NOTE - IF ALL ELSE FAILS, PLEASE READ INSTRUCTIONS!

INSTRUCTION MANUAL
AND
PARTS LISTS
FOR
HORIZONTAL AND VERTICAL
MILLING MACHINES
MODELS
747 - 747VS - 847 - 860

WELLS-INDEX CORPORATION
NEW—MACHINERY—USED
FITZPATRICK MACHINERY SALES
Rt. 473 (South of Church Rd.)
Mt. Laurel, N.J. 08057
WA-5-0531 PA.—NO.5-2530 N.J.
FINANCING—TERMS

PRICE $5.00
FOREWORD

Your new Wells-Index Milling Machine was designed and manufactured to conform to our high standards of machine tool performance. It was built to conform to set of rigid specifications by trained workmen who take pride in the quality of their work. Each Wells-Index machine must pass a rigid series of final inspection tests including actual metal cutting operations before it is released for packing and shipping. In order that this machine may provide you with a long period of continuous and satisfactory service it is necessary that it be properly installed, operated and maintained, and this manual has been prepared to assist you in carrying out these functions. We urge you to study the contents of this manual and to be guided by the suggestions contained herein.

Warranty

The Wells-Index Corporation warrants this machine and all parts and equipment manufactured by them against defects of material or workmanship for a period of one year from the date of sale. The manufacturers liability under this warranty shall be limited to replacing free of charge, F.O.B. Three Rivers, Michigan, any such parts proved defective within the period of the warranty. The manufacturer will not be responsible for transportation charges or consequential damages. Parts which are claimed to be defective, but show tangible evidence of abuse will not be replaced on a no charge basis.

Wells-index Corporation reserves the right, at its own discretion, without notice, and without making similar changes in articles previously manufactured, to make changes in materials, design, finish, and/or specifications.

Wells-Index Corporation makes no warranty with respect to electrical equipment or purchased parts other than the original manufacturers warranties.

DEFECTIVE PARTS

When so called defective parts are replaced, parts shipped out in replacement will be billed at regular prices, and will be shipped charges collect. The determining of credit to be allowed, if any, is left to the discretion of Wells-Index Corporation after receipt and inspection of parts. Parts to be replaced must be returned to Wells-Index within 60 days from the date of Wells-Index's replacement invoice or no credit will be granted.

WELLS-INDEX CORPORATION  Three Rivers, Mich.
INSTRUCTION MANUAL & PARTS LIST

HORIZONTAL & VERTICAL MILLING MACHINES

Machine Serial No. ____________

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WELLS-INDEX CORPORATION
1100 W. Broadway Street / Three Rivers, Michigan 49093 / (616) 279-7414

LITHO U.S.A.
LOCATION OF CONTROLS & ADJUSTMENTS FOR INDEX MILLING MACHINES

- Spindle Motor Control Lever
- Motor Pivot Clamp Lever
- Back Gear Control Lever
- Power Feed Transmission Engage Lever
- Head Clamp Nuts - L.H.
- Head Tilt Crankshaft
- Turret Clamp Nuts
- Table Handwheel
- Saddle Clamp Lever
- Table Clamp Lever
- Knee Clamp Lever
- Drawbar
- Quill Feed Handwheel
- Quill Feed Reversing Knob
- Quill Feed Engage Lever
- Depth Stop
- Quill Lock Lever
- Quill
- Spindle Brake & Lock Lever
- Motor Clamp Lever
- Quill Feed Rate Lever
- Quill Feed Lever
- Head Tilt Crankshaft
- Overarm Clamp Nuts
- Overarm Crankshaft
- Turret Clamp Nuts
- Table & Saddle Power Feed Control Box
- On-Off Switch & Reset Button
- Table Power Feed Trip Dogs & Limit Switch
- Saddle Power Feed Trip Dogs & Limit Switch
- Table Power Feed Directional Feed Rate & Rapid Controls
RECOMMENDED LUBRICATION FOR INDEX MILLING MACHINES

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NOTE: Wipe Lube Fittings Clean Before Greasing.
Do Not Overlubricate Ball Bearings.
III. PRELIMINARY INFORMATION

A. UNCRATING:

Carefully remove the protective crating and skid so that the machine and parts are not marred, scratched or otherwise damaged. In the event of any damage in transit, notify our representative at once as well as the transportation company making final delivery. The machine should be lifted from the base of the crate by placing a sling under the overarm.

B. SHORTAGES:

Inspect the complete shipment carefully against the itemized packing list to make sure that all items are present. In the event damage or shortages are noticed they should be reported immediately to the delivering carrier and to the representative from whom the machine was purchased with a clear indication as to which parts have not been received.

C. CLEANING:

Thoroughly clean the rust preventive materials from the machine with gasoline, kerosene, or other suitable solvents. Do not move the table, saddle, knee or other moving parts until all of the sliding way surfaces have been well cleaned and lubricated. After cleaning carefully move to a limit stop in one direction the table, saddle and knee, and clean and lubricate the exposed way surfaces. Then move each of these units to the opposite limit stop and similarly clean and lubricate the exposed way surfaces. Loosen the four bolts to unlock the overarm and move this forward and backward to the extreme position in order to clean and lubricate.

D. FOUNDATION:

For best performance it is important that the machine be placed on a solid foundation and that it be level. A solid concrete floor is desirable, but a firm wooden floor, free from vibration, may be suitable. If the machine is to be located on an upper floor or balcony it should be placed as close as possible to a strong supporting pillar or column.

E. LEVELING:

The machine is provided with four bolt holes one at each corner of the base. Steel wedges or steel plates should be used for leveling. A good machinist's level should be used in the leveling process and the bubble should have adequate time to come to rest. The level should be placed both lengthwise and crosswise on the machine table.

F. VERTICAL HEAD ON OVERARM: (EXPORT ONLY)

When the machine leaves the factory the vertical head is positioned on the overarm with the spindle up and the motor down. Before operating the machine it is necessary that the head be returned to its normal operating position by loosening the 4-5/8 hexagonal nuts located at the head end of the overarm. It will then be possible to tilt the head into normal operating position by using a crank on the 1/2" stud located on the right side of the front end of the overarm. Because of the heavy overhung weight involved, the tilting of the head back to its normal position will be greatly facilitated if a second person can help push it into position. The head may then be trammed in as described in Section V, paragraph H-I.

G. VERTICAL HEAD ON OVERARM

When the machine leaves the factory the vertical head is tilted back on the overarm. Before operating the machine it is necessary that the head be returned to its normal operating position and trammed in as described in Section V, Paragraph H-I.
IV. ADJUSTMENTS

A. PROPER GIB ADJUSTMENT PROCEDURE MUST BE DONE AFTER 40-HOURS ON NEW MILLS

Each 700 and 800 series of mills have three gibs. One at front dovetail of table; one on left dovetail of saddle; one on left dovetail of knee.

Each gib is supplied with two lock or adjustment screws.

The table gib has a lock screw on the right front of the saddle and the adjusting screw would be on the left front of the saddle.

The saddle gib lock screw is at the rear of saddle on the left side, the adjusting screw is at the front of the saddle on the left side.

The knee gib lock screw is on the bottom of the knee on the left side, the adjusting screw is on the top on the left side.

Loosen the table gib lock screw several turns and tighten the adjusting screw until you feel the gib pressing against table dovetail, then snug up the lock screw, "never get this lock screw too tight as it will distort the gib."

Run the table back and forth and check for drag.

Repeat this adjustment for the saddle and the knee gib.

Now to check the gibs with an indicator, the following checks must be made: (See Figure 1 for reference)

1. With indicator mounted as in Position 3, the table gib can be tested for shake by pulling back and forth on the end of the table.
   Anything over .0015 is too much, also the table should snap back to "0" each time.

2. To check the saddle gib, the indicator should be mounted as in Position 7 and the same tolerance should exit here.

3. The knee gib will be checked as in Position 5 by grasping the end of the table and lifting up and pushing down. Deflection here should not be more than .0003.

   Now as a final check use Position 2 and run the table to its extreme right and left position.
   The indicator runout should not be more than .0015.

B. QUILL FEED CLUTCH:

When the machine left the factory this clutch had been tested by drilling a 5/8 dia. drill in mild steel. After testing, the the clutch was then adjusted to a minimum setting. If in operation, larger pressures are developed which cause the clutch to "Rachet" it may be well to readjust the clutch using the steps below. If still larger pressures are needed after readjusting, you may assist the Quill Feed by applying a downward pressure on the hand feed lever.

PROCEDURE FOR ADJUSTING THE CLUTCH

Reference drawing 101-212-202, Section K-K

1. In the rear of the head between the head and the adapter is a hex nut (100-002-906) with a No. 10-24 x 1/2 socket head cap screw for a lock.
   a. First unscrew this lock screw until it is freely rotated with the fingers.

2. The minimum clutch tension is the position shown in the drawing. If more tension is desired, rotate the hex nut (100-002-906) up to 180° from its present position, and relock the No. 10-24 socket head screw.

3. It may also be desirable to adjust the travel of the clutch plunger:
   a. This is done by means of the 1/4 - 20 x 3/4 socket set screw immediately behind the (100-004-543) feed cam housing as shown in Section F-F.
   b. With the clutch disengaged tighten the set screw until a little roughness can be felt when moving the quill down by means of the hand lever.
C. PROCEDURE FOR REMOVING AND REPLACING QUILL COUNTER-BALANCE SPRING

(Extreme caution should be exercised in this operation and instructions followed closely as this spring is 11 foot long when unwound.)

Using drawing (101-212-202) which is the head and quill assembly refer to section K-K and (101-112-101) base assembly refer to B-B and view Z:

1. The safest way to perform this operation is to first drop the quill assembly (101-212-307) down until the rack on the quill clears the pinion on the (100-004-546) cross shaft.
   a. This is performed by first removing the drawbar and the (100-027-771) vernier holder and then the two 5/16-18 x 7/8 socket heads in the (100-002-917) quill block.
   b. Holding the left hand on the bottom of the spindle and the right hand on the hand feed lever (101-212-312) slowly run the quill down out of the head casting by rotating the hand lever counter-clockwise (When the quill rack clears the pinion, the quill is free to fall and the hand lever may unwind very rapidly causing a painful bruise if not held tight and unwound slowly.)

2. Referring to drawing (101-112-101) section B-B remove the two 7/16-14 x 2 socket head screws which hold the (100-007-100) plate to the (100-009-202) adapter.

3. Remove the three 5/8 hex nuts which bolt the (100-007-100) plate to the head casting.

4. Grasp the (100-007-100) in such a way that the thumb can be pressed against the (100-002-910) cover shown in section K-K and gently pull the entire assembly away from the head.

   It may be necessary to gently tap this plate with a soft hammer to break the initial contact with the head.

5. After this assembly is removed from the head and laid on a bench, very carefully lift the (100-002-910) cover off the spring by holding it in place and pulling the (100-002-909) coupling away from the assembly.

6. Very carefully pry the shield (100-002-911) away from the spring assembly.

7. Now the spring can be pushed out of the (100-004-542) housing from the bottom of the inside.

8. When the new spring is installed, it will have to be in the right direction so that the hook on the spring is in the same direction as the slot in the (100-002-909) coupling.

9. When the three 5/8 nuts are put back on, they should only be snugged up until the (100-007-100) plate is securely fastened to the (100-009-202) adapter by means of the two 7/16-14 x 1-1/2" socket head cap screws.

10. When the quill is replaced in the head, the counter-balance spring must be wound up tight by moving the hand lever (101-212-312) counter-clockwise to its limit and then engage the quill rack with the cross shaft pinion.

NOTE: This spring is not intended to return the quill to its upper position, it is merely to cancel out the weight of the quill assembly.

D. QUILL FEED TRIPS & DEAD STOP ADJUSTMENT:

Refer to drawing #101-212-202. Your Index Vertical Mill is provided with a means for setting an adjustable automatic feed trip device for the downward movement of the quill. Feed trip rod #100-002-961 actuates feed trip plunger #100-002-958 through feed trip arm #100-002-952 to disengage clutch. Disengagement occurs when quill feed trip key #100-002-917 contacts quick shift dial sleeve nut #100-002-763.

Downward feed adjustment is made by loosening knurled thumb screw #056-033-152 and repositioning quick shift dial sleeve nut #100-002-763.

E. DRIVE BELTS:

Refer to drawing #101-212-204. To provide the necessary slack for shifting of belt it is only necessary to loosen the motor clamp handle #100-002-955 (on right rear of pulley guard) and move motor forward. Increase belt tension by moving motor back and tightening motor clamp handle. To replace worn or broken belt remove 6 socket head screws from top of #111-212-002 drive pulley cartridge and lift off #111-212-002 cartridge. (2 tapped holes provided for jack screw if req'd.)
F. SPINDLE BRAKE - VARIABLE SPEED HEAD

Refer to Drawing #101-218-201 (Sect. AA).

TO ADJUST THE SPINDLE BRAKE:

1. Start the spindle.
2. Turn 1/4-20 set screw #010-102-576 in until you hear the brake rubbing, then back
   the set screw out just enough to stop rubbing. Lock in place with jam nut.
3. Turn complete brake handle ass'y. so that 111-218-204 shaft rotates clockwise
   until you hear the brake rubbing, then turn counter clockwise just enough to stop
   rubbing & allow the handle to be hanging down. If the handle is pointing up when
   properly adjusted, knock the 3/16 dia. spirol pin #010-454-512 out, reverse the
   handle 180° & replace the 3/16 dia. pin, so that the handle is hanging down.

V. OPERATION (See page 2 for location of various adjustments, handles and controls)

A. VERTICAL SPINDLE

1. The spindle Start - Stop - Reverse Control is located at the upper left on the
   motor.
2. On the standard vee belt drive head the spindle brake lever is located at the top left
   of the pulley guard assembly. Move it to the left or right to engage the brake.
   After moving to the left or right this lever may be raised to maintain brake
   engagement and hold the spindle in a fixed radial position for tool changing.
3. On the variable speed drive head the spindle brake is located at the bottom
   left of the pulley guard. It is engaged by pulling the control lever out away
   from the pulley guard. This camming action actuates the caliper type brake
   and will hold it in engagement until the control lever is returned back to its
   normal position flush with the pulley guard.

CAUTION: Always be sure spindle brake is completely disengaged before attempting
   to start spindle rotation in either direction.

4. Spindle speeds on the standard vee belt drive are changed by changing the
   position of the vee belt connecting the motor pulley to the spindle pulley and
   by shifting the back gear lever (high, low, or neutral).
5. Spindle speeds on the variable speed drive head are even more readily changed
   by moving the control lever from left to right or right to left with the spindle
   motor running and by shifting the back gear (high low or neutral).

CAUTION: Always be sure spindle motor is running before attempting to move
   variable speed adjustment lever.

B. BACK GEAR (See Drawing #101-212-204)

The back gear lever (shift lever #100-002-900) is located on the upper left side of
the head. The lever has 3 positions; high, low, and neutral. In the high (out) position,
spindle drive is geared directly from spindle pulley to spindles (dog clutch #100-002-
991 in up position, in contact with drive cone pulley hub #100-002-999). In the
low (in) position, spindle drive is geared through back gear #100-002-985 (dog
clutch #100-002-991 is in down position, back gear #100-002-991 is in mesh with
back gear #100-004-557).

NOTE:1 Because of back gear construction, when machine is running in low speed
range, spindle rotation is opposite to that of high speed range. Therefore, forward
on reversing switch becomes reverse when in low speed range.

NOTE:2 When shifting from neutral to high or low, turn spindle by hand while pushing back
   gear lever into position. This allows gears to line up in low speed and dog clutch to line up in high
   speed. When shifting into high it is imperative to have the spindle brake in the "brake on"
   position.

C. POWER FEED TRANSMISSION ENGAGEMENT (See Drawing #101-212-202).

The power feed engagement lever #100-002-900 is located directly below the back
gear lever. This lever has 2 positions: "in", to engage spindle power feed trans­
mission, and "out" to disengage spindle power feed transmission.
INSTRUCTION MANUAL

WELLS INDEX MILL

CAUTION: Always be sure spindle motor is stopped before attempting to move this lever to the "in" or engaged (upper) position.

NOTE: Disengage spindle power feed transmission when it is not being used. This will stop unnecessary wear on power feed worm gear.

D. QUILL (See Drawing #101-212-202)

1. The quill may be locked in a given vertical location by turning the quill-clamp in a clockwise direction. Lever is located at bottom of right side of head.

CAUTION: Do not engage quill feed with quill-clamp lever fully tightened.

2. The quill (or spindle) hand feed lever #100-002-107 can be adjusted to any one of six operating positions by moving outwards (to the right) on the lever hub and rotating to the desired position. The hand feed lever is held on by a spring plunger and can be pulled off when not in use.

3. Any one of three power feeds (in either an upward or downward direction) may be selected by moving the feed shift lever, located on right side of head, to the desired feed (.0015", .003" or .006") per spindle revolution. A neutral position is provided between each of these feed settings. If power feed is not being used it is wise to place the feed shift lever in one of the neutral positions. It may be somewhat easier to change the position of the feed selector lever when the spindle is rotating.

4. The fine feed handwheel #100-004-545 is placed in operating condition by locating the feed shift lever in a neutral position and engaging the power feed engaging lever #100-002-953. The fine feed handwheel is held on by a spring plunger and can be pulled off when not in use.

5. The knob on the shaft located in the center of the feed handwheel is used to select downfeed (pushed-in position), neutral (mid-position) or upfeed (pulled-out position) for either the power feed or the handwheel feed.

NOTE: Positions noted are for clockwise rotation of spindle. Counter clockwise rotation reverses these positions.

E. VERTICAL SPINDLE DRAWBAR (See Drawing #101-212-202)

Use spindle brake to restrict spindle rotation when tightening or loosening drawbar.

1. To install collet or tool holder in spindle—first, remove drawbar by pulling it out of spindle from top. Then, place collet or tool holder into spindle. Put drawbar back into spindle and tighten into collet or tool holder, using discretion.

2. To remove tool from spindle—loosen drawbar 3 or 4 turns and tap on end to free tool.

CAUTION: Do not loosen drawbar less than 4 or more than 5 turns when removing tool. If drawbar is too loose, the threads may be stripped when tapping on end.

F. HORIZONTAL SPINDLE DRAWBAR (See Drawing #101-180-203 & #101-180-207)

Use spindle brake located at back of machine to restrict spindle rotation when tightening or loosening drawbar. (Otherwise it is the same as the Vertical Spindle Drawbar).

G. HORIZONTAL SPINDLE:

1. Spindle direction is set by forward-reverse switch located on left side of column. (Otherwise it is the same as the Vertical Spindle – see paragraph V-A-3 & V-A-5)

H. HEAD: (See Drawing 101-112-101)

1. Tilting of the head in a front to back plane (turret and overarm models) is readily accomplished by loosening the 3 nuts at the right hand side of the head (around the hand feed lever) and the 3 nuts on the left side of the head, and applying crank to forward head tilting worm stud #100-002-963, located at bottom rear of head -- left side.
CAUTION: When returning head to vertical position, sweep the table with an indicator attached to spindle to make sure head is square to table.

2. To tilt head from side to side, loosen the hex nuts which clamp the head to the overarm or the machine column (whichever the case may be). Then tilt head the desired amount by applying crank to the sidewise tilting worm stud at the right to the rear of the spindle head.

CAUTION: When returning head to vertical position, sweep the table with an indicator attached to spindle to make sure head is square to table.

I. OVERARM OR RAM: (See Drawing 101-112-101 & 101-180-101)

The back to front position of the head and overarm is readily changed by loosening the 4 hex nuts which clamp the overarm to the turret. Apply a crank to the overarm adjustment shaft extension and move to desired position.

J. TURRET (Vertical Mill): (See Drawing 101-112-101)

To index the entire turret-overarm-head assembly loosen the 4 hex nuts, 2 on either side of the overarm which clamp the turret to the top of the column. Then swing the turret to the desired position and reclamp.

NOTE: It is highly recommended that all clamping nuts and bolts (turret to column, overarm to turret, head side-wise tilt and head forward-back tilt) be securely tightened before any machining cuts are taken. Always check these points before starting a cut. Also, when returning overarm to normal position, attach an indicator to the overarm, and slide the overarm in and out, with the indicator riding against a square, which has been squared to front of table to make sure overarm is square with table.

K. TURRET (Horizontal Mill): (See Drawing 101-180-101)

1. The turret can be rotated on the column a full 360°.

2. The locating pins are effective only when the ram is used with the overarm support for the horizontal spindle. The vertical spindle at this time would be at rear of machine. It may be necessary to tilt the vertical head slightly for clearance at the rear of the machine when the machine is set for horizontal milling with a long milling cutter arbor.

NOTE: It is highly recommended that all clamping nuts and bolts (turret to column, overarm to turret, head side-wise tilt and head forward-back tilt) be securely tightened before any machining cuts are taken. Always check these points before starting a cut.

Also, when returning overarm to position for vertical milling, attach an indicator to the overarm, and slide the overarm in and out, with the indicator sliding against a square which has been squared to front of table to make sure overarm is square with table.

3. The complete horizontal spindle, turret, overarm & arbor bearing may be positioned 30° either side of normal horizontal milling position by loosening the four 5/8 hex. hd. screws (two on either side of the spindle, slightly below the C/L of the spindle) and swing the entire top unit to the desired angular position.
VI PREVENTIVE MAINTENANCE

A. INSPECTIONS:

1. Inspect taper of spindle for cleanliness and freedom from chips of foreign matter.
   Frequency - Each time tool holder is inserted.
   Inspection by machine operator.
   No special equipment required.

2. Inspect and adjust gibs of slide ways.
   Frequency - every 160 hours. Oftener if looseness is noted by operator.
   Inspection and adjustment by machine operator or machine maintenance man.
   No special equipment required other than allen wrench.
   (See gib adjustment instructions item IV-A)

3. Inspect for general cleanliness of machine, paying particular attention to keep dirt
   and chips from slide ways. Do not use air to remove such dirt and chips -- but
   wipe off ways or keep them covered. Flood ways with light oil and work slide
   movements back and forth to wash out foreign matter. Then re-lubricate machine
   according to lubrication instructions.
   Frequency - Constantly, as far as wiping off chips and dirt are concerned. Every
   40 hours ways should be flooded with oil and cleaned as above.
   No special equipment required.

4. Inspect drive belts for wear, hard spots at splice, etc.
   Frequency - Every 40 hours.
   Inspection by machine operator or machine maintenance man.
   No special equipment required.

5. Inspect to see if vertical head is square with table, by mounting indicator on
   spindle and sweeping table.
   Frequency - Every 80 - 120 hours, or after head has been tilted.
   Inspection by machine operator or machine maintenance man.
   Special equipment required consists of (1) A short accurate arbor to insert in
   spindle. (2) A clamp for use in clamping a 6" bar to above arbor in a horizontal
   position. (3) 6" bar approximately 1/2" in diameter. (4) An accurate dial
   indicator to clamp to above 6" bar in position so when spindle is revolved by
   hand, nib of indicator in contact with table, sweeps table in a full circle and
   indicates out of squareness.

   NOTE: Table is intentionally left .0005" high in front. This will gradually decrease
   as machine is used.

6. Inspect electrical equipment.
   Frequency - In accordance with standard plant policy.
   Inspection by machine maintenance man.
   No special equipment required.

B. PARTS REPLACEMENT:

None except as indicated by wear or malfunction.
Frequency or replacement only as above.

C. LUBRICATION - (See Lubrication Sheet Page 2)

VII TROUBLE SHOOTING

NOTE: Ordinarily trouble will not manifest itself except when actually working with
machine.

1. Slide ways working hard or binding.
   a. Cause - gibs out of adjustment, either too tight or too loose.
      in latter case causing gib to "wedge".
      Remedy - Adjust gibs.
   b. Cause - Dirt in slide ways.
      Remedy - Wash out slide ways with light oil.
2. Chatter or vibration when cutting.
   a. Cause - Dirt in spindle taper, causing bad fit between tool holder shank and
      spindle taper.
      Remedy - Clean spindle taper and shank of tool holder.
   b. Cause - Faulty shank on tool holder.
      Remedy - Replace shank or dress off burrs, if due to nicks or burrs.
   c. Gibs poorly adjusted on slide ways, or dirty.
      Remedy - Adjust as in IV-A.
   d. Work improperly clamped to table of machine.
      Remedy - Check for rocking or movement, and correct by proper clamping.
   e. Improper grind on cutting tool.
      Remedy - Replace or re-grind tool.
   f. Hard spot at splice of drive belts or worm belts.
      Remedy - Replace belts.
   g. Spindle quill worn in quill head.
      Remedy - Tighten quill head lock slightly.
   h. Incorrect spindle speed, table feed, or both.
      Remedy - Ordinarily increase spindle speed and/or increase or decrease
      feed to break up vibration period. Experiment by using hand feed to feed
      table.
   i. Drive pulleys worn in grooves or loose on shafts.
      Remedy - replace pulleys.

3. Boring or milling out of square or at an angle.
   a. Cause - Head not properly aligned with table.
      Remedy - Check head for alignment and correct.
   b. Work improperly set up; i.e. not square and flat.
      Remedy - Check and re-align work.

4. Failure to hold center distance when locating for boring.
   Cause - Failure to take back-off tension on lead screw after coming up to
   indicator reading, causing table to "creep", or failure to lock up slide ways
   with same amount of tension after moving table to new position.

VIII SPARE PARTS RECOMMENDED

SET OF DRIVE BELTS FOR ALL DRIVES; (See Parts List)

IX SPECIAL MAINTENANCE

Should it become necessary to disassemble certain major elements of the machine
the following suggestions may prove helpful.

A. TO REMOVE VERTICAL SPINDLE PULLEY (Drive Cone Pulley), SPINDLE BEARINGS;
   AND SPINDLE BEARING SUPPORT:

1. Refer to drawing #101-212-204

2. Remove 6 socket head screws holding drive pulley cartridge #111-212-002 to
   pulley guard. (2 tapped holes provided in this part for jack screws if req'd.

3. Lift out drive pulley cartridge (containing drive cone pulley, spindle bearings
   and spindle bearing support).

4. Remove cartridge bearing lock nut #100-003-000.

5. Put drive pulley cartridge in an arbor press, locating on bottom face of drive
   cone pulley #111-212-003. Drive out drive cone pulley hub #111-212-201. This
   frees drive cone pulley (spindle pulley).

6. Remove cartridge bearing retaining plate #111-212-004 by removing 4 socket
   head screws.

7. Flip drive pulley cartridge #111-212-002 over on arbor press and drive out
   spindle bearings.
B. TO REMOVE MILLING MACHINE TABLE & LEAD SCREW. (See Drawing #101-436-101)

1. Remove handwheels #111-438-001, dials #111-346-008 & end plates #111-436-005 from each end of table.

2. Remove retaining cap #111-436-006 from left end.

3. If machine has a table power feed, disassemble by removing the bronze gear inside the power feed, (4) screws & R.H. end plate #B111-436-005.

4. Disconnect end brackets #111-436-003 & #111-436-004 by removing 4 screws.

5. The table can now be removed by sliding in either direction.

C. TO REMOVE SADDLE (See Drawing #101-346-101)

1. First remove the table, as in “B” above.

2. Remove handwheel #111-438-001 & dial #111-346-008.

3. If machine has independent saddle power feed unit, disassemble by removing the bronze gear inside the power feed & 4 screws.

   Remove plate #111-346-003 replace the handwheel & turn until lead screw is free of nut.

4. Remove lead screw nut #111-436-012 shown on drawing #101-436-101. It may be necessary to pry the nut loose from two roll pins which position the nut.

5. The saddle can now be removed by sliding forward.

D. PROCEDURE FOR REPLACING OIL SEAL IN BACK GEAR HOUSING OF ALL GEAR HEAD — MODELS 823 and IRD-125

1. To make this job relatively simple, it is advisable to remove the spindle motor first. This is accomplished as follows after shutting off the power and moving the speed lever to 4200 RPM.

   a. Remove the two 3/8 hex cap screws which hold the motor bracket to the pulley guard assembly (111-180-303).

   b. Slide the motor forward toward the spindle as far as possible. Then by working the variable speed belt over the edge of the bottom sheave of the motor pulley, the motor will then be free of the belt.

   c. The spindle motor can then be lifted off the pulley guard.

2. Now remove the 1/2-13 hex nuts (3) which holds the back gear housing (101-180-305) to the top of the head.

3. Run the quill all the way to the bottom of its travel by means of the (101-212-312) hand feed lever.

4. Now lift the entire (101-180-305) and (101-180-303) assembly off the spindle spline and the top of the head, and lay onto a suitable work bench with the three studs in the (101-180-305) at the top and the mounting surface for the spindle motor on the bottom.

5. Remove the eight 1/4-20 x 7/8 socket heads which hold the (101-180-305) back gear assembly to the (101-180-303) pulley guard assembly and lift the (101-180-305) away from the (101-180-303) pulley guard.

6. This exposes the (111-180-220) drive shaft which can be removed by lifting out of the back gear housing thus exposing the top side of the (058-010-088) oil seal which can then be tapped out of the casting, being very careful not to damage the (077-103-003) Fafnir 2815 INA bearing.

7. Now put the (111-180-220) drive shaft back into the back gear housing and, being very careful, start the new (058-010-088) oil seal back into the back gear housing with the lip of the inner race of the seal setting properly against the OD of the (111-180-220) drive shaft.

8. Now, reassemble in reverse order.
E. PROCEDURE FOR ELIMINATING SHAKE IN QUILL FEED HAND LEVER

Shake in the quill feed is usually caused by shipping vibration. The proper way to eliminate this is as follows:

1. Shift the speed range into the direct drive or up position on the back gear lever.
2. Run the spindle speed at approximately 1200 RPM with the quill fully retracted into the head casting.
3. Loosen the three 1/2" nuts which hold the back gear housing (100-009-204) to the top of the head, thus allowing the back gear and pulley guard assembly to "float".
4. Then by snugging up the 1/2" nuts, preferably the front one first, the back gear assembly will tend to center itself. (NOTE: A little experimenting may have to be done if tightening the front nut first does not eliminate the shake.)
5. In rare cases, the pulley guard housing could have been shaken out of line from the (100-009-204) back gear housing. In this case, the eight 1/4-20 x 7/8 socket heads which hold these two assemblies together will have to be loosened slightly and the unit allowed to center itself as explained in Step 4.

F. PROCEDURE FOR CHANGING R-8 PIN 745, 747, 756, 757, 847, 856, 857, 760, 860, and 887

1. Loosen 10/32 socket set screw on the bottom and read of the quill body.
2. Unscrew the (100-002-972) or (100-002-977) nut from the end of the quill using a spanner wrench with 5/32 or 3/16 lugs.
3. Pull or pry the (100-002-974) brass retainer down over the taper end of the spindle thus exposing the head of the R-8 pin which can then be pulled out of the spindle.
4. Replace the pin and reassemble in reverse order.

G. PROCEDURE FOR CHANGING HEADS 745, 747, 845, 847, 760, 860, 887

CAUTION: Before loosening all four 5/8" nuts on front of overarm, have a sling on the head to prevent falling.

1. Remove motor from pulley guard for VSD, see Step 5.
2. Remove (010-222-378) tilt shaft which will free up the (056-008-053) Boston worm gear and allow it to fall free of the overarm.
3. Remove three of the 5/8 hex nuts which hold the (100-009-202) adaptor to the front of the overarm.
4. Then after a hoist or sling is attached around the head or pulley guard, the remaining 5/8 nut may be loosened. (Caution: The head is then free to fall to either side.)
5. Then pull straight out on the head assembly to clear the (100-004-569) tilt gear and the (100-002-904) T bolts.

H. STEPS TO TAKE TO CHANGE MOTORS ON VARIABLE SPEED HEADS

1. Speed shift lever set at 4200 RPM.
2. Remove two 3/8 - 16 x 1-1/4 hex head cap screws which hold the motor to the pulley guard.
3. Slide motor as far as possible toward the spindle and work the belt over the motor pulley.
4. Remove motor from the pulley guard housing.
5. Remove pulley from defective motor and reassemble in reverse order.
6. It may be necessary to force the motor pulley flanges apart a little to facilitate slipping the belt over the pulley.
I. INSTRUCTIONS FOR CHANGING SPINDLES IN THE FOLLOWING MODELS 745, 747, 756, 757, 845, 847, 856, 857, 760, 860, and 887.

1. Remove drawbar.
2. Drop knee and move saddle to rear so as to provide clearance for quill removal.
3. Remove (100-027-771) adjustable vernier blade holder.
4. Remove two 5/16-18 x 7/8 socket head cap screws in (100-002-917) quill feed trip key and remove key.
5. Put right hand on (101-212-312) spindle feed handle arm and left hand on the bottom of the quill, and by moving the (101-212-312) handle in a counter-clockwise direction, run the quill down until the rack on the quill clears the pinion on the cross shaft.
6. When this happens, the (101-212-312) hand lever will unwind very rapidly. If released, it could cause injury. So it must be unwound slowly.
7. Let the quill slide down out of the head casting and put it in a vise, being sure to use brass or lead jaws in the vise.
8. Release the locking ear of the W-07 lock washer in the N-07 locknut or snap ring in the top of the quill and remove nut from the spindle. (See Paragraph 11)
9. Remove (100-002-972) front bearing retainer from quill after first releasing the 10/32 socket set screw in the lower rear of the quill. (NOTE: In the case of #30 MMT, the number is 100-002-977.)
10. Remove quill from the vise and strike spline or upper end of spindle against a solid piece of wood laying against a solid surface, such as the floor. The spindle and the two lower spindle bearings and spacers will then come out of the quill.
11. Replace new spindle and assembly in reverse order making very sure that the N-07 locknut is tight enough so as to put tension on the 2968 spacer on serial number before approximately 17105 on R8 spindles and approximately 17360 on #9 B & S and #30 MMT spindles. After this serial number make sure the locknut is tight against the bearing.
12. When putting the quill back into the head casting, first start the quill into the bore of the casting by gentle pressure and care (do not force).
13. Line up the spline of the spindle with the spline of the (100-004-576) drive hub by turning the spindle after it goes up against the bottom of the (100-004-576) hub.
14. Next, wind the 101-212-312 counter-clockwise to the end of its spring tension and push quill up until the rack of the quill engages the pinion of the cross shaft and use (101-212-312) hand lever to raise quill up to the top of its travel.

J. PROCEDURE FOR FREEING UP BACK GEAR TO DIRECT DRIVE 745, 756, 760, 845, 856, 747, 757, 860, 847, and 857

This particular problem is usually caused by the (111-218-001) pulley guard being jolted out of line during shipment and can usually be remedied as follows:
1. Shift the back gear lever into the direct drive or upper range and set the speed at about 1500 RPM.
2. Loosen the eight 1/4-20 x 7/8 socket head cap screws which hold the (111-218-001) belt guard to the (111-218-212) assembly.
3. Turn on the spindle motor, move the (111-218-001) belt guard a very slight distance in several directions. The dowel pin hole in the front of the pulley guard can be used with 1/4" allen wrench to move the pulley guard back and forth.
4. The pulley guard will actually tend to center itself if reasonable care is exercised when retightening the eight socket heads that hold the belt guard to the back gear housing.
K. PROCEDURE FOR ELIMINATING CREEP IN VSD SHIFTER

1. Referring to drawing (101-218-201) variable speed drive sandwich assembly, lower right hand drawing at the extreme top of the head you will notice four 10/32 x 7/8 button head screws which hold the (111-218-002) shift lever assembly to the (111-218-003) cam housing.

These four screws keep enough tension on the (056-004-451) cup washers to provide the proper friction between the shift lever and the housing to prevent creeping.

This creeping is easily remedied by snugging up these four button head screws.

L. METHOD OF CHANGING PRESENT SPINDLE FOR OLDER TYPES WITH 2968, 2969, AND 2970 SPACERS

1. Remove N-07 lock nut from top of spindle.
2. Loosen 10/32 lock screw from bottom of quill.
3. Remove 2972 quill nut be turning counter-clockwise.
4. Tap splined end of spindle on block of hard wood and spindle and two lower bearings will come out.
5. Discard spacer 2968.
6. Put 200-039 spacer on splined end of spindle against the thrust bearings of new spindle.
7. Press entire assembly in quill and install quill nut.
8. Install snap ring on top of spindle.
9. If old spindle bearings are used, discard spacers 2969 and 2970.

M. PROCEDURE FOR CHANGING BRAKE SHOES ON VARIABLE SPEED HEAD ASSEMBLY

1. With spindle motor running shift spindle speed to highest RPM then remove spindle motor as described in paragraph "H".
2. Referring to drawing 101-218-201 in the service manual remove the 111-218-002 speed shift lever by removing the four (4) socket head cap screws which hold it against the 111-218-205 ring.
3. Remove the six (6) 1/4 - 20 x 3/4 socket heads which hold the 111-218-003 cam housing to the pulley guard and remove housing from pulley guard.
4. Now by reaching thru the holes in the sides of the pulley guard the lower pulley sleeve can be worked up out of the pulley guard casting, thus exposing the brake shoes.
5. Now the 3/8 x 3-1/4 roll pins can be driven in to clear the brake shoes. (Note: The pins must be driven all the way to clear the pulley guard casting and fall free.)
6. Unscrew the 111-218-204 brake pull rod and remove old shoes.
7. Reassemble in reverse order making sure the 056-009-636 Browning cog belt is around the drive hub. This is made simpler if the cog hub is slowly rotated while being pushed or tapped down into its proper position.
8. After reassembly is completed, the shoes can be properly adjusted by first tightening the 1/4 - 20 x 1-1/4 socket set screw above the brake handle until the shoe makes contact with the outer race of the pulley and then backing off to just clear. Then the 111-218-004 brake pull rod should be turned clock-wise until contact is made with the inner pulley race and then backed off to clear.
N. PROPER WAY TO CHECK FOR POSSIBLE LOOSENESS OF QUILL IN HEAD CASTING AND FOR LOOSENESS OF SPINDLE IN QUILL HOUSING

Once in a while there is a complaint on what appears to be looseness in the head and or quill assembly.

In 99% of these cases this is caused by loose gibbs and has nothing to do with the fit of the spindle and quill in the head casting.

However, in the event that a check is to be made, it should be done as in Figure 1, Position 1 & 9 with the indicator base mounted solidly on the head itself.

If a reasonable amount of force is applied to the spindle, a reading of up to .0005 is not out of line, with the Quill retracted.

X RECOMMENDED "INDEX" SPEEDS FOR HIGH SPEED FAST SPIRAL END MILLS:

<table>
<thead>
<tr>
<th>SIZE</th>
<th>TOOL STEEL AND FORGINGS</th>
<th>MACHINE STEEL C.R. STEEL</th>
<th>CAST IRON AND FREE CUTTING STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>1675</td>
<td>2850</td>
<td>2850</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>1000</td>
<td>1675</td>
<td>1675</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>1000</td>
<td>1000</td>
<td>1675</td>
</tr>
<tr>
<td>5/16&quot;</td>
<td>600</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>600</td>
<td>600</td>
<td>1000</td>
</tr>
<tr>
<td>7/16&quot;</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>355</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>5/8&quot;</td>
<td>355</td>
<td>355</td>
<td>600</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>355</td>
<td>355</td>
<td>600</td>
</tr>
<tr>
<td>7/8&quot;</td>
<td>210</td>
<td>355</td>
<td>355</td>
</tr>
<tr>
<td>1&quot;</td>
<td>210</td>
<td>355</td>
<td>355</td>
</tr>
</tbody>
</table>

The foregoing should be regarded as approximate, as many factors control the efficient operation of end mills. Always keep cutters sharp, and a steady flow of oil or compound directly on the working point will allow much higher cutting speed. Keep rate of feed consistent with finish required.
### XI  GENERAL SPEED RECOMMENDATIONS:

<table>
<thead>
<tr>
<th>MATERIAL TO BE CUT</th>
<th>ROUGH CUT</th>
<th>ROUGH AND FINISH</th>
<th>LIGHT AND FINISH CUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast Iron-Soft- (Under 200 Brinnell)</td>
<td>70</td>
<td>80-90</td>
<td>120</td>
</tr>
<tr>
<td>Cast Iron-Med.- (200-300 Brinnell)</td>
<td>55</td>
<td>60-70</td>
<td>90</td>
</tr>
<tr>
<td>Cast Iron-Hard- (over 200 Brinnell)</td>
<td>40</td>
<td>50-60</td>
<td>70</td>
</tr>
<tr>
<td>Steel (Chrome Nickel 40-45 Shore)</td>
<td>30</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Steel (Stainless)</td>
<td>60</td>
<td>80</td>
<td>90</td>
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<tr>
<td>Steel (Low Carbon)</td>
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<td>90</td>
<td>140</td>
</tr>
<tr>
<td>Steel (High Carbon)</td>
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<td>50</td>
<td>70</td>
</tr>
<tr>
<td>Bronze (Medium)</td>
<td>90</td>
<td>120</td>
<td>150</td>
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<tr>
<td>Bronze (Hard)</td>
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<td>90</td>
<td>130</td>
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<tr>
<td>Brass (Hard)</td>
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<td>200</td>
</tr>
<tr>
<td>Copper</td>
<td>150</td>
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<tr>
<td>Duraluminum</td>
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<tr>
<td>Aluminum</td>
<td>600</td>
<td>---</td>
<td>1000</td>
</tr>
</tbody>
</table>

### XII  TABLE OF CUTTING SPEEDS AND FEEDS

<table>
<thead>
<tr>
<th>DIAMETER, INCHES</th>
<th>REVOLUTIONS PER MINUTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16&quot;</td>
<td>917 1222 1528 1833 2445 3056 3667 4278 4889 5500 6112</td>
</tr>
<tr>
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</tr>
<tr>
<td>5/16&quot;</td>
<td>183 244 306 367 469 611 733 856 978 1100 1222</td>
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<td>153 204 255 306 407 509 611 713 815 917 1019</td>
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<td>7/16&quot;</td>
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<td>115 153 191 229 306 382 458 535 611 688 764</td>
</tr>
<tr>
<td>5/8&quot;</td>
<td>91 122 153 183 244 306 367 428 489 550 611</td>
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<tr>
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<td>76 102 127 153 204 255 306 357 407 458 509</td>
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<tr>
<td>7/8&quot;</td>
<td>65 87 109 131 175 218 262 306 349 393 437</td>
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<tr>
<td>1-1/8&quot;</td>
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<tr>
<td>1-1/4&quot;</td>
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<tr>
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<tr>
<td>1-7/8&quot;</td>
<td>30 40 50 61 81 102 122 143 163 183 204</td>
</tr>
<tr>
<td>2&quot;</td>
<td>28 38 47 57 76 95 115 134 153 172 191</td>
</tr>
</tbody>
</table>
NOTE

ALL METRIC DIMENSIONS ARE IN CENTIMETERS (X X)

WELLS-INDEX CORPORATION
Three Rivers, Mich.

FLOOR PLAN MODELS 747-847

8900-011
NOTE

ALL METRIC DIMENSIONS
ARE IN CENTIMETERS (XX)
CUTTLER HAMMERSIZE "0" REVERSING DRUM SWITCH 9441H136A

T1 T2 T3
T7 T8 T9
T4 T5 T6
220 V CONNECTION

T1 T2 T3
T7 T8 T9
T4 T5 T6
440 V CONNECTION

WELLS-INDEX CORPORATION
Three Rivers, Michigan
WIRING DIAGRAM FOR 220/440 V 60 CY, 3 PH, 1 & 2 HP MOTOR 45 MILL & 645
(CONNECTIONS FOR HEAD MOTOR) 14 FEB 57 RIP 2032
DOERR 1HP, 115/230 V
1740 RPM MOTOR TERMINAL
BOX FR66, TEFCEBB

TO REVERSE ROTATION,
INTERCHANGE COIL LEADS
5 AND 8.

CUTLER-HAMMER SIZE "O"
REVERSING DRUM SWITCH # 9441H136A
NOTE:
SAME AS DW#2611 EXCEPT
FOR NEW NEMA STD.

WELLS-INDEX CORPORATION
Three Rivers, Michigan

WIRING DIAGRAM - 115 V, 60 CYC.,
SINGLE PHASE - 1 HP - DOERR MTR.
NEW NEMA STD.

WEF 10 OCT. 69 A 100003360
NOTE

100-003-186
MTR 1/2 HP 3/20/1440/60
SEE Dwg NO 100-004-610(B SIZE Dwg)

038-990-801
STGHT. CONN 3/8 APPLETON

038-992-001
WIRE BLACK 14-7-TW
(3 Wires Req'd)

010-113-955
SCCRD HD MACH
1/4-20x1/2 (3 Req'd)

010-142-016
PLUG DOT SNAP
IN FASTENER 1/2 HAL

View From Back of Motor

NOTE

WIRING DIAGRAM NO 100-002-092
USE (6) STAKON CONN. INDEX NO
038-991-502 & ALSO USE (6)
WIRE WRAPS NO 038-992-401

WELLS-INDEX CORPORATION
Three Rivers, Mich.

1HP 3PH MOTOR ASS'Y

B 101-670-101
WELLS-INDEX CORPORATION
Three Rivers, Mich.

2 HP MOTOR ASS'Y

B-101-671-101

NOTE

Use (6) strain connections
index no. 038-991-902 &
also use (6) wire wrap,
connections index no.
038-992-402
NOTE:

For wiring diagram see A size DWG No 100-003-340
Use (4) wire wraps type Scotchlock Index No 038-992-402
Use (8) Sta-Kons T&B 14-8 B-339-002 Index No 038-991-502

100-003-237 MTR 1 HP, 1 PH 115/230V - 60 CYC.
See B size 100-004-610 Motor
informative for specs on mtr.

View from back of MTR.

100-003-345
MTG BRKT.

038-990-802
Conn. 3/8" x 90° Appleton # 738

038-992-251
Wire simplex tirex
#14/4 x 18

056-500-024 (2-REQ'D)
Sec. butt HD SCR
#16-32 x 1/2 LG

038-990-801 (2-REQ'D)
5ght conn 3/8 Appleton

111-212-202
SWT A

038-992-001
Wire black 14-7-TW

038-995-012
Handle for SWT
C/H # 94414136 9441E

Wells-Index Corporation
Three Rivers, Mich.

1 HP 1 PH Motor Ass'y

B101-672-101