

Service Manual

INSTALLATION—
MAINTENANCE—
REPAIR PARTS—



SERVICE MANUAL

- FOR -

WARNER & SWASEY RAM TYPE TURRET LATHES

The purpose of this booklet is to instruct the maintenance foreman, millwright and operator in the correct method of installation and care of the machine from the moment it arrives at its destination.

Warner & Swasey Turret Lathes are built to a high degree of precision and accuracy and must pass rigid inspection standards before shipment. Properly installed and with ordinary care and periodic inspection and leveling, they will maintain their original accuracy for long periods.

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ERECTING

In the box with the wrenches, etc., is an envelope which contains valuable data. BE SURE THE CONTENTS OF THE ENVELOPE ARE PRESERVED AND TURNED OVER TO THE RIGHT MAN IN CHARGE.

Packing List

This list gives an itemized statement of all parts included in the shipment. Every item on the list should be carefully checked and accounted for by the Receiving Clerk. It is suggested that this list be filed permanently for future reference with the order records of the machine.

Data Sheet

This print should first be used by the Millwright for installing the machine, then placed on file in the Planning Department because it gives the complete data for production planning, such as speeds and feeds available, etc.

Electrical Equipment Specifications

Deliver to the Electrician for his permanent file.

Unloading

When receiving the machine, remove the crate and be careful that any small boxes attached to the crating are not destroyed. Leave the skids under the machine until it has been moved to its final location or until it has been moved under a crane. Weights of the machine are as follows:

No. 3	3400 lbs.
No. 4	4000 lbs.
No. 5	4900 lbs.

The crane rope sling should be applied to the machine as shown in Figure 1. Be sure the rope is close to the legs under the pan. Cross the rope inside the crane hook to prevent slipping. Lift lightly to see if the machine balances and shift the rope in the hook if necessary.

Place a pad or felt between machine and rope wherever the two come together so as not to scratch the paint.

All loose parts, such as wrenches, tools, etc., are packed in the separate wooden box that is nailed to the skids.

Location

A turret lathe must rely on its foundation for alignment. It is essential that the floor be rigid. Ground floors are best. Ground level floors should have a concrete subfloor. On balconies and upper stories, the best construction is reinforced concrete, but even then, it is best to have the head end of the

machine as near to a pillar as possible or place the machine close to a heavy wall. See Figures (2) and (3).

Wood swells and contracts with atmospheric changes, hence wooden floors had best be removed under and a few inches more all around the four leg corners. These holes should then be filled with concrete to floor level. Drill four holes in the concrete for expansion nuts and lag screws.

Place the machine on $\frac{1}{4}$ " thick steel plates so that the load on the concrete is not concentrated on the set screw area. Plates are shown as shaded areas in Fig. 6.

When it is absolutely necessary to place the machine on a balcony or upper story of wood construction, the weight must be distributed over as large a floor area as possible. Place four plates made from boiler plate about $\frac{1}{2}$ " thick, approximately 12" to 18" square to suit the need, one under each leg. (One company having a very weak floor condition, cut out a plate the full size of the entire machine from boiler plate with very satisfactory results).

Oversize holes should be drilled in these plates for the lag screws (one for each leg) by means of which the machine is bolted to the floor. All turret lathes should be bolted down regardless of their location.

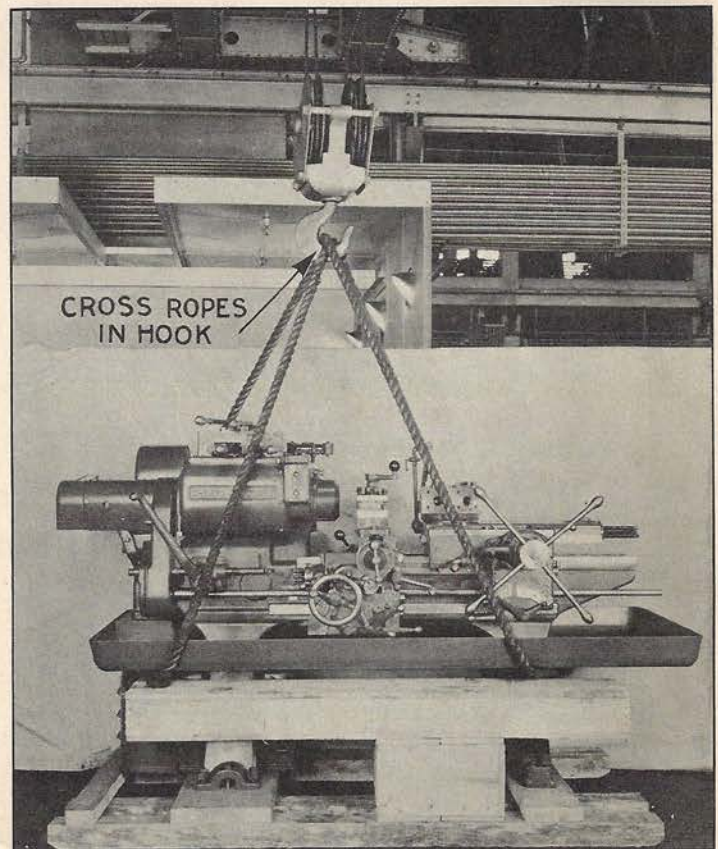


Fig. 1. Proper Method of Lifting Turret Lathe with Crane

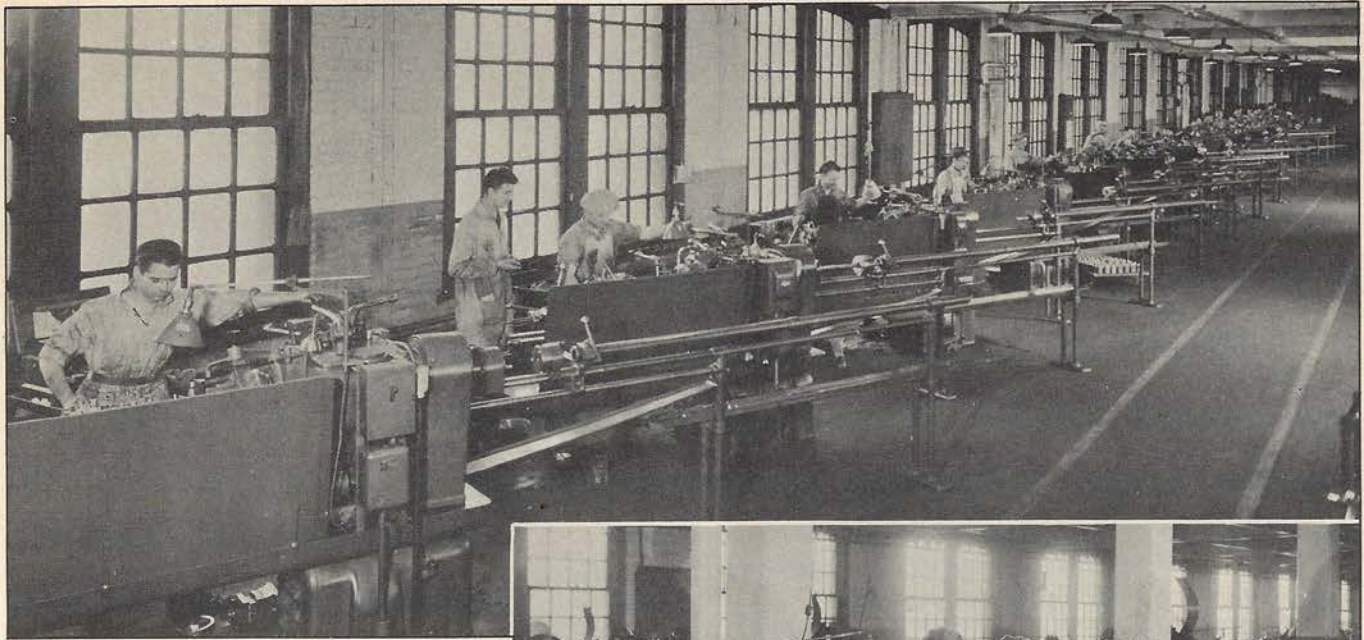


Fig. 2. Proper location of turret lathes on upper floor. Note that machines are close to the wall where floor is most rigid. Window light falls directly on tools. Bar feed tubes are close to the aisle where new bar stock can be delivered from truck.

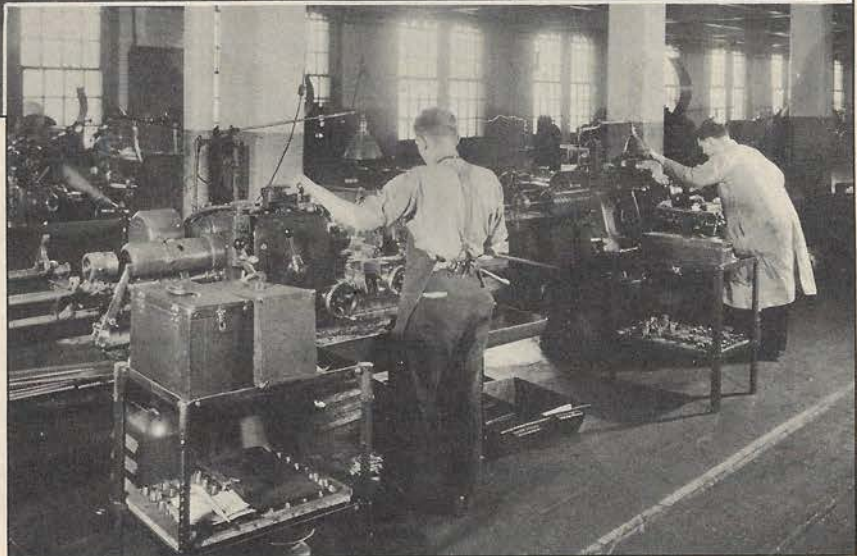


Fig. 3. Location of turret lathes on upper floor with machines near columns where floor is most rigid.

Cleaning

1. Do not operate the machine slides before cleaning and oiling, for sludge will get into the bearing surfaces if this rule is not observed.

2. Use new kerosene for cleaning. A stiff brush will get into the corners. Rags are better than waste because they leave no lint.

3. After cleaning, rub machine oil over all bearing areas and make sure there is no grit left.

CAUTION

Warner & Swasey Turret Lathes are sprayed with a cellulose base lacquer, the highest grade paint available. Do not use caustic cleaners, they will injure the finish.

4. Periodic cleaning of the machine after installation is advisable. Prevent the development of permanent stains by wiping the machine off once a week with a rag soaked in new kerosene.

Lubricating

1. Do not operate the machine before oiling and leveling, for all oil has been drained before shipment and the slides will bind unless the bed is level.

2. Fill head with oil to red line, half way up on gage glass when head is not running. (Fig. 4, No. 2).
 *Use a good grade of engine oil. It should be a "straight run" mineral oil without compound, made from paraffin base crude (Pennsylvania).

Viscosity 200 seconds Saybolt at 100° F.

Gravity 25 to 27

Flash 390

Fire 450

In remote territories where one cannot be sure that the oil available will meet the above specifications a standard grade of Pennsylvania automobile engine oil S. A. E. 10 or 10W will be satisfactory.

3. Grease all nipples with No. 1 consistency "Roller Bearing Grease." Use grease gun furnished with machine. Be sure to grease nipple inside of hexagon turret center hole (Fig. 4, No. 3) and if bar equipment is furnished, look for two nipples (front and rear) on upper end of wedge shifter fork at left hand end of spindle (Fig. 4, No. 1).

*Specify 'Turbine Oil' 200 sec. Saybolt at 100° F.

4. Fill worm troughs (Fig. 4, No. 4) generously in both aprons through oilers with same grade of oil as is used in head stock.

5. Move cross slide all the way in and then fill the plunger pump (Fig. 4, No. 5) **FOUR TIMES** with oil. Force the oil down by inserting plunger and pushing it all the way down each time. This pump delivers oil to the front and rear bed ways, the cross slide ways, and the cross feed screw and its nut.

6. Fill cups on front and rear of turret slide caps (Fig. 4, No. 6).

7. Fill oil cup on top of hexagon turret (Fig. 4, No. 7).

8. On machines with bar chucks, apply a mixture of white or red lead and machine oil to the left hand end of spindle where the hardened wedge (or spool) slides (Fig. 4, No. 8). Do this for several days until these units are thoroughly burnished or "run in."

Regular LUBRICATION Attention

(1) ONCE A DAY

- (a) Fill worm troughs generously (See Note 4).
- (b) Oil cross slide and bed ways by giving pump four fillings and four full plunger strokes. (See Note 5).
- (c) Oil turret slide (See Note 6).
- (d) Oil hexagon turret (See Note 7).

(2) ONCE A WEEK

Grease all nipples (See Note 3).

(3) ONCE A YEAR

Drain oil in head and flush head thoroughly. Re-fill, then watch oil gage of head stock and add oil when required. Oil level should reach to red line half way up on glass tube when head is not running (Fig. 4, No. 2). Be sure vent in hand hole cover on top of head is kept open or pressure in head will cause oil leakage.

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 may also cause staining or rusting of the bright metal parts.

Coolant Leakage

The left hand (head end) leg of the bed is bolted to the floor leg directly, while the pan can slide a limited amount between the two to allow the pan to expand or contract without affecting the 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 $\frac{1}{4}$ " pipe plugs in the bed leg near the pan (Fig. 4, No. 9), insert grease nipple and apply waterproof automobile water pump grease, available in most automobile service stations.

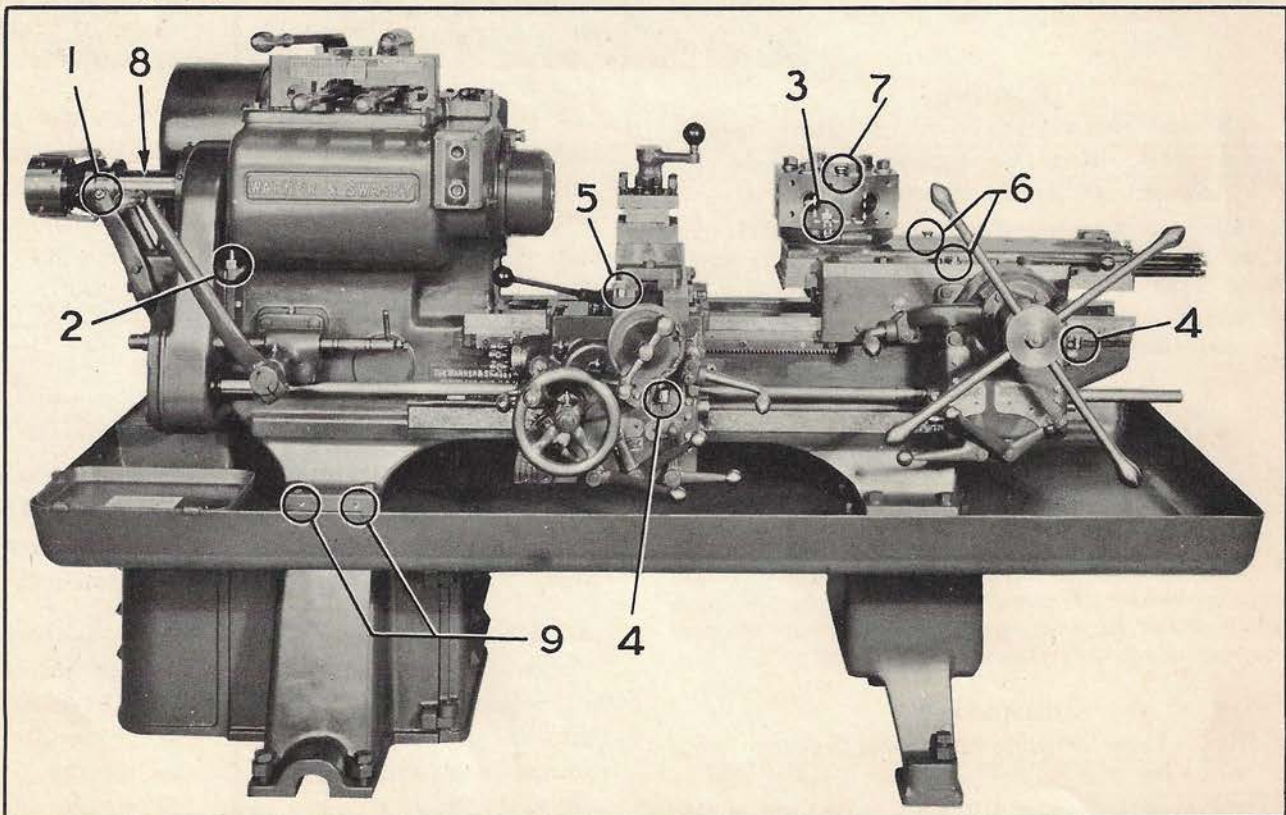


Fig. 4. Lubrication

ALIGNMENT

The alignment of a turret lathe bed must be undertaken with great care because its accuracy and wear depend, to a great extent, upon a machine free from warp.

Alignment "Dont's"

1. Don't use wooden wedges for leveling machine tools. Wood expands and contracts.
2. Don't use a machinist's level. It's not accurate enough.
3. Don't disturb the bolts which hold the bed, pan and legs together. These bolts have been carefully adjusted to match the pan.
4. Don't try to level a machine that has just been brought into the shop. It may have been exposed to the blazing sun or extreme cold. Give it 24 hours to take on room temperature.
5. Don't expect a machine to line up accurately at once, after it has been in storage on skids for an extended period, such as in a warehouse or on board ship. A machine tool is under tremendous strain under such conditions and it will take some time for these strains to be equalized.

Proceed by leveling the machine as well as possible, at first, and after a month or so recheck the alignment.

6. Don't expect a machine to remain level permanently. Buildings settle and floors warp. A periodic checkup of the machine's alignment is necessary to maintain utmost precision.

Alignment Instructions

For leveling machine tools a sensitive graduated tube spirit level is required, reading to 10 seconds per graduation (.0006" per foot) and provided with screw adjustment. Ordinary levels are not accurate enough. A suitable level, in a case, is listed in the W & S Small Tool Catalog, Part No. SO-660 (Fig. 5).



Fig. 5. W & S Sensitive Level (Part No. SO-660)

The actual length of a level frame has no bearing on its accuracy. The glass tube alone determines its sensitiveness. 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.

Parallel Alignment

Machines are leveled by raising the legs off the floor. Adjusting screws are provided for that purpose in the bottom of each leg (Fig. 6, Numbers 1 to 6). On machines which do not have these screws, sheet metal stock, cut to suitable size should be used for shims.

To level a machine (See Fig. 6)

- (1) Back out set screws 1 to 6 so they do not support the machine.

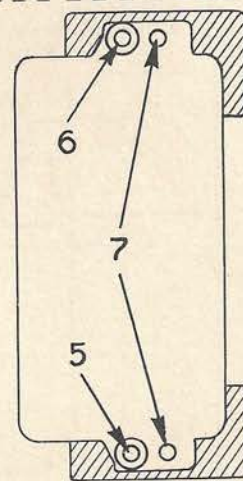
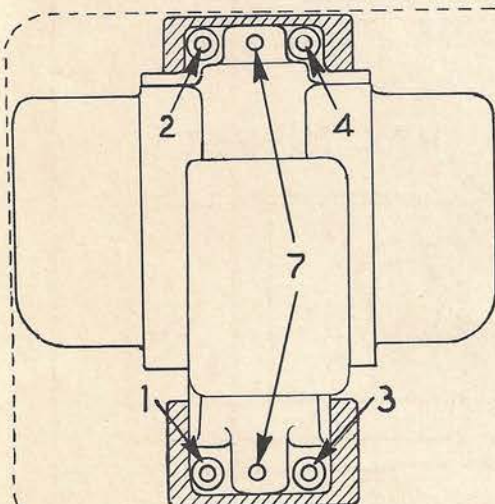


Fig. 6. Leg Diagram Showing Leveling Screws

- (2) Level the machine bed with ordinary carpenter's level, using set screws 3, 4, 5 and 6 only. Be sure all four leg castings are free from the floor at least $\frac{1}{8}$ inch. Do not bring screws 1 and 2 to bear as yet.

NOTE: Operation (2) brings the machine into as level a condition as is required. In the further steps described for alignment operations, it is not necessary to attain greater accuracy of true level. These additional steps are merely for the purpose of removing all twist from the bed so that the slides will travel on the entire ways, in parallel relation to the spindle.

- (3) Place spirit level across bed at right-hand end and adjust level at right angles to bed, . . . if level is too short, use a parallel underneath it. Adjust level to center the bubble.

It takes several seconds for the bubble of a sensitive level to come to rest. Give it plenty of time.

- (4) Transfer level to head end of bed, square it again and make corrections with screws 5 and 6, to center the bubble.
- (5) Repeat above operations (3) and (4) until the two readings are alike within one division on glass tube or better.
- (6) Bring screws 1 and 2 down solid and repeat operations (3) and (4) as final check.

Precision Alignment

For most purposes the leveling operations described above are sufficient. In exceptional cases where work must be finished straight (without tapering) to very close limits, it will pay to carry the alignment process farther as described below:

(7) Work Test for precision horizontal parallel alignment.

The final test of alignment, of course, consists of checking the accuracy of work being machined. To do this, chuck a piece of work and turn the outside diameter with the square turret (Tool in front of work and at center height) Fig. 8.

If right-hand end of work comes smaller (Fig. 8), turn adjusting screw 6 (Fig. 6) down slightly. This will raise the rear right-hand end of bed.

If right-hand end of work comes larger (Fig. 8), turn adjusting screw 5 (Fig. 6) down slightly. This will raise the front right-hand end of bed.

NOTE: Warner & Swasey factory inspection limit for this test is .0005 inch actual alignment, or .001 inch variation of work diameter in 6 inches of length.

(8) Work Test for precision vertical parallel alignment.

It is possible to adjust the relation of spindle to bed a limited amount in the vertical plane by means of screws 1 and 2 (Fig. 6).

Turn or bore work with the hexagon turret, with the tool mounted vertically above the spindle in bar held in vertical slide tool (Fig. 7).

Bar stock should not be used for such testing purposes, for it bends downward of its

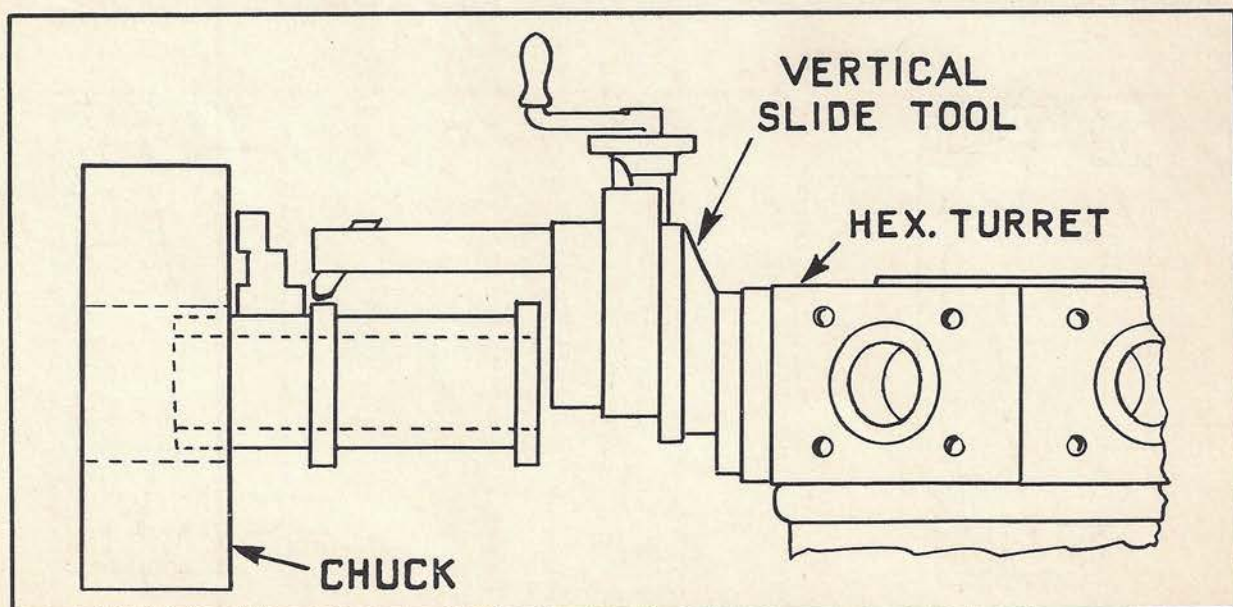


Fig. 7. Vertical Parallel Alignment Test of Spindle with Ways.

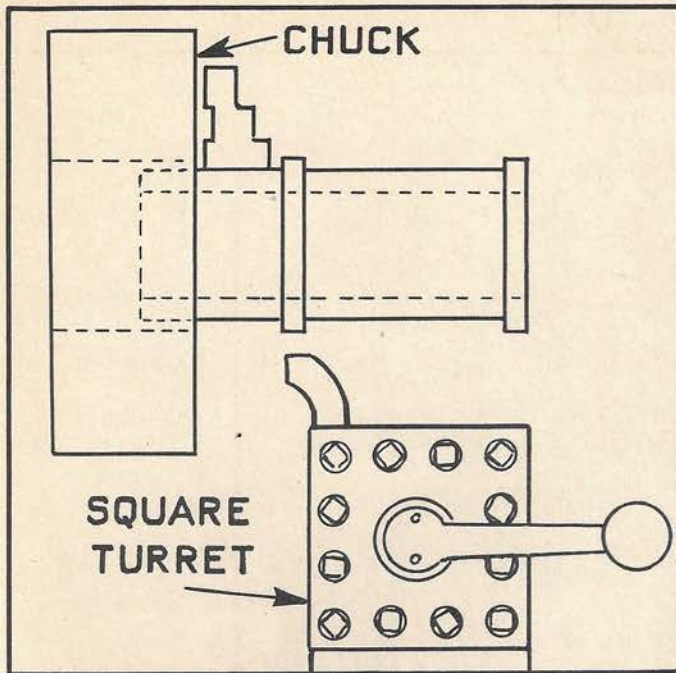


Fig. 8. Horizontal Parallel Alignment Test of Spindle with Ways.

own weight if projecting any distance at all. If the test is made on work of small diameter, tubing must be used, or else the work must be of sufficiently large diameter, relative to its length, to prevent sagging.

If right-hand end of work comes smaller (Fig. 7), turn adjusting screws 1 and 2 down (Fig. 6). This will raise left-hand end of spindle.

If right-hand end of work comes larger (Fig. 7), turn adjusting screws 1 and 2 up (Fig. 6). This will drop left-hand end of spindle.

NOTE: Warner & Swasey factory inspection limit for this test is .0005 inch actual alignment, or .001 inch variation of work diameter in 6 inches of length.

Turret Holes in Line with Spindle

At the Warner & Swasey Company's factory, after final inspection and after careful leveling, the turret holes and faces are finished from the machine's own spindle. This method assures highest possible accuracy. After the machine has been leveled in accordance with previous instructions, this alignment between spindle and turret is automatically re-established and requires no further attention.

If it is desired to check the turret hole alignment, special tools are required as shown in Fig. 9.

A piece of tubing is held in the 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 of revolution 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.

It must be appreciated that the turret hole alignment with the spindle varies with varying temperatures of the headstock. Consequently the turret holes are bored with head temperature approximating as nearly as possible average running conditions in a machine shop. When making a turret hole alignment check on the machine, be sure therefore that the machine is run until the head is warm.

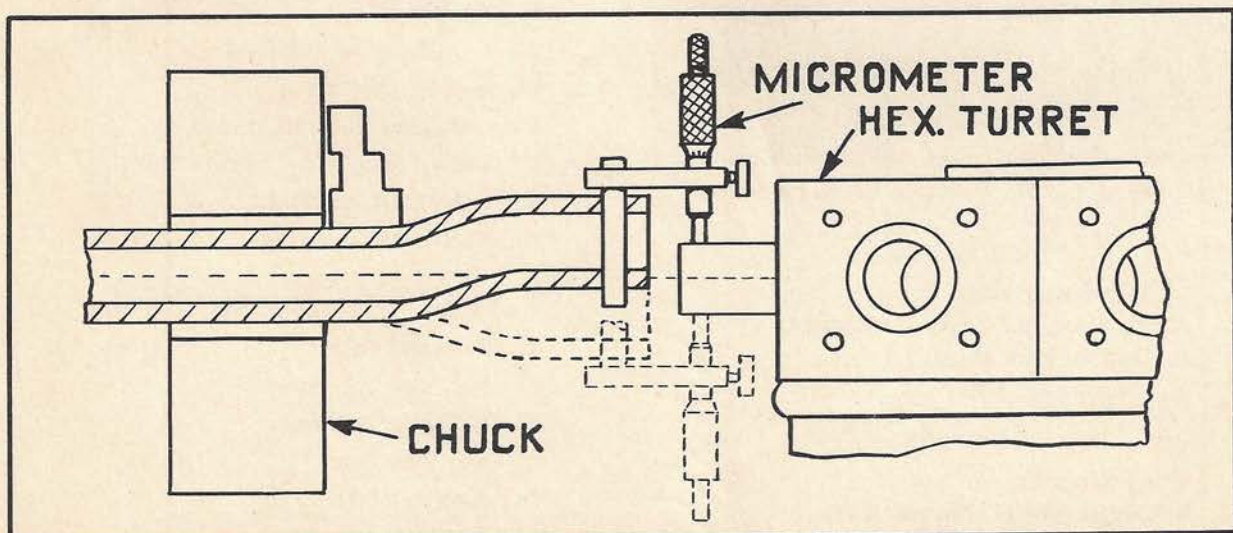


Fig. 9. Alignment Test for Turret Holes

NOMENCLATURE

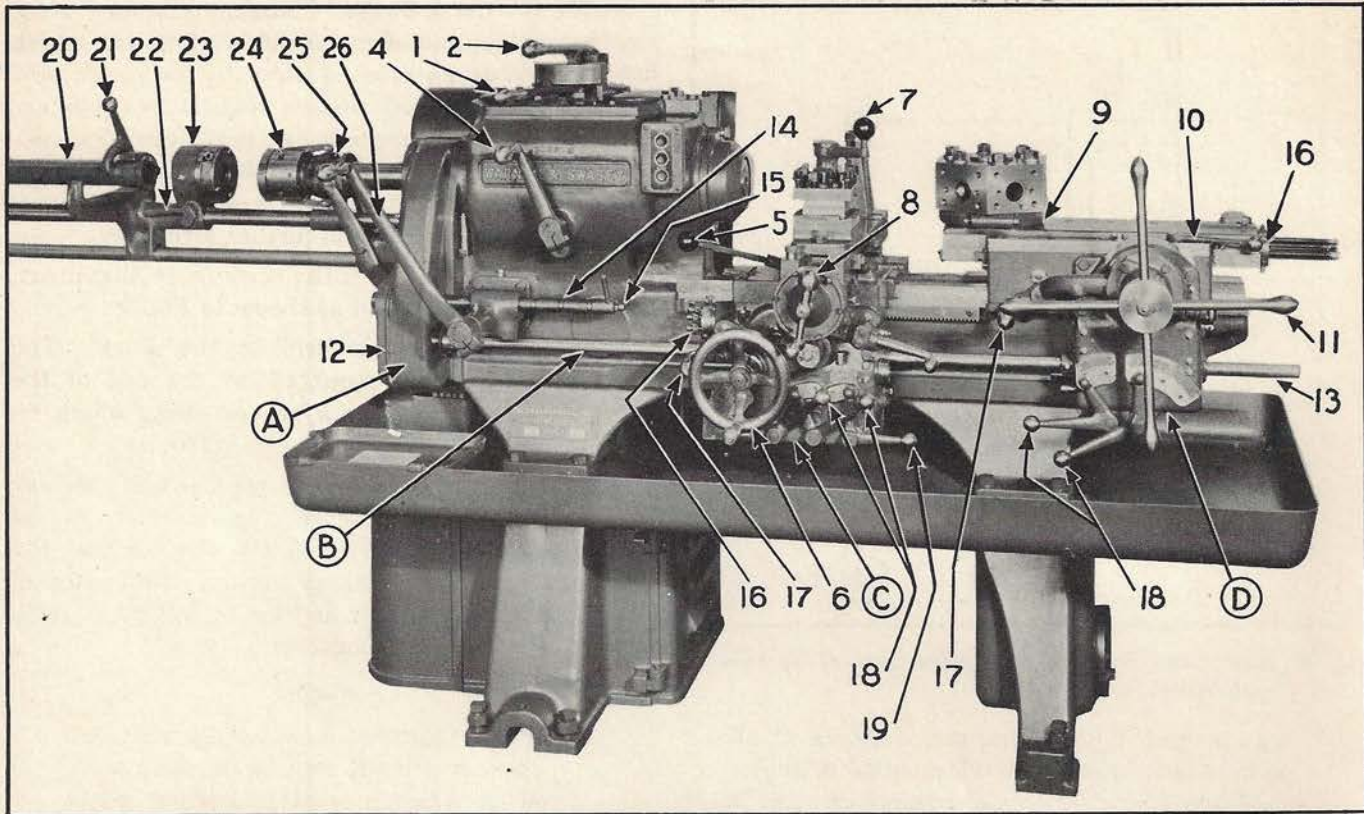


Fig. 11. No. 3 Six Speed Universal Turret Lathe

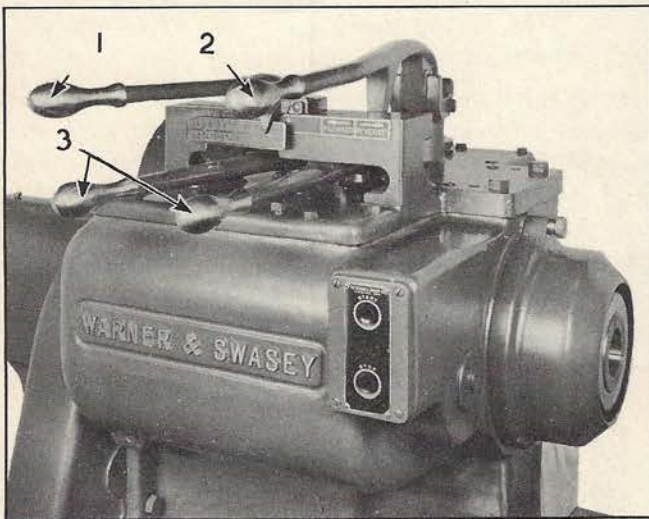


Fig. 10. No. 4 and No. 5 Twelve Speed Headstock

Headstock

1. Triple gear shift.
2. Forward and reverse clutches
3. Double gear shifts
4. High-low clutch

Carriage

5. Carriage clamp
6. Longitudinal feed handwheel
7. Turret index and clamp lever
8. Cross slide screw handle

Turret Slide and Saddle

9. Circumference binder ring
10. Turret slide clamp
11. Turnstile

Feed Train

12. Change gear box (for halving or doubling all feeds.)
13. Feed shaft
14. Longitudinal stop rod
15. Master stop screw
16. Longitudinal feed stop rolls
17. Longitudinal feed clutch handles
18. Feed shift handles
19. Feed reverse handle

Bar Chuck and Bar Feed

20. Bar feed tube
21. Bar feed tube clamp
22. Ratchet pawl lever
23. Bar feed head
24. Finger holder
25. Bar chuck wedge
26. Bar chuck lever

ADJUSTMENTS AND ASSEMBLY

To Adjust "Pullmore" Forward and Reverse Clutches

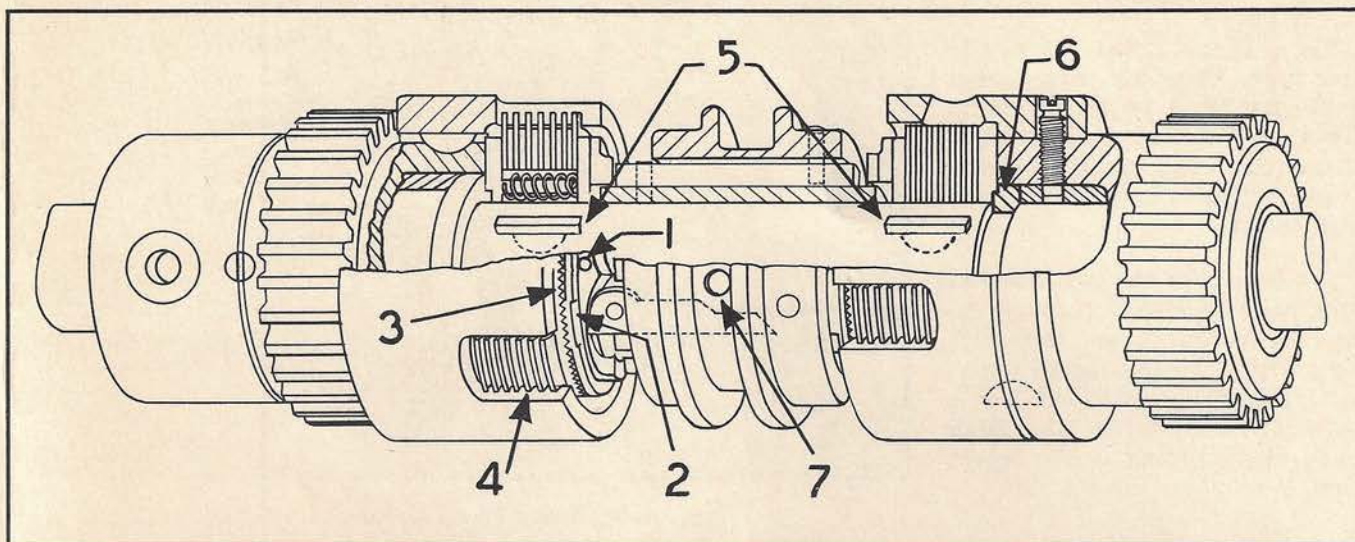


Fig. 12. The "Pullmore" Clutch

It is important that these disc clutches be in proper adjustment because a slipping clutch will wear rapidly. To adjust the clutches, stop the drive pulley. Place the clutch operating handle in neutral, bring slots (4) Fig. 12, and serrated block (3) to the top so they are approximately in line. This will bring hole (1) to the top. Insert a $\frac{1}{8}$ " pin in hole (1) and pry sideways to push block (3) and disc (2) apart until the teeth can slide past each other.

Advance disc (2) one tooth only and test the adjustment by engaging the clutch. If not tight enough, advance the disc another tooth. In actual use the clutch lever should be pushed into engagement with steady pressure rather than with a jerk, as the shock of instantaneous clutch engagement exerts a tremendous pull on the driving belt. This is especially true when the spindle is reversed from a high forward speed.

To Adjust "Twin Disc" Forward and Reverse Clutches

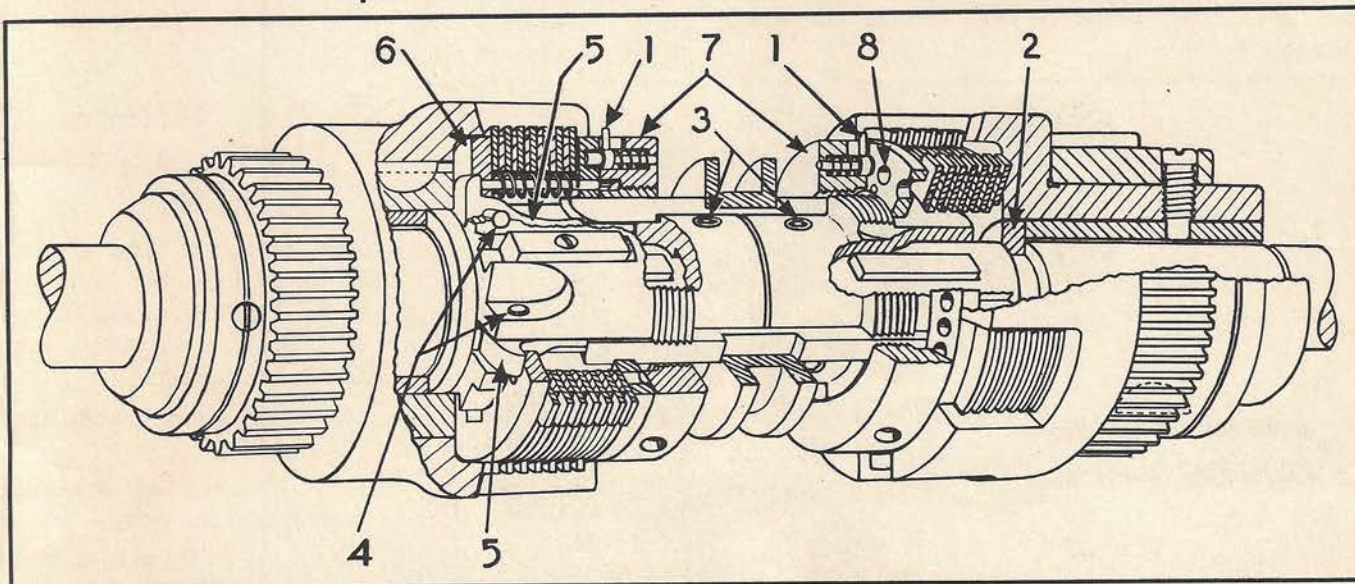


Fig. 13. The "Twin Disc" Clutch

Pull back pin (1) and turn collar (7) clockwise to tighten. Advance pin one hole at a time (8) and test adjustment by engaging the clutch with a steady

pressure rather than a jerk. Instantaneous clutch engagement exerts a tremendous pull on the driving belt, especially at high speeds.

High-Low Clutch: No. 3 Turret Lathe Only; Fig. 14

These two clutches are of the cone type. To adjust them loosen screws (4) Fig. 14 which clamp the threaded and split collars. Rotate the latter and then clamp screws (4) again 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.

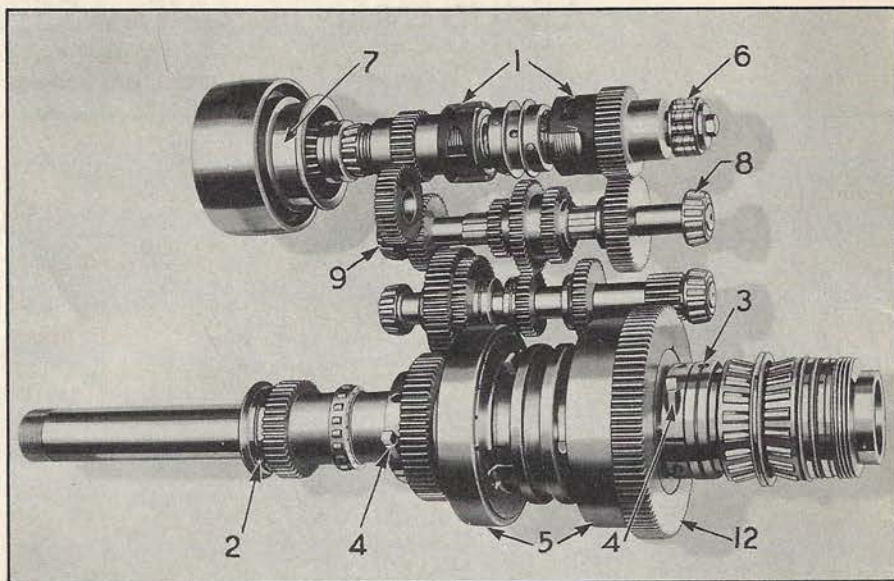


Fig. 14. Six Speed Head of No. 3 Turret Lathes

To keep 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, but they will give years of satisfactory service. To replace the lining, return the drum to the factory. For export shipment it is advisable to order complete new drums.

Pulley Shaft (6) Fig. 14, 15, 16

At the right-hand end the shaft floats in a straight roller bearing (6), to allow for elongation from heat developed by the clutches. A double row Timken Bearing at the left-hand end, locates the shaft endwise.

To Remove Pulley Shaft Assembly

1. Remove the drive pulley (7). Loosen the adjusting collar set screw located on the shaft inside the pulley and unscrew the collar.
2. Remove the screw in the head wall which retains the housing for bearing (6). This housing is not threaded into the headstock.
3. Unscrew the threaded housings which retain bearings (8) and (9) of the gear shaft, drop right-hand end of this shaft assembly down into headstock.
4. By striking the pulley shaft (left-hand end) with babbitt hammer, the entire assembled unit can now be pushed out of the right-hand end of headstock housing.

To Take "Pullmore" Clutches Apart Fig. 12

1. Remove gears and clutch shells from both ends of shaft. This leaves the latter with the two disc units and the spool assembled.
2. Drive out spool center pin (7) Fig. 12.
3. Release clutch adjustments completely on both sides.
4. Compress entire double unit in arbor press or in vise until split collar (6) Fig. 12, on shaft is completely exposed. Remove the latter and one set of discs.

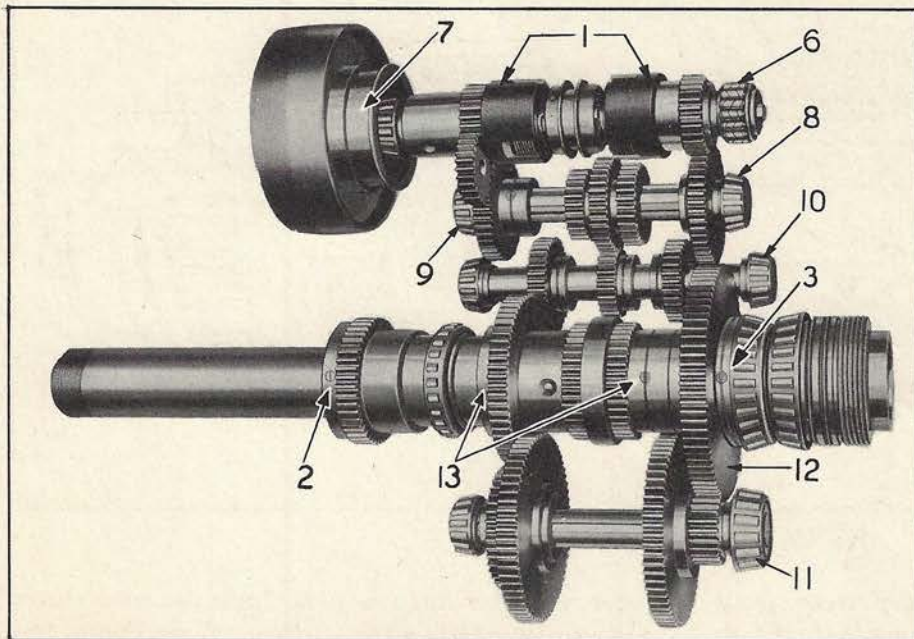


Fig. 15. Twelve Speed Head of No. 4 Turret Lathes

5. Three hardened keys are now exposed which must be removed from the shaft. These are of special shape (5) Fig. 12, and can be withdrawn by gripping each one firmly in a vice and then striking the shaft with a babbitt hammer.
6. The center spool and the other set of discs can now be removed.

To Take "Twin Disc" Clutches Apart, Fig. 13

1. Release clutch adjustments (1) on both sides.
2. Remove gears and clutch shells from both ends of shaft.
3. Remove split collar (2) Fig. 13, from right-hand end of shaft.
4. Loosen screws (3) Fig. 13, and pull off entire clutch.
5. Compress plate unit to expose finger lever pins (4). Drive out finger lever pins (4) and remove fingers (5). The floating plates (6) and clutch plates can then be removed.

Gear Shafts

The gear shafts are mounted on adjustable Timken Bearings. These are adjusted by means of the threaded collars in the headstock. The collars, Fig. 17, are locked by tightening the set screw. The shafts should run free and without drag, but there also should be no lost motion.

To Remove a Gear Shaft

1. Remove the set screws which lock the gears on the shaft.
2. Unscrew the adjusting collar, Fig. 17.
3. Remove the center screw in the non-adjustable collar at the opposite end of the shaft, Fig. 18.
4. It is now necessary to move the gear shaft sideways. This requires sliding it through the inner Timken Bearing race (for instance 10 or 11, Fig. 16) and through the gears on the shaft.

It will be necessary to insert spacers, cut to measured length from cold rolled steel stock, to hold the gears and the Timken race in their proper places while the shaft is being pushed through them. The actual pressure is best exerted by means of a screw fitting the inside thread of the plug, Fig. 18. It is also possible to advance the shaft by inserting a bronze rod through the tapped hole in the plug, and striking the end of this rod with a hammer.

On the gear shaft immediately beneath the pulley shaft, this latter method is the only one possible because there is no plug similar to Fig. 18 in this shaft assembly, both ends having plugs like Fig. 17.

Spindle Bearings

Spindle bearings are carefully set at the factory to suit the speed range in which it is intended to operate the machine. If at any time the spindle is to be speeded up considerably beyond its original range, a man from our factory should be called in to make the proper alterations. Beyond this the bearings require no attention on the part of the user.

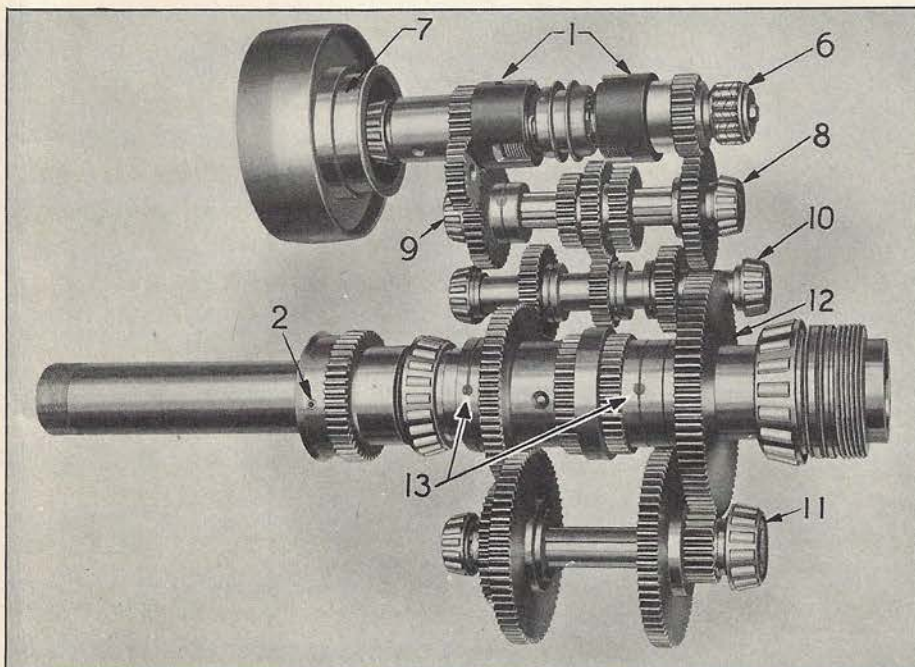


Fig. 16. Twelve Speed Head of No. 5 Turret Lathes

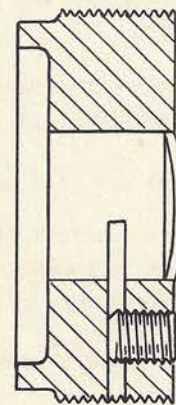


Fig. 17

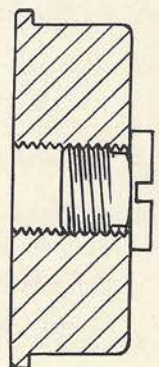


Fig. 18

THE CROSS SLIDE CARRIAGE

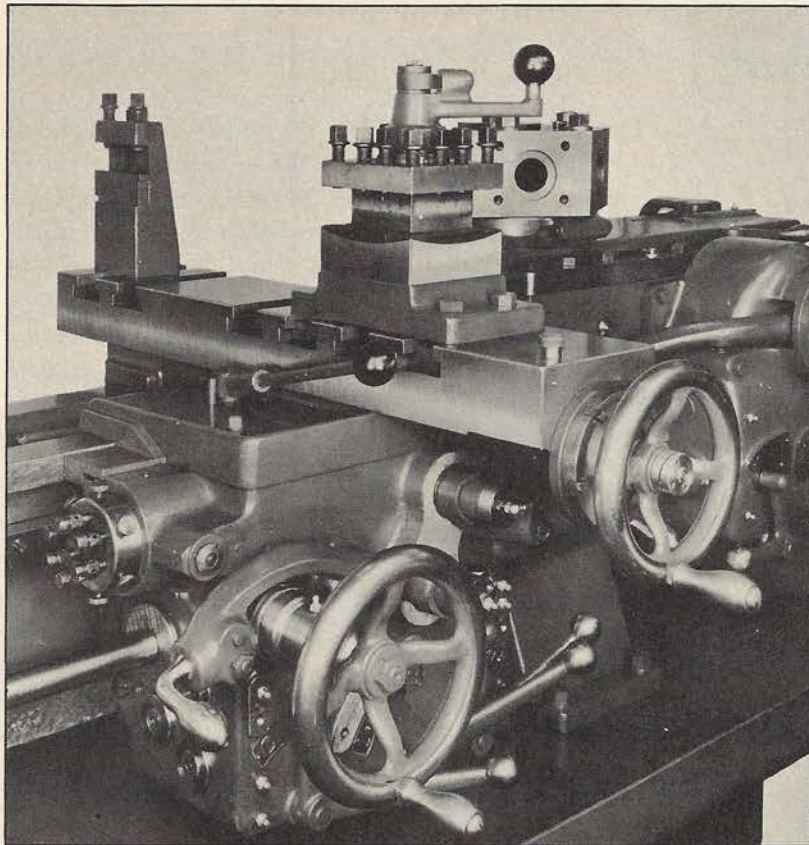


Fig. 19. Universal Cross Slide Carriage

The Cross Slide Carriage, Fig. 19, is gibbed to the inside of the front rail of the bed with a taper gib (6) Fig. 20. In addition, caps are fitted to the front and rear, which bear on the under side of the bed rails.

To Remove the Carriage

1. Support the apron from the pan with wooden blocks and wedges.
2. Release the bed clamp, remove its handle and unscrew the bolt (5) Fig. 20.
3. Remove the taper gib (6) Fig. 20.
4. Remove the five cap screws (1) Fig. 20, taking care to loosen first the slotted head set screws (7) which lock cap screws in place.
5. Remove the cross slide to reduce the weight to be handled. To do this, unscrew nut (4), remove handle and dial, and then pull cross slide off by hand. If it moves too hard, loosen its taper gib at the rear.
6. Loosen dowel (2), by twisting its head.
7. Remove the six bolts (3), which hold the apron

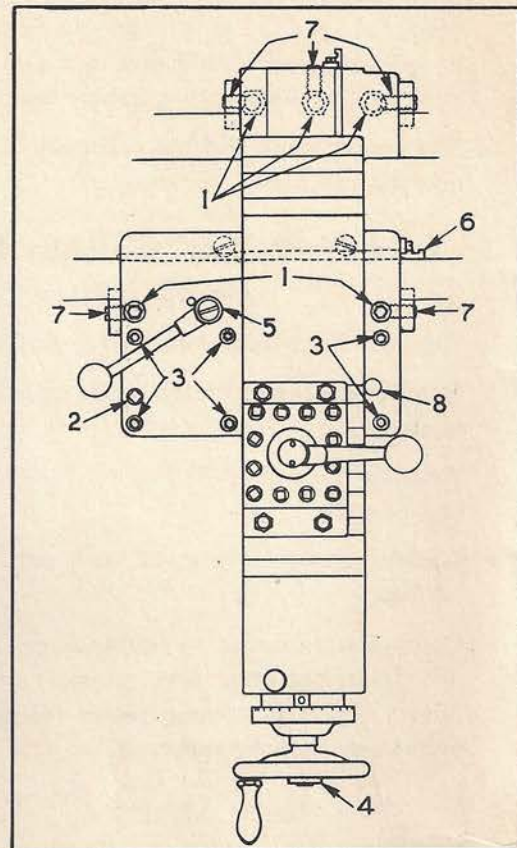


Fig. 20. Top View of Cross Slide

to the carriage, and the latter can then be lifted off. Be sure to raise carriage high enough to avoid bending the cross feed knockout plunger (8) Fig. 20.

To Assemble the Carriage

Proceed in the reverse order of instructions for removing it. Clean out the oil channels carefully before doing so and finally be sure to lock the bolts (1) Fig. 20, after adjusting the caps. In lowering the carriage on the apron, be careful not to bend the cross feed knockout plunger (8).

To Remove the Cross Slide

Always loosen the nut (4) in front, remove the handle and dial, and then pull cross slide off by hand. If it is desired to remove the cross feed screw, replace the handle and unscrew it separately.

To Assemble the Cross Slide

Proceed in the reverse order for removing it. This procedure makes it easier to engage the key in the feed screw driving pinion with the keyway in the feed screw without damaging the thread of the latter.

The Square Turret

The square turret is the automatic indexing type. Units recently made have the timed relation of the members marked so that they can be assembled speedily. Look for these marks at (6) and (8) Fig. 21, on shaft and collars.

CAUTION: Some of the earlier units were not marked and it is advisable to punch four marks as shown at (6) and (8) before taking the unit apart, to facilitate proper timing on assembly.

The Indexing Mechanism Functions as Follows: Fig. 21

Pawl (4) acting on collar (5) disconnects the handle from stud (7) during the operation of clamping the turret to its seat, but at all other times holds collar and handle in timed relation to each other. Collar (9) has ratchet teeth which, through pawl (10) make indexing of the turret possible. Latch (12) drops the lockbolt (13), out of the lockbolt bushing (15). The lockbolt spring is retained by plate (14).

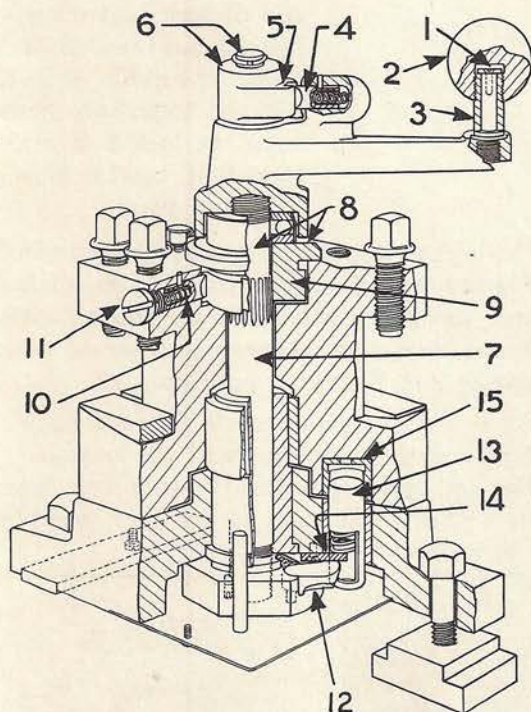


Fig. 21. The Automatic Indexing Square Turret

To Take Square Turret Apart:

Lift off Collar (5) Fig. 21, and unscrew the handle. Release set screw (11) and lift Turret off, together with collar (9). The lockbolt bushing (15) can be pushed out of its seat by inserting a screw into the thread in the head. The lockbolt should be lubricated with light oil, not machine oil, before assembling. It has a close, ground and lapped fit in the bushing and may stick if machine oil is used on a new assembly.

The automatic indexing feature can be locked, making a hand indexed turret out of the unit. To do this, consult Fig. 22 and text below.

Pin (16) is already in place, and hole for screw (17), though not used, has been tapped into the base. Insert into it a $\frac{3}{8}$ x 16 per inch $\frac{1}{2}$ inch long screw with $\frac{1}{2}$ inch diameter head. This screw can be obtained from the W & S Company or can be quickly made in the tool room.

Remove set screw (11) Fig. 21, withdraw plunger and spring (10) and return set screw.

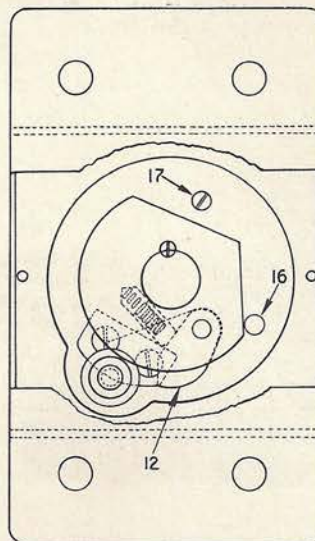


Fig. 22. Bottom of Square Turret showing arrangement for converting into a hand indexed unit

NOTE:

Some of the first automatic indexing turrets made did not have the auxiliary hole tapped into the base. If it is desired to convert one of these turrets, ask for instructions for locating the tapped hole from the Warner & Swasey Company, giving the serial number of the machine the turret is used on.

Taper Attachment

This unit can be furnished with the machine or it can be installed later. In the latter case, installation instructions are sent with the unit.

It is also possible to purchase as an additional feature a feed nut slack eliminator Fig. 23. This feature is necessary for cutting irregular shapes such as crowns, profiles, etc., with reverse curvatures. The installation requires the accurate location, and counterboring of one cross hole, a simple operation if a boring mill or milling machine is available.

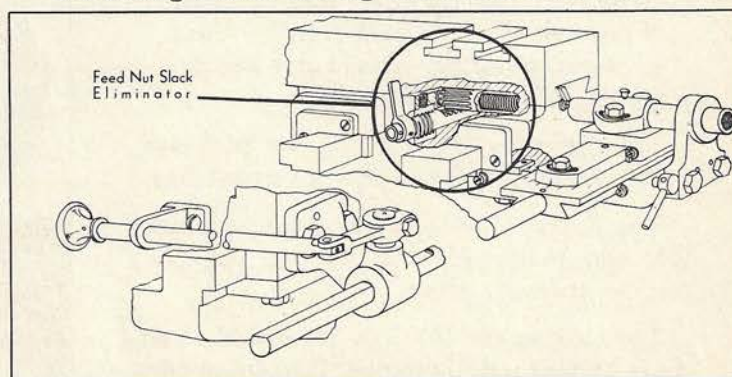


Fig. 23. Taper Attachment Feed Nut Slack Eliminator (To Special Order Only)

THE TURRET SLIDE AND SADDLE

The Saddle is clamped to the bed with four bolts on each side (1), Fig. 24. It is aligned against the side of the bed by two shoes backed up by set screws and lock nuts (2). These shoes should be adjusted to a sliding fit and locked. Then they require practically no further attention, as 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.

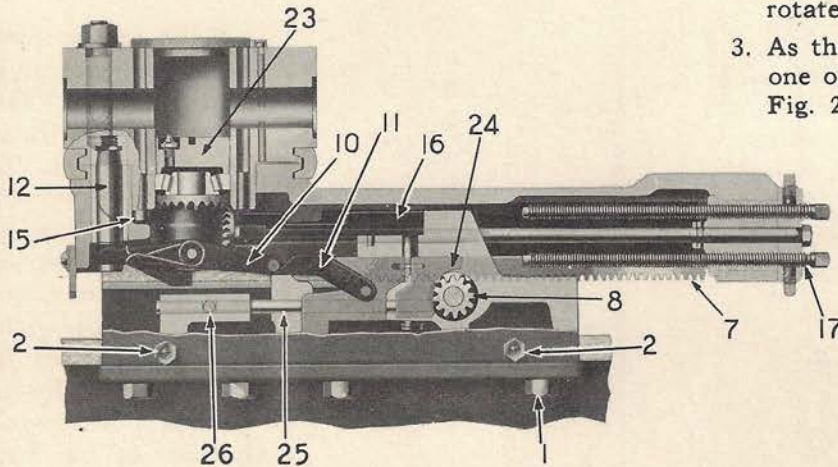


Fig. 24. Phantom View of Turret Slide and Saddle

Hardened and ground steel wear-strips on which the slide rides (3), Fig. 25, are anchored in the saddle. These are replaceable and can be supplied thicker than standard for repair purposes.

Side alignment is obtained through two taper gibs (4), Fig. 25. Care should be used and both sides moved the same amount, to keep the turret in alignment with spindle. In case of doubt, an alignment check should be made (See chapter on alignment).

CAUTION: When making alignment check, be sure to test the bed first, because the turret may be "out" because of bed twist (See Pages 5 and 6). Such an error obviously should not be corrected by gib adjustment.

The top caps (5), Fig. 25, are provided with taper gibs (6) for adjusting vertical play.

The Turret Slide is operated through rack (7), and pinion (8) Fig. 24 and Fig. 25, on the turnstile shaft.

The rack screws (9), Fig. 26, should at all times be kept well tightened. Two dowel pins take the feeding thrust load, relieving the screws of all side strain.

The Indexing Mechanism Functions as Follows:

1. Beginning with the slide in its forward position, moving it to the rear causes lock bolt lever (10), Fig. 24, to strike the rising angle of tumbler (11). This action lowers the lock bolt (12) and frees the turret.
2. At the same time the turret binder ring has been released, because toggle (13,) Fig. 27 has been swung to the unlatched position by its passing over stud (14) on the rear top cap.

The turret is now free to rotate and can be rotated by hand in either direction.

3. As the turret slide moves farther to the rear, one of the six index pins (15), Fig. 24 and Fig. 26, contacts with pawl (16), Fig. 24 and 25, holding the pin against further movement and thus causing the turret to rotate one-sixth turn.

4. In the meantime the rear end of lock bolt lever (10), Fig. 24, has reached the rear corner of tumbler (11), causing the lock bolt lever to snap the lock bolt into the lock bolt bushing in the hexagon turret.

5. During this turret rotation the stop roll unit (17), Fig. 24, has also been rotated one-sixth of a turn through a bevel gear connection with the turret, bringing the next stop screw (bottom screw) into operative position.
6. As the turret slide travels forward again, the binder ring is clamped and the tumbler (11), Fig. 24, rises, allowing the lock bolt lever to pass, then drops back to its seat, completing the cycle.

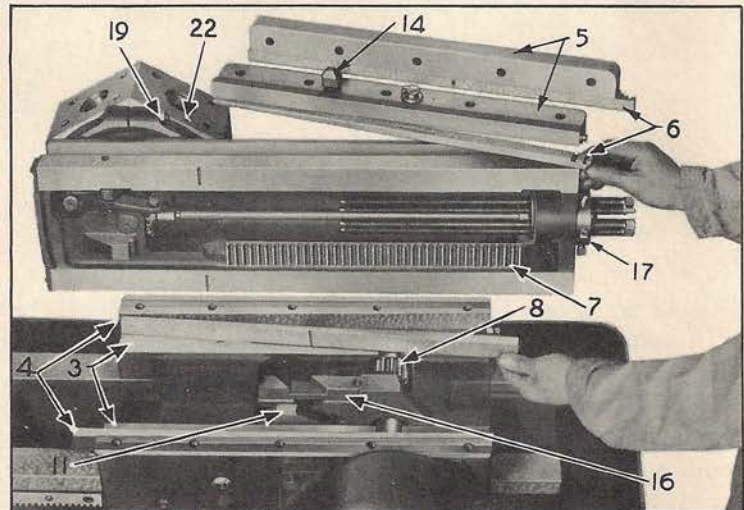


Fig. 25. Bottom of Turret Slide

To Remove the Turret

Move the turret slide to its rearmost position to free the binder ring. Then unscrew the two nuts and the front screw that hold the two halves of the binder ring together (18) and (19), Fig. 26. The ring can then be taken off and the turret lifted off its seat.

To Adjust the Binder Ring

1. Place turret slide in extreme rear position.
2. See that the slot between the two ring halves at the front is $\frac{1}{8}$ inch wide. Lock the front screw with its lock nut (19), Fig. 25. 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 inches.
4. Rotate turret so that one of its corners (instead of a face) points toward the spindle. In this position the lock bolt cannot enter into the lock bolt bushing and the turret can be rotated by hand.
5. Advance turret slide so that toggle (13), Fig. 28, has risen to within $\frac{1}{8}$ inch from the top on the angular surface of the toggle actuating stud (14) as indicated in the cut.
6. In this position, clamp turret slide in its saddle with clamp handle (20), Fig. 26.
7. Now adjust nut (18), Fig. 27, 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 (18) Fig. 27.
9. When the turret is now advanced farther, the corner of tumbler will rise the additional $\frac{1}{8}$ inch and clamp the turret the correct amount for satisfactory performance.

The toggle actuating stud (14), Fig. 28, is threaded into the top cap. It is locked with set screw (21). The setting should not be disturbed. It has been adjusted properly in assembly. If it is necessary to remove the stud, measure its projection (A), Fig. 28, from the cap and re-establish this height on assembly, as shown in the cut.

Binder Ring Breakage

1. 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 the above instructions are not carried out.

2. 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 (14), Fig. 27, on its return stroke instead of rocking over it.
3. When fitting a new ring, scrape the taper surfaces for good contact.

To Adjust the Timken Bearing in Center of Turret

1. Bring turret slide to extreme rear position.
2. Loosen set screw (22), Fig. 25, which locks the bearing adjusting plug (23), Fig. 24.
3. Unscrew the latter a fraction of a turn until free.
4. Advance turret and check binder ring adjustment as described in previous chapter.
5. Advance turret farther to fully clamped position.
6. Bring bearing adjusting plug (23), Fig. 24, down forcefully to a solid and firm 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 bearing.

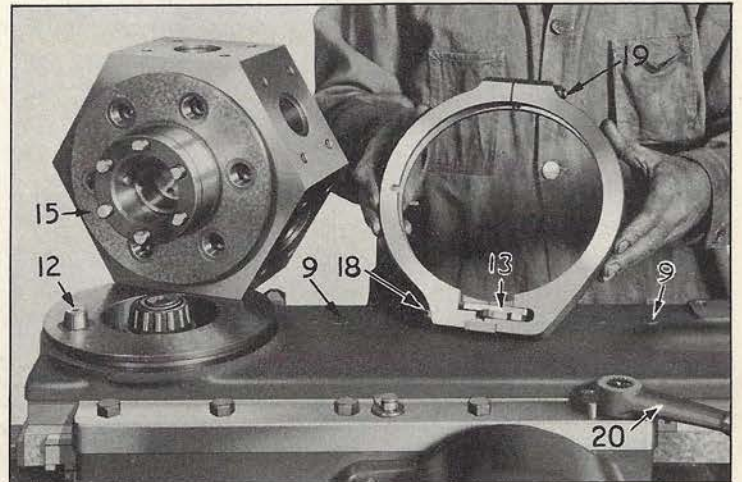


Fig. 26. Turret Seat and Circumference Binder Ring

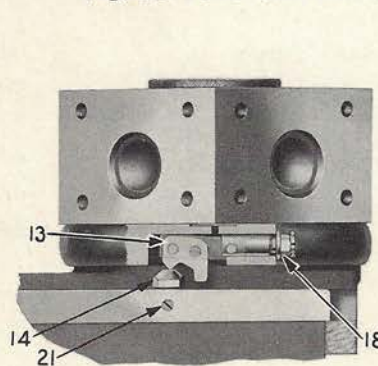


Fig. 27. Turret Binder Mechanism

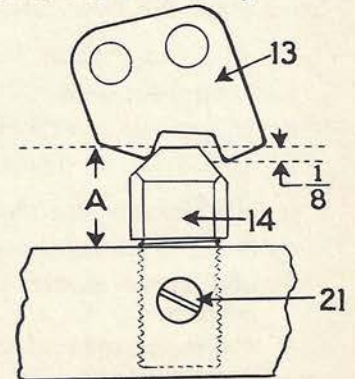


Fig. 28. Proper Toggle Stud Adjustment

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 out will allow the turret slide to function properly again.

A chip protector, Fig. 29, can be furnished, which can be 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 instead.

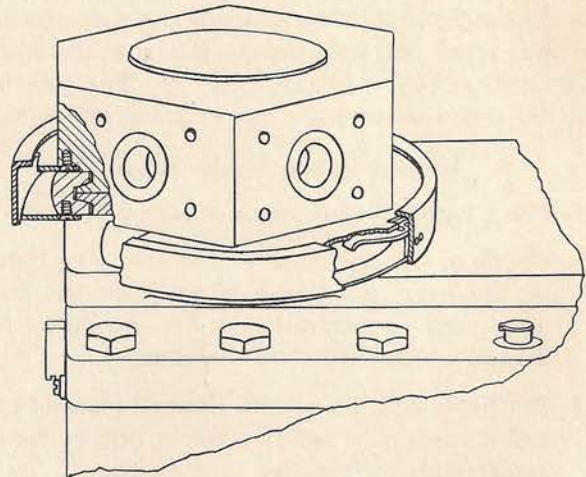


Fig. 29. Chip Protector for Hexagon Turret
(for Brass and Aluminum Work)

THE FEED TRAIN

The Feed Train consists of—The Head End Gear Box, Fig. 11 (A)—the Feed Shaft (B)—Carriage Apron (C)—Hexagon Turret Apron (D).

The Hexagon Turret Apron (Fig. 31)

The power is transmitted through the feed shaft (1) to the gear shaft (2). The final reduction is through a worm on shaft (3) to the worm gear and friction clutch (4) mounted directly on the turnstile shaft where a pinion operates the rack shown at (5). See also (7) and (8) Fig. 24.

The feed clutch (4) is shown in Fig. 31. It is engaged through raising handle (6) Fig. 30, whereby its trip pin (7), Fig. 30 and 32, is made to fall into bushing (8), Fig. 30. See also (8), Fig. 32. Inside of this bushing slides the feed knockoff rod shown at (9), Fig. 30 and 32.

When the turret slide stop screw (17) strikes anvil (24) Fig. 24, the latter moves forward and imparts this motion also to rod (25) Fig. 24, (See also (10), Fig. 30), which in turn through an angular flat or cam surface pushes out the feed knockoff rod (9) Fig. 30 and 32, thereby disengaging the feed clutch handle and the feed clutch.

To Adjust the Feed Clutch

1. Loosen set screw (11) Fig. 31.
2. Adjust clutch with threaded plug (12).
3. Lock collar by tightening set screw (11).

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. 30.
5. Remove feed shaft coupling pin at head end gear box.
6. Withdraw feed shaft.
7. Support the apron in the pan with wooden blocks and wedges.
8. Remove four bolts (15) Fig. 30.
9. Apron with turnstile shaft can now be withdrawn.

The taking apart and assembly of the apron, Fig. 30 and 31, requires no special instructions. To reach the friction clutch, the worm and gear shafts must be removed first. The clutch is similar to that shown in Fig. 36. When assembling it, make sure that the four plungers (1) Fig. 36, 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 hex turret apron on the machine, leave bottom plate off until assembly is completed. This is necessary in order to make sure that feed shaft is properly entered into triple gear cluster with its key. Insert feed shaft with keyway facing down. Make sure gear cluster is assembled with small gear to the right.

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).

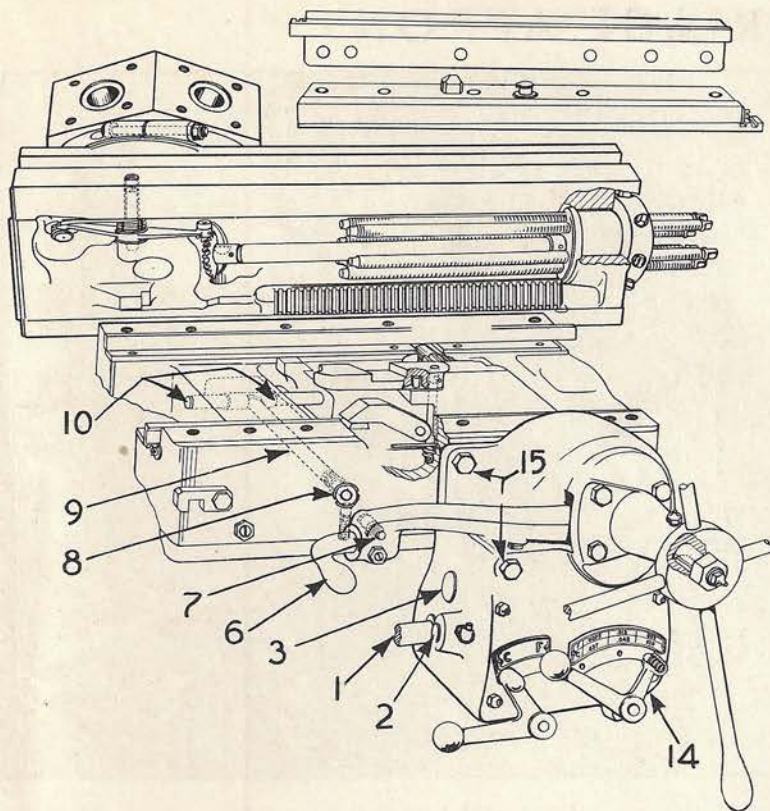


Fig. 30. Hexagon Turret Saddle and Apron

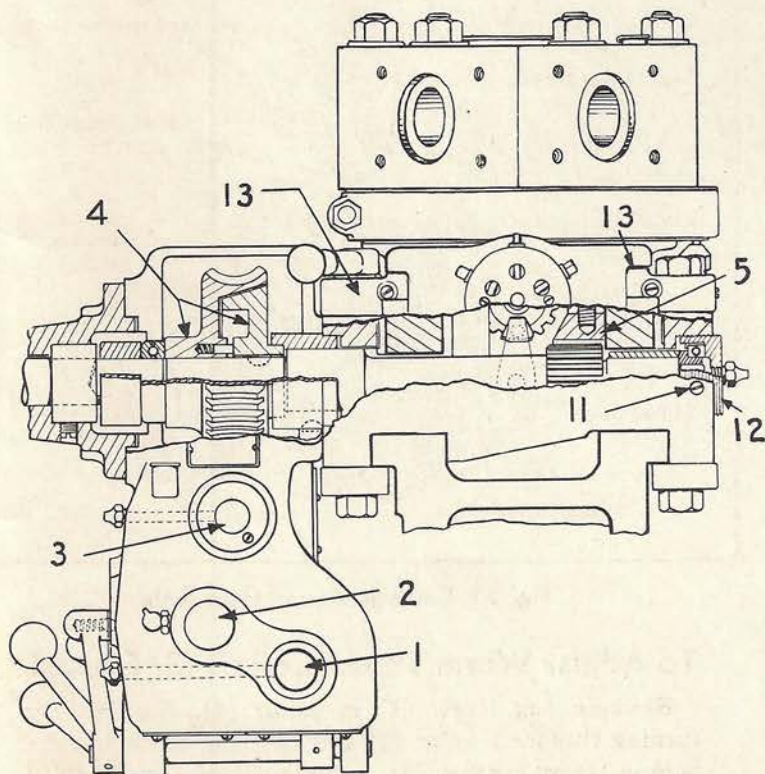


Fig. 31. End View of Saddle and Apron Unit

**To Adjust the Feed Knockoff Bushing
(See (8) Fig. 30 and 32)**

1. Loosen set screw (4), Fig. 32.
2. Advance turret slide toward spindle by rotating the turnstile by hand and bring it to a solid stop. This will push feed knock-off rod (9) Fig. 32, to its extreme out position.

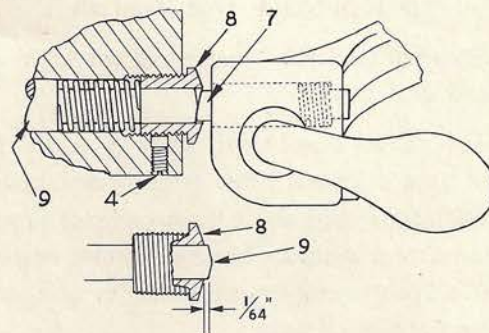


Fig. 32. Power Feed Knockoff Adjustment

3. Adjust bushing (8) until rod (9) projects approximately 1/64 inch.
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 inch more by hand. If this amount is more or less than the above, adjust bushing (8) until corrected, being mindful of the caution note given 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 the dead stop with its full feeding pressure!

**To Adjust Worm Thrust Collars
(See (3) Fig. 31 and 34)**

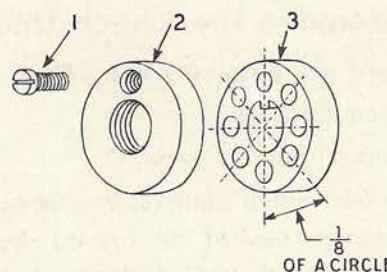


Fig. 33. Worm Shaft End Play Adjustment Collar

Remove dog screw (1) in collar (2) Fig. 33. By turning threaded collar (2) and entering screw in next hole in thrust washer (3), adjustment of one-eighth of a revolution is possible.

THE CARRIAGE APRON

The action of the carriage apron is similar in principle to the hexagon turret apron, except that a second clutch (6), Fig. 34 and 35, is incorporated for cross feeding, clutch (4) being for longitudinal travel.

To Remove the Apron

1. Remove feed shaft coupling pin at head end gear box.
2. Turn Feed Shaft until keyway is on the bottom to prevent key falling out of gear. Withdraw feed shaft from carriage apron only, and support the right-hand end of shaft projecting from the hex turret apron on a horse or box.
3. Support the apron in the pan with wooden blocks and wedges.
4. Remove dowel pin (2), Fig. 20, by twisting its square head.
5. Remove the six hollow head screws that hold the apron on to the carriage (3) Fig. 20.
6. The apron can now be dropped until the alignment keys are free from the carriage and it is then free to slide away from the bed. Be very careful to lower apron far enough to clear cross feed knockout plunger (8) Fig. 20.

If it is desired to remove the clutches for cleaning or repair, it is not necessary to remove the feed gear train, as the clutches can be reached from above.

To Remove the Clutch Units

1. Remove dog screw (4) Fig. 36.
2. Unscrew collar (5).
3. Pull off all outside parts.
4. Cross feed clutch shaft (6) Fig. 34 and 35, can now be pushed out toward the rear while longitudinal feed clutch shaft (4) slides out to the front.

For the removal of the remaining gear shafts, no special instructions are required. The worm shaft thrust collar adjustment is the same as that shown in Fig. 33.

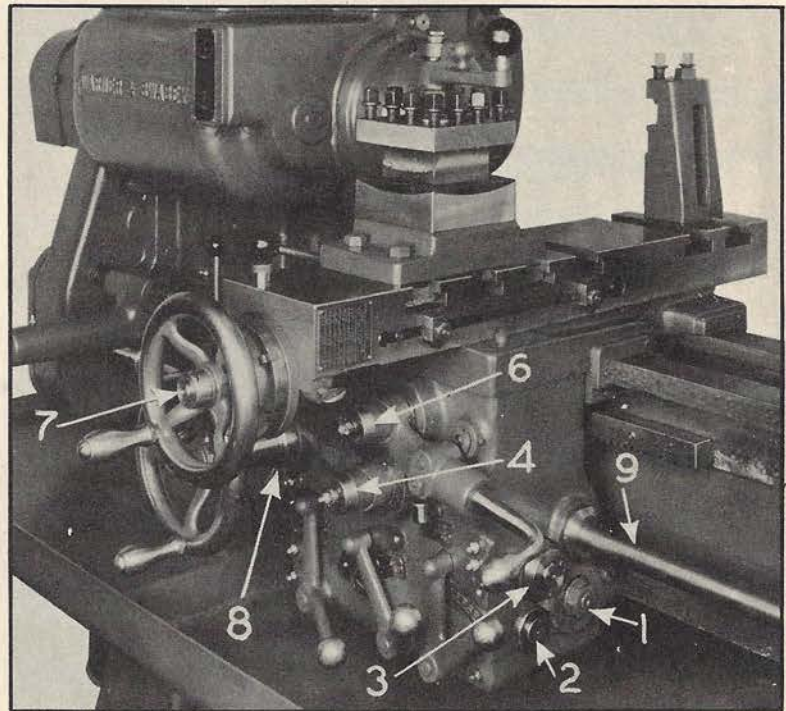


Fig. 34. Universal Carriage Apron

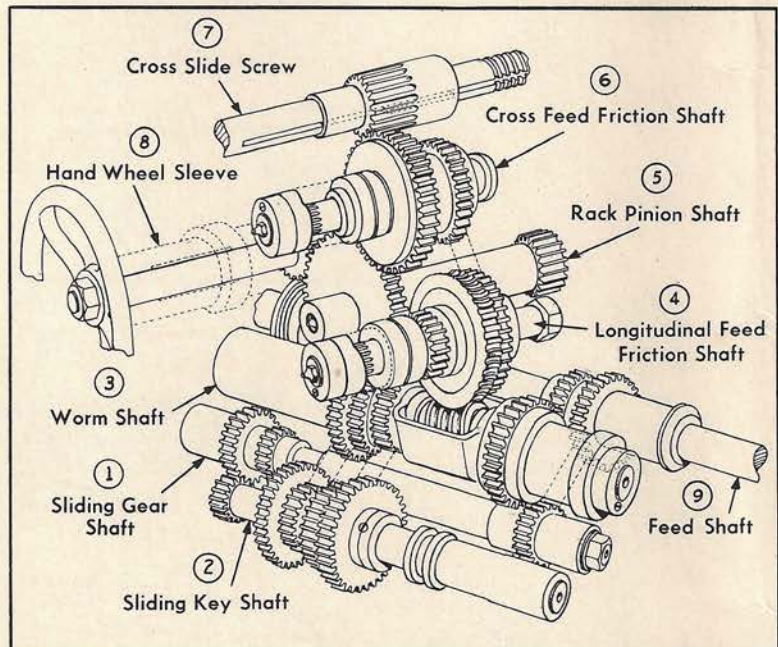


Fig. 35. Carriage Apron Gear Train

To Adjust Worm Thrust Collars (3) Fig. 34

Remove dog screw (1) in collar (2), Fig. 33. By turning threaded collar (2) and entering screw in next hole in thrust washer (3), adjustment of one-eighth of a revolution is possible.

Longitudinal Feed Stop Roll (6) Fig. 37, is removed by loosening screw (4), unscrewing bushing (1) and withdrawing plunger (2).

Remove screw (7) to relieve spring pressure on ball (8). Turn stop roll slightly so that ball (8) will be pushed back into hole. Stop roll may now be pulled out. Be careful that ball (8) does not fall into apron.

When assembling the apron, be certain that the key in the longitudinal feed clutch shaft (2) Fig. 36, is in line with the keyway in the casting. It would be well to chalk the shaft end and mark the position of the keyway on it.

The lower gib should be released before mounting the apron and adjusted after completing the assembly.

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).

To Adjust Feeding Frictions

Friction adjustment collar (5) Fig. 36, has two holes, the lower hole being one-twenty-fourth of the circumference out of line with top hole. The cam next to it (6) Fig. 36, has 12 holes. By entering screw (4) alternately in upper and lower hole, adjustment of one-twenty-fourth of a revolution is possible.

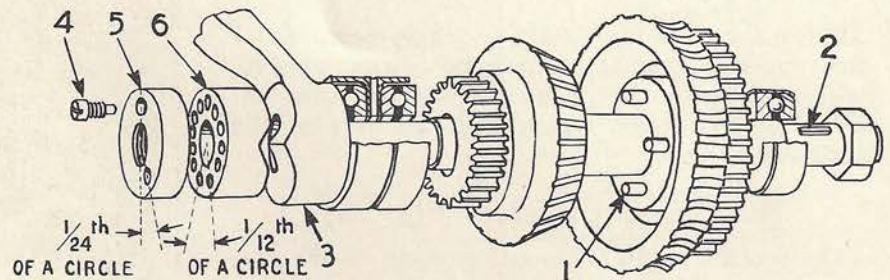


Fig. 36. Longitudinal Feed Clutch Assembly

To Adjust the Feed Knockoff Bushing

(See Fig. 37)

1. Loosen set screw (4).
2. Advance carriage along bed toward the left by rotating the handwheel by hand. Bring it to a solid stop. This will push feed knockoff rod (2) to its extreme out position.
3. Adjust bushing (1) until rod (2) projects approximately $1/64$ inch.
4. Pull carriage back a small amount, engage longitudinal power feed and allow it to trip off.
5. It should now be possible to advance the slide by hand $1/64$ inch more. If this amount is more or less than the above, adjust bushing (1) until corrected, being mindful of the caution note given below.
6. Lock bushing (1) by tightening screw (4).

CAUTION: Extreme care must be used not to engage power feed until step (3) has been carried out, for if the rod (2) did not project, it could not knock off the feed, and the power feed would pull against the dead stop with its full feeding pressure!

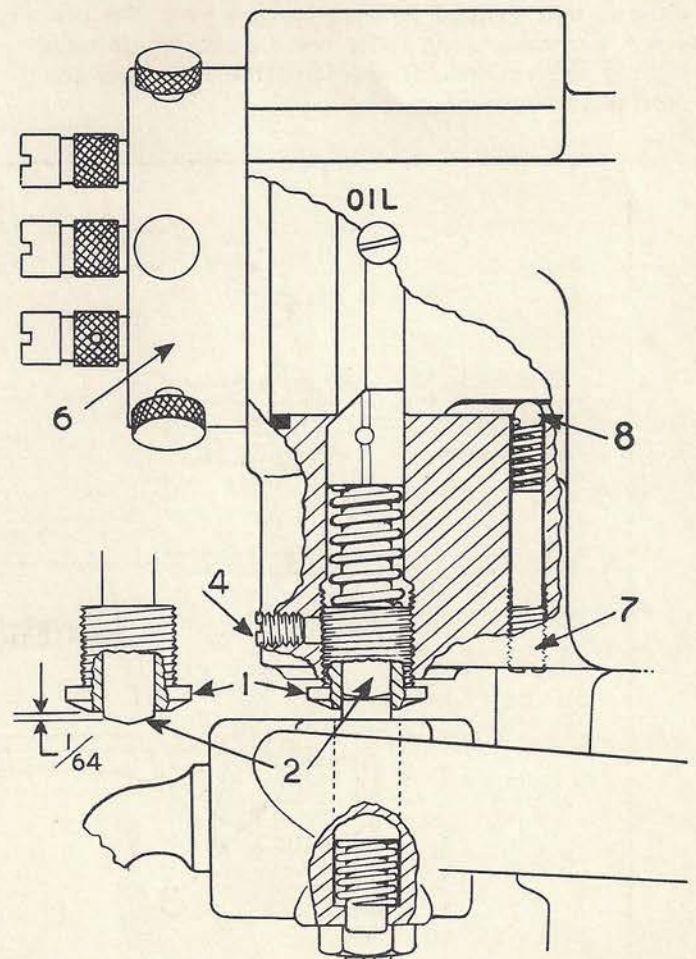


Fig. 37. Longitudinal Stop Roll and Feed Knockoff Adjustment

Head End Gear Box

Removable change gears, Fig. 38, of ratio 1 to 1 are furnished with the standard machine giving standard catalog feeds. For special requirements, the feeds can be doubled or halved, changing thereby all feeds of the aprons in proportion. A special set of gears is available for this purpose.

To Remove the Entire Gear Box

Disconnect the feed shaft coupling, remove bar chuck operating units, remove two dowel pins by twisting them by their square heads, and then unscrew the four bolts which hold the box to the headstock.

The Coolant System (Fig. 39)

The coolant pump (1) is self priming. If the machine is run without coolant for any length of time, the coupling (2) should be disconnected so that the pump does not rotate.

The coolant strainer (3) should be removed occasionally and cleaned thoroughly. If the coolant ceases to flow freely the cause is generally a clogged strainer.

The coolant reservoir in the foot end leg 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.

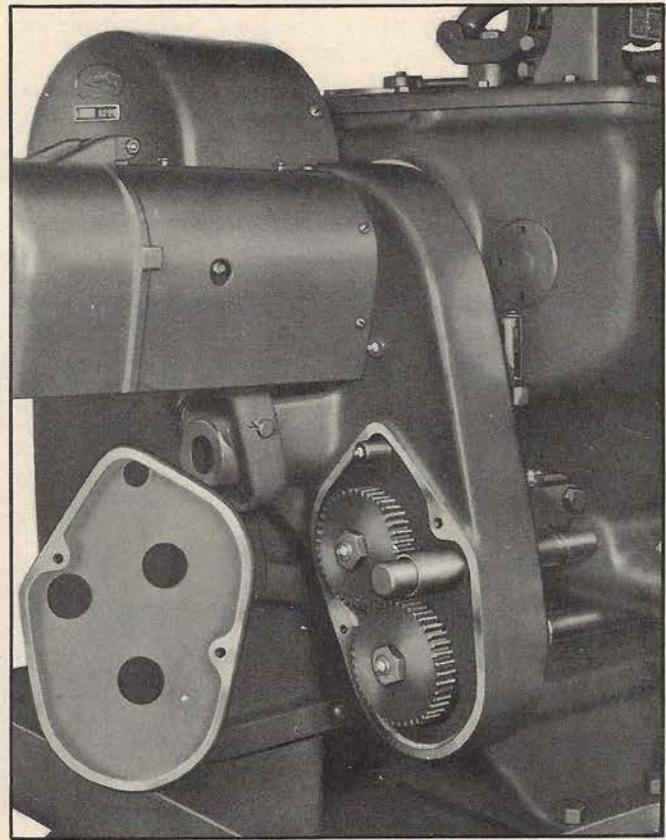


Fig. 38. Head End Change Gear Box

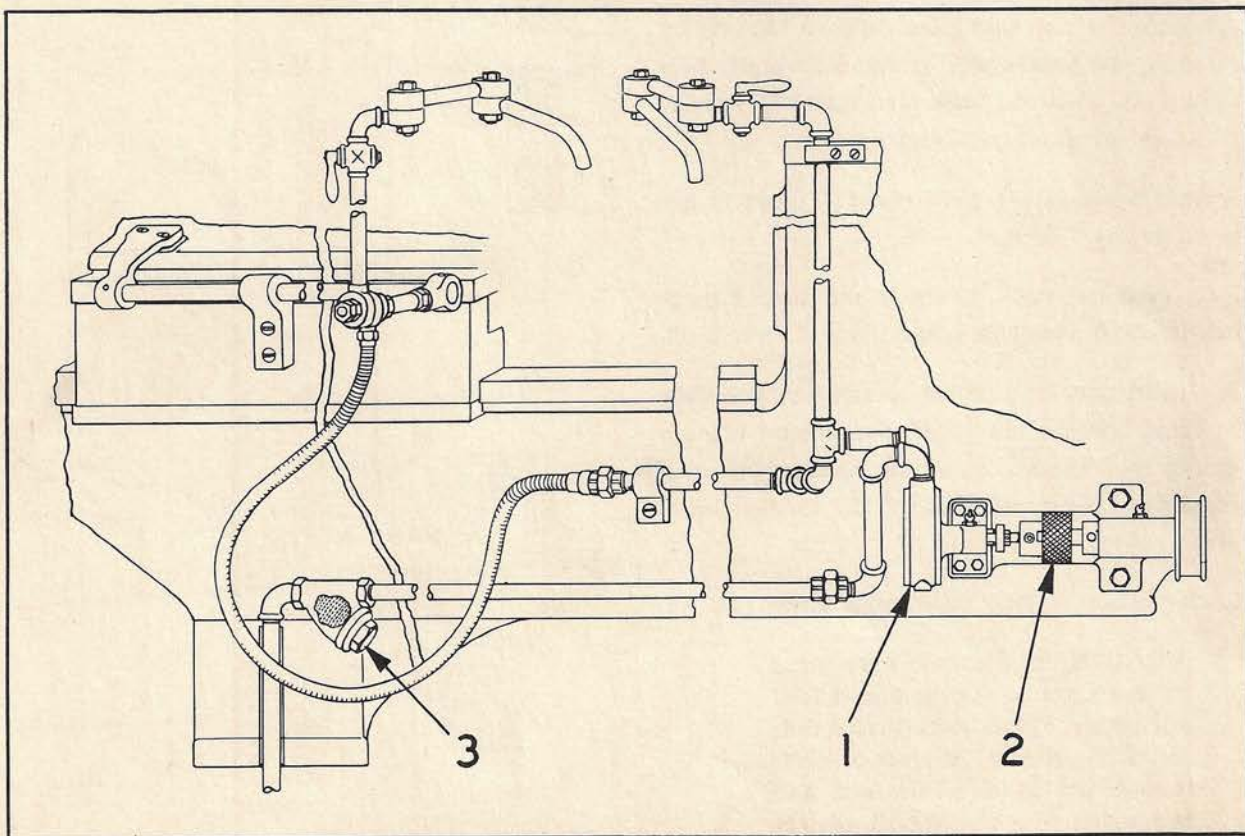


Fig. 39. Coolant Pump and Strainer

FORM NO. 101

MACHINE TOOL STANDARD DATA SHEET

THE WARNER & SWASEY CO.
CLEVELAND OHIO, U.S.A.

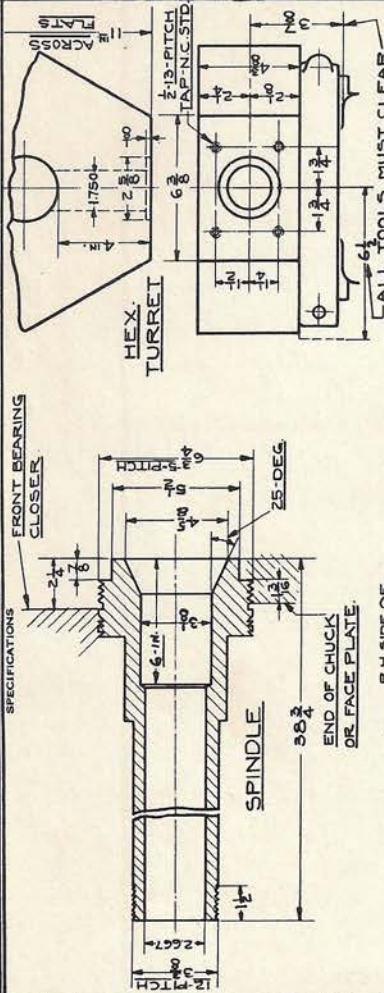
BUILDER'S SERIAL NUMBER

M-1240
MACHINE DESCRIPTION
WARNER & SWASEY
N°5-TWELVE SPEED ALL GEARED HEAD TURRET LATHE

STARTING LOT - 8
USER'S MACHINE NUMBER

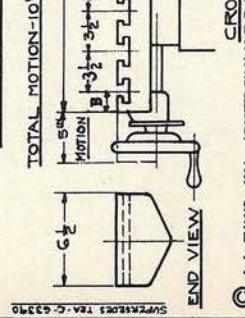
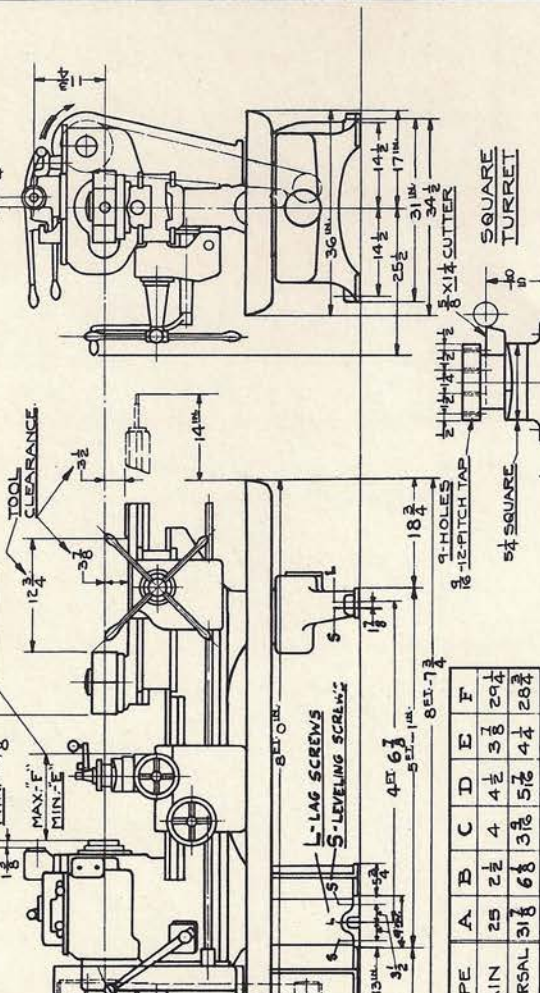
INSTALLATION

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.

DRIVE PULLEY - 10 IN. DIA. 3/4" FACE
600-R.P.M. STANDARD
1200-R.P.M. DOUBLE
3/4" DOUBLE BELT



SPEED AND FEED TABLE

STANDARD		STANDARD & DOUBLE	
DRIVE PULLEY		DRIVE PULLEY	
600-R.P.M.		1200-R.P.M.	
26	151	26	151
34	198	34	198
47	274	47	274
62	364	62	364
81	475	81	475
112	658	112	658

FEEDS PER REVOLUTION OF SPINDLE FOR UNIV. CARRIAGE - M-1248

CROSS FEEDS	LEVER POSITIONS	LONG. FEEDS
.003	F 1	.0045
.0045	F 2	.007
.007	F 3	.012
.0115	C 1	.019
.0175	C 2	.029
.027	C 3	.045

FEEDS PER REVOLUTION OF SPINDLE FOR HEX. TURRET SLIDE - M-1244

CROSS FEEDS	LEVER POSITIONS
.005	F 3
.0075	F 1
.012	F 2
.020	C 3
.030	C 1
.049	C 2

AUTOMATIC CHUCK CAPACITY

ROUND - 2 1/2 SQUARE - 1 1/2 HEXAGON - 1 1/2 HOLE IN AUT. CHUCK PLUNGER - 3/16

SWING OVER BED - 20" OVER CROSS SLIDE - 10 1/4 TAPER ATTACHMENT CAPACITY 3/16" PER FT. - 8" LG. MAX. LENGTH TURNED - 13" IN.

NOTE: TWO CHANGE GEARS CAN BE FURNISHED ON SPECIAL ORDER FOR HEAD END GEAR BOX. THESE WILL HALVE OR DOUBLE ALL FEEDS AND CHASING PITCHES.

DR. BY G. S. *APP* DATE JAN 13, 1936 DWG. NO. C-74517

FLOOR PLAN HP. WT.

FACTORY LAYOUT 8 FT 7 1/2

TEE SLOTS

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LENOX TRACING CO. E. K. ELLIOTT CO.

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

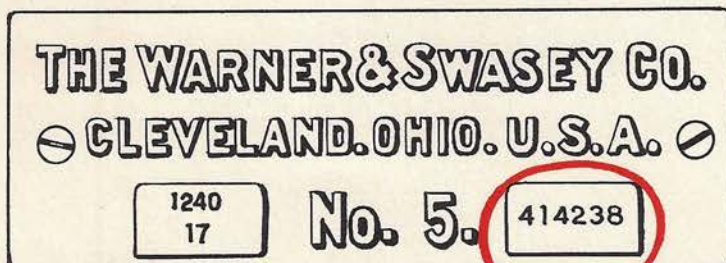
1 Piece 1A-150 Clutch Fork
3 Pieces 1E-177 Bearings
For Serial Number 414238

Example For Ordering By Telegraph

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

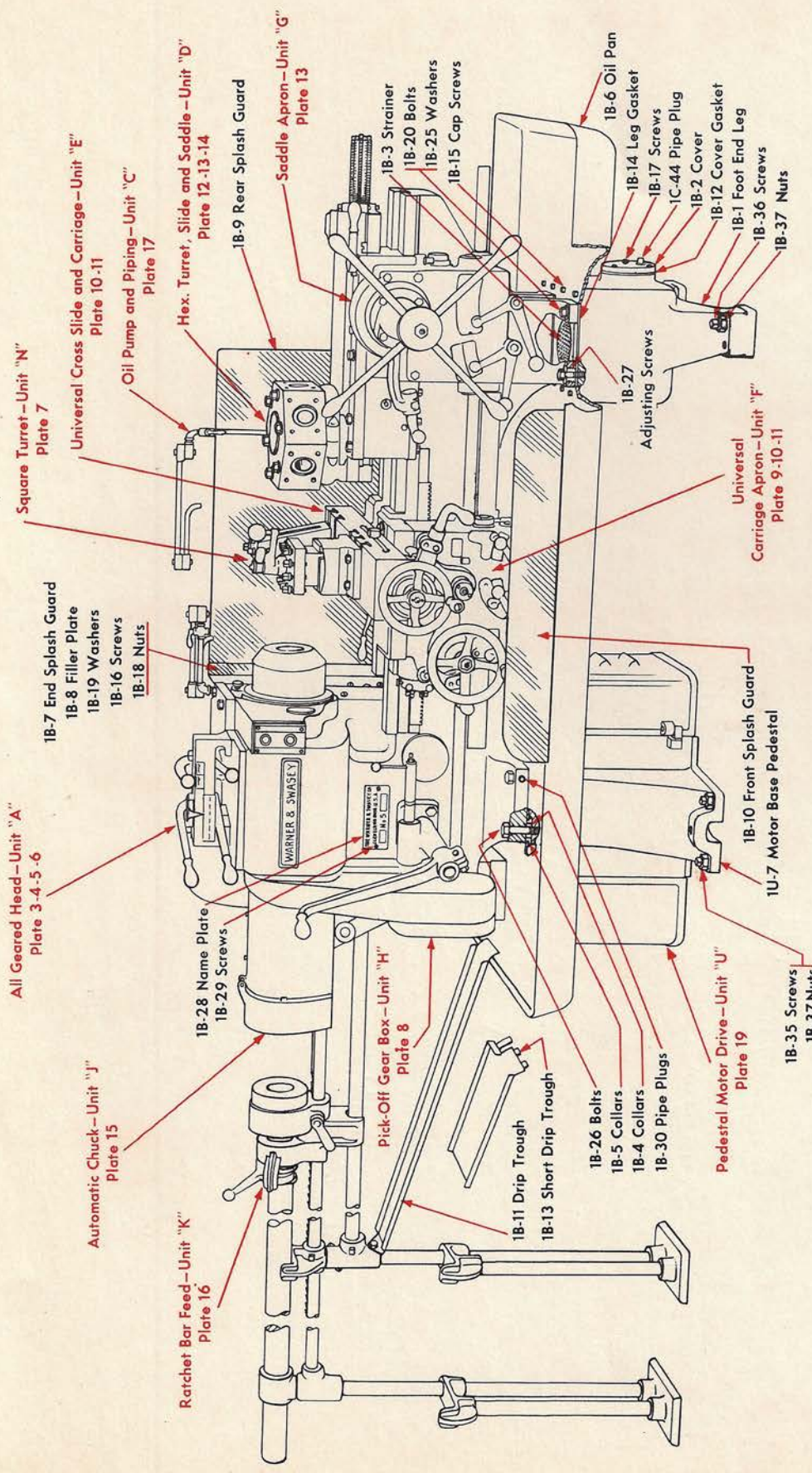
The SERIAL NUMBER IS ABSOLUTELY NECESSARY due to the numerous machine designs. The symbol letters and numbers shown in this book simply designate the location of the part on the machine. Parts are not carried in our stock under these numbers, therefore, the symbol letter and number alone is not sufficient,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

Bed, Pan and Legs - Unit "B"



When Ordering Parts

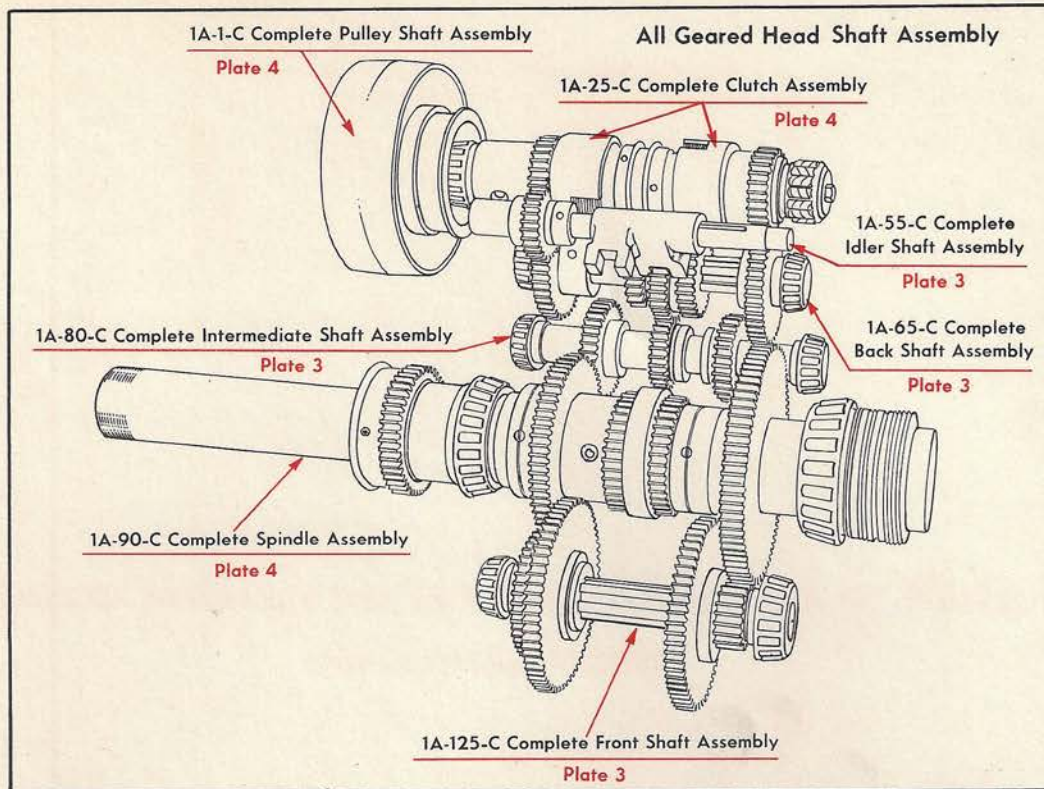
Be sure to give the serial number that is stamped on the name plate.

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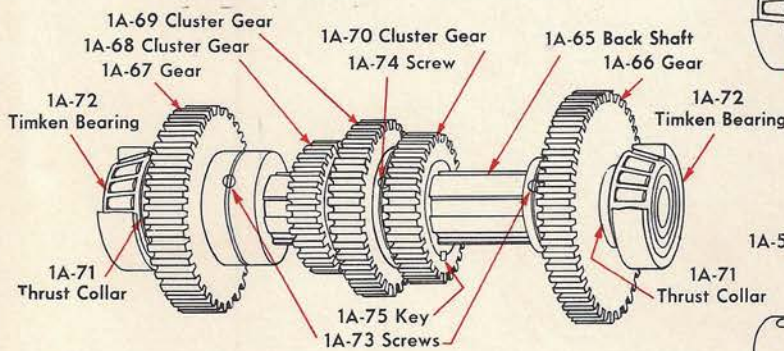
Before ordering parts read instructions on Plate 1

All Geared Head - Unit "A"

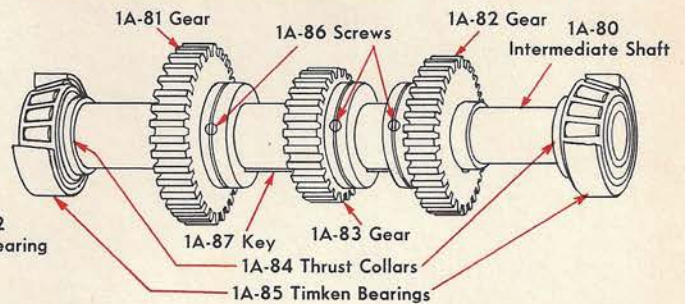


Before ordering parts read instructions on Plate 1

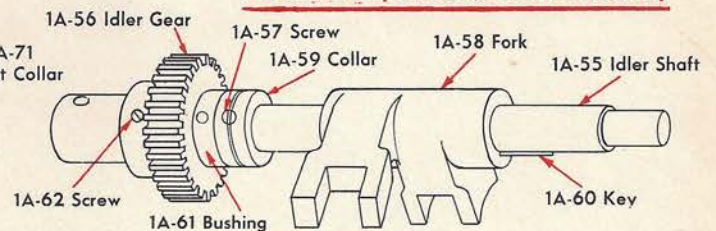
1A-65-C Complete Back Shaft Assembly



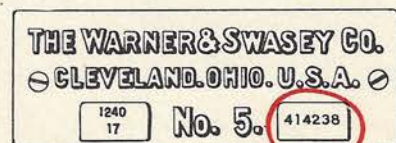
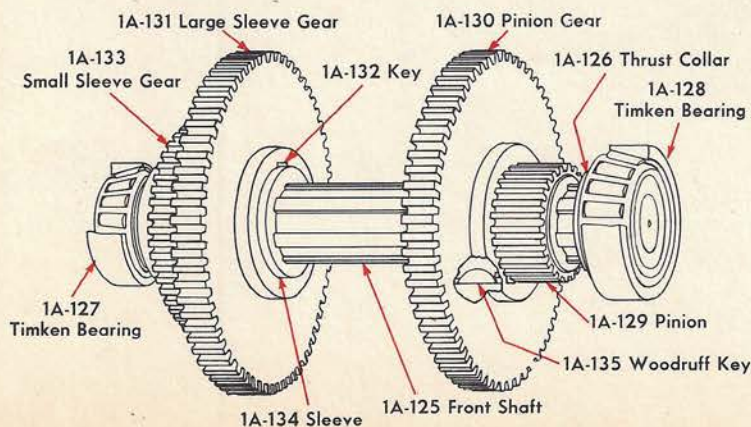
1A-80-C Complete Intermediate Shaft Assembly



1A-55-C Complete Idler Shaft Assembly



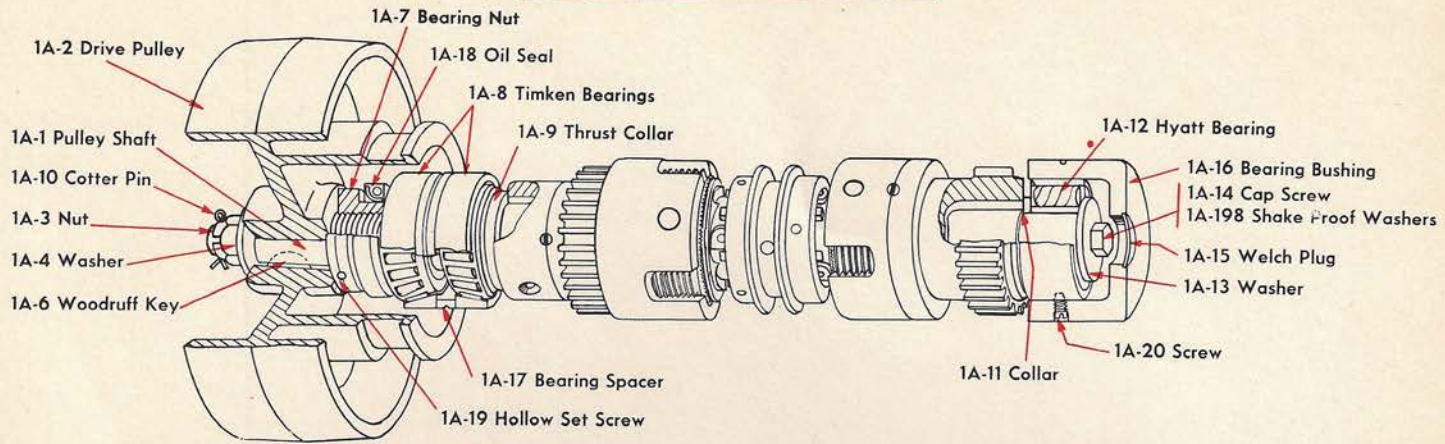
1A-125-C Complete Front Shaft Assembly



When Ordering Parts

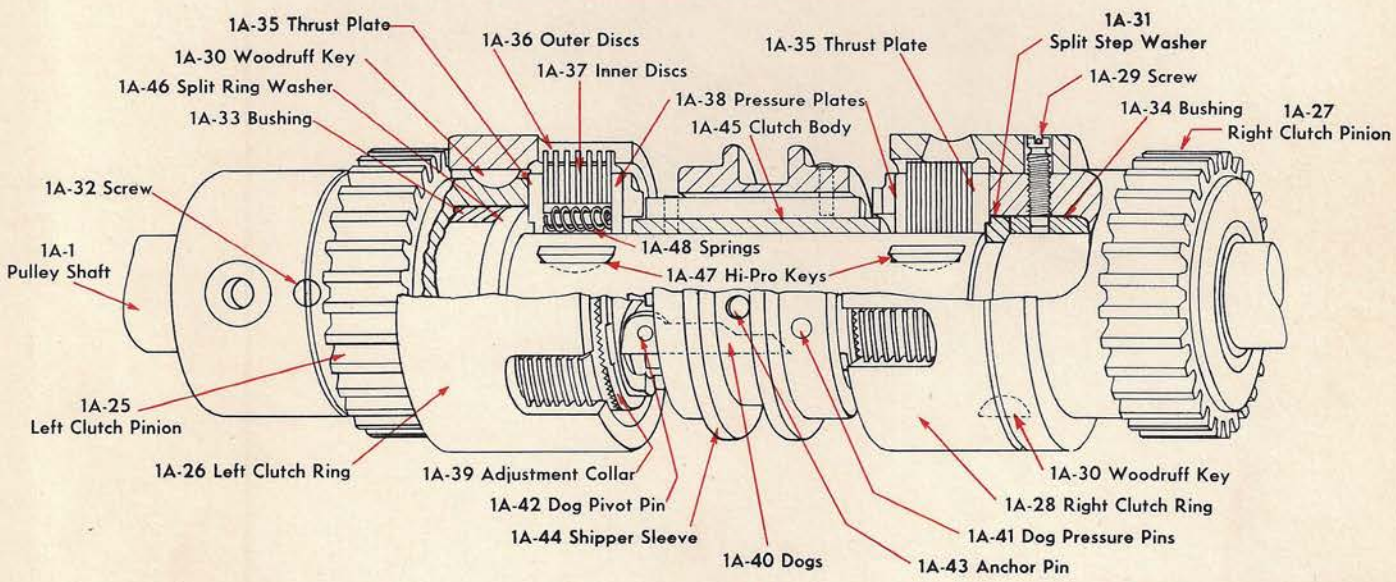
Be sure to give the serial number that is stamped on the name plate.

1A-1-C Complete Pulley Shaft Assembly



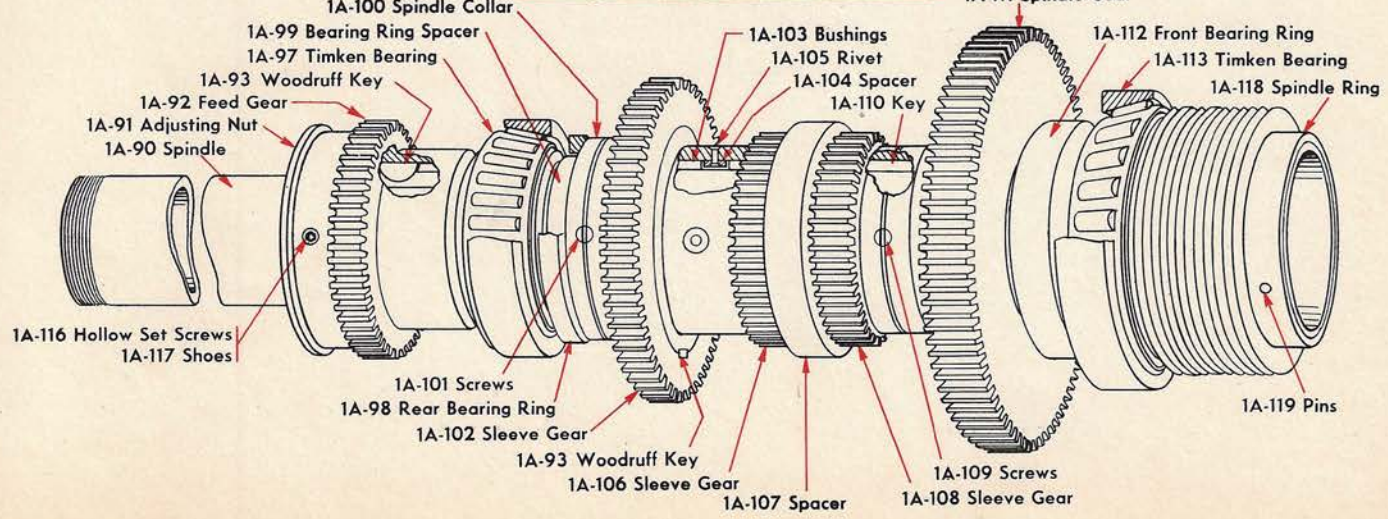
Before ordering parts read instructions on Plate 1

1A-25-C Complete Clutch Assembly

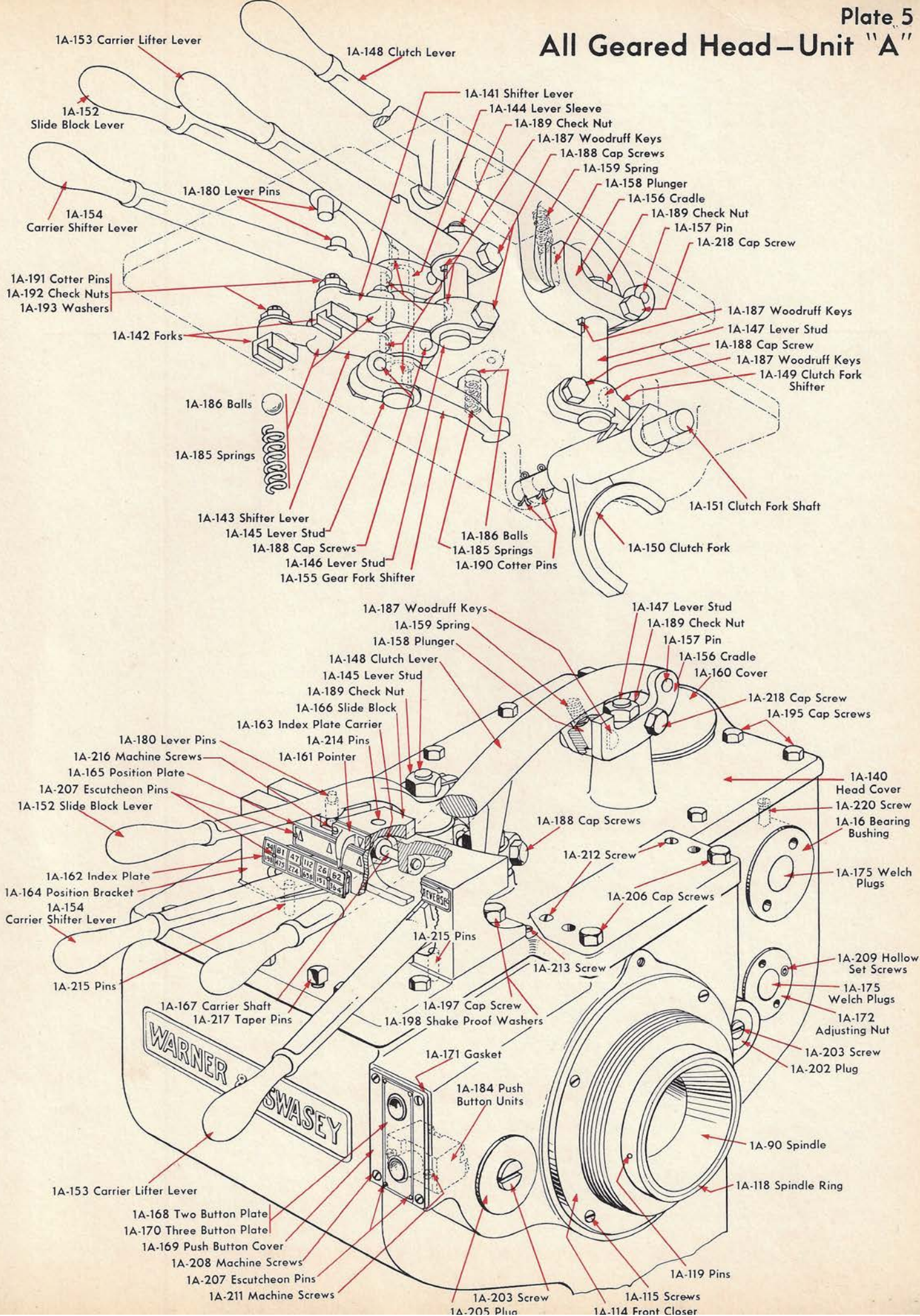


Before ordering parts read instructions on Plate 1

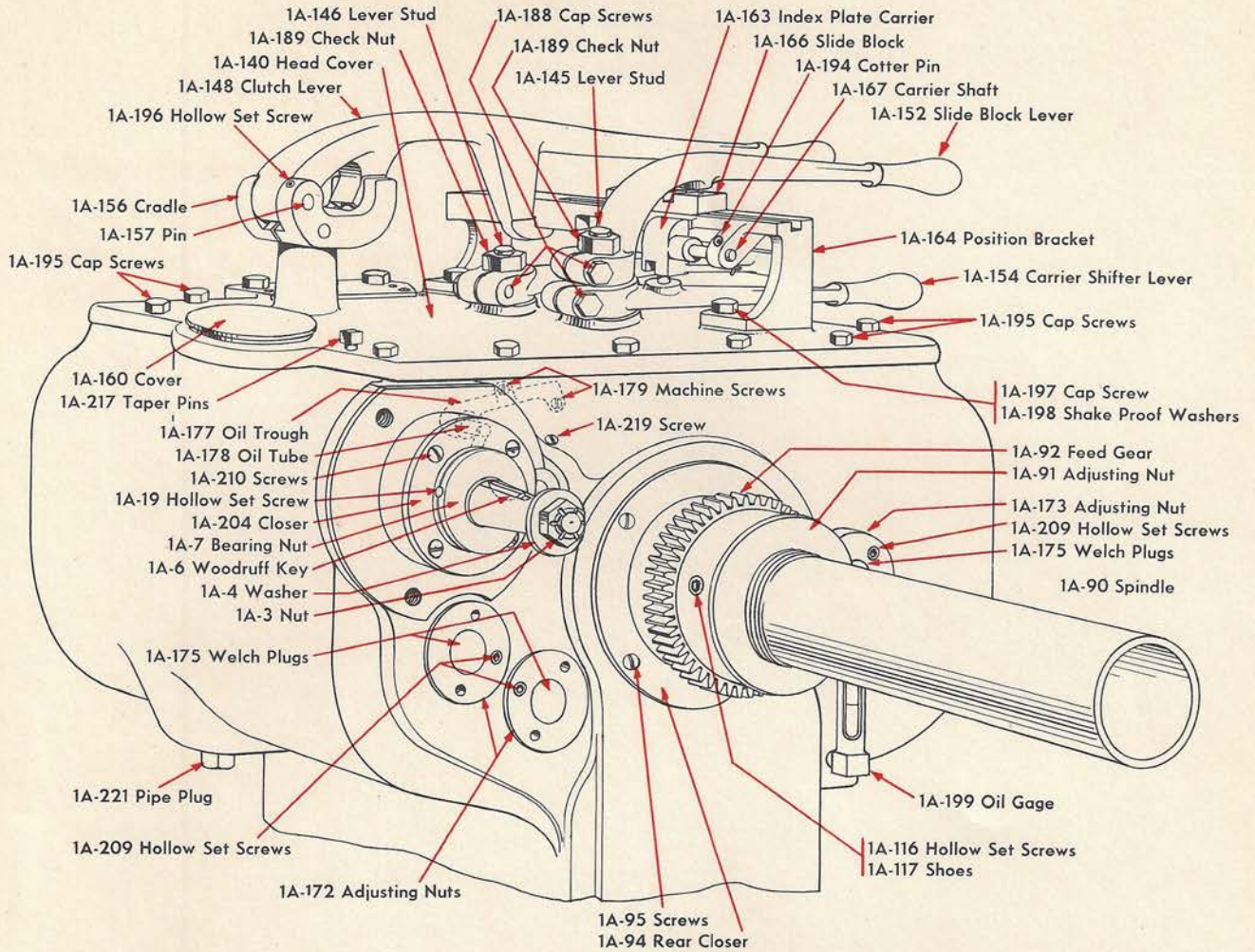
1A-90-C Complete Spindle Assembly



All Geared Head-Unit "A"

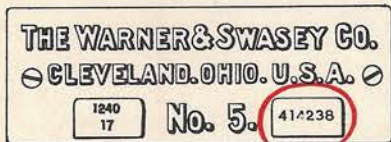
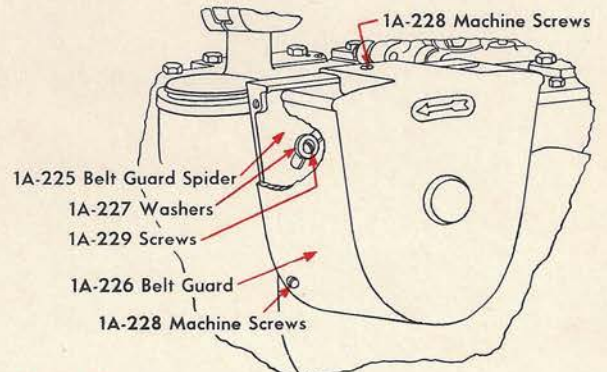


All Geared Head - Unit "A"



Before ordering parts read instructions on Plate 1

1A-225-C Complete Belt Guard Assembly



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

Plate 7
Square Turret—Unit "N"

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

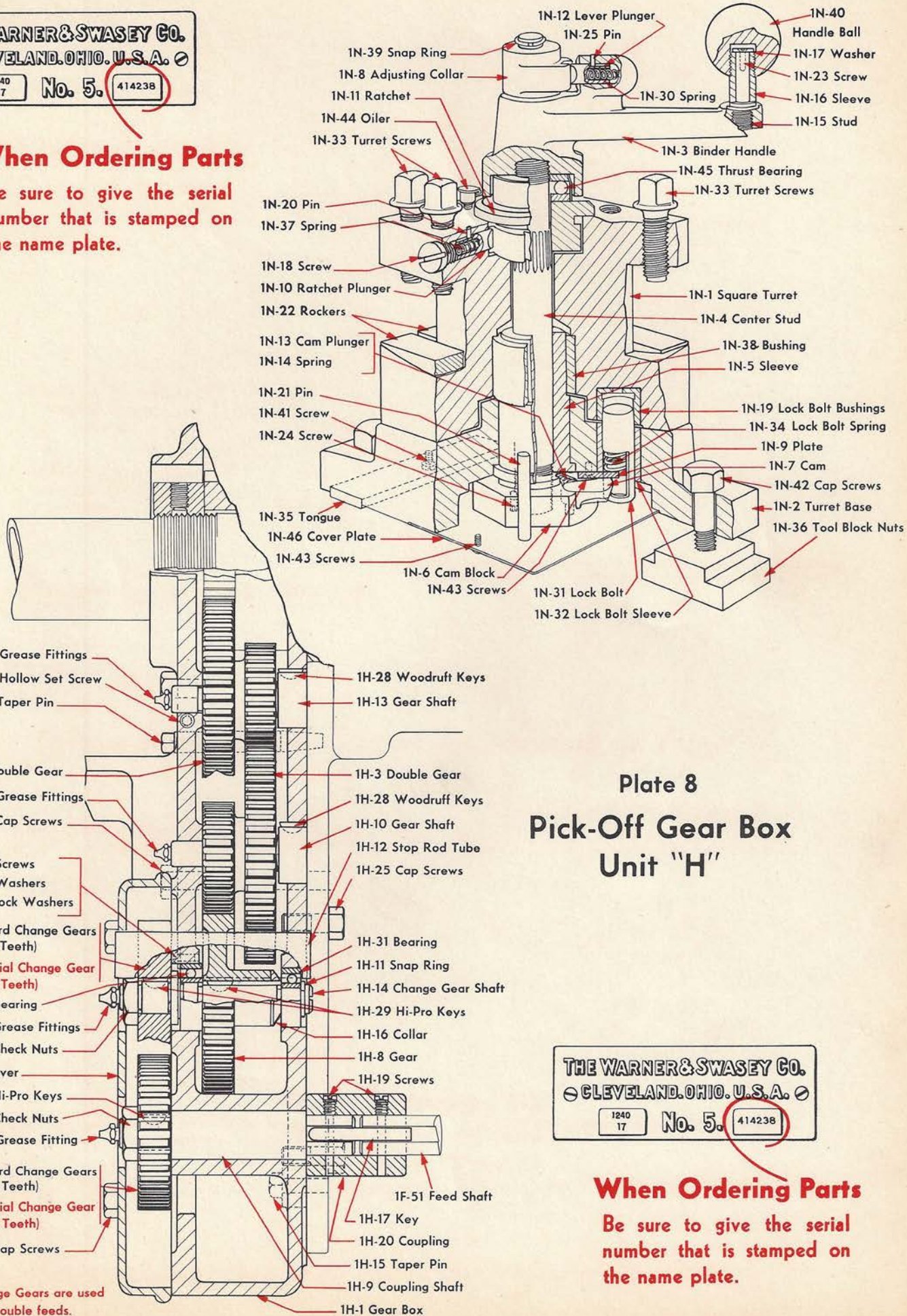


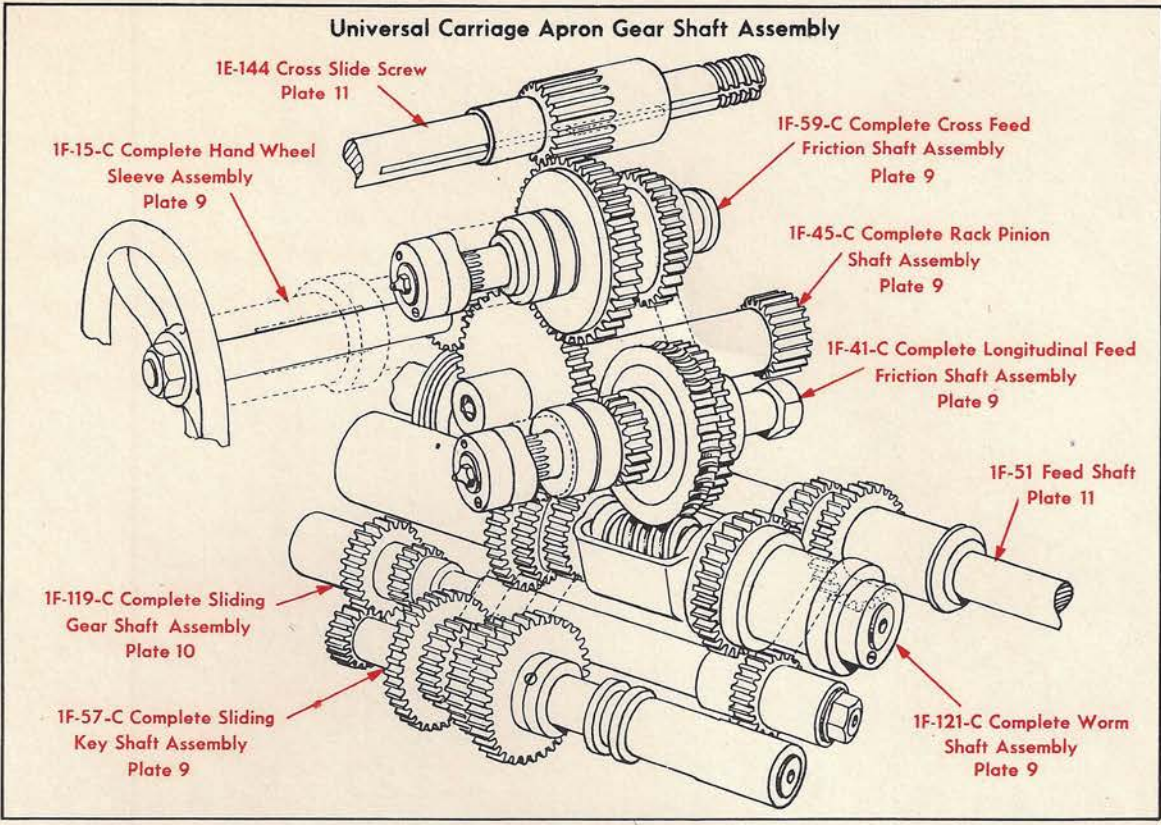
Plate 8
Pick-Off Gear Box
Unit "H"

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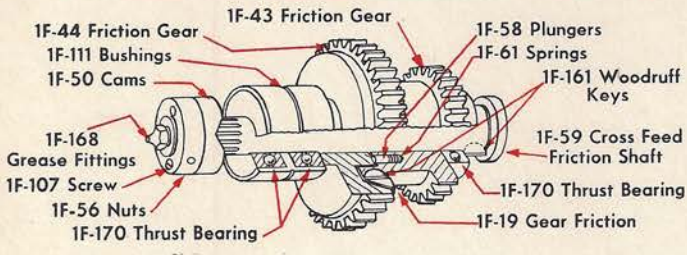
When Ordering Parts
Be sure to give the serial number that is stamped on the name plate.

*These Change Gears are used to halve or double feeds.

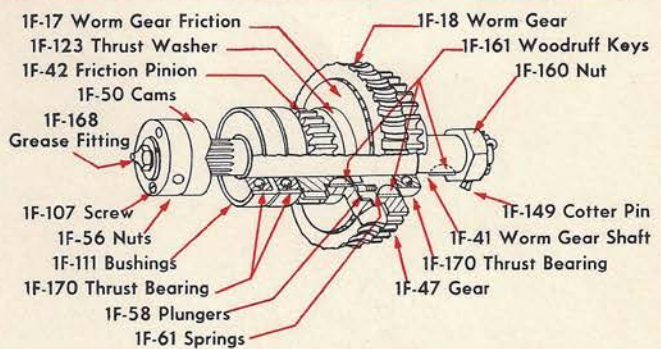
Universal Carriage Apron - Unit "F"



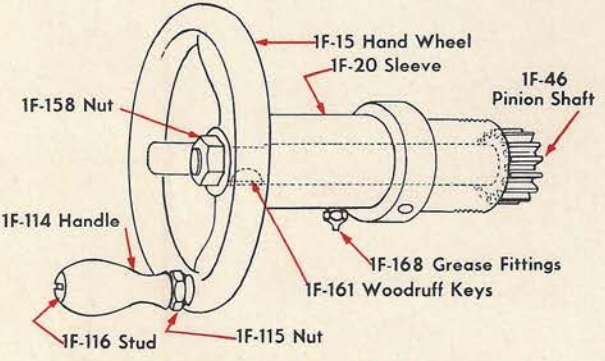
1F-59-C Complete Cross Feed Friction Shaft Assembly



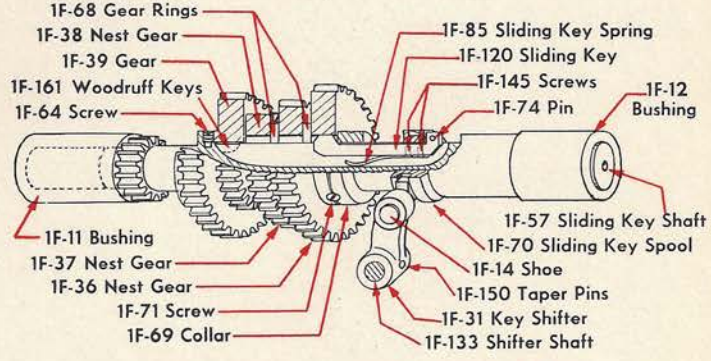
1F-41-C Complete Longitudinal Feed Friction Shaft Assembly



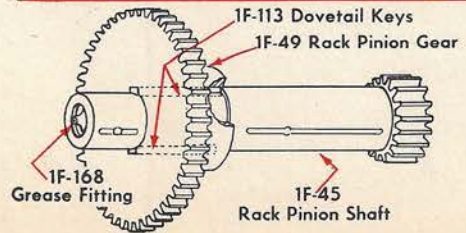
1F-15-C Complete Hand Wheel Sleeve Assembly



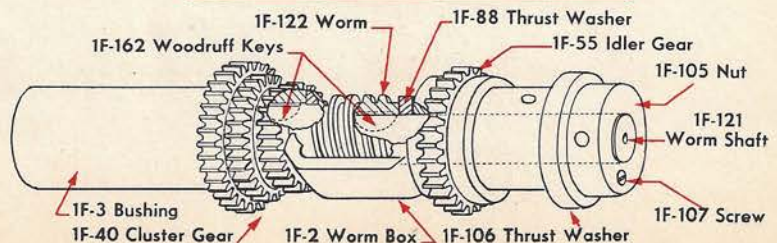
1F-57-C Complete Sliding Key Shaft Assembly



1F-45-C Complete Rack Pinion Shaft Assembly

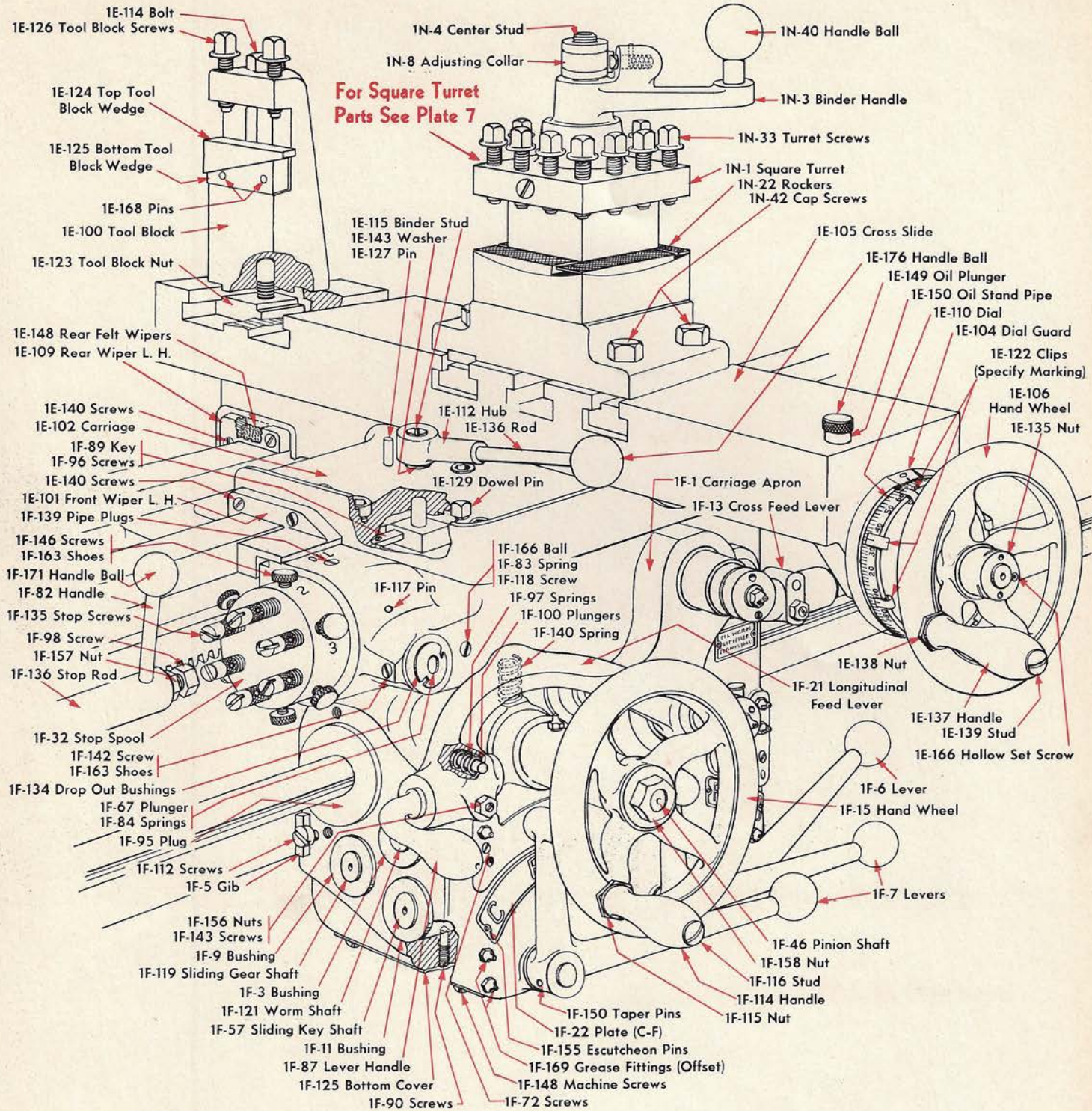


1F-121-C Complete Worm Shaft Assembly

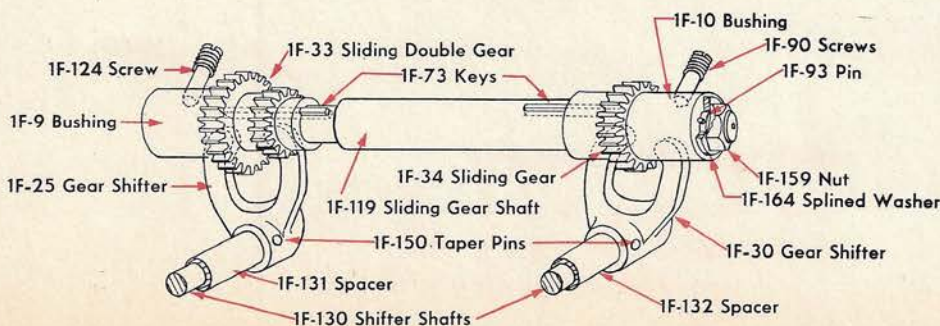


Before ordering parts read instructions on Plate 1

Universal Cross Slide and Carriage—Unit "E" Universal Carriage Apron—Unit "F"



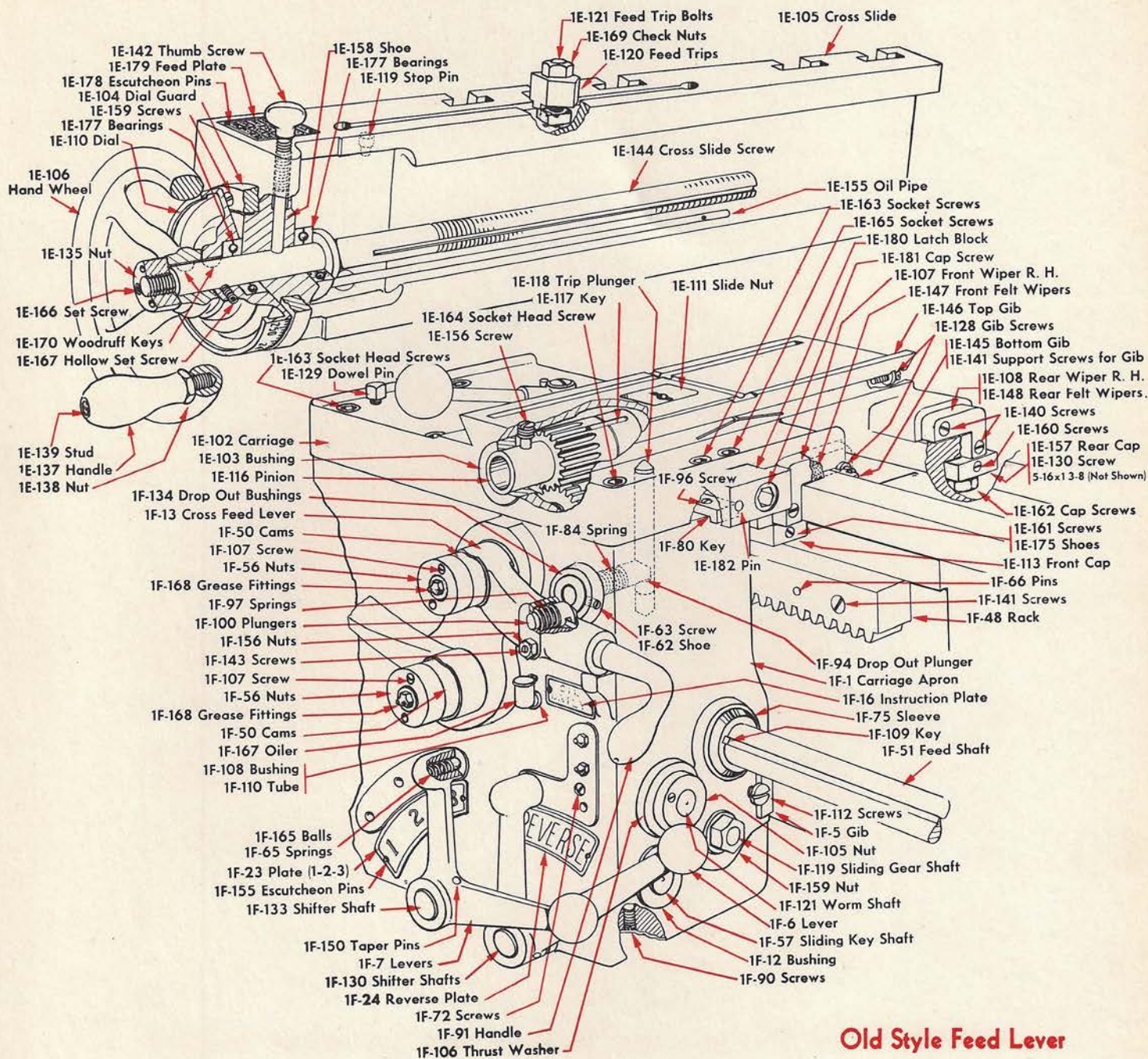
1F-119-C Complete Sliding Gear Assembly



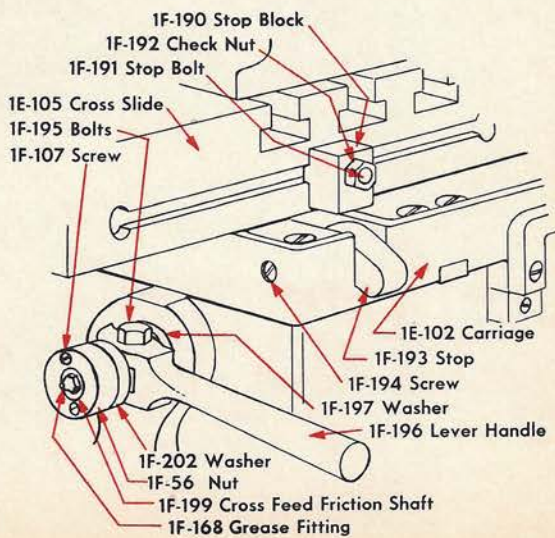
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When Ordering Parts
 Be sure to give the serial number that is stamped on the name plate.

Universal Cross Slide and Carriage - Unit "E" Universal Carriage Apron - Unit "F"



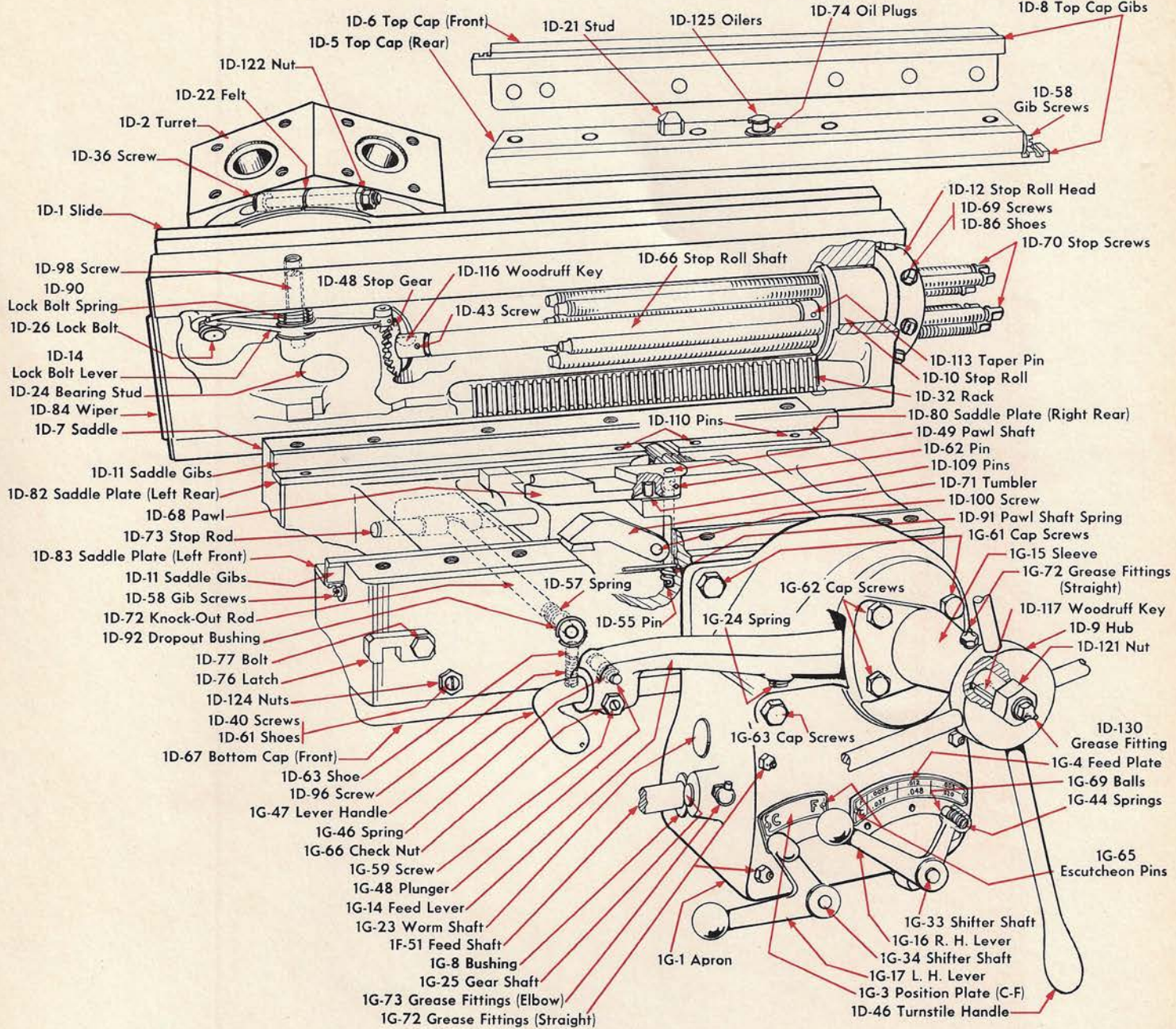
Old Style Feed Lever



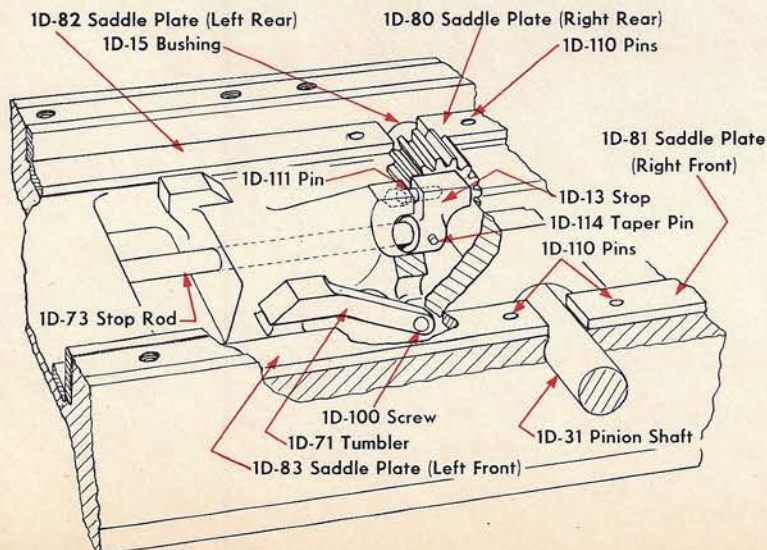
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When Ordering Parts
 Be sure to give the serial number that is stamped on the name plate.

Hex. Turret, Slide and Saddle - Unit "D" Saddle Apron - Unit "G"



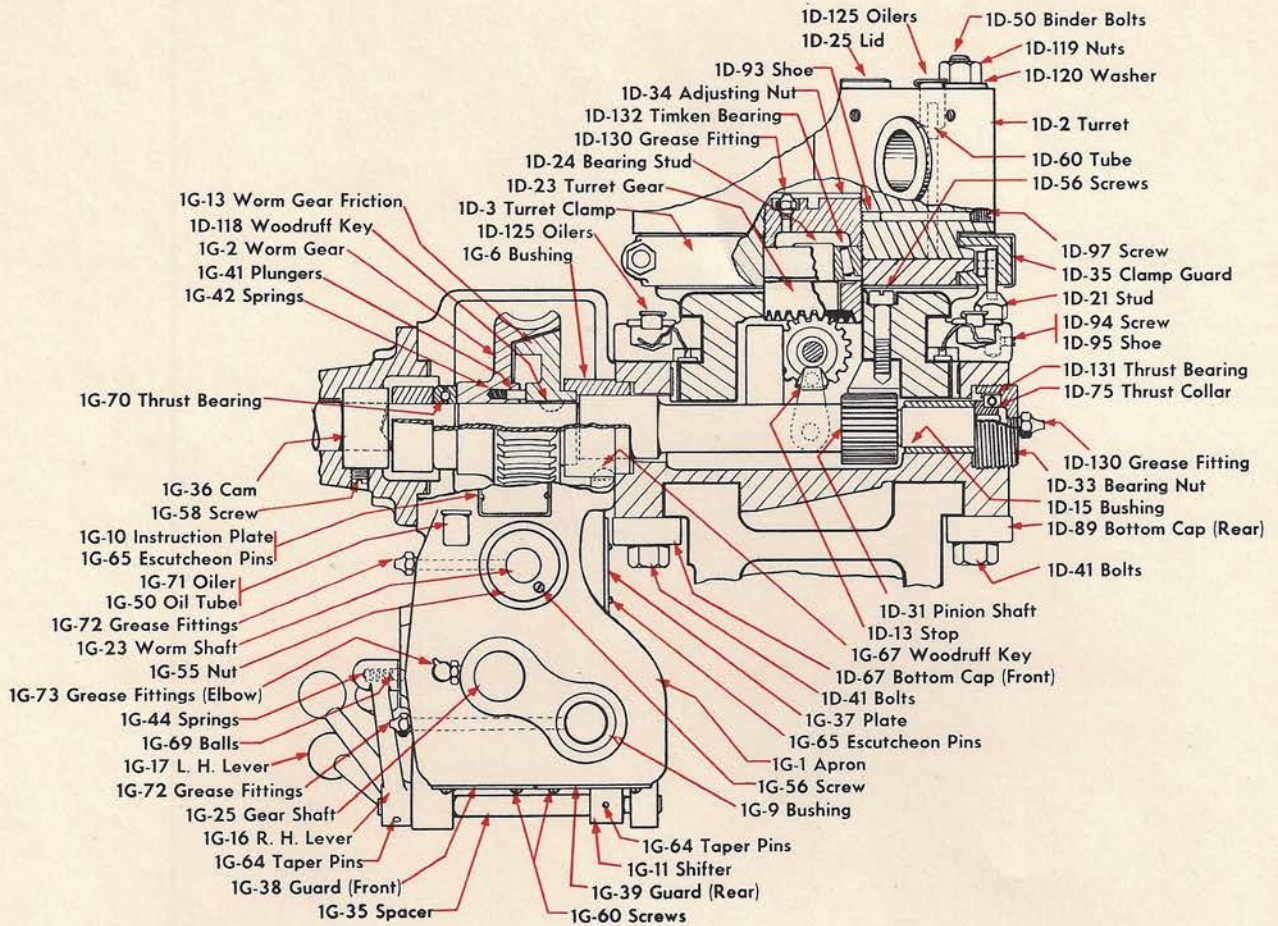
Before ordering parts read instructions on Plate 1



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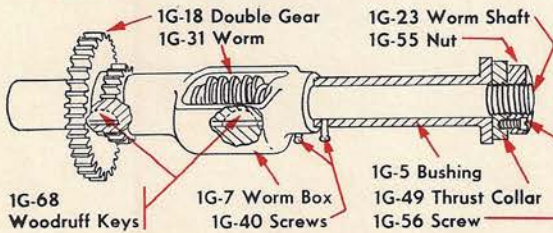
When Ordering Parts
Be sure to give the serial number that is stamped on the name plate.

Hex. Turret, Slide and Saddle – Unit "D" Saddle Apron – Unit "G"

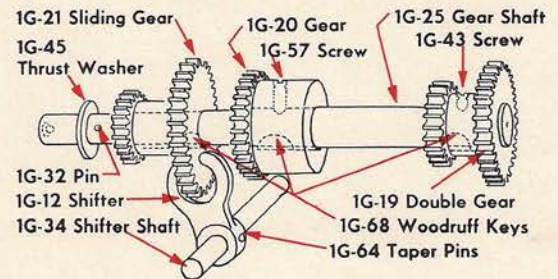


Before ordering parts read instructions on Plate 1

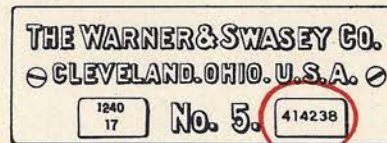
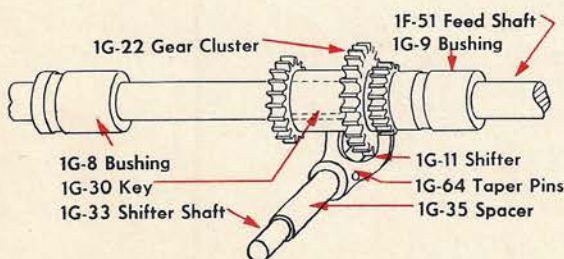
1G-23-C Complete Worm Shaft Assembly



1G-25-C Complete Gear Shaft Assembly



Before ordering parts read instructions on Plate 1

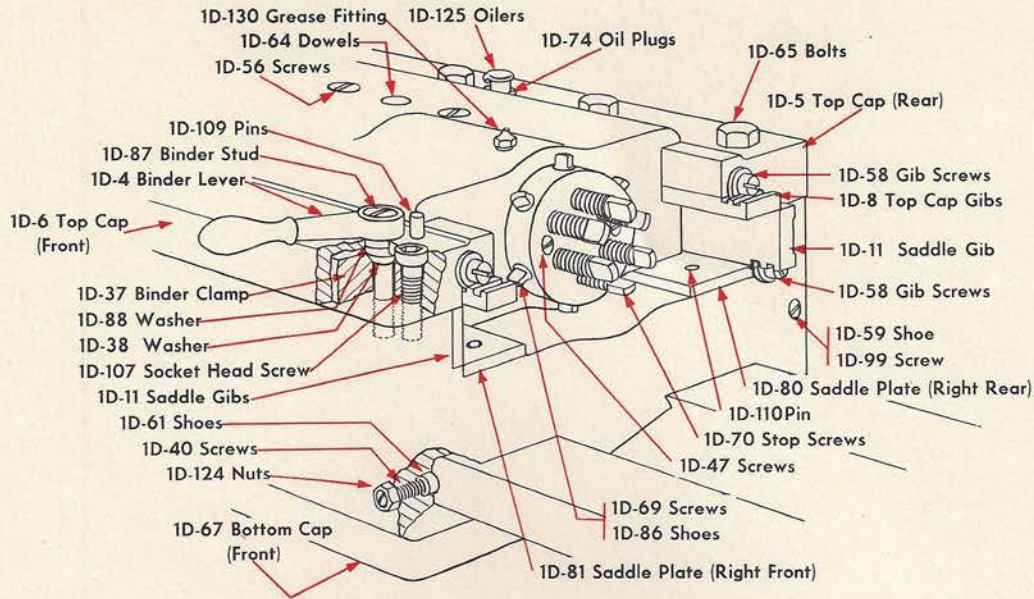


When Ordering Parts

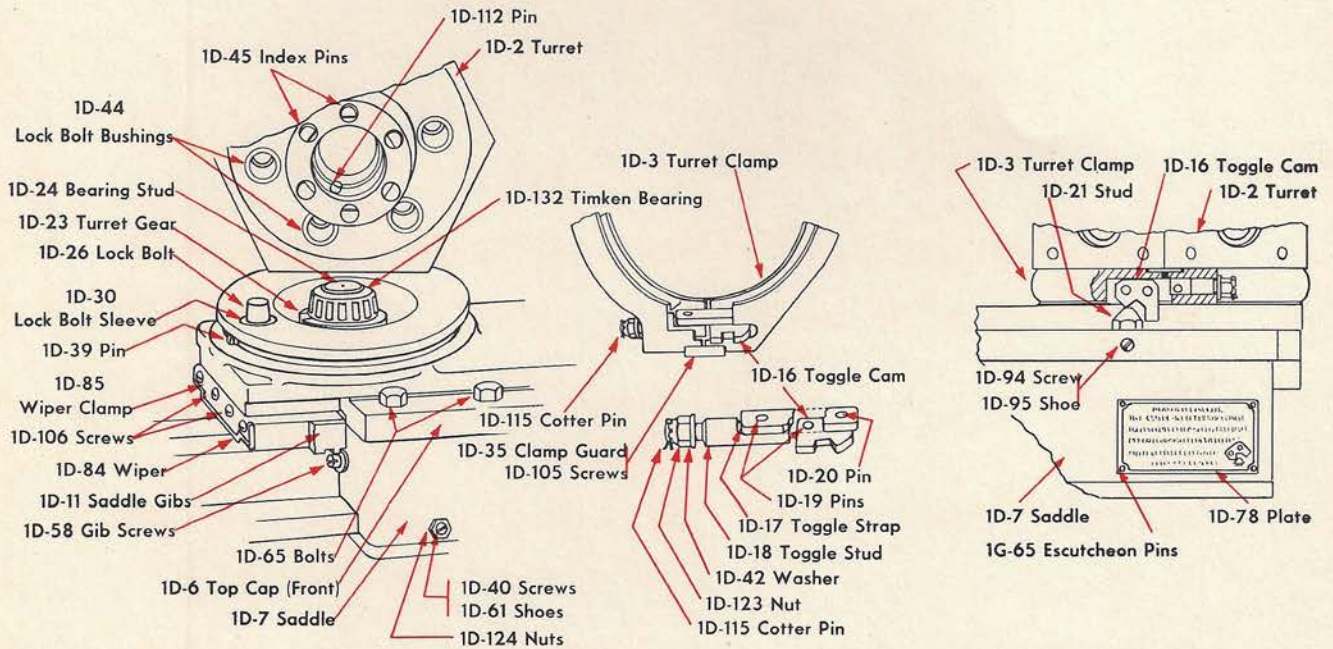
Be sure to give the serial number that is stamped on the name plate.

Before ordering parts read instructions on Plate 1

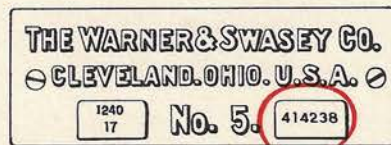
Hex. Turret, Slide and Saddle - Unit "D"



Before ordering parts read instructions on Plate 1



Before ordering parts read instructions on Plate 1



When Ordering Parts

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

Plate 15 Automatic Chuck - Unit "J"

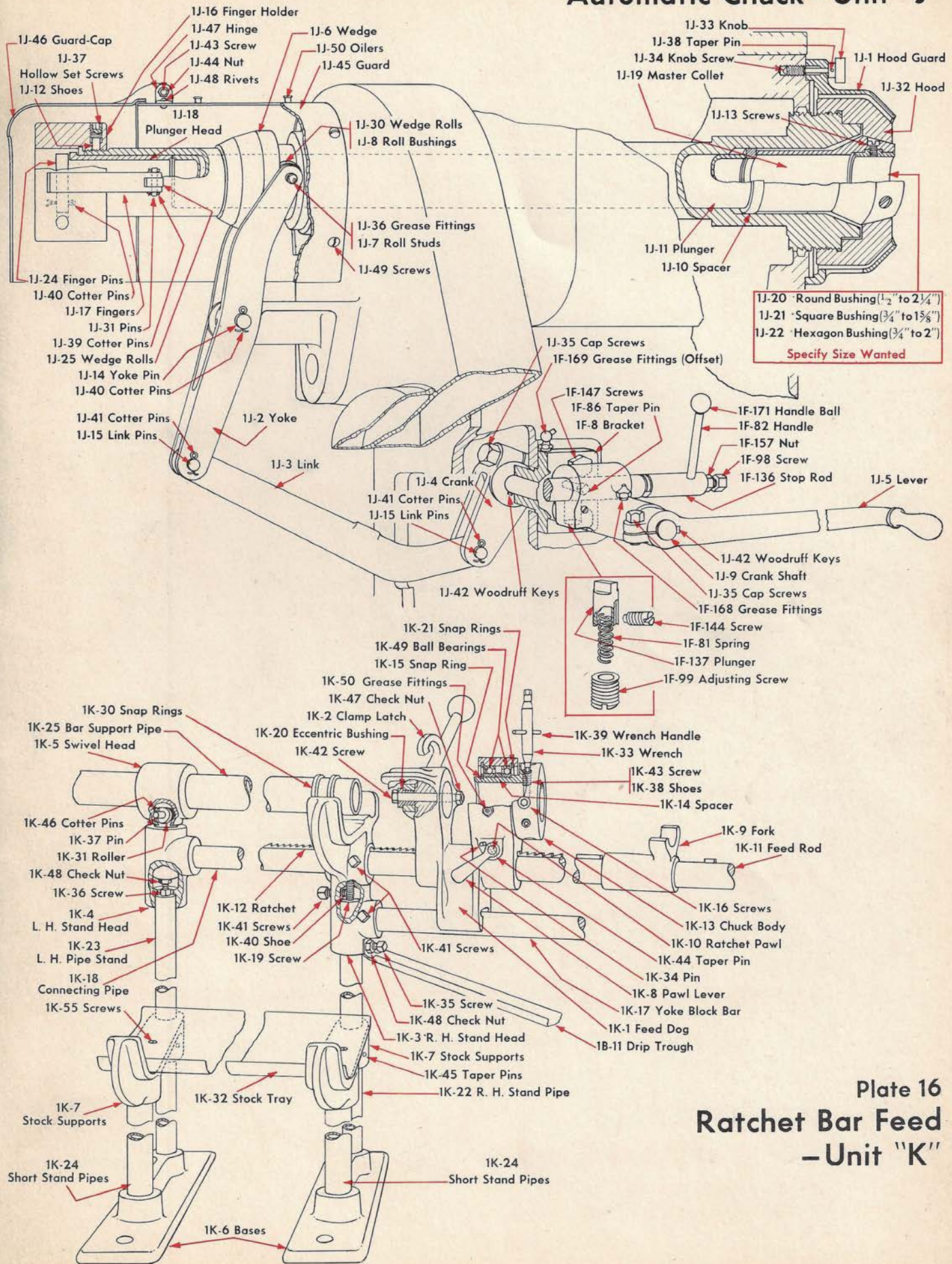
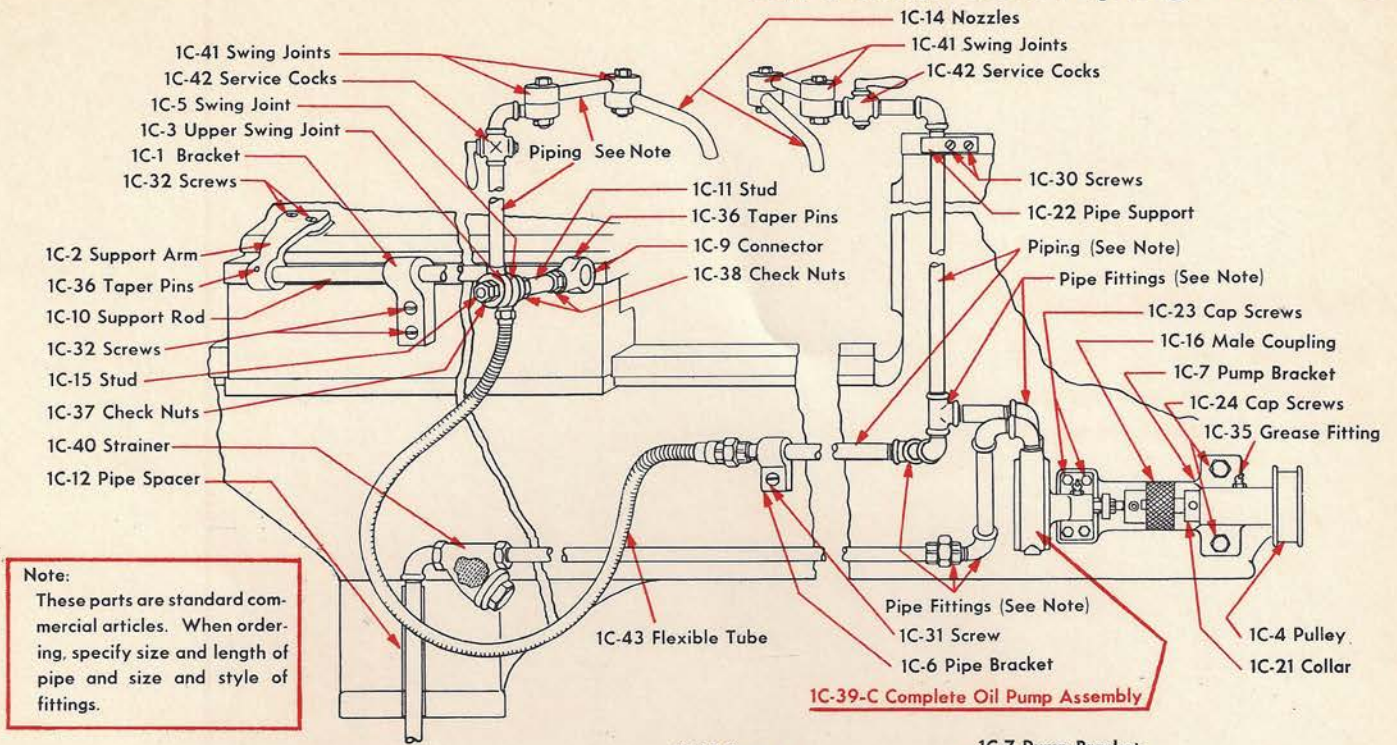


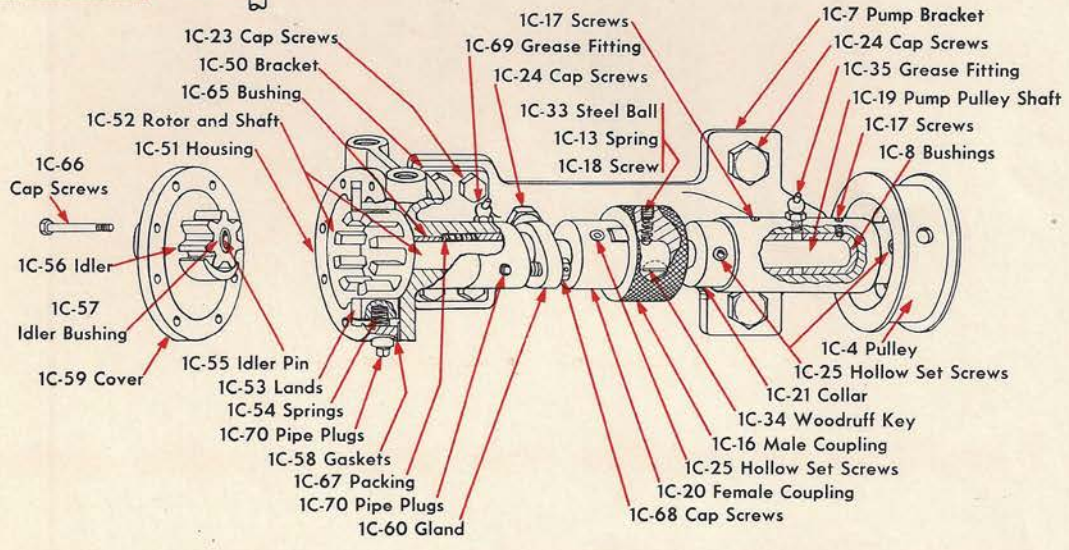
Plate 16 Ratchet Bar Feed - Unit "K"

Before ordering parts read instructions on Plate 1

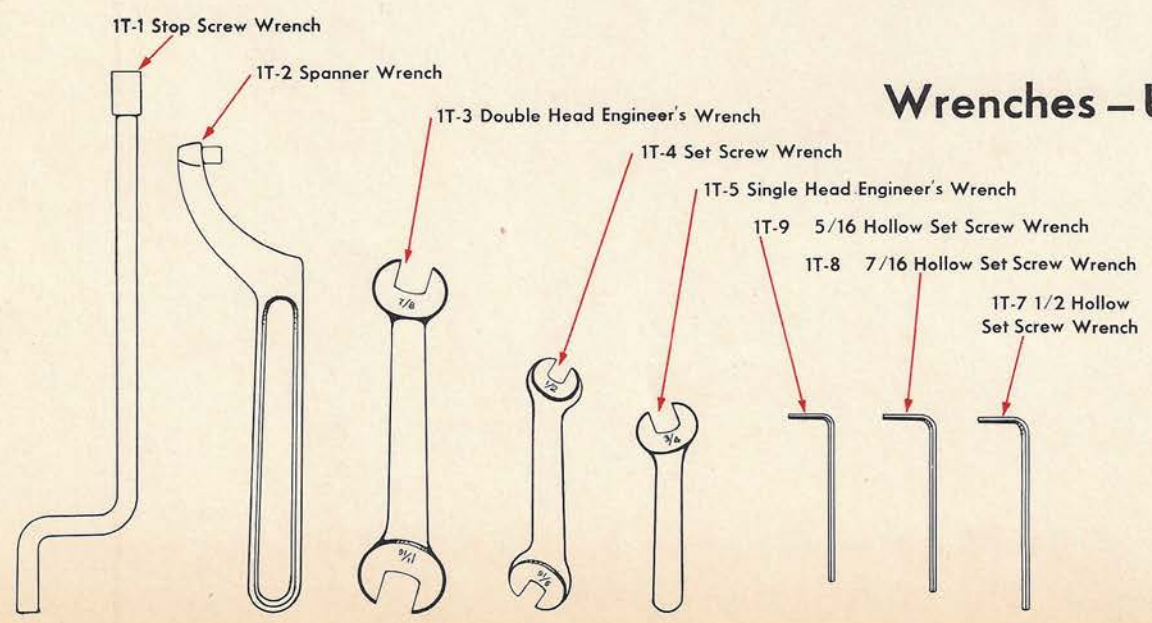
Oil Pump and Piping—Unit "C"



Note:
These parts are standard commercial articles. When ordering, specify size and length of pipe and size and style of fittings.

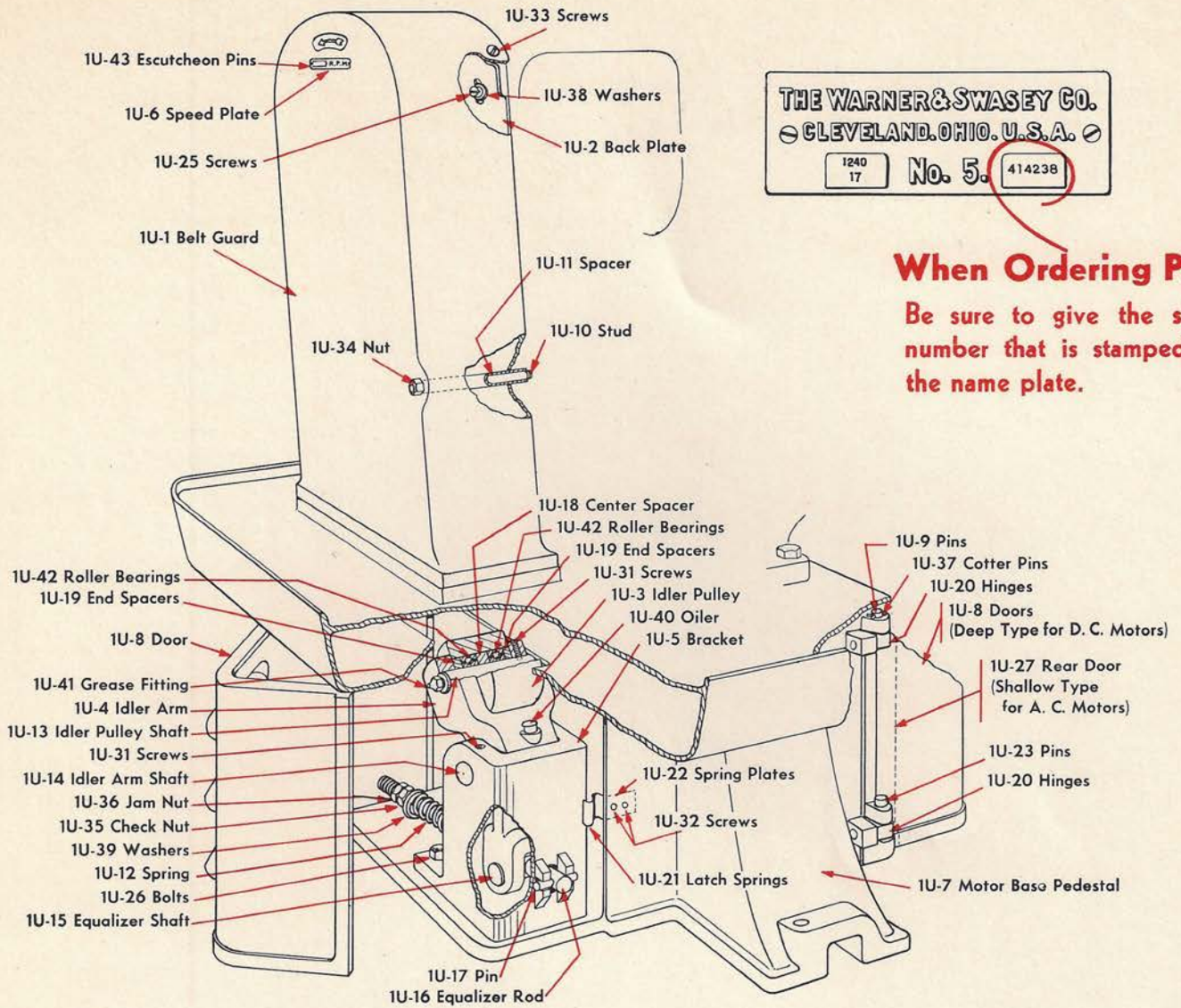


Before ordering parts read instructions on Plate 1



Wrenches—Unit "T"

Pedestal Motor Drive—Unit "U"

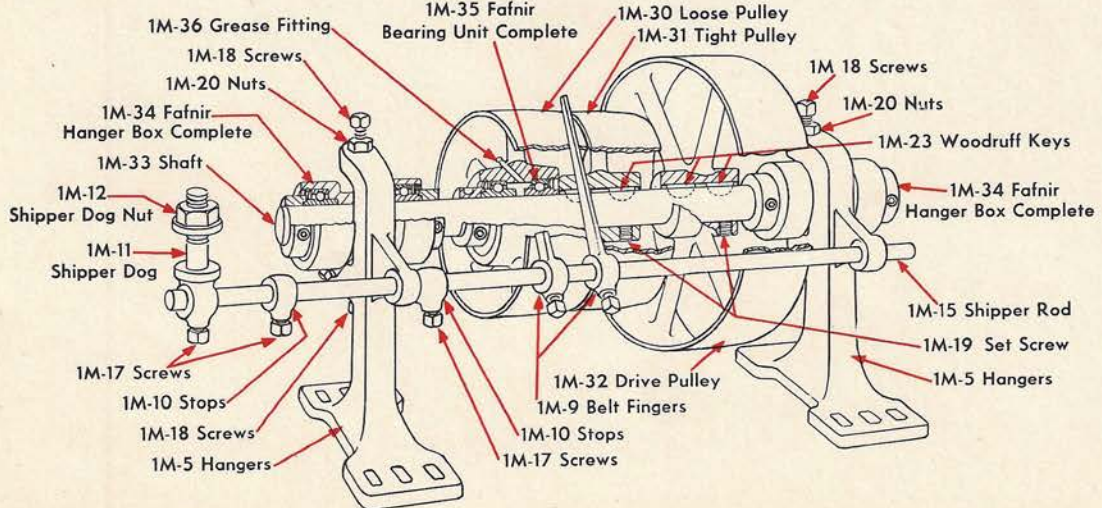


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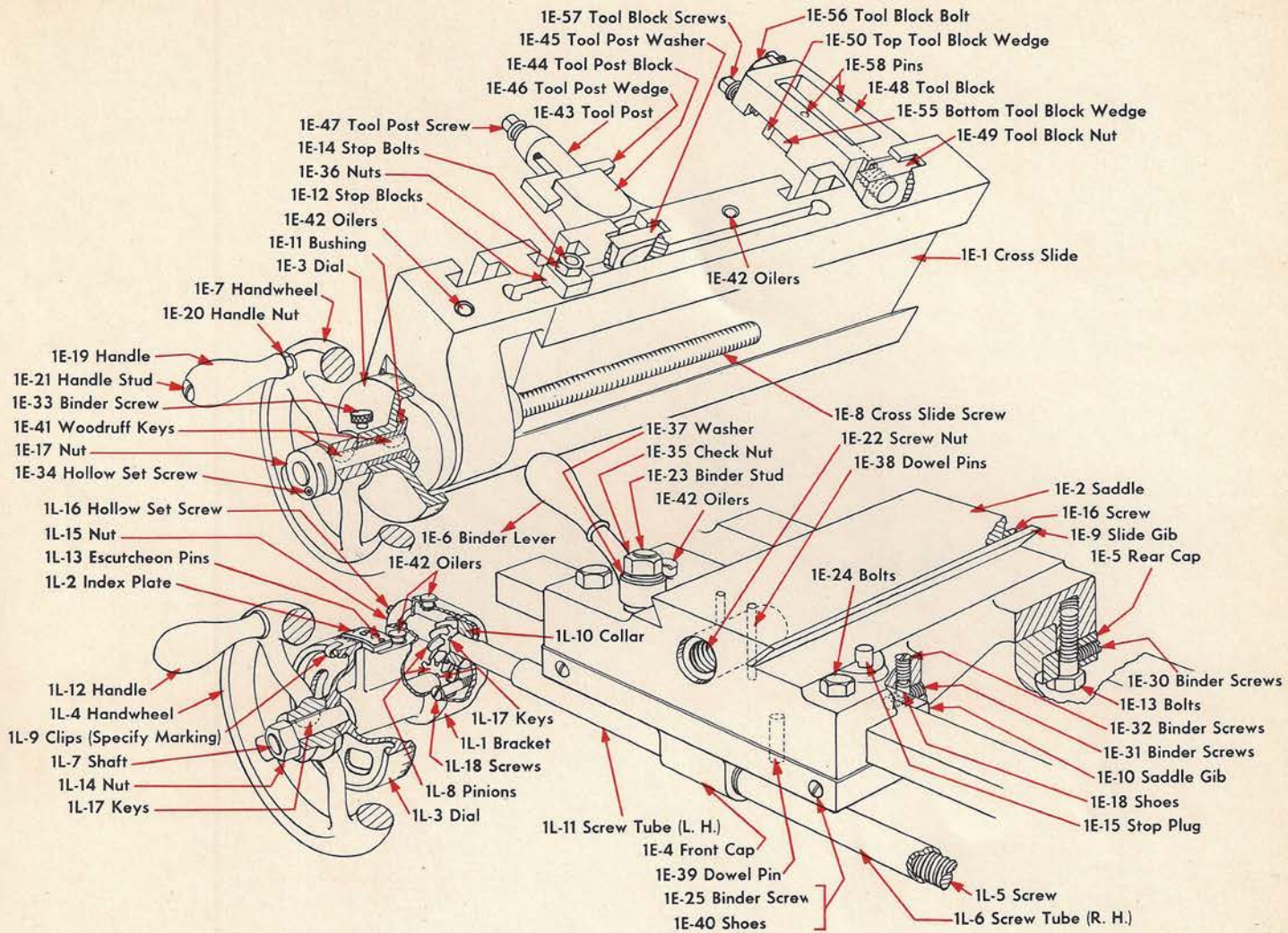
When Ordering Parts
 Be sure to give the serial number that is stamped on the name plate.

Before ordering parts read instructions on Plate 1 Plate 20
Countershaft—Unit "M"



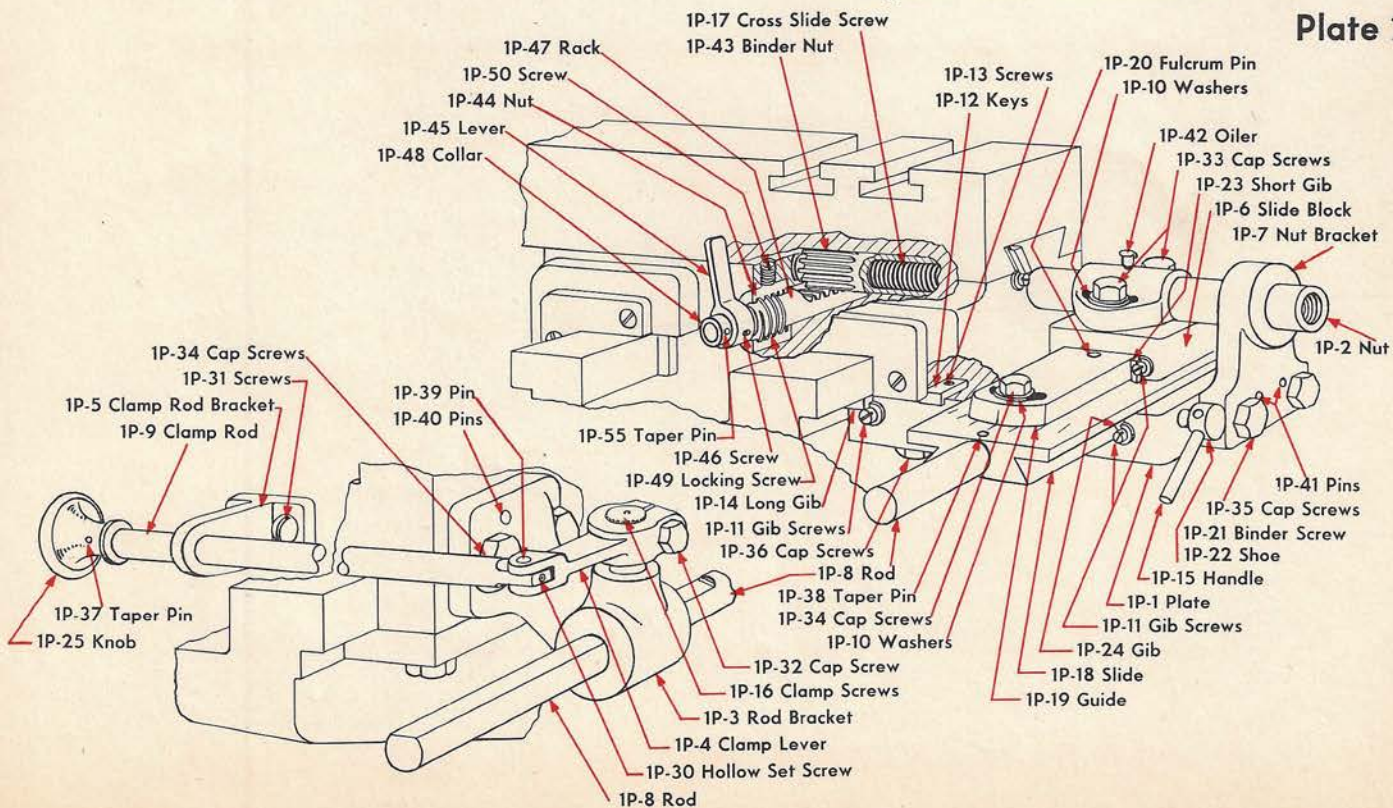
Before ordering parts read instructions on Plate 1

Plain Screw Feed Cross Slide – Unit "E"

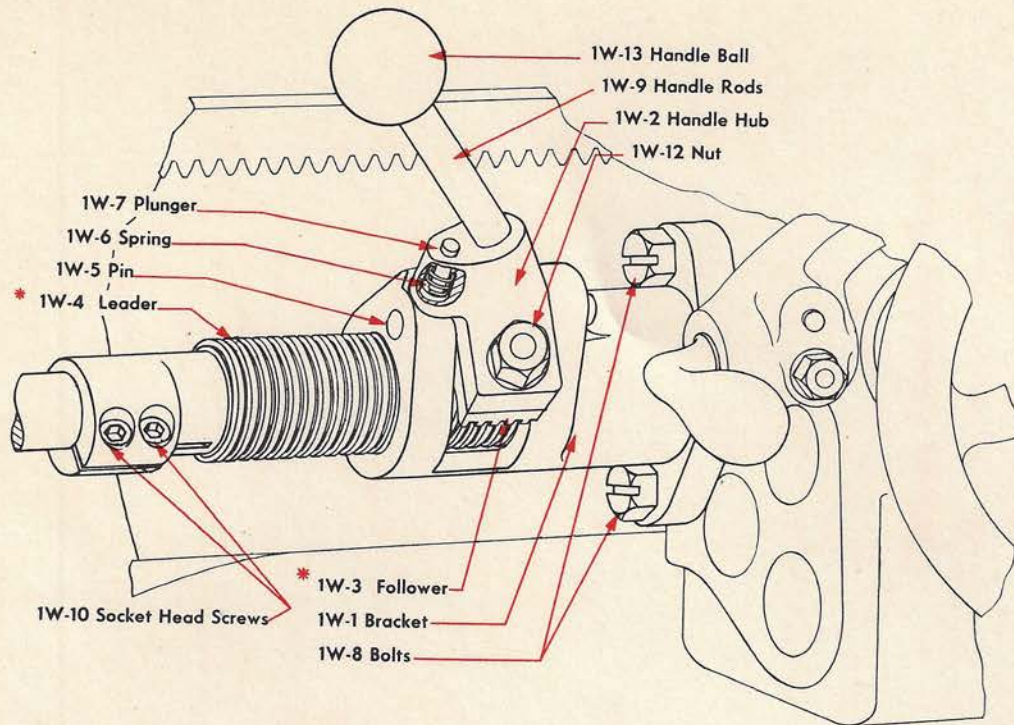


Taper Attachment – Unit "P"

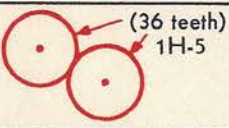
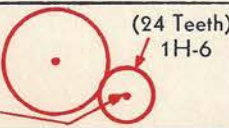

Plate 22



Thread Chasing Attachment – Unit "W"



*** When Ordering DO NOT SPECIFY PITCH OF LEADER AND FOLLOWER (See NOTE Below)**

Type of Thread	Acme Standard Single							Acme Standard Double					Acme Std. Triple		
	2 $\frac{7}{8}$	3	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4	4 $\frac{1}{2}$	5	3	3 $\frac{1}{2}$	4	4 $\frac{1}{2}$	5	5 $\frac{1}{2}$	3	3 $\frac{3}{4}$
Pitch of Leader and Follower STANDARD FEEDS (4 to 1 Gear Reduction) Pitch of thread cut on work using two Standard Change Gears 1H-5 (36 teeth) 	11 $\frac{1}{2}$	12	13	14	16	18	20	6	7	8	9	10	11	4	5
DOUBLE STANDARD FEEDS (2 to 1 Gear Reduction) Pitch of thread cut on work using Special Change Gear 1H-6 (24 teeth) on Coupling Shaft 1H-9. 	5 $\frac{3}{4}$	6	6 $\frac{1}{2}$	7	8	9	10	3	3 $\frac{1}{2}$	4	4 $\frac{1}{2}$	5	5 $\frac{1}{2}$	2	2 $\frac{1}{2}$
HALF STANDARD FEEDS (8 to 1 Gear Reduction) Pitch of thread cut on work using Special Change Gear 1H-7 (48 teeth) on Coupling Shaft 1H-9. 	23	24	26	28	32	36	40	12	14	16	18	20	22	8	10

Right-Hand Leaders will Cut Right-Hand Threads.

NOTE: Read carefully to avoid misunderstanding and delay.

We must have the following information on orders for Leaders and Followers:

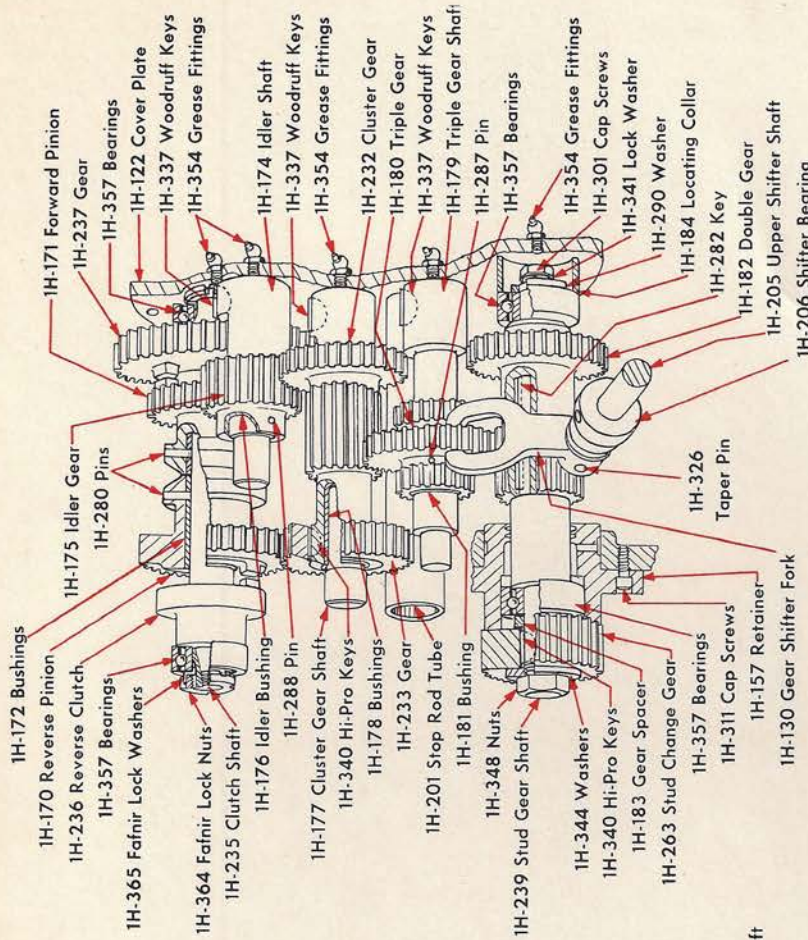
- (1) Specify PITCH TO BE CUT ON WORK.
- (2) Specify whether you are using STANDARD, HALF-STANDARD OR DOUBLE STANDARD Feed Gears in gear box (See Plate 8).
- (3) Be sure to give the SERIAL NUMBER of the Machine.

EXAMPLE:

1 Piece 1 W-3 Follower (or 1 W-4 Leader or both) to cut 4 pitch thread with Double Standard Feed Gears on machine serial number 414238.

Leaders and Followers are stamped to indicate the pitch of thread they will cut with Standard Feed Gears 1 H-5 in head end gear box (See Plate 8). From your order we will determine whether single, double or triple thread should be furnished.

Threading and Feed Gear Box with Apron Attachment Unit "H"

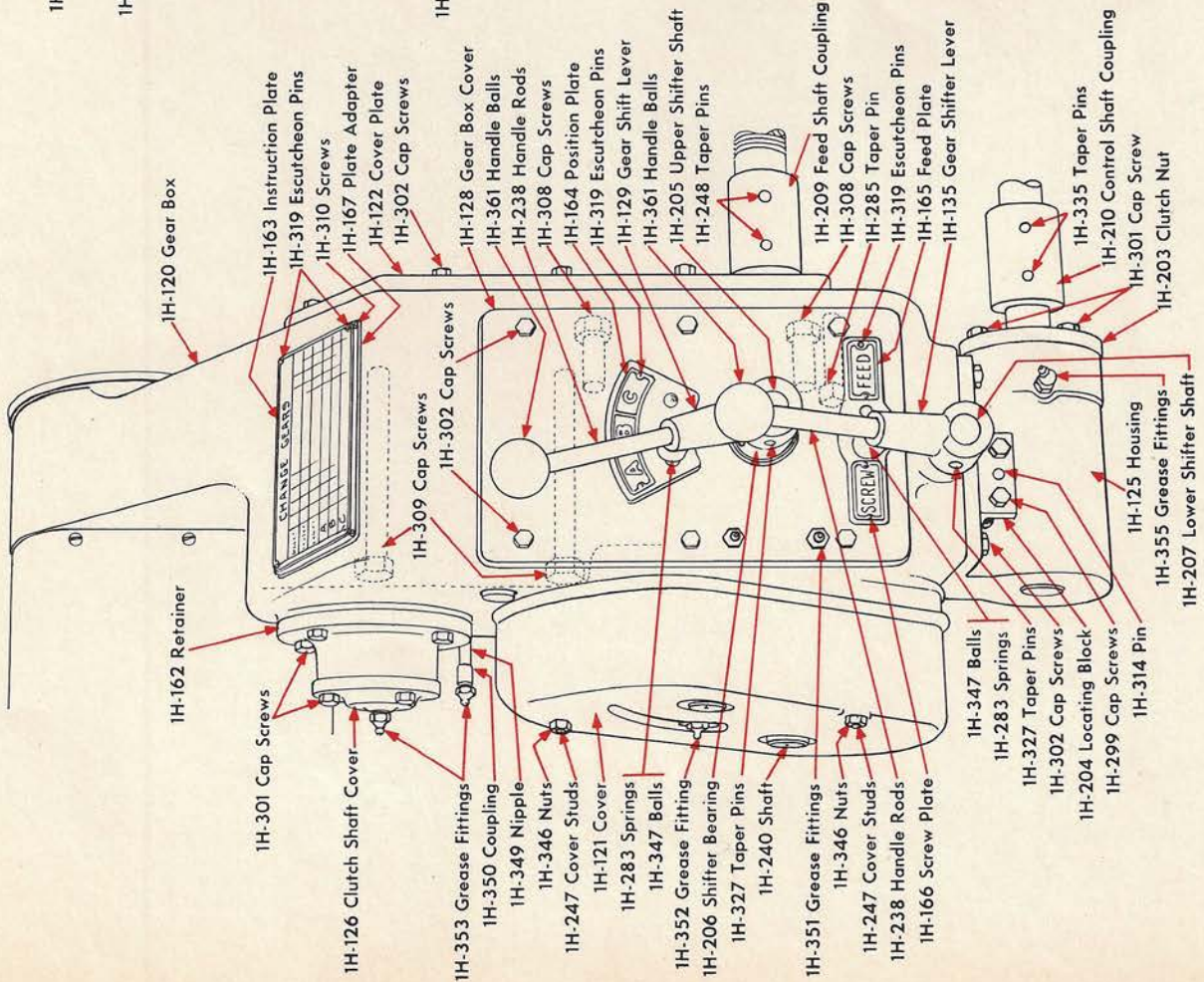


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When Ordering Parts
Be sure to give the serial
number that is stamped on
the name plate.



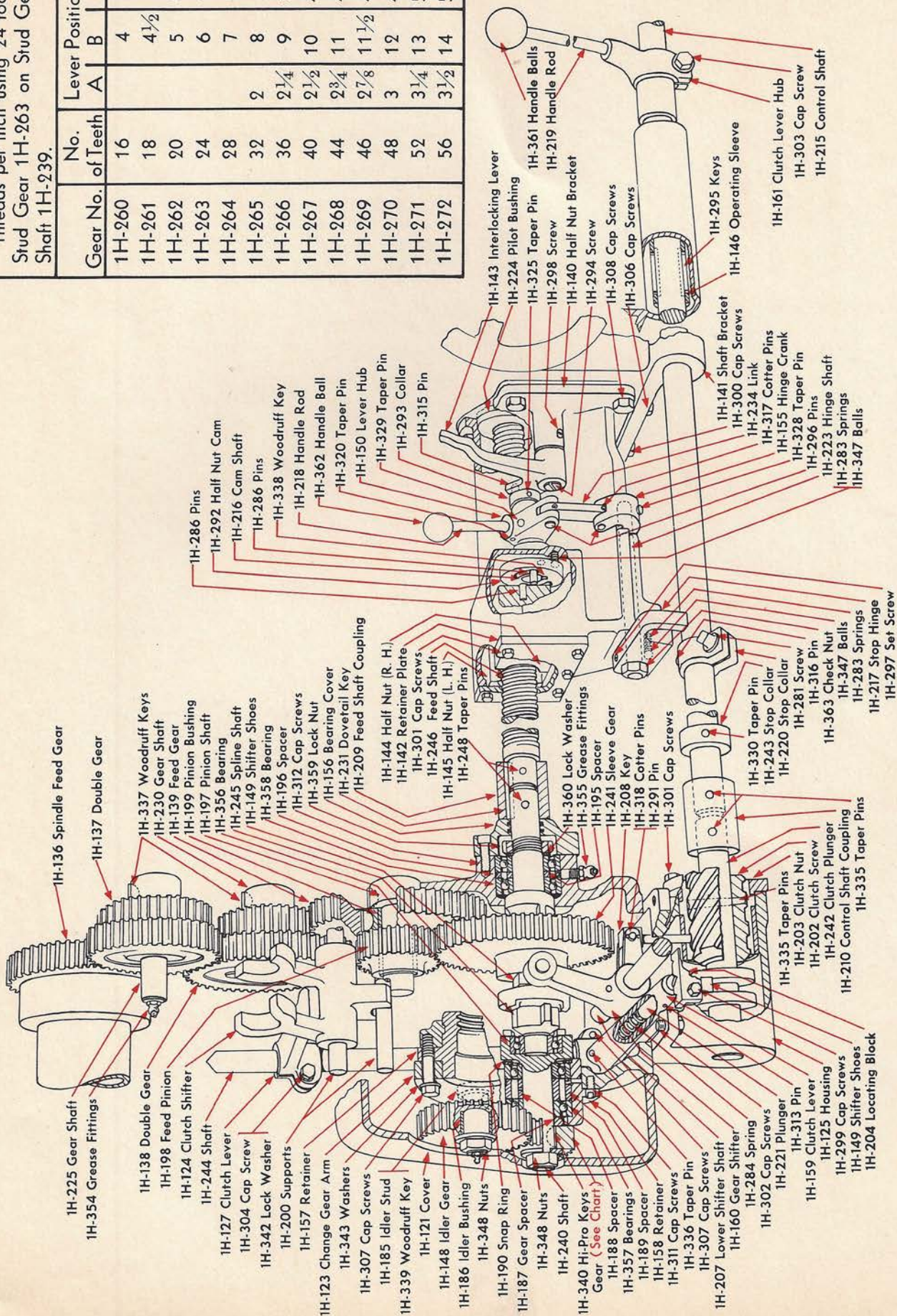
Before ordering parts read instructions on Plate 1

Threading and Feed Gear Box with Apron Attachment Unit "H"

CHANGE GEARS

Threads per inch using 24 tooth Stud Gear 1H-263 on Stud Gear Shaft 1H-239.

Gear No.	No. of Teeth	Lever Positions		
		A	B	C
1H-260	16	4		
1H-261	18	4 1/2		
1H-262	20	5		
1H-263	24	6		
1H-264	28	7		
1H-265	32	8		
1H-266	36	2 1/4	9	36
1H-267	40	2 1/2	10	40
1H-268	44	2 3/4	11	44
1H-269	46	2 7/8	11 1/2	46
1H-270	48	3	12	48
1H-271	52	3 1/4	13	52
1H-272	56	3 1/2	14	56



Before ordering parts read instructions on Plate 1