Service Manual

INSTALLATION—
MAINTENANCE—
REPAIR PARTS—

THE WARNER & SWASEY CO., CLEVELAND, OHIO

SERVICE MANUAL

INSTALLATION MAINTENANCE REPAIR PARTS

WARNER & SWASEY No. 1 ELECTRIC, No. 2 ELECTRIC AND No. 2 ALL GEARED HEAD TURRET LATHES

Warner & Swasey Turret Lathes are built to a high degree of precision and accuracy and must pass rigid inspection standards before leaving the factory. It is essential that the machine you purchase be properly installed and subsequently maintained to preserve its built-in accuracy, and to obtain its maximum productivity.

The purpose of this booklet is to instruct the maintenance foreman, millwright, and operator in these fundamentals. This manual should be kept available to these men at all times so that they may become familiar with instructions for correct lubrication and adjustment, and details of construction necessary to the best operation of the machine.

In addition to this instruction there is a section devoted to repair parts for this particular machine, serial number of which is given on the cover. The parts section should be used in connection with *this one machine only*. When a machine is transferred to another department or plant, the Service Manual and Parts List should accompany the machine.

★ ★ INDEX ★ ★

ERECTING

ALIGNMENT

ADJUSTMENTS AND ASSEMBLIES

are built, Cleveland, Ohio.
Open to visitors.

SIZES AND TYPES OF TURRET LATHES

RAM TYPE

No. 1—ELECTRIC TURRET LATHE (600 to 3600 R. P. M.) Bar Capacity, 5/8"—Swing, 11"

No. 2—ELECTRIC TURRET LATHE (600 to 3600 R. P. M.) Bar Capacity, 1"—Swing, 14"

No. 2—SIX SPEED ALL GEARED HEAD TURRET LATHE—Bar Capacity, 1"—Swing, 14"

No. 3—UNIVERSAL SIX SPEED ALL GEARED HEAD TURRET LATHE—Bar Capacity, 1½" —Swing, 15⅜"

No. 4—UNIVERSAL TWELVE SPEED ALL GEARED HEAD TURRET LATHE—Bar Capacity, 1¾"—Swing, 18⅛"

No. 5—UNIVERSAL TWELVE SPEED ALL GEARED HEAD TURRET LATHE—Bar Capacity, 2½"—Swing, 20"

SADDLE TYPE

1-A—UNIVERSAL HEAVY DUTY TURRET LATHE—Bar Capacity, 2½"—Swing, 16¼"

2-A—UNIVERSAL HEAVY DUTY TURRET LATHE—Bar Capacity, 3½"—Swing, 20"

3-A—UNIVERSAL HEAVY DUTY TURRET LATHE—Bar Capacity, 4½" or 6"—Swing, 23½"

4-A—UNIVERSAL HEAVY DUTY TURRET LATHE—Bar Capacity, 8" or 9"—Swing, 28¼"

5-A—UNIVERSAL HEAVY DUTY TURRET LATHE—Bar Capacity, 10" or 12"—Swing, 32" or 33"

LEAD SCREW FOR THREAD CUTTING can be furnished for No. 3, No. 4, No. 5 Universal Ram Type Turret Lathes—1-A, 2-A, 3-A, 4-A, and 5-A Heavy Duty Turret Lathes.

COMPOUND CROSS SLIDE can be furnished for 1-A, 2-A, 3-A, and 4-A Heavy Duty Turret Lathes.

STANDARD TOOLS AND CHUCKS for all sizes of Turret Lathes carried in stock. Write for your copy of the New Warner and Swasey Tool Catalog.

WARNER & SWASEY *Turret Lathes*

Cleveland, Ohio

Boston Chicago Detroit Los Angeles Newark Pittsburgh
Buffalo Dayton Houston Milwaukee Philadelphia Syracuse

Printed in U. S. A.

An envelope containing valuable data is included in the box with the wrenches and miscellaneous parts. This envelope contains:

1. Packing List
2. Machine Tool Data Sheet (specifications)
3. Electrical Equipment Specifications

PRESERVE THE CONTENTS OF THIS ENVELOPE AND GIVE THEM TO THE RIGHT PERSONS IN CHARGE.

PACKING LIST

The Packing List is an itemized statement of all parts included in the shipment. The Receiving Clerk should check and account for each item on the list. It is suggested that the packing list be made a part of the permanent record of the machine.

MACHINE TOOL DATA SHEET

The Machine Tool Data Sheet contains information necessary to the millwright when installing the machine. When he has taken the necessary data from the print, the Planning Department should file the print with their records. It gives complete production-planning data, including feeds and speeds available and specifications.

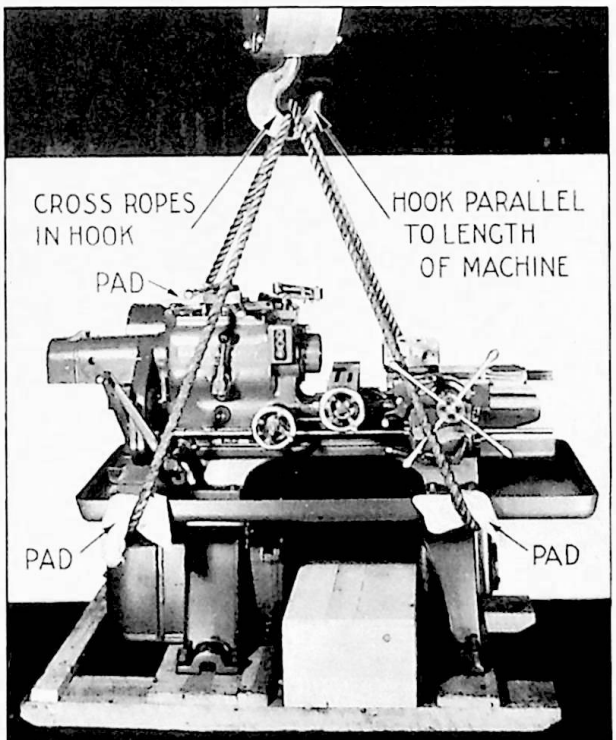


FIG. 1 *Proper Method of Lifting Turret Lathe with Crane.*

ELECTRICAL EQUIPMENT SPECIFICATIONS

The Electrician should receive these specifications as a part of his permanent record.

UNLOADING

The approximate gross weights of the No. 1 and No. 2 machines are given below as a guide for necessary handling equipment.

No. 1 Electric	1400 lbs.
No. 2 Electric	2600 lbs.
No. 2 All Geared Head	2900 lbs.

Upon receipt of machine remove the crate but be careful to save any small boxes which may be attached. They contain important parts of the machine. The skids should remain attached to the machine until it has been moved under a crane or to its permanent location.

Fig. 1 shows the proper method of lifting with a crane or chain hoist using a rope sling. The rope is applied close to the legs of the machine under the pan. Place a pad between rope and machine where they contact to prevent marring the painted surfaces. In order to prevent slipping, cross the ropes in the crane hook. The hook should be parallel to the length of the machine. Raise the machine slightly to test its balance. Adjust the rope in the hook to make the machine lift evenly.

All loose parts such as piping, wrenches and tools are packed in a separate wooden box attached to the skids.

LOCATION

The accuracy of the turret lathe is dependent upon its foundation. A rigid floor is essential. Ground floors are best. Ground level floors should have a concrete sub-floor. If machines must be placed on balconies or upper floors the best construction is reinforced concrete. Even with this construction it is best to have the head end of the machine as near to a pillar or close to a supporting wall as possible. Fig. 2 and 3 illustrate typical turret lathe installations that make use of the maximum support obtainable from the building.

Wood floors swell and contract with atmospheric changes. A better foundation will be obtained if the wooden flooring is removed from the areas where the feet of the machine will rest. Remove an area for each leg several inches larger than the size of the foot. Fill the holes with concrete to floor level. Drill holes in the concrete for expansion nuts and lag screws to fit the particular pattern of the turret lathe leg. (Refer to machine-tool data sheet —See Page 25.)

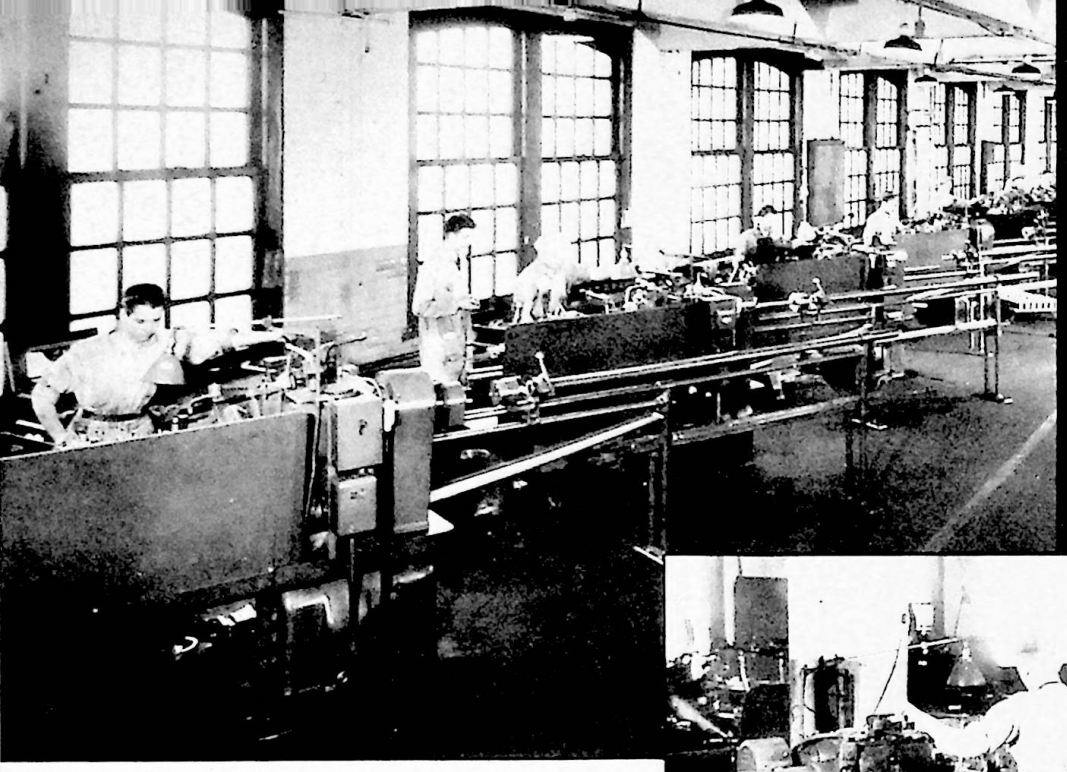


FIG. 2 *Proper Location of Turret Lathes on Upper Floor near Wall.*

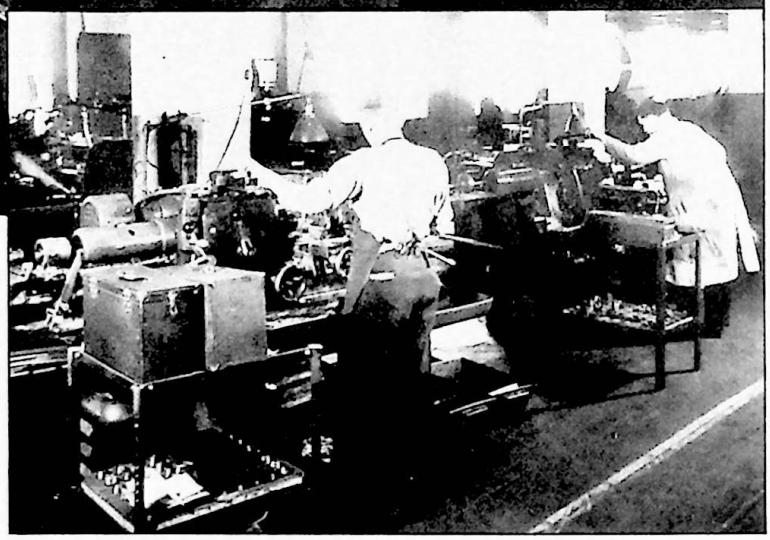


FIG. 3 *Proper Location of Turret Lathes near Columns.*

Place steel plates ⅜" thick on top of the concrete to prevent concentration of load at the leveling screws. Plates are shown as shaded areas in Fig. 6.

When a machine must be placed on a balcony or upper story of wood construction, distribute the weight over as large a floor area as possible. Cut extra large plates from boiler plate ½" thick to suit the need. If floor is very weak it may be found best to cut a plate the full size of the machine in order to distribute the load. Drill oversize holes (7), Fig. 6, in the steel plate to accommodate the lag screws that hold down the machine.

ALL TURRET LATHES SHOULD BE BOLTED DOWN REGARDLESS OF THEIR LOCATION.

CLEANING

CAUTION—Warner & Swasey Turret Lathes are spray-painted with the highest grade cellulose-base lacquer. Avoid the use of caustic cleaners. They will injure the finish.

1. Do not move the machine slides before thoroughly cleaning and oiling.
2. Use new, clean kerosene for removing the sludge. Rags should be used in preference to waste because they leave no lint. Use a stiff bristle brush to get into corners. **DO NOT USE AN AIR HOSE** because air pressure will drive dirt and grit between the bearing surfaces.
3. When machine is thoroughly cleaned, rub clean machine oil over all bearing areas and make sure there is no grit left.
4. Periodic cleaning of the machine after installation is recommended. Prevent the development of permanent stains by wiping the machine off once a week with a rag soaked in clean kerosene.

LUBRICATION

1. DO NOT OPERATE THE MACHINE BEFORE OILING AND LEVELING. Unless the bed is leveled and the slides oiled, the slides will bind. All oil is drained from the machine prior to shipment.
2. NO. 2 ALL GEARED HEAD TURRET LATHE. Fill head with oil to red line half way up on gage glass (3), Fig. 4. Do not fill above or below this mark. Fill when the head is *not* running.

   A good grade of turbine oil (not ordinary engine oil) made from paraffin base crude (Pennsylvania) having a viscosity of 180 to 220 seconds Saybolt at 100 degrees Fahrenheit should be used.

   In remote territories, if the above specifications cannot be met, use a standard grade of SAE 10 or 10W (Pennsylvania) Automobile Engine Oil.

   Inferior oils, oils too thick or in improper amounts, especially at high spindle speeds, result in excessive oil friction, carbonizing and gumming, with consequent overheating and expensive repairs.

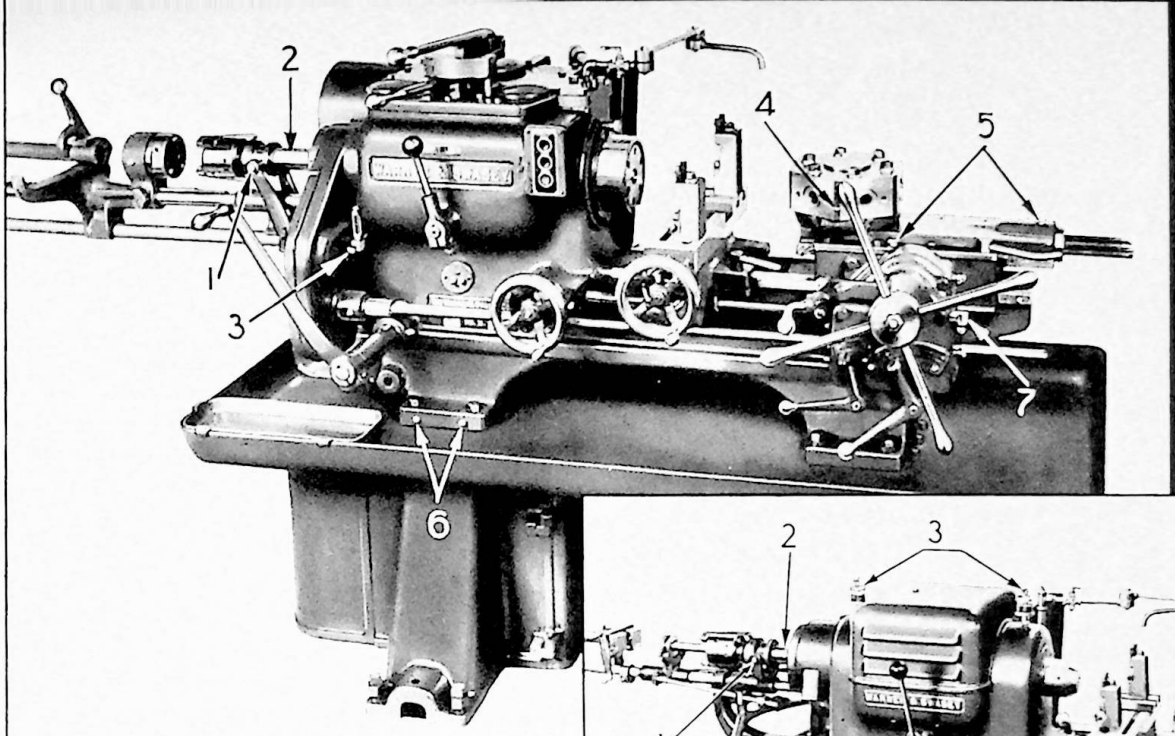


FIG. 4 *Lubrication of No. 2 A. G. H. Turret Lathe.*

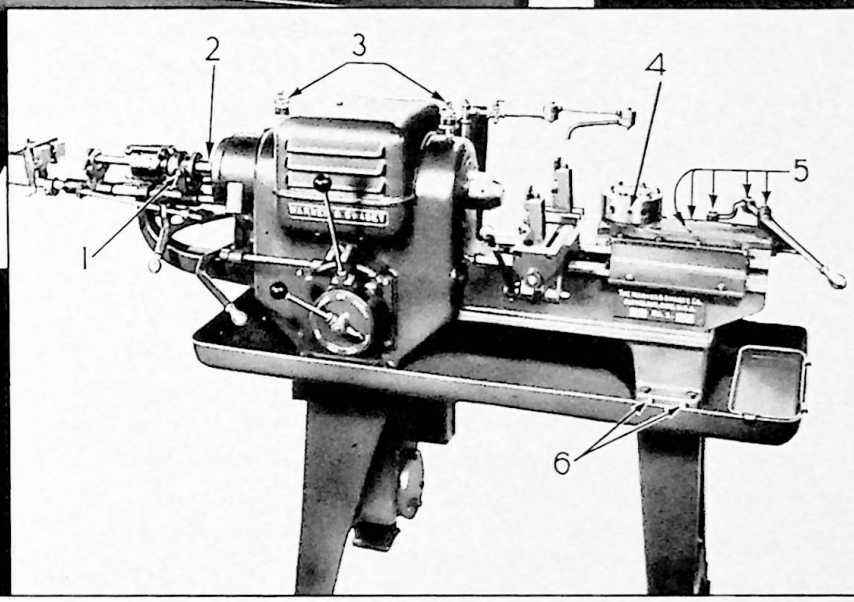


FIG. 5 *Lubrication of No. 1 Electric Turret Lathe.*

3. NO. 1 AND NO. 2 ELECTRIC MOTOR SPINDLE MACHINES—Fill sight feed oilers, (3), Fig. 5. For best results use same oil as specified under item 2. Adjust oilers so that one fill lasts one eight hour shift. Too much oil will cause overheating of spindle bearings.

4. Grease all fittings with pressure grease gun furnished with machine. Use a high quality pressure-gun lubricant. Be sure to grease fittings inside the hexagon turret center hole of all No. 2 machines. (4), Fig. 4. On No. 1 machines remove plug (4), Fig. 5 and fill with oil. If bar equipment is furnished look for two fittings (front and rear) on upper end of wedge shifter fork at left hand end of spindle (1), Fig. 4 and 5.

5. Fill worm trough in the hexagon turret apron of all No. 2 machines with a generous supply of good machine oil. The oiler (7), Fig. 4, is for this purpose.

6. Fill cups on top of turret slide and saddle of all No. 2 machines (5), Fig. 4. Fill oil holes on turret slide of No. 1 Electric machine. (5), Fig. 5.

7. On machines equipped with collet chucks, rub some dry graphite powder on the left hand end of spindle (1), Fig. 4 and 5 where the hardened wedge (or spool) slides. Do this for several days until these units are thoroughly burnished or run in.

LUBRICATION TIME TABLE

1. DAILY
   a. Fill worm troughs generously (see Note 5 under "Lubrication").
   b. Fill oil cups on turret, slide and saddle (see Note 6).
   c. Check sight feed oilers of electric head machines (see Note 3). Fill if necessary.
2. WEEKLY
   a. Grease all nipples (see Note 4).
   b. Check head oil level of all geared head machine (see Note 2, under "Lubrication").
3. TWICE A YEAR

   Drain oil from head, flush with clean oil and refill to gage mark—never above. Do not fill head when machine is running.

   Be sure air vent in hand hole cover on top of geared head is kept open or pressure in head will cause oil leakage.

COOLANT LEAKAGE

The left hand (head end) leg of the bed of No. 2 All Geared Head Turret Lathes and the right hand leg of No. 1 and No. 2 Electric Turret Lathes is bolted to the floor leg directly, but the pan can slide a limited amount between the two to allow for expansion or contraction without affecting bed alignment. This slip joint is packed in waterproof grease and should not require attention. If, however, slight leaks should ever develop, remove the four ⅛" pipe plugs (6), Fig. 4 and 5, in the bed leg near the pan, insert grease fittings and apply waterproof automobile water pump grease, available at most automobile service stations. Remove grease fittings and replace pipe plugs after greasing.

COOLANTS

The water soluble oil coolants and cutting oils now marketed by the principal oil manufacturers do not injure the finish of the machine nor do they cause the bright metal parts to rust.

Occasionally a shop is found where the coolant is compounded by the user. Doing this should be discouraged because any coolant of a caustic nature may attack the high-grade lacquer finish of the machine and also may cause staining or rusting of the exposed metal parts.

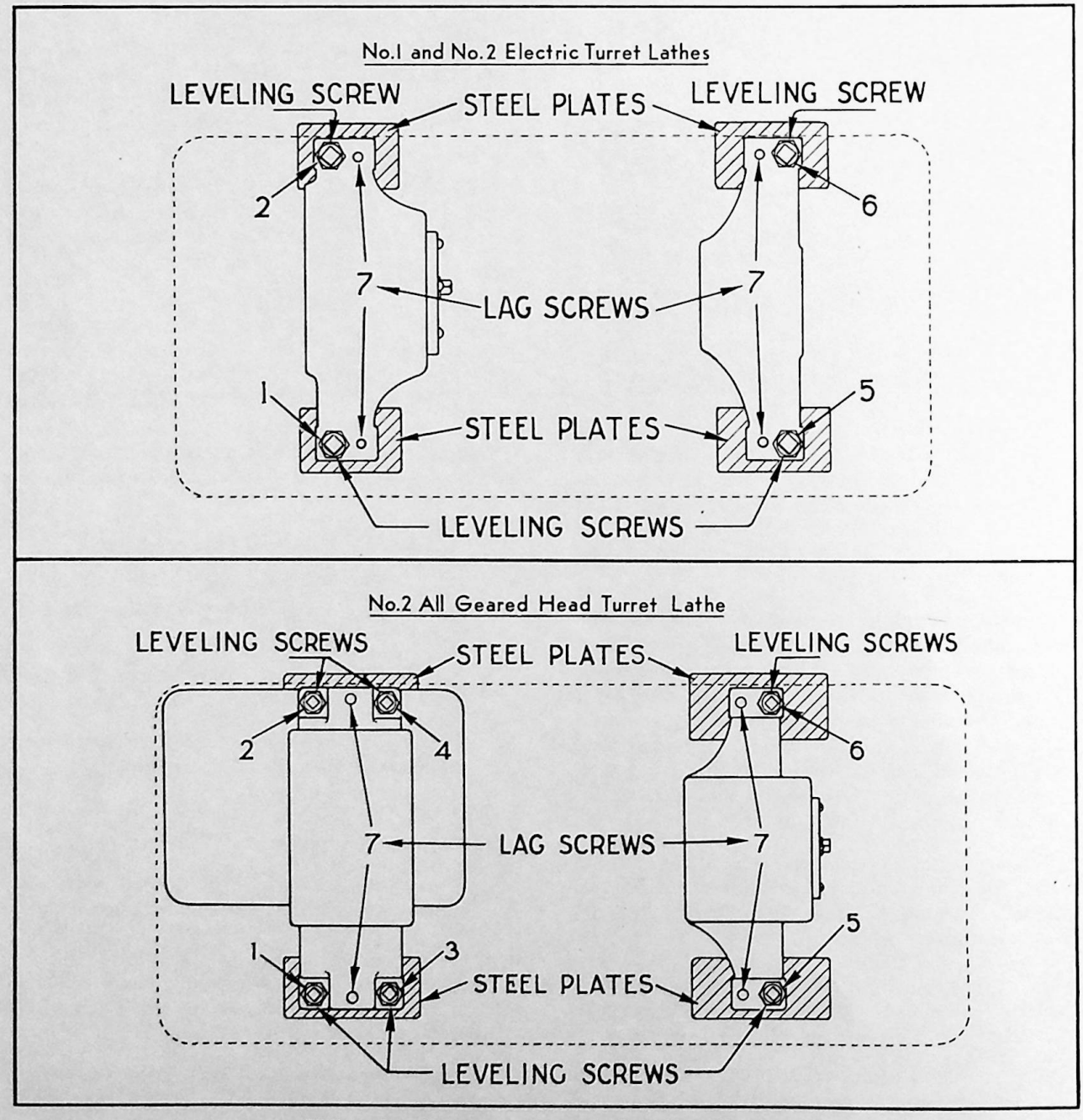


FIG. 6 *Leg Diagram showing Leveling Screws.*

ALIGNMENT

The care exercised in the alignment of a turret lathe bed determines the degree of accuracy with which the finished product is turned out by the machine. Align the machine carefully when installing and periodically check the alignment to keep wear at a minimum and to obtain the accuracy built into the machine.

ALIGNMENT "DON'TS"

Preliminary to a description of the aligning methods for turret lathes, the following points are listed as Alignment "Don'ts."

1. Don't use wooden wedges for leveling machine tools. Wood expands and contracts with moisture changes. Use leveling screws.
2. Don't use a machinist's level. It is not sufficiently accurate. Use a sensitive spirit level of the type shown in Fig. 7.
3. Don't take an immediate reading with a sensitive level. Wait thirty seconds to allow the bubble to come to absolute rest.
4. Don't change the setting of the bolts that tie the pan, bed and legs together. These bolts were carefully set during the construction of the machine.
5. Don't try to level accurately a machine that has just been brought into the shop. It may have been exposed to extremes of temperature. Allow the machine to assume room temperature over a period of twenty-four hours or longer.
6. Don't expect a machine to line up accurately at once if it has been in storage on skids for an extended period of time, as in a warehouse or on shipboard. Under such conditions heavy strains may be set up and time is required for these strains to equalize. Level the machine as accurately as possible at first and after several weeks recheck the alignment.
7. Don't expect a turret lathe to remain level permanently. Buildings settle and floors warp with seasonal changes. Periodical check should be made of the alignment.

ALIGNMENT INSTRUCTIONS

For leveling turret lathes a sensitive, graduated tube spirit level is required, reading to ten seconds per graduation (.0006" per foot) and provided with screw adjustment. Ordinary levels are not accurate enough. A suitable level, with case, is listed in the W & S Tool Catalog on page 152 as Part No. SO-660, (see Fig. 7).

The actual length of a level frame has no bearing on its accuracy. The glass tube alone determines its sensitivity. A short level with long tube is best. It costs less and can be handled or stored with less danger of damage. When the frame is not long enough an accurate parallel can be laid underneath it.

ROUGH LEVELING

Fig. 6

Machines are leveled by raising the legs off the floor. Adjusting screws are provided for this purpose in the bottom of each leg. Nos. (1), to (6), Fig. 6, indicate the arrangement of these screws in the feet of No. 2 All Geared Head Machines. No. 1 and No. 2 Electric Machines have but two leveling screws in the head end leg, located at (1), and (2), Fig 6. On machines which do not have these screws, sheet metal stock cut to suitable size should be used for shims.

1. With machine in position on steel plate, screw the lag screws (7), loosely into prepared sockets or directly into wood floor. Back out all leveling screws until they do not bear on plates.
2. Using an ordinary carpenter's level, establish the bed of the machine in a physically level condition crosswise and lengthwise. On the electric head machines this is done by adjusting all four leveling screws. On the No. 2 All Geared

FIG. 7 W & S Sensitive Level (Part No. SO-660).

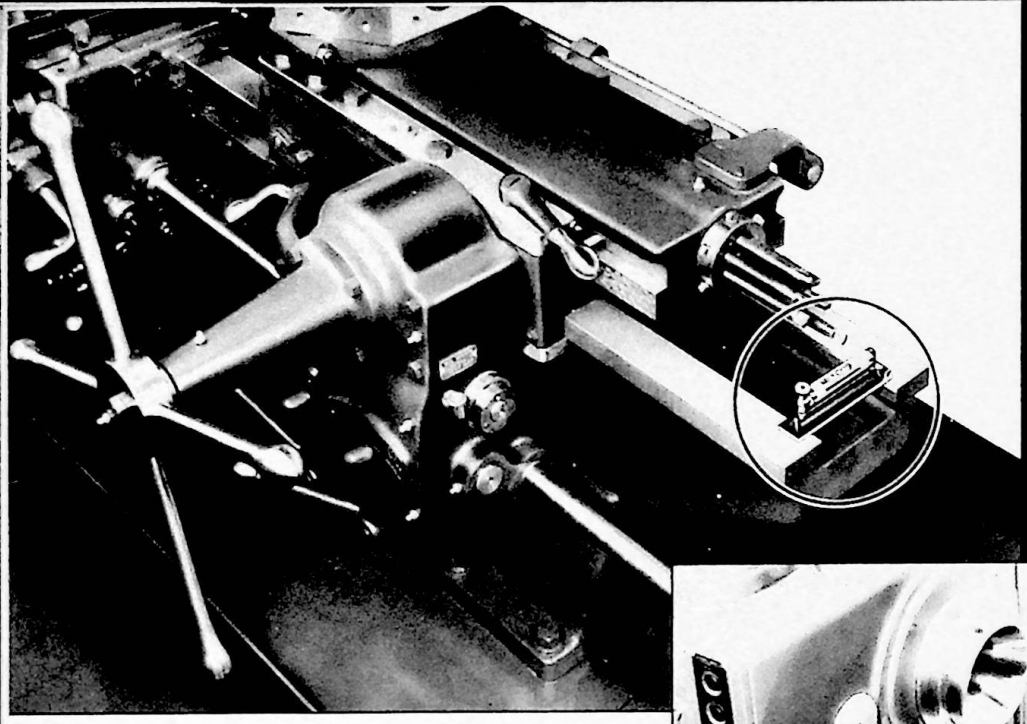


FIG. 8 *Level at Right Hand End of Bedways.*

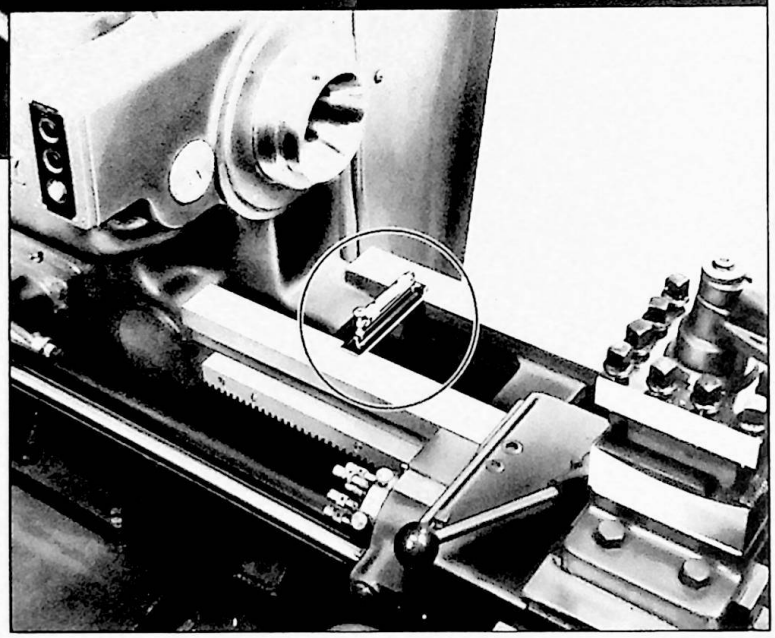


FIG. 9 *Level at Left Hand End of Bedways.*

Head Machine adjust the four screws, (3, 4, 5 and 6) *but do not bring the screws 1 and 2 to bear as yet.* Be sure that all four legs are at least ⅛" off the steel floor plates.

NOTE—This establishes the rough leveling of the machine. The further steps give alignment. They are necessary to remove twist from the bed, thus allowing slides to travel the entire length of the ways in parallel relation to the spindle.

ALIGNMENT

1. Place sensitive spirit level across bed at right hand end (Fig. 8) and adjust level at right angles to bed. If level is too short use a parallel beneath it. Adjust level to center the bubble. It takes at least thirty seconds for the bubble of a level to come to rest. Give it plenty of time.
2. Transfer level to head end of bed (Fig. 9). Square it again and make corrections with screws (5), and (6), Fig. 6, to center the bubble.
3. Repeat above operations 1 and 2 until the two readings are alike within one division on glass tube.
4. If the machine has extra screws (1), and (2), Fig. 6, bring these screws down to a solid bearing and recheck with level. Tighten all check nuts on the leveling screws and bolt the machine firmly down with lag screws, (7), Fig. 6. Again recheck with level.

TURRET HOLES IN LINE WITH SPINDLE

Turret Hole Alignment and Turret Face Squareness with the spindle are established at the factory under the best possible conditions of alignment. The turret lathe's own spindle is used to finish the turret holes and turret faces after the machine is completely assembled. After the machine has been leveled in accordance with previous instructions this alignment between spindle and turret is automatically reestablished and requires no further attention.

If it is desired to check the turret hole alignment after the machine has been in use for a considerable time, special tools are required as shown in Fig. 10.

Before making this test, however, be sure that the saddle is adjusted to a snug sliding fit on the bed. Check also the taper gib adjustment at the sides of the turret slide. Read carefully, the discussion on page 16 which describes the construction of this unit.

The procedure for checking turret hole alignment is as follows:

A piece of tubing is held in the collet chuck. The

micrometer head is mounted at the end of the tube. It revolves around a ground plug which, in turn, must have a good fit in the turret hole. The tubing does not have to run true and need not be straight. It has purposely been shown in the sketch with a bend in it and it is obvious that the micrometer will still travel around the center line of the spindle and hence will give a true reading of the spindle location.

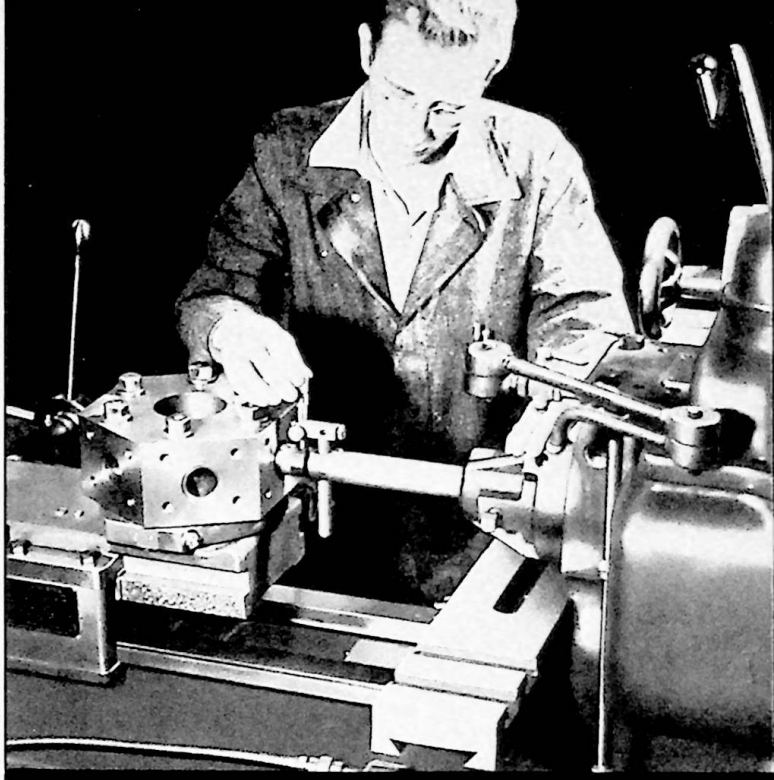
CAUTION

1. A dial indicator must not be used because it will not read to the same zero point when rotated to several positions with the spindle.
2. Do not use solid bar stock in place of the tubing because it sags of its own weight.

Turret hole alignment with the spindle will vary with varying temperatures of the head stock, consequently the turret holes are bored at the factory with head temperature approximating as nearly as possible average running condition in a machine shop. When making a turret hole alignment check on the machine, therefore, be sure the machine is run until the head is warm.

TURRET INDEX ACCURACY

The accuracy of index of the hexagon turret should not be confused with turret hole alignment.



Making a Turret Hole Alignment Test.

Accuracy of index is dependent on the adjustment of the center bearing, fit of lockbolt, lockbolt sleeve, lockbolt bushing and lockbolt spring. A check of these parts will often show that what is thought to be index error or turret-hole misalignment, is a matter of renewing the lockbolt spring. *Do not use an ordinary or homemade lockbolt spring*. The lockbolt spring is made to our special specifications based on its particular requirements. These springs are always carried in stock at the factory and cost very little.

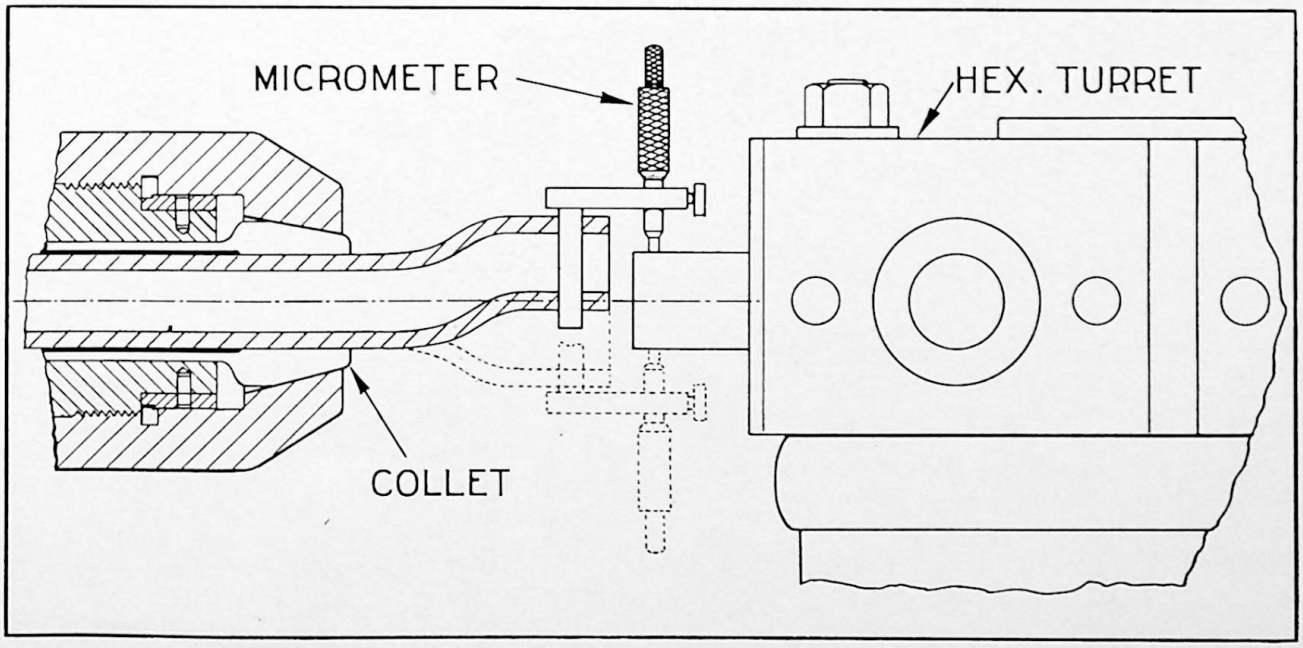


FIG. 10 *Alignment Test for Turret Holes.*

HEADSTOCK, NO. 2 ALL GEARED HEAD TURRET LATHE, (FIG. 11)

1. Triple Gear Shift Lever
2. Forward and Reverse Clutch Lever
3. High-Low Clutch Lever

HEADSTOCK, NO. 1 AND NO. 2 ELECTRIC TURRET LATHES. (FIG.12)

4. Speed Change Lever
5. Forward, Reverse and Brake Lever

CROSS SLIDE. (FIG. 11 AND FIG. 12)

6. Screw Feed Handwheel
7. Lever Feed Handle
8. Tool Posts

HAND LONGITUDINAL ADJUSTMENT. (FIG. 11)

9. Longitudinal Adjustment Handwheel
10. Longitudinal Adjustment Screw
11. Carriage Binder Clamp

TURRET, SLIDE and SADDLE. (FIG. 11 and FIG. 12)

12. Circumference Binder Ring
13. Turret Slide Clamp
14. Turnstile
15. Stop Roll and Stop Screws
16. Turret Feed Lever

POWER FEED TRAIN, NO. 2 MACHINES. (FIG. 11)

17. Feed Shaft
18. Feed Shift Handles
19. Feed Clutch Handle
20. Gear Box

COLLET CHUCK AND BAR FEED. (FIG. 11 AND FIG. 12)

21. Bar Support Pipe
22. Bar Chuck Collet
23. Collet Chuck and Bar Feed Lever
24. Collet Chuck Lever
25. Bar Feed Lever
26. Wedge
27. Finger Holder
28. Vise or Feed Chuck
29. Feed Tube
30. Bar Feed Plunger

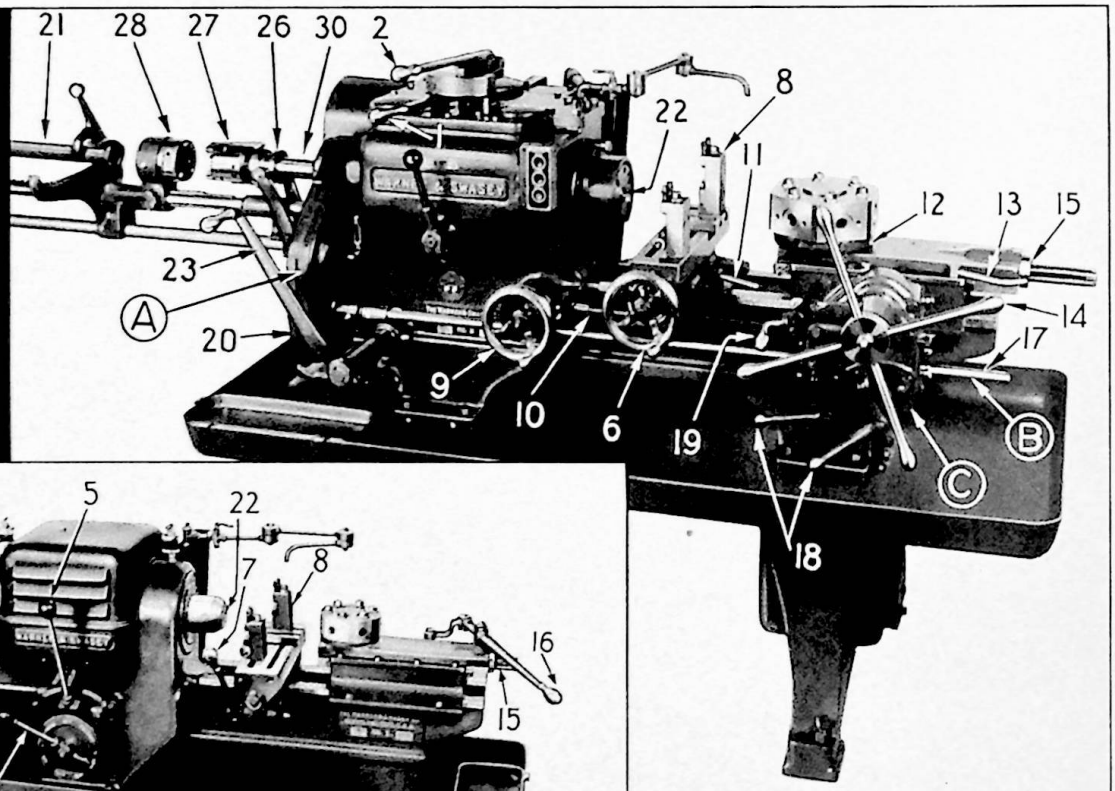


FIG. 11 *Nomenclature —No. 2 Six Speed A. G. H. Turret Lathe.*

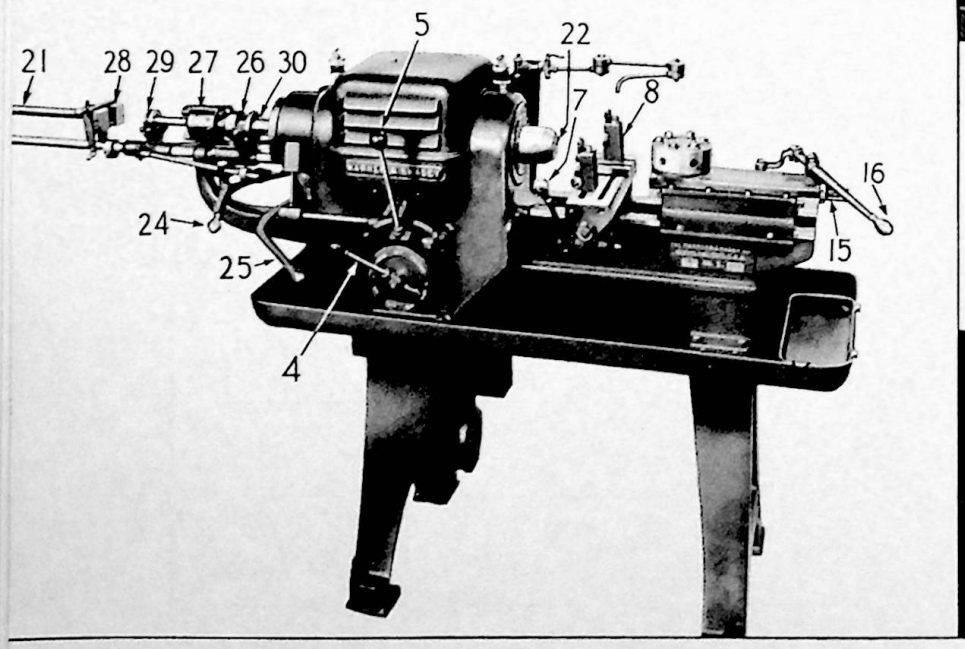


FIG. 12 *Nomenclature —No. 1 Electric Turret Lathe.*

The following section covers assemblies by units for the No. 1 and No. 2 Electric Turret Lathes and the No. 2 All Geared Head Turret Lathes. Principal adjustments and construction details are given for the proper maintenance of the machines. A careful study of these sections will effect better care, more efficient maintenance and will prolong the life and usefulness of the machines. The units covered are the headstock, cross slide, turret slide and saddle, feed train and the coolant system. It should be remembered that all units of the No. 2 Electric and No. 2 All Geared Head Turret Lathe are the same except for the headstock; and that the No. 1 and No. 2 Electric Spindle Machines are similar *only* with respect to the headstocks.

NOTE—All references to right or left hand are understood as seen from the front of the machine. Thus, the right-hand end of the spindle is the chuck end.

NO. 1 AND NO. 2 ELECTRIC HEADSTOCK

Fig. 13

The completely self-contained alternating current motor has its rotor mounted directly on the spindle and the stator mounted in the head housing. Speed changes and spindle reversal are accomplished electrically through the drum type controller and magnetic contactor. Fig. 13 shows the electric head with cover removed and the insert illustrates the three simple electric units.

The spindle and rotor are dynamically balanced at the factory to insure smooth operation at high speeds and are mounted on preloaded ball bearings. Neither the balance of the spindle and rotor, nor the spindle bearings themselves should require further attention by the user. If any question or difficulty should arise the Warner & Swasey service man should be called.

CAUTION—Do not remove the black grease on the spindle and stator under the head cover. This is a rust preventative.

Reversal of the spindle means changing the direction of the electrical motor of which the spindle is an integral part. For instance, a change from forward to reverse and back to forward again constitutes two reversals. The maximum number of spindle reversals per minute is stamped on a plate attached to the head cover.

The limiting factor for permissible reversals per minute is overheating of the motor. Maximum temperature of these motors is 95°C. For normal operation, the stated reversals will be safe. However, when larger chucks and air cylinders are used, the extra effort required for stopping and starting naturally reduces the number of spindle reversals per minute.

To stop the spindle, the operator throws the motor temporarily into electrical reverse and an operator quickly becomes expert in doing this.

The hand brake, operated by the forward and reverse lever, is to prevent rotation when attaching chucks, loading work, etc. Continued use of this brake to stop the spindle, particularly when operating at high speeds, will cause excessive wear of the brake lining and should be avoided. If replacement is necessary, do not use ordinary lining. Order the proper type of lining from the factory.

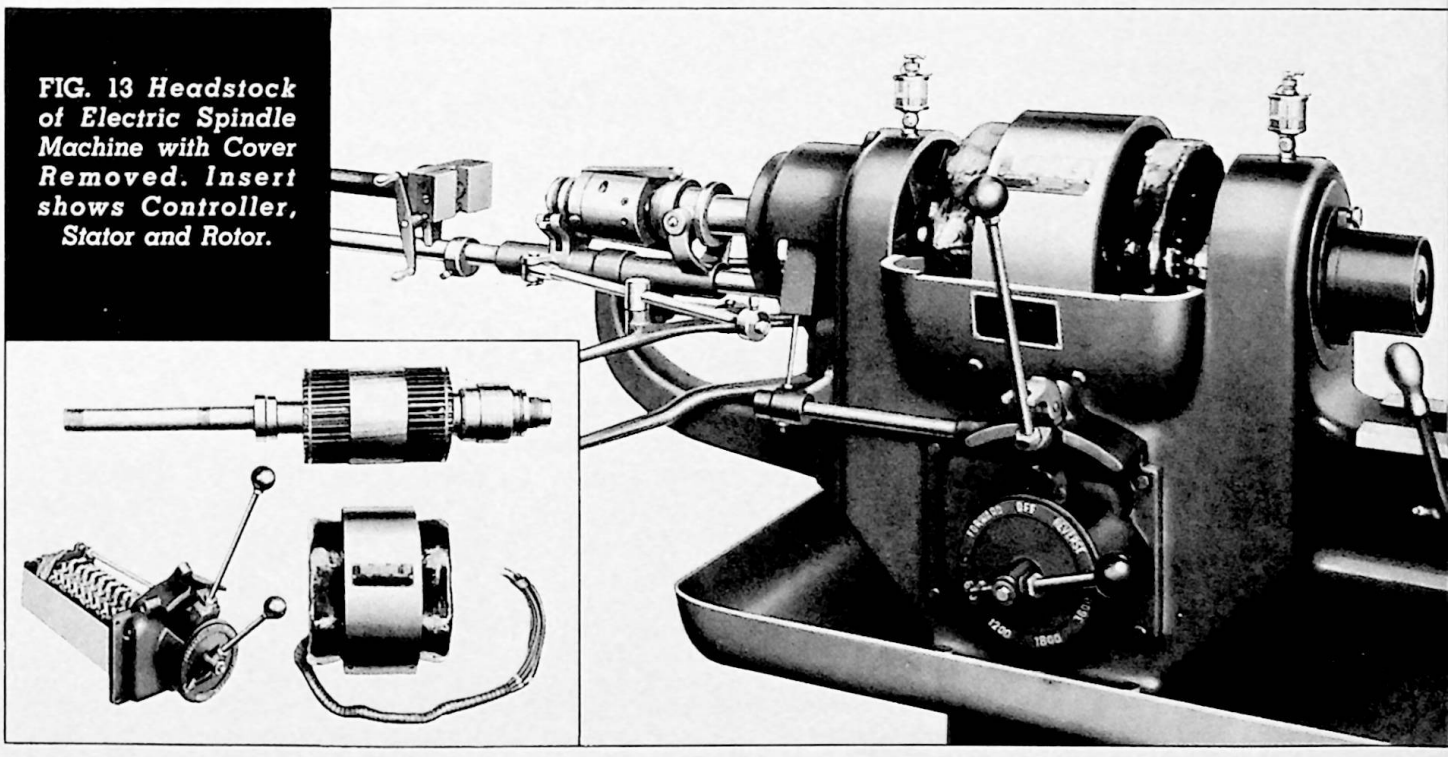


FIG. 13 *Headstock of Electric Spindle Machine with Cover Removed. Insert shows Controller, Stator and Rotor.*

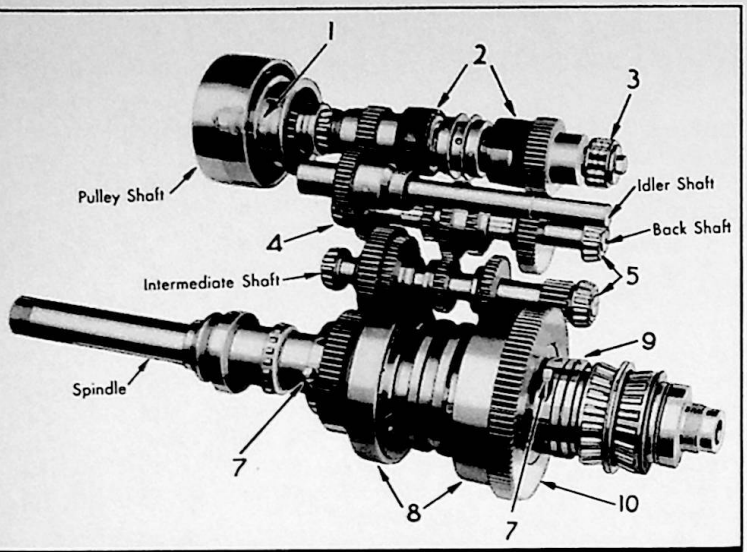


FIG. 14 *Six Speed Head for No. 2 Turret Lathe.*

NO. 2 SIX-SPEED ALL GEARED HEAD

Fig. 14

The forward and reverse drive clutches and the high-low spindle clutch are adjusted through the hand holes without removing the head cover.

The anti-friction spindle bearings are carefully set at the factory to suit the speed range in which it is intended the machines should operate. If, at any time, the spindle is to be speeded up considerably beyond its original range, a Warner & Swasey service man should be called to make the proper adjustments. Beyond this the bearings require no attention on the part of the user.

HIGH-LOW CLUTCHES

Fig. 14

These two clutches are of the cone type. To adjust them, loosen the screws, (7), which clamp the threaded (R. H. thread) and split collars. Adjust the collars and then clamp screws (7), before trying the adjustment.

The linings of the two clutches have been developed through extensive experiments and tests with a variety of clutch-facing materials. The low-speed clutch has a metallic lining, while the high-speed clutch lining is of organic type.

To keep the organic lining in the best possible condition for smooth action even at the highest speeds, *keep the high speed side of the clutch in engagement whenever the machine stands idle* such as during the night, etc. Both linings are renewable.

To replace lining, return the clutch drums to the factory. For export shipments, it is advisable to order complete new clutch drums.

FORWARD AND REVERSE DRIVE CLUTCH

Maintain proper adjustment of multiple-disc clutch to prevent slipping under load. A slipping clutch wears rapidly. In actual use the clutch lever should be engaged with a steady pressure rather than a jerk. The shock of instantaneous clutch engagement exerts a tremendous pull on the driving belts and will weaken them. This is especially true when the spindle is reversed from a high forward speed.

TO ADJUST "PULLMORE" FORWARD AND REVERSE CLUTCH

Fig. 15

1. Rotate drive pulley by hand with clutch engaged until hole (1) comes into view through hand-hole cover. Disengage clutch.
2. Insert ⅛" pin in hole (1) and pry sideways to push serrated pressure plate (3) and adjustment collar (2) apart. Teeth in collar (2) will now slide past teeth in pressure plate (3).
3. Advance collar (2) one tooth only and test adjustment by engaging clutch. To tighten clutch, advance collar (2) in same direction as when tightening a nut on a right hand thread.
4. Test clutch adjustment. If not tight enough, advance collar (2) one tooth at a time until proper adjustment is attained.

CAUTION—Engage clutch with a steady pressure rather than with a jerk. The shock of instantaneous clutch engagement exerts a tremendous pull on the driving belts and will weaken them. This is especially true when the spindle is reversed from a high forward speed.

TO TAKE "PULLMORE" CLUTCHES APART

Fig. 15

1. Remove entire pulley shaft from head (see instructions, page 14).
2. Release clutch adjustment completely on both sides.
3. Drive out anchor pin (4).
4. Remove gears, bearings and clutch shells from both ends of pulley shaft (strike ends of shaft on wooden block).
5. Compress entire double unit in arbor press or vise until split collar (5) on shaft is completely exposed. Remove collar and one set of discs.
6. Three hardened keys (6) are now exposed. These must be removed and can be withdrawn from shaft by gripping each one firmly in a vise and striking the shaft with a babbit hammer.
7. The center spool and other set of discs can now be removed.

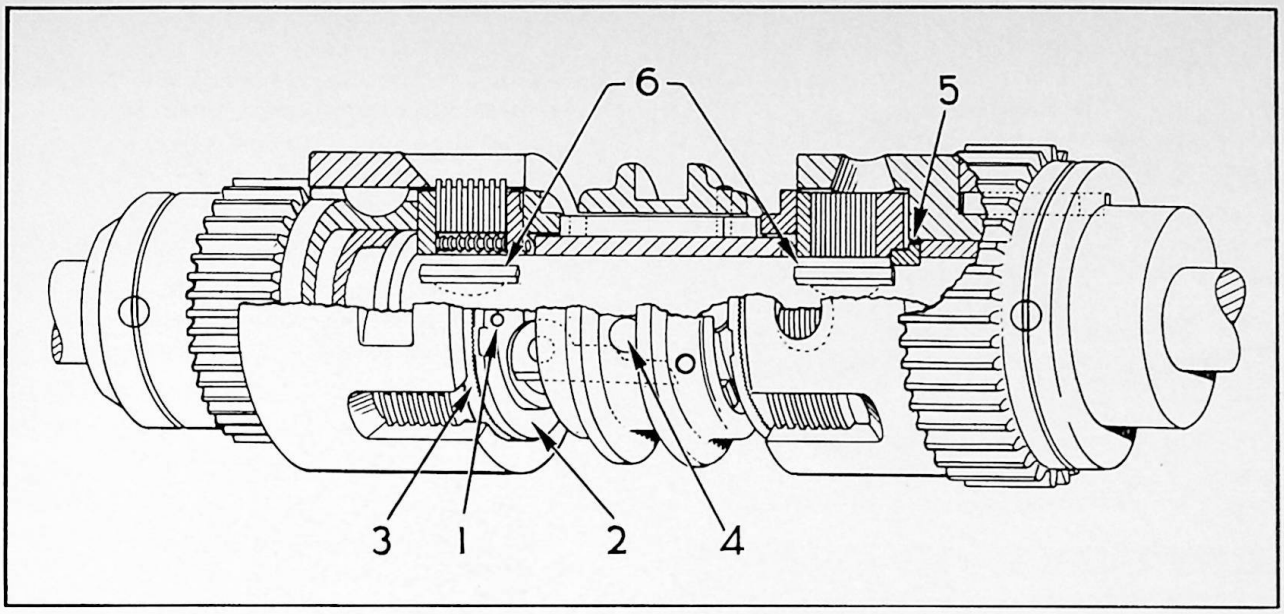


FIG. 15 *The "Pullmore" Clutch.*

TO ADJUST "TWIN DISC" FORWARD AND REVERSE CLUTCH

Fig. 16

1. Rotate drive pulley by hand with clutch engaged until pin (1) comes to view through hand-hole. Disengage clutch.
2. Pull back pin (1) and advance collar (7) until pin (1) snaps into the next hole (3). Advance one hole at a time. To tighten clutch, advance the collar (7) in the same direction as when tightening a nut on a right hand thread.
3. Test adjustment by engaging the clutch with a steady pressure rather than a jerk. If not tight enough, advance collar (7) to next hole until properly adjusted.

TO TAKE "TWIN DISC" CLUTCHES APART

Fig. 16

1. Remove entire drive pulley shaft from head (see instructions page 14).
2. Release clutch adjustment on both sides.
3. Remove gears, bearings and clutch shells from both ends of shaft (strike ends of shaft on a wooden block).
4. Compress entire double unit, remove split collar (2), and slip off entire clutch unit.
5. Loosen collars (7) and compress plate unit to expose finger lever pins (4). Drive out pins (4) and remove fingers (5). The floating plates (6) and clutch plates can now be removed.

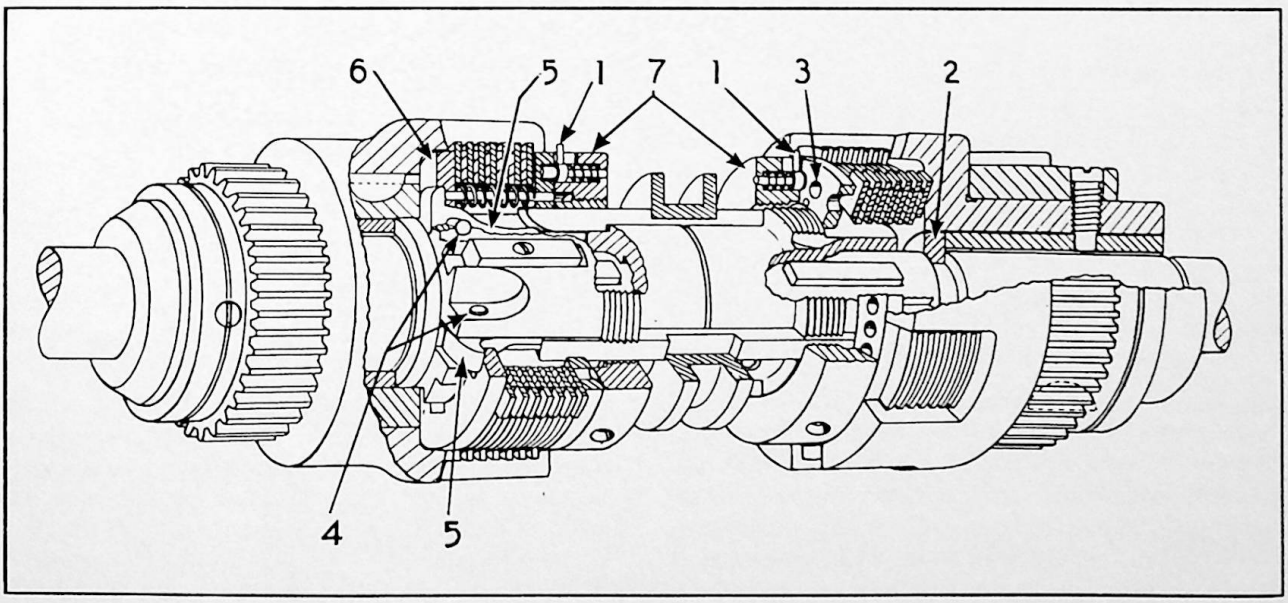


FIG. 16 *The "Twin Disc" Clutch*

CLUTCH ASSEMBLY

In reassembling the drive clutch, be sure to remove any burrs on the clutch plate that may have been thrown up by the keys. If keyways of inner discs are damaged, reverse the plate to present a good keyway surface for the driving side.

Occasionally, through the use of improper grade of oil in the headstock of the machine, a burned film of oil may be deposited on the plate. In such cases polish the plates with emery cloth.

DRIVE PULLEY SHAFT REMOVAL

Fig. 14

The right hand end of the pulley shaft floats in a straight roller bearing, (3), to allow for elongation from heat developed by the clutches. A double row of Timken bearings at the left hand end locates the shaft endwise.

To remove the drive pulley shaft assembly, proceed as follows:

1. Remove drive pulley, headcover, and splash guard.
2. Loosen the set screw in the adjusting collar (1) located at the pulley end of the shaft and unscrew the collar.
3. Remove the screw in the head wall at right hand end of pulley shaft which retains the bushing for bearing (3). This bushing is not threaded into the head stock.

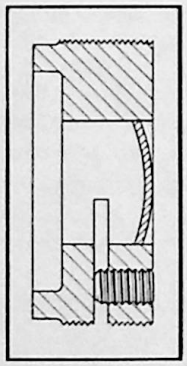


FIG. 17
Bearing Adjustment Collar.

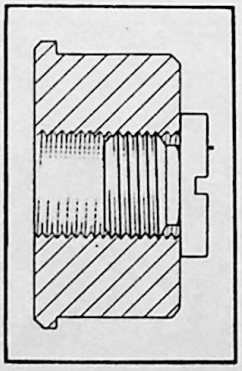


FIG. 18 *Bearing Plug.*

4. Unscrew the adjusting nuts (Fig. 17) which retain bearings (4) and (5) of the back shaft. Drop right hand end of this shaft assembly down into headstock. (See Gear Shaft Removal).
5. By striking the left hand end of the pulley shaft with a babbit hammer, the entire assembled unit can now be pushed out of the right hand end of the headstock housing.

IDLER SHAFT REMOVAL

Fig. 19

Before the intermediate and back shafts can be removed the idler shaft must be taken out.

1. Remove long screw (1) in left side head wall.
2. Remove screw (2) in collar (3).
3. Remove cotter pin, screw and spring in gear fork (4).

   CAUTION—When shaft is released—be careful not to drop steel ball from gear fork.

4. Drive the shaft out by tapping with bronze bar at right end.
5. Parts can now be removed as shaft is drawn out of hole in left wall.

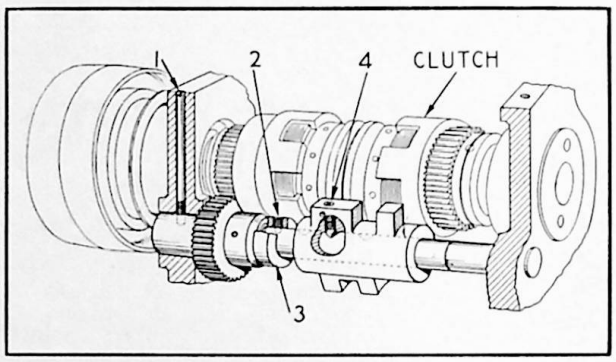


FIG. 19 *Idler Shaft for No. 2 A. G. H. Turret Lathe.*

GEAR SHAFT REMOVAL

Fig. 14

The gear shafts are mounted on adjustable Timken bearings. Adjustment is by means of the threaded collars in the headstock. These collars, Fig. 17, are locked by tightening the set screws. After adjustment the shaft should run free and without drag, but there should also be no end play.

1. Remove the set screws which lock the gears on the shaft.
2. Unscrew the adjusting collar, Fig. 17. If the shaft has a non-adjustable collar at its right hand end, remove the center screw, Fig. 18, otherwise remove both adjusting collars, Fig. 17.
3. Move the gear shaft sideways by sliding it through the inner Timken bearing race (5), and through the gears on the shaft.

Spacers should be cut to measured length from cold rolled steel stock to hold the gears and the Timken races in their proper places while the shaft is being pushed through them. If possible, the actual pressure should be exerted by means of a screw fitting the inside thread of the plug, Fig. 18, otherwise the shaft may be advanced by tapping with a brass rod.

CROSS SLIDE

Three types of cross slides are available for these machines: plain lever feed, screw feed and combination lever and screw feed.

TO REMOVE CROSS SLIDE—SCREW FEED OR COMBINATION TYPE

Fig. 20

1. Do not remove cross slide by running the feed screw all the way out of its nut. (See caution note below). Follow carefully instructions given below. Attempts to assemble the feed screw into the nut without first removing the screw from the cross slide may result in damage to the feed nut.

2. Run cross slide in as far as it will go. Remove handwheel, graduated dial and the stop screw block, (2).

3. Slide the cross slide from its carriage, leaving the cross slide screw in place. If it is desired to remove the cross slide screw, replace the handwheel and unscrew it separately.

CAUTION—If the cross slide screw is accidentally run out of its nut, always remove the screw from the cross slide (loosen nut, remove handwheel and dials) and start screw in nut by hand. Then replace cross slide, dials, handwheel and nut.

TO REMOVE ENTIRE UNIT

No. 1 Electric Turret Lathe, Fig. 20

Loosen locking screws (5). Remove cap screws (1) and lift entire unit from bedways. Be careful not to lose the two steel shoes, (4). These shoes, backed by set screws and lock nuts, maintain alignment of carriage with side of bed. In reassembling the cross slide and carriage unit, they should be adjusted to a sliding fit and locked.

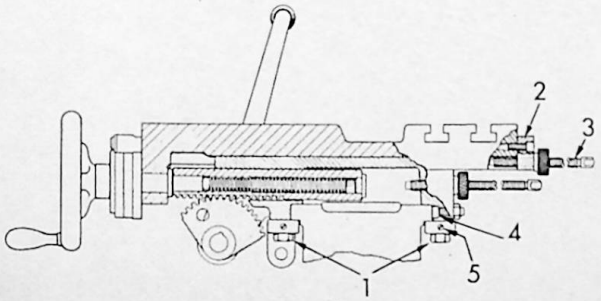


FIG. 20 *Cross Slide and Carriage Assembly*

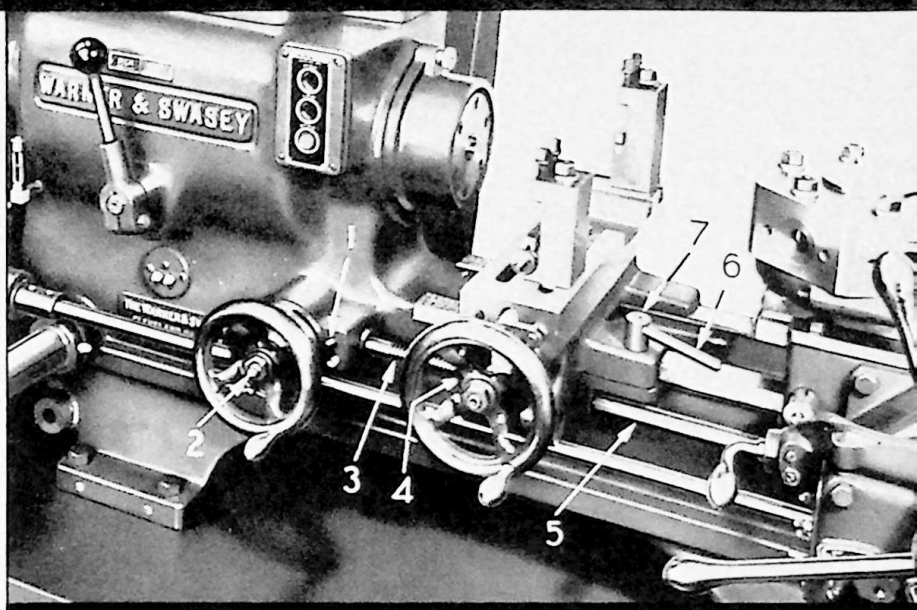


FIG. 21 *Cross Slide and Hand Longitudinal Units for No. 2 Machines.*

TO REMOVE ENTIRE UNIT

No. 2 Turret Lathes

1. Unscrew protecting pipes (4) and (5), Fig. 21.

2. Run the cross slide unit to the right until the nut runs out of the hand longitudinal adjusting screw (3), Fig. 21. To do this it will be necessary to move the turret saddle to the extreme right.

CAUTION—Do not allow the saddle apron to run off the end of the feed shaft. If necessary, disconnect the feed shaft from the gear box coupling, move the shaft to the right with the apron. This will prevent dropping of feed gear into apron.

3. Remove binder handle (6), Fig. 21, and unscrew binder nut (7), Fig. 21.

4. Remove cap screws (1), Fig. 20, and lift entire unit from bedways, being careful not to lose the steel shoes (4), Fig. 20. (See instructions for No. 1 Turret Lathe above).

HAND LONGITUDINAL ADJUSTMENT

No. 2 Turret Lathes, Fig. 21

The bevel gears and bearings in this simple unit are properly set at the factory, so they should require no further adjustment. If desired, however, screw (3), with bevel gear and bearing attached, may be removed by loosening dowel pin (1). Shaft (2), with bearing and bevel gear may be removed by removing handwheel and the cap screws behind the dial.

TURRET SLIDE AND SADDLE

The saddle is clamped to the bed with cap screws through bottom caps on each side, (4), Fig. 22 and Fig. 23. It is aligned against the side of the bed by two shoes backed up by set screws and lock nuts. These shoes (located on the front of the saddle for a No. 1 machine, at the back for the No. 2 machines) should be adjusted to a sliding fit and locked. They will require a minimum of attention since the saddle is moved along the bed only when setting up the machine for a new job. However, when these screws are not properly adjusted the turret saddle is not parallel with the bed, causing inaccuracy in the work.

On No. 2 machines hardened and ground steel wear strips (17), Fig. 24, on which the slide rides are anchored to the saddle. These are replaceable and can be supplied thicker than standard for repair purposes.

On No. 1 machines the saddle bears on a taper base on the bed ways (15), Fig. 23. The entire saddle unit may be raised to compensate for wear by adjusting this taper base to the right by means of adjusting screws at each end of the saddle. One screw moves taper base while the other screw locks it in place. Side alignment is obtained through two taper gibs (16), Fig. 23 and Fig. 24. When adjusting these gibs to compensate for wear, be careful to move both sides the same amount to keep the turret in alignment with the spindle. In case of doubt a turret hole alignment check should be made (see "Turret Hole Alignment," Page 8).

CAUTION—When making alignment check be sure to test the bed first because the turret may be "out" due to bed twist, see pages 7 and 8. Such an error obviously should not be corrected by gib adjustment.

Turret slide of No. 1 machine is operated through lever (14), Fig. 23, on top of slide.

The turret slide of No. 2 machines is operated through rack (11), and pinion (12), Fig. 22 and Fig. 24, of turnstile shaft.

The rack screws (22), Fig. 25, for rack (11), Fig. 24, should at all times be kept well tightened. Two dowel pins take the feeding thrust load.

INDEXING MECHANISM

The construction and operation of the turret indexing mechanism is similar for these machines except that the No. 1 turret lathe is not equipped with external binder as shown in Fig. 26. The mechanism functions as follows (Refer to Fig. 22 and 23):

1. Beginning with the slide in its forward position, moving it to the rear causes lockbolt lever (3), to strike the rising angle of tumbler (8), Fig. 22 and Fig. 23. This action lowers the lockbolt (1), Fig. 22 and Fig. 23, and frees the turret.
2. On No. 2 machine the turret binder ring is released and toggle (24), Fig. 26, is swung to the unlatched position by passing over stud (25), on the rear top cap.
3. As the turret slide moves farther to the rear, one of the six index pins (2), Fig. 22, 23 and 25, contacts the pawl (7), Fig. 22, 23 and 24, which holds the pin against further movement and causes the turret to rotate one-sixth of a turn.
4. In the meantime the rear end of lockbolt lever (3), has reached the rear angle of tumbler (8), drops down behind it and snaps the lockbolt into its bushing in the hexagon turret.

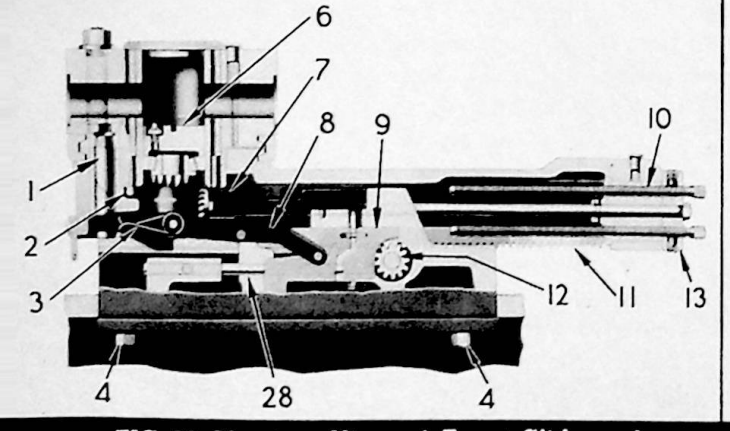


FIG. 22 *Phantom View of Turret Slide and Saddle for No. 2 Turret Lathes.*

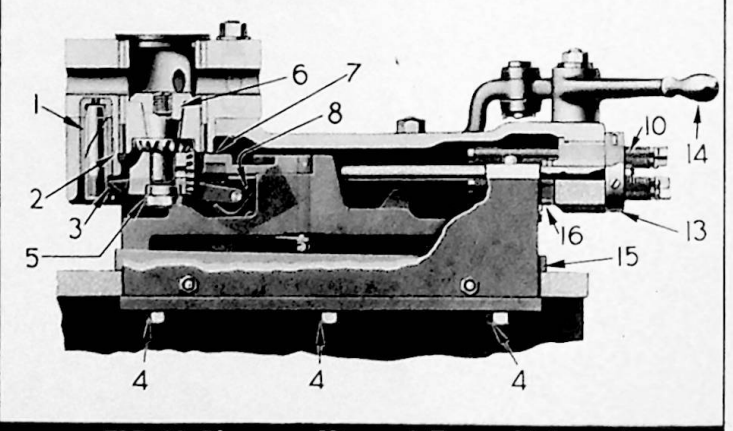


FIG. 23 *Phantom View of Turret Slide and Saddle for No. 1 Electric Turret Lathe.*

5. During this turret rotation the stop roll unit (13), Fig. 22, 23 and 24, has been rotated one-sixth of a turn through a bevel gear connection with the turret. This brings the next stop screw (bottom screw) into operating position.
6. As the turret slides forward again, tumbler (8), rises, allowing the lockbolt lever to pass, then drops back to its seat, completing the cycle. With this forward motion the binder mechanism of No. 2 machines automatically clamps the turret.

TO REMOVE THE TURRET

No. 1 Electric Turret Lathe, Fig. 23

Advance the slide towards the spindle until hexagon nut (5), can be removed with wrench. Remove slotted ½"-13 screw from taper stud (6). Using a suitable clamp on top of turret, insert a bolt or long cap screw and draw taper stud from its keyed seat in the slide. Turret and stud can now be lifted off.

TO REMOVE THE TURRET

No. 2 Turret Lathes

Move the turret slide to the rearmost position away from the spindle to free the binder ring. Unscrew the two nuts and the front screw that holds the two halves of the binder ring together (19) and (20), Fig. 25. Remove the binder ring and lift the turret off its seat.

CAUTION—When assembling turret to slide, move one stop screw (10), Fig. 22, 23 and 24, to top position when turret holes are in line with spindle. This will insure proper mesh of turret gear and stop roll gear (see Figs. 22 and 23) for correct turret index.

TO ADJUST CENTER BEARING OF TURRET

NOTE—Before adjusting center bearing on No. 1 and No. 2 Turret Lathes, turret should be removed and all parts thoroughly cleaned.

No. 1 Electric Turret Lathe, Fig. 33

Tighten nut (5) to draw taper stud (6) and turret to seat. Adjust until turret rotates freely while bearing at all points on its seat.

No. 2 Turret Lathes

1. Bring turret slide to extreme rear position.
2. Loosen set screw (18), Fig. 25, which locks the Timken bearing adjusting plug (6), Fig. 22.
3. Unscrew adjusting plug until the bearing is absolutely free.
4. Advance turret and check binder ring adjustment as described below.
5. Advance turret farther to full clamp position.
6. Bring bearing adjusting plug (6), down forcefully to a solid seat.
7. Tighten set screw to lock plug.

NOTE—When adjustment has been made as described above, the turret will be off its seat a slight amount when the binder ring is free. This condition facilitates indexing and prolongs the accurate alignment of the turret. The powerful clamping action of the binder ring pulls the turret on to its full seat by loading the bearings.

TO ADJUST THE BINDER RING

No. 2 Turret Lathes Only

1. Place turret slide in extreme rear position.
2. See that the slot between the two ring bands at the front is ⅛" wide. Lock the front screw (20), Fig. 25, with its locknut. This screw should not be disturbed thereafter.
3. For hand grip insert and clamp a piece of cold rolled stock or a tool in a turret hole so that it projects about 8".

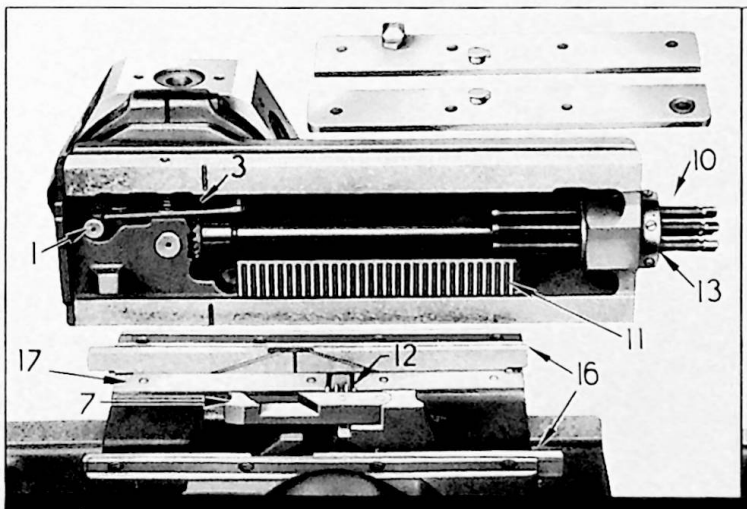


FIG. 24 *Bottom of Turret Slide—No. 2 Machines.*

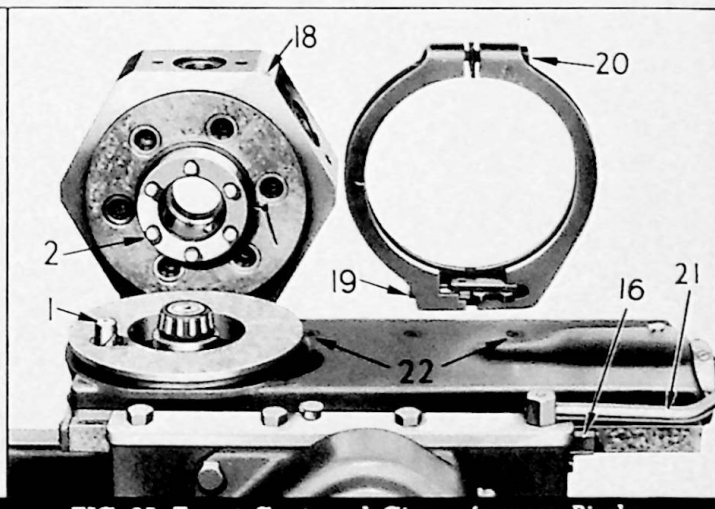


FIG. 25 *Turret Seat and Circumference Binder Ring, No. 2 Turret Lathes.*

4. Rotate turret so that one of its corners (instead of a face) points toward the spindle. In this position the lockbolt cannot enter into the lockbolt bushing and the turret can be rotated by hand.
5. Advance turret slide so that toggle (24), Fig. 26 and Fig. 27, has risen to within ⅛" of the top of stud (25), as indicated in Fig. 27.
6. In this position clamp turret slide in its saddle with clamp handle (21), Fig. 25.
7. Now adjust nut (19), Fig. 25 and Fig. 26, so that it is possible to just barely rotate the turret when pulling steadily and firmly with one hand on the bar projecting from the turret hole (see item 3 above).
8. Lock this adjustment with cotter pin through castellated nut. See (19), Fig. 25 and 26.

When the turret is now advanced farther, the corner of tumbler will rise the additional ⅛" and clamp the turret the correct amount for satisfactory performance.

The toggle actuating stud (25), Fig. 26, is threaded into the top cap. It is locked with set screw (27), and lock nut (26). This setting should not be disturbed. It has been adjusted properly in assembling. *If it is necessary to remove the stud, measure its projection "A," (Fig. 27), from the cap and maintain this height when reassembling.*

BINDER RING BREAKAGE

It is apparent that the toggle lever is a very powerful clamp. Therefore it is possible to exert sufficient force through this toggle to actually break the binder ring, if instructions (above) for adjustment are not carried out. On the other hand, if binder ring is not clamped tightly enough, there is no strain on the toggle when the turret is working and vibration will cause the toggle to fall down to its loose position. This also can cause ring breakage because the toggle will then bump into stud (25), Fig. 26, on its return stroke instead of rocking over it.

If it is necessary to install a new ring, the Warner & Swasey service man should be called to assure correct fit of tapered surfaces.

CHIP PROTECTOR FOR HEXAGON TURRET

With brass and aluminum work, the turret is constantly bombarded by flying chips traveling at a high rate of speed. These get into the smallest crevice, clogging the mechanism. Only a dismantling operation and a thorough cleaning will allow the turret to function properly again.

A chip protector, (Fig. 28), can be furnished which is easily attached to any existing machine that has a circumference binder ring. When ordering, give serial number of machine. Installation instructions will be included.

> CAUTION—*Do not clean a turret lathe with an air nozzle.* The driving force of the air blast will cause the chips to reach the most remote corners, entering through minute clearance spaces and impairing the efficiency of the unit. Use a handbrush for better results.

THE COOLANT SYSTEM

The coolant pump is self-priming. If machine is run without coolant for any length of time, pump should be disconnected. This is accomplished on all geared head machines by disconnecting coupling.

The coolant strainer in the suction line should be removed occasionally and cleaned thoroughly. If the coolant ceases to flow freely, the cause is generally a clogged strainer.

The coolant reservoir is in the foot end leg on the No. 2 All Geared Head Turret Lathe and in the head end leg on No. 1 and No. 2 Electric Turret Lathes. This reservoir should be drained and cleaned at least twice a year. On precision bar work using roller rest turners, where high quality finish is demanded, it is advisable to clean the reservoir every month.

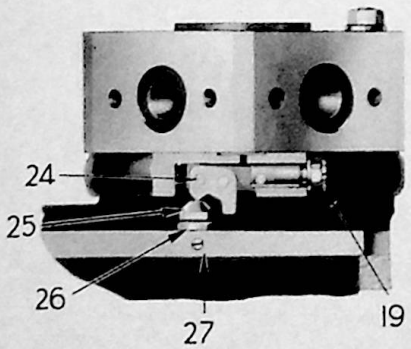


FIG. 26 *Turret Binder Mechanism.*

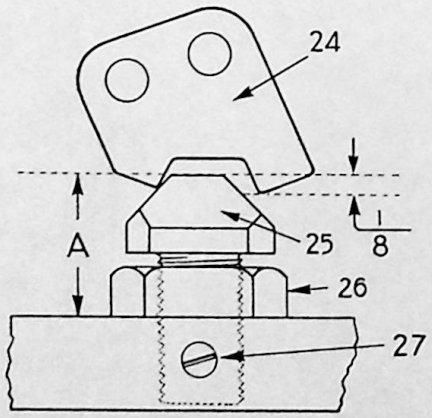


FIG. 27 *Proper Toggle Stud Adjustment.*

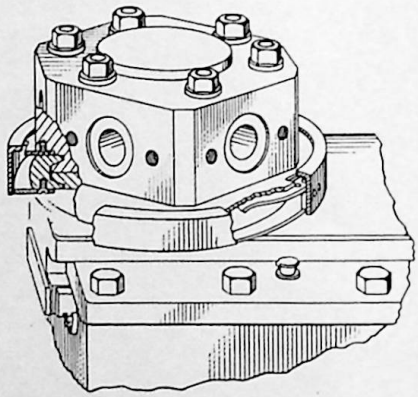


FIG. 28 *Hex Turret Chip Protector (for Brass and Aluminum Work).*

THE FEED TRAIN

No. 2 TURRET LATHES

The feed train on No. 2 Electric and All Geared Head machines consists of: (see Fig. 11).

1. The head end gear box (A).
2. The feed shaft (B).
3. The hexagon turret apron (C).

HEAD END GEAR BOX

Fig. 29

This unit transfers power from the spindle through the feed shaft to the hexagon turret longitudinal feed. Pulley (2), is driven by an endless vee belt from the spindle. Pinion (3), is keyed to pulley (2), and drives gear (1), which is connected through shaft and coupling to the feed shaft (6).

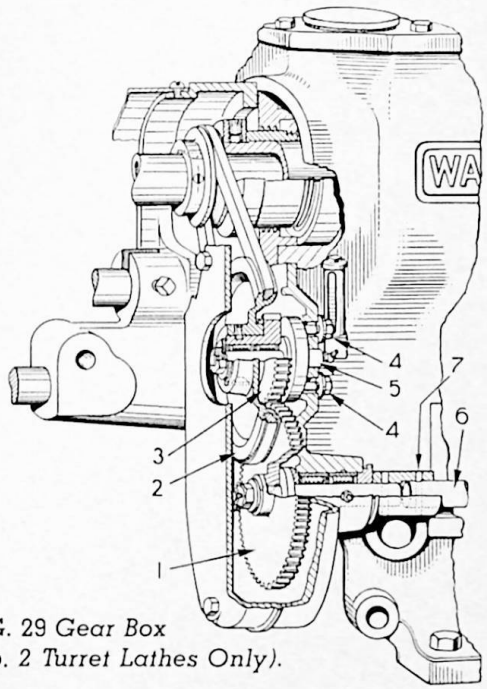


FIG. 29 *Gear Box (No. 2 Turret Lathes Only).*

Roller bearings are used throughout. The only adjustment necessary is an occasional tightening of the vee belt to compensate for wear. This is accomplished by loosening the two cap screws (4), and sliding entire shaft assembly toward the front of the machine. Screws (4), and shaft (5), are in elongated slots, curved so that pinion (3), and gear (1), are always in proper mesh.

HEXAGON TURRET APRON

Fig. 31 and 32

Power is transmitted through the feed shaft (1), Fig. 31 to the gear shaft (2), Fig. 31. The final reduction is through a worm on shaft (3), Fig. 31 to the worm gear on friction clutch (4), Fig. 31 mounted directly on the turnstile shaft. A pinion on the turnstile shaft engages with the rack (5), Fig. 31 to give longitudinal motion to the turret slide.

The friction clutch (4), Fig. 31 is engaged by cam action when handle (6), Fig. 32 is raised. Trip pin (7), Fig. 32 falls into bushing (8), Fig. 32 to hold the feed clutch in engagement for power feed. (See Fig. 31 also.) Inside of this bushing is the feed knockout rod. (9), Fig. 32.

When the turret stop screws (10), Fig. 22, strikes stop (9), Fig. 22 the latter goes forward and imparts this motion also to stop rod (28), Fig. 22. See also (10), Fig. 32. This stop rod pushes out the feed knockout rod (9), Fig. 32, which disengages the friction clutch handle and friction clutch.

TO ADJUST THE FEED KNOCKOFF BUSHING

1. Loosen set screw (4). (see Fig. 30).
2. Advance turret slide toward spindle by rotating the turnstile by hand and bring it to a solid stop. This will push feed knockout rod (9) to its extreme "out" position.
3. Adjust bushing (8) until rod (9) protrudes approximately 1/64" as shown in Fig. 30.
4. Pull turret slide back a small amount, engage power feed and allow it to trip off.
5. It should now be possible to advance the slide 1/64" more by hand. If this amount is more or less than the above, adjust bushing (8) until corrected, being mindful of the caution note below.

CAUTION—Extreme care must be used not to engage power feed until steps 2 and 3 have been carried out, for if the rod (9) does not project, it cannot knock off the feed and the power feed will pull up to a dead stop with its full feeding pressure.

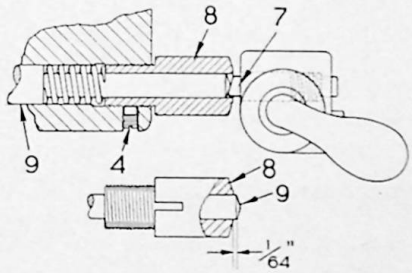


FIG. 30 *Power Feed Knock-off Adjustment.*

TO ADJUST THE FEED CLUTCH

1. Loosen set screw (11). (see Fig. 31).
2. Adjust clutch with threaded plug (12). Turning this nut clockwise tightens the clutch.
3. Lock collar by tightening set screw (11).

APRON REPAIRS

The gear and worm shaft of this apron (2) and (3), Fig. 31 and Fig. 32, as well as the feed shaft, (1), run in anti-friction bearings. The right hand end of the worm shaft (3), has a ball bearing to take the thrust load of the worm. All other bearings are the straight roller type.

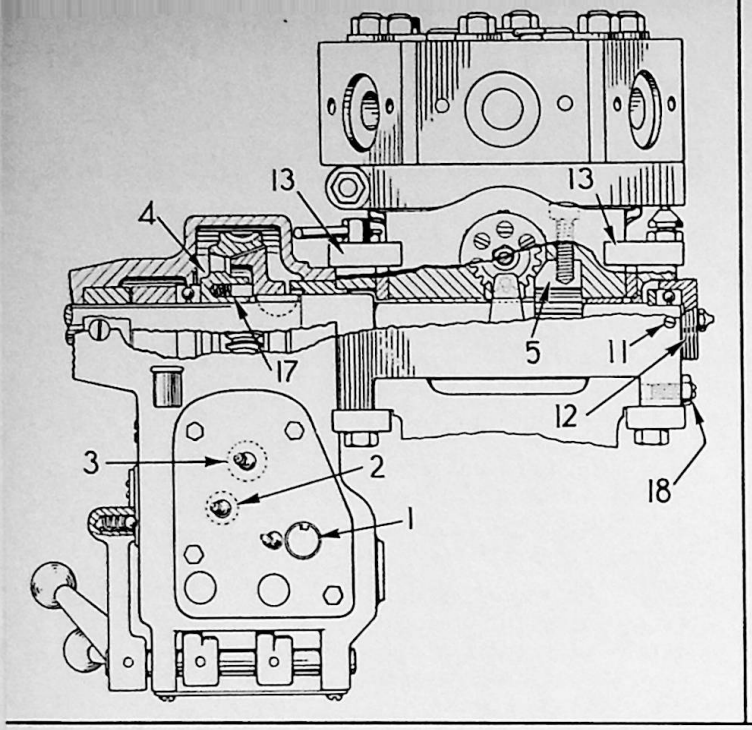


FIG. 31 *End View of Saddle and Apron Unit.*

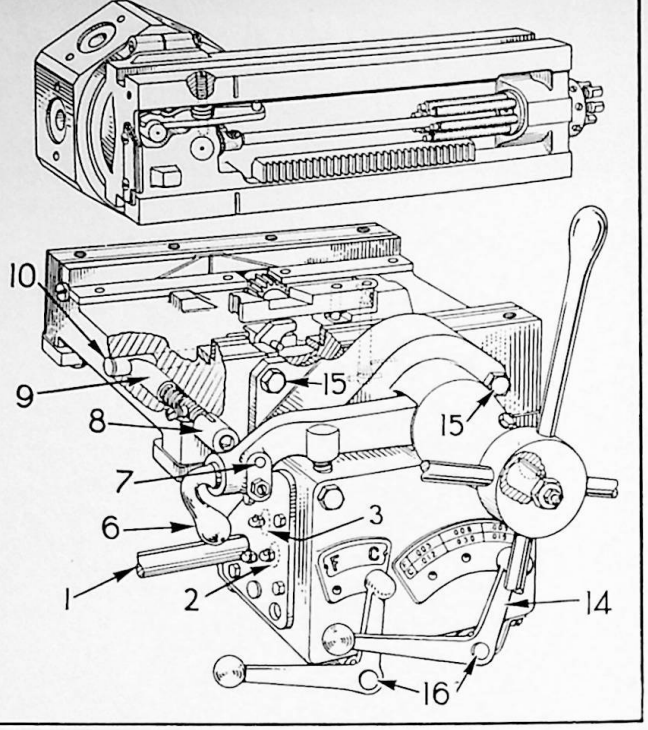


FIG. 32 *Hexagon Turret, Slide, Saddle and Apron.*

Properly greased, these bearings should last indefinitely (see chapter on "Lubrication," Page 4). Should it prove necessary, however, the roller bearings can be easily replaced by simply removing the apron end plates and withdrawing the bearings gently with a piece of bent wire.

It should not be necessary to remove the apron from the saddle to accomplish this.

To replace the left hand feed shaft bearing, it will, of course, be necessary to disconnect the feed shaft from the coupling at the head end gear box in order to slip the bearing over the end of the shaft.

On removing the thrust bearing at the right hand end of worm shaft (3), Fig. 31, be sure to first remove the split collar at the extreme right end of the shaft.

To reach the friction clutch (4), Fig. 31, all shafts including the turnstile shaft must be removed.

TO REMOVE THE HEXAGON TURRET APRON

1. Remove top saddle caps (13), Fig. 31.
2. Lay board across ways between saddle and carriage.
3. Tip turret slide up on its end and let it rest on the board.
4. Set triple shift feed lever (14) to position shown in Fig. 32. Rotate the feed shaft to bring keyway to bottom.
5. Remove feed shaft coupling pin (7), Fig. 29, at head end gear box and withdraw feed shaft entirely from the apron.
6. Support the apron in the pan with wooden blocks and wedges.
7. Remove four bolts (15), Fig. 32.
8. Apron with turnstile shaft can now be withdrawn.

TO TAKE APART AND ASSEMBLE THE APRON

1. Remove apron from saddle (see instructions in preceding section).
2. Support apron upside down and remove two end plates and bottom plate.
3. Remove shift lever shafts (16), Fig. 32.
4. Remove screws which locate the gears on gear shaft (2), Fig. 31 and Fig. 32. Remove bearings and gears by sliding shaft to the right through the gears.
5. Remove worm shaft (3), Fig. 31, by following the procedure of paragraph 4, above.
6. Remove turnstile and slide turnstile shaft out of the back of apron.

Feed clutch (4), Fig. 31, can now be removed. When re-assembling it, make sure that the four plungers (17), Fig. 31, and the small springs behind them are in their proper places. These should move quite freely and should be cleaned from all gum when the clutch is apart.

When mounting the hexagon turret apron on the machine, leave bottom plate off until assembly is complete. This is necessary in order to make sure that feed shaft is properly entered into the bearings and triple gear cluster. Insert feed shaft with keyway facing down. Make sure gear cluster is assembled with smallest gear to the left. Be careful when threading the feed shaft through apron bearings not to shear the small pins which fasten the keys to the inner bearing races.

NOTE—When assembling the apron give all parts, including the gear teeth, a generous coating of the proper grade of grease. (See chapter on "Lubrication," Page 5).

COLLET CHUCK AND BAR FEED

Hand operated collet chucks for No. 1 and No. 2 Electric and No. 2 All Geared Head Turret Lathes operate on similar principles. Roller fingers mounted in a holder (14), Fig. 33, at the back of the spindle are spread by wedge (13). This wedge may be operated by hand lever (6), or automatically by power (see Power Automatic Chucks, Page 23). These roller fingers act as powerful levers on plunger (17), to force split collet to grip the work. The finger holder is threaded to end of spindle to provide adjustment of the collet grip.

Bar feed mechanisms for these machines fall into three general classes—ratchet bar feeds, finger bar feeds and power automatic finger bar feeds. Finger type bar feeds (often combined with ratchet type) are used for feeding small bars and for high speed work.

When loading new bars, release clamp (20) and swing bar tube (3) forward on front support. This enables operator to load stock from operating position.

Filler tubes (2), Fig. 33 and 34, reduce inside diameter of feed tube, or pipe. They prevent whipping action of small diameter bars at high speeds and are available in three different bore sizes to cover the capacity range of each machine.

INSTALLING BAR FEEDS

When installing a bar feed on a new machine be sure the bar support pipe (3), Fig. 33 and 34, is in line with spindle. Check this with a reliable level to compare with bed of machine.

For rough leveling, shims may be used under feet of stand pipe. For more accurate leveling, adjusting screws (1), Fig. 33 and 34, are provided. Sight through spindle to establish lateral alignment.

HAND OPERATED FINGER BAR FEED MECHANISM

No. 1 Electric Turret Lathe, Fig. 33

A spring type feed finger (4) attached to feed tube (5), grips the stock inside the spindle close to the collet chuck. Collet chuck lever (7) opens and closes the chuck and actuates the feed tube (5) at the rear of the spindle to feed bar stock forward.

After collet chuck lever (7) has fed stock forward and closed the collet, the finger bar feed lever (6) returns feed tube (5) to starting position. Collar (11) on bar (10) limits the bar feed stroke to desired length. Collar (12) must be set to provide the necessary delay required to open collet before feed tube (5) can be moved forward by collet chuck lever (7). *Both collars must be adjusted for each different length of stock.*

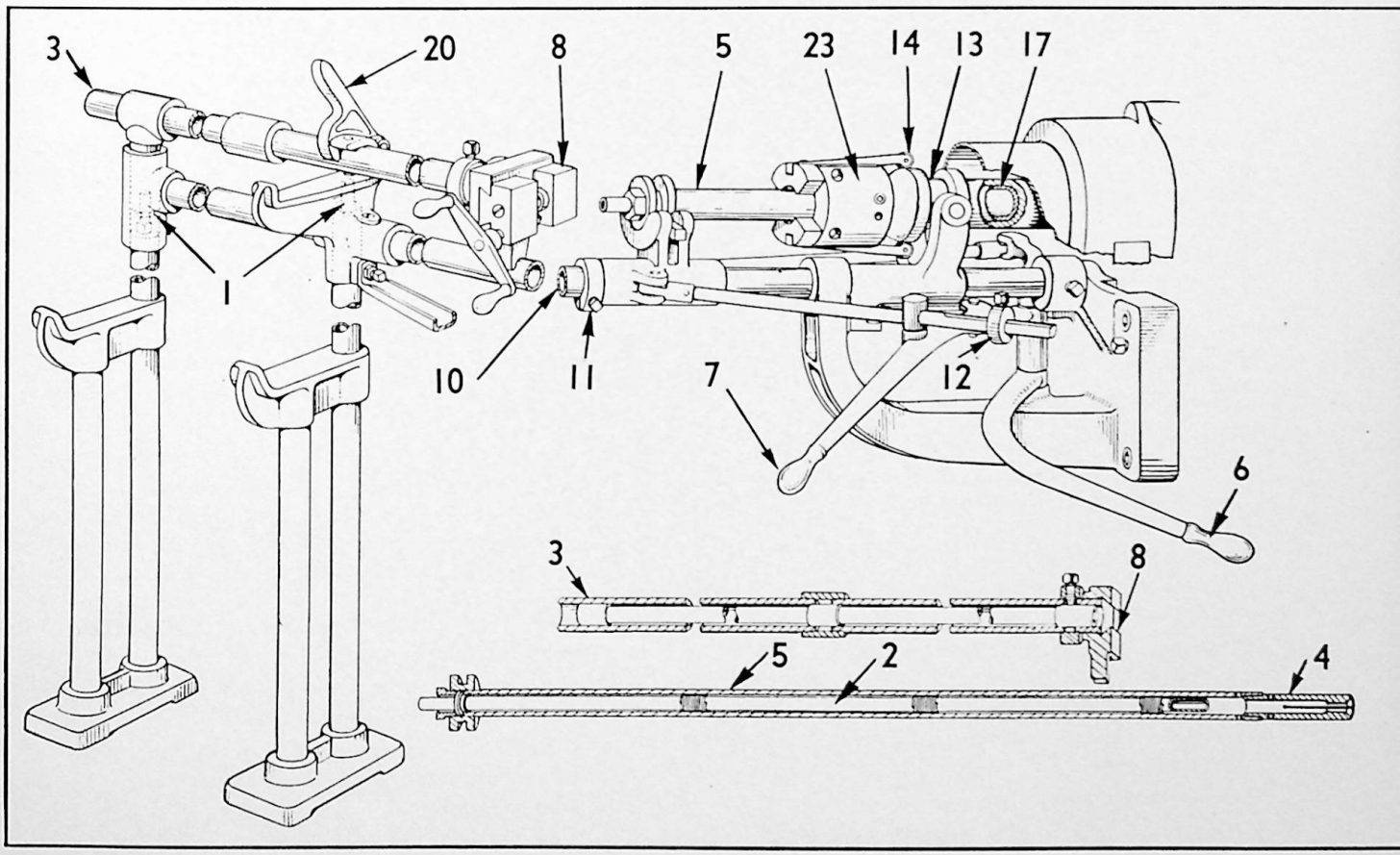


FIG. 33 *Finger Bar Feed (No. 1 Electric Turret Lathe).*

Vise (8) is used only when a new piece of bar stock is being inserted. Its purpose is to hold the bar while feed finger (4) is being stripped over the end of the new stock. Remove burrs from ends of bars and champer slightly. During actual feeding operations the jaws of vise (8) are released and left open.

COMBINED FINGER & RATCHET BAR FEED MECHANISM

No. 2 Turret Lathes, Fig. 34

When used as a *finger bar feed* unit, revolving chuck (9) is clamped at position "A" on bar (10). This chuck holds new bar stock stationary while feed finger (4) is stripped back over the bar. During feeding operation however, chuck (9) remains clamped at position "A" but jaws are left open.

When this unit is used as a *ratchet bar feed*, revolving chuck (9) clamps bar stock and moves with ratchet (18) during feeding motion. (See discussion of ratchet bar feed.) Bar stock revolves with chuck (9) during operation of machine.

Function of this unit as a *finger bar feed* is similar to No. 1 Electric Finger Bar Feed previously described, except that levers operate in a vertical instead of a horizontal plane. Collet chuck lever (7) opens and closes collet and feeds stock forward to desired length as regulated by adjustable stop collar (11). Collar (12) provides the necessary delay required to open the collet before feed tube (5) can be moved forward by collet chuck lever (7). Finger bar feed lever (6) returns feed tube (5) to starting position, stripping feed finger (4) back over bar stock.

Position of stop collar (21) is fixed by a dog-point scew in bar (10) to prevent finger bar feed yoke (22) from hitting finger holder (23).

HAND OPERATED RATCHET BAR FEED MECHANISM

No. 2 Turret Lathes, Fig. 34

The ratchet bar feed mechanism is operated entirely by lever (7). Yoke (13), opens the collet and pulls ratchet (18), and bar feed head (15) forward. Returning the lever (7), to its starting position closes the collet and pushes the ratchet back for the next feeding.

In order to use this ratchet bar feed on machines equipped with combination ratchet and finger bar feed, it is necessary to remove the feed tube. To do this, remove yoke pivot pin (16), and lower the yoke enough to withdraw feed tube and its parts from the spindle. Replace yoke and yoke pivot pin and clamp the adjustable feed collar (12), to the extreme right on the feeding rod. Adjustable stop collar (11), should be moved forward and clamped in order to lock the finger bar feed mechanism.

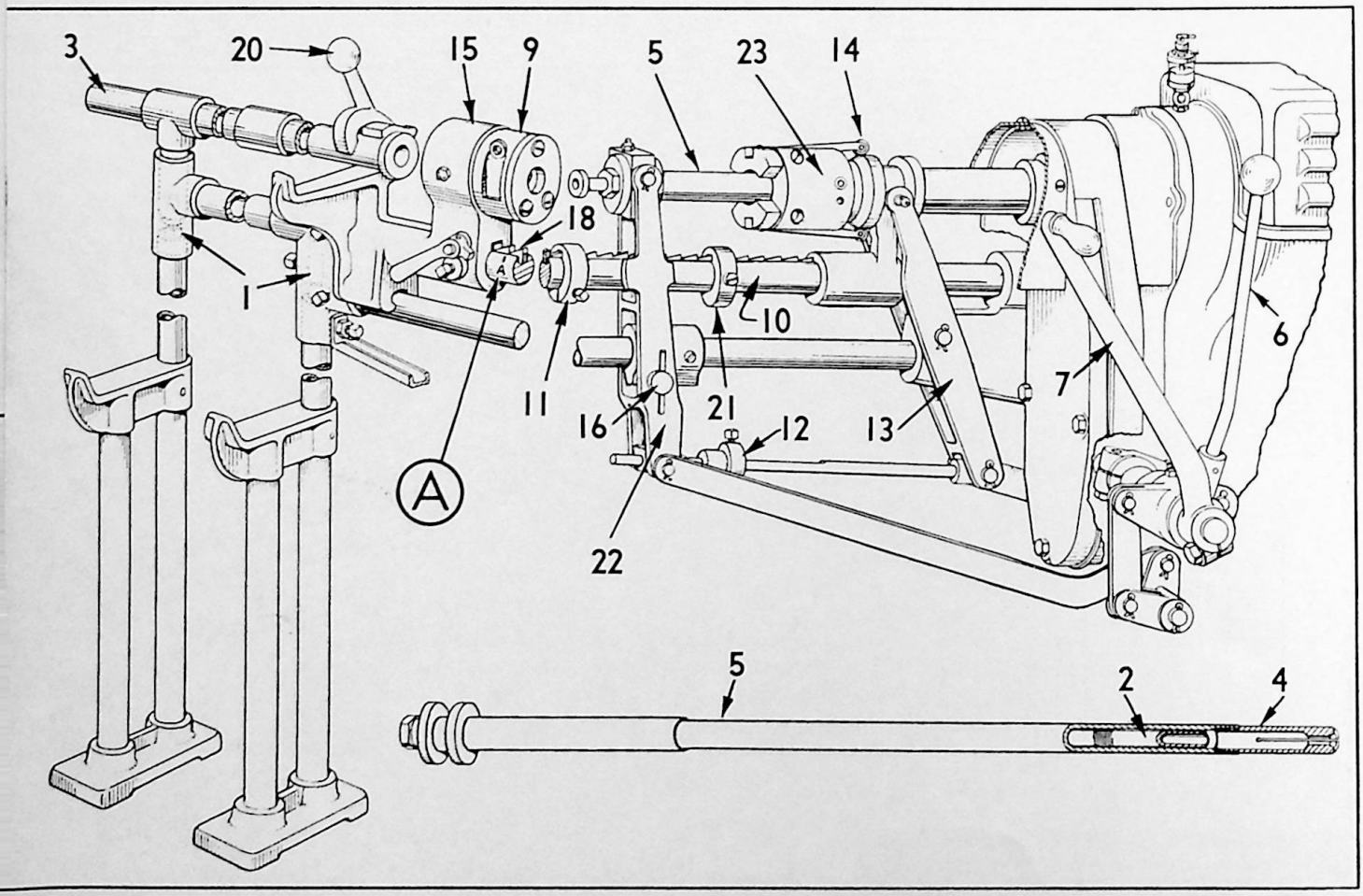


FIG. 34 *Combination Ratchet and Finger Bar Feed (No. 2 Turret Lathes).*

POWER AUTOMATIC CHUCK AND BAR FEED

Figs. 35 and 36

This independent motor-driven unit can be substituted for the regular hand-operated unit for No. 1 and No. 2 Electrics and No. 2 All Geared Head Turret Lathes.

The principles of bar chuck and bar feed, the sequence of operation for opening and closing the collet, feeding the stock and returning feed finger to the starting position remain in the same simple form as for hand operation.

Adjustment of collet gripping pressure is done, as it is with hand-operated units, by screwing or unscrewing finger holder at back of spindle. Adjustment of the feeding stroke is provided by a slide block (1), and graduated feeding arm (2).

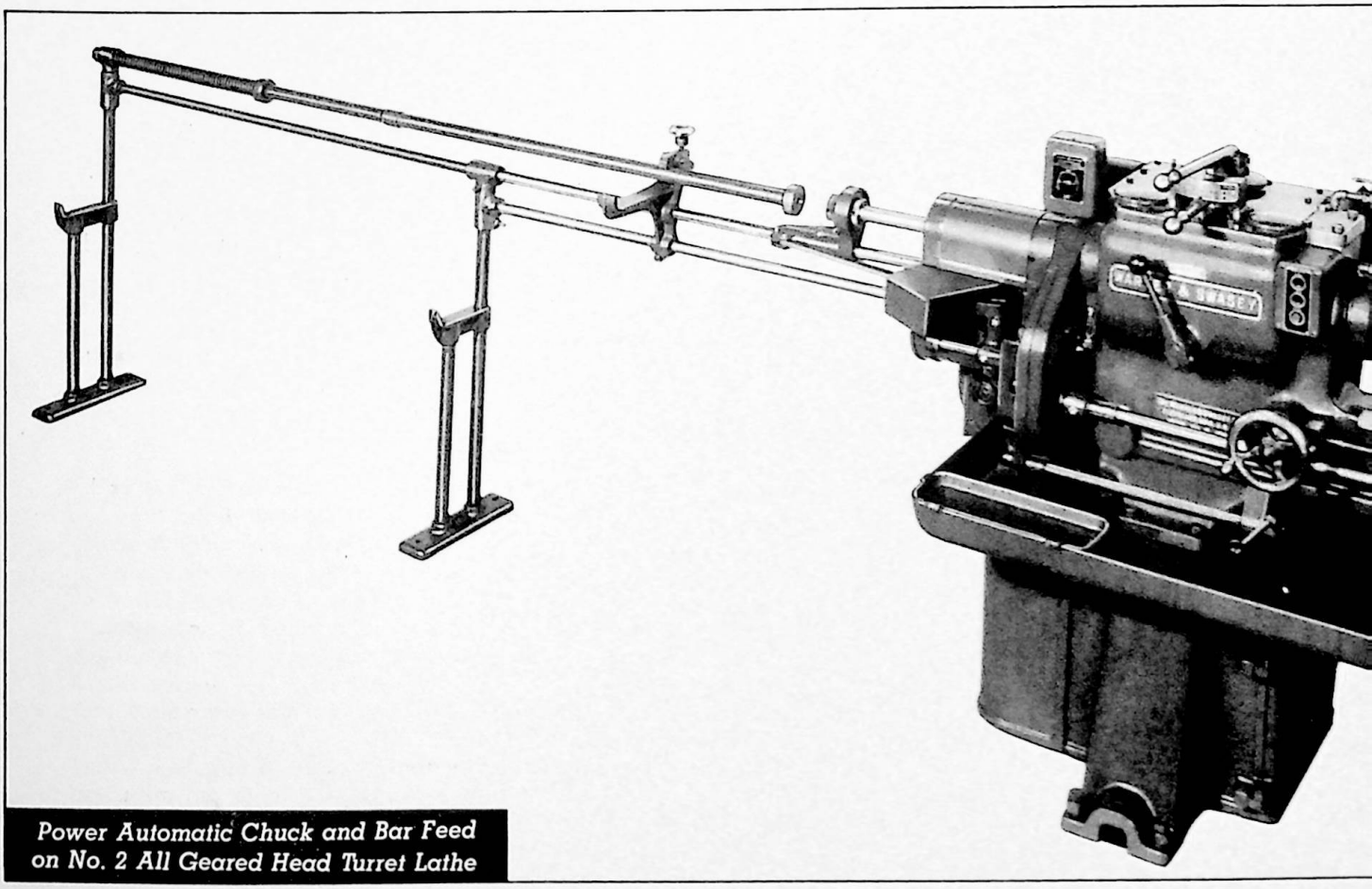
The attachment operates either for first operation work of producing pieces from bar stock or for second operation work where no feeding motion is required. Changeover is accomplished by simply shifting link (3), to zero position on arm (2)—and moving operation selector lever (8) to desired position. (See Fig. 36).

Operation Selector lever (8), Fig. 35 controls the cam action in half cycles or full cycles. With lever (8), thrown to the left, in half cycle position, the cam will open the collet when operation lever (5) is tripped. The collet will stay open until operation lever (5), is tripped a second time.

When lever (8), is thrown to the right, into full cycle position, the cam will open the collet, feed the bar, and close the collet, with one trip of operation lever (5).

TO SET UP FOR FIRST OPERATION WORK

1. Apply proper size of collet and feed finger. Use a filler tube in the feed tube if stock is very small.
2. Adjust collet grip by means of finger holder using a sample of bar stock in the collet. *The adjustment of the finger holder for tightness of collet should be tested by hand before applying the power*. A bar for operating the collet by hand is furnished. It fits into a socket (4), in the top of cam lever (Figs. 35 and 36).
3. Set required length of feed by clamping the slide block (1), to position along the graduated feed arm (2). A stock stop may or may not be required according to the conditions of operations.



Power Automatic Chuck and Bar Feed on No. 2 All Geared Head Turret Lathe

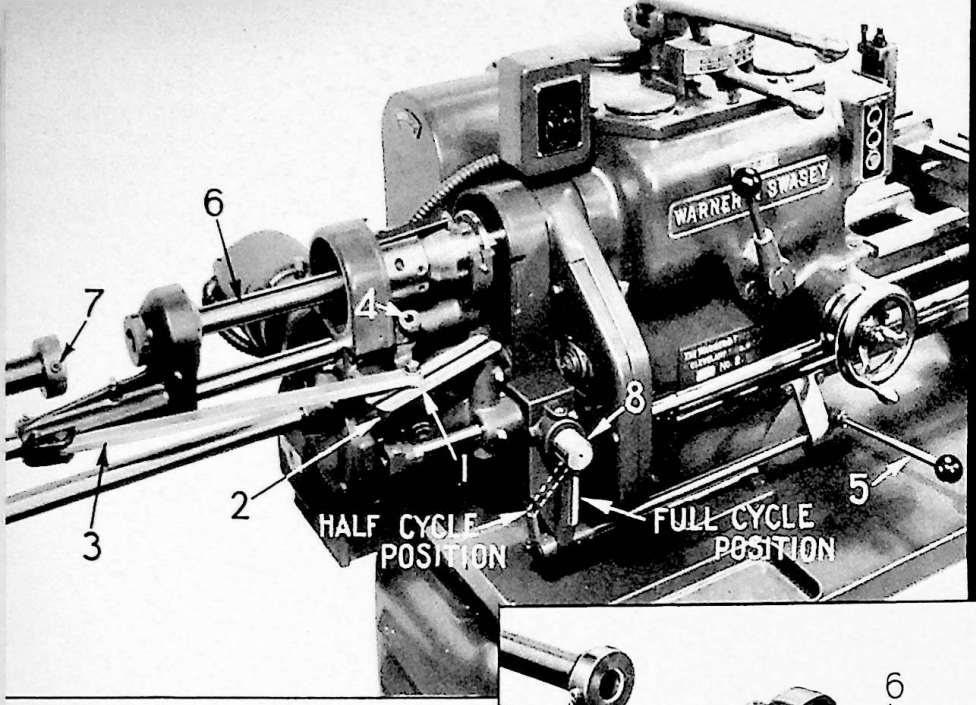
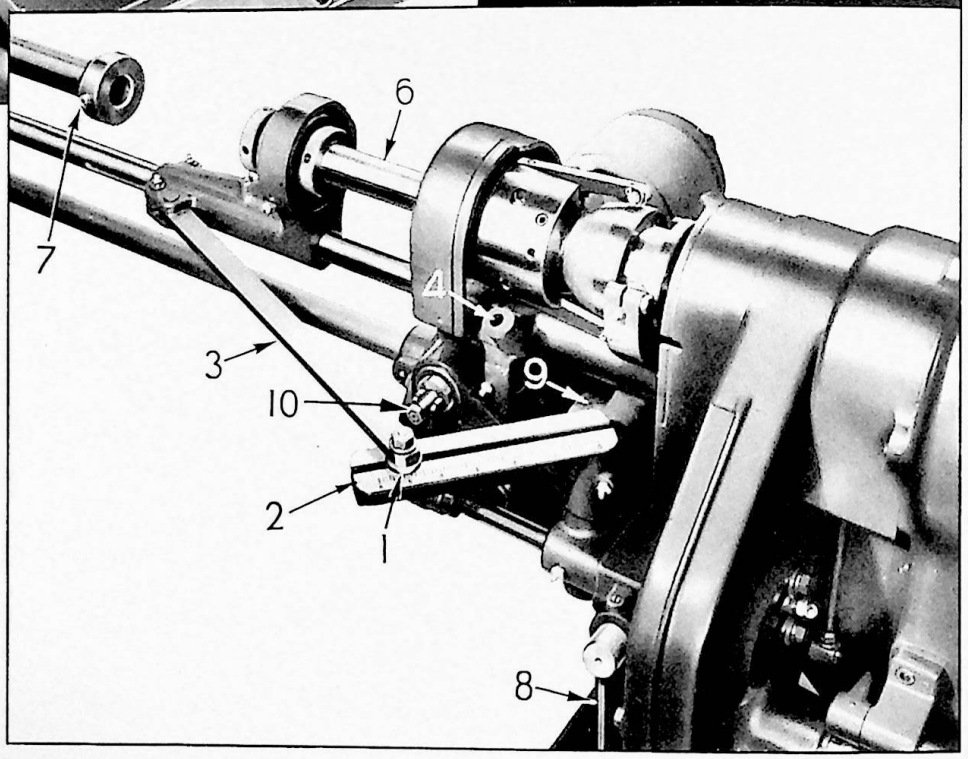


FIG. 35 *Power Automatic Chuck and Bar Feed.*

FIG. 36 *Graduated Feeding Arm Power Automatic Chuck and Bar Feed.*



4. Start motor and test operation by means of operating lever (5). Throw operation selector (8), toward the left (half cycle position) and trip operating lever (5), to open the collet. Feed tube (6), will then be in its forward position.

5. Load a bar of stock in the bar feed (see that end of bar is free from burrs and is round), push bar into feed tube (6) until it strikes the feed finger. Clamp the bar in the bar support pipe with set screw (7), and trip the operating lever (5). This will force the feed finger over the bar of stock.

6. Release screw (7), on the bar support pipe. Trip operating lever (5), and hold until stock is fed through collet.

7. With cutoff cutter set, trim end of bar, trip operating lever (5), and check length of feeding stroke by measurement from end of bar. If the length is not correct, push the stock back through the feed finger, reset the length of feed (see paragraph 3 above) and check again. Return lever (8), to full cycle position (toward the right).

SECOND OPERATION WORK

When using the power operation of this mechanism for second operation chucking, set length of feed stroke to zero on graduated feeding arm (2), throw operation selector lever (8), to second operation position (toward the left). Cam (9), will now act on half cycles. When the operating lever (5), is tripped, the collet is opened and stays open until the lever is again tripped to close the collet and grip the work.

NOTE—It is possible to set the collet closure adjustment so tight that the motor will stall in the cycle. A safety switch is supplied as part of the motor equipment to prevent damage. When the safety switch operates, do not reset and try to use the power until the strain has been released from the fingers in the finger holder. Turn the worm shaft (10), to back off the pressure of the feed fingers by applying a wrench to the hex end. Release finger pressure by adjusting finger holder slightly back. After correct adjustment has been made, *test by hand*, then resume operation by power.

MACHINE TOOL STANDARD DATA SHEET

BUILDER'S NAME: THE WARNER & SWASEY CO.
CLEVELAND OHIO, U.S.A.

BUILDER'S SERIAL NUMBER: M-1270

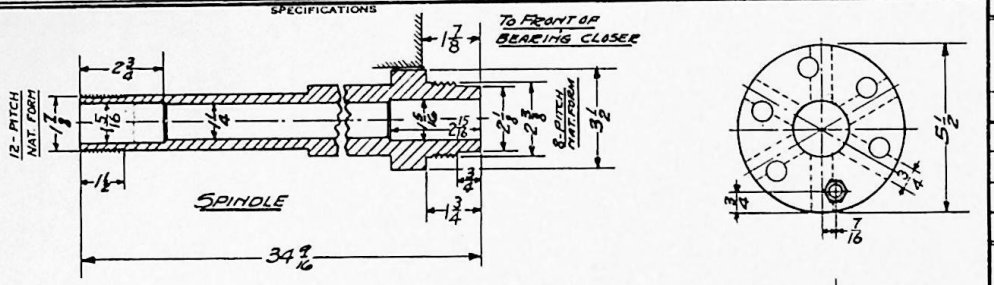
MACHINE DESCRIPTION: WARNER & SWASEY No. 1-ELECTRIC TURRET LATHE — START LOT-4

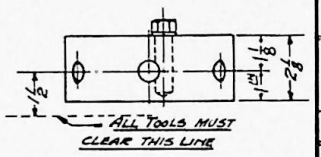
USER'S MACHINE NUMBER:

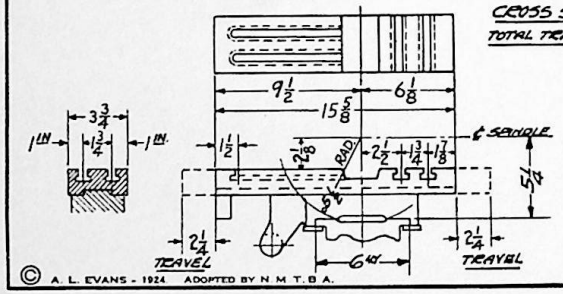
INSTALLATION

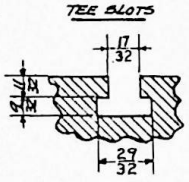
MOTOR	A.C.	D.C.
SER. NO.	SHOP NO.	
MAKE		
TYPE	FRAME	
H.P.	R.P.M.	
VOLTS	PH.	CY.
PULLEY		
GEAR		
CHAIN		
SHAFT	KEY	
SLIDE RAILS		
CONTROL EQUIP.		

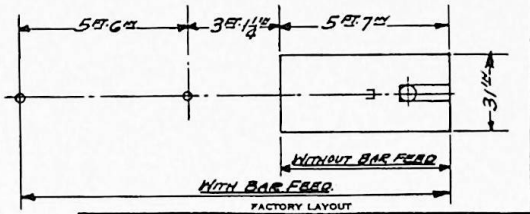
SPECIFICATIONS











SPEED AND FEED TABLE

SPINDLE SPEEDS - R.P.M. FOR 220/440 VOLTS - 3 PHASE - 60 CYCLE		H.P.	
IDLE	FULL LOAD		
600	550	1	
1200	1150	1.5	
1800	1720	2	
3600	3400	3	

SPINDLE SPEEDS - R.P.M. FOR 220/440 VOLTS - 3 PHASE - 50 CYCLE		H.P.	
IDLE	FULL LOAD		
500	455	1	
1000	955	1.5	
1500	1430	2	
3000	2830	3	

AUTOMATIC CHUCK CAPACITY

ROUND - 5/8 SQUARE - 7/16 HEXAGON - 1/2

HOLE IN AUTOMATIC CHUCK PLUNGER - 1 1/32

SWING

OVER BED - 11"

OVER CROSS SLIDE - 4 1/4

MAXIMUM LENGTH TURNED - 4"

BAR FEED

MAXIMUM SINGLE FEED STROKE - 4"

FLOOR PLAN 1/4 IN.--1FT. | HP. | WT.

DR. BY W.F.M. APPR. W.F.S. | DATE SEP. 25, 1930 | DWG. NO. C-68712

DATA SHEET

TWO SPEED RANGES
EITHER 600,900,1200,1800 R.P.M.
OR 600,1200,1800,3600 R.P.M.

SPEED AND FEED CHART

ELECTRIC TURRET LATHES

M-1360
M-1270

NO. 1 M-1270 — NO. 2 M-1360

THE WARNER & SWASEY CO. Cleveland, Ohio

R.P.M.	600	900	1200	1800	3600
DIAMETER	SURFACE SPEED IN F.P.M.				
1/16	10	15	20	29	59
1/8	20	29	39	59	118
3/16	29	44	59	88	177
1/4	39	59	79	118	236
5/16	49	74	98	147	294
3/8	59	88	118	177	353
7/16	69	103	137	206	412
1/2	79	118	157	236	471
9/16	88	133	177	265	530
5/8	98	147	196	294	589
11/16	108	162	216	324	648
3/4	118	177	236	354	706
13/16	128	192	255	383	765
7/8	137	206	275	412	824
15/16	147	221	294	442	883
1	157	236	314	471	942
1-1/4	196	295	393	589	1178
1-1/2	236	354	471	707	1413
1-3/4	275	413	550	825	1678
2	314	472	628	942	1884
2-1/2	393	590	785	1178	
3	471	708	942	1413	
3-1/2	550	826	1099	1649	
4	628	944	1256	1884	
4-1/2	707	1062	1413		
5	785	1180	1570		
5-1/2	864	1298			
6	942	1416			

No. 2 ELECTRIC FEEDS	TIME IN MINUTES FOR ONE INCH OF CUT				
.003	.56	.37	.28	.19	.09
.005	.33	.22	.17	.11	.06
.008	.21	.14	.10	.07	.03
.012	.14	.09	.07	.05	.02
.019	.09	.06	.04	.03	.01
.030	.06	.04	.03	.02	.009

No. 1 ELECTRIC HAND FEED ONLY

REPAIR PARTS SECTION

IMPORTANT

PROMPT SERVICE
on repair parts orders depends upon your furnishing us the following information:

★

1. Quantity Wanted

2. Number and Name of Parts as Listed

3. SERIAL NUMBER of the Machine for Which the Part is Needed

EXAMPLE FOR ORDERING PARTS BY MAIL

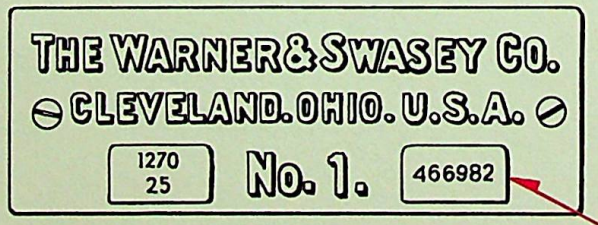
1 PIECE 10A-150 CLUTCH FORK
3 PIECES 10E-177 BEARINGS
FOR SERIAL NUMBER 466982

EXAMPLE FOR ORDERING BY TELEGRAPH

ONE PIECE TEN A ONE FIVE NAUGHT CLUTCH FORK STOP
THREE PIECES TEN E ONE SEVEN SEVEN BEARINGS FOR
SERIAL NUMBER FOUR SIX SIX NINE EIGHT TWO.

The **SERIAL NUMBER IS ABSOLUTELY NECESSARY** due to the numerous machine designs. The symbol letters and numbers shown in this book simply designate the location of the part on the machine. Parts **are not** carried in our stock under these numbers, therefore, the symbol letter and number alone is not sufficient, **we must also have the serial number of the machine.**

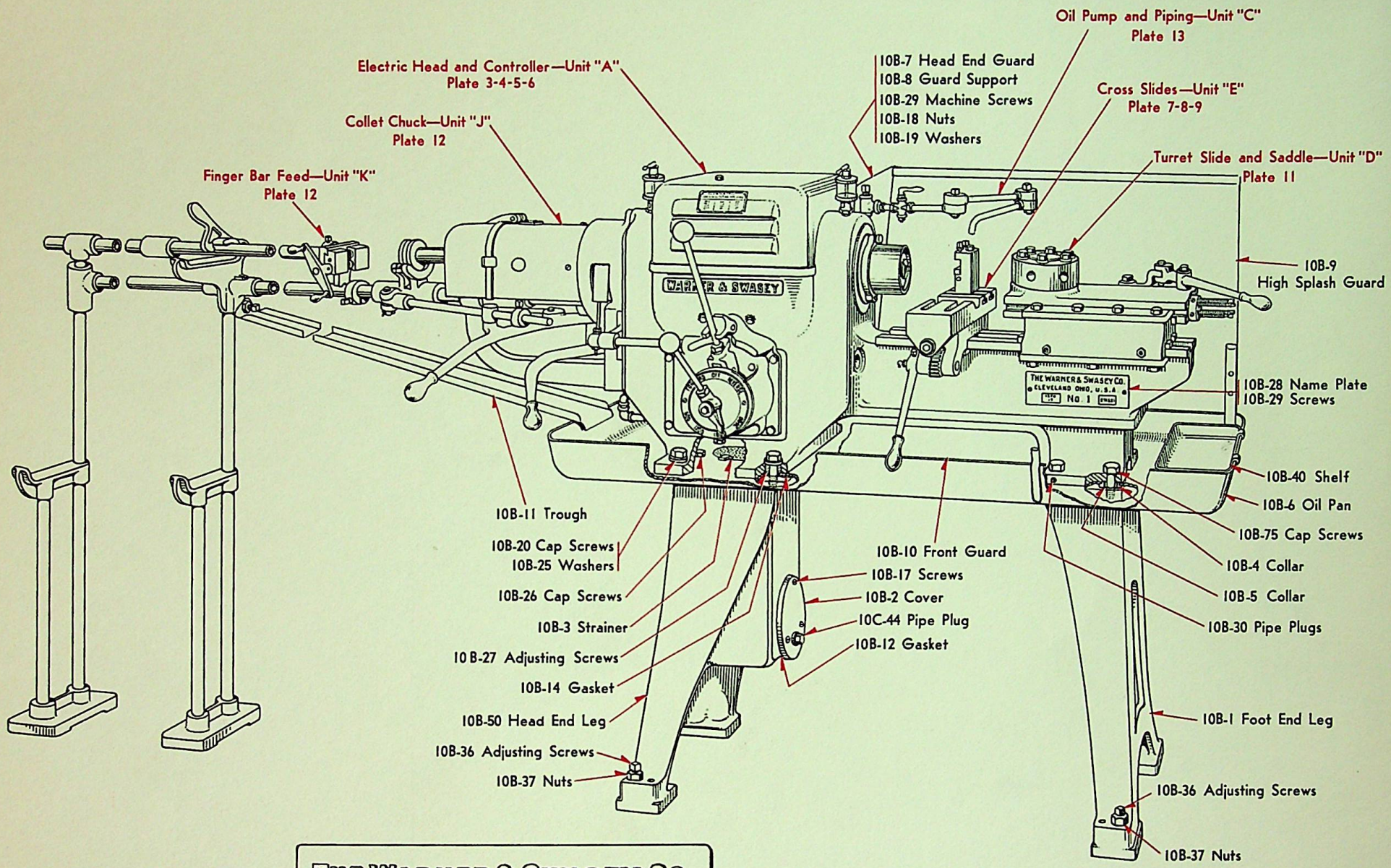
In order to avoid expensive delays and possibility of error please follow these instructions carefully.



When Ordering Parts

Be sure to give the serial number that is stamped on the name plate.

Plate 2
Bed, Pan and Legs—Unit "B"



THE WARNER & SWASEY CO.
CLEVELAND. OHIO. U.S.A.
1270
25
No. 1.
466982

When Ordering Parts

Be sure to give the serial number that is stamped on the name plate.

Plate 3
Head—Unit "A"

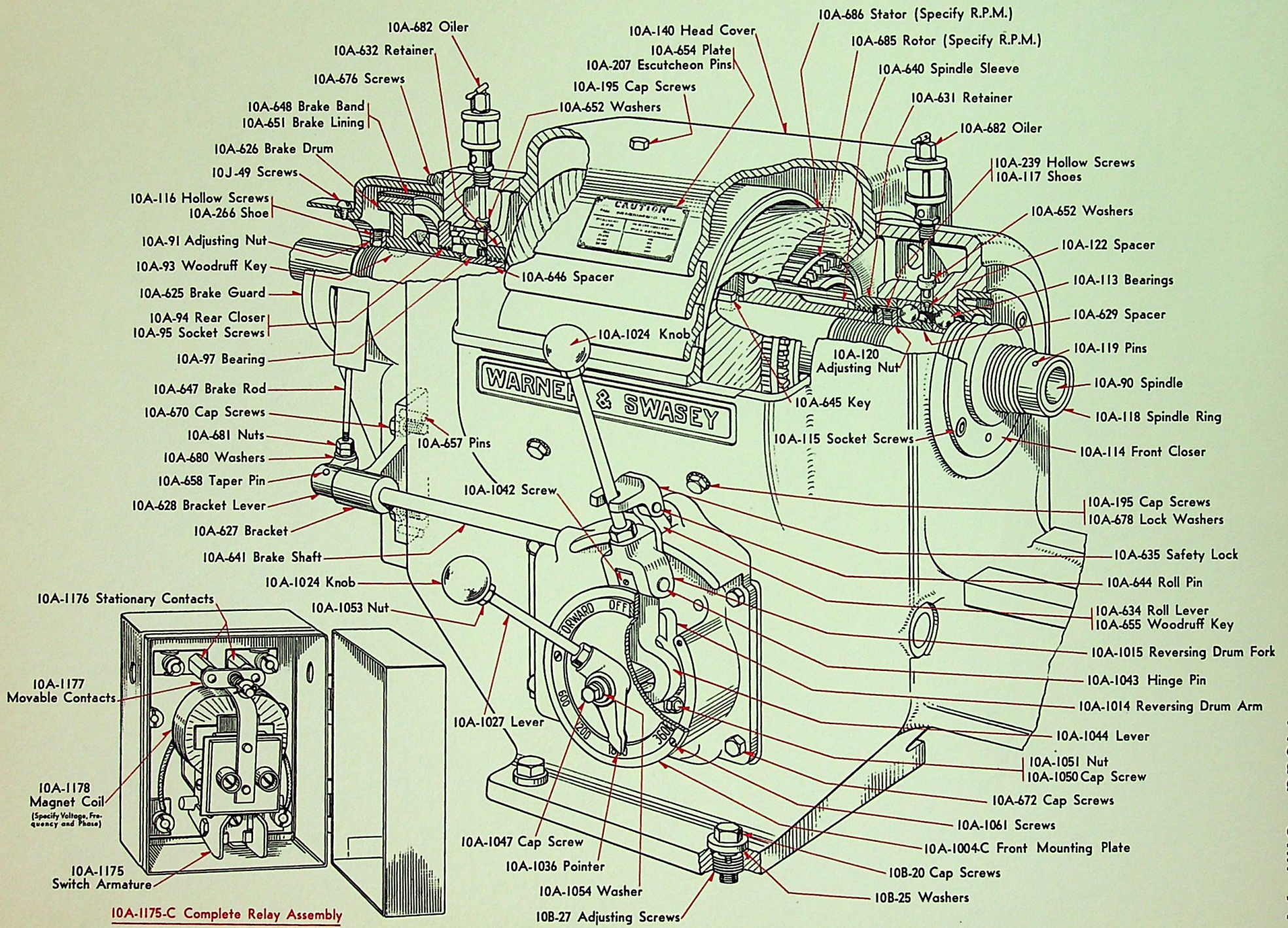
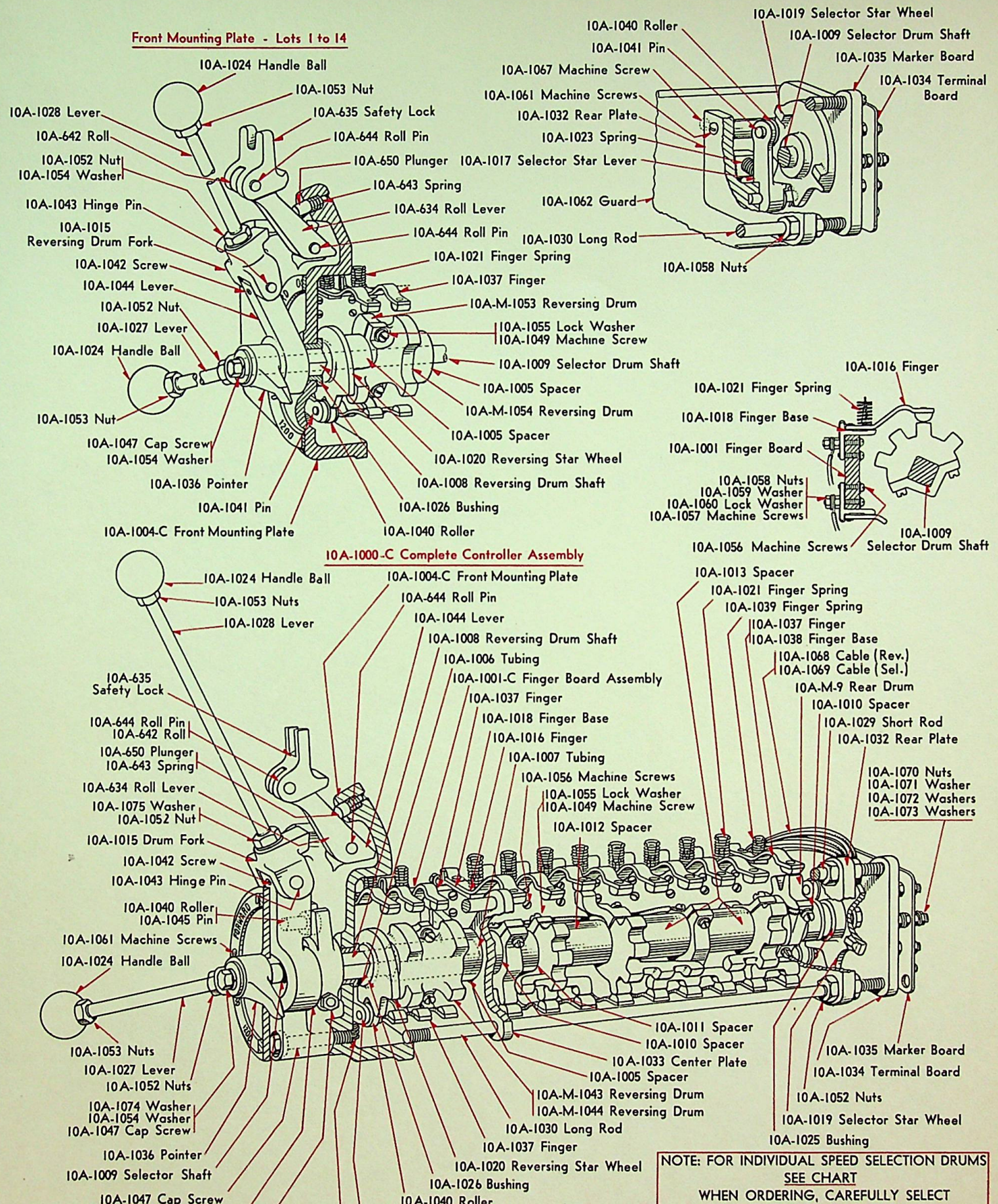


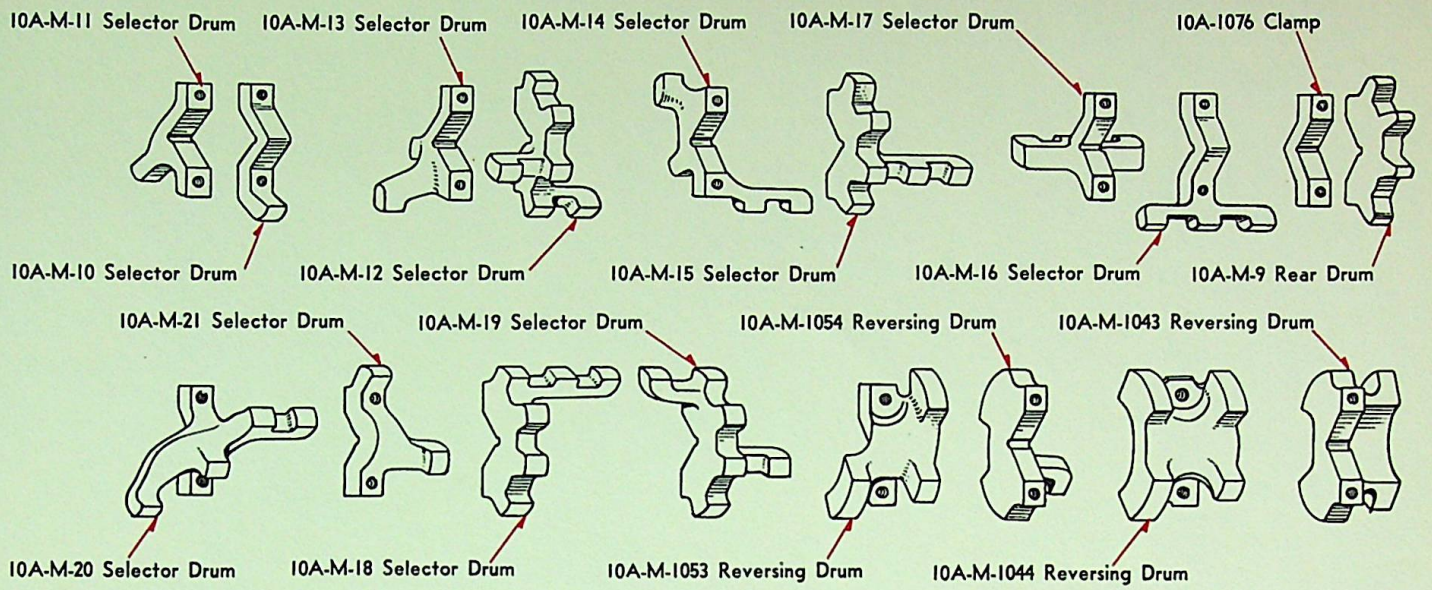
Plate 4
Head—Unit "A"



NOTE: FOR INDIVIDUAL SPEED SELECTION DRUMS SEE CHART
WHEN ORDERING, CAREFULLY SELECT THE DRUM SECTION YOU WISH TO REPLACE. GIVE DRUM SECTION NUMBER, QUANTITY AND SERIAL NUMBER OF YOUR MACHINE.

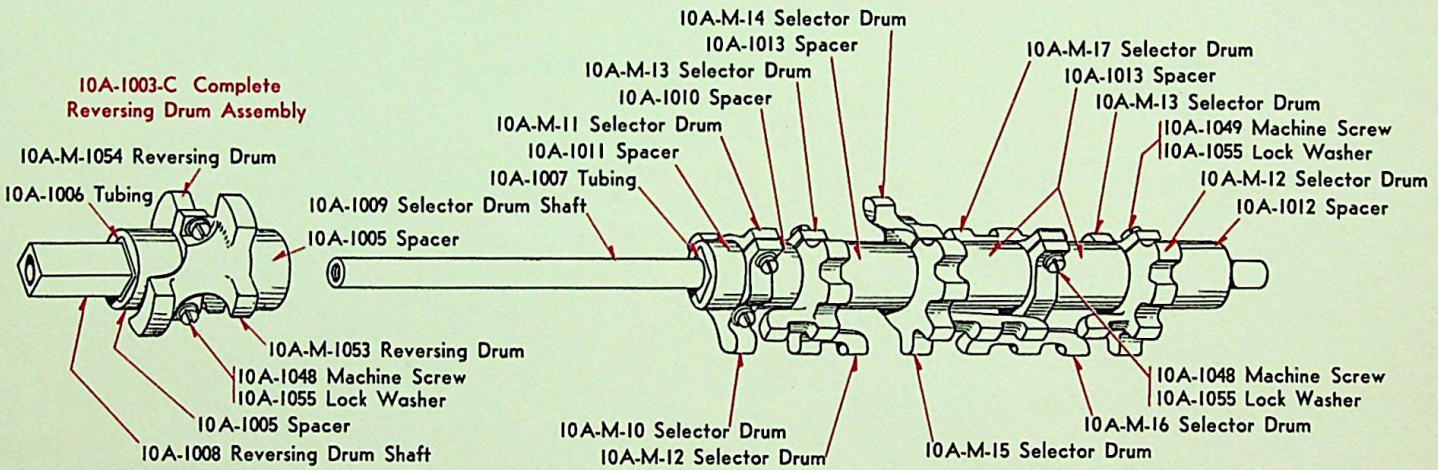
Head—Unit "A"

INDIVIDUAL SPEED SELECTION DRUMS CHART

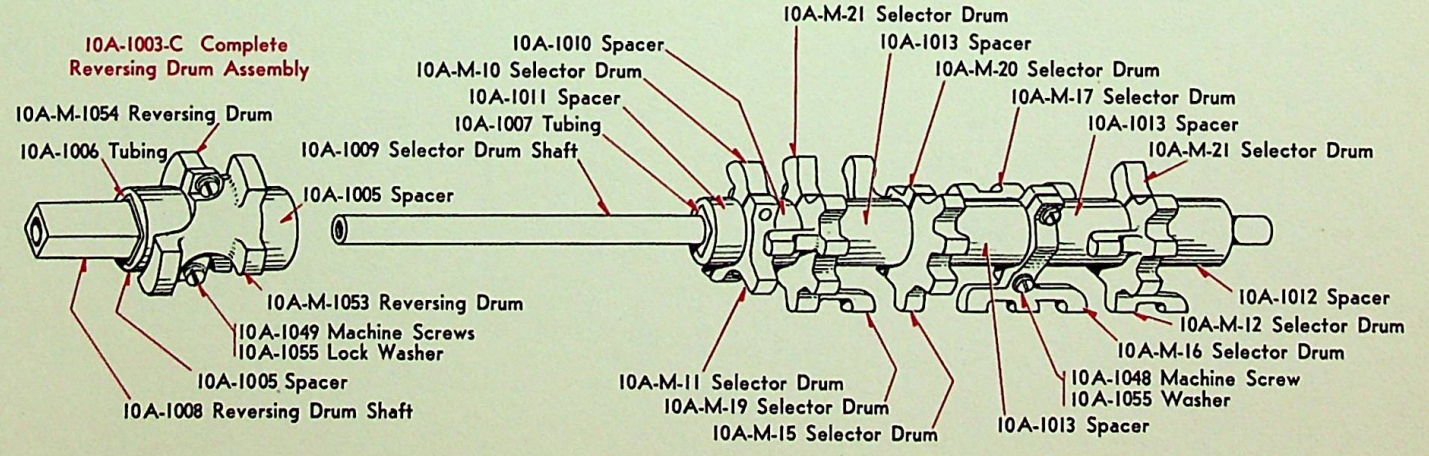


Before ordering parts read instructions on Plate 1

10A-1002-C Complete Selector Drum Assembly 600-1200-1800-3600 R.P.M.

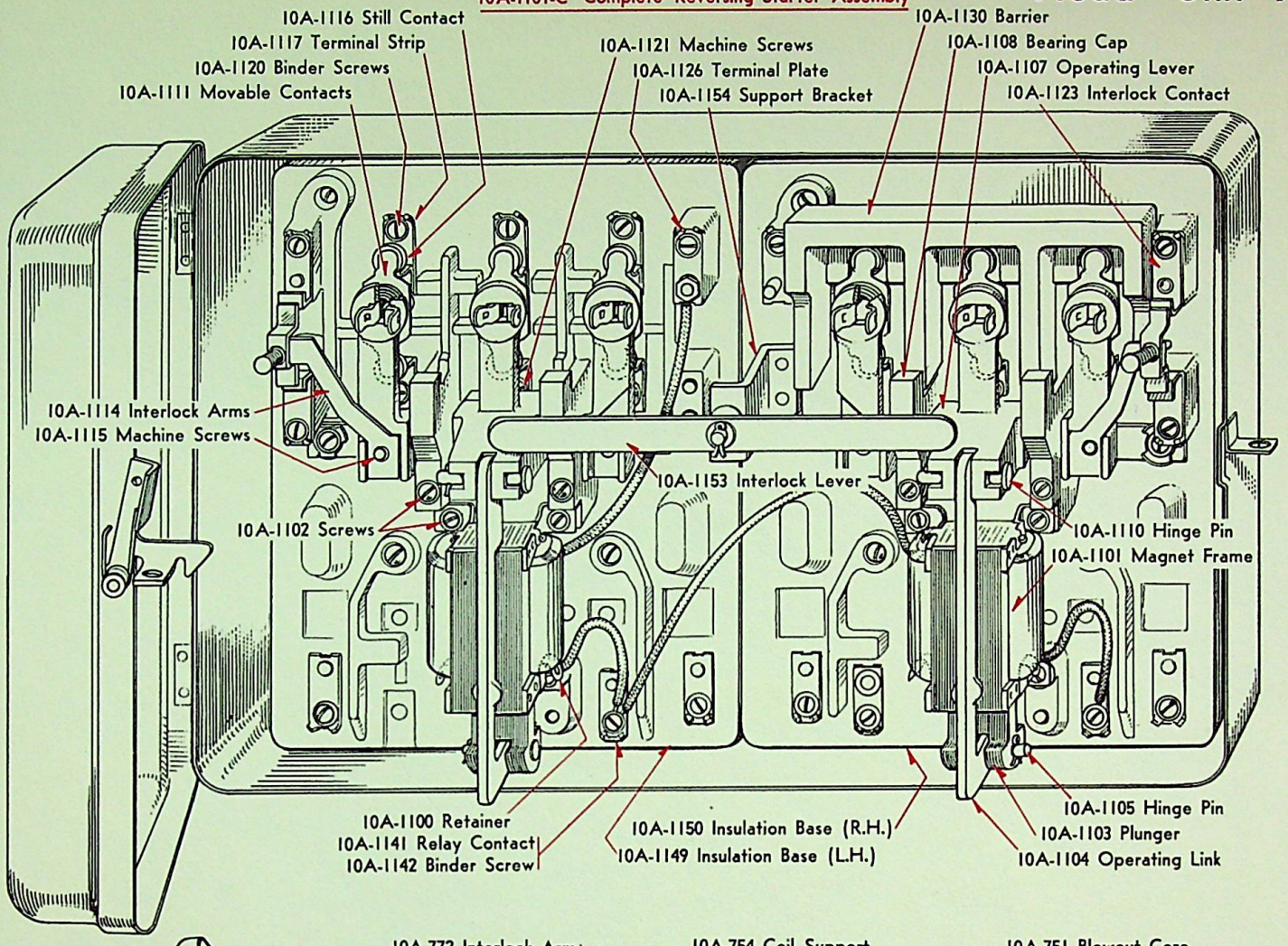


10A-1002-C Complete Selector Drum Assembly 600-900-1200-1800 R.P.M.



Before ordering parts read instructions on Plate 1

Plate 6
Head—Unit "A"



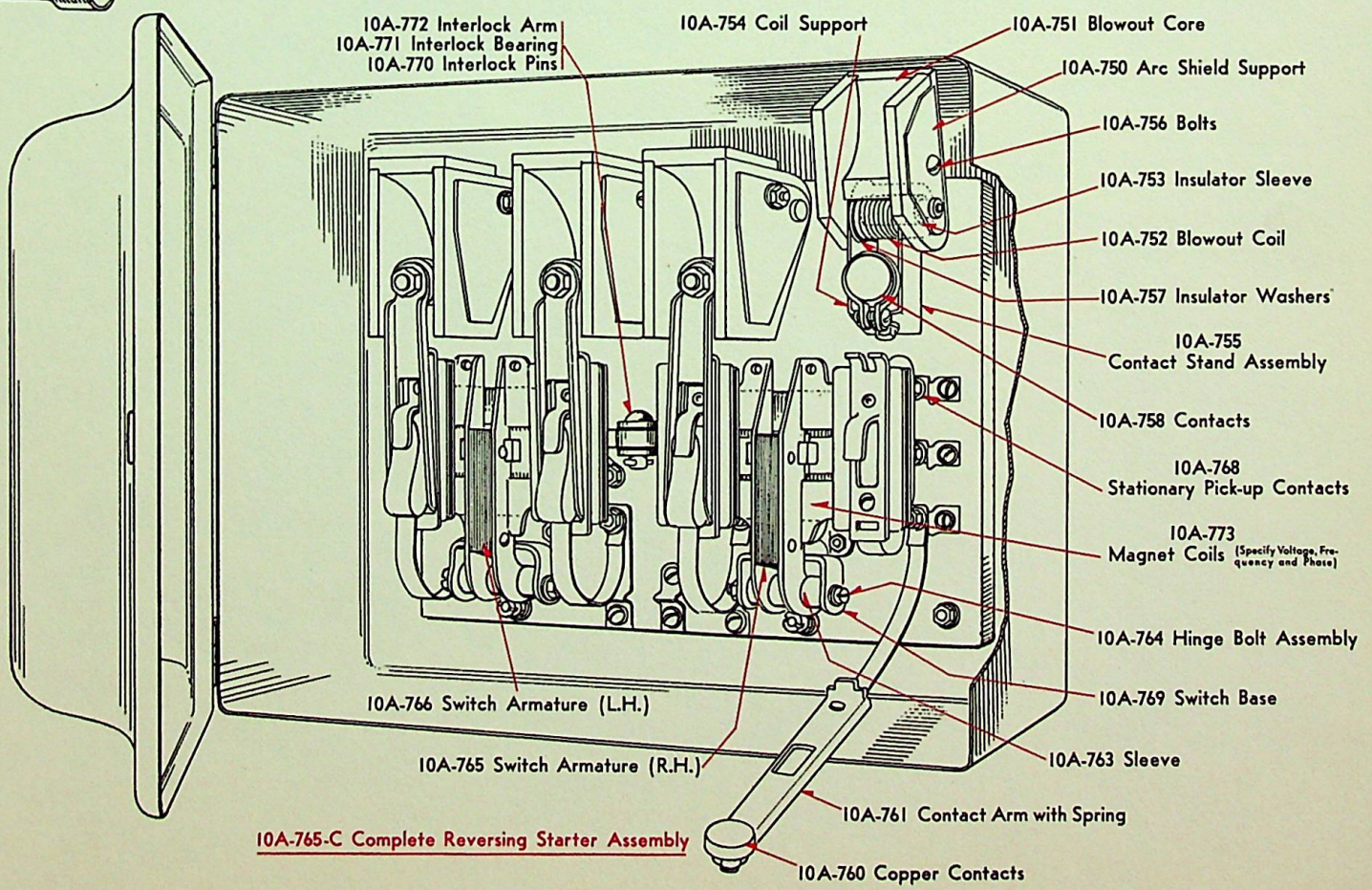


Plate 7

Lever Feed Cross Slide —Unit "E"

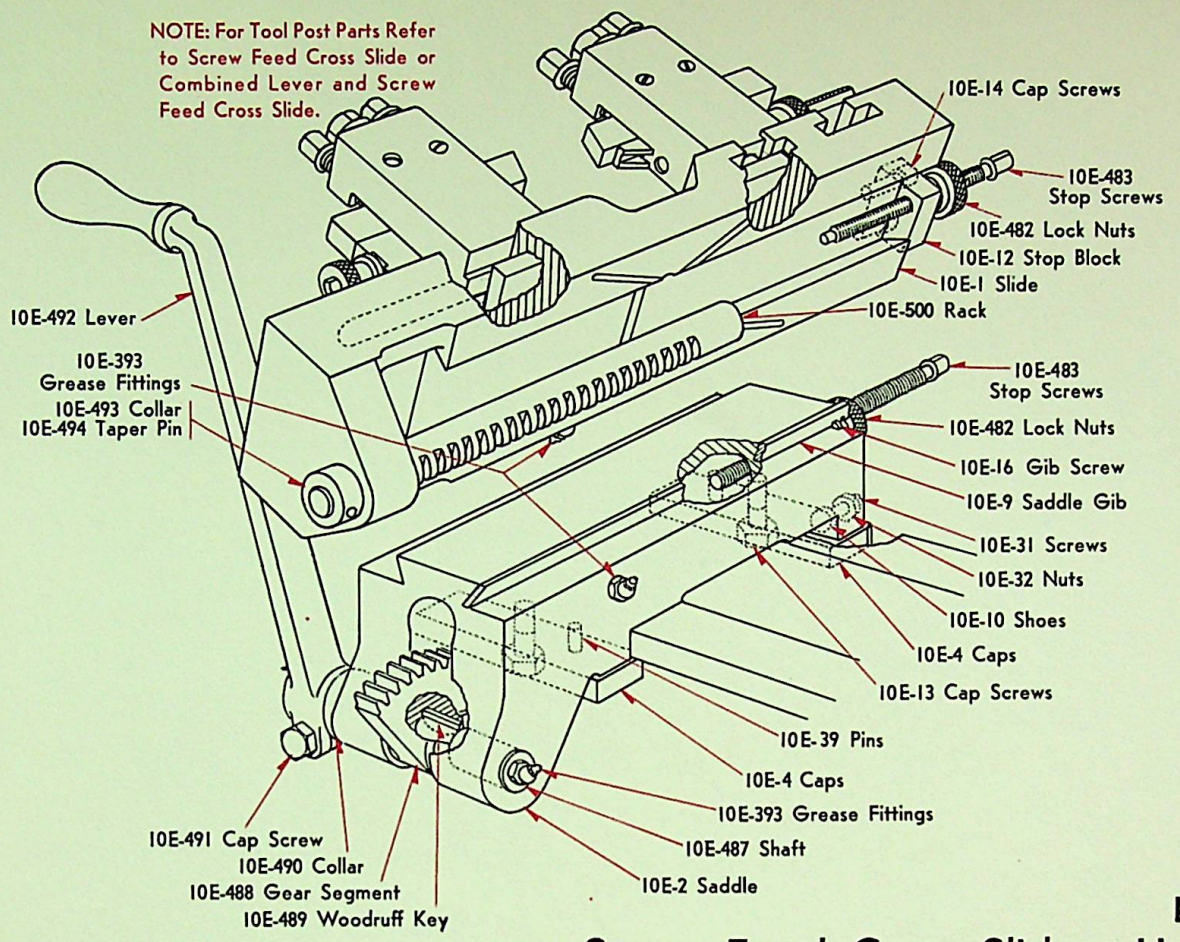


Plate 8

Screw Feed Cross Slide —Unit "E"

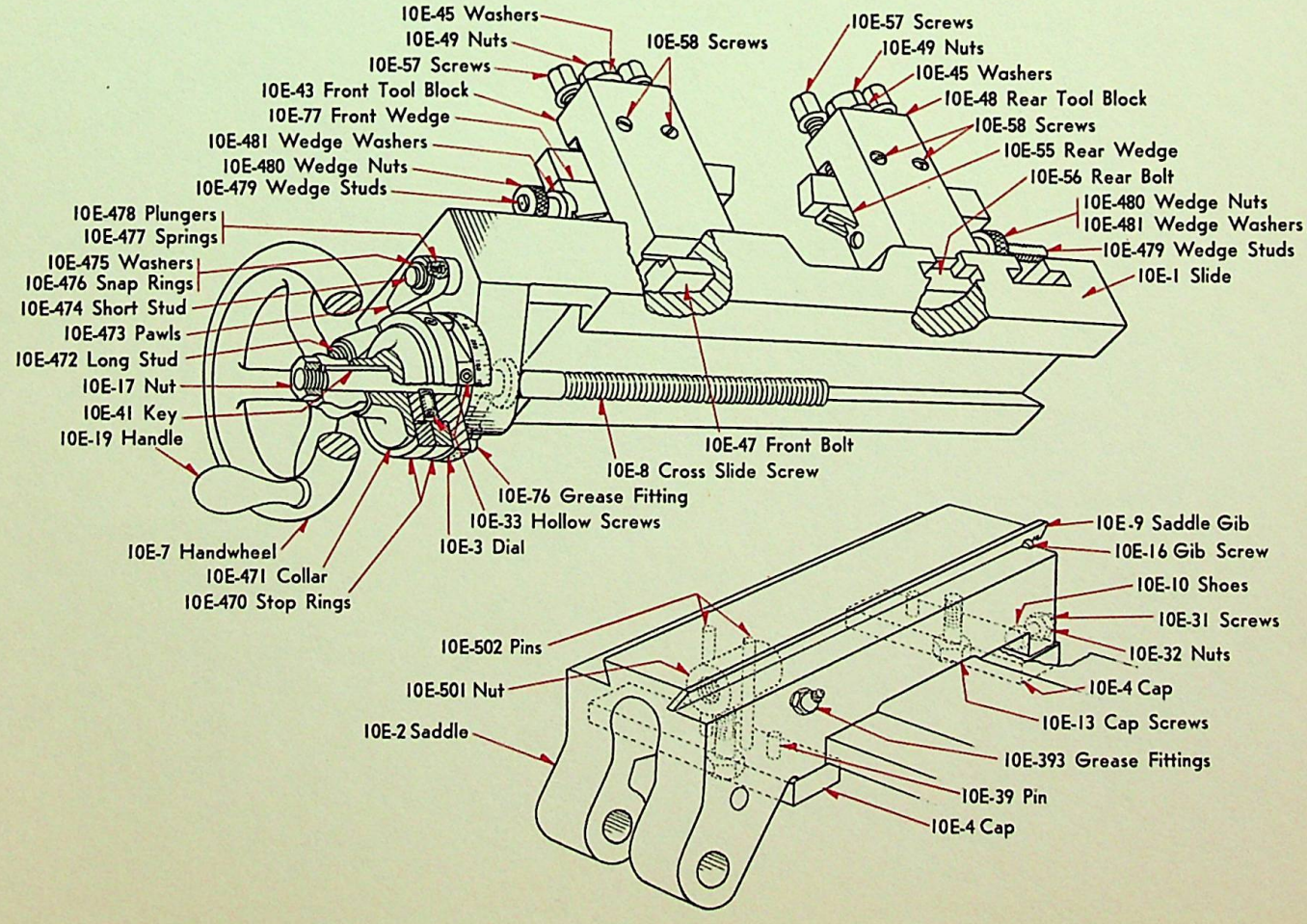
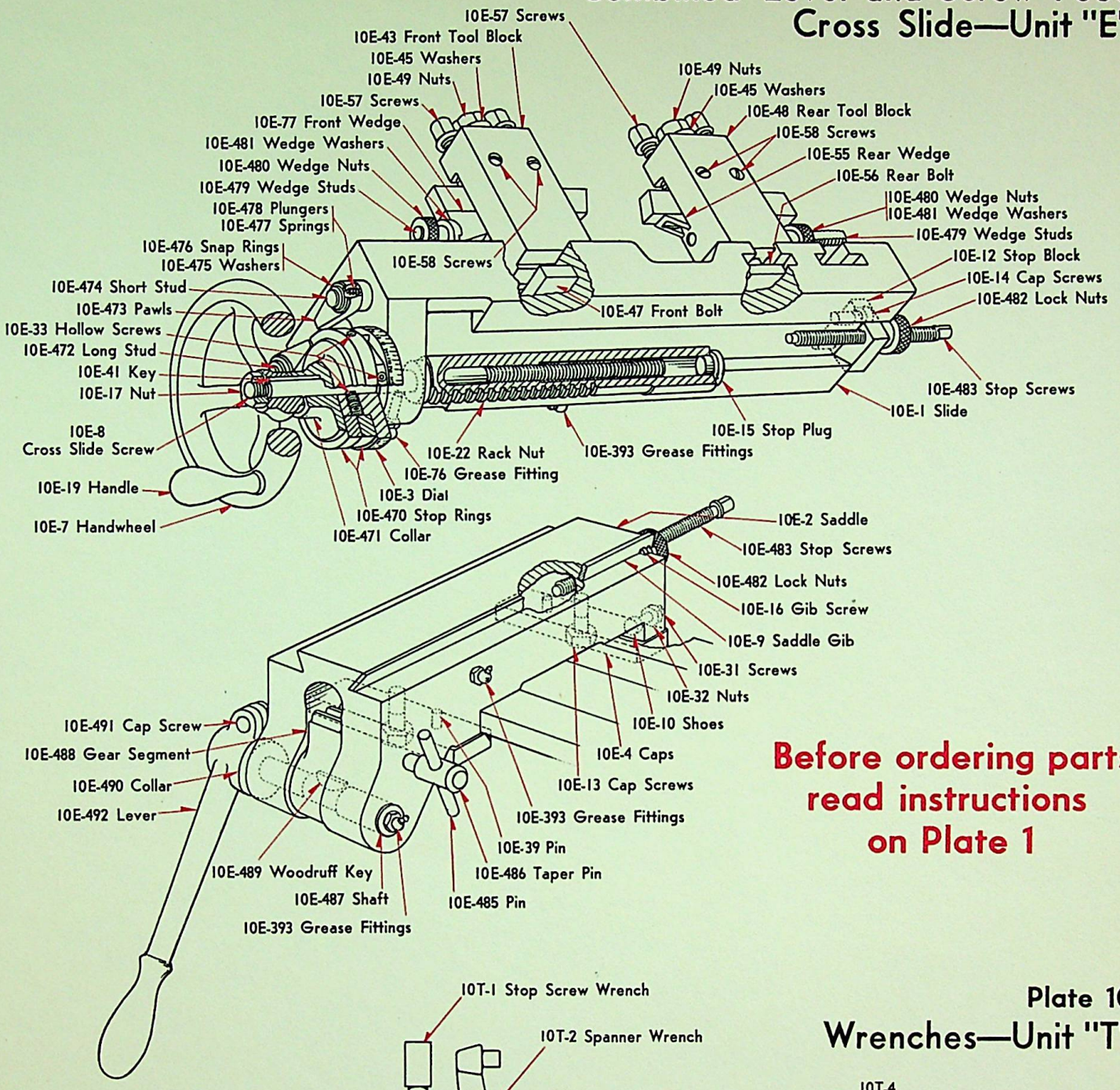


Plate 9

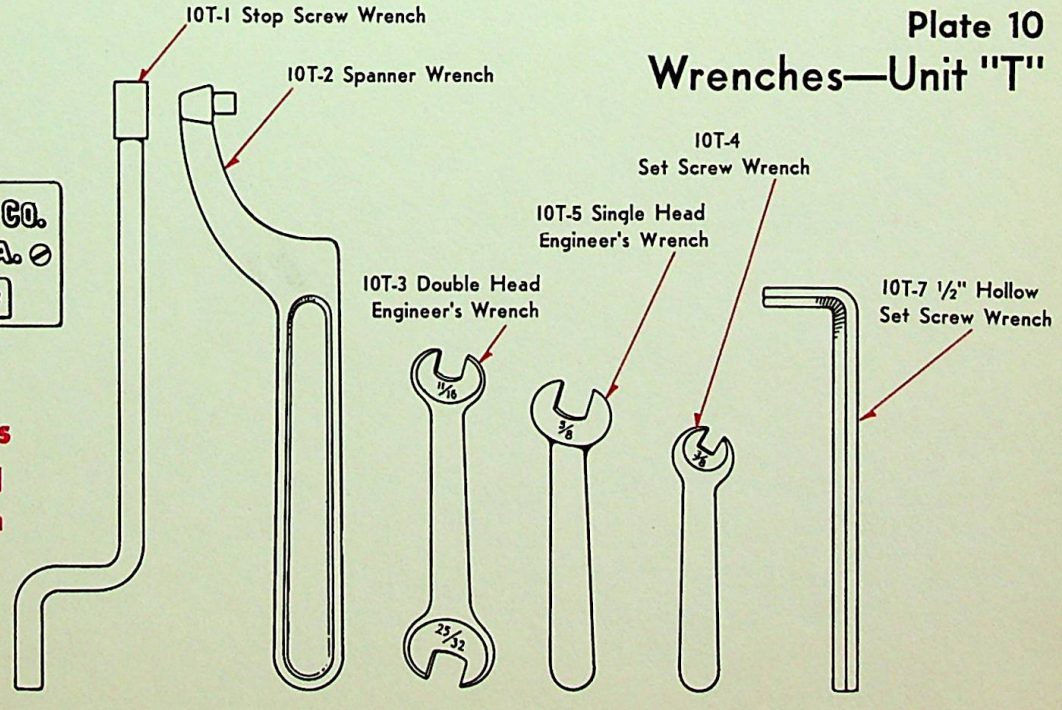
Combined Lever and Screw Feed Cross Slide—Unit "E"

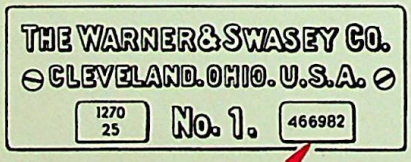


Before ordering parts read instructions on Plate 1

Plate 10

Wrenches—Unit "T"

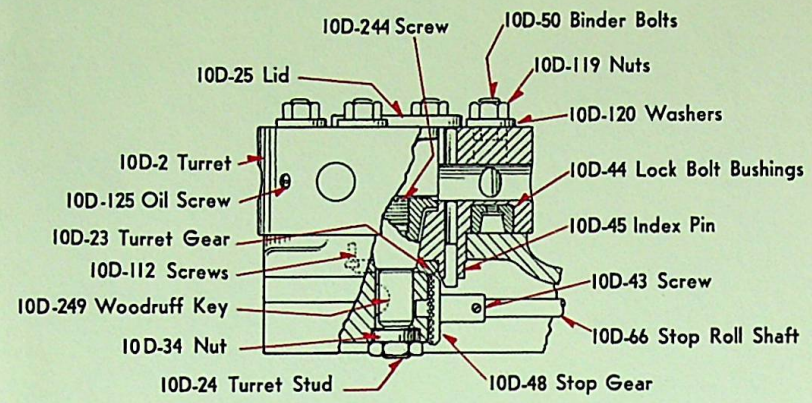


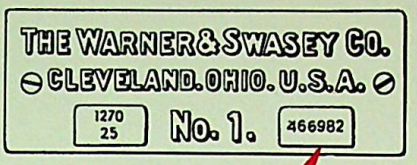


When Ordering Parts

Be sure to give the serial number that is stamped on the name plate.

Turret Slide and Saddle—Unit "D"

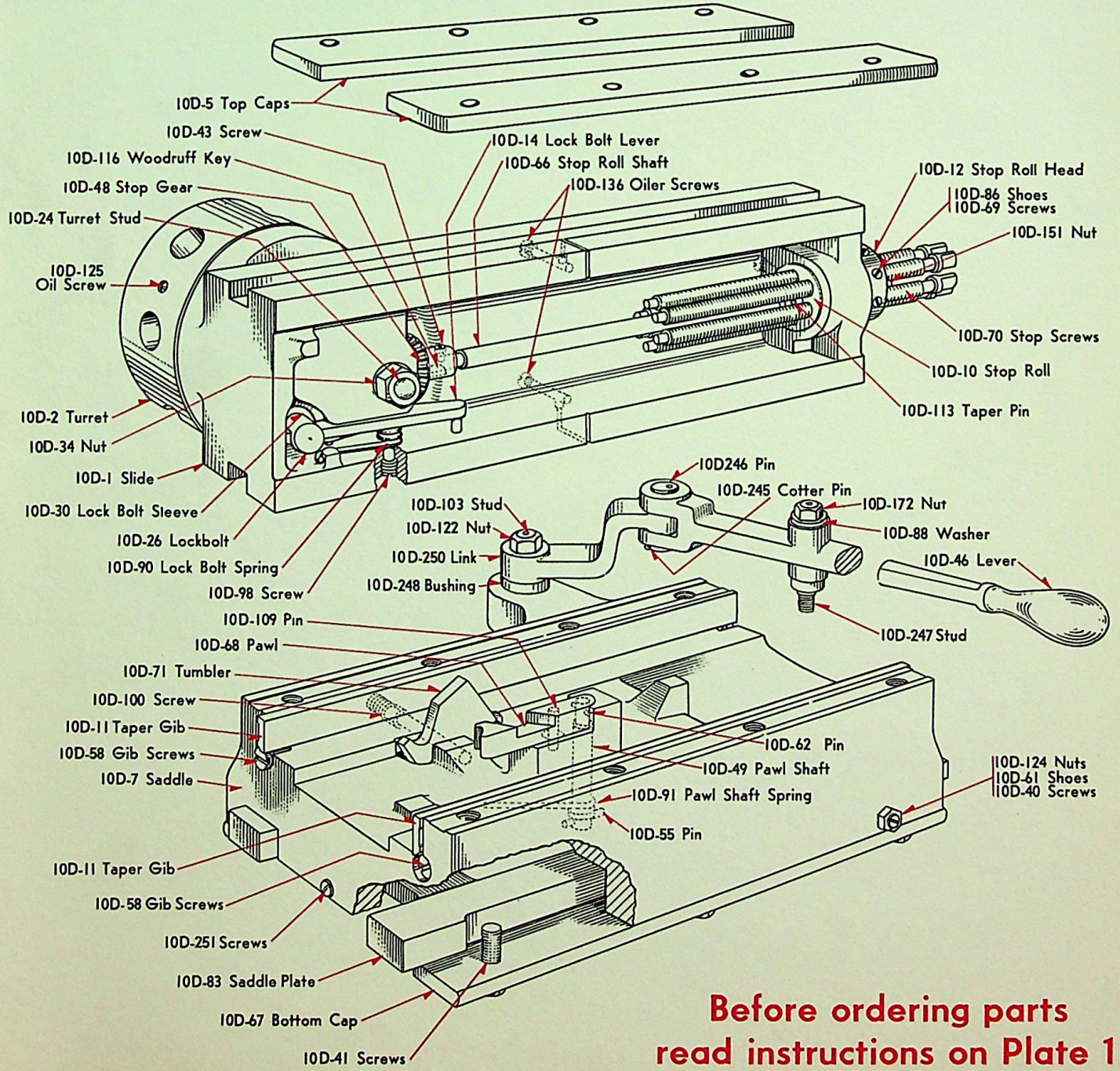




When Ordering Parts

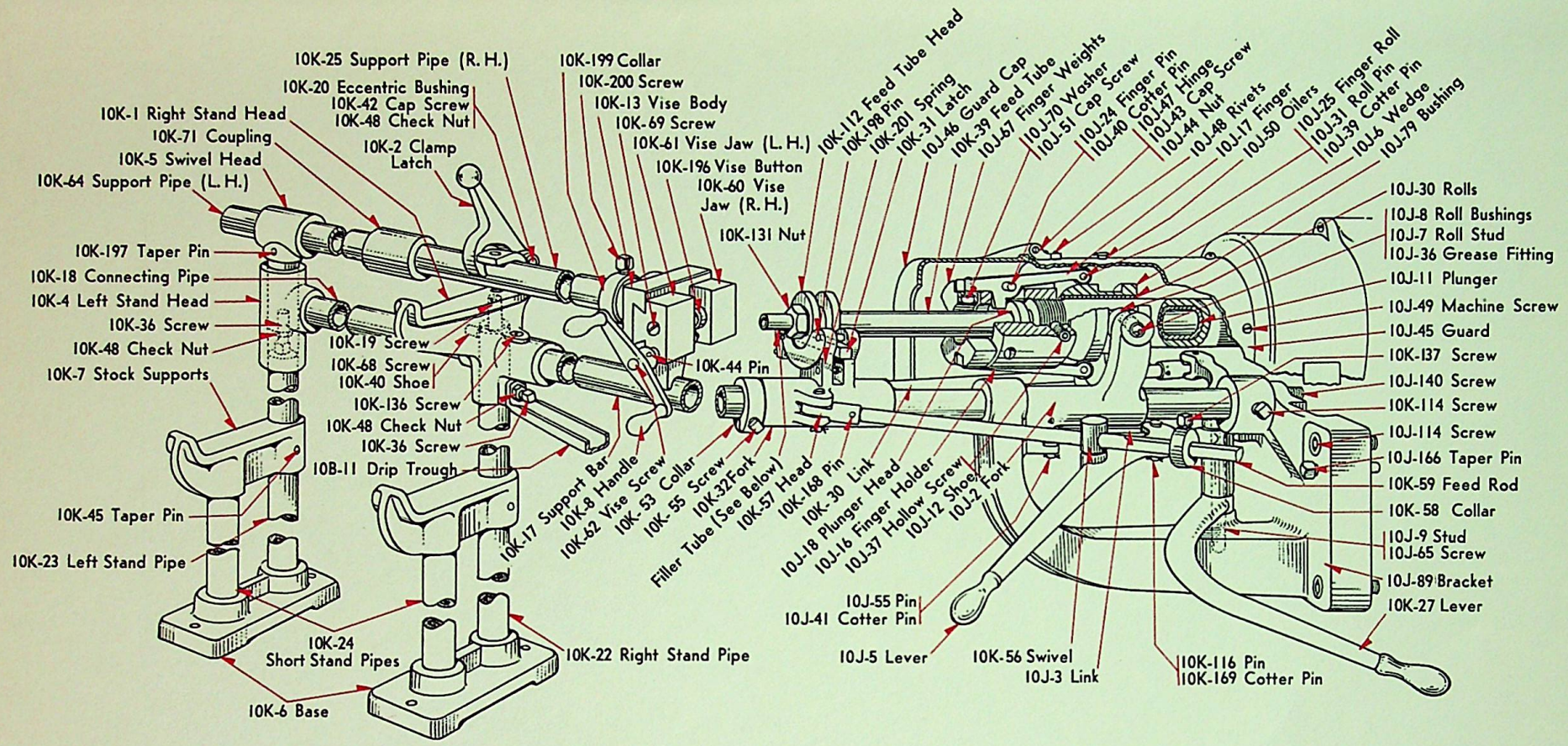
Be sure to give the serial number that is stamped on the name plate.

Before ordering parts read instructions on Plate 1

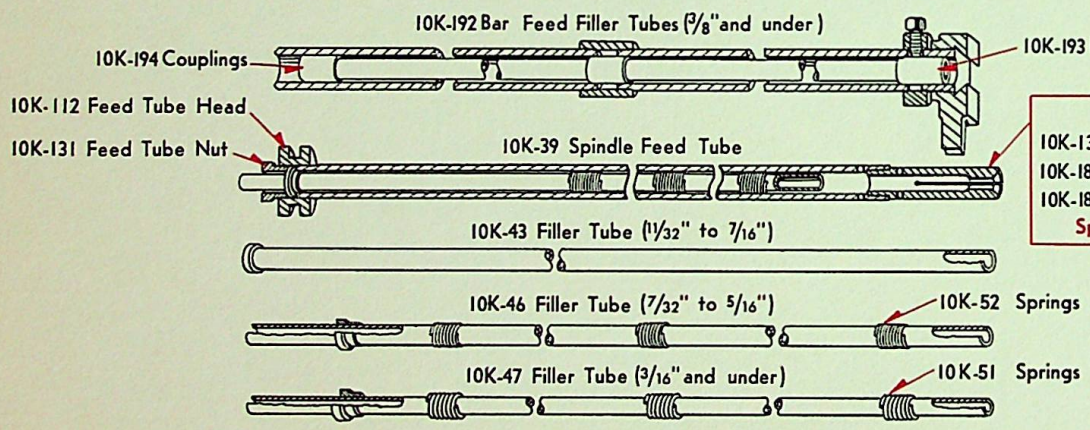


Before ordering parts read instructions on Plate 1

Plate 12
Finger Bar Feed—Unit "K"
Collet Chuck—Unit "J"

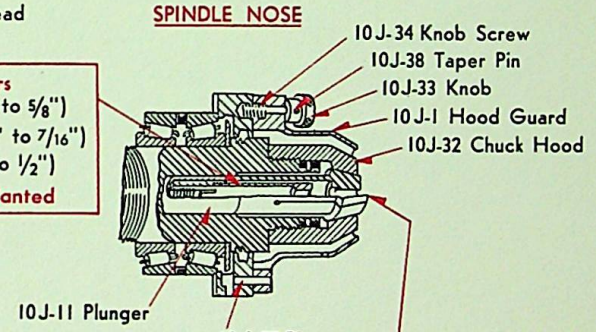


NOTE: Bar Feed and Spindle Filler Tubes — (Specify Size Wanted)



Feed Fingers
10K-135 Round (1/8" to 5/8")
10K-187 Square (3/16" to 7/16")
10K-188 Hex (3/16" to 1/2")
Specify Size Wanted

SPINDLE NOSE

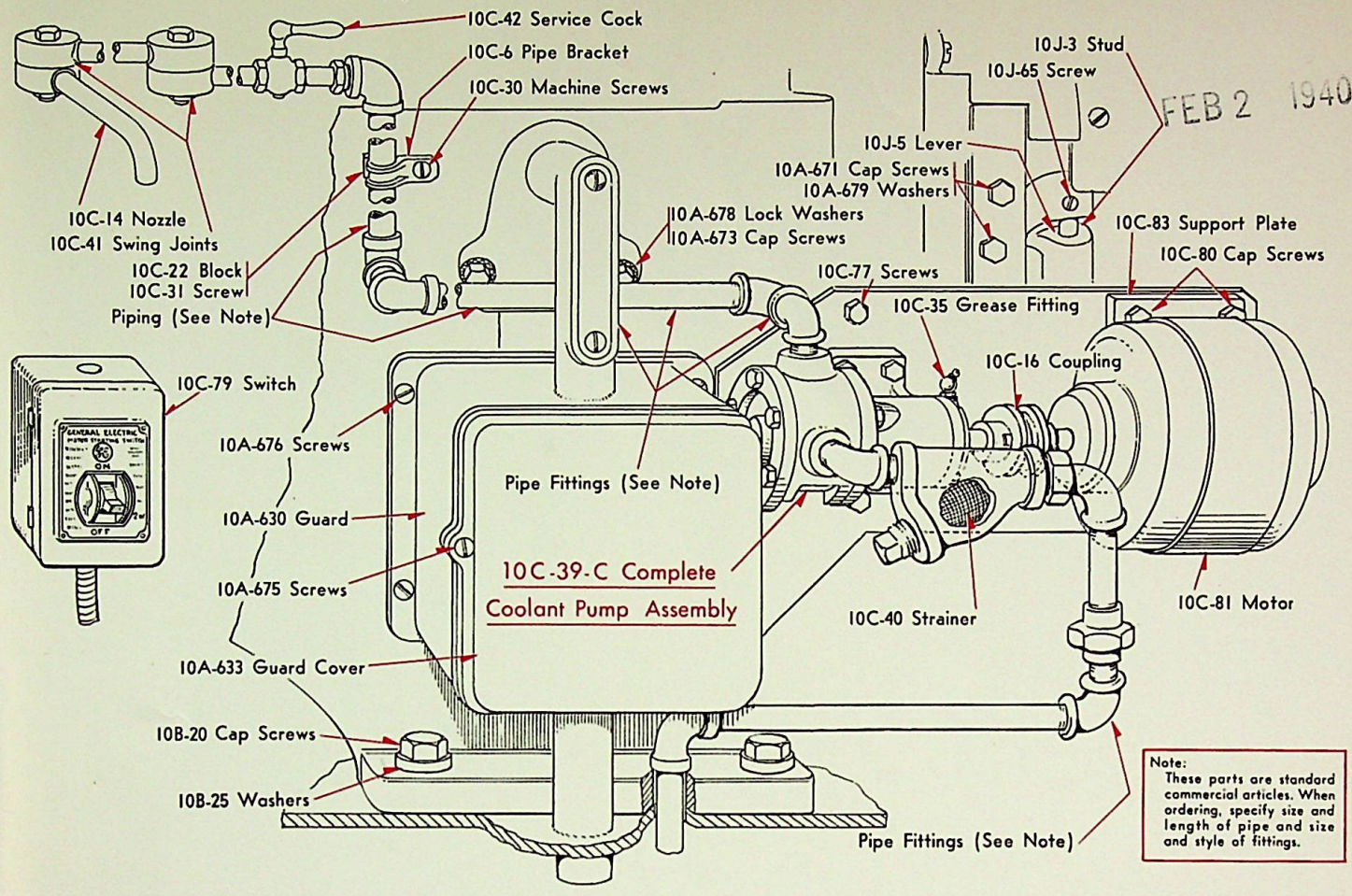


10J-20 Round Collet (3/32" to 1")
10J-21 Square Collet (3/16" to 11/16")
10J-22 Hex Collet (1/8" to 7/8")
Specify Size Wanted

Before ordering parts read instructions on Plate 1

This sheet applies to machines shipped after Jan 1, 1940

Coolant Pump and Piping—Unit "C"

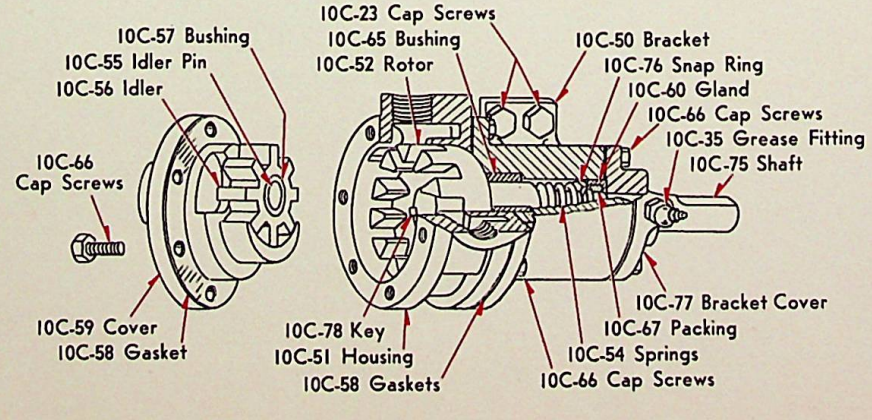


THE WARNER & SWASEY CO.
CLEVELAND. OHIO. U.S.A.
1270 25 No. 1. 466982

When Ordering Parts

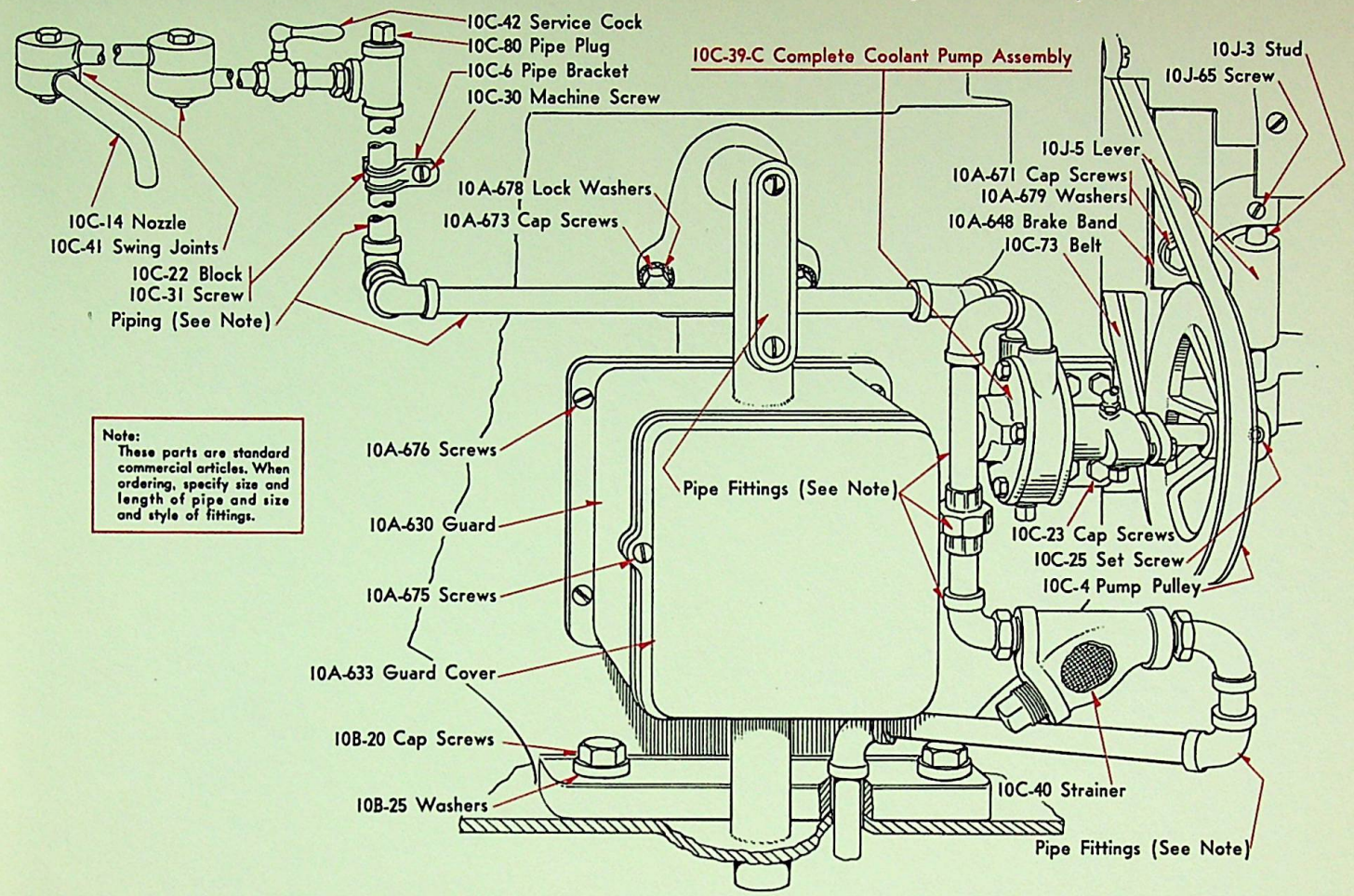
Be sure to give the serial number that is stamped on the name plate.

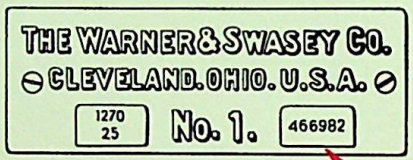
10C-39-C Complete Coolant Pump Assembly



Before ordering parts read instructions on Plate 1

Oil Pump and Piping—Unit "C"

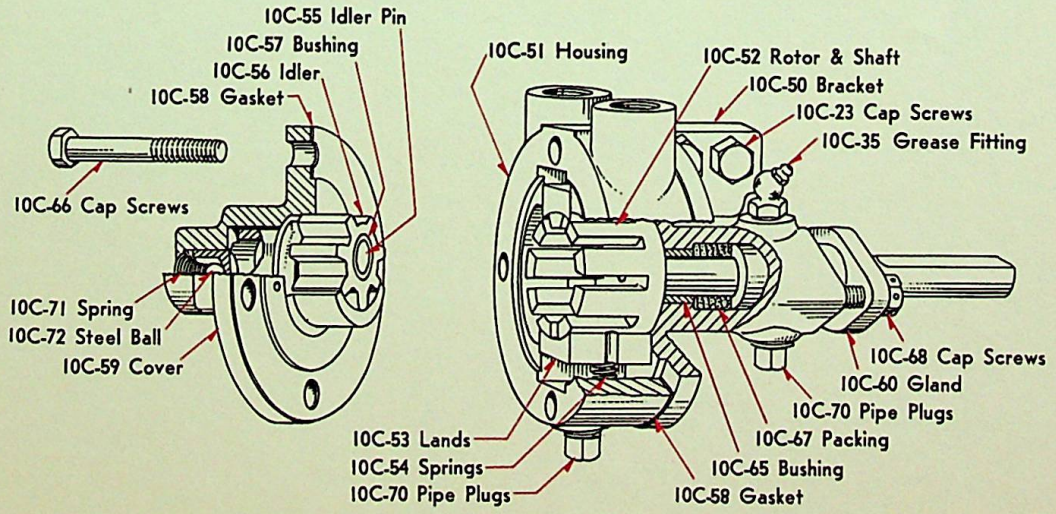




When Ordering Parts

Be sure to give the serial number that is stamped on the name plate.

10C-39-C Complete Coolant Pump Assembly



Before ordering parts read instructions on Plate 1

Plate 14

Power Collet Chuck—Unit "J"

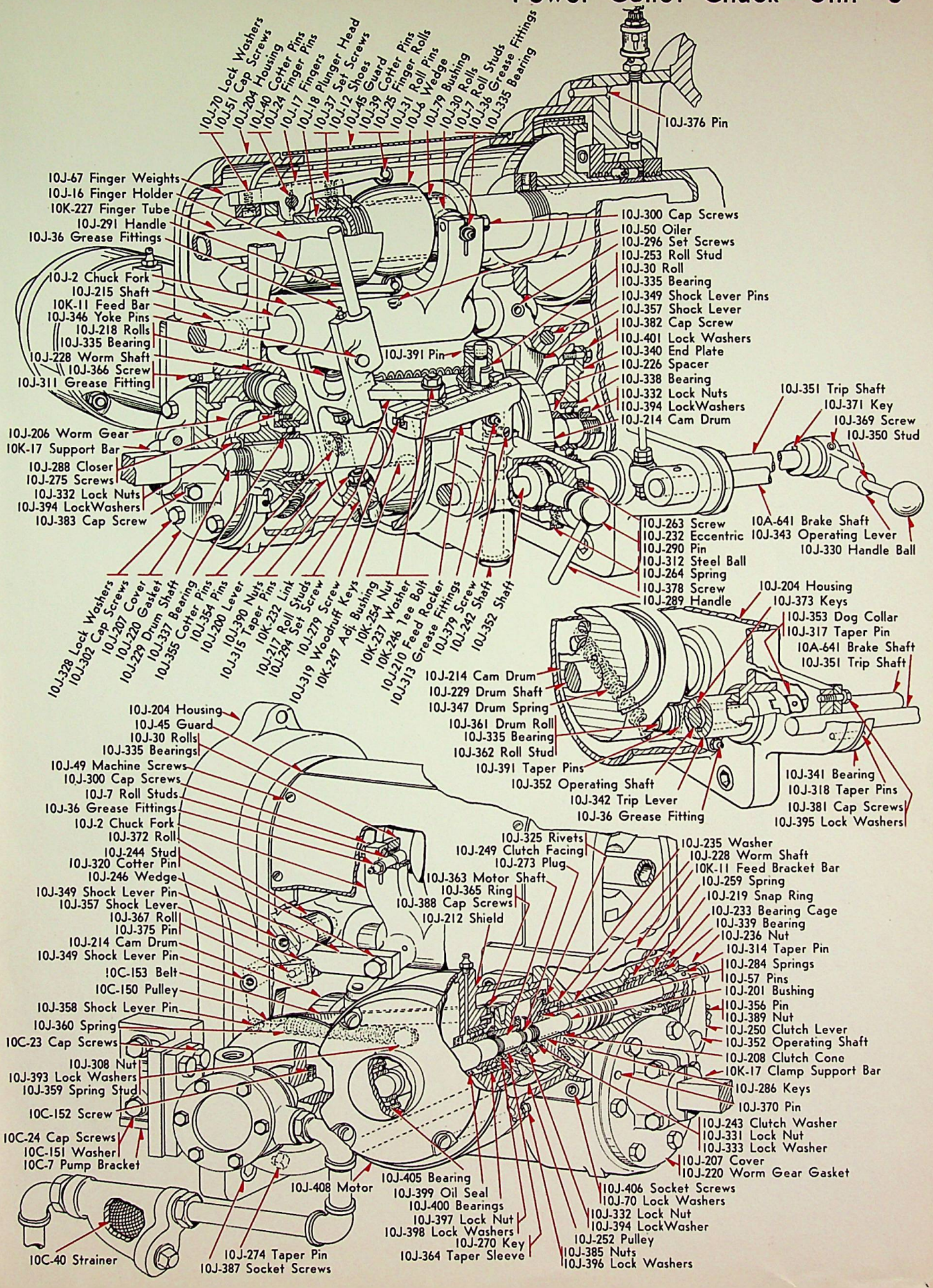
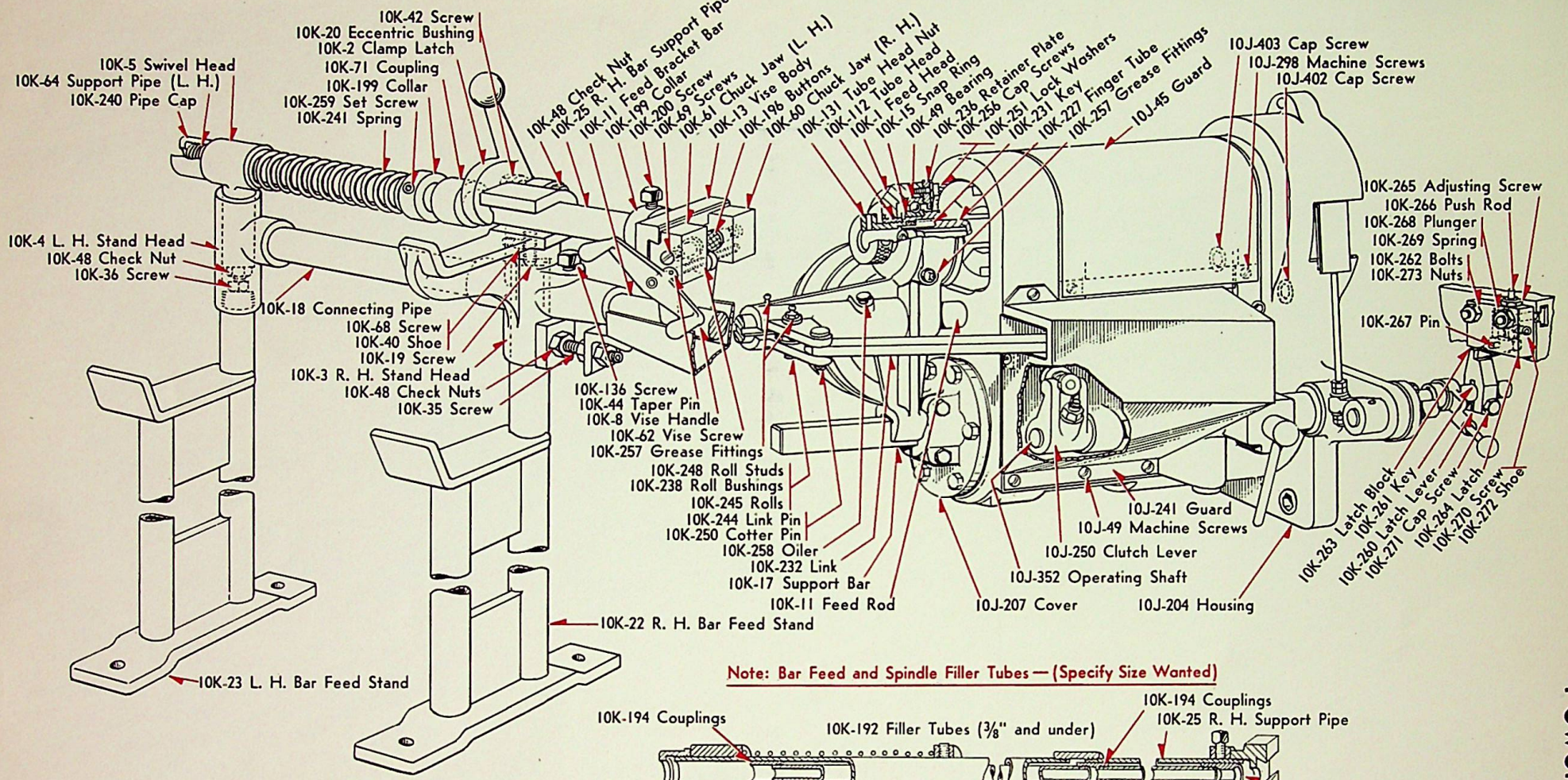
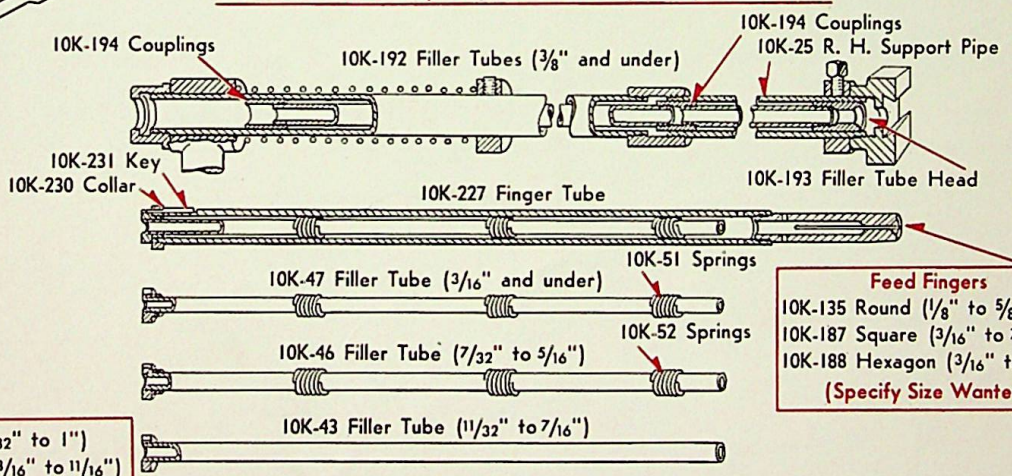


Plate 15
Power Bar Feed—Unit "K"

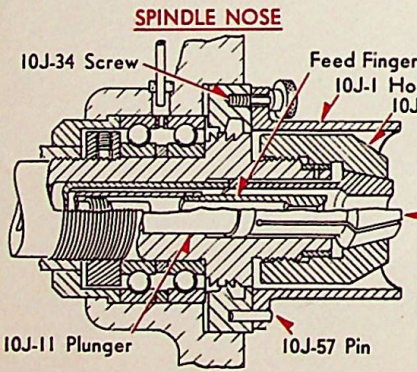


Note: Bar Feed and Spindle Filler Tubes — (Specify Size Wanted)



Feed Fingers
10K-135 Round (1/8" to 5/8")
10K-187 Square (3/16" to 7/16")
10K-188 Hexagon (3/16" to 1/2")
(Specify Size Wanted)

SPINDLE NOSE



10J-20 Round Collet (3/32" to 1")
10J-21 Square Collet (3/16" to 11/16")
10J-22 Hexagon Collet (1/8" to 7/8")
(Specify Size Wanted)

Before ordering parts read instructions on Plate 1