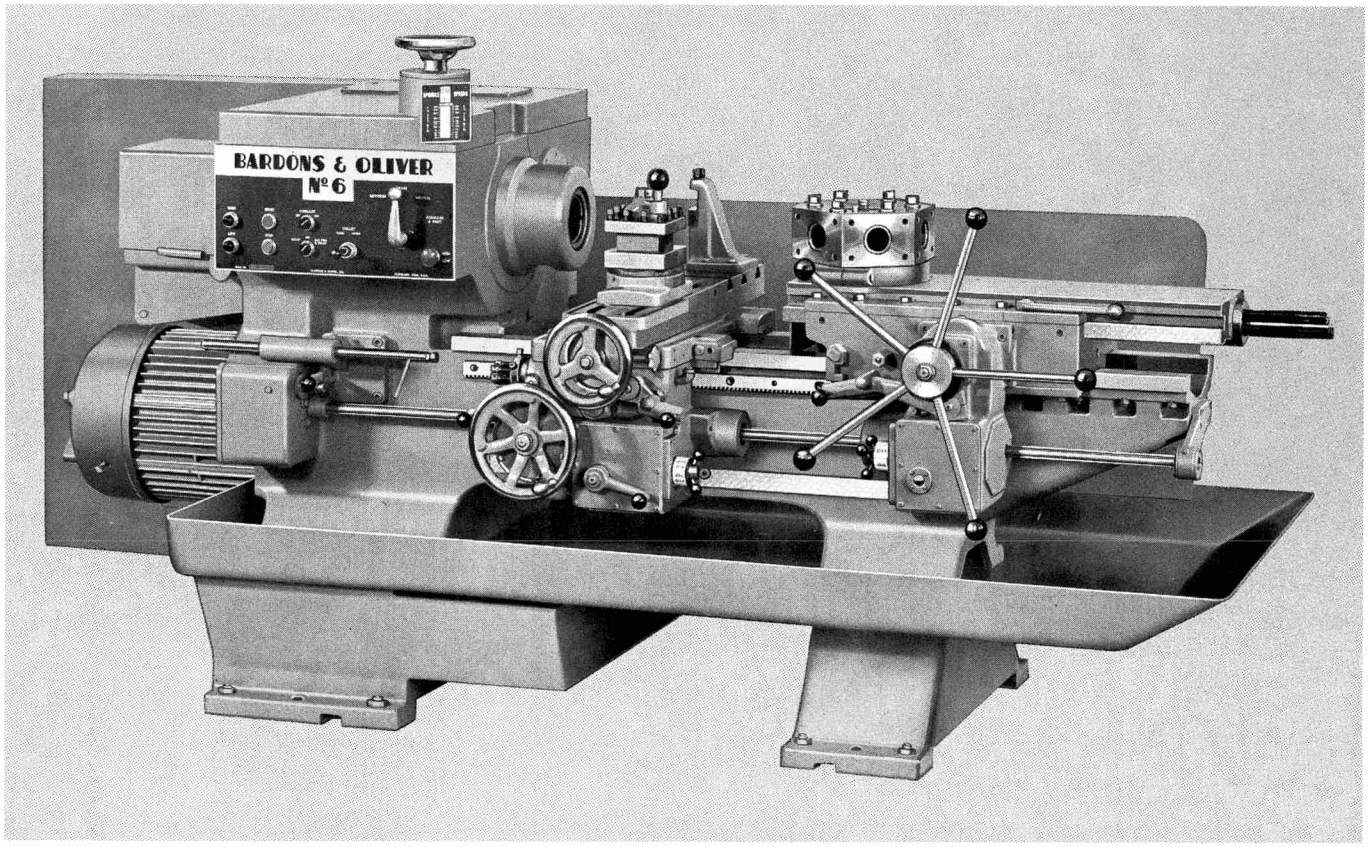
BARDONS & OLIVER

No. 6

UNIVERSAL TURRET LATHE



INSTRUCTION MANUAL

NO. 6 UNIVERSAL TURRET LATHE

The Bardons & Oliver No. 6 Universal Turret Lathe was designed and built to produce accurate work over a long period under conditions of hard usage. In order that the inherent accuracy be retained, extreme care must be given to the installation of the machine. Thorough inspection of the machine should be made at regular intervals, the frequency depending on the type of work handled and the accuracy desired.

Do not attempt to run the machine until all of the following instructions for Unpacking, Installing, Lubrication, Electrical Connections, and Leveling have been carefully and completely followed in the order listed.

UNPACKING

Turret Lathes for domestic customers are shipped in individual crates: those for foreign customers are shipped in individual boxes. While the machine is being unpacked, particular care should be taken not to mar the finish or damage the working parts.

Whenever possible, tools, chucks, and fixtures are attached directly to the machine. Wrenches and other items which cannot be attached, together with a data envelope, will be found in a separate box fastened to the platform or skids.

Contained in the data envelope are the instruction manual, electrical diagram, parts catalogue, and packing list. Be sure this data is preserved and delivered to the proper departments.

Check and account for each item on the packing list before disposing of any crating or boxing material.

INSTALLING

The machine is mounted on heavy wooden skids to prevent bed warpage in shipping. Locate the machine approximately in its final position before removing the skids. In removing the skids care must be taken to prevent undue twisting which might cause permanent distortion of the bed.

If possible, the legs should rest on a concrete foundation. A wooden floor lacks rigidity and its surface swells or shrinks according to climatic conditions.

To maintain accuracy, place steel bearing plates under each leg, as shown on the outline drawing of the machine. These plates should be grouted in concrete flush with the floor. If it is impossible to set these plates in or on concrete, they may be bolted down to a wooden floor. Here it is advisable to use plates affording a much larger bearing area on the floor. Drill and tap for the hold down screws after the bearing plates are firmly fastened to the floor.

On machines equipped with the hydraulic collet chuck and bar feed unit, assemble the bar feed unit according to the foundation drawing on the back cover of the manual and place the unit in its approximate position with respect to the machine. The bar feed unit should be located on bearing plates the same thickness as used under the machine.

LUBRICATION

The headstock is fully enclosed and spray lubricated. Controlled by a pressure switch, the main motor does not start until the oil pressure in the headstock is sufficient to insure full lubrication of all moving parts. The head end bracket receives lubrication from the headstock and has no separate oil reservoir.

The aprons are splash lubricated. The plunger pumps on the aprons lubricate the bearing surfaces of the turret slide, the cross slide, carriage, feed screw, and nut, as well as bearing surfaces in each apron not reached by the splash system. Since the plunger pumps take oil from the aprons, it may be necessary to add oil to the aprons more often than to the headstock.

The apron oil reservoirs are filled to the proper level before shipment. Fill the headstock and check the aprons. Make sure that the oil level in each reservoir is at approximately the center of the gage glass. Check the oil levels before starting the machine, as the level drops somewhat after the machine is started. Raising the oil level above the center line on the gage will cause oil leakage at various points and excessive oxidation or gumming of the oil.

On machines equipped with the hydraulic collet chuck and bar feed unit, connect the two hydraulic lines to the collet chuck cylinder underneath the end of the spindle. Each hose and fitting are suitably marked. Fill the oil reservoir in the hydraulic unit to the center line on the gage.

The instructions on the lubrication chart (Page 10) must be followed. If the machine is operated on a multi shift basis, the headstock and aprons should be drained, flushed and refilled two or three times as often as called for on the chart.

ELECTRICAL CONNECTIONS

The machine is shipped from the factory with all electrical equipment wired. It is only necessary to connect the main power lines to the terminals on the disconnect switch in the upper right hand corner of the electric control cabinet. When the headstock oil reservoir is filled as outlined in the "LUBRICATION" instruction, close the disconnect switch and press the "START" button located on the push button control

panel. If the power lines have been connected to give the correct rotation of the motors, the gage in Figure 4 will show about 275 lbs. pressure, and the main motor will start. If the gage does not show pressure within a few seconds, press the "STOP" button and reverse two of the incoming leads.

On machines equipped with the hydraulic collet chuck and bar feed unit, insert the plug attached to the end of the cable on the bar feed stand into the receptacle on the right hand side of the electric control cabinet on the machine. The hydraulic pump, located in the bar feed stand, will not operate unless the main motor is running. With the main motor running, the pump is started by turning the selector switch to "COLLET" and the collet lever switch to "OPEN" or "CLOSE".

LEVELING

The accuracy originally built into the machine will be lost unless the machine is properly leveled. To maintain this accuracy the level of the machine should be checked at least twice a year.

Before leveling, allow the machine to reach normal operating temperature. To level, raise the machine by turning the leveling screws so that a 1/8 inch thickness gage may be slipped between the bottom of each leg and the bearing plate. Use a precision level about fifteen inches long. Starting at the head end, place the level lengthwise on the bed ways, and level by turning the adjusting screws. Then place the level across the bed ways and level. Repeat the two operations at the tail end of the machine. After leveling at each end, repeat the leveling process until all readings are equal. After proper alignment, bolt down the legs and recheck the level.

If extremely accurate work is to be done on the machine, the leveling can be further checked by chucking a round bar and taking a turning cut with the carriage or hexagon turret. Any remaining misalignment will be indicated by the amount of taper in the turned diameter. This can be corrected by slight adjustment of the leveling screws.

On machines equipped with the hydraulic collet chuck and bar feed unit, this unit should be bolted to the floor only after it is leveled and aligned with the spindle. To level and align the unit (Figure 1), do as follows: Place the unit in approximately the proper position with respect to the machine, and make necessary electrical and hydraulic connections. Insert a test bar (equal to the maximum capacity of the collet) through the revolving scroll chuck and just through the collet. The bar should be straight, of a uniform diameter and about 12 feet long. Close the collet. Place a parallel between the support bars and the test bar as shown in Figure 2. Using a 2 inch parallel, raise the second stand until the test bar is level. Check alignment of support bars by placing level lengthwise on top of the bars and then crosswise on the bars adjacent to the parallel. Adjust by leveling the second stand. Level the first stand lengthwise and at right angle to the support bars. Using the test bar as a guide, align the stands with the center line of the spindle. Recheck level of test bar and support bars. As a check of alignment, the test bar should be concentric with the hole in the abutment sleeve. Recheck the levels throughout the bar feed unit.

To insure proper installation of the bar feed unit, tighten the chuck until it grips the test bar. Loosen the chuck just enough so that it can be moved back and forth over the test bar. It must slide freely over the whole length. After lining up and leveling the bar feed stands, bolt them securely to the floor.

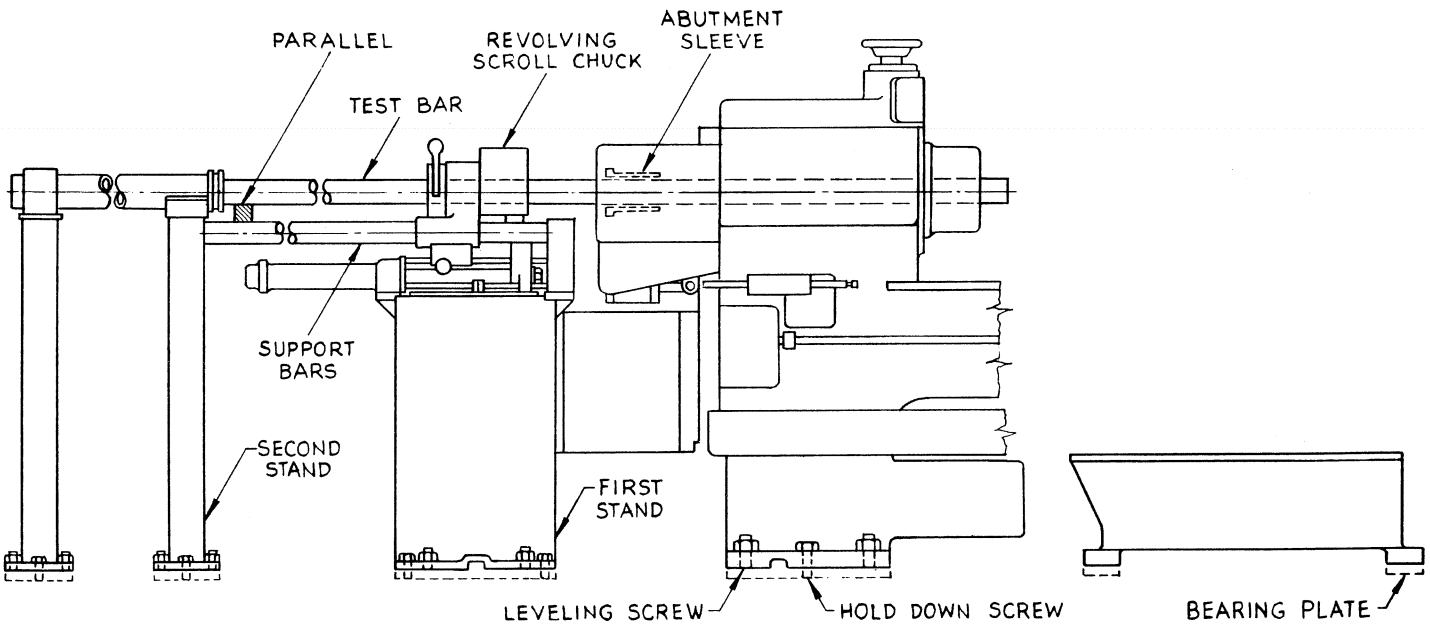


FIG. 1

HEADSTOCK

The No. 6 Universal Turret Lathe features a 16 speed, preselection headstock with automatic spindle speed changing and simplified controls (Figure 2).

1. Main Drive Motor — The "Start" button starts the headstock hydraulic pump. When pressure is sufficient to insure lubrication of all headstock components, a pressure switch closes, starting the main drive motor. The "Stop" button stops both the hydraulic pump and main drive motors.

2. Coolant Pump — A selector switch turns on and off the separate motor driven coolant pump.

3. Jog — The "Jog" button when depressed engages the low forward clutch. The spindle nose can be "inched" to any desired position.

4. Preselector — The preselector drum with large convenient handwheel indicates the 16 spindle speeds and corresponding surface or cutting speeds for various work diameters. The cutting speed chart refers to the spindle speed marked in red. The spindle speed marked in black can be obtained instantly by pressing the "High-Low" pushbutton. Spindle speeds may be preselected at any time.

5. Main Control Lever — This lever controls all actions of the turret lathe spindle — FORWARD, SHIFT, REVERSE, BRAKE, AND NEUTRAL.

All actions except SHIFT are initiated by rotating the lever. In order to change speeds, the lever must first be in the FORWARD position. To initiate the shift, the lever is then pulled directly out toward the operator. As soon as contact is made and the shifting cycle starts, the lever should be released. The automatic speed change should take only a few seconds and occur smoothly without any perceptible clashing of gears.

The spindle should be allowed to brake to a slow speed when the lever is moved from FORWARD to REVERSE.

6. High-Low Spindle Control — A touch of the HIGH-LOW pushbutton instantaneously affords a 2.84 to 1 spindle speed change. Touch the button again and the spindle changes back to the original speed. Lights on the far left of the control panel indicate whether the High or Low clutch is engaged.

FIG. 2

HEADSTOCK ADJUSTMENTS

1. Figure 3 is the headstock hydraulic diagram with adjustment points indicated. Figure 4 shows the location of these adjustment points on the machine.

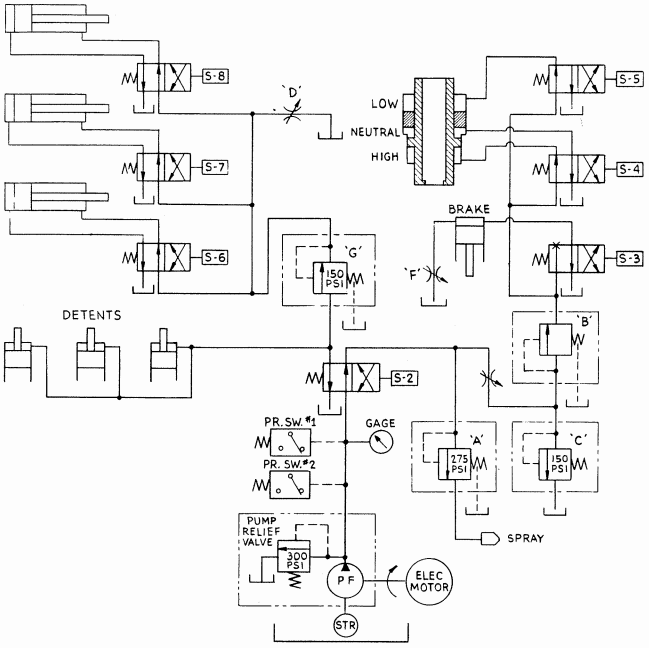


FIG. 3

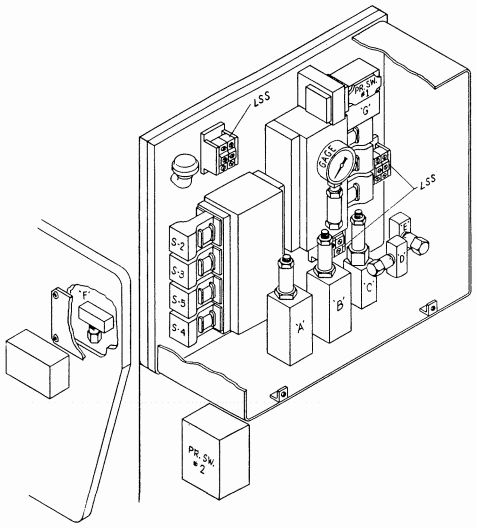


FIG. 4

2. Sequence of Operation

a. High-Low — When the main control lever is moved to forward either the High or Low clutch solenoid valve (S-4 or S-5) is energized. Engagement of the clutch is controlled by the pressure relief valves "S" and "C" and the flow control valve "E". Clutches should engage quickly and smoothly without grabbing.

b. Brake — When the main control lever is moved to brake, the High or Low clutch solenoid is de-energized and the brake solenoid S-3 is energized. Brake action is controlled by the flow control valve "F".

c. Reverse — When the main control lever is moved to reverse the main motor is reversed.

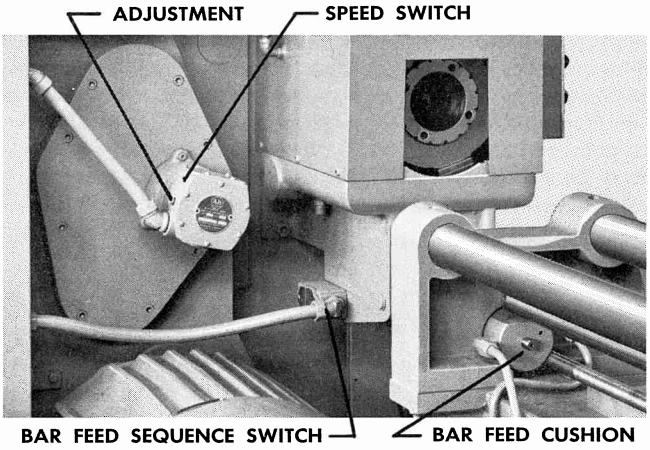


FIG. 5

d. Shift — When the main control lever is pulled out to initiate the shift, the following takes place:

1. The High or Low clutch solenoid is de-energized.

2. The brake solenoid is energized.

3. When the spindle is rotating very slowly, the speed switch closes (Figure 5), de-energizing the brake solenoid and energizing S-2 which diverts the headstock oil to the shifting cylinders.

4. Shifter arm detents which keep gears from coming out of mesh during machine operations are retracted at 50 psi.

5. Solenoids S-6, S-7, and/or S-8, depending on the speed preselected, are energized. Speed of gear shifting is controlled by the flow control valve "D".

6. If gear shift is completed, limit switches (LSS) inside the headstock will close and the High or Low clutch solenoid will be energized.

7. If the gear shift is not completed, pressure to the shifting cylinders increases to 300 psi and the pressure switch No. 2 closes. This in turn momentarily de-energizes S-2 and energizes the Low clutch solenoid causing the spindle to be jogged. Momentary jogging will occur until the shift has been completed. The pressure switch is adjusted so jogging takes place at about 300 psi on the gage.

3. Limit switches on the main control lever and on the preselector drum control all solenoids in Figure 3. Limit switches are numbered according to the electrical diagram located in the machine electrical control box.

4. Malfunction in the headstock operation is most often caused by a clogged filter on the intake line to the headstock hydraulic pump. The filter should be cleaned regularly — See Lubrication Instructions.

5. Spindle bearing adjustment — The spindle is mounted in two single row precision tapered roller bearings. A split adjustment nut, located on the rear end of the spindle outside the headstock may be easily reached with a pin wrench. In adjusting, all end play should be eliminated, but no pre-loading should be introduced.

SQUARE TURRET

The Bardons & Oliver Square Turret features rugged construction and accuracy, assuring repetitive indexing within a few ten thousandths of an inch. A protective skirt around the bottom of the turret effectively keeps chips from the bearing surfaces. Daily maintenance of the square turret consists of oiling at the point indicated on the figure.

When the indexing lever (1) is in the extreme clockwise position as shown in the figure, the lockbolt (2) is seated in the turret bushing (3) and the turret is clamped to the base. Tapered pins position the lockbolt cam (4) and stud collar (5) on the center stud (6) in the proper timed relationship. The indexing sequence is as follows: - The indexing lever is moved counterclockwise. The turret is unclamped. The hardened pin (7) in the indexing lever engages the stud collar, causing the center stud to move with the indexing lever. The lockbolt cam engages the tumbler (8), depressing the lockbolt lever (9), which in turn disengages the lockbolt. The second hardened pin (10) in the indexing lever then engages the indexing plate (11) causing the turret to turn. The lockbolt rides on a recess in the turret until the next position is reached. Moving the indexing lever clockwise returns the lockbolt cam against the lockbolt sleeve (12). The indexing lever then disengages the stud collar and moves on the double acme threads causing the turret to be clamped to the base.

To properly maintain the square turret it should be completely disassembled and cleaned at least every six months. To completely disassemble, remove the bottom plate (13), stud collar (5), indexing lever (1), turret, center stud (6), tumbler pivot screw (14), tumbler (8), lockbolt lever (9), tumbler plunger (15), screw plug (16), lockbolt spring, and lockbolt (3) in that order. Reassemble in the reverse order, taking care that each part is placed in its original position, particularly the tumbler and lockbolt lever. Double acme threads locate the indexing lever on the center stud. It is possible to assemble this unit with the lever 180 degrees from the proper position. If the tapered pin which locates the stud collar on the center stud fits flush with both sides of the collar, the lever is properly positioned. If the pin goes in only half way, remove the indexing lever and reengage it opposite to the prior point of engagement. In adjusting the tumbler plunger the set screw should be tightened just enough to keep the tumbler in the proper indexing position. Tightening the set screw too much may cause the plunger to bind and shear.

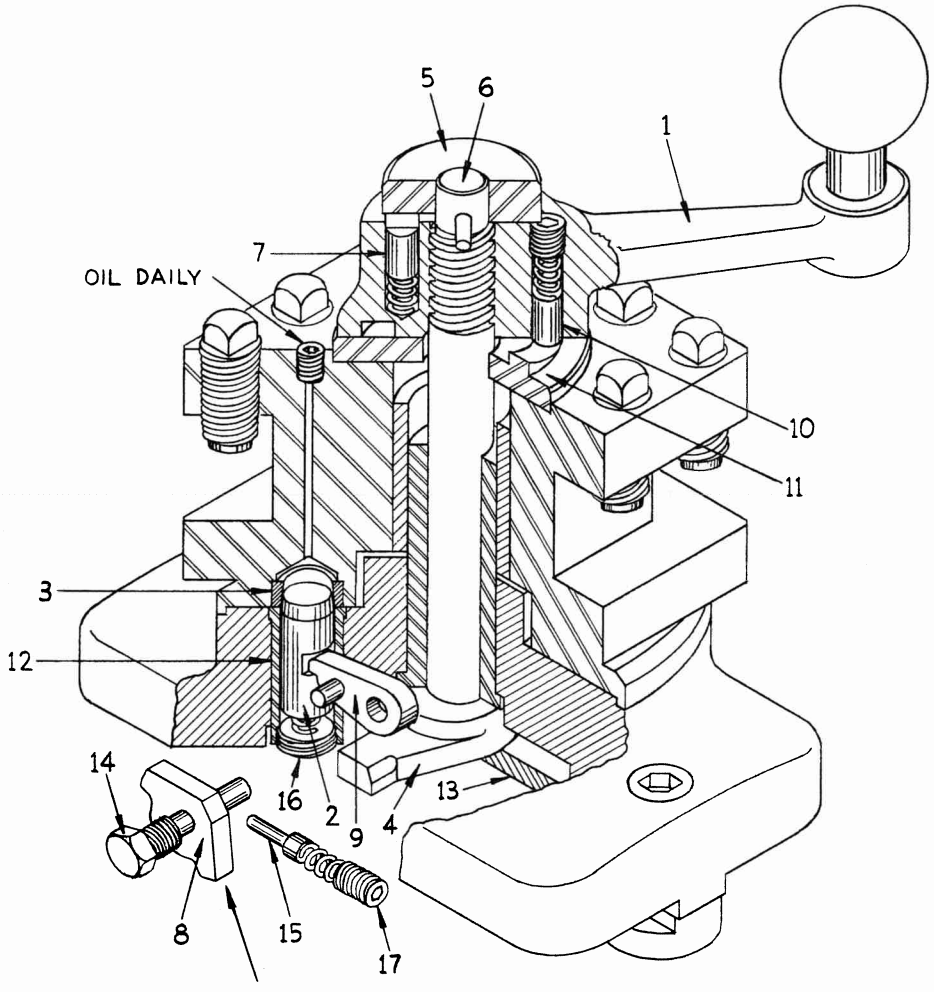


FIG. 10

HYDRAULIC COLLET CHUCK AND BAR FEED

The hydraulic collet chuck and bar feed are shown in Figure 11. Both chuck and bar feed are operated from a completely self-contained hydraulic pumping unit mounted in the bar feed stand. Controls for the unit are located on the machine control panel on the front of the headstock. (Figure 2)

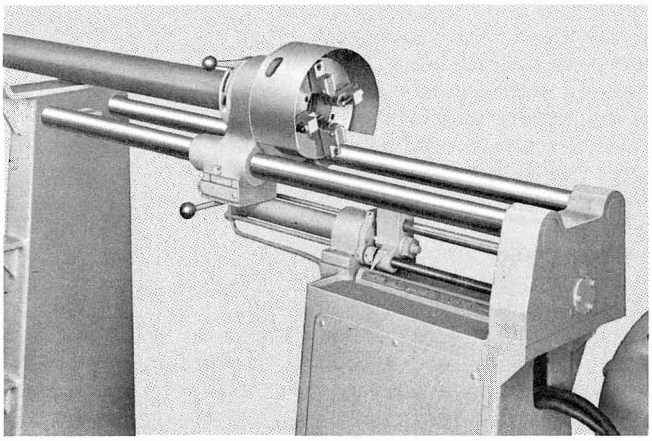


FIG. 11

The selector switch determines whether the collet operates separately or in conjunction with the bar feed. The operating lever controls the action of the collet separately, or controls the collet and bar feed together depending on the position of the selector switch.

Bars to be fed into the machine are held in a revolving scroll chuck. (Figure 11) Two opposed jaws are equipped with eccentric drivers which grip on the forward stroke and release on the back stroke. The other two jaws are equipped with set screws to center the work.

The bar feed cylinder has an adjustable stroke with a maximum travel of 12 inches. An "easy to read" scale graduated to 1/16" together with handy adjusting nuts simplifies the setting of the bar feed stroke.

To insert a new bar and to regulate the grip of the scroll chuck, set the selector switch to "BAR FEED & COLLET" and open the collet by moving the operating lever to "OPEN". Position the chuck about halfway between the bar stands by moving the lever at the bottom of the chuck head to the left. Swing the support tube forward and insert the bar. Pass the bar through the chuck and just through the collet. Set the bar feed stroke for length. Close the collet. Close the chuck jaws until the drivers grip the bar securely when the chuck is moved forward, but release when the chuck is moved back. Then move the chuck all the way back.

As the collet is repeatedly opened and closed the bar will feed forward by steps until the chuck reaches the block at the front of the rack bar. After that the chuck will feed the bar and strip back until it passes over the end of the bar. Insert a new bar against the end of the old bar, and move the chuck head all the way back to starting position.

COLLET CHUCK

To change collet pads remove the pad screws from the master collet. These can be reached through holes in the collet hood. (Figure 12) To avoid runout of stock, clean the master collet and pads carefully before putting in the new pads.

The grip of the collet is adjusted at the rear end of the spindle by use of the spanner wrench for which holes are provided in the end of the abutment sleeve. (Figure 12) The finger holder should at all times abut tightly against the end of the spindle. The collet grip should be adjusted so that the finger rollers pass just beyond the top of the wedge incline when the collet is closed.

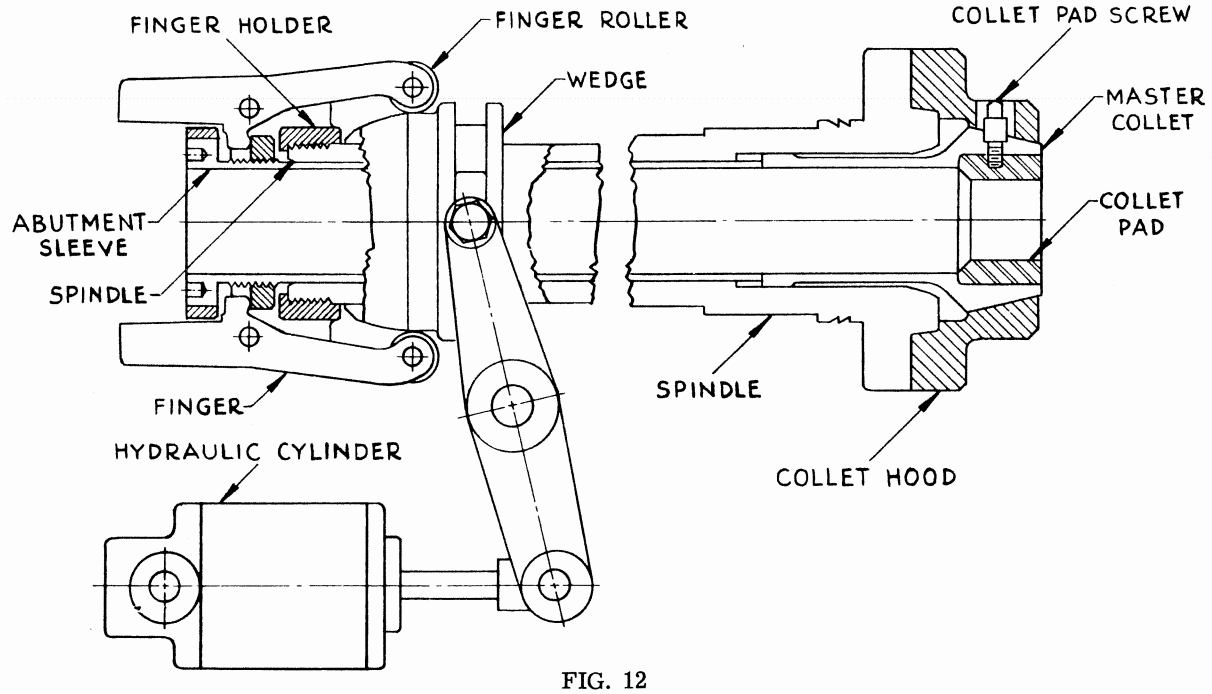


FIG. 12

HYDRAULIC COLLET CHUCK AND BAR FEED ADJUSTMENTS

1. Dirt and fine chips working into the collet and spindle recess may cause the collet to stick and not release. To avoid this condition, remove the collet hood and clean the collet and spindle recess frequently.

2. Figure 13 is the collet chuck and bar feed hydraulic circuit. Figure 14 shows the location of components in the power unit.

3. The bar feed head should slow down as it reaches the end of its stroke. This is controlled by the cushion (Figure 5).

4. After the collet closes the bar feed head is repositioned for the next feed out cycle. Repositioning of the head is initiated by the sequence limit switch on the collet yoke bracket. (Figure 5)

5. Collet closing pressure is applied only until the finger rollers pass beyond the top of the wedge incline. The check valve and accumulator valve (Figures 13 and 14), relieve the pressure on the wedge shoes after the collet is closed.

COOLANT SYSTEM

An impeller type pump with integral motor drive is mounted directly over the coolant sump, and is controlled by an independent push button switch mounted on the control panel at the front of the headstock.

The coolant sump, located at the head end of the machine, is divided into two compartments by a baffle. Metal particles settle in the first compartment, and thus the pump located in the second compartment is protected. The sump should be cleaned frequently.

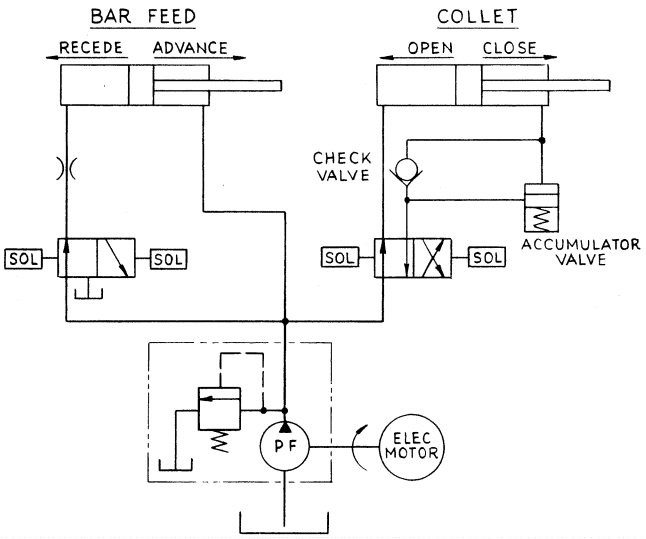


FIG. 13

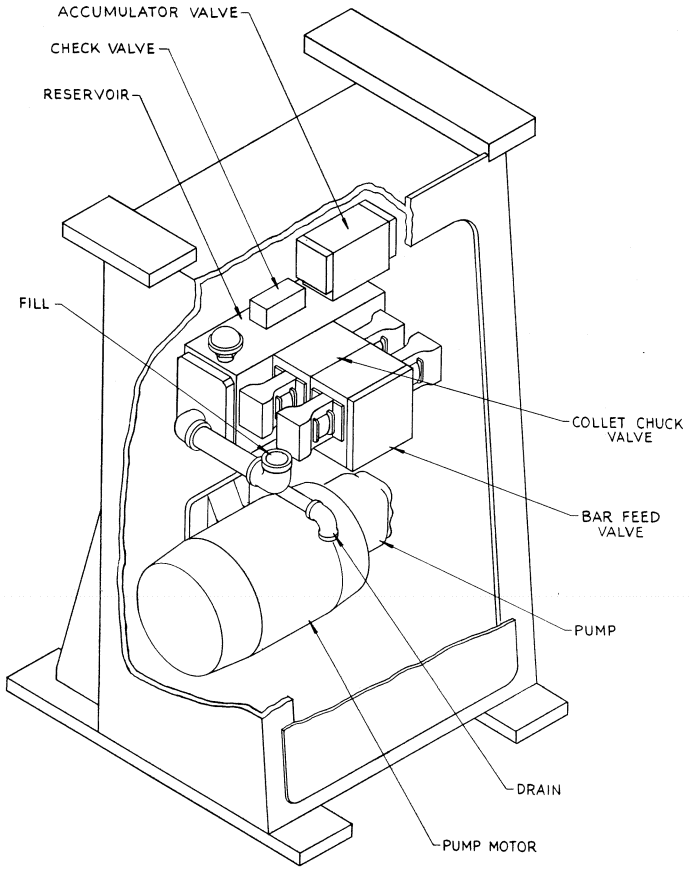


FIG. 14

LUBRICATION CHART

INSTRUCTIONS

Before Starting	—	Fill all oil reservoirs to the center line on the gages. Fill oil cups. Depress apron pump plungers 3 or 4 times.
Every 4 hours	—	Fill oil cups. Depress apron pump plungers 3 or 4 times.
Every 3 months	—	Drain apron oil reservoirs. Flush with solvent type flushing oil. Refill reservoirs.
Every 6 months	—	Drain headstock oil reservoirs. Flush thoroughly with solvent type flushing oil. Clean oil filter on inside of reservoir cover. Refill headstock.

OIL SPECIFICATIONS

Headstock and Bar Feed	—	High grade mineral oil, with a viscosity of 145 - 155 seconds at 100°F.
Aprons	—	High grade extreme pressure lead naphthanate type oil having a viscosity of 300 - 325 seconds at 100°F.
Oil Cups	—	High grade oil of about S.A.E. 10 viscosity.

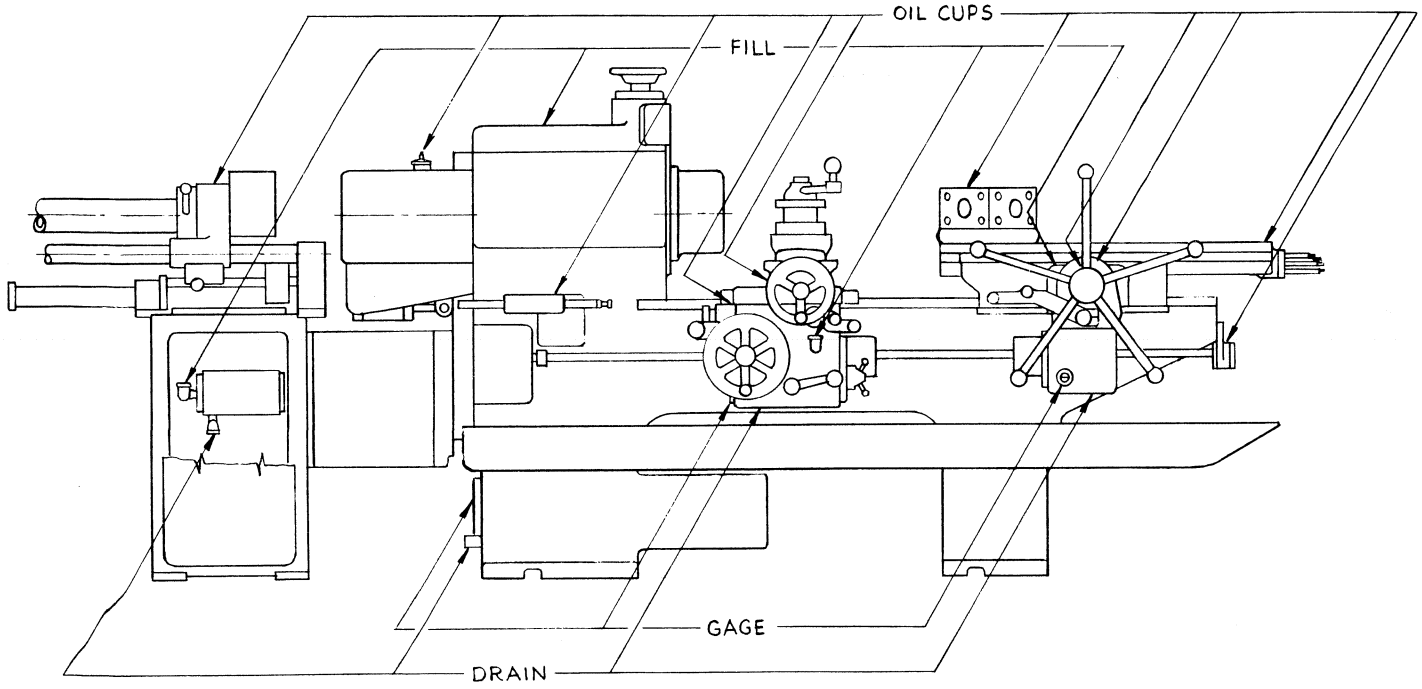
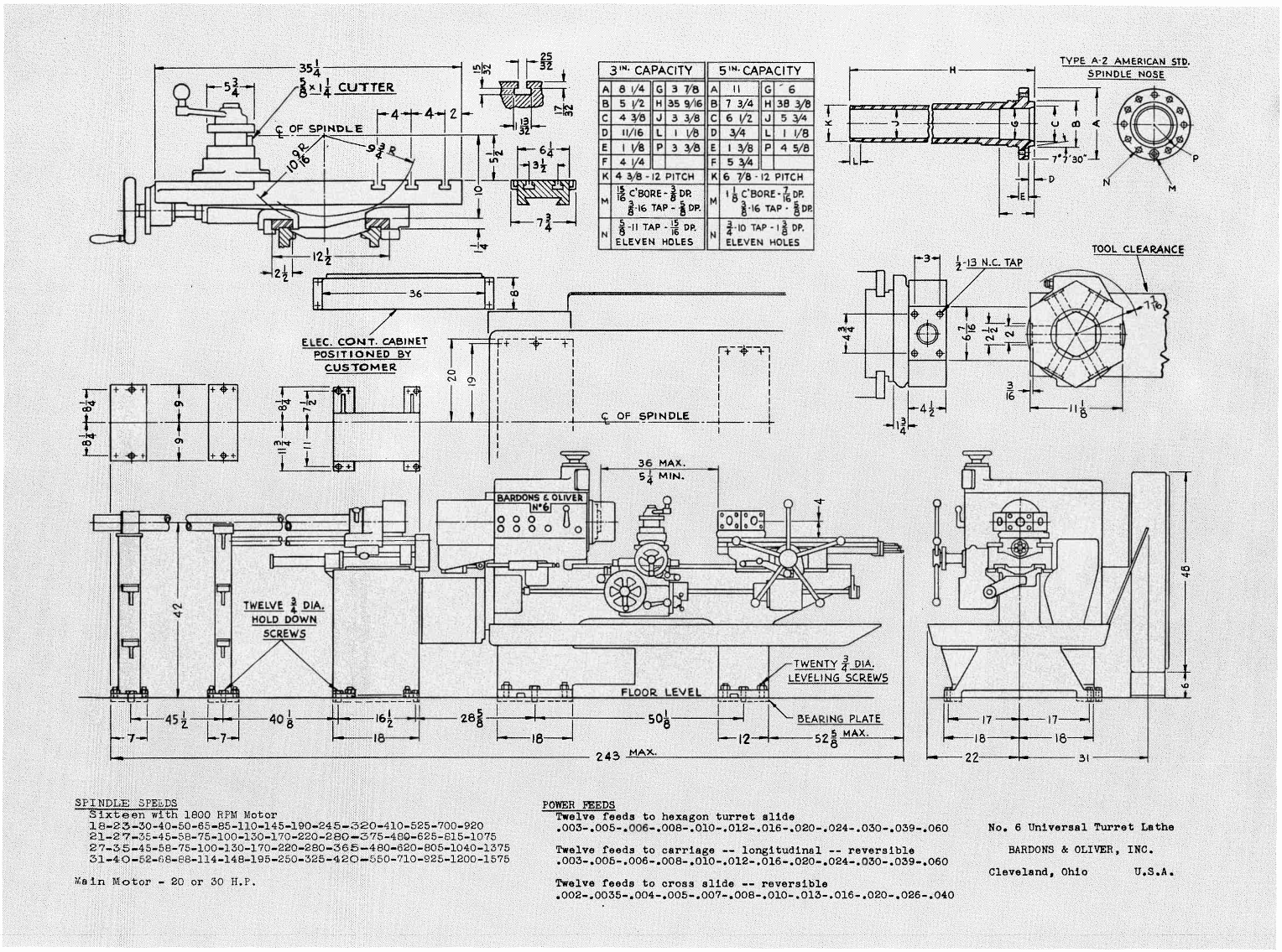


FIG. 15

BARDONS & OLIVER No. 6 UNIVERSAL
RAM TYPE TURRET LATHE



SPINDLE SPEEDS
Sixteen with 1800 RPM Motor
18-23-30-40-50-65-85-110-145-190-245-320-410-525-700-920
21-27-35-45-58-75-100-130-170-220-280-375-480-625-815-1075
27-35-45-58-75-100-130-170-220-280-365-480-620-805-1040-1375
31-40-52-68-88-114-148-195-250-325-420-550-710-925-1200-1575

Main Motor - 20 or 30 H.P.

POWER FEEDS
Twelve feeds to hexagon turret slide
.003-.005-.006-.008-.010-.012-.016-.020-.024-.030-.039-.060

Twelve feeds to carriage -- longitudinal -- reversible
.003-.005-.006-.008-.010-.012-.016-.020-.024-.030-.039-.060

Twelve feeds to cross slide -- reversible
.002-.0035-.004-.005-.007-.008-.010-.013-.016-.020-.026-.040

No. 6 Universal Turret Lathe
BARDONS & OLIVER, INC.
Cleveland, Ohio U.S.A.

		3″ Cap.	5″ Cap..
Swing	Over Bed	21⅛″	21⅛″
	Over Carriage Guides	19½″	19½″
	Over Cross Slide	11″	11″
Universal Chuck Size	Medium Duty, Steel Body, 3 Jaw	15″	15″
Max. Distance	End of Spindle to Face of Turret	36″	36″
Spindle	American Standard Flange	8″-A2	11″-A2
	Hole	3⅜″	5¾″
Bed	Width Across Ways	12½″	12½″
Bar Capacities	Round	3″	5″
	Square	2⅛″	3⅛″
	Hexagon	2⅝″	4⅝″
	Hole in Collet Chuck Plunger	3⅛″	5¼″
Hexagon Turret	Effective Travel at One Setting	15″	15″
	Size Across Flats	11⅛″	11⅛″
	Diameter of Tool Holes	2″	2″
	Center of Tool Holes to Top of Slide	4″	4″

		3″ Cap.	5″ Cap.
Cross Slide Carriage	Total Cross Travel	13″	13″
	Total Longitudinal Travel	30½″	30½″
Power Feeds	Hexagon Turret — Twelve	.003″ - .060″	.003″ - .060″
	Carriage, Cross Slide — Twelve	.002″ - .040″	.002″ - .040″
	Carriage, Longitudinal — Twelve	.003″ - .060″	.003″ - .060″
Spindle Speeds	Number of Speeds with Single Speed Motor	16	16
	Speed Ranges with 1800 R.P.M., 60 Cycle Motor — Choice of	27 - 1375	18 - 920
	—or—	31 - 1575	21 - 1075
Motor	Horsepower	20 or 30	20 or 30
Floor Space (Approx.)	Machine Without Bar Feed	4′9″ x 14′2″	4′9″ x 14′2″
	Additional Length for Bar Feed	6′1″	5′0″
Weights (Approx.)	Net, Without Bar Feed & Collet Chuck	7000 lbs.	7100 lbs.
	Add to Above for Bar Feed & Collet Chuck	725 lbs.	1250 lbs.
	Add to Above for Crating	500 lbs.	500 lbs.
	Add to Above for Boxing	1000 lbs.	1000 lbs.
Boxed Size	Measurement, Machine with Bar Feed	375 cu. ft.	375 and 95 cu. ft.

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BARDONS & OLIVER

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