

This book has been reprinted from the original publication without revisions except the addition of the Safety Precautions.
The Cincinnati Lathe & Tool Co., by change of name, is now Cincinnati Milacron, Inc.

OPERATING, PARTS and SERVICE MANUAL for

**CINCINNATI "TRAY-TOP"
ENGINE & TOOL ROOM LATHES**

PUBLICATION NO.: T-107-3

IMPORTANT

Carefully read the instructions and safety precautions given in this manual. Do not operate and/or service this machine/equipment until you have read this manual thoroughly.

At the time of writing, the book was completely up-to-date. However, due to continual improvements in design, it is possible that descriptions contained herein may vary to a slight extent from the machine delivered to you. This merely implies that the machine has been improved to better fulfill your requirements. If there are any questions, you are encouraged to contact the nearest Cincinnati Milacron representative for clarification.

CINCINNATI MILACRON

Cincinnati, Ohio 45209

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Reprinted in USA 100 10/79 CM

Reprinted in U.S.A. 100 8/82 CM

FOREWORD

This Manual has been prepared for use with the 10-in., 12 1/2-in., 15-in. and 18-in. Cincinnati Tray-Top Engine and Tool Room Lathes and 15" & 18" Cincinnati Tray-Top Fixed Gap Bed Lathes manufactured by Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio, U.S.A.

Because of continual betterment of design, it is possible that data contained in this Manual may not fully apply to the machine delivered to you. Any differences merely indicate that your machine incorporates improvements better to fulfill your requirements.

PATENT NOTICE

The machine and attachments illustrated and described in this book are manufactured under and protected by issued and pending United States and Foreign patents.

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The design and specifications of Tray-Top Cincinnati Lathes are subject to change without notice.

Cincinnati Lathe & Tool Co. reserves the right to make such changes without incurring any obligation to apply them to lathes previously sold.

SAFETY PRECAUTIONS

IMPORTANT

These safety precautions for this CINCINNATI MILACRON machine have been prepared to assist the operator and maintenance personnel in practicing good shop safety procedures.

Operator and maintenance personnel must read and understand these precautions completely before operating, setting up, running, or performing maintenance on the machine.

These precautions are to be used as a guide to supplement safety precautions and warnings in the following:

- a) All other manuals pertaining to the machine.
- b) Local, plant, and shop safety rules and codes.
- c) Federal and national safety laws and regulations.

See the latest edition of the OCCUPATIONAL SAFETY AND HEALTH STANDARDS, available from the DEPARTMENT OF LABOR, WASHINGTON, D.C.

WARNING

Read related safety precautions before operating this machine. Failure to follow safety instructions may result in personal injury and/or damage to machine components.

WARNING: ILLUSTRATIONS

In order to clearly show details of this machine, some covers, shields, guards, barriers, devices or doors have either been removed or shown in an "open" position. All such protective components must be installed in position before operating this machine. Failure to follow this instruction may result in personal injury and/or machine damage.

GENERAL SAFETY INSTRUCTIONS AND CONSIDERATIONS

PERSONAL SAFETY

Machine owners, operators, setup men, maintenance, and service personnel must be aware of the fact that constant day-to-day safety procedures are a vital part of their job. Accident prevention must be one of the principal objectives of the job regardless of what activity is involved.

WARNING

Failure to follow instructions on this page may result in personal injury and/or damage to machine components.

Know and respect your machinery. Read and practice the prescribed safety and checking procedures. Make sure that everyone who works for, with, or near you fully understands and - more importantly - complies with the following safety precautions and procedures when operating this machine.

Sudden movements, loud noises, horse-play, etc. must be avoided. These distractions may result in unsafe conditions for those working near the machinery.

Observe and follow safety instructions such as "NO SMOKING", "High Voltage", DANGER, etc., in your working area.

Accidents can occur that result in serious personal injury to yourself or others due to clothing and other articles becoming entangled in cutters, handwheels, levers, or moving machine elements. The following suggestions, if followed, will help you to avoid such accidents: Neckties, scarfs, gloves, loose hanging clothing, and jewelry such as watches, rings, or necklaces must not be worn around moving machinery. Restrain long hair with a cap or net. Wear gloves only when handling rough, sharp, or hot parts.

Use safety protective equipment. Wear clean approved eye or face protection. Safety-toe shoes with slip-proof soles can help you avoid injury. Keep your protective equipment in good condition.

WORK AREA SAFETY

Always keep your work area clean. Dirty work areas with such hazards as oil, debris, or water on the floor may cause someone to fall to the floor, into the machine, or onto other objects resulting in serious personal injury.

Make sure your work area is free of hazardous obstructions and be aware of protruding machine members.

Return tools and similar equipment to their proper storage place immediately after use. Keep work benches neat, orderly, and clean.

Report unsafe working conditions to your supervisor or safety department. Items such as: worn or broken flooring, ladders, and handrails, unstable or slippery platforms, or scaffolds must be reported and repaired before use. Do not use skids, workpieces, stock, machines, tote pans, and boxes as makeshift climbing aides.

TOOL SAFETY

Sharp edged cutting tools must be handled with gloves or a shop cloth. Inspect cutting tools before use and reject defective tools.

Remove hand tooling such as wrenches, measuring equipment, hammers, and other miscellaneous parts from the machine immediately after usage.

LIFTING AND CARRYING SAFETY

WARNING

Failure to follow instructions on this page may result in personal injury and/or damage to machine components.

Contact supervision if you have any questions or are not sure about the proper procedures for lifting and carrying.

Before lifting or carrying an object, determine the weight and size by referring to such things as tags, shipping data, labels, marked information, or manuals.

Use power hoists or other mechanical lifting and carrying equipment for heavy, bulky, or hard to handle objects. Use hookup methods recommended by your safety department and know the signals for safely directing a crane operator.

Never place any part of your body under a suspended load or move a suspended load over any part of another person's body. Before lifting, be certain that you have a safe spot for depositing the load. Never work on a component while it is hanging from a crane or other lifting mechanism.

If in doubt as to the size or type of lifting equipment, method, and procedures for lifting, contact Cincinnati Milacron before proceeding to lift the machine or its components.

Always inspect slings, chains, hoists, and other lifting devices prior to use. Do not use lifting devices found to be defective or questionable.

Never exceed the safety rated capacity of cranes, hoists, slings, eyebolts, and other lifting equipment. Follow standards and instructions applicable to any lifting equipment you use. (For example, ANSI Standard B18.15, available from The American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018, contains information concerning safe lifting loads for different size eyebolts, for various angles of lift and application instructions for safe use of eyebolts.)

Before inserting an eyebolt, be certain that both the eyebolt and the hole have the same size and type threads. To attain safe working loads, at least 90% of the threaded portion of a standard forged eyebolt must be engaged.

INSTALLATION AND RELOCATION SAFETY

Before lifting the machine, consult the machine manual or Cincinnati Milacron for proper methods and procedures.

WARNING

Failure to follow instructions on this page may result in personal injury and/or damage to machine components.

An electrician must read and understand the electrical schematics prior to connecting the machine to the power source. After connecting the machine, test all aspects of the electrical system for proper functioning. Always make sure the machine is grounded properly. Be certain that all exposed electrical systems are covered properly. Place all selector switches in their OFF or neutral (disengaged) position. The doors of the main electrical cabinet must be closed and the main disconnect switch must be in the OFF position after the power source connection is complete.

Always lock the main disconnect device in the OFF position if the machine is left unattended. Never bypass or wire around safety devices.

When the machine is installed, be sure that the motors rotate in the proper indicated direction.

SETUP AND OPERATION SAFETY

Read and understand all the safety instructions before setting up, operating, or servicing this machine. Assign only qualified personnel, instructed in safety and all machine functions, to operate or service this machine.

Operators and maintenance personnel must carefully read, understand, and fully comply with all machine mounted warning and instruction plates. Do not paint over, alter, or deface these plates or remove them from the machine. Replace all plates which become illegible. Replacement plates can be purchased from Cincinnati Milacron.

Safety guards, shields, barriers, covers, and protective devices must be connected or in place before operating the machine.

Safety disengagements or interlocks provided on handwheels must be in place before operation.

When setting up or adjusting a workpiece or fixture, be certain it is a safe distance away from the cutting tool. Always retract the workpiece a safe distance from the cutting tool when loading and unloading.

The spindle must be stopped before adjusting the coolant discharge nozzle.

Never brake or slow down moving machinery with your hand or with some makeshift device. Never use machine power to remove a nut from any shaft. The spindle and slides must be stopped when measuring workpieces, changing tools, or removing chips and grit. Remove chips and grit with a chip rake or brush, not with your hands.

Keep all parts of your body off the machine table, table edge, out of the path of moving units, trip dogs, trip plungers, and out of the "machining area" during machining operations. Never lean on a machine or reach over or through a machine — you can become entangled in tooling and other moving elements or you may accidentally activate start buttons, feed controls, rapid traverse controls, power work holding control, or similar devices.

During operation, be attentive to the machining process. Excessive vibration, unusual sounds, etc., can indicate problems requiring your immediate attention. Watch for conditions such as packed chips or grit which can cause breakage of tooling or machine elements.

Shut off power to your machine when you leave the operating area or at the end of your work period; never leave a machine running unattended. Turn the master disconnect device to the OFF position before cleaning the machine at the end of the working day or when guards or covers are removed that expose hazardous areas.

MAINTENANCE SAFETY

WARNING

Failure to follow instructions on this page may result in personal injury and/or damage to machine components.

Do not attempt to perform maintenance on this machine until you read and understand all the safety instructions.

Assign only qualified service or maintenance personnel to perform maintenance and repair work on this machine. Consult the service manual before attempting any service or repair work and when in doubt contact Cincinnati Milacron. Use only Cincinnati Milacron replacement parts; others may impair the safety of the machine. Before performing maintenance or service work, Warning or Danger signs must be placed conspicuously about the machine. Before detaching counterweights or driving mechanisms, vertical sliding members must be blocked properly. See the Service Manual for proper dismantling procedures.

DANGER: HIGH VOLTAGE

Before working on any electrical circuits, turn the machine Main Disconnect Device "OFF" and lock it.

Unless expressly stated in applicable Cincinnati Milacron documentation or by the appropriate Cincinnati Milacron Field Service Representative, do NOT work with electrical power "ON". If such express statement or advice exists, working with electrical power "ON" should be performed by a Cincinnati Milacron Field Service Representative. The customer and subsequent transferees must determine that any other person performing work with electrical power "ON" is trained and technically qualified.

FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN DEATH OR SERIOUS PERSONAL SHOCK INJURY.

Before removing or opening any electrical enclosure, cover, plate, or door, be sure that the main disconnect switch is in the OFF position. If any tool is required to remove a guard, cover, bracket, or any basic part of this machine, place the main disconnect switch in the OFF position, lock it in the OFF position. If possible, post a sign at the disconnect switch indicating that maintenance is being performed.

Whenever maintenance is to be performed in an area away from the disconnect and the disconnect is not locked, tag all start button stations with a "DO NOT START" tag. Adequate precautions, such as locks on circuit breakers, warning notices, or other equally effective means must be taken to prevent electrical equipment from being electrically activated when maintenance work is being performed.

Before attempting to adjust, repair, or perform maintenance on electrical circuits connected with yellow wires, first find the source of power, turn it off; and lock it in the OFF position. Machine tool interlock control circuits connected with yellow wires are powered from a source away from the machine and carry voltage even when the machine's main disconnect device is turned to the OFF position.

When removing electrical equipment, place number or labelled tags on those wires not marked. If wiring is replaced, be sure it is of the same type, length, size, and has the same load carrying capacity.

Close and securely fasten all guards, shields, covers, plates, or doors before power is reconnected.

An electrical technician must analyze the electrical system to determine the possible use of power retaining devices such as capacitors. Such power retaining devices must be disconnected, discharged or made safe before maintenance is performed.

Working space around electrical equipment must be clear of obstructions. Provide adequate illumination to allow for proper operation and maintenance.

WARNING

Failure to follow instructions on this page may result in personal injury and/or damage to machine components.

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CINCINNATI LATHE & TOOL CO.

CINCINNATI 9, OHIO, U.S.A.

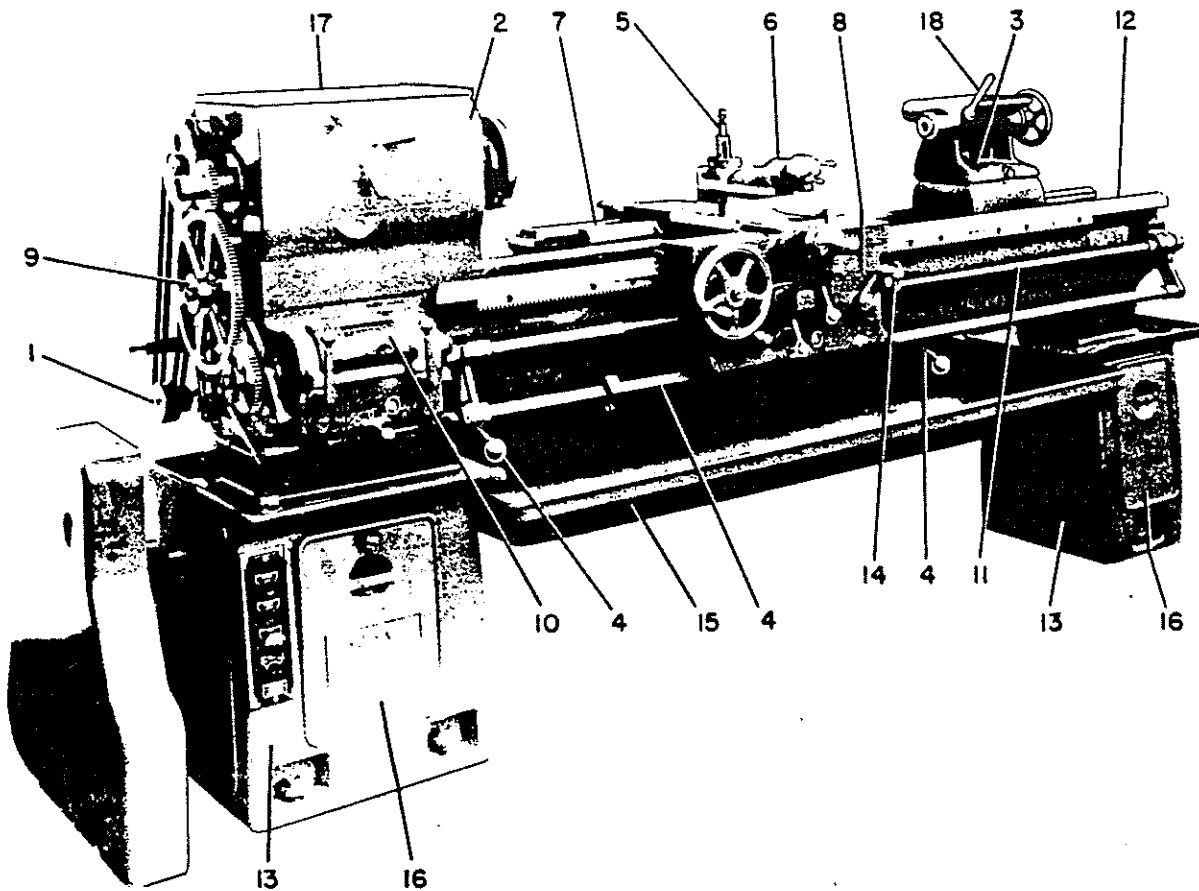


Figure 1-1. Cincinnati Tray-Top Lathe

- | | |
|---------------------------------|------------------------|
| 1. Motor Drive | 10. Quick Change Box |
| 2. Headstock | 11. Leadscrew |
| 3. Tailstock | 12. Bed |
| 4. Control Levers - Control Rod | 13. Legs |
| 5. Tool Post | 14. Chasing Dial |
| 6. Compound Rest | 15. Dry Pan |
| 7. Carriage | 16. Storage Enclosures |
| 8. Apron | 17. Headstock Tray-Top |
| 9. End Gearing | 18. Tailstock Tray-Top |

SECTION I

DESCRIPTION

1-1. The Tray-Top is basically a conventional, standard type of engine or tool room lathe, built by line assembly methods of completely tooled components, units and details, produced in quantities by organized manufacture.

1-2. It is used chiefly to perform those operations normally done on a lathe, such as turning, facing, boring and threading, on the surfaces of rotating work pieces, thereby producing shapes which are basically cylindrical in form.

1-3. The performance of these operations calls for certain functions which require the incorporation in the units comprising the lathe of certain structures and mechanisms.

1-4. The major functions and the units which provide for them are as follows:

<u>Function</u>	<u>Unit</u>
Transmit power to rotate the work piece.	Motor Drive (1) Headstock (2)
Hold or support the work piece.	Headstock (2), Tailstock (3), and upon occasion the Steady Rest and/or the Follow Rest
Provide control and various speeds of work rotation.	Headstock (2), Mechanical or Electrical Control Assembly (4)
Hold the cutting tool in position.	Tool Post (5) Compound Rest (6)
Provide for Hand and Power Movements (at various feed rates) of the cutting tool.	Carriage (7), Apron (8), End Gearing (9), Quick Change Box (10) and Leadscrew (11)
Provide Frame-work upon which these units are mounted and upon which they function.	Bed (12) Legs (13)

1-5. In addition, somewhat less important functions

and their corresponding units are:

<u>Function</u>	<u>Unit</u>
Thread cutting.	Leadscrew (11), Chasing Dial (14), and upon occasion, Depth Threading Stop
Collection of chips and upon occasion, supply and collection of cutting fluid.	Dry Pan (15), Motor Driven Pump and Piping, Wet Pan
Storage of accessories, tools, etc.	Enclosures in Cabinet Legs (16)
"Parking Places" for tools, small accessories, etc.	"Tray-Tops" on Headstock (17) and Tailstock (18)

1-6. GENERAL DESCRIPTION OF MAJOR UNITS.

1-7. **MOTOR DRIVE.** The Tray-Top Lathe is driven by a constant speed motor of requisite horsepower which is mounted on a pivoted motor plate located at the rear of the head end leg. Adjusting screws provide for the proper tension of the vee belts which transmit power from the motor pulley to the drive sheave on the input shaft to the headstock.

1-8. **HEADSTOCK.** The headstock unit consists of a cast iron housing into which is assembled the mechanism and gearing which transmits the power from the motor to the spindle in the form of controlled speeds. The spindle is provided with means for mounting centers, face plates, chucks or other suitable devices to hold and to drive the work piece. The headstock is securely positioned on the inner ways of the bed.

1-9. **TAILSTOCK.** The tailstock is mainly used to support the right end of a work piece when held between centers. It is occasionally used to support drills, etc. for operating on work pieces not supported on centers. This unit may be positioned longitudinally along the inner ways of the bed.

1-10. CARRIAGE - APRON. The carriage is supported on the outer vee and flatway of the bed and can be moved manually or by power along the bed. Suspended from the front of the carriage is the apron which contains the mechanisms and gearing driven from the splined leadscrew that provide power feed to the carriage and the cross slide. Mounted upon the carriage is the cross slide, compound rest and toolpost. The complete unit provides the mechanism for positioning the cutting tool and controlling and directing its manual or power movements.

1-11. QUICK CHANGE GEAR BOX. The quick change gear box is a unit located on the left front face of the bed directly below the headstock. It is driven from the headstock spindle by the end gearing. This mechanism controls the rate of rotation of the splined leadscrew in relation to that of the headstock spindle which drives

the work piece, thereby providing the various feed rates and lead changes for thread chasing.

1-12. LEADSCREW. The leadscrew is located along the front of the bed and transmits power from the quick change gear box to the apron-carriage unit. The spline provides the drive for power feeds to the carriage and cross slide. The threads of the leadscrew provide the drive to the carriage for thread chasing only.

1-13. BED - LEGS. The lathe bed is made of close grain cast iron. It supports the functioning units and provides accurate guideways for those that move on it. The structural stability of the bed is accomplished by cross girths which are placed at close intervals. The bed is supported at each end on cabinet type legs.

GENERAL SPECIFICATIONS

	10 In.	12 1/2 In.	15 In.	18 In.
CAPACITY				
Swing over bed	10 1/4"	12 3/4"	15 1/4"	18 1/4"
Swing over cross slide	6"	8 1/4"	9 1/8"	11 7/8"
Distance between centers (maximum turning length)	24" to 36"	18" to 60"	24" to 114"	24" to 114"
Center distance increase increments	6"	6"	6"	6"
Motor -- standard	1 hp	1 1/2 hp	2 hp	3 hp
Motor -- high spindle speed range	1 1/2 hp	2 hp	3 hp	3 hp
HEADSTOCK				
Area of tray top	165 sq in	165 sq in	205 sq in	205 sq in
Spindle speeds (number)	12	12	12	12
Spindle speed range (standard) (40 to 1 ratio)	30 -- 1200 rpm	30 -- 1200 rpm	20 -- 820 rpm	20 -- 820 rpm
Spindle speed range -- high	45 -- 1800 rpm	45 -- 1800 rpm	30 -- 1200 rpm	30 -- 1200 rpm
Spindle reverse	Electrical	Electrical	Electrical	Electrical
Spindle nose	L00	L00	L0	L0
Spindle -- diameter of hole through	1 11/32"	1 11/32"	1 9/16"	1 9/16"
Spindle -- number of bearings	3	3	3	3
Spindle -- size of center	No. 2 Morse	No. 3 Morse	No. 3 Morse	No. 4 Morse
Headstock -- base length on bed	17 1/2"	17 1/2"	20 9/16"	20 9/16"
THREAD AND FEED RANGE				
Number of thread and feed changes	48	48	48	48
Range of threads per inch	3 to 184	3 to 184	1 1/2 to 92	1 1/2 to 92
Range of feeds -- carriage (inches per turn of spindle) .....	.0019 to .1215	.0019 to .1215	.0019 to .1215	.0019 to .1215
Range of feeds -- cross slide (inches per turn of spindle) .....	.0005 to .0308	.0005 to .0308	.0009 to .0578	.0009 to .0578
Leadscrew (Acme) (diameter and threads per inch)	1" -- 8	1 1/8" -- 8	1 1/4" -- 6	1 3/8" -- 6
Range of metric leads with (2) conversion gears, MM .....	.1875 to 11.5	.1875 to 11.5	.375 to 23	.375 to 23
Range of feeds -- carriage (mm per turn of spindle) .....	.0683 to 4.1912	.0683 to 4.1912	.0683 to 4.1912	.0683 to 4.1912
Range of feeds -- cross slide (mm per turn of spindle) .....	.0173 to 1.0625	.0173 to 1.0625	.0325 to 1.9975	.0325 to 1.9975
CARRIAGE AND COMPOUND REST				
Cross slide travel	8"	8"	10 1/2"	10 1/2"
Top slide travel	2 1/2"	2 1/2"	3 3/8"	3 3/8"
Solid tool size	3/8" x 3/4"	1/2" x 1"	5/8" x 1 1/4"	5/8" x 1 1/4"
Tool holders -- size of tool shank	3/8" x 7/8"	1/2" x 1 1/8"	5/8" x 1 3/8"	5/8" x 1 3/8"
Carriage bearing on ways	18 1/4"	18 1/4"	22 3/8"	22 3/8"
Width of bridge	4 3/4"	4 3/4"	6"	6"

	10 In.	12 1/2 In.	15 In.	18 In.
TAILSTOCK				
Area of tray top	32 sq in	48 sq in	68 sq in	75 sq in
Spindle travel	3"	4 1/2"	6 1/4"	6 1/2"
Spindle diameter	1 1/4"	1 1/2"	1 7/8"	2 1/4"
Spindle -- size of center	No. 2 Morse	No. 3 Morse	No. 3 Morse	No. 4 Morse
Tailstock body -- length on bed	7"	8 3/4"	10 1/2"	10 1/2"
Tailstock set-over (either side of center) .	1/2"	1/2"	1"	1"
TAPER ATTACHMENT				
Maximum taper per foot	3 1/2"	3 1/2"	4"	4"
Turns at one setting	12"	12"	16"	16"
MISCELLANEOUS				
Face plate -- large and small (diameter) ..	9 1/2" -- 7"	12" -- 7"	14 1/2" -- 9"	17 1/2" -- 9"
Steady rest -- minimum and maximum (diameter) STANDARD OVERSIZE	1/4" to 3 1/2" 3" to 6"	1/4" to 3 1/2" 3" to 6"	1/2" to 5" 4 1/2" to 7 1/2"	1/2" to 5" 4 1/2" to 7 1/2"
Follow rest -- minimum and maximum (diameter)	1/4" to 2"	1/4" to 2"	1/2" to 2 1/2"	1/2" to 2 1/2"
DRIVE -- MOTOR				
Motor -- standard	1 hp	1 1/2 hp	2 hp	3 hp
Motor -- high spindle speed range (extra cost)	1 1/2 hp	2 hp	3 hp	3 hp
Number of vee belts	2	2	2	2
Pulley size -- headstock	6 7/16"	6 7/16"	7 3/16"	7 3/16"
Pulley speed -- headstock .....rpm	770	770	750	750

The Cincinnati Tray-Top Lathe with Fixed Gap Bed, available only in 15-in. and 18-in. nominal swing sizes, provides the following increased capacity.

	Nominal Swing	
	15 In.	18 In.
Swing over gap	22"	25"
Approximate distance end of spindle nose to end of gap	9"	10"
Gap face plate available	21"	24"
Cross slide travel without taper attachment	12"	12"
Cross slide travel with taper attachment	9 7/8"	11"
Distance between centers (maximum turning length)	24" to 108"	24" to 108"

SHIPPING DATA - EXCEPT FIXED GAP BED	10 In.	12 1/2 In.	15 In.	18 In.
Basic machine size	10" x 24"	12 1/2" x 18"	15" x 24"	18" x 24"
Net weight approx.	1465 lbs	1510 lbs	2040 lbs	2170 lbs
Add for each 6 in. extra of bed ... approx.	25 lbs	30 lbs	40 lbs	50 lbs
Weight -- domestic shipment approx.	2035 lbs	2050 lbs	2640 lbs	2770 lbs
Add for each 6 in. extra of bed approx.	55 lbs	60 lbs	70 lbs	80 lbs
Weight -- boxed for export approx.	2470 lbs	2420 lbs	3140 lbs	3270 lbs
Add for each 6 in. extra of bed approx.	120 lbs	125 lbs	135 lbs	145 lbs
Space occupied (crated)				
Width, height, length	47" x 61" x 78"	47" x 61" x 72"	47" x 61" x 84"	47" x 61" x 84"
Add 6 in. to length for each 6 in. extra of bed.				
Cubic contents approx.	130 cu ft	120 cu ft	140 cu ft	140 cu ft
Add for each 6 in. extra of bed . approx.	10 cu ft	10 cu ft	10 cu ft	10 cu ft
SHIPPING DATA -- FIXED GAP BED				
Basic machine size approx.			15" x 24"	18" x 24"
Weight net approx.			2210 lbs	2350 lbs
Add for each 6 in. extra of bed . approx.			40 lbs	50 lbs
Weight -- domestic shipment approx.			2840 lbs	2980 lbs
Add for each 6 in. extra of bed approx.			70 lbs	80 lbs
Boxed for export approx.			3405 lbs	3545 lbs
Add for each 6 in. extra of bed . approx.			135 lbs	145 lbs

SECTION II

SPECIAL SERVICE TOOLS

2-1. There are no special tools required for servicing and overhauling these machines.

2-2. Standard tools furnished with the 10-in. and 12 1/2-in. machines are as follows:

Wrench - Williams adjustable hook spanner #474 (2-4 3/4-in. dia. capacity), our Part #601265

Wrench - Hexagon Box for Tailstock (1 1/16 in. across flats), our Part #600968

Wrench - Tool Post (9/16-in. square box and 11/16-in. open end), our Part #601427

2-3. Standard tools furnished with the 15-in. and 18-in. machines are as follows:

Wrench - Williams adjustable hook spanner #474-A (4 1/2-6 1/4-in. dia. capacity), our Part #600986

Wrench - Hexagon Box for Tailstock (1 1/4-in.

across flats), our Part #600967

Wrench - Tool Post (5/8-in. square box and 7/8-in. open end), our Part #601345

2-4. Wrenches needed but not furnished:

Wrench - Male Socket - Allen -	3/32 in.
" " " "	1/8 in.
" " " "	5/32 in.
" " " "	3/16 in.
" " " "	7/32 in.
" " " "	5/16 in.
" " " "	3/8 in.

2-5. Also required:

Standard Type Screw Driver - 1/16 in. thick x 5/16 in. wide blade

Bent Scratch Awl (for clutch driven machines)

Adjustable Face Spanner - 3-in. size (J. H. Williams Co. No. 483)

SECTION III

OPERATION

3-1. PREPARATION FOR USE.

3-2. SELECTING LOCATION FOR MACHINE.

3-3. For best results from any machine, which depend to a great extent on the skill of the operator, it is important that the zone selected for its erection be well-lighted, as dry as possible, and as free as possible from vibration.

3-4. The machine should be located so that adequate space is provided for utilization of maximum ranges, as well as the space required for making adjustments. A minimum of 18-in. clearance space should be provided at the ends and rear of the lathe and at least 36 in. at the front for the operator.

NOTE

For important dimensions, see figures 3-1 and 3-2.

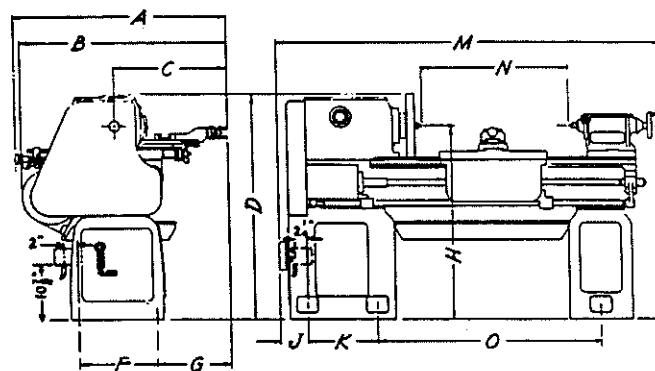


Figure 3-1. Cincinnati Tray-Top Lathe, Standard Bed

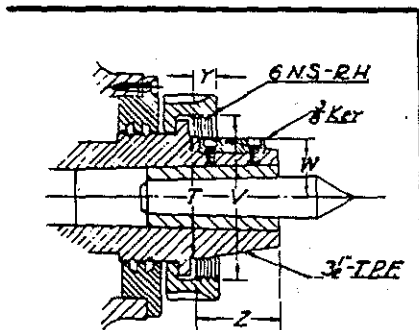
General Dimensions- Cincinnati Tray-Top Lathe, Standard Bed

LATHE SIZE	Dimensions - In Inches								
	A	B	C	D	F	G	H	J	K
10"	33 11/16	35 3/16	17 13/16	46 5/8	14 1/4	10 11/16	41 7/8	5	10 1/8
12 1/2"	34 9/16	35 5/8	18 1/4	48 3/4	14 1/4	11 1/8	44	5	10 1/8
15"	45	44 1/16	23 13/16	48 7/8	15 1/4	16 3/16	41 7/8	5	12 1/2
18"	46 1/8	44 5/8	24 3/8	51	15 1/4	16 3/4	44	5	12 1/2

Center Distance (N)	18	24	30	36	42	48	54	60	66 *
Bed Length (10" & 12 1/2")	4 1/2'	5'	5 1/2'	6'	6 1/2'	7'	7 1/2'	8'	-
M (10" & 12 1/2")	64 1/4	70 1/4	76 1/4	82 1/4	88 1/4	94 1/4	100 1/4	106 1/4	-
O (10" & 12 1/2")	36 7/8	42 7/8	48 7/8	54 7/8	60 7/8	66 7/8	72 7/8	78 7/8	-
Bed Length (15" & 18")	-	5 1/2'	6'	6 1/2'	7'	7 1/2'	8'	8 1/2'	9'
M (15")	-	77 3/8	83 3/8	89 3/8	95 3/8	101 3/8	107 3/8	113 3/8	119 3/8
M (18")	-	78 7/16	84 7/16	90 7/16	96 7/16	102 7/16	108 7/16	114 7/16	120 7/16
O (15" & 18")	-	45 7/8	51 7/8	57 7/8	63 7/8	69 7/8	75 7/8	81 7/8	87 7/8

Center Distance (N)	72	78	84	90	96	102	108	114
Bed Length (10" & 12 1/2")	-	-	-	-	-	-	-	-
M (10" & 12 1/2")	-	-	-	-	-	-	-	-
O (10" & 12 1/2")	-	-	-	-	-	-	-	-
Bed Length (15" & 18")	9 1/2'	10'	10 1/2'	11'	11 1/2'	12'	12 1/2'	13'
M (15")	125 3/8	131 3/8	137 3/8	143 3/8	149 3/8	155 3/8	161 3/8	167 3/8
M (18")	126 7/16	132 7/16	138 7/16	144 7/16	150 7/16	156 7/16	162 7/16	168 7/16
O (15" & 18")	93 7/8	99 7/8	105 7/8	111 7/8	117 7/8	123 7/8	129 7/8	135 7/8

General Dimensions-15" and 18" Cincinnati Tray-Top Fixed Gap Bed Lathe



SPINDLE NOSE DIMENSIONS STANDARD & FIXED GAP BED		
Dimension	10 and 12 1/2	15 and 18
T	2 3/4	3 1/4
V	3 3/4	4 1/2
W	1.367	1.617
	1.365	1.615
Y	5/8	9/16
Z	1 7/8	2 1/4

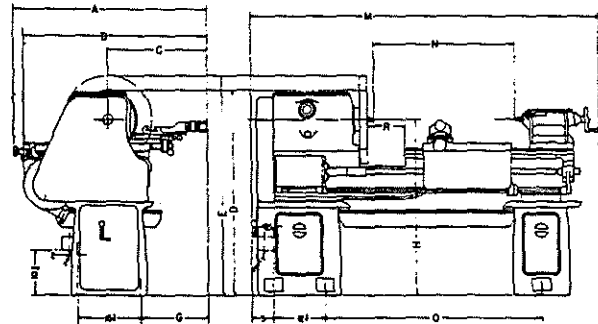


Figure 3-2. Cincinnati Tray-Top Lathe, Fixed Gap Bed

15" and 18" LATHES					15" and 18" LATHES				
Bed Length	Dimensions				Bed Length	Dimensions			
	M15	M18	N	O		M15	M18	N	O
6'	83 3/8	84 7/16	24	51 7/8	10'	131 3/8	132 7/16	72	99 7/8
6 1/2'	89 3/8	90 7/16	30	57 7/8	10 1/2'	137 3/8	138 7/16	78	105 7/8
7'	95 3/8	96 7/16	36	63 7/8	11'	143 3/8	144 7/16	84	111 7/8
7 1/2'	101 3/8	102 7/16	42	69 7/8	11 1/2'	149 3/8	150 7/16	90	117 7/8
8'	107 3/8	108 7/16	48	75 7/8	12'	155 3/8	156 7/16	96	123 7/8
8 1/2'	113 3/8	114 7/16	54	81 7/8	12 1/2'	161 3/8	162 7/16	102	129 7/8
9'	119 3/8	120 7/16	60†	87 7/8	13'	167 3/8	168 7/16	108	135 7/8
9 1/2'	125 3/8	126 7/16	66	93 7/8					

LATHE SIZE	Dimensions - In Inches							
	A	B	C	D	E	G	H	R
15"	46 1/2	44 1/16	23 13/16	48 7/8	52 3/8	16 3/16	41 7/8	9
18"	47 5/8	44 5/8	24 3/8	51	56	16 3/4	44	10

* Center leg furnished this length and longer, standard beds.

† Center leg furnished this length and longer, fixed gap beds.

3-5. FOUNDATION.

3-6. A special foundation is not essential for this machine. However, it is advisable to place it on a substantial foundation of concrete if possible. If placed on a wooden floor, care should be taken to see that it is adequately supported and free from vibration. If the machine is to be placed on an upper floor, locate it directly over a supporting beam or girder to reduce any vibration generated by nearby machines.

3-7. UNCRATING THE MACHINE.

3-8. Upon receipt of shipment, remove crating carefully, but do not remove skids from under the legs until the lathe has been moved to the approximate place selected for its erection.

3-9. CLEANING THE MACHINE.

3-10. Do not move the carriage or tailstock on the bed ways before cleaning thoroughly and oiling the ways. Use a good clean grease solvent to remove slushing compound and dirt accumulated in transit. Use rags rather than waste to eliminate lint. Do not use an air hose as this will force grit and dirt into important functioning units. Use a stiff bristle brush to get into corners and to clean leadscrew thoroughly. When the machine has been cleaned satisfactorily, rub clean machine oil over all ways and make certain no grit remains. Before moving the carriage on the bed, remove the filler plug on the top of the carriage and fill the apron with the proper oil as specified in the Lubrication Chart. Pump the one shot oil plunger several times to force oil to carriage ways on bed. Then proceed with moving the carriage to balance the load. Also check the end gearing for proper meshing of gears. Clearance between meshing gear teeth should be .003 in. to .004 in., the thickness of a piece of paper.

3-11. LIFTING THE MACHINE.

3-12. To obtain a balanced condition before lifting, it is necessary to move the tailstock to the right-hand end of the bed and clamp it there (see paragraph 3-10, and be sure to clean bed ways before moving carriage or tailstock. With the cross support "A" under the approximate center of gravity, lift the machine about 1 in. from the floor and make minor adjustments of the center of gravity by moving the carriage along the bed.

NOTE

Make certain the load is on balance and that the sling does not touch the leadscrew or control rod before lifting.

3-13. If a crane is used in lifting, exercise care that none of the mechanism is damaged. Chain, wire cable, or rope may be used to lift the lathe. If ropes are used, be certain that they are strong enough to safely carry the weight of the machine. The finished surfaces of the machine must be protected from chains by using wooden blocks. Figure 3-3 shows the machine after

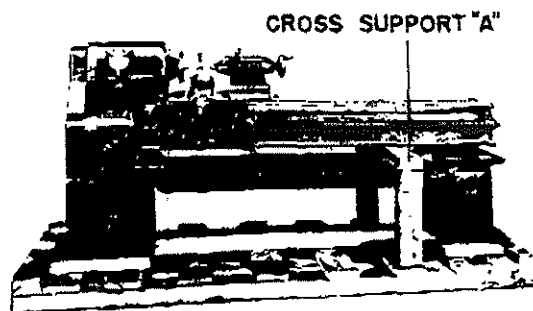


Figure 3-3. Lathe with Crating Removed

crating has been removed. The method of lifting is shown by figure 3-4. After removing cross support "A", place it under the bed as shown, making certain it does not contact control rod. This support has been offset to avoid this condition, so be certain it is properly set before lifting.

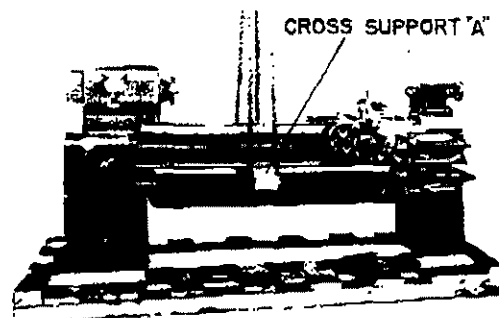


Figure 3-4. Method of Lifting

3-14. LEVELING THE MACHINE.

3-15. Leveling a lathe and keeping it level is one of the primary essentials in proper lathe operation.

3-16. Cincinnati Tray-Top lathes are equipped with built-in leveling jacks to simplify this operation. Four are located in the headstock leg and two in the tailstock leg.

3-17. The complete leveling jack consists of the parts shown in figure 3-5.

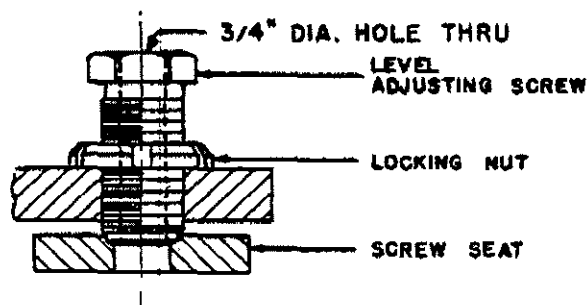


Figure 3-5. Leveling Jack Assembly

3-18. If the machine is not to be fastened to the floor, it is only necessary to see that the screw seats are properly placed before proceeding with the leveling as described below.

3-19. It may be desirable to anchor the machine firmly in place by bolting it to the foundation. This can be accomplished by means of the hole through the center of the leveling jack.

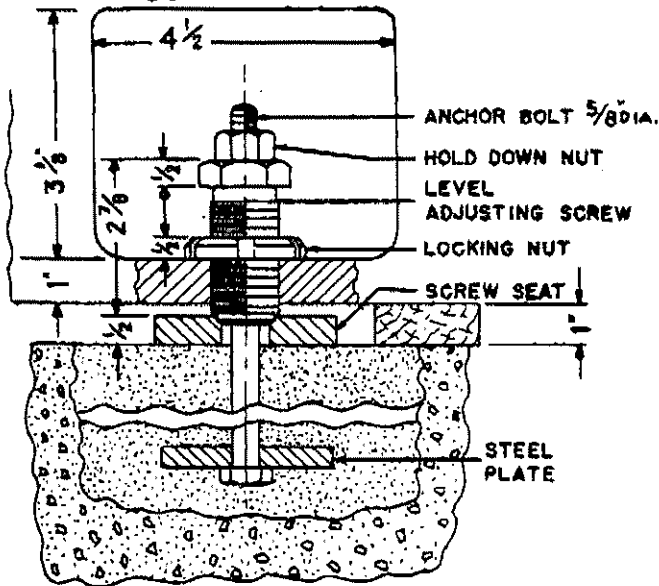


Figure 3-6. Anchoring Machine

3-20. If the lathe is to be bolted to a concrete floor, anchor bolts (not supplied with the lathe) should be used. If the lathe is to be fastened down on a wooden floor, lag screws may be used. Since the center distance between bolt holes as shown on the dimensional drawing are approximate, it will be necessary accurately to locate the anchor bolts or lag screws in the floor.

3-21. This can be done by setting the machine in its exact location and marking the leveling screw locations directly on the floor. Then, in the case of a concrete floor, proceed as follows:

3-22. Move the machine out of the way and drill the holes for the anchor bolts about 6 in. in diameter and 6 in. deep.

3-23. Raise the machine with a crane approximately 10 in. from the floor. Place 4-in. square steel plates and screw seats on 5/8 in. diameter anchor bolts, 9 1/2 in. long, and insert the bolts through the bores in the level adjusting screws, engaging the holddown nuts on the bolts to hold the entire assembly in place. Lower the machine into position, placing a 1-in. thick board under each leg of the lathe.

3-24. Fill the holes around the anchor bolts with quick drying cement, thin enough to flow easily.

3-25. After the cement around the anchor bolts has set, the boards should be removed, the machine lowered to the floor, and the holddown nuts threaded onto the anchor bolts. The leveling jack assembly appears as in figure 3-6. The machine is now ready for leveling.

3-26. Where the machine is to be fastened to a wooden floor by lag screws, the pilot holes for the lag screws can be drilled after their locations have been determined as indicated in paragraph 3-21 above. Then when the machine is spotted over the screw holes in the floor and the lag screws have been partially screwed down, the leveling operation can proceed.

3-27. PROCEDURE FOR LEVELING.

3-28. Use a precision level that is graduated to at least .001 in. per foot. A carpenter's level or the level in a machinist's combination square is not accurate enough.

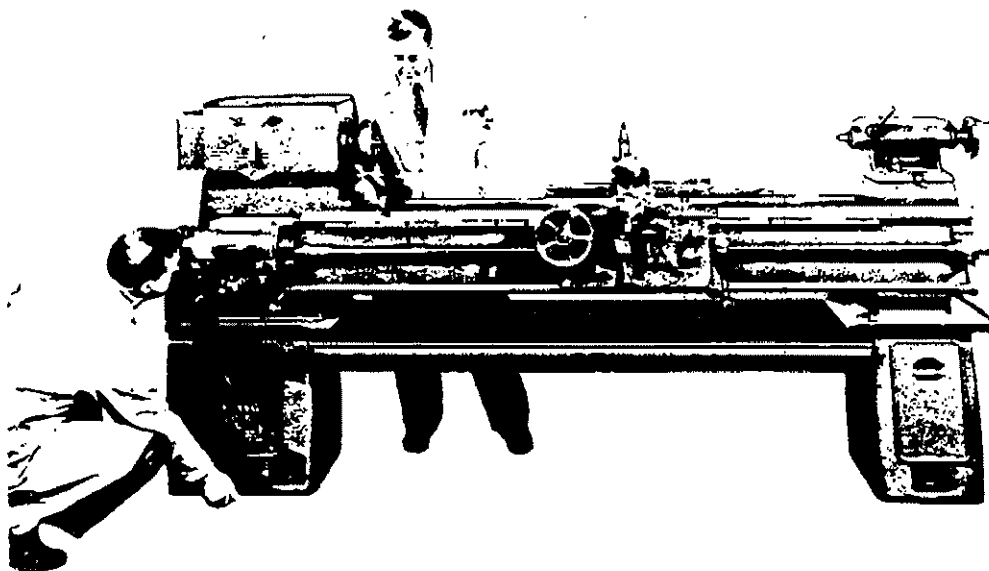


Figure 3-7. Leveling the Lathe

3-29. The leveling process is accomplished in two phases, the first being the preliminary leveling and the second the final leveling. The preliminary leveling is to remove any pronounced twist in the bed and should be done with the units remaining in one position. This is accomplished in the following manner.

3-30. Place the level across the top of the vee ways close to the headstock as shown in figure 3-7.

3-31. Adjust the screws under the headstock end leg until reading is zero. Then move the level to the tailstock end and with the level across top of the vee ways adjust the screws under tailstock end leg until reading is zero. Then recheck and make minor adjustments with the level at each of the above mentioned positions. This completes the preliminary leveling.

3-32. For final leveling, place the level lengthways on the front flat way close to the headstock end and adjust screws under headstock end leg until reading is zero and at the same time checking with the level across the top of the bed ways to make certain these adjustments do not cause a twist in the bed.

3-33. Place the level lengthways on the front flat way,

close the tailstock, and repeat the operations above, also checking with the level across the vee ways to eliminate any twist.

NOTE

Repeat these operations and make whatever minor adjustments are required.

3-34. The next operation is to level the lathe crossways by placing the level across the carriage wings and moving the carriage from one end of the bed to the other without disturbing the position of the level. If the level shows any variation throughout its travel, the screws nearest the point where variation occurs should be raised or lowered to bring the level back to zero.

3-35. Any adjustment made to bring the lathe level in one direction may affect the level of the lathe in the other direction, and it is only a combination of adjustments that will bring the lathe into proper level.

3-36. During the first week of operation, or until foundation has "set," the level of the machine should be checked frequently. Periodic rechecks should be made at least every six months.

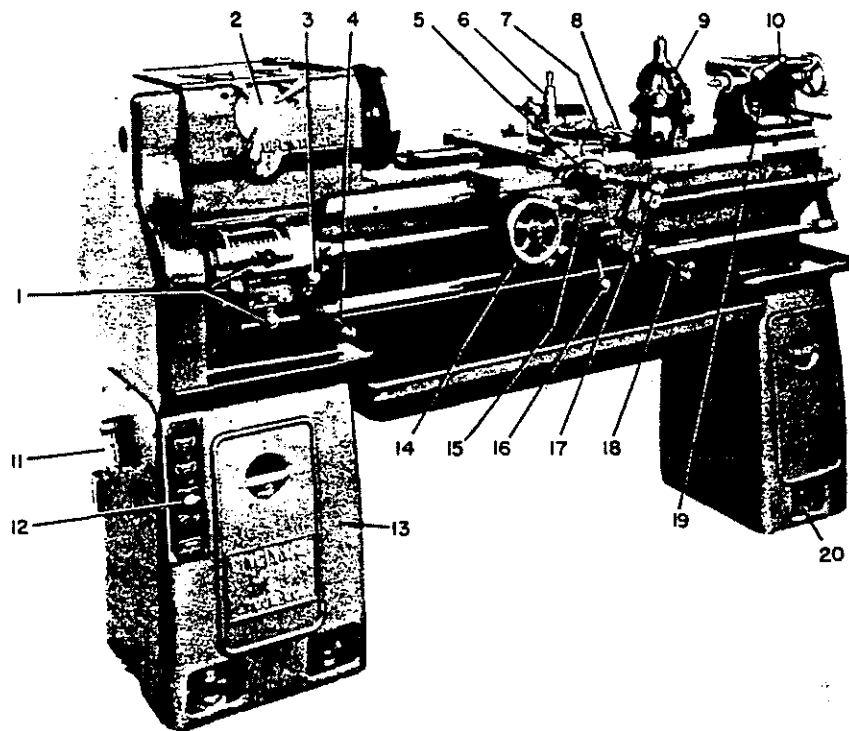


Figure 3-8. Functional Diagram, 10-in. and 12 1/2-in. Cincinnati Tray-Top Lathe

- | | | |
|---------------------------------------|------------------------------|--|
| 1. Thread and Feed Selector Levers | 8. Compound Adjusting Handle | 15. Power Feed Selector Knob |
| 2. Spindle Speed Selector Dial | 9. Steady Rest | 16. Power Feed Engaging Lever |
| 3. Leadscrew Reverse | 10. Tailstock Spindle Clamp | 17. Half-Nut Engaging Lever |
| 4. Headstock Spindle Start-Stop Lever | 11. Disconnect Switch | 18. Headstock Spindle Start-Stop Lever |
| 5. Cross Slide Adjusting Handle | 12. Push Button Panel | 19. Tailstock Clamping Nut |
| 6. Tool Post | 13. Storage Compartment | 20. Leveling Screw |
| 7. Carriage Clamp | 14. Carriage Handwheel | |

3-37 LUBRICATION.

3-38. The importance of correct lubrication cannot be stressed too strongly. Thorough lubrication of the machine must be done after the lathe has been unpacked and before it is used. See Section IV for detailed instructions and for the required specification of the lubricants.

3-39. ELECTRICAL CONTROLS (See also wiring diagrams Pages 23, 24, 25, and 26.)

3-40. ALL-ELECTRIC DRIVE (Standard).

3-41. Complete electrical equipment consisting of magnetic reversing starters, reversing drum switch, non-fused disconnect switch, and instant reversing main drive motor, is furnished.

3-42. CLUTCH DRIVE.

3-43. Complete electrical equipment consisting of start-stop-reverse push buttons mounted on the headstock end leg, magnetic reversing starters, non-fused disconnect switch, and instant reversing main drive

motor, is furnished.

3-44. ALL-ELECTRIC (Standard) AND CLUTCH DRIVE.

3-45. For all AC circuits of 220 volts and over, a control transformer with 110 volt coils is supplied. All electrical equipment (except pushbuttons) is located on a panel in the recessed compartment at the left end of the headstock end leg.

3-46. Access to the electrical panel may be gained only after throwing the disconnect switch which is integral with the cover plate, to the "OFF" or "OPEN" position, removing the Allen screws, and taking off the cover plate.

3-47. An independent selector switch for the coolant pump (when supplied), is mounted on the front of the headstock end leg and a magnetic starter for the pump is included on the electrical panel.

3-48. OPERATING A CINCINNATI TRAY-TOP LATHE.

3-49. Study the functional diagrams (Figs. 3-8, 3-9,

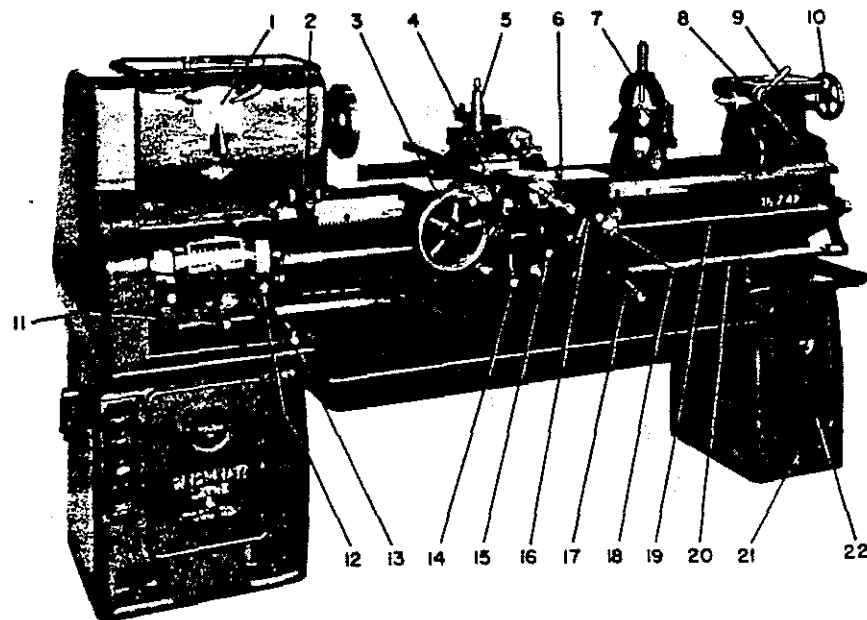


Figure 3-9. Functional Diagram, 15-in. and 18-in. Cincinnati Tray-Top Lathe, Standard Bed

1. Spindle Speed Selector Dial
2. Micrometer Carriage Stop
3. Carriage Handwheel
4. Depth Threading Stop
5. Tool Post
6. Carriage Clamp
7. Steady Rest
8. Tailstock Set-over Adjusting Screw
9. Tailstock Spindle Clamp
10. Tailstock Spindle Adjusting Wheel
11. Thread and Speed Selector Levers

12. Leadscrew Reverse
13. Headstock Spindle Start-Stop Lever
14. Longitudinal Power Feed Engaging Lever
15. Cross Slide Power Feed Engaging Lever
16. Half-Nut Engaging Lever
17. Headstock Spindle Start-Stop Lever
18. Chasing Dial
19. Splined Leadscrew
20. Control Rod
21. Leveling Screw
22. Storage Compartment

3-10) and become familiar with the operating units and control levers.

3-50. All Cincinnati Tray-Top lathes are equipped with a preloaded friction type safety clutch (see paragraph 5-24 and figure 5-5) to prevent possible damage by overloading to elements of the feed transmission.

3-51. If the safety clutch slips in operation, it will be necessary to let it cool before again operating the machine. This is necessary in order to bring the safety clutch back to its full load-bearing capacity.

3-52. ALL-ELECTRIC DRIVE (Standard).

3-53. Check the rotation of the motor. To do this, turn the disconnect switch to the "ON" position. Momentarily engage the spindle start and stop lever in its upper position to jog the spindle. As you face the spindle from the tailstock end, the spindle should rotate in a counterclockwise direction. If it does not, it is necessary to reverse the rotation of the motor

before attempting to operate the lathe.

3-54. The lathe is started and stopped with manually operated levers on the control rod which starts and stops the main drive motor through the medium of an electric drum switch and magnetic starters.

3-55. To obtain forward rotation of the spindle, pull the start-stop lever up. To reverse the spindle, push the start-stop lever down. For quick spindle stopping, move the start-stop lever past the neutral position momentarily, which tends to reverse the motor. Return the lever to the neutral position quickly to prevent reverse rotation of the spindle.

3-56. CLUTCH DRIVE.

3-57. Check the rotation of the motor. To do this, turn the disconnect switch to the "ON" position and press the "FORWARD" button on the electrical panel to start the motor. Engage the clutch by raising the start-stop lever. As you face the spindle from the

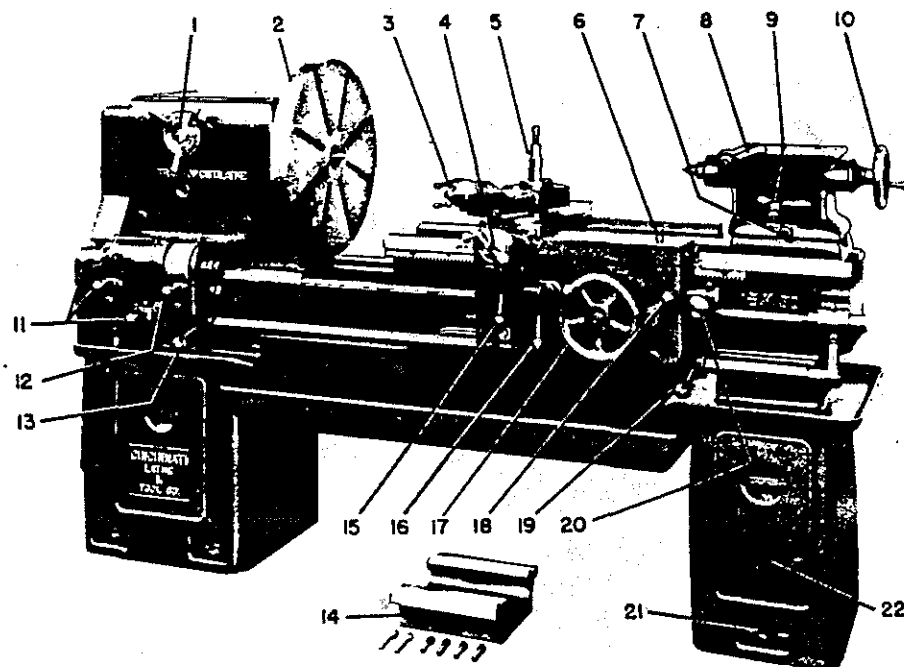


Figure 3-10. Functional Diagram, 15-in. and 18-in. Cincinnati Tray-Top Lathe, Fixed Gap Bed

- | | |
|---|--|
| 1. Spindle Speed Selector Dial | 12. Leadscrew Reverse |
| 2. Gap Face Plate | 13. Headstock Spindle Start-Stop Lever |
| 3. Compound Adjusting Handle | 14. Removable Gap Block |
| 4. Cross Slide Adjusting Handle | 15. Cross Slide Power Feed Engaging Lever |
| 5. Tool Post | 16. Longitudinal Power Feed Engaging Lever |
| 6. Carriage Clamp | 17. Carriage Handwheel |
| 7. Tailstock Set-over Adjusting Screw | 18. Half-Nut Engaging Lever |
| 8. Tailstock Spindle Clamp | 19. Headstock Spindle Start-Stop Lever |
| 9. Tailstock Clamping Nut | 20. Chasing Dial |
| 10. Tailstock Spindle Adjusting Handwheel | 21. Leveling Screw |
| 11. Thread and Feed Selector Levers | 22. Storage Compartment |

tailstock end, the spindle should rotate in a counter-clockwise direction. If it does not, it is necessary to reverse the rotation of the motor before attempting to operate the lathe.

3-58. Forward spindle rotation is obtained as in paragraph 3-57 above. To reverse rotation of the spindle lower the spindle start-stop lever to neutral, press the "REVERSE" push-button, and re-engage the clutch by raising the spindle start-stop lever. To stop the spindle depress the spindle start-stop lever which then engages a multiple-disc friction type brake.

3-59. SPINDLE SPEED SELECTION.

3-60. Spindle speeds are changed by three levers, the positions of which are selected by reference to a direct reading "color-match" dial located on the front face of the headstock. Four groups of colors are employed to distinguish the various speed selectors. The complete dial consists of a fixed reference ring, outer and intermediate adjustable selector rings, and an inner dial showing the various speeds.

3-61. To obtain a specific spindle speed, for example, one of the three speeds located in the green sector, proceed in the following manner:

- a. Stop headstock spindle. DO NOT ATTEMPT TO MAKE SPEED CHANGES WITH THE SPINDLE RUNNING. Rotate the spindle by hand if proper engagement of sliding gears is not obtainable when changing speeds.
- b. Move outer adjustable selector ring (upper left-hand lever) so the green mark coincides with the green mark of the fixed reference ring.
- c. Move intermediate adjustable selector ring (upper right-hand lever) so that green mark coincides with the green mark on the outer ring.
- d. Move the inner dial (lower lever) so that the desired speed in the green sector coincides with the green mark on the intermediate dial.

3-62. Follow the same procedure for speeds located in the blue, yellow or red sectors, matching the corresponding colors.

3-63. A neutral position of the headstock gearing is readily obtainable at any time by moving the outer adjustable selector ring (upper left-hand lever) so "N" coincides with the small arrow at the top of the fixed reference ring.

3-64. THREAD AND FEED SELECTION.

3-65. The quick change box provides selection of 48 thread and feed changes through positioning the index slide, one two-position lever, and one three-position lever. To obtain the desired thread or feed, proceed in the following manner:

- a. Stop the headstock spindle. To facilitate spur gear engagement, jog the spindle when necessary.
- b. Pull out the index slide plunger and permit the slide to drop, thereby disengaging the tumbler gears.
- c. Shift the two-position lever to A or B, and the three-position lever to C, D or E as required for the selected thread or feed.

d. Move the index slide to any one of the eight positions, depending on the thread or feed desired, obtaining the approximate location by matching the appropriate line on the index plate with the fixed reference on the cylindrical portion of the quick change box. Seat the index plunger in location hole for final setting of index plate.

3-66. Also incorporated in this unit is a leadscrew reverse lever to facilitate chasing right- or left-hand threads and to reverse the feeding direction of the carriage and cross slide.

3-67. To engage power movements to the carriage or cross slide, a drop lever engaging device, located on the apron, is employed. On 10-in. and 12 1/2-in. lathes a single drop lever is used, with selection between carriage or cross feed obtained by a push and pull selector. On 15-in. and 18-in. lathes independent drop levers are provided.

3-68. CHASING THREADS.

3-69. CHASING ENGLISH THREADS ON MACHINES EQUIPPED WITH AN ENGLISH LEADSCREW.

3-70. The pair of half-nuts is engaged with the leadscrew by depressing the lever at the right side of the apron. This lever can be moved only with the feed engaging drop levers in the down or disengaged position. A simple interference device prevents the engagement of the drop levers, when the half-nut is closed or vice versa, to prevent damage to gearing.

3-71. The chasing dial to facilitate thread chasing is mounted on a swivel bracket on the right end of the apron. This dial is rotated by a small worm wheel which is engaged with the threads of the leadscrew and rotates as the leadscrew turns. The bracket can be swiveled to disengage the worm wheel from the leadscrew to reduce wear when not chasing threads. The procedure followed in chasing threads, when the tool setup has been completed, is to bring the carriage to the starting point of the thread by hand and then watch the graduations on the chasing dial as they pass the index mark on the bracket. When one particular graduation, say "zero," coincides with the index mark, the half-nuts are closed. The chasing dial remains stationary as it travels with the carriage until the half-nuts are opened again at the end of the thread. The tool is then withdrawn from contact with the work, the carriage returned by hand to the start of the thread, and the cross feed reset to the proper depth. The particular graduation on the chasing dial to be used for closing the half-nuts again depends on the lead of thread being chased.

3-72. On the 10-in. and 12 1/2-in. machines the half-nuts can be closed at the point, without regard to the chasing dial, for any number of threads per inch divisible by eight. This same rule applies to the 15-in. and 18-in. machines, but for threads per inch divisible by six. The general rule to follow for all other threads, regardless of the size of your lathe, is for even number of threads per inch close the half-nuts on any line; for odd number of threads close the half-nuts on any num-

bered line; and for fractional threads close the half-nuts every full revolution.

3-73. CHASING METRIC THREADS ON MACHINES EQUIPPED WITH AN ENGLISH LEADSCREW.

3-74. In less than fifteen minutes a Tray-Top Lathe with an English screw can be changed to cut a full series of Metric threads using the Quick Change Box in the normal manner.

3-75. Only two additional gears and another (Metric) thread index plate are required. (Supplied on special order.) One gear is pinned to the 120-tooth idler gear normally furnished so that only one gear need be stored in the cabinet leg when not in use.

3-76. Follow the directions given in Fig. 3-11 to make the conversion. Then refer to paragraph 3-77 below for Metric thread chasing instructions. Disregard

and disengage the chasing dial after making the above conversion.

3-77. Move the carriage by hand to the starting point of the thread. Close the half-nuts and begin the chasing cut. At the end of the thread, withdraw the tool from contact with the work, but keep the half-nuts closed. If standard drive, reverse machine by pushing start-stop lever down; if clutch drive, lower start-stop lever to neutral and press "REVERSE" push-button. Stay in reverse with half-nuts closed until carriage returns to the start of the thread. Reset the cross feed to the proper depth, and, with the half-nuts still closed, re-engage the tool with the work and take another cut.

3-78. Repeat the above operation until the full depth of thread is reached. Caution: the half-nuts must remain closed until the thread has been completely finish machined.

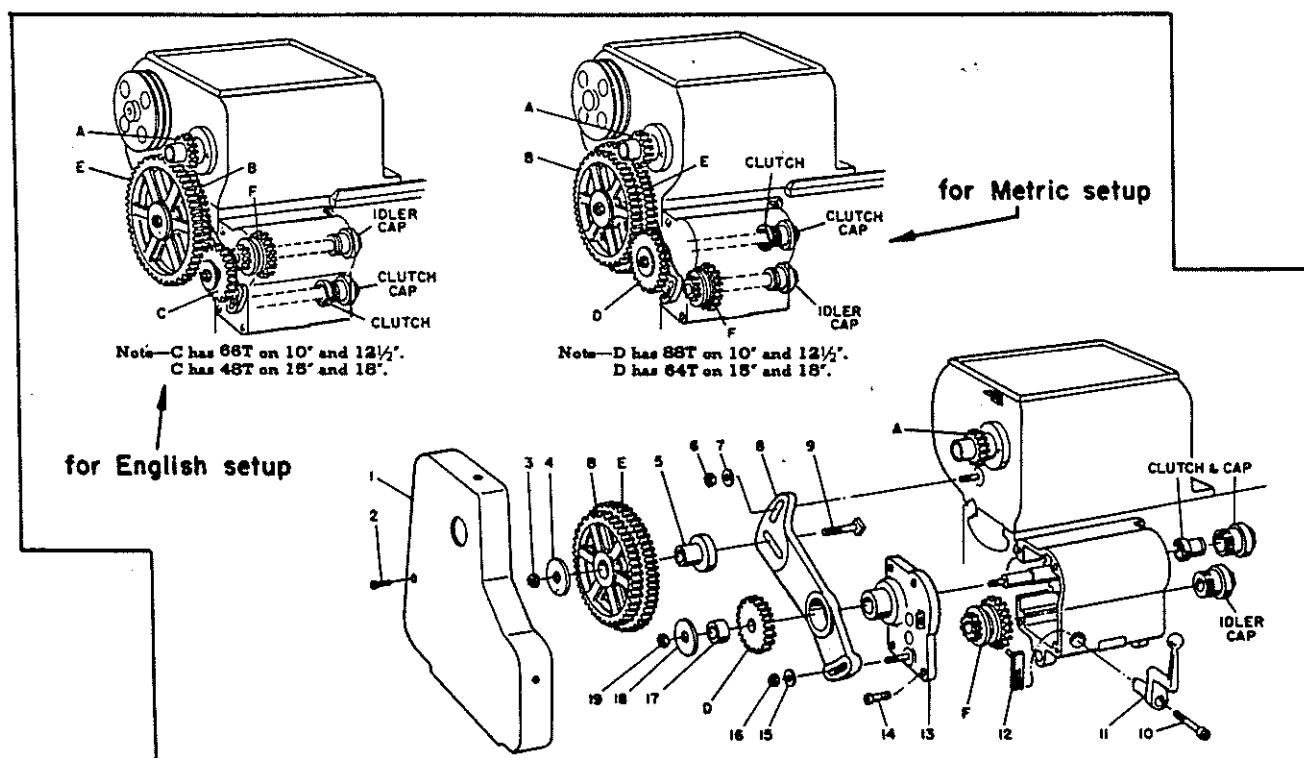


Figure 3-11. Metric Conversion

PROCEDURE

1. Remove end gearing cover (marked 1).
2. Remove gear (C).
3. Remove nuts (6) and (16) and pull off quadrant (8) with gear (B) and (E) still attached.
4. Remove four Allen screws (14) and pull off end cover (13).
5. Remove gear (F) from top shaft and place on bottom shaft and replace cover (13).
6. Turn gear (B) and (E) around so (E) is engaged with (A) and reassemble parts using gear (D), in place of gear (C).
7. Remove clutch and idler caps.
8. Remove clutch from bottom shaft and place on top shaft. Replace caps in reverse position.
9. Replace end gearing cover (marked 1).
10. Change quick change box plates. (Two plates on top of each other and held on quick change box by thumb screws.)

3-79. TAPER ATTACHMENT (TELESCOPIC).

3-80. The taper attachment is furnished as an extra and is supplied only when ordered except on toolroom lathes. It incorporates the use of a telescopic cross screw which does not have to be disengaged for turning taper work. This feature eliminates the necessity of disconnecting the cross screw nut, permits normal use of the cross feed adjustment, and greatly simplifies the transition from straight to taper turning.

3-81. Installation of this unit on machines in the field is not recommended. This is due to the necessity of installing a different cross screw than that normally supplied with a machine not originally equipped with a taper attachment. Therefore, it is advisable to order this attachment at the time the machine order is placed. In exceptional cases field installation is possible; however, additional service costs are involved.

3-82. The swivel slide is graduated in both degrees (left end) and inches taper per foot (right end) and represents the included angle or taper.

3-83. To set the attachment for any desired taper, loosen clamping nuts "C," "D," "E," "F," and "G" (figure 3-12). The swivel bar can then be adjusted by hand to the approximate setting and after tightening

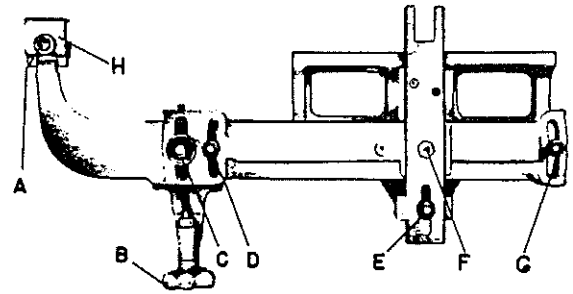


Figure 3-12. Taper Attachment

nut "C," fine adjustments can be made by using the adjusting screw "B." Tighten clamping nuts "D," "F," and "G" when the proper setting has been obtained. Nut "E" must remain loose during taper turning. Move the tool into position for the first cut before tightening nut "A" which engages the taper attachment. To disengage the attachment loosen nut "A" and tighten nut "E" which must remain tight except during taper turning. If the taper attachment is not in regular or frequent service, the clamping block "H" should be removed to reduce wear on the bed.

SECTION IV

LUBRICATION

4-1. LUBRICATION.

4-2. The importance of correct lubrication cannot be over-emphasized. Under no circumstances should the

lathe be operated without first seeing that it has been thoroughly oiled.

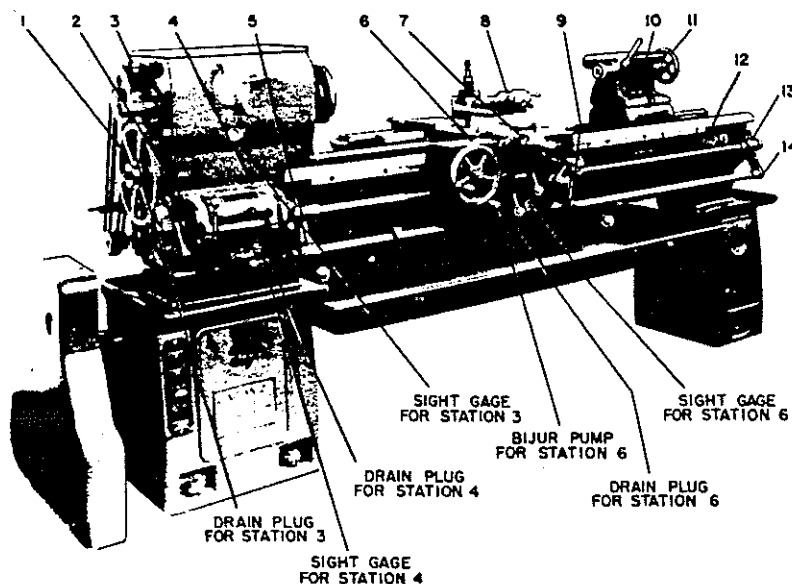


Figure 4-1. Lubrication Diagram

4-3. The successful and satisfactory operation of the lathe, as well as its useful service life, depend upon the care with which the lubrication instructions given below are followed.

4-4. Since all oil was drained from the machine before shipment, it is necessary at the outset to fill the reservoirs in the headstock, quick change box, and apron to the levels indicated on the sight gages with which each unit is provided. All of the other points indicated on the diagram and covered in the instructions should be thoroughly oiled.

NOTE

Lubricate electric motor according to motor manufacturer's recommendations. Do not over-lubricate.

LUBRICATION DATA

WHEN TO OIL	STATION NUMBER	INSTRUCTIONS	PARTS LUBRICATED	SPECIFICATIONS
6 Months	1	Remove end gearing cover. Lubricate gearing with grease.	Change gears and bearings.	Medium quality fibrous grease. +
6 Months	2	Remove end cover of quick change box. Lubricate gearing with grease.	End gearing and shifter pin in quick change gear box.	Medium quality fibrous grease. +
Keep Filled	3	Remove end gearing cover to fill. Check oil sight gage daily. Drain and refill every 6 months.* 10/12 1/2-3 quarts required. 15/18-10 quarts required.	Complete headstock gearing. Splash system.	General purpose machine oil. #
Keep Filled	4	Check oil sight gage daily, drain and refill every 6 months.* 10/12 1/2-1/2 pint required. 15/18-1 pint required.	Quick change gear box mechanism. Splash system.	General purpose machine oil. #
Daily	5	Use bench oil can.	Automatic length stop (when supplied).	General purpose machine oil. #
Keep Filled	6	Check oil sight gage daily, drain and refill every 6 months.* Pull out handle full length several times daily. 10/12 1/2-1/2 pint required. 15/18-1 pint required.	Apron gearing, splash system. Bijur pump lubricates leadscrew, bedways, and cross slide.	General purpose machine oil. #
Daily	7	Use bench oil can.	Cross screw.	General purpose machine oil. #
Daily	8	Use bench oil can.	Compound screw.	General purpose machine oil. #
Bi-Weekly	9	Use bench oil can.	Control rod bearings on apron.	General purpose machine oil. #
Bi-Weekly	10	Use bench oil can.	Tailstock spindle.	General purpose machine oil. #
Bi-Weekly	11	Use bench oil can.	Tailstock spindle nut.	General purpose machine oil. #
Daily	12	Use bench oil can.	Leadscrew.	General purpose machine oil. #
Bi-Weekly	13	Use bench oil can.	Leadscrew bearing.	General purpose machine oil. #
Bi-Weekly	14	Use bench oil can.	Control rod bearing.	General purpose machine oil. #

Key for Figure 4-1

- * After draining, flush thoroughly with a mixture of four parts kerosene and one part light lubrication oil, and then refill at the end of the first two-month operating period. The second oil change should be made four months later and thereafter every six months to one year, depending on actual operating time of the lathe.
- # We recommend rust- and oxidation-inhibited general purpose oil, viscosity 200 to 220 seconds Saybolt at 100° F. This is a general purpose oil, the equivalent of Texaco Regal "B," Ror O type, Socony Vacuum "Gargoyle Vactra Oil Heavy Medium," Shell "Tellus 29," Vitrea 29," Gulf "Harmony 'B' WCR Type," or Sun Oil "Sunvis 921."
- + We recommend medium fibrous grease equivalent to Valvoline X-5, 1104, or Socony Vacuum Gargoyle Viscolite No. 20 fluid or Dorcia No. 150.

SECTION V
MAINTENANCE

5-1. GENERAL MAINTENANCE.

a. Be certain that the lathe is properly lubricated at all times and that oil reservoirs are filled to correct levels in accordance with lubricating instructions.

b. To insure prolonged accuracy of the machine, level the bed at installation, recheck in one month, again at two months, and at least every six months thereafter.

c. NEVER, UNDER ANY CIRCUMSTANCES, ATTEMPT TO SHIFT SPINDLE SPEEDS WITH THE SPINDLE RUNNING. Stop the machine and jog spindle, if necessary, to facilitate spur gear engagement.

5-2. TROUBLE SHOOTING.

5-3. The following service chart lists possible service troubles, their probable cause, and corrections.

TROUBLE SHOOTING CHART

TROUBLE	PROBABLE CAUSE	CORRECTION
Vibration	Loose leveling screws Torn or mismatched vee belts Work or chuck out of balance operating at high spindle speeds Motor out of balance (Check by taking off drive belts and running lathe from a motor mounted on floor.)	Set all screws so they bear evenly on floor. Renew vee belts with matched set. Balance chuck or reduce spindle speed. Contact local representative of motor manufacturer.
Chatter	Cutter bit improperly ground or too wide of area of contact Tool overhang too great RPM of work too high Feed rate too high Gibs of cross slide or compound rest loose Work improperly supported Vibration Spindle bearing loose	Regrind cutter bit or adjust tool holder so that area of contact between tool bit and work is decreased. Keep point of cutter bit as close as possible to center line of tool post. Reduce spindle speed. Reduce feed. Adjust gibs per paragraph 5-8. Adjust tailstock center. Use steady rest or follow rest on long slender shafts. See "Vibration" trouble above. See instructions in paragraph 5-10 to adjust spindle bearings.
Work not turned straight	Headstock and tailstock centers not aligned Work improperly supported Bed not level Tool not on center when using taper attachment	Align tailstock center. Use steady rest or follow rest. Reduce overhang from chuck. Relevel bed, using precision level. Put tool on center.

TROUBLE SHOOTING CHART (CONTINUED)

TROUBLE	PROBABLE CAUSE	CORRECTION
Work out of round	Work loose between centers or centers are excessively worn--work centers out of round	Adjust tailstock center. Regrind centers. Lap work centers.
Cross slide or compound rest movement does not coincide with dial movement on respective adjusting screw	Gib setting too tight or too loose Work is too long and slender	Adjust gibs per instructions in paragraph 5-8, Use steady rest or follow rest.

5-4. ADJUSTMENTS.

5-5. Many adjustments and minor repairs, described below, can easily be accomplished when competently supervised by your own maintenance department. The need of many of these adjustments will be greatly lessened if the instructions regarding the machine, particularly lubrication, are strictly adhered to.

5-6. ADJUSTING THE MAIN DRIVE VEE BELTS.

5-7. All Tray-Top Lathes are motor driven with the motor mounted on a hinged plate at the rear of the headstock end leg. This plate is equipped with two adjusting screws for securing proper vee belt tension. To tighten belts, loosen the lower screw sufficiently to permit the weight of the motor to provide the correct tension. Then tighten the upper screw until the motor plate is firm.

CAUTION

Too much tension created on the side of the bed by belt tension adjusting screws will throw headstock out of alignment.

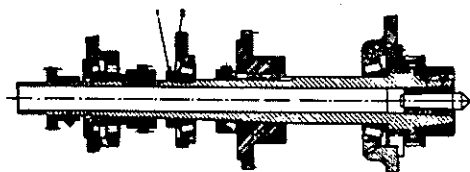
5-8. ADJUSTING THE CROSS SLIDE AND COMPOUND REST GIBS.

5-9. Headless type taper gibs are provided to compensate for wear between the bearing surfaces of these sliding units. Two adjusting screws are employed for each gib, one located at the thick or front end of the gib and the other at the thin or rear end. To adjust this type of gib, proceed in the following manner.

- See that power engaging lever of the unit containing the gib to be adjusted is in the neutral position.
- Loosen the adjusting screw at the rear of the gib several turns.
- Turn the front adjusting screw until tight, then back off one turn.
- Retighten the rear adjusting screw.

NOTE

Gibs should never be drawn up so tightly as to prohibit free movement of the particular unit with adjusting handle. Tight adjustments squeeze out the oil film, resulting in rapid wear.



1. Lockscrew
2. Adjusting Nut

Figure 5-1. Adjusting Headstock Spindle Bearings

5-10. ADJUSTING THE HEADSTOCK SPINDLE BEARINGS (See figure 5-1).

- Run the headstock about an hour, until the bearings are warm.
- Remove the top cover of the headstock unit.
- Move upper left-hand lever on spindle speed selector dial so "N" on outer adjustable selector ring coincides with small arrow on fixed reference ring.
- Rotate the spindle by hand until lock screw (1) is in upper position so it may be loosened.
- Tighten nut (2) with a spanner wrench until bearings are drawn up snug.

CAUTION

Spindle must rotate freely but be free from shake.

- Lock set screw.
- Replace the cover.

5-11. ADJUSTING THE CLUTCH AND BRAKE MECHANISM (CLUTCH DRIVE MACHINES ONLY)

5-12. The multiple disc clutch (figure 5-2) in the headstock has been carefully adjusted before leaving the factory and is of adequate size for the heaviest load. However, it is subject to wear and may require adjustment from time to time. The clutch, which is located on the drive shaft near the top of the headstock and drive pulley, can be adjusted without difficulty by removing the head cover plate and following the directions in the next paragraph.

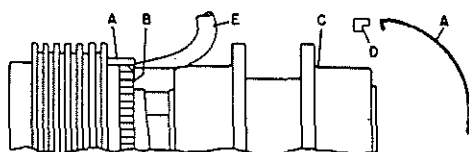


Figure 5-2. Clutch Adjustment

NOTE

Tool E as shown in figure 5-2 is a bent scratch awl.

5-13. To adjust the clutch, before operation, first see that the shifter sleeve "C" is in neutral. Next lift spring "A" with tool "E" resting on the sleeve, as shown. Do not use a screw driver. Lift spring just high enough for lip "D" to clear the teeth on collar "B." Then turn collar "B" one notch at a time, clockwise, BY HAND.

CAUTION

Lifting the spring too high may cause breakage, or the spring to fly off. All parts will fit, if properly installed. Do NOT grind any PULL-MORE part, except the keys -- and these only to insure a good, tight fit in shaft.

5-14. ADJUSTING THE LEADSCREW THRUST.

(See figure 5-11).

5-15. The adjustment for the lead screw thrust is located at the extreme right end of the lead screw. Adjustment should be made with the outer nut only after the Allen set screw has been loosened. Tighten this nut sufficiently to eliminate excessive end play in the lead screw, but do not overload the thrust bearings. Lock this nut in the adjusted position by retightening the Allen set screw.

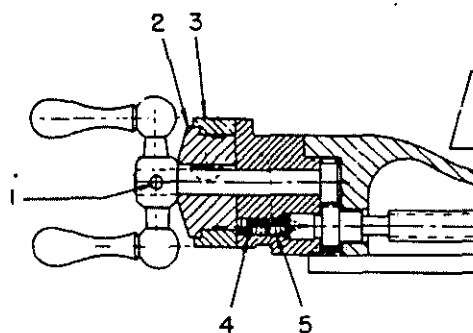
5-16. ADJUSTING THE CROSS FEED THRUST.

5-17. When backlash occurs in the cross feed adjusting screw, the small nut at the end of the screw, between the dial and the ball crank, should be tightened in the same manner as that described in the preceding paragraph. This adjustment will not compensate for excessive wear between the adjusting screw and the nut of the cross feed unit. Only by replacing these parts can this correction be made.

5-18. ADJUSTING THE COMPOUND REST END THRUST (See figure 5-3).

5-19. Adjustment for end play in the compound rest is made in the following manner.

- Knock out the taper pin (1) and remove the ball crank handle.
- Slide the bushing (2) and dial (3) off the screw.
- Remove locking set screw (4).
- Tighten set screw (5) only enough to take out excessive end play.
- Replace the locking set screw and other parts in the reverse order in which they were removed.



- | | |
|------------|----------------------|
| 1. Pin | 3. Dial |
| 2. Bushing | 4. Locking Set Screw |
| | 5. Set Screw |

Figure 5-3. Adjusting Compound Rest End Thrust

5-20. ADJUSTING THE HALF-NUT ENGAGEMENT.

5-21. Under normal operating conditions, it is doubtful if this adjustment will ever be required. However, if excessive use of this unit necessitates an adjustment, stop the machine and proceed in the following manner.

- Back out the adjusting screw, located in the arm of the lower half-nut, several turns.
- Move half-nut engaging lever to down position.
- Tighten adjusting screw until it contacts the upper half-nut.
- Raise engaging lever and advance adjusting screw one-quarter to one-half turn to provide proper clearance between half-nuts and lead screw. This clearance is essential to prevent a binding action between these units.

5-22. ADJUSTING POWER FEED ENGAGING DROP LEVER (See figure 5-4).

5-23. If the power feed engaging drop levers do not remain in the engaged position, the following adjustment is required.

- Remove the drop lever housing by removing the two Allen screws holding this cover in position. Make certain the compression spring is not lost when removing this cover.

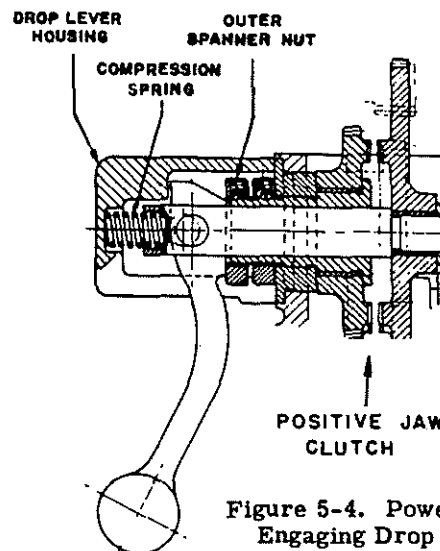
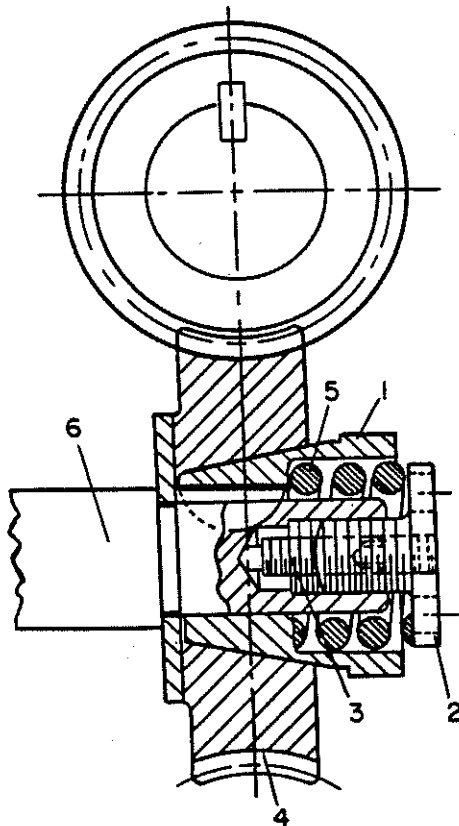


Figure 5-4. Power Feed Engaging Drop Lever

- b. Loosen the Allen set screw in the outer spanner nut on the feed shaft.
- c. Adjust the spanner nut so that the desired tension in the engagement of the drop lever exists. Make only a slight adjustment and check by engaging the drop lever. If the spanner nut is over-tightened, excessive wear will result on the feed shaft bearings.
- d. Lock the spanner nut in position by retightening the Allen set screw.
- e. Replace drop lever housing and compression spring.



- | | |
|--------------------|----------------|
| 1. Clutch Cone | 4. Worm Wheel |
| 2. Adjusting Screw | 5. Spring |
| 3. Allen Set Screw | 6. Input Shaft |

Figure 5-5. Safety Clutch

5-24. To prevent possible damage to elements of the feed transmission, including the quick change box, a preloaded friction type safety clutch (figure 5-5) is used to transmit the feeding force from the worm wheel (4) at the rear of the apron to input shaft (6) in the apron. This has been carefully set at assembly so that the cone clutch (1) will slip with a torque of 150 in.-lbs. (for 15-in. and 18-in. machines) on this lead-screw. On the 10-in. and 12 1/2-in. machines this torque is 100 in.-lbs. Once these settings are obtained, the adjusting screw (2) is locked in position by means of an Allen head set screw (3) so that no further adjustment will be necessary.

NOTE

If the clutch slips in operation, it will be necessary to let the clutch cool before operating the machine. This is necessary in order to bring the clutch back to its full load-carrying capacity.

5-25. DISASSEMBLY INSTRUCTION.

5-26. TO REMOVE AND DISMANTLE HEADSTOCK SPINDLE (See figure 5-6).

- a. Remove face plate or chuck, center, and center bush. Remove tray cover from top of headstock. Remove spindle gearing lubrication trough. Remove end gearing guard.
- b. Loosen lock screw and remove end gearing drive gear (2) from rear end of spindle (1).
- c. Remove bearing cap (3). This cap is a plug fit in the housing and has two 3/8-16 tapped holes to facilitate removal. Two studs at least 8 in. long and having at least 2 in. of threads at the outer end are fitted into the tapped holes. A bar is then placed over the studs and rests against the end of the spindle. Two nuts are then screwed onto the studs and bear against this bar. By alternately tightening each nut, the cap can be removed from the housing.
- d. To remove rear lock nut (4), loosen set screw, using an Allen wrench, and tap to free lock shoe. Then unscrew nut from spindle.
- e. To remove the roller bearing (5) and the spindle bearing spacer (6), tap the helical gear (7) toward the rear of the spindle with a brass bar. Slide these parts off the spindle and remove the spindle gear key.
- f. Loosen the set screw in lock nut (11), tap to free lock shoe, and unscrew lock nut until it contacts rear Timken roller bearing (9). Using brass bar, tap large face gear (12) toward rear of spindle to loosen from taper.
- g. Loosen set screw in lock nut (8), tap to free lock shoe, unscrew lock nut, and remove from spindle. Insert a screw driver behind the tip of bearing key (10) and remove key.
- h. Remove the four Allen cap screws from spindle front bearing cap (15) and tap spindle forward approximately 1/2 in. Complete unscrewing lock nut (11).
- i. Tap spindle forward until free and remove spindle from headstock casting, removing in turn rear Timken bearing cone, face gear locking nut (11), large face gear (12), and face gear driving key.
- j. To remove the front Timken bearing cone (13), oil slinger (14), spindle front bearing cap (15), and spindle nut (16) from spindle, tap the spindle nut toward the rear of spindle with a brass bar or babbitt hammer until these parts are free.

5-27. TO REMOVE AND DISMANTLE SPEED SHIFTER MECHANISM (See figure 4, Parts List).

- a. Remove drain plug and drain oil from headstock.
- b. Remove tray cover from headstock.
- c. Set spindle speed selector levers in highest speed position.
- d. To facilitate reassembly, a line should be scribed across each shifter segment and its mating rack.
- e. Unscrew the four screws holding the two rack spacers in place. Remove bearing lubrication trough

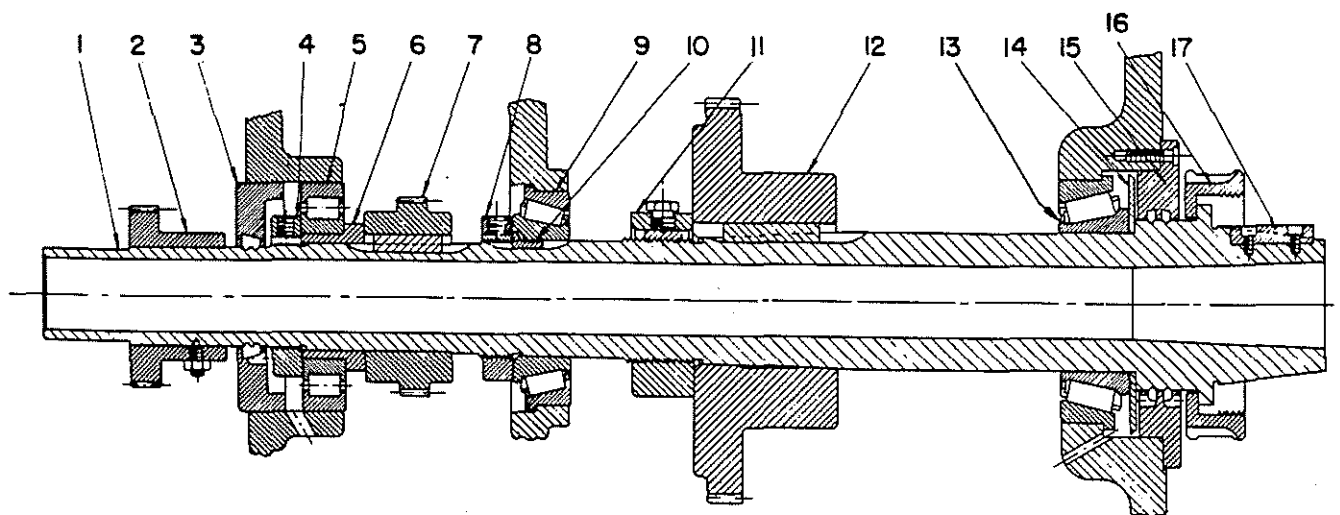


Figure 5-6. Headstock Spindle

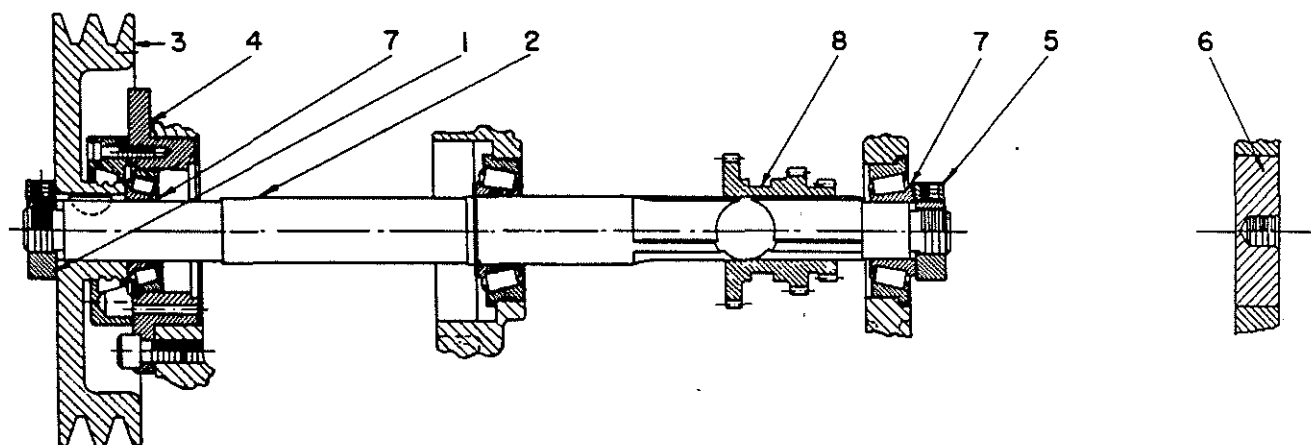


Figure 5-7. Drive Shaft (Standard Drive)

and lift off the two rack spacers, being careful that the three ball detents are not lost. Remove the three ball detents and the three springs.

f. Drive out the taper pin in the drive shaft shifter segment.

g. Loosen set screw, tap to free lock shoe, and unscrew lock nut from drive shaft shifter rod at rear of headstock.

h. Withdraw the drive shaft shifter rod from the front of the headstock, removing in turn the drive shaft shifter segment, cluster back gear shifter segment, and the sliding back gear shifter segment.

i. Complete by removing the two shifter dials from the front of the headstock.

5-28. TO REMOVE DRIVE SHAFT.

5-29. STANDARD DRIVE (See figure 5-7).

a. Proceed as outlined in paragraphs 5-27a to i inclusive under "TO REMOVE AND DISMANTLE SPEED SHIFTER MECHANISM."

b. Loosen set screw in the lock nut (1), tap to free

lock shoe, and unscrew nut from drive shaft (2).

c. Remove drive shaft pulley (3) and key.

d. Unscrew the five socket head screws from the bearing retainer bushing (4).

e. Remove lock nut (5) from right end of drive shaft by loosening set screw, tapping to free lock shoe, and unscrewing lock nut.

f. Remove plug (6) in headstock casting in line with drive shaft. This can be done by screwing a rod, with a nut on its outer end, into the plug. Slide a clearance drilled weight along the rod and hammer against the nut until the plug is drawn out.

g. Using a brass bar, tap out the drive shaft (2) through the pulley end, removing in turn the taper roller bearing (7), cluster gear (8), and bearing retainer bush (4).

5-30. CLUTCH DRIVE (See figure 5-8).

a. Proceed as outlined in paragraphs 5-27a to i inclusive under "TO REMOVE AND DISMANTLE SPEED SHIFTER MECHANISM."

b. Drive out the taper pin on the external linkage,

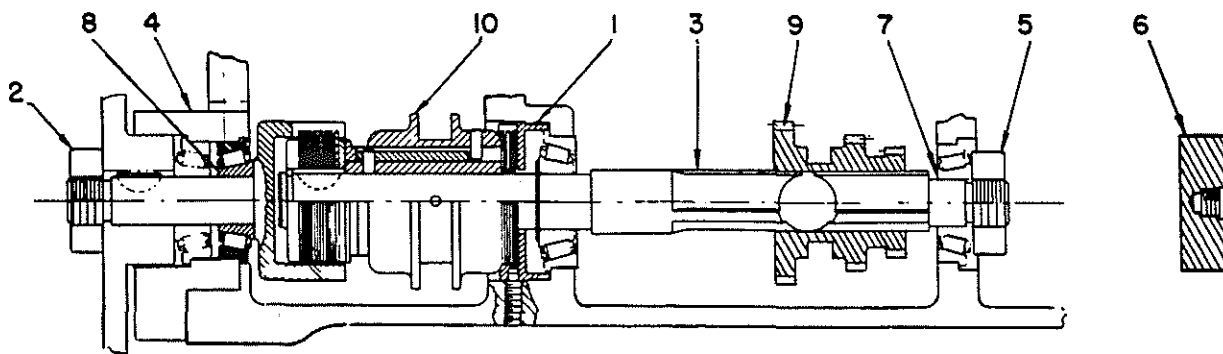


Figure 5-8. Drive Shaft (Clutch Drive)

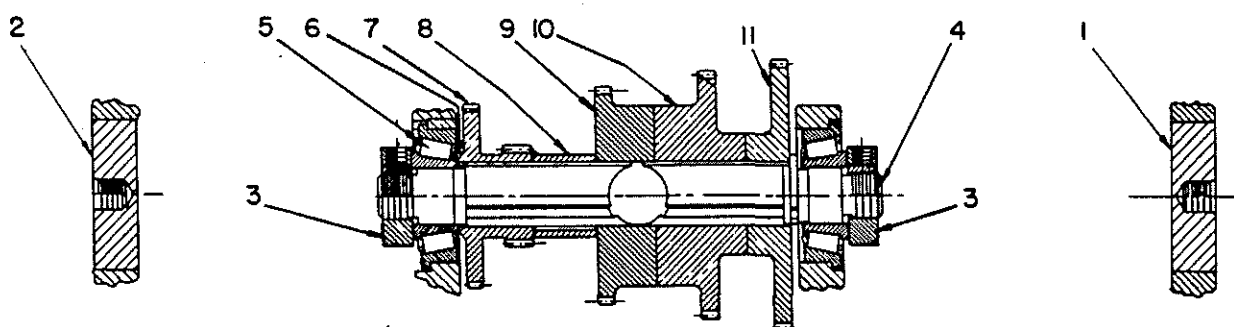


Figure 5-9. Intermediate Shaft

unscrew the set screw and remove the clutch shifter finger.

c. Remove set screw holding clutch brake cup (1). On 10-in. and 12-1/2-in. lathes, this set screw is located at the rear of the headstock. On 15-in. and 18-in. lathes, it is located at the top of the boss around the clutch brake cup inside the headstock.

d. Loosen set screw in the lock nut (2), tap to free lock shoe, and unscrew nut from drive shaft (3).

e. Remove drive shaft pulley and key.

f. Unscrew the five socket head screws from the bearing retainer bushing (4).

g. Remove lock nut (5) from right end of the drive shaft by loosening set screw, tapping to free lock shoe, and unscrewing lock nut.

h. Remove plug (6) in headstock casting in line with drive shaft. This can be done by screwing a rod, with a nut on its outer end, into the plug. Slide a clearance drilled weight along the rod and hammer against the nut until the plug is drawn out.

i. Using a brass bar, tap out the drive shaft (3) through the pulley end removing in turn the taper roller bearing (7), bearing retainer bushing (4), bearings (8), clutch cup (1), and cluster gear (9).

j. To remove clutch (10) from drive shaft, drive out pin holding clutch on shaft. Push clutch toward right end of shaft, remove split ring, and slide complete clutch off shaft.

5-31. TO REMOVE AND DISMANTLE INTERMEDIATE (SECONDARY) SHAFT (See figure 5-9).

a. Proceed as in paragraphs 5-27a to i inclusive under "TO REMOVE AND DISMANTLE SPEED SHIFTER MECHANISM;" if standard drive, as in paragraph 5-29b to g inclusive under "STANDARD DRIVE;" if clutch drive, as in paragraphs 5-30b to j inclusive under "CLUTCH DRIVE."

b. Remove the plugs (1) and (2) in the headstock casting in line with shaft. Refer to paragraph 5-29f under "TO REMOVE DRIVE SHAFT" for method of removing plugs.

c. To remove lock nuts (3) from both ends of shaft (4), loosen set screw, tap to free lock shoe, and unscrew lock nuts (3). On 10-in. and 12 1/2-in. lathes, a spanner type lock nut is used at the left end of the intermediate shaft (4).

d. Using a brass bar, tap shaft toward front of headstock, removing in turn taper roller bearing cone (5), secondary shaft spacer (6) (10" & 12 1/2" only - 15" & 18" shown), primary gear (7), primary gear spacer (8), and primary gears (9), (10), and (11).

5-32. TO REMOVE AND DISMANTLE BACK GEAR SHAFT (See figure 5-10).

a. Proceed as outlined in paragraphs 5-27a to i inclusive under "TO REMOVE AND DISMANTLE SPEED SHIFTER MECHANISM;" if standard drive, as in

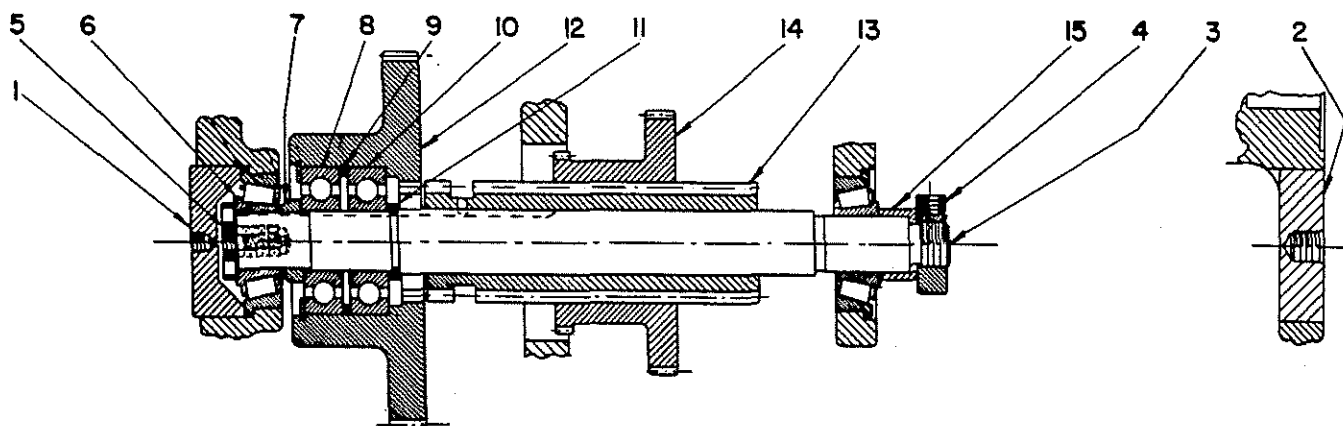


Figure 5-10. Back Gear Shaft

paragraph 5-29b to g inclusive under "STANDARD DRIVE;" if clutch drive, as in paragraphs 5-30b to j inclusive under "CLUTCH DRIVE," and as in paragraph 5-31b to d inclusive under "TO REMOVE AND DISMANTLE INTERMEDIATE (SECONDARY) SHAFT."

b. Remove the plugs (1) and (2) from the headstock casting in line with the back gear shaft (3). Refer to paragraph 5-29f under "TO REMOVE AND DISMANTLE DRIVE SHAFT" for method of removing plugs.

c. To remove lock nut (4), loosen set screw, tap to free lock shoe, and unscrew lock nut (4) from right end of shaft. Remove back gear shaft thrust collar (15).

d. Using a face spanner wrench (2-5, item c), re-

move back gear screw (5). (On earlier designs remove snap ring which was used instead of screw.)

e. Using a brass bar, tap shaft toward front of headstock, removing in turn taper roller bearing cone (6), back gear shaft spacer (large) (7), back helical gear (12), which includes ball bearing (8), bearing spacer (9), ball bearing (10), and back gear shaft spacer (small) (11), sliding back gear (13), and cluster sliding gear (14).

5-33. TO REMOVE AND DISMANTLE LEADSCREW AND CONTROL ROD (See figure 5-11).

a. Move carriage to approximate center of bed.

b. Remove end gearing guard.

c. Drive out taper pins in control rod lever (8) and control handle (1). If clutch drive, loosen set screw

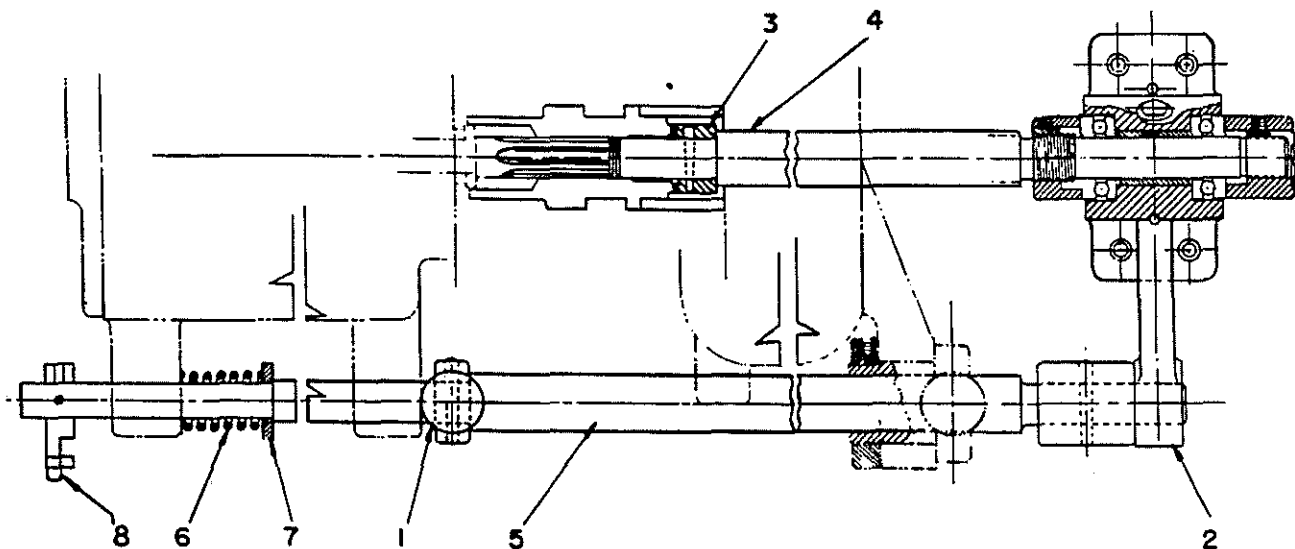


Figure 5-11. Leadscrew and Control Rod

in control rod lever.

d. Unscrew four socket head screws and tap loose back box (2).

e. Engage half-nuts and move carriage toward tail-stock end of bed until leadscrew clutch (3) is exposed. Drive out the taper pin and remove clutch.

f. Release half-nuts and slide out the leadscrew (4) and control rod (5), removing in turn control rod lever (8), spring (6), spring thrust washer (7), and control handle (1) from the control rod.

5-34. TO REMOVE APRON UNIT.

a. Proceed as per paragraphs 5-33a to f inclusive under "TO REMOVE AND DISMANTLE LEADSCREW AND CONTROL ROD."

b. Unscrew the four socket head screws (10-in. and 12 1/2-in. lathes) or six socket head screws (15-in. and 18-in. lathes). To prevent dropping apron when the screws are removed another man is required.

5-35. TO REMOVE QUICK CHANGE GEAR BOX.

a. Proceed as per paragraphs 5-33a to f inclusive under "TO REMOVE AND DISMANTLE LEADSCREW AND CONTROL ROD."

b. Unscrew nut and slide off washer, change gear spacer and drive shaft gear.

c. Unscrew the two nuts locking the quadrant plate in position and remove quadrant plate and idler gear.

d. Unscrew four socket head screws and remove end cover, including drive shaft and gear.

e. Unscrew four socket head screws (one located inside casting at end cover end) and remove by tapping quick change box with rubber mallet to break loose from key.

5-36. INSTRUCTIONS FOR INSTALLATION OF TAPER ATTACHMENT ON TRAY-TOP LATHES IN THE FIELD.

5-37. To facilitate installation of the telescopic taper attachment on Tray-Top Lathes in the field, we supply with the attachment when ordered a completely assembled telescopic cross screw consisting of ball crank handle, locking collar, cross feed dial bush, spring, dial, bush, pinion, telescopic screw and nut with attaching parts. The cross feed screw, which is splined, can be easily removed from the pinion for assembly purposes. The correct method of installing the taper attachment on lathes in the field should be accomplished in the following manner:

a. Remove the present cross feed screw, including locking collar, ball crank handle, bush, and pinion. This is easily accomplished by removing the two Allen head socket screws holding the bush and then tapping the bush free. The cross feed screw then can be un-

screwed through the cross feed nut.

b. To remove the cross feed nut, slide the cross slide assembly toward the rear of the machine, and unscrew the cross feed nut screw which fastens the nut to the underside of the cross slide. Remove the chip guard from the rear of the cross slide, push the cross slide toward the front of the machine, exposing the cross feed nut which can now be lifted out.

c. Mount the taper attachment on the rear of the carriage (bolt holes have been drilled and tapped at factory).

d. Alignment of the attachment depends on the alignment of the dovetailed draw bar between the taper attachment and the carriage. This draw bar must be "scraped in," at assembly, to the dovetail in the carriage. With the locking nut removed, the draw bar should slide freely between the carriage and the taper attachment units. To facilitate the alignment of this attachment it is suggested that the mounting bolts be tightened only enough to hold the attachment in position so that by tapping the bracket with a rubber or wooden mallet it can be correctly positioned.

e. When correct alignment has been obtained, the mounting bolts should be tightened. Drill the two holes for the taper pins using a 13/64 drill to a depth of 1 3/4 in. in the carriage. Taper ream using a No. 4 taper reamer. Pin the bracket in position.

f. Remove the draw bar and install the new cross feed screw completely assembled with cross feed nut cross feed screw bearing bracket, and thrust washer. This unit should be placed in position from the rear of the lathe. Insert and tighten the screw holding the cross feed nut in position. Slide the draw bar into position and attach to the bearing bracket with the two screws and two straight pins provided. Position the cross slide so that the shoulder screw connecting the draw bar to the taper attachment top slide shoe can be inserted and tightened.

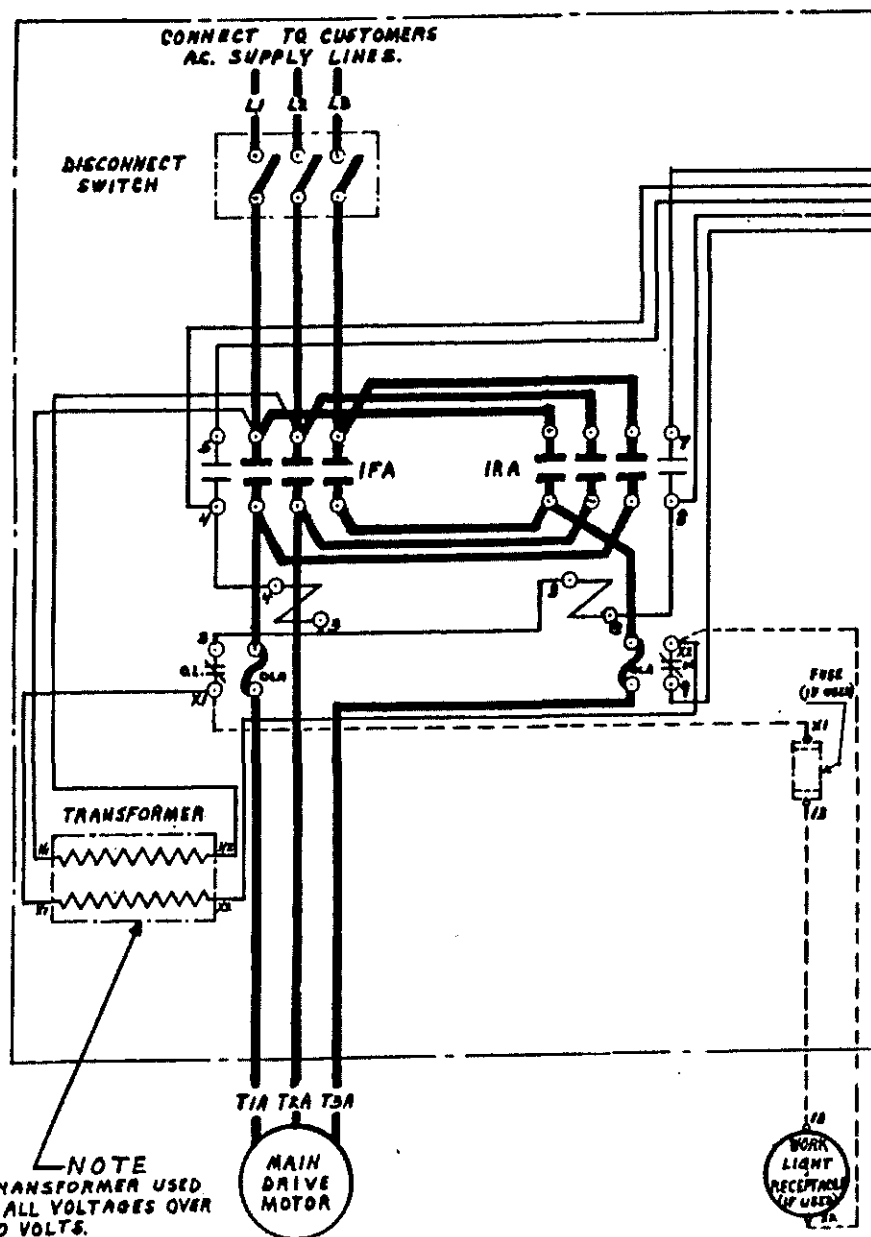
g. Install the ball crank handle and dial assembly, making certain that the internal key of the cross feed pinion aligns with the keyway of the cross feed screw. Fasten this unit in position with the two screws provided for the cross feed bush.

h. Check alignment of the cross feed nut and screw by moving the cross slide to the extreme positions. If binding action occurs at either extreme front or rear positions, loosen and then retighten the screw holding the cross feed nut. If the lathe is older design, it may be necessary to add a shim under the cross feed nut to correct a change made in the lower slide.

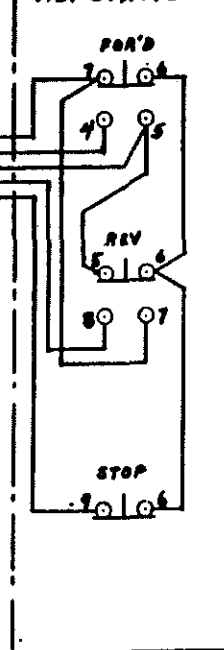
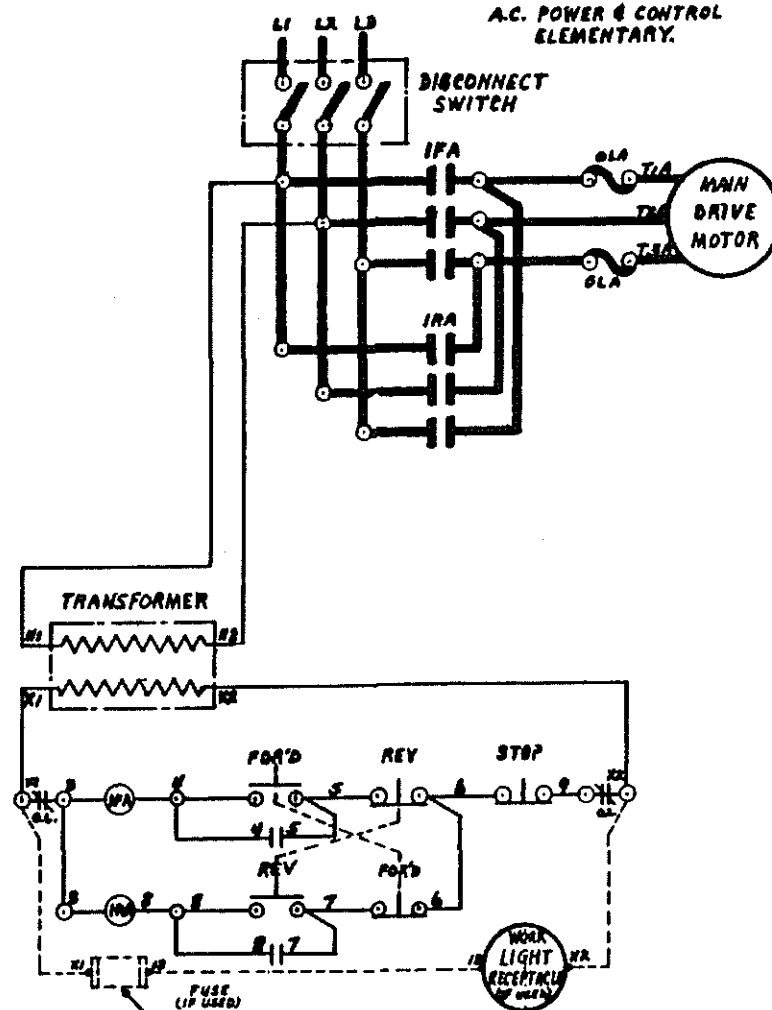
i. As a final check to ascertain whether the gibs on the taper attachment and cross slide are set properly, tighten the locating clamps of the taper attachment and move the carriage slowly by hand along the bed. It should move freely and evenly. If the gibs are too tight the movement of the cross slide will be jumpy instead of operating smoothly.

See following pages for Wiring Diagrams

CONTROL PANEL



P.B. STATION

A.C. POWER & CONTROL
ELEMENTARY.

MAIN DRIVE MOTOR CIRCUIT (3 PHASE)

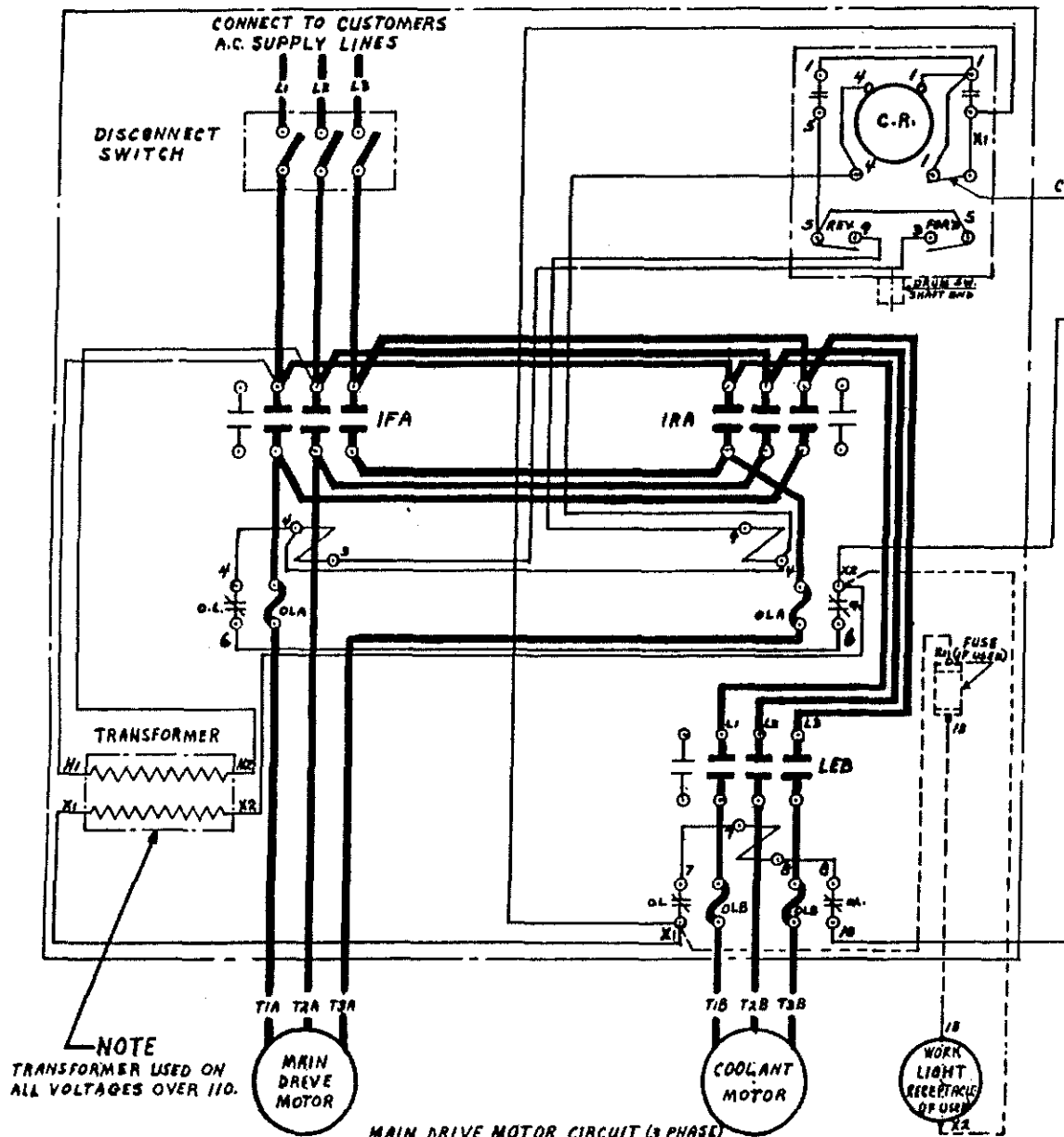
NOTE

FOR 2 PHASE 3 WIRE, TERMINALS L2 & T2 ARE COMMON. WITH TRANSFORMER CONNECT H1 TO L1 & H2 TO L2. WITHOUT TRANSFORMER CONNECT X1 TO L1 & X2 TO L2.

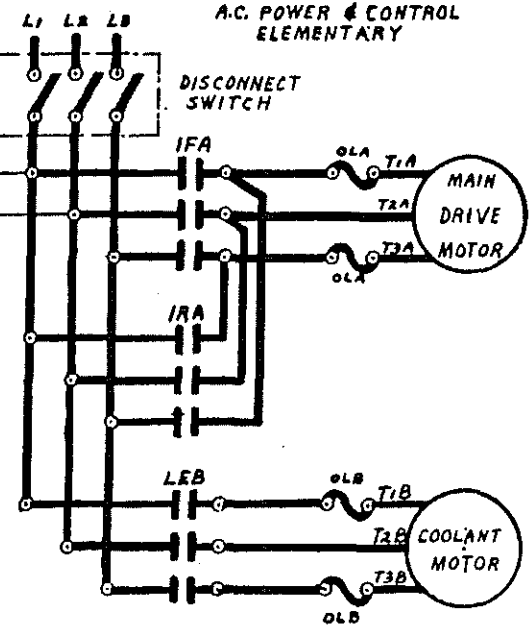
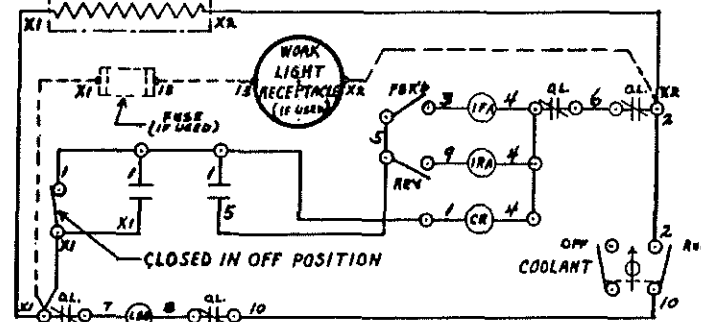
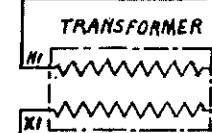
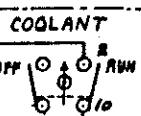
UNITS OF FRACTIONAL DESIGNATIONS ARE 1/8 OR 1/16 UNLESS OTHERWISE SPECIFIED

WIRING DIAGRAM FOR CLUTCH CONTROLLED LATHE. (WITH TRANS.)					
MACHINE 10 12 15 18 TRAY TOP CINTI LATHE					
DESIGNED BY R.H. PETTY	DATE 12-3-50	CHART	SHEET	SAT'L. SHEET	WAT. TRAY.
DRAWN BY R.H. PETTY		DATE 12-3-50			
TOL. BY		STG.			
TOL. CH. BY		APPROVED		SUPERVISOR	
SCALE		CINCINNATI LATHE & TOOL CO.		CINCINNATI 9, OHIO U. S. A.	
		602292			

CONTROL PANEL

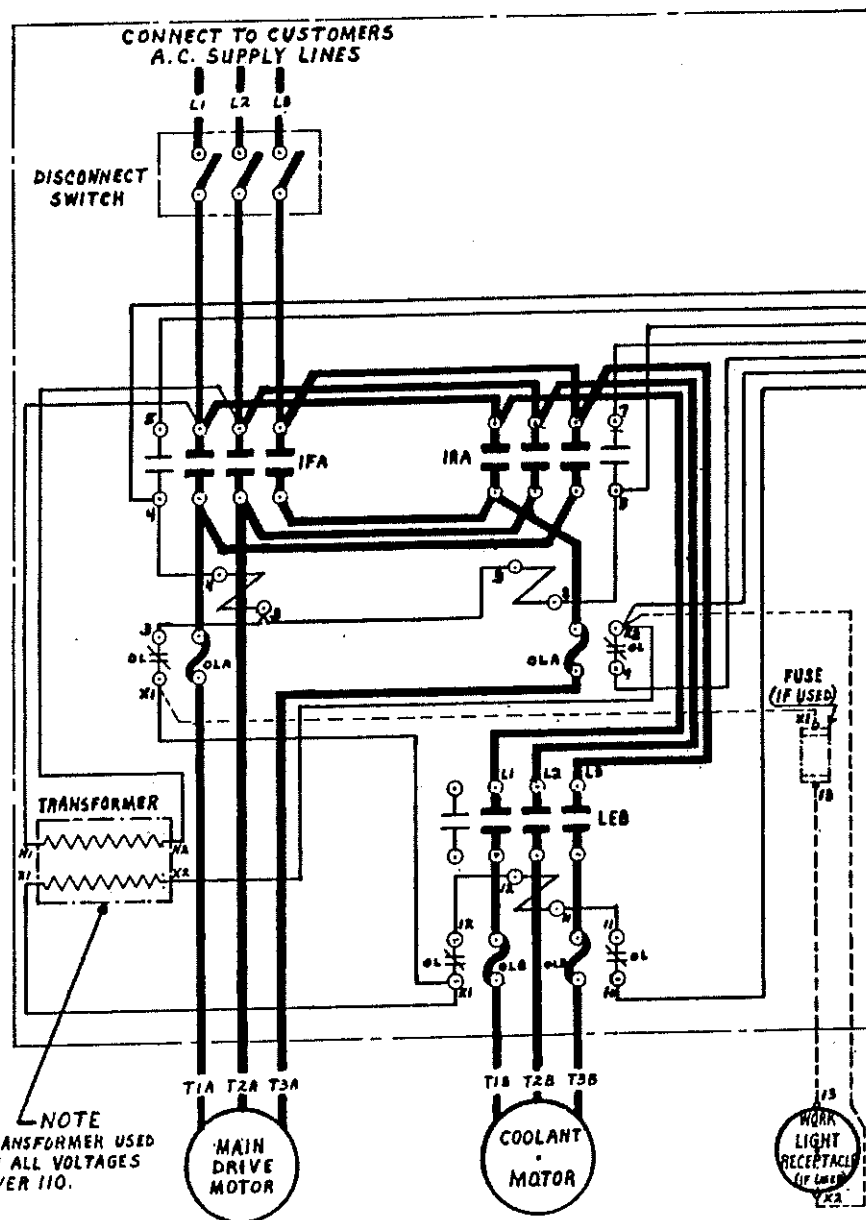


CLOSED IN OFF POSITION

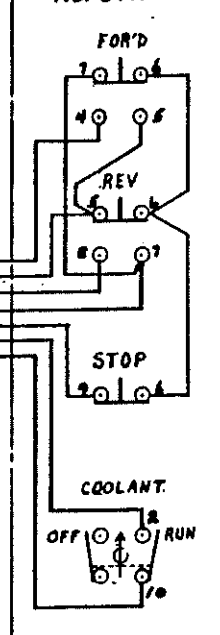


LIMITS OF FUNCTIONAL DIMENSIONS ARE ± .005 UNLESS OTHERWISE SPECIFIED				
WIRING DIAGRAM FOR ELECTRICALLY CONTROLLED LATHE (WITH PUMP & TRANS.)				
MACHINE 10-12-15-18 TRAY TOP CINTI LATHE				
DATE	QUANT.	MATERIAL	NAT'L. SPEC.	HEAT TREAT.
9-26-50				
DRAWN BY A.H. PETTIT		DATE 9-26-50		
CHECKED BY		DATE		
TOL. BY		PTOL.		
TOL. CH. BY		APPROVED		
SCALE		CINCINNATI LATHE & TOOL CO.		
		CINCINNATI 9, OHIO U. S. A.		
		APPROVED BY		
		602290		

CONTROL PANEL



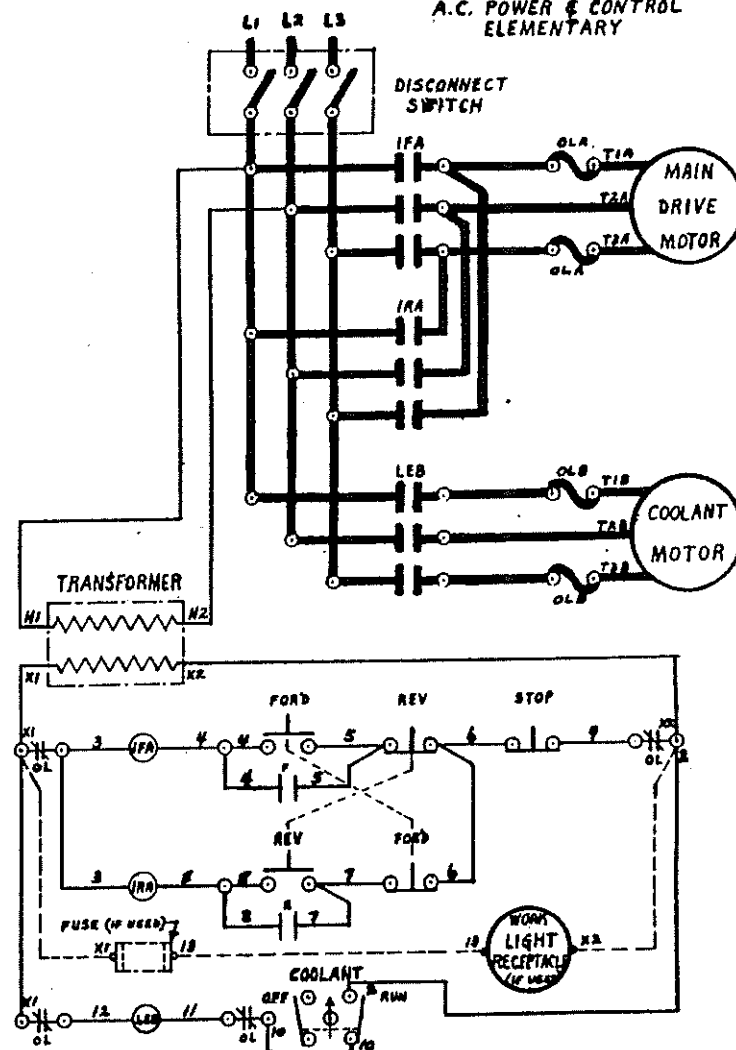
P.B. STATION



MAIN DRIVE MOTOR CIRCUIT (3 PHASE)

NOTE
FOR 2 PHASE 3 WIRE, TERMINALS L2 & T2 ARE COMMON. WITH TRANSFORMER CONNECT H1 TO L1 & H2 TO L2. WITHOUT TRANSFORMER CONNECT X1 TO L1 & X2 TO L2.

A.C. POWER & CONTROL ELEMENTARY



LISTS OF PRELIMINARY DIMENSIONS AND + OR - VOLTAGE UNLESS OTHERWISE SPECIFIED

WIRING DIAGRAM FOR CLUTCH CONTROLLED LATHE (WITH PUMP & TRANS)			
MACHINE 10 12 15 18 TRAY TOP CINTI LATHE			
DESIGNED BY A.H. PETTIT	DATE 9-23-50	MATERIAL	DATE
DRAWN BY	DATE	APPROVED	SUPERVISOR
TO BY	DATE	APPROVED	SUPERVISOR
TO BY	DATE	APPROVED	SUPERVISOR
CINCINNATI LATHE & TOOL CO. CINCINNATI 9, OHIO U. S. A.			

602289

SECTION IV

PARTS LIST

FOR

CINCINNATI "TRAY-TOP"

ENGINE AND TOOLROOM LATHES

SIZES - 10 in., 12 1/2 in., 15 in. and 18 in.

AND

CINCINNATI

"TRAY-TOP" FIXED GAP BED LATHES

SIZES - 15 in. and 18 in.

INTRODUCTION

This parts list has been prepared for your assistance in ordering replacement parts for 10-in., 12-1/2 in., 15-in. and 18-in. Cincinnati "Tray-Top" Engine and Tool Room Lathes, including Fixed Gap Bed models.

The group assembly parts listings are divided into five columns. The first column indicates the figure and index number of the part. The figure number indicates the illustration on which the part is shown. The index number is keyed to the part for identification purposes. The second column contains the Cincinnati Lathe and Tool Co. part number. The third column contains the complete name of the part. The fourth column contains the number of parts required for the assembly. The last, or right-hand column, contains the application code, indicating production usage of parts between the four sizes of lathes covered by this parts list.

Code	Size of Lathe
A	10 in.
B	12 1/2 in.
C	15 in.
D	18 in.

The word "All" is inserted in the application code column where that part is used in all four sizes.

Electrical equipment parts for these machines are not shown. Contact the local representative of the electrical manufacturer for servicing and maintenance of his equipment.

ORDERING REPAIR PARTS

You will receive quicker service when ordering repair parts if you will proceed as follows:

1. State amount wanted.
2. Give part number stamped on part, or shown in the parts list, specifying where you obtained the number.
3. Give complete serial number of the machine. The serial number is stamped between the front flat and vee way at the tailstock end of the bed.
4. Give complete size of machine, i. e. (15" x 72" Cincinnati Tray-Top Lathe).
5. Specify each individual part required. Never use the term "complete assembly", it always raises the question of how much of a unit to supply.
6. State how and where to ship. Do not say "ship quickest way". Be definite and state the agency desired, that is Air Parcel Post, Special Delivery, Railway Express, Motor Freight, etc. Give complete destination.

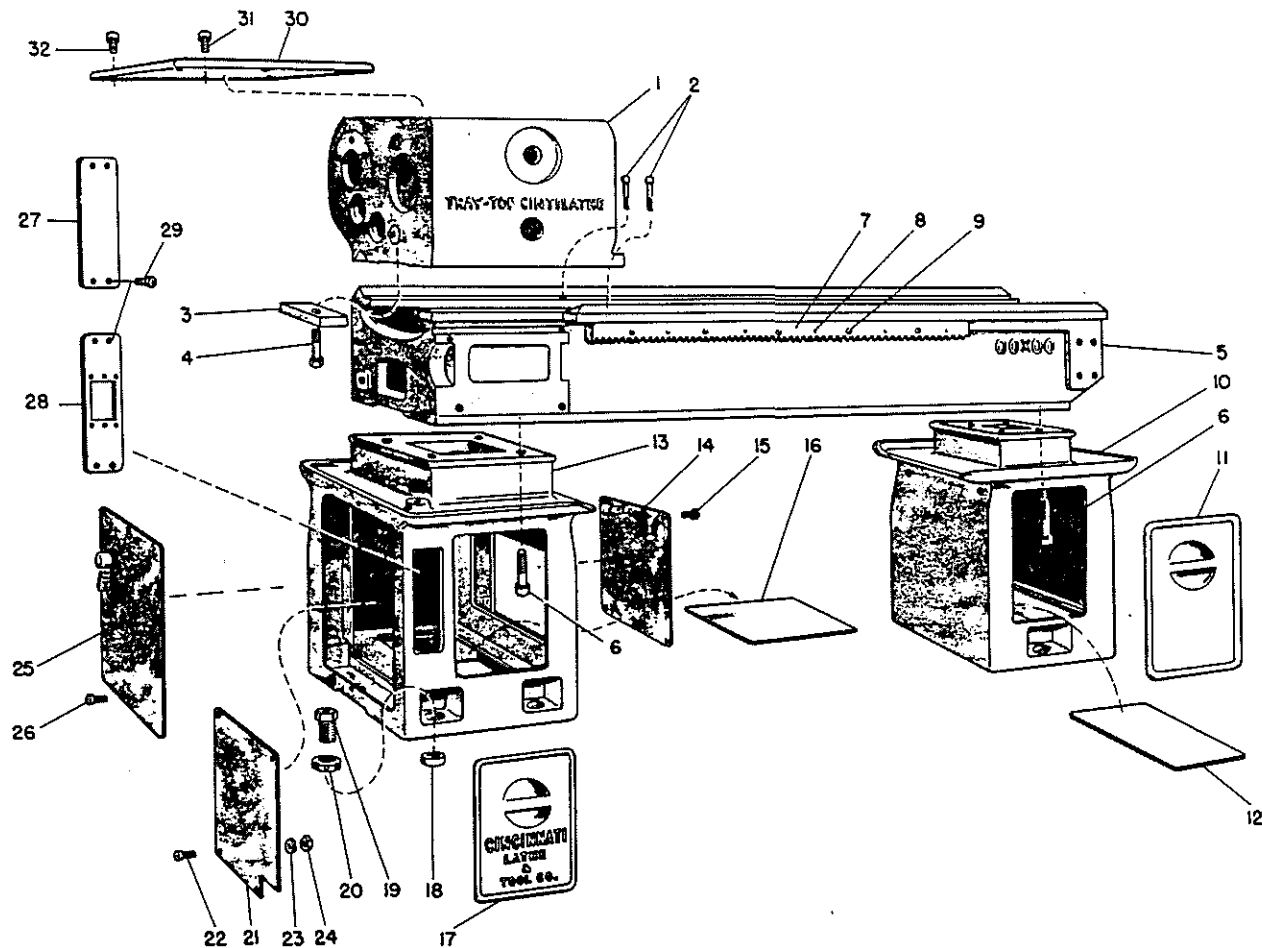


Figure 1. General Assembly

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
GENERAL ASSEMBLY									
1-1	601691	.	Headstock					1	A
-1	601692	.	Headstock					1	B
-1	600879	.	Headstock					1	C
-1	600880	.	Headstock					1	D
			Attaching Parts						
-2	3343	.	Screw - Socket head cap					2	AB
-2	1929	.	Screw - Socket head cap					2	CD
			-----*						
-3	600756	.	Clamp - Headstock					1	A
-3	600757	.	Clamp - Headstock					1	B
-3	600244	.	Clamp - Headstock					1	C
-3	600519	.	Clamp - Headstock					1	D
			Attaching Parts						
-4	3429	.	Screw - Hex head cap					1	AB
-4	3468	.	Screw - Hex head cap					1	CD
			-----*						
-5	601051	.	Bed					1	A
-5	601052	.	Bed					1	B
-5	601047	.	Bed					1	C
-5	601048	.	Bed					1	D

Figure & Index No	Part Number	Nomenclature						Units Per Assy	Application Code
1	2	3	4	5	6				
GENERAL ASSEMBLY (CONTINUED)									
1-5	601582	.	Bed - Flame hardened					1	A
-5	601583	.	Bed - Flame hardened					1	B
-5	601584	.	Bed - Flame hardened					1	C
-5	601585	.	Bed - Flame hardened					1	D
-5	601270	.	Bed - Gap					1	C
-5	601292	.	Bed - Gap					1	D
-5	601606	.	Bed - Gap flame hardened					1	C
-5	601607	.	Bed - Gap flame hardened					1	D
		Attaching Parts							
-6	3343	.	Screw - Socket head cap					8	AB
-6	3408	.	Screw - Socket head cap					8	CD
		----- *							
-7	600035	.	Rack					1	AB
-7	600331	.	Rack					1	CD
		Attaching Parts							
-8	663	.	Pin - Taper					AR	AB
-8	83800	.	Pin - Taper					AR	CD
-9	3227	.	Screw - Socket head cap					AR	AB
-9	3400	.	Screw - Socket head cap					AR	CD
		----- *							
-10	601054	.	Leg - Tail end cabinet					1	AB
-10	601050	.	Leg - Tail end cabinet					1	CD
-11	601327	.	Door - Leg					1	All
-12	601100	.	Shelf - Tail end leg					1	AB
-12	601098	.	Shelf - Tail end leg					1	CD
-13	601053	.	Leg - Motor					1	AB
-13	601049	.	Leg - Motor					1	CD
-13	601294	.	Leg - Motor					1	CD
-14	601330	.	Cover, End - Motor leg					1	All
		Attaching Parts							
-15	3199	.	Screw - Low socket head cap					4	All
		----- *							
-16	601099	.	Shelf - Motor leg					1	AB
-16	601097	.	Shelf - Motor leg					1	CD
-17	601327	.	Door - Motor leg					1	AB
-17	602461	.	Door - Motor leg					1	CD
-18	219948	.	Washer					6	All
-19	113157	.	Screw - Leveling					6	All
-20	127579	.	Nut					6	All
-21	601227	.	Panel - Electrical					1	All
		Attaching Parts							
-22	3206	.	Screw - Low socket head cap					4	All
-23	2123	.	Washer - Lock					4	All
-24	3477	.	Nut - Full hex standard					4	All
		----- *							
-25	601219	.	Cover, End - Motor leg front					1	AB
-25	601218	.	Cover, End - Motor leg front					1	CD
		Attaching Parts							
-26	3199	.	Screw - Low socket head cap					8	All
		----- *							
-27	601232	.	Cover - Core					1	All
-28	602621	.	Plate - Selector switch					1	All
		Attaching Parts							
-29	3198	.	Screw - Low socket head cap					4	All
		----- *							
-30	600912	.	Cover - Headstock					1	AB
-30	600869	.	Cover - Headstock					1	CD
		Attaching Parts							
-31	3206	.	Screw - Phillip's head cap					1	CD
-32	3204	.	Screw - Low socket head cap					7	CD
-32	3203	.	Screw - Phillip's head cap					8	AB
		----- *							

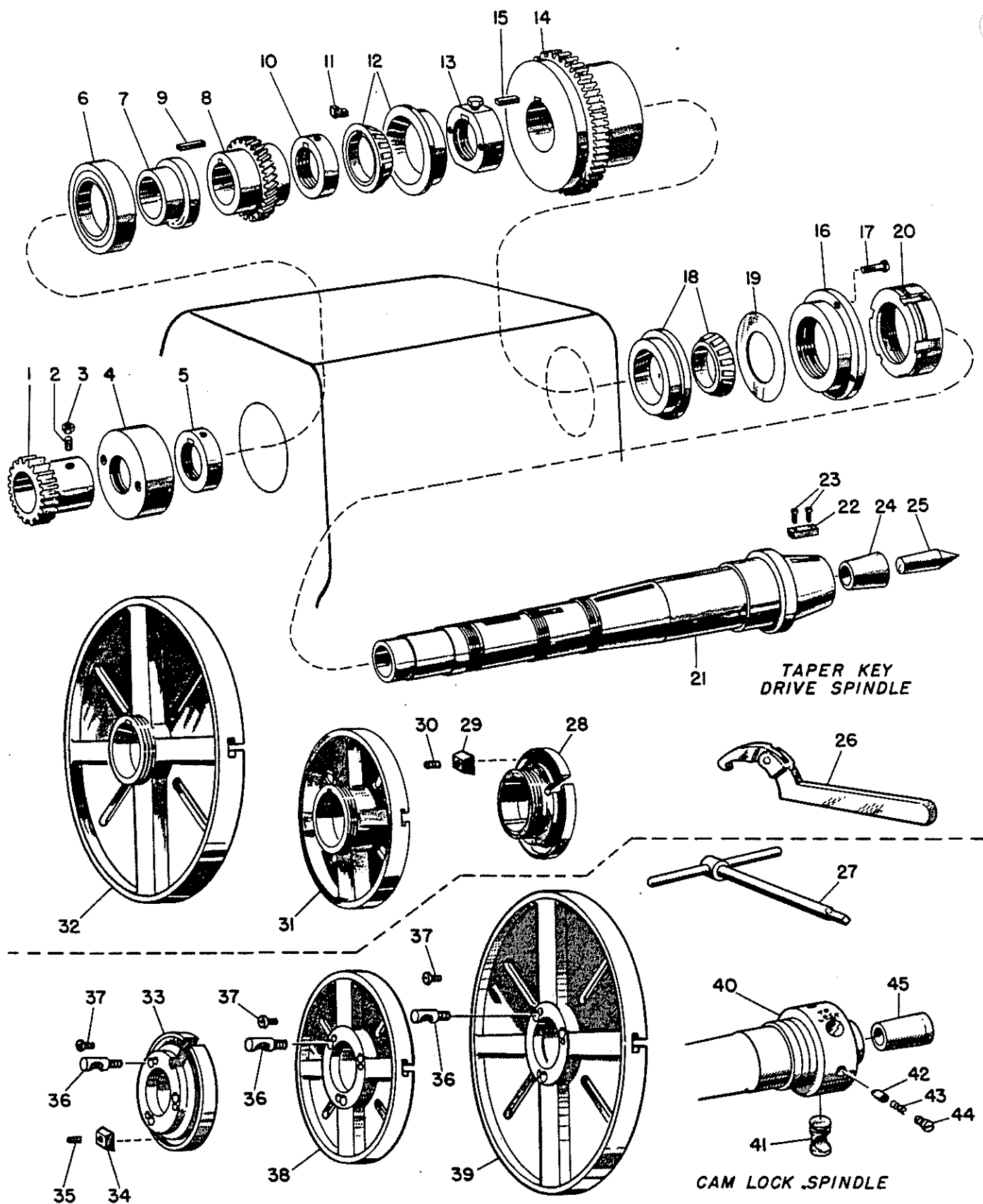


Figure 2. Headstock Spindle Assembly

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
1	2	3	4	5	6				
HEADSTOCK SPINDLE ASSEMBLY									
2-1	600813	.	Gear - Change					1	AB
-1	600216	.	Gear - Change					1	CD
		Attaching Parts							
-2	3230	.	Screw - Hex socket dog point set					1	All
-3	3472	.	Nut - Hex thin					1	All
		----- * -----							
-4	601503	.	Cap - Spindle bearing					1	AB
-4	600214	.	Cap - Spindle bearing					1	CD
-5	4193	.	Nut - Lock					1	AB
-5	4195	.	Nut - Lock					1	CD
-6	602921	.	Bearing - Ball					1	AB
-6	602922	.	Bearing - Ball					1	CD
-7	601502	.	Spacer - Spindle bearing					1	AB
-7	600212	.	Spacer - Spindle bearing					1	CD
-8	601012	.	Gear - Spindle helical					1	AB
-8	601192	.	Gear - Spindle helical					1	CD
-9	3278	.	Key - Spindle gear					1	AB
-9	3448	.	Key - Spindle gear					1	CD
-10	4195	.	Nut - Lock					1	AB
-10	4197	.	Nut - Lock					1	CD
-11	4021	.	Bearing - Locking key					1	AB
-11	4024	.	Bearing - Locking key					1	CD
-12	601504	.	Bearing - Timken roller (standard)					1	AB
-12	601375	.	Bearing - Timken roller (standard)					1	CD
-12	601863	.	Bearing - Timken roller (tool room)					1	AB
-12	601861	.	Bearing - Timken roller (tool room)					1	CD
-13	4196	.	Nut - Lock					1	AB
-13	3857	.	Nut - Lock					1	CD
-14	600809	.	Gear - Face					1	AB
-14	600208	.	Gear - Face					1	CD
-15	965	.	Key - Square					1	AB
-15	3450	.	Key - Square					1	CD
-16	600806	.	Cap - Spindle front bearing					1	AB
-16	600870	.	Cap - Spindle front bearing					1	CD
		Attaching Parts							
-17	3194	.	Screw - Socket head cap					4	AB
-17	3204	.	Screw - Socket head cap					4	CD
		----- * -----							
-18	600808	.	Bearing - Timken roller (standard)					1	AB
-18	601860	.	Bearing - Timken roller (standard)					1	CD
-18	601862	.	Bearing - Timken roller (tool room)					1	AB
-18	206071	.	Bearing - Timken roller (tool room)					1	CD
-19	600807	.	Slinger - Oil					1	AB
-19	600207	.	Slinger - Oil					1	CD
-20	600805	.	Nut - Spindle					1	AB
-20	600205	.	Nut - Spindle					1	CD
-21	601505	.	Spindle					1	AB
-21	600202	.	Spindle					1	CD
-22	600803	.	Key - Spindle					1	AB
-22	600203	.	Key - Spindle					1	CD
		Attaching Parts							
-23	3194	.	Screw - Socket head cap					2	All
		----- * -----							
-24	600760	.	Sleeve - Center					1	A
-24	601381	.	Sleeve - Center					1	B
-24	600243	.	Sleeve - Center					1	C
-24	601374	.	Sleeve - Center					1	D
-25	600204	.	Center					1	A
-25	600242	.	Center					1	BC
-25	601373	.	Center					1	D

Figure & Index No.	Part Number	Nomenclature 1 2 3 4 5 6	Units Per Assy	Application Code
HEADSTOCK SPINDLE ASSEMBLY (CONTINUED)				
2-26	601265	. Wrench - Adj. hook spanner	1	AB
-26	600966	. Wrench - Adj. hook spanner	1	CD
-27	602711	. Wrench - Cam lock (includes 602712)	1	AB
-27	602692	. Wrench - Cam lock (includes 602693)	1	CD
-28	601586	. Dog Plate	1	AB
-28	601587	. Dog Plate	1	CD
-29	601602	. Segment - Dog plate balancing	3	AB
-29	601603	. Segment - Dog plate balancing	3	CD
Attaching Parts				
-30	2333	. Screw - Hex socket set	3	All
----- *				
-31	600759	. Face Plate	1	A
-31	601971	. Face Plate	1	B
-31	600510	. Face Plate	1	C
-31	601973	. Face Plate	1	D
-32	601296	. Face Plate - Gap bed lathe only	1	C
-32	601295	. Face Plate - Gap bed lathe only	1	D
-33	601617	. Dog Plate - Cam lock	1	AB
-33	601625	. Dog Plate - Cam lock	1	CD
-34	601603	. Segment - Dog plate balancing	3	CD
Attaching Parts				
-35	2333	. Screw - Hex socket set	3	All
-36	601618	. Stud - Cam lock face plate	3	AB
-36	601626	. Stud - Cam lock face plate	3	CD
-37	3218	. Screw - Cam lock face plate	3	All
-38	601616	. Face Plate - Cam lock	1	A
-38	601972	. Face Plate - Cam lock	1	B
-38	601624	. Face Plate - Cam lock	1	C
-38	601974	. Face Plate - Cam lock	1	D
-39	601296	. Face Plate - Cam lock - Gap bed only	1	C
-39	601295	. Face Plate - Cam lock - Gap bed only	1	D
-40	601975	. Spindle - Headstock - Cam lock	1	AB
-40	601619	. Spindle - Headstock - Cam lock	1	CD
-41	601614	. Cam - Spindle nose	3	AB
-41	601623	. Cam - Spindle nose	3	CD
-42	601612	. Plunger - Spindle nose detent	3	All
-43	601615	. Spring - Spindle nose detent	3	All
-44	601613	. Screw - Spindle nose detent	3	AB
-44	2320	. Screw - Spindle nose detent	3	CD
-45	601610	. Sleeve - Center - Cam lock	1	A
-45	601611	. Sleeve - Center - Cam lock	1	B
-45	601621	. Sleeve - Center - Cam lock	1	C
-45	601622	. Sleeve - Center - Cam lock	1	D
HEADSTOCK SECONDARY AND BACK SHAFT ASSEMBLIES				
3-1	3562	. Plug - Standard	1	AB
-1	601434	. Plug - Standard	1	CD
-2	4184	. Nut - Lock	2	CD
-3	212356	. Cone - Timken roller bearing	2	CD
-4	202877	. Cup - Timken roller bearing	2	CD
-5	601548	. Gear - Primary cluster	1	CD
-6	601549	. Spacer - Primary gear	1	CD
-7	600229	. Gear - Primary 56T	1	CD
-8	600228	. Gear - Primary 64T	1	CD
-9	600227	. Gear - Primary 70T	1	CD
-10	600794	. Shaft - Secondary	1	CD
-11	95633	. Nut - Lock	1	AB
-12	95632	. Washer - Lock	1	AB
-13	600804	. Cone - Timken roller bearing	1	AB
-14	600921	. Cup - Timken roller bearing	1	AB
-15	600904	. Spacer - Secondary shaft	1	AB
-16	602759	. Gear - Primary 29T	1	AB
-17	602781	. Gear - Primary 16T	1	AB
-18	679	. Key - Woodruff	1	AB
-19	600827	. Spacer - Primary gear	1	AB

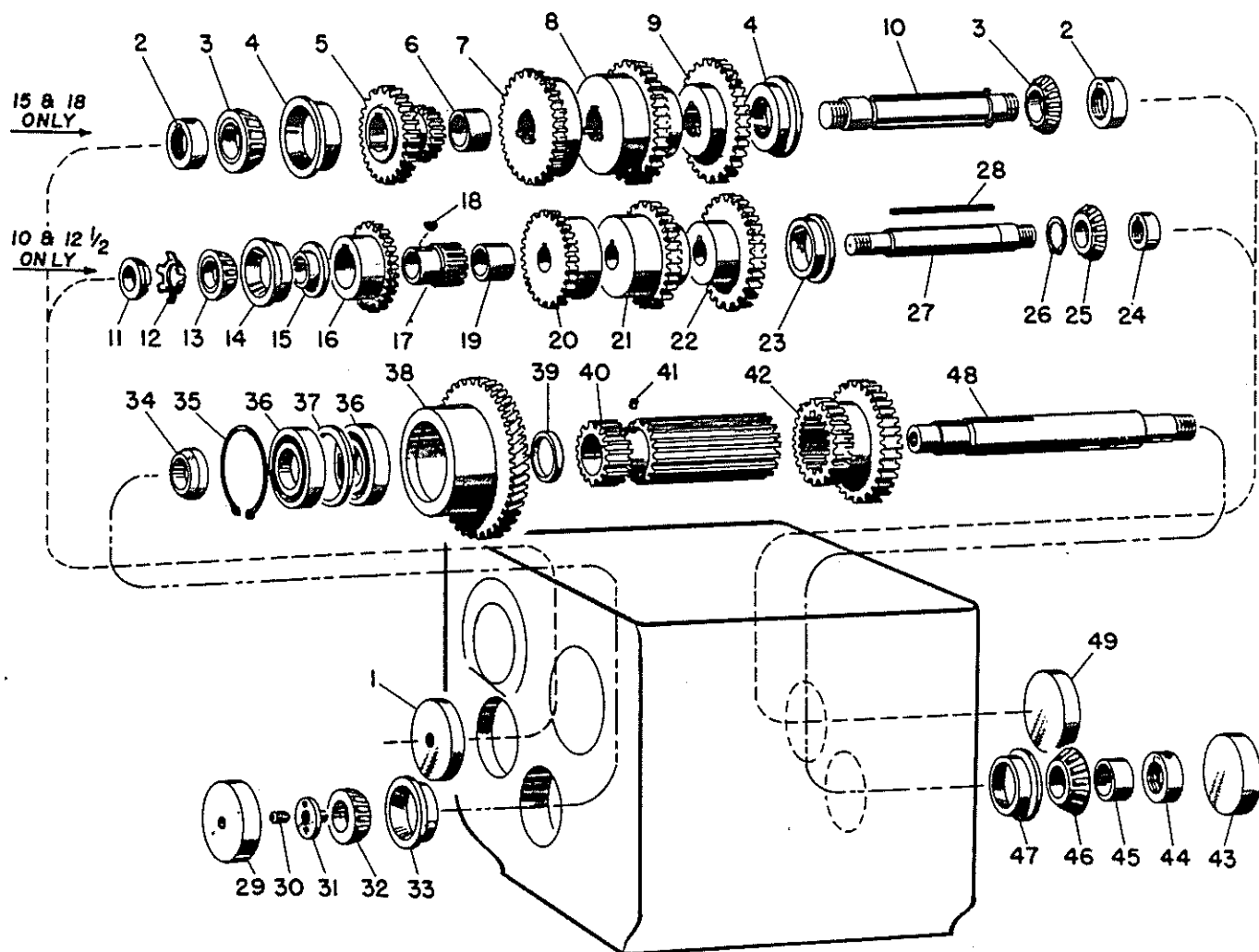


Figure 3. Headstock Secondary and Back Shaft Assemblies

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		
HEADSTOCK SECONDARY AND BACK SHAFT ASSEMBLIES (CONTINUED)				
3-20	600826	. Gear - Primary 41T	1	AB
-21	600825	. Gear - Primary 48T	1	AB
-22	600824	. Gear - Primary 54T	1	AB
-23	78732	. Cup - Timken roller bearing	1	AB
-24	4184	. Nut - Lock	1	AB
-25	78731	. Cone - Timken roller bearing	1	AB
-26	237432	. Ring - External retainer	1	AB
-27	600907	. Shaft - Secondary	1	AB
-28	600823	. Key - Secondary shaft	1	AB
-29	3852	. Plug - Standard	1	AB
-29	600792	. Plug - Standard	1	CD
-30	3165	. Screw - Hex socket dog point set	1	All
-31	602801	. Screw - Back gear	1	All
-32	78731	. Cone - Timken roller bearing	1	AB
-32	212356	. Cone - Timken roller bearing	1	CD
-33	78732	. Cup - Timken roller bearing	1	AB
-33	202877	. Cup - Timken roller bearing	1	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		

HEADSTOCK SECONDARY AND BACK SHAFT ASSEMBLIES (CONTINUED)

3-34	600821	.	Spacer - Back gear shaft (large)					1	AB
-34	600218	.	Spacer - Back gear shaft (large)					1	CD
-35	240206	.	Ring - Retaining internal snap					1	AB
-35	238243	.	Ring - Retaining internal snap					1	CD
-36	221105	.	Bearing - Ball					2	AB
-36	601220	.	Bearing - Ball					2	CD
-37	600820	.	Spacer - Bearing					1	AB
-37	600221	.	Spacer - Bearing					1	CD
-38	601011	.	Gear - Back helical					1	AB
-38	601191	.	Gear - Back helical					1	CD
-39	600818	.	Spacer - Back gear shaft					1	AB
-39	600220	.	Spacer - Back gear shaft					1	CD
-40	600816	.	Gear - Sliding back					1	AB
-40	600222	.	Gear - Sliding back					1	CD
-41	601432	.	Pin - Sliding back gear					1	AB
-41	601433	.	Pin - Sliding back gear					1	CD
-42	602782	.	Gear - Cluster sliding back					1	AB
-42	600223	.	Gear - Cluster sliding back					1	CD
-43	601434	.	Plug					1	All
-44	4184	.	Nut - Lock					1	All
-45	600815	.	Collar - Back gear shaft					1	AB
-45	600224	.	Collar - Back gear shaft					1	CD
-46	202876	.	Cone - Timken roller bearing					1	AB
-46	212356	.	Cone - Timken roller bearing					1	CD
-47	202877	.	Cup - Timken roller bearing					1	All
-48	602802	.	Shaft - Back gear					1	AB
-48	601391	.	Shaft - Back gear					1	CD
-49	3852	.	Plug - Standard					1	AB
-49	601434	.	Plug - Standard					1	CD

HEADSTOCK SHIFTER ASSEMBLY

4-1	600883	.	Nut - Lock					1	All
			Attaching Parts						
-2	2353	.	Screw - Low socket set					1	All
-3	1994	.	Plug - Brass					1	All
			- - - - - * - - - - -						
-4	601429	.	Ring - "O"					1	All
-5	600255	.	Segment - Shifter bar					1	CD
			Attaching Parts						
-6	141	.	Pin - Taper					1	All
			- - - - - * - - - - -						
-7	600252	.	Segment - Shifter sleeve (includes 600251)					1	CD
-8	600249	.	Segment - Shifter sleeve (includes 600248)					1	CD
-9	600962	.	Ring - Dial					1	AB
-9	600795	.	Ring - Dial					1	CD
-10	3178	.	Screw - Drive					14	All
-11	601440	.	Ring - "O"					1	All
-12	602575	.	Dial - Sliding back gear shifter (includes 601435)					1	AB
-12	602571	.	Dial - Sliding back gear shifter (includes 601435)					1	CD
-13	602576	.	Ring - Sliding back gear shifter					1	AB
-13	602572	.	Ring - Sliding back gear shifter					1	CD
-14	601430	.	Ring - "O"					1	All
-15	602577	.	Dial - Cluster back gear shifter (includes 601436)					1	AB
-15	602573	.	Dial - Cluster back gear shifter (includes 601436)					1	CD
-16	602578	.	Ring - Cluster back gear shifter					1	AB
-16	602574	.	Ring - Cluster back gear shifter					1	CD
-17	601429	.	Ring - "O"					1	All
-18	600848	.	Rod - Shifter (includes 600965)					1	AB
-18	600254	.	Rod - Shifter (includes 601437)					1	CD
-19	600923	.	Plate - Speeds 30-1200					1	All
-19	601318	.	Plate - Speeds 45-1800					1	AB
-19	600871	.	Plate - Speeds 20-800					1	CD

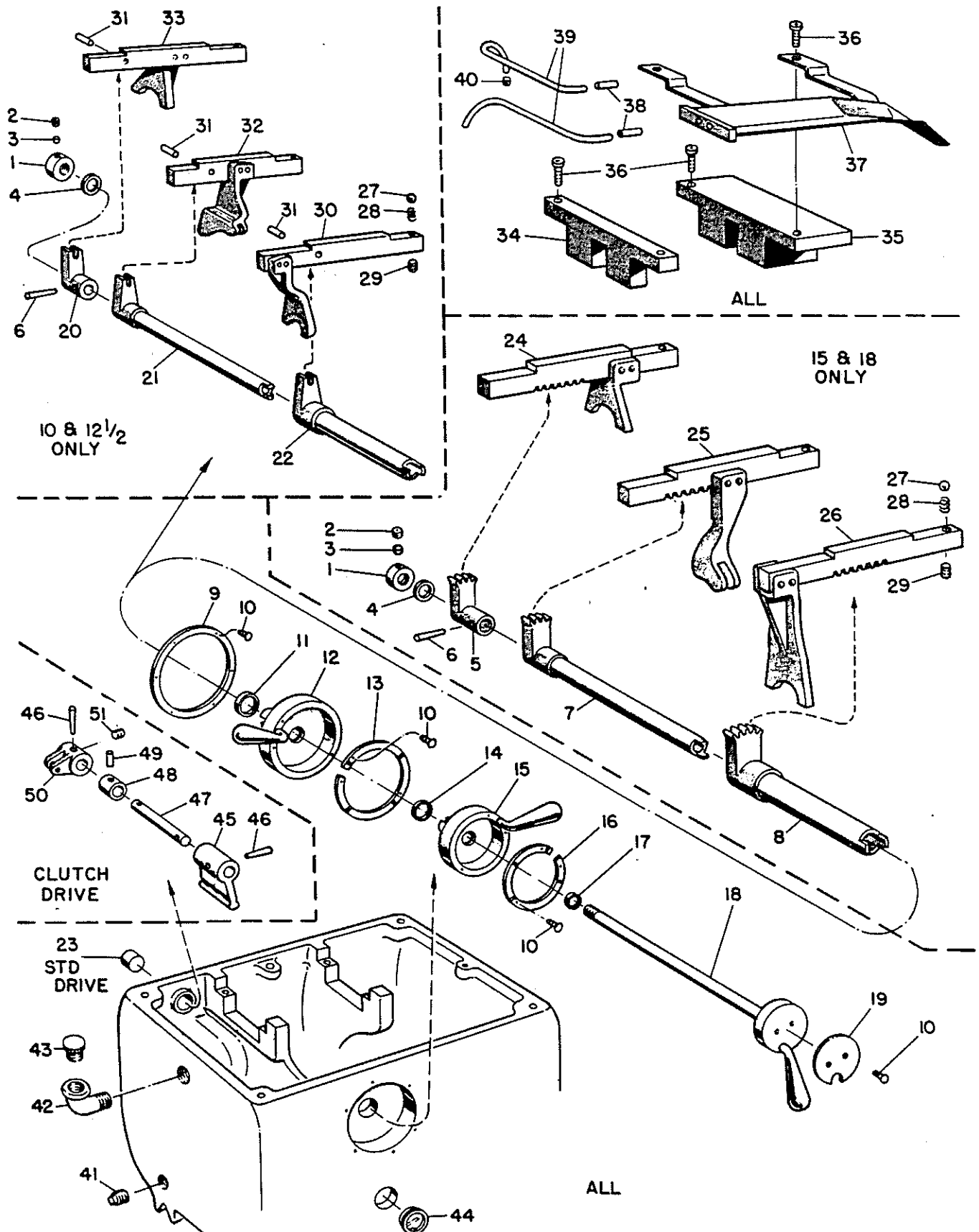


Figure 4. Headstock Shifter Assembly

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		

HEADSTOCK SHIFTER ASSEMBLY (CONTINUED)

4-20	600849	. Finger - Shifter rod	1	AB
-21	600847	. Finger - Back gear cluster shifter (includes 600846)	1	AB
-22	600844	. Finger - Back gear shifter (includes 600843)	1	AB
-23	3551	. Plug - Steel (standard drive only)	1	All
-24	600876	. Rack - #3 drive shaft gear shifter (includes 600257)	1	CD
-25	601544	. Rack - #2 back gear shifter (includes 600773)	1	CD
-26	600873	. Rack - #1 back gear shifter (includes 600758)	1	CD
-27	30060	. Ball - 1/4" diameter	3	All
-28	601683	. Spring - Detent	3	AB
-28	601684	. Spring - Detent	3	CD
-29	2355	. Screw - Hollow hex lock	3	AB
-29	2316	. Screw - Flat point hex socket set	3	CD
-30	600911	. Bar - Sliding back gear shifter (includes 600855)	1	AB
-31	3431	. Pin - Straight	3	AB
-32	600910	. Bar - Shifter (includes 600853)	1	AB
-33	600909	. Bar - Shifter (includes 600851)	1	AB
-34	600856	. Spacer - Shifter bar	1	AB
-34	600263	. Spacer - Shifter bar	1	CD
-35	602500	. Spacer - Shifter bar	1	AB
-35	602499	. Spacer - Shifter bar	1	CD
		Attaching Parts		
-36	3203	. Screw - Phillips	4	AB
-36	3205	. Screw - Phillips	4	CD
		----- *		
-37	601457	. Trough - Spindle bearing lubrication	1	AB
-37	601458	. Trough - Spindle bearing lubrication	1	CD
-38	2190	. Bushing - Oil tube	2	All
-39	601459	. Tubing - Copper (clutch drive only)	1	All
-40	2251	. Plug - Felt	1	All
-41	220784	. Plug - Pipe	1	AB
-41	4119	. Plug - Pipe	1	CD
-42	24792	. Elbow - Street	1	All
-43	60959	. Plug - Oil filler	1	All
-44	237701	. Gage - Oil sight	1	AB
-44	241087	. Gage - Oil sight	1	CD
-45	600840	. Finger - Gear shifter	1	AB
-45	600121	. Finger - Gear shifter	1	CD
		Attaching Parts		
-46	642	. Pin - Taper	2	All
		----- *		
-47	600286	. Shaft - Clutch shifter finger	1	All
-48	3564	. Bushing	1	All
		Attaching Parts		
-49	601263	. Pin - Bushing lock	1	AB
-49	3383	. Pin - Bushing lock	1	CD
		----- *		
-50	600461	. Lever	1	All
		Attaching Parts		
-51	78600	. Screw - Hex socket set	1	All
		----- *		

PULLEY DRIVE SHAFT ASSEMBLY

5-1	4184	. Nut - Lock	1	All
-2	600834	. Pulley - Drive shaft	1	AB
-2	600236	. Pulley - Drive shaft	1	CD
-3	600235	. Cap - Drive shaft bearing	1	CD
		Attaching Parts		
-4	3200	. Screw - Low socket head cap	3	CD
		----- *		
-5	78731	. Cone - Timken roller bearing	1	AB
-5	212905	. Cone - Timken roller bearing	1	CD

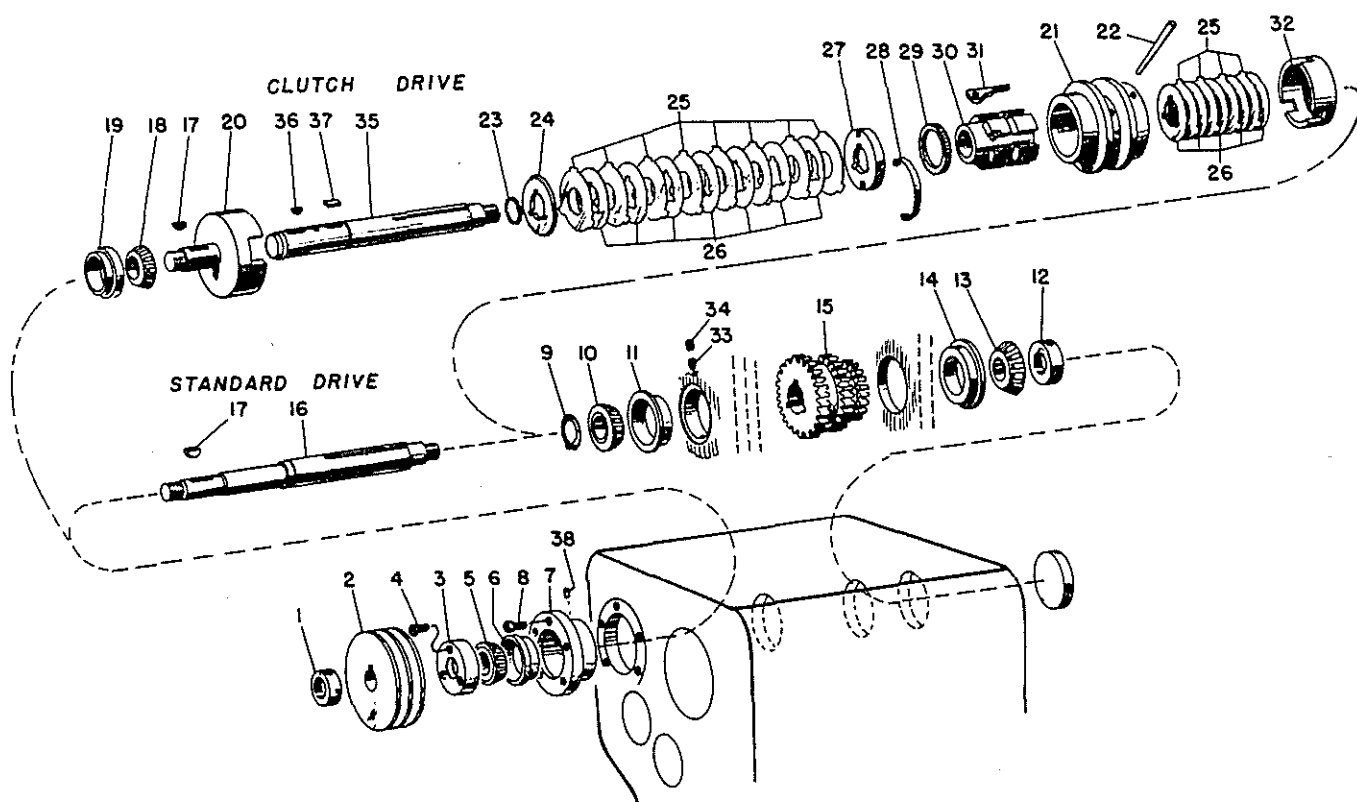


Figure 5. Pulley Drive Shaft Assembly

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
PULLEY DRIVE SHAFT ASSEMBLY (CONTINUED)									
5-6	78732	.						1	AB
-6	212429	.						1	CD
-7	600833	.						1	AB
-7	600234	.						1	CD
		Attaching Parts							
-8	3266	.						5	AB
-8	3399	.						5	CD
		-----*							
-9	113079	.						1	AB
-9	119181	.						1	CD
-10	221593	.						1	AB
-10	72197	.						1	CD
-11	212429	.						1	AB
-11	72196	.						1	CD
-12	4184	.						1	All
-13	78731	.						1	AB
-13	212356	.						1	CD
-14	78732	.						1	AB
-14	202877	.						1	CD
-15	600832	.						1	AB
-15	600233	.						1	CD
-16	600835	.						1	AB
-16	600237	.						1	CD
		Attaching Parts							
-17	679	.						1	All
		-----*							
-18	78731	.						1	AB
-18	212905	.						1	CD
-19	78732	.						1	AB
-19	212429	.						1	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
1	2	3	4	5	6				
PULLEY DRIVE SHAFT ASSEMBLY (CONTINUED)									
5-20	600838	.	Shaft - Drive clutch cup					1	AB
-20	600240	.	Shaft - Drive clutch cup					1	CD
-21	601829	.	Shifter - Sleeve					1	AB
-21	601841	.	Shifter - Sleeve					1	CD
		Attaching Parts							
-22	601837	.	Pin - Anchor					1	AB
-22	601848	.	Pin - Anchor					1	CD
			----- *						
-23	601839	.	Ring - Split					1	AB
-23	601850	.	Ring - Split					1	CD
-24	601832	.	Plate - Thrust					1	AB
-24	601844	.	Plate - Thrust					1	CD
-25	601834	.	Disc - Outer					11	AB
-25	601846	.	Disc - Outer					11	CD
-26	601835	.	Disc - Inner					12	AB
-26	601847	.	Disc - Inner					13	CD
-27	601833	.	Plate - Pressure					1	AB
-27	601845	.	Plate - Pressure					1	CD
-28	601838	.	Spring - Adjustment lock					1	AB
-28	601849	.	Spring - Adjustment lock					1	CD
-29	601831	.	Collar - Adjustment					1	AB
-29	601843	.	Collar - Adjustment					1	CD
-30	601830	.	Body - Clutch					1	AB
-30	601842	.	Body - Clutch					1	CD
-31	601836	.	Dog					3	All
-32	600837	.	Cup - Brake					1	AB
-32	600239	.	Cup - Brake					1	CD
-33	3228	.	Screw - Hex socket dog point set (clutch drive)					1	All
-34	2332	.	Screw - Hex socket flat point set (clutch drive)					1	AB
-34	3228	.	Screw - Hex socket dog point set (clutch drive)					1	CD
-35	600836	.	Shaft - Drive					1	AB
-35	600238	.	Shaft - Drive					1	CD
-36	601840	.	Key - Hypo					3	All
-37	601728	.	Key - Square					3	AB
-37	601729	.	Key - Square					3	CD
-38	2251	.	Plug - Felt					1	All
TAILSTOCK ASSEMBLY									
6-1	601632	.	Top - Tailstock					1	A
-1	601635	.	Top - Tailstock					1	B
-1	601643	.	Top - Tailstock					1	C
-1	601650	.	Top - Tailstock					1	D
-2	60062	.	Cup - Oil					2	All
-3	104207	.	Bearing - Ball thrust					1	AB
-3	89134	.	Bearing - Ball thrust					1	CD
-4	600169	.	Cap - End					1	A
-4	600534	.	Cap - End					1	B
-4	600007	.	Cap - End					1	C
-4	601652	.	Cap - End					1	D
-5	600171	.	Wheel - Hand					1	AB
-5	3929	.	Wheel - Hand					1	C
-5	601033	.	Wheel - Hand					1	D
-6	1014	.	Handle					1	AB
-6	3501	.	Handle					1	C
-6	3502	.	Handle					1	D
-7	3473	.	Nut - Thin hex					1	AB
-7	3474	.	Nut - Thin hex					1	C
-7	3479	.	Nut - Thin hex					1	D
-8	601662	.	Screw - Spindle					1	A
-8	601658	.	Screw - Spindle					1	B
-8	601660	.	Screw - Spindle					1	C
-8	601659	.	Screw - Spindle					1	D

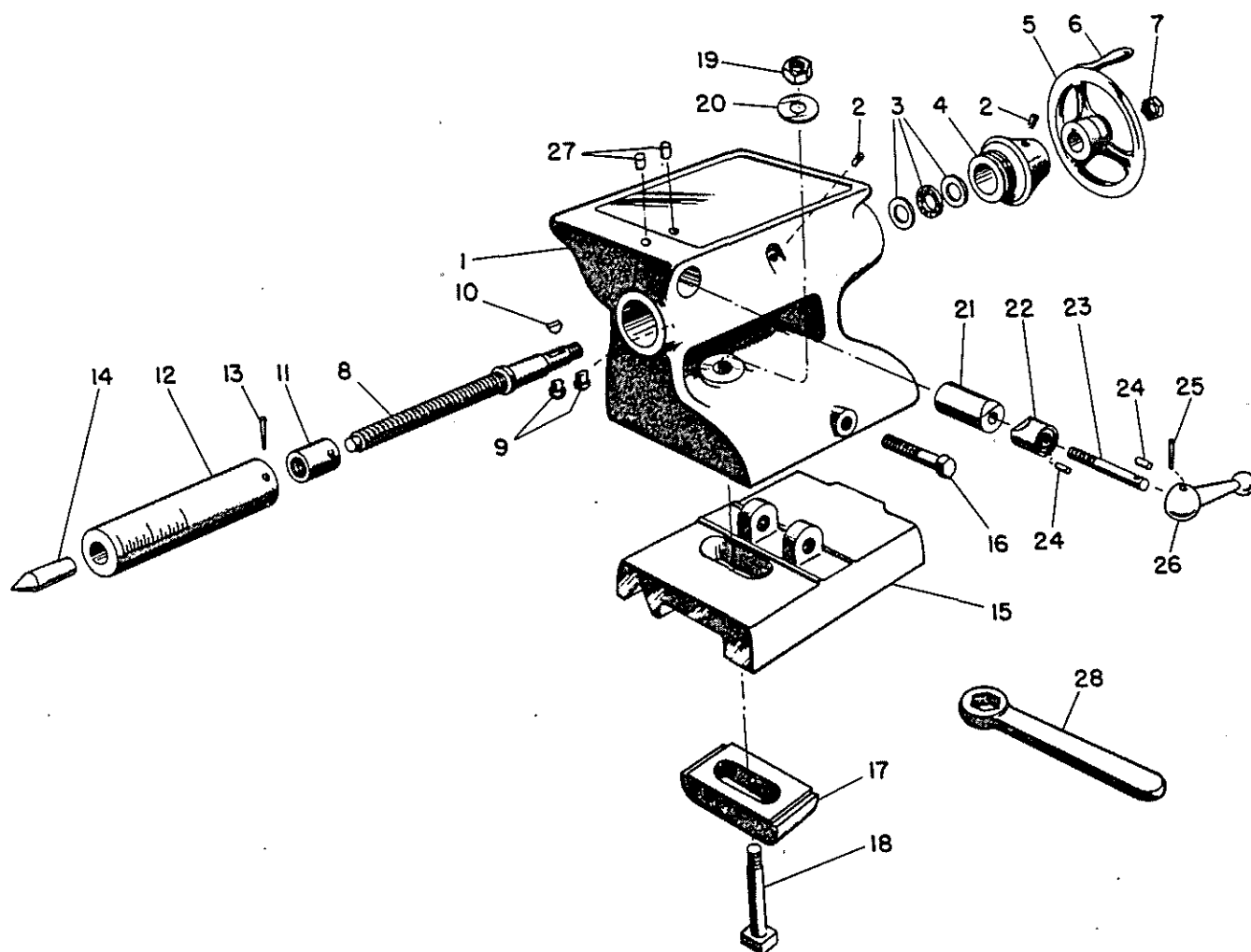


Figure 6. Tailstock Assembly

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		
TAILSTOCK ASSEMBLY (CONTINUED)				
6-9	603045	. Key - Tailstock	2	AB
-9	603046	. Key - Tailstock	2	CD
-10	1266	. Key - Woodruff	1	AB
-10	679	. Key - Woodruff	1	CD
-11	600166	. Nut - Spindle	1	AB
-11	600004	. Nut - Spindle	1	CD
-12	601661	. Spindle	1	A
-12	601657	. Spindle	1	B
-12	601664	. Spindle	1	C
-12	601649	. Spindle	1	D
-13	237819	. Pin - Taper	1	A
-13	140	. Pin - Taper	1	BC
-13	642	. Pin - Taper	1	D
-14	600204	. Center - Tailstock	1	A
-14	600242	. Center - Tailstock	1	BC
-14	601373	. Center - Tailstock	1	D
-15	601633	. Bottom - Tailstock	1	A
-15	601636	. Bottom - Tailstock	1	B
-15	601634	. Bottom - Tailstock	1	C
-15	601651	. Bottom - Tailstock	1	D

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
1	2	3	4	5	6				
TAILSTOCK ASSEMBLY (CONTINUED)									
6-16	2249	.	Screw - Hex head cap					2	AB
-16	212211	.	Screw - Hex head cap					2	CD
-17	600179	.	Clamp - Tailstock					1	A
-17	600539	.	Clamp - Tailstock					1	B
-17	600014	.	Clamp - Tailstock					1	C
-17	600610	.	Clamp - Tailstock					1	D
-18	601631	.	Bolt - Clamp					1	A
-18	601638	.	Bolt - Clamp					1	B
-18	601639	.	Bolt - Clamp					1	C
-18	601648	.	Bolt - Clamp					1	D
-19	3480	.	Nut					1	AB
-19	3481	.	Nut					1	CD
-20	1040	.	Washer					1	AB
-20	764	.	Washer					1	CD
-21	600173	.	Nut - Spindle clamp					1	A
-21	600535	.	Nut - Spindle clamp					1	B
-21	601663	.	Nut - Spindle clamp					1	C
-21	601647	.	Nut - Spindle clamp					1	D
-22	601628	.	Bushing - Spindle clamp					1	A
-22	601637	.	Bushing - Spindle clamp					1	B
-22	601641	.	Bushing - Spindle clamp					1	C
-22	601646	.	Bushing - Spindle clamp					1	D
-23	601629	.	Screw - Spindle clamp					1	AB
-23	601642	.	Screw - Spindle clamp					1	CD
-24	3383	.	Pin - Straight					2	AB
-24	3336	.	Pin - Straight					2	CD
-25	143	.	Pin - Taper					1	AB
-25	642	.	Pin - Taper					1	CD
-26	60177	.	Handle - Clamp					1	AB
-26	600862	.	Handle - Clamp					1	CD
-27	600176	.	Plug - Drive					2	AB
-27	247024	.	Plug - Drive					2	CD
-28	600968	.	Wrench - Hex box					1	AB
-28	600967	.	Wrench - Hex box					1	CD
LEADSCREW AND CONTROL ROD ASSEMBLY									
7-1	601415	.	Clutch - Leadscrew					1	AB
-1	601532	.	Clutch - Leadscrew					1	CD
		Attaching Parts							
-2	143	.	Pin - Taper					1	AB
-2	105165	.	Pin - Taper					1	CD
		----- *							
-3	601082	.	Nut - Front adjusting					1	AB
-3	601057	.	Nut - Front adjusting					1	CD
-4	216283	.	Bearing - Ball thrust					2	AB
-4	94705	.	Bearing - Ball thrust					2	CD
-5	600733	.	Bearing - Plain					1	AB
-5	600027	.	Bearing - Plain					2	CD
-6	44980	.	Oiler					1	All
-7	601083	.	Nut - Rear adjusting					1	AB
-7	601058	.	Nut - Rear adjusting					1	CD
-8	203828	.	Plug - Expansion					1	All
-9	3922	.	Spring					1	All
-10	1040	.	Washer					1	AB
-10	601056	.	Washer					1	CD
-11	601422	.	Handle - Control					1	AB
-11	601418	.	Handle - Control					1	CD
		Attaching Parts							
-12	642	.	Pin - Taper					1	AB
-12	645	.	Pin - Taper					1	CD
		----- *							

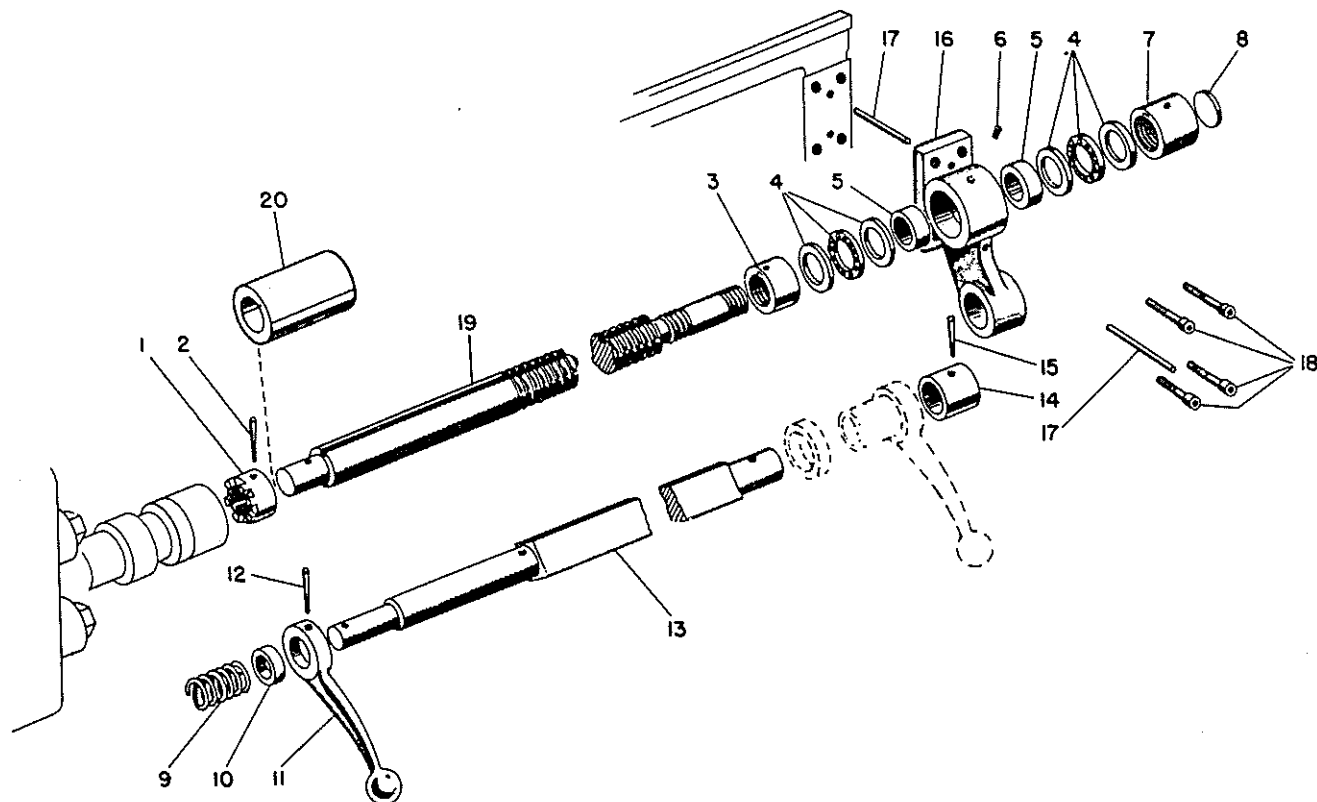


Figure 7. Leadscrew and Control Rod Assembly

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		
LEADSCREW AND CONTROL ROD ASSEMBLY (CONTINUED)				
7-13	601085	. Rod - Operating	1	AB
-13	601090	. Rod - Operating	1	CD
-14	600764	. Collar	1	AB
-14	601255	. Collar	1	CD
		Attaching Parts		
-15	642	. Pin - Taper	1	All
		----- *		
-16	600732	. Box - Back	1	AB
-16	600089	. Box - Back	1	CD
		Attaching Parts		
-17	3285	. Pin - Straight	2	AB
-17	3162	. Pin - Straight	2	CD
-18	3227	. Screw - Socket head cap	4	AB
-18	3266	. Screw - Socket head cap	4	CD
		----- *		
-19	601088	. Leadscrew (American)	1	AB
-19	601091	. Leadscrew (American)	1	C
-19	601093	. Leadscrew (American)	1	D
-19	601089	. Leadscrew (Metric)	1	AB
-19	601092	. Leadscrew (Metric)	1	C
-19	601094	. Leadscrew (Metric)	1	D
-20	601448	. Sleeve - Extension (gap bed lathes only)	1	C
-20	601447	. Sleeve - Extension (gap bed lathes only)	1	D

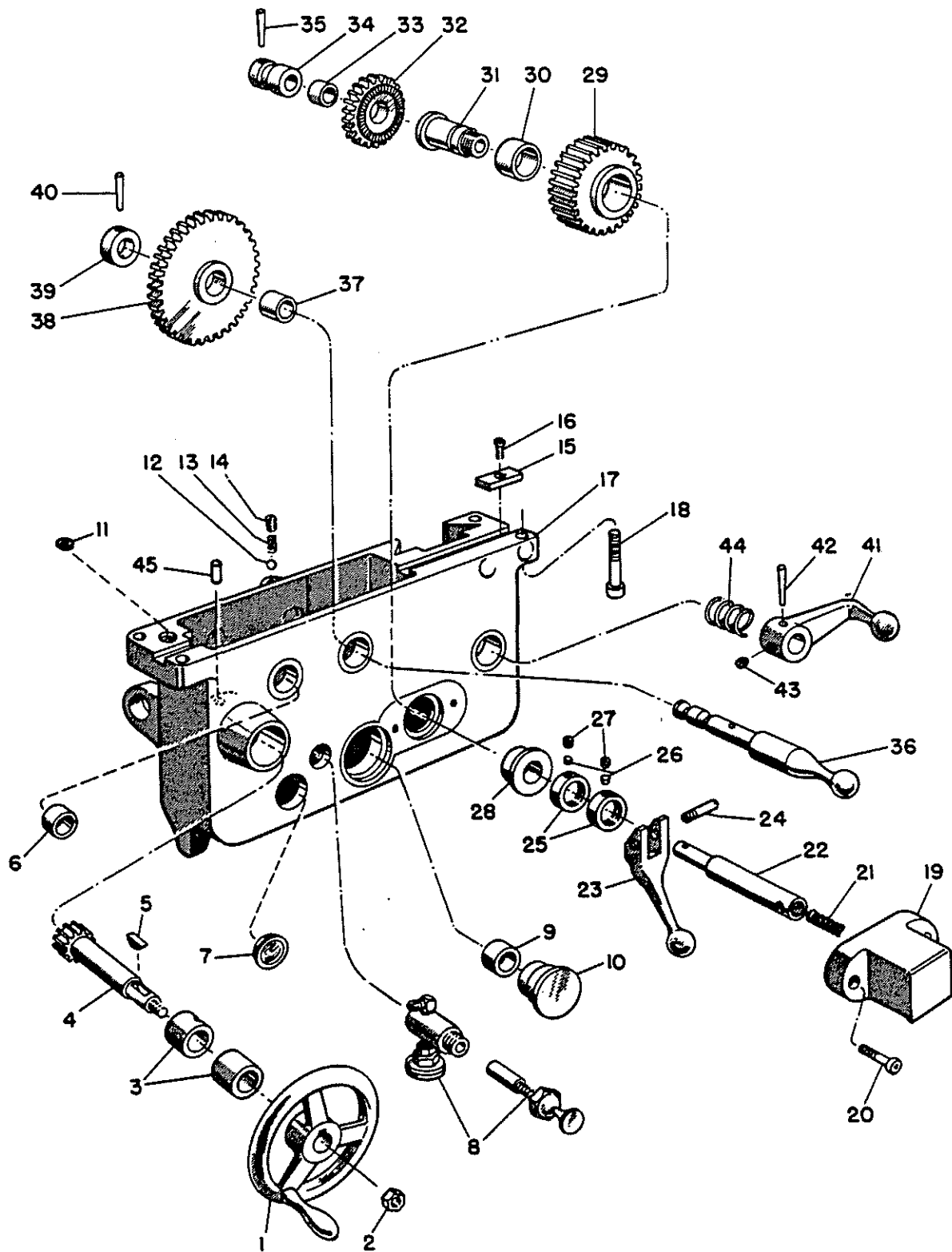


Figure 8. Apron Assembly (Front) 10" and 12 1/2"

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
APRON ASSEMBLY (FRONT) 10" AND 12 1/2"									
8-1	601033	Wheel - Hand (includes 3502)						1	AB
		Attaching Parts							
-2	3474	. Nut - Hex thin						1	AB
		----- * -----							
-3	601709	. Bearing - Plain oilite						2	AB
-4	601955	. Pinion - Handwheel						1	AB
-5	679	. Key - Woodruff						1	AB
-6	601455	. Bearing - Plain oilite						1	AB
-7	237701	. Gage - Oil sight						1	AB
-8	600180	. Lubricator						1	AB
-9	601268	. Bearing - Plain oilite						1	AB
-10	601710	. Plug - Closure						1	AB
-11	600184	. Washer - Seal						1	AB
-12	13665	. Ball - Steel						1	AB
-13	1837-T	. Spring - Compression						1	AB
-14	3211	. Screw - Hex socket set						1	AB
-15	600458	. Key - Apron						2	AB
-16	3218	. Screw - Socket head cap						2	AB
-17	602628	. Apron						1	AB
		Attaching Parts							
-18	3400	. Screw - Socket head cap						4	AB
		----- * -----							
-19	600437	. Housing - Drop lever						1	AB
		Attaching Parts							
-20	3396	. Screw - Socket head cap						2	AB
		----- * -----							
-21	126-T	. Spring - Compression						1	AB
-22	600981	. Shaft - Feed						1	AB
-23	600772	. Lever - Drop						1	AB
-24	600439	. Stud - Shoulder						1	AB
-25	600129	. Nut - Feed shaft						2	AB
-26	600436	. Plug						2	AB
-27	2330	. Screw - Hex socket set						2	AB
-28	600419	. Bushing - Flange						1	AB
-29	601717	. Gear - Feed						1	AB
-30	601708	. Bearing - Plain oilite						1	AB
-31	601706	. Sleeve - Feed shaft						1	AB
-32	600978	. Gear - Feed						1	AB
-33	600433	. Bearing - Plain						1	AB
-34	600983	. Collar - Detent						1	AB
-35	2291	. Pin - Taper						1	AB
-36	600639	. Shaft - Selector						1	AB
-37	600637	. Bearing - Plain						1	AB
-38	600975	. Gear - Cluster						1	AB
-39	600974	. Collar						1	AB
-40	2291	. Pin - Taper						1	AB
-41	600450	. Lever - Half-nut						1	AB
-42	642	. Pin - Taper						1	AB
-43	1911	. Screw - Flat point hex socket set						1	AB
-44	136-T	. Spring - Compression						1	AB
-45	3544	. Pin - Straight						1	AB

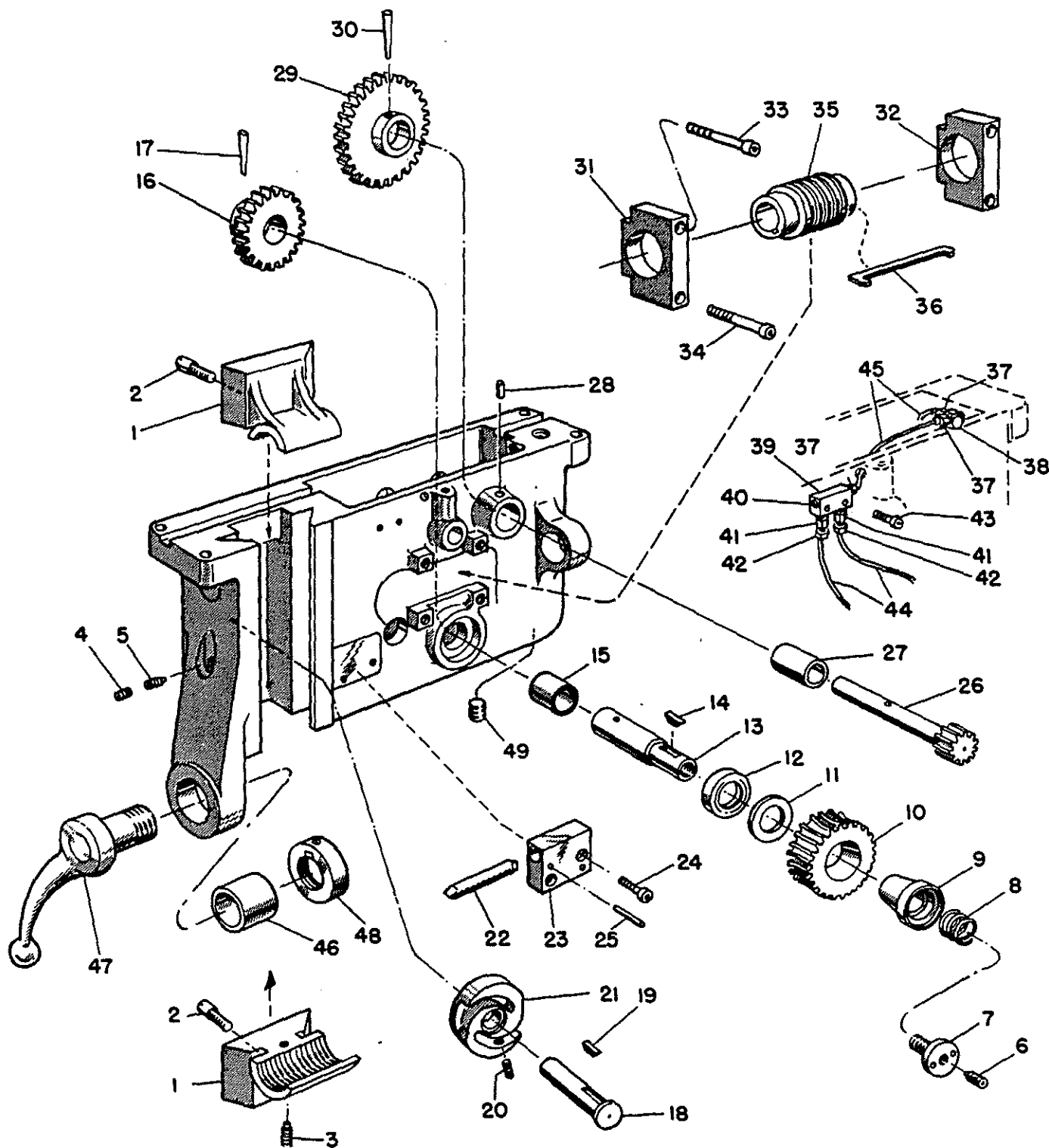


Figure 9. Apron Assembly (Rear) 10" and 12 1/2"

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
1	2	3	4	5	6				
APRON ASSEMBLY (REAR) 10" AND 12 1/2"									
9-1	600649	.	Nut - Half American					1	AB
-1	600652	.	Nut - Half Metric					1	AB
-2	600108	.	Stud - Positioning					2	AB
-3	3454	.	Screw - Headless dog point set					1	AB
-4	1215	.	Screw - Headless dog point set					1	AB
-5	3498	.	Screw - Headless dog point set					1	AB
-6	3165	.	Screw - Dog point set					1	AB
-7	602801	.	Screw - Back gear					1	AB
-8	601409	.	Spring - Cone clutch					1	AB
-9	601416	.	Cone - Clutch					1	AB
-10	601407	.	Worm - Wheel					1	AB
-11	601408	.	Spacer - Main drive shaft					1	AB
-12	93233	.	Seal - Oil victorprene					1	AB
-13	601406	.	Shaft - Main drive					1	AB
-14	1266	.	Key - Woodruff					1	AB
-15	601268	.	Bearing - Plain oilite					1	AB
-16	600976	.	Gear - Drive					1	AB
-17	105165	.	Pin - Taper					1	AB
-18	600642	.	Shaft - Half-nut cam					1	AB
-19	1266	.	Key - Woodruff					1	AB
-20	600641	.	Stud - Locating					1	AB
-21	600640	.	Cam - Half-nut					1	AB
-22	600643	.	Pin - Interference					1	AB
-23	600644	.	Guide - Interference					1	AB
-24	3227	.	Screw - Socket head cap					2	AB
-25	3542	.	Pin - Straight					2	AB
-26	600972	.	Pinion - Rack					1	AB
-27	601456	.	Bearing - Plain oilite					1	AB
-28	3383	.	Pin - Straight					1	AB
-29	600973	.	Gear - Rack pinion					1	AB
-30	642	.	Pin - Taper					1	AB
-31	600995	.	Bracket - Worm					1	AB
-32	600980	.	Bracket - Worm					1	AB
Attaching Parts									
-33	2325	.	Screw - Socket head cap					2	AB
-34	601490	.	Screw - Worm bracket body fit cap					2	AB
- - - - - * - - - - -									
-35	602699	.	Gear - Worm					1	AB
-36	600996	.	Key - Worm					1	AB
-37	600181	.	Bushing - Compression (includes 600182)					3	AB
-38	600937	.	Tee - Adapter					1	AB
-39	600936	.	Bar - Junction					1	AB
-40	600186	.	Plug - Closure					1	AB
-41	600946	.	Unit - Meter					2	AB
-42	600188	.	Nut - Compression (includes 600189)					2	AB
-43	3246	.	Screw - Hex head cap					2	AB
-44	600193	.	Tubing - Oil 3/32 O.D.					AR	AB
-45	600193	.	Tubing - Oil 5/32 O.D.					AR	AB
-46	602630	.	Bushing - Control handle					1	AB
-47	602629	.	Handle - Apron control					1	AB
-48	64190	.	Nut - Lock					1	AB
-49	76645	.	Plug - Pipe					1	AB

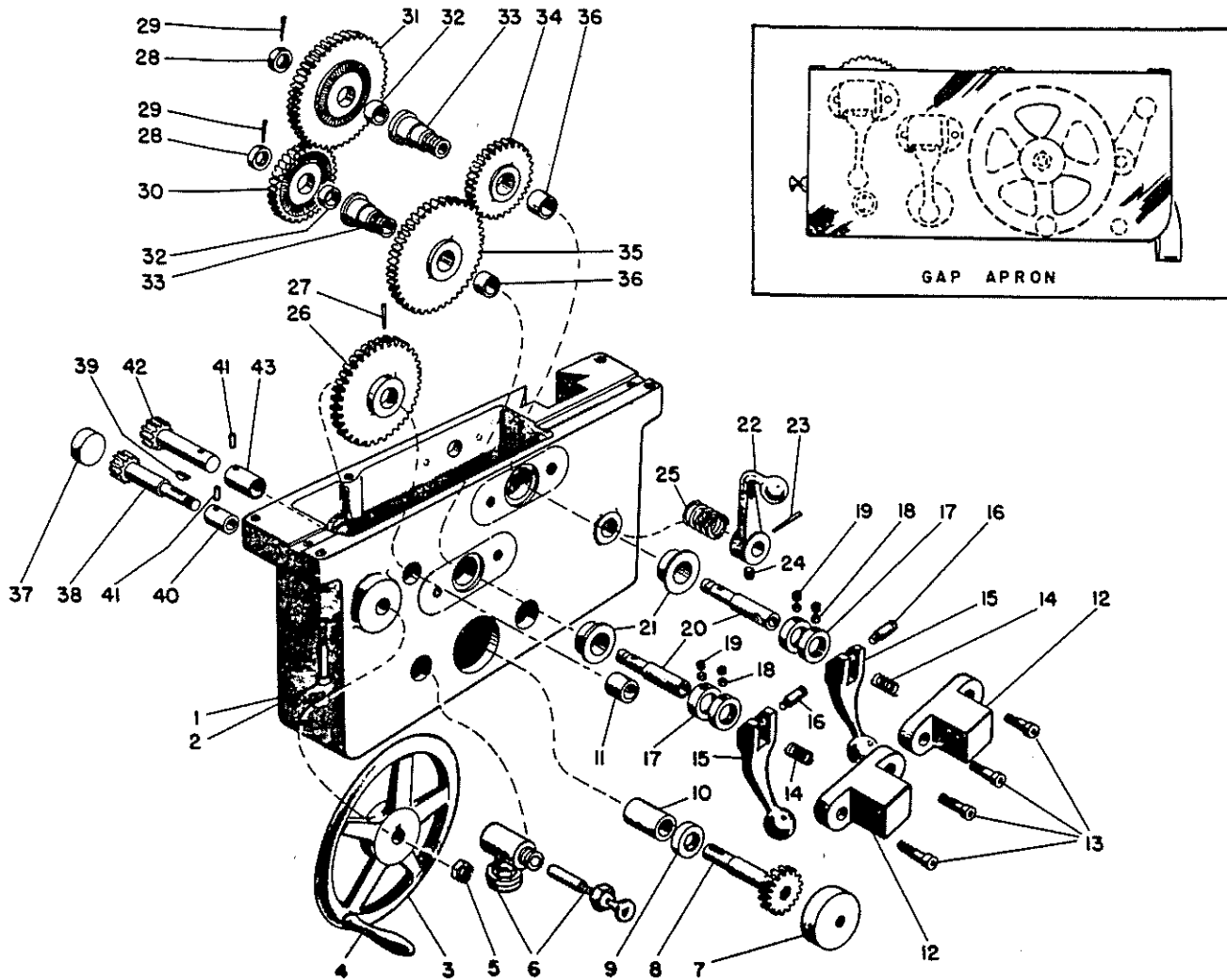


Figure 10. Apron Assembly (Front) 15'' and 18''

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		
APRON ASSEMBLY (FRONT) 15'' AND 18''				
10-1	602626	. Apron	1	CD
-1	602694	. Apron - Gap	1	CD
		Attaching Parts		
-2	3343	. Screw - Socket head cap	4	CD
		----- *		
-3	3510	. Wheel - Hand	1	CD
-4	3502	. Handle	1	CD
		Attaching Parts		
-5	3474	. Nut - Hex	1	CD
		----- *		
-6	600180	. Lubricator	1	CD
-7	3947	. Plug - Standard	1	CD
-8	601395	. Gear - Main drive	1	CD
-9	93233	. Seal - Oil victoprene	1	CD
-10	600422	. Bearing - Plain	1	CD
-11	600417	. Bearing - Plain	1	CD
-12	600437	. Housing - Drop lever	2	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
APRON ASSEMBLY (FRONT) 15" AND 18" (CONTINUED)									
		Attaching Parts							
10-13	3396	.	Screw - Socket head cap					4	CD
		.	----- *						
-14	126-T	.	Spring - Compression					2	CD
-15	600772	.	Lever - Drop					2	CD
-16	600439	.	Stud - Shoulder					2	CD
-17	600129	.	Nut - Feed shaft					4	CD
-18	600436	.	Plug					4	CD
-19	2330	.	Screw - Hex socket set					4	CD
-20	602624	.	Shaft - Feed					2	CD
-21	600419	.	Bushing - Flange					2	CD
-22	600450	.	Lever - Half-nut					1	CD
		Attaching Parts							
-23	642	.	Pin - Taper					1	CD
-24	1911	.	Screw - Flat point hex socket set					1	CD
		.	----- *						
-25	136-T	.	Spring - Compression					1	CD
-26	600443	.	Gear - Rack pinion					1	CD
		Attaching Parts							
-27	642	.	Pin - Taper					1	CD
		.	----- *						
-28	600434	.	Collar					2	CD
		Attaching Parts							
-29	2291	.	Pin - Taper					2	CD
		.	----- *						
-30	600954	.	Gear - Small longitudinal feed					1	CD
-31	600953	.	Gear - Large cross feed					1	CD
-32	600433	.	Bearing - Plain					2	CD
-33	600144	.	Sleeve - Feed shaft					2	CD
-34	600956	.	Gear - Small cross feed					1	CD
-35	600955	.	Gear - Large longitudinal feed					1	CD
-36	600430	.	Bearing - Plain					2	CD
-37	3563	.	Plug - Standard					1	CD
-38	600444	.	Pinion - Handwheel					1	CD
		Attaching Parts							
-39	679	.	Key - Woodruff					1	CD
		.	----- *						
-40	600418	.	Bearing - Plain					1	CD
-41	3377	.	Pin - Straight					2	CD
-42	600440	.	Pinion - Rack					1	CD
-43	600442	.	Bearing - Plain					1	CD
APRON ASSEMBLY (REAR) 15" AND 18"									
11-1	600452	.	Nut - Half (American)					1	C
-1	600601	.	Nut - Half (Metric)					1	D
-1	600603	.	Nut - Half (American)					1	C
-1	600602	.	Nut - Half (Metric)					1	D
-2	600108	.	Stud - Positioning					2	CD
-3	3455	.	Screw - Set headless dog point					1	CD
-4	3455	.	Screw - Set headless dog point					1	CD
-5	1175	.	Screw - Headless set					1	CD
-6	602631	.	Handle - Apron control					1	CD
-7	602540	.	Bushing - Control handle					1	CD
-8	4191	.	Nut - Lock					1	CD
-9	600458	.	Key - Apron					2	CD
-10	3218	.	Screw - Socket head cap					2	CD
-11	600447	.	Cam - Half-nut					1	CD
-12	600448	.	Stud - Locating					1	CD
-13	600449	.	Shaft - Half-nut cam					1	CD
		Attaching Parts							
-14	1266	.	Key - Woodruff					1	CD
		.	----- *						

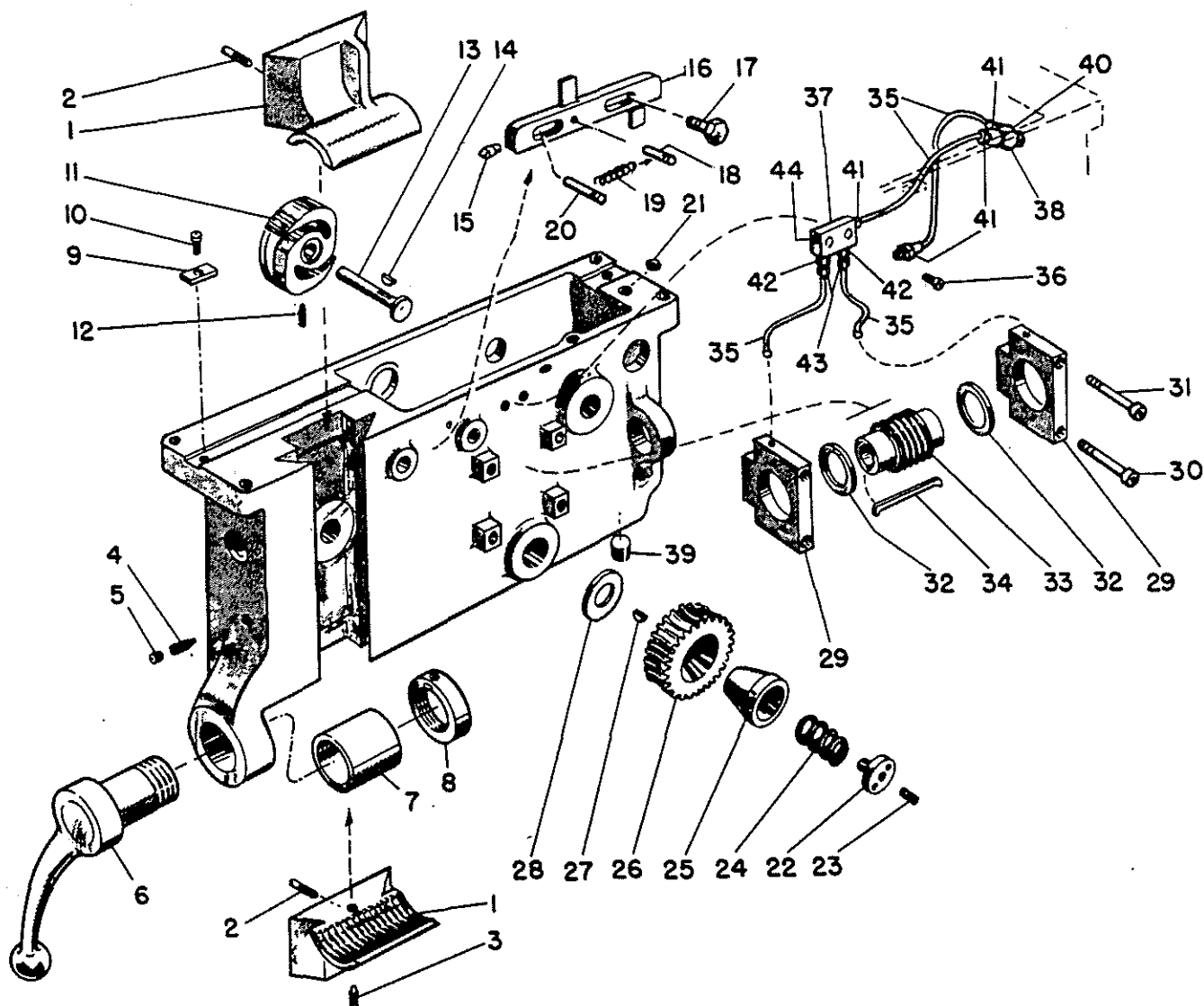


Figure 11. Apron Assembly (Rear) 15'' and 18''

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		
APRON ASSEMBLY (REAR) 15'' AND 18'' (CONTINUED)				
11-15	601361	. Pin - Interference	1	CD
-16	602622	. Bar - Interference	1	CD
-17	601282	. Screw - Hex head shoulder	2	CD
-18	98826	. Pin - Spring	1	CD
-19	109394	. Spring - Expansion	1	CD
-20	98825	. Pin - Spring	1	CD
-21	600184	. Washer - Seal	1	CD
-22	602801	. Screw - Back gear	1	CD
-23	3165	. Screw - Dog point set	1	CD
-24	601405	. Spring - Cone clutch	1	CD
-25	601397	. Cone - Clutch	1	CD
-26	601399	. Worm - Wheel	1	CD
-27	679	. Key - Woodruff	1	CD
-28	601398	. Spacer - Main drive shaft	1	CD
-29	601016	. Bracket - Worm	2	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
1	2	3	4	5	6				
APRON ASSEMBLY (REAR) 15" AND 18" (CONTINUED)									
11-30	601362	.	Screw - Cap, body fit worm bracket					2	CD
-31	2326	.	Screw - Socket head cap					2	CD
			----- *						
-32	601017	.	Washer - Thrust					2	CD
-33	602841	.	Worm					1	C
-33	602440	.	Worm					1	D
			Attaching Parts						
-34	601013	.	Key - Worm					1	CD
			----- *						
-35	600193	.	Tubing					AR	CD
-36	3246	.	Screw - Socket head cap					2	CD
-37	600936	.	Bar - Junction					1	CD
-38	600937	.	Tee - Adapter					1	CD
-39	76645	.	Plug					1	CD
-40	600183	.	Adapter - Straight					1	CD
-41	600181	.	Bushing - Compression					2	CD
-41	600182	.	Sleeve - Compression					2	CD
-42	600946	.	Meter - Unit					2	CD
-43	600188	.	Nut - Compression					2	CD
-43	600189	.	Sleeve - Compression					2	CD
-44	600186	.	Plug - Closure					1	CD
QUICK CHANGE BOX ASSEMBLY (FRONT)									
12-1	601421	.	Handle - Shifter right					1	AB
-1	601425	.	Handle - Shifter right					1	CD
			Attaching Parts						
-2	141	.	Pin - Taper					1	All
			----- *						
-3	600402	.	Seal - Oil					1	All
-4	3942	.	Spring					2	All
-5	30154	.	Ball - Steel					2	All
-6	237701	.	Gage - Oil sight					1	All
-7	601420	.	Handle - Shifter left					1	AB
-7	601424	.	Handle - Shifter left					1	CD
-8	3217	.	Screw - Socket head cap					1	AB
-8	3401	.	Screw - Socket head cap					1	CD
-9	220784	.	Plug - Pipe					1	All
-10	601600	.	Box - Quick change					1	AB
-10	601539	.	Box - Quick change					1	CD
-11	601557	.	Cover - End					1	AB
-11	601536	.	Cover - End					1	CD
			Attaching Parts						
-12	3218	.	Screw - Socket head cap					4	AB
-12	3399	.	Screw - Socket head cap					4	CD
			----- *						
-13	601558	.	Bearing - Needle					2	AB
-13	601518	.	Bearing - Needle					2	CD
-14	601159	.	Bearing - Plain					2	AB
-14	601112	.	Bearing - Plain					1	CD
-15	601155	.	Bushing - Pivot end cover					1	AB
-15	601113	.	Bushing - Pivot end cover					1	CD
-16	601148	.	Gear - Large					1	AB
-16	601114	.	Gear - Large					1	CD
-17	601161	.	Shaft - Drive					1	AB
-17	601121	.	Shaft - Drive					1	CD
-18	3280	.	Key - Hypo					1	All
-19	600355	.	Key					1	All
-20	601145	.	Shifter - Drive gear (includes 601184)					1	AB
-20	601111	.	Shifter - Drive gear (includes 601177)					1	CD

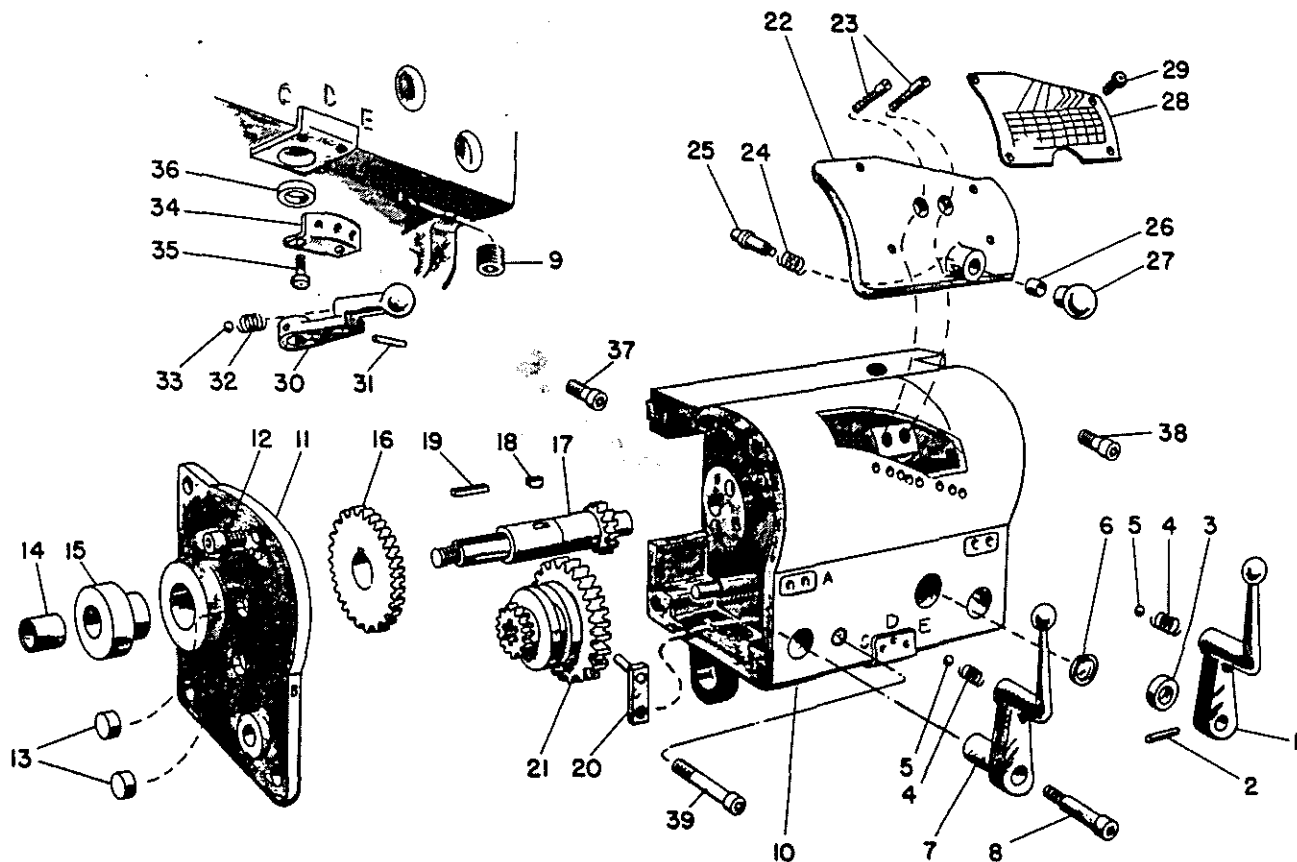


Figure 12. Quick Change Box Assembly (Front)

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		
QUICK CHANGE BOX ASSEMBLY (FRONT) (CONTINUED)				
12-21	601570	. Gear - Cluster	1	AB
-21	601537	. Gear - Cluster	1	CD
-22	601579	. Slide - Index	1	AB
-22	601542	. Slide - Index	1	CD
		Attaching Parts		
-23	601162	. Bolt - Body fit index slide	2	AB
-23	601106	. Bolt - Body fit index slide	2	CD
		----- *		
-24	203247	. Spring	1	All
-25	600143	. Plunger	1	AB
-25	600401	. Plunger	1	CD
-26	600095	. Bushing - Shifter handle	1	All
-27	600096	. Ball	1	All
-28	600155	. Plate - Index (American)	1	AB
-28	600156	. Plate - Index (Metric)	1	AB
-28	600451	. Plate - Index (American)	1	CD
-28	600457	. Plate - Index (Metric)	1	CD
		Attaching Parts		
-29	2285	. Screw - Flat fillister head	4	All
		----- *		
-30	600406	. Handle - Shifter	1	All
-31	141	. Pin - Taper	1	All
-32	3942	. Spring	1	All
-33	30154	. Ball - Steel	1	All
-34	600407	. Selector - Back shaft gear	1	All

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		

QUICK CHANGE BOX ASSEMBLY (FRONT) (CONTINUED)

		Attaching Parts							
12-35	3198	.	Screw - Low socket head cap					2	All
		.	-----*						
-36	600402	.	Seal - Oil					1	All
-37	3400	.	Screw - Socket head cap					1	AB
-37	3251	.	Screw - Socket head cap					1	CD
-38	3399	.	Screw - Socket head cap					2	AB
-38	3266	.	Screw - Socket head cap					2	CD
-39	220400	.	Screw - Socket head cap					1	AB
-39	109428	.	Screw - Socket head cap					1	CD

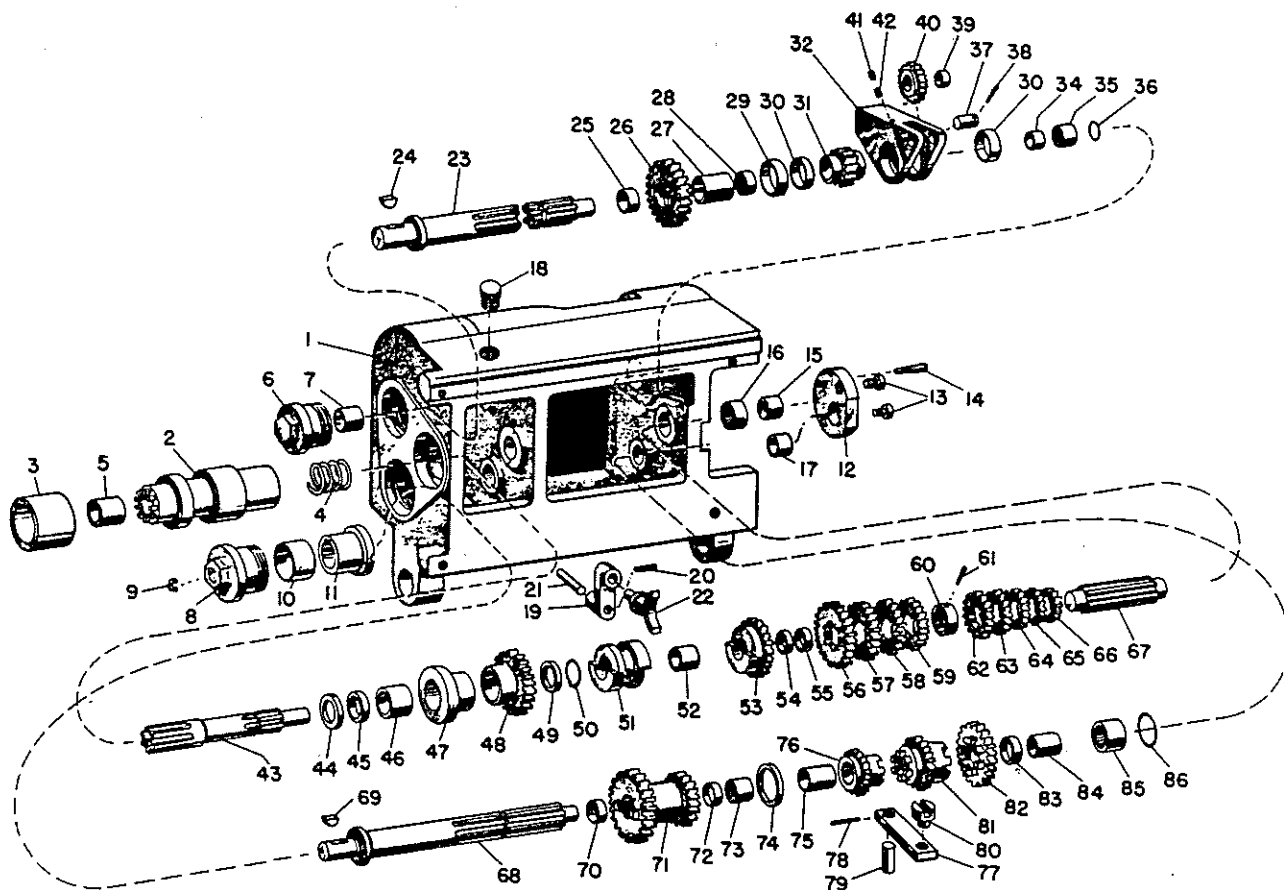


Figure 13. Quick Change Box Assembly (Rear)

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		

QUICK CHANGE BOX ASSEMBLY (REAR)

13-1	601600	.	Box - Quick change					1	AB
-1	601539	.	Box - Quick change					1	CD
-2	601567	.	Housing - Clutch					1	AB
-2	601530	.	Housing - Clutch					1	CD
-3	601568	.	Collar - Clutch housing (taper nose spindle)					1	AB
-3	602784	.	Collar - Clutch housing (cam lock spindle)					1	AB
-3	601531	.	Collar - Clutch housing (taper nose spindle)					1	CD
-3	602785	.	Collar - Clutch housing (cam lock spindle)					1	CD
-4	601216	.	Spring - Trip					1	AB
-4	226199	.	Spring - Trip					1	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
QUICK CHANGE BOX ASSEMBLY (REAR) (CONTINUED)									
13-5	601569	.	Bearing - Plain					1	AB
-5	601550	.	Bearing - Plain					1	CD
-6	600136	.	Retainer - Shaft					1	AB
-6	600393	.	Retainer - Shaft					1	CD
-7	600082	.	Bearing - Plain					1	AB
-7	600347	.	Bearing - Plain					1	CD
-8	600057	.	Retainer - Drive clutch					1	AB
-8	600353	.	Retainer - Drive clutch					1	CD
-9	3336	.	Letter - Raised indentification					1	All
-10	600058	.	Bearing - Plain					1	AB
-10	600354	.	Bearing - Plain					1	CD
-11	601175	.	Clutch - Drive					1	AB
-11	601102	.	Clutch - Drive					1	CD
-12	601147	.	Bushing - Eccentric					1	AB
-12	601125	.	Bushing - Eccentric					1	CD
Attaching Parts									
-13	3396	.	Screw - Socket head cap					2	All
-14	3304	.	Pin - Taper					1	All
----- *									
-15	601153	.	Race - Inner (needle bearing)					1	AB
-16	601152	.	Bearing - Needle					1	AB
-16	601067	.	Bearing - Needle					1	CD
-17	600342	.	Bearing - Plain					1	AB
-17	600347	.	Bearing - Plain					1	CD
-18	90377	.	Plug - Oil filler					1	All
-19	600151	.	Shifter - Feed reverse clutch					1	AB
-19	600412	.	Shifter - Feed reverse clutch					1	CD
-20	141	.	Pin - Taper					1	All
-21	600150	.	Shaft - Shifter					1	AB
-21	600411	.	Shaft - Shifter					1	CD
-22	600152	.	Shoe - Shifter					1	AB
-22	600413	.	Shoe - Shifter					1	CD
-23	601554	.	Shaft - Tumbler gear					1	AB
-23	601499	.	Shaft - Tumbler gear					1	CD
Attaching Parts									
-24	3279	.	Key					1	AB
-24	3280	.	Key					1	CD
----- *									
-25	601578	.	Bearing - Plain					1	AB
-25	601524	.	Bearing - Plain					1	CD
-26	601577	.	Gear - Feed reverse					1	AB
-26	601128	.	Gear - Feed reverse					1	CD
-27	601576	.	Spacer - Tumbler gear shaft					1	AB
-27	601535	.	Spacer - Tumbler gear shaft					1	CD
-28	601564	.	Bearing - Needle					1	AB
-28	601525	.	Bearing - Needle					1	CD
-29	601110	.	Bushing					1	CD
-30	601154	.	Bearing - Plain					2	AB
-30	600384	.	Bearing - Plain					2	CD
-31	601575	.	Gear - Tumbler					1	AB
-31	601498	.	Gear - Tumbler					1	CD
-32	601573	.	Yoke - Tumbler					1	AB
-32	601540	.	Yoke - Tumbler					1	CD
-34	601571	.	Race - Inner					1	AB
-34	601534	.	Race - Inner					1	CD
-35	601066	.	Bearing - Needle					1	AB
-35	601533	.	Bearing - Needle					1	CD
-36	601429	.	Ring - "O"					1	AB
-36	601543	.	Ring - "O"					1	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
QUICK CHANGE BOX ASSEMBLY (REAR) (CONTINUED)									
13-37	601574	.	Shaft - Tumbler idler gear					1	AB
-37	601538	.	Shaft - Tumbler idler gear					1	CD
-38	140	.	Pin - Taper					1	AB
-38	2291	.	Pin - Taper					1	CD
-39	600042	.	Bearing - Plain					1	AB
-39	600342	.	Bearing - Plain					1	CD
-40	600130	.	Gear - Tumbler					1	AB
-40	600387	.	Gear - Tumbler					1	CD
-41	2330	.	Screw - Hex socket set					2	AB
-41	2332	.	Screw - Hex socket set					1	CD
-42	2340	.	Screw - Socket head set					2	AB
-42	3228	.	Screw - Socket head set					1	CD
-43	601555	.	Shaft - Feed reverse					1	AB
-43	601527	.	Shaft - Feed reverse					1	CD
-44	600083	.	Washer					1	AB
-44	601115	.	Washer					1	CD
-45	600074	.	Bearing - Thrust					1	AB
-45	600371	.	Bearing - Thrust					1	CD
-46	601566	.	Bearing - Plain					1	AB
-46	601541	.	Bearing - Plain					1	CD
-47	601260	.	Bushing - Feed reverse					1	AB
-47	601262	.	Bushing - Feed reverse					1	CD
-48	601180	.	Gear - Idler 44T					1	AB
-48	601213	.	Gear - Idler 44T					1	CD
-49	600077	.	Washer					1	AB
-49	600374	.	Washer					1	CD
-50	240852	.	Ring - Retaining					1	AB
-50	237432	.	Ring - Retaining					1	CD
-51	601565	.	Clutch - Feed reverse					1	AB
-51	601528	.	Clutch - Feed reverse					1	CD
-52	600082	.	Bearing - Plain					1	AB
-52	600377	.	Bearing - Plain					1	CD
-53	601182	.	Gear - Idler 36T					1	AB
-53	601214	.	Gear - Idler 36T					1	CD
-54	600082	.	Bearing - Plain					1	AB
-55	600059	.	Bearing - Plain					1	AB
-55	600356	.	Bearing - Plain					1	CD
-56	601142	.	Gear - Cone 48T					1	AB
-56	601077	.	Gear - Cone 48T					1	CD
-57	601141	.	Gear - Cone 46T					1	AB
-57	601076	.	Gear - Cone 46T					1	CD
-58	601140	.	Gear - Cone 44T					1	AB
-58	601075	.	Gear - Cone 44T					1	CD
-59	601139	.	Gear - Cone 40T					1	AB
-59	601074	.	Gear - Cone 40T					1	CD
-60	601138	.	Spacer - Gear cone					1	AB
-60	601078	.	Spacer - Gear cone					1	CD
-61	2291	.	Pin - Taper					1	AB
-61	143	.	Pin - Taper					1	CD
-62	601137	.	Gear - Cone 36T					1	AB
-62	601073	.	Gear - Cone 36T					1	CD
-63	601136	.	Gear - Cone 32T					1	AB
-63	601072	.	Gear - Cone 32T					1	CD
-64	601135	.	Gear - Cone 28T					1	AB
-64	601071	.	Gear - Cone 28T					1	CD
-65	601134	.	Gear - Cone 26T					1	AB
-65	601070	.	Gear - Cone 26T					1	CD
-66	601133	.	Gear - Cone 24T					1	AB
-66	601069	.	Gear - Cone 24T					1	CD
-67	601143	.	Shaft - Cone					1	AB
-67	601095	.	Shaft - Cone					1	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		

QUICK CHANGE BOX ASSEMBLY (REAR) (CONTINUED)

13-68	601553	.	Shaft - Back					1	AB
-68	601500	.	Shaft - Back					1	CD
-69	3279	.	Key					1	AB
-69	3280	.	Key					1	CD
-70	601563	.	Bearing - Plain					1	AB
-70	601526	.	Bearing - Plain					1	CD
-71	601176	.	Gear - Cluster					1	AB
-71	601101	.	Gear - Cluster					1	CD
-72	601563	.	Bearing - Plain					1	AB
-72	601526	.	Bearing - Plain					1	CD
-73	601564	.	Bearing - Needle					1	AB
-73	601525	.	Bearing - Needle					1	CD
-74	600049	.	Collar					1	AB
-74	600348	.	Collar					1	CD
-75	601563	.	Bearing - Plain					1	AB
-75	601526	.	Bearing - Plain					1	CD
-76	600047	.	Gear - Clutch					1	AB
-76	600343	.	Gear - Clutch					1	CD
-77	600148	.	Lever - Shifter					1	AB
-77	600409	.	Lever - Shifter					1	CD
-78	140	.	Pin - Taper					1	All
-79	600408	.	Shaft - Shifter					1	All
-80	600149	.	Shoe - Sliding clutch shifter					1	AB
-80	600410	.	Shoe - Sliding clutch shifter					1	CD
-81	601562	.	Gear - Sliding clutch					1	AB
-81	601523	.	Gear - Sliding clutch					1	CD
-82	601556	.	Gear - Clutch					1	AB
-82	601522	.	Gear - Clutch					1	CD
-83	601561	.	Bearing - Plain					1	AB
-83	601521	.	Bearing - Plain					1	CD
-84	601559	.	Race - Inner					1	AB
-84	601519	.	Race - Inner					1	CD
-85	601560	.	Bearing - Needle					1	AB
-85	601520	.	Bearing - Needle					1	CD
-86	601429	.	Ring - "O"					1	AB
-86	601543	.	Ring - "O"					1	CD

COMPOUND REST AND TOOL POST ASSEMBLY

14-1	600945	.	Handle - Crank					1	AB
-1	600888	.	Handle - Crank					1	CD
-2	600553	.	Handle					2	All
-3	2291	.	Pin - Taper					1	All
-4	600545	.	Spring - Dial					1	AB
-4	600288	.	Spring - Dial					1	CD
-5	600581	.	Bushing - Dial					1	AB
-5	600313	.	Bushing - Dial					1	CD
-6	600587	.	Dial - Top slide (American)					1	AB
-6	600590	.	Dial - Top slide (Metric)					1	AB
-6	600320	.	Dial - Top slide (American)					1	CD
-6	600323	.	Dial - Top slide (Metric)					1	CD
-7	600889	.	Shaft - Dial					1	CD
-8	1266	.	Key - Woodruff					1	All
-9	3218	.	Screw - Socket head cap					2	AB
-9	3399	.	Screw - Socket head cap					2	CD
-10	2332	.	Screw - Hex socket set					2	AB
-10	1911	.	Screw - Hex socket set					2	CD
-11	600579	.	Bushing - Top slide					1	AB
-11	600279	.	Bushing - Top slide					1	CD

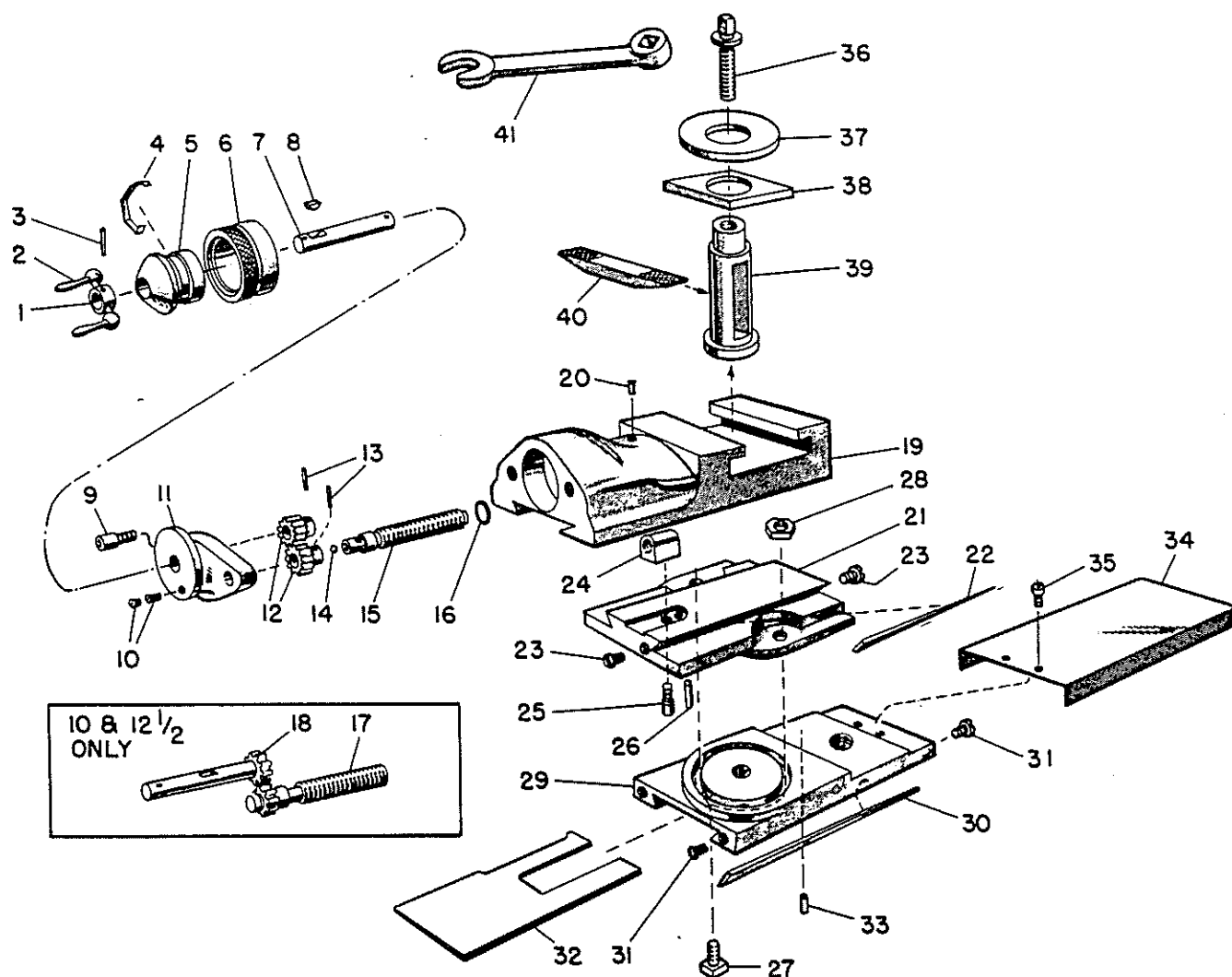


Figure 14. Compound Rest and Tool Post Assembly

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		
COMPOUND REST AND TOOL POST ASSEMBLY (CONTINUED)				
14-12	600311	. Pinion - Feed	2	CD
		Attaching Parts		
-13	140	. Pin - Taper	2	CD
		----- *		
-14	2290	. Ball	1	AB
-14	30060	. Ball	1	CD
-15	600319	. Screw - Top slide feed (American)	1	CD
-15	600322	. Screw - Top slide feed (Metric)	1	CD
-16	601417	. Bearing - Thrust	1	AB
-16	601426	. Bearing - Thrust	1	CD
-17	600586	. Screw - Top slide feed (American)	1	AB
-17	600589	. Screw - Top slide feed (Metric)	1	AB
-18	600944	. Pinion - Dial	1	AB
-19	601466	. Slide - Top	1	A
-19	600577	. Slide - Top	1	B
-19	601963	. Slide - Top	1	CD
-20	60062	. Oiler	1	All
-21	600951	. Swivel	1	A
-21	601468	. Swivel	1	B

Figure & Index No.	Part Number	1	2	3	4	5	6	Nomenclature	Units Per Assy	Application Code
COMPOUND REST AND TOOL POST ASSEMBLY (CONTINUED)										
14-21	602030	.						Swivel	1	C
-21	602031	.						Swivel	1	D
-22	600943	.						Gib - Top slide	1	AB
-22	600890	.						Gib - Top slide	1	CD
								Attaching Parts		
-23	600576	.						Screw - Gib	2	AB
-23	600273	.						Screw - Gib	2	CD
								* - - - - -		
-24	600585	.						Nut - Top slide (American)	1	AB
-24	600588	.						Nut - Top slide (Metric)	1	AB
-24	600318	.						Nut - Top slide (American)	1	CD
-24	600321	.						Nut - Top slide (Metric)	1	CD
								Attaching Parts		
-25	3218	.						Screw - Socket head cap	1	AB
-25	3399	.						Screw - Socket head cap	1	CD
-26	228563	.						Pin - Taper	1	A
-26	140	.						Pin - Taper	1	B
-26	141	.						Pin - Taper	1	CD
								* - - - - -		
-27	600591	.						Bolt - Swivel	2	A
-27	601489	.						Bolt - Swivel	2	B
-27	600274	.						Bolt - Swivel	2	C
-27	600210	.						Bolt - Swivel	2	D
-28	3473	.						Nut - Thin hex	2	AB
-28	3474	.						Nut - Thin hex	2	C
-28	3479	.						Nut - Thin hex	2	D
-29	600941	.						Slide - Cross	1	AB
-29	602029	.						Slide - Cross	1	CD
-30	600942	.						Gib - Cross slide	1	AB
-30	600891	.						Gib - Cross slide	1	CD
								Attaching Parts		
-31	600576	.						Screw - Gib	2	AB
-31	600273	.						Screw - Gib	2	CD
								* - - - - -		
-32	600947	.						Guard - Cross slide front	1	AB
-32	600917	.						Guard - Cross slide front	1	CD
-33	3383	.						Pin - Straight	1	All
-34	600584	.						Guard - Cross slide	1	AB
-34	600316	.						Guard - Cross slide	1	CD
								Attaching Parts		
-35	234042	.						Screw - Low socket head cap	2	AB
-35	3198	.						Screw - Low socket head cap	2	CD
								* - - - - -		
-36	601465	.						Screw - Tool post	1	A
-36	600596	.						Screw - Tool post	1	B
-36	600162	.						Screw - Tool post	1	CD
-37	601461	.						Ring - Tool post	1	A
-37	600598	.						Ring - Tool post	1	B
-37	602928	.						Ring - Tool post	1	C
-37	601966	.						Ring - Tool post	1	D
-38	601463	.						Square - Tool post	1	A
-38	600597	.						Square - Tool post	1	B
-38	600163	.						Square - Tool post	1	CD
-39	601462	.						Post - Tool	1	A
-39	600595	.						Post - Tool	1	B
-39	600161	.						Post - Tool	1	CD
-40	601464	.						Wedge - Tool post	1	A
-40	600599	.						Wedge - Tool post	1	B
-40	600165	.						Wedge - Tool post	1	CD
-41	601427	.						Wrench - Tool post	1	AB
-41	601345	.						Wrench - Tool post	1	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
CROSS FEED AND CARRIAGE ASSEMBLY									
15-1	600564	.	Nut - Cross feed (American)					1	AB
-1	600567	.	Nut - Cross feed (Metric)					1	AB
-1	600304	.	Nut - Cross feed (American)					1	CD
-1	600308	.	Nut - Cross feed (Metric)					1	CD
		Attaching Parts							
-2	600543	.	Screw - Cross feed nut					1	AB
-2	4169	.	Screw - Cross feed nut					1	CD
		----- *							
-3	600548	.	Gib - Rear					1	AB
-3	600292	.	Gib - Rear					1	CD
-3	601302	.	Gib - Rear (gap)					1	CD
		Attaching Parts							
-4	3396	.	Screw - Socket head cap					5	AB
-4	3266	.	Screw - Socket head cap					5	CD
		----- *							
-5	600934	.	Carriage					1	A
-5	600935	.	Carriage					1	B
-5	600918	.	Carriage					1	C
-5	600919	.	Carriage					1	D
-5	601300	.	Carriage - Gap					1	C
-5	601301	.	Carriage - Gap					1	D
-6	600542	.	Pad - Shear wiper rear					2	AB
-6	600285	.	Pad - Shear wiper rear					2	CD
-7	600541	.	Wiper - Shear rear					2	AB
-7	600284	.	Wiper - Shear rear					2	CD
		Attaching Parts							
-8	3199	.	Screw - Low socket head cap					4	All
		----- *							
-9	600528	.	Pad - Shear wiper front					2	AB
-9	600283	.	Pad - Shear wiper front					2	CD
-10	600527	.	Wiper - Shear front					2	AB
-10	600282	.	Wiper - Shear front					2	CD
		Attaching Parts							
-11	3199	.	Screw - Low socket head cap					4	All
		----- *							
-12	600552	.	Gib - Front					2	AB
-12	600295	.	Gib - Front					2	CD
		Attaching Parts							
-13	3397	.	Screw - Socket head cap					2	AB
-13	3251	.	Screw - Socket head cap					2	CD
		----- *							
-14	600549	.	Clamp - Carriage					1	AB
-14	600293	.	Clamp - Carriage					1	CD
		Attaching Parts							
-15	600551	.	Screw - Carriage clamp					1	AB
-15	600294	.	Screw - Carriage clamp					1	CD
-16	2095	.	Pin - Cotter					1	All
		----- *							
-17	220784	.	Plug - Pipe					1	All
-18	600553	.	Handle					1	AB
-18	3501	.	Handle					1	CD
-19	601678	.	Crank - Ball					1	AB
-19	601697	.	Crank - Ball					1	CD
		Attaching Parts							
-20	2291	.	Pin - Taper					1	AB
-20	143	.	Pin - Taper					1	CD
		----- *							
-21	600883	.	Nut - Lock					1	AB

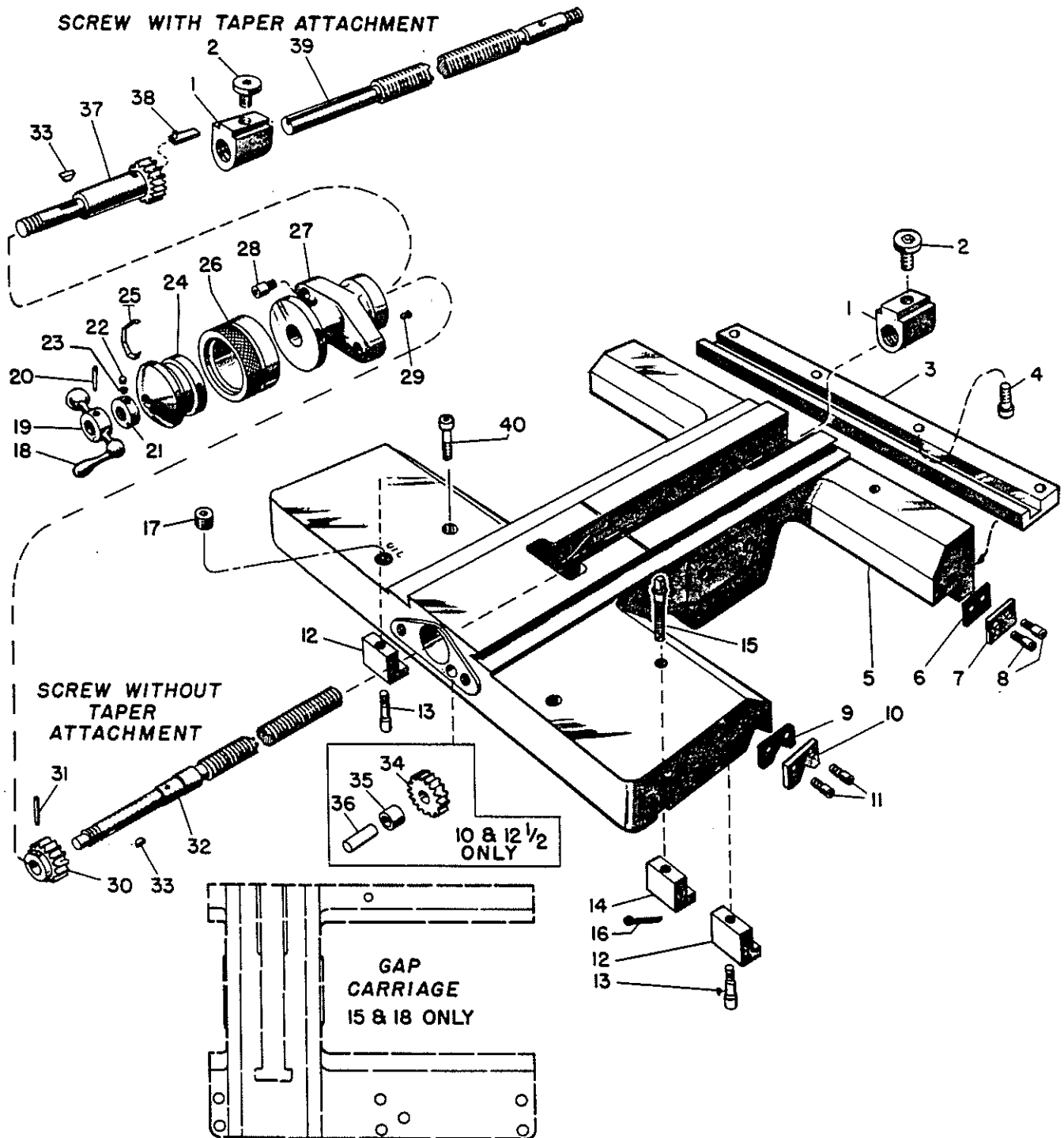


Figure 15. Cross Feed and Carriage Assembly

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
CROSS FEED AND CARRIAGE ASSEMBLY (CONTINUED)									
15-21	601702	.	Nut - Lock					1	CD
			Attaching Parts						
-22	2353	.	Screw - Low socket head set					1	All
-23	1994	.	Plug - Brass					1	All
			----- *						
-24	601679	.	Bushing - Cross feed dial					1	AB
-24	601698	.	Bushing - Cross feed dial					1	CD
-25	600545	.	Spring - Dial					1	AB
-25	600288	.	Spring - Dial					1	CD
-26	600559	.	Dial - Cross feed (American)					1	AB
-26	600561	.	Dial - Cross feed (Metric)					1	AB
-26	600302	.	Dial - Cross feed (American)					1	CD
-26	600301	.	Dial - Cross feed (Metric)					1	CD
-27	600987	.	Bushing - Cross feed					1	AB
-27	601002	.	Bushing - Cross feed					1	CD
-27	600986	.	Bushing - Cross feed (with taper attachment)					1	AB
-27	601003	.	Bushing - Cross feed (with taper attachment)					1	CD
			Attaching Parts						
-28	3399	.	Screw - Socket head cap					2	AB
-28	3343	.	Screw - Socket head cap.					2	CD
			----- *						
-29	600529	.	Oiler					1	AB
-29	44980	.	Oiler					1	CD
-30	600555	.	Pinion - Cross feed					1	AB
-30	600297	.	Pinion - Cross feed					1	CD
			Attaching Parts						
-31	140	.	Pin - Taper					1	AB
-31	663	.	Pin - Taper					1	CD
			----- *						
-32	601675	.	Screw - Cross feed (American)					1	AB
-32	601676	.	Screw - Cross feed (Metric)					1	AB
-32	601701	.	Screw - Cross feed (American)					1	CD
-32	601700	.	Screw - Cross feed (Metric)					1	CD
			Attaching Parts						
-33	1266	.	Key - Woodruff					1	All
			----- *						
-34	600989	.	Gear - Idler					1	AB
-35	600990	.	Bearing - Plain					1	AB
-36	600988	.	Shaft - Idler gear					1	AB
-37	601677	.	Pinion - Cross feed (with taper attachment)					1	AB
-37	600884	.	Pinion - Cross feed (with taper attachment)					1	CD
-38	600558	.	Key - Tit					1	AB
-38	600300	.	Key - Tit					1	CD
-39	602766	.	Screw - Crossfeed (American)					1	A
-39	602768	.	Screw - Crossfeed (American)					1	B
-39	602767	.	Screw - Crossfeed (Metric)					1	A
-39	602769	.	Screw - Crossfeed (Metric)					1	B
-39	602754	.	Screw - Crossfeed (American)					1	C
-39	602757	.	Screw - Crossfeed (American)					1	D
-39	602755	.	Screw - Crossfeed (Metric)					1	C
-39	602758	.	Screw - Crossfeed (Metric)					1	D
-40	3405	.	Screw - Socket head cap					2	CD
-40	3405	.	Screw - Socket head cap (gap)					6	CD

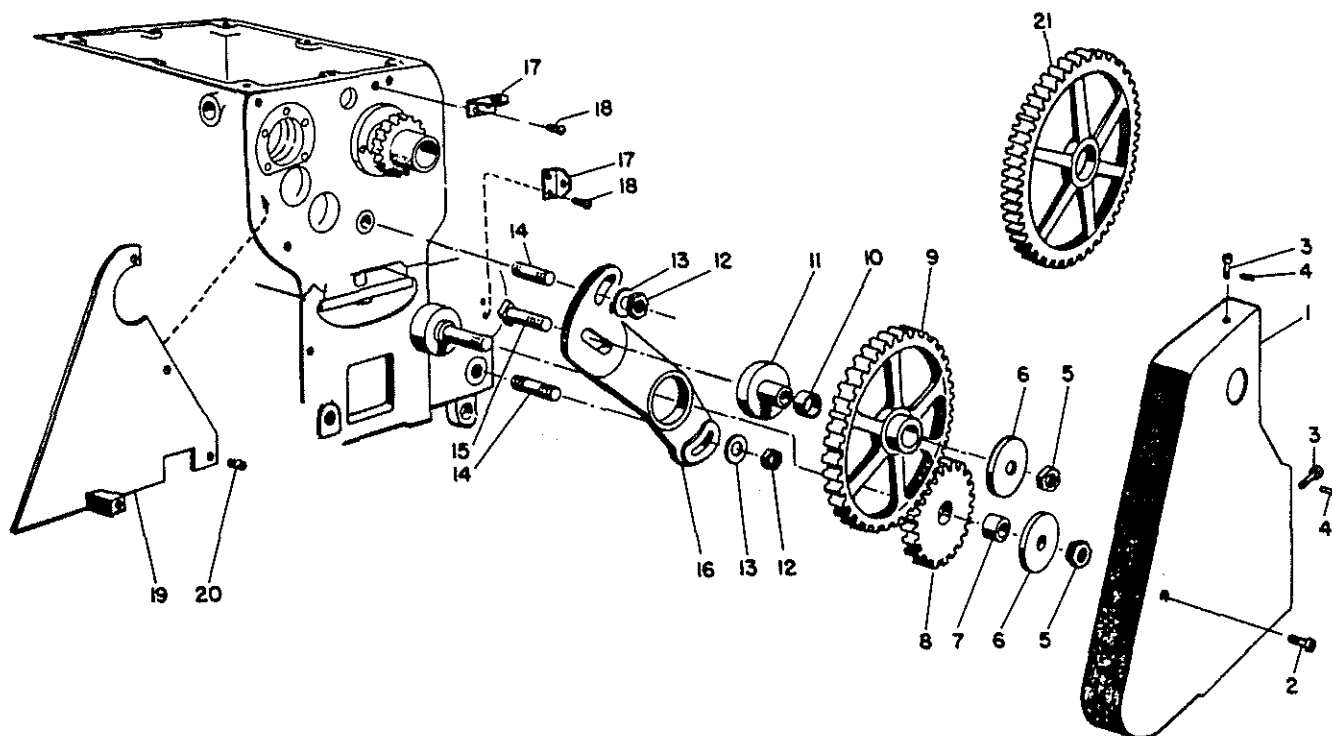


Figure 16. End Gearing Assembly

Figure & Index No.	Part Number	Nomenclature	Units Per Assy	Application Code
		1 2 3 4 5 6		
END GEARING ASSEMBLY				
16-1	601186	. Guard - Belt, front half	1	A
-1	601187	. Guard - Belt, front half	1	B
-1	601028	. Guard - Belt, front half (also gap)	1	C
-1	601129	. Guard - Belt, front half (also gap)	1	D
		Attaching Parts		
-2	3485	. Screw - Filister head cap	1	AB
-2	83484	. Screw - Filister head cap	1	CD
-3	600477	. Stud - Oval head	2	All
-4	600478	. Pin - Cross	2	All
		----- *		
-5	3478	. Nut - Hex full	2	AB
-5	3479	. Nut - Hex full	2	CD
-6	600695	. Washer	2	AB
-6	600117	. Washer	2	CD
-7	601041	. Spacer - Change gear	1	AB
-7	601046	. Spacer - Change gear	1	CD
-8	601042	. Gear - Drive shaft 66T (American)	1	AB
-8	601043	. Gear - Drive shaft 88T (Metric)	1	AB
-8	601044	. Gear - Drive shaft 48T (American)	1	CD
-8	601045	. Gear - Drive shaft 64T (Metric)	1	CD
-9	600692	. Gear - Quadrant 120T	1	AB
-9	600109	. Gear - Quadrant 120T	1	CD
-10	600673	. Bearing - Plain	1	AB
-10	600110	. Bearing - Plain	1	CD
-11	601513	. Bushing - Quadrant gear	1	AB
-11	601512	. Bushing - Quadrant gear	1	CD
-12	3473	. Nut - Thin hex	2	AB
-12	76639	. Nut - Thin hex	2	CD
-13	3441	. Washer - Plain	2	AB

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
1	2	3	4	5	6				
END GEARING ASSEMBLY (CONTINUED)									
16-14	600198	.	Stud					2	AB
-14	600118	.	Stud					2	CD
-15	600619	.	Bolt - Tee					1	AB
-15	600106	.	Bolt - Tee					1	CD
-16	601515	.	Plate - Quadrant					1	AB
-16	601514	.	Plate - Quadrant					1	CD
-17	600476	.	Bracket - Angle					2	All
		Attaching Parts							
-18	3198	.	Screw - Low socket head cap					4	All
		----- *							
-19	601186	.	Guard - Belt, rear half					1	A
-19	601187	.	Guard - Belt, rear half					1	B
-19	601028	.	Guard - Belt, rear half					1	C
-19	601129	.	Guard - Belt, rear half					1	D
		Attaching Parts							
-20	3202	.	Screw - Low socket head cap					3	All
		----- *							
-21	600699	.	Gear - Quadrant 127T					1	AB
-21	600111	.	Gear - Quadrant 127T					1	CD
MOTOR DRIVE ASSEMBLY									
17-1	Coml	.	Motor (as specified)					1	All
		Attaching Parts							
-2	Coml	.	Bolt - Hex head					AR	All
-3	Coml	.	Washer - Flat					AR	All
		----- *							
-4	*	.	Pulley - Drive (std speed range 30-1200 rpm)					1	
-4	*	.	Pulley - Drive (high speed range 45-1800 rpm)					1	
-4	*	.	Pulley - Drive (std speed range 20-820 rpm)					1	
-4	*	.	Pulley - Drive (high speed range 30-1200 rpm)					1	
		Attaching Parts							
-5	2332	.	Screw - Hex socket set					1	AB
-5	1911	.	Screw - Hex socket set					1	CD
-6	Coml	.	Key					1	All
		----- *							
-7	601196	.	Belt - Drive (std speed range 30-1200 rpm and high speed range 45-1800 rpm)					2	A*
-7	601190	.	Belt - Drive (std speed range 30-1200 rpm)					2	B*
-7	601197	.	Belt - Drive (high speed range 45-1800 rpm)					2	B*
-7	601193	.	Belt - Drive (std speed range 20-820 rpm)					2	C*
-7	601189	.	Belt - Drive (std speed range 20-820 rpm)					2	D*
-7	601188	.	Belt - Drive (high speed range 30-1200 rpm)					2	C*
-7	601194	.	Belt - Drive (high speed range 30-1200 rpm)					2	D*
-8	600749	.	Plate - Motor					1	AB
-8	600471	.	Plate - Motor					1	CD
-9	600269	.	Screw - Hex head					1	All
-10	3236	.	Screw - Hex socket dog point set					1	All
-11	601024	.	Screw - Hex head					1	All
-12	600751	.	Shaft - Motor plate					1	AB
-12	600472	.	Shaft - Motor plate					1	CD
-13	3824	.	Collar					1	All
		Attaching Parts							
-14	642	.	Pin - Taper					1	All
		----- *							

*When ordering parts ALWAYS include serial number of machine, motor voltage, motor phase, motor cycle, motor frame size, motor speed and H. P.

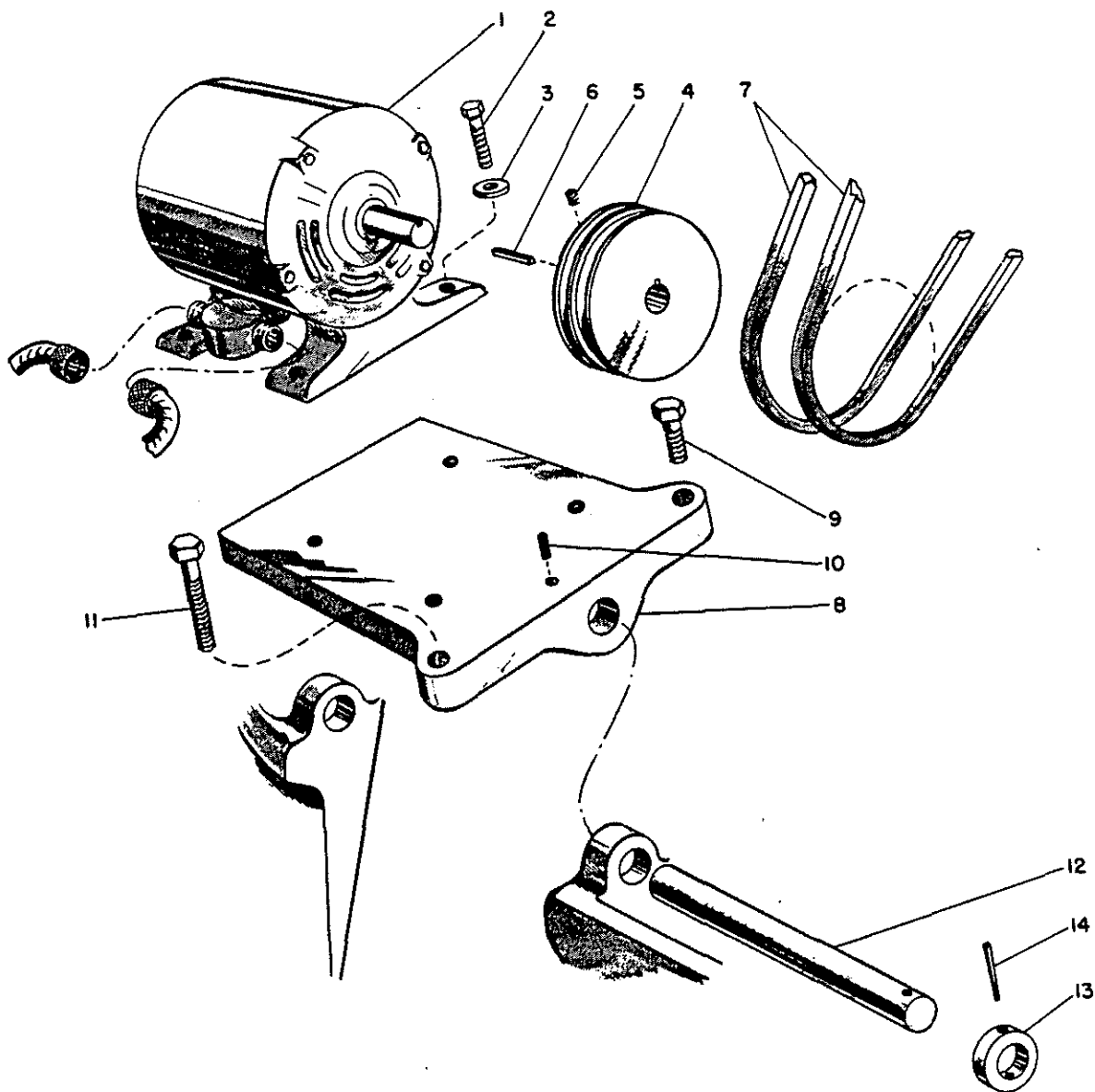


Figure 17. Motor Drive Assembly

When ordering parts **ALWAYS** include serial number of machine, motor voltage, motor phase, motor cycle, motor frame size, motor speed and H. P.

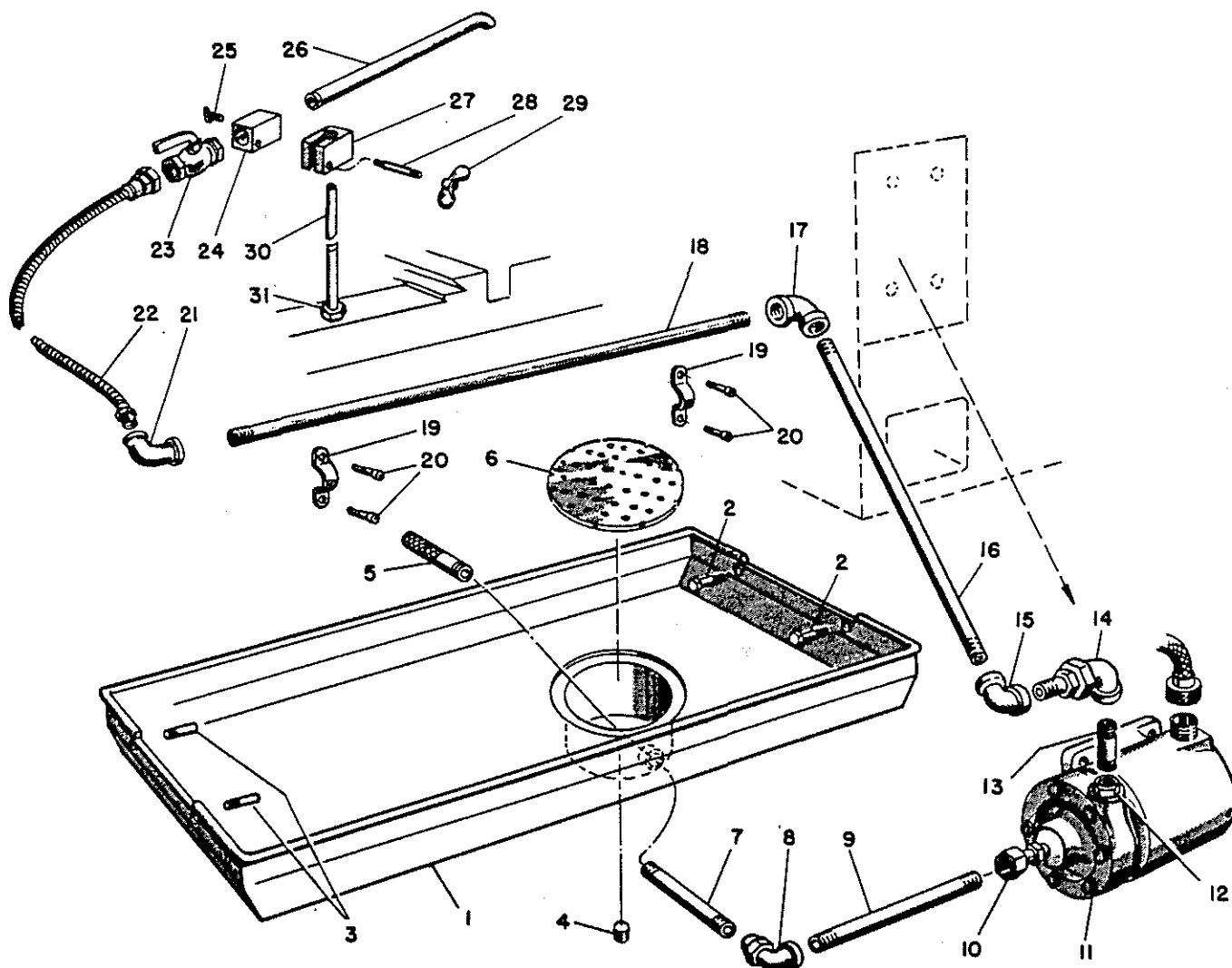


Figure 18. Pan and Coolant Assembly

Figure & Index No.	Part Number	1	2	3	4	5	6	Nomenclature	Units Per Assy	Application Code
PAN AND COOLANT ASSEMBLY										
18-1	601248	.						Pan - Dry	1	AB
-1	601246	.						Pan - Dry	1	CD
-1	602872	.						Pan - Wet	1	AB
-1	602875	.						Pan - Wet	1	CD
		Attaching Parts								
-2	49	.						Screw - Hex head cap	2	All
-3	602706	.						Stud	2	All
		----- * -----								
-4	220784	.						Plug - Pipe	1	All
-5	600122	.						Strainer - Wire screen	1	All
-6		.						Sieve (stamped from pan)	1	All
-7	601783	.						Nipple - 1/2"	1	All
-8	50935	.						Elbow - 90°	1	All
-9	602891	.						Pipe - 1/2"	1	All
-10	65211	.						Bushing - Shoulder type	1	All
-11	Coml	.						Pump - Motor (specify phase, cycle and voltage)	1	All
-12	59799	.						Bushing - Shoulder type	1	All
-13	601776	.						Nipple	1	All

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
1	2	3	4	5	6				
PAN AND COOLANT ASSEMBLY (CONTINUED)									
18-14	90685	.	Elbow - 90°					1	All
-15	24024	.	Elbow - 90°					1	All
-16	601781	.	Pipe - 3/8"					1	All
-17	24024	.	Elbow - 90°					1	All
-18	601782	.	Pipe - 3/8"					1	AB
-18	601778	.	Pipe - 3/8"					1	CD
-19	89869	.	Strap - Pipe					2	All
		Attaching Parts							
-20	3198	.	Screw - Low socket head cap					4	All
			- - - - - * - - - - -						
-21	24024	.	Elbow - 90°					1	All
-22	600094	.	Hose - Galvanized steel					1	All
-23	600097	.	Cock - Lever handle					1	All
-24	601252	.	Block - Pivot					1	All
-25	2253	.	Screw - Thumb					1	All
-26	600124	.	Spout - Coolant					1	AB
-26	601771	.	Spout - Coolant					1	CD
-27	601251	.	Block - Swivel					1	All
-28	601250	.	Stud - Short					1	All
-29	564	.	Nut - Wing					1	All
-30	602034	.	Rod - Sliding block					1	All
		Attaching Parts							
-31	3474	.	Nut - Hex					1	All
			- - - - - * - - - - -						
STEADY REST ASSEMBLY									
19-1	600021	.	Tip - Jaw					3	All
-2	600717	.	Jaw					3	AB
-2	600020	.	Jaw					3	CD
		Attaching Parts							
-3	2154	.	Screw - Hex head					3	AB
-3	600022	.	Screw - Hex head					3	CD
			- - - - - * - - - - -						
-4	600719	.	Screw - Adjusting					3	AB
-4	600023	.	Screw - Adjusting					3	CD
-5	600714	.	Top - Steady rest					1	AB
-5	600017	.	Top - Steady rest					1	CD
		Attaching Parts							
-6	600716	.	Bolt - Eye					1	AB
-6	600019	.	Bolt - Eye					1	CD
-7	76639	.	Nut - Hex					1	CD
-8	3478	.	Nut - Hex					1	AB
-9	3441	.	Washer - Flat					1	AB
-10	1384	.	Pin - Hinge					1	AB
-10	1900	.	Pin - Hinge					1	CD
			- - - - - * - - - - -						
-11	600721	.	Bottom - Steady rest					1	A
-11	600724	.	Bottom - Steady rest					1	B
-11	600018	.	Bottom - Steady rest					1	C
-11	600025	.	Bottom - Steady rest					1	D
-12	600722	.	Clamp					1	A
-12	600725	.	Clamp					1	B
-12	600024	.	Clamp					1	C
-12	600026	.	Clamp					1	D
-13	3286	.	Bolt - Tee					1	A
-13	600726	.	Bolt - Tee					1	B
-13	2235	.	Bolt - Tee					1	C
-13	2232	.	Bolt - Tee					1	D

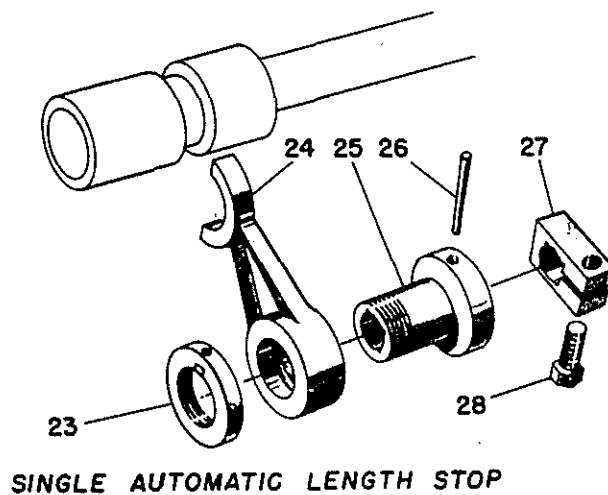
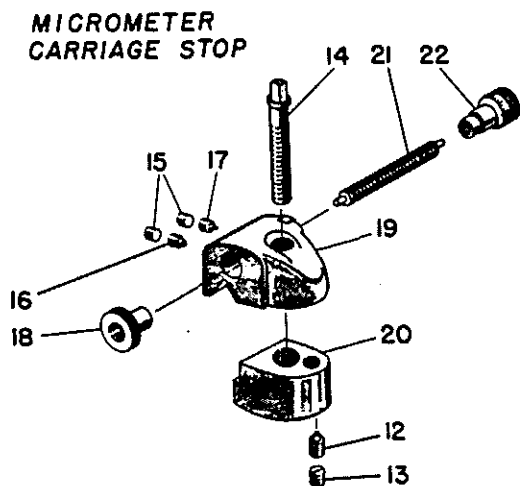
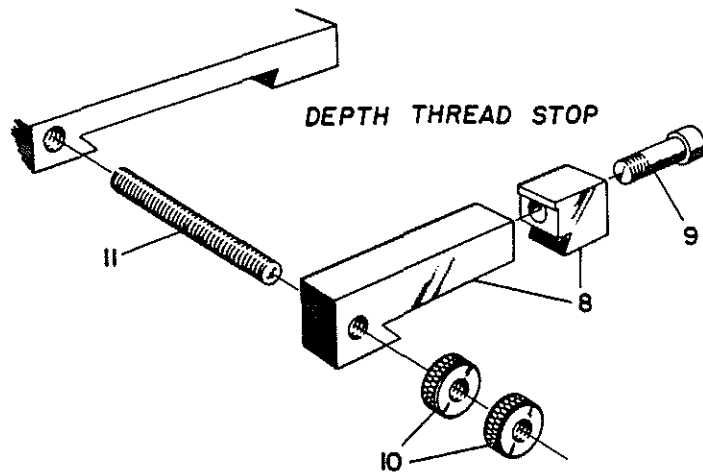
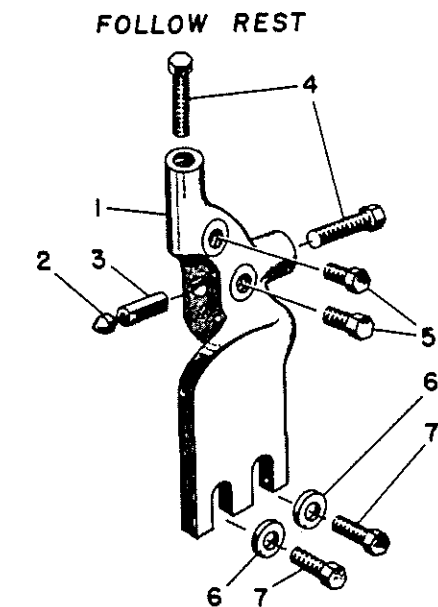


Figure 20. Standard and Special Equipment

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
STANDARD AND SPECIAL EQUIPMENT (CONTINUED)									
20-		Depth Thread Stop Assembly							
20-8	601978	.	Bracket - Thread stop					1	AB
-8	602027	.	Bracket - Thread stop					1	CD
-9	3400	.	Screw - Socket head cap					1	AB
-9	3251	.	Screw - Socket head cap					1	CD
-10	601222	.	Collar - Stop					2	AB
-10	601007	.	Collar - Stop					2	CD
-11	601980	.	Screw - Thread stop					1	AB
-11	602028	.	Screw - Thread stop					1	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
STANDARD AND SPECIAL EQUIPMENT (CONTINUED)									
20-		Micrometer Carriage Stop Assembly							
20-12	2248	.	Screw	-	Hex	head	set	1	All
-13	2248	.	Screw	-	Hex	head	set	1	AB
-13	1910	.	Screw	-	Hex	head	set	1	CD
-14	600294	.	Screw	-	Carriage	clamp		1	All
-15	72640	.	Screw	-	Flat	point	set	2	All
-16	3228	.	Screw	-	Hex	socket	dog point set	1	All
-17	1846-T	.	Screw	-	Headless	cone	point	1	All
-18	601040	.	Nut	-	Locking			1	All
-19	601036	.	Body	-	Carriage	stop		1	All
-20	601037	.	Clamp	-	Carriage	stop		1	AB
-20	602481	.	Clamp	-	Carriage	stop		1	CD
-21	601038	.	Screw	-	Adjusting			1	All
-22	601039	.	Dial	-	Micrometer	(American)		1	All
-22	601346	.	Dial	-	Indicator	(Metric)		1	All
20-		Single Automatic Length Stop Assembly							
-23	4190	.	Nut	-	Lock			1	AB
-23	4191	.	Nut	-	Lock			1	CD
-24	601349	.	Lever	-	Trip			1	AB
-24	601347	.	Lever	-	Trip			1	CD
-25	601350	.	Bush	-	Trip	lever		1	AB
-25	601348	.	Bush	-	Trip	lever		1	CD
		Attaching Parts							
-26	1890	.	Pin	-	Taper			1	All
		----- *							
-27	601084	.	Stop	-	Length			1	AB
-27	601059	.	Stop	-	Length			1	CD
-28	2260	.	Screw	-	Hex	head	cap	1	AB
-28	3428	.	Screw	-	Hex	head	cap	1	CD
TAPER ATTACHMENT									
21-1	600675	.	Knob	-	Star			1	AB
-1	601337	.	Knob	-	Star			1	CD
		Attaching Parts							
-2	2291	.	Pin	-	Taper			1	AB
-2	663	.	Pin	-	Taper			1	CD
		----- *							
-3	600902	.	Swivel	-	Index	screw		1	AB
-3	600896	.	Swivel	-	Index	screw		1	CD
-4	96952	.	Collar	-	Taper	pin		1	AB
-4	103103	.	Collar	-	Taper	pin		1	CD
-5	140	.	Pin	-	Taper			1	AB
-5	2291	.	Pin	-	Taper			1	CD
-6	600673	.	Screw	-	Index			1	AB
-6	600491	.	Screw	-	Index			1	CD
-7	600668	.	Nut	-	Index	screw		1	AB
-7	600487	.	Nut	-	Index	screw		1	CD
-8	601277	.	Bushing	-	Index	screw		1	AB
-8	601276	.	Bushing	-	Index	screw		1	CD
-9	1040	.	Washer					1	AB
-9	764	.	Washer					1	CD
-10	3475	.	Nut	-	Thin	hex		1	AB
-10	3476	.	Nut	-	Thin	hex		1	CD
-11	200160	.	Stud					1	AB
-11	48955	.	Stud					1	CD
-12	3441	.	Washer					1	AB
-12	3442	.	Washer					1	CD
-13	3478	.	Nut	-	Hex	full		1	AB
-13	3479	.	Nut	-	Hex	full		1	CD
-14	600908	.	Screw	-	Hex	cap		1	AB
-14	601443	.	Screw	-	Hex	cap		1	CD

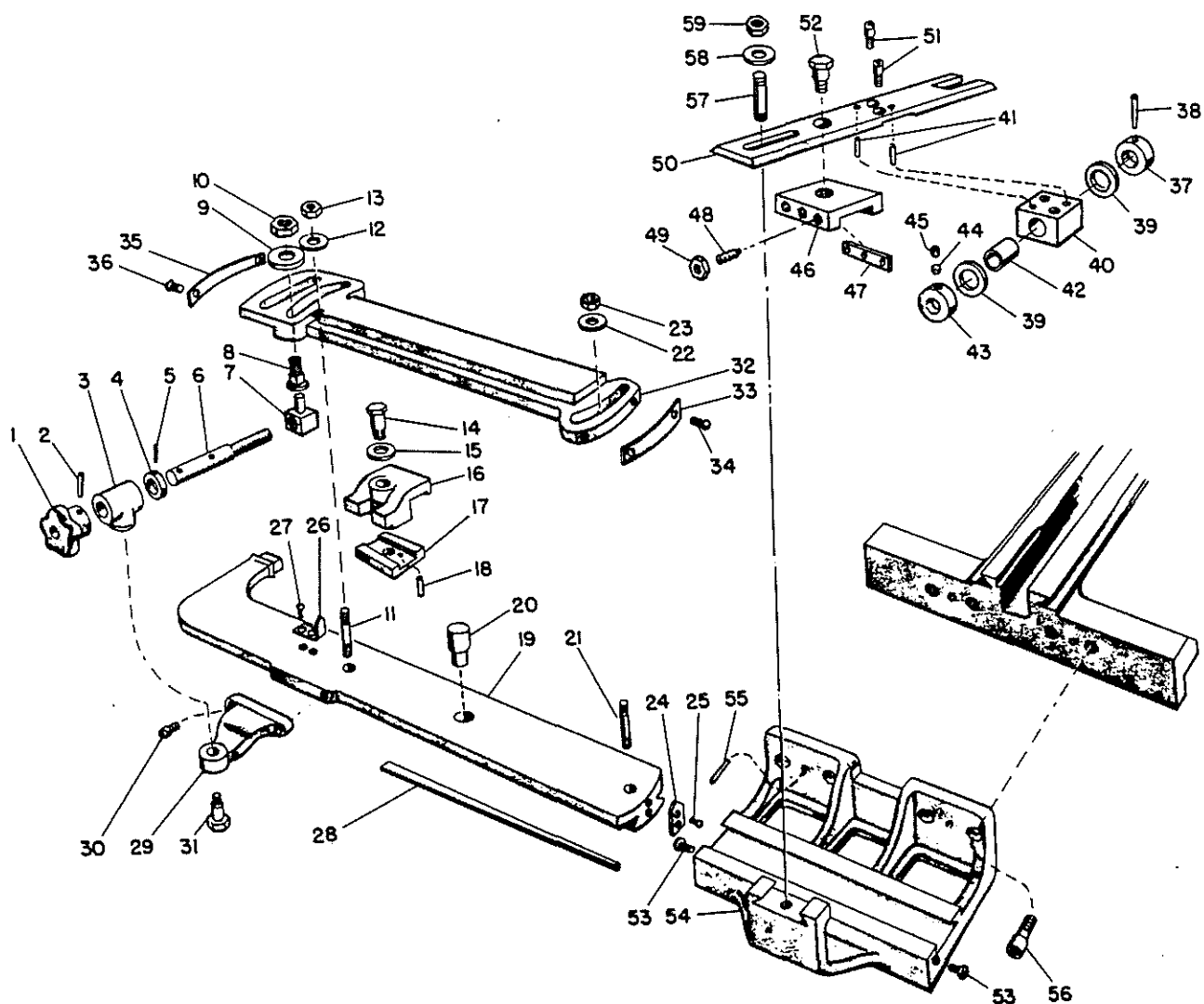


Figure 21. Taper Attachment

Figure & Index No.	Part Number	Nomenclature						Units	Application
		1	2	3	4	5	6	Per Assy	Code
TAPER ATTACHMENT (CONTINUED)									
21-15	3442	.	Washer					1	AB
-15	1040	.	Washer					1	CD
-16	600687	.	Cap - Locating clamp					1	AB
-16	600509	.	Cap - Locating clamp					1	CD
-17	600686	.	Clamp - Locating					1	AB
-17	600508	.	Clamp - Locating					1	CD
-18	3270	.	Pin - Straight					1	AB
-18	3431	.	Pin - Straight					1	CD
-19	600899	.	Slide - Bottom					1	AB
-19	600893	.	Slide - Bottom					1	CD
-20	600666	.	Stud - Swivel					1	AB
-20	600485	.	Stud - Swivel					1	CD
-21	75946	.	Stud					1	AB
-21	81693	.	Stud					1	CD
-22	3441	.	Washer					1	AB
-22	3442	.	Washer					1	CD
-23	3478	.	Nut - Hex full					1	AB
-23	3479	.	Nut - Hex full					1	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
TAPER ATTACHMENT (CONTINUED)									
21-24	600685	.	Pointer - Index					1	AB
-24	600507	.	Pointer - Index					1	CD
		Attaching Parts							
-25	3459	.	Screw - Round head machine					2	All
		----- * -----							
-26	600683	.	Pointer - Index					1	AB
-26	600505	.	Pointer - Index					1	CD
		Attaching Parts							
-27	3459	.	Screw - Round head machine					2	All
		----- * -----							
-28	600900	.	Gib					1	AB
-28	600894	.	Gib					1	CD
-29	600901	.	Bracket - Index screw					1	AB
-29	600895	.	Bracket - Index screw					1	CD
		Attaching Parts							
-30	3246	.	Screw - Socket head cap					2	AB
-30	3396	.	Screw - Socket head cap					2	CD
		----- * -----							
-31	600903	.	Screw - Shoulder					1	AB
-31	600796	.	Screw - Shoulder					1	CD
-32	600665	.	Slide - Top					1	AB
-32	600484	.	Slide - Top					1	CD
-33	600684	.	Scale - Index (degrees)					1	AB
-33	600506	.	Scale - Index (degrees)					1	CD
		Attaching Parts							
-34	3459	.	Screw - Round head machine					2	All
		----- * -----							
-35	600688	.	Scale - Index (American)					1	AB
-35	600689	.	Scale - Index (Metric)					1	AB
-35	600504	.	Scale - Index (American)					1	CD
-35	600518	.	Scale - Index (Metric)					1	CD
		Attaching Parts							
-36	3459	.	Screw - Round head machine					2	All
		----- * -----							
-37	600677	..	Collar - Feed screw					1	AB
-37	600496	.	Collar - Feed screw					1	CD
		Attaching Parts							
-38	140	.	Pin - Taper					1	AB
-38	143	.	Pin - Taper					1	CD
		----- * -----							
-39	602762	.	Bearing - Ball thrust					2	AB
-39	700418	.	Bearing - Ball thrust					2	CD
-40	600930	.	Bracket - Feed screw bearing					1	AB
-40	600495	.	Bracket - Feed screw bearing					1	CD
-41	3270	.	Pin - Straight					2	AB
-41	3541	.	Pin - Straight					2	CD
-42	240669	.	Bushing					1	AB
-42	223048	.	Bushing					1	CD
-43	602763	.	Nut - Thrust adjustment					1	AB
-43	602751	.	Nut - Thrust adjustment					1	CD
-44	600436	.	Plug - Brass					1	AB
-44	1550	.	Plug - Brass					1	CD
-45	2353	.	Screw - Low socket set					1	AB
-45	2332	.	Screw - Low socket set					1	CD
-46	600669	.	Shoe - Top slide					1	AB
-46	600488	.	Shoe - Top slide					1	CD
-47	600670	.	Gib - Top slide shoe					1	AB
-47	600489	.	Gib - Top slide shoe					1	CD
-48	600671	.	Screw - Gib set					3	AB
-48	3165	.	Screw - Gib set					3	CD

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code	
		1	2	3	4	5	6			
TAPER ATTACHMENT (CONTINUED)										
21-49	2280	.	Nut - Hex						3	AB
-49	3472	.	Nut - Hex						3	CD
-50	602752	.	Bar						1	AB
-50	600924	.	Bar						1	CD
-51	3204	.	Screw - Low socket head cap						2	AB
-51	3210	.	Screw - Low socket head cap						2	CD
-52	600681	.	Screw - Shoulder						1	AB
-52	600502	.	Screw - Shoulder						1	CD
-53	600576	.	Screw - Gib						2	AB
-53	600273	.	Screw - Gib						2	CD
-54	600898	.	Bracket						1	AB
-54	600892	.	Bracket						1	CD
		Attaching Parts								
-55	663	.	Pin - Taper						2	All
-56	3266	.	Screw - Socket head cap						4	AB
-56	3403	.	Screw - Socket head cap						4	CD
		----- *								
-57	602054	.	Stud						1	AB
-57	602055	.	Stud						1	CD
-58	3441	.	Washer						1	AB
-58	3442	.	Washer						1	CD
-59	3473	.	Nut - Thin hex						1	AB
-59	3474	.	Nut - Thin hex						1	CD
CHASING DIAL ASSEMBLY										
22-1	600327		Dial - Chasing						1	All
		Attaching Parts								
-2	3203	.	Screw - Phillips						1	All
		----- *								
-3	600959	.	Stud - Chasing dial						1	All
-4	202831	.	Knob - Knurled						1	All
-5	600993	.	Bracket - Chasing dial						1	AB
-5	600961	.	Bracket - Chasing dial						1	CD
-6	600653	.	Shaft - Chasing dial						1	AB
-6	600328	.	Shaft - Chasing dial						1	CD
-7	600657	.	Worm - Wheel						1	AB
-7	600607	.	Worm - Wheel						1	CD
		Attaching Parts								
-8	2291	.	Pin - Taper						1	All
		----- *								

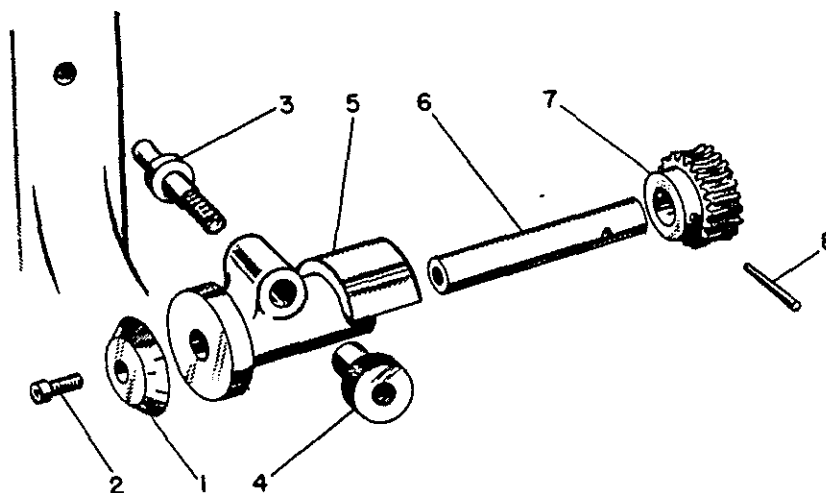


Figure 22. Chasing Dial Assembly

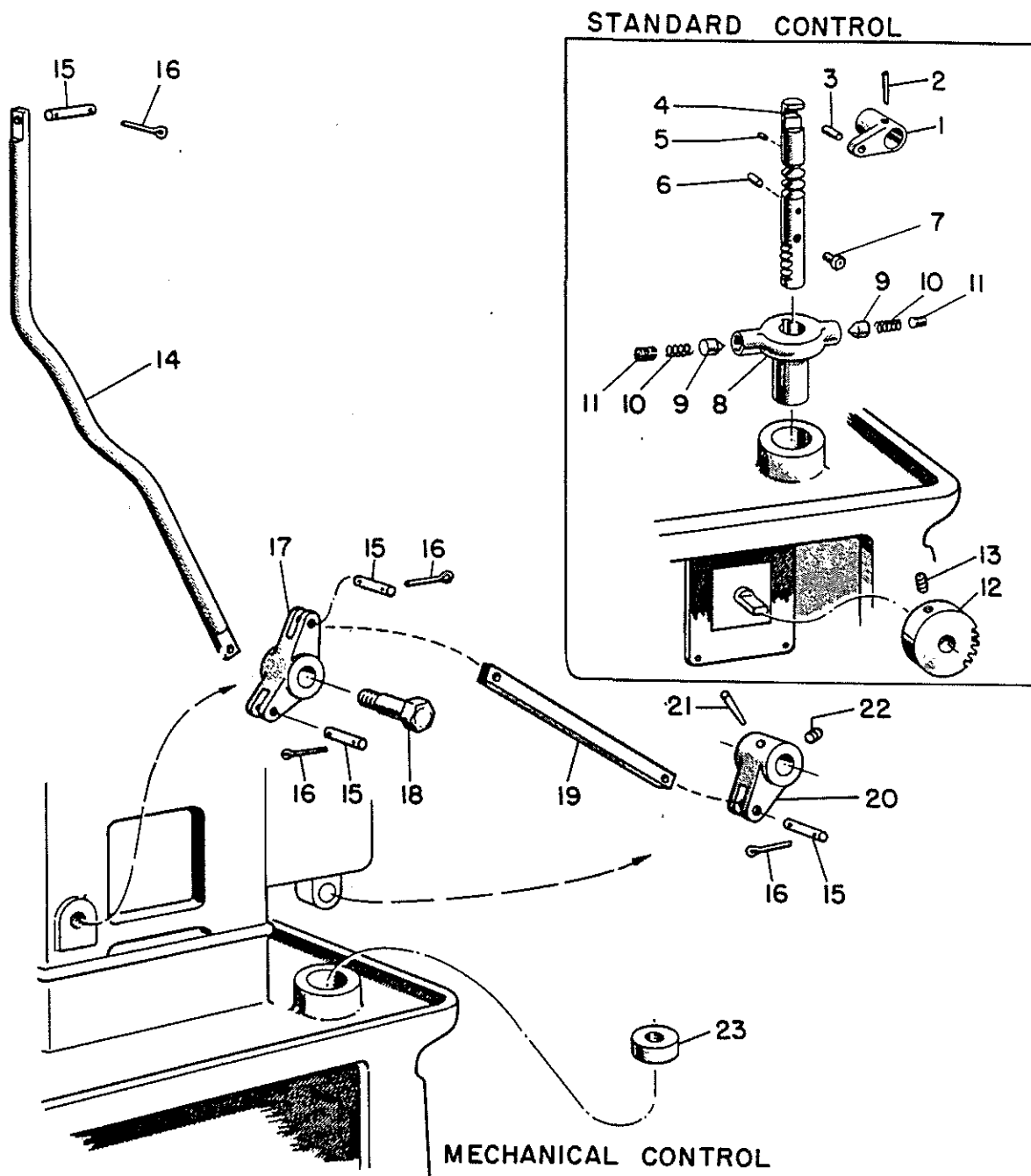


Figure 23. Standard and Mechanical Controls

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code	
		1	2	3	4	5	6			
STANDARD AND MECHANICAL CONTROLS										
23-		Standard Control								
23-1	601019	.	Lever - Control rod					1	AB	
-1	601030	.	Lever - Control rod					1	C	
-1	601344	.	Lever - Control rod					1	D	
		Attaching Parts								
-2	663	.	Pin - Taper					1	All	
-3	3299	.	Pin - Straight					1	All	
----- *										

Figure & Index No.	Part Number	Nomenclature						Units Per Assy	Application Code
		1	2	3	4	5	6		
STANDARD AND MECHANICAL CONTROLS (CONTINUED)									
23-4	601026	.	Shaft - Drum switch operating					1	AC
-4	601027	.	Shaft - Drum switch operating					1	B
-4	601029	.	Shaft - Drum switch operating					1	D
-5	3377	.	Pin - Straight					1	All
-6	3383	.	Pin - Straight					1	All
-7	3221	.	Screw - Socket head cap					1	All
-8	601021	.	Housing - Drum switch plunger					1	All
-9	601022	.	Plunger					2	All
-10	3945	.	Spring - Compression					2	All
-11	2336	.	Screw - Hex socket					2	All
-12	601023	.	Gear - Drum switch operating					1	All
-13	2342	.	Screw - Hex socket set					1	All
23-			Mechanical Control						
-14	600709	.	Link - Long					1	A
-14	600713	.	Link - Long					1	B
-14	600469	.	Link - Long					1	C
-14	600515	.	Link - Long					1	D
			Attaching Parts						
-15	76345	.	Pin - Hinge					4	All
-16	3329	.	Pin - Cotter					8	All
			----- *						
-17	600467	.	Lever					1	All
-18	600468	.	Stud - Shoulder					1	All
-19	600708	.	Link - Short					1	A
-19	600712	.	Link - Short					1	B
-19	600466	.	Link - Short					1	C
-19	600514	.	Link - Short					1	D
-20	600703	.	Lever					1	AB
-20	600461	.	Lever					1	CD
			Attaching Parts						
-21	642	.	Pin - Taper					1	All
-22	78600	.	Screw - Hex socket set					1	All
			----- *						
-23	3827	.	Plug					1	All