



# INSTALLATION, OPERATION, MAINTENANCE, AND PARTS LIST

## SERIES I MILLING MACHINES



TP5260

Revised: August 29, 2005

Manual No. M-450  
Part No. M -0009500-0450

Litho in U.S.A.  
June, 2003

# CHAPTER 2 - OPERATION

## HEAD CONTROLS

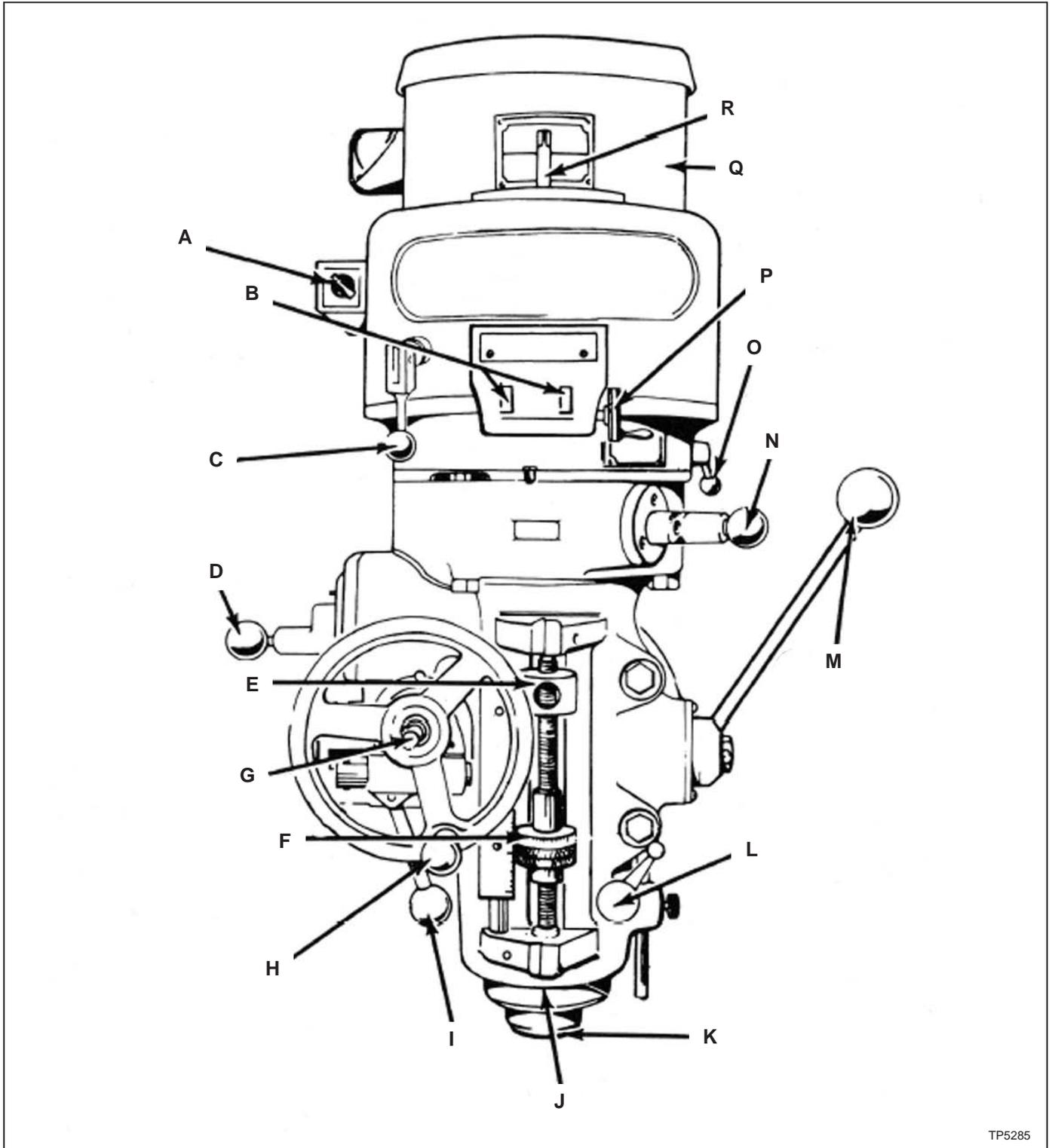


Figure 2.1 - Head Controls Parts Assembly

TP5285

## HIGH-LOW RANGE SWITCH

High-Low Range Switch "A", Figure 2.2, is a motor reversing switch. When the attachment is in direct drive (HIGH SPEED), the motor and spindle are turning in a clockwise direction as viewed from the top of machine. When the attachment is in "Back Gear" (LOW SPEED), the spindle will run backwards (counter-clockwise) unless the motor direction is reversed by moving switch to "Low".

The back gear lever is marked Hi-Lo. This will indicate the proper switch position. They should be positioned alike or the spindle will run backwards.

### - NOTE -

Spindle should run in clockwise position.

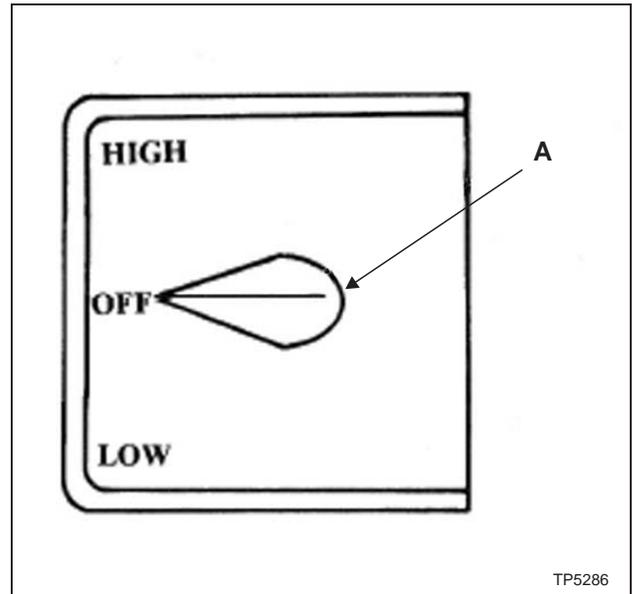


Figure 2.2 - High-Low Range Switch

## VARIABLE SPEED DIAL

Variable Speed Dial "B", Figure 2.3, visibly indicates, in windows, the speed range that the machine is operating in, 60 to 500 low range, 500 to 4200 high range.

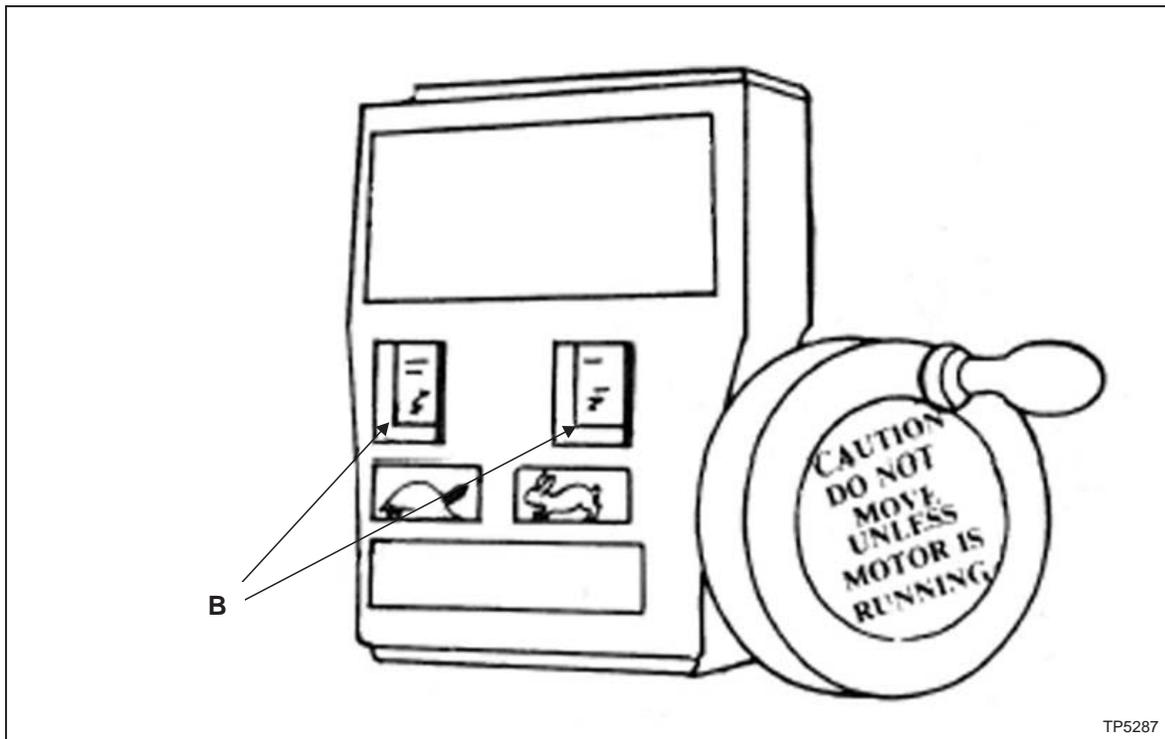


Figure 2.3 - Variable Speed Dial

## SPINDLE BRAKE

Spindle Brake "C", Figure 2.4, can be moved in either direction to stop spindle; however, when locking spindle, brake lever should be moved either by pulling towards the operator or pushing away from the operator, then raised. When brake is worn out it has to be replaced. There are no adjustments to be made.

### - CAUTION -

**BE certain that spindle brake is released before starting the motor. This is important as the motor can be damaged if switch is turned on with brake in locked position.**

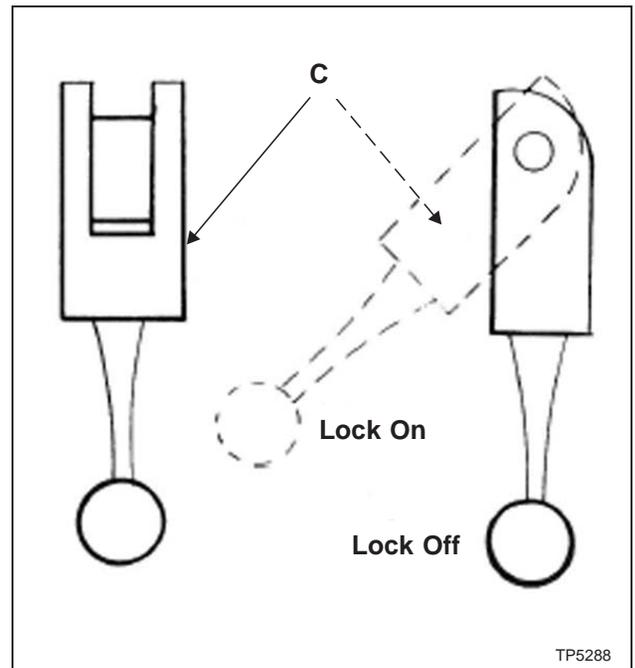


Figure 2.4 - Spindle Brake

## QUILL FEED SELECTOR

The Quill Feed Selector "D", Figure 2.5, is used for selecting the three feeds: .0015", .003" and .006" per revolution. It is shifted by pulling knob out and turning from one position to the other. Feeds are stamped on cover below indentation hole. Feed is more readily engaged when spindle is running.

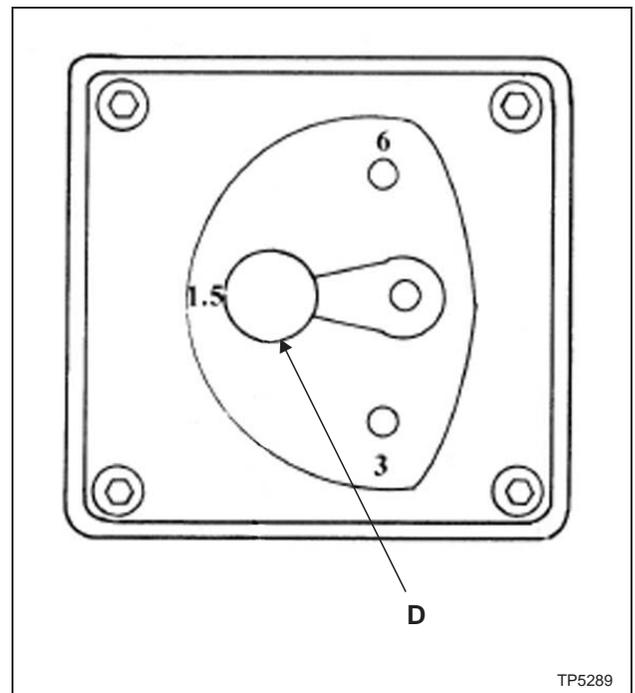


Figure 2.5 - Quill Feed Selector

## QUILL STOP KNOB

Quill Stop Knob "E", Figure 2.6, is used to disengage automatic feed in either direction as well as the stop point setting working depths.

## MICROMETER NUT

Micrometer Nut "F", Figure 2.6, is used for setting depths. Each graduation on nut indicates .001" of depth, it reads directly to scale mounted along the side of it. Depths may be obtained by setting micrometer nut in conjunction with quill stop.

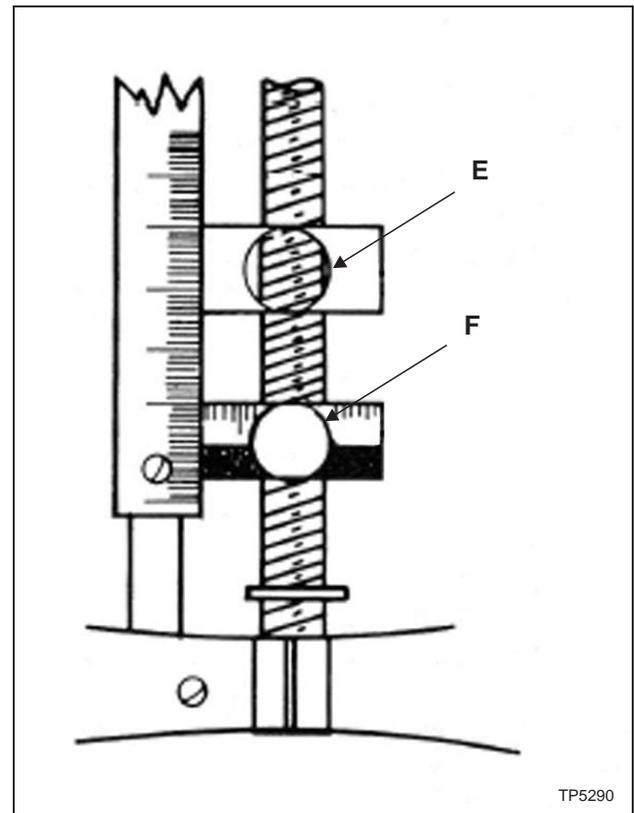


Figure 2.6 - Quill Stop Knob and Micrometer Nut

## FEED REVERSE KNOB

The position of the Feed Reverse Knob "G", Figure 2.7, depends upon direction of spindle rotation. If boring with right hand cutting tools, pull feed handle towards operator until clutch becomes engaged.

Neutral position is between forward and reverse position. It is recommended that the handle be left in neutral position when not in use.

## MANUAL FEED HANDWHEEL

Feed Reverse Knob "G" should be in neutral position and Feed Control Lever "I", Figure 2.8 engaged. Clockwise rotation of Manual Feed Handwheel "H", Figure 2.7, moves quill down. The manual feed handwheel and the quill feed handle may be disengaged by moving them outward about .125".

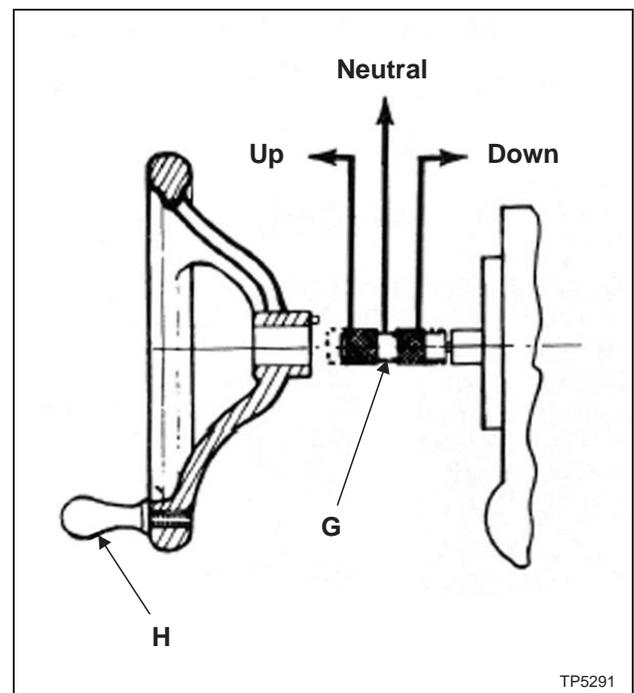


Figure 2.7 - Feed Reverse Knob and Manual Feed Handwheel

## FEED CONTROL LEVER

Feed Control Lever "I", Figure 2.8, engages overload clutch on pinion shaft when positioned left and will stay engaged until either quill stop comes in contact with micrometer adjusting nut, forcing feed control lever to drop out automatically, or release manually by engaging lever to right.

## FEED CONTROL OVERLOAD CLUTCH

The Feed Control Overload Clutch is set at the factory to hold up to 200 lbs of down pressure on quill, which will accommodate drills up to .375" diameter in mild tool steel.

### - CAUTION -

**This clutch should not be tampered with in the field.**

### - NOTE -

The feed control lever must be engaged in order to use manual feed controls. the quill feed handle and manual feed handwheel may be removed when not in use.

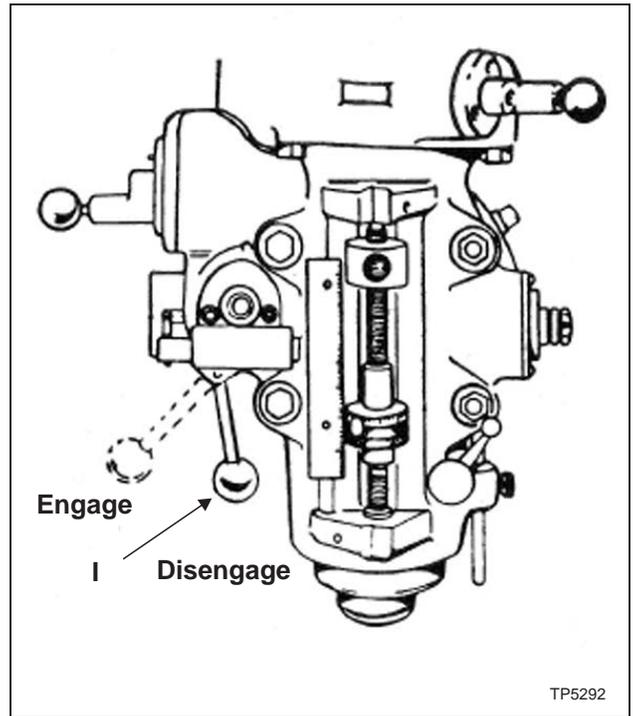


Figure 2.8 - Feed Control Lever and Feed Control Overload Clutch

## QUILL

Quill "J", Figure 2.9, contains the spindle assembly and can be raised or lowered by using the quill feed handle "M", Figure 2.10.

## SPINDLE

Spindle "K", Figure 2.9, performs the actual rotation and also retains the machine tooling.

## QUILL LOCK

Quill Lock "L", Figure 2.9, is a friction lock for use when quill is in a stationary position such as a milling operation. It is recommended that this lock be used whenever quill movement is not desired.

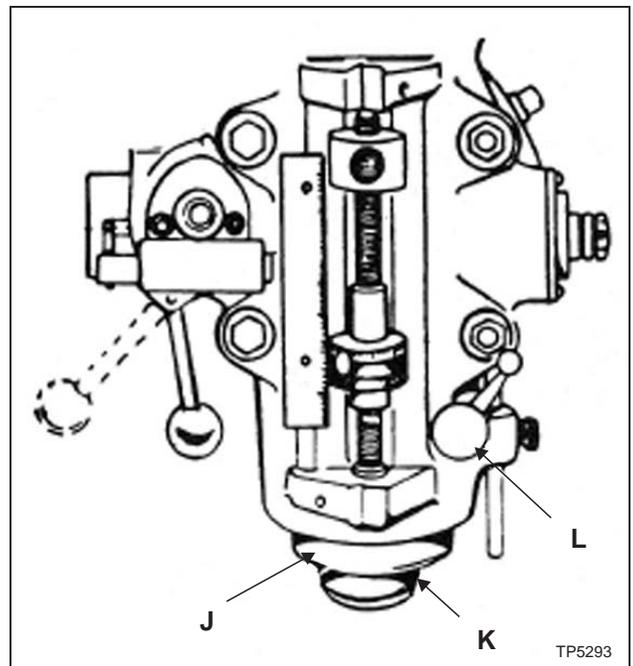


Figure 2.9 - Quill, Spindle and Quill Lock

## QUILL FEED HANDLE

Quill Feed Handle "M", Figure 2.10, is used to raise and lower the quill manually. It is generally recommended that handle be engaged when using the power feed. It may be removed by simply pulling handle off.

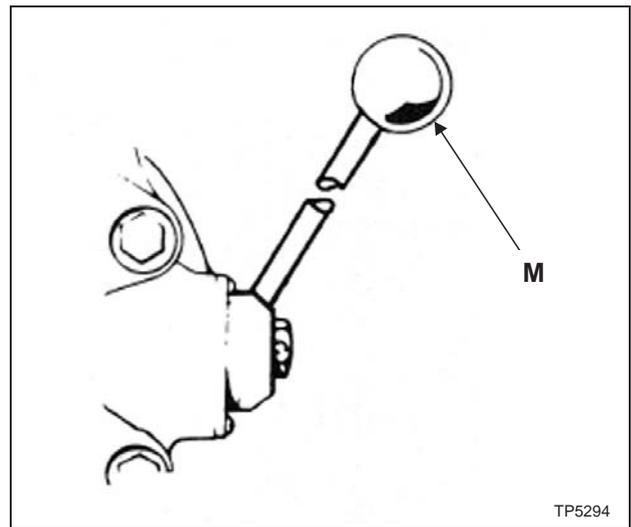


Figure 2.10 - Quill Feed Handle

## POWER FEED TRANSMISSION ENGAGEMENT CRANK

Power Feed Transmission Engagement Crank "N", Figure 2.11, engages power feed worm gear. When lever is in right hand hole, the power feed worm gear is engaged.

To engage worm gear, pull knob out and crank handle in clockwise or down direction and move to opposite position (see Figure 2.12).

### - NOTE -

Crank should be rotated counter-clockwise to engage power quill feed. Crank should be rotated clockwise to disengage.

### - CAUTION -

**Power feed worm gear may be engaged when spindle is rotating, however, it should be engaged gently to avoid damage to worm gear. The worm gear may be disengaged at any time. do not use power feed at speeds above 3000 RPM.**

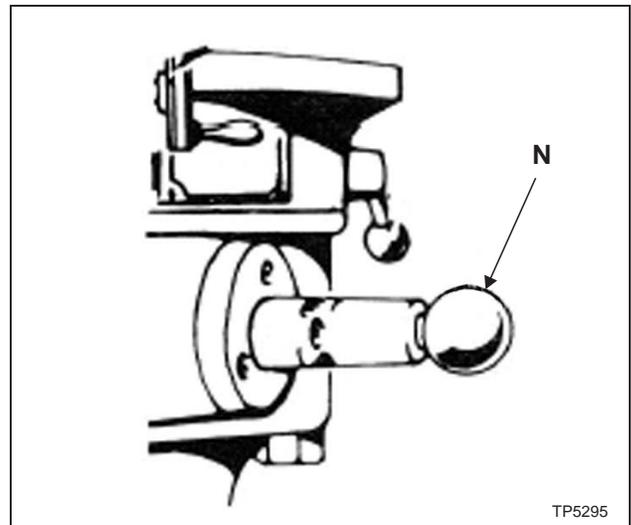


Figure 2.11 - Power Feed Transmission Engagement Crank

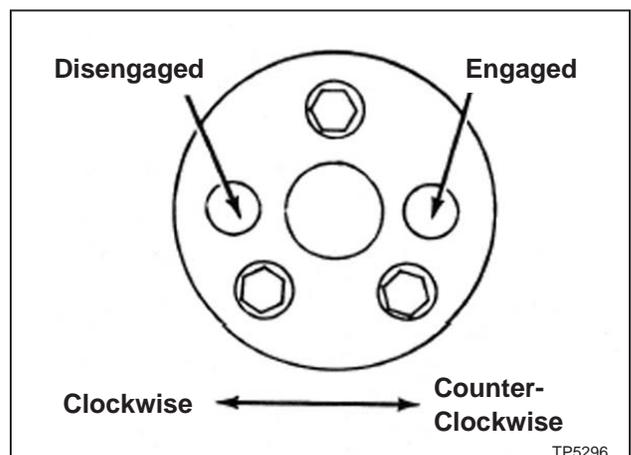


Figure 2.12 - Worm Gear Disengagement

## HI-NEUTRAL-LO LEVER

The Hi-Neutral-Lo Lever "O", Figure 2.13, is used to put the attachment into either back gear or direct drive. Rotate the spindle by hand to facilitate meshing of clutch or gears.

Neutral is provided to permit free spindle rotation for indicating and setup work.

In the high speed position (direct drive) the spindle is driven by tapered clutch teeth. If the clutch is not meshed tightly, clutch rattle will be heard. This can be corrected by loosening the two securing screws in lever while in high speed position. The clutch spring will automatically adjust the clutch. Tighten the two securing screws in lever.

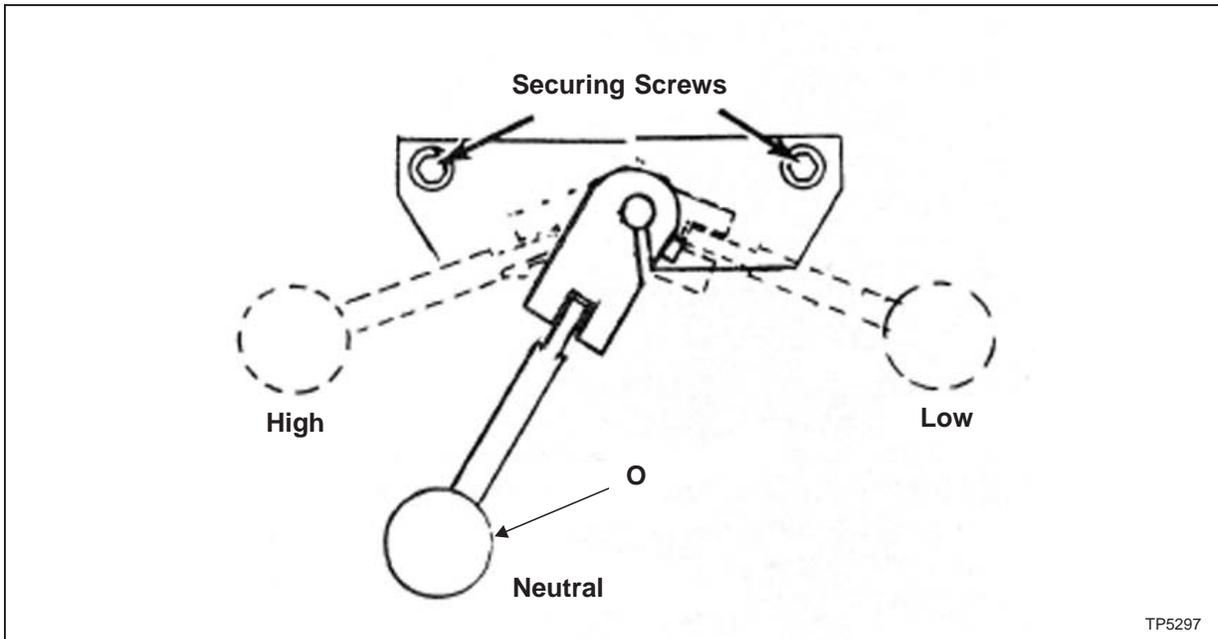


Figure 2.13 - Hi-Neutral-Lo Lever

**- CAUTION -**  
**Do not shift hi-lo lever while motor is running.**

## SPEED CHANGE HANDWHEEL

### - CAUTION -

**DO NOT attempt to change spindle RPM unless the motor is running. Dial speeds will only be approximate. Belt wear will cause a slight variation in speeds from what is indicated on the dial.**

Spindle speeds are adjusted by turning Speed Change Handwheel "P", Figure 2.14, on the front of the belt housing. There are two ranges: 60 to 500 and 500 to 4200.

To obtain 60 to 500 (low range):

1. Hold the Hi-Neutral-Lo lever (right rear side of the attachment) so the gears are clear of one another.
2. rotate the spindle nose by hand until the gears line up, then move the Hi-Neutral-Lo lever to the "Lo" position (back gear).
3. Use the low range on the drum switch to engage the back gears.

### - CAUTION -

**If the back gears do not mesh, do not force the lever.**

To obtain 500 to 4200 (high range):

1. Hold the Hi-Neutral-Lo lever (right rear side of the attachment) so the gears are clear of one another.
2. rotate the spindle nose by hand until the gears line up, then move the Hi-Neutral-Lo lever to the "Hi" position.
3. Set the drum switch to high range.

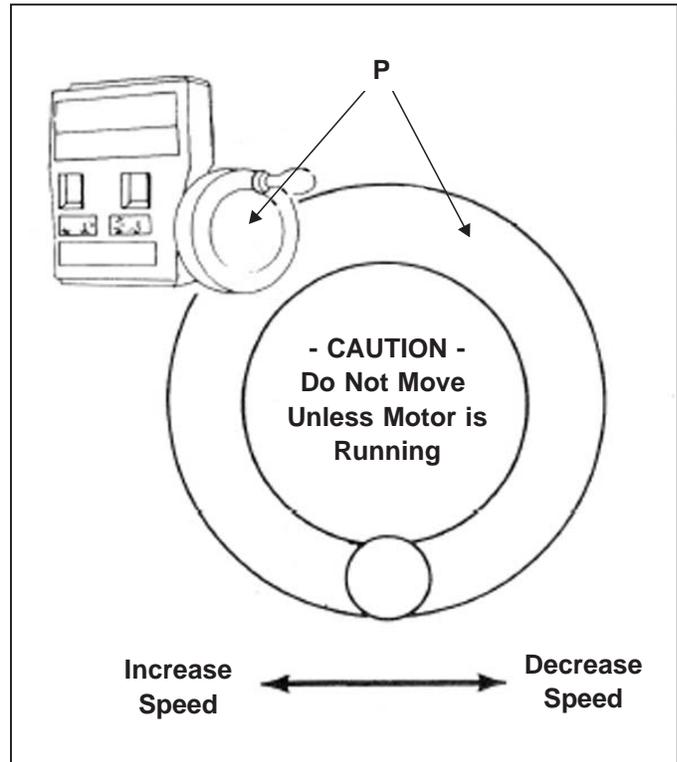


Figure 2.14 - Speed Change Handwheel

### - CAUTION -

**Try to avoid shifting the hi-lo lever when the feed worm is engaged.**

## MOTOR

Motor "Q", Figure 2.15, has the following specifications:

- 2 HP variable speed (with 2J head)
- 3 HP 30 minute duty rate

## DRAWBAR

When tightening or loosening the Drawbar "R", Figure 2.15, it is necessary to lock the spindle. To accomplish this, use the spindle brake which is located on the left side of the belt housing, pulling towards the operator or pushing away from the operator until it binds, then raise the quill feed handle.

Drawbar has 7/16"-20 right hand thread and should be tightened by hand with normal amount of pressure using wrench furnished with machine. To loosen collet, back off drawbar and if collet does not open immediately, give knob on top of drawbar a slight tap. Spindle has non-sticking taper and collet should release readily.

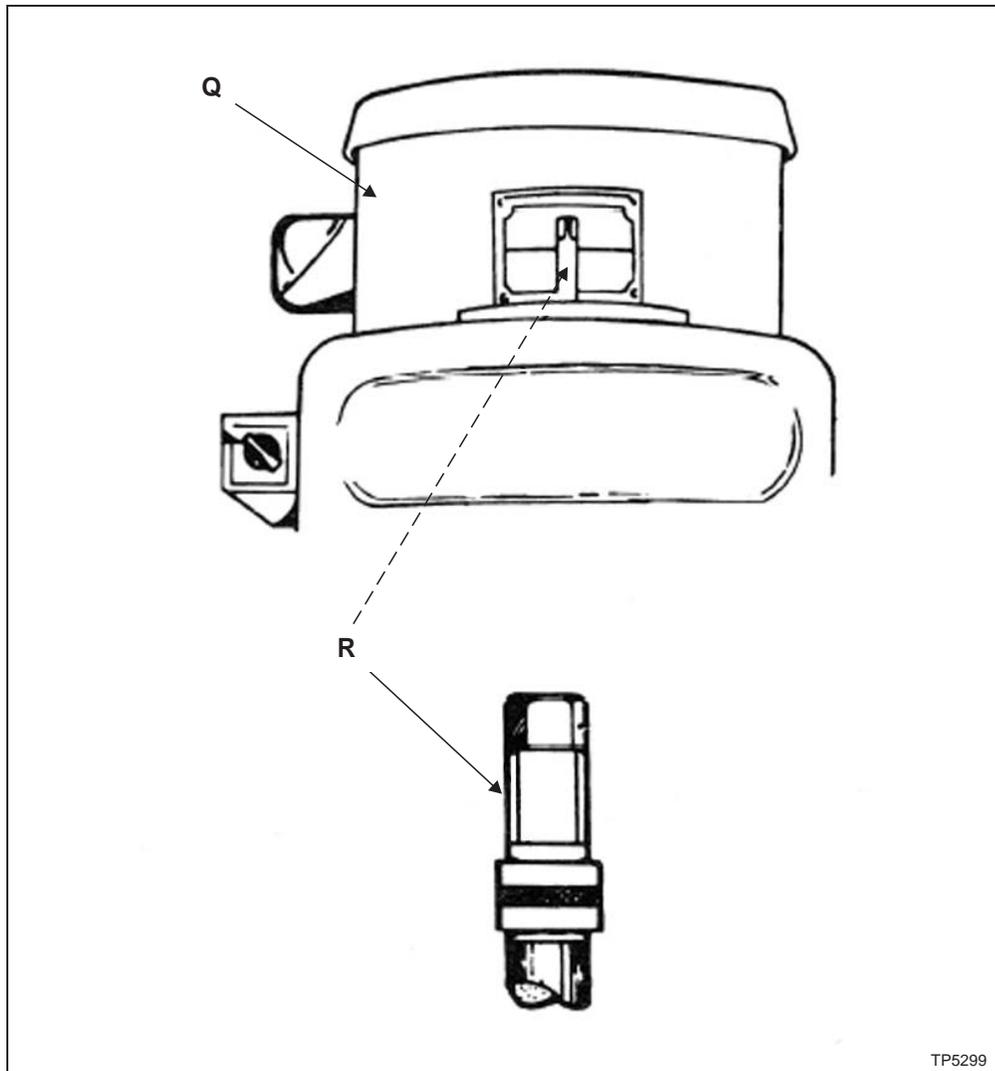


Figure 2.15 - Motor and Drawbar

## OPERATIONAL PROCEDURES

### Spindle Speed

**- CAUTION -**

**DO NOT change speed when spindle is stationary. Change speed only when spindle is running.**

To change speed within range:

1. Start spindle.
2. Turn handwheel "A", Figure 2.16, to select required speed.

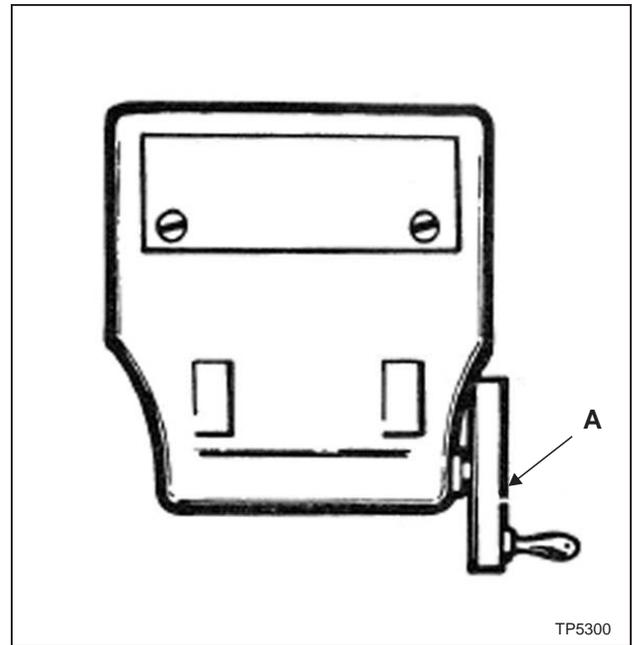


Figure 2.16 - Spindle Speed Change

### Back Gear (Low Speed)

**- CAUTION -**

**DO NOT change range while spindle is running. Change range only when spindle is stationary.**

To change range from direct to back gear drive:

1. Switch "B", Figure 2.17, to OFF (Stop spindle rotation).
2. Move lever "C" through neutral to LOW (This reverses the spindle rotation).
3. Switch "B" to LOW.

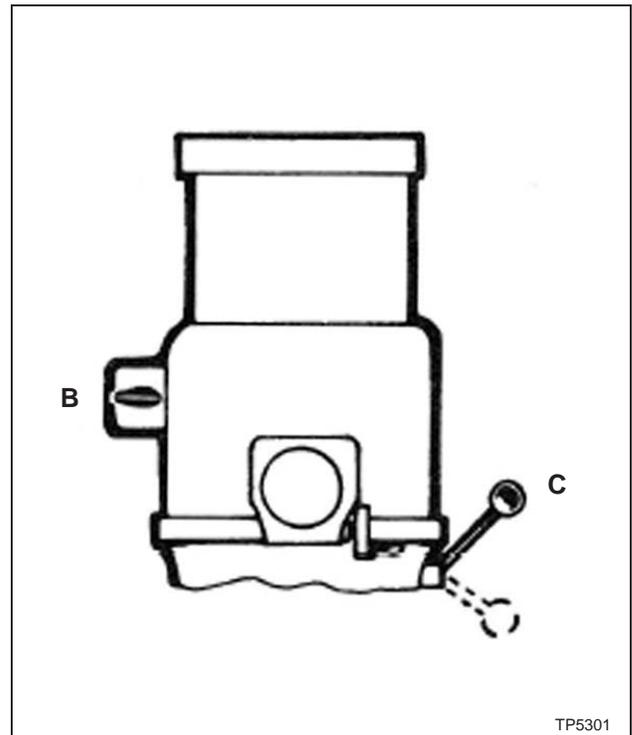


Figure 2.17 - Back Gear Range Change

## Direct Drive (High Speed)

To change range from back gear to direct drive:

1. Switch "B" to OFF (Stop spindle rotation).
2. Move lever "C", Figure 2.18, through neutral to HIGH.
3. Rotate spindle by hand until the clutches are felt to engage.
4. Switch "B" to HIGH.

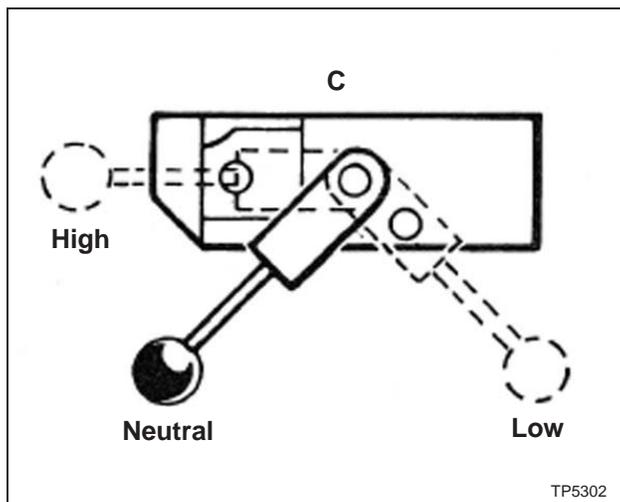


Figure 2.18 - Direct Drive Lever

## Quill Feed

### FINE HAND FEED

1. Disengage Auto Quill Feed "D", Figure 2.19.
2. Locate "F" in mid (neutral) position.
3. The quill is now under handwheel control

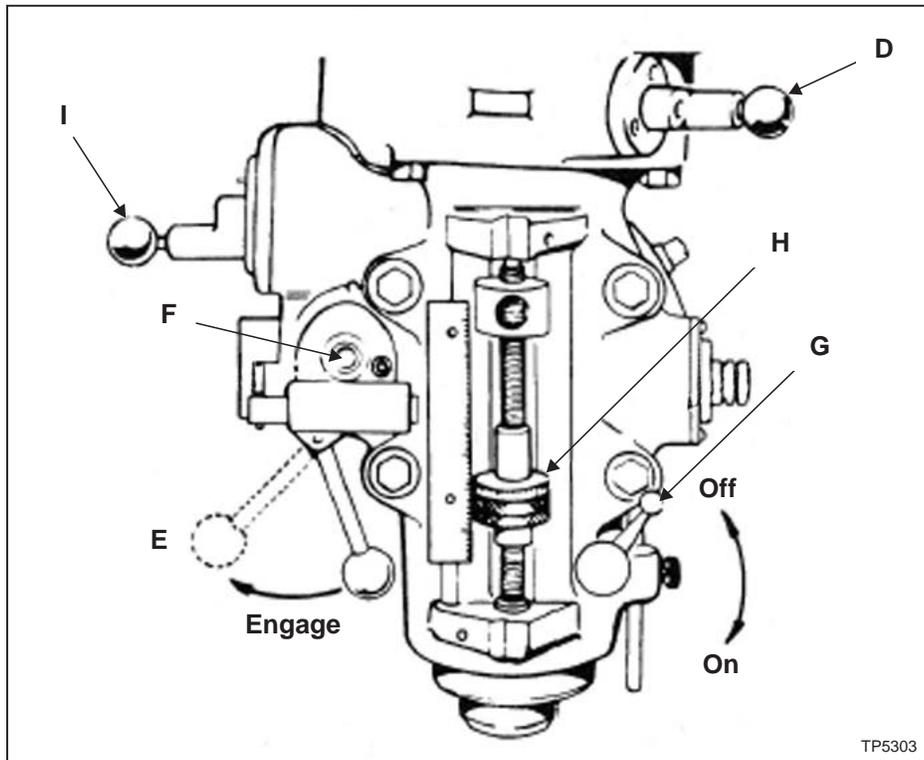


Figure 2.19 - Quill Feed  
Fine Hand Feed Control

## AUTOMATIC FEED

### - NOTE -

Maximum loading .375" (9.5mm) diameter drill steel.

1. Ensure quill lock "G", is off.
2. Set micrometer dial "H" to required depth.
3. Engage auto quill feed "D" when motor has stopped
4. Select feed rate "I".
5. Select feed direction "F", Figure 2.22.
6. Engage feed trip lever "E". The feed will automatically trip out at a depth within .010" (.25mm)
7. Hand feed to dead stop for repeating accuracy .001" (.025mm)

### - CAUTION -

**Do not engage quill feed "D" over 3000 RPM.**

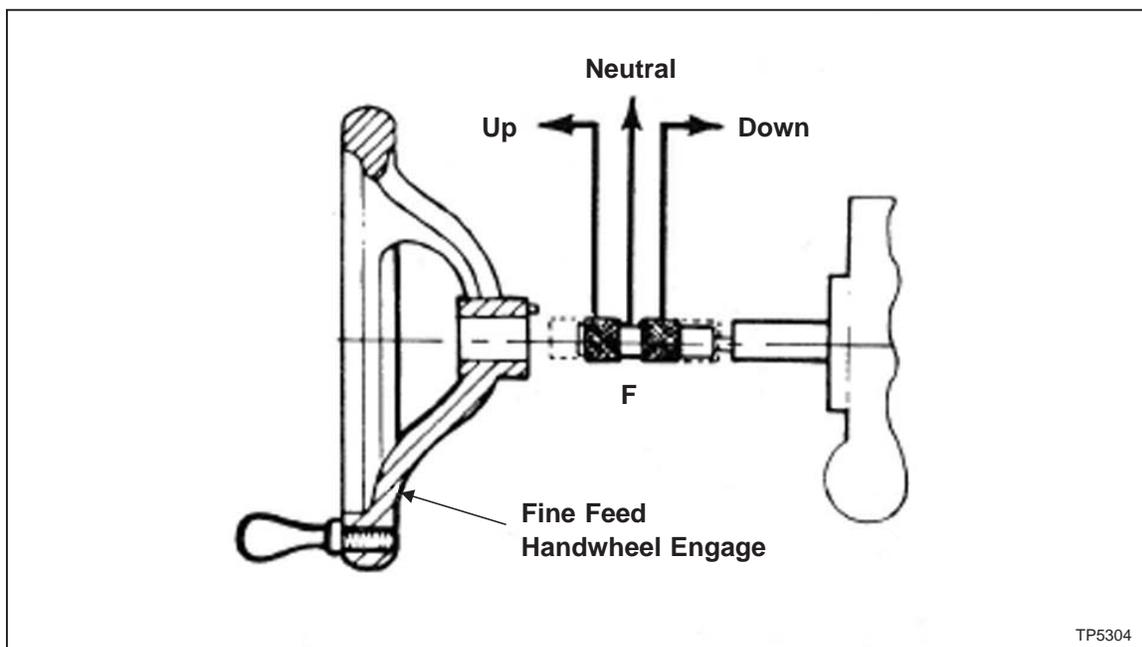


Figure 2.20 - Quill Feed Automatic Feed Control

# HEAD

## OPERATIONAL PROCEDURES

### Spindle Brake

Brake lever has capability to rotate in either direction to brake and lock.

1. CAM upwards to lock and prevent movement of spindle (see Figure 2.21).

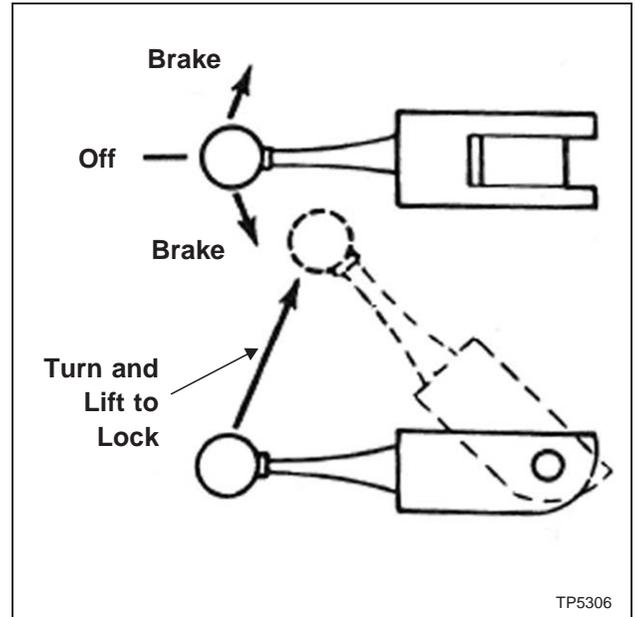


Figure 2.21 - Spindle Brake

### Quill Sensitive Hand Feed

1. Place the handle on the quill feed shaft.
2. Select the most suitable position.
3. Push home until the locating pin engages.

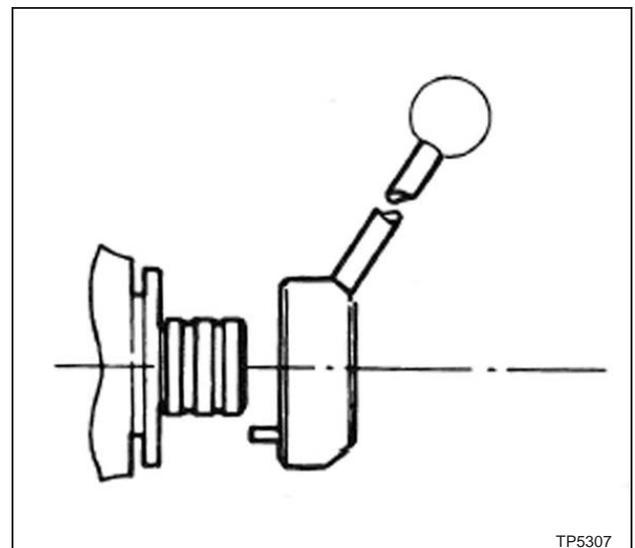


Figure 2.22 - Quill Sensitive Hand Feed

# MACHINE

## OPERATIONAL PROCEDURES

### Swivel Belt Housing

**- CAUTION -**

Incorrect spline alignment can be caused by unequal tightening of the locknuts 'J' causing fluctuation of the quill feed which can be felt through the sensitive feed handle. It is advised to call Hardinge service department before attempting this procedure.

1. Loosen three locknuts "J", Figure 2.23.

**- WARNING -**

**DO NOT remove these locking nuts.**

2. Swivel to required angular setting.
3. Tighten three locknuts "J" snugly before final tightening of locknuts. Run spindle to give correct spline alignment, then tighten locknuts securely.

### Swivel Turret

1. Use wrench supplied with machine to loosen the four bolts "K", Figure 2.24.

**- WARNING -**

**DO NOT remove these four bolts.**

2. Index to the required setting.
3. Lock the four bolts "K" to 47 lb-ft.

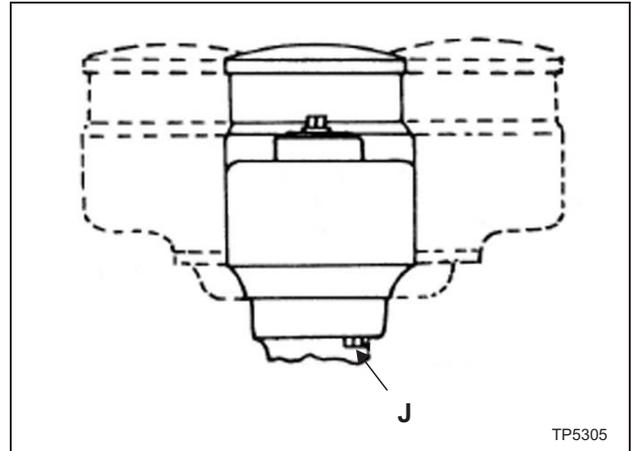


Figure 2.23 - Swivel Belt Housing

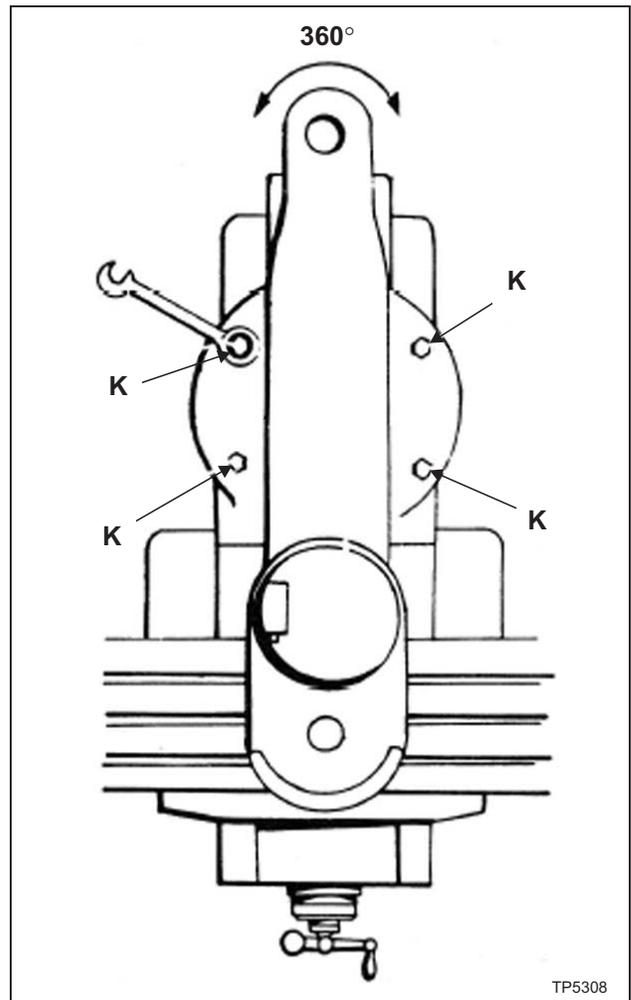


Figure 2.24 - Swivel Turret

### Move Ram Slide

1. Use wrench provided with machine to loosen bolts "L" and "M", Figure 2.25.
2. Use wrench to move the slide to the desired position using bolt "N".
3. Tighten bolts "L" and "M", starting with the rear bolt.

**- NOTE -**

It is recommended that on heavy milling work, head should be kept as close to column as possible, where maximum rigidity is obtained.

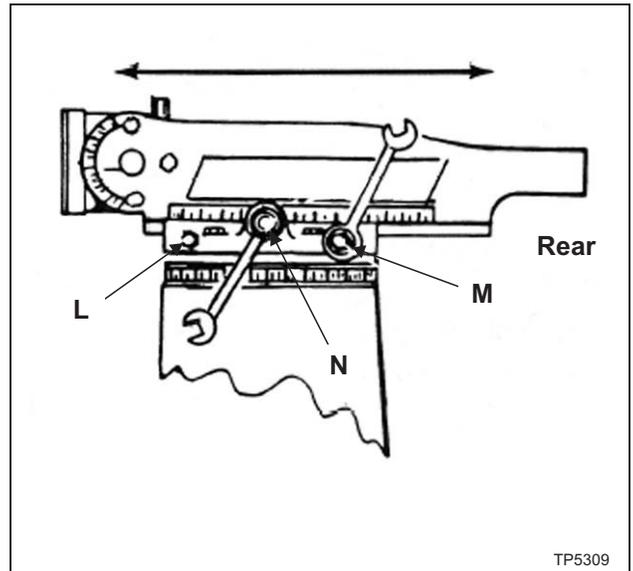


Figure 2.25 - Ram Slide

### Saddle Clamping

When milling with longitudinal table feed only, it is advisable to clamp the knee to the column (see Figure 2.27) and the saddle to the knee to add rigidity to these members and provide for heavier cuts with a minimum of vibration. The saddle locking lever is located on the left hand side of the saddle.

Excessive moisture can cause slight table bind. Use moderate clamping pressure, as this will hold saddle sufficiently.

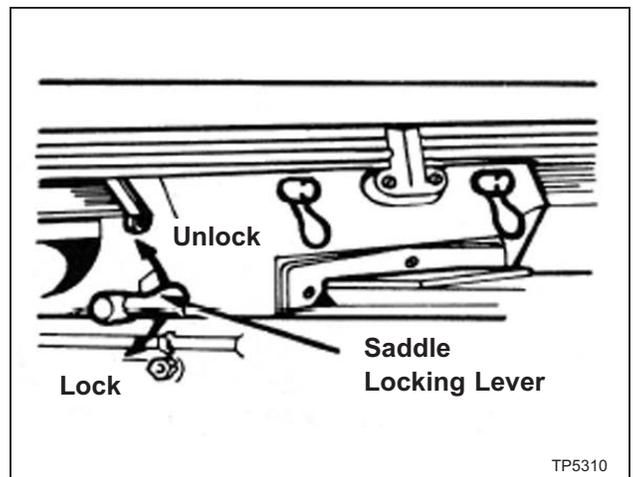


Figure 2.26 - Saddle Clamping

## Table Clamping

The table clamp levers are located on front of saddle and should always be clamped when longitudinal movement is not required (see Figure 2.28).

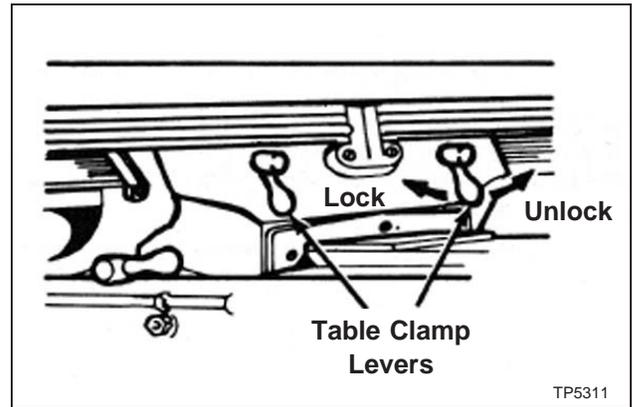


Figure 2.28 - Table Clamping

## Knee Clamping

The knee clamping levers are at the left side of the knee and front of knee. Leave clamped at all times unless using knee in operation (see Figure 2.27).

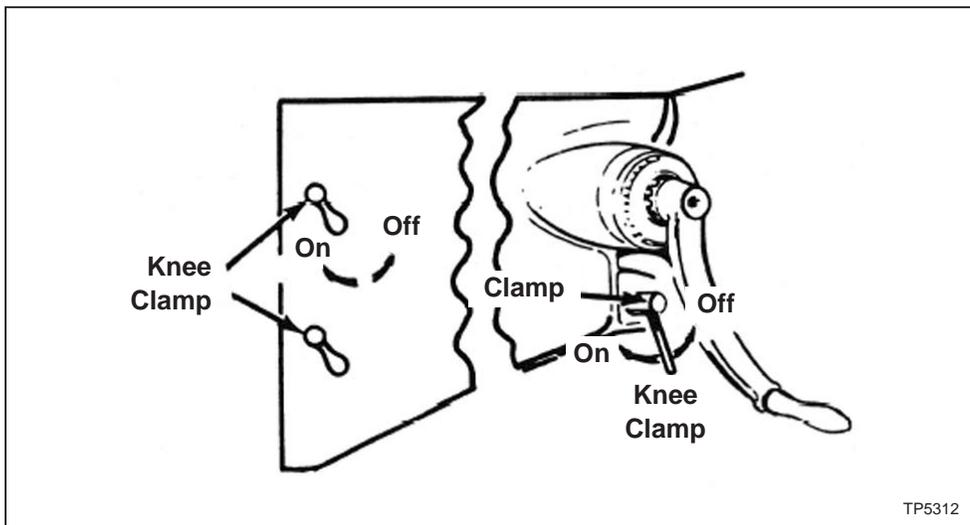


Figure 2.27 - Knee Clamping

# POWER FEED CONTROLS

## OPERATIONAL PROCEDURES

### Variable Table Feeds

Power Feed (X-Axis) Table

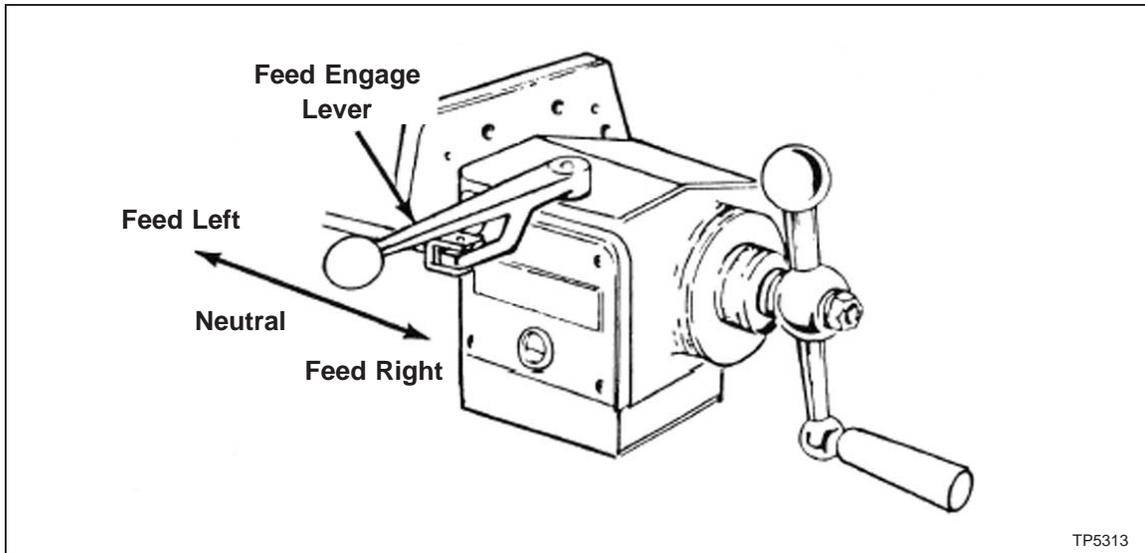


Figure 2.29 - Variable Table Feeds

### Quick-Release Safety Handle

Grip handle and turn to either left or right until spring loaded plunger engages in position.

**- NOTE -**

Ball crank handle is a safety device. Do not tamper with this assembly.

### Variable Cross Slide Feed

Cross Feed Power Feed (Y-Axis)

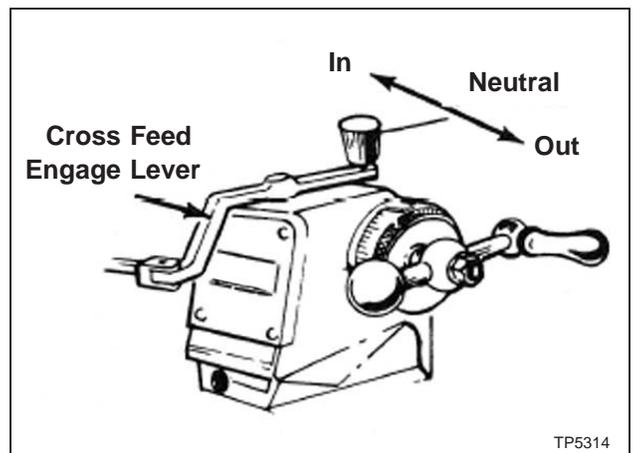


Figure 2.30 - Variable Cross Slide Feed

# E-HEAD CONTROLS

## OPERATIONAL PROCEDURES

### Head Swivel

1. Loosen the four locknuts (see Figure 2.32). Support unit to prevent free fall.
2. Swivel to required angular setting.
3. Tighten the four locknuts first to 25 lb-ft. Then 50 lb-ft (ref. Page 1-4).

**- NOTE -**

Remove the screw sealing vent hole before operating machine (ref. Page 3-15).

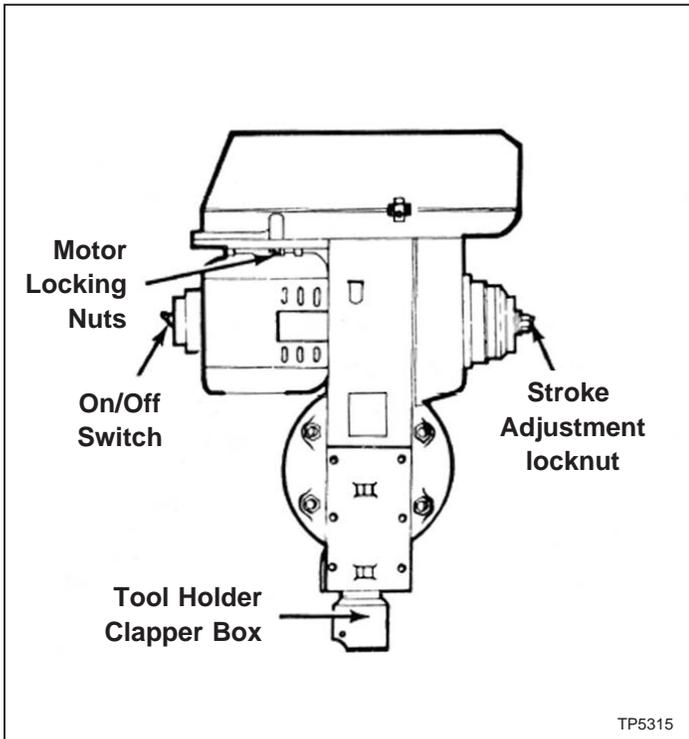


Figure 2.31 - Shaping Head  
(Guard Removed for Clarity)

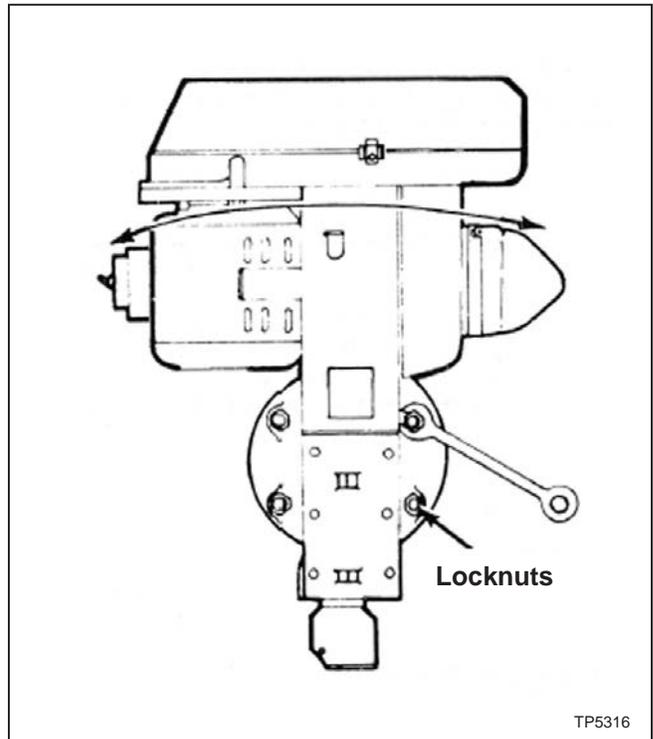


Figure 2.32 - Shaping Head  
(Guard Installed)

### To Change Speed

1. Disconnect power from head.
2. Loosen the two motor locknuts (see Figure 2.33).
3. Slide motor forward.
4. Position vee belt on appropriate pulleys.
5. Slide motor to rear to tension vee belt.
6. Tighten the two motor locknuts.

With 50 cycle 1425 rpm 60, 85, 120, 170, 245 350 strokes per minute.

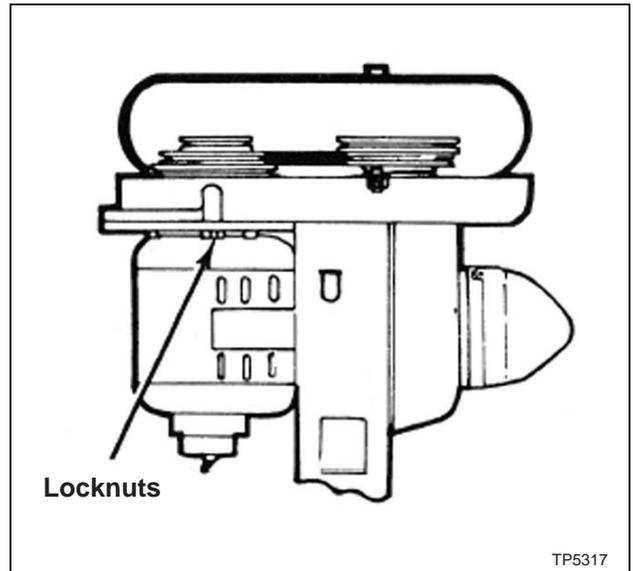


Figure 2.33 - Changing E-Head Speed

### To Change Stroke

1. Loosen locknut (see Figure 2.34).
2. Turn stroke dial to required setting.
3. Press dial home to engage pin.
4. Tighten locknut.

#### - NOTE -

Before operating attachment, ensure locknut is tight.

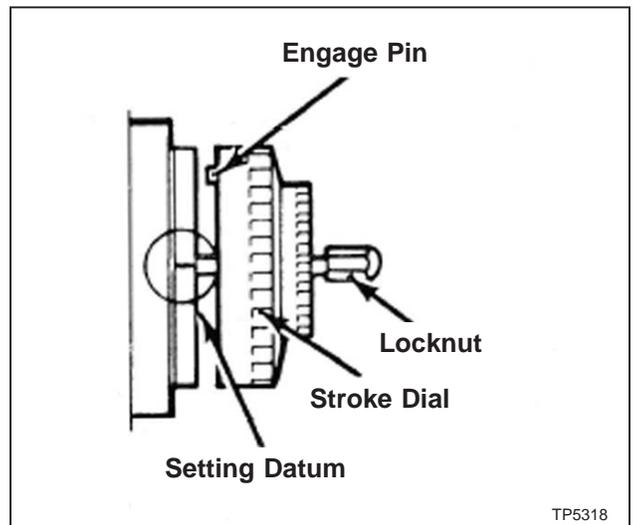


Figure 2.34 - Changing E-Head Stroke

## Clapper Box

To Swivel Clapper Box:

1. Loosen the two set screws "O", Figure 2.35.
2. Rotate to the required angular setting.
3. Tighten the two set screws "O".

Tool Relief

1. Loosen set screw "P".

The tool will now have automatic relief on the return stroke.

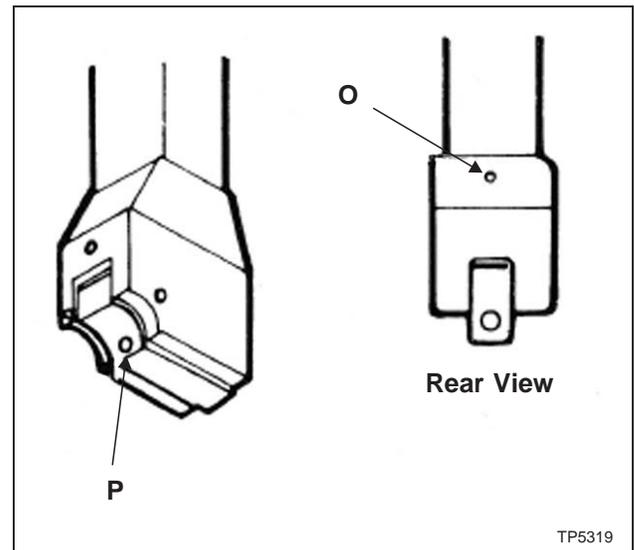


Figure 2.35 - Swiveling E-Head Clapper Box

- NOTES -

