

WAR DEPARTMENT TECHNICAL MANUAL

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SHOP, ENGINEER,
MOTORIZED, AVIATION BATTALION,
MACHINE, COUSE, TYPE "B"
(EQUIPMENT ONLY)



MAINTENANCE INSTRUCTIONS

COUSE SERIAL NUMBERS 15-289.
C. OF E. PURCHASE ORDERS 55067, 55621, 56992, NY-4349, NAD 2436.
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COUSE LABORATORIES • NEWARK, N. J., U. S. A.

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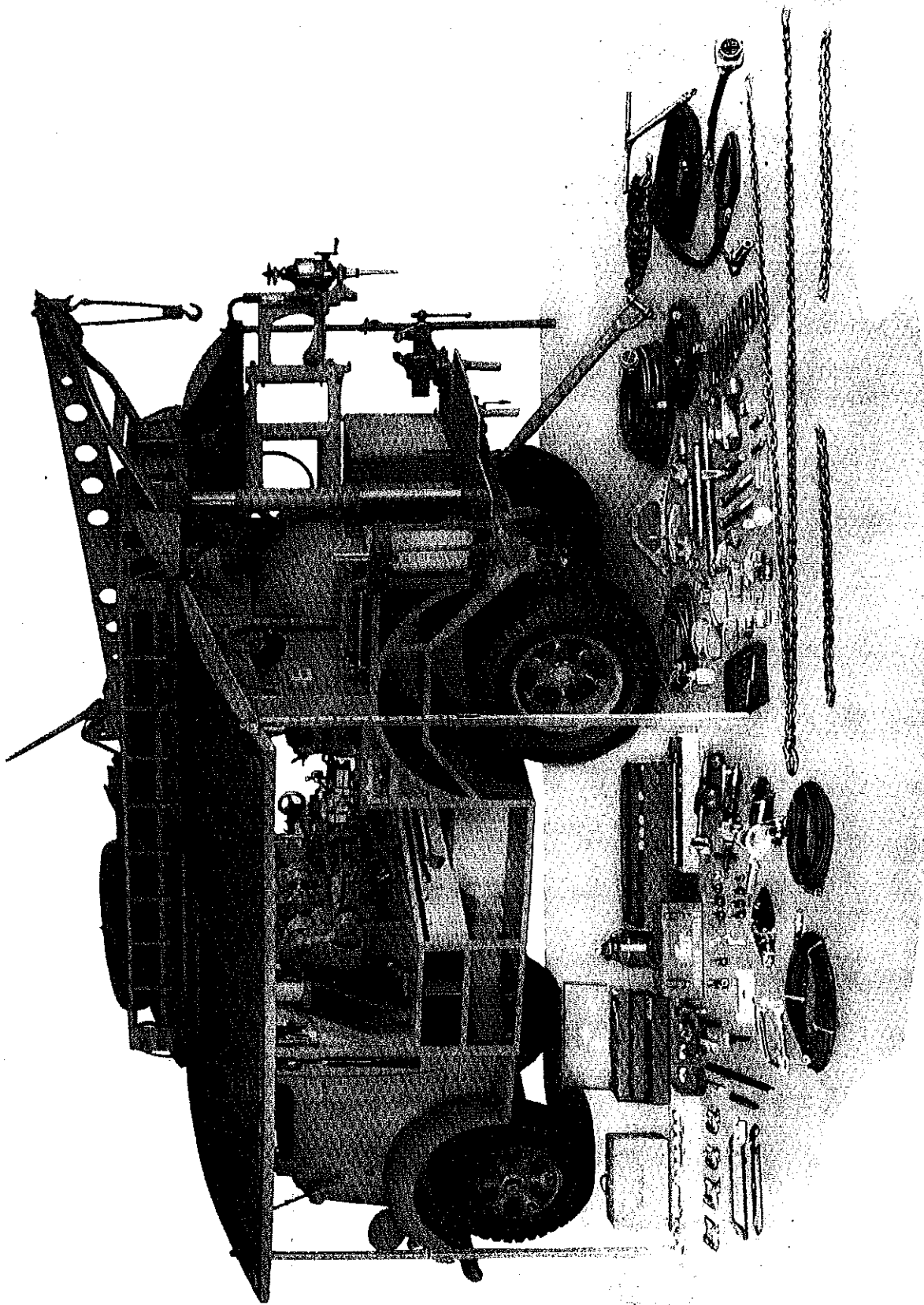


Fig. 1—Couse Type "B" Machine Shop

FOREWORD

This manual has been prepared to supply operators and maintenance mechanics with all the essential information for insuring the most efficient performance of the Couse Motorized Type "B" Shop.

The Couse Parts numbering system is designed so that a basic group number and a part number is assigned to each unit in the vehicle. The Couse Number (CD-304-0401), for example, is made up of the prefix CD which is used to designate all Couse parts, the next three digits referring to the group to which the part relates and the last four digits differentiating the various parts within a group. All hoisting equipment parts, for example, are in group 200, all electrical parts are in group 300, etc. The Couse numbers appearing on illustrations, and referred to in the text throughout this manual, are identical with the numbers appearing in the Parts Manual.

The number at the inner top corner of each page is the group number applying to the devices discussed in the text and the number on the outer corner is the page number. All pages are numbered consecutively.

In each section, a brief description is given of the operating principle involved in the particular assembly discussed. Operators, as well as mechanics, will thus have some knowledge as to the functioning of each unit. In addition, detailed instructions on removing and installing parts, effecting necessary adjustments quickly, and properly lubricating all parts, are covered.

K. W. Couse

GENERAL DESCRIPTION

This manual covers equipment operation, maintenance and lubrication of the Couse Type "B" Motorized Machine Shops for Engineer Aviation Battalions.

For operation, maintenance and lubrication of all truck parts refer to Maintenance Manual TM 5-9121 and for all parts listings refer to Parts Catalogs TM 5-9120 and TM 5-9126.

The Type "B" Motorized Maintenance Shop is one of two types of units developed for Engineer Aviation Battalions, the other being known as the Couse Type "A" Motorized Maintenance Shop for Engineer Aviation Battalions.

Each unit is capable of independent operation and is furnished with a full assortment of tools and equipment which permit its use as a completely integrated repair shop for the purpose intended. The Type "B" unit is fully equipped for use as a mobile machine shop. The Type "A" unit is fully equipped for use as a mobile welding shop.

The tools and equipment of the two types taken together are designed to supplement each other in such a manner that when the two units are operated together as companion shops, they form a completely balanced general purpose field repair shop for all types of work up to and including caterpillar tractors, bulldozers, power shovels, etc. On locations where the volume of work is extensive, several "A" shops may be used to advantage in connection with each "B" shop. It must be stressed, however, that such combined use of "A" and "B" units is not essential to full utilization of the functions of an individual unit for the purpose for which it was designed.

COUSE LABORATORIES

EXTERIOR

The Couse Type "B" Mobile Machine Shop is of rigid all-steel welded construction of special design, having low center of gravity.

The side panels, made of weatherproof plywood mounted on steel frames, are hinged to the body roof at their upper edge so they may be opened as shown in Fig. 1. The adjustable legs, attached to the side, support the side when in open position and act as closures and locks for the side when closed. The side panels will frequently be referred to herein as "Lifting Sides." Each side has a small door (Fig. 2) hinged at the top edge, which can be used as an entrance to the shop when the lifting sides are closed. The doors are equipped with a shatter-proof glass window, blackout shield and canvas storm curtains. In cold weather the shop may be operated with the lifting sides closed and the small door and window open for ventilation.

The body roof (Fig. 3) is of all-steel welded construction with arched rib supporting members. It is further strengthened by the air tank which is integral with, and runs longitudinally through, the center of the roof structure. A steel railing encircles the roof and has built in, at each corner, a lifting loop. These loops can be used to raise the entire shop, with chassis, for loading aboard ship.

Front and rear bulkheads are of welded steel construction. The front bulkhead has two light-proof ventilators mounted in it above the cab roof. These provide ventilation to the interior of the body. Three rungs, secured to the front bulkhead, to the right of the cab, form a ladder for climbing to the roof of the body. Also, on this side of the bulkhead, is mounted a Pioneer Tool Set, consisting of a shovel, axe and pick-mattock. A bracket containing a Lux Fire Ex-

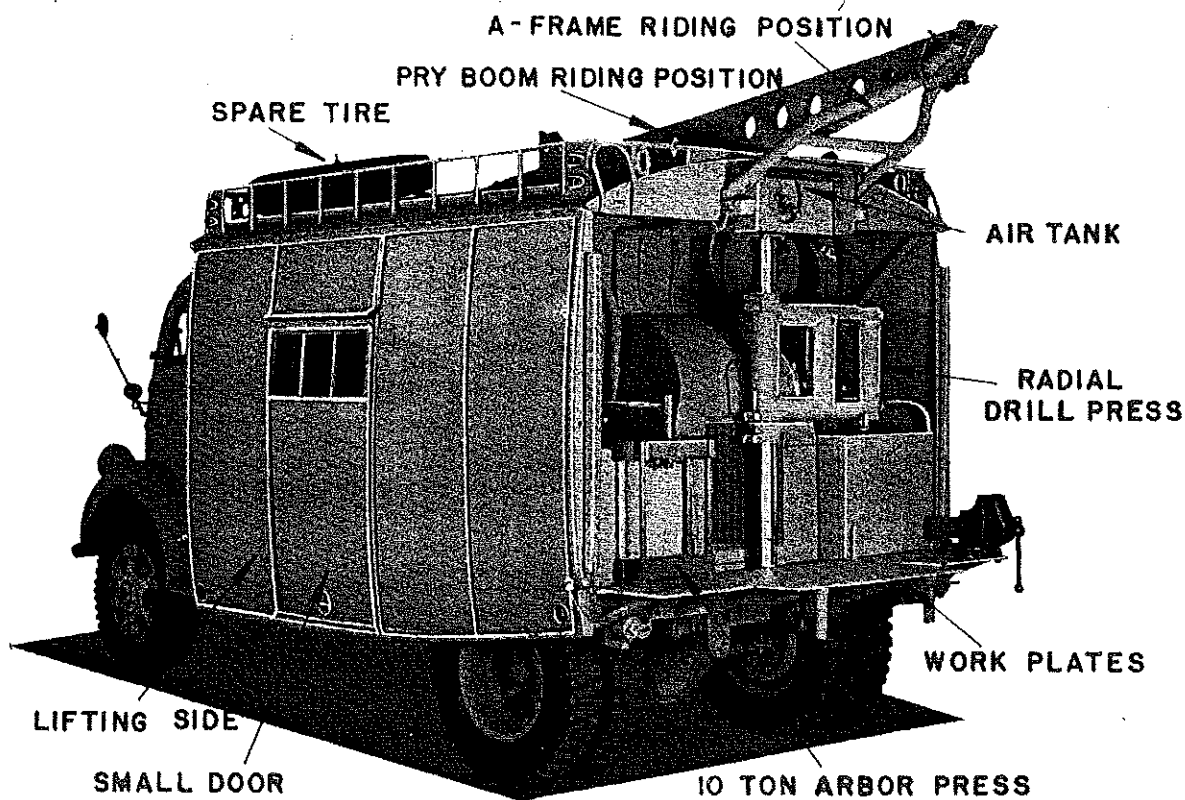


Fig. 2—Rear and Side View of Truck, Showing "Riding" Position of Lifting Sides and Equipment

tinguisher (Fig. 4) is attached to the front bulkhead, to the left of the cab.

On the rear of the truck is mounted a radial arm drill press, attached to a vertical drill post (Fig. 2). An air-powered portable drill is used in this press. Just to the front of the drill post is mounted the radiator with hood and side covers of the Schramm Generator-Air Compressor unit. The Schramm unit, besides generating electric power for the shop, pumps compressed air into the tank mounted in the shop roof. Three air hose connections are provided in the air tank over the rear of the truck. Portable air-powered tools, supplied with the shop, are connected at these points. This is described in detail in the chapter in this manual covering "Air-Powered Tools." A 10 ton Porto-Power Arbor Press and ram are mounted on a socket hinge, welded to the left steel fender box. The pump for this hydraulic unit is carried on the top of the fender box. The right-hand fender box may be used as a riding seat and is provided with a hand rail. The two large pipes running up to the air tank

connect with the air compressor unit. The small pipe and valve, running down the center of the bulkhead, is used to drain the moisture which accumulates in the compressed air tank. The large pipe on the left is the exhaust pipe for the Schramm unit.

Three work plates are mounted on the rear of the body. See Fig. 2. The small right-hand plate with the bench vise and the small plate on the left, are fixed in position and cannot be moved. The large high carbon steel work plate in the center is hinged to the body with a steel pin and is removable. Legs are provided on the underside so the plate may be used as a portable working surface.

Also on the rear bulkhead are electrical receptacles for connecting cables and portable tools used in conjunction with the operation of this vehicle. The use of these tools are all fully described in the chapters in this manual covering "Electrical Equipment."

A bracket on the front left side of the roof provides a mounting for the spare tire and wheel.

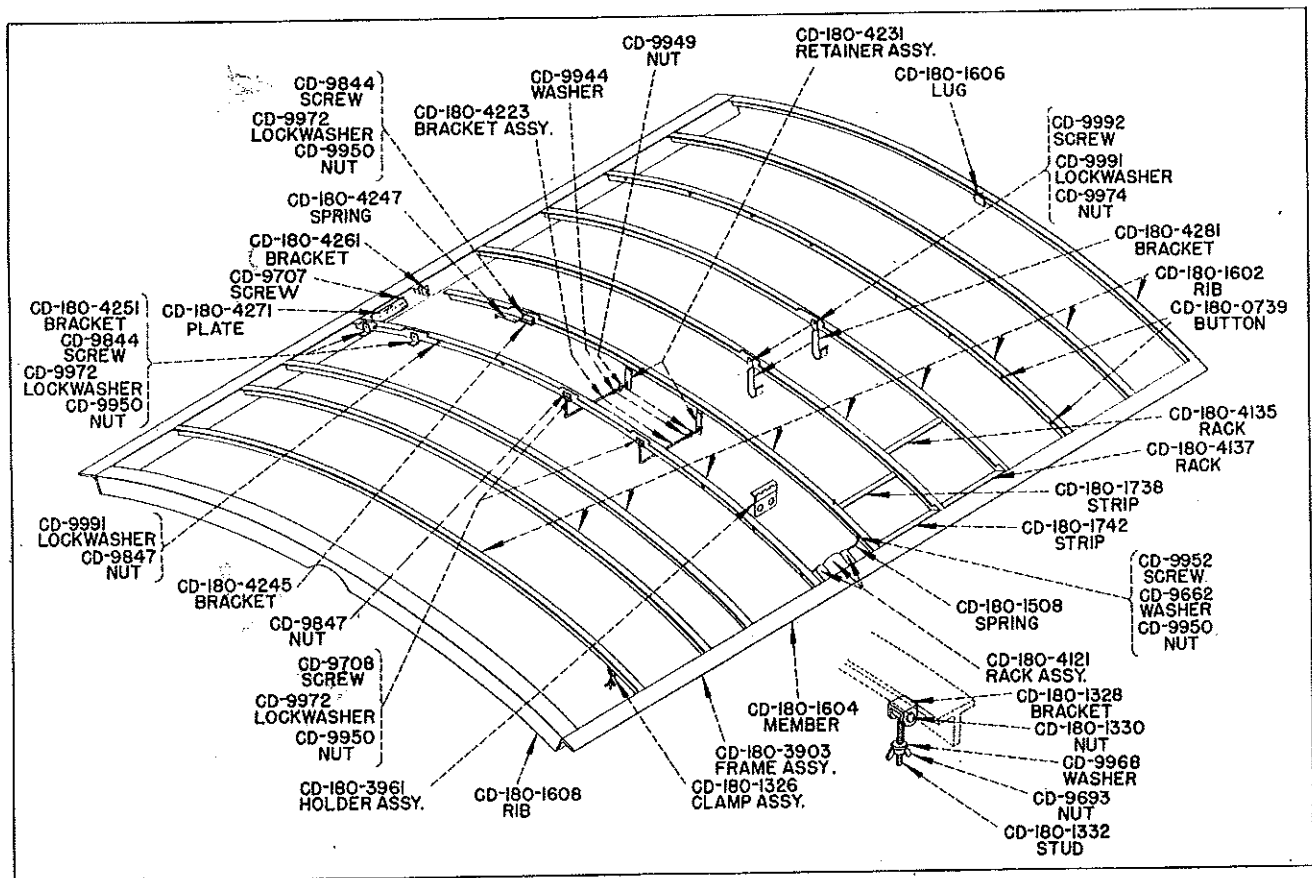


Fig. 3—Frame of the All-Steel Body Roof, Showing Parts and Part Numbers

The pry boom and A-frame which are used to form the shop hoisting equipment are stowed loosely on the roof when minimum road clearance is desired. Normally they are mounted in the position shown in Figs. 1 and 2. Cross pins, which are mounted in the three recesses down the center of the roof, hold the end of the pry boom when it is in any one of the three possible positions of the truck hoisting equipment. The truck hoist bracket is mounted on the rear edge of the roof and serves to support the A-frame in the hoisting positions. Two Galanot Tyr-Tracs for the dual rear wheels are placed on the right side of the roof.

EXTERIOR LIGHTS AND REFLECTORS

Four amber service reflectors are mounted on the front corners of the body. The rear corners are equipped with four red reflectors. Each corner of the roof has two side clearance lights, mounted vertically. The upper one is the service light and the lower one is the blackout light. The front and rear edges of the lifting sides carry service clearance lights, amber in front and red in rear.

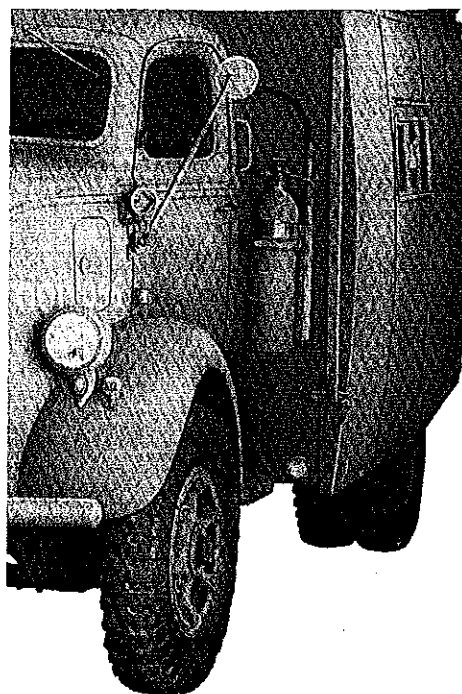


Fig. 4—The Lux Fire Extinguisher Shown in Place at Left Bulkhead

INTERIOR

In the interior, the shop is equipped with oak-topped work benches, front and rear. The rear work bench is equipped with a vise at each end. In the center of this bench is the hood which covers the interior end of the Schramm air compressor unit. The hood can be swung up and latched in place to give access to the unit. In warm weather the hood is kept up to help cool the air compressor when it is operating. In cold weather, a special fan can be mounted on the Schramm unit to draw air through its radiator and blow it into the shop. The interior can be heated in this manner.

A three-sided screen encloses the shop generator on the inner end of the Schramm unit. The two sides of the screen are hinged and can be opened to give access to the generating equipment. An oak sliding top covers the enclosure. This top is movable and can be pulled out to

form a seat when operating the lathe.

The main electrical panel is mounted on the rear bulkhead over the work bench. This carries all the controls, switches and meters used in the operation of the shop electrical equipment and the Schramm Generator-Air Compressor unit.

An extendable gap-bed lathe is mounted across the shop on the low front work bench. Its motor and belt drive are attached to the front bulkhead over the lathe spindle head. Tool shelves are provided on the right side of the bulkhead and under the lathe work bench. The latter may be reached from either side of the shop.

Built into the body over the rear wheels are a series of shelves and pockets for storing shop equipment. These are sealed from road dirt and dust by the strips mounted on the side panels of the body.

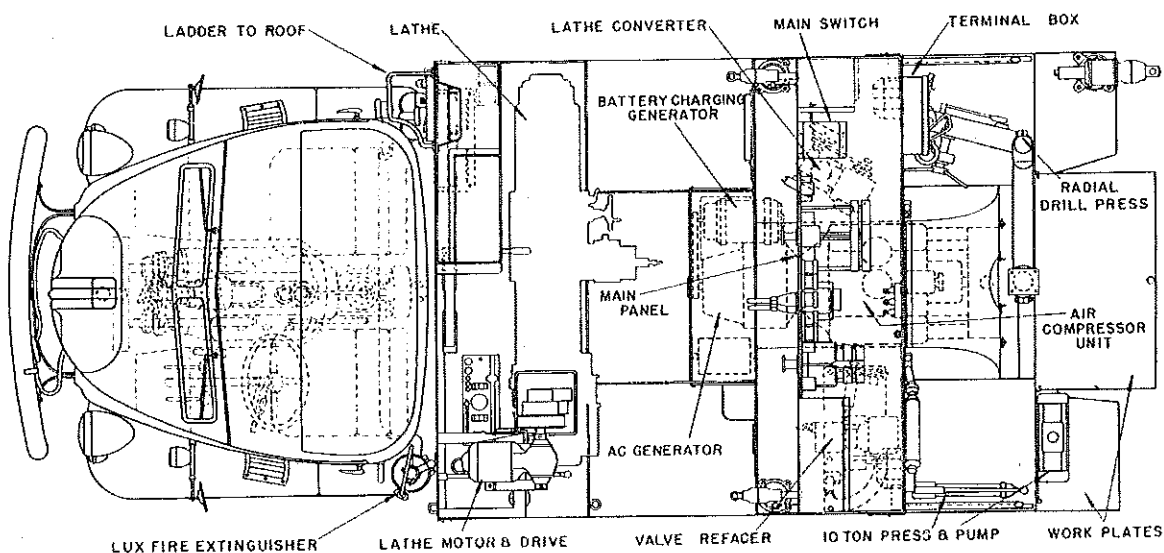


Fig. 5—Top View of Truck, Showing Position of Fixed Equipment

INTERIOR LIGHTS

Fixed pull-chain lights and four gang receptacles are mounted on the bulkheads over the work benches. A pull-chain light is also provided at the ceiling on each side of the air tank. An adjustable work light, clamped to the lathe motor bracket, is to be used for all lathe work.

EQUIPMENT MOUNTINGS

The equipment mountings are illustrated in Figs. 5, 7, and 8, and are described in detail in the chapters covering specific equipment that follow.

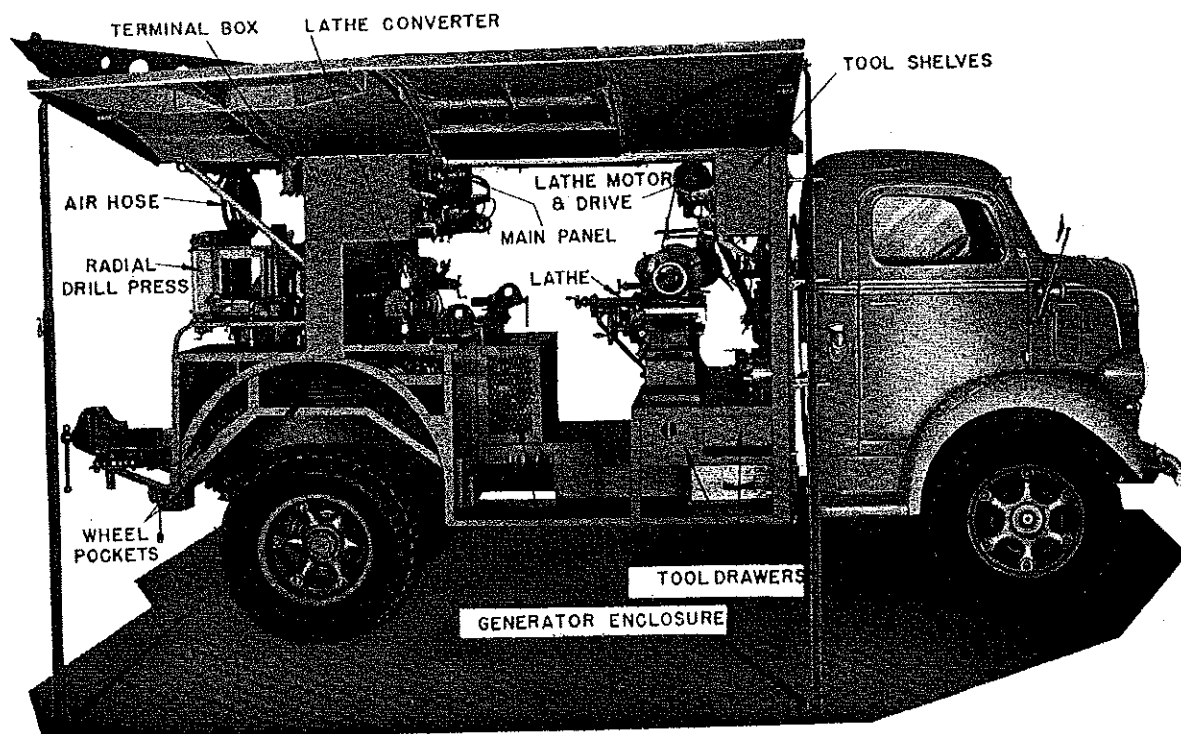


Fig. 6—Right Side of Shop, Showing Position of Fixed Equipment

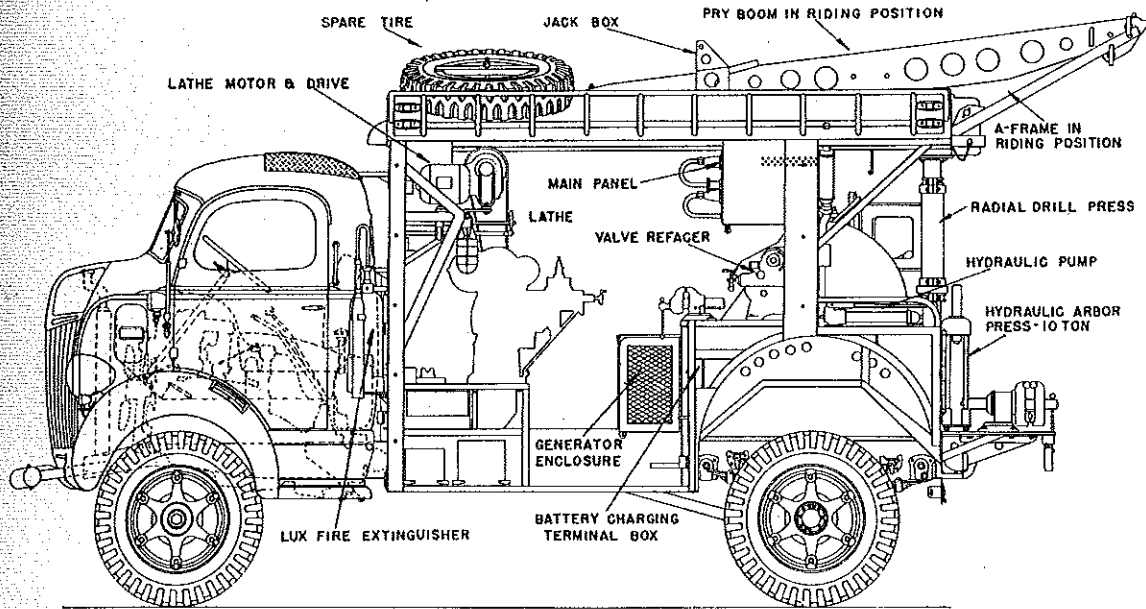


Fig. 7—Left Side View of Shop, Showing Position of Fixed Equipment

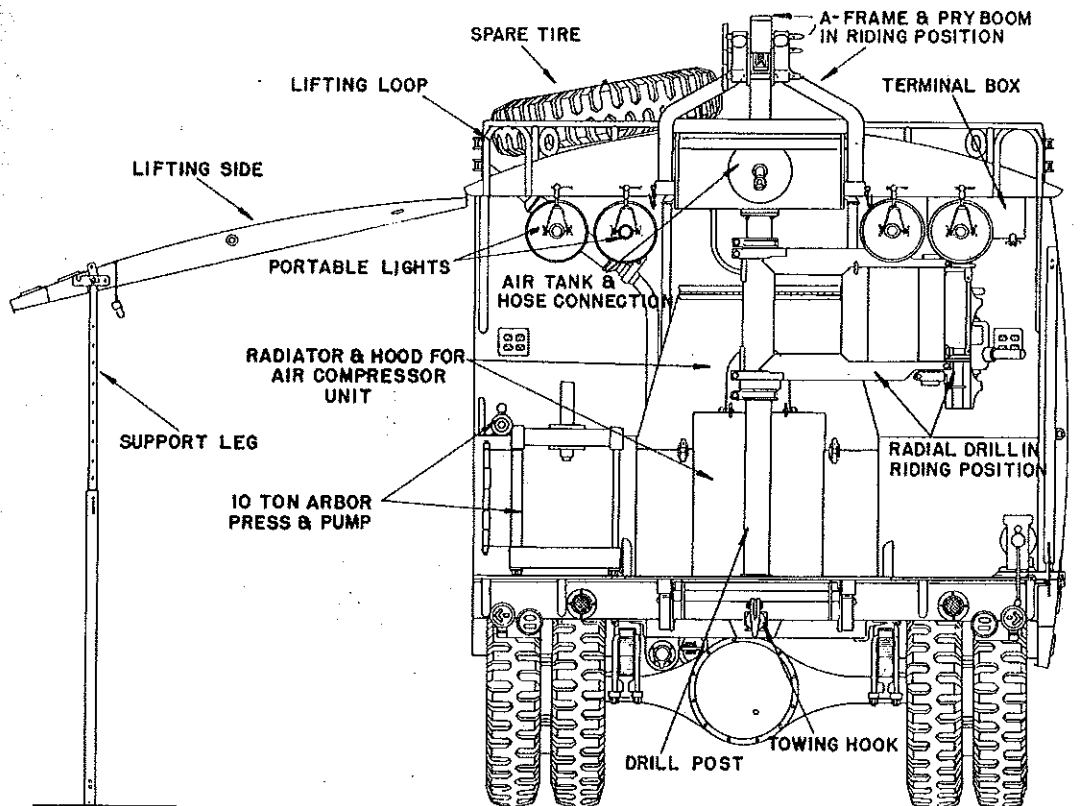


Fig. 8—Rear View of Shop, Showing "Riding" Position of Equipment

OPERATION OF THE BODY

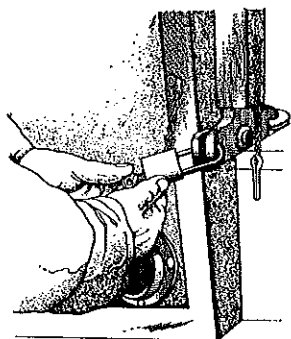


Fig. 9—Removing Locks from Hasps

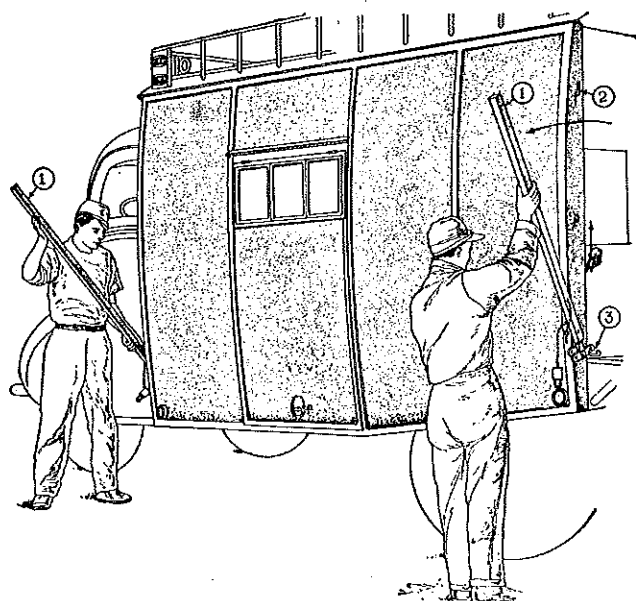


Fig. 10—Lifting Up Square Support Legs

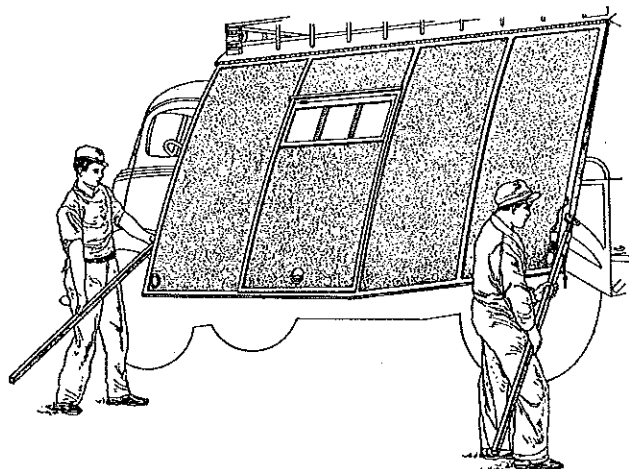


Fig. 11—Swinging Out the Lifting Sides

OPENING LIFTING SIDES

The sides of the body are padlocked and, as an extra precaution when shipped, the padlock hasps are tack-welded at each corner of the body. Open the tack welds with a hacksaw and, after the shop side is open, clean the rough edges on the hasps with a file. The keys for the padlocks and the small door in each side of the body are sealed to the truck steering post. If the truck cab has not been opened, the key to the cab door will be found under the left front fender, sealed to the headlight loom.

Two men are required to open each side of the shop. They should follow this procedure:

1. Unlock the four padlocks located at each corner of the shop. One key fits all of them. Remove from hasps. See Fig. 9.

2. Lift up square support leg (1), in Fig. 10, far enough to free top end from pin (2), mounted on the edge of the side.

3. Swing leg down so closure (3), in Fig. 10, opens and unhooks from the body of the shop.

4. With one man at each support leg, swing out (Fig. 11) and up to the desired position (Fig. 12). Insert cotter pin through the holes in each telescopic support leg to retain the side at the proper height. Be sure to have the cotter pins pass completely through the leg.

5. Straighten the support legs to a vertical position.

OPENING SIDE DOOR

The small door in each side of the body is locked and the latch is pinned on the inside of the body when the shop is shipped. The doors cannot be opened until the sides of the shop are opened and the large cotter pins are removed from the hole in each latch of both doors. After this has been done, unlock the door with one of the keys that was sealed to the steering post and proceed as follows:

1. After lock (1), in Fig. 13, is open, handle (2) is turned to the right to unlatch the door.

2. Door is then raised until struts (3 and 4), in Fig. 14, are in line. Struts are locked in position when the pin on the lower strut engages the slot (5) in the upper strut.

3. To close the door, push upward on it slightly so that pin is released from the slot. Push struts toward the truck body and lower the door. Close and secure by turning handle (2), in Fig. 13, to the left. Lock with key.

DRILL POST BEARING

The weight of the radial arms and the drill are supported by the lower collar bearing assembly (CD-220-0101) clamped to the main post. This bearing is exposed for repairs when the drill press has been removed from the truck and the lower collar slipped off the drill post. The four screws (CD-9471) are then removed and the bearing cover (CD-220-0113) taken off. The ball bearing is then open for maintenance or replacement.

The upper collar on the drill post acts as a stop and does not carry any weight. For this reason it is not equipped with a ball bearing.

RADIAL DRILL PRESS ASSEMBLY

Clean the ways, gibs and bracket and apply a light coating of CG lubricant, general purpose grease. Loosen the lock nuts (CD-9934) on the four Allen set screws (CD-9466). These are on the left side of the ways and are used to adjust the position of the gib. Back off the Allen set screws. Place the gib in the ways.

Be sure the rack is securely bolted to the drill mount bracket. Push the gib against the left side of the ways and start the bracket into the ways from the bottom. The top of the bracket, as shown in Fig. 193, should enter the bottom of the ways on the frame. Engage the rack into the feed mechanism and raise the bracket until it projects above the frame. Engage the slow speed feed to hold the bracket in place.

Tighten the four Allen set screws evenly until there is no side play in the drill mount bracket. Tighten the lock nuts to hold this setting. Replace the stop assembly and connect the absorber linkage to the drill mount bracket.

Reassemble the arms and the drill post by following the instructions for disassembly in a reverse order. Clean all parts of rust and dirt before assembly and apply a light coat of CG lubricant to all machined surfaces. Follow Fig. 193 for the correct positioning of all parts. Be sure the lower collar on the drill post is correctly positioned. The bearing side of the collar should be up to carry the weight of the arms.

FEED MECHANISM DISASSEMBLY

To remove the feed mechanism from the drill mount frame, take out the two cap screws, Fig. 194 (CD-9591), which clamp the housing (CD-

220-0193) to the frame. Lower the drill mount bracket to its lowest position, or, if the drill press is mounted on the shop, lower the arms and rest the bracket on the work plates. Pull on the housing and slide the entire feed mechanism out of the drill mount frame.

To disassemble, remove the two machine screws (CD-9464) holding the semi-circular cover (CD-220-0197) to the side of the housing. Take off the nut, lock washer and washer from the end of the slow speed feed shaft (CD-220-0251). Pull on the small wheel assembly (CD-220-0243) and remove the shaft from the housing. Turn the four-spoke feed handle and remove the worm gear (CD-220-0269) from the housing. Place the key (CD-220-0267) with the worm gear so it will not be lost.

Unscrew the nut (CD-9835) and lock washer from the end of the feed shaft (CD-220-0213). Pull off the four-spoke wheel and its key. Take out the three machine screws (CD-9464) and remove the cover plate (CD-220-0195) from the face of the housing. Loosen the Allen set screw (CD-9478) in the hub of the large gear (CD-220-0219). Pull the feed shaft out from the rear of the housing. The gear with its key can now be lifted out.

The bushings (CD-220-0155) in the housing and the single bushing in the drill mount frame can be pushed out. They should be replaced if they show signs of wear.

FEED MECHANISM ASSEMBLY

Follow the instructions for the disassembly in reverse order. Clean all dirt and rust from the parts and lubricate with CG general purpose grease before assembly. Replace any parts that are worn or damaged.

Replace the cover plate (CD-220-0195) and the four spoke wheel. This is the last part of the assembly procedure. The gear housing can be packed with grease when the gears are assembled.

Be sure to replace the spring (CD-220-0203) and ball (CD-9737) in the housing. This acts against the eccentric to hold the shift in either the fast or slow feed positions. Make sure that all the keys on both shafts are properly placed and that the set screw in the hub of the large gear is lined up with the hole in the shaft.

Pack the housing about half full of CG lubricant. Replace the cover plate and bolt the four-spoke wheel on the shaft to complete assembly.

SMITH-DRUM EXTENSION GAP BED ENGINE LATHE—DESCRIPTION

The Smith-Drum extension gap bed engine lathe is specially designed and constructed for turning work of extra large diameter and length, as well as doing accurate work within its ordinary capacity. It has ample power and strength to turn the full diameter of the swing in the gap. At the same time it is free from any awkward or objectionable features when used on ordinary work.

By sliding the top bed, the gap can be varied to suit the requirements of the work. This extension of the bed is an extremely important feature, because it not only increases the swing of the lathe, but also lengthens the distance between the centers for turning long work.

The nominal swing of the lathe with the gap bed closed is 14". The maximum distance between centers is then 36". When the gap bed is open to its extreme position, the center distance is 54". The swing in the gap is 28".

Fig. 195 shows work of a large diameter mounted in the lathe with the gap partially opened. Note the position of the tailstock and the extra length obtained between centers for handling long work. The large face plate is mounted on the lathe spindle as illustrated in Fig. 196 when the gap is opened as shown. Large diameter work can be bolted on the face plate and turned in this manner.

The two lathe beds are the backbone of the machine. The lower bed is mounted on the oak top of the steel work bench, which in turn is a part of the shop body. Many of the lathe accessories are stored in racks on the bench and bulkhead behind the lathe.

The headstock is designed with three sets of reduction gears. The back gears, of which there are two sets, have ratios of 10 to 1 and 4.5 to 1. These gears are mounted on a quill which rotates on an eccentric shaft. The third set of gears is arranged in the front part of the headstock. These gears only come into action when the large face plate is used. The small gear on the end of the auxiliary shaft meshes with the gear built into the back of the face plate. This gives a driving ratio between cone pulley and face plate of 24 to 1. With all the back gears out of

mesh, the spindle will run at its highest speed.

The tailstock slides on a V-way and a flat-way of the bed. It can be clamped in any desired position along the bed by tightening the two clamping bolts. There is a cross-bed adjustment built into the base of the tailstock. This can be used to center the tailstock accurately on the ways, or offset the tailstock to turn long tapers.

The carriage of the lathe is divided into four distinct parts; the saddle, the apron, the compound rest, and the tool post. Since the carriage supports the cutting tool and takes all the strain and vibration of the cutter, it is a very important part of the lathe. Care has been taken to make it strong and dependable and to provide the proper adjustments so that all play can be eliminated.

The apron which is suspended from the front of the saddle contains the power longitudinal and cross-feed mechanism. A thread cutting indicator is mounted on the apron. The carriage is moved along the ways for thread cutting and longitudinal power feeding by the action of the lead screw within the apron. The speed of travel depends upon the feed gear arrangements driving the lead screw. For thread cutting, half-nuts, which are operated by a lever on the right end of the apron, close on the feed screw and provide the drive. For operations other than thread cutting, the apron is driven by the keyway in the lead screw.

The compound rest is mounted on top of the cross slide of the saddle. The cross slide is either hand driven by the ball feed crank on the front of the carriage, or driven by power from the lead screw keyway when the clutch is engaged. The compound rest is moved independently by means of the ball crank handle attached to its telescopic feed screw. The rest is held on the cross slide by two clamping bolts. When these are loosened, the rest can be swung to any angle for turning short tapers or for other purposes.

The apron is fitted with gearing and clutches for the carriage feeds. Both longitudinal and cross-feed are controlled by the two notched

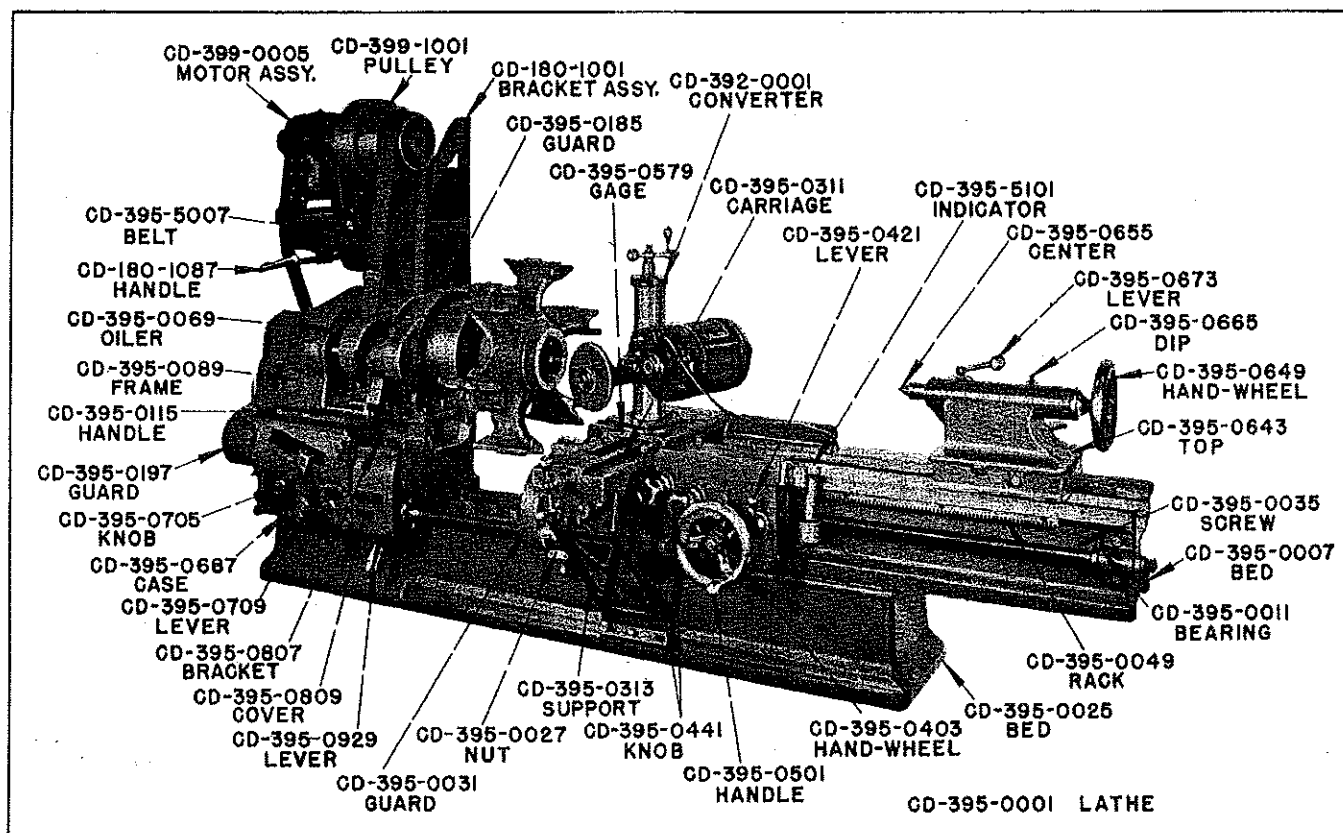


Fig. 195—Smith-Drum Lathe With Lathe Drive Mechanism and Lathe Converter on Carriage. Cap Bed Is Open

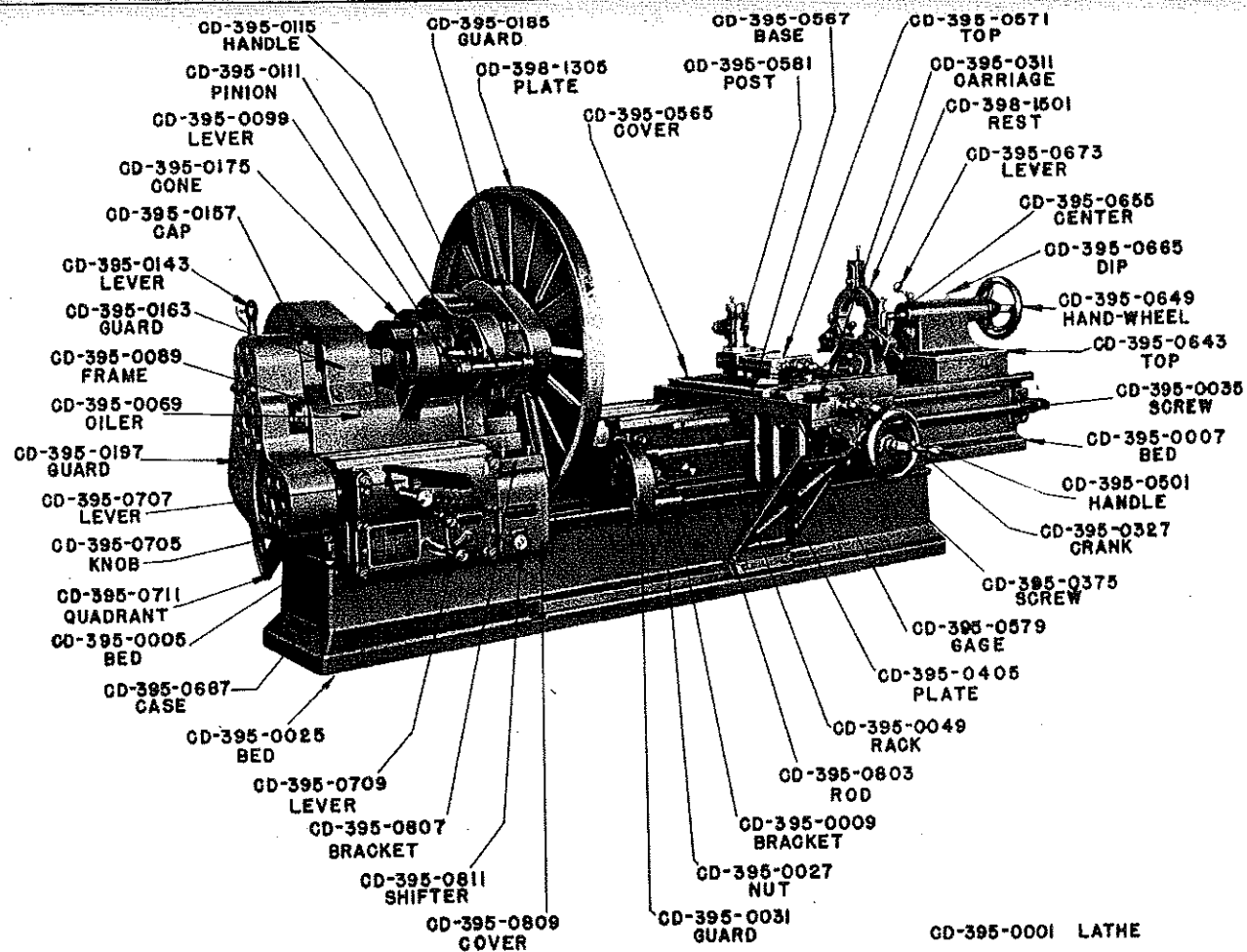


Fig. 196—General View of the Smith-Drum Lathe

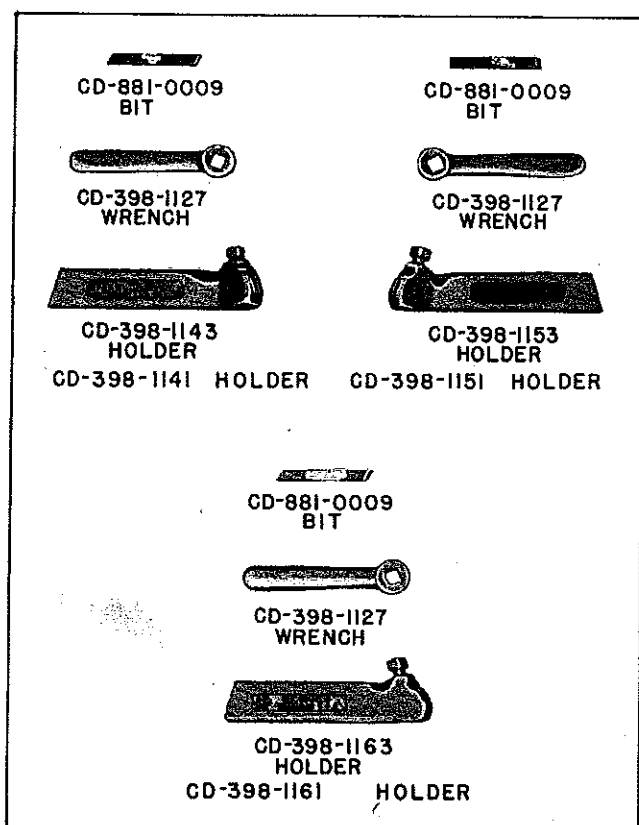


Fig. 197—Tool Bit Holders

knobs mounted on the apron. When the right-hand knob is tightened, the friction drive carries the carriage along the bed of the lathe. Tightening the left-hand knob engages the friction clutch to drive the cross-feed. The feed for both the carriage and the cross slide may be reversed at any time by changing the position of the gear quadrant in the gear train driving the feed shaft.

The lathe is fitted with a quick change gear box to give various speeds of the lead screw in relation to the spindle speed. In this manner, various pitches of screw threads may be cut without the use of loose change gears. An index plate attached to the quick change gear box, gives the gear combination required for different threads per inch or cutting feeds in thousandths of an inch. Loose transposing gears are available for mounting in the gear train of the lead screw drive for cutting metric screw threads. Some shops are supplied with these gears.

CUTTING TOOLS AND HOLDERS

The lathe turning and boring tools with their holders are illustrated in Figs. 197 and 198. The holders and the boring tools are stored on the top shelf of the front bulkhead on the right side. The tool bits for the holders are in the machinists' kit on the shelf over the lathe.

The holders in Fig. 197 use square high speed tool bits which are ground to the proper cutting edge for the type of work to be done. Straight, right offset, and left offset holders are supplied. The holders shown in Fig. 198 (top), are for cutting-off tools using a thin cutting blade. A straight and right offset holder is provided. The small boring tools and holder are also illustrated (bottom). This holder can be used to hold the dial indicator in the tool post for truing work settings in the lathe.

A complete large boring set, Fig. 199, is mounted in a wood block behind the lathe on the left side. This consists of a holder assembly, three bars and an assortment of cutting bits. The bits are ground to the correct cutting edge for the work handled.

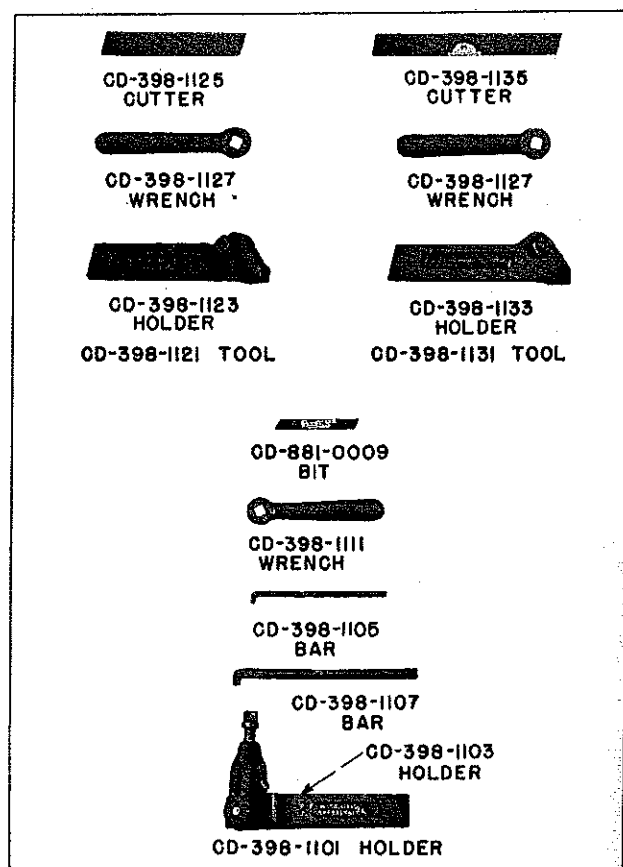


Fig. 198—Cutting Tools and Boring Tool Holders

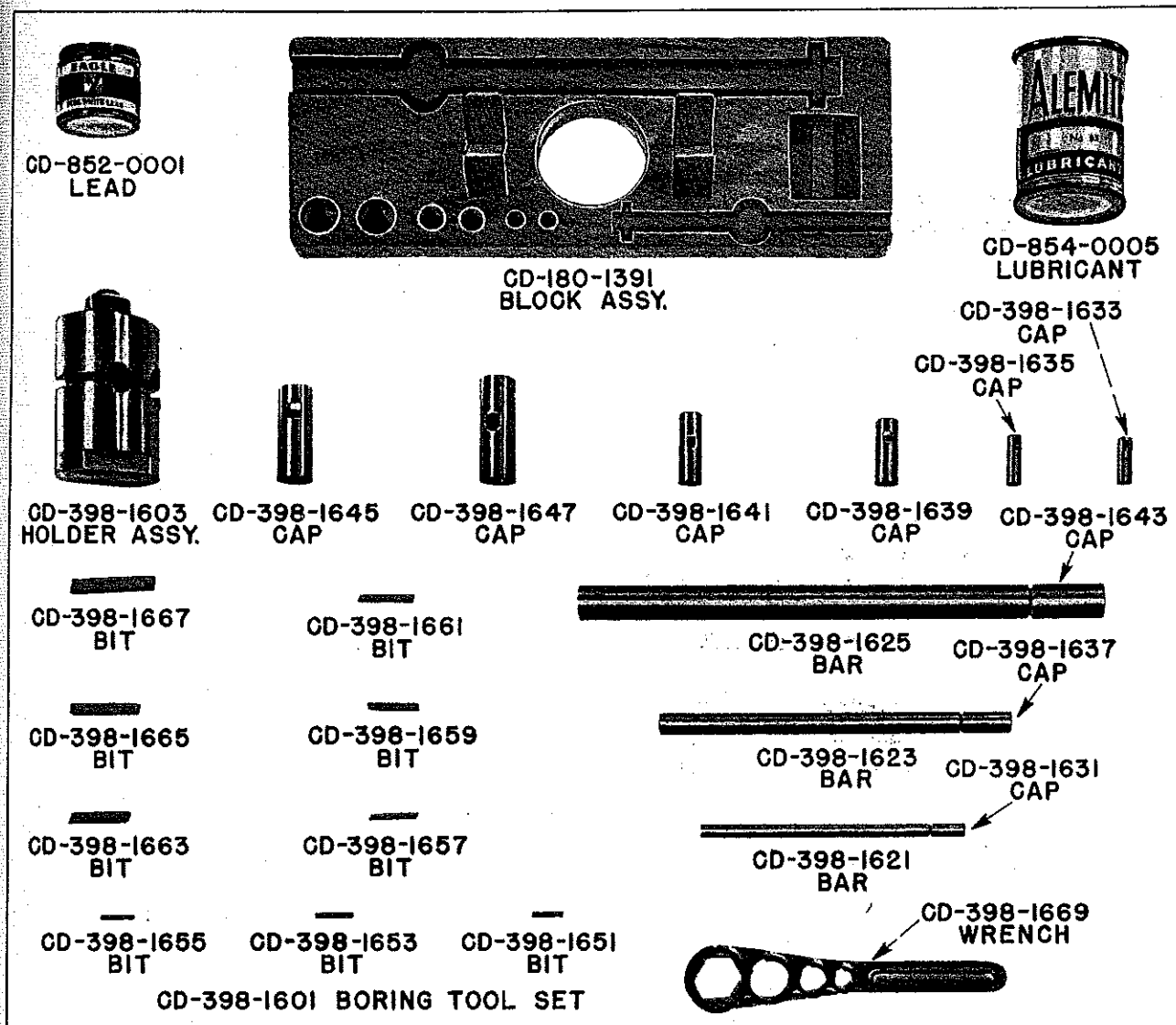


Fig. 199—Three Bar Boring Tool Set, White Lead and Alemite

LATHE DOGS

Eight lathe dogs are supplied and are stored on the shelf under the rear work bench on the left side. The five dogs for round work, shown in Fig. 200, range in capacity from $\frac{1}{2}$ " to $2\frac{1}{2}$ ". The two clamping dogs for square or rectangular work have a capacity of $1\frac{3}{4}$ " and $3\frac{1}{2}$ ". The safety clamp dog has an adjustable capacity of $\frac{7}{8}$ " to 2". All the dogs are used with the face plates in the lathe for turning work between centers. They also may be used in conjunction with the steady rest for cutting off or end turning operations.

FACE PLATES

There are three different size face plates on the shop. The large 28" face, mounted on the front bulkhead behind the lathe, can be used only when the gap bed is open. Large work is bolted or clamped to its face for various lathe operations. A gear, built into the back of this plate, engages with the auxiliary gear shaft on the front of the headstock to give the lowest speed for lathe turning and to relieve the lathe spindle of the driving strain. The 12" face plate is mounted on the lathe when the shop is shipped. This can be used for either driving the lathe

dogs or for clamping small work to its face. The 6" face plate is used mainly for driving the lathe dog when material is being worked between the lathe centers. This plate is mounted in a bracket on the front bulkhead on the left side.

Fig. 201 shows the four face plate clamps provided to clamp work to the face plates. These are used with either the 28" or 12" plates. These clamps are located on the shelf under the rear work bench, right side.

LATHE CHUCKS

6" and 8" four-jaw independent chucks are provided. Two three-jaw universal chucks are also supplied. (See Fig. 202). One is 5" in diameter and the other 8". Both are equipped with a set of reverse jaws. These chucks are mounted on either the front bulkhead or the lathe bench on the right side. The keys to operate all the chucks are located in brackets on the left side of the bulkhead.

The universal self-centering chucks are used to hold round or hexagonal work when it is not convenient to mount the work between the lathe

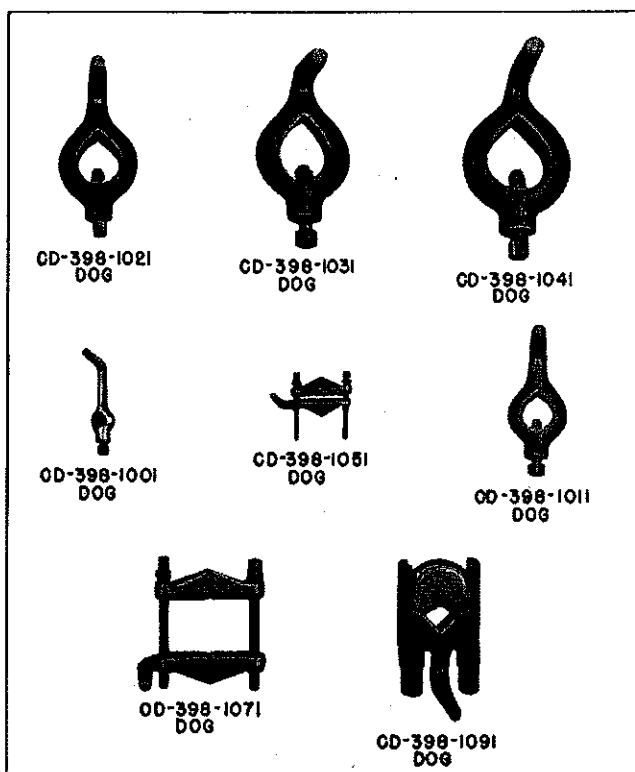


Fig. 200—Lathe Dogs

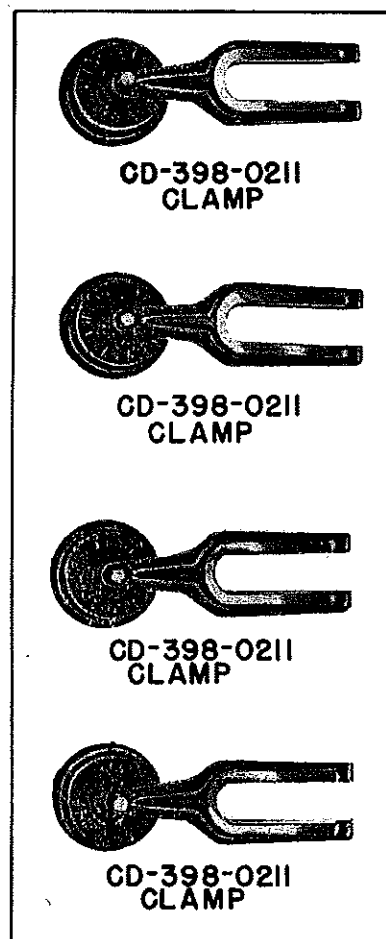


Fig. 201—Face Plate "U" Clamps

centers. The independent four-jaw chucks are used for holding work of irregular shape or for centering work in the lathe with greater accuracy than the universal chucks, which are not built to run closer than 3 to 5 thousandths. The two large chucks can be mounted directly on the lathe spindle in place of the face plate and should be used in preference to the two smaller chucks when the work will permit. These do not mount directly on the lathe spindle as the spindle thread is too large. A Couse chuck adapter is used to mount them. The adapter has a tapered shank (Fig. 203) which fits the taper of the lathe spindle. A large brass nut screws over the lathe spindle and holds the adapter in place. The small chucks can then be screwed on the threaded end of the adapter. This adapter is stored in a wooden box on the front bulkhead behind the file rack.

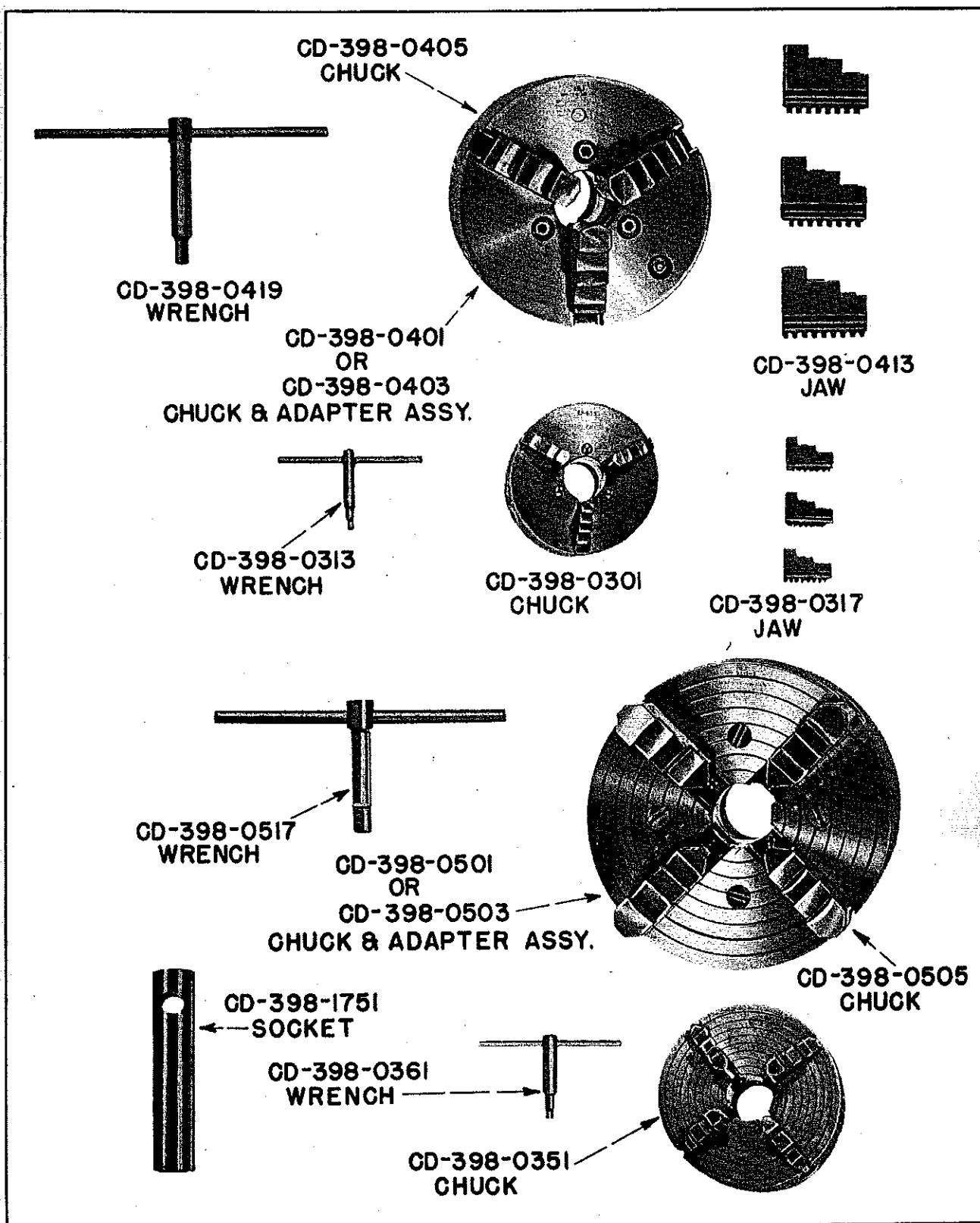


Fig. 202—Large and Small Universal and Independent Jaw Chucks

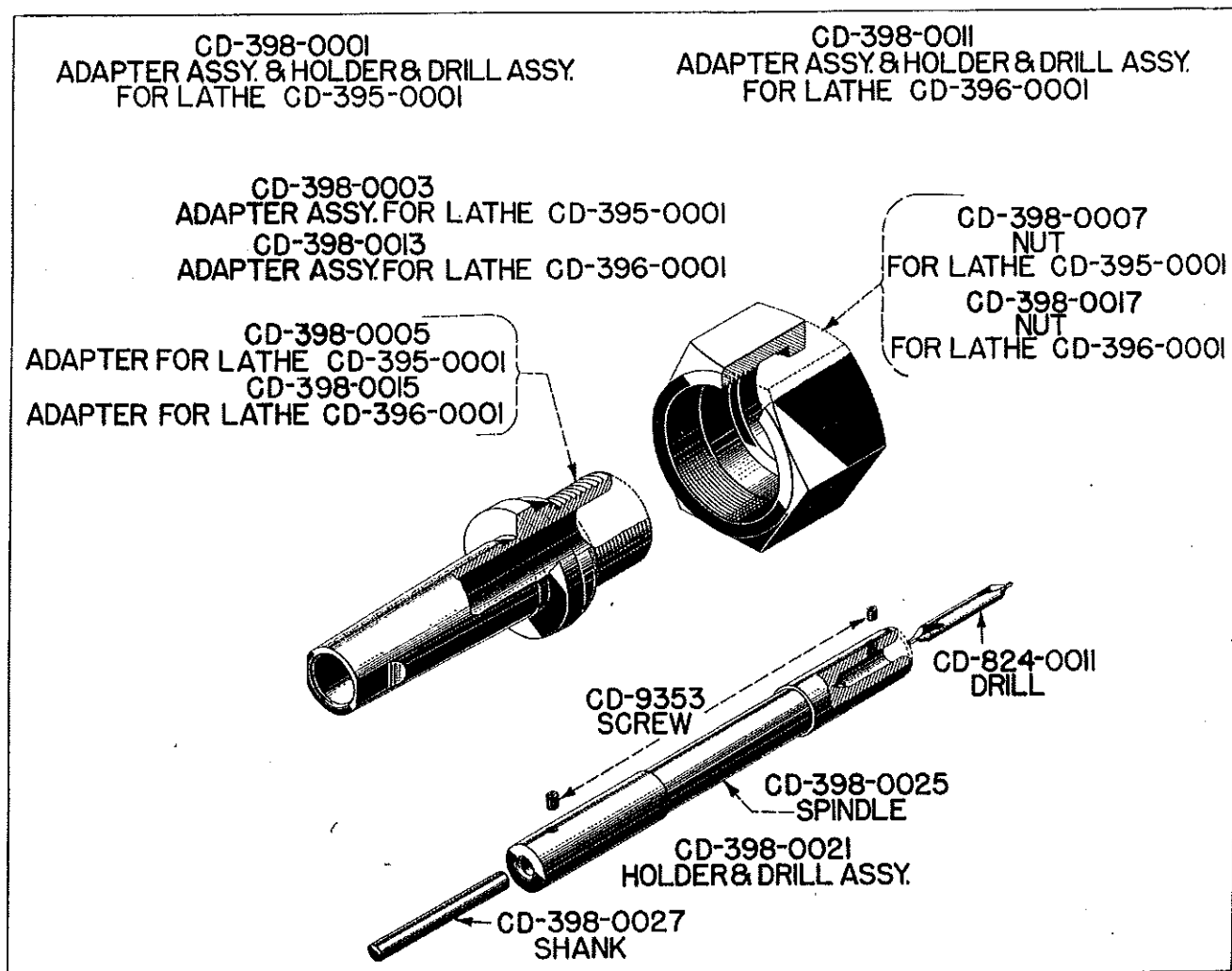


Fig. 203—Couse Lathe Adapter, Center Drill Holder and Drill

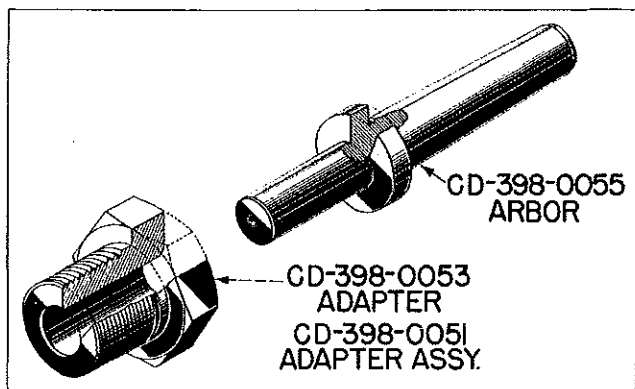


Fig. 204—Couse Live Center Chuck Adapter

The Couse lathe adapter can also be used to center-drill large round work where this operation cannot be done in the lathe. Its use for this purpose is explained under the operating instructions on page 243.

Another Couse chuck adapter of the "live center" type (Fig. 204) is supplied in the same box with the lathe adapter. The tapered shank is placed in the tailstock spindle. The threaded brass adapter is screwed into the back of one of the small chucks and the assembly is slipped over the arbor in the tailstock, upon which it rotates freely. This makes a convenient device for supporting the end of long work which cannot be mounted between centers. Hollow shafts, pipe, or long work of irregular shape can be turned in the lathe in this manner.

Fig. 205 illustrates the Sjogren collet chuck with which the lathe is equipped. It is mounted in a bracket on the front bulkhead. Just below the chuck, in a wood block on the shelf, is a set of sixteen collets (Fig. 206) used with the chuck. These range in size from $\frac{1}{16}$ " to 1" in steps of $\frac{1}{16}$ ". This assembly provides a rapid means of holding and driving bars and round stock in the lathe with much greater accuracy of centering than can be provided in any universal chuck.

LATHE CENTERS AND DRILL CHUCKS

In an oak block on the left side of the front bulkhead are mounted three drill chucks with tapered arbors, four Morse taper steel sleeves, and three lathe centers. The smallest drill chuck, as in Fig. 207, has a capacity of 0" to $\frac{1}{2}$ ", and is supplied with a No. 2 Morse taper

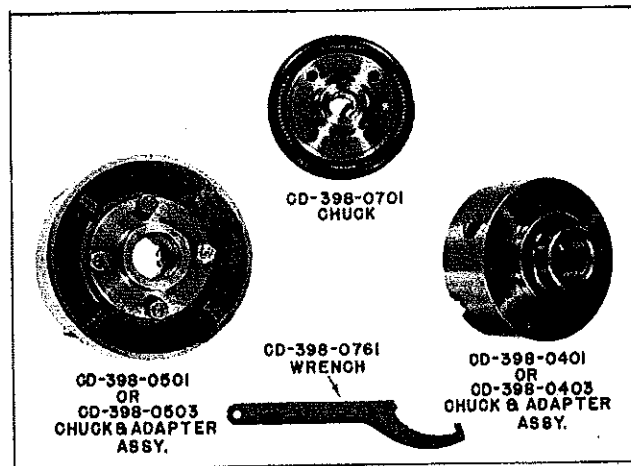


Fig. 205—Rear View of 10" Universal Chuck and 8" Universal Chuck, Showing Adapter, Also the Sjogren Collet Chuck and Collet Chuck Wrench

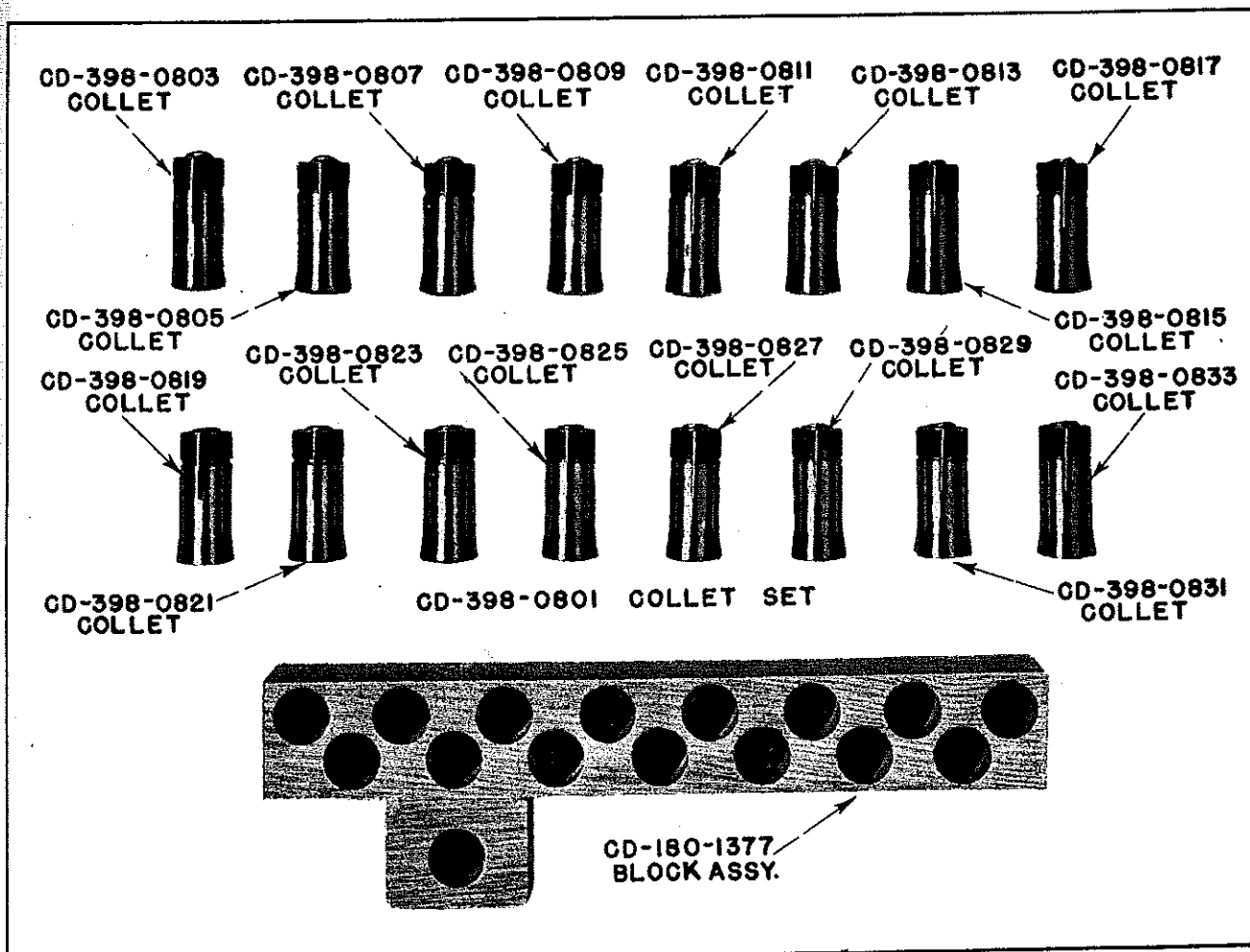


Fig. 206—Round Collet Set Used With the Sjogren Chuck

arbor. The other chucks are a $\frac{1}{8}$ " to $\frac{5}{8}$ " and a $\frac{1}{4}$ " to $\frac{3}{4}$ " capacity with a No. 3 Morse taper arbor. The $\frac{1}{4}$ " to $\frac{3}{4}$ " has brass jaws to form an adjustable bearing to support small armature shafts which are sometimes without center holes. These chucks can be used in the tailstock, which has a No. 3 Morse taper, or in the No. 4 Morse taper of the lathe spindle. The steel sleeves are used on the chuck arbors, where necessary, to match the tapers in the lathe.

The three lathe centers are for the tailstock, and are made of hardened steel. The live center is mounted in the lathe spindle with a steel sleeve having a No. 4 to No. 3 Morse taper.

The set of twist drills, also mounted on the front bulkhead, can be used in the lathe in conjunction with the Morse taper sleeves. The drills in this set vary in size from $\frac{1}{2}$ " to 1" in steps of $\frac{1}{64}$ ".

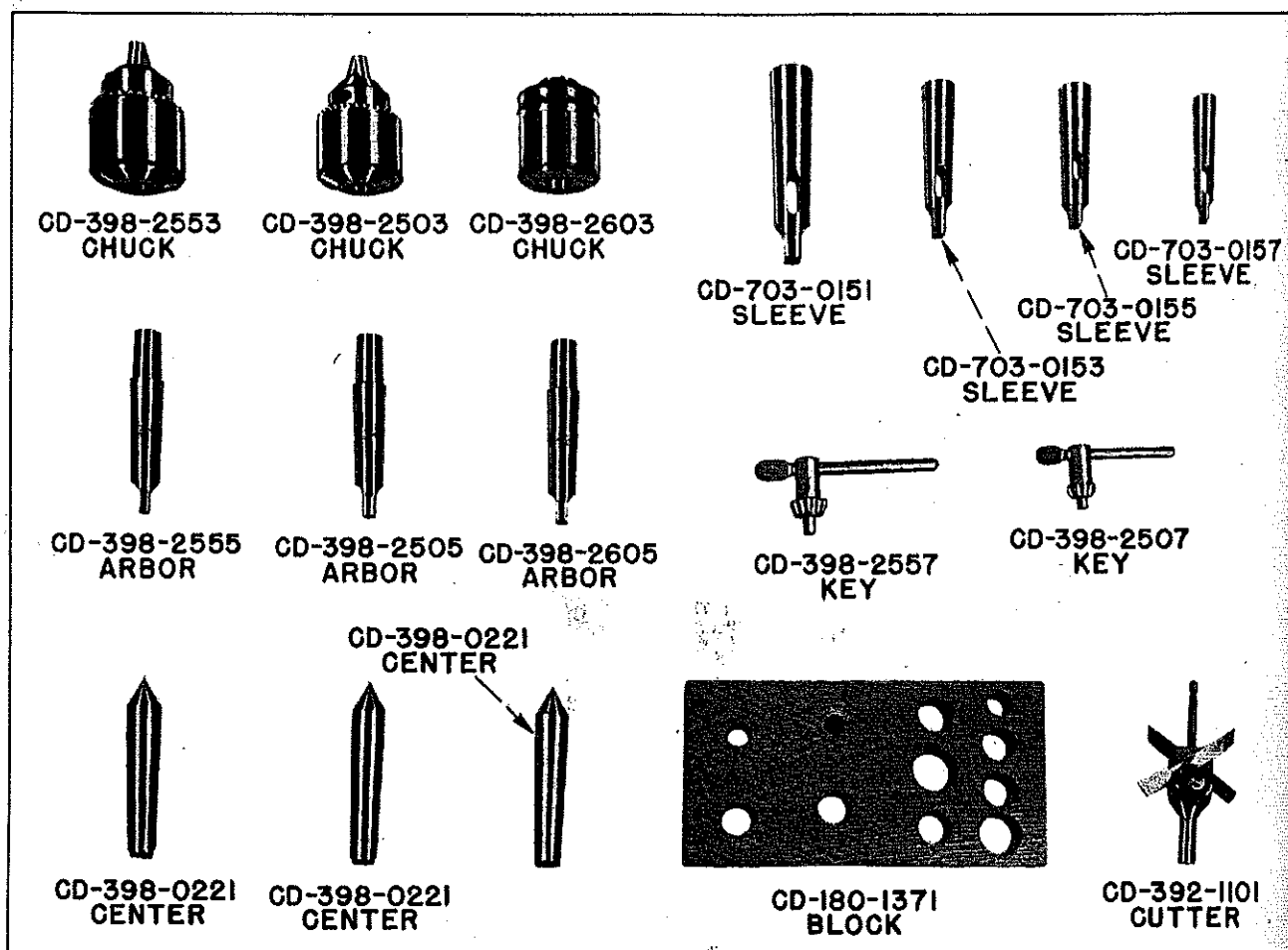


Fig. 207—Lathe Centers, Morse Taper Arbors, Jacobs Chucks, Chuck Keys, Morse Taper Steel Sleeves, Hole Cutter and Wood Block for the Above

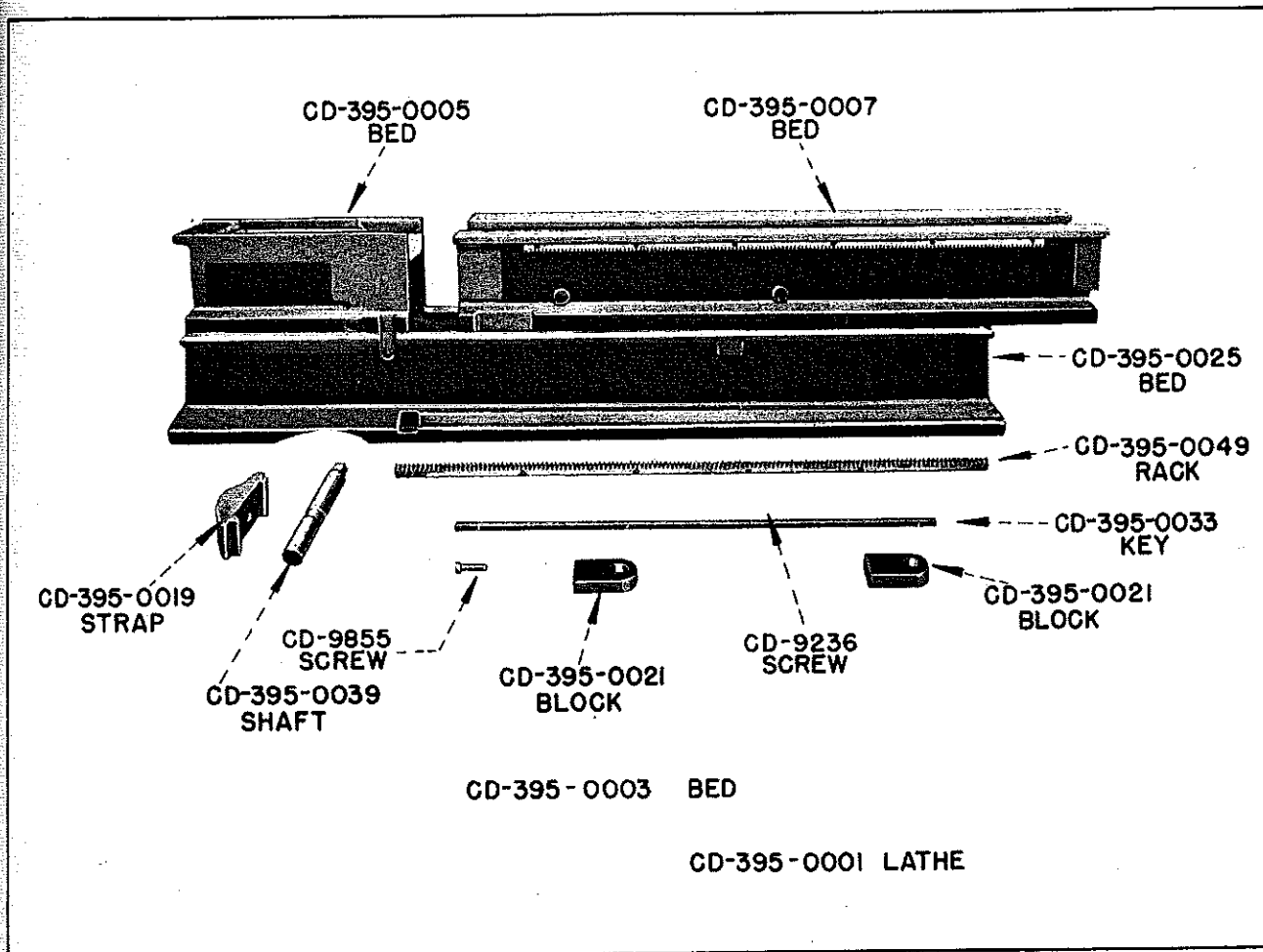


Fig. 208—Upper and Lower Bed for the Smith-Drum Lathe

SMITH-DRUM EXTENSION GAP BED ENGINE LATHE—OPERATION

LATHE BEDS

The lathe, having an adjustable gap, requires two beds, one above the other. The bottom bed (CD-395-0025) in Fig. 208 is stationary. The top bed (CD-395-0007) is movable. The stationary bed carries the headstock, mounted on top of the spacer bed (CD-395-0005), the quick change gear box, and the feed shaft mounted on its face. The feed shaft is the lower shaft on the front of the lathe. It is driven from the quick change gear box. The lead screw, which is mounted on the movable bed, is driven from the feed shaft by means of the set of gears carried on the headstock end of the mov-

able bed. A slip gear in this set slides over the feed shaft and transmits motion to the lead screw through the gear train. Besides carrying the lead screw, the movable bed holds the carriage, steady rest, and the tailstock.

When the lathe is in operation, the upper bed is clamped to the lower bed by means of two clamping devices of the eccentric type. The eccentric portion of the shaft, mounted in the movable bed, pulls the strap up against the underside of the ways of the stationary bed. This clamps the beds together. These clamps have to be loosened when the upper bed is moved. To do this, remove the tailstock wrench and reach over the lathe to its rear side. The

shafts of the two clamps project out to the back of the top bed at about the center of the lathe. Turn these shafts with the wrench to loosen the clamps.

To move the top bed after the clamps have been loosened, first see that the lathe spindle is clear and nothing is in the way of the bed as it moves. Start the lathe, and select a quick gear change to give a low speed to the feed shaft. The direction of rotation of the feed shaft controls the direction in which the bed will move. Check the bed moving nut (CD-395-0027). Refer to Fig. 196. See that the feed shaft rotation is correct. The rotation can be changed by shifting the gear quadrant in the gear train which drives the shaft from the spindle. See page 237. Swing the bed moving handle upward and move the bed to the desired position. Do not open the bed any more than is necessary to handle the work conveniently. Disengage the bed moving

nut by swinging the handle downward. Lock the bed in position by tightening the clamping devices with the tailstock wrench. The lathe can now be operated. The bed can also be moved by hand by pushing or pulling it to the desired opening. This method is safer, for if the clamps are not completely free, the power-driven half-nut may be stripped in attempting to move the bed by power.

HEADSTOCK

The headstock is illustrated in Fig. 209 which shows the spindle and gearing with the gear guards removed. Power is transmitted from the motor drive to the spindle cone pulley (CD-395-0175) by a leather belt. An endless leather belt is provided to avoid the click of a belt fastening. The three steps of the cone provide for the initial spindle speed selection. With the belt on the

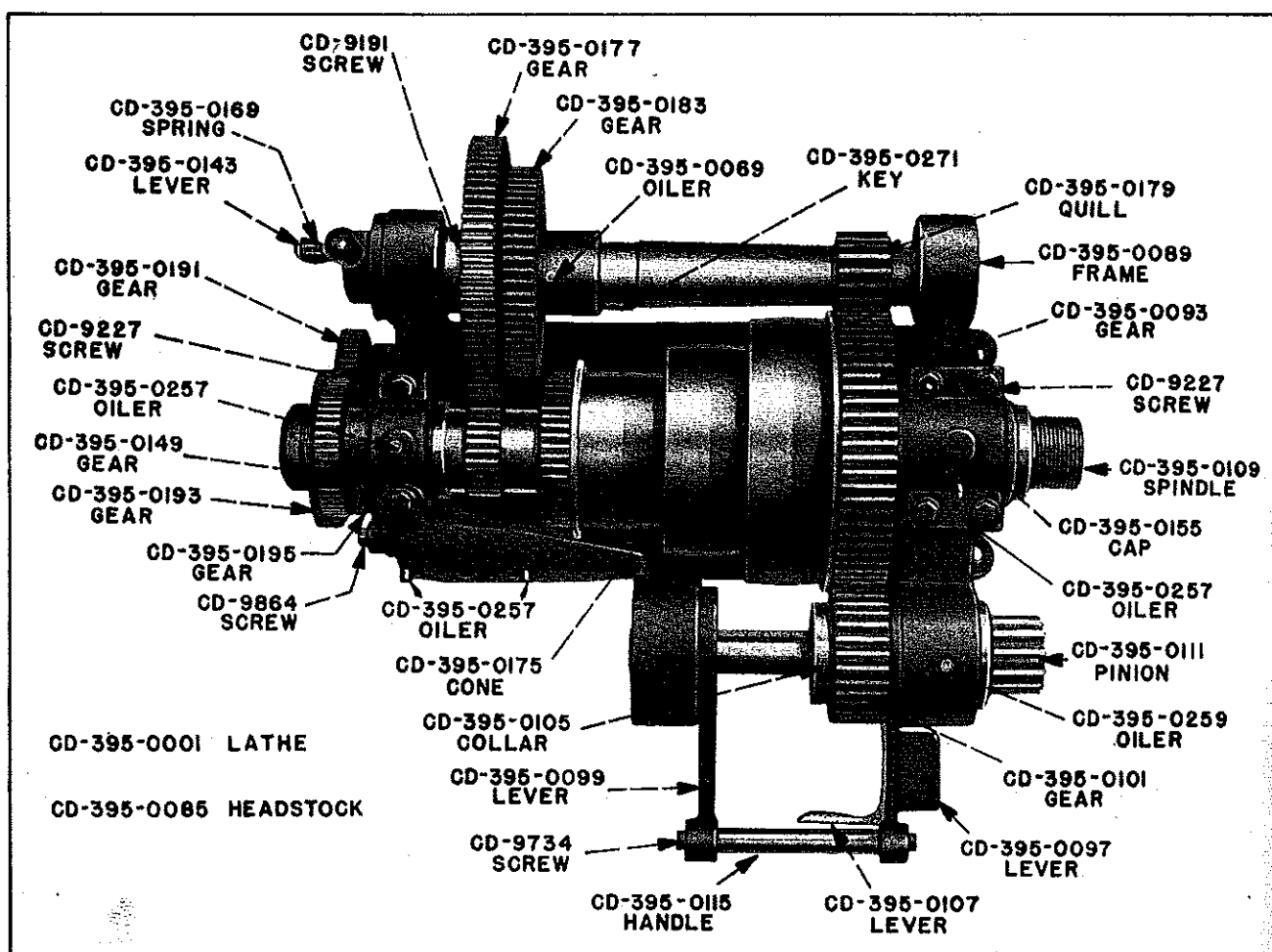


Fig. 209—Assembled Headstock for the Smith-Drum Lathe

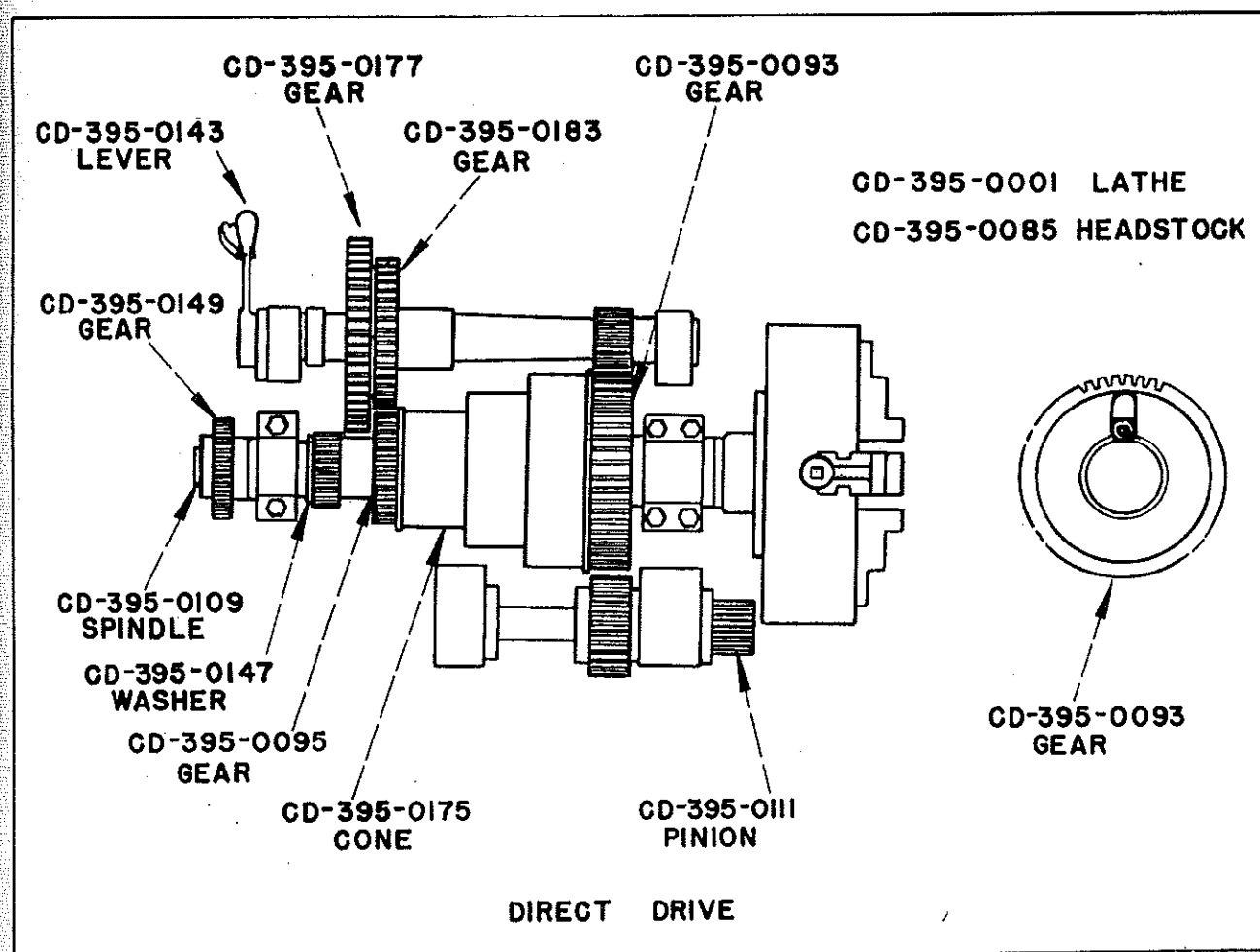


Fig. 210—Positions of Back Gears and Spindle Lock for Direct Drive, Cone to Spindle

first or smallest step, a spindle speed of 273 RPM is obtained. The middle step gives 167 RPM, and the third or largest step, 104 RPM. Additional speed and power variations are possible through the headstock back gearing.

Highest spindle speeds, as given above, are obtained when the spindle and cone pulley are locked together and rotate as a unit. A disc, keyed to the spindle, and mounted in the large end of the cone behind the spindle gear (CD-395-0093) in Fig. 209, is locked to the cone when the locking device is in the position shown in Fig. 210. The disc and locking device is illustrated in Fig. 211. The locking device is placed in this position by first opening the gear guard behind the face plate and swinging it up out of the way. Disengage the back gears by placing the shift levers in the positions shown in Fig. 210. Turn the spindle and spindle gear until the

locking device can be reached. Loosen the lock with an Allen wrench and slide it down toward the spindle to the position shown. Turn the cone by hand, so that the lock engages properly. Tighten the Allen screw in the lock. In this position, the cone and spindle are locked together and rotate as a unit. The Allen (hex.) wrench is bent into a suitable shape to reach the lock.

Two back gear speed ratios are available. When the gears are engaged as shown in Fig. 212, the cone to face plate speed are 4.5 to 1. When the gear (CD-395-0177) is pushed over so it engages the smaller cone gear (CD-395-0095) the ratio is 10 to 1. This is shown in Fig. 209. The large double back gear is mounted on the quill as shown in Fig. 213. A spring-loaded ball engages with grooves in the quill and holds the double gear in either position. These gears are shifted by hand on the quill when the back

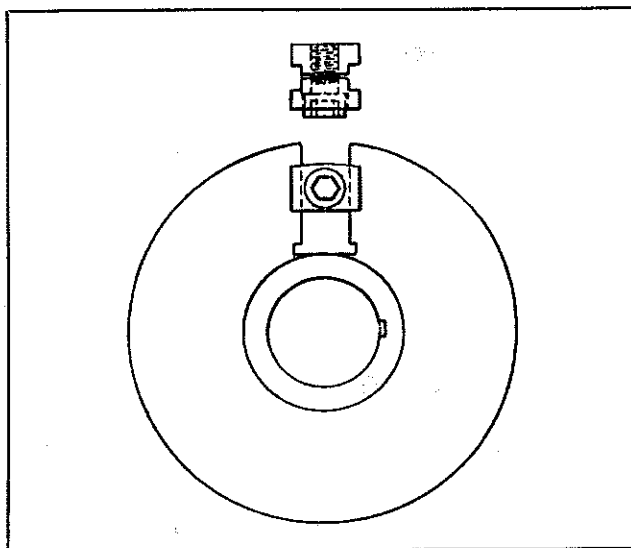


Fig. 211—Lathe Spindle Disc and Lock

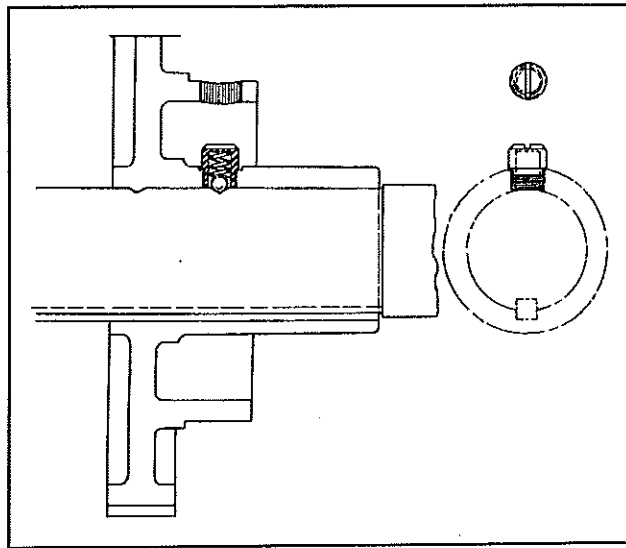


Fig. 213—Quill Mounting of 2-Speed Back Gears

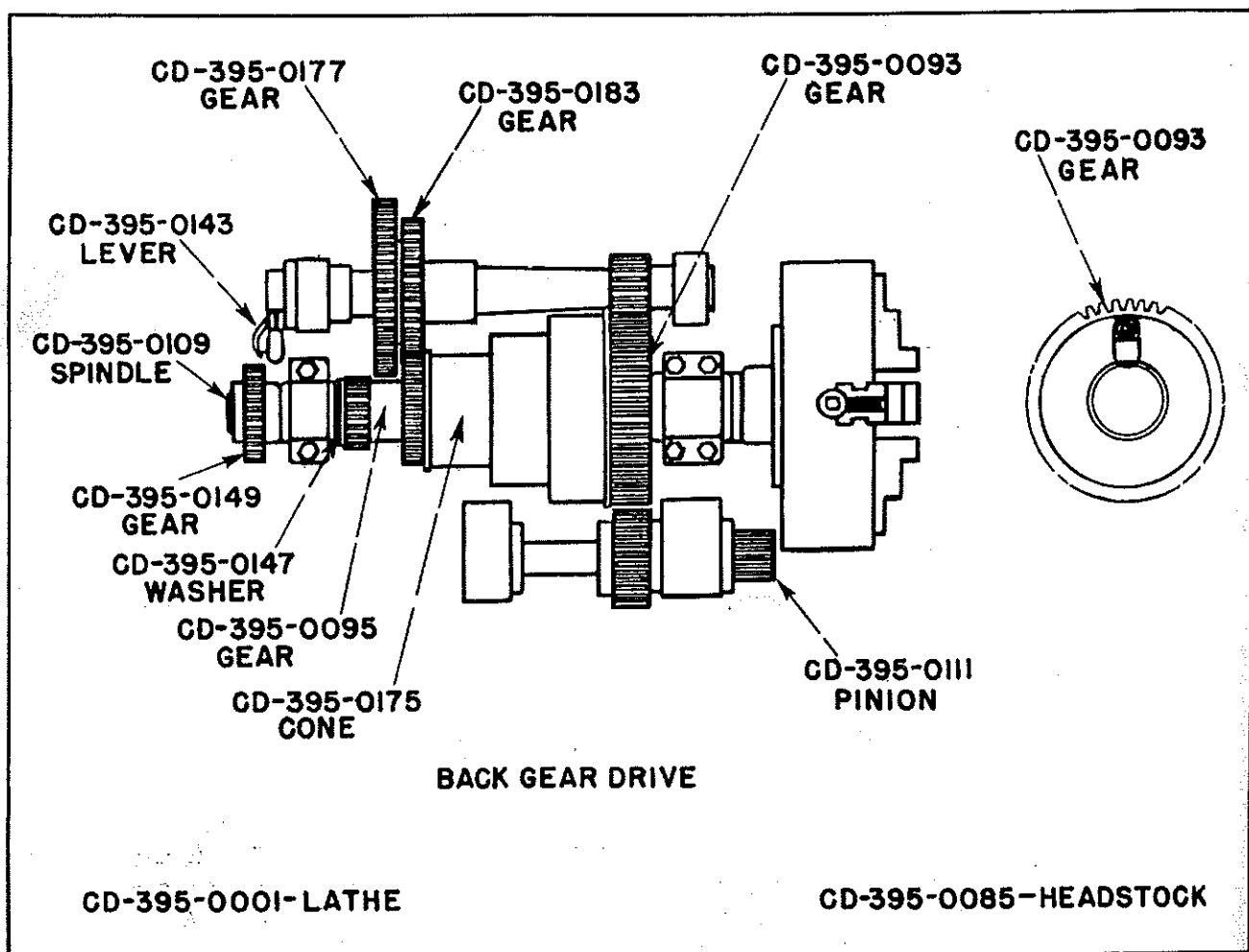


Fig. 212—Position of Back Gears and Spindle Lock to Drive Spindle Through Back Gearing

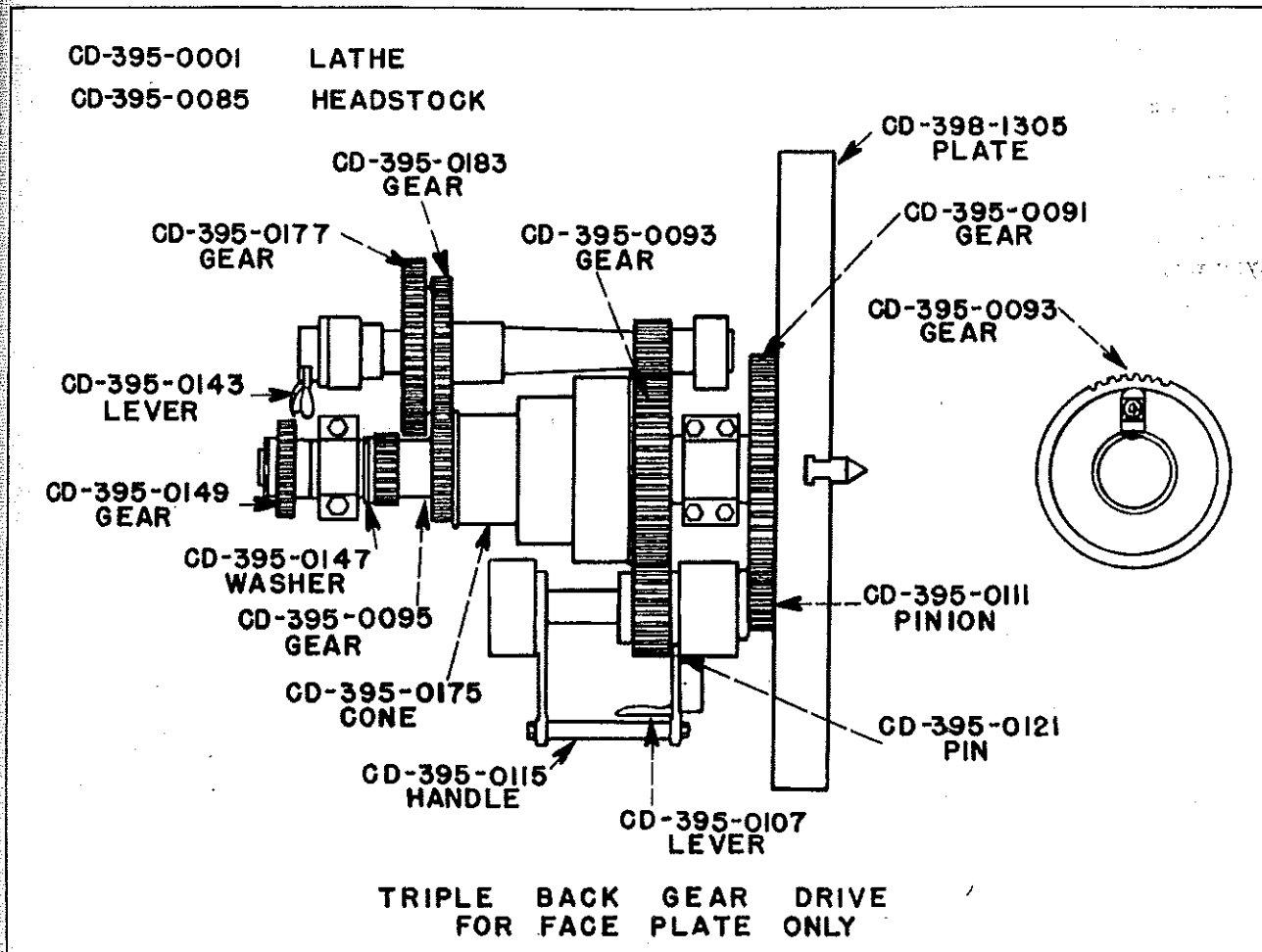


Fig. 214—Position of Back Gears and Spindle Lock to Drive 28" Face Plate

gear is disengaged. To engage the back gear, first open the gear guard and turn the spindle until the locking device can be reached. Loosen the Allen set screw and shift the lock until it is in the highest position as shown in Fig. 212. This locks the spindle to the spindle gear (CD-395-0093). Tighten the Allen screw. Next shift the double back gear along the quill to give the desired speed ratio. Squeeze the back gear shift lever (CD-395-0143) and bring it forward as far as it will go, as shown. Turn the cone while the shift is being made as this will help bring the gears into mesh. The auxiliary gear on the front of the headstock should be disengaged with the lever down. NEVER shift back gears while the lathe is in motion.

The slowest spindle speed of the lathe is obtained only when the large face plate is mounted. The triple back gear then drives the face plate through the front auxiliary shaft. For this

drive, the locking device on the spindle disc is clamped in a neutral position as shown in Fig. 214. This should be done before the face plate is mounted on the spindle. The back gears are then engaged as already explained. The front auxiliary gear is engaged by swinging the shift lever (CD-395-0107) up as far as it will go. The pinion (CD-395-0111) then engages the gear (CD-395-0091) on the rear of the face plate. If a higher speed is required with the large face plate, the front auxiliary gear is disengaged by swinging the shift lever down. The locking device is set in its topmost position and the back gears are used to drive the spindle. High speed should be avoided as the driving of the large face plate is then done by the spindle threads instead of the built-in gear.

The large face plate can only be mounted on the lathe when the gap has been opened. If the plate is being used for the first time, it

should be checked for trueness and, if necessary, resurfaced with a light cut. This is explained on page 250. The plate is a large thin casting and is liable to warp until seasoned.

TAILSTOCK

The tailstock, Fig. 215, is of the "cutaway" type which allows the compound rest to be swung around parallel to the ways of the bed. It is provided with "set-over" or lateral adjustment screws for taper work and for maintaining perfect alignment with the headstock. When the two clamp bolt nuts are loosened with the tailstock wrench the tailstock may be moved longitudinally to any desired point on the ways. These nuts must be tight when the lathe is in use.

A description of the adjustment of the tail-

stock to bring it into alignment with the headstock is given on page 242. The use of "set-over" screws for turning tapers is described on page 255.

Clockwise rotation of the tailstock handwheel moves the spindle and dead center toward the headstock. Do not have the spindle extended far out of the tailstock for heavy work. The binder lever which locks the position of the spindle must always be tightened when the lathe is in use.

An oil dip fits into a small reservoir in the tailstock top and is used to carry oil, or white lead, to the dead center when turning. The dead center should be well lubricated and not adjusted too tightly against the work. It must be readjusted frequently to allow for the heat expansion of the piece being turned.

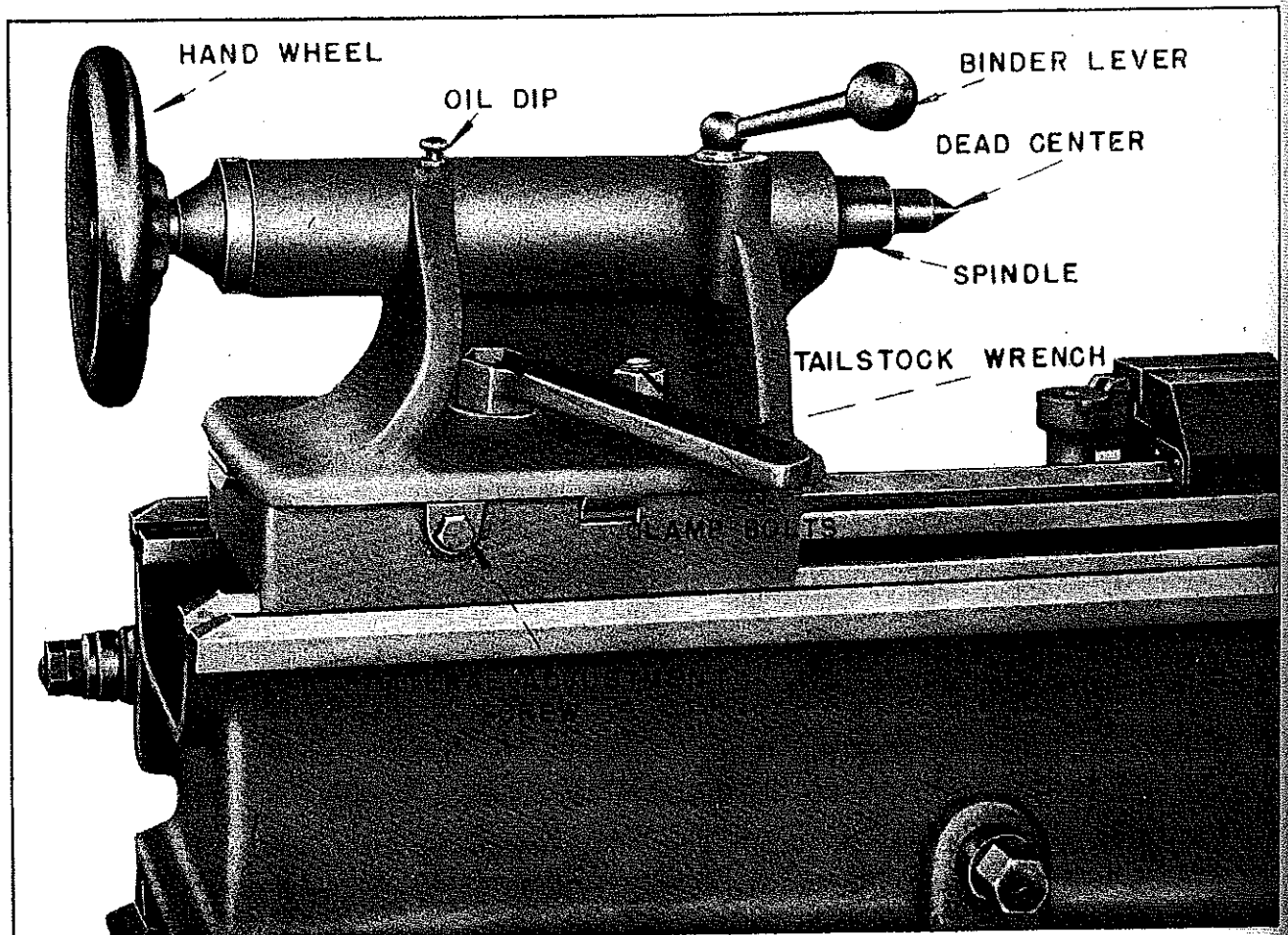


Fig. 215—Tailstock Viewed from the Rear of the Smith-Drum Lathe

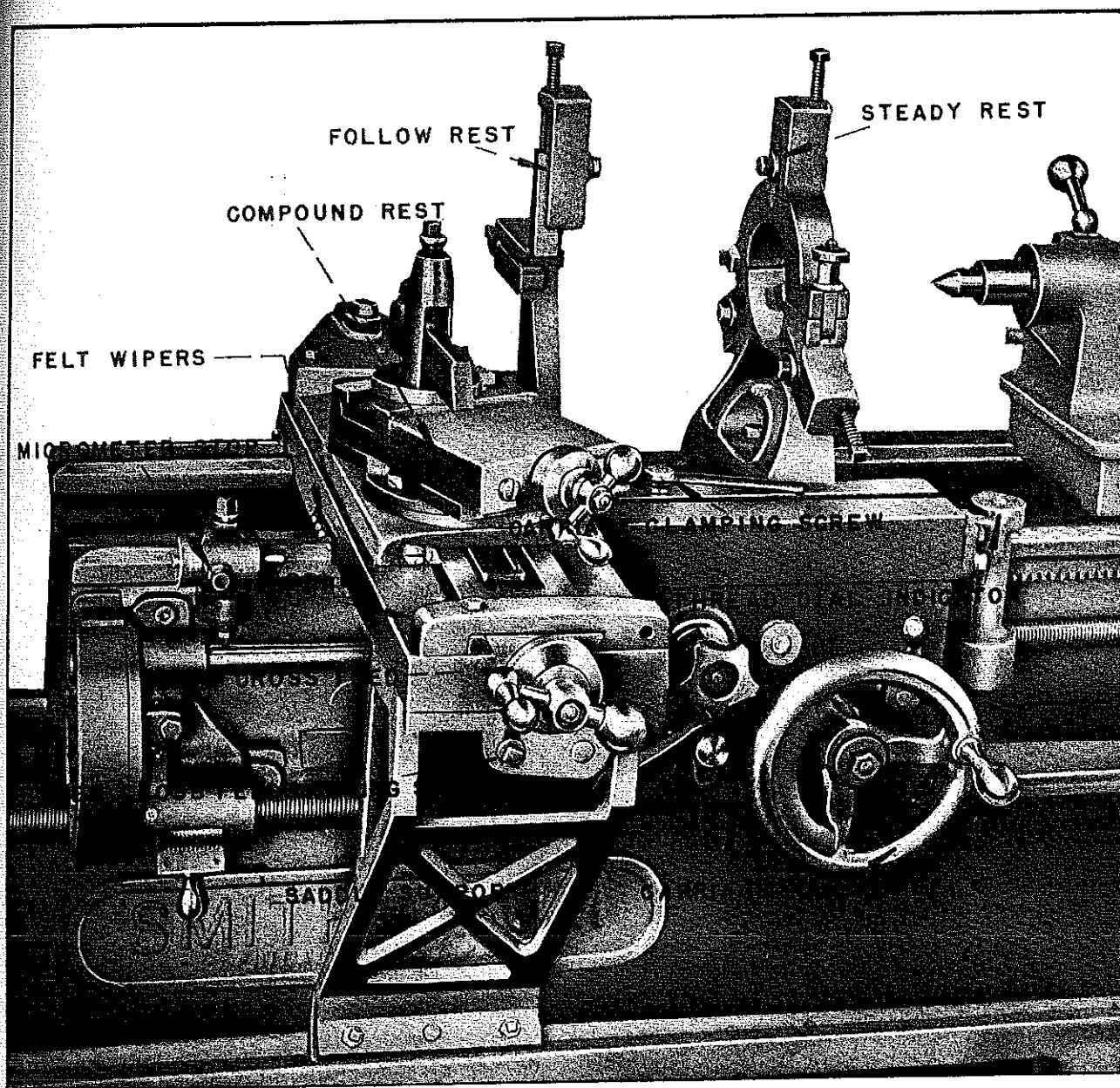


Fig. 216—Smith-Drum Lathe Carriage. Steady and Follow Rests are Shown in Mounted Positions

CARRIAGE

Carriage is the term applied to the whole central assembly which carries the turning tools and accomplishes the longitudinal and cross movements. Its components, as shown in Fig. 216, are the saddle, the cross-feed and compound rest, the apron, and the saddle support. Longitudinal movements of the carriage along the bed ways are accomplished manually with the carriage handwheel. Manual cross movements are made with the hand cross-feed crank handle. Power feeds for these movements are explained

under the operation of the APRON on page 236.

The carriage clamping screw (turned with the tool post wrench) which locks the carriage to the bed, should always be loose except when facing or cutting-off operations are performed. The power cross-feed pinion should always be out of mesh, with the clamping screw in the position shown (bottom of slot) when the power cross-feed is not used.

Six felt wipers are provided where the saddle contacts the ways. These should be kept well lubricated.

COMPOUND REST

The compound rest, as shown in Fig. 217, mounts on the dove-tail slide of the carriage saddle. It provides for cross and angular movements of the cutting tool. The tool post mounts in a T-slot in its top.

Rotation of the carriage cross-feed handle moves the compound rest at right-angles to the lathe bed. Angular movements of the tool are

accomplished by turning the compound rest screw handle after the rest has been offset at the desired angle. Both screw handles are equipped with micrometer index collars. These may be set to the zero mark at any position of the screw by loosening the knurled lock nut. Angular settings of the compound rest are made by loosening the two binder screws (one is shown in Fig. 217) and turning the rest in either direction. The base is graduated in degrees: 90°

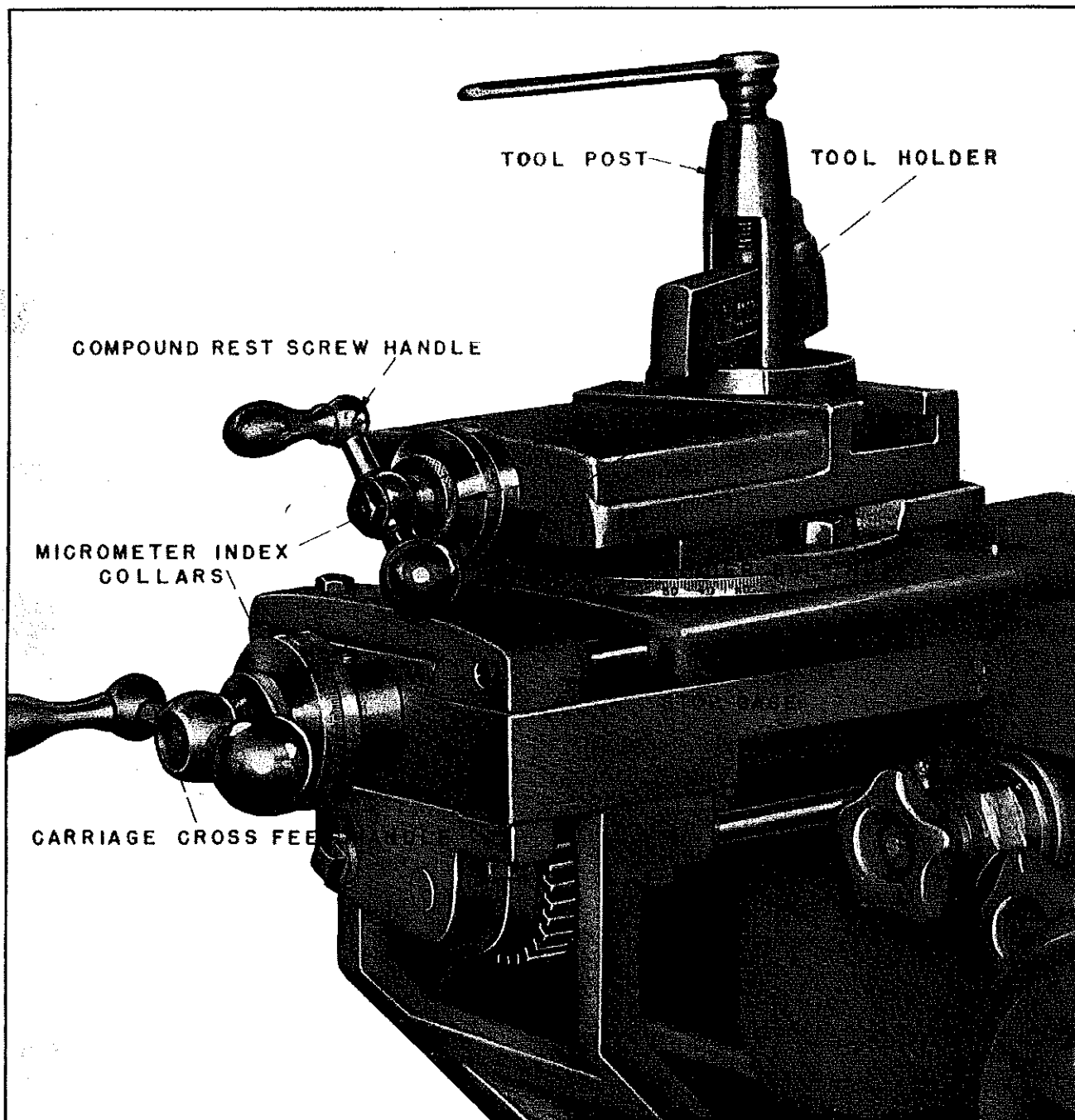


Fig. 217—Compound Rest and Cross-Feed Slide of Smith-Drum Lathe

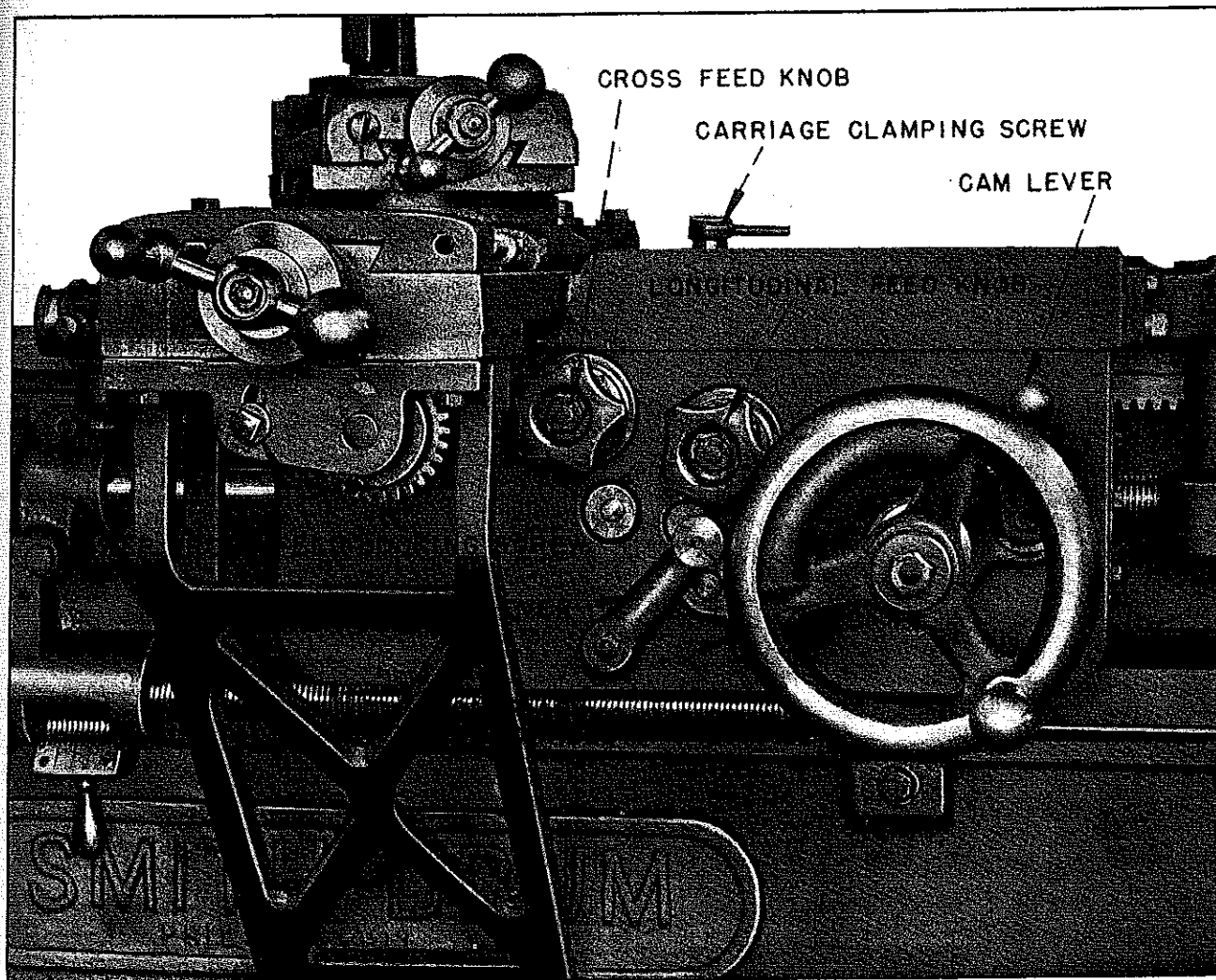


Fig. 218—Carriage Apron and Power Feeds

in each direction from 0. The binder nuts should be tightened after the setting is made.

The compound rest feed screw should be used only for angular movement of the tool. The carriage cross-feed handle is used for all movements of the tool across the lathe bed: that is, for facing work. The reason for this is that the compound rest cannot be set exactly at zero without careful measurement. The rest always has some angularity, and does not have the precise 90° setting with the lathe center line, as does the carriage cross-feed. When making heavy cuts, the compound rest should not overhang its base.

Both the top and base of the compound rest

are equipped with adjustable taper gibs in the dovetail slides. These, as well as the back and front saddle gibs, should be adjusted at regular intervals. The base gib should always fit snugly as this slide is used continually.

When the compound rest is not in use, it should be offset about 20° as in Fig. 216. In this position, it will not interfere with the operation of the carriage cross-feed handle.

The stop gage, equipped with a knurled adjusting nut, is used when cutting threads to regulate the depth of each successive cut, or to bring the cross slide back to the same position after withdrawing the tool for the return trip to the beginning of the thread.

APRON

The apron contains the power feed mechanism for operating the carriage and cross-feed, also

it mounts the various controls. These are shown in Fig. 218.

The power cross-feed is operated by first loosening the power cross-feed locking screw with

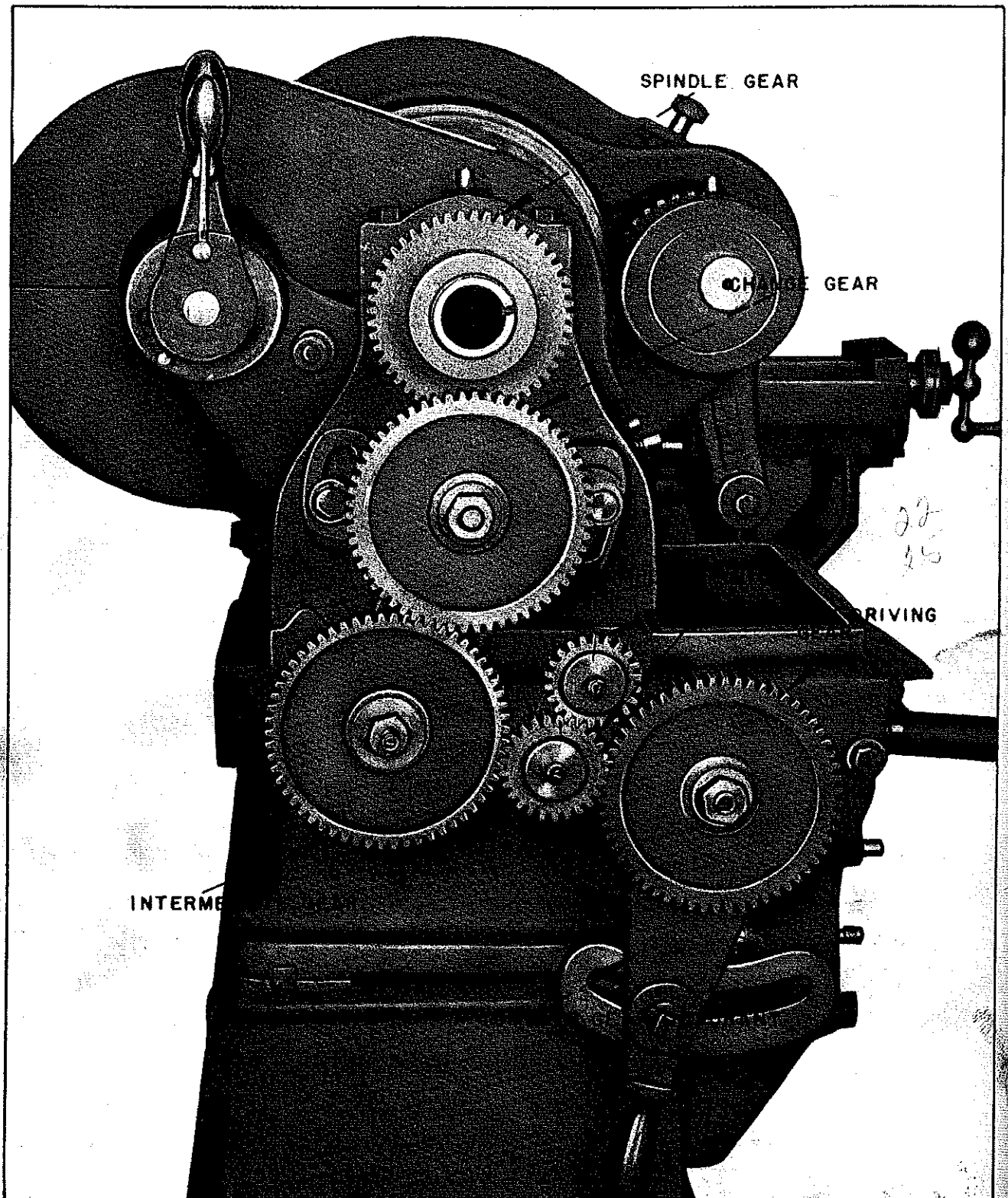


Fig. 219—Change and Tumbler Gears of Smith-Drum Lathe

the tool post wrench. Raise the screw to the upper position in the slot and re-tighten. Lock the carriage to the lathe bed by tightening the carriage clamping screw. Then tighten the cross-feed knob by turning it clockwise. The direction of feed is controlled by the feed reverse lever. In the "Up" position, with the lead screw rotating clockwise as viewed from the tailstock end, the tool moves toward the operator. In the "Down" position, the tool moves away from the operator. The center position is neutral.

Longitudinal power feed of the carriage is applied in the following manner: loosen the carriage clamping screw, then loosen the power cross-feed locking screw and swing it to the lower position in the slot. Next, tighten the locking screw, loosen the cross-feed knob and tighten the longitudinal feed knob. The carriage will move toward the headstock when the feed reverse lever is in the "Up" position. With this lever in the "Down" position, the carriage moves towards the tailstock.

The cam lever operates the lead screw split-nut which is used for thread cutting. In its "Down" position, the split-nut is closed on the lead screw to drive the carriage. In this position both the power feed knobs automatically become ineffective.

CHANGE AND TUMBLER GEARS

The change and tumbler gears are mounted on the headstock end of the lathe and provide the drive between the spindle and the quick-change gear mechanism. Fig. 219 illustrates these gears with the gear guard removed. The tumbler pinions have two settings, as in Figs. 219 and 220. These give different directions to the rotation of the lead screw. When the tumbler gear quadrant lever is in the position shown in Fig. 219, the lead screw rotates clockwise, as viewed from the tailstock end. This is the direction of rotation for cutting right-hand threads. With the quadrant in the other position, as in Fig. 220, the lead screw rotates counter-clockwise, and left-hand threads can be cut.

The rotation of the lead screw can be changed by loosening the locking screw in the quadrant and swinging the lever over as far as it will go. Turn the lathe spindle by hand to help bring the gears into mesh. Lock the new setting of the quadrant with the screw. It is not necessary to remove the gear guard to make this change.

The tumbler gear quadrant supplied with the lathe carries a 58 tooth driving gear. This gives

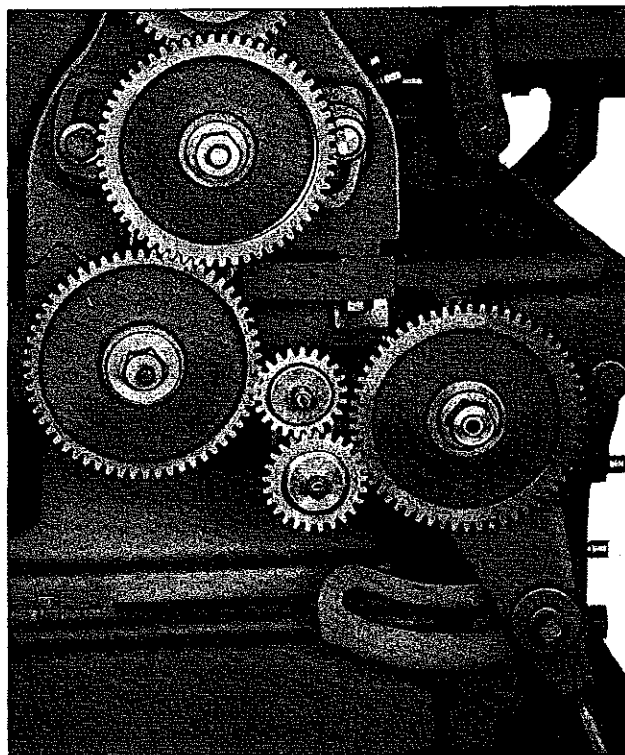


Fig. 220—Tumbler Gears in Alternate Position to Reverse Lead Screw Rotation

a range for thread cutting of 4 to 32 threads per inch.

The change gear and the intermediate gear mounted on the lathe in conjunction with the 58-tooth driving gear give a range of ratios for thread cutting of 4 to 32 threads per inch.

Various change gears can be used in place of these to give special driving ratios of the lead screw. These are installed when metric thread cutting is desired. Operating instructions for thread cutting are given on page 251.

QUICK CHANGE AND FINE FEED GEARS

The quick change and fine feed gears are mounted on the stationary lathe bed below the headstock, as illustrated in Fig. 221. This mechanism provides for practically all the power feed changes obtainable with the lathe. The 58 tooth driving gear on the tumbler quadrant mounts on the left end of the upper, or driving, shaft of the quick-change gear box. This gear drives the quick-change mechanism from the spindle through the change and tumbler gearing.

Any desired speed of the power feed is obtained by positioning the upper and lower levers according to the direct-reading index plate. The letters (A, B, and C) in Fig. 222, on the plate

show the three positions of the lower lever. Each of the nine columns of numbers on the plate represent one of the nine positions of the upper lever. The large number in each square indicates the number of threads per inch which that setting of levers will give. The upper small number, over each large number, is the carriage feed in inches when the fine feed lever is in "Thread Cutting" position. When the fine feed lever is in the "Fine Feed" position, the carriage feed in inches is shown by the small number in each square under the number of threads per inch.

The fine feed gear box is merely a multiplier gear set interposed to make very fine feeds available. It must therefore always be in direct drive or "Thread Cutting" position whenever threads are to be cut, and is of no value for feeds of .0143" or coarser. These can be obtained without it.

As an example for setting these levers, suppose 24 threads per inch are to be cut. The index plate shows that the lower lever should be in position "B." The upper lever should be in the fourth hole from the left end of the row of nine holes. The fine feed lever in the "Thread Cutting" position will give 24 threads per inch. The carriage is driven by the lead screw split-nut when cutting threads. This is engaged by swinging the cam lever on the carriage apron to the "Down" position. All "feeds" derive their power from the lead screw keyway—not its threads.

The lower lever is changed by pulling out the knurled knob and swinging it over to the desired position. The spindle should be turned by hand to bring the gears into mesh more readily. The upper lever is changed by pulling out its knurled

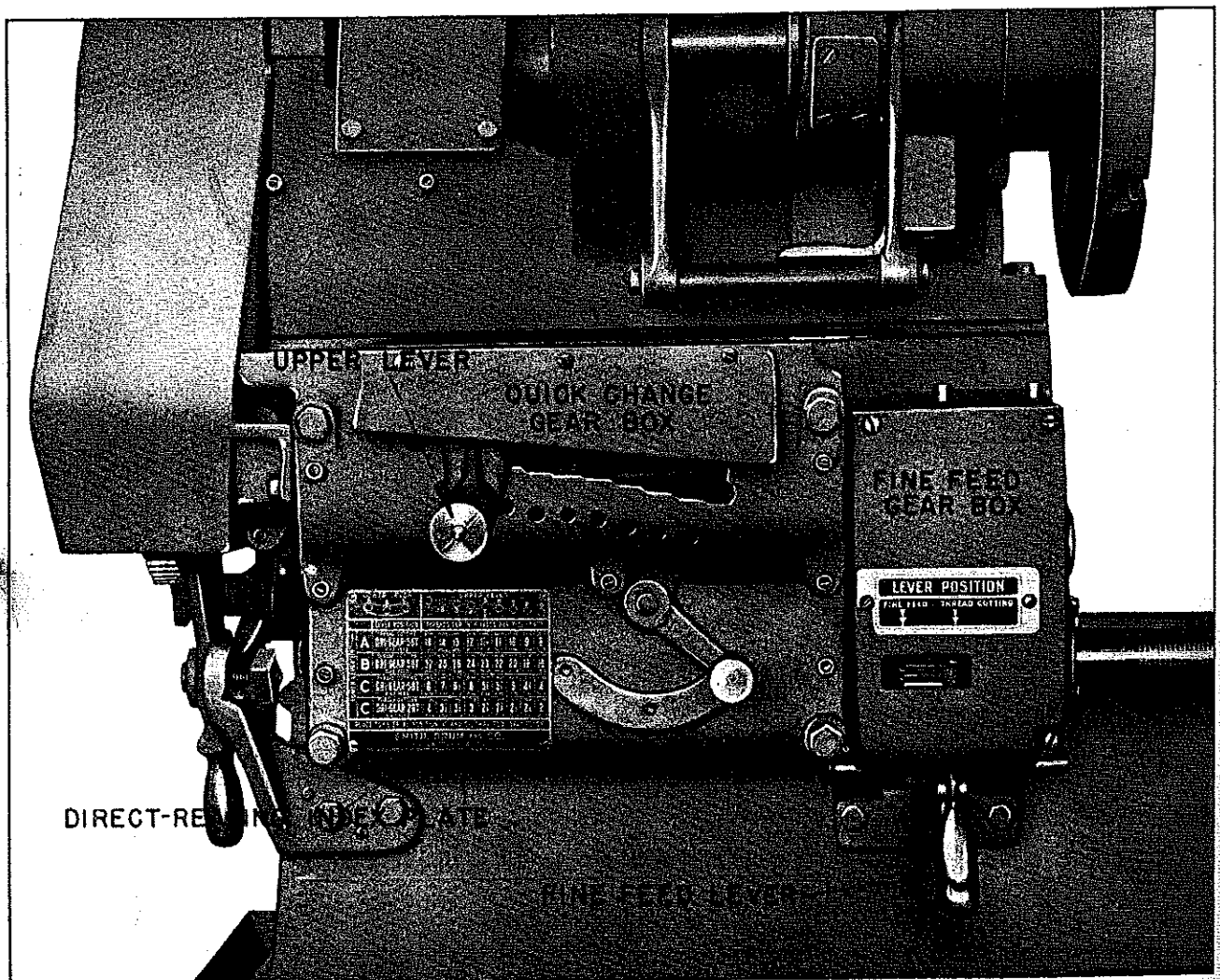


Fig. 221—Quick Change and Fine Feed Gear Boxes of Smith-Drum Lathe

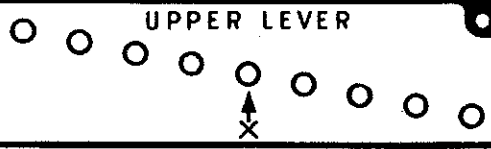
LOWER LEVER		UPPER LEVER									
											
LOWER LEVER ON	LEVER POSITION	THREADS PER INCH · FEEDS PER THOUSANDS									
	A	THREAD CUTTING	0286 16	0326 14	0352 13	0373 12	0400 11½	0416 11	0458 10	0508 9	0572 8
		FINE FEED	0054	0062	0068	0072	0076	0078	0086	0096	0108
	B	THREAD CUTTING	0143 32	0163 28	0176 26	0189 24	0200 23	0208 22	0229 20	0254 18	0286 16
		FINE FEED	0027	0031	0033	0036	0038	0039	0043	0048	0054
	C	THREAD CUTTING	0572 8	0652 7	0704 6½	0756 6	0800 5¾	0832 5½	0916 5	1016 4½	1144 4
		FINE FEED	0108	0124	0132	0144	0152	0156	0172	0192	0216
PLACE TUMBLER AT POSITION "X," AND OIL THRU TOOL TRAY PLUGS.											
SMITH, DRUM & CO. PHILADELPHIA, PA.											

Fig. 222—Index Plate Giving Lever Settings for Thread Cutting and Carriage Feeds

knob and swinging the lever up. Slide it to its new position, swing down and bring the gears into mesh. Be sure the pin seats into the hole in the gear box cover. Before shifting the fine feed lever, swing the plate marked LEVER POSITION up, so that the gearing can be observed. Turn the lathe spindle by hand until the fine feed clutch lines up with the pinion. The lever can then be shifted to the desired position.

The finest feed obtainable with the fine feed lever in the "Thread Cutting" position is .0143". With the lever in "Fine Feed," the finest feed will be .0027". The fine feed gear box is necessary for feeds between these two figures only.

MOTOR DRIVE AND CONTROL

The lathe is driven from a 1½ HP, 110 volt, 60 cycle, 3 phase motor through a 12:1 reduction gear to give a pulley speed of 144 RPM. A flat leather belt transmits the drive from the three step pulley to the lathe spindle cone. The drive is mounted over the headstock as shown in Fig. 195.

Belt shifting is accomplished by means of a lever which rocks the motor and pulley to tighten or loosen the belt. The handle of this lever projects out from under the drive. When the belt is loose, the handle points to the left. The

belt is tightened by twisting the handle in a clockwise direction until it locks and points to the right. The drive is disengaged in reverse manner. Means are provided on the lever and connecting linkage for adjusting the belt tension.

Electric power to drive the motor, is obtained either from the generator-air compressor unit on the shop, or from an external source of power. Detailed instructions for supplying power to all the shop electrical equipment in either manner, are given in the ELECTRICAL EQUIPMENT OPERATION section, starting on page 47. When the shop is supplied with electric power, the lathe motor can be started by placing the LATHE MOTOR switch on the main panel in the ON position and then by putting the lathe reversing drum switch in the FORWARD position. This drum switch is mounted on the right of the front bulkhead under the tool shelf. It has three positions. When the handle is pushed to the right, the lathe spindle will have forward rotation for normal operation. When the handle is pulled to the left, the spindle will rotate in the reverse direction. Note that the short arm on the top of the switch moves in a direction opposite to that of the switch handle. The power is off when the handle is in a neutral position between

FORWARD and REVERSE. Refer to Figs. 55 and 55A on page 44. The reversing switch can be thrown directly from FORWARD to REVERSE, or the other way, while operating the lathe, without damage to the shop equipment. However, better operation will be obtained, if the switch handle is left in the OFF position for a few seconds before the motor rotation is reversed. Be particularly careful of quick reversing when heavy work, or the large face plate, is in the lathe. Inertia may unscrew it from the lathe spindle.

The LATHE MOTOR switch on the main panel has a built-in overload device. This will operate when the lathe is overloaded and trip the switch to the OFF position. The lathe can be started again by first removing the cause of the overload and then placing the switch in the ON position. A second safety feature is the lathe belt, which will usually slip before damage occurs.

The lathe rotation may not be as given above when operating on an external source of electric power. This will occur when the power cable has not been correctly connected to the power supply. To correct it, interchange any two leads of the cable where it connects to the supply. This is known as "phasing out."

LATHE TOOL GRINDING

Careful grinding of the lathe tools is of paramount importance if accurate work is to be accomplished. Almost any type of cutting edge on the lathe tools will cut metal in the lathe, but good work cannot be done unless the tools are properly ground. Particular attention should be paid to the clearance and rake angles of the tools. These depend somewhat on the metal being cut, but more so on the manner in which the tool is to be used. Directions given below and the diagrams in the figures on these pages give the more common types of tool shapes used. A sufficient number of tool bits are supplied on the shop to make one or more of each of the tool shapes shown.

The tool can be ground on the bench grinder with which the shop is equipped. This is a dry stone grinder and care should be taken not to allow the tool to overheat while it is being ground. Overheating damages the metal and a sharp cutting edge cannot be obtained. Dip the

tool in water frequently while grinding it. Any portion of the edge that turns blue in grinding is worthless and must be carefully ground away. "Make haste slowly." Use the gages and the protractors in the tool cabinet to help in grinding the correct clearance and rake angles. The center gage and thread gages can be used to shape the thread cutting tools.

Figs. 223, 224, and 225, give the tool shapes and application instructions for the usual types of turning cutters used with the tool holders supplied with the lathe. The rake, clearance and included angles are those recommended for machining cast iron and steel. For turning brass, use a cutter which is ground in a manner similar to the round nose turning cutter in Fig. 223. For brass, the cutter should be ground with a 15° negative back rake so the top of the cutter will be flat when inserted in the tool holder. This keeps the tool from hooking into the work. The cutter holder channel is broached at a 15°

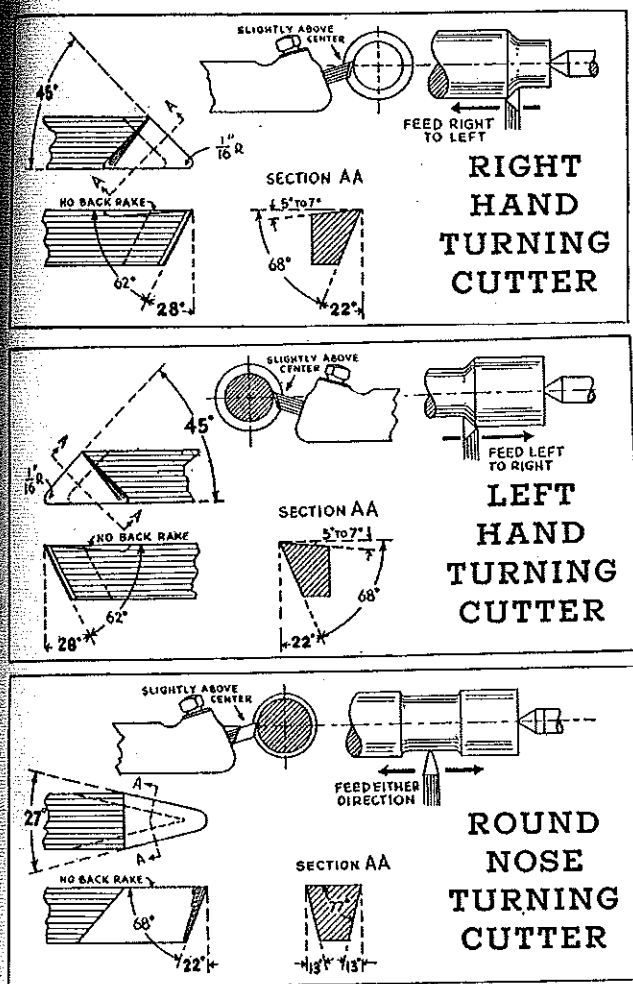


Fig. 223—Lathe Tool Shapes for Turning (Courtesy J. H. Williams & Co.)

angle. Negative back rake offsets this and makes the top of the tool horizontal. Brass cutting tools should be set at the exact center of the work. Do not set above the center as shown for iron and steel.

The shape for the right-hand side cutter is shown in Fig. 224. The straight shank cutting-off tool with the $\frac{1}{8}$ " by $\frac{3}{4}$ " cutter can be used for this tool. The cutter is made with side clearance and has to be ground only on the front and top as shown.

The cutting-off tool is also illustrated in Fig. 224. The right-hand offset holder with the $\frac{1}{8}$ " by $\frac{3}{4}$ " cutter should be used. Side clearance is already provided in the cutter and does not have to be ground. The top and front surfaces should be shaped as shown. If the cutter tends to chatter during cutting-off operations, even when cutting oil is used, the tool can be reversed. Turn the cutter upside down and operate the lathe in reverse direction. For all cutting-off opera-

tions, the tool should not extend out from the tool post any further than necessary.

Various forms of boring tools are shown in Fig. 225. The boring tool cutters or the boring bars can be formed in the manner shown for either regular boring or internal threading. The boring bars are used when the boring tools with inserted cutters are too large for the work. Always use a cutting oil when cutting threads. This will give much better operation and an improved surface on the work.

The shape of the threading cutter shown in Fig. 225 is the usual 60° included angle used for forming American National Threads. Other thread shapes can be made by grinding the cutter to the proper shape. The center gage is helpful in grinding this 60° cutter. The other thread gages can be used when grinding other shaped threading cutters.

External threading cutters can be ground in the same manner as those for internal work with the following exception. A 15° negative back rake is necessary to bring the top surface of the tool horizontal when it is mounted in the tool holder. The cutter must be held so that its top surface is at the center of the work and is in a horizontal position. Also, not quite as much front clearance is required for external threading. This is automatically reduced by the 15° angle of the tool holder, but may be reduced still further by grinding if necessary. If the point of

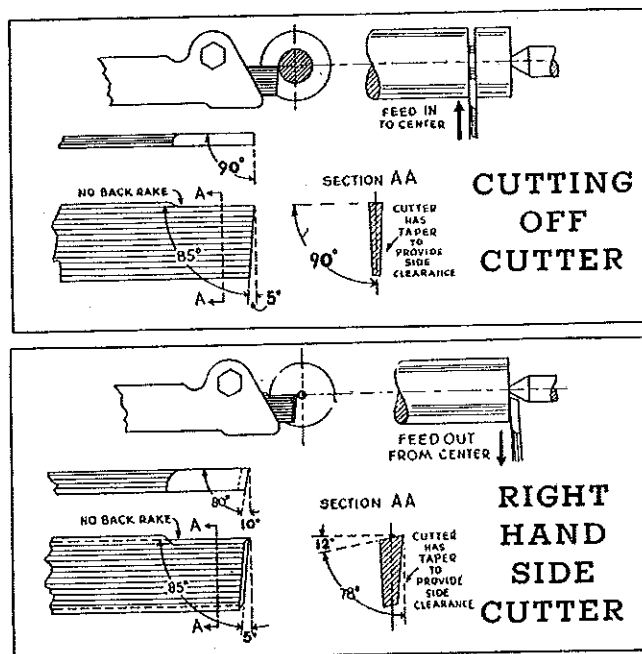


Fig. 224—Lathe Tool Shapes for Cutting-Off and Facing (Courtesy J. H. Williams & Co.)

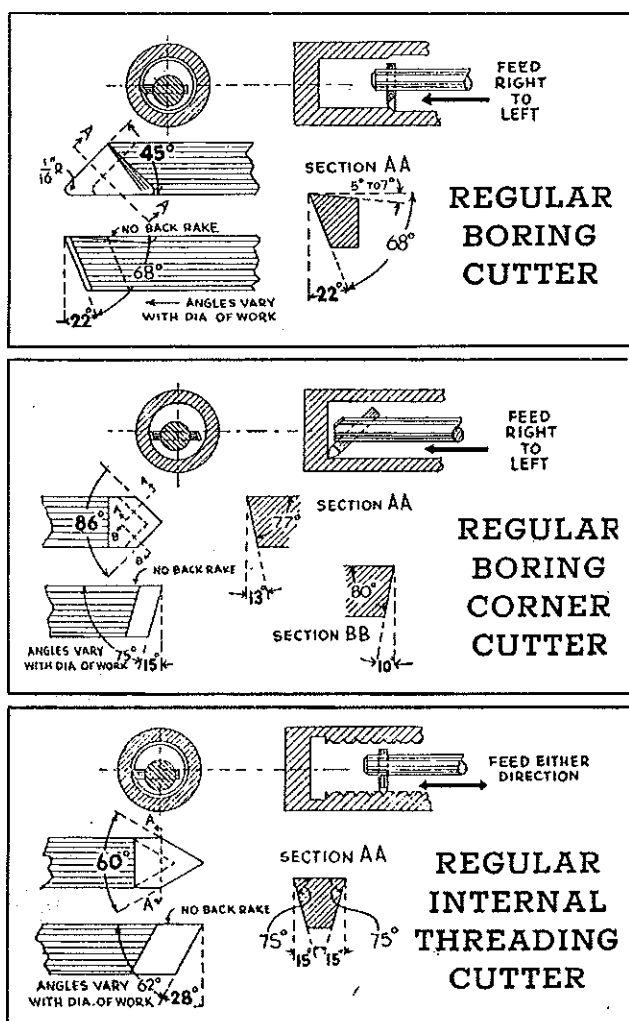


Fig. 225—Lathe Tool Shapes for Boring and Threading (Courtesy J. H. Williams & Co.)

the tool breaks off, the front clearance should be made smaller. For small threads, a good threading tool can be made from one of the cutting-off tools. This has the horizontal top surface required in external threading. Other shapes of thread-cutting tools can be ground as desired.

Additional information as to types and shapes of cutting tools is given in the "American Machinist's Handbook," supplied with the shop. Refer to Section IX, "Turning and Boring," page 321 in this handbook.

PRELIMINARY LATHE OPERATION AND ADJUSTMENT

The first step in lathe operation is to become thoroughly familiar with all the controls and points of lubrication. The points to be oiled and the frequency with which this is done are explained on page 258, and on the Chek-Chart sup-

plied with the shop. All these points are painted red for easy identification. It must be remembered, however, that a new lathe should be oiled with greater frequency than a unit that has had the bearings and journals well soaked with lubricant.

The operation of the lathe controls are described on the previous pages. These should be operated before any work is done, so the operator knows how they work. It is good practice to run the lathe light, while becoming familiar with the controls, to check the bearings for heat, see that all lubrication points have been taken care of, and in general, to give the equipment a short "break-in" period.

NOTE: The care taken of the lathe in lubricating, cleaning, and checking for any loose parts, each day, has a direct bearing on the quality of the work done and the useful life of the lathe.

An "American Machinist's Handbook" is supplied with the shop. This contains considerable information on all types of machine work. You will find it helpful to refer to this book for additional information on the operation of the lathe and its accessories.

Before any work is done in the lathe, it should be checked for accuracy. Two checks are necessary, the alignment of the lathe bed with the headstock and the alignment of the tailstock spindle with the headstock spindle. To check the lathe bed, remove the face plate and center from the headstock and mount the large three-jaw chuck. Be sure that the threads of the chuck and spindle are clean. Place a bar about 12" long and 1½" in diameter in the chuck with about 10" extending from the chuck. Take a very light cut over the entire 10" of the bar. Measure the diameter of the bar at each end with a micrometer and note any difference. If a difference of more than .001" exists, the lathe bed should be adjusted. Loosen the four mounting bolts on the tailstock end of the stationary bed. Adjust the position of the bed by placing shims under the front and back corners of the lower bed at this end. A few trials, taking a light cut from the bar and measuring the result, will give the proper adjustment.

The tailstock can be roughly centered with the lathe spindle by lining up the marks on the two base portions. For accurate work this is not sufficient and a center alignment check is required.

Mount a steel bar about 14" long and $1\frac{1}{2}$ " in diameter between the centers. Take a light finishing cut the length of the bar up to the lathe dog. Measure the diameter of the finished surface at each end with a micrometer. If the measurements differ, adjust the tailstock setting with the two lateral adjustment screws. The two clamp bolts must be loosened before the adjust-

ment is made. (Refer to Fig. 215.) When the work has a smaller diameter at the tailstock end, the tailstock should be moved toward the rear of the lathe. Adjusting it to the front is the proper direction when the tailstock end of the work has a larger diameter. The tailstock is set over one half the difference between the two diameter measurements.

MOUNTING WORK IN LATHE

WORK BETWEEN CENTERS

When work is mounted between centers, it is driven by means of a lathe dog clamped to the headstock end. One of the smaller face plates is used to drive the dog. Follow the preliminary instructions given above and adjust the tailstock if accurate work is required. The live center is placed in the headstock spindle and one of the hardened dead centers is mounted in the tailstock. Select one of the smaller face plates and screw it on the lathe spindle. Be sure the threads on both are clean.

The ends of the work have to be center-drilled before the work can be mounted in the lathe. This can be done in two ways. Before setting up the lathe with the centers and face plate, mount the large three-jaw universal chuck on the lathe spindle. Mount the small drill chuck in the tailstock. Select the correct size combination center drill and countersink from the rack attached to the left end of the machinist kit shelf. The larger size center drills are used for large work. Clamp this in the drill chuck. Hold the work in the three-jaw chuck, start the lathe, and drill each end of the work.

When the work is long and too large to fit through the lathe spindle, another method can be used to center-drill the ends. The set-up shown in Fig. 226 is used. The drilling is done away from the lathe, usually with the work held in a vise, and therefore the size of the work does not affect the operation. The small three-jaw chuck is used automatically to locate the drill at the center of the work if it is round or hexagonal. The center drill spindle assembly (CD-398-0021), in Fig. 203, is used. This carries a standard size E-1 center drill. The Couse lathe adapter, Fig. 203, is screwed in the back of the chuck and the spindle assembly is oiled and in-

serted through the adapter. The $\frac{1}{4}$ " electric drill is chucked to the end of the spindle and drives it to drill the center hole.

CAUTION: *Do not butt the end of the shaft against the face of the chuck. The end may not be cut exactly square. When chucking the work, rotate the chuck slightly as the jaws are tightened. This movement allows the chuck to line up with the work.*

Bring the drill up to the work carefully and use a light feeding pressure. All center drills are delicate and easily broken. Use cutting oil when drilling iron or steel.

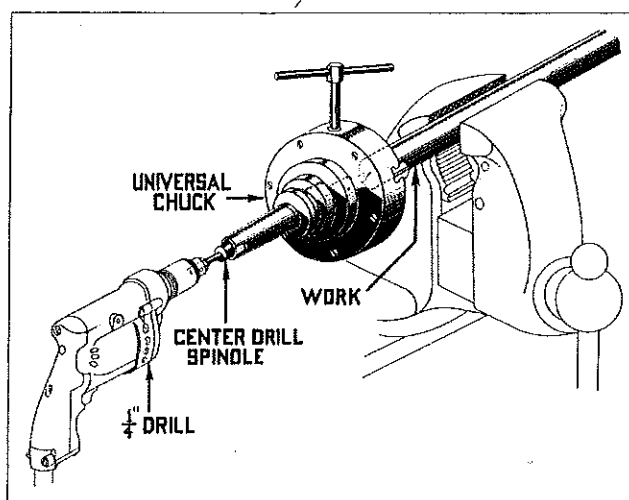


Fig. 226—Center Drilling With the Couse Chuck Adapter and Drill Spindle

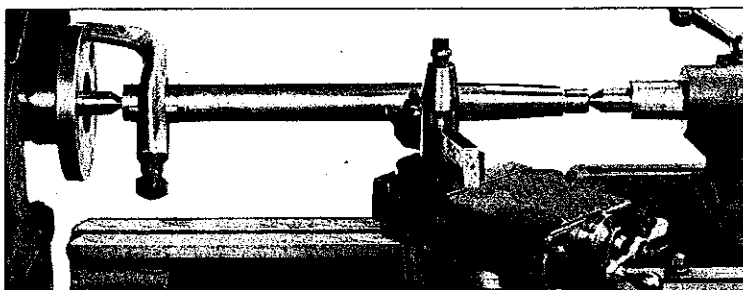


Fig. 227—Work Mounted Between Centers with Drive Plate and Lathe Dog

The center holes in square work can be drilled by hand. The center should be carefully marked off on each end of the work and then center-punched. Mount the drill chuck and center drill in the lathe spindle. Hold the work between the drill and the tailstock center. Start the lathe and feed the work against the drill by means of the tailstock feed. Use a low speed and a slow feed and hold the work from turning by hand.

After the center holes have been drilled, select a lathe dog to fit the work. Slip the dog over one end and place the work between the lathe centers as in Fig. 227. The bent tail of the dog fits into one of the slots of the face plate. Clamp the dog to the work. If necessary, protect any finished surface on the work from the clamping action of the dog. Use a thin brass sheet or similar material to wrap around the portion of the work held in the dog. Be sure, particularly when cutting threads, that the dog has a firm grip on the work. Clamp the tailstock in position and oil the dead center, using the oil dip in the tailstock. Do not screw the dead center too hard against the work. There should be no play between centers, nor should the work fit too tightly. Test by swinging the tail of the dog in the face plate as the tailstock handwheel is tightened. Where there is a slight drag against moving the dog, tighten the binder lever on the tailstock. This completes the set-up.

The accuracy of the centers can be tested by mounting them in the lathe spindle and watching the points as they spin. The dead center is hardened steel and has to be ground. This can be done in the lathe with the center mounted in the spindle and the lathe converter with its grinding attachments used to grind the center.

CAUTION: In mounting either taper sleeves or centers in the lathe spindle or tailstock, be sure to wipe off the outside of the part and the inside of the lathe taper. Place a light film of

oil on tapers before putting them together. This ensures correct alignment.

WORK IN LATHE CHUCKS

When mounting the chucks on the lathe spindle, the live center and face plate first have to be removed. The center can be knocked out with the brass knock-out bar. This is inserted through the left end of the spindle and tapped against the inner end of the center or sleeve. Hold your right hand, protected by a rag, over the center, to prevent the center from popping out and falling.

The chuck pilot (Fig. 228) provides a simple means of aligning the threads of the two larger chucks with the spindle. Clean the taper of the pilot and that of the spindle. Apply a light film of oil to both, then seat the pilot in the spindle.

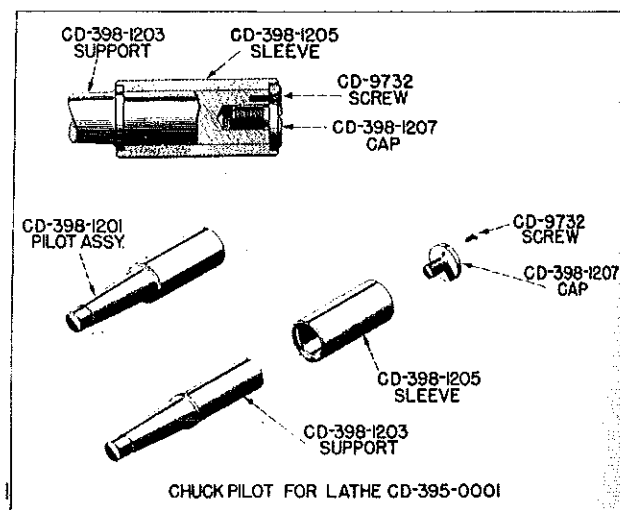


Fig. 228—Lathe Chuck Pilot—Assembled and Exploded Views

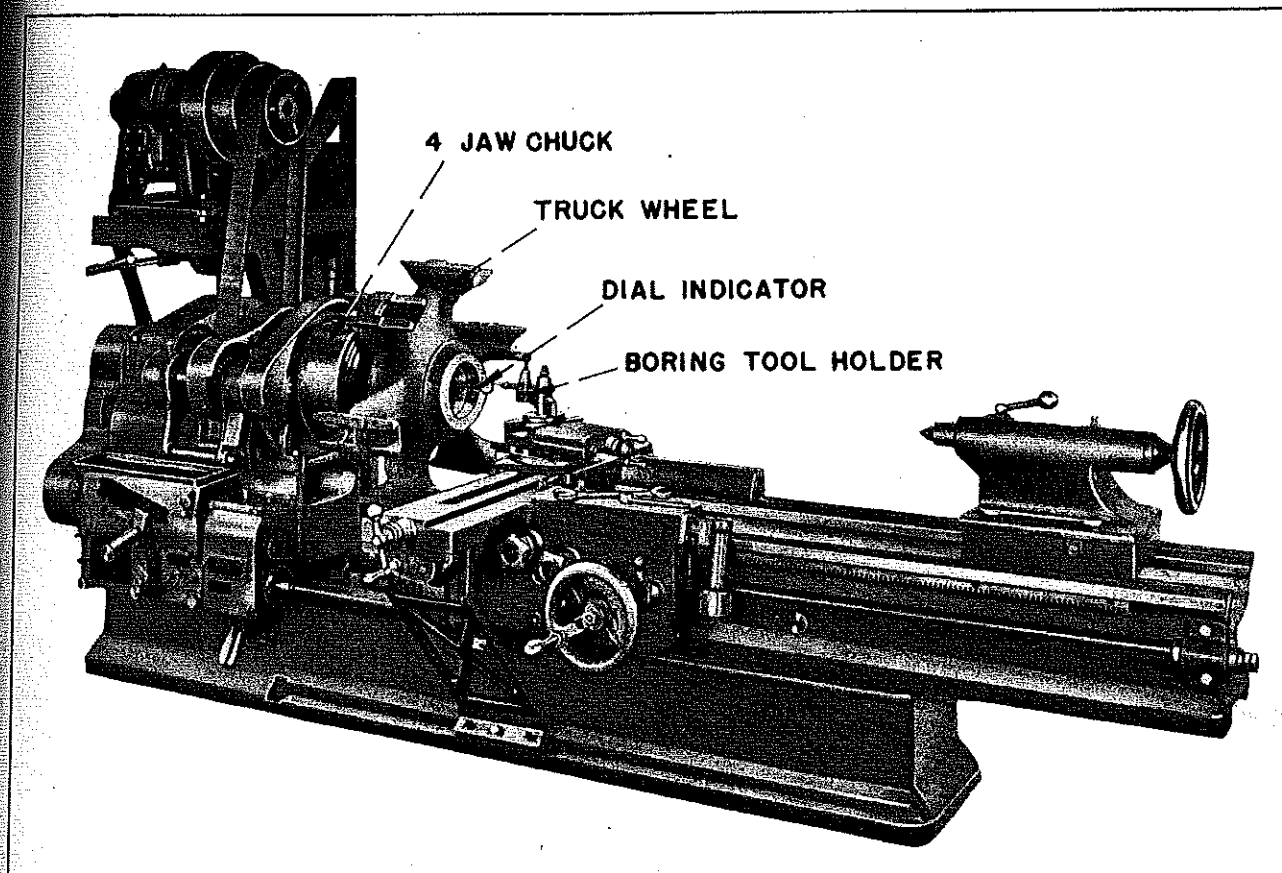


Fig. 229—Centering Large Work in the Four-Jaw Chuck by Means of the Dial Indicator. The Gap Bed Is Open to Accommodate Work

Select the chuck to be used. Place a board over the ways of the lathe and swing the chuck up on the board. Clean the spindle nose and threads and clean out the back of the chuck. Open the jaws of the chuck so they will clear the pilot, then slip the chuck on the pilot. Screw the chuck on the spindle, by hand—never use power. The board on the ways of the lathe not only supports the chuck but also protects the ways, if the chuck is dropped accidentally.

WARNING: *Never force a chuck onto the spindle. Keep cleaning the threads until you can screw it into place with your hands. Dirt too small to be noticed by the eye will cause it to stick. Always use oil.*

The two small chucks are not mounted directly on the lathe spindle but are mounted on the Couse lathe adapter, as shown in Fig. 203. These chucks are used to hold work of small size where the jaws of the large chucks prove bulky. The hardened and ground adapter sleeve (CD-398-0005 or CD-398-0015) fits into the lathe spindle. Be sure the mating parts are perfectly

clean and covered with a light film of oil. Seat the sleeve into the spindle by tapping gently with the lead hammer or a block of wood. The bronze nut (CD-398-0007 or CD-398-0017) of the adapter is threaded to fit the lathe spindle and acts merely as a retainer. Either of the two small chucks can then be screwed to the threaded nose of the adapter. Clean the threads of the chuck and adapter and oil them slightly before mounting the chuck.

The two three-jaw universal chucks supplied provide a quick and automatic means of centering round or hexagonal work within a few thousandths of an inch. Place the work in the jaws of the chuck and tighten one screw just enough to hold the work in place. Rotate it slightly with the right hand to seat it parallel with the jaws. Do not butt the work against the face of the chuck as this may throw it off. The end may not be cut off exactly square. Tighten the other screws a little at a time, and in sequence, until all are tight. Always use the wrench furnished with the chuck. The reverse jaws are used in these chucks when the work is gripped from the inside, as in Fig. 234.

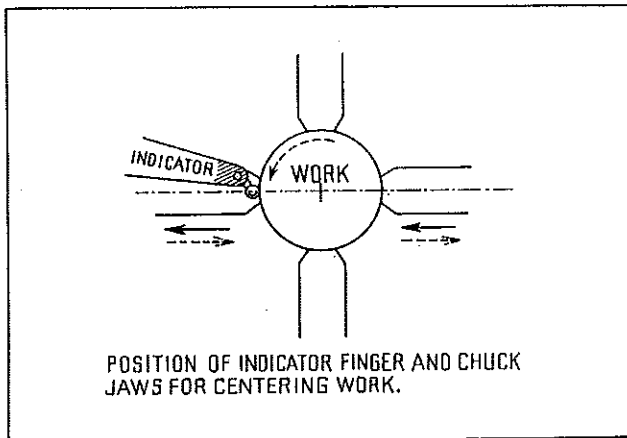


Fig. 229A—Correct Positioning of Indicator Finger and Chuck Jaws

The four-jaw independent chucks are used when it is desired to have work run dead true. They also can hold rectangular or irregular shaped work that does not match the jaws of the three-jaw chucks. Mount the work in the chuck and roughly center it by eye. The con-

centric rings on the chuck face assist the eye in bringing each jaw down equally.

Tighten the jaws lightly and revolve the work slowly. Hold a piece of chalk in a fixed position near the rotating work and allow it to mark the high spot. This will be on a spot that is farthest from the center. Loosen the jaw opposite the mark and tighten the one nearest the mark. Repeat the operation until the chalk contacts the full circumference of the work. This method will center the work roughly and should be used for all pieces having rough or unfinished surfaces.

The chalk method is often used, but when greater accuracy is required the tip of the tool bit is used to judge the amount by which the work is off center. Rotate the lathe by hand and bring the tool almost in contact with the high point. Rotate $\frac{1}{2}$ revolution and observe the gap.

When the work has to be centered within a few thousandths of an inch, or dead true, the dial indicator is used. Mount the indicator in the small boring tool holder and mount this in the tool post. See Fig. 229. Chuck the work and center it roughly, using the chalk or tool bit method described above. Bring the finger up to

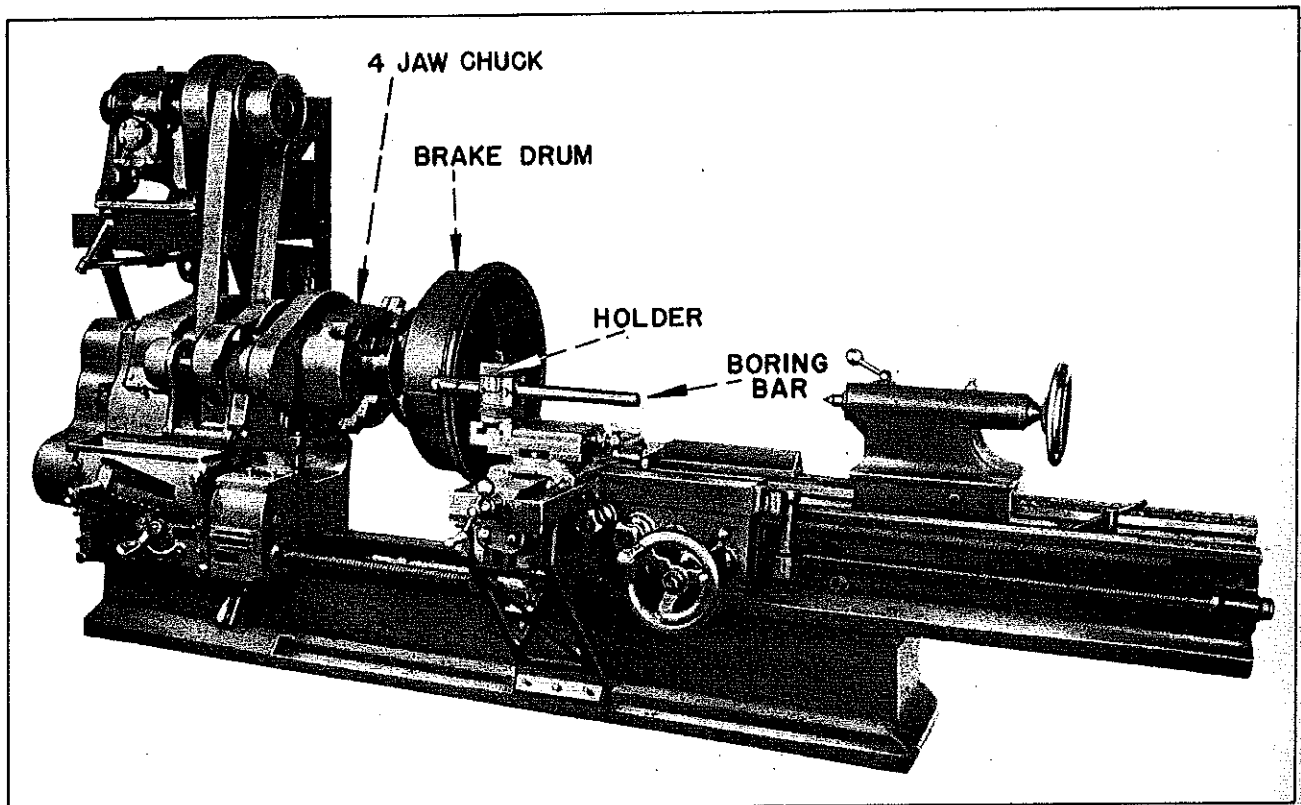


Fig. 230—Turning Large Work in the Lathe with the Four-Jaw Chuck. The Gap Bed Is Open

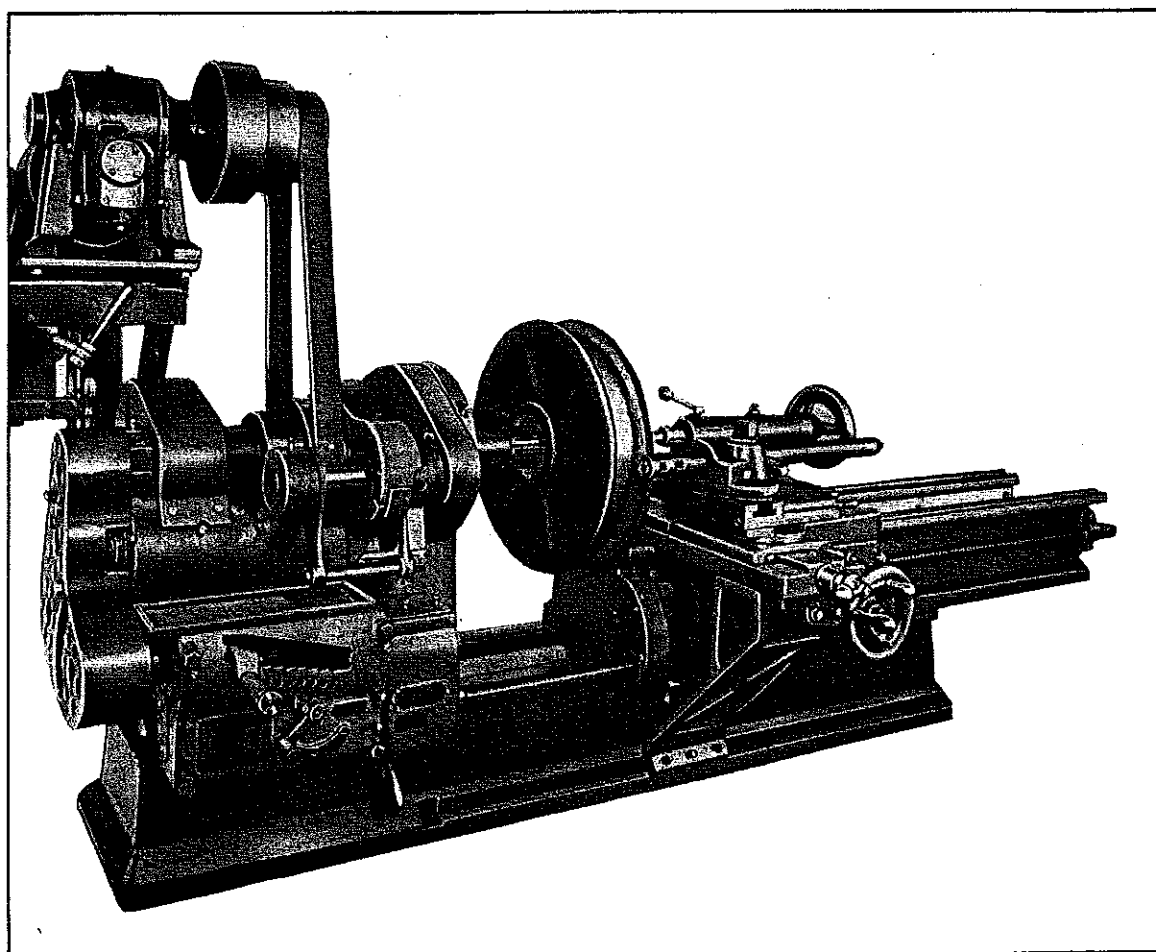


Fig. 231—Turning Large Work in Lathe with Special Arbor Mounted Between Centers

the surface to be centered until a reading is shown on the dial. Revolve the work slowly by hand and watch the indicator. Adjust the jaws of the chuck to eliminate the high spots, or until the indicator reading does not change as the work is turned. See Figure 229A for proper location of the indicator and chuck jaws.

CAUTION: *Do not use the indicator on a rough surface.*

In chuck work, small diameter stock should not project more than about four times its diameter from the chuck. All cuts should be light. Heavy cutting pressure may cause the small work to spring and ride the cutter. When the work is long, support it with the tailstock center, or use the steady or follower rest. Do not overload the chuck by mounting large work which necessitates having the jaws almost all the way out of the chuck body. Very large diameter work should be clamped to the 28" face plate and should not be mounted in any of the chucks.

Figs. 229 and 230 illustrate the use of the large chucks for turning large diameter work in the lathe. In Fig. 229, a truck wheel is mounted in the large independent four-jaw chuck and the dial indicator, is used to center it. A brake drum is chucked in the lathe in Fig. 230 for machining operations. Note that the large boring tool is being used to hold the cutter. The lathe carriage will not pass under the work and it is necessary to use the boring tool to bring the cutter up to the side of the brake drum.

Another method of handling large work in the lathe is illustrated in Fig. 231. In this case a large sheave is mounted on a special arbor and turned between the lathe centers. A face plate and dog are used to drive the arbor. In this case, as above, the boring tool is used to carry the cutter. This allows the cutter to overhang the carriage and prevents the carriage from interfering with the work.

The Sjogren collet chuck is used for chucking round stock rapidly and accurately. The spring collets range in size from $\frac{1}{16}$ " to 1" in steps of

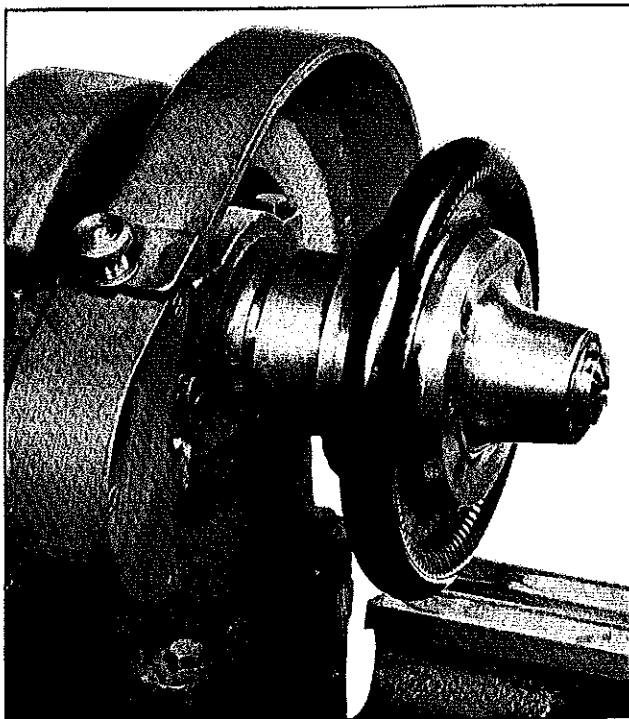


Fig. 232—Sjogren Chuck Mounted on Lathe Spindle

$\frac{1}{16}$ ". They are extremely useful where duplicate work is being done or where soft metal work may be damaged in the three or four-jaw chucks.

Remove the center and sleeve from the lathe spindle and take off the face plate or chuck, whichever the case may be. Clean the threaded spindle nose and clean the threaded adapter plate on the rear of the collet chuck. Screw the chuck on the spindle and tighten with the spanner wrench. See Fig. 232. Select the size of collet to fit the work. There is very little adjustment in the collets, and the size that fits the work the closest must be used.

Insert the collet in the tapered hole of the chuck and line up the small keyway in the collet with the key in the chuck. Turn the hand-wheel clockwise to tighten the collet. Every precaution should be taken to keep the chuck and collets free of dirt and chips. This also applies to the part of the work placed in the collet. A small chip or burr will impair the accuracy of the collet.

Do not use the collets on work that does not have a finished surface. Work covered with scale or rust should not be chucked in this manner. Reserve the collet chuck for precision work only.

COUSE LIVE CENTER CHUCK ADAPTER

The Couse live center chuck adapter takes the place of a series of conventional pipe centers and does more accurate work than the usual cone-shaped pipe center. This adapter can also be used to align work with the center line of the lathe and thereby give a simple means of adjusting the steady rest into position. This is described on page 249.

The parts of the adapter are shown in Fig. 233. They consist of a hardened and ground arbor (CD-398-0055) one end of which has a No. 3 Morse taper which fits the lathe tailstock. The other end has a cylindrical stud on which runs the bronze adapter (CD-398-0053). The bronze adapter screws into the back of either of the small chucks. This provides a "live" centering device on the tailstock.

The complete assembly of both adapters is illustrated in Fig. 234. They are shown holding a pipe, or bushing, by the inside at both ends. In this case, both small chucks are used. If the nature of the work permits, it is always better to use one of the large chucks on the lathe spindle. This leaves a choice of either of the small chucks for the tailstock end.

When making up this assembly, be sure that all the threaded and tapered portions of the parts are clean and covered with a light film of oil. After the set-up is finished and before starting the lathe, withdraw the tailstock spindle about $\frac{1}{32}$ " to permit the rotating chuck to float on the adapter. This allows for any expansion of the work.

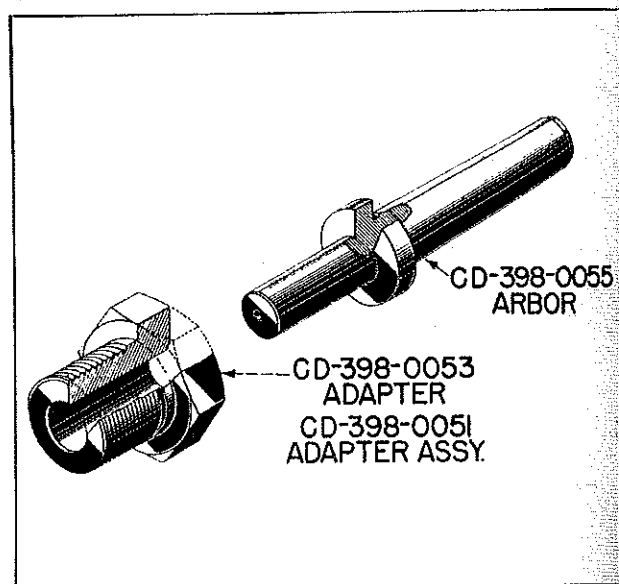


Fig. 233—Couse Live Center Chuck Adapter

LATHE RESTS

The follow rest bolts to the saddle of the lathe carriage, as shown in Fig. 216. The rest is used to support small diameter work of some length when working between the lathe centers. It prevents the work from springing away from the cutting tool or climbing over the top of the tools. As the follow rest bolts to the carriage, it follows the motion of the tool, bearing against the opposite side of the work toward the tailstock side of the tool.

Loosen the two cap screws in the tailstock side of the saddle and mount the follow rest as shown in Fig. 216. Loosen the jaws of the rest and mount the work between the lathe centers. Screw the jaws against the work with a piece of cigarette paper between as a feeler. The jaws should just touch the work and not tend to push it off-center. Lock the jaws in the rest and place some oil on the bearing surfaces. The follow rest can be used on machined surfaces only. Do not use on a rough or scaly surface.

The follow rest is particularly useful when cutting threads on a long small diameter shaft. It is also useful for cutting-off operations on long work. It can be used for turning down long shafting, but the jaws have to be reset for each cut that is taken.

The steady or center rest is used to support long slender shafts in the center, or to hold spindles or bushings where the ends are being bored or threaded. It is needed to support the end of work which extends more than a few inches from the lathe headstock and which, by

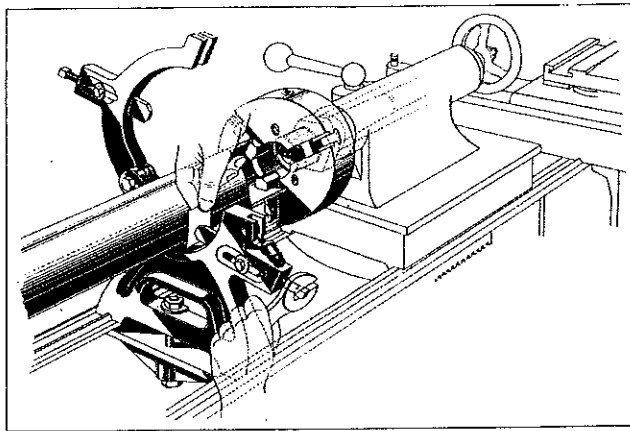


Fig. 235—Steady Rest Adjustment with Live Center Chuck Adapter

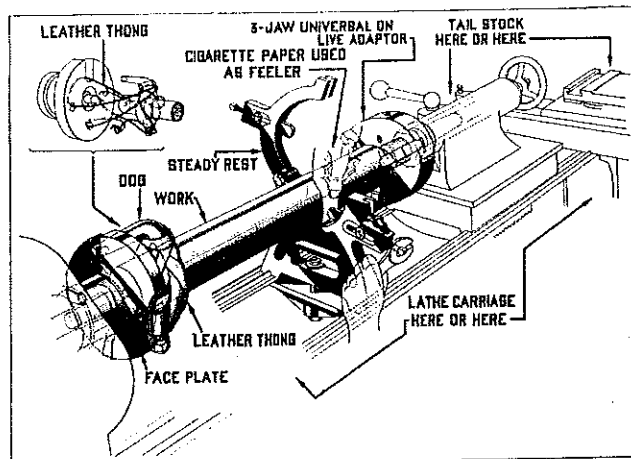


Fig. 236—Steady Rest Adjustment with Dog and Face Plate Drive

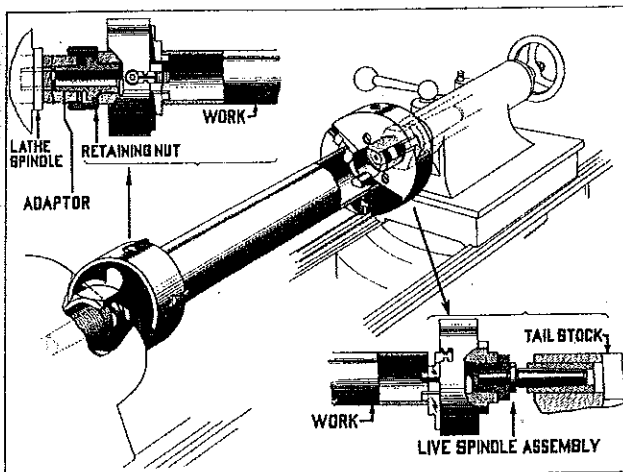


Fig. 234—Complete Couse Chuck Adapter Assemblies Mounted on Lathe

its nature, cannot be supported from the tailstock. The rest clamps to the ways of the upper lathe bed. See Fig. 235.

In its simplest terms, the steady rest is a three point adjustable bearing, but it is not of the self-centering type. Accurate adjustment to the work is greatly facilitated by temporarily holding the outer end of the work in the small three-jaw chuck mounted on the live center adapter. This is shown in Figs. 235 and 236. After the work has been mounted in the lathe by means of the adapter and the small chuck, adjust the three fingers of the rest to contact but not displace the work. Use a piece of cigarette paper as a feeler between the finger and the work. After the fingers are adjusted and locked, the entire chuck adapter and tailstock assembly is removed bodily from the lathe. This permits free access of the tool carriage to the work.

Fig. 236 shows this same set-up used in the rare case where the driving end of the work must be held on a center, instead of in the chuck which is the customary way. Note that the work is driven by a lathe dog which in turn is lashed to the small face plate. A leather thong should be used for this lashing. A long rawhide boot-lace is best. Never use wire, as the lashing must have sufficient spring to hold the work back against the center. If a rawhide lacing is not available, use 1" wide rubber bands cut from a scrap inner tube.

WORK CLAMPED ON FACE PLATES

Large or irregular shaped work can be turned in the lathe by clamping it to one of the larger face plates. The four face plate clamps provided can be used. Other clamps, however, can be improvised from bolts and pieces of flat stock. Short pieces of pipe can be used on the bolts to act as sleeve washers.

The 12" face plate can be installed in the usual manner. Clean the threads of the plate and the

spindle nose, then oil them lightly. If difficulty is experienced in screwing the face plate to the spindle, do not force it. Dirt or chips are causing the tight fit.

The gap bed has to be opened before the 28" face plate can be installed on the spindle. Follow the instructions on page 227 to do this. Be sure to open the gap far enough to handle the work as well as to mount the plate on the lathe. The chuck pilot should be inserted in the spindle to help guide the face plate into place. The pilot has a brass bushing which passes through the center hole of the plate and lines up the plate threads with the threads on the lathe spindle.

Use the small crane and chain hoist, attached to the side of the air tank over the lathe, to pick up the face plate and swing it around over the spindle. Be sure that the threads are clean and oiled. Swing the plate over the pilot, start the threads and screw the plate on tight. The pilot can then be removed from the spindle.

When the plate is used for the first time, or when very accurate work is required, the face plate should be checked for trueness. Mount the

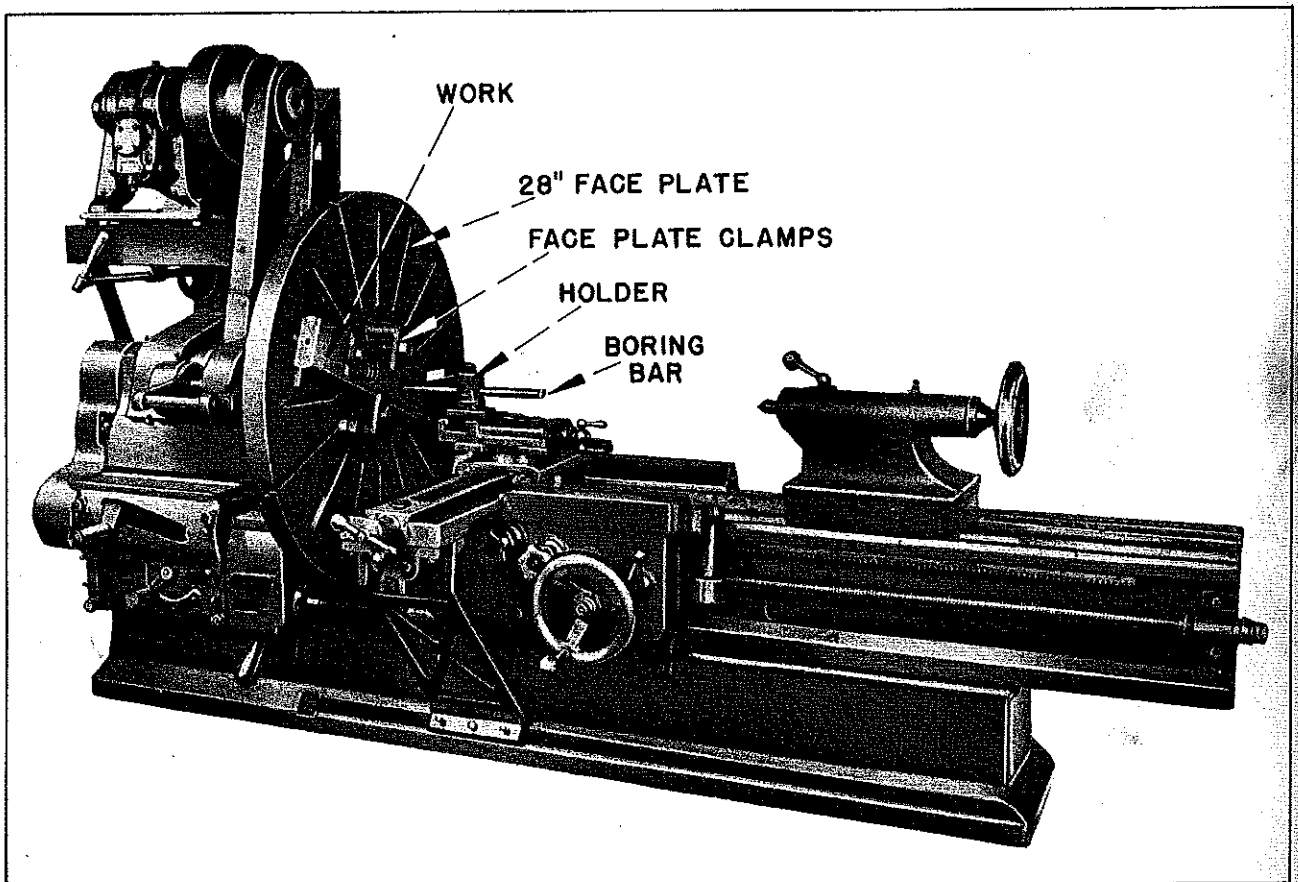


Fig. 237—Boring Large Work in Lathe with 28" Face Plate and Clamps

dial indicator in the small boring tool holder and clamp it in the tool post. Run the carriage up to the face plate so the indicator finger rests against the plate. Test the plate at different diameters by turning it by hand and reading the indicator. The difference in successive readings of the indicator shows how much the plate is off. If it is necessary to true the plate, engage the triple back gearing of the lathe, as explained on page 231, and take a light finishing cut across the surface of the plate.

If the plate is off a large amount, check the threads between the plate and the spindle. A small chip or burr is sufficient to throw the plate off a considerable amount. Clean the threads and recheck the plate.

A method of clamping work to the face plate is shown in Fig. 237.

CUTTING SCREW THREADS

The shape, or profile, of the thread to be cut is determined by the shape of the cutter used. This is explained on page 240. The pitch of the thread is the measured distance, parallel to the axis, between a point on the thread to a corresponding point on the adjacent thread. The lead of a thread is the distance a nut advances in one turn of the screw. On a single screw thread the pitch and the lead are the same. On a double screw thread, the lead is double the pitch. The thread gages should be used to find the type and pitch of the thread to be cut. A micrometer should be used to find the diameter of the thread. With this information, a cutter can be ground to match the thread and a blank of the correct diameter cut for threading. If a completely new threaded piece is to be made, the thread cut on the lathe should match the thread of the tap or die used on the opposite part.

Considerable information as to thread dimensions, thread forms, and other useful data will be found in the "Machinist's Handbook"—Section 1, Screw Threads. A copy of this handbook is supplied with the shop.

Once the pitch and size of thread are known, the quick change gearing of the lathe can be set to give the correct speed to the lead screw. The feed index plate on the lathe (Fig. 222) gives the setting of the levers to cut from 4 to 32 threads per inch. These are all for single threads. Multiple threads can be cut by dividing the pitch in threads per inch by the number of multiple threads. The levers should be set where this number shows on the plate.

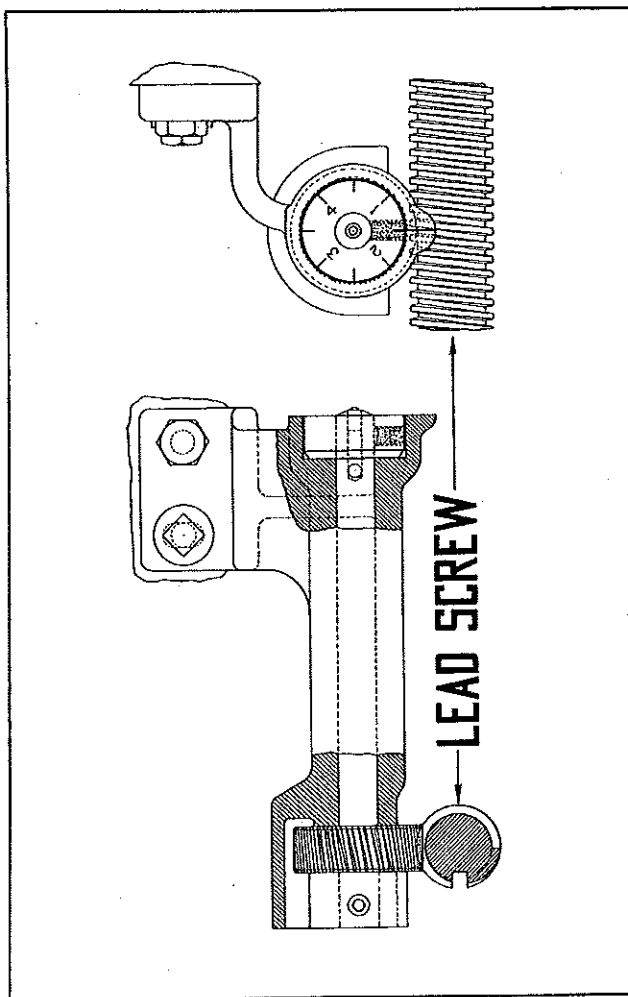


Fig. 238—Thread Dial Indicator

Refer to page 237 and set the levers to give the number of threads per inch desired. The fine feed lever must be in the **THREAD CUTTING** position. This will ensure the correct speed of the lead screw to drive the carriage.

The carriage drive for thread cutting has to be more positive than the usual friction drive used for the longitudinal feed. A split nut is mounted in the carriage which clamps on the lead screw and forms a positive drive with the screw. The action of the split nut is controlled by the cam lever. See Fig. 218. When this lever is pushed down, the split nut engages the lead screw. The nut is disengaged with the lever in the "Up" position.

In order that the split nut engages the lead screw at the correct point when the cam lever is pushed down, a thread dial indicator is used. This is mounted on the right end of the carriage

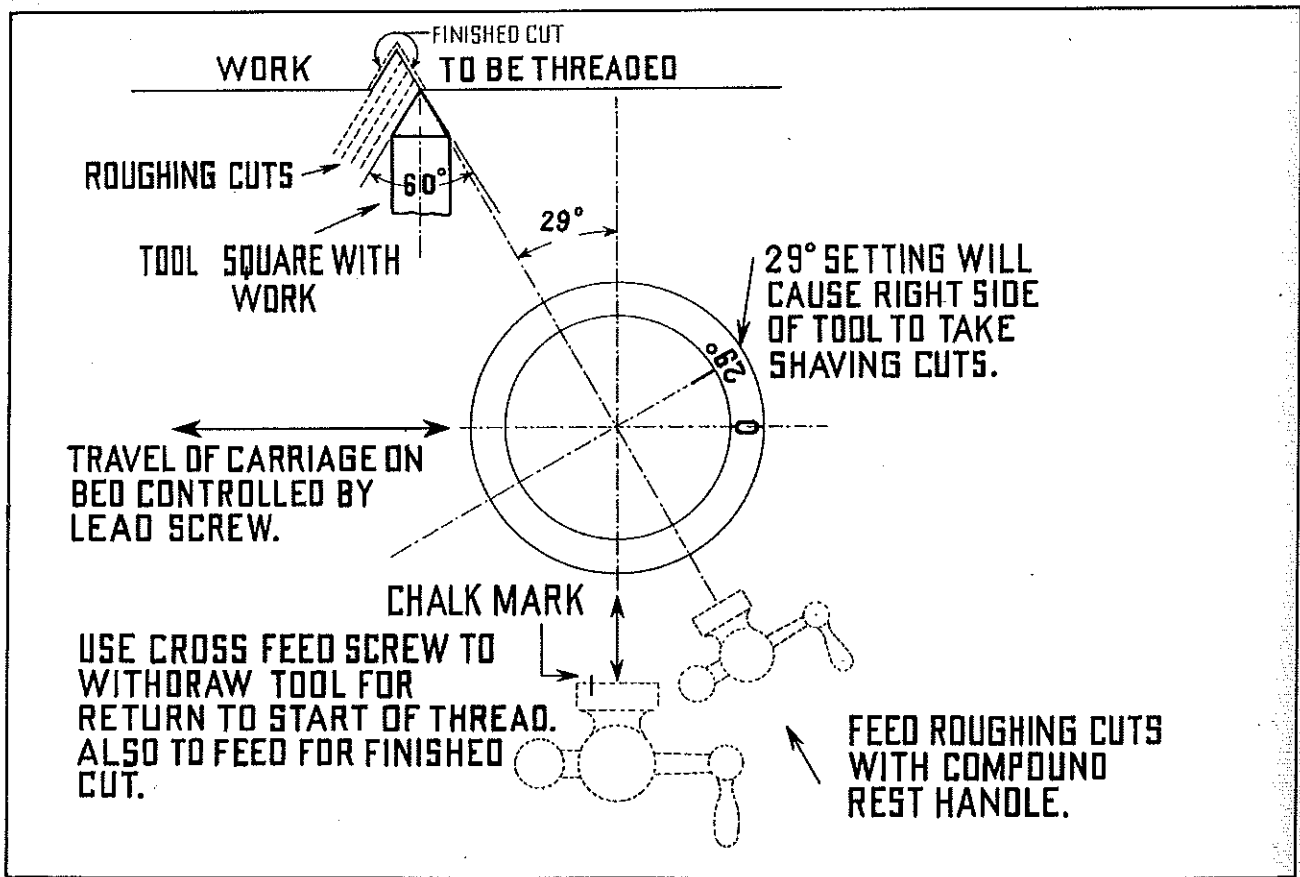


Fig. 239—Positions of Tool and Compound Rest for Cutting USS or American National Threads

apron as shown in Fig. 216. Ordinarily, to save wear, this is not engaged with the lead screw. For thread cutting, loosen the lower cap screw, Fig. 238, which clamps the indicator to the apron, and engage the lower gear of the indicator with the lead screw. Tighten the cap screw.

Set the feed reverse lever on the carriage apron (Fig. 218) to its center position. Start the lathe and try the drive of the carriage. Watch the marks on the thread dial indicator. When one of these marks lines up with the fixed mark, the cam lever can be pushed down to engage the split nut. Right-hand threads are cut with the tool moving from the right to the left. Left-hand threads are cut with the tool moving from left to right. The lead screw rotation is reversed for left-hand threads by shifting the tumbler gears, as explained on page 237.

When cutting an even number of threads per inch, the split nut can be engaged when any one of the eight lines on the dial indicator lines up with the fixed line. For an odd number of threads per inch, the nut should be engaged when one of the four numbered lines matches the fixed line. When cutting fractional threads, such

as $11\frac{1}{2}$ threads per inch, close the split nut at either of the odd numbered lines (1 or 3). In each case, this will ensure that the cutter will enter the thread correctly. If this is too hard to remember, the same result can be obtained by putting a chalk mark across the dial and housing, at any point, WHILE THE SPLIT NUT IS ENGAGED AND JUST BEFORE STARTING THE LATHE ON THE FIRST CUT.

Mount the work in the lathe and be sure that it is clamped tight enough so it will not turn in the chuck or the lathe dog. Set the thread cutting tool in the tool post so that the top of the tool is horizontal and level with the point of the tailstock center. Loosen the binder nuts on the compound rest and set it over to the right, as in Fig. 239, at an angle of 29° . This applies to all American National thread forms. For cutting left-hand threads, the rest should be set over the same angle to the left. Use the center gage, and square the tool with the work, as shown in Fig. 240. Keep the top of the tool horizontal and even with the center line of the work.

The index collar on both the cross-feed and compound rest screws can be used to advantage for cutting threads. After setting the cutter to the work, bring the point of the tool up against, and just touching, the work. Set both index collars to zero. Use the compound rest screw to give the depth of cut to be taken. Use the cross-feed screw to disengage the cutter from the work. The cross-feed stop can be set, to simplify the action of bringing the cross-feed slide back to zero point.

Feed the compound rest in for three or four thousandths. Watch the thread dial indicator and engage the split nut when the proper lines match up. Take a very light trial cut over the work and remove the cutter at the end by means of a quick twist of the cross-feed screw. Disengage the split nut at the same time. Test the pitch of the thread with a rule or thread gage to check the setting of the gears. See Fig.

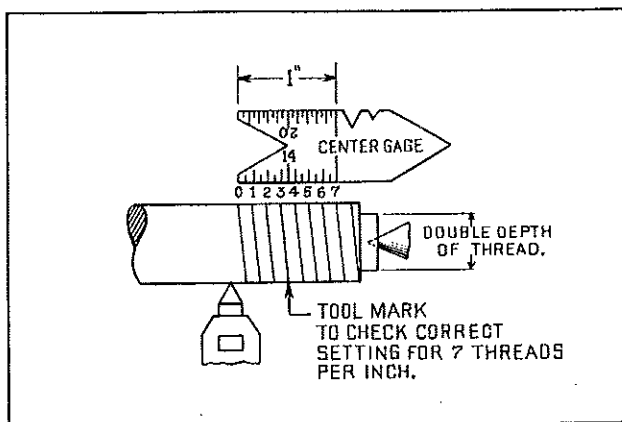


Fig. 241—Testing Pitch of Thread with Center Gage

241. This figure also shows a checking shoulder turned on the end of the work piece to indicate the proper depth of thread. The diameter of this shoulder is obtained by subtracting the "double depth of thread" from the diameter of the work.

Bring the carriage back to the starting point by means of the handwheel. Turn the compound rest screw in several thousandths, for the next cut. Turn the cross-feed screw back to the zero mark, or against the stop. Engage the split nut at the proper time and take the second cut. Fig. 239 shows how the tool is advanced for each cut by the compound rest feed until the complete thread is formed. Use a generous supply of cutting oil when threading steel.

Accurate thread cutting is done with a tool bit carefully ground to the exact form of thread desired and set as has been described. This form tool can be fed straight into the work until the desired depth of thread is generated. But this means that a heavy chip will be produced on both sides and at the point of the tool. Under such conditions the point of the tool is easily wedged and broken. This is the reason for feeding in, by means of the compound rest set at 29° , —to throw the heavy cutting onto one edge of the tool bit and reduce "wedging." Since the feeding angle is 29° and the rear tool edge is 30° , the rear edge will continue to take a slight shaving cut, maintaining the forming function of the cutter.

Many threads in field practice do not require extreme accuracy, but must be cut quickly. For this type of work a very free cutting tool can be produced by grinding a relief on the top surface of the tool bit, as shown in Fig. 242.

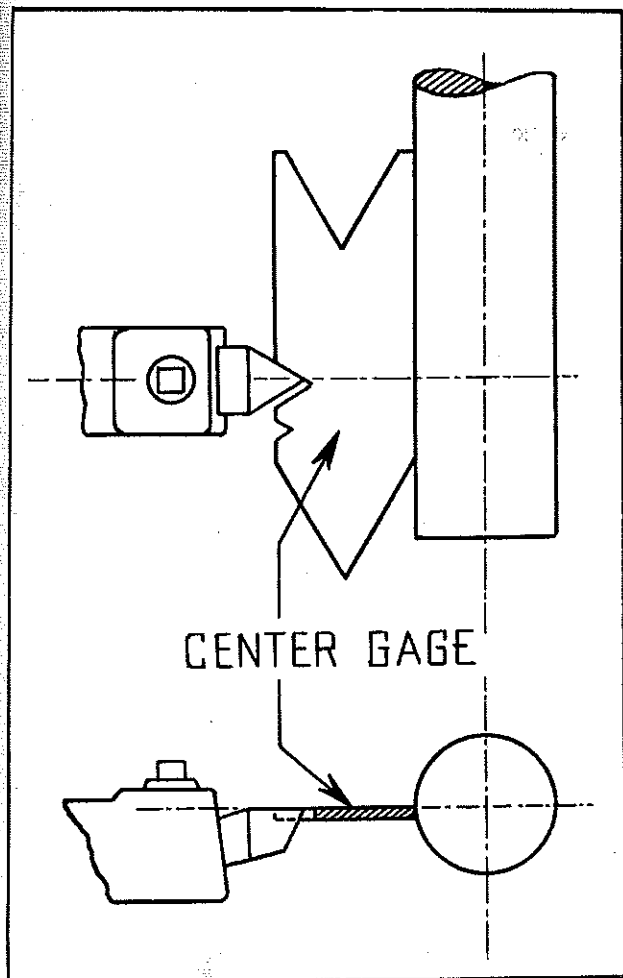


Fig. 240—Correct Alignment of Thread Cutting Tool

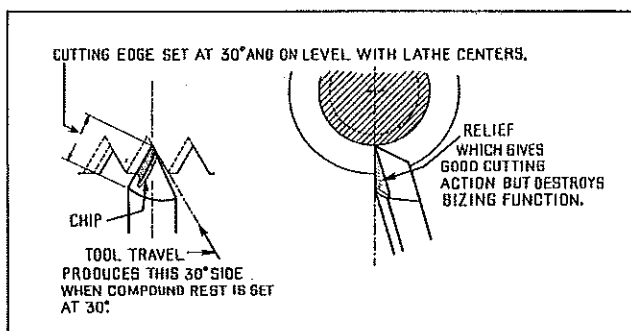


Fig. 242—Tool Shape for Rapid Thread Cutting

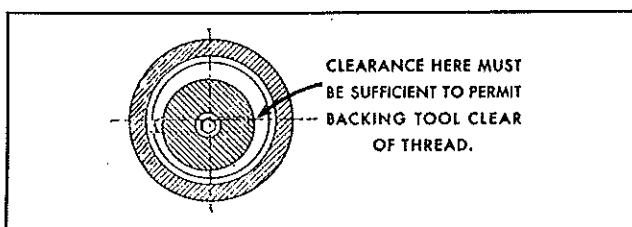


Fig. 243—Position of Tool for Internal Thread Cutting. (Courtesy J. H. Williams & Co.)

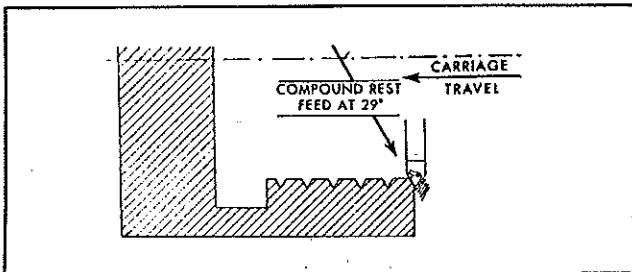


Fig. 244—Feed and Travel of Tool for Internal Thread Cutting. (Courtesy J. H. Williams & Co.)

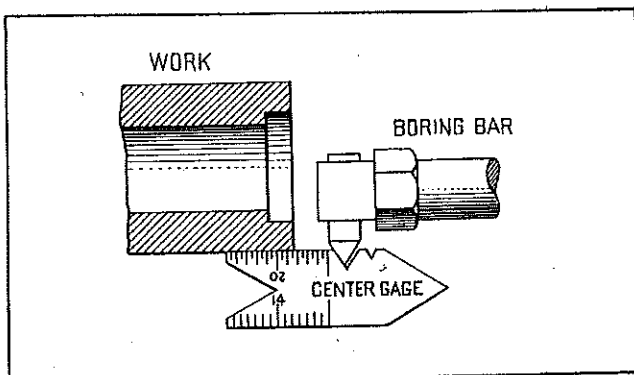


Fig. 245—Alignment of Tool for Internal Threads

Since this relief destroys the sizing functions of the cutter, the compound rest must be set at 30° to cause the feed of the tool point to generate the required 30° rear angle of the thread.

Internal thread cutting is performed in much the same way. For small diameters, the small boring bars can be ground to the proper shape and used for threading. The large boring tool set can be used for large diameter work. The top of the tool should be set at the exact center of the work, as shown in Fig. 243. A bar of the largest practical diameter should be used in order to provide the maximum rigidity. For right-hand threading, the compound rest is set over to the right at 29° , as in Fig. 244. The tool should travel toward headstock as shown. For left-hand threading this is reversed. The tool should be mounted square with the surface of the work. A center gage (See Fig. 245) can be used for this purpose. The thread cutting operations are the same as those for cutting external threads with the exception that the direction of the tool feed is reversed. The compound rest is feed "outward." At the end of the thread, the cross-feed screw is feed "inward" to move the tool out of the thread.

Metric screw threads can be cut in the lathe by using transposing gears in the lead screw drive between the spindle and the quick-change gear box. The table shown in Fig. 246 gives the pitch of the metric threads in inches and millimeters. To obtain these feeds of the lead screw, the change gear, with the number of teeth listed in the third column, is mounted on the lathe as shown. The tumbler gears are shifted to bring them into mesh with the change gear and the driving gear. The third and fourth columns in the table show the positions of the upper and lower levers. The last column gives the required number of teeth on the driving gear. For all but the largest pitches listed, this gear is the 58 tooth gear mounted on the lathe. The fine feed lever must be in the **THREAD CUTTING** position for all thread cutting.

CUTTING TAPERS

Tapers can be cut in the lathe in two different ways. For short tapers or for large angles, the compound rest provides the simplest taper cutting device. The angle of the taper will either be given in the specifications of the work or can be measured from the part to be duplicated. This will be given as the total included angle or the angle with the lathe center line, as in Fig.

247. The compound rest is graduated in degrees and is set at an angle equal to the total included angle. For example, suppose, as in Fig. 247, it is required to reface the soft "live" center. This has a total included angle of 60°, or an angle with the lathe center line of half that, namely 30°. The binder nuts of the compound rest are loosened and the rest swung around until the mark is at the 60° graduation. In this case, the rest can be swung either to the right or the left. When the tailstock is used to support the work, the rest is always swung so the feed handle does not get in the way of the work. Always test the angle for correctness with the gages supplied before taking the finishing cut.

Gradual tapers of some length are best machined in the lathe by using the offset tailstock method. Tapers of this type are usually measured in inches per foot. They give the decreases in diameters of the tapered piece for a one foot length. See Fig. 248. The amount of taper in a 12" length is the difference between the end

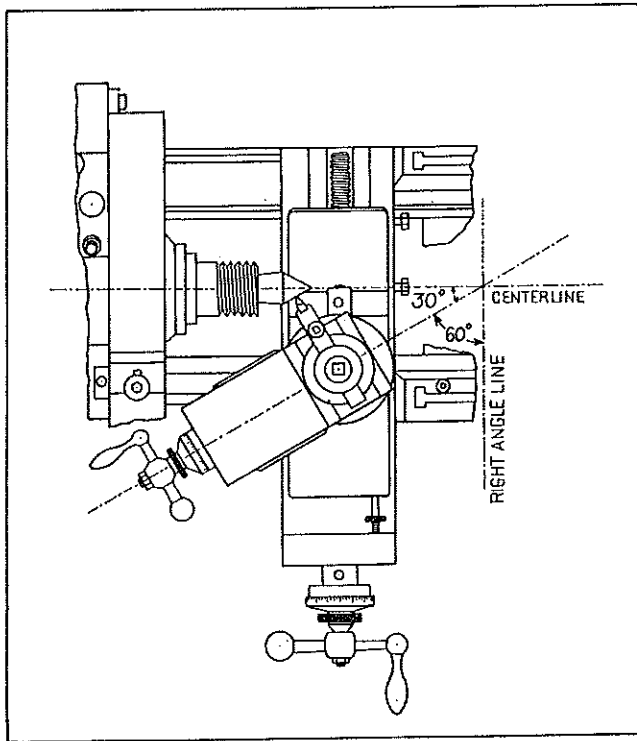


Fig. 247—Truing Taper of Live Center with Compound Rest

diameters or 0.5". However, if this same piece were cut to only 8" long the rate of taper would still be the same, or 0.5" per foot. In offsetting the tailstock, it is usually more convenient to know the amount of taper in one inch of length. Then this can be multiplied by the actual length of the stock between the centers and divided by 2 to find the amount of offset for the tailstock. For example, as in Fig. 248, the taper per inch is 0.5 divided by 12, or .0417" taper per inch. Suppose the stock length between centers is 8", then the tailstock offset will be the .0417" taper per inch, times 8", divided by 2, or .167". If the center distance is 6", the offset would be .125".

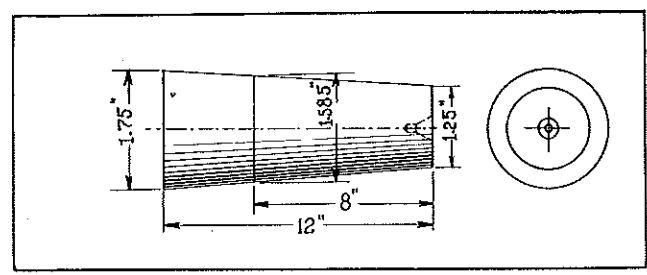


Fig. 248—Relation of Diameters and Lengths for Taper Turning

CHANGE GEAR
CHANGE GEAR CASE
DRIVING GEAR

DRIVING GEAR 29-TEETH
TUMBLER GEAR QUADRANT
DRIVING GEAR 58-TEETH

TRANSPOSING GEAR CHART
METRIC SCREW THREADS
ENGLISH PITCH LEAD SCREW

LOWER LEVER			UPPER LEVER						
A B C			1 2 3 4 5 6 7 8 9						
PITCH INCHES	PITCH M M	CHANGE GEARS	LOWER LEVER	UPPER LEVER	DRIVING GEAR				
.0197	0.500	37-T	B	1	58T				
.0246	0.625	37	B	3	58				
.0295	0.750	55	B	1	58				
.0345	0.875	56	B	2	58				
.0394	1.000	55	B	4	58				
.0443	1.125	59	B	5	58				
.0492	1.250	57	B	7	58				
.0591	1.500	55	A	1	58				
.0681	1.750	56	A	2	58				
.0787	2.000	55	A	4	58				
.0885	2.250	59	A	5	58				
.0984	2.500	57	A	7	58				
.1181	3.000	55	C	1	58				
.1378	3.500	56	C	2	58				
.1575	4.000	55	C	4	58				
.1772	4.500	59	C	5	58				
.1969	5.000	57	C	7	58				
.2362	6.000	55	C	9	58				
.2756	7.000	56	C	2	29T				
.3150	8.000	55	C	4	29T				

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Fig. 246—Feed and Gear Index for Metric Screw Threads

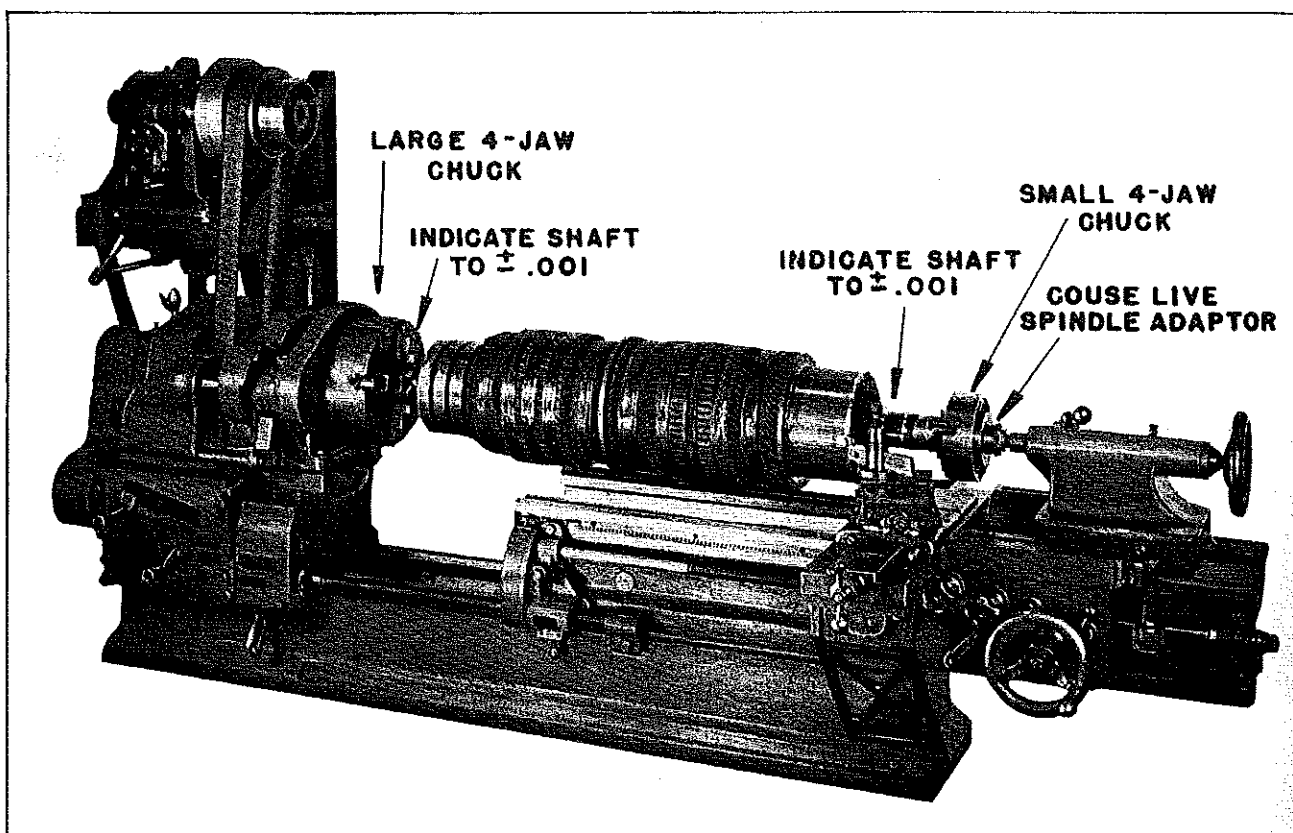


Fig. 249—Turning the Dynamotor-Welder Armature in the Lathe by Using the Couse Live Center Chuck Adapter

Keep in mind that this method of taper cutting can only be used when the work is mounted between the lathe centers. The "cut and try" system must be used in cutting tapers, because the slightest error will prevent a taper from seating.

Refer to Section XVII, Tapers and Dovetails, starting on page 785 of the "Machinist's Handbook" (supplied with the Shop). This handbook contains much useful information on the calculation of tapers and their machining.

COMMUTATOR REFINISHING IN THE LATHE

The commutator on direct current armatures often becomes worn or badly pitted and requires truing and under-cutting of the mica. This can be done in the lathe. Small size armatures of the type used in the portable tools, and small generators supplied with the Couse shops, do not present any unusual maintenance problems. Most of these can be handled in the lathe by mounting them between centers and driving with

a lathe dog. Alternatively they can be driven from one of the three-jaw chucks, with the commutator end supported on the tailstock center. A special "drill" chuck with brass jaws is provided for use in the tailstock to provide an adjustable bearing for small centerless armatures.

The Couse Dynamotor-Welder, supplied with the Type "A" Shop, has a hollow armature shaft with no centers. Mounting this armature in the lathe to true up the commutator, presents a good example of the utility of the Couse "live" center adapter. The set-up is shown in Fig. 249.

The large four-jaw chuck is mounted on the lathe spindle to hold and drive the armature shaft. The rear end of the shaft is supported by the small four-jaw chuck on the "live" center adapter mounted on the tailstock. Both chucks are of the independent type as it is necessary to have the armature centered with considerable accuracy. Both chucks should be arranged with their jaws in the same plane as this simplifies the adjustment to make the shaft run true at both ends. The dial indicator should be used to indicate the shaft at the ball bearing seats and

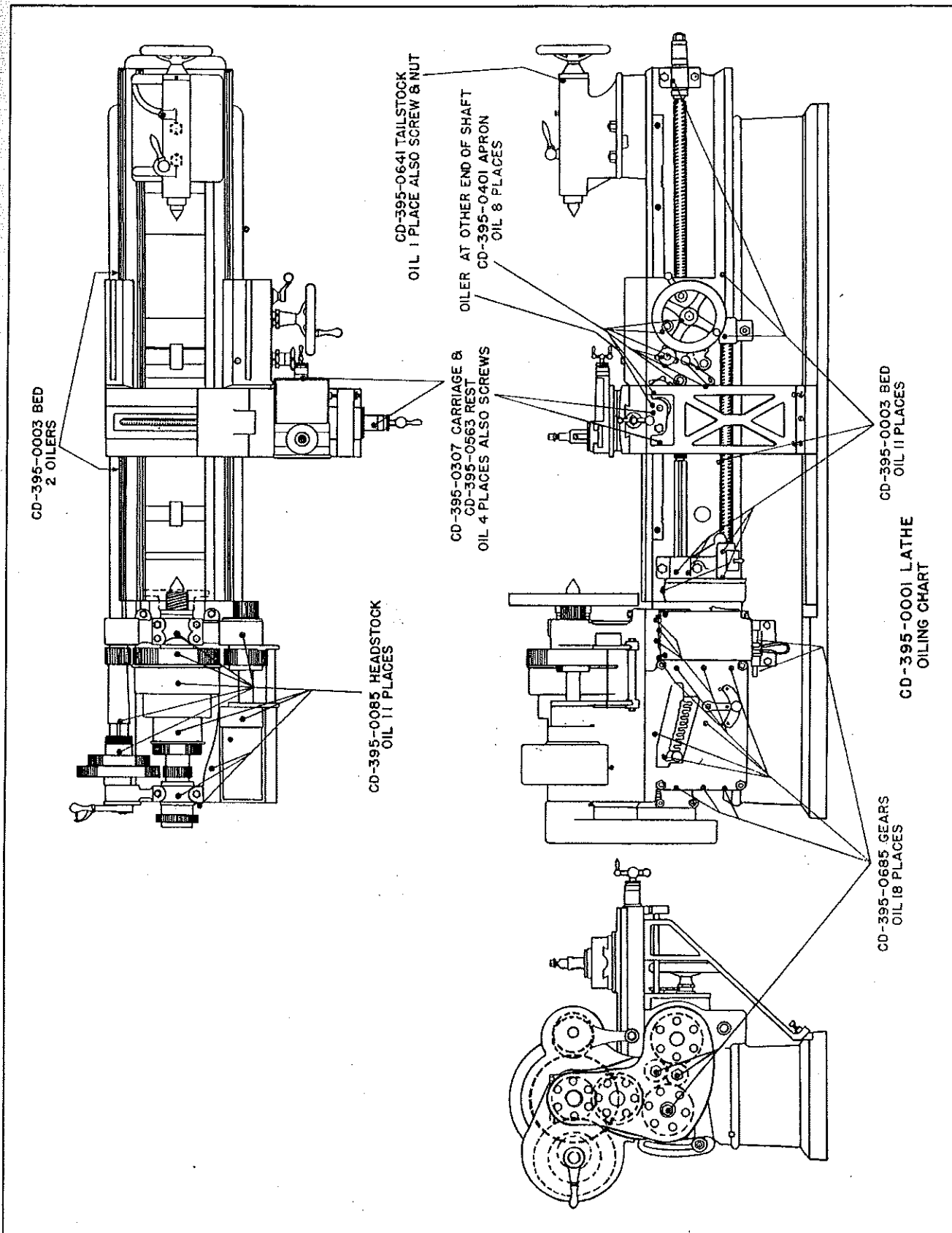


Fig. 250—Lubrication Chart for Smith-Drum Lathe

the chucks should be adjusted so the shaft will run true within a pointer movement of two one-thousandths of an inch. See Fig. 249. Fig. 229A, on page 246, shows the correct relation of chuck jaws and indicator for centering work in a four-jaw chuck.

The lathe carriage cannot be brought up to the headstock as the gap bed is open. This will require clamping some bar stock to the lathe bed to hold the indicator at this point. Use a heavy enough piece of stock to hold the indicator firmly, yet light enough to be bent with the hands to bring the indicator into position.

Set up a keen-edged pointed tool in the tool post and take several light cuts from the commutator. Use a fine carriage feed. Remove only enough copper to clean up all the low spots.

After the commutator has been refaced, the next operation is to undercut the mica between

the commutator bars. This is done with a sharp pointed threading (60°) tool bit, set on its side in the left-hand holder. The tool bit is made to act as a planing tool by traversing the lathe carriage back and forth with the handwheel. The V-shape of groove is not essential but has the advantage of being self-cleaning.

It may be found, due to war production conditions, that the commutator bars are not set exactly parallel. In this case it is necessary to scrape out the mica by hand with a piece of hacksaw blade.

The final polish is given to the commutator with very fine SANDPAPER. Do not use emery cloth. The emery particles may collect in the grooves and short circuit the bars.

Other commutators are handled in the same manner as explained above.

SMITH-DRUM EXTENSION GAP BED ENGINE LATHE—LUBRICATION

Before using the lathe, all bright surfaces and bearings should be cleaned off. Every bearing must be oiled thoroughly at the points shown in the oiling chart in Fig. 250. Use a good grade of engine oil. OE SAE 10 is excellent for general lathe lubrication. When the lathe is new and the bearings have not become oil-saturated, the lathe should be lubricated every four hours. After some use, once every eight hours will be sufficient lathe lubrication.

Do not attempt to oil the lathe while it is running, also be sure not to use too much oil. A few drops in each oil hole is sufficient. When more is applied, it will only run out of the bearings and mess up the lathe, making it necessary to clean it more frequently. Always oil in the same order so that no oil holes will be missed.

CONE PULLEY

Every time the back gears are used to drive the spindle, remove the two small screws in the first and third steps of the cone pulley. Oil freely with OE SAE 10. Oil the back gear shaft at the same time. Replace the screws in the cone pulley after oiling.

GEARS

Apply frequently GO SAE 90 gear lubricant to all the gear teeth. This will give smoother operation and prevent excessive wear. Remove all the oil from the gear teeth before applying this lubricant. Otherwise, it will not cling to the gear teeth.

SADDLE WIPERS

Oil the saddle wipers on the carriage each time the lathe is used. Saturate the felts on the front and back wipers with OE SAE 10.

MOTOR DRIVE BEARINGS

Every time the lathe is used, the left and right spindle bearing of the motor is automatically lubricated from the worm gear case. The rear bearing should be cleaned and lubricated with bearing grease when the motor has been taken down for repairs or maintenance.

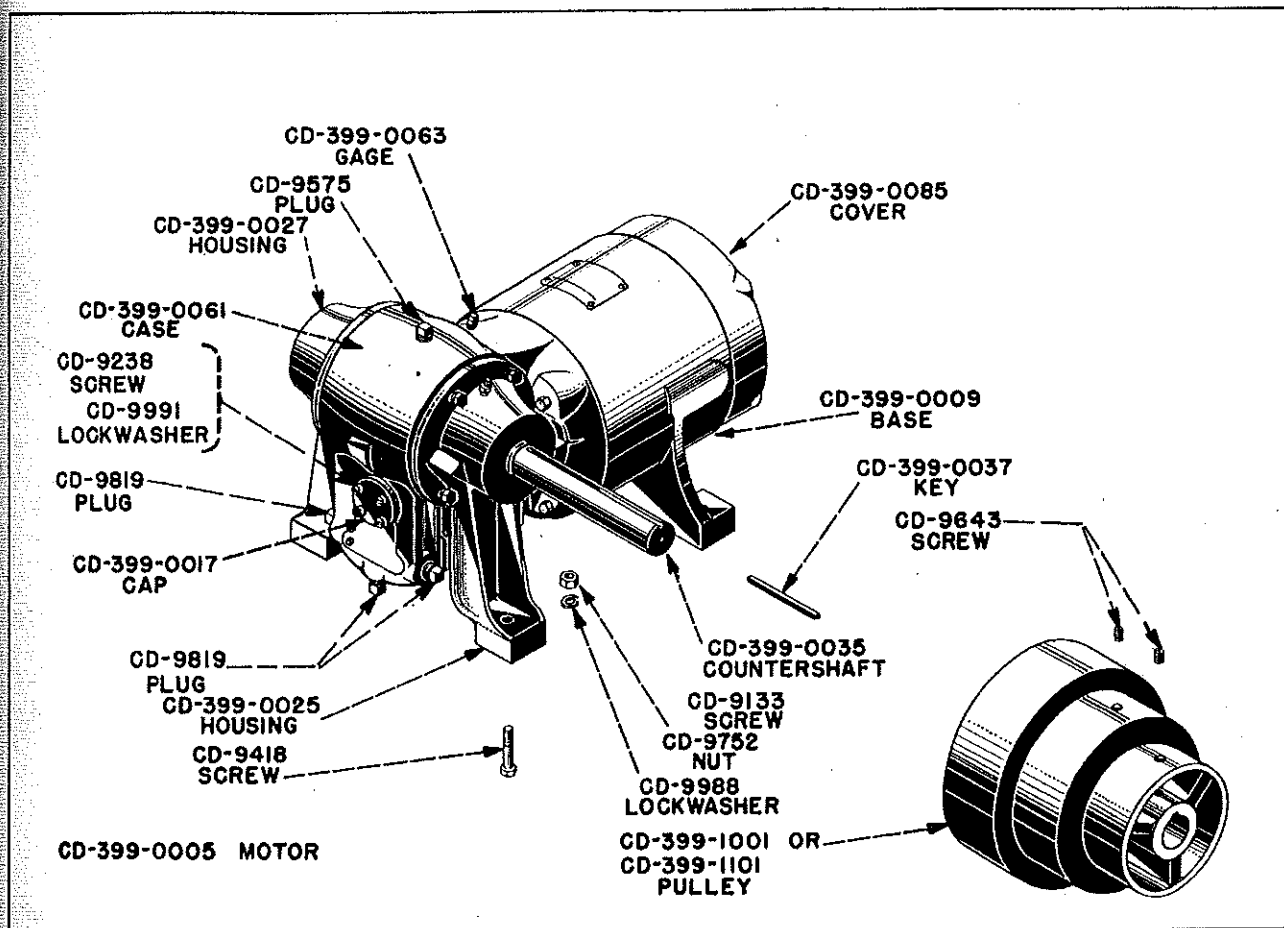


Fig. 251—Assembled View of Lathe Motor and Drive Pulley

The worm gear case should be filled with lubricant to a level between the high and low marks of the bayonet gage. This gage (CD-399-0063) is shown in Fig. 251. Every forty hours remove the gage and check the level of the lubricant. If necessary, add GO SAE 90 to bring it up to the correct level. The lubricant is added through the gage hole. The plug in the top of the case is an air vent and should not be removed. After 512 hours of operation, drain and flush the gear case with flushing oil. Add fresh lubricant GO SAE 90 to the correct level.

Belt dressing should be applied to the pulley

side of the drive belt whenever it begins to slip. The belt will stretch as it becomes "broken-in" and the shifting device should be adjusted to take up the slack. Belt dressing will not prevent slipping if the belt is loose. Use the dressing only when the belt has the proper tension but is still slipping on the pulleys. For dried out and stiff belts, Neatsfoot or olive oil is a good dressing.

Every eight hours, go over the motor shifting mechanism and lubricate the shaft bearings and the eccentric shifting device. Apply a few drops of OE SAE 10 at each bearing point.

SMITH-DRUM EXTENSION GAP BED ENGINE LATHE—MAINTENANCE

GENERAL

The natural life of a lathe is ten to twenty years. Maintenance problems can be avoided, or at least postponed for a considerable length of time, by giving the lathe proper care in handling and lubrication. Cleanliness is a paramount consideration. Remove all burrs and metal chips that accumulate on the parts of the lathe and be particularly careful in cleaning off grinding dust and grit as often as possible. Protect all parts of the lathe that are subject to rusting with a generous coating of oil, and keep the lathe covered when not in use.

Do not overload the parts of the lathe, also see that everything is tight when heavy work is being done. The tool carriers and the tailstock should not be extended any more than necessary when taking heavy cuts. Slow speed should be used and lathe tools should always be sharp.

The shop is equipped with sufficient hand tools to perform all maintenance work.

MINOR ADJUSTMENTS

Accurate work in the lathe is dependent upon the correct alignment of the bed and the tailstock. If the bed is not correctly supported, the headstock will be thrown out of alignment with the bed ways. The lathe cannot do accurate work under these conditions. When the tailstock is misaligned with the lathe spindle, the lathe centers will be out and the tool will cut a taper on the work. This must be corrected. Both of these alignment checks have been explained on page 242 and their correction is given.

The carriage saddle is steadied by an "X" support as shown in Fig. 252. Adjustment is provided at the base of this support to take up wear and lost motion. This should be tightened to give a firm support to the saddle, but not too tight as this would lift the saddle from the bed and cause chattering. The sliding gib is adjusted by loosening the two lock nuts and tightening the two square-head set screws. Tighten the center cap screw to hold the gib in place and lock the setting by tightening the two lock nuts. It is especially important to have this support properly adjusted when the large face plate is being used and the tool holder is positioned over the front overhang of the carriage.

The compound rest and cross-feed slides are both equipped with adjustable gibs to take up wear or side play. Both of these are mounted on the left-hand side of the dovetail of the ways. They are held in place with a fillister screw at each end. To tighten the gibs, loosen the screw at the front end and tighten the screw at the rear ends of the dovetails. After the setting has been made, both screws should be tight. The rear screw on the gib of the cross-feed ways is under the removable cover attached to the cross-feed base. The cover can be lifted off to reach this screw.

The lathe carriage is held to the bed ways by means of adjustable gibs. One of these is on the underside, inner edge, of the front way. The other is under the rear way and is reached from the back of the lathe. These gibs act as holders to prevent the carriage from riding off the V-ways or developing side motion which

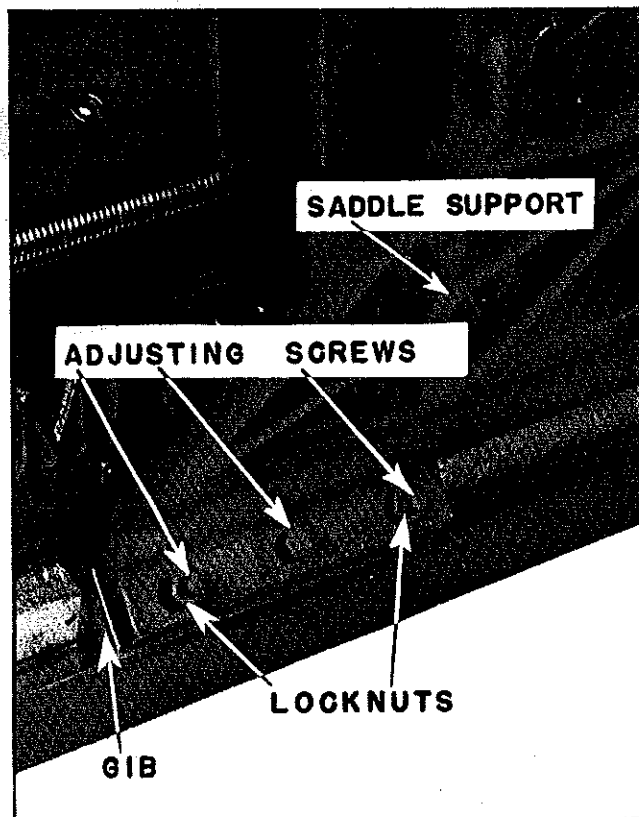


Fig. 252—Carriage Saddle Support Bearing and Adjusting Screws

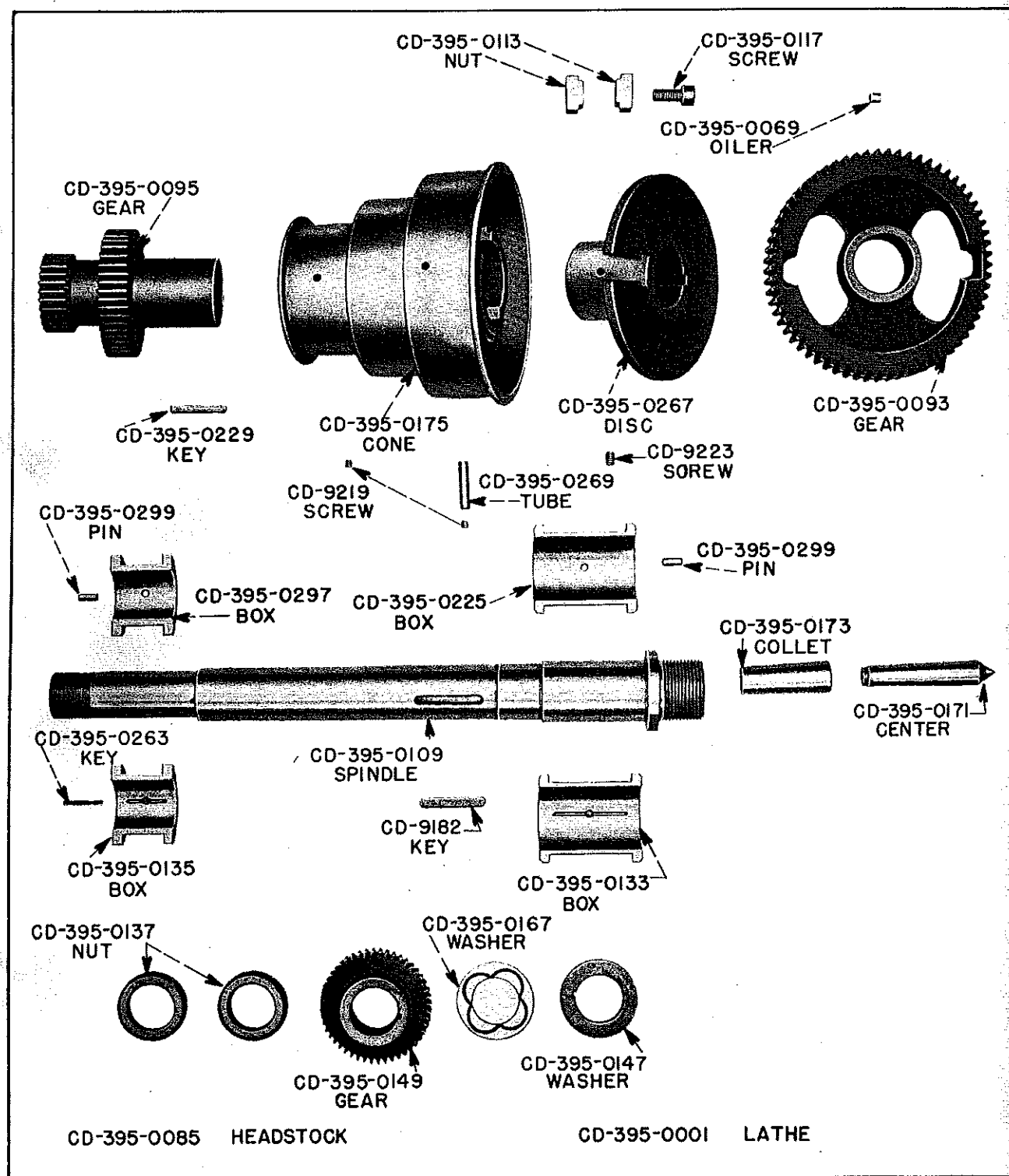


Fig. 254—Headstock Spindle, Main Gear, Cone Gear, Cone, Spindle Feed Gear, Large and Small Headstock Boxes for Smith-Drum Lathe

removed. Note that the bottom brass in each bearing is pinned in place.

Remove the two lock nuts (CD-395-0137), in Fig. 254, from the end of the spindle and take off the feed gear (CD-395-0149) and the two thrust washers (CD-395-0147 and CD-395-0167). Remove the cone pulley (CD-395-0175) by sliding it off the small end of the spindle. If this is a tight fit, bump the end of the spindle against a block of wood.

Loosen the set screw (CD-9223) in the hub of the disc (CD-395-0267) and remove the disc and bull gear (CD-395-0093) from the spindle. These should slide off freely. Note that the disc is keyed to the spindle with the key (CD-9182).

Remove the two-step gear (CD-395-0095) from the cone by driving it free from the key (CD-395-0229). Use a round piece of hard wood for this purpose and drive from the end of the pulley.

The clamping nut (CD-395-0113) can be removed from the disc by unscrewing the screw (CD-395-0117). The center and taper sleeve are removed from the spindle by bumping them out with the brass knock-out bar. The bottom bearing brasses are removed by tapping them out with a wooden block or lead hammer.

When these parts are separated for maintenance, examine them for wear. The extent of the wear in the brass bearings and thrust washers can best be detected before they are disassembled. Excessive chatter of the tool while the lathe is operating may be due to too much clearance in the spindle bearings. Noticeable side motion of the spindle indicates that the bearings are badly worn and should be replaced immediately. If the thrust washers wear, causing excessive end play of the spindle, they should be renewed.

Reassemble the spindle with its parts in the

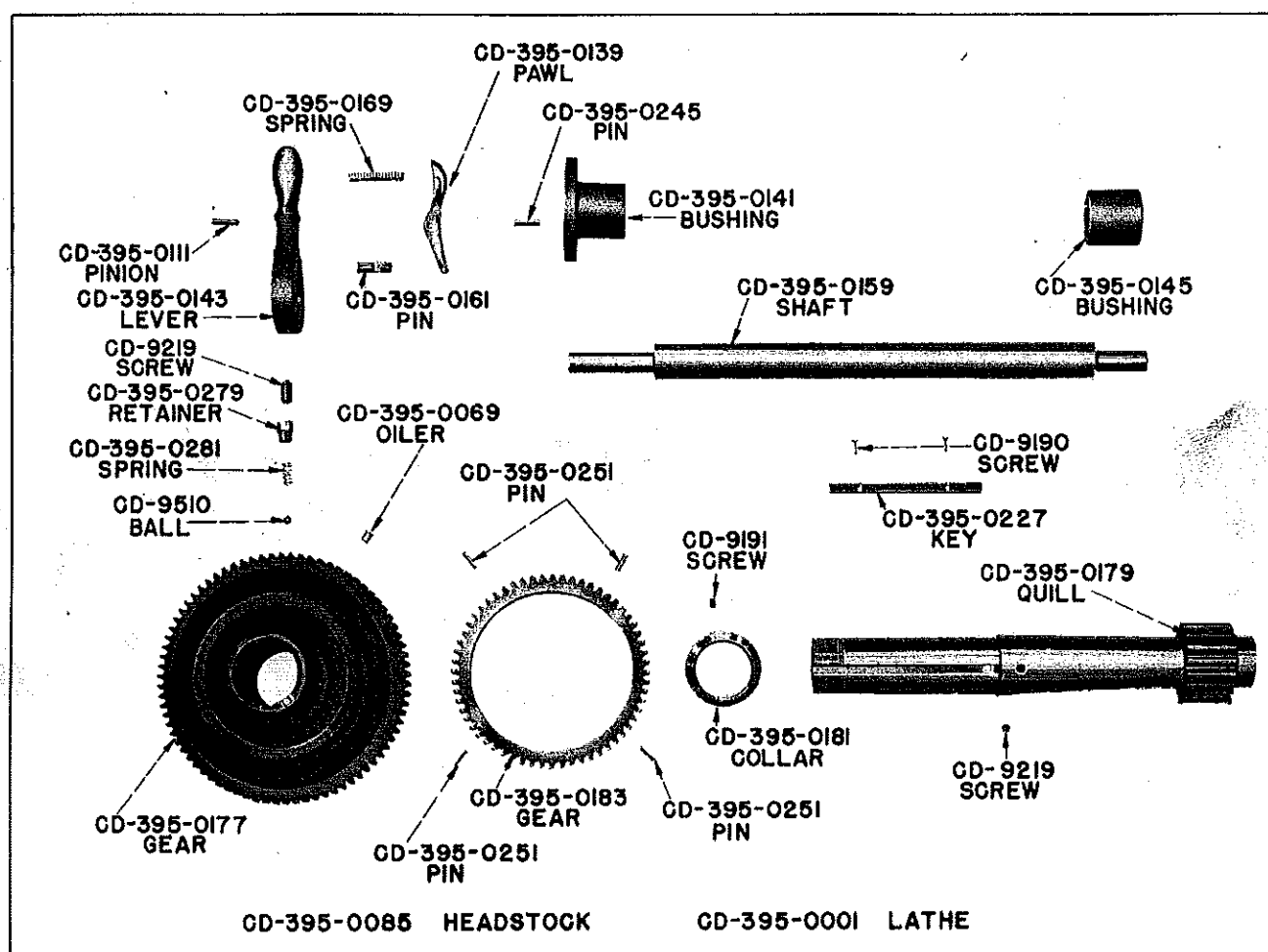


Fig. 255—Exploded View of Back Gearing and Quill, Smith-Drum Lathe

reverse order of the preceding instructions. Be sure to remove all dirt and grit with kerosene and a fine brush. Oil all the parts before reassembly and pay particular attention to the main spindle and thrust bearings.

For metal turning, a rather tight main spindle bearing is essential. After the lathe is "broken-in," the spindle should turn with a slight drag. This can be felt by turning the spindle by hand. Make sure not to get the bearings too tight. This would cause the bearings to heat up and may damage both the spindle and bearings.

Be sure that the leather belt is placed around the cone pulley before assembling the headstock.

BACK GEAR

The back gear is disassembled by first taking out the set screw (CD-9219), in Fig. 255, from the end of the lever (CD-395-0143) and the screw from the end of the shaft. Pull the lever off the shaft. The locking pin in the lever can be removed, if necessary, by knocking out the fulcrum pin and removing the lever pawl and spring. The locking pin (CD-395-0161) can then be lifted out.

Remove the two Allen set screws from the rear of the back gear frame. These two screws hold the two bushings in the frame. Use the brass knockout bar on the spindle nose end of the shaft (CD-395-0159) and knock out the shaft and the large bushing (CD-395-0141). The quill (CD-395-0179) and the large double gear can be removed from the frame after the shaft is taken out. The small bushing (CD-395-0145) is a press-fit in the frame and can be knocked out with the brass bar.

To disassemble the back gears from the quill, loosen the set screw (CD-9191) and unscrew the collar (CD-395-0181) from the end of the quill shaft (CD-395-0179). The compound gear can then be slipped off the quill. Ring gear (CD-395-0183) is locked to the other gear (CD-395-0177) by means of the four pins (CD-305-0251). This gear is keyed to the quill by means of the key (CD-395-0227). The key is removable by taking out the two set screws which hold it to the quill. The screw (CD-9219) in the center of the quill is for an oil hole. The ball locking device on the hub of the compound gear is removed by taking out the retainer (CD-395-0279) and lifting out the spring and ball.

The back gear can be reassembled by following

the above instructions in reverse order. Examine all parts carefully before reassembling them and be sure they are clean and well oiled. Replace any parts that are worn. If the bushings, shaft or gear teeth are badly worn, they will rattle and be very noisy. Renew them if the wear is excessive.

TRIPLE GEAR DRIVE

The triple gear assembly, which is used only to drive the large 28" face plate, is not in continual use and will not be subject to much wear. The assembly will give rise to few maintenance problems.

The gear can be disassembled by first taking out the two set screws (CD-9221), in Fig. 256, in the collar (CD-395-0105) behind the larger gear (CD-395-0101). Tap the gear and collar away from the face plate end of the shaft, using a block of wood or a lead hammer. The gear should be moved along the shaft until it is free of the shoulder on which it is seated. Remove the key (CD-9251) which is then exposed. When the gear is free, the pinion (CD-395-0111) and shaft can be pulled out from the pinion end. The washer, collar, and gear will drop out when the shaft is removed.

The two levers are removed by taking out the two cap screws (CD-9734) from the ends of the handle (CD-395-0115) and lifting out the handle. The levers (CD-395-0097 and CD-395-0099) can then be slipped out of the frame. The lever lock is taken apart by removing the set screw (CD-9222) and spring (CD-395-0123). Loosen the set screw (CD-9291) in the pin (CD-395-0121) and take out the lever (CD-395-0107) and then the pin.

Reassemble the triple gear by following the above instructions in reverse order. All the parts should be cleaned and oiled before assembly. Replace worn or damaged parts as required.

QUICK CHANGE GEARS

The quick change gear mechanism is one of the most important assemblies on the lathe. Be particularly careful in its disassembly and reassembly. Do not force any of the parts or damage the bearing surfaces.

To disassemble the quick change gears, first remove the gear guard covering the change and tumbler gears on the end of the lathe. Take out the four cap screws from the corners of the

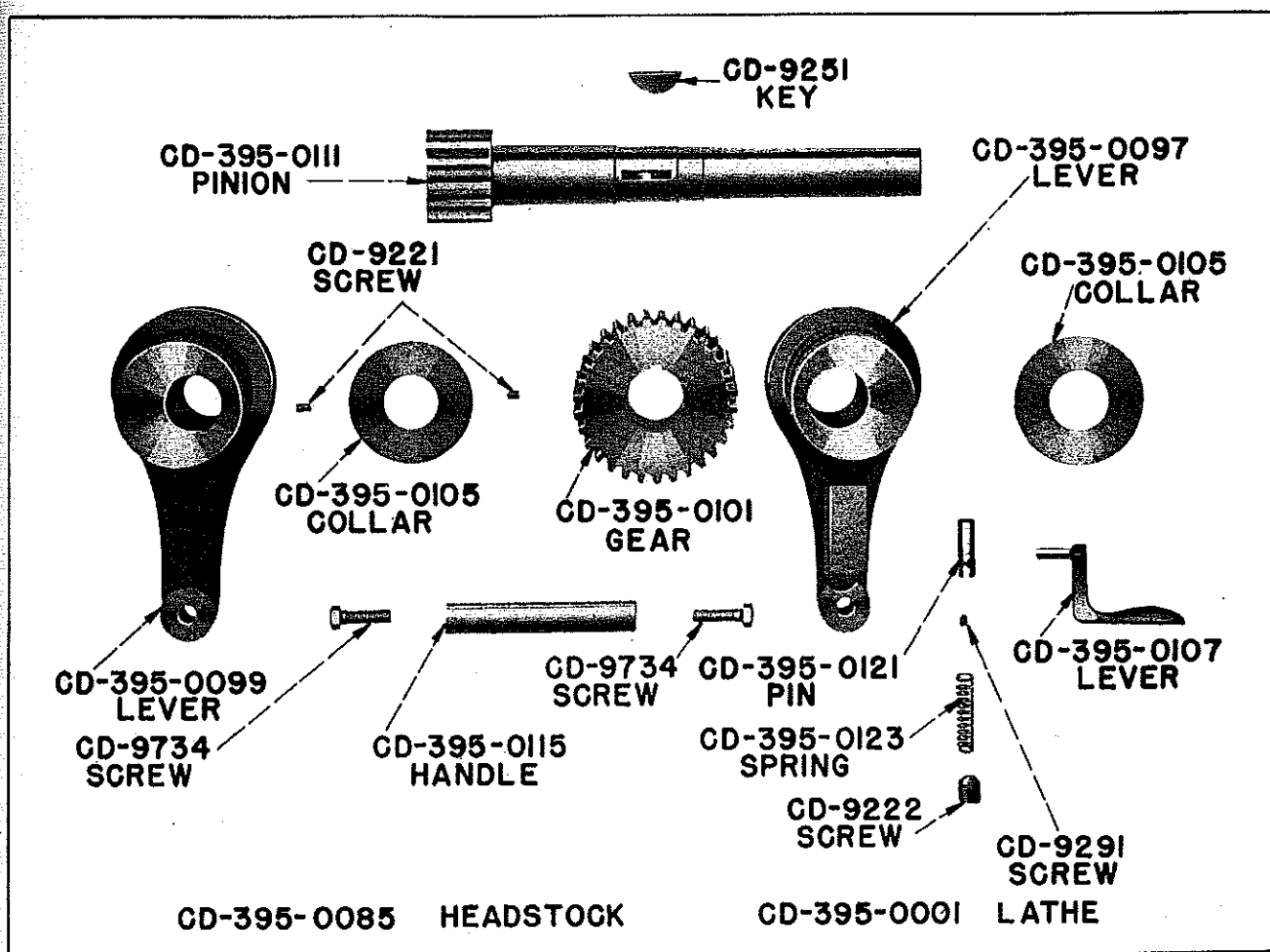


Fig. 256—Exploded View of Triple Gear Drive, Smith-Drum Lathe

gear case. Remove the two hollow-head cap screws from the portion of the cover just behind the driving gear on the left. These screws are reached from the back of the cover. Remove the Allen set screw (CD-9188), in Fig. 257, in the upper shift lever (CD-395-0707) and take out the bushing (CD-395-0727) with the pin and spring. The front of the gear case can now be pulled off. Do this carefully so as not to disturb the gears and shafting in the case. Gearing will then appear as in Fig. 258.

Next, remove the driving gear (CD-395-0713) in Fig. 257, by taking off the nut and washer from the end of the pinion shaft. Remove the key from the shaft. Remove the pinion shaft assembly (CD-395-0733) by lifting it out of the supports. The bushings (CD-395-0691 and CD-395-0695) and the slip gear lever assembly will come out with the shaft. The gear (CD-395-0721) can be removed from the lever assembly

by removing the set screw (CD-9230) and removing the stud (CD-395-0723) and bushing (CD-395-0703) from the lever. Use the arbor press, if necessary, for this removal. The screw (CD-9827) in the end of the stud closes the oil passage. It can be removed if required. The two bushings can be slipped off the ends of the pinion (CD-395-0733). The bushing (CD-395-0701) in the shift lever is removed by loosening the three set screws (CD-9189) and slipping off the collar (CD-395-0725). The bushing can then be pulled out of the lever. The key (CD-395-0791) comes out with the bushing.

Remove the middle shaft (CD-395-0735) with its bank of gears from the gear case. The bushings (CD-395-0693 and CD-395-0697) can be slipped off the ends of the shaft. The bank of gears can be removed from the shaft by pressing them off in the arbor press.

Take out the lower shaft or rod (CD-395-

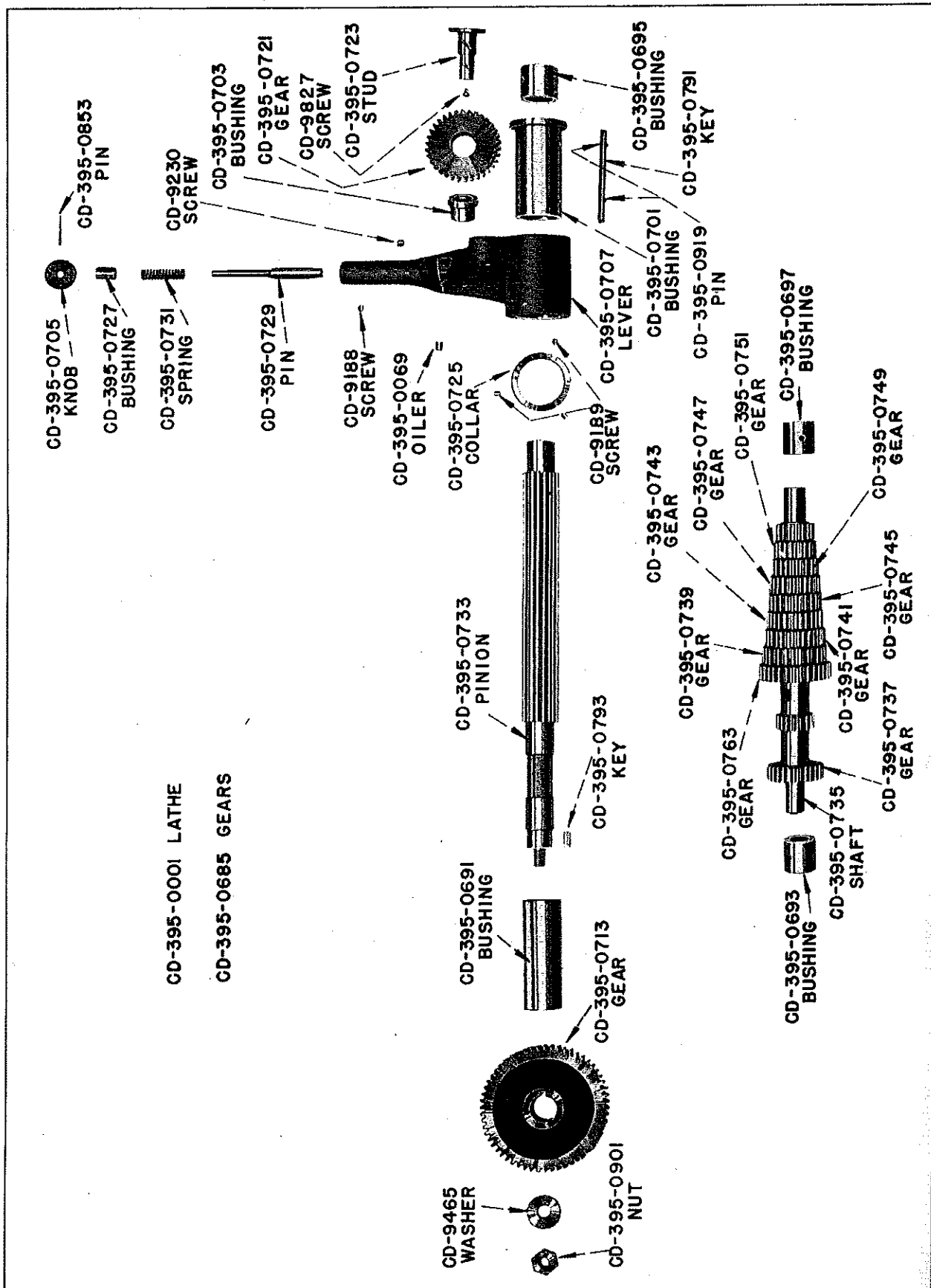


Fig. 257—Exploded View of Quick Change Gearing, Smith-Drum Lathe, Showing Driving Pinion and Gear Bank

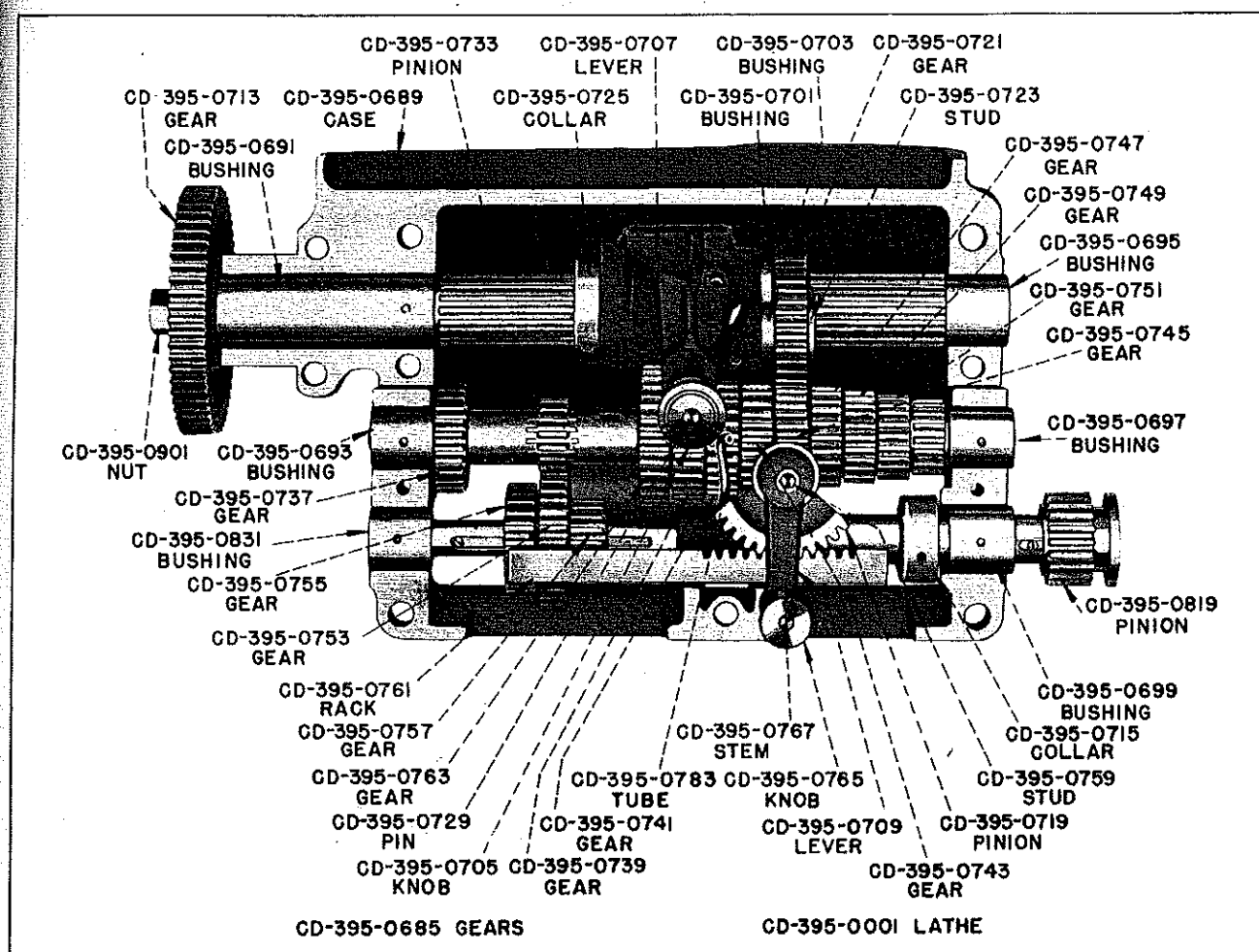


Fig. 258—Assembled View of Quick Change Gearing with Cover Removed, Smith-Drum Lathe

0805), in Fig. 259, and remove the two set screws (CD-9235) from the two collars (CD-395-0715). Knock out the taper pin (CD-9462) from each collar. Remove the bushing (CD-395-0831) from the small end of the rod and pull off the slip gears (CD-395-0755). The collars can then be removed from the shaft. The pinion (CD-395-0819) and bushing (CD-395-0699) can be slipped off the large end of the rod. The two keys are fastened to the rod by means of set screws. These can be removed if necessary.

The shifting rack and pinion which is controlled by the lower lever is mounted in the back of the gear case cover. They can be removed by taking out the four machine screws (CD-9298) which hold the plate (CD-395-0773) to the cover. Remove the plate and take out the rack (CD-395-0761). Remove the lever (CD-395-0709) by taking out the small Allen set screw

and knocking out the pin (CD-9256) which holds the lever to the stud (CD-395-0759). Remove the lever and take out the stud and the rack pinion (CD-395-0719).

Before reassembling the parts, examine them carefully for wear. Replace any parts that require it. Do not use any of the keys, screws, pins or bushings that have nicks or are bent. If the gears or bushings are badly worn they are apt to rattle and be noisy. Renew these parts if they are in this poor condition.

Clean all the parts and oil them before assembly. Be careful to replace the parts so they are properly located in the gear case. Replace all pins and tighten all set screws sufficiently. Locate the slip gears correctly so they engage the rack mounted in the front of the gear case. Be sure to position the bank of gears on the middle shaft so the slip gear engages them properly

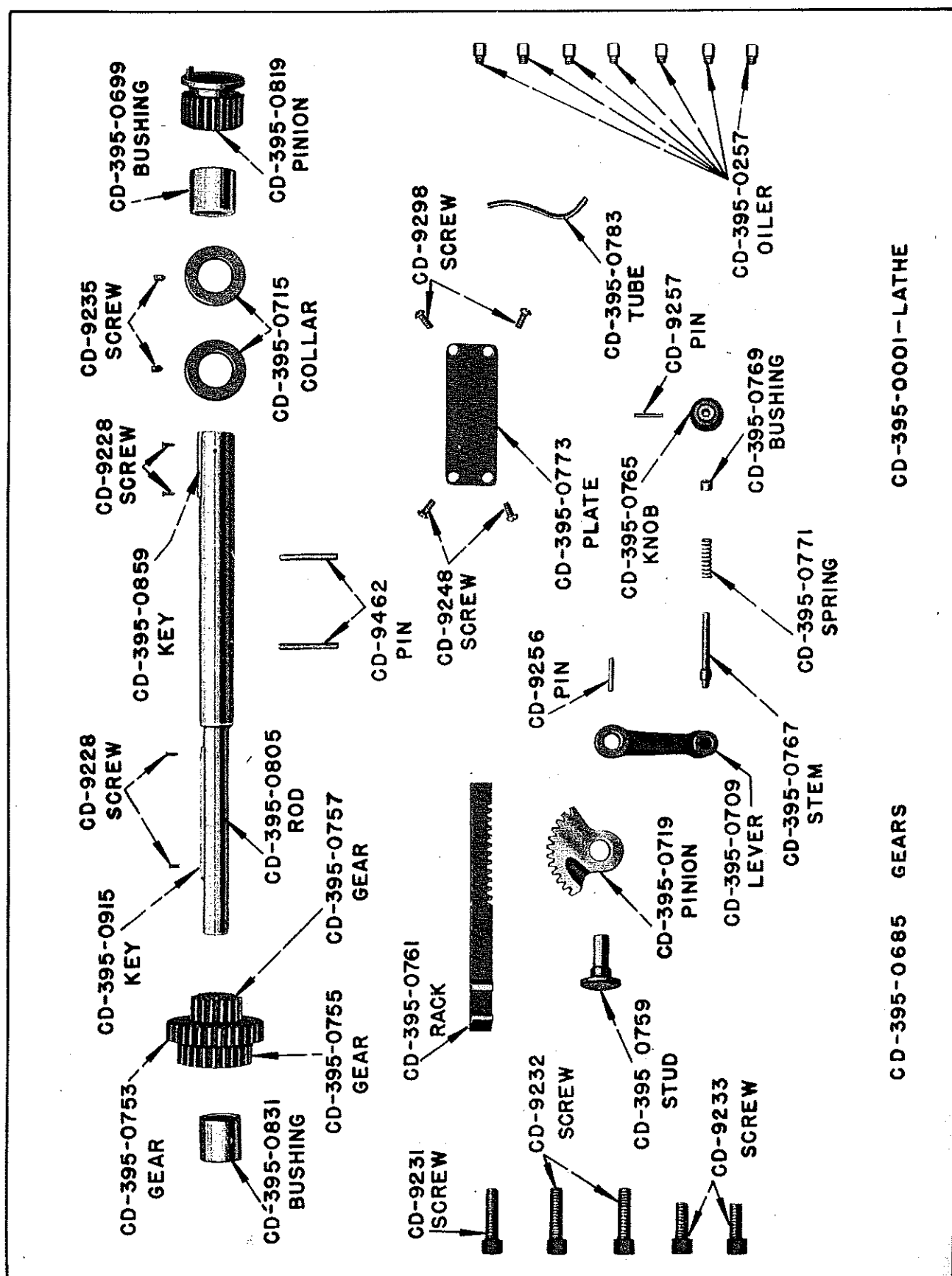


Fig. 259—Exploded View of Slip Gears and Shaft, Quick Change Gearing, Smith-Drum Lathe

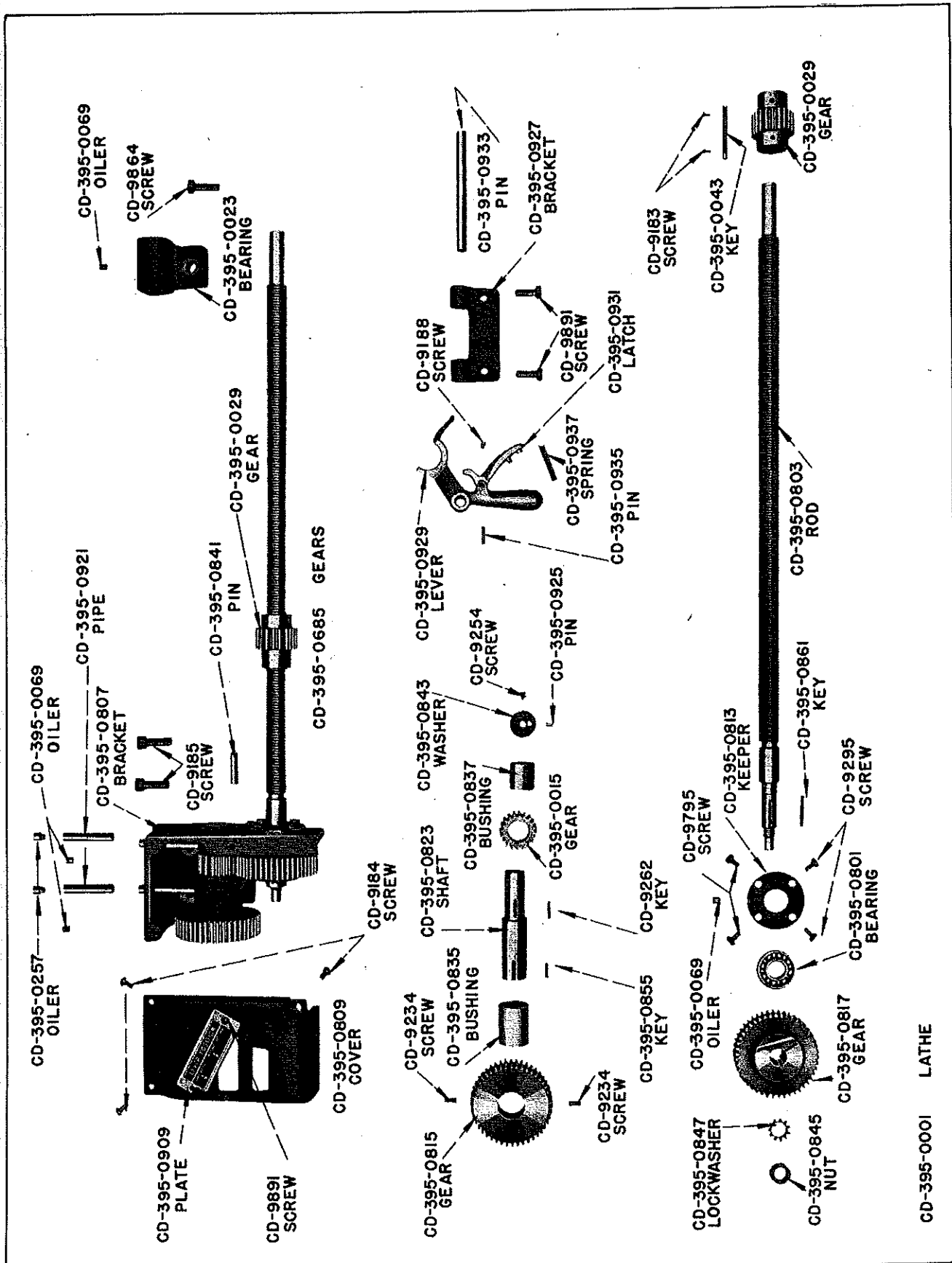


Fig. 260—Assembled and Exploded Views of Fine Feed Gearing and Feed Shaft, Smith-Drum Lathe

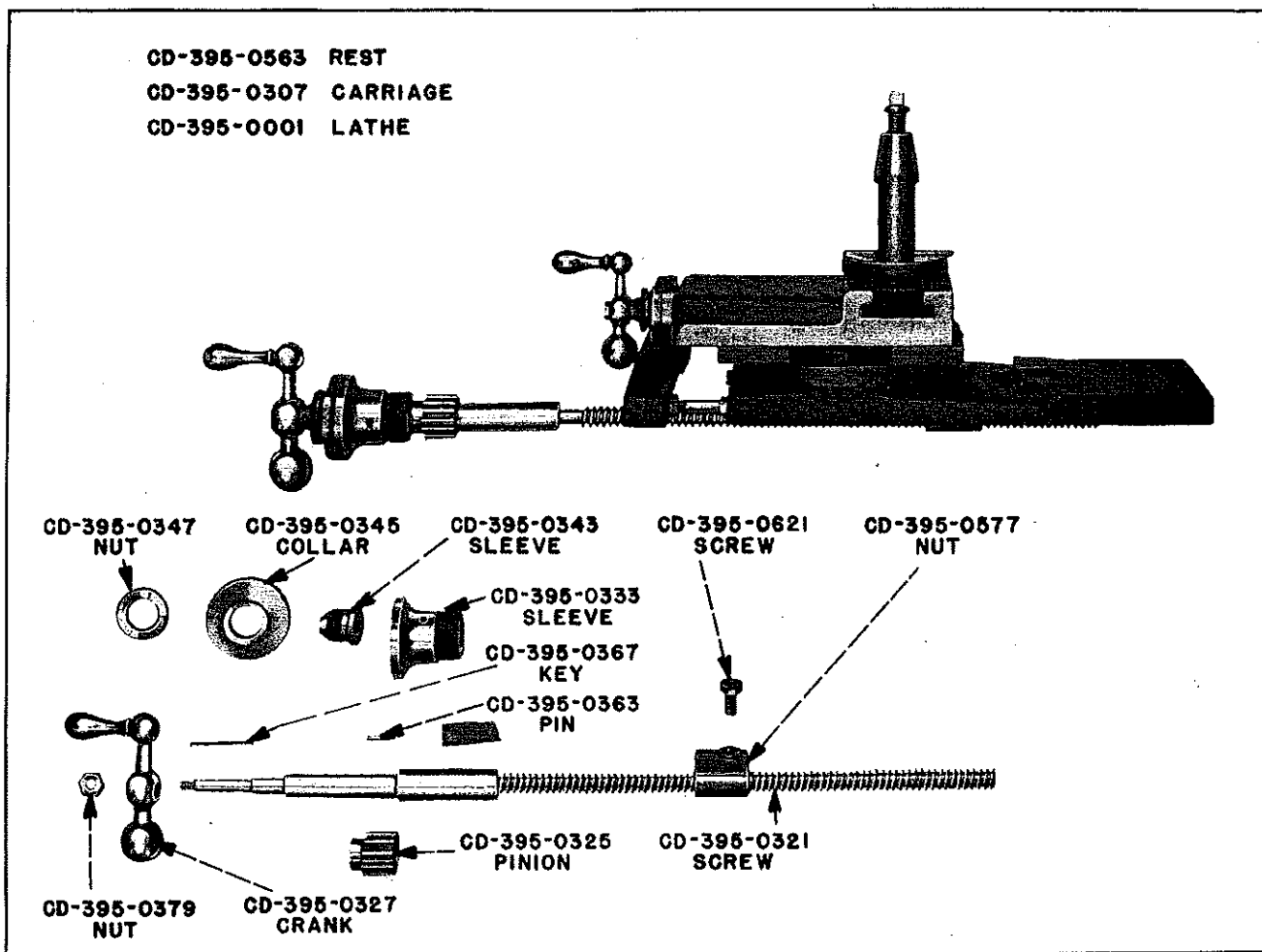


Fig. 261—Assembled and Exploded Views of Cross-Feed, Smith-Drum Lathe

when the upper lever is locked in any one of nine positions. Lubricate carefully after assembly.

FINE FEED GEAR

Before the fine-feed gear can be disassembled, the top bed of the lathe should be moved over to give about a 10" gap. Then remove the two screws (CD-9891), Fig. 260, which hold the shifter lever bracket (CD-395-0927) to the bed of the lathe. Remove the bracket and lever assembly. This can be further disassembled, if necessary, by taking out the Allen set screw (CD-9188) and driving out the pin (CD-395-0933). Use a brass drift for this purpose.

Remove the four cap screws (CD-9795) which hold the keeper (CD-395-0813) to the side of the gear case. Take off the cover (CD-395-0809) of the case by taking out the three screws (CD-9184) which hold it in place.

Unscrew the lock nut (CD-395-0845) from the end of the feed rod (CD-395-0803) and take off the lock washer, gear (CD-395-0817) and key (CD-395-0861). Take out the cap screw (CD-9864) which holds the outer bearing of the feed rod. Slip the bearing off the rod. The rod can then be pulled to the right, out of the fine-feed gear case. The ball bearing (CD-395-0801) will come out with the rod. The rod can be taken off the lathe after the fine-feed gear case has been removed. The gap bed should be open as far as possible for this purpose. The feed rod will slip out of the lead screw drive mounted on the upper bed.

Take off the bracket (CD-395-0807) by taking out the two cap screws (CD-9185). Remove the screw (CD-9254) and washer (CD-395-0843) from the side of the bracket. Drive out the shaft (CD-395-0823) and lift out the gear (CD-395-0015). The large gear (CD-395-0815) can be removed from the shaft by taking out the

set screws (CD-9234) and then pressing the gear off the shaft. Note that both these gears are keyed to the shaft.

Follow the above instructions in reverse order when the fine-feed gear is to be reassembled. Replace any worn or damaged parts. Be sure to clean and oil all the parts before and after assembly.

CARRIAGE CROSS-FEED

The compound rest is mounted on, and carried by, the cross-feed base. This base can be removed as a unit, and the compound rest will come off with it. If necessary, the compound rest

can be disassembled and removed from the cross-feed base. This can be done without taking the cross-feed assembly apart.

Fig. 261 illustrates the assembly of the cross-feed and the compound rest. An exploded view of the cross-feed screw is also shown. The cross-feed base and the compound rest are illustrated in Fig. 262 (exploded view).

To remove the complete cross-feed assembly, turn the compound rest handle until it is as far front as possible. Remove the cross-feed screw cover (CD-395-0565), in Fig. 262, and take out the cap screw (CD-395-0621), in Fig. 261, which holds the base (CD-395-0567) to the feed screw

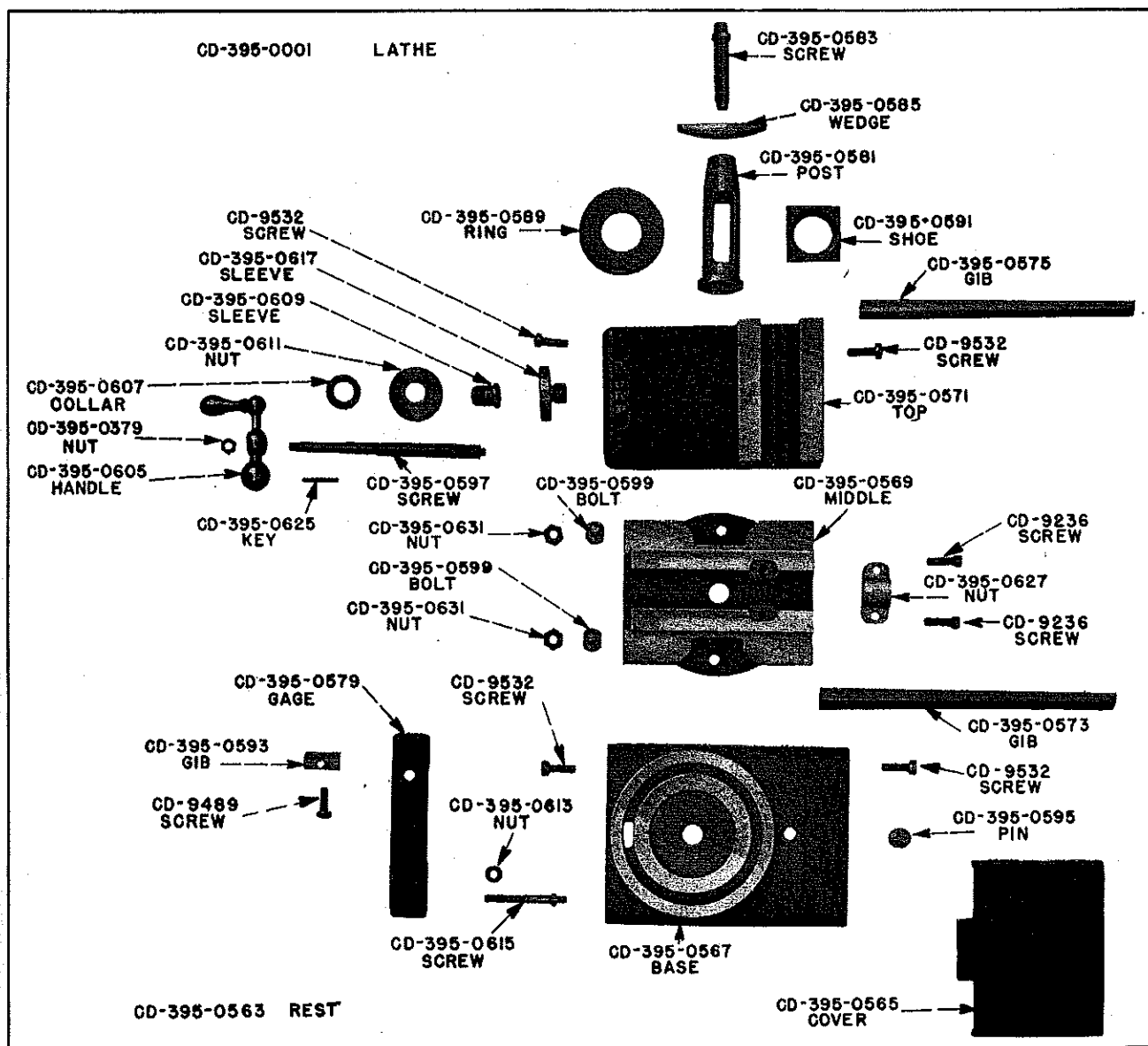


Fig 262—Exploded View of Compound Rest Parts for Smith-Drum Lathe

nut (CD-395-0577). Remove the nut (CD-395-0379) and crank (CD-395-0327) from the end of the screw. Take off the key (CD-395-0367) which holds the handle to the screw. Slide off the index collar (CD-395-0345) with its knurled nut and sleeve (CD-395-0343). Use a spanner wrench to remove the cross-feed sleeve (CD-395-0333) from the lathe carriage. The feed screw can then be pulled out from the rear of the lathe.

The pinion (CD-395-0325) which connects the feed screw to the power drive, is pinned to the screw with a pin (CD-395-0363). This and the pinion can be removed if necessary.

The cross-feed assembly can then be removed by sliding it off either end of the carriage ways. If the assembly is removed toward the front of the lathe, the gage (CD-395-0579), in Fig. 262, has to be removed first. This can be done by loosening the screw (CD-9489) which clamps it to the carriage ways, and sliding it off to the front.

The compound rest can be removed as a unit by unscrewing the two binder nuts (CD-395-0631) which clamp it to the cross-feed base. When these nuts are removed, the whole rest can be lifted off. This leaves the base (CD-395-0567) and the swivel pin (CD-395-0595) mounted on the carriage.

Turn the handle (CD-395-0605) of the compound rest feed screw counter-clockwise until the screw has left the nut (CD-395-0627). Loosen the gib (CD-395-0575) of the rest by loosening the screw (CD-9532) in the rear of the way, and tightening the screw (CD-9532) in the front. The top (CD-395-0571) of the rest can then be slipped off the middle piece (CD-395-0569).

To remove the feed screw, take off the nut (CD-395-0379) from the end and slide off the handle and key. Remove the lock nut (CD-395-0611) and take off the index collar and sleeve. The index sleeve (CD-395-0617) is removed from the top of the rest by unscrewing it with a spanner wrench.

The base (CD-395-0567) is removed from the carriage ways in the manner already explained for the removal of the cross-feed assembly. Note that there is a hole in the base to provide a means of removing the binder bolts (CD-395-0599). If necessary, the old bolts can be removed from the circular T-slot, and new ones inserted through this hole.

Reassembly of this unit is accomplished by following the above instructions in reverse order. Inspect the parts carefully while they are

disassembled, and discharge any that are damaged or badly worn. Pay particular attention to the threaded parts and see that they do not have any wear or backlash. Replace the feed screws and nuts as a unit, if necessary.

In reassembling, make sure that all keys and screws are put in their proper places. If any of these parts are bent or the threads damaged, replace with new ones or repair the old ones. Be sure the parts are thoroughly cleaned and oiled before putting them together.

The gibs on the cross-feed and the compound rest should be adjusted to give a snug running fit. They should take up all side play in the ways and have an even pressure along the entire gib. The gibs are tightened by loosening the gib screw on the front end of the ways and tightening the screw on the rear. When the setting has been made, both screws should be tight. The gib is loosened by reversing this process.

CARRIAGE APRON

In order to disassemble the carriage apron, the lead screw has to be removed. Loosen the upper lathe bed clamps, and open the gap about a foot. Remove the cover guard (CD-395-0031), in Fig. 263, from the gear drive on the left end of the lead screw. Remove the gear (CD-395-0015) and its Woodruff key (CD-9378) from the end of the lead screw.

Move the tailstock and carriage as far out on the right end of the bed as possible. Take off the two nuts (CD-9861) from the right end of the lead screw. Remove the washer and thrust bearing (CD-395-0037). Take out the two cap screws (CD-9864) and slide the bearing (CD-395-0011) off the end of the lead screw. The inner thrust bearing can then be pulled off the screw. This frees the lead screw and it can be removed from the lathe by pulling it out to the right. Be sure the thread dial indicator is not in mesh with the lead screw.

Remove the extension support from the carriage saddle by taking out the three cap screws which hold it in place. These screws are on the under side of the extension. Take off the extension rod support, on the underside at the front of the carriage extension, by unscrewing the two cap screws. The support can then be slipped off the rod. The cross-feed drive gear and plate will come off with the support.

The apron is held to the carriage saddle by two socket-head cap screws. These are under

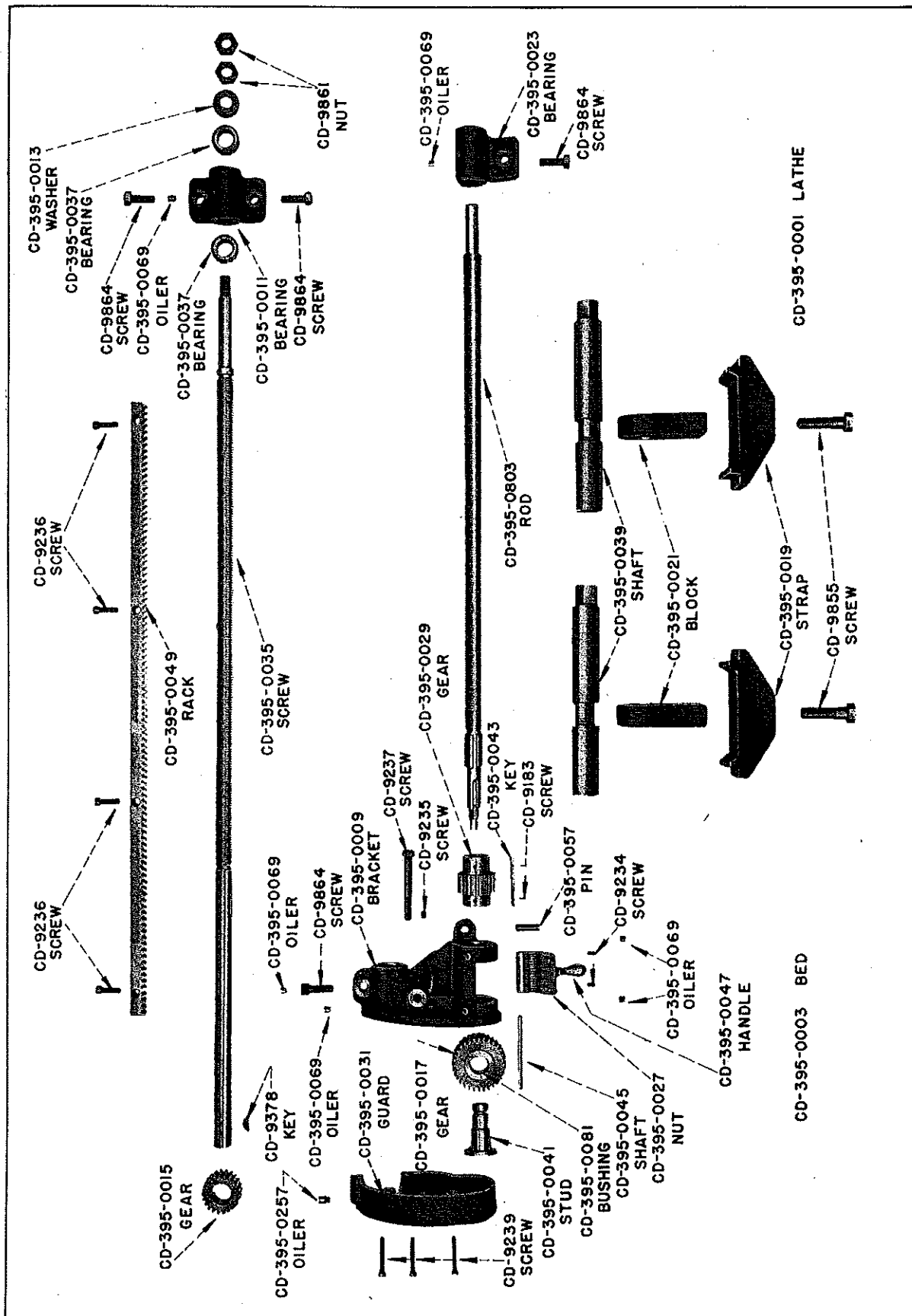


Fig. 263—Exploded View of Lead Screw Drive, Smith-Drum Lathe.
Lathe Bed Clamps Are Also Shown

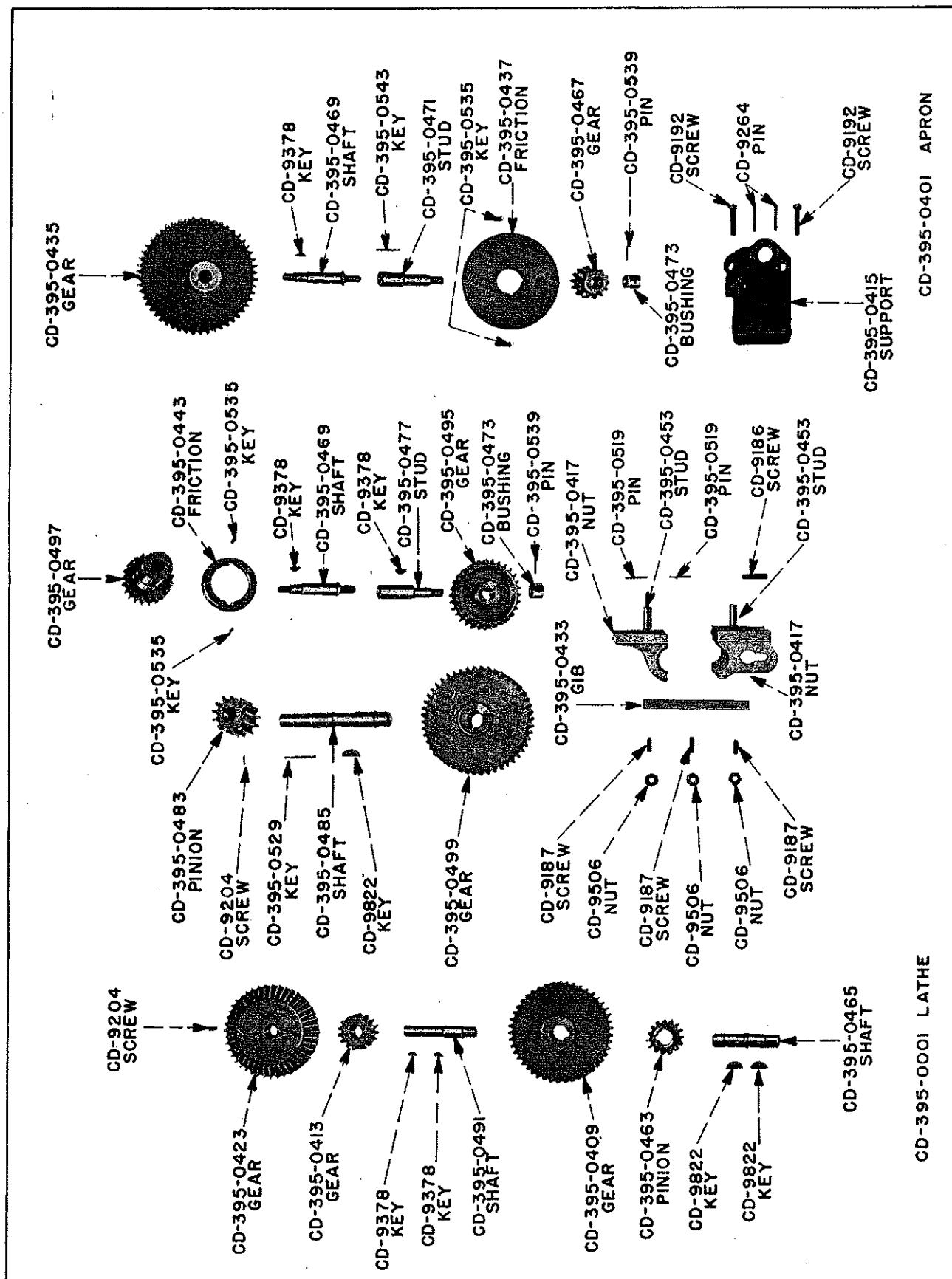


Fig. 264—Exploded View of Part of Carriage Apron Gearing, Smith-Drum Lathe

the top ends of the apron, just in front of the lathe bed ways. Remove these screws and lift off the apron. In order to keep the parts of the apron from falling out when the back and front plates are removed, lay the assembly on two wooden supports with the front side down.

Remove the lead screw support (CD-395-0415), in Fig. 264, by taking out the two cap screws (CD-9192). Note that this support is positioned by means of two dowel pins (CD-9264). Take out the two screws (CD-9609), in Fig. 265, which hold the reverse bearing (CD-395-0427) in place. Remove the bearing cap and take out the reverse rod (CD-395-0411). The two reverse fingers (CD-395-0425) can be removed from the rod by loosening the set screw (CD-9205) in each. The pinion (CD-395-0493) carried in each finger can be lifted out.

The reverse lever (CD-395-0429) is taken off the reversing shaft (CD-395-0457) by knocking out the pin (CD-9266) and loosening the set screw (CD-9180) which connect the two. The shaft and the feed reversing handle (CD-395-0431) is then slipped out from the front of the apron.

The back plate of the apron is removed by unscrewing the three cap screws (CD-9207) and the flat-head screw (CD-9179) which hold it in place. Four dowel pins (CD-395-0537) through the back plate assure proper alignment with the rest of the apron assembly.

Lay the back plate assembly on a flat wood support. From the rear of the plate, drive the shaft (CD-395-0465), Fig. 264, out of the small pinion (CD-395-0463). Remove the Woodruff key (CD-9822) from the shaft. The shaft with the gear (CD-395-0409) will then drop out of the plate. The shaft can be driven out of the gear, if necessary. A Woodruff key connects the gear and shaft.

Slide the two lead screw half nuts (CD-395-0417) out of their ways in the back plate. The gib (CD-395-0433) can then be removed from the ways. In assembling the half nuts in the ways, be sure to adjust the gib to give a snug running fit. There should not be any side play of the nuts as this will impair the accuracy of the thread cutting. The gib is tightened by tightening the three set screws (CD-9187). Use the three lock nuts (CD-9506) to lock the setting.

The studs (CD-395-0453) are held in the half nuts by means of pins (CD-395-0519). These,

as well as the set screw (CD-9186), can be removed, if necessary.

Take out the set screw (CD-9181), in Fig. 265, from the hub of the nut cam (CD-395-0419) and pull the cam off the shaft. Knock out the pin (CD-9266) which holds the cam lever (CD-395-0421) to the cam shifting shaft. Remove the lever. Loosen the set screw (CD-9180) in the side of the cam washer (CD-395-0481) and remove the washer from the shaft. Take the Woodruff keys out of the shaft, and slip it out of the plate.

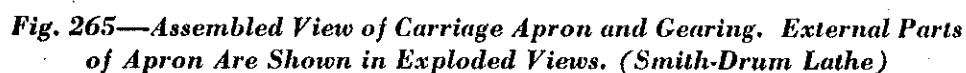
The longitudinal feed handwheel (CD-395-0403), Fig. 265, is removed by first taking off the nut (CD-9838) which holds it in place. Note that a key (CD-395-0533) holds the wheel to the shaft. Remove the shaft sleeve (CD-395-0449) from the front plate by means of a wrench. The shaft stem (CD-395-0489) with the pinion (CD-395-0483) is taken out by sliding it out of the rear of the front plate. The pinion is keyed and pressed on the stem. It can be removed in the arbor press.

The extension rod (CD-395-0323) is removed from the front plate by first loosening the set screws (CD-9235) in the hub of each gear (CD-395-0309). Take out the Woodruff keys and slide the shaft out of place.

The two star wheel knobs (CD-395-0441) are removed by unscrewing the nuts (CD-9752) which hold them in place. Remove the knobs and keys and lift out the washer (CD-395-0475) under each. The cross-feed sleeve and the lateral feed sleeve (CD-395-0439 and CD-395-0447) are screwed into the front plate. These can be removed with a wrench.

When the knobs have been removed, the feed gears and shafts can be lifted from the rear of the front plate. To disassemble the longitudinal gears, press the shaft (CD-395-0469), in Fig. 264, out of the feed gear (CD-395-0435). Remove the key from the shaft. Knock out the pin from the bushing (CD-395-0473) on the other end of the shaft and unscrew the bushing. The gear (CD-395-0467) and the friction disc (CD-395-0437) can then be slipped off the shaft. The shaft and stud (CD-395-0471) screw together to provide the clutch action of the friction disc.

The cross-feed gears and shafts are disassembled in much the same manner. Knock out the pin (CD-395-0539) which holds the bushing (CD-395-0473) to the end of the stud. Unscrew the bushing and remove the gear (CD-395-0497),



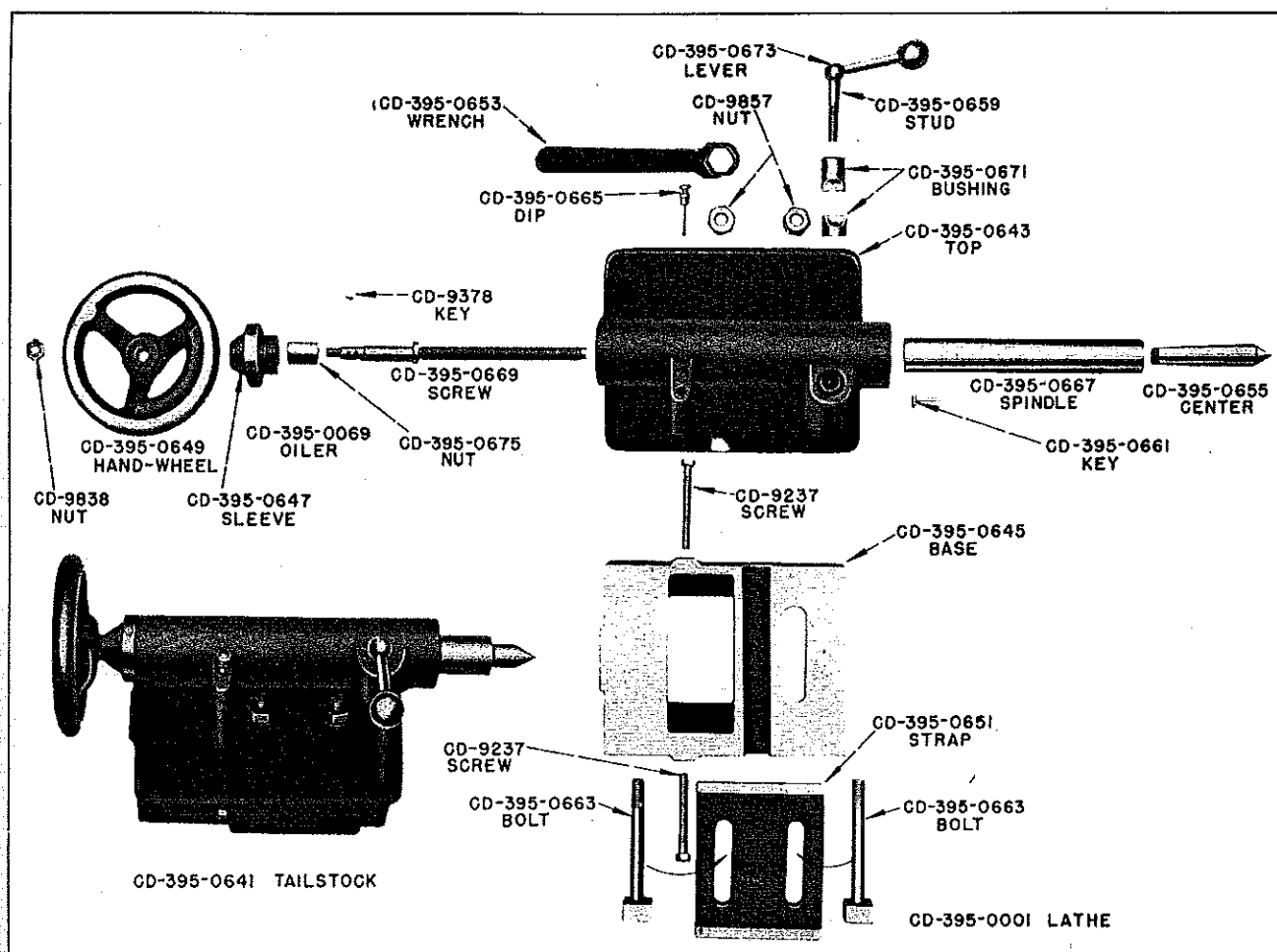


Fig. 266—Exploded and Assembled View of Tailstock, Smith-Drum Lathe

friction collar (CD-395-0443), with its keys from the other end of the shaft. The stud (CD-395-0477) and shaft screw together to form the clutch with the friction disc.

The bevel drive gear and pinion gear (CD-395-0413) can be removed from their shaft by taking out the set screw in the hub of the bevel gear. The gears and their keys can then be slipped off the shaft (CD-395-0491). These gears and the shaft can be lifted out of place when the rear apron plate is removed.

The apron rack pinion (CD-395-0483) and the rack gear (CD-395-0499) with their connecting shaft comes off with the rear plate. They can be removed from the plate by first loosening the set screw (CD-9204) in the pinion. The arbor is used to push the shaft out of the gears. Remove the keys from the shaft and slip it out of the plate.

When reassembling the apron, be sure to have all the parts clean, and covered with a light film

of machine oil. Renew all gears, keys, bearings, etc., which are damaged or worn. Take particular care to see that all the keys, set screws, and pins are correctly placed and are tight. The only adjustment necessary is for the gib of the lead screw half nuts. This has already been explained.

TAILSTOCK

The entire tailstock assembly can be removed from the lathe bed, if necessary, to provide additional room for certain lathe operations. Loosen the two binder nuts which clamp the tailstock to the lathe bed and slide the entire assembly off the right end of the ways. The binder bolts and the strap, which rests against the underside of the ways, will come off with the stock.

To disassemble the tailstock, first remove the stud (CD-395-0659), in Fig. 266, which clamps the spindle in position. Unscrew it all the way and take it out. The upper bushing (CD-395-

0671) can then be lifted out. The lower bushing cannot be taken out until the spindle has been removed. This is done by turning the handwheel and screwing the spindle out as far as it will go. The spindle screw is then disengaged and the spindle can be removed. The lower bushing (CD-395-0671) can also be removed. The tailstock center can be knocked out of the spindle with a bar inserted at the other end of the spindle. The center can also be removed (before the spindle is taken out), by screwing the spindle inward until the end of the screw pushes the center out.

When the spindle has been removed, its key (CD-395-0661) can be lifted out. Note that the inner end of the key has a pin end which fits into a hole in the tailstock bore. Unscrew the nut (CD-9838) from the center of the hand-

wheel and take the handwheel off the tailstock screw (CD-395-0669). Remove the key (CD-9378) from the screw. The screw can then be pulled out from the spindle end of the tailstock. The sleeve (CD-395-0647) which holds the screw in place, is screwed into the stock and can be removed with a spanner wrench.

The spindle nut (CD-395-0675) which is mounted in the end of the spindle, is held in place with two Allen set screws. After the set screws are removed, the nut can be knocked out with a piece of hardwood dowel inserted in the spindle from the center end. The nut is brass and should not be hammered on with steel or other hard metal.

The top (CD-395-0643) of the tailstock can be removed from the base (CD-395-0645) by un-

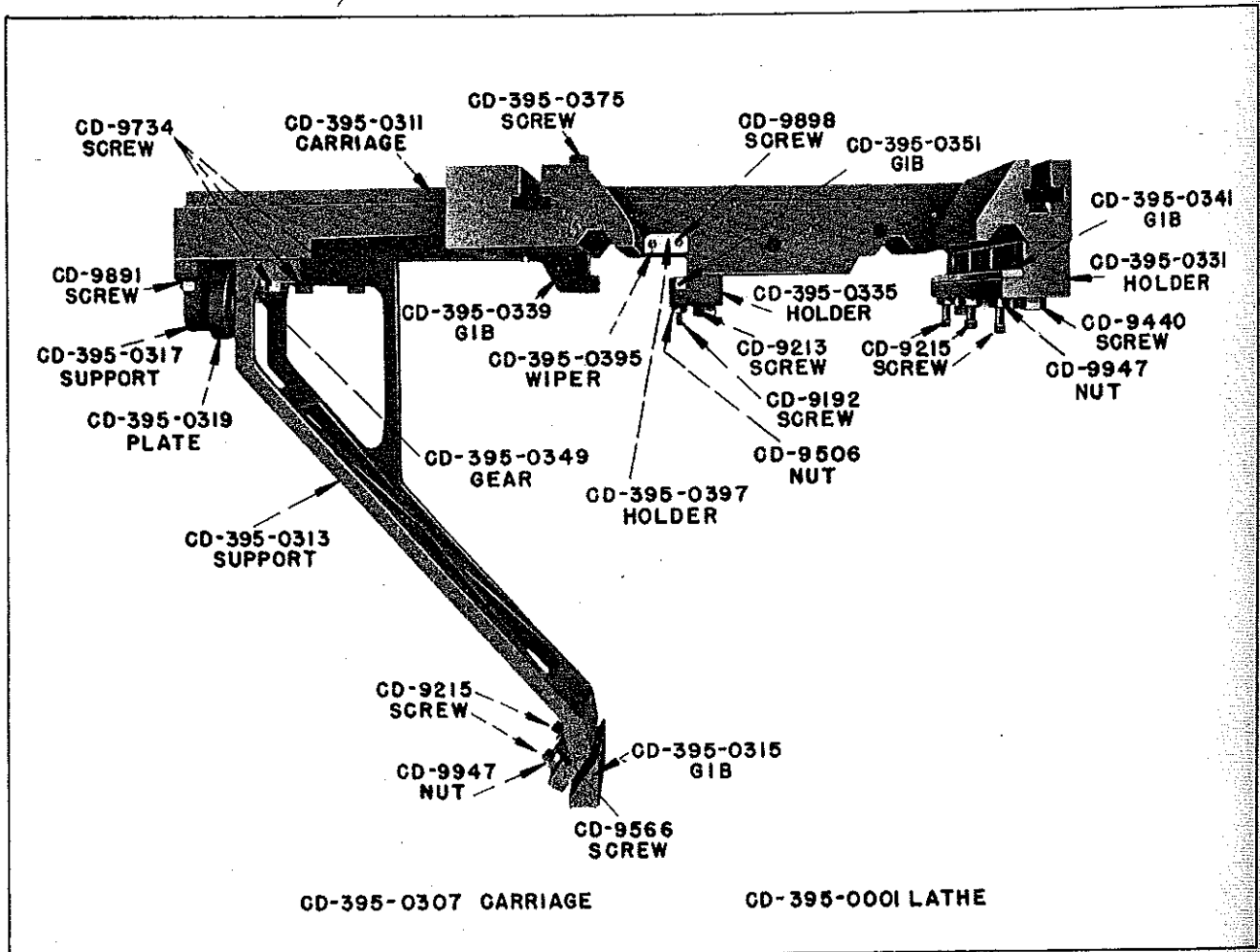


Fig. 267—Assembled View of Carriage and Support, Smith-Drum Lathe

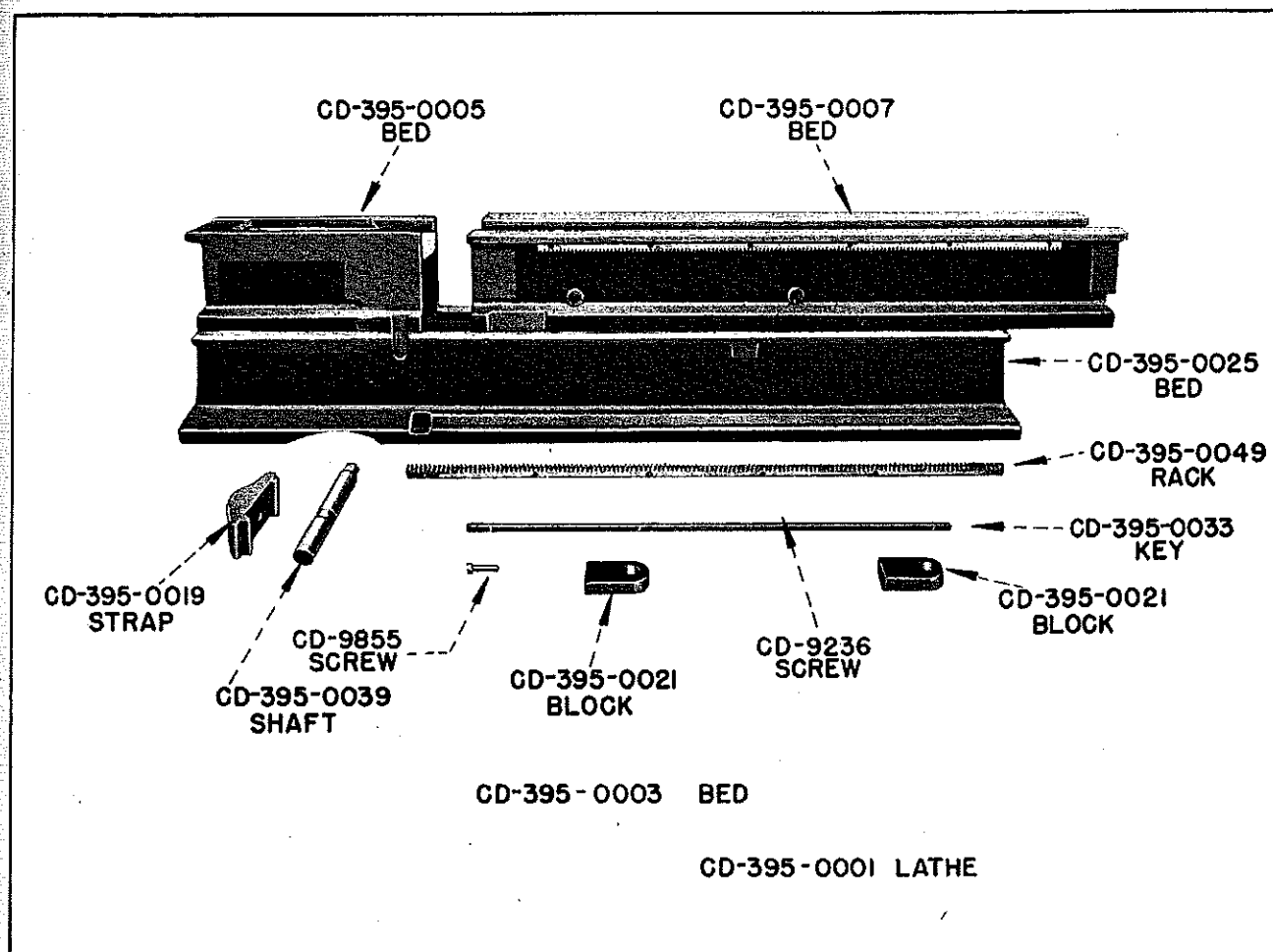


Fig. 268—Assembled View of Lathe Bed Stripped of Parts, Smith-Drum Lathe

screwing the two nuts (CD-9857) from the binder bolts (CD-395-0663). Remove the bolts and the strap. Take out the two adjustment screws (CD-9237) and remove the top from the base.

After disassembly, clean the parts and inspect for damage or wear. Replace those parts which are badly worn or would cause misalignment. A worn spindle screw or nut is not serious as these are used only to position the spindle. Side play of the spindle in the stock would cause inaccuracies in lathe work and must be corrected. Use new parts if necessary.

Oil the parts carefully and reassemble, following the above instructions in reverse order. The spindle is assembled last. The lower bushing (CD-395-0671) and the spindle screw have to be in place before the spindle is inserted in the top of the stock. When assembly is complete and the tailstock is mounted on the lathe, it should be checked for alignment with the head-

stock center. A rough check can be made by bringing the tailstock center up to the headstock center and using the adjusting screws to bring the center points in line. A more accurate check is explained on page 242.

CARRIAGE

The parts of the lathe carriage are shown in Fig. 267. The apron and front extension support have to be removed before the carriage can be taken off the upper bed of the lathe. Instructions for their removal are given on page 272. The cross-feed and compound rest do not have to be taken off.

Loosen the carriage gibs by unscrewing the lock nuts (CD-9947) a few turns on the three set screws (CD-9215) which hold the rear gib in place. Loosen the set screws. Loosen the front gib in the same manner. In this case, the set

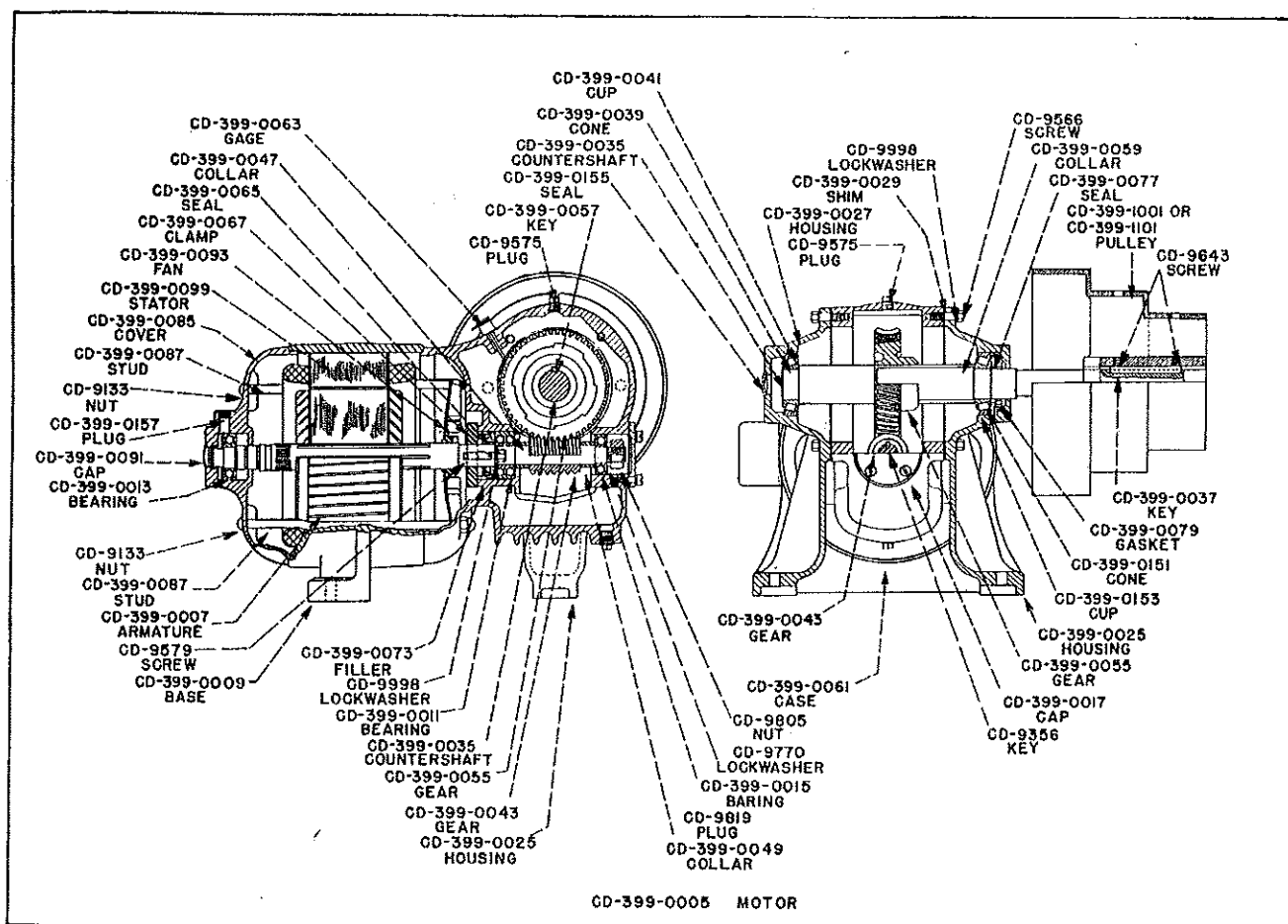


Fig. 269—Sectional Views of Lathe Motor and Gear-Driven Pulley

screws (CD-9192) have socket heads and an Allen wrench is required.

Remove the screws (CD-9440) which hold the rear gib holder (CD-395-0331) to the carriage, and take off the holder. Take out the cap screws (CD-9213) under the center of the carriage and remove the front gib holder (CD-395-0335). Unscrew the carriage locking screw (CD-395-0375) and remove the locking gib (CD-395-0339). The carriage is then free and can be lifted off the ways of the lathe.

After the carriage has been reassembled on the lathe bed, the gibs should be left loose until the last operation. They should then be adjusted to give a snug running fit of the carriage to the ways. Adjustment is made by means of the set screws which hold the gibs in place. The lock nuts on the set screws should be tightened after the adjustment has been made. The carriage locking gib requires no adjustment. It is loose

for all lathe operations where the carriage has to be moved. It is tightened to lock the carriage in place for cutting off or other facing operations.

LATHE BEDS

The lead screw and feed rod gearing, which is mounted on the left end of the upper lathe bed, is shown in Fig. 263, on page 273, as an exploded view. The gearing can be disassembled by first taking out the three cap screws (CD-9239) and removing the gear guard (CD-395-0031). The upper bed will have to be moved to the right, about a foot, before this can be done.

The lead screw drive gear (CD-395-0015) can be taken off the end of the lead screw after the gear guard is removed. The key (CD-9378) should be removed from the lead screw also. This frees the left end of the lead screw. The

right end is unfastened by taking out the two cap screws (CD-9864) which hold the bearing (CD-395-0011) to the lathe bed. The lead screw is then slipped out toward the right.

Remove the cover from the fine feed gear

box and take off the nut and lock washer from the end of the feed rod (CD-395-0803). The gear (CD-395-0817) and its key (CD-395-0861) can then be loosened on the end of the rod. Refer to Fig. 260. Unscrew the four cap screws (CD-

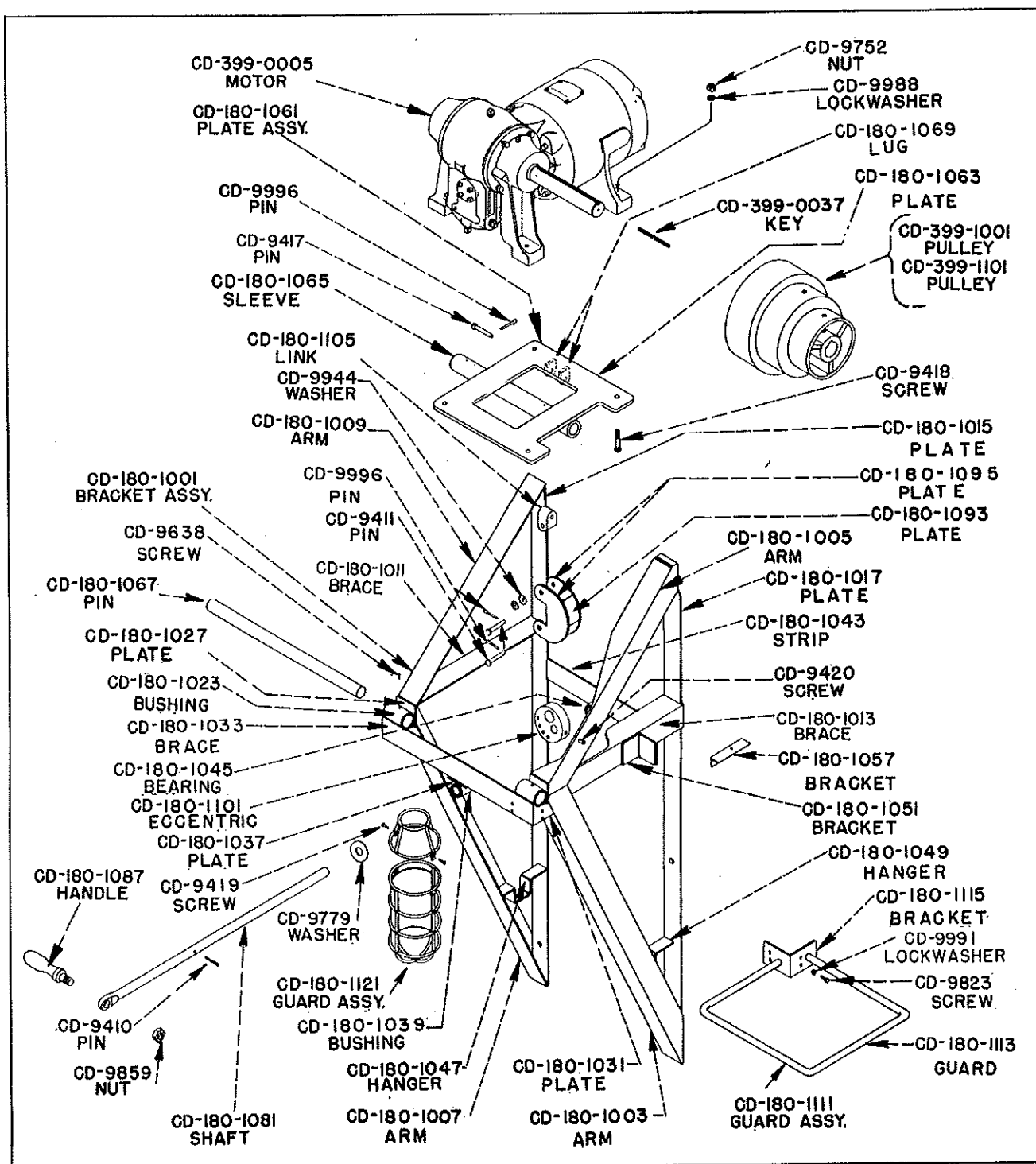


Fig. 270—Exploded View of Lathe Motor Drive and Shifter Mechanism

9295) and remove the bearing keeper (CD-395-0813) from the side of the fine-feed gear box. Take out the cap screw (CD-9864), in Fig. 263, and remove the bearing (CD-395-0023) from the end of the feed rod. Pull the rod to the right so both ends are free. Unscrew the two cap screws (CD-9864 and CD-9237) which hold the lead screw gear bracket (CD-395-0009) to the upper bed. Remove the bracket with the feed rod. The rod can then be pulled out of the bracket.

Disassemble the gearing if necessary. The intermediate gear (CD-395-0017) runs on a stud (CD-395-0041) which is held in the bracket by means of a set screw. The half nut (CD-395-0027) is hinged to the bottom of the bracket by the shaft (CD-395-0045).

The upper bed can be removed from the lower lathe bed after the lead screw, long feed rod and gearing have been taken off. The tailstock, carriage and apron should also be removed. Loosen the bed clamps and remove the cap screw (CD-9855), in Fig. 268, which holds the strap (CD-395-0019) to each clamping block (CD-395-0021). The upper bed is then free and can be lifted off the lathe.

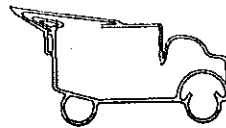
In reassembling, follow these instructions in reverse order. Replace the parts carefully and be sure to have all the keys, pins, and set screws in their proper places. Replace any parts that

are worn beyond repair or are damaged. Adjust the thrust bearings of the lead screw so they give a smooth running fit without end play.

LATHE DRIVE

Electrical maintenance instructions of the lathe motor control are given in the section covering electrical maintenance, starting on page 88. The motor is a 110 volt, 60 cycle, 3 phase, induction motor. This type of motor does not have slip rings or commutator with carbon brushes and therefore does not require the maintenance that these would entail. Very few maintenance problems will arise if the motor and gear drive are given the proper lubrication. Fig. 269 illustrates the parts of the motor and show their respective assembled positions. Refer to this illustration for maintenance purposes.

An exploded view of the lathe motor bracket and shifter is shown in Fig. 270. The lathe belt will stretch after use and require a new setting of the shifting device to prevent the belt from slipping. Adjustment can be made by removing the clevis pin (CD-9411) from the eccentric (CD-180-1101). Shift the eccentric so another hole lines up with the hole in the half plate and replace the clevis pin. Do not make the adjustment too tight. The belt should be loose when the drive is disengaged.



DESCRIPTION AND OPERATION OF THE SENECA FALLS
GAP BED LATHE AND ACCESSORIES

DESCRIPTION AND OPERATION

A few of the Couse Type "B" Machine Shops are equipped with a Seneca Falls gap bed lathe in place of the Smith-Drum Lathe described in the previous pages. The Seneca Falls lathe has a fixed bed with a normal swing of 14". The gap feature is obtained by removing the bridge from the lathe bed. This gives a 21" swing in a gap about 7" wide.

The instructions given for operating the Smith-Drum lathe can be followed, with a few exceptions, for the operation of the Seneca Falls lathe. The different features are pointed out in the descriptions given below.

HEADSTOCK

The lathe headstock (CD-396-0303), in Fig. 271, is equipped with a four-step cone pulley and the usual double reduction back gears. Unlike the Smith-Drum lathe, a triple reduction gear to drive the largest face plate is not provided. The face plate is driven from the spindle through the back gears.

To engage the back gears, turn the pulley by hand until the locking pin on the inside of the bull gear is exposed. Pull the pin outward and give it half a turn to hold it in the unlocked position. Grasp the back gear lever (CD-396-0319) and swing it toward you. If the cone pulley is turned by hand at the same time, the gears will mesh more easily.

The knob (CD-396-0369) on the lower left side of the headstock is the feed reverse knob. This controls the direction of rotation of the lead screw. When the knob is in its highest position, the lead screw will revolve in one direction. With the knob in its lowest position, the lead screw will rotate in the opposite direction. The middle position of the knob disengages the drive to the change and tumbler gears and the lead screw will not operate. The knob should be shifted only when the lathe is not running.

QUICK-CHANGE GEARS

The quick-change gears and controls are mounted on the lathe bed below the headstock. They are enclosed in the cage (CD-396-0235), shown in Fig. 271. These gears control the speed of the lead screw and thereby govern the speed of the lathe carriage and cross-feeds. Two knobs (CD-396-0259) operate the gear changes. The knob on the left has three positions, numbered 1, 2, and 3. The knob on the right has eight positions. An index plate (CD-396-0249), mounted over the right knob, gives the positions for various feeds in inches and pitches of threads in threads per inch. The feed in inches refers to the speed of the carriage when the friction feed on the carriage apron is used. The threads per inch refer to the use of the split nut to drive the carriage. This is only used for thread cutting purposes.

The second column of the index plate gives the position of the left knob. The eight columns, to the right of this, gives the position of the right knob. For example: a feed of .0112" per revolution of the lathe spindle, when the friction carriage drive is used, is obtained with the left feed knob in position No. 2 and the right knob in the fifth hole from the left. The carriage will move .0112" for each turn of the spindle when the friction knob on the apron is tightened. This same position of the right and left feed knobs will give the correct speed of the lead screw for cutting 16 threads to the inch. In this case, however, the carriage is driven from the lead screw by the split nut. The split nut is always used to drive the carriage for all thread cutting. The number in the upper left corner of each rectangle on the index plate gives the number of threads per inch when the feed levers are set as indicated and the split nut is used. The number in the lower right corner gives the feed in inches when the split nut is disengaged and the carriage is driven through the friction drive.

EFSB L-1018

ENGINEER FIELD SERVICE
BULLETIN No. L-1018

WAR DEPARTMENT
Office, Chief of Engineers
Washington, D. C. November 19, 1942

LUBRICATION INSTRUCTIONS FOR
SHOP, MOTORIZED, AVIATION BATTALION, TYPE B
(COUSE TYPE B, FORD 1½ TON, 100 HP)

1. GENERAL—The following lubrication instructions for the Shop, motorized, aviation battalion, type B; (Couse type B, Ford 1½ ton, 100 hp), are published for the information and guidance of all concerned, and supersede all previous instructions.

a. References—Equipment will be lubricated in accordance with the latest instructions contained in Lubrication Guides and Engineer Field Service Bulletins. Reference is made to the General Instruction section (EFSB L-1000-A) for additional lubrication information, and to the Product Guide section (EFSB L-1000-F) for latest approved lubricants.

2. LUBRICATION GUIDE—Lubrication instructions for all points to be serviced are shown in War Department Lubrication Guides No. 1018 and 1018A, which specify the types of lubricants required and the intervals at which they are to be applied. The following lubrication instructions contain the same information as the Guides. Guides from which data are reproduced are 10 x 15 in. laminated guides which are an accessory of each piece of equipment.

3. REPORTS AND RECORDS — *a. Reports* — If lubrication instructions are closely followed, proper lubricants used, and satisfactory results are not obtained, a report will be made to the engineer officer responsible for the maintenance of the equipment.

b. Records—A complete record of lubrication servicing for the equipment will be kept on two Lubrication Check Cards, using one for speedometer points, the other for hour meter points.

For the Chief of Engineers:

R. F. FOWLER,
Brigadier General, Corps of Engineers,
Chief, Supply Division.

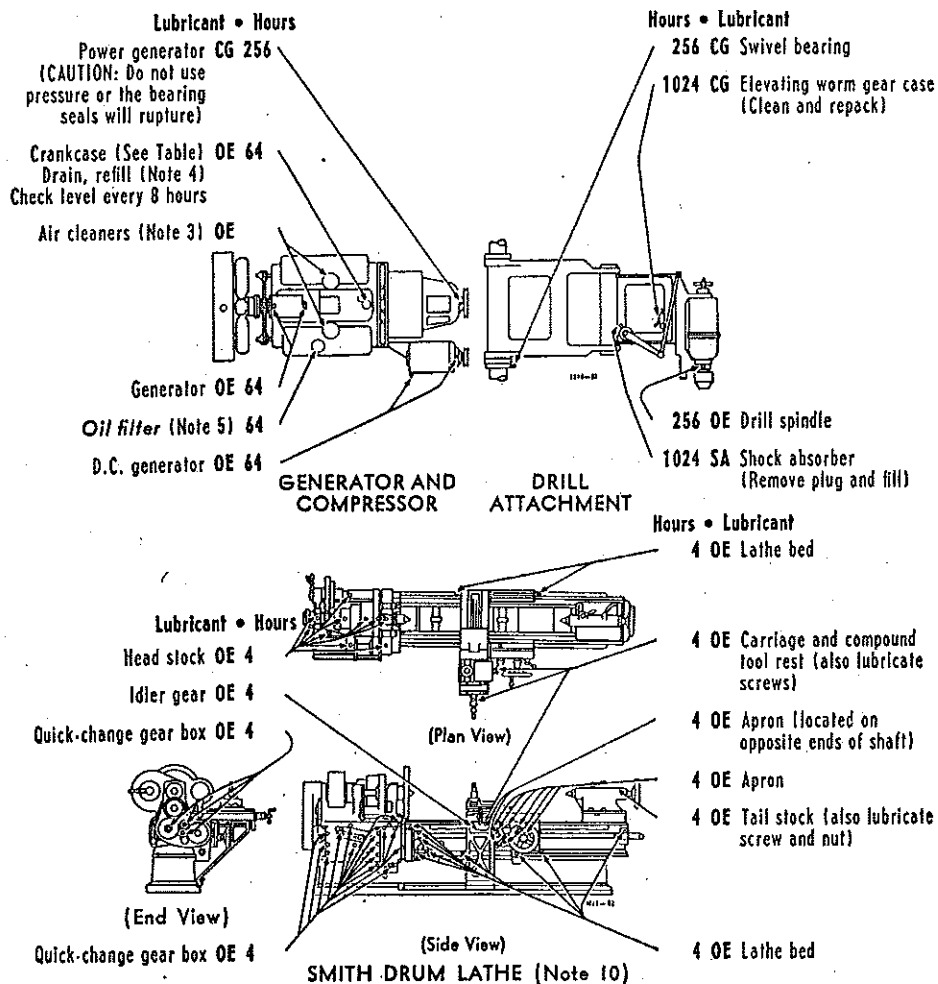
EFSB L-1018

No. 1018

WAR DEPARTMENT LUBRICATION GUIDE

CORPS OF ENGINEERS

SHOP, MOTORIZED, AVIATION BATTALION, TYPE B (COUSE TYPE B, FORD 1½ TON, 100 HP)



NOTE—See page 4 for lubrication of ADDITIONAL EQUIPMENT UNITS

KEY

LUBRICANTS	
OE—OIL, engine Crankcase grade	CG—GREASE, general purpose No. 1 (above +32° F.) No. 0 (+32° F. to 0° F.)
	SA—SHOCK ABSORBER FLUID, heavy

CHK. CHART NO. 1018

-2-

(7197) 2nd Revise—12-10-42—GG-42

EFSB L-1018

TABLE OF CAPACITIES AND LUBRICANTS TO BE USED

1018

UNIT	CAPACITY (Approx.)	LOWEST EXPECTED AIR TEMPERATURE		
		Above +32° F.	+32° F. to 0° F.	Below 0° F.
Crankcase	5 qt.	OE SAE 30	OE SAE 10	Refer to EFSB L-1000-D

HIGH TEMPERATURE: For Lubrication and Service above +90° F., refer to EFSB L-1000-E.

ACCESSORY UNITS

1. FITTINGS—Clean before applying the lubricant gun. Lubricate until new grease extrudes from the bearing.
2. HOURS—The hours indicated are for normal service. For extreme conditions of heat, water, snow and dust, change crankcase oil and lubricate more frequently.
3. AIR CLEANERS—Every 64 hours, and more often under dusty conditions, disassemble both air cleaners, wash and dry. Fill to level with OE and reassemble. CAUTION: Do not wash filters in gasoline; use kerosine or Diesel fuel.
4. CRANKCASE—Every 8 hours, check and fill to level. Drain only when engine is thoroughly warm. Refill to FULL mark on gage. See Table. CAUTION: When running engine, be sure pressure gage indicates oil is circulating.
 - a. If gage registers no pressure, stop engine and determine cause.
5. OIL FILTER—When changing crankcase oil, renew filter element.
6. GEAR CASES—Every 8 hours check level, add lubricant if necessary. When draining, drain immediately after operation.
 - a. Drain and refill worm gear case with fresh oil at the end of the first 64 hours of operation; thereafter as indicated at the point on guide.
7. STARTER BEARINGS—When disassembled for any purpose, inspect bearings and replace if worn.
8. AIR LINE FILTERS—Every 64 hours, or more often if necessary, disassemble, clean, dry and reassemble. The filter is located in the air line between the air tank and the bottom of the pilot valve.
 - a. To prevent oil and water from being carried to the pilot valve disassemble filter and clean as follows:
 1. Remove hexagonal nut from the top so entire element can be removed.
 2. Turn small knurled nut, at bottom of element, a turn or two so that pile of filter elements will separate.
 3. Wash element in kerosine or Diesel fuel and blow dry.
 4. Tighten knurled nut and replace element.
9. RUST PREVENTION—Every 8 hours or immediately after use, rub all machined surfaces and tools using a rag thoroughly saturated with CG No. 0.

(Continued on page 5)

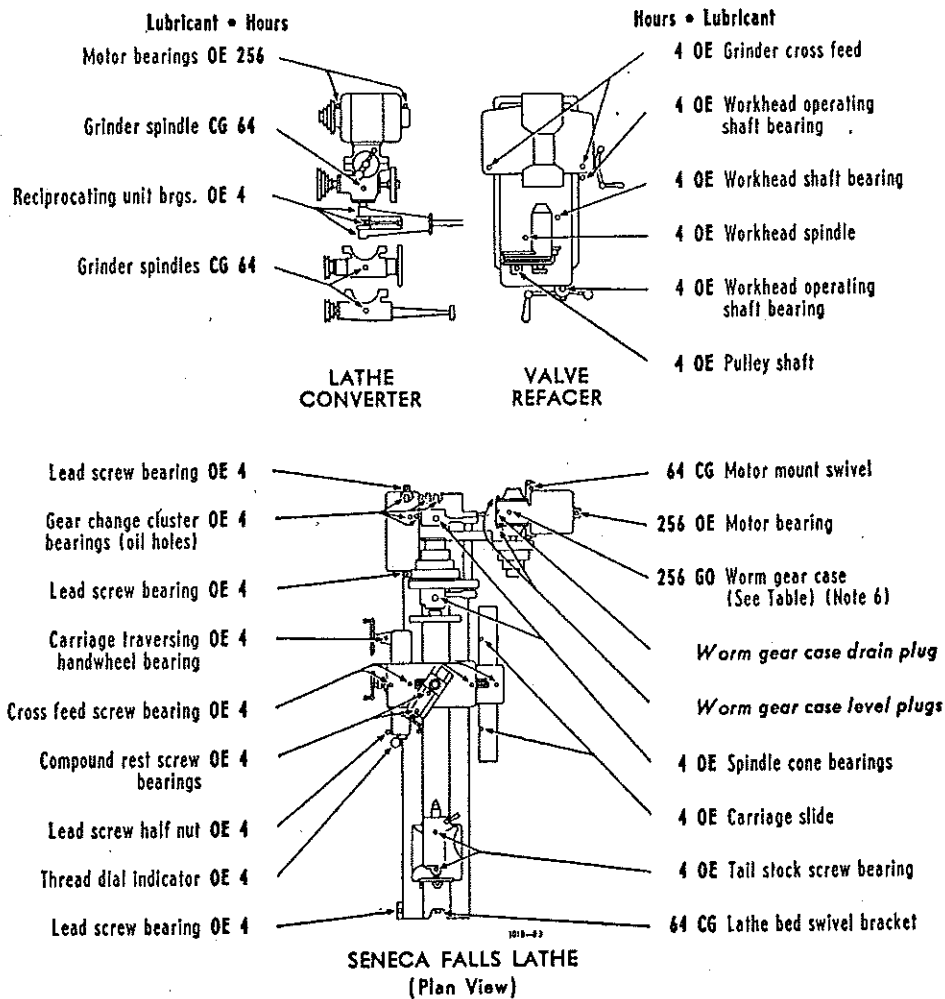
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EFSB L-1018

No. 1018

WAR DEPARTMENT LUBRICATION GUIDE CORPS OF ENGINEERS

SHOP, MOTORIZED, AVIATION BATTALION, TYPE B (COUSE TYPE B, FORD 1½ TON, 100 HP)



NOTE—See page 2 for lubrication of ADDITIONAL EQUIPMENT UNITS

KEY

LUBRICANTS	
OE —OIL, engine SAE 30	CG —GREASE, general purpose No. 1 (above +32° F.) No. 0 (+32° F. to 0° F.)
	GO —LUBRICANT, gear, universal

CHECK CHART NO. 1018

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(7197) 2nd Revise—12-10-42—GG-43

EFSB L-1018

TABLE OF CAPACITIES AND LUBRICANTS TO BE USED

1018-B

UNIT	CAPACITY (Approx.)	LOWEST EXPECTED AIR TEMPERATURE		
		Above +32° F.	+32° F. to 0° F.	Below 0° F.
Worm Gear Case	1/2 pt.	GO SAE 90	GO SAE 80	Refer to EFSB L-1000-D

HIGH TEMPERATURE: For Lubrication and Service above +90° F., refer to EFSB L-1000-E.

ACCESSORY UNITS

(Continued from page 3)

10. SMITH DRUM LATHE—*a. Cone Pulley*—When using lathe in back gear, remove two small screws in first and third steps, and lubricate freely with OE SAE 10. Also lubricate back gear shaft at same time. Replace screws.
- b. Gears*—Frequently apply GO SAE 90 to all gear teeth. Be sure to remove all oil from gear teeth; otherwise lubricant will not cling to teeth.
- c. Saddle Wipers*—Each time lathe is used saturate the felts of the front and back wipers with OE SAE 10.
- d. Spindle Bearings*—When lathe is used lubricate left and right spindle bearings of headstock with OE SAE 10.
- e. Lead Screws*—Every 256 hours, clean the lead screw threads with a small stiff brush. Coat sparingly with OE SAE 10.
- f. Quick-Change Gear Box*—Place slip gear lever in position, as indicated on gear instruction plate before lubricating. Every 8 hours, lubricate two points with OE SAE 10. One point is lubricated by removing screw in tool tray; the other point is located in the hub of the slip gear lever and is reached through opening in cover.
- g. Tailstock Center*—Fill the well located in the casting of the tailstock with a mixture of white lead and oil. Apply this to the tailstock center when turning between centers.
- h. Keep Lathe Covered*—The lathe should be completely covered when in a dirty location, or standing idle, to prevent dust and grit accumulating; thus causing wear during operation. Do not fail to cover the bed ways during grinding operation.
11. OIL CAN POINTS—Every 64 hours, lubricate throttle control rod ends and accelerator linkage with OE. Every 8 hours, lubricate lathe ways, slides, lead screws, drill chuck, etc., with OE SAE 30.
12. POINTS REQUIRING NO LUBRICATION—Distributor, Water Pumps.
13. BATTERY—Weekly, check level of water in battery. Add distilled, rain, or other clean fresh water to bring level $\frac{3}{8}$ in. above top of separators. Clean terminals, tighten snugly, and coat lightly with CG.

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[7197] 3rd Revise - 12-22-42 - GG-44

EFSB L-1018

No. 1018A

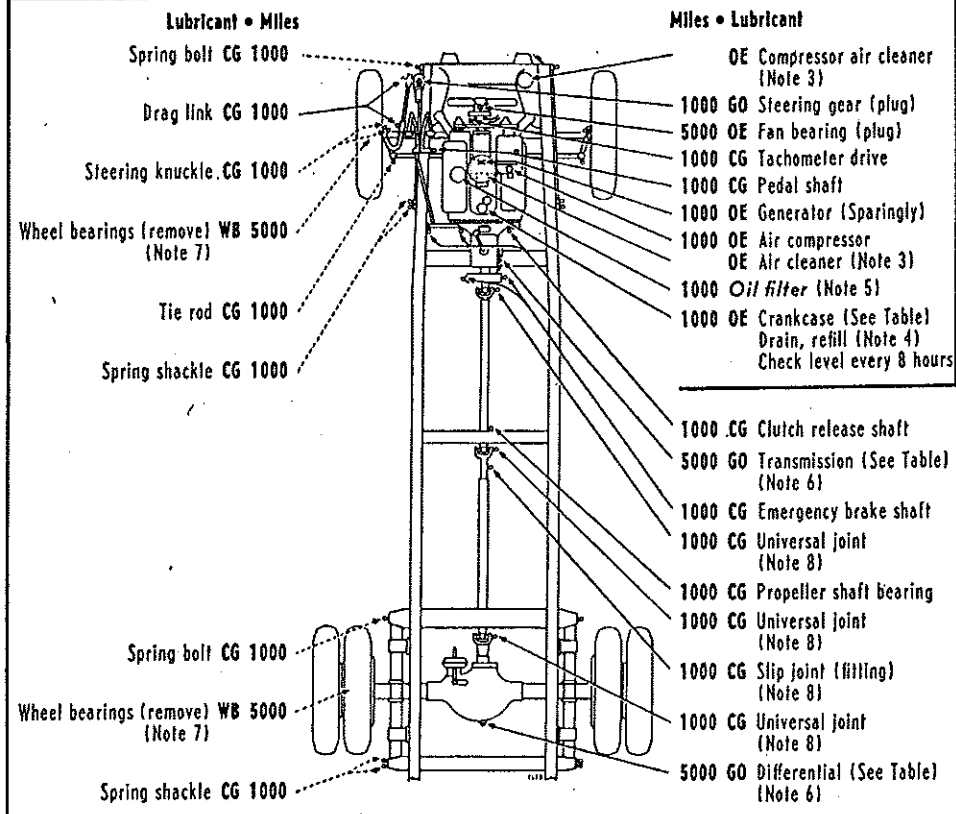
WAR DEPARTMENT LUBRICATION GUIDE

CORPS OF ENGINEERS

**SHOP, MOTORIZED,
AVIATION BATTALION, TYPE B**
(COUSE TYPE B, FORD 1½ TON, 100 HP)
MFR'S. SERIAL No. located on plate on dash.

CAUTION—Lubricate Dotted
Arrow Points on BOTH SIDES

SERVICED FROM UNDER HOOD



(See pages 2 and 4 for lubrication of EQUIPMENT UNITS)

KEY**LUBRICANTS**

OE —OIL, engine
Crankcase grade
GO —LUBRICANT, gear, universal

CG —GREASE, general purpose
No. 1 (above +32° F.)
No. 0 (+32° F. to 0° F.)
WB —GREASE, general purpose No. 2

CHEK-CHART NO. 1018A

— 6 —

(7197) 2nd Revise—12-10-42—GG-44

EFSB L-1018

TABLE OF CAPACITIES AND LUBRICANTS TO BE USED

UNIT	CAPACITY (Approx.)	LOWEST EXPECTED AIR TEMPERATURE			TIRE PRESSURES
		Above +32° F.	+32° F. to 0° F.	Below 0° F.	
Crankcase	5 qt.	OE SAE 30	OE SAE 10	Refer to EFSB L-1000-D	Front 60 lb.
Transmission	2 1/2 qt.	GO SAE 90	GO SAE 80		Rear 60 lb.
Differential	7 1/2 qt.				101BA

HIGH TEMPERATURE: For Lubrication and Service above +90° F., refer to EFSB L-1000-E.

CHASSIS

1. FITTINGS—Clean before applying the lubricant gun. Lubricate until new grease extrudes from the bearing. CAUTION: Lubricate chassis points after washing truck.
2. MILES—The miles indicated are for normal service. For extreme conditions of speed, heat, water, mud, snow, rough roads and dust, change crankcase oil and lubricate more frequently.
3. AIR CLEANERS—(Engine) Every 1,000 miles, and more often under dusty conditions, disassemble, wash and dry. Dip wire gauze element in OE, and drain off surplus oil. CAUTION: Do not wash or oil felt. (Compressor) The oil bath filter is located under radiator grille on right side. Every 1,000 miles, and more often, under dusty conditions, disassemble, wash and dry. Fill to level with OE and reassemble.
4. CRANKCASE—Every 8 hours check and fill to level. Drain only when engine is thoroughly warm. Refill to FULL mark on gage. See Table. CAUTION: When running engine, be sure pressure gage indicates oil is circulating.
 - a. If gage registers no pressure, stop engine and determine cause.
5. OIL FILTER—Every 1,000 miles or more often if necessary, renew filter element. After renewing element, refill crankcase to FULL mark on gage. CAUTION: When running engine, be sure pressure gage indicates oil is circulating.
6. GEAR CASES—Every 1,000 miles, check level with truck on level ground and add lubricant if necessary. When draining, drain immediately after operation.
 - a. When reassembling after complete disassembly, pour 1 pt. GO into plug hole at top of case.
7. WHEEL BEARINGS (Front and rear)—Remove wheel, clean and repack bearings. Refer to EFSB L-1000-E for high temperature operation.
 - a. To clean and repack bearings, remove wheel, disassemble bearings from hub, wash grease from bearings and inside of hub. Inspect seals and bearings and replace if necessary. Dry and knead grease into the bearing races until the spaces between the rollers are completely filled. Install bearings in hub and replace wheel on spindle. CAUTION: Do not apply grease to inside of hub or hub cap.

EFSB L-1018

CHASSIS

NOTES

8. UNIVERSAL JOINTS AND SLIP JOINT—Apply lubricant to joint until it overflows at relief valve and to the slip joint until lubricant extrudes.
9. STARTER BUSHINGS—When disassembled for any purpose, clean and inspect starter bushings and replace if worn.
10. CLUTCH PILOT AND CLUTCH RELEASE BEARINGS—When clutch is disassembled for any purpose, inspect bearings and replace if worn.
11. OIL CAN POINTS—Every 1,000 miles, lubricate throttle control rod ends, accelerator linkage and brake rod clevises with OE.
12. POINTS REQUIRING NO LUBRICATION—Chassis Springs, Distributor, Water Pumps.
13. BATTERY—Weekly, check level of water in battery. Add distilled, rain, or other clean fresh water to bring level $\frac{3}{8}$ in. above top of separators. Clean terminals, tighten snugly, and coat lightly with CG.

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