points (V through AA).

b. Definition of Terms. The general inspection of each item applies also to any supporting member or connection and is generally a check to see whether the item is in good condition, correctly assembled, secure, and not excessive worn.

(1) The inspection for "good condition" is usually an external visual inspection to determine whether the unit is damaged beyond serviceable limits. The term "good condition" is explained further by the following: not bent or twisted, not chafed or burred, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut, not deteriorated.

(2) The inspection of a unit to see that it is "correctely assembled" is usually an external visual inspection to see whether it is in its normal assembled position.

(3) Inspection of a unit to determine if it is "secure" is usually an external visual examination or an examination by hand or wrench for looseness. Such an examination must include any brackets, lockwashers, locknuts, locking wires, or cotter pins used.

(4) By "excessively worn" is meant worn beyond serviceable limits or to a point likely to result in failure if the unit is not replaced before the next scheduled inspection.

77. Cleaning

a. General. Any special cleaning instructions required for specific mechanisms or parts are contained in the pertinent section. General cleaning instructions are as outlined in (1) through (5) below.

(1) Wipe all dirt and chips from all parts of the engine lathe. A small brush of the paint type can be used for this purpose.

(2) Use mineral spirits paint thinner or dry-cleaning solvent to clean or wash grease or oil from all metal parts of the engine lathe.

Note. Whenever grease or oil is removed, immediately oil all scraped and polished surfaces.

(3) Use carbon tetrachloride for cleaning all electrical parts. See *b* (1) below for general precautions when cleaning with carbon tetrachloride.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. make sure adequate ventilation is provided.

(4) After the parts are cleaned, rinse and dry them thoroughly. Take care to keep parts clean. Apply a light grade of oil (2075) to all surfaces having a polished surface to prevent rust.

(5) Before installing new parts, remove any rust preventive compound, protective grease, etc., and for those parts requiring lubrication, apply the lubricant prescribed in the lubrication chart.

b. General Precautions in Cleaning.

(1) Provide adequate ventilation both during and after use of carbon tetrachloride. Work rooms must not be closed in. Avoid prolonged inhalation of vapor; headache or nausea may result. In contact with skin, this cleaner may cause irritation.

(2) Mineral spirits paint thinner and dry-cleaning solvent are flammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used. Use only in well-ventilated places.

(3) These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin and, in the case of some individuals, a mild irritation or inflammation.

(4) Avoid getting petroleum products, such as dry-cleaning solvent, mineral spirits paint thinner, engine fuels, or lubricants on rubber parts, as they will deteriorate the rubber.

(5) The use of Diesel fuel oil, gasoline, or benzine (benzol) for cleaning is prohibited.

(6) Never use soap solutions or water to clean the engine lathe. Water and moisture will quickly stain and rust highly finished surfaces.

Table X. Organizational Preventive Maintenance Services

Intervals				Procedure
Before operation	During operation	After operation	Weekly	
				USUAL CONDITIONS
		X	X	*Cleanliness.* Keep the lathe free of chips and dirt. Clean as often as necessary (par. 77). Wipe off excess cutting oils and lubricants.
X	------	------	------	*Flat drive and V belts.* Inspect the belts for proper tension and any indications of wear. If belts are frayed or badly worn, replace (par. 8).
		X	X	*Equipment.* Place all equipment into racks or cabinets. Do not allow equipment to lay on the bench or lathe.
		X	------	*Controls.* Place all controls in neutral or disengaged position after the day's operation.
X	------	------	------	*Power source.* Check power source for proper voltage (par. 6).
				UNUSUAL CONDITIONS
X	------	------	------	*Extreme cold.* Check for proper lubrication (fig. 21).
X	------	------	------	*Sandy or dusty conditions.* With machine running, blow dry compressed air through all machined surfaces. Wipe external surfaces clean of grit and dust (par. 64).
X	------	------	------	*High humidity.* Wipe off moisture on exposed parts (par. 66).

78. Organizational Preventive Maintenance Services

a. Purpose. To insure efficient operaton, it is necessary that the engine lathe be systematically inspected at intervals each day it is operated, and weekly, so that defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. The correction of any defect or unsatisfactory operating characteristics beyond the scope of the operator or organizational mechanic must be reported at the earliest opportunity to the supporting ordnance unit for correction (par. 73).

b. Services. Operators and organizational mechanics preventive maintenance services are listed in table X. Every organization equipped with the engine lathe must thoroughly train its personnel in performing the maintenance procedures for this materiel.

Section IV. TROUBLESHOOTING

79. Scope

Troubleshooting is a systematic isolation of defective components by means of observing malfunctions, determining the casue, then correcting the causes. The causes and corrections provided in this section are for an organizational level of maintenance.

80. Procedure

Malfunctions which may occur with the engine lathe are listed in table XI. Upon observing any one of these malfunctions, take immediate steps to locate and correct the cause. Causes are opposite each malfunction and are arranged according to the ease of correction.

Table XI. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Jerky engagement of lathe with speed box control lever.	Speed box control lever moves too far; speed box clutch grabs.	Adjust speed box control lever (par. 97).
2. Lack of power at headstock spindle.	Speed box clutch worn or out of adjustment.	Adjust speed box clutch (par. 96).
	Other causes	Refer other causes to ordnance maintenance personnel for correction.
3. Drive belt slips	Oil on drive belt	Remove oil from drive belt and cone pulleys.
	Insufficient drive belt tension.	Adjust drive belt tension (par, 84).
4. Drive cone pulley does not brake.	Worn braking disk	Adjust or replace braking disk (par. 96).
5. Work does not run true between centers.	Worn headstock bearings	Adjust headstock bearings (pars. 82 and 83).
	Wear on tailstock	Adjust tailstock gib (par 93).

Table XI. Troubleshooting—Continued

Malfunction	Probable cause	Corrective action
6. Work does not center in chucks.	Worn headstock bearings.	Adjust headstock bearings (pars. 82 and 83).
	Dirty spindle threads.	Remove chuck, clean threads, and install chuck.
7. Lack of power for carriage friction lever.	Loose or worn friction lever clutch.	Adjust friction lever (par. 90).
	Other causes.	Refer other causes to ordnance maintenance personnel for correction.
8. Work is not being machined true.	Sideplay in compound slide rest assembly.	Adjust compound slide rest assembly gibs (par 87).
	Sideplay in carriage.	Adjust carriage gib (par 89).
	Other causes.	Refer other causes to ordnance maintenance personnel for correction.

Section V. HEADSTOCK ASSEMBLY

81. General

This section contains information for the adjustment of the front and rear headstock bearings and replacement of the flat drive belt.

82. Rear Headstock Bearing

a. Description. The position of the rear headstock bearing is determined by the setting of the rear headstock bearing screw (fig. 24) located just under the headstock spindle. The rear headstock bearing is tapered and split so that it is compressed as it is moved into the headstock with the rear bearing screw.

b. Adjustment.

(1) Remove the spindle gear (fig. 24) from the headstock spindle by loosening the hexagon socket setscrew in the spindle gear.

Note. Do not lose the ball and spring located under the setscrew.

(2) Insert a screwdriver into the rear headstock bearing screw. To tighten the rear headstock bearing, turn the screw clockwise; to loosen the bearing, turn the screw counterclockwise. Adjust the bearing until it is snug but not tight.

(3) Place the spindle gear on the spindle and secure with the hexagon socket setscrew (fig. 24).

83. Front Headstock Bearing

a. Description. The front headstock bearing is held in position by the check-nut (fig. 25). The check-nut is locked in position by

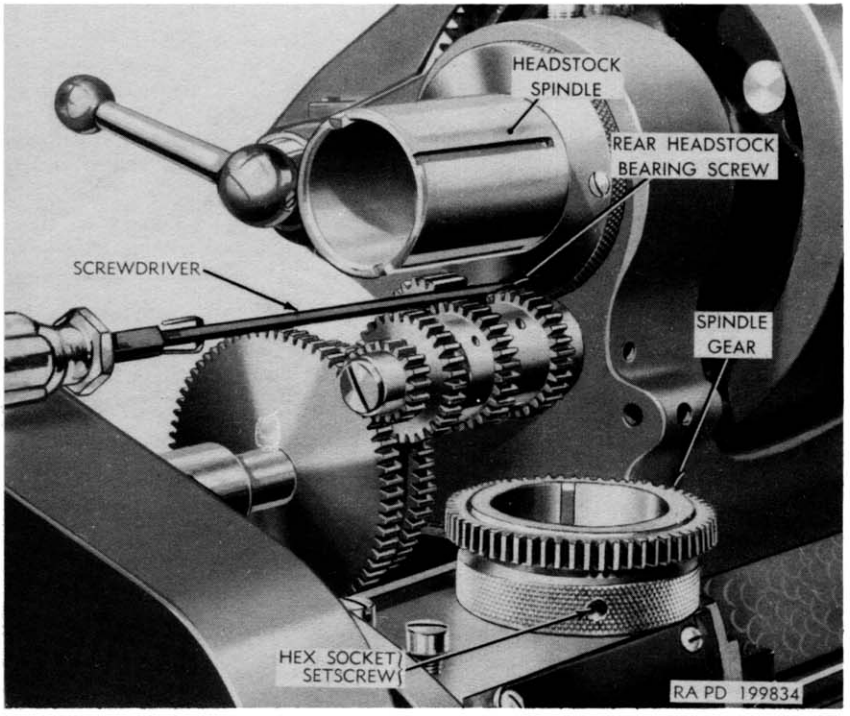


Figure 24. Rear headstock bearing adjustment.

the check-nut setscrew (fig. 25). As the check-nut is turned in, the front headstock bearing is drawn into the headstock spindle.

b. Adjustment (fig. 25).

(1) Turn the headstock driving gear to a convenient working position. The left-hand gear guard and oiler are shown removed for clarity but this is not necessary for adjustment.

(2) Loosen the check-nut setscrew. Then insert a screwdriver into the slot in the check-nut and rotate the check-nut. Clockwise rotation tightens the front headstock bearing; counterclockwise rotation loosens it. The front headstock bearing should be snug without being tight.

(3) Lock the position of the check-nut with the check-nut setscrew.

84. Flat Drive Belt

a. Adjustment.

(1) Loosen the jack pedestal hexagon nuts on the underside of the bench top.

(2) Insert a short length of $\frac{1}{4}$-inch or $\frac{5}{16}$-inch round stock into the holes in each jack pedestal (fig. 1) head. Turn the pedestal head clockwise to raise the lathe bed and increase drive belt tension.

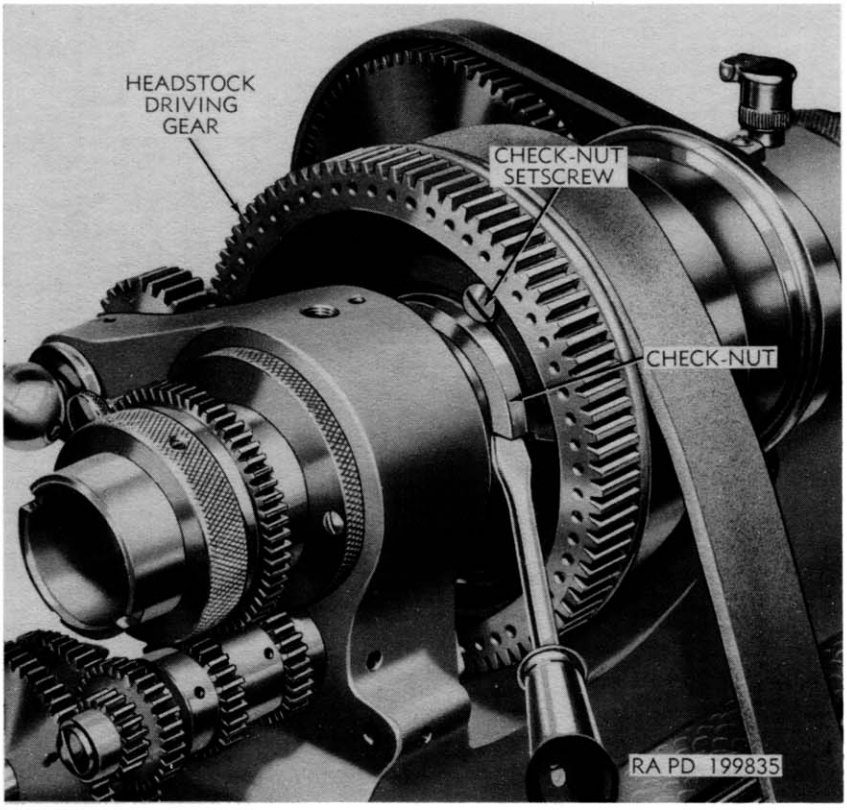


Figure 25. Front headstock bearing adjustment.

(3) Adjust the drive belt tension and keep the lathe bed level. Check this with a spirit level placed lengthwise on the ways.
(4) Tighten the jack pedestal hexagon nuts (par. 8*f*).

b. Removal.

(1) Remove the tie block from the flat drive belt guard (fig. 4) by unscrewing two flat head screws on the end of the frame.
(2) Remove the left and right gear guards (fig. 4) on the headstock by unscrewing the two fillister-head screws securing each guard.
(3) Loosen the hexagon socket setscrew in the gear shaft lever (fig. 8) and pull off the lever.
(4) Loosen the two hexagon socket setscrews underneath the front and rear gear shaft bushings (fig. 8). Then pry the bushings from the headstock with a screwdriver or other flat tool.
(5) Slide out the back gear shaft and remove the back gear (fig. 8).

(6) Pull the flat drive belt through the flat drive belt guard and loop over the end of the gear box to free the belt.

c. Installation.

(1) Place the flat drive belt over the headstock cone pulley (fig. 1) and loop the lower end over the gear box. The rough surface of the drive belt must contact the cone pulleys.

(2) Place the back gear (fig. 8) between the flanges on the headstock and slip the back gear shaft through the back gear.

(3) Place the front and rear gear shaft bushings into their mountings and over the back gear shaft. The rear gear shaft bushing has a V slot cut into its flange. Rotate the back gear shift if there is difficulty in placing the bushings. Secure each bushing with one hexagon socket setscrew.

(4) Secure the gear shaft lever (fig. 8) to the back gear shaft with one hexagon socket setscrew. Mount the left and right rear guards (fig. 4) with four fillister-head screws.

(5) Slip the flat drive belt through the flat drive belt guard and over the drive cone pulley. Adjust the jack pedestals if necessary (par. 8*i*). Secure the tie block in the flat drive belt guard with two flat head screws.

(6) Check the operation of the back gear (par. 15).

Section VI. COMPOUND SLIDE REST ASSEMBLY

85. General

This section contains information on the adjustment of the upper slide gib, lower slide gib, and feed screws.

86. Feed Screws

Adjust any play in the feed screws (fig. 9) by tightening each slotted head screw on the ends of the upper and lower feed screws.

87. Slide Gibs

a. Description. The upper and lower slides are fitted with gibs to compensate for wear. The upper slide (fig. 9) is gibbed on the front; the lower slide is gibbed on the right side. Thus, all thrust from the work is taken on the ungibbed surface. The upper gib is adjusted with two hexagon socket setscrews and locking hexagon nuts. The lower gib is adjusted with four hexagon socket setscrews and locking hexagon nuts.

b. Adjustment. Loosen the hexagon nuts for the gib to be adjusted. Run the hexagon socket setscrews into the slide slowly until all play is removed. This can best be done by moving the slide manually as the setscrews are adjusted. Make certain all setscrews are turned the same number of turns for equal wear takeup. Then lock the position of the setscrews with the hexagon nuts. The upper and lower

slides (fig. 9) should move freely but not loosely and without any sideplay.

Section VII. CARRIAGE AND CARRIAGE ANGLE ASSEMBLY

88. General

This section contains information on the adjustment of the friction clutch, carriage gib, and rear end plate gib.

89. Carriage Gib

a. Description. The upper front dovetailed guideway of the carriage is gibbed to compensate for wear. This gib is tapered and extends the length of the carriage.

b. Adjustment. Loosen the carriage gib screw (fig. 26) and tighten the corresponding carriage gib screw on the right side of the carriage. Do this carefully as a series of adjustments will probably have to be made. Make certain both gib screws are secure after adjustment. The carriage should move freely without looseness or binding (par. 23).

90. Friction Clutch

a. Description. The friction clutch which controls the friction lever rod transmits sufficient power for the heaviest cuts. The internal mechanism of the clutch is actuated by the friction plunger under the end of the friction lever (fig. 26). As the friction plunger moves farther into the carriage, the clutch engagement becomes more positive. Occasional adjustment is necessary to compensate for wear.

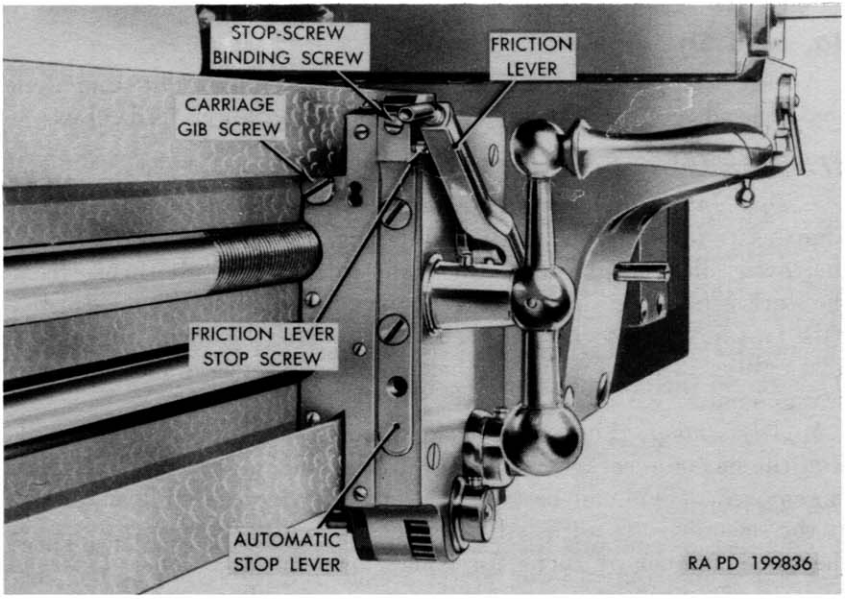


Figure 26. Carriage adjustments.

b. Adjustment. Loosen the stop-screw binding screw (fig. 26) in the automatic stop lever. Press the automatic stop lever down so the friction lever stop screw clears the friction lever. Then turn the friction lever stop screw (fig. 26) out until it holds the friction lever out far enough to have positive clutch engagement. Then tighten the stop-screw binding screw.

c. Testing. Check the operation of the friction lever (par. 24) to see that the clutch works properly. Adjust the friction lever stop screw if necessary.

91. Rear End Plate Gib

a. Description. The rear end plate gib is located under the rear end plate (fig. 11) and bears on the rear of the lathe bed. It can be adjusted to compensate for wear due to thrusts on carriage angle. Three slotted setscrews which are located in the lower part of the rear end plate are used for adjustment.

b. Adjustment. Turn the three slotted setscrews into the rear end plate carefully and evenly until all sideplay and looseness are eliminated. Operate the carriage manually to check the adjustment. Do not overtighten the setscrews since this will cause excessive wear and binding.

Section VIII. TAILSTOCK ASSEMBLY

92. General

This section contains information on the adjustment of the tailstock gib.

93. Tailstock Gib

(fig. 12)

a. Description. The tailstock is gibbed in the rear dovetailed guideway in the tailstock base. It is seldom that this gib needs adjusting since it compensates for wear largely occurring when the tailstock is set over.

b. Adjustment. Loosen the left tailstock adjusting screw. Then slowly turn in the two tailstock gib screws. At the same time, check the gib takeup by turning the right tailstock adjusting screw to move the tailstock. Repeat this adjustment until all play is eliminated. Then center the tailstock over the lathe bed (par. 40b).

Section IX. SPEED BOX ASSEMBLY

94. General

This section contains information on the adjustment of the speed box clutch and control lever, motor V belt, and the repair and adjustment of the automatic brake.

95. Automatic Brake

a. Description. The automatic brake is applied to the inside face of the drive cone pulley (fig. 1) on the speed box. A cork cushion presses against the cone pulley whenever the speed box control lever (fig. 1) is in neutral by means of a dog and spring arrangement. As the cork wears or adjustments are made on the control lever (par. 97), the brake must be repaired or adjusted.

b. Cork Cushion Replacement.

(1) Loosen the hexagon socket setscrew in the brake socket. Draw back the brake rod (fig. 27) against the brake spring and slide off the brake socket.

(2) Replace the old cork cusnion (fig. 27) with a new one.

(3) Pull back the brake rod, slip the brake socket over the end, and secure with the hexagon socket setscrew.

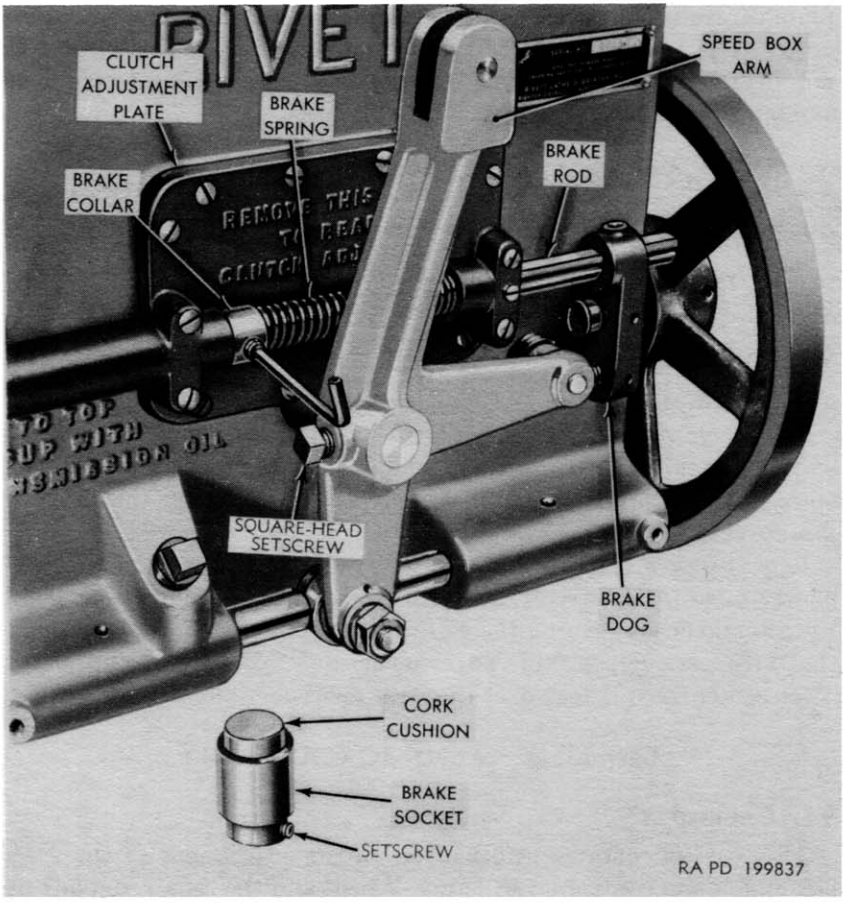


Figure 27. Automatic brake.

c. Adjustment (fig. 29).

(1) For greater braking action, loosen the hexagon socket setscrew in the brake collar (fig. 27). Slide the collar to the right to further compress the brake spring. Tighten the setscrew.

(2) For less braking action, loosen the setscrew, move the collar to the left, and tighten the setscrew.

96. Speed Box Clutch

a. Description. The speed box clutch is a double-type Pullmore Number 2 multiple disk clutch. The adjustment collars can be moved to compensate for wear of the friction disks.

b. Disassembly.

(1) Disconnect the offset connecting rod (fig. 1) of the speed box control lever from the speed box arm (fig. 1) by tapping out the attaching pin. The arm is shown disconnected in figure 27.

(2) Remove the speed box arm from the clutch shaft (fig. 28) by unscrewing one square head setscrew (fig. 27).

(3) Unscrew 10 short fillister-head screws and 4 long fillister-head screws. Then pull off the braking mechanism, clutch adjustment plate (fig. 27), felt washer, and plate gasket.

c. Adjustment.

(1) Place the slipper sleeve (fig. 28) in neutral position as shown and rotate the clutch until the bent end of the adjustment lock spring faces the hole as shown.

(2) Lift the bent end of the lock spring up carefully with a pointed tool or rod just far enough to clear the teeth in the adjustment collar (fig. 28). Then turn the collar one tooth at a time by hand. Turn clockwise to tighten, counterclockwise to loosen.

Caution: Do not use a screwdriver to lift the lock spring. Also, do not lift the lock spring too high as this will bend or break it.

(3) A short length of $\frac{3}{16}$-inch round stock which is bent and filed to a point works well for lifting the lock spring.

(4) Engage the side of the clutch which is being adjusted by pushing the slipper sleeve (fig. 28) to that side. The speed box arm (fig. 1) can be secured to the clutch shaft with the square head setscrew (fig. 27) for easier movement of the slipper sleeve.

(5) Turn the sheave on the speed box to the right by hand to determine how well the clutch is transmitting power. A series of adjustments may be required to insure proper clutch action. Normally the adjustment collar (fig. 28) needs only slight

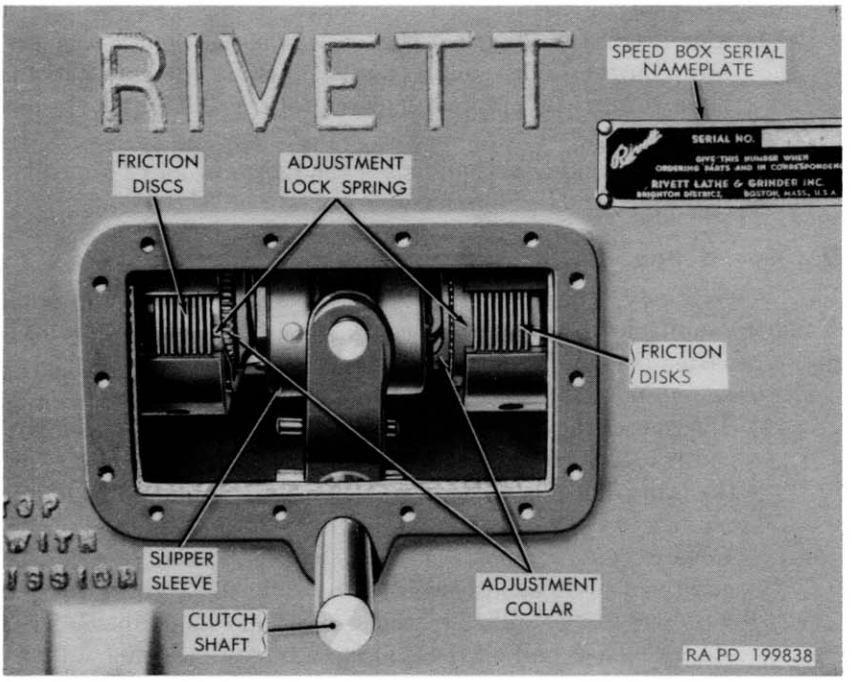


Figure 28. Speed box clutch.

rotation ((2) above). Overadjustment will cause the clutch to "grab."

(6) Adjust the other side of the clutch as instructed in (1) through (5) above.

d. Assembly.

(1) Secure the plate gasket, felt washer, and clutch adjustment plate (fig. 27) to the speed box with 10 short fillister-head screws and 4 long fillister-head screws.

(2) Mount the speed box arm (fig. 27) to the clutch shaft (fig. 28) with one square head setscrew (fig. 27).

(3) Secure the offset connecting rod (fig. 1) from the speed box control lever (fig. 1) to the speed box arm with the pin provided.

e. Speed box control level adjustment. Adjust the speed box control lever (par. 97).

97. Speed Box Control Lever

a. Description. The speed box control lever is permanently mounted to the bench. Whenever any adjustment is performed on the speed box clutch, the throw of the control lever must be adjusted to prevent any "grabbing" action.

b. Adjustment.

(1) Check the operation of the speed box control lever (par. 11)

in all three positions. Note any "grabbing" or "slipping" of the clutch.

(2) For adjustment loosen the screws securing the small guide blocks on the quadrant of the speed box control lever (fig. 1) and secure in a new position. For "grabbing", move the blocks toward the center of the quadrant. For "slipping" move the blocks outward.

(3) Check the speed box control lever until it operates properly.

98. Motor V Belt

a. Description. Two V-belts are supplied with the engine lathe. One is installed with the equipment; the other is a spare. Provision is made to compensate for stretching of the V-belt during use by means of a stud and two bexagon nuts on the back of the speed box.

b. Adjustment. Loosen the outer hexagon nut on the stud. Turn the inner hexagon nut out to move the motor plate out and tighten the V-belt. Secure the motor plate with the outer hexagon nut.

c. Replacement. Loosen the outer and inner hexagon nuts on the stud on the rear of the speed box. Slip off the old V-belt. Replace with a new V-belt and adjust the tension of the belt.

Section X. EQUIPMENT

99. General

This section contains information on the adjustment of the taper attachment gib. All other maintenance of the engine lathe equipment consists of the replacement of worn or damaged parts. Repair and disassembly of equipment is beyond the scope of organizational maintenance.

100. Taper Attachment Gib

a. Description. The taper lathe attachment (fig. 19) is gibbed along the swivel bar to compensate for wear. The gib screws are located in the slide.

b. Adjustment.

(1) Install the taper lathe attachment as for operation (par. 56).

(2) Turn in the two slotted setscrews evenly. At the same time, check the adjustment by operating the carriage manually (par. 23). Make a series of adjustments until all play or binding is eliminated.

(3) Remove the taper lathe attachment as required (par. 56).

CHAPTER 4

FIELD MAINTENANCE INSTRUCTIONS

Section I. GENERAL

101. Scope

The instructions in this chapter are for the information and guidance of personnel responsible for field maintenance. These instructions contain information on maintenance which is beyond the scope of the spare parts, tools, equipment, or supplies normally available to using organizations. This chapter does not contain information for the using organization, since such information is available in other chapters of this technical manual.

102. Procedure

This chapter contains procedures for inspection, disassembly, repair, assembly, and troubleshooting of the engine lathe. The inspection procedures prescribed in this chapter consist of two types, i. e., in-process inspections for each component and final inspection for the complete engine lathe. Troubleshooting is performed prior to repairing the item and/or component. In-process inspections are performed during the process of repairing components. Final inspection is performed after all repairs have been completed and the item has been assembled.

Note. The fact that this engine lathe is a precision equipment cannot be overemphasized. During any disassembly or assembly operation, the greatest care must be exercised to insure that parts are not damaged other than wear occurring when the lathe was in use. At all times, disassembled parts must be protected from the effects of moisture. After cleaning, oil parts lightly with the proper lubricant if necessary. Components should be repaired as units and individual parts grouped to facilitate proper assembly. If there is any doubt over procedures or parts, label the parts and take notes on their peculiarities.

Section II. PARTS, TOOLS, AND EQUIPMENT FOR FIELD MAINTENANCE

103. General

Tools, equipment, and maintenance parts over and above those available to the using organization are supplied to ordnance field maintenance units for repairing the materiel.

104. Maintenance Parts

Maintenance parts are listed in Department of the Army Supply Manual ORD 7–8 SNL J–268 which is the authority for requisitioning replacements.

105. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this materiel are listed in ORD 6 SNL's which are authorized for issue by TA and TOE.

106. Tools and Equipment

No tools or equipment for performing the operations in this chapter are required.

Section III. TROUBLESHOOTING

107. Scope

Troubleshooting is a systematic isolation of defective components by means of reported malfunctions, determining the cause, then correcting the causes. The causes and corrections provided in this section supplement those contained in paragraphs 79 and 80, which is for an organizational level of maintenance.

108. Procedure

Malfunctions which may occur with the engine lathe are listed in table XII. In effect, table XII is the continuation of table XI. Causes are listed opposite each malfunction and are arranged according to the ease of correction.

Table XII. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Lack of power at the headstock spindle.	Excessive wear of speed box clutch.	Remove, disassemble, repair, assemble, and adjust clutch (pars. 168–175).
	Faulty motor	Replace motor (pars. 177–181).
2. Lack of power for carriage friction lever.	Excessive wear of friction lever clutch.	Remove, disassemble, repair, assemble, and adjust clutch (pars. 137–142).
3. Work is not being machined true.	Lathe bed is not level	Level bed and check accuracy (par. 8*j*).
	Cam action of headstock spindle or headstock out of alinement.	Check accuracy of headstock spindle; repair headstock if necessary (pars. 130–135).

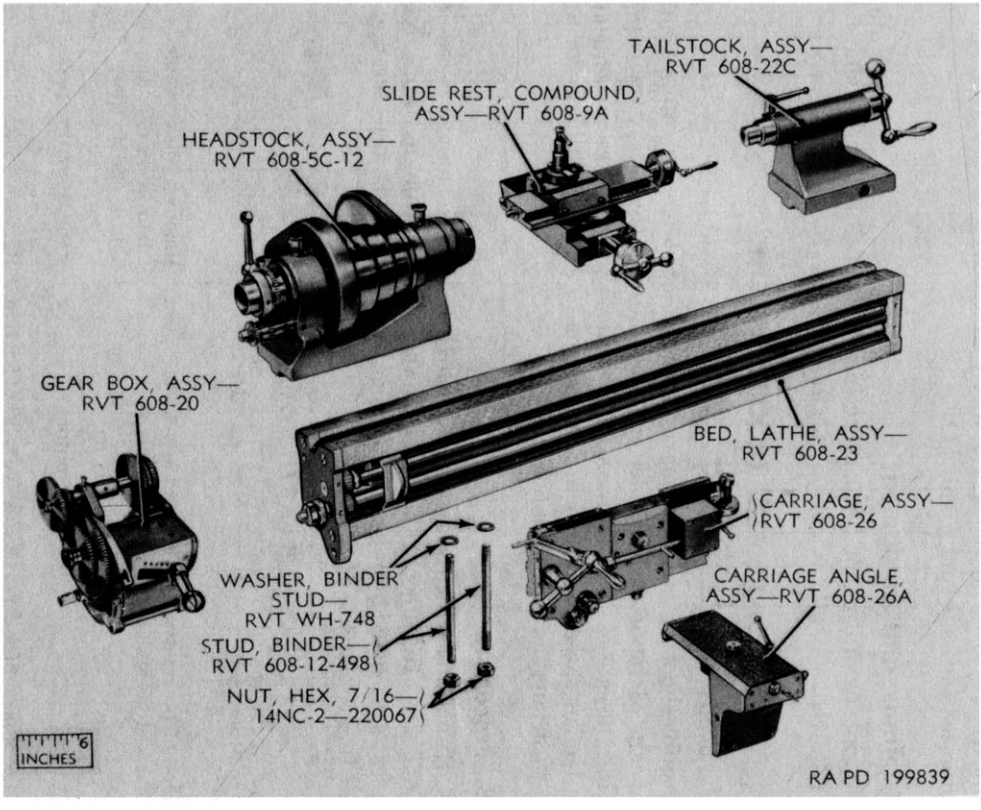


Figure 29. Component parts of engine lathe—exploded view.

Table XII. Troubleshooting—Continued

Malfunction	Probable cause	Corrective action
	Tailstock out of alinement.	Check accuracy of tailstock; repair tailstock if necessary (pars. 123–128).
	Improper feed of compound slide rest assembly.	Check accuracy of slide rest; repair slide rest if necessary (pars. 116–121).
	Cam action of lead screw.	Check accuracy of lead screw; repair lathe bed if necessary (pars. 151–157).
	Backlash in gear box.	Inspect gear box for wear; check accuracy; repair if necessary (pars. 110–114).
4. Inoperative power crossfeed.	Worn power crossfeed.	Remove, disassemble, repair, assemble, and install carriage angle (pars. 144–149).
5. Compound slide rest assembly slips out of position.	Loose T-binder stud.	Check binder stud action (par. 30); repair if necessary (pars. 144–149).

Section IV. GEAR BOX

Note. The key letters shown in parentheses in this section refer to figure 30.

109. General

The gear box provides variable gearing from the headstock spindle to the friction lever rod. Maintenance of the gear box consists chiefly of replacing gears which are worn or damaged from usage.

110. Removal

a. The gear box is mounted to the left side of the lathe bed with one hexagon-head bolt, one flat washer, the T-binder bolt, T-binder nut, and T-binder handle.

b. Unscrew the T-binder handle from the T-binder nut. Unscrew the T-binder nut and pull the T-binder bolt out through the hole in the lathe bed end plate and slot in the gear box.

c. Unscrew the hexagon-head bolt in the upper rear radial slot in the gear box from the lathe bed end plate. Support the gear box when removing the hexagon-head bolt and flat washer so it does not revolve on the feed rod end.

d. Carefully pull the gear box from the feed rod end. Place it in a clean dry location.

111. Disassembly

a. Remove the large and small fixed gears (P and Q) as a unit by unscrewing the gear retaining screw (S) in the end of the compound shaft (M). Remove the lower compound gears (BB and CC) as a unit with the compound gear thimble (AA) by unscrewing the thimble retaining screw (Z).

b. To separate the large and smal fixed gears, remove three attaching fillister-head screws (R). Unscrew three fillister-head screws (R) to separate the 112-tooth and 70-tooth compound gears (BB and CC). These gears are tightly fitted. Gentle tapping with a rawhide mallet will separate them.

Note. Take care not to lose the lock ball (QQ) and lock ball spring (PP) in the 70-tooth compound gear. These are small parts.

c. Slip the retaining ring (Y) from the compound gear thimble (AA). Pry the two keys (X) from the compound gear thimble (AA).

d. Loosen the hexagon socket setscrew (J) in the compound shaft collar (K) and the fillister-head screw (G) in the upper compound gear (H).

Note. Take care not to lose the lock ball (QQ) and lock ball spring (PP) when removing the upper compound gear by unscrewing the fillister-head screw (NN).

e. Pull the compound shaft (M) through the upper compound gear (H), compound shaft collar (K), and gear case front plate with dowel pins (UU), and remove the gear and collar. Remove the two compound shaft keys (L and N) and two shaft end keys (WW).

f. Lay the gear box on its right side. Unscrew the change gear shaft end screw (V). Remove the hexagon socket setscrew (KK) in the bottom of the yoke. Unscrew the yoke binder nut (FF) from the yoke binder on the inside of the gear case front plate with dowel pins (UU). Remove the yoke binder washer (EE) and push out the yoke binder (DD) through the radial seat in the yoke. Pull off the yoke (T).

g. Unscrew four fillister-head screws (C) from the gear case front plate. Unscrew two internal wrenching bolts (A) from the two spacing rods (GG). Lift off the gear case front plate and gear case (HH) and spacing rods.

h. Unscrew three fillister-head screws (W) securing the change gear shaft bearing (U) to the gear case front plate. Remove three fillister-head screws (R) and pull out the bearing (VV).

i. Unscrew the flat head screw (TT) in the ball handle (SS) and remove the ball handle. Pull the tumbler shaft (ZZ) from the tumbler handle (LL) and gear case front plate. Remove the upper compound gear (H), tumbler driving gear (MM) and keys (YY and AB) from tumbler shaft (ZZ). Carefully remove the tumbler handle with gears attached.

j. Loosen the hexagon socket setscrew (KK) in the tumbler idler gear (JJ), pull out the idler gear bushing (XX), and remove the idler gear. Unscrew the plunger assembly (RR) from the tumbler shaft handle (LL). Do not disassemble the plunger assembly.

k. Lift the change gear assembly (fig. 31) from the gear case rear plate (D). Do not disassemble this unit unless inspection indicates that replacement of parts is required. If necessary, disassemble as follows: Unscrew one hexagon socket setscrew in the change gear shaft nut (fig. 31) and remove the setscrew tip (fig. 31). Slide off the shaft nut. The seven change gears are pinned to the change gear shaft and to each other with dowels. Use care in pulling the gears from the shaft and dowels.

l. Unscrew four fillister-head screws (C) in the gear case rear plate assembly (D) and remove the index plate (E). Remove three fillister-head screws (G) securing the thread table (F), and remove the thread table. Unscrew two socket-head cap screws (A) and remove the spacing rods (GG).

m. Do not remove the dowel pins or oil cups from the gear case plates or index plate.

112. In-Process Inspection and Repair

a. Inspection. Examine all gears for broken teeth or excessive wear. Inspect shafts for excessive wear, bending, damaged keyways, and scoring. See that there are no stripped threads on threaded parts. Examine bearings and bushings for marring and excessive wear. Make sure all keys are in good condition. Inspect all parts for breakage, distortion, and excessive wear. Replace any parts which would cause malfunction of the gear box.

b. Cleaning. Clean all parts in accordance with paragraph 77.

113. Assembly

a. Locate and position the index plate (E) over the dowel pins on the gear case rear plate (D); secure with four No. 10–32 x 5/8 fillister-head machine screws (C).

b. Screw the plunger assembly with index pin, bushing, and spring (RR) into the end of the tumbler shaft handles (LL). Secure the two spacing rods (GG) to the gear case rear plate (D) with two 5/16–18 x 3/4 internal wrenching bolts (A). Lay the rear plate face down. Place the gear case (HH) on the rear plate endwise so one beveled edge is flush with the index plate (E).

c. Insert the tumbler shaft bearing (VV) into the recessed hole in the gear case front plate with dowel pins (UU) and secure with three No. 4–20 x 3/8 fillister-head machine screws (R). Mount the change gear shaft bearing (U) in the lower hole with three No. 4–40 x 5/8 fillis-

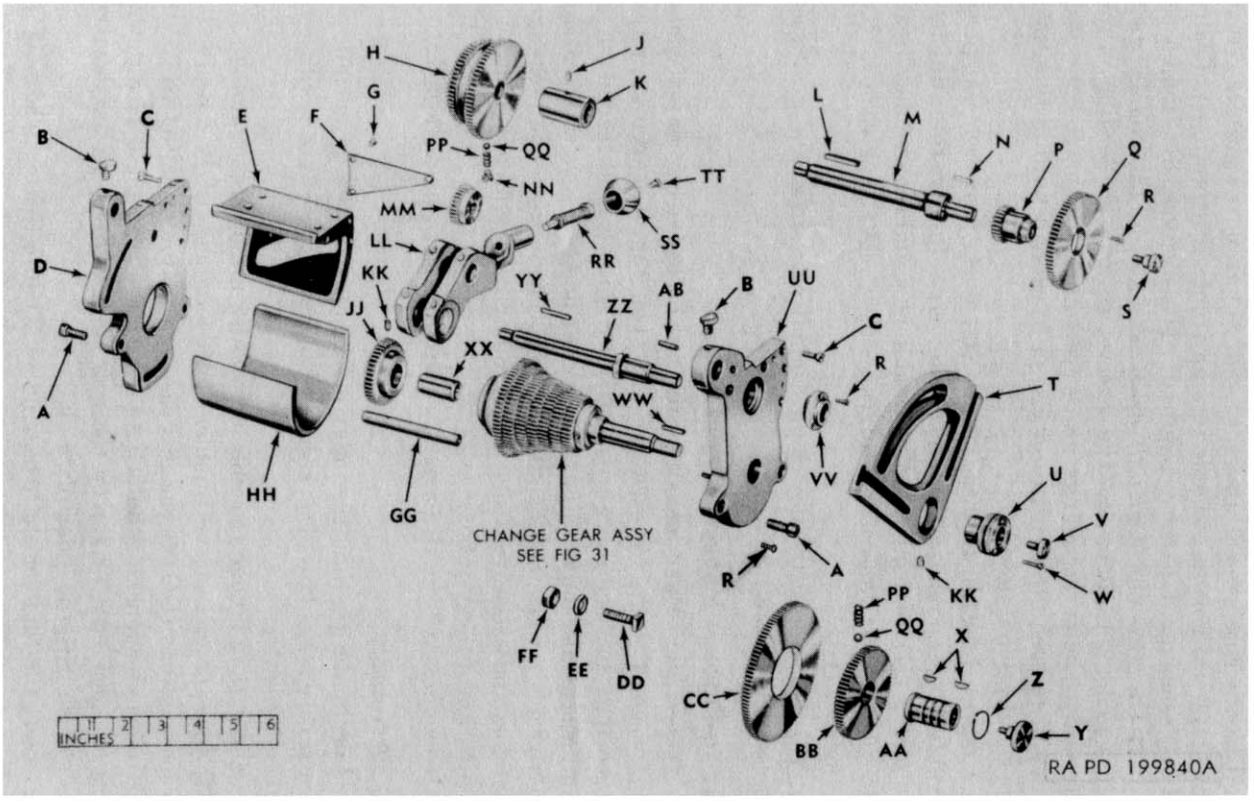


Figure 30. Gear box assembly—exploded view.

A—Internal wrenching bolt, 5/16-18 X 3/4—426367
B—Cup, oil—GTS-101 (Style B)
C—Screw, mach, fil-hd, No. 10-32 X 5/8—132119
D—Plate, rear, gear case—RVT-608-20-380
E—Plate, index—RVT-608-20-382
F—Table, thread—RVT-608-20-677
G—Screw, mach, fil-hd, No. 3-56 x 1/8
H—Gear, compound, upper—RVT-608-20-235
J—Setscrew, hexagon socket, cup-pt, No. 10-32 X 3/16—140879
K—Collar, compound shaft—RVT-608-20-193
L—Key, compound shaft—RVT-608-20-670
M—Shaft, compound—RVT-608-20-441
N—Key, compound shaft—RVT-608-20-291
P—Gear, small, fixed, compound—40-G-85-659
Q—Gear, large fixed, compound—40-G-85-638
R—Screw, mach, fil-hd, No. 4-40 X 3/8—131835
S—Screw, gear retaining—RVT-608-20-638
T—Yoke—RVT-608-20-540
U—Bearing, shaft, change gear—RVT-608-20-118
V—Screw, shaft end, change gear—RVT-608-20-637
W—Screw, mach, fil-hd, No. 4-40 X 5/8—131850
X—Key—RVT-608-20-671
Y—Ring, retaining—WKI-NAS-51, No. 87
Z—Screw, thimble retaining—RVT-608-20-639
AA—Thimble, compound gear—RVT-608-20-717
BB—Gear, compound, 70-tooth—40-G-85-656
CC—Gear, compound, 112-tooth—40-G-85-657
DD—Binder, yoke—RVT-608-20-129
EE—Washer, yoke binder—RVT-608-20-522
FF—Nut, yoke binder—RVT-608-20-325
GG—Rod, spacing—RVT-608-20-826
HH—Case, gear—RVT-608-20-172
JJ—Gear, tumbler idler—RVT-608-20-817
KK—Setscrew Hexagon socket, cup-pt, 1/4-20 X 3/8—102570
LL—Handle, shaft tumbler—RVT-608-20-258
MM—Gear, tumbler driving—RVT-608-20-816
NN—Screw, mach, fil-hd, No. 10-32 X 3/16—225556
PP—Spring, lock ball—RVT-608-20-666
QQ—Ball, lock, 5/32 DIAM
RR—Plunger assembly w/index pin, bushing, and spring.
SS—Handle, ball—RVT-608-20-259
TT—Screw, mach, fil-hd, No. 8-32 X 3/8—133482
UU—Plate, front, gear case w/dowel pins—RVT-608-20-379
VV—Bearing, shaft, tumbler—RVT-608-20-324
WW—Key, shaft end—RVT-608-20-290
XX—Bushing, idler gear—RVT-608-20-156
YY—Key, tumbler driving gear—RVT-608-20-672
ZZ—Shaft, tumbler—RVT-608-20-440
AB—Key, tumbler shaft—RVT-608-20-291

Figure 30—Continued.

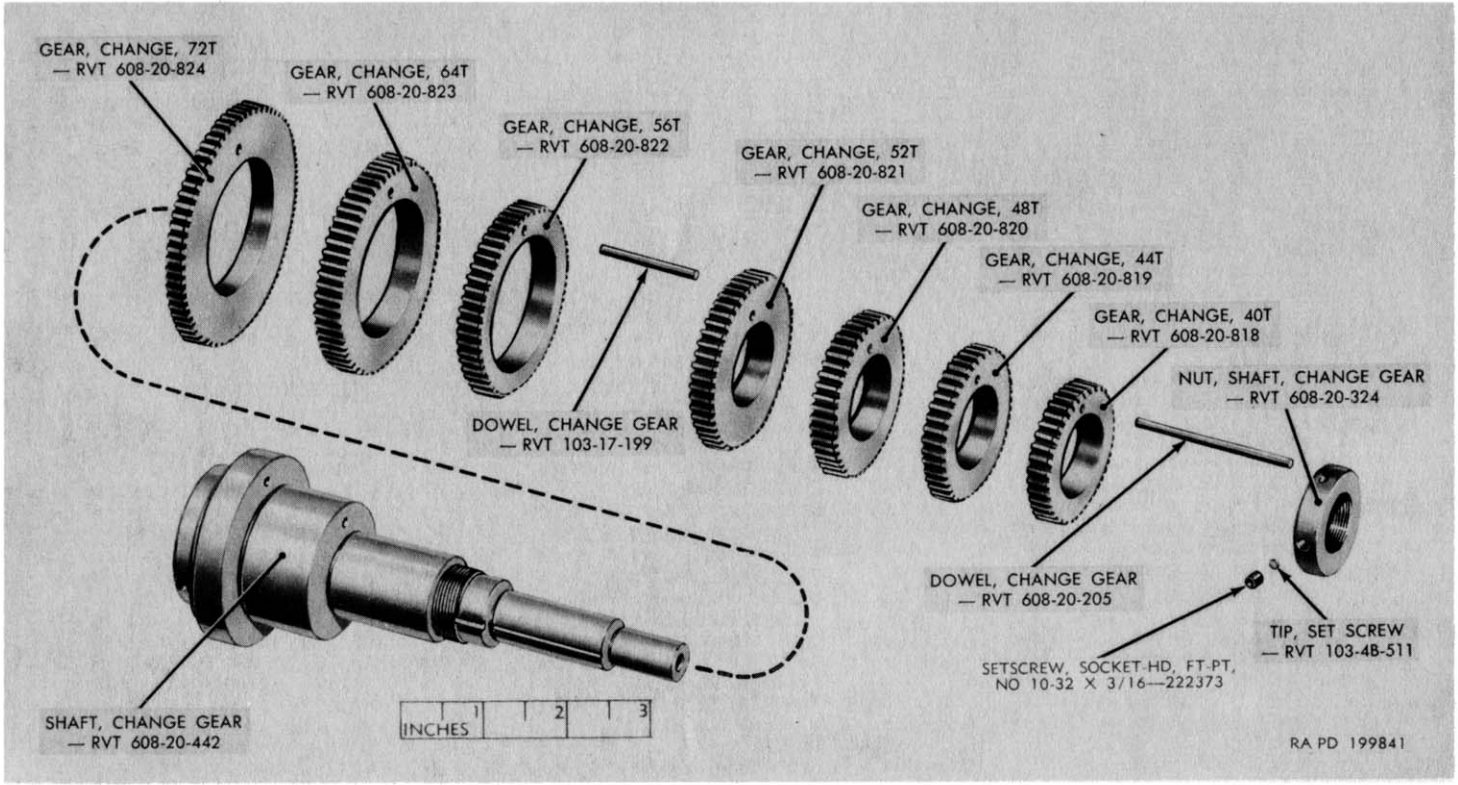


Figure 31. Change gear assembly—exploded view.

ter-head machine screws (W) and screw change gear shaft end screw (V) into change gear shaft bearing.

Note. Be sure to aline the oilholes in both bearings with the corresponding inner oilholes in the front plate.

d. Slide the change gears (fig. 31) individually over the change gear shaft and dowels. Use care in pinning the gears in place. Slide the change gear shaft nut over the shaft flush with the smallest change gear. Secure the nut with one setscrew tip and one No. 10–32 x 3/16 flat-point hexagon socket setscrew. There must be no lateral sideplay between any change gears. Place the cone end of the change gear assembly into the large hole in the gear case rear place (D) just below the tumbler shaft hole and press shaft end key (WW) in shaft of change gear assembly.

e. Press the tumbler driving gear key (YY) into tumbler shaft (ZZ). Aline the tumbler driving gear with the upper (smaller) holes in the tumbler shaft handle (LL), then insert the tumbler shaft into the gear and handle.

f. Aline the tumbler idler gear (JJ) with the lower (larger) holes in the tumbler handle. Insert the idler gear bushing (XX) and secure with one 1/4 x 3/8 cup-point hexagon socket setscrew (KK) in the idler gear. Insert the handle end of the tumbler shaft handle (LL) into the slot in the index plate (E) and at the same time place the tumbler shaft (ZZ) in its hole in the gear case rear plate (D). The blank face of both tumbler gears must face the gear case front plate.

g. Guide the gear case front plate with dowel pins (UU) over the tumbler shaft (ZZ) and change gear assembly shaft until flush with the edge of the index plate (E). Fasten the front plate to the index plate with four No. 10–32 x 5/8 fillister-head machine screws (C). Secure the two spacing rods (GG) with two 5/16–18 x 3/4 interval wrenching bolts (A).

h. Place the yoke (T) over the change gear shaft bearing (U) in the front plate and secure with one 1/4 x 3/8 cup-point hexagon socket setscrew (KK) underneath the yoke. Insert the yoke binder (DD) through the radial slot in the yoke (T) and through the corresponding hole in the gear case front plate (UU). Secure the yoke binder with the yoke binder washer (EE) and yoke binder nut (FF).

i. Insert one 5/32 diameter steel lock ball (QQ) and lock ball spring (PP) into the diametrically located hole in the upper compound gear (H). Screw in the securing No. 10–32 x 3/16 fillister-head machine screw (NN).

j. Slide the compound shaft (M) through the uppermost hole in the gear case front place (UU) and through the compound shaft collar (K). Insert the compound shaft key (L) into the compound shaft. Then slide the compound shaft through the upper compound gear (H) and into the gear case rear plate (D). The larger gear must

face the front plate. Secure the position of the compound shaft by fastening the compound shaft collar (K) flush with the front plate with one No. 10–32 x 3/16 cup-point hexagon socket setscrew (J).

k. Assemble the compound large and small fixed gears (P and Q) with three No. 4–40 x 3/8 fillister-head machine screws (R). Before pressing them together, aline the screw holes so as not to strip the threads in assembly.

l. Insert the lock ball (QQ) and lock ball spring (PP) into the small diametrically located hole in the 70-tooth compound gear (BB) in that order. Carefully press the 70-tooth compound gear (BB) in that order. Carefully press the 70-tooth compound gear into the 112-tooth compound gear (CC) so that the screw holes match and the spring does not bind. Secure the gears with three No. 4–20 x 3/8 fillister-head machine screws (R).

m. Insert two keys (X) into the compound gear thimble (AA) and install oil cups (B) in top of gear case front plate (UU). Slip the retaining ring (Y) into the single rear slot on the thimble. Insert tumbler shaft key (AB) into the end of the tumbler shaft (ZZ). Slide the compound gear tumbler (AA) over the shaft and slide the 70-tooth and 112-tooth compound gears (BB and CC) over the thimble. Secure the thimble with the thimble retaining screw (Z). The small compound gear must face outward as shown in figures 8 and 16.

n. Insert the compound shaft key (N) into the end of the compound shaft (M), slide on the large and small fixed gears (P and Q), and secure with the gear retaining screw (S). The large fixed gear must face out as shown in figure 8.

o. Fasten the thread table (F) to the front of the index plate (E) with three No. 3–56 x 1/8 fillister-head machine screws (G). Then fasten the ball handle (SS) to the end of the tumbler shaft handle (LL) with one No. 8–32 x 3/8 flat head machine screw (TT).

114. Installation

Install the gear box to the lathe (par. 8*l*).

Section V. COMPOUND SLIDE REST ASSEMBLY

Note. The key letters shown below in parentheses in this section refer to figure 32.

115. General

Organizational maintenance of the compound slide rest assembly is described in paragraphs 85 through 87.

116. Removal

Lift up binder handle (fig. 11) on the right side of the carriage angle to release the T-binder stud (fig. 11). Carefully slide the compound slide rest assembly from the carriage angle.

117. Disassembly

a. Remove the tool holder grip (D), tool holder (F), tool holder clamp assembly (E), and tool holder washer (C) from the top slide (B).

b. Unscrew the stop block screw (LL) and remove the adjustable stop. Loosen the stop screw check-nut (NN), and unscrew the stop screw (MM) from the stop block (PP).

c. Loosen one hexagonal socket setscrew (P) in the top slide ball handle (R) and bottom slide ball handle (DD). Turn the ball handles upward and pull off the ball handles. Loosen one hexagonal socket setscrew (N) in indicator flange (M). Remove one hexagon socket setscrew (AB), dial binder spring (AC), setscrew tip (AD), and cork tip (AE) from each feed screw dial (S). Pull off the two feed screw dials and indicator flanges.

d. Unscrew the two feed screw adjusting screws (KK) and pull out the top and bottom feed screw sleeves (JJ and TT). Remove two fillister-head screws (HH) from side of base. Unscrew four bearing plate screws (EE) and remove the feed screw bearing plate (FF). Unscrew two indicator flange support screws (L) and remove the indicator flange support (K).

e. Fasten the ball handles (R and DD) to their respective feed screws (J and GG) with the hexagon socket setscrews (P) in each. Turn each ball handle counterclockwise until the feed screws thread themselves from the base and lower swivel. Unscrew the setscrews (P) and remove the ball handles and retaining pins (Q and CC). Do not attempt to dissasemble the ball handles. Remove the pin (AJ) and intermediate gear (AF) from the base (AG). Remove setscrew (AK) from base.

f. Unscrew the bottom slide feed nut screw (XX); this unfastens the bottom slide feed nut (ZZ) under the bottom slide. Unscrew the four hexagon nuts (H) and setscrews (W) on the right side of the bottom slide (Y). Slide the bottom slide and remaining parts from the base as a unit and turn them upside down.

g. Remove the bottom slide gib (SS) from the dovetailed slot in the bottom slide (Y) but do not remove the dowel pins which locate it. Unscrew the lower swivel cone gib binder (X) with handle from the bottom slide.

h. Then unscrew three lower swivel cone screws (BB) in the lower swivel cone (AA) and remove pin (AH). This releases the swivel cone and bottom slide. Slip the lower swivel cone gib (Z) from the bottom slide. Remove four fillister-head screws (U) to unfasten the swivel graduated dial (V). Unscrew two oval-head screws (YY) from the top of the bottom slide (Y).

i. Unscrew two hexagon nuts (H) and setscrews (G) from the top slide (B). Then slide the top slide off the front of the lower swivel

and remove the two machine screws (HH) from the side of the base (AG).

j. Unscrew the dowel screw (WW) and travel stop block screw (VV) from the underside of the lower swivel (T). Slide out the travel stop feed screw block (UU).

k. Remove the top slide gib (A) from the top slide (B). Do not attempt to remove the locating pins for the gib from the top slide. Remove the top slide feed screw nut (RR) from the top slide by unscrewing two feed screw nut screws (QQ).

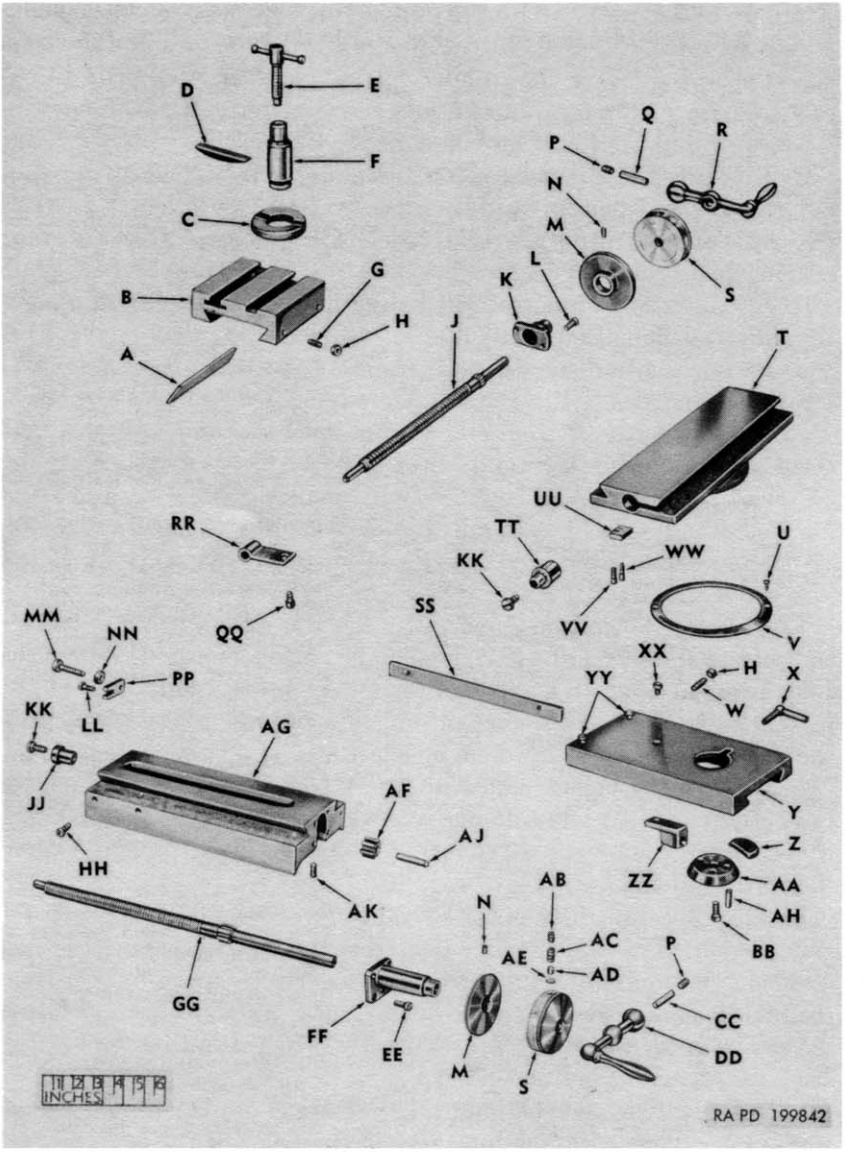


Figure 32. Compound slide rest assembly—exploded view.

l. Do not remove any of the locating pins from the base, bottom slide, lower swivel, or top slide.

118. In-Process Inspection and Repair

Examine the feed screws for wear, particularly on the threads. Examine all bearing surfaces for wear. This includes dovetailed guideways and feed screw sleeves. Inspect the feed screw nuts for worn threads. Check the graduations on dials for wear and readability. Examine the gibs for wear and surface nicks. Examine all parts for breakage, cracks, surface mars, and other defects which would cause malfunction of the slide rest. Replace all defective parts.

A—Gib, top slide—RVT-505-9-246
B—Slide, top—RVT-505-9-463
C—Washer, tool holder—RVT-505-9-521
D—Grip, tool holder—RVT-505-9-249
E—Clamp, tool holder, assy
F—Holder, tool—RVT-506-9-275
G—Setscrew, hex-socket, FL-PT, No. 8-32 x 5/8
H—Nut, hex—RVT-918-9-324
J—Screw, feed, topslide—RVT-918-9-557.
K—Support, indicator flange—RVT-505-9-568
L—Screw, support, indicator flange—RVT-506-9-646
M—Flange, indicator—RVT-918-9-217
N—Setscrew, hex-socket, cup-pt, 5/32-40 x 1/8
P—Setscrew, hex-socket, cup-pt, 1/4-20 x 3/8—221182
Q—Pin, retaining—RVT-918-9-354
R—Handle, ball, top slide
S—Dial, feed screw—RVT-918-9-193
T—Swivel, lower—RVT-505-9-504
U—Screw, mach, fil-hd, No. 3-48 x 1/4—224996
V—Dial, graduated, swivel—RVT-505-9-193
W—Setscrew, hex-socket, cup-pt, No. 8-32 x 7/8
X—Binder, cone gib, lower swivel, w/handle
Y—Slide, bottom—RVT-505-9-462
Z—Gib, cone, lower swivel—RVT-506-9-248
AA—Come, lower swivel—RVT-506-9-187
BB—Screw, lower swivel cone—RVT-506-9-946
CC—Pin, retaining—RVT-918-9-355
DD—Handle, ball, bottom slide
EE—Screw, bearing plate—RVT-506-9-641
FF—Plate, bearing, feed screw—RVT-505-9-374
GG—Screw, feed, bottom slide—RVT-608-9-560
HH—Screw, mach. fil-hd, 1/4-20 x 5/8—114354
JJ—Sleeve, feed screw—RVT-505-9-117
KK—Screw, adjusting, feed screw—RVT-506-9-638
LL—Screw, stop block—RVT-506-9-947
MM—Screw, stop—RVT-506-9-643
NN—Check-nut, stop screw—RVT-506-9-326
PP—Block, stop—RVT-506-9-133
QQ—Screw, nut, feed screw—RVT-506-9-637
RR—Nut, feed screw, top slide—RVT-505-9-324
SS—Gib, bottom slide—RVT-506-9-247
TT—Sleeve, feed screw, top slide—RVT-505-9-457
UU—Block, travel stop feed screw—RVT-506-9-134
VV—Screw, travel stop block—RVT-506-9-650
WW—Screw, dowel—RVT-506-9-199
XX—Screw, feed nut, bottom slide—RVT-506-9-645
YY—Screw, mach, oval-hd, No. 6-32 x 3/8
ZZ—Nut, feed, bottom slide—RVT-505-9-325
AB—Setscrew, hex-socket, FL-PT, No. 10-32 x 3/8—222376
AC—Spring, dial binder—RVT-608-22C-666
111
AD—Tip, setscrew—RVT-103-4B-111
AE—Tip, cork—RVT-608-22C-511
AF—Gear, intermediate—RVT-608-9-226
AG—Base—RVT-505-9-115
AH—Pin, lower swivel cone—RVT-506-9-355
AJ—Pin, intermediate gear—RVT-106-20-356
AK—Setscrew, hex-socket, cup-pt, No. 10-32 x 1/4—140880

Figure 32—Continued.

119. Assembly

a. Fasten the top slide feed screw nut (RR) to the underside of the top slide (B) with two feed screw nut screws (QQ). Place the top slide gib (A) in the dovetail slot in the slide over the locating pins. Slide this unit over the lower swivel so the dovetails engage.

b. Place the travel stop feed screw block (UU) into the back of the slot in the lower swivel (T) and secure with one dowel screw (WW) and one travel stop block screw (VV). Lightly screw two No. 8–32 x 5/8 flat-point hexagon socket setscrews (G) into the side of the top slide (B) and screw on two hexagon nuts (H).

c. Thread the top slide feed screw (J) into the top slide feed screw nut (RR) in the lower swivel (T). Place the indicator flange support (K) over the feed screw and secure it to the swivel with two indicator flange support screws (L). Slide the top slide feed screw sleeve (TT) into the lower swivel (T) over the top slide feed screw (J) and secure it with one feed screw adjusting screw (KK).

d. Fasten the swivel graduated dial (V) to the top of the bottom slide (Y) with four No. 3–48 x 1/4 fillister-head machine screws (U). Insert the lower swivel cone gib (Z) into the slot in the bottom slide so the beveled edge faces inward and downward. Center the lower swivel (T) over the swivel graduated dial. Place the lower swivel cone (AA) over the pin (AH) in the lower swivel which now protrudes through the bottom slide. Secure the swivel cone with three lower swivel cone screws (BB). Then screw the lower swivel cone gib binder (X) with handle into the hole on the bottom slide opposite the swivel cone gib (Z).

e. Place the bottom slide feed nut (ZZ) into the slot in the base loosely so the tapped hole faces the back of the slide. Insert the bottom slide feed nut screw (XX) through the bottom slide and thread it into the bottom slide feed nut (ZZ). Place the intermediate gear (AF) over the pin (AJ) below the feed nut screw so it engages the gear on the feed screw. Screw one No. 10–32 x 1/4 cup-point hexagon socket setscrew (AK) in base (AG). Slide the feed screw bearing plate (FF) over the feed screw and secure with four bearing plate screws (EE). Place the feed screw sleeve (JJ) over the bottom slide feed screw (GG) and secure with one feed screw adjusting screw (KK).

f. Place the bottom slide gib (SS) over the locating pins in the dovetailed guideway in the bottom slide (Y). Slide the bottom slide over the base (AG) until the hole just back of the graduated dial is centered over the threaded hole in the bottom slide feed nut (ZZ). Then screw the bottom slide feed nut screw (XX) into the feed nut.

g. Lightly screw four No. 8–32 x 7/8 cup-point hexagon socket setscrews (W) into the bottom slide (Y) and screw on four hexagon nuts

(H). Place one indicator flange (M) over the indicator flange support (K) and another flange (M) over feed screw bearing plate (FF). Secure each indicator flange (M) with one 5/32–40 x 1/8 cup-point hexagon socket setscrew (N). The setscrews should be on top so the reference line on each flange is on top.

h. Slide one feed screw dial (S) over each feed screw (J and GG) flush with the indicator flange (M). Insert one cork tip (AE), setscrew tip (AD) and dial binder spring (AC) in each dial and secure with one No. 10–32 x 3/8 flat-point hexagon socket setscrew (AB). Place the stop and bottom slide ball handles (R and DD) over their respective feed screws. Insert one retaining pin (Q and CC) in each ball handle and secure with one 1/4–20 x 3/8 cup-point hexagon socket setscrew (P). The larger ball handle is for the bottom slide feed screw.

i. Screw the stop screw (MM) into the stop screw check-nut (NN) and stop block (PP). Attach this adjustable stop to the rear of the base with one stop block screw (LL). Screw two 1/4–20 x 5/8 fillister-head machine screws (HH) into the side of the base. Screw two No. 6–32 x 3/8 oval head machine screws (YY) into the top of the bottom slide.

j. Screw the tool holder clamp assembly (E) into the tool holder (F). Insert the tool holder through the tool holder washer (C) and place in one of the T-slots in the top slide. Insert the tool holder grip (D) on the tool holder washer and tighten the tool holder clamp. A small piece of wood inserted between the tool holder grip and clamp will aid in holding the tool holder parts securely.

120. Adjustment

Adjust the feed screws (par. 86) and slide gibs (par. 87).

121. Installation

Carefully slide the compound slide rest assembly over the carriage angle so the T-slot in the base engages the T-binder stud (par. 30) on the carriage angle. Then lock the compound slide rest assembly in place.

Section VI. TAILSTOCK ASSEMBLY

Note. The key letters shown below in parentheses in this section refer to figure 33.

122. General

Organizational maintenance of the tailstock assembly is described in paragraphs 92 and 93.

123. Removal

Pull up the tailstock binder (par. 33) to release the tailstock assembly. Then slide the tailstock assembly off the lathe bed (fig. 29).

124. Disassembly

a. Unscrew the tailstock clamp (B) from the tailstock assembly. Do not attempt to disassemble the tailstock clamp. Remove the spindle guide screw (C). Turn the feed screw ball handle clockwise as far as the spindle will travel to push the tailstock spindle with nut (A) from the tailstock (D). Pull out the spindle.

b. Unscrew the ball handle screw (M) and pull off the feed screw ball handle (N). Unscrew one hexagon socket setscrew (L) from the tailstock dial (Q). Take care not to lose the dial spring (K), brass tip (J) and cork tip (H) under the setscrew. Remove feed screw key (P) and pull off the tailstock dial (Q). Remove dial bushing (R) from tailstock feed screw (E). Unscrew four fillister-head screws (G) in the end plate (F) and remove the end plate and tailstock feed screw (E).

c. Unscrew one tailstock adjusting screw (V) from each side of the tailstock base (U). Unscrew two tailstock gib screws (S) from the rear of the tailstock. Unscrew one slot-drive setscrew (X) in the binder stud and remove the binder stud (AA) plunger spring (Y) and plunger (Z).

d. Unscrew one eccentric binder retaining screw (W) from the underside of the tailstock base. Pull the eccentric binder (BB) with handle from the rear of the stock. Then pull the binder stud (AA) from the base and slide the base from the tailstock. Remove the tailstock gib (T).

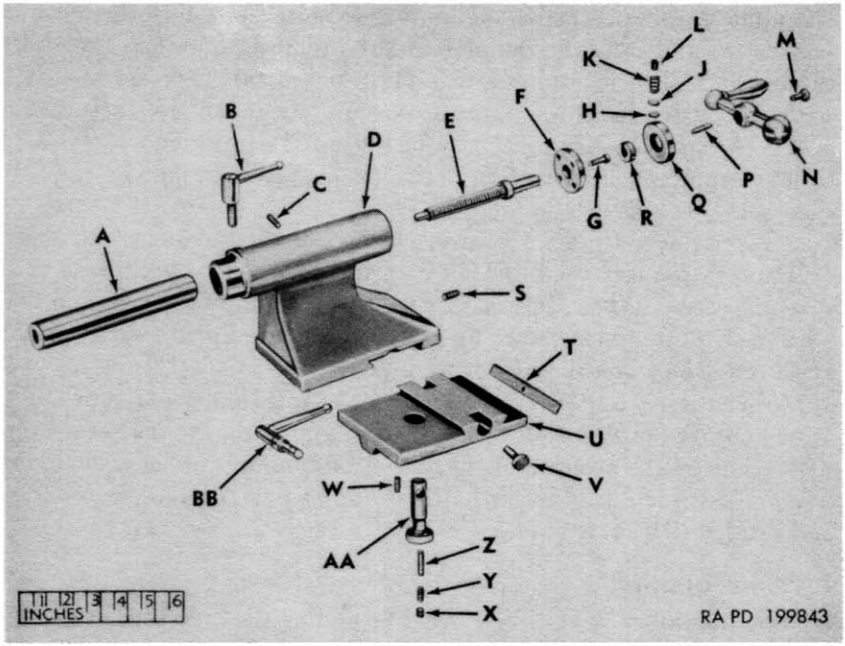
e. Do not disassemble the eccentric binder (BB) with handle or feed screw ball handle. Remove the oil cup from the end plate only if the oil cup needs replacement.

125. In-Process Inspection and Repair

Examine the threads on the tailstock feed screw (E) and spindle (A) for wear. Inspect the inner and outer surfaces of the spindle for surface mars. Examine the dovetailed guideway and guide on the tailstock and tailstock base (U) for wear and surface defects. Particularly check the tailstock gib (T) for wear. Inspect the graduations on the tailstock dial (Q) for readability. Examine all parts for cracks, breaks, and other defects. Replace any defective parts.

126. Assembly

a. Place the tailstock gib (T) over the locating pins on the dovetailed guide on the tailstock base (U). Then slide the base into the dovetailed guideway in the tailstock (D). Screw two tailstock gib screws (S) in rear of tailstock. Insert the binder stud (AA) into the base and insert the eccentric binder with handle (BB) through the tailstock so it passes through the binder stud.



A—Spindle, tailstock, w/nut
B—Clamp, tailstock, w/handle
C—Screw, guide, spindle—RVT–506–22–639
D—Tailstock—RVT–608–22C–508A
E—Screw, feed, tailstock—RVT–506–22–556
F—Plate, end—RVT—608–22C–374
G—Screw, mach, fil-hd, No. 8–32 x 3/8—131963
H—Tip, cork—RVT–608–22C–511
J—Tip, brass—RVT–103–4B–511
K—Spring, dial—RVT–608–22C–666
L—Setscrew, hex-socket, fl-pt, No. 10–32 x 3/16—222373
M—Screw, ball handle—RVT–506–22–637
N—Handle, ball, feed screw
P—Key, feed screw—RVT–506–22–287
Q—Dial, tailstock—RVT–608–22C–193
R—Bushing, dial—RVT—608–22C–151
S—Screw, tailstock gib—RVT–608–22C–637
T—Gib, tailstock—RVT–608–22C–245
U—Base, tailstock—RVT–608–22C–115
V—Screw, adjusting, tailstock—RVT–608–22–637
W—Screw, retaining, eccentric binder—RVT–608–22–638
X—Setscrew slot-drive, 5/16–18 x 7/16
Y—Spring, plunger, binder stud—RVT–507–5–478
Z—Plunger, binder stud—RVT–608–22–655
AA—Stud, binder—RVT–608–22–498
BB—Binder, eccentric, w/handle

Figure 33. Tailstock assembly—exploded view.

b. Screw the eccentric binder retaining screw (W) into the tailstock base (U) so the tip engages the concentric slot in the eccentric binder (BB) with handle. Insert the binder stud plunger (Z) and binder stud plunger spring (Y) into the binder stud and secure them with a 5/16–18 x 7/16 slot-drive setscrew (X).

c. Screw one tailstock adjusting screw (V) into each side of the tailstock base. Do not overtighten the adjusting screws.

d. Screw the spindle guide screw (C) into the cylindrical part of the tailstock (D). Look into the hole in the tailstock to see how far

the guide screw protrudes. The long axis of the guide tip must be horizontal and must fit the slot in the tailstock spindle. Carefully screw the tailstock feed screw (E) into the tailstock spindle (A) with nut about halfway. Insert this unit into the tailstock so the slot in the spindle engages the tip of the spindle guide screw (C) as it slides through, and screw in tailstock clamp with handle (B) in tailstock.

e. Place the end plate (F) over the end of the tailstock feed screw (E) and fasten it to the tailstock with four No. 8–32 x 3/8 fillister-head machine screws (G). Insert the cork tip (H), brass tip (J), and dial spring (K) into the tailstock dial (Q) and secure lightly with one No. 10–32 x 3/16 hexagon socket setscrew (L).

f. Place the feed screw key (P) in the tailstock feed screw (E). Insert the dial bushing (R) into the dial and slip over the feed screw (E). Secure the position of the dial by tightening the setscrew in the dial. Fasten the feed screw ball handle (N) to the feed screw with one ball handle screw (M).

127. Installation

Slide the tailstock assembly over the end of the lathe bed (fig. 29). Secure the tailstock assembly to the bed by tightening the tailstock binder (par. 33).

128. Adjustment

Adjust the tailstock gib (par. 93).

Section VII. HEADSTOCK ASSEMBLY

Note. The key letters shown below in parentheses in this section refer to figure 34.

129. General

Organizational maintenance of the headstock assembly is described in paragraphs 81 through 84.

130. Removal

The headstock assembly is secured to the lathe bed with two binder studs, binder stud washers, and hexagon nuts (fig. 29). However, the drive belt must also be removed to clear the headstock.

a. Remove the drive belt (par. 84*b*).

b. Then remove the hexagon nuts and washers from the underside of the lathe bed and lift up the headstock. Unscrew the binder studs from the headstock.

131. Disassembly

a. Remove the left-hand and right-hand gear guards (C and P) by unscrewing four fillister-head screws (D). Unfasten the gear shaft

lever (U) by removing the shaft lever screw (V) in the lever. Remove the front and rear gear shaft bushings (W and AA) by unscrewing two setscrews (Z) on the underside of the headstock flange arms. Pull out the bushings and back gear shaft (X). This will free the back gear (Y).

b. Remove the setscrew in the spindle gear (T) and pull the gear from the headstock spindle (BB). Take care not to lose the spring (R) and ball (S) under the setscrew (Q). Remove the spindle key (DD) and driving gear key (CC) from the spindle.

c. Remove the stud gear assembly (UU) from the switch gear assembly (WW) by unscrewing one stud gear retaining screw (PP). Unscrew the setscrews securing the intermediate gear with bushing (QQ) and switch gear assembly (WW) to the headstock with front bushing (EE). Pull off these gears. Do not disassemble the switch gear assembly.

d. Unscrew two oil cups (JJ) from the headstock. Pull out the index pin (MM) in the headstock and remove. Unscrew the setscrew (HH) in the hole at right angles to the pin. Remove the detent spring (GG) and detent pin (FF) from under the setscrew.

Caution: Take great care that the bearing surfaces of bushings, the spindle, and gears are not damaged.

e. Unfasten the rear dust ring (NN) by unscrewing two fillister-head screws (D). Unscrew setscrew (SS) from headstock and carefully back out the rear bushing key screw (RR). The rear spindle bushing (TT) will slide out with the key screw. Remove the rear bushing key (VV) and two fiber spacers (LL) from the bushing.

f. Unscrew the check-nut setscrew (KK) from the driving gear assembly (L). Carefully unscrew the gear check-nut (N). This check-nut is split to aid in adjustment and removal (par. 83).

g. Remove the front dust cap (B) and spindle nose guard (A) from the spindle (BB). Carefully slide the headstock spindle from the headstock and driving gear. Remove the spindle key (DD). Lift out the driving gear assembly (L) and headstock cone pulley assembly (G). Remove the pulley spacer (E) from the cone pulley and separate the pulley and driving gear assembly (L).

h. Unscrew the setscrew (K) in the ring on the driving gear assembly (L), and remove the drive pin spring (T) and detent pin (H) under the setscrew. Then pull out the drive pin (M). Unscrew the setscrew (F) in the center cone on the cone pulley.

i. Do not further disassemble the headstock cone pulley. The front bushing in the headstock may be removed if suitable equipment is available but only if the bushing is damaged or worn excessively.

132. In-Process Inspection and Repair

Examine all bushings and bearing surfaces for excessive wear and scoring. Inspect the gears for worn or damaged teeth. Examine the

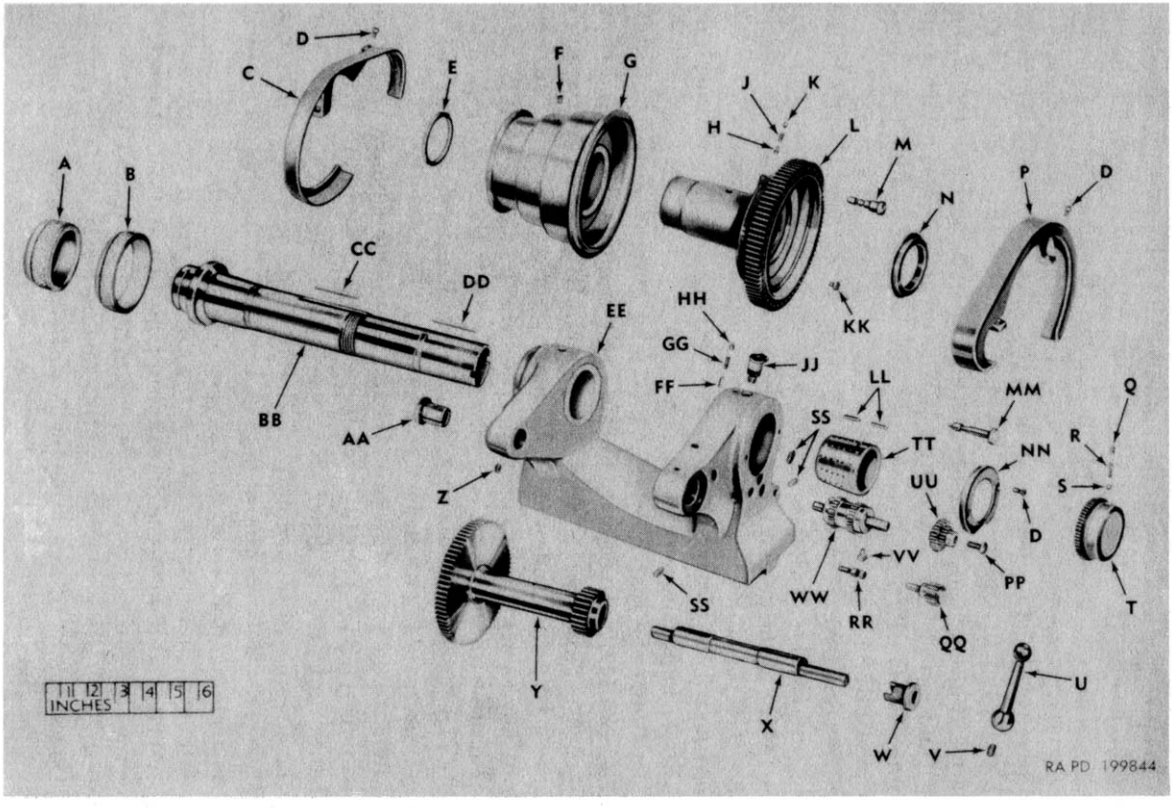


Figure 34. Headstock assembly—exploded view.

A—Guard, spindle nose—RVT–505–5C–12–251
B—Cap, dust, front—RVT–608–5C–12–163
C—Guard, gear, right-hand—RVT–608–5C–12–253A
D—Screw, mach, fil-hd, No. 8–32 x 3/8—131963
E—Spacer, pulley—RVT–608–5C–12–473
F—Setscrew—RVT–103–17–639
G—Headstock pulley, cone, assy
H—Pin, detent—RVT–608–5C–12–356
J—Spring, drive pin—RVT–608–20–666
K—Setscrew, hex-socket, cup-pt, No. 10–32 x 1/4—140880
L—Gear, driving, assy
M—Pin, drive—RVT–608–5C–12–355
N—Check-nut, gear—RVT–608–5C–12–324
P—Guard, gear, left-hand—RVT–608–5C–12–252A
Q—Setscrew, slot-drive, No. 10–32 x 1/8
R—Spring—RVT–608–5C–12–667
S—Ball, steel, 5/32 DIAM
T—Gear, spindle, 60-TOOTH—40–G–85–608
U—Lever, gear shaft—RVT–608–12–302
V—Screw, gear shaft lever—RVT–608–12–240
W—Bushing, gear shaft, rear—40–B–1259–656
X—Shaft, back gear—RVT–608–12–440
Y—Gear, back—40–G–85–573
Z—Setscrew, hex-socket, cup-pt, 1/4–28 x 1/4—139009
AA—Bushing, gear shaft, front—40–B–1259–653
BB—Spindle, headstock—RVT–608–5C—12–468
CC—Key, driving gear—RVT–608–12–287
DD—Key, spindle—RVT–GK21–288
EE—Headstock w/front bushing
FF—Pin, detent—RVT–608–5C–12–357
GG—Spring, detent—RVT–608–5C–12–666
HH—Setscrew, hex-socket, cup-pt, 1/4–20 x 1/4—102569
JJ—Cup, oil—GTS–2201
KK—Setscrew, check-nut—RVT–608–12–642
LL—Spacer, fiber—RVT–608–5C–12–334
MM—Pin, index
NN—Ring, dust, rear—RVT–608–5C–12–164
PP—Screw, retaining, stud gear—RVT–608–12–641
QQ—Gear, intermediate, w/bushing
RR—Screw, key, rear bushing—RVT–10312–638
SS—Setscrew, hex-socket, cup-pt, 14/20 x 3/8—102570
TT—Bushing, rear spindle—40–B–1259–665
UU—Gear, stud, assy
VV—Key, rear bushing—RVT–103–12–287
WW—Gear, switch, assy

Figure 34—Continued.

headstock spindle for damaged or worn threads and marred surface. Inspect threads on all parts which are threaded. Generally, examine all parts for surface defects, cracks, breaks, and deformity. Replace any defective parts.

133. Assembly

a. Insert the drive pin (M) into the hole in the inside face of the driving gear assembly (L). Insert the detent pin (FF) and detent spring (GG) into the hole in the boss on the ring on the driving gear assembly (L) which is at right angles to the drive pin (M). Secure the drive pin by screwing in one No. 10–32 x ¼ cup-point hexagon socket setscrew (K) drive pin spring (J) and detent pin (H).

b. Place the spindle key (DD) and driving gear key (CC) in the grooves in the headstock spindle (BB). Slide the driving gear assembly (L) into the headstock cone pulley assembly (G) and secure with setscrew (F). Place the pulley spacer (E) over the shaft end of the driving gear assembly (L) and screw check-nut setscrew (KK) in driving gear assembly (L). Rotate the driving gear until the drive pin (M) engages the cone pulley so the gear and pulley are almost flush. Place this unit between the bearing uprights on the headstock.

c. Now carefully slide the headstock spindle (BB) through the driving gear assembly (L) so the spindle key (DD) engages the driving gear. At the same time, slip the gear check-nut (N) over the emerging end of the spindle. The larger end of the check-nut must face the driving gear.

d. Partially thread the gear check-nut (N) onto the spindle. Insert the rear bushing key (VV) into the rear gear shaft bushing (W). Place two fiber spacers (LL) into the split slot in the rear spindle bushing (TT). Insert the rear bushing key screw (RR) into the headstock just below the rear bearing. Rotate the rear bearing so the rear bushing key (VV) engages the radial groove in the key screw. Carefully side the rear spindle bushing (TT) into the headstock by screwing in the key screw. Do not overtighten the key screw which will cause binding of the bushing.

e. Fasten the rear dust ring (NN) to the headstock with two No. 8–32 x ⅜ fillister-head machine screws (D). Place the front dust cap (B) over the headstock spindle (BB) and screw on the spindle nose guard (A).

f. Insert the unthreaded end of the switch gear assembly (WW) into the hole in the headstock to the right and below the rear bushing key screw (RR). Secure with one ¼–20 x ⅜ cup-point hexagon socket setscrew (SS). Fasten the intermediate gear with bushing (QQ) to the headstock with one ¼–20 x ⅜ cup-point hexagon socket setscrew (SS) in like manner so the gears mesh. Fasten the stud gear assembly (UU) to the end of the switch gear assembly (WW) with one stud gear retaining screw (PP).

g. Insert one $\frac{5}{32}$ diameter steel ball (S) and spring (R) into the 60-tooth spindle gear (T) and lightly screw in one No. 10–32 x $\frac{1}{8}$ slot-drive setscrew (Q). Place the spindle key (DD) into the groove in the spindle. Slide the spindle gear (T) over the spindle so the key engages. Secure the setscrew in the spindle gear but do not overtighten.

h. Insert the index pin (MM) into the hole in the headstock with front bushing (EE) next to the left-hand gear shaft bushing in hole. Screw in oil cup (JJ) and check-nut setscrew (KK) in headstock (EE). Insert the detent pin (FF) and detent spring (GG) into the hole over the index pin. Secure the pin position with one $\frac{1}{4}$–20 x $\frac{1}{4}$ cup-point hexagon socket setscrew (HH). Pull the index pin out so it does not engage the driving gear.

i. Place the back gear (Y) between the arms on the headstock uprights and slide the back gear shaft (X) through the headstock and gear. The pin on the eccentric must be pointed to the rear of the headstock. Take care that the gear teeth do not clash.

j. Rotate the back gear shaft (X) so the eccentric pin is downward. Then place the front and rear gear shaft bushings (W and AA) over the shaft and into the headstock. The indentations on the bushings should match each hole under the arm. The rear gear shaft bushing (W) is also radially slotted to clear the eccentric pin. Secure each bushing with one $\frac{1}{4}$–28 x $\frac{1}{4}$ cup-point hexagon socket setscrew (Z).

k. Fasten the gear shaft lever (U) to the back gear shaft (X) with gear shaft lever screw (V). Pull up on the lever carefully to see if the back gear moves in and out of mesh with the driving gear. Adjust the position of the gear shaft if necessary. Fasten the left and right-hand gear guards (C and P) to the headstock with four No. 8–32 x $\frac{3}{8}$ fillister-head machine screws (D).

134. Bearing Adjustment

Adjust the rear and front headstock bearings (pars. 82 and 83).

135. Installation

a. Thread the two binder studs (fig. 29) into the bottom of the headstock assembly. Guide the studs through the holes in the lathe bed and lower the headstock assembly onto the bed. Fasten the studs with two binder stud washers and two $\frac{7}{16}$–14 hegagon nuts.

b. Replace the flat drive belt (par. 84*c*) and then adjust the belt (part. 84*a*).

Section VIII. CARRIAGE ASSEMBLY

136. General

a. The carriage assembly (figs. 35 and 36) and carriage angle assembly (fig. 37) form a single major functional unit. Each component must be partially disassembled to separate them. The two

components may be separated first or the entire functional units removed from the lathe bed and then separate. Generally both components are serviced at the same time. However, use either procedure depending on the extent of repair.

b. Organizational maintenance of the carriage assembly is described in paragraphs 88 through 91.

137. Removal

Note. The key letters shown in parentheses in *a* through *c* below refer to figure 38.

a. Remove the tailstock from the lathe bed (par. 123).

b. Unscrew two thrust washer screws (M) and remove the two thrust washers (K) and keys (L) from the right end plate (J) on the lathe bed. Unscrew four end plate screws (B) and pull off the right end plate (J).

c. Release the carriage clamp (par. 26). Move the carriage assembly and carriage angle assembly to the left by turning the carriage hand feed clockwise (par. 23) until the units slide from the bed.

Note. The key letters shown in parentheses in *d* and *e* below refer to figure 36, except where otherwise indicated.

d. Unscrew cover screws (LL) and lift off the cover plate (E). Unscrew one setscrew (YY) in the locking fork (J). Unscrew the interlocking handle (L). This will allow rotation of the interlocking shaft (K) to get at the taper pin (N) securing the locking dog (M). Pull this taper pin or gently tap it out. Then unscrew the nut cover plug (P) on the right side of the lead-screw nut cover (D). Slide the interlocking shaft (K) through the carriage angle assembly (E, fig. 37), locking dog (M) and nut cover (D).

e. Unscrew three fillister-head screws (B, fig. 37) to remove the rear end plate (C, fig. 37) on the carriage angle assemble (E, fig. 37). Unscrew four fillister-head screws (S and T, fig. 37) on the front of the carriage angle. Now slide the carriage angle from the carriage.

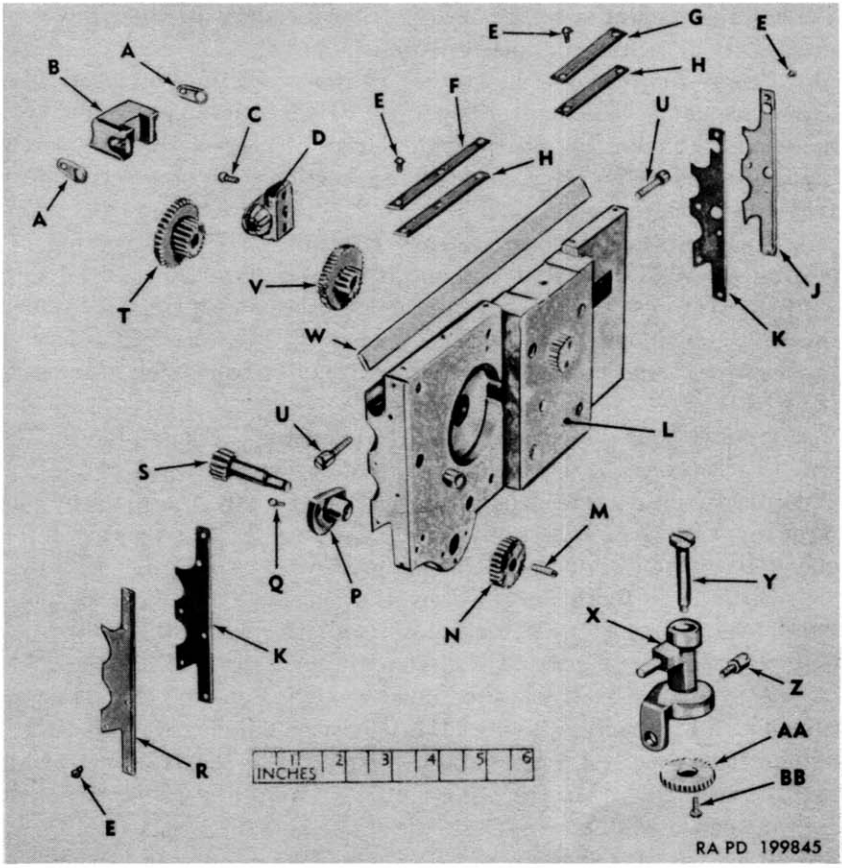
Note. Take care that the cross interfeed gear inside the carriage angle does not drop out.

138. Disassembly

Note. The key letters shown below in parentheses refer to figure 36, except where otherwise indicated.

a. Unscrew the locating screw (Z, fig. 35) and remove the thread dial assembly (Y, fig. 35). To disassemble the thread dial assembly, unscrew one round head screw (BB, fig. 35) in the worm gear (AA, fig. 35) on the underside. Pull off the worm gear from the dial and push out the dial from the bracket. Do not remove the bracket pin from the thread dial bracket assembly (X, fig. 35).

b. Unscrew the carriage binder assembly (Z) and remove the carriage clamp (AA) and stud (BB) on the underside of the carriage. Unscrew two carriage gib screws and lift out the carriage gib. Remove



A—Link, unt—RVT-608-26-312
B—Nut, lead screw, assy
C—Screw, mach, fil-hd, No. 4-40 x 3/8—115456
D—Pinion, feed screw—RVT-608-26P
E—Screw, retaining plate, wiper—RVT-608-26-945
F—Clamp, wiper, long—RVT-608-26-179
G—Clamp, wiper, short—RVT-608-26-744
H—Blank, wiper, top—RVT-608-26-742
J—Clamp, wiper, right-hand—RVT-608-26-177
K—Blank, wiper, side—RVT-608-26-741
L—Carriage, assy
M—Key, gear—RVT-608-26-291
N—Gear, intermediate rack, 30-tooth—40-G-85-598
P—Bearing, rack gear—40-B-128-36
Q—Screw, bearing—RVT-608-26-646
R—Clamp, wiper, left-hand—RVT-608-26-178
S—Gear, rack—40-G-85-606
T—Gear, compound—RVT-608-26HA
U—Screw, carriage gib—RVT-608-26-639
V—Gear, bevel, assy
W—Carriage, gib—RVT-608-26-245
X—Bracket, thread dial, assy
Y—Dial, thread—RVT-LVK-193
Z—Screw, locating—RVT-LVK-637
AA—Gear, worm—RVT-LVK-811
BB—Screw, mach, rd-hd, No. 4-40 x 1/4—132627

Figure 35. Carriage assembly—first exploded view.

the hand feed handle assembly (S) from the shaft of the hand feed gear (FF) by tapping out one taper pin (VV).

c. Unscrew two stop lever screws (Y) to remove the stop lever (X). Take care not to lose the lever spring (PP) and lever plunger (NN) under the knurled lip on the stop lever. Unscrew the stop-screw binding screw (EE); then unscrew the friction lever stop screw (W) from the stop lever.

d. Unscrew the intermediate rack gear nut (UU) and spring retaining screw (U) located just above the rack gear nut. Take care not to lose the locking ball (T) and rack gear bearing spring (V) under the screw. Tap out one taper pin (VV) in the friction lever (R) and taper pin (Q) and remove the lever and remove front rack gear bearing (TT).

e. Remove four plate screws (SS), lift off the carriage plate (RR) and two screws (QQ) and remove stop lever guard (MM). Unfasten the friction lever base (WW) from the carriage plate by unscrewing two lever base screws (XX). Remove the friction lever guard from the top of the plate by unscrewing two flat head screws.

f. Lift the 30-tooth intermediate rack gear (N, fig. 35), 12-tooth hand feed gear (FF), 18-tooth intermediate rack gear (DD), and 57-tooth hand feed gear (CC) from the carriage. Slide the gear key (M, fig. 35) from the rack gear. Remove the friction plunger (KK), friction spring (HH), friction clutch assembly (GG), and friction gear (A) from the carriage. Slip the friction spring and pin assembly (B) from the clutch. The plunger pin (C) will fall out of the clutch.

g. Remove the rack gear (S, fig. 35) and compound gear (P, fig. 37) from the back of the carriage. Unfasten the rack gear bearing (TT) and rack gear bearing (P, fig. 35) by unscrewing three bearing screws (Q, fig. 35). Pull the bearing from the rear of the carriage. Unscrew two fillister-head screws (C, fig. 35) and remove the feed screw pinion (D, fig. 35), bevel gear assembly (V, fig. 35), and compound gear (T, fig. 35) from the back of the carriage. Remove the carriage gib (W, fig. 35) by removing gib screw (U, fig. 35).

h. From the back push the lead screw nut assembly (B, fig. 35) out through the front of the carriage. The other lead screw nut parts will drop out with the nut. Unscrew the eccentric nut shaft screw (JJ) from the underside of the lead screw nut cover (D). Unscrew the set screw (G) in the locking disk (F) on the eccentric locking lever assembly (H). Carefully remove the eccentric locking lever assembly, lead screw nut assembly (B, fig. 35), two nut links (A, fig. 35) and locking disk (F) from the nut cover (D).

i. Remove the four wiper clamps (F, G, J, and R, fig. 35) and wiper blanks (H and K, fig. 35) from the edges of the carriage assembly (L, fig. 35) and carriage clamp stud (BB) by unscrewing 16 wiper retaining plate screws (E, fig. 35).

j. Do not disassemble the carriage further. The crossfeed gears, gear studs, and locating pins are press-fitted in place.

139. In-Process Inspection and Repair

Examine all gears for worn or damaged teeth. In particular, examine, the threads on the lead screw nut assembly (B, fig. 35) for excessive wear. See that the carriage gib (W, fig. 35) is free from surface mars and excessive wear. Inspect the friction lever (R, fig. 36), spring, gear, spring and pin, and clutch for wear, breakage and deformity. Examine the locking fork (J, fig. 36), locking dogs (M, fig. 36) and locking disk (F, fig. 36) for wear and deformity. Check the graduation on the thread dial (Y, fig. 35) for readability. Inspect the stop lever (X, fig. 36) and wiper clamps for bends. Check the wiper blanks (H and K, fig. 35) for wear and deterioration. Examine the threads on all threaded parts. Replace all defective parts.

140. Assembly

Note. The key letters shown in parentheses in *a* through *c* below refer to figure 35, except where otherwise indicated.

a. Fasten the four top and side wiper blanks (H and K) and four long, short, right- and left-hand wiper clamps (F, G, J, and R) to the top and side edges of the carriage assembly (L) with 16 wiper retaining plate screws (E). Thread the carriage clamp stud (BB, fig. 36) into the bottom center of the carriage assembly.

b. Place the 33-tooth intermediate feed gear (V, fig. 37) on its stud shaft in the rear of the carriage. The gear should mesh with the 12-tooth crossfeed gear (Y, fig. 37) which is mounted in position. Place the bevel gear assembly (V) on its stud shaft below the compound gear (T) so it meshes. Then fasten the feed screw pinion (D) and compound gear (T) to the carriage with two No. 4–40 x 3/8 fillister-head machine screws (C) so it positions over and engages the bevel gear.

c. Insert the rack gear bearing (P) and rack gear bearing (TT, fig. 36) to the hole in the semicircular flange in the carriage. Secure the bearing with three bearing screws (Q). Insert the rack gear (S) into the rack gear bearing. The rack gear has a shaft as an integral part. Turn the carriage so the front faces up. Place

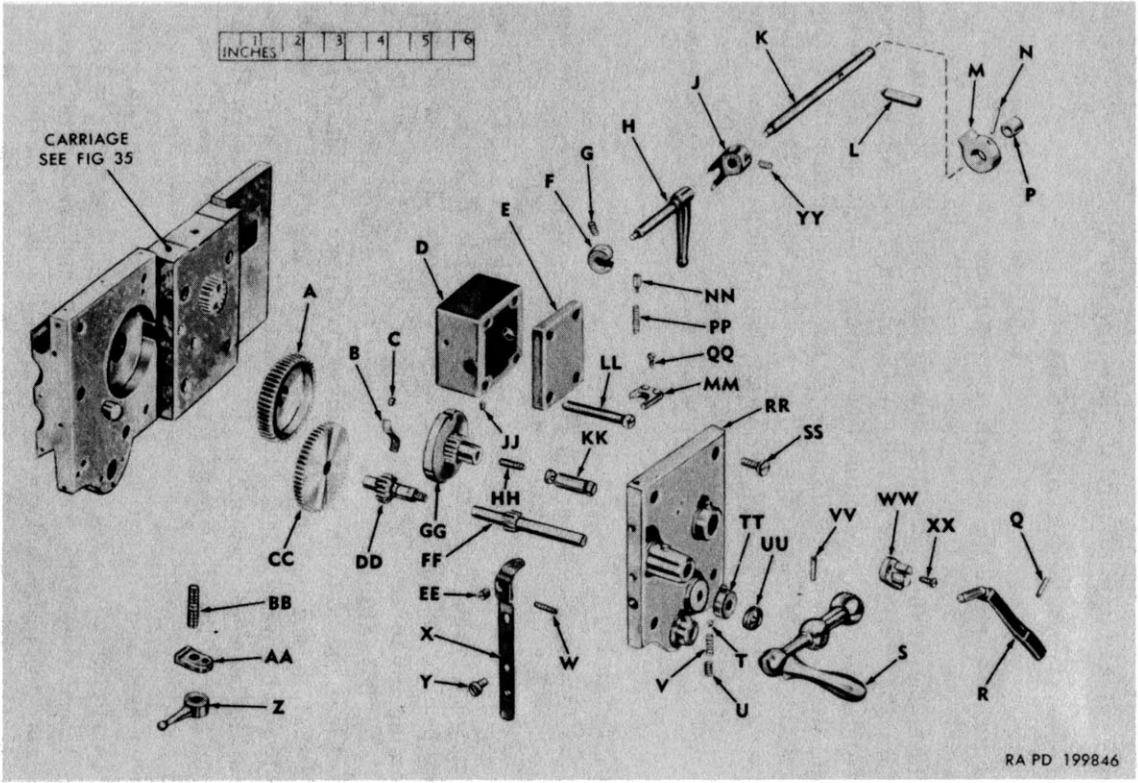


Figure 36. Carriage assembly—second exploded view.

A—Gear, friction—40–G–85–571
B—Spring and pin, friction, assy
C—Pin, plunger—RVT–608–26–359
D—Cover, nut, lead screw—RVT–608–26–182
E—Plate, cover—RVT–608–26–377
F—Disk, locking—RVT–608–26–654
G—Setscrews, slot-drive, No. 10–32 x ¼—140880
H—Lever, eccentric locking, assy
J—Fork, locking—RVT–608–26–220
K—Shaft, interlocking—RVT–608–26–438
L—Handle, interlocking—RVT–608–26–216A
M—Dog, locking—RVT–608–26–208
N—Pin, taper, No. 3 x ⅞—113497
P—Plug, nut cover, lead screw—RVT–608–26–379
Q—Pin, taper, No. 3 x ¾—111828
R—Lever, friction — RVT–608–26–302
S—Handle, hand feed, assy
T—Ball, locking, ⅛ in. diam
U—Screw, spring retaining—RVT–608–26–650
V—Spring, bearing, rack gear—RVT–608–26–666
W—Screw, stop, friction lever—RVT–608–26–643
X—Lever, stop—RVT–608–26–303
Y—Screw, stop lever—RVT–608–26–638
Z—Binder, carriage, assy
AA—Clamp, carriage—RVT–608–26–378
BB—Stud, carriage clamp—RVT–608–26–142
CC—Gear, hand feed, 57-tooth—40–G–85–583
DD—Gear, rack, intermediate, 18-tooth—RVT–608–26–228
EE—Screw, binding, stop-screw—RVT–608–26–644
FF—Gear, hand feed, 12-tooth—RVT–608–26–226
GG—Clutch, friction, assy
HH—Spring, friction—RVT–608–26–480
JJ—Screw, shaft, eccentric nut—RVT–608–26–649
KK—Plunger, friction—RVT–608–26–655
LL—Screw, cover, No. 10–32 x 1¾
MM—Guard, stop lever—RVT–608–26–252
NN—Plunger, lever—RVT–608–26–656
PP—Spring, lever—RVT–608–26–481
QQ—Screw, mach, fil-hd, No. 4–40 x ¼—133364
RR—Plate, carriage—RVT–608–26–374
SS—Screw, plate—RVT–608–26–640
TT—Bearing, rack gear—RVT–608–26–119
UU—Nut, rack gear, intermediate—RVT–608–26–679
VV—Pin, taper, No. 3 x 1—111829
WW—Base, friction lever—RVT–608–26–115
XX—Screw, lever base—RVT–608–26–645
YY—Setscrew, slot-drive, No. 10–32 x ⅛—217501

Figure 36—Continued.

the gear key (M) into the rack gear (shaft) and slide the 30-tooth intermediate rack gear (N) onto the shaft on the rack gear (S).

Note. The key letters shown in parenthese in *d* through *q* below refer to figure 36, except where otherwise indicated.

d. Locate the friction lever base (WW) over the two small pins on the front of the carriage plate (RR) and secure it with two lever base screws (XX). Fasten the friction lever (R) to the friction lever base with one No. 3 x 3/4 taper pin (Q). Place the friction gear (A) into the large hole in the front of the carriage. The friction gear should now engage the 33-tooth intermediate feed gear (V, fig. 37) on the rear of the carriage through the slot to the side of the large hole.

e. Insert the friction spring (HH) and friction plunger (KK) into the friction clutch assembly (GG) and hold them in place with the fingers. Insert the plunger pin (C) into the radial hole in the opposite side of the clutch at right angles to the plunger. Place the friction spring and pin assembly (B) in the clutch so the pin locks to the edge of the clutch and the spring fits over the plunger pin hole.

f. Press down on the friction plunger (KK). This should push the plunger pin partially out of its hole which in turn moves the friction spring to cause expansion of the clutch ring. The tip of the plunger pin must ride in the curved groove in the friction plunger so that cam action movement is possible.

g. Insert the friction clutch assembly (GG) mechanism into the friction gear (A). Place the 57-tooth hand feed gear (CC) near its stud shaft so it meshes with the gear on the feed screw clutch. Insert the unthreaded shaft end of the 18-tooth intermediate rack gear (DD) into the carriage so it meshes with the 57-tooth hand feed gear (CC). Insert the 12-tooth hand feed gear (FF) into the hole to the upper left of the 57-tooth hand feed gear so they engage.

h. Now place the carriage plate (RR) over the front of the carriage so the shafts and plunger slide into their respective bearing bosses. Fasten the carriage plate securely with four plate screws (SS). Fasten the stop level guard (MM) to the top of the carriage plate with two No. 4–40 x 1/4 flat head machine screws (QQ).

i. Insert the lever spring (PP) and lever plunger (NN) into the hole between the lips of the stop lever guard (MM). Place the stop lever over the lever plunger and flush with side of the carriage plate. Fasten the stop lever (X) in place with two stop lever screws (Y) so that the stop lever is free to slide without binding or sideplay.

j. Push down on the knurled lip on the stop lever and screw the friction lever stop screw (W) into its side until about one-quarter of an inch of the screw protrudes. Then lightly secure the position of the stop screw by screwing the stop-screw binding screw (EE) into the stop lever. Insert the 1/8-inch diameter locking ball (T) and rack gear

bearing spring (V) into the center boss on the carriage plate (RR) and lightly secure them with the spring retaining screw (U) and install front rack gear bearing (TT). Screw the intermediate rack gear nut (UU) onto the threaded shaft on the 18-tooth intermediate rack gear (DD).

k. Insert the eccentric locking lever assembly (H) into the rearmost hole in the lead screw nut cover (D). At the same time, slide the eccentric shaft through one nut link (A, fig. 35), the locking disk (F) and a second nut link (A, fig. 35). Continue to slide the eccentric locking lever into the small hole in the opposite side of the lead screw nut cover (D). Then secure the position of the eccentric locking lever assembly (H) by screwing the eccentric nut shaft screw (JJ) into the bottom edge of the lead screw nut cover (D) underneath the locking lever. The tip of the eccentric shaft screw must ride in the detent groove in the locking lever. This shaft screw must be flush with the edge of the nut cover but not so tight as to bind the locking lever.

l. Secure the locking disk (F) to the eccentric shaft in its proper position with No. 10–32 x ¼ slot-drive setscrew (G). Fit the nut links (A, fig. 35) over the pins on the lead screw nut assembly (B, fig. 35). Carefully press the lead screw nut assembly into the rectangular hole in the carriage until the lead screw nut cover (D) is flush with the carriage.

m. Fasten the hand feed handle assembly (S) to the shaft on the 12-tooth hand feed gear (FF) extending through the upper bearing boss on the carriage plate with one No. 3 x 1 taper pin (VV).

n. Insert the thread dial (Y, fig. 35) into the thread dial bracket assembly (X, fig. 35) and secure the worm gear (AA, fig. 35) to the thread dial with one No. 4–40 x ¼ round head machine screw (BB, fig. 35).

o. Carefully place the carriage angle assembly (E, fig. 37) on the carriage. Make sure the crossfeed gears engage properly. Secure the carriage angle assembly with two ⅜–16 x 1 fillister-head machine screws (T, fig. 37) and two ⅜–16 x 1½ fillister-head machine screws (S, fig. 37).

p. Slide the interlocking shaft (K) through the threaded hole in the lead screw nut cover (D) and through the carriage angle assembly (E, fig. 37). Faster the locking dog (M) to the right end with one No. 3 x ⅞ taper pin (N). The locking dog must point in so it will slide through the slot in the locking disk. Screw the lead screw nut cover plug (P) into the nut cover (D).

q. Slip the locking fork (J) into the groove in the friction plunger just underneath the friction lever (R). Rotate the fork so it slides onto the interlocking shaft (K). Secure the fork to the shoulder in the interlocking shaft with one No. 10–32 x ⅛ slot-drive setscrew

(YY). Then screw the interlocking handle (L) into the interlocking shaft (K) where it passes through the carriage angle. Secure the lead screw nut cover (D) and cover plate (E) to the carriage with four No. 10–32 x 1¾ cover screws (LL).

141. Installation

Note. The key letters shown below in parentheses refer to figure 38, except where otherwise indicated.

a. Slide the carriage assembly (L, fig. 35) and carriage angle assembly (E, fig. 37) over the right end of the lathe bed so the dovetailed guideways engage. Make sure the feed screw pinion (D, fig. 35) slides over the feed screw on the bed so the key is in the slot. Then move the carriage to the left manually (par. 23).

b. Place the right end plate with dowels (J) over the end of the feed rod assembly (D) and lead screw (F) flush with the lathe bed. Secure the end plate to the bed with four end plate screws (B). Place the two thrust washers (K) and thrust washer keys (L) over the feed rod assembly (D) and lead screw (F) so the keys fit in the slots. Secure the thrust washers and keys with two thrust washer screws (M).

c. Slide the small end of the carriage gib (W, fig. 35) into the right side of the carriage just above the upper dovetailed guide. Lightly screw in one carriage gib screw (U, fig. 35) into each side of the carriage at the carriage gib.

d. Fasten the carriage angle rear end plate (C, fig. 37) to the rear of the carriage angle with three No. 10–32 x ⅝ fillister-head machine screws (B, fig. 37).

e. Secure the carriage clamp (AA, fig. 36) to the carriage clamp stud (BB, fig. 36) by turning on the carriage binder assembly (Z, fig. 36). Fasten the thread dial bracket assembly (X, fig. 35) to the left side of the carriage with one knurled locating screw (Z, fig. 35) so that the worm gear (AA, fig. 35) engages the lead screw on the lathe bed.

142. Adjustment

Adjust the carriage gib (par. 89) and adjust the rear end plate gib (par. 91). Then adjust the friction clutch (par. 90).

Section IX. CARRIAGE ANGLE ASSEMBLY

Note. The key letters shown below in parentheses in this section refer to figure 37.

143. General

a. Since the carriage assembly and carriage angle assembly form one major functional unit, both components are generally serviced at the same time. For the coordinate disassembly of these components, reference is made to appropriate paragraphs in section VIII, chapter 4.

Other procedures outlined in this section apply only to the carriage angle assembly.

b. Organizational maintenance of the carriage angle assembly is described in paragraphs 88 through 91.

144. Removal

Remove the carriage angle assembly from the carriage (par. 137).

145. Disassembly

a. Lift the intermediate feed gear (V) from the stud shaft on the rear of the carriage angle. Unscrew two setscrews (A) and three fillister-head screws (B) from the rear end plate (C) and pull off the rear end plate gib (D).

b. Unscrew one binder stud spring (H) and spring screw (J) in the top of the binder stud (G). Take care not to lose the binder stud spring (H) under the spring screw (J). Pull the carriage angle binder assembly (F) from the right side of the carriage angle and lift out the binder stud (G).

c. Unscrew four fillister-head screws (N) and lift off the front end plate assembly (M). Slide the bearing block cover (K) off the front of the carriage angle assembly. Unscrew the pivot screw (W) from the hole in the carriage angle next to the carriage angle binder hole. Lift out the bearing block (Q), 22-tooth compound gear (P) and the crossfeed gear (Y) with shaft.

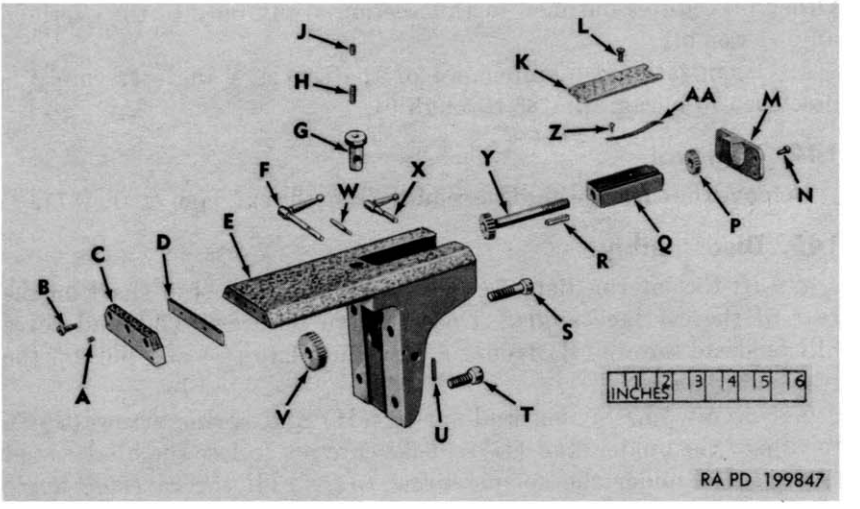
d. Pull the 22-tooth compound gear from the shaft of the other crossfeed gear and slide out the gear key (R). Pull the crossfeed gear (Y) with shaft from the bearing block (Q). Unscrew the bearing block spring screw (Z) and remove the bearing block spring (AA).

e. Unscrew the lever stop screw (U) from the curved front part of the carriage angle. Pull the bearing block eccentric lever assembly (X) from the right side of the carriage angle. Unscrew the cover oil screw (L) from the bearing block.

f. Do not disassemble the front end plate of the carriage angle further. Two felt wipers are cemented into the slots on the underside of the carriage angle. Do not remove the wipers unless they are excessively worn.

146. In-Process inspection and repair

Examine all gear teeth for excessive wear. Inspect all threads on screws for wear and stripping. Check the tips of the pivot screw (W) and lever stop screw (U) for wear and bending. Examine the binder stud (G) for worn corners, nicks, and deformity. See that the carriage angle binder assembly (F) and bearing block eccentric lever assembly (X) are straight and not excessively worn. Examine the guard handle and gear guard on the front end plate for bending,



A—Setscrew, hdls, No. 10-32 x 5/16—540988
B—Screw, mach, fil-hd No. 10-32 x 5/8—503904
C—Plate, rear end, carriage angle—RVT-608-26-376
D—Gib, plate, rear end—RVT-608-26-246
E—Angle, carriage, assy
F—Binder, carriage angle, assy
G—Stud, binder—RVT-608-26-673
H—Spring, binder stud—RVT-608-26-667
J—Screw, spring, binder stud—RVT-608-26-637
K—Cover, bearing block—RVT-608-26-181
L—Screw, oil, cover, No. 8-36 x 1/8
M—Plate, front end, assy
N—Screw, mach, fil-hd, No. 8-32 x 3/8—224550
P—Gear, compound, 22-tooth—RVT-608-26-243
Q—Block, bearing—RVT-608-26-133
R—Key, gear—RVT-103-17-287
S—Screw, mach, fil-hd, 3/8-16 x 1 1/2—132410
T—Screw, mach, fil-hd, 3/8-16 x 1—132400
U—Screw, lever stop—RVT-608-26-641
V—Gear, intermediate feed, 33-tooth—40-G-85-592
W—Screw, pivot—RVT-608-26-642
X—Lever, eccentric, bearing block, assy
Y—Gear, crossfeed, 12-tooth—40-G-85-560
Z—Screw, spring, bearing block, 1/8-40 x 1/4
AA—Spring, bearing block—RVT-608-26-482

Figure 37. Carriage angle assembly—exploded view.

cracks, and binding. Inspect springs for cracks, breaks, and tension. Examine the carriage wipers for excessive wear. Check the top surface of the carriage for mars, dents, nicks, and other surface defects. Replace any defective parts.

147. Assembly

a. Insert the bearing block eccentric level assembly (X) into the right side of the carriage angle and secure its position by screwing in the lever stop screw (U). The lever stop screw threads into the vertical hole in the curved front part of the carriage angle. The eccentric lever must be free to rotate in order to raise the bearing block (Q) during operation of the lathe.

b. Secure the bearing block spring (AA) to the bearing block with one bearing block spring screw (Z). Slide the shaft on the 12-tooth crossfeed gear (Y) through the rear of the bearing block. Insert the gear key (R) and slide the 22-tooth compound gear (P) over the key and shaft. Screw the No. 8–36 x 1/8 cover oil screw (L) into the bearing block cover (K). Then place this bearing block and gear unit into the front of the carriage angle and at the same time slide the bearing block cover (K) in position.

c. Secure the position of the bearing block by screwing the pivot screw (W) into the right side of the carriage angle until it seats itself in the bearing block. Fasten the front end plate assembly (M) to the front of the carriage angle with four No. 8–32 x 3/8 fillisted-head machine screws (N). See that the lever is moved to the right to cover the 22-tooth crossfeed gear (P) and that the bearing block eccentric lever assembly (X) is pointing downward.

d. Insert the binder stud (G) into the hole on the top of the carriage angle. Then slide the carriage angle binder assembly (F) into the right side so it passes through the binder stud. Insert the binder stud spring (H) into the binder stud and secure the spring with the binder stud spring screw (J). The spring screw must be flush with the top of the binder stud.

e. Screw the three No. 10–32 x 5/16 headless setscrews (A) into the carriage angle rear end plate (C) until they are flush with the inside face of the end plate. Place the rear end plate gib (D) over the locating pins on the end plate.

148. Installation

Place the 33-tooth intermediate feed gear (V) on its stud shaft on the inner side of the carriage angle. Carefully place the carriage angle assembly (E) over the carriage and secure with two 3/8–16 x 1 fillister-head machine screws (T) and two 3/8–16 x 1½ fillister-head machine screws (S). Fasten the carriage angle rear end plate (C) with gib (D) to the rear of the carriage angle with three No. 10–32 x 5/8 fillister-head machine screws (B).

149. Adjustment

Adjust the rear end plate gib (par. 91).

Section X. LATHE BED ASSEMBLY

Note. The key letters shown below in parentheses in this section refer to figure 38.

150. General

The lathe bed assembly is the supporting component for all other components which are used in actual machining operations. The accuracy of the lathe bed is fundamental to precision work.

151. Dismounting Other Components

The gear box, tailstock, compound slide rest assembly, carriage assembly, and carriage angle assembly must be removed from the lathe bed before disassembly. The headstock need not be removed since the lathe bed can be disassembled without dismounting it from the bench. However, if the bed itself or the jack pedestals need removal, the headstock must be removed.

a. Remove the gear box (par. 110).

b. Remove the compound slide rest assembly (par. 116).

c. Remove the tailstock (par. 123).

d. Remove the carriage assembly and carriage angle assembly (par. 137).

e. Remove the headstock assembly if necessary (par. 130).

f. Remove the taper attachment by unscrewing two hexagon head cap screws (Z) from the lathe bed (fig. 38).

152. Removal

The lathe bed can be removed from the bench by simply removing two hexagon nuts and pedestal bolt washers on the underside of the bench top and by lifting the bed straight up off the pedestals. However, it is better to disassemble the lathe bed first and then remove the bed proper if necessary.

153. Disassembly

a. Unscrew two thrust washer screws (M) and remove two thrust washers (K) and thrust washer keys (L) from the right end plate. The right end plate is removed when the carriage is removed. Unscrew four end plate screws (B) and pull off the right end plate with dowels (J). Remove four end plate screws (B) and pull off the left end plate with dowels (C) with the feed rod assembly (D), lead screw (F), and gears (V and W) attached.

Note. Use great care in handling the feed rod and lead screw either individually or assembled to other parts. In particular, protect the lead screw threads.

b. Pull the lead screw gear (V) from the lead screw (F) and lift out the lead screw gear key (G). Carefully slide the lead screw from the left end plate with dowels (C). Pull the feed rod gear (W) from the feed rod assembly (D) and lift out the feed rod gear key (E). Carefully pull the feed rod through the left end plate and centering collar (H).

c. The feed rod bushing (A) can be removed from the left end plate if replacement is necessary because of wear. Use great care in pressing the bushing from the end plate.

d. Slide the gear guard assembly (X) from the dovetailed guideway. Remove the carriage rack (Q) from the underside of the lathe

bed (Y) by unscrewing nine carriage rack screws (R). Unscrew the jack pedestal heads (N) from the jack pedestal bases (P).

e. Do not remove the steel ball (AA) or gear guard spring from the gear guard. Do not remove the steel balls or taper attachment bracket dowel pins (BB) from the lathe bed.

154. In-Process Inspection and Repair

Examine the threads on the lead screw (F) for wear. Inspect the surface of the feed rod assembly (D) for wear and finish. Check the teeth on the carriage rack (Q), lead screw gear (V) and feed rod gear (W) for wear and breakage. Examine the ways and all bearing surfaces of the bed for mars, ridges, and other surface defects. Check to see that bed is true, with no twist or warp. Examine the end plates (C and J) for worn bearing holes and surface mars. Inspect the feed rod bushing (A) for wear. See that keys, screws, and washers are in good condition. Examine the threads and upper surface of the jack pedestal heads (N) for wear. Replace any defective parts.

155. Assembly

a. Screw the jack pedestal heads (N) into the jack pedestal bases (P). Fasten the carriage rack (Q) to the underside of the bed (Y) with nine carriage rack screws (R). Slide the gear guard assembly (X) into the dovetailed guideway on the bed.

b. If the feed rod bushing (A) was removed, a new bushing must be pressed into the left end plate with dowels (C). The bushing must be pressed into place with an arbor press or other suitable equipment. Do not drive the bushing in with hand tools.

c. Place the centering collar (H) over the feed rod assembly (D) and insert the feed rod through the feed rod bushing. Insert the lead screw (F) through the left end plate. Insert the feed rod and lead screw gear keys (E and G) into the feed rod and lead screw. Place the 30-tooth lead screw gear (V) over the lead screw and the 30-tooth feed rod gear (W) over the feed rod (D).

d. Do not mount the left or right end plates with lead screw and feed rod unless the carriage is to be mounted. The right end plate with dowels (J) cannot be installed until the carriage is mounted. If the left end plate with dowels (C) is installed separately, it will not provide sufficient support for the lead screw (F) and feed rod (D) (par. 141).

e. The yoke binder (U), yoke binder nut (T), and yoke binder nut handle (S) are used to mount the gear box. The two ½–13 x 1¼ hexagon-head cap screws (Z) on the rear of the bed are used in mounting the taper attachment.

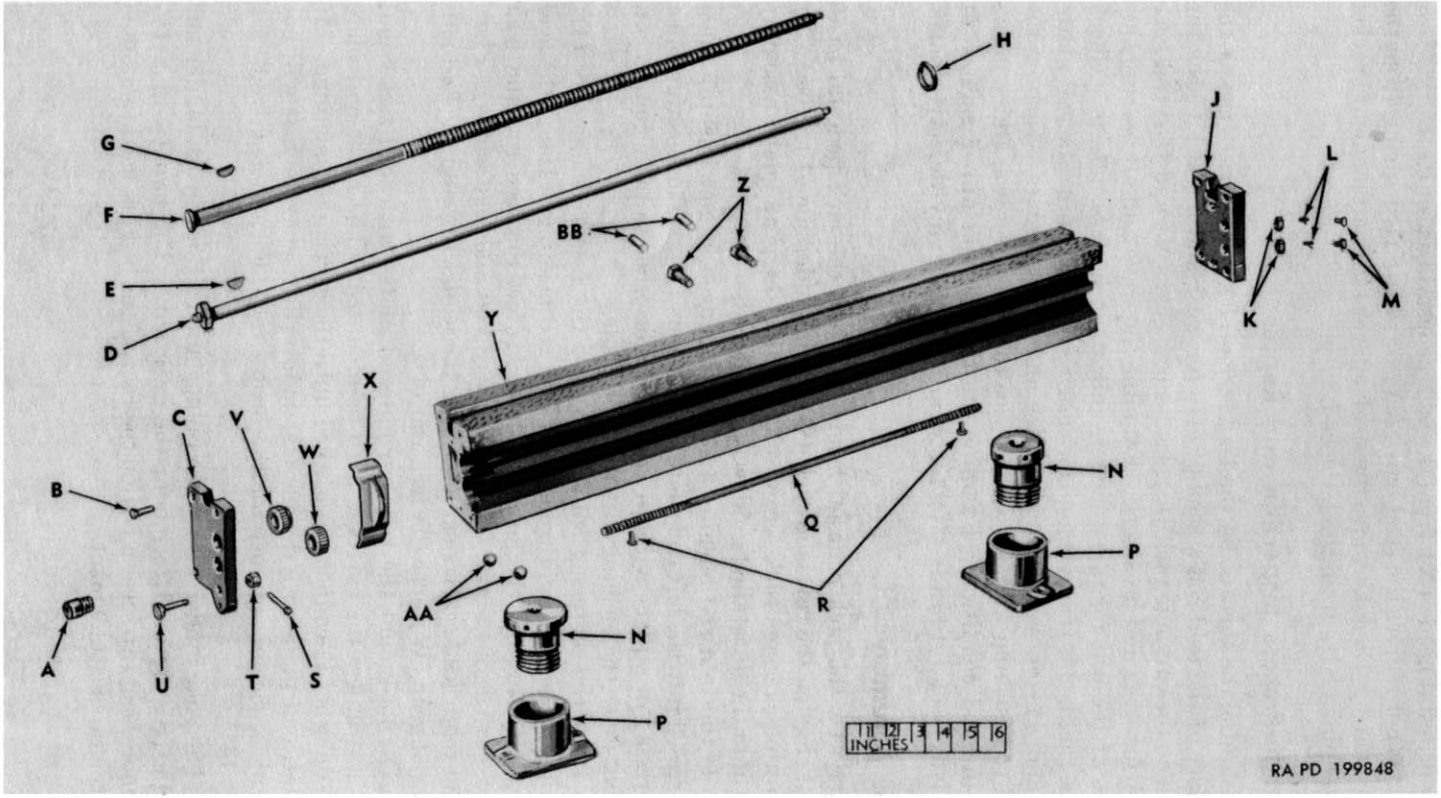


Figure 38. Lathe bed assembly—exploded view.

A—Bushing, feed rod—RVT—608–23–155
B—Screw, end plate—RVT—608–23–642
C—Plate, end, left, w/dowels—RVT—608–23–375
D—Rod, feed, assy—RVT—608–23–425
E—Key, gear, feed rod—RVT—608–23–291
F—Screw, lead—RVT—608–23–637
G—Key, gear, lead screw—RVT—608–23–288
H—Collar, centering—RVT—608–23–192
J—Plate, end, right, w/dowels—RVT–608–23–376
K—Washer, thrust—RVT—608–23–525
L—Key, thrust washer—RVT—608–23–290
M—Screw, thrust washer—RVT–608–23–641
N—Head, jack pedestal—RVT—505–23–270
P—Base, jack pedestal—RVT—505–23–115
Q—Rack, carriage—RVT—608–23–401
R—Screw, carriage rack—RVT–606–23–643
S—Handle, nut, yoke binder—RVT–608–23–260
T—NUT, YOKE BINDER—RVT–608–23–327
U—Binder, yoke—RVT—608–23–131
V—Gear, lead screw, 30-tooth—RVT–608–23–240
W—Gear, feed rod, 30-tooth—RVT–606–23–241
X—Guard, gear, assy
Y—Bed—RVT–608–23–570
Z—Screw, cap, hex-hd, ½–13 x 1¼—217179
AA—Ball, steel, ½ diam
BB—Pin, dowel, taper attachment bracket—RVT–608–23–201

Figure 38—Continued.

156. Installation

For bench installation of the lathe bed assembly refer to paragraph 8*g*.

157. Mounting Components

a. Install the headstock assembly (par. 135).
b. Install the carriage assembly and carriage angle assembly (par. 141).
c. Install the tailstock assembly (par. 127).
d. Install the taper attachment (par. 56).
e. Install the compound slide rest assembly (par. 121).
f. Install the gear box (par. 114).

Section XI. INDEXING ATTACHMENT

Note. The key letters shown below in parentheses in this section refer to figure 39.

158. General

For information on the description, use, removal, and installation of the complete indexing attachment refer to paragraph 52. The disassembly and assembly procedures in this section apply to the index bracket only.

159. Disassembly

Unscrew the plunger lock nut (E) and slide the index plunger (C) from the bracket (B). Pull one retaining pin (F) from the plunger knob (G), and separate the plunger knob, lock nut (E), plunger spring (D), and index plunger (C).

160. In-Process Inspection and Repair

Examine the tip of the index plunger (C) for rough or worn edges. Check the tension of the plunger spring (D). Inspect the plunger lock nut (E) for worn threads. Examine the divisions on the index plates for wear. See that all surfaces of parts are free of nicks and other surface defects. Replace any defective parts.

161. Assembly

Place the plunger spring (D) and plunger lock nut (E) over the index plunger (C) and fasten the plunger knob (G) to the end of the plunger with one retaining pin (F). Insert the index plunger into the bracket (B) so the slot in the plunger engages the key in the bracket. Screw the plunger lock nut (E) into the bracket.

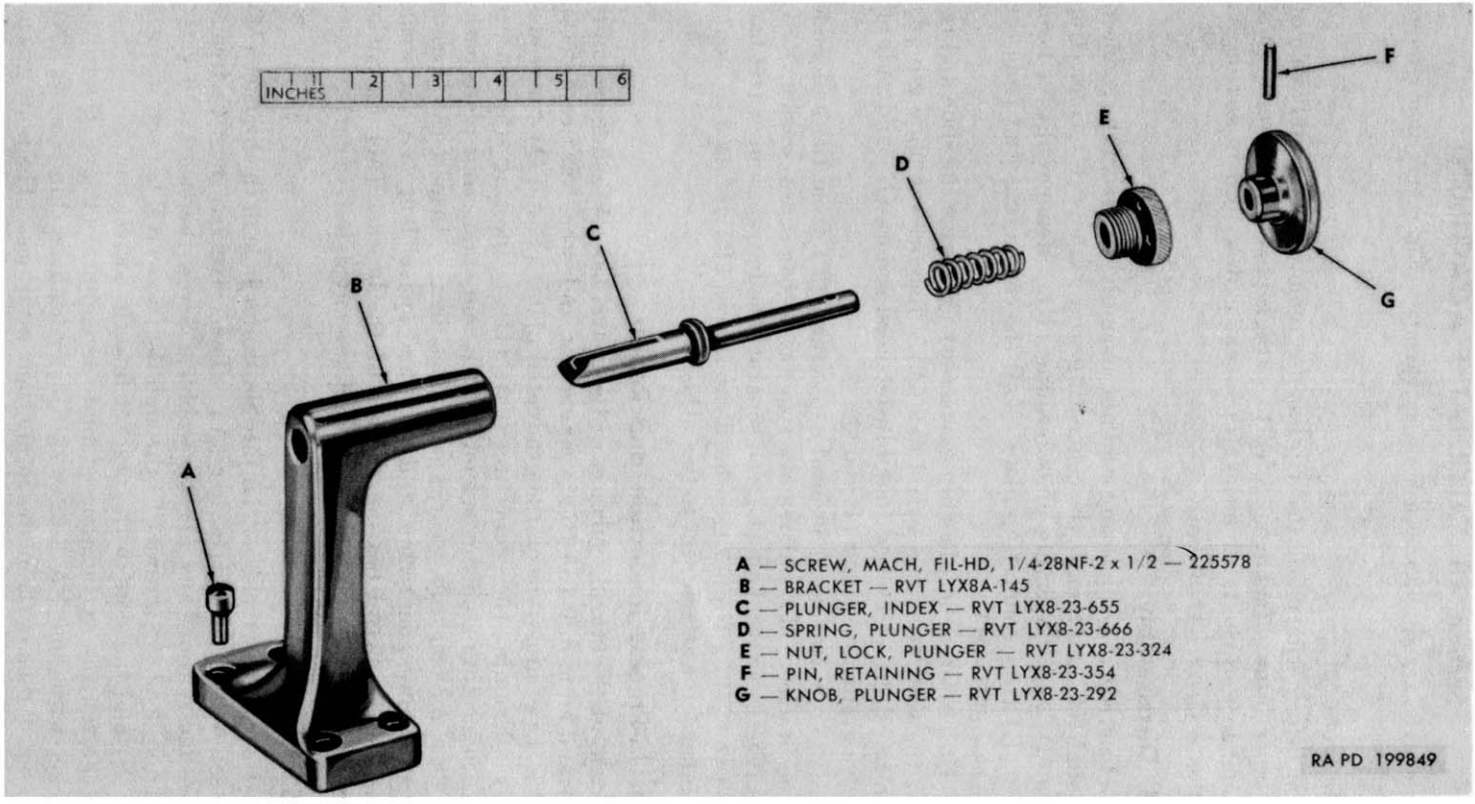


Figure 39. Index bracket assembly—exploded view.

Section XII. TAPER LATHE ATTACHMENT

Note. The key letters shown below in parentheses in this section refer to figure 40.

162. General

For information on the description, use, removal, and installation of the taper lathe attachment refer to paragraph 56. Organizational maintenance of the taper lathe attachment is described in section X, chapter 3 (pars. 99 and 100).

163. Disassembly

a. Unscrew the connecting stud nut assembly (B) from the connecting stud (G) and remove the connecting stud washers (C), connecting plate (D) and connecting plate bushing (F). Remove fillister-head screw (E) from connecting plate. Lift the connecting stud from the slide assembly (H).

b. Unscrew two headless brass setscrews (K) from the slide and remove the slide from the swivel bar (A). Remove the slide gib (J) from the slide. Unscrew four fillister-head screws (N) and pull off the two graduated plates (P and Q).

c. Unscrew two hexagon-head cap screws (T) from the underside of the bracket (M) and remove two swivel bar screw washers (S). Unscrew the swivel bolt (L) and separate the bracket and swivel bar. The two ½–13 x 1¼ hexagon-head cap screws (R) are used to mount the taper lathe attachment to the lathe bed.

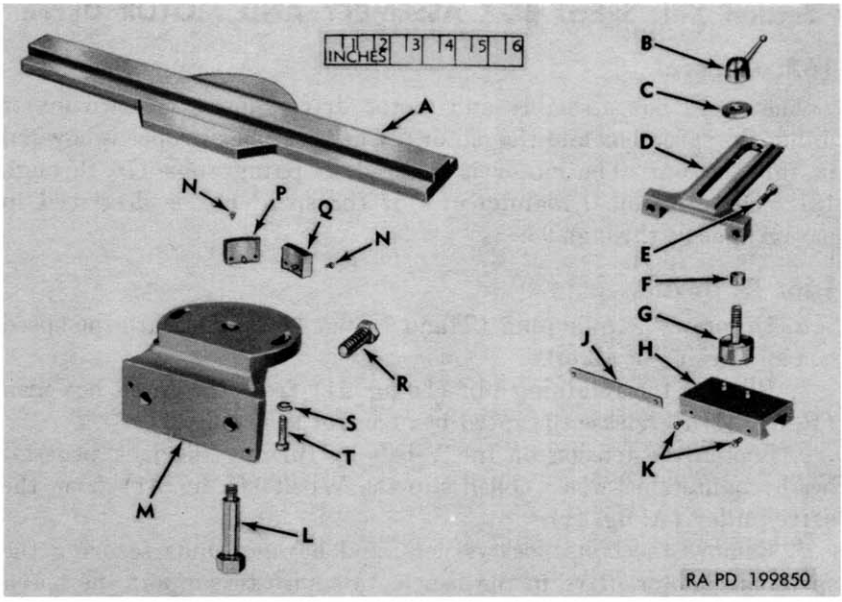
164. In-Process Inspection and Repair

Examine the bearing surfaces of the swivel bar (A), slide assembly (H) and slide gib (J) for wear, nicks, and other surface defects. Check the graduations on the graduated plates (P and Q) for readability. Examine the connecting plate (D), connecting stud washer (C), connecting stud nut assembly (B), and connecting plate bushing (F), for marking, wear, and surface dents. Inspect the threads on cap screws, connecting stud (G), and swivel bolt (L) for wear. Examine the swivel bearing surface of the bracket (M) for nicks, ridges, and other surface defects. Replace any defective parts.

165. Assembly

a. Insert the swivel bolt (L) into the center hole in the bracket (M) and screw it into the wivel bar (A). The swivel bar must be free to rotate but without any play or wobble. Screw the two ⅜–16 x 1⅛ hexagon-head cap screws (T) through the two swivel bar screw washers (S) and the slots in the bracket into the swivel bar.

b. Fasten the two graduated plate assemblies (P and Q) to the bracket with four No. 6–32 x ½ fillister-head machine screws (N). The dowel pins in the plates locate their positions. The plate assem-



A—Bar, swivel—RVT-LRM8A-611
B—Nut, stud, connecting, assy
C—Washer, connecting stud—RVT-LRM8A-521
D—Plate, connecting—RVT-LRM8A-377
E—Screw, mach, fil-hd, ¼-20 x ⅞—132268
F—Bushing, Connecting plate—RVT-LRM8A-151
G—Stud, connecting—RVT-LRM8A-498
H—Slide, assy
J—Gib, slide—RVT-LRM8A-245
K—Setscrew, hdls, br., No. 10-32 x ⅜—540989
L—Bolt, swivel—RVT-LRM8A-142
M—Bracket—RVT-LRM8A-145
N—Screw, mach, fil-hd, No. 6-32 x ½—131899
P—Plate, graduated inches (per foot), assy
Q—Plate, graduated degrees (taper), assy
R—Screw, cap, hex-hd, ½-13 x 1¼—217179
S—Washer, swivel bar screw—RVT-WH-751
T—Screw, cap, hex-hd, ⅜-16 x 1⅛—122138

Figure 40.—Taper lathe attachment assembly—exploded view.

bly (P) graduated in inches per foot goes on the left; the plate assembly (Q) graduated in degrees taper goes on the right.

c. Place the slide gib (J) on the gib pins in the slide. Place the slide on the swivel bar. Screw two No. 10–32 x ⅜ brass headless setscrews (K) into the slide.

d. Place the connecting stud (G) on the two locating pins on the slide assembly (H), then secure the connecting plate bushing (F), connecting plate (D) and connecting stud washer (C) to the connecting stud with the connecting stud nut assembly (B). Secure connecting plate to slide assembly with two ¼–20 x ⅞ fillister-head machine screws (E).

166. Adjustment

Adjust the taper attachment gib (par. 100).

Section XIII. SPEED BOX ASSEMBLY AND MOTOR DRIVE

167. General

The speed box assembly and motor drive consists of two major units: the speed box and the motor. The speed box proper is covered in this section. The motor is covered in paragraphs 176 through 181. Organizational maintenance of the speed box is described in paragraphs 94 through 98.

168. Removal

a. Unscrew the pipe plug (T and U, fig. 43) underneath the speed box and drain out all oil.

b. Remove the retaining pin (L, fig. 41) from the speed box arm (R, fig. 41) to release the speed box control lever (fig. 1).

c. Loosen the tension on the V-belt by turning the jack pedestal heads counterclockwise. Then slip the V-belt (G, fig. 41) from the drive pulley (A, fig. 41).

d. Remove the bolts, lockwashers, and hexagon nuts securing the speed box motor drive to the bench. Be sure to support the speed box and motor drive adequately so the unit does not drop during removal.

169. Disassembly

Note. The key letters shown in parentheses in *a* through *e* below refer to figure 41, except where otherwise indicated.

a. Remove the setscrew (B) in the drive pulley (A) and pull the pulley from the clutch shaft. Remove the key (C) from the clutch shaft.

b. Loosen the hexagon nuts (N, fig. 42) on the stud (P, fig. 42) to release the tension on the V–belt. Remove the belt. Unscrew the setscrew (E) in the sheave (F). Pull off the sheave and remove the key (D) from the lower shaft.

c. Remove two setscrews (N and T) from the arm (R) and pull off the arm. Unscrew one hexagon nut (P) and remove one lockwasher (Q), roller (S) and roller stud (CC) from the arm. Unscrew one setscrew (N) to remove the brake stud roller assembly (M).

d. Unscrew 14 fillister-head screws (GG) and lift off the clutch adjustment plate (Y), plate gasket (X), and felt washer (HH). Unscrew one setscrew (H) in the top of the brake dog (J); remove brake dog from brake rod (W). Unscrew two setscrews (K) on the side of the brake dog and unscrew two brake adjusting screws (AA).

e. Unscrew one setscrew (DD) in the brake rod collar (EE) and one fillister-head screw (FF) from speed box (JJ) and pull out the brake rod (W). Lift out the brake spring (BB) and collar. Unscrew the guide screw (Z) from the clutch adjustment plate (Y). Re-

move the cork cushion (U) from the socket (V). Unscrew one setscrew (N) in the socket and pull the socket from the brake rod (W).

Note. The key letters shown in parentheses in *f* and *g* below refer to figure 42.

f. Disconnect the cables from the switch box (fig. 1) to the motor (see wiring diagram, fig. 5). Unscrew four hexagon head cap screws (A) and remove four flat washers (B) from the motor plate (Q) to remove the motor (C). Remove two hexagon nuts (N) on the stud (P) in the back of the speed box (S). Unscrew two setscrews (D) in the motor plate. Unscrew two setscrews (M) in the bosses on the rear of the speed box and remove two shaft binders (L). Pull out the plate swivel (R) and remove the motor plate.

g. Unscrew 16 fillister-head screws (E) and lift off the cover plate (F) and speed box gasket (K). Unscrew two round head screws (J) and remove the oil lip (G) and two lockwashers (H) from the cover plate (F). Remove the stud (P) from the speed box if it requires replacement.

Note. The key letters shown in parentheses in *h* through *o* below refer to figure 43.

h. Tap out two taper pins (S) in the clutch arm (N), and remove setscrew (R). The taper pins and setscrews are accessible through the clutch adjustment port in the front of the speed box. Pull out the yoke shaft (P) and remove the arms and collar. Rotate the two clutch yokes (E) and separate them by unscrewing two yoke screws (H). Remove the clutch yokes.

i. Unscrew four fillister-head screws (K) in each of two (open) bearing cups (M). Carefully pull out the (open) bearing cups and remove the bearing adjusting shims (GG), two retaining washers (EE and PP) and roller bearings (FF). Rest the ends of the lower shaft in the bearing holes.

Caution: Support all shafts, gears, and bearings adequately to prevent damage by dropping and banging together.

j. Unscrew four fillister-head screws in each of two (closed) bearing cups (J). Carefully pull out the (closed) bearing cups (J) and remove the bearing adjusting shims (GG), two roller bearings (FF), and two retaining washers (KK and NN). Then carefully juggle the position of the clutch shaft (D) and raise the shaft, gear assemblies (A and G) and clutch assembly (F) from the speed box.

k. Lift the lower shaft (CC) with gears attached from the speed box. The 22-tooth gear (DD) and 30-tooth gears (JJ) on the lower shaft can be pressed from the shaft if necessary. Each gear is keyed to the shaft. Remove the two keys (HH).

l. Pull two cotter pins (BB) from two castellated nuts (AA) and unscrew the nuts. Unscrew two setscrews (W) from the plunger bosses on the speed box and remove two setscrew tips (V). Unscrew two adjusting screws (Z) and remove two plungers (X and plunger

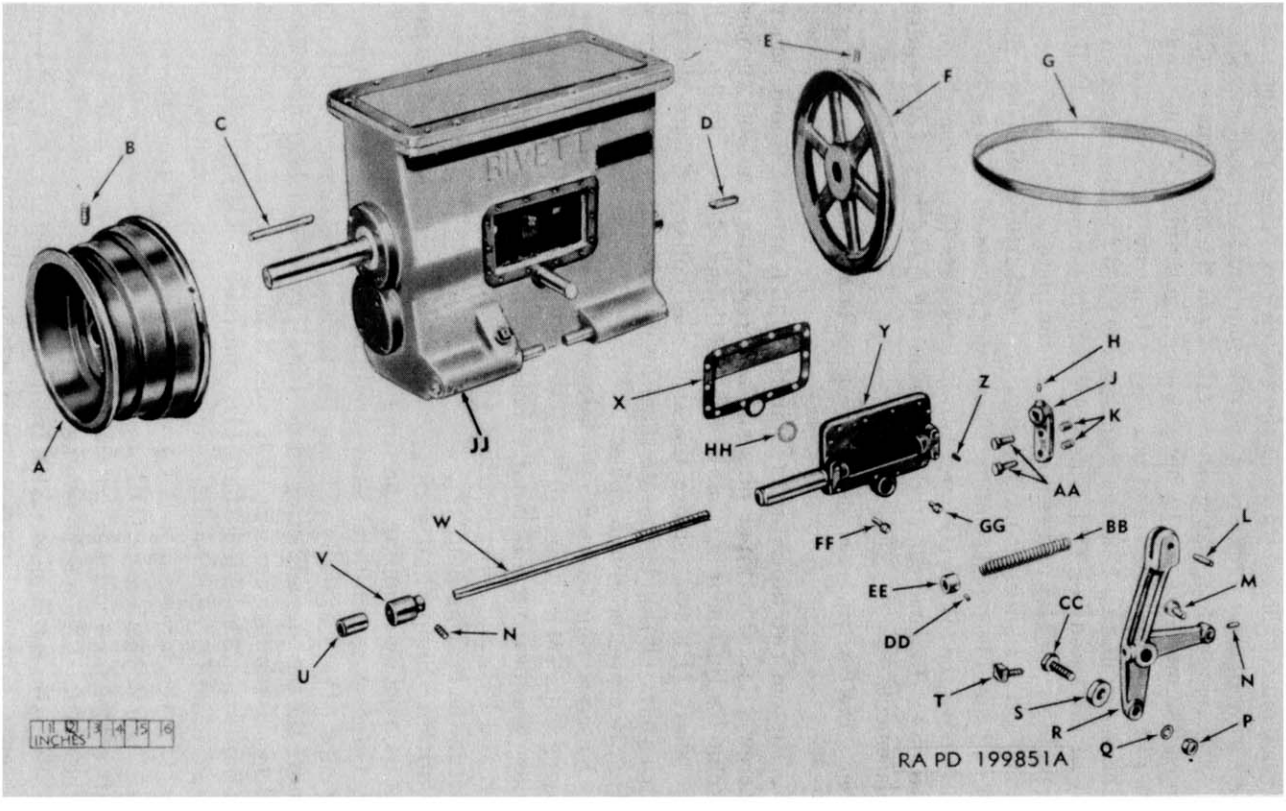


Figure 41. Speed box assembly—partially exploded—first view.

A—Pulled, drive—RVT–504–20–384
B—Setscrew, hex-socket, cup-pt, 3/8–16 x 1/2—102593
C—Key, drive pulley—RVT–LVJ–288
D—Key, sheave—RVT–106–15–287
E—Setscrew, hex-socket, cup-pt, 5/16–18 x 1/2—102582
F—Sheave—Daw-bk—90, 1 in bore
G—Belt, V—33–B–210–335
H—Setscrew, hex-socket, cup-pt, 1/4–20 x 3/8—102570
J—Dog, brake—RVT–LRQ–20B–206
K—Setscrew, hex-socket, cup-pt, 1/4–20 x 1/2—120680
L—Pin, retaining—RVT–LRQ–20K–357
M—Roller, stud, brake, assy
N—Setscrew, hex-socket, cup-pt, 1/4–20 x 1/4—102569
P—Nut, hexagon, plain, 3/8–16—220066
Q—Washer, lock, bolt size med, 3/8—115093
R—Arm, speed box—RVT–LRQ–20B–114
S—Roller—RVT–LRQ–20–427
T—Set screw, sq-hd, cup-pt, 3/8–16 x 1/2—544486
U—Cushion, cork, 3/4 diam x 1 1/4
V—Socket—RVT–LRQ–20B–214
W—Rod, brake—RVT–LRQ–20B–447
X—Gasket, plate—RVT–LRQ–201–993
Y—Plate, clutch adjustment—RVT–LRQ–20B–374
Z—Screw, guide—RVT–506–22–639
AA—Screw, brake adjusting—RVT–LRQ–20B–637
BB—Spring, brake—RVT–LRQ–20B–480
CC—Stud, roller—RVT–LRQ–20–498
DD—Setscrew, hex socket, cup-pt, 1/4–20 x 3/16–221183
EE—Collar, brake rod—RVT–LRQ–20B–188
FF—Screw, mach, fil- hd, No. 10–32 x 1—132133
GG—Screw, mach. fil-hd, No. 10–32 x 1/2—120216
HH—Washer, felt—RVT–LRQ–20–525
JJ—Speed box

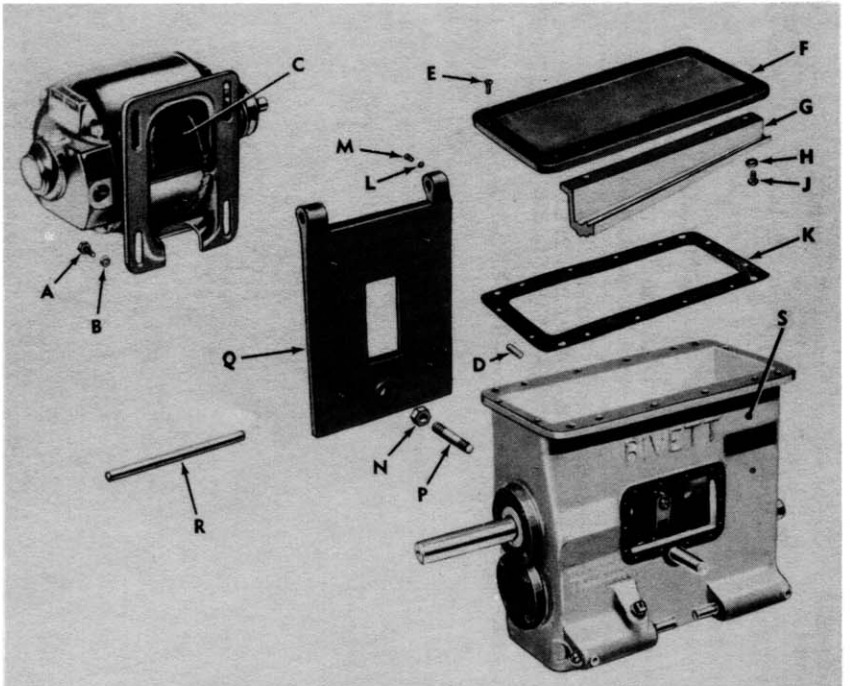
Figure 41—Continued.

springs (Y). Unscrew the pipe plugs (T and U) from the front of the speed box.

m. Pull the gear assemblies from the clutch shaft. Tap out the taper pin (C) in two clutch shaft collars (B) and slide off the collars.

n. Remove the oil seals (L) from the two (open) bearing cups (M) if replacement is required. Do not remove the serial number plate (MM) from the speed box (LL).

o. Keep the bearing adjusting shims (GG) used with the bearing cups together. Also group each bearing cup with its respective retaining washer to prevent mixing parts. Each of these retaining washers is slightly different.



A—SCREW, CAP, HEX-HD, 3/8-16 X 1—122135
B—FLAT WASHER, 3/8—106262
C—MOTOR—17-B-3305-112
D—SETSCREW, MACH, FIL-HD, 5/16-18 X 1/2—571361
E—SCREW, MACH, FIL-HD,1/4-20 X 1/2—132255
F—PLATE, COVER—RVT-LRQ-20-375
G—LIP, OIL—RVT-LRQ-20-311
H—WASHER, LOCK, BOLT SIZE, 1/4 IN—103319
J—SCREW, MACH, RD-HD, 1/4-20 X 5/8—113956
K—GASKET, SPEED, BOX—RVT-LRQ-201-992
L—BINDER, SHAFT—RVT-LRQ-20-127
M—SETSCREW, HEX-SOCKET, 1/4-20 X 5/16—571347
N—NUT, HEX, PLAIN, 1/2-13—220068
P—STUD—RVT-LRQ-20-904
Q—PLATE, MOTOR—RVT-LRQ-20-115
R—SWIVEL, PLATE—RVT-LRQ-20-503
S—SPEED BOX

RA PD 199852A

Figure 42. Speed box—partial exploded second view.

170. Clutch Disassembly

Note. The key letters shown below in parentheses refer to figure 44, except where otherwise indicated.

a. Slide one thrust plate (A), eight outer disks (B), seven inner disks (C), one pressure plate (D), one adjustment lock spring (E), one adjustment collar (F), and three keys (L) from each end of the clutch shaft (D, fig. 43).

b. Remove the slipper sleeve (K) from the clutch body (H). This will require some manipulation since the pins on the sleeve must clear the dogs. Lift out six dogs (J).

c. The clutch body is tightly fitted to the clutch shaft but can be removed if necessary. To remove the clutch body (H), tap out the anchor pin (G) and slowly force the body off with an arbor press or other suitable equipment.

171. In-Process Inspection and Repair

a. Brake Mechanism. Examine the cork cushion for wear. Check the plunger springs and brake spring for tension and breaks. Inspect the brake rod, rod collar, socket, plungers, brake dog, arm and clutch adjustment plate for wear and breaks or cracks. Examine the plate gasket for deterioration.

b. Drive Mechanism. Examine all gears for chipped teeth and wear. Inspect bearing cups, rollers, collars, yokes, and arms for wear and cracks or breaks. Check the shafts for wear and surface defects. Examine the roller bearings for wear. Inspect the oil seals for wear and deterioration.

c. Attaching Parts. Examine all screws, washers, setscrew tips, nuts, cotter pins, taper pins, pipe plugs, studs, and keys individually to see that they are serviceable.

d. Clutch Assembly. Examine the inner and outer disks for wear. See that the adjustment lock spring is free of breaks, cracks, or bends. Inspect the thrust plate, pressure plate, slipper sleeve, dogs, and clutch body for wear.

172. Clutch Assembly

Note. The key letters shown below in parentheses refer to figure 44, except where otherwise indicated.

a. Slide the clutch body (H) onto the clutch shaft (D, fig. 43). If the fit is close, use an arbor press or other suitable equipment to force the body into place; the hole in the clutch body and shaft must line up perfectly. Secure the clutch body by tapping in the anchor pin (G).

b. Place the dogs (J) on the clutch body, slide and twist the slipper sleeve (K) so it centers on the body. Slide the sleeve back and forth to see that the pins properly engage the dogs.

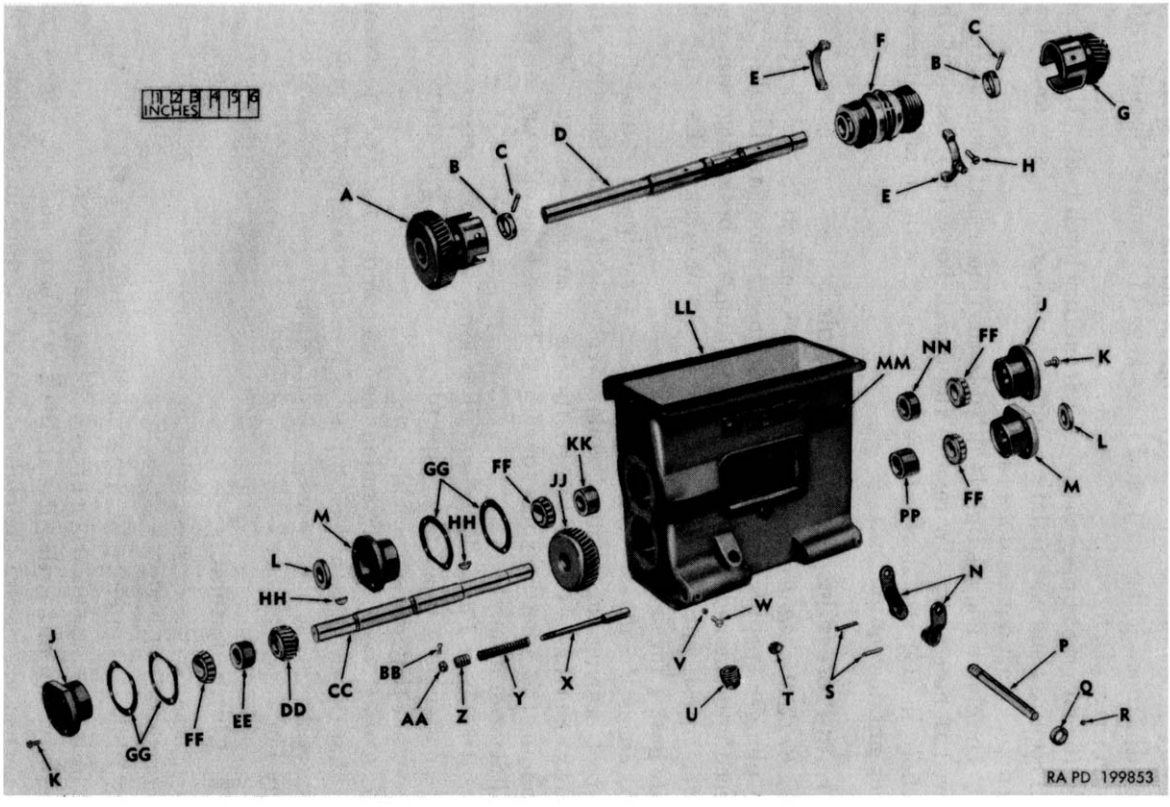


Figure 43. Speed box assembly—partial exploded third view

A—Gear, assy
B—Collar, clutch shaft—RVT–LRQ–201–192
C—Pin, taper, No. 2 x 1⅜—110779
D—Shaft, clutch—RVT–LRQ–201–449
E—Yoke, clutch—RVT–LRQ–20–540
F—Clutch, assy—MCC—double oil type, No. 2 Pullmore
G—Gear, assy
H—Screw, yoke, ¼–20 x 1⅛
J—Cup, bearing (closed)—RVT–LRQ–201–543A
K—Screw, mach. fil-hd, ¼–20 x ¾—132264
L—Seal, oil—GPC–295 klosure
M—Cup, bearing (open)—RVT–LRQ–201–544A
N—Arm, clutch—RVT–LRQ–20–110
P—Shaft, yoke—RVT—LRQ–20–439
Q—Collar, yoke shaft—RVT–LRQ–201–118
R—Setscrew, sex-socket, cup-pt, ¼–20 x 3/16—571345
S—Pin, taper, No. 2 x 1—103584
T—Plug, pipe, sq-hd, ⅜—219191
U—Plug, pipe, sq-hd, ¾—219301
V—Tip, setscrew, fl-pt—RVT–103–10–511
W—Setscrew, hdls, fl-pt, ¼–20 x ⅜—102376
X—Plunger—RVT–LRQ–20–655
Y—Spring, plunger—RVT–LRQ–20–666
Z—Screw, adjusting—RVT–LRQ–20–637
AA—Nut, slotter castellated, 5/16–24—122712
BB—Pin, cotter, split, 1/16 x ¾—103362
CC—Shaft, lower—RVT–LRQ–201–447
DD—Gear, 22-tooth—RVT–LRQ–201–232
EE—Washer, retaining lower—left—RVT–LRQ–201–257
FF—Bearing, roller, Timken—703220
GG—Shims, adjusting, bronze—RVT–LRQ–201–817
HH—Key, hi-pro—MCC No. 9
JJ—Gear, 30-tooth—RVT–LRQ–201–230
KK—Washer, retaining upper—left—RVT–DRQ–201–528
LL—Box, speed—RVT–LRQ–20–140
MM—Plate, serial number—RVT–RQ–20–378
NN—Washer, retaining, upper—right—RVT–LRQ–201–530
PP—Washer, retaining, lower—right—RVT–LRQ–201–529

Figure 43—Continued.

c. Insert three No. 9 Hi-Pro keys (L) into each end side of the clutch shaft. The keys must fit tightly so there is no rocking motion. Insert the end thread of one adjustment lock spring (E) into the slot in each pressure plate (D).

d. Slide one adjustment collar (F) and one pressure plate (D) with adjustment lock spring (E) onto the clutch shaft. Position the adjustment collar (F) so its curved cam surfaces fit around the dogs (J). Lock the position of the adjustment collars by placing the ends of the adjustment lock springs (E) into one of the teeth on each collar.

e. Slide eight outer disks (B) and seven inner disks (C) onto each end of the clutch shaft. The disks must be placed alternately so no two disks of the same type are together. Slide one thrust plate (A) and one clutch shaft collar (B, fig. 43) onto each end of the shaft and secure each collar with one No. 2 x 1⅜ taper pin (C, fig. 43).

173. Assembly

Note. The key letters shown in parentheses in *a* through *i* below refer to figure 43, except where otherwise indicated.

a. Press fit two oil seals (L) into two (open) bearing cups (M) with an arbor press or other suitable equipment. The face of the oil seal should be flush with the face of the bearing cup.

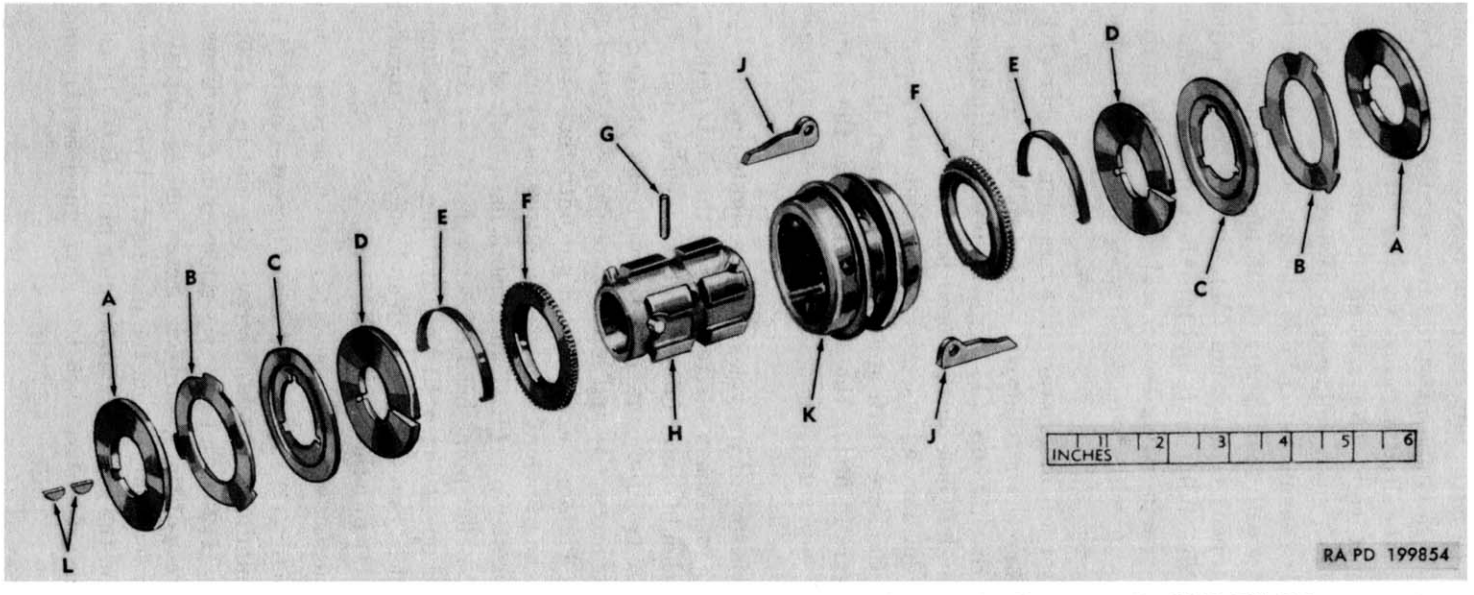
b. Insert two No. 9 Hi-Pro keys (HH) into the lower shaft. Press the 22-tooth gear (DD) and 30-tooth gear (JJ) onto the shaft and its key with an arbor press or other suitable equipment. The 30-tooth gear must be on the sheave end of the shaft.

c. Fasten two clutch yokes (E) around the center groove in the slipper sleeve (K, fig. 44) with two ¼–20 x 1⅛ yoke screws (H). Slide the gear assemblies over the clutch shaft so the slots engage the ears on the outer disks of the clutch assembly. The gear assembly (A) must be on the drive pulley (A, fig. 41) end of the shaft.

d. Place the lower shaft (CC) with gears into the speed box so the shaft ends rest in the (open) bearing cup holes. Then lower the clutch shaft (D), clutch assembly (F), and gear assemblies (A and G) into the speed box (LL) so the shaft projects out of the left-hand (closed) bearing cup hole.

Note. Use care in manipulating the lower shaft and clutch shaft so they are not damaged.

e. Insert the yoke shaft (P) through the center hole in the front of the speed box and through the yoke shaft collar (Q) and two clutch arms (N). Fasten the rearmost arm to the shaft with one No. 2 x 1 taper pin (S). Rotate the shaft and slide it into the boss on the rear



A—Plate, thrust—MCC–PM–211
B—Disk, outer—MCC–PM–226
C—Disk, inner—MCC–PM–206
D—Plate, pressure—MCC–PM–221
E—Spring, adjustment lock—MCC–PM–222
F—Collar, adustment—MCC–PM–207
G—Pin, anchor—MCC–PM–203
H—Body, clutch—MCC–PM–201
J—Dog—MCC—PM–104
K—Sleeve, slipper—MCC–PM–202D
L—Key hi pro–MCC–No. 9

Figure 44. Clutch—exploded view.

(inside) of the speed box. Slip the pivot boss on one yoke into the mounted arm. Slip the clutch operating arm over the other yoke pivot boss and fasten it to the shaft with one No. 2 x 1 taper pin (S).

f. Slide the upper right (N) and upper left retaining washers (KK) onto the clutch shaft followed by two roller bearings (FF). Place one (closed) bearing cup (J) in the upper right hole in the speed box and secure with four 1/4–20 x 3/4 fillister-head machine screws (K). Slide one (open) bearing cup (M) with its bronze adjusting shims (GG) over the clutch shaft and into the upper left hole in the speed box. Take care in fitting the oil seal (L) over the shaft. Secure the bearing cup with four 1/4–20 x 3/4 fillister-head machine screws (K).

g. Slide the lower left and lower right retaining washer (EE and PP) over the lower shaft followed by two roller bearings (FF). Place one closed bearing cup (J) with its bronze adjusting shims (GG) in the lower left hole in the speed box and secure with four 1/4–20 x 3/4 fillister-head machine screws (K). Slide one (open) bearing cup (M) over the lower shaft and into the lower right hole in the speed box. Use care in fitting the oil seal (L) over the shaft. Secure the bearing cup with four 1/4–20 x 3/4 fillister-head machine screws (K).

h. Secure the position of the yoke shaft by tightening the 1/4–20 x 3/16 cup-point hexagon socket setscrew (R) in the shaft collar. The clutch yokes (E) should center fairly evenly in the clutch arms (N).

i. Insert each of two plungers (X) through one plunger spring (Y) and adjusting screw (Z) and screw on one 5/16–24 slotted castellated nut (AA). Tighten the castellated nut until the spring exerts positive force on the plunger. Fasten the nut to each plunger with one 1/16 x 3/4 split cotter pin (BB) and install flat-point setscrew tip (V) and 1/4–20 x 3/8 flat-point headless setscrew (W). Screw these assemblies into the speed box until the adjusting screw is flush with the edge of the hole. Screw one 3/8-inch and one 3/4-inch square head pipe plug (T and U) into the speed box.

Note. The key letters shown in parentheses in *j* and *k* below refer to figure 42.

j. Fasten the oil lip (G) to the underside of the cover plate (F) with two 1/4–20 x 5/8 round head machine screws (J) and two 1/4 bolt size lockwashers (H). If the stud (P) was removed during disassembly, screw it into the rear of the speed box. Screw one 1/2–13 plain hexagon nut (N) onto the stud. Slide the plate swivel (R) through the mounting bosses on the speed box and motor plate (Q). Fasten the plate swivel to the speed box with two shaft binders (L) and two

1/4–20 x 5/16 hexagon socket setscrews (M). Faster the plate swivel to the motor plate with two 5/16–18 x 1/2 hexagon socket setscrews (D).

k. Rotate the motor plate (Q) over the stud and secure it with one 1/2–13 plain hexagon nut. Fasten the motor plate to the motor (C) with four 3/8-inch flat washers (B) and four 3/8–16 x 1 hexagon-head cap screws (A). Secure the speed box gasket (K) and cover plate (F) to the top of the speed box (S) with sixteen 1/4–20 x 1/2 fillister-head machine screws (E).

Note. The key letters shown in parentheses in *l* through *p* below refer to figure 41, except where otherwise indicated.

l. Screw the guide screw (Z) into the right-hand boss on the clutch adjustment plate (Y) so that the tip will engage the slot in the brake rod (W) when assembled. Insert the 3/4 diameter x 1 1/4 cork cushion (U) into the socket (V) and fasten the socket to the brake rod (W) with one 1/4–20 x 1/4 cup-point hexagon socket setscrew (N) and one No. 10–32 x 1 fillister-head machine screw (FF).

m. Screw two brake adjusting screws (AA) into the brake dog (J). Secure each adjusting screw with one 1/4–20 x 1/2 cup-point hexagon socket setscrew (K). Slide the brake rod (W) through the lengthwise hole in the clutch adjustment plate (Y), brake rod collar (EE), brake spring (BB), and out the opposite side. Secure adjustment plate with plate gasket (X) and felt washer (HH) to speed box with fourteen No. 10–32 x 1/2 fillister-head machine screws (GG). Secure the brake rod collar with one 1/4–20 x 3/16 cup-point hexagon socket setscrew (DD). Fasten the brake dog (J) to the brake rod with one 1/4–20 x 3/8 cup-point hexagon socket setscrew (H).

n. Fasten the brake stud roller assembly (M) to the speed box arm (R) with one 1/4–20 x 1/4 cup-point hexagon socket setscrew (N) and retaining pin (L). Secure 3/8–16 x 1/2 cup-point square head setscrew (T) to speed box arm. The roller must be on the rear side of the side bracket on the arm. Fasten the roller (S) and roller stud (CC) to the speed box arm with one 3/8 bolt size lockwasher (Q) and one 3/8–16 plain hexagon nut (P). The roller stud must pass through the rear of the lower hole in the arm.

o. Insert the sheave key (D) into the protruding lower shaft and fasten the sheave (F) in place with one 5/16–18 x 1/2 cup-point hexagon socket setscrew (E). Be sure the motor pulley (N, fig. 43) and sheave are alined. Slip the V-belt (G) over the sheave (F). Then adjust the tension on the V-belt (par. 98).

p. Insert the drive pulley key (C) into the protruding clutch shaft and fasten the drive pulley (A) to the shaft with one 3/8–16 x 1/2 cup-point hexagon socket setscrew (B).

174. Installation

a. Fasten the speed box assembly to the underside of the bench top with four bolts, four lockwashers, and four hexagon nuts used in the initial installation (par. 8*f*).

b. Slip the drive belt over the drive pulley (A, fig. 41). Adjust the drive belt (par. 84*a*).

175. Adjustment and Final Assembly

a. Clutch. Greater care must be exercised to adjust the clutch after overhaul since it is usually farther out of adjustment. Refer to paragraph 96 for adjustment procedures. Full assembly procedures are also given.

b. Speed Box Control Lever. Adjust the speed box control lever as directed in paragraph 97.

c. Automatic Brake. Adjust and assemble the automatic brake (par. 95). It may be necessary to adjust the position of the adjusting screws (Z, fig. 43) and/or plungers (X, fig. 43) to insure proper control lever action. The brake adjusting screws must be out far enough to allow the automatic brake to completely disengage when the clutch is engaged. The plungers merely provide a positive return of the speed box control lever to neutral.

Section XIV. MOTOR

Note. The key letters shown below in parentheses in this section refer to figure 45.

176. General

The motor is a ¾-horsepower repulsion-induction type which operates on 3-phase, 220-volt, 60-cycle alternating current at 1750 rpm. The construction of this motor makes it impractical to repair it other than the replacement of worn ball bearings. The disassembly and assembly procedures are primarily for cleaning and inspection purposes. The exploded view is for use in identification of parts only.

177. Removal

Remove the motor (par. 168).

178. Disassembly

a. Remove the motor pulley (N) by unscrewing one setscrew (M). Lift out the armature shaft key (J). Unscrew two round head screws (A) and remove the cover plate (B).

b. Unscrew four through bolts (L), four hexagon nuts (C), and remove four lockwashers (D). Pry the open and closed bell housings (E and K) from the field frame assembly (G) and slide out the armature assembly (H). Do not lose the two insulator washers (F) on each end of the armature shaft.

c. Remove the ball bearings (P) from each bell housing with a bearing puller if they are worn excessively.

179. In-Process Inspection and Repair

a. Check the field frame assembly for open and short circuits, damaged insulation, and fractures in the housing. The entire motor must be replaced if the field frame assembly is defective.

b. Inspect the armature assembly for bent or cracked fan blades, shaft alinement and physical damages to the armature itself. Repair bent fan blades. If damage is serious, replace the entire motor.

c. Measure ball bearings for wear. Replace the bearings if worn excessively and if no other parts are damaged so as to require replacement of the entire motor.

180. Assembly

a. Press fit one new ball bearing (P) into the well in each bell housing (E and K).

Caution: Be sure that the bearings are seated properly. Misalinement will cause excessive wear and will burn out.

b. Carefully slide the armature assembly (H) into the field frame assembly (G). Place one insulator washer (F) over each end of the armature shaft. Fit the closed bell housing (E) to the frame assembly (G) taking care to guide the field lead wires through the holes in the housing. Fit the open bell housing (K) to the frame assembly and secure with four through bolts (L), lockwashers (D), and hexagon nuts (C).

c. Fasten the cover plate (B) to the closed bell housing with two round head screws (A). Install armature shaft key (J). Fasten the motor pulley (N) to the armature shaft with one hexagon socket setscrew (M).

181. Installation

Install the motor (par. 173).

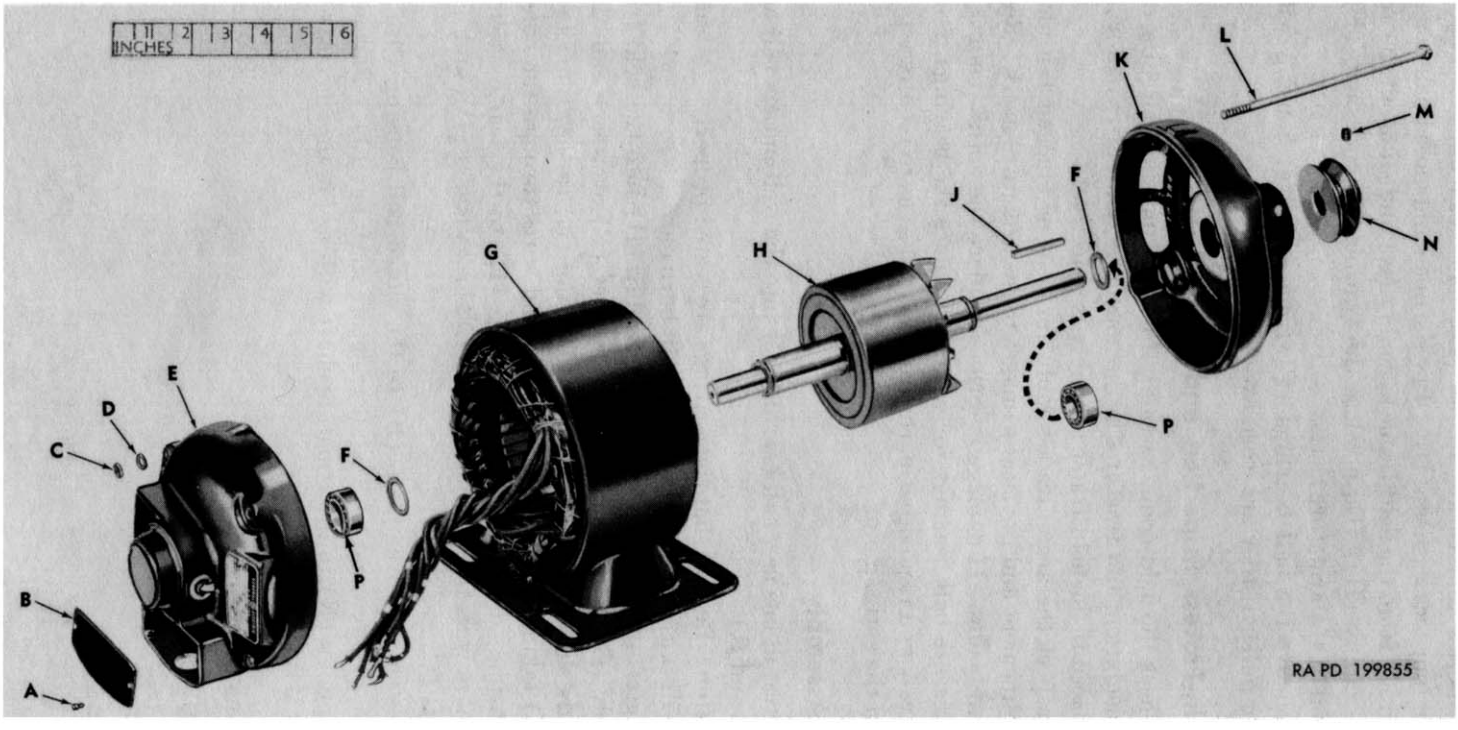


Figure 45. Motor—exploded view.

A—Screw, round head
B—Plate, cover
C—Nut, hex
D—Washer, lock
E—Housing, bell, closed
F—Washer, insulator
G—Frame, field, assembly
H—Armature assembly
J—Key, armature shaft
K—Housing, bell, open
L—Bolt, through
M—Setscrew, hex-socket
N—Pulley, motor
P—Bearing, ball, (MIL–STD–Code–111–02002 LT non-loading groove 1 shield 0.7874 bore, 1.8504 OD 0.5512 W)—700120

Figure 45—Continued.

Section XV. FINAL INSPECTION

182. Lubrication

Before any tests are made on the lathe, lubricate the lathe completely in accordance with paragraphs 72 and 73. Give consideration to the fact that parts of the lathe were cleaned during repair and had only a slight amount of lubricant applied to them for protective purposes. The amount of lubricant which must be applied for testing or subsequent operation must be increased accordingly to insure proper lubrication of all parts which require it. This initial lubrication applies particularly to the headstock assembly, carriage assembly, gear box assembly, and speed box assembly. During operating tests lubricate as required.

183. Inspection

a. Examine all functional parts of the lathe which are accessible. This includes gears, bearings, and sliding surfaces. Follow a systematic order by inspecting each major component individually. All parts must be secure.

b. Check the movement of controls in a systematic manner (pars. 9–33).

c. Remove any foreign matter from the lathe and clean (par. 77).

184. Operational Tests

Check the "running" operation of all controls. Simulate all machining operations of which the lathe is capable by using each control individually and in conjunction with other controls with which it is normally used. Refer to paragraphs 9 through 33.

185. Accuracy Tests

Certain accuracy tests should be made on this lathe. Tolerances must come within the original limits (par. 4). These tests often require the actual machining of work and the use of precision dials and gages for measurement. Complete information for accuracy tests can be found in standard reference works such as the American Machinist's Handbook.

CHAPTER 5

SHIPMENT AND STORAGE AND DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

Section I. DOMESTIC SHIPMENT AND LIMITED STORAGE

186. Domestic Shipping Instructions

a. Preparation. When shipping the engine lathe, the officer in charge of preparing the shipment will be responsible for furnishing lathes in a serviceable condition, properly preserved, packaged, and packed as prescribed in paragraph 188. Personnel withdrawing lathes from storage for shipment must not open crates that have been previously inspected and packed. If it is determined that crates have been opened, completely inspect the contents to insure that they are complete and serviceable, and process, package, and pack in accordance with paragraph 188. Defective lathes will be segregated and classified and, where possible, placed in a serviceable condition. If repairs are beyond the scope of the organization, ordnance maintenance will be notified.

b. Army Shipping Documents. Prepare all Army shipping documents accompanying freight in accordance with TM 38–705.

187. Limited Storage Instructions

a. Preparation for Storage. Immediately upon receipt, lathes will be given a technical inspection. If lathes are received for storage in a damaged condition, the transportation officer will be notified and a DD Form 6 will be prepared in accordance with AR 700–58. Lathes reported on these forms will be held for disposition instructions. Serviceable lathes that are improperly packaged will be prepared for storage in accordance with paragraph 188.

b. Storage Site. The preferred storage site for lathes is under dry, covered storage. When it is necessary to store lathes outdoors, protect against the elements as prescribed in TB ORD 379.

188. Processing, Packaging, and Packing Instructions

a. Disassembly.

Note. The lathe covered herein has been processed in accordance with Level C—minimum military package and packed in accordance with AR 740–15. This level will afford adequate protection against corrosion, deterioration, and physical damage during shipment from supply source to the first receiving activity for immediate use.

Prior to cleaning and preserving the lathes remove the drive belts. Detach all removable accessories and attachments.

b. Cleaning. Remove shop dirt and other foreign matter from all metal surfaces by any of the applicable or available cleaning methods described in TM 9–1005.

Caution: Wear cloth or synthetic rubber gloves, while handling items. Do not apply solvents other than carbon tetrachloride to electric motors, drive belts, electrical equipment, or rubber items.

c. Preservation.

Caution: Apply preservatives immediately after cleaning. Do not apply preservatives to electrical equipment or rubber items.

(1) *Sliding surfaces.* Apply preservative lubrication oil (medium) (type P–7) to sliding surfaces.

(2) *Finished unpainted metal surfaces.* Dip, spray, or brush all finished unpainted metal surfaces of the grinder, parts, and equipment with a uniform coating of heated corrosion-preventive compound (medium) (type P–5).

(3) *Recessed metal surfaces.* Dip, spray, or brush all unpainted mechanism screws, recesses, blind holes, and cavities, which cannot be easily degreased, with corrosion-preventive compound (medium) (type P–5).

(4) *Other unpainted metal surfaces.* Cover all other unpainted or unprotected noncritical metal surfaces with a coating of corrosion-preventive compound (hard film) (type P–1).

(5) *Tools.* Preserve critical surfaces of tools such as gages and measuring instruments with corrosion-preventive compound (medium) (type P–5). Preserve tool having noncritical surfaces with corrosion-preventive compound (hard film) (type P–1) and allow to dry thoroughly.

d. Packaging.

(1) *Tools.* Wrap all tools preserved with type P–5 preservative with greaseproof barrier-material, grade C, type I. Wrap other tools to provide mechanical protection. Apply identification labels.

(2) *Drive belts.* Package drive belts only as required for unitizing, mechanical protection, and identification.

(3) *Motors.* Cover all openings of the motors with water-resistant, pressure-sensitive adhesive tape and over-spray with ignition insulation compound.

(4) *Switchboxes and electrical controls.* Cover all openings of switchboxes and controls with water-resistant, pressure-sensitive adhesive tape and over-spray with ignition insulation compound.

e. Packing.

(1) Pack and block the lathe in an unsheathed nailed wood crate

as prescribed in TM 9–1005. Apply interior protective shroud.

(2) Pack the motor, speed box, and switch in a style 2 nailed wood box and block in place within the lathe crate ((1) above).

(3) Pack the attachments and accessories in a style 2 nailed wood box and block in place within crate ((1) above).

f. Marking. Mark containers as prescribed in TM 9–1005.

189. Loading and Blocking Instructions

For general loading rules and procedures for loading and blocking crated items in closed cars refer to TM 9–1005.

Section II. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

190. General

a. Destruction of the bench type engine lathe, when subject to capture or abandonment in the combat zone, will be undertaken by the using arm only when in the judgment of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by, the army commander. When in the hands of ordnance maintenance personnel or in storage, destruction will be in accordance with FM 9–5 and the information below as applicable.

b. The information which follows is for guidance only. Certain of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items of issue to the using organization. The issue of these and related materials, and the conditions under which destruction will be effected, are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are:

Mechanical—Requires axe, pick mattock, sledge, crowbar, or similar implement.

Burning —Requires gasoline, oil, incendiary grenades, or other flammables, or welding, or cutting torch.

Demolition —Requires suitable explosives or ammunition.

[1] Gunfire —Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstances hand grenades may be used.

[1] Disposal —Requires burying in the ground, dumping in streams or marshes, or scattering so widely as to preclude recovery of essential parts.

In general, destruction of essential parts, followed by burning will

[1] Generally applicable only when the engine lathe is to be destroyed in conjunction with other equipment.

usually be sufficient to render the materiel useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, the materiel must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the materiel, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like materiel so that the enemy cannot construct one complete unit from several damaged ones.

d. If destruction by demolition or gunfire is directed, due consideration should be given to the observance of appropriate safety precautions.

191. Destruction of the Bench Type Engine Lathe

a. Method No. 1—by Mechanical Means.

(1) Disconnect the engine lathe from its source of electricity.

(2) Using an axe, pick mattock, sledge, or other heavy implement, destroy the engine lathe by smashing the headstock, tailstock, carriage, quick change gear box, compound slide rest, lead screw, pulleys, feed rod, feed rack, oil cups, control handles and levers, switch box, and motor. Elapsed time: about 3 minutes.

b. Method No. 2—by Burning.

(1) Disconnect the engine lathe from its source of electricity.

(2) Using a welding or cutting torch, burn through the headstock, tailstock, lead screw, and fuse the control handles and levers to their housings. Also fuse the gears in the quick change gear box and motor.

(3) In the absence of a welding or cutting torch, place combustible on and about the headstock. tailstock, quick change gear box, bed, carriage, and motor. Pour gasoline and oil over the combustible and in and over the entire engine lathe. Ignite by means of an incendiary grenade fired from a safe distance, a combustible train of suitable length, or other appropriate means. Take cover immediately. A very hot fire is required to render the materiel useless.

Caution: When igniting gasoline, due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in painful burns.

Elapsed time: about 5 minutes.

c. Method No. 3—by Demolition

(1) Disconnect the engine lathe from its source of electricity.

(2) Planning for simultaneous detonation, prepare three 1-pound charges of EXPLOSIVE, TNT (one 1-lb. block or equivalent together with the necessary detonating cord to make up each charge). Place the charges as follows:

(*a*) Place the *first* charge on the quick change gear box.

(*b*) Place the *second* charge between the carriage and the bed.

(*c*) Place the *third* charge on the motor.

(3) Connect the charges for simultaneous detonation with detonating cord.

(4) Provide for dual priming to minimize the possibility of a misfire. For priming, either a nonelectric blasting cap crimped to at least 5 feet of safety fuse (safety fuse burns at the rate of 1 ft in aprx 40 sec; test before using), or an electric blasting cap and firing wire may be used. Safety fuse, which contains black powder, and nonelectric blasting caps must be protected from moisture at all times. The safety fuse may be ignited by a fuse lighter or a match; the electric blasting cap requires a blasting machine or equivalent source of electricity.

Caution: Keep the blasting caps, detonating cord, and safety fuse separated from the charges until required for use.

Note. For the successful execution of methods of destruction involving the use of demolition materials, all personnel concerned will be thoroughly familiar with the pertinent provisions of FM 5–25. Training and careful planning are essential.

(5) Detonate the charges. If primed with nonelectric blasting cap and safety fuse, ignite and take cover. If primed with electric blasting cap, take cover before firing the charges. The danger zone is approximately 250 yards. Elapsed time: about 5 minutes.

APPENDIX

REFERENCES

1. Publications Indexes

DA pamphlets of the 310-series and DA Pam 108–1 should be consulted frequently for latest changes or revisions of references given in this appendix and new publications relating to the materiel covered in this manual.

2. Supply Manuals

The following manuals of the Department of the Army Supply Manual pertain to this materiel:

Abrasives, Adhesives, Cleaner, Preservatives, Recoil Fluids, Special Oils, and Related Items. — ORD 3 SNL K–1

Explosives, Bulk Propellants, Explosive Devices — SM 9–5–1375

Grenades, Hand and Rifle, and Related Components. — SM 9–5–133

Index of Supply Manuals—Ordnance Corps — DA Pam 310–29

Introduction — ORD 1

Lathe, Engine, Precision Bench Type, 220 V, 60 C, 3 Ph, 8½–In. Swing, 40-In. Bed, Quick Change Gear Box, Back Geared, W/Equipment (Rivett Lathe and Grinder, Inc, Model 608 PC (40–L–22). — ORD 7–8 SNL J–268

Tool Set, General Mechanics — ORD 6 SNL J–10, Sec. 4

3. Forms

The following forms pertain to this materiel:

DA Form 9–71,	Locator and Inventory Control Card.
DA Form 9–77,	Job Order Register.
DA Form 9–78,	Job Order.
DA Form 9–79,	Parts Requisition.
DA Form 9–80,	Job Order File.
DA Form 9–81,	Exchange Part or Unit Identification Tag.
DA Form 450,	Army Shipping Document (portions, as applicable).
DA Form 468,	Unsatisfactory Equipment Report.
DA Form 811,	Work Request and Job Order.
DA Form 865,	Work Order.
DA Form 866,	Consolidation of Parts.
DA Form 867,	Status of Modification Work Order.
DD Form 6,	Report of Damaged or Improper Shipment.
DD Form 250,	Materiel Inspection and Receiving Report.

4. Other Publications

The following explanatory publications contain information pertinent to this materiel and associated equipment:

a. Camouflage.

Camouflage, Basic Principles ..... FM 5–20

b. Decontamination.

Decontamination ..... TM 3–220

Defense Against Chemical Attack ..... FM 21–40

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Marking of Oversea Supply---------- SR 746–30–5
Shipment Digit Marking---------- SR 746–30–6
Operational List of Packaging Specifications and Instructions ([1]) (General Supplies).
Ordnance Storage and Shipment Chart—Group J--- SB 9–OSSC–J
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[1] For a complete listing of cleaning, preservation, packaging, and packing specifications, consult the Operational List of Packaging Specifications and Instructions (General Supplies). Copies may be obtained from Commanding Officer, Rossford Ordnance Depot, Todelo 1, Ohio, ATTN: ORDWD–P.

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By Order of *Wilber M. Brucker*, Secretary of the Army:

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Chief of Staff.

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JOHN A. KLEIN,
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USAR: None.

For explanation of abbreviations used, see SR 320–50–1.

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