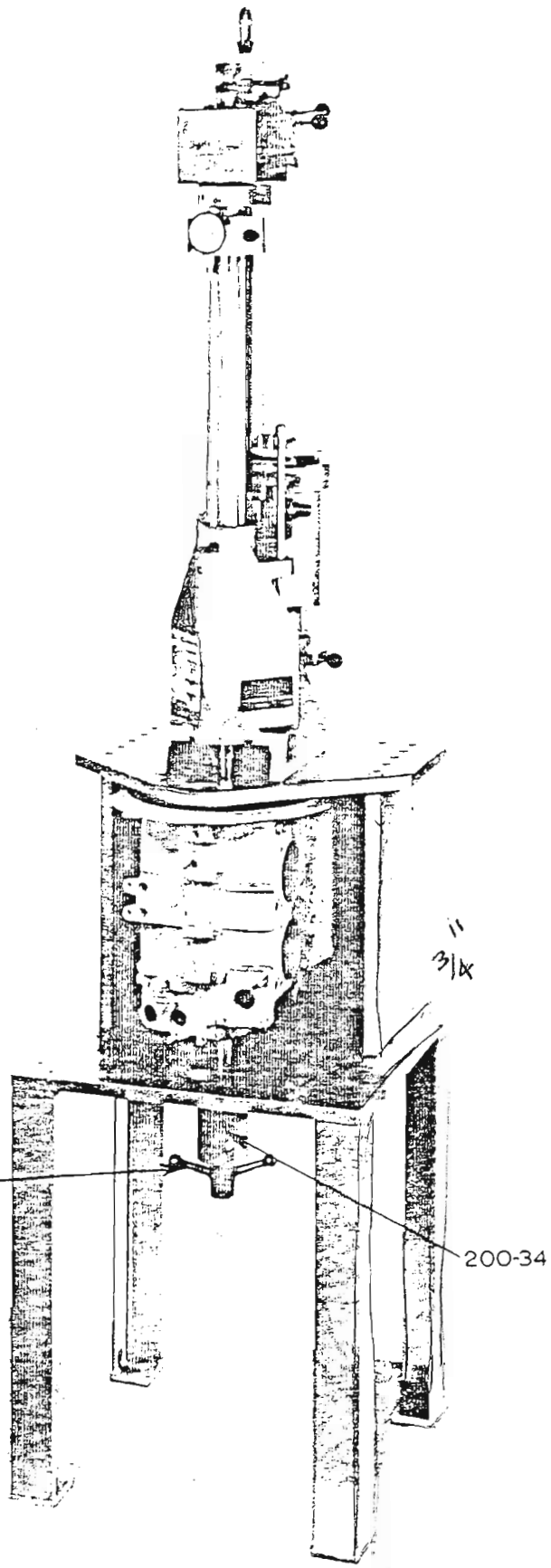
# A PRECISION MACHINING CENTER FOR VOLKSWAGEN ENGINE REPAIRS

## BORES CRANKCASES, CYLINDER HEADS AND CYLINDERS

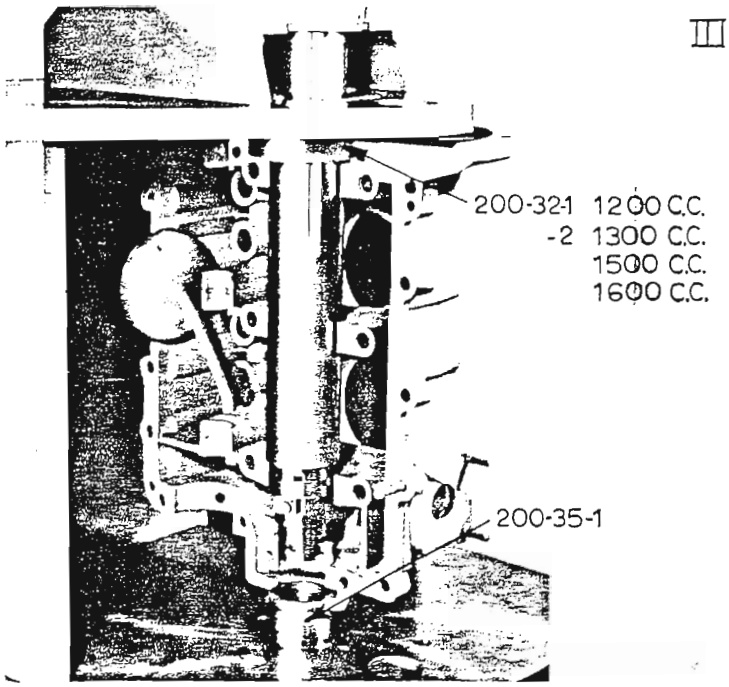
**-quick setup**
**-fast production**
**-high precision**
**-simple to use**




MODEL DA-VW

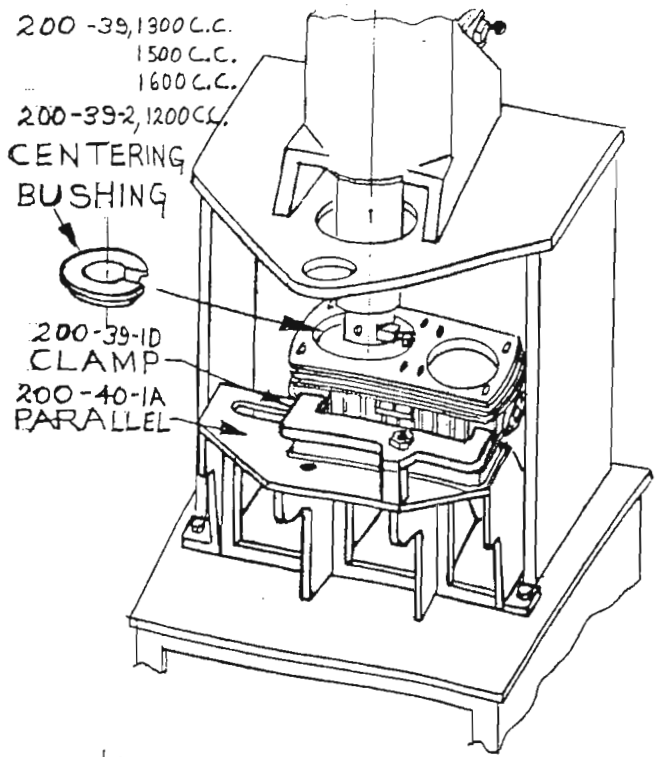
ROTTLER

I



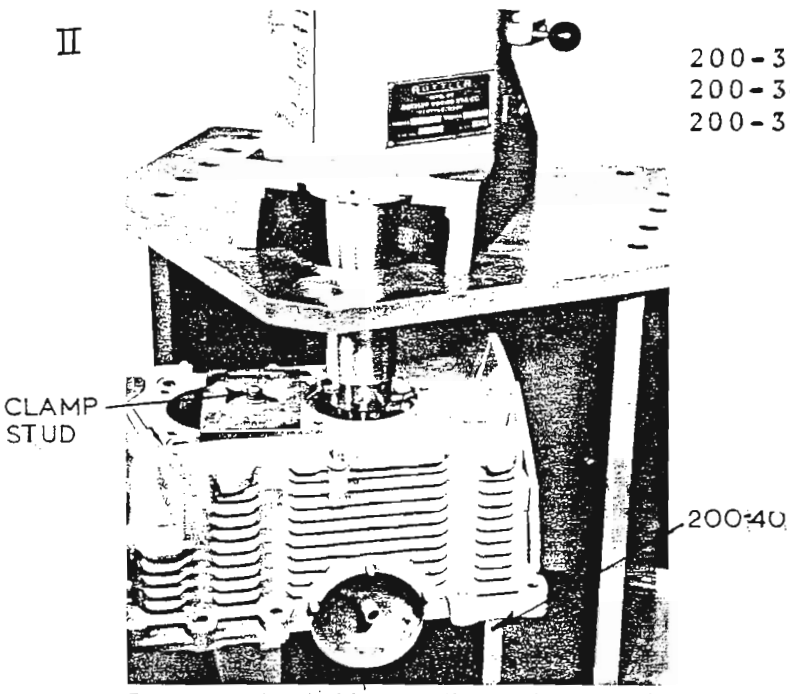

Multiple cutter head with preset cartridge type tools bore main bearings oversize with a single pass. Thrust is then faced with dial indicator depth control. Back face too, if necessary.

III



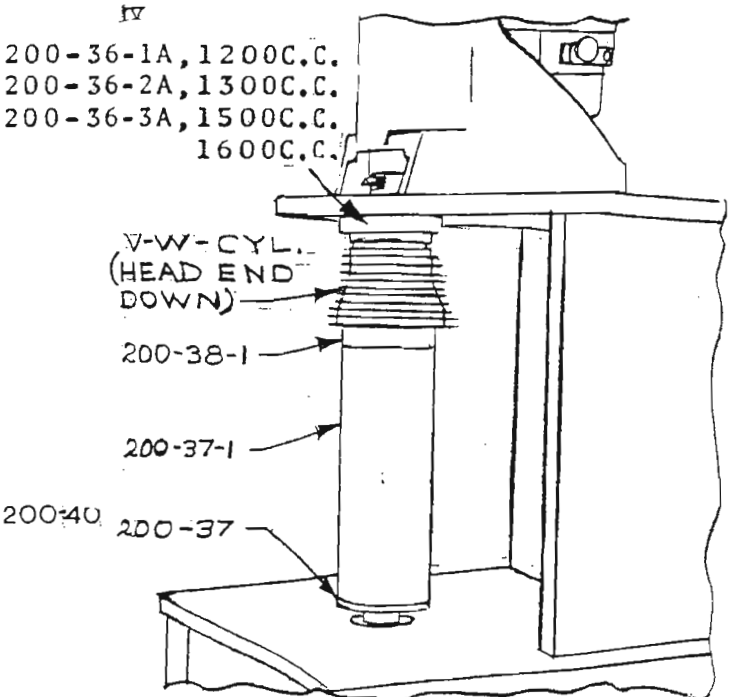

BORE & FACING TOOL, BORES CYLINDER HEADS TO INSTALL LARGER CYLINDERS AND FACES HEADS TO ADJUST COMPRESSION RATIO

II




Boring tool machines cylinder location in crankcase oversize for installation of larger cylinders.

IV




CENTERING BUSHING AND CLAMPING TUBE COMBINE TO PRECISION REBORE CYLINDERS FOR OVERSIZE PISTONS (OPTIONAL)

**DA-VW STANDARD TOOLS**

1 hand crank for manual feed.
1 dial depth indicator assembly.
1 tool setting micrometer assembly.
1 set centering fingers.
1 centering bushing for cylinder heads.
1 sharpening fixture to control cutting tool angles on machine mounted sharpening wheel.
1 thrust facing tool bit.
1 standard boring tool.
1 boring bit for 4th main bearing.
1 facing bit for cylinder heads.
4 tool holders for above operations.
1 tool puller.
1 tool bit and holder locking wrench.
1 spacer parallel to support heads and crankcase halves.
1 36 H.P. crankcase locator.
1 40 H.P. crankcase locator.

**DA-VW OPTIONAL TOOLS**

Holding adapters and additional tool holder and bit for cylinder boring—Porsche accessories.

**DA-VW BAR**

| | |
|---|---|
| Net weight | 140 lbs. |
| Gross weight | 185 lbs. |
| Measurements crated | 13"x18"x50" (330x457x1270 mm) |

**DA-VW STAND**

| | |
|---|---|
| Net weight | 550 lbs. |
| Gross weight | 575 lbs. |
| Measurements crated | 20"x22"x42" (508x559x1067mm) |

# D E S C R I P T I O N

The Model DA-VW Machine is a rigid, precision single point tooled boring center, designed for a number of machining operations on Volkswagon crankcase, cylinders, and cylinder heads.

A Two-cutter head is provided for most efficient boring of the two sizes found in Volkswagon main bearing journals. Centering finger capability is included for fast centering in cylinders, crankcases, or block bores and may be used for other workpieces shops may find convenient to machine on this equipment.

A dial indicator depth travel readout is provided to properly control spindle during facing operations of main bearing thrust surfaces and cylinder head depth control. All feeds and traverses are power operated and controlled from the upper gear housing unit. An auxiliary hand travel is located at the base of the feed screw. Power is furnished by end mounted AC single phase 110-220- volt General Electric motor of 3/4 H.P. 3 phase motor is also available. A quick change lever selects two spindle speeds.

Gear housings are aluminum alloy in order to incorporate the lightest possible weight without sacrificing rigidity.

NOTE: When spindle is shipped from factory the machined surfaces are protected with rust veto. After uncrating, use clean cloth dampened with kerosene or solvent and remove the protective oil.

## ASSEMBLY OF MACHINE COMPONENTS

Before any fastenings are locked it will be necessary to carefully level the machine and lock the lower jacking screws seated in washers so that the base is equally supported at four points on the floor.

Place the machine in position using the two dowels provided to locate it properly. Now attach a dial indicator to the machine spindle cutter head or tool holders that may be placed in the head. Now check to make sure the spindle rotation indicates a maximum total indicator runout reading of .0005 or .01 millimeters in the upper plate bore.

Check this reading after you have locked the two spindle hold down bolts and then run the spindle down to check the concentricity of the lower locator as depicted in figure on page 1*. Total indicator reading should not exceed .001 or .025 millimeters at any point of rotation of the lower locator.

If necessary release and lightly lock flange bolts of lower locator and move into the correct position to limit runout. Re-check after locking flange bolts.

* First page of Manual

# C O N T R O L S

We suggest, before setting up machine for boring, you assemble the machine spindle approximately in position on the work holding fixture and actuate the controls to become familiar with them.

1. Feed lever is latching lever on side of bar. Press down until lever latches to engage cutting feed. To disengage press feed release arm which will unlatch lever and allow it to return to neutral position. Lift feed lever until it latches to engage rapid return travel. Bar will automatically return to neutral upon reaching top of travel. If you wish to return bar to neutral while it is in rapid up travel, again press feed release arm which will unlatch lever and allow it to return to neutral position. As a safety precaution we recommend that the motor be stopped when centering or positioning bar. Inadvertant spindle rotation engagement could injure operators other hand or damage cutter head parts. You will note stop rod that is held in base casting by thumb screw has a cone shaped end which will release cutting feed when it contacts lever. This is most conveniently raised up and locked by thumb screw in proper position on completion of first bore cut. This rod should not be used to hold close tolerance shoulders.

2. The fast down travel lever is located next to feed lever. Check feed lever to see that it is in neutral position before actuating. Lever should be pulled down quickly and firmly and not allowed to ratchet. Control is spring loaded and will release when you release pressure. This control should be used on slow speed only on automotive and high RPM machines.

3. Spindle clutch control is located to left side of feed lever. PULL RELEASE A rapid down movement will engage spindle rotation and a reverse action will disengage. In that this is a jaw clutch we recommend stopping the motor or jogging the motor to engage clutch on the high RPM of the higher speed machines. Standard procedure is to throw out clutch upon completion of the bore. Turn cutter head around to indexing detent to position tool to front, then reverse travel. The small knob on top of the upper housing may be used for manually turning spindle when necessary. On the automotive type units this knob is also used for centering.

4. 2-3/8" manual travel is actuated by rotating handle attached to spline at top of base. This travel should always be left in full up position after using bar. Normal procedure is to rapid travel or feed bar to point requiring manual travel. If back feeding is necessary run hand travel down first and then rapid travel down to where tool can be inserted.

5. Speed control is operated by pulling knob at motor gear housing and raising for low speed and lowering for high. These may be changed when bar is running although it is desirable to jog motor when changing from low to high on higher speed machines.

# O P E R A T I N G  I N S T R U C T I O N S

## Main Bearing Resizing

CAUTION: Magnesium case and particularly cuttings resulting from machine are highly inflamable. A dry chemical powder extinguisher should be available since most other means will not extinguish flames.

Install the proper upper locator in the top plate of the work fixture. The locators are marked 1300 for 36 cases and 1500 & 1600 for the 40 H.P. and larger cases.

The lower plate is machined flat and may aid you in checking flatness before case assembly. Be sure dowel pins and bearing liners have been removed from bores. Be sure burrs and high spots are completely removed from case half and carefully assemble halves, torquing the fastenings to the manufacturers recommendations.

Check both thrust areas and bearing bores to determine the amount of oversize required to the bores. Measure width across thrusts.

Now place the upper main bearing boring tool holder and cutter in the micrometer to set to the bore size you wish. Carefully do this operation in accordance with micrometer section and auto boring only. Place the set tool into the upper tool slot and repeat the process with the 2nd lower tool holder and offset bit that will contact the 2nd mike anvil in the mike frame. This offset bit, due to the short length of holder and bit, is more difficult to set exactly and considerable care must be taken. An extremely light screw tension on the tool bit flat will help prevent excessive growth in the tool when locking. Lightly lock set tools into slots with set screws.

Now install case in fixture and wind up lower locator until tight and then back off lower handle a half turn. This will allow a preset spring tension to hold case properly without distorting the case or fixture.

Now simply turn on motor of boring spindle. Carefully rapid travel upper tool to first bore, being careful to avoid over travelling. Engage spindle clutch and then feed lever. Boring may be done on high spindle speed.

Watch for completion of the last bore by the smaller tool and set feed stop rod to immediately stop feed. Disengage spindle clutch and rotate or allow spindle to turn to indent position and engage rapid return travel. Remove upper boring tool.

Caution: Always turn motor off unless bar is actually machining or necessarily travelling. Inadvertant spindle rotation engagement could injure operator or damage machine or work.

Now set the dial depth indicator to allow the exact amount that is required to face from thrust and proceed to that point. Retract hand feed and then power feed to remove case.

## RESIZING CYLINDER HOLES IN CRANKCASE

Note: Remove upper locator in DA-VW machine for both the following operations. Operate on high speed.

Oversize boring of cases to accept larger cylinders utilize the upper tool holder arrangement. Centering fingers are used to locate bore concentric to spindle and case half is held down with stud through adjacent bore as shown in figure II.* Remove tool holder and tool bit before centering. Do not use excessive clamp force, distortion of the case will introduce cylinder misalignment when reseating cylinder flange faces.

Properly sharpened generous raked tools allow one cut to open bore to size and machine can be operated on high speed. Machine bores to .008-.010" or .20 to .25 millimeters over nominal cylinder size. Limit depth of bore to a little more than the skirt length on the cylinder, since this will leave more metal section where it is needed in the crankcase.

## RESIZING CYLINDER FIT BORE IN HEADS AND FACING HEADS TO ADJUST COMPRESSION RATIO

(Operate on High Speed)

To machine VW head it will be necessary to install a head support parallel on the lower work table. This fixture must be locked down to the table by four bolts. The VW heads are held in place on the parallel by a clamp and centered to the boring spindle by means of a concentric bushing which is simply dropped into the VW head bore.

An offset tool bit is used for boring and facing of VW heads and is to be used in the lower tool slot. The tool setting on the micrometer will be correct for this diameter only if used on an offset anvil. (Note: Always bear in mind it will be necessary to make allowance on micrometer size setting when using a straight tool bit in the lower tool slot.)

The procedure for the machine VW head is as follows:

First, install head support parallel on lower work table.

Second, place VW head on support parallel with one head cylinder bore directly under spindle, then lightly clamp head. (Finger tight only) (Note: Rocker box cover mounting surface on head must be flat so that head does not rock on support parallel. If necessary, dress off burrs, sand flat or shim, this is required for all head machining operations.) Now place centering bushing in head bore and hand travel the cutter head into this bushing. This will center the head. Then secure head to support by tightening the nut of the clamp. (Note: Excessive clamp force can distort head, torque clamp nut to 30 foot pounds.) In some applications, a slightly higher force is required.

Third, set offset tool bit to cut relief bore approximately 3/8" or 10 millimeters under the finish bore size. This will allow a fine accurate seat for the cylinder on the finish cut. (Note: All head machining operations are hand feed operations and are performed similarly in both cylinder bores and also to equal dial indicator depths.) This will insure that the bore seats will remain parallel and in an exact line with each other.

Fourth, set offset tool bit for finish cut and insert into cutter head, hold tool up and in to cutter head while locking set screw. (keep a finish facing tool bit set if possible). Now make finish bore and facing cut. If shims are used to support head, be sure to keep shims in same relationship when moving head to second hole. It is not necessary to remove the offset head-facing tool and holder when centering the cylinder head if care is taken to clear the slot in the locator.

An occasional check of the accuracy of these two counter bore seats can be made with a dial indicator attached to the spindle. By properly positioning the dial, you can tip the head on the parallel and slide it under the dial indicator, when set the dial to "0" and check relative readings in both seats by sliding the head. You must again make sure the head sets flat on all sides, if necessary shim in three places for three point support. Dial readings should be consistent. If they are .003 higher front to back, they should be the same in the other bore, to a maximum error of .0015. If the reading is .004 different from extreme outboard sides of bores, the inboard sides should be incremental between minimum and maximum, to a maximum of .002.

The crankcase halves bores may be checked in the same manner to insure correct seating of cylinder on assembly.

Remember, too, cylinder must be equidistant from upper hub to the crankcase mounting shoulder.

Note: Remove upper cylinder locators and case mainline locators when doing head work.

## SHARPENING CUTTER

The performance of your boring bar and quality of work it will do is almost entirely dependent on the care of the cutting tool. It is the most frequent cause of size and finish problems in boring.

To sharpen the carbide bit insert tool holder in sharpening jig slot. Place the jig over the pin provided on the top of the motor housing and sharpen bit on the small diamond wheel provided on the motor shaft. Always make sure you sharpen the tool on the side of the diamond that is running toward the top face of the bit. Sharpening on the wrong side can readily chip the point. When sharpening use very light pressure, moving the tool back and forth across the diamond wheel to improve cutting and prevent grooving of diamond. After sharpening a number of times dress excess steel away from carbide on grinding wheel. This will facilitate use of chip remover hoods and make for quicker sharpening. Diamond wheel is designed for carbide only. Steel tends to load it. A tool bit used for aluminum boring should never alternately be used for cast iron or steel. Iron or steel weld on top of the bit will cause a rough finish on aluminum work.

## FACING THRUST

If it is necessary to back face thrust, set the tool provided to the proper size, travel the spindle down so the tool may be inserted through the cylinder opening.

Pre-travel hand feed down as previously mentioned so back facing travel will be available. Position back face tool at cutting point so an immediate short travel will clean the back face area.

Remove tool through opening and return machine to top. If back facing is done it will be now necessary to again measure across the thrusts to determine necessary stock removal from the front face.

Measuring devices can be purchased particularly on larger cases to measure in the machines, or the case may be removed for measuring.

Now place and lock a properly sized front facing tool in the upper slot and set dial depth indicator so it is operating on tool contact with the work.

Contact of tool with the work can be better observed if the face is marked with a black pencil. The machine may be hand traveled to the face with spindle rotating or spindle stopped and hand traveled rotating spindle by hand to determine exactly when face is contacted.

The DA-VW machine may also be used to clear the outer head surface, should there be interferance with the cylinder after deepening bore. Make cuts of about 1/2" or 12 millimeters in diameter increased in one cut.

## CYLINDER BORE RESIZING FOR OVER SIZE PISTONS

To bore cylinder (.040 maximum) over size, it will be necessary to install the proper upper centering locator into the top plate of the work fixture, and to install the lower support tube over the lower locator.

Then place the cylinder (head end down) you wish to bore into the recess in the support tube. (Note: Cylinder must be seated in its proper step in support tube.) If 1500 or 1600cc cylinder are to be bored, set feed stop rod so that tool bit does not travel over 1/8" beyond the end of the cylinder. Then wind up the lower locator until the cylinder is seated and clamped. Do not back the clamp off on cylinder boring, since distortion is not a problem and cylinder requires more clamp force. Now, using the upper tool slot set a seperate tool, one you do not intend to use for case or head boring, then with machine set at low spindle RPM proceed to bore cylinder. After boring is complete, disengage spindle clutch and rapid travel machine to up position.

## B O R I N G - AUTOMOTIVE ONLY

If tool is properly sharpened place cutter and proper tool holder in micrometer. Hold tool bit lightly against mike anvil and loosen Allen screw with wing wrench. Gently let tool holder slide back to make contact with micrometer spindle. This procedure will prevent chipping carbide. This micrometer is .050 to a revolution rather than .025 as on a conventional mike. Set mike to size you wish to bore and tighten set screw lightly. Back off mike and tighten set screw. Here again excessive tightening only tends to nick mike anvil and make future setting difficult. After tightening recheck size.

Make sure tool holder and tool holder slot in head are free from dirt. Insert tool in slot making sure it is completely back and latched. Lightly lock set screw with socket type screw driver provided with tools.

## FOR CHIP REMOVER USE ONLY

Insert proper length vacuum hood in hole provided in cutter head and press in until tool bit tip extends out of hole in hood at least .025. Insert vacuum gooseneck in ball bearing on top of centering knob. Start vacuum motor.

## B O R I N G

Engage spindle clutch and latch feed lever in down position. When bar has completed boring, set stop rod so lever will be thrown into neutral position. Stop rod will then be set for the other holes on the same cylinder block.

Disengage spindle clutch. Turn cutter head to front position and latch feed lever in up position. Turn off motor. Remove vacuum hood and tool holder with tool puller. (Always remove tool holder after boring.) Loosen anchor bolt and proceed to next cylinder. If bore is to be chamfered with bar this should be done before loosening anchor bolt.

If vacuum is used a cylinder block can generally be bored before emptying dust bag. Keep bag and filter clean. An oil saturated bag or filter will restrict the flow of air.

## C H A M F E R I N G

A special tool is available for chamfering. Tool may be set by either inserting in head and approximately setting or place in mike and set approximately .100 over bore size. Chamfering may be done either by using feed and releasing when adequate chamfer has been developed or by use of hand feed.

## C O U N T E R B O R I N G

The slow travel manual feed is provided for use in counter boring, facing sleeves flush etc. A optional dial indicator depth of cut read out is available for accurate control of counter bore depths.

## AUTOMOTIVE

# Boring Bar - OPERATING INSTRUCTIONS

## CENTERING FINGERS

Centering fingers are adequate to center the new bore within .002 of the centering of old bore; providing the old bore is reasonably round and if you follow operating instructions properly. Centering fingers can be lapped periodically to obtain near perfect centering. Use the following procedure in an undersize bore or junk block.

## TO LAP FINGERS

1. Bore hole and remove cutter but do not unclamp bar.
2. Rapid traverse bar down into hole.
3. Extend fingers and exert pressure on them against cylinder wall while rotating inner spindle knob to left by hand (counter-clockwise).
4. After rubbing, examine points on all fingers to make sure they are all making contact.

## MICROMETER

Your boring bar micrometer, as with any other measuring tool, should be used delicately and with care to be assured of the greatest accuracy. Particular attention should be paid to inserting the tool in micrometer without allowing tool bit to snap into mike anvil. Care should be used in the method of lightly locking tool bit before tightening.

After a period of use you will note that the tool bit tip will force a depression in the micrometer anvil. This, of course, will result in inconsistent sizes, particularly after resharpening the bit. Periodically we would recommend turning the anvil slightly and finally end for end so that a flat surface is exposed to the tool bit tip.

## SETTING MICROMETER

1. Bore a hole.
2. Remove tool holder and bit and place in mike.
3. Adjust mike so that it reads the same size as the hole you have bored. Small variations may be made by turning the mike sleeve with spanner wrench provided. Larger changes should be made by moving the anvil.

## DIAMOND WHEEL

### Care of Diamond Sharpening Disk

If the diamond disk is handled with care it will provide many years of service

Occasionally diamond surface can load up if steel part of tool bit is not ground back as sharpening instructions indicate. To clean disk apply a small amount of solvent or thinner and rub off.

## LUBRICATION

Upper Housing should be packed with Union Oil UNOBA F1 OR F2 LUBE. approximately 25,000 boring cycles.

Motor gear housing should be re-packed with 3 parts Ebon cup light grease, 1 part 30 weight machine oil approximately every 50,000 boring cycles. A very occasional drop of oil in the motor gear pot (socket head screw near bottom) will help maintain lubrication at right consistency.

Every 2 days of operation fitting at top of spindle should be lubricated with Ebon cup light grease for top inner spindle bearing.

A few drops of oil put in approximately every 500 bores in hole in key way of spindle will keep spindle lubricant fluid.

## ADJUSTMENT OF OUTER SPINDLE

Main spindle bearings are tapered split cast iron rings held in seat by adjustment nut. Tension on bearings is normally adequate to require no adjustment for many boring cycles.

Caution should be used in adjusting these bearings in order to avoid a too tight spindle which only serves to wear out machine and make control operation difficult. If it should be necessary to adjust proceed as follows:

Upper bearing is adjusted by removing felt retaining nut at top of base forcing felt up and adjust nut with punch.

For lower bearing first back off 8-32 set screw at bottom spindle bearing. Then remove felt retainer at bottom of base and turn nut with punch.

1. Place and clamp bar over hole or overhang so spindle can be run down. Loosen set screw and both adjusting nuts.

2. Tighten upper bearing until additional pressure is required to operate hand feed.

Repeat this sequence on lower bearing taking care that hand feed operates only slightly tighter.

3. Traverse bar at all points of travel and make sure hand feed works easily. Spindles are ground slightly tapered to secure maximum rigidity at lower limits of travel where it is most required.

4. Spindle adjustment may also be checked by feeding spindle down and pulling slack out of feed mechanism by forcing down upper housing. Pressure required should be 50-75 lbs.

## ADJUSTMENT OF INNER SPINDLE

1. Remove two screw and small cover on back side of upper housing.

2. Remove stop set screw restricting up travel of spindle clutch lever and move lever to full up position.

3. Insert pin (diam. .180 or less) in one of the holes provided in the O D of take up nut. (See inner spindle nut.) Hold spindle knob with one hand and turn take up nut to right (clockwise). You will note the nut ratchets in notches as you take up. Take up until spindle is tight and back off 3/4 to 1 1/2 notches. Run bar on high speed making sure there is only slight heating at bottom of spindle. If heat is excessive, back off one notch further.

4. Replace cover and reset spindle clutch stop screw to allow clutch lever to stop in its upper detent.

## EXCESSIVE LOADS

Note: If excessive loads are imposed on your boring bar the following occurs:

1. Thrust loads - If bar is fed or rapid-travelled into object that imposes an excessive thrust load on spindle, the Brass Thrust Nut Part No. 500-41 will probably be sheared and require replacing. This accident could happen with spindle either rotating or stationary.

   The effect of this will be for the bar to continue to run but with no feed or down travel working. If bar is left in feed or down travel, drive spline will be pulled completely out of mesh at which point motor will continue to run but feed screw will not turn at all.

2. Radial loads - If bar has a tool in cutter head that turns into an object an excessive radial shock will be imposed on spindle and will probably shear motor drive key No. 500-62. This would likely happen only when spindle drive clutch is in.

   The immediate effect of this will be for the motor only to run not turning any visible parts of the boring bar. A movement of the speed change lever will indicate the lower gear box is entirely inoperative.

## REMOVAL OF MOTOR FIELD ASSEMBLY

Note: This is the only disassembly required to replace Micarta Motor Drive Key in cases of excessive radial load on machine spindle.

## SECTION B

Remove fan shroud cover and shroud. Remove 4 long motor screws and lift off motor field assembly. Be careful not to lose spring washer on top bearing, and replace properly in reassembly.

Lay blocks or shims on bottom end bell and pry up stator out of drive to remove stator.

## GENERAL MAINTENANCE AND TROUBLE SHOOTING

Most problems possible with portable boring bars will be readily overcome if carefull attention is given to proper tool dressing.

Size problems will relate largely to the carefull use of the cutting tool, tool holders, and micrometer. These parts must be maintained in good order.

At least a yearly inspection should be made of both the inner and outer spindle adjustment as noted in this manual.

Should there be a tendency for the machine to chatter at the bottom of the bore and the tool bit is in proper order, it will be necessary to clean the dampening counter weight 200-78 in the cutter head. (See sec. B-B) Remove the 4 head screws, the head and carefully clean the counter weight and cavity making sure it fits freely back into place.

## DISASSEMBLY OF MOTOR HOUSING

Note: Motor housing may be removed without disassembly of upper housing and feed screw.

### SECTION A-1

Remove 2 hex socket screws on bottom of 500-97 hand feed bracket and 2 screws holding 500-96 plate to 500-70 housing. Turn out (counter clockwise) bevel gear.

Remove 4 flat head hex socket screws in 500-70 housing. Lift out screw, or if upper housing is still intact hold in rapid down lever, 500-30, and rotate screw counter clockwise until feed screw is clear of motor unit. On reassembly it may be necessary to rotate motor and screw, using care in aligning spline in gear to match screw spline. Make sure threaded key does not jam on entering slot.

## REMOVAL OF FEED SLEEVE AND BEARING

Note: For removal of brass nut only. (This disassembly is not necessary to remove motor housing).

### SECTION A-2

Remove snap ring set screw 5002-185, and press sleeve assembly, 500-73, off bearing. Back out socket set screw from brass thrust nut and screw off nut. Bearing may now be removed from shaft.

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## REMOVAL OF MOTOR HOUSING

To remove motor housing take out 4 bolts in housing flange. Note: In reassembly motor alignment must be check after screw sleeve is in place before flange bolts are permanently locked. Use surface plate over screw and spindle.

To disassemble housing, remove pin and 6 screws and bottom screw in middle of bottom of gear pot. Remove set screws and roll pin on speed shifter lever.

Tap lightly on motor pinion, 500-64, and screw drive gear, 500-69 and housing will come apart. Pinion shaft, 500-68, with clutch and gears may be tapped out with small punch through center hole in bottom of gear pot.

## DISASSEMBLY OF UPPER HOUSING & SPINDLE REMOVAL

Remove 500-16A knob by releasing socket set screw. Remove 500-17 knob by releasing socket set screw. (On automotive units you may then draw out centering rod). Unscrew spindle clutch lever stop screw 500-30-4. Raise lever to extreme top, which will allow removal of countersunk screw and lever assembly. Remove cap screw to disassemble trip lever, 500-35. (Caution: Don not lose trip spring). Remove 6 screws holding upper housing sections together and lift off upper lid, 500-22.

Now shifting lever 500-38, with spring may be removed along with 500-25 upper fast return gear with plunger and spring, spindle clutch and key 500-3, ball bearing with take-up spring 500-18, (be sure spring is reassembled properly), sleeve gear 500-1, feed nut 500-2, and feed gear with thrust washer 500-8.

If the bar is in a vertical spindle position we suggest you place something under the spindle nose to prevent lubrication from running out and then remove 500-5 spindle nut. Nut can be started off through adjusting access hold and then hand turned. Now drive gear assembly 500-6, may be worked off along with 500-4 spacer and woodruff key.

Inner spindle may now be removed.

2" cap screws in upper housing should be removed and housing may be driven off spindle. Heat on housing will simplify removal of this sweat fit.

Lift off of feed screw.

Nut should be removed from 500-29 shaft and shaft may be pressed out with gear.

500-7 long gear with radial and thrust bearings may be removed along with oil seal.

Extreme care should be taken when removing long gear out of seal or seal out of housing. Seal is fragile and garter spring will come out easily. When reassembling, open seal as long gear is pushed in to prevent garter spring from snapping out.

## RAPID RETURN TRAVERSE

If the boring bar should ever fail or hesitate to return to top of travel when shift lever is lifted and latched, the following procedure may be used to adjust return traverse clutches.

1. Run bar down into hole a few inches.

2. Loosen set screw at top of upper housing. (Refer Sec. A-A)

3. This will allow you to tap rapid return tumbler assembly, (Top of shaft located on top of upper housing opposite spindle side down slightly which will result in deeper engagement of clutches. Adjust tumbler shaft so that when shift lever is in neutral, clutches do not clatter. Clutches should engage immediately upon latching lever.

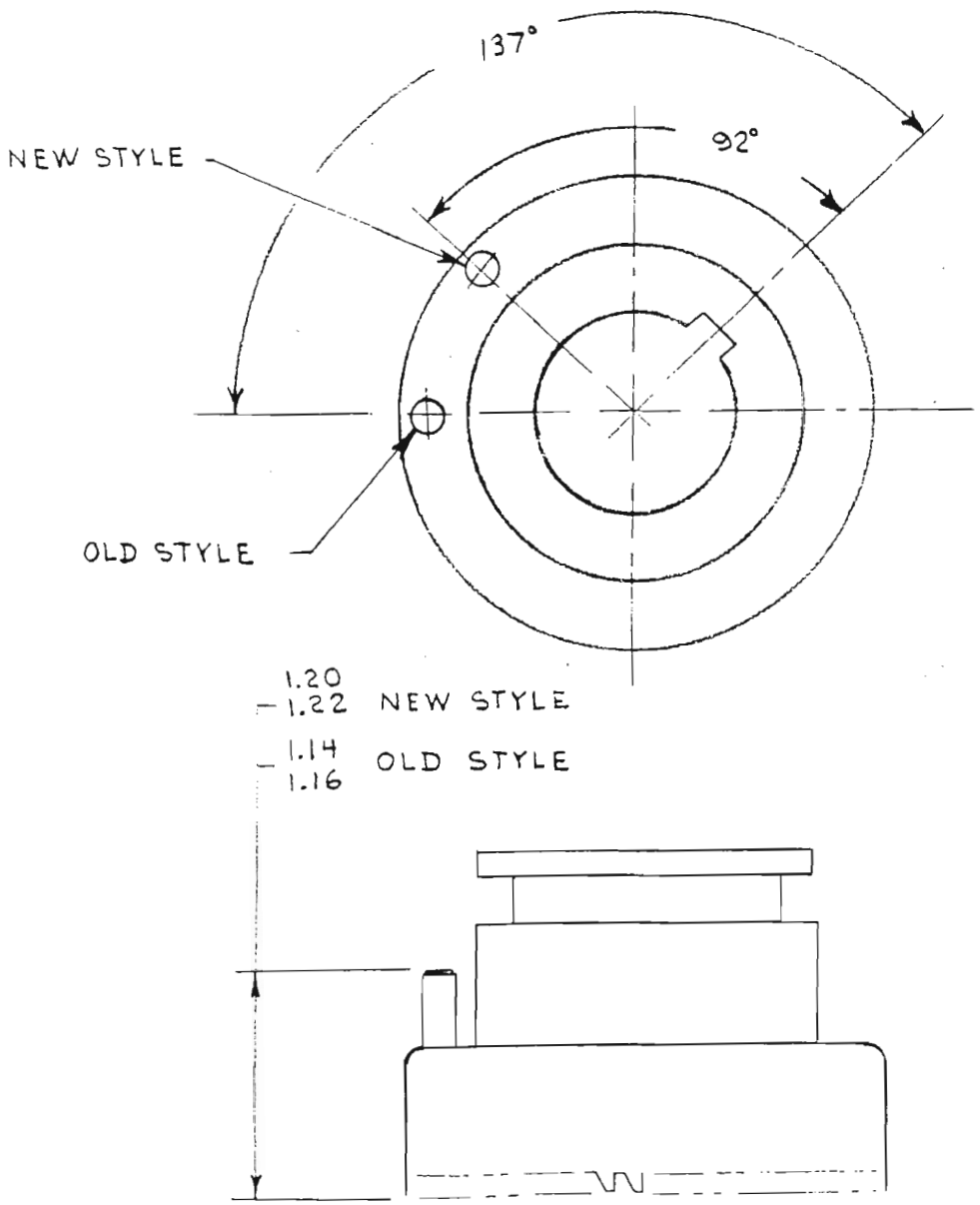
4. Tighten set screw to relock shaft. Check to see adjustment has not been changed by set screw.

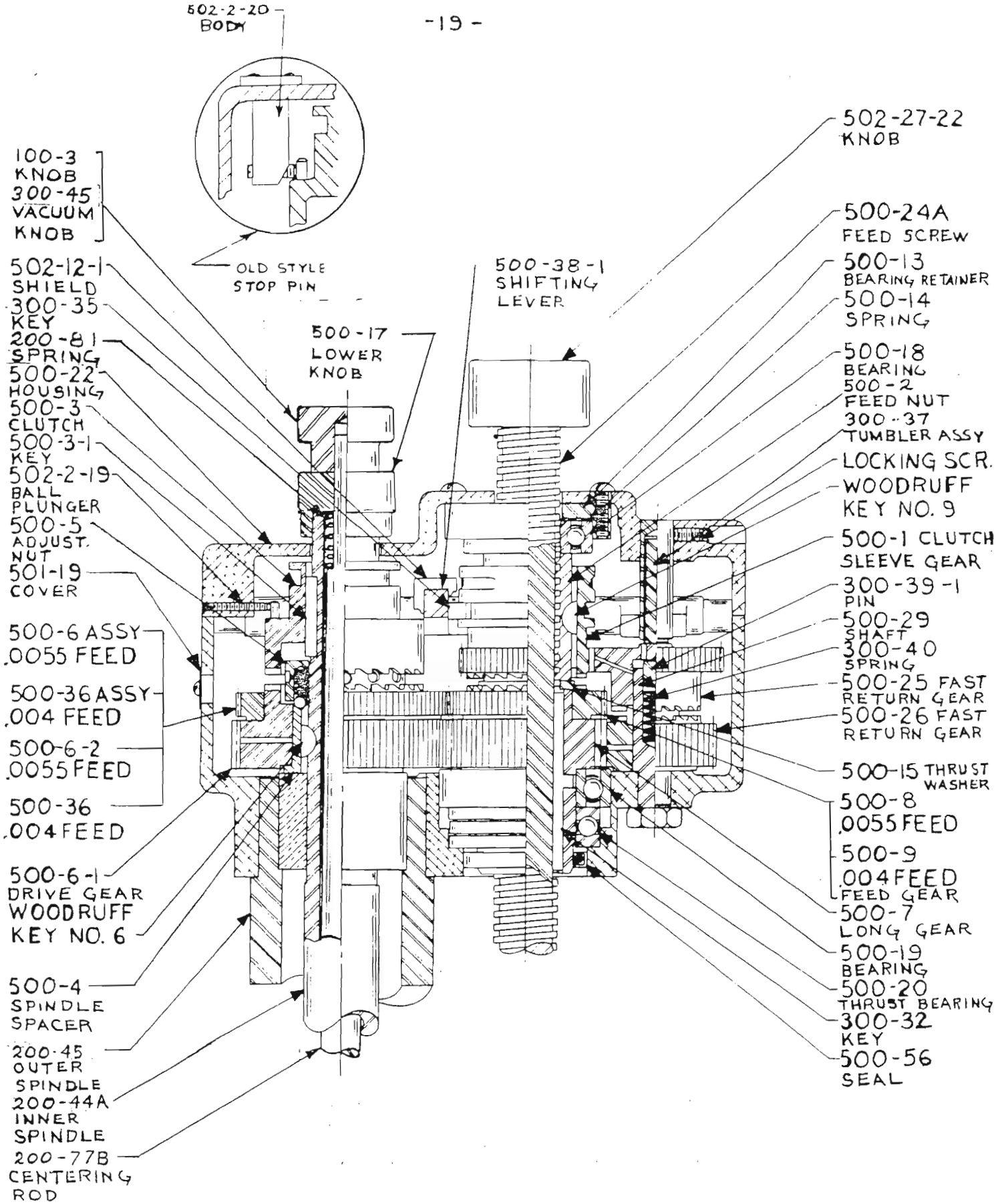
STOP PIN ASSEMBLY IN 500-3 CLUTCH SLEEVE
for (old and new style ball detent)

Refer to the upper housing drawing for the old and new ball detent styles. Press pin into correct clutch sleeve hole to the height shown below.

The purpose of the ball detent is to stop the spindle from turning with the tool bit facing the machine operator. The new style has the advantage of being able to adjust the ball detent plunger, 502-2-19, from the outside while the old style had to be taken out of the upper housing case to be adjusted.

Assemble clutch in upper housing and adjust the ball detent plunger so that when the machine is idling and the spindle clutch is disengaged, the spindle will stop turning with the tool bit facing the machine operator.

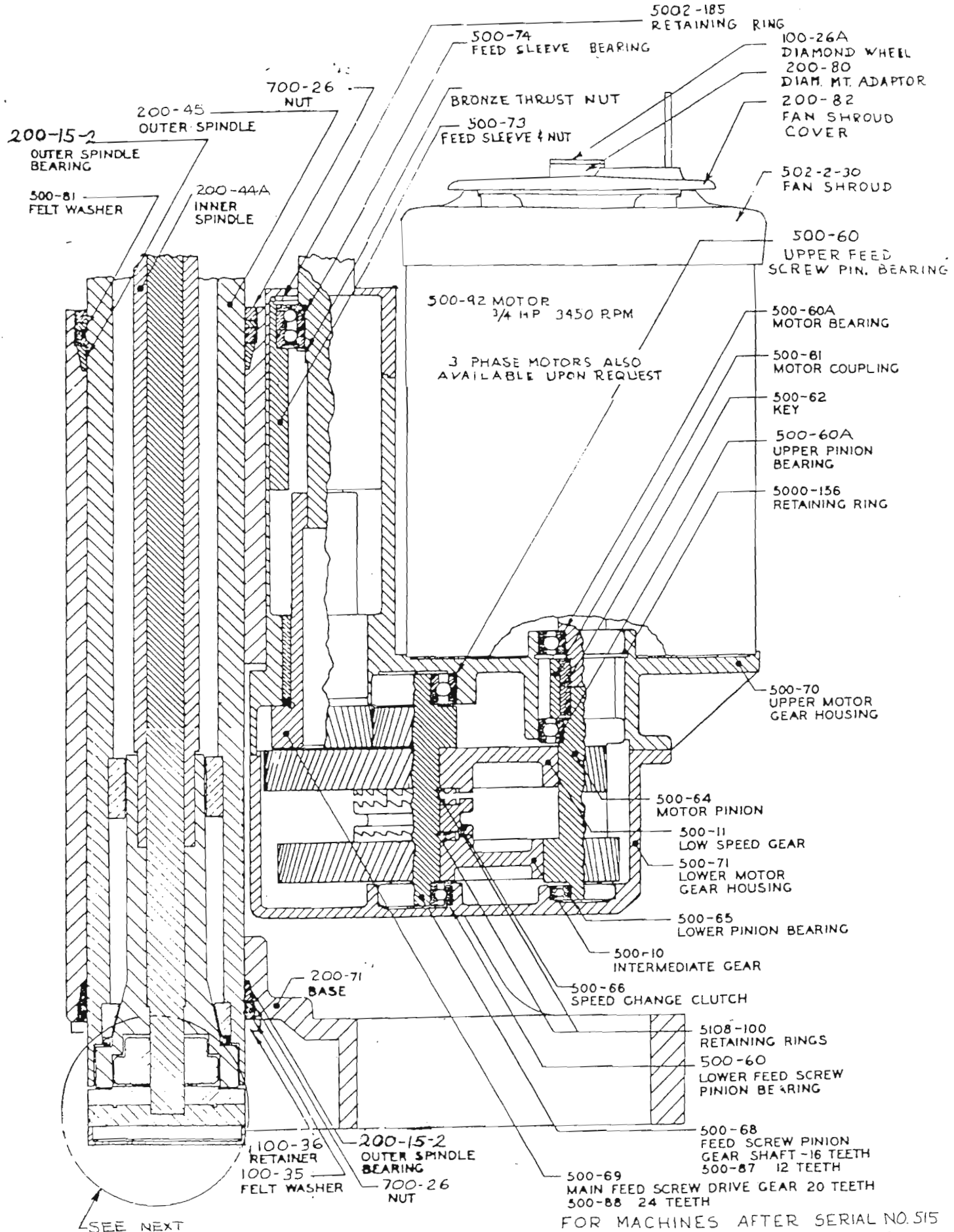





SECTION A-A

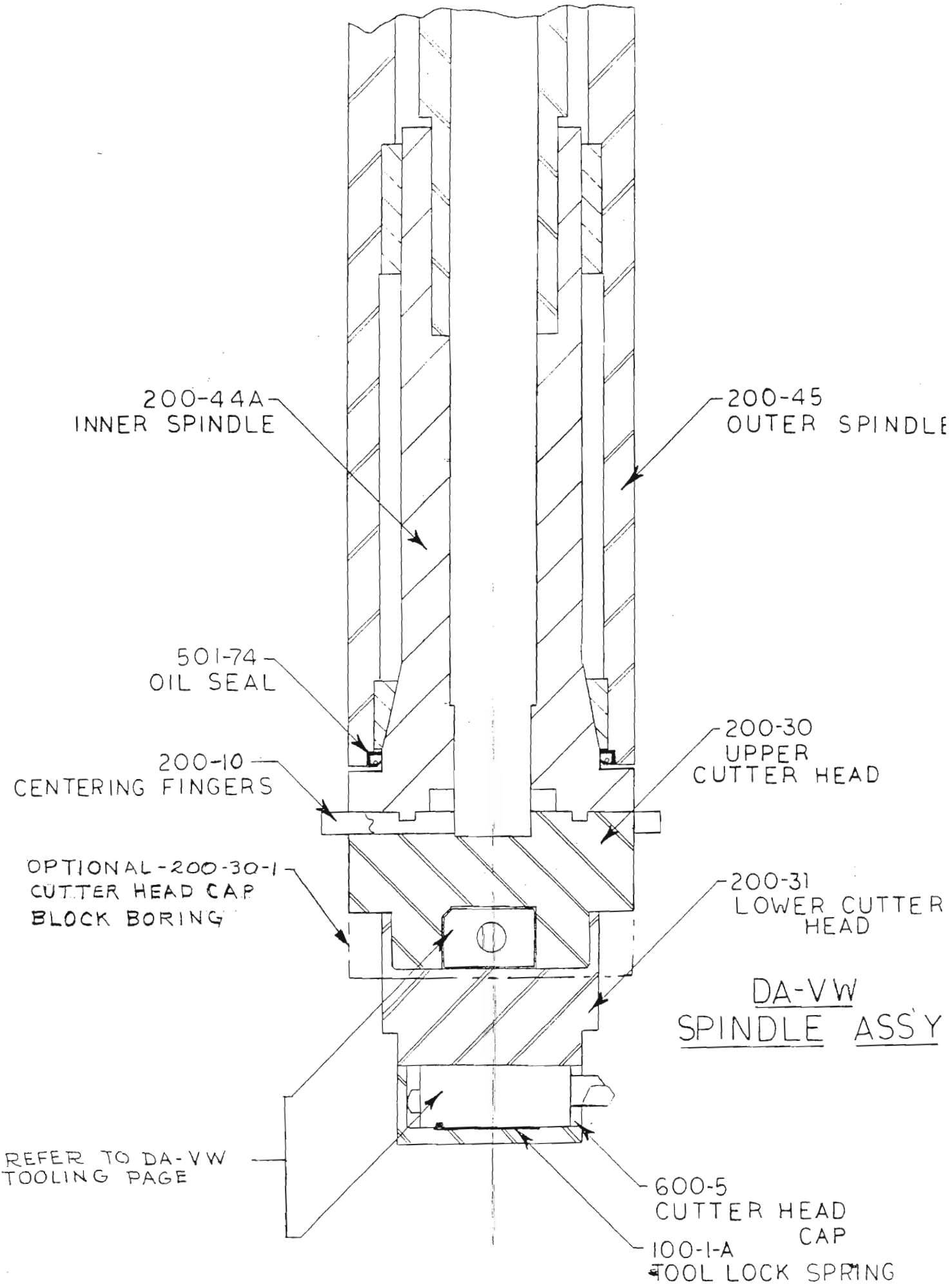
DA-VW

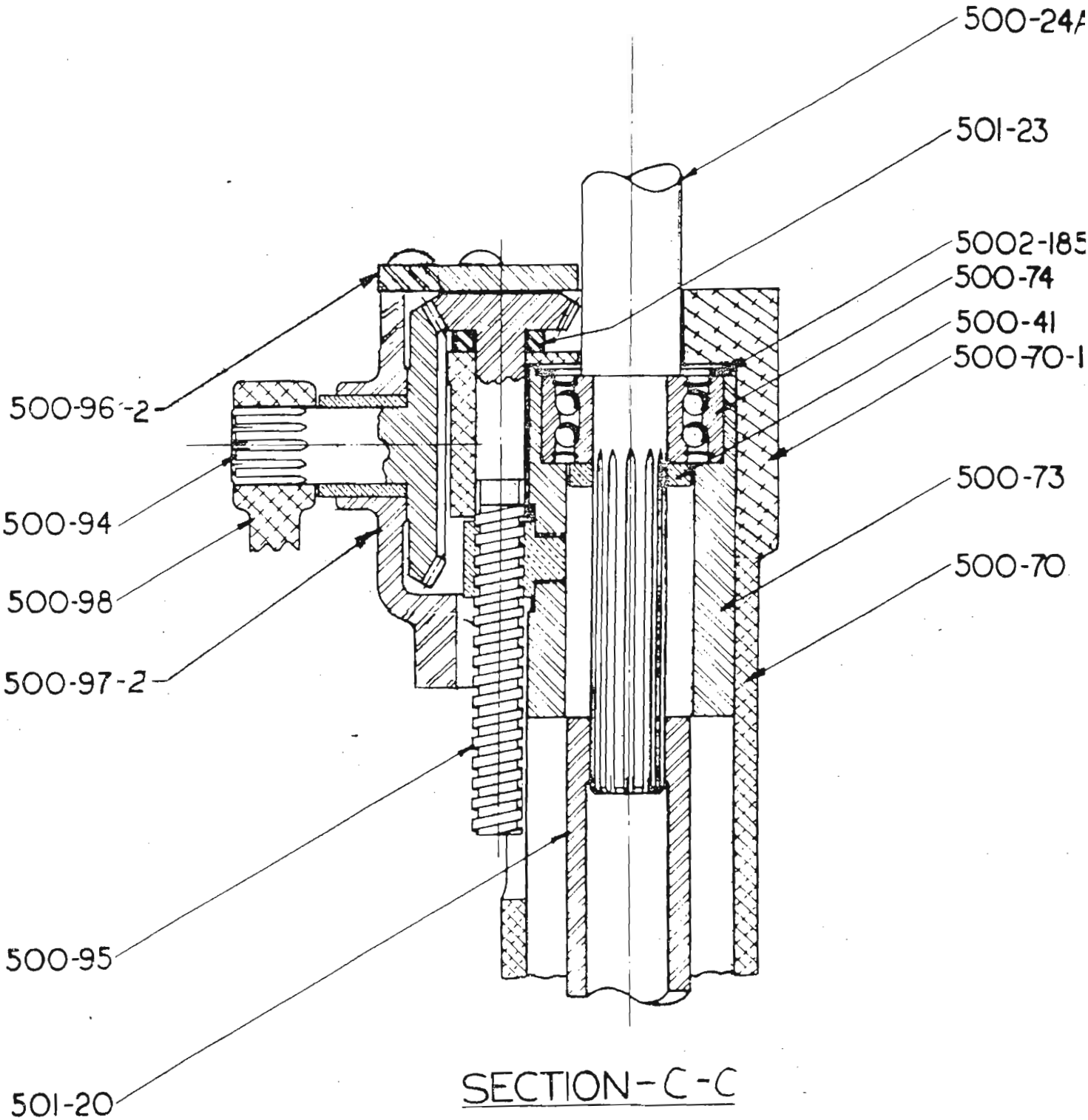
UPPER HOUSING




FOR MACHINES AFTER SERIAL NO. 515 REFER TO THE FOLLOWING PAGE FOR SPINDLE ASS'YS.

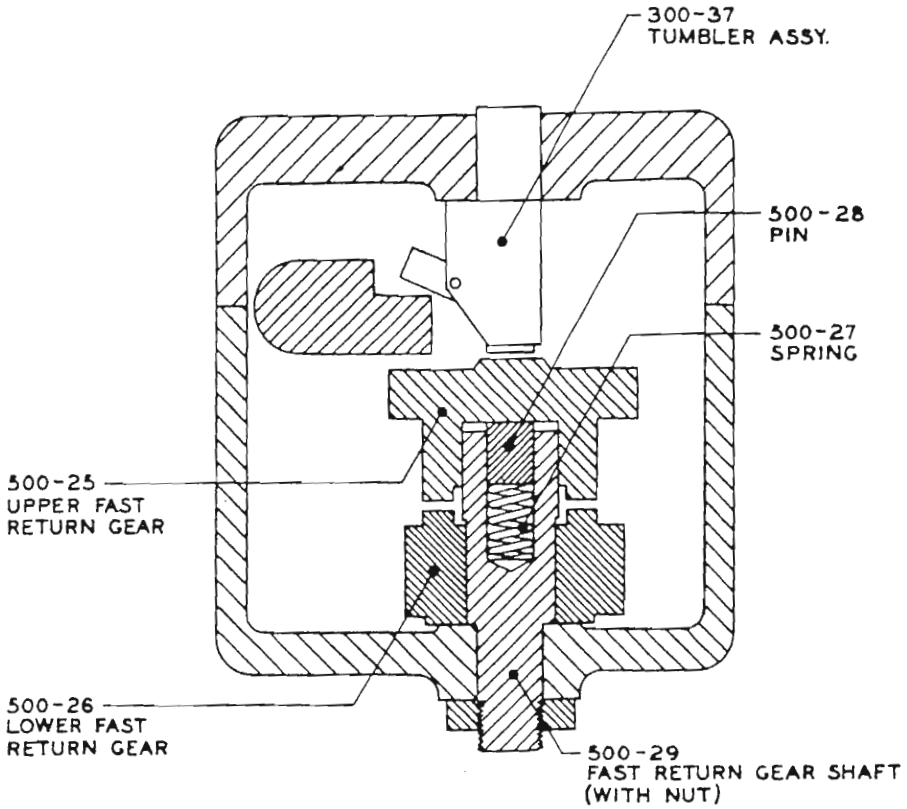
SECTION B-B


200-44A
INNER SPINDLE
200-45
OUTER SPINDLE
501-74
OIL SEAL
200-10
CENTERING FINGERS
200-30
UPPER
CUTTER HEAD
OPTIONAL-200-30-1
CUTTER HEAD CAP
BLOCK BORING
200-31
LOWER CUTTER
HEAD
DA-VW
SPINDLE ASSY
REFER TO DA-VW
TOOLING PAGE
600-5
CUTTER HEAD
CAP
100-1-A
TOOL LOCK SPRING

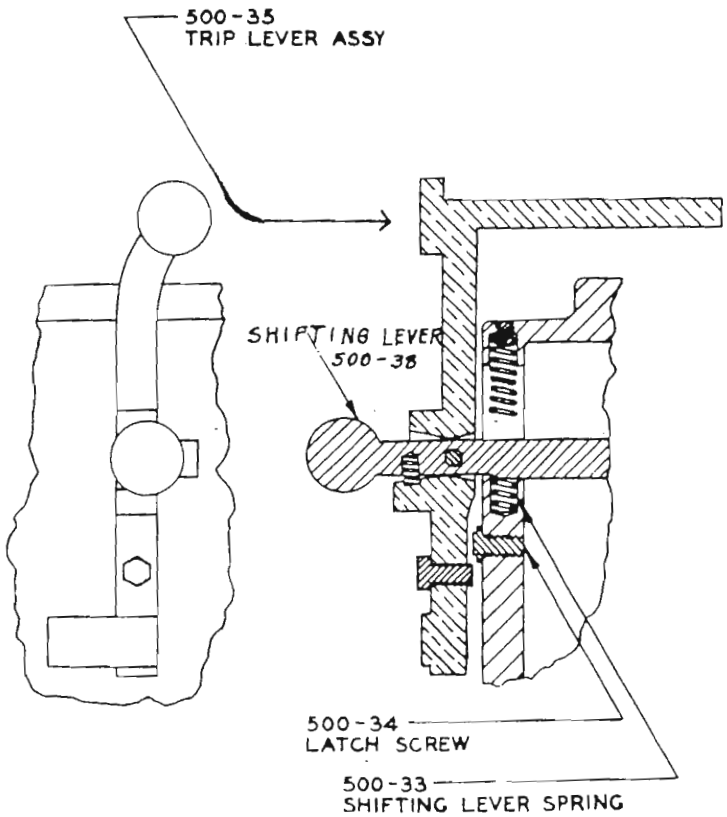



SECTION - C - C

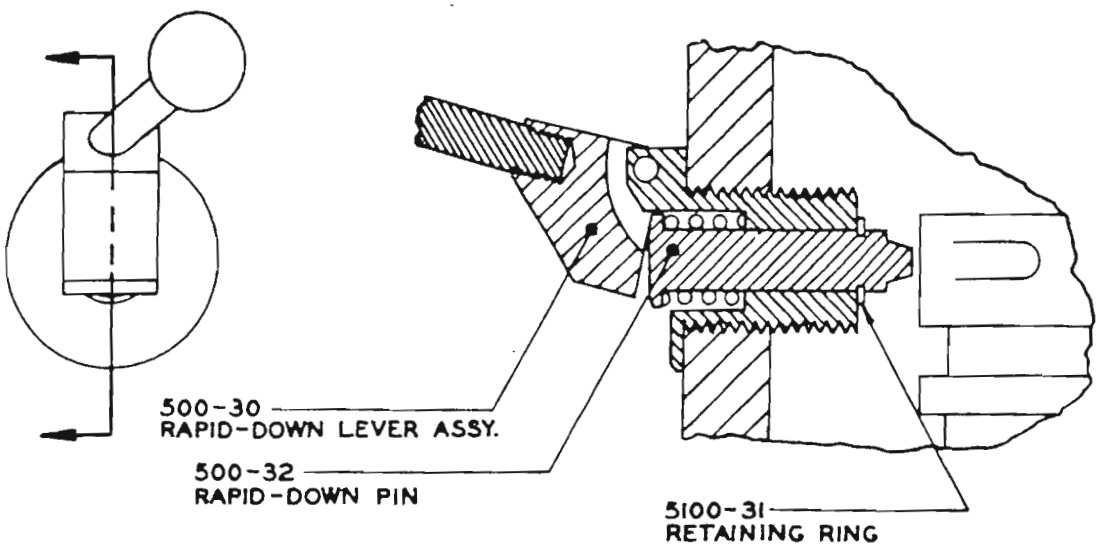
HAND FEED



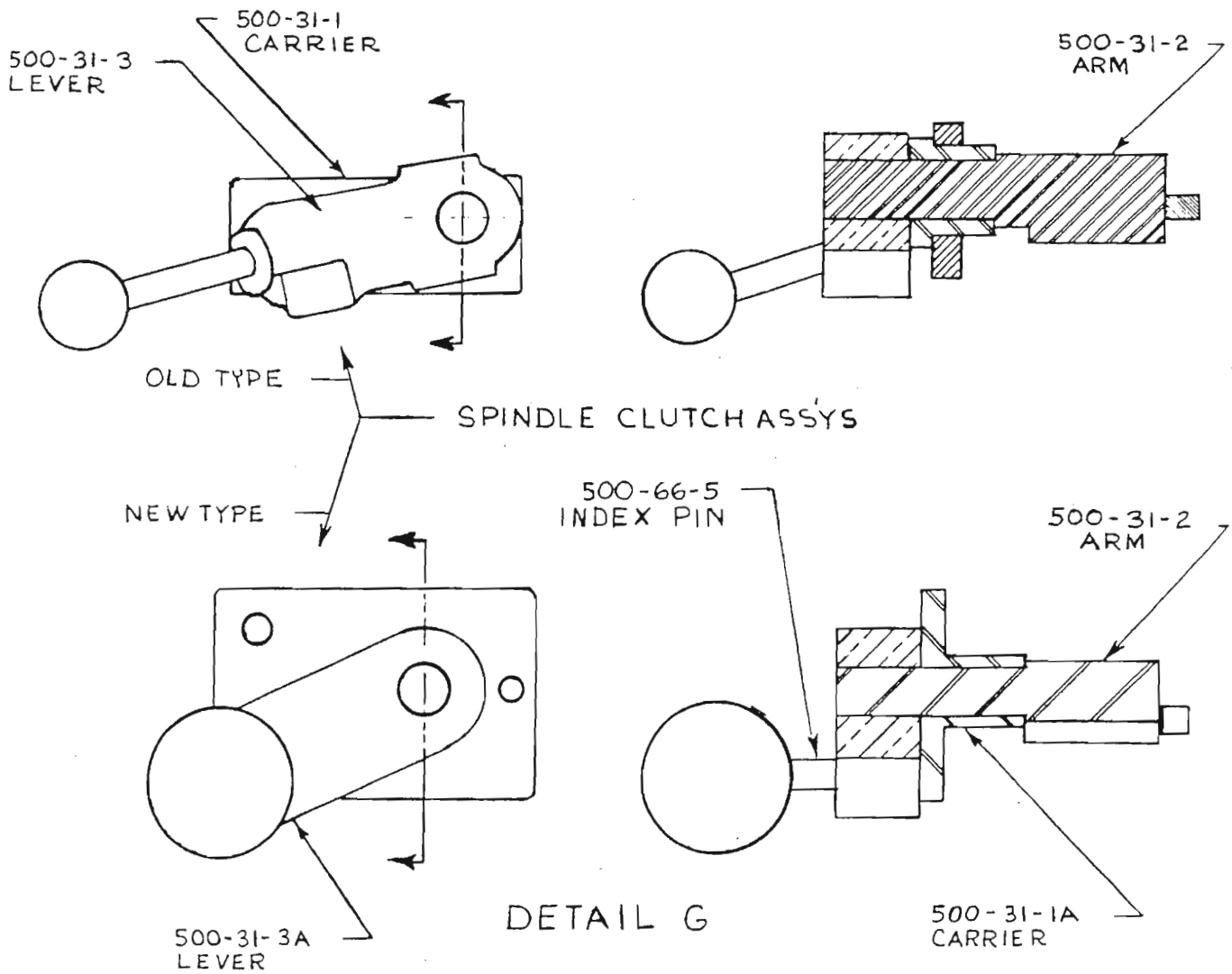

SECTION D-D



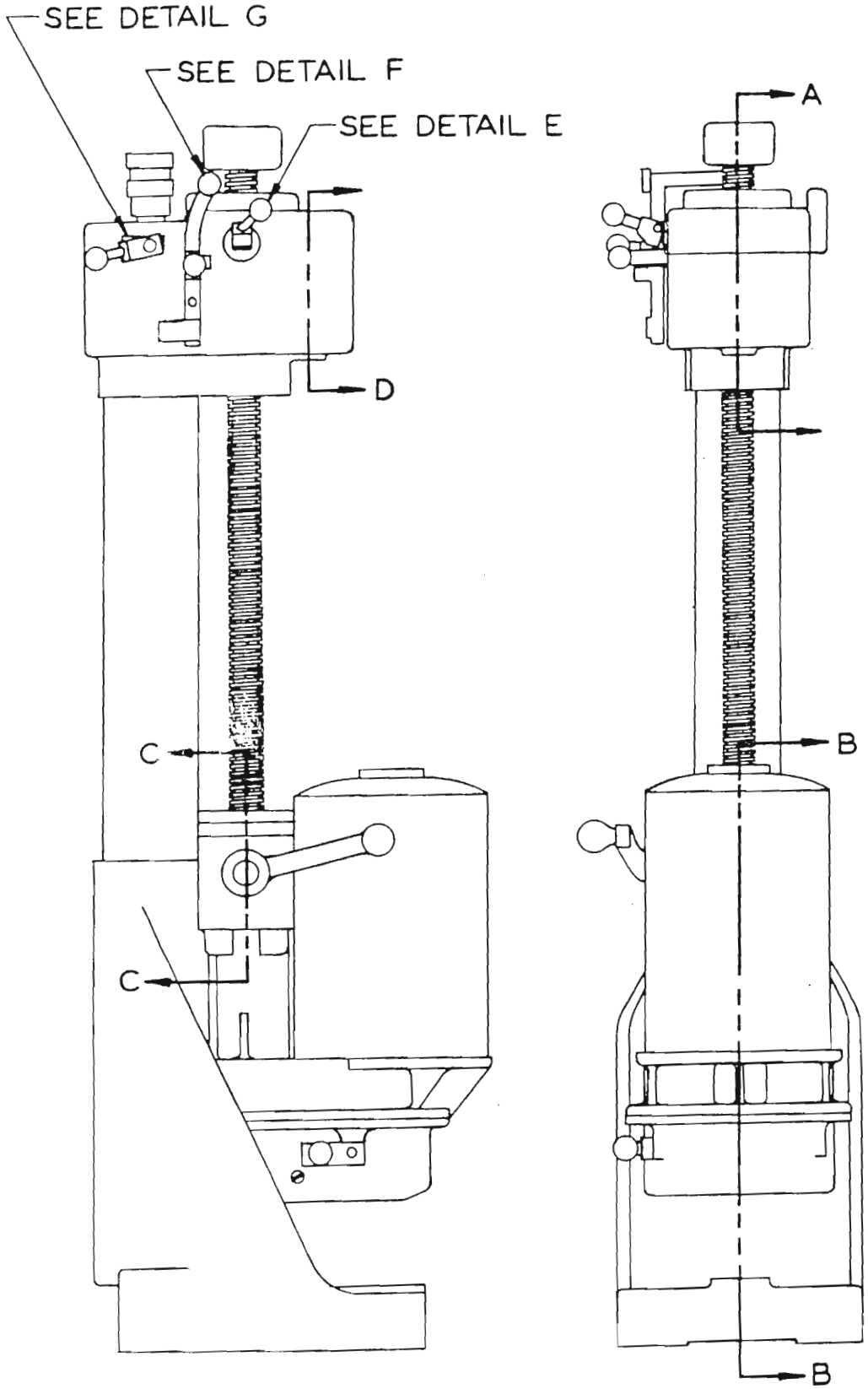

DETAIL F

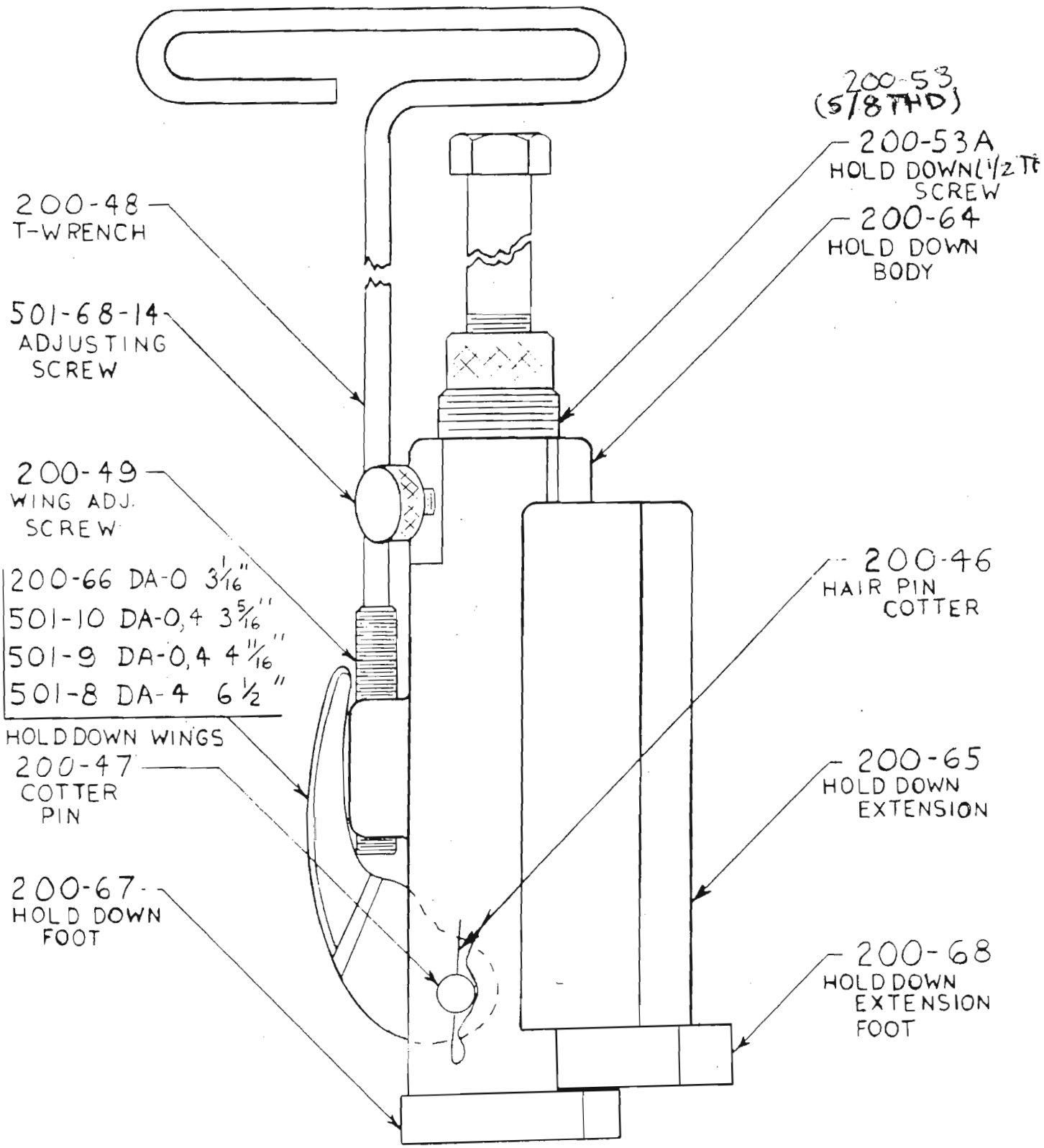



DETAIL E




DETAIL G


SEE DETAIL G
SEE DETAIL F
SEE DETAIL E
A
D
C
C
B
B




DA-0 HOLDDOWN ASSEMBLY

# DA-VW TOOLING

| | |
|---|---|
| 199-89 | 1-1/2" Tool holder (case thrust bearing) used in upper cutter head |
| 100-74 | Double sided facing bit (case thrust bearing) |
| 199-90 | 1-3/4" tool holder (case mainline, cylinder hole in case, head facing) |
| 501-31 | R8 carbide tool bit (case mainline, cylinder boring, cylinder hole in case) used in upper cutter head |
| 100-76 | Offset bit (head facing) used in lower cutter head |
| 199-94 | 2-1/4" Tool holder (chamfer head) used in lower cutter head |
| 501-33D | 30° Chamfer bit (chamfer head) |
| 199-96 | 1-1/4" tool holder (4th main bearing in case) used in lower cutter head |
| 100-29-5 | Offset bit, 1" long (4th main bearing case) |
| 200-32-1 | Upper locator; case 1200cc |
| 200-32-2 | Upper locator; case 1300-1600cc |
| 200-36-1A | Upper locator; 1200cc cylinder |
| 200-36-2A | Upper locator; 1300cc cylinder |
| 200-36-3A | upper locator; 1500-1600cc cylinder |
| 200-37 | Tubing adaptor; cylinder |
| 200-37-1 | Steel tubing; cylinder |
| 200-38-1 | Lower locator; 1200 & 1300cc, 1500 & 1600cc |
| 200-39 | Centering bushing; 1300-1500-1600cc cylinder head |
| 200-39-1D | Hold down clamp; (short) cylinder head 1300-1500-1600cc |
| 200-39-2 | Centering bushing; 1200cc cylinder head |
| 200-40 | Parallel case support |
| 200-85 | Hold down washer; case |
| 200-40-1A | Head support parallel |
| 200-10 | CENTERING FINGER |