

“MODERN”

MODERN TOOL WORKS LIMITED

MONTCALM AVENUE - YORK TOWNSHIP

TORONTO, CANADA

OPERATING INSTRUCTIONS

FOR

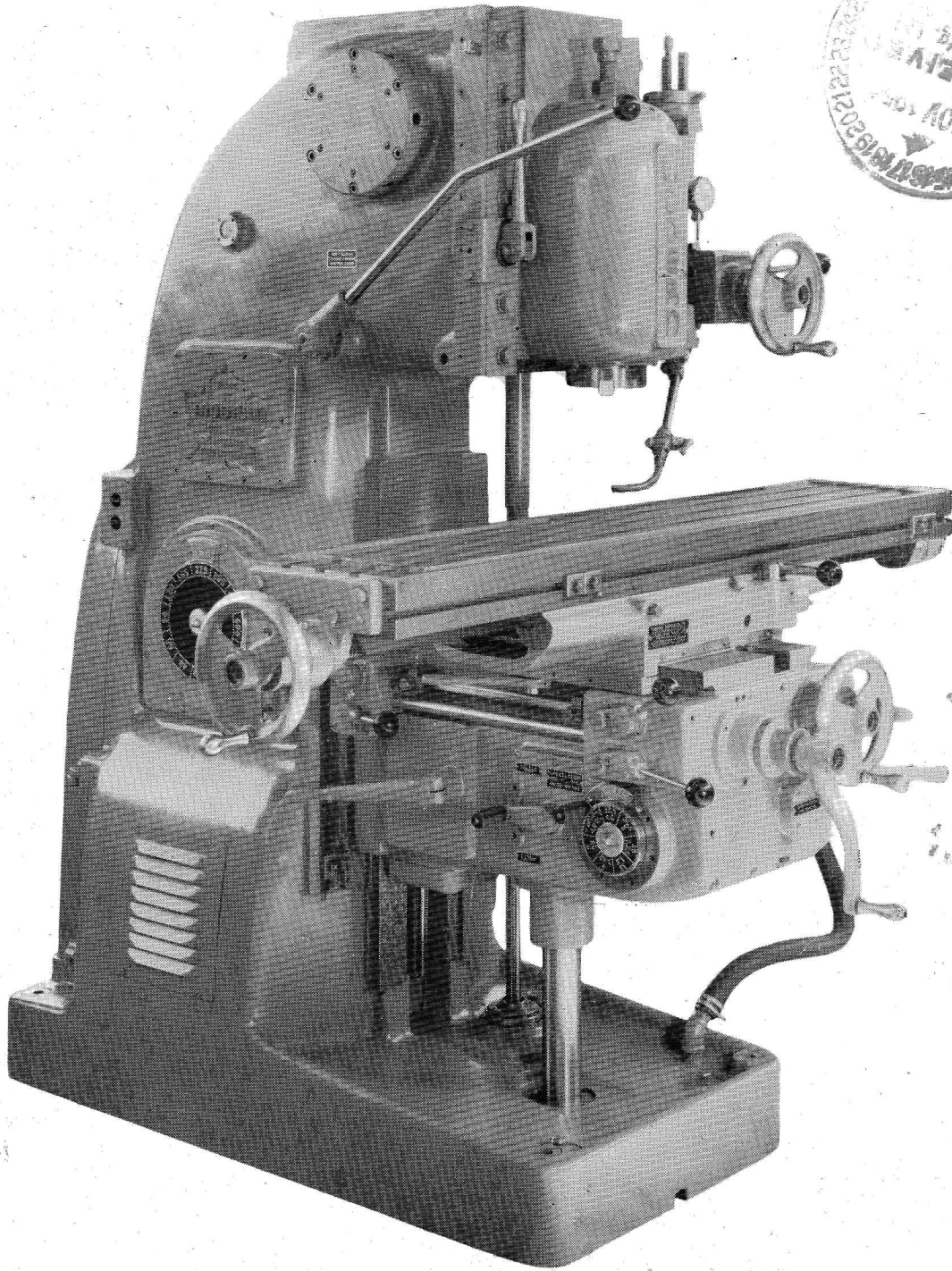
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**No. 2 H.V. and No. 3 L.V.
Vertical Milling Machines**

QUALITY

ACCURACY

PERFORMANCE

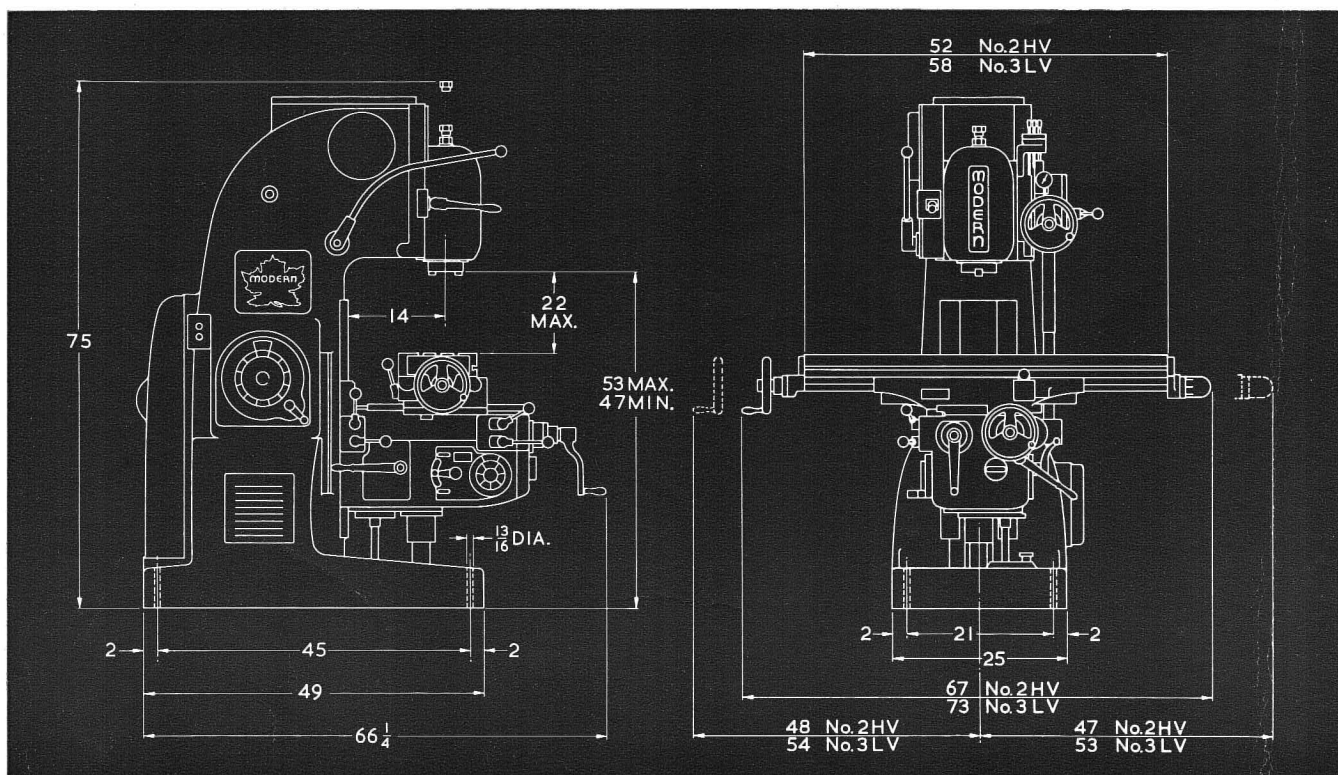


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No. 2 H.V. and No. 3 L.V. Vertical Milling Machines

Dimensional Specifications

No. 2 H.V. and No. 3 L.V. Vertical Milling Machines



TABLE

Working surface and size overall—No. 2 H.V... 52" x 11 1/4"
 —No. 3 L.V... 58" x 11 1/4"
 T-slots, number and width..... Three 1 1/16"
 Distance between T-slots..... 2 1/2"
 Back edge of table to centre of rear T-slot..... 3 1/4"

RANGE

Longitudinal power feed—No. 2 H.V..... 28"
 —No. 3 L.V..... 34"
 Cross or transverse power feed..... 11"
 Vertical power feed (knee)..... 15"
 Sliding head travel..... 6"
 Vertical power feed (head)..... 6"

SPINDLE

No. 50 National Standard Spindle Nose.....
 Diameter of nose..... 5 1/16"
 Width of driving keys..... 1"
 Diameter at large end of 3 1/2" taper per foot
 tapered hole..... 2 3/4"
 Size of four tapped holes on 4" diameter
 bolt circle..... 5/8—11 U.S.S.
 Diameter of through hole for 1" diameter
 draw-in rod..... 1 1/16"

SPEEDS

Twelve speeds in either direction independent of feeds.
 Standard range in geometrical progression (45 to 1500)
 from 900 r.p.m. constant speed pulley.

FEEDS

Twelve rates in geometrical progression
 Longitudinal table feeds and cross table feeds from 3/4"
 to 3 7/8" per minute.
 Vertical knee feeds and vertical head feeds from .30" to
 15" per minute.

RAPID TRAVERSE

Longitudinal and cross rate..... 180" per min.
 Vertical rate (knee and vertical head)..... 70" per min.

DRIVE

Multiple Vee Belts from motor in base through Twin Disc
 dryplate clutch in drive pulley.
 Speed of driving pulley..... 900 r.p.m.
 Max. size of motor..... Frame 284
 Max. power available with 25 cycle motor..... 5 h.p.
 Max. power available with 60 cycle motor..... 7 1/2 h.p.

SHIPPING DATA

Net weight..... 5700 lbs.
 Gross weight (domestic)..... 6000 lbs.
 Gross weight (export)..... 6300 lbs.
 Size of case (export)..... 72" x 80" x 90"
 Cubic displacement..... 297 cu. ft.

Note:—If motor and electrical starting equipment is
 ordered with machine, add 240 lbs. to the weight given.
 Please specify cycles, voltage and phase when ordering
 the equipment.



Head Office and Plant

MODERN TOOL WORKS LIMITED

69 Montcalm Avenue, Toronto 10, Ontario, Canada

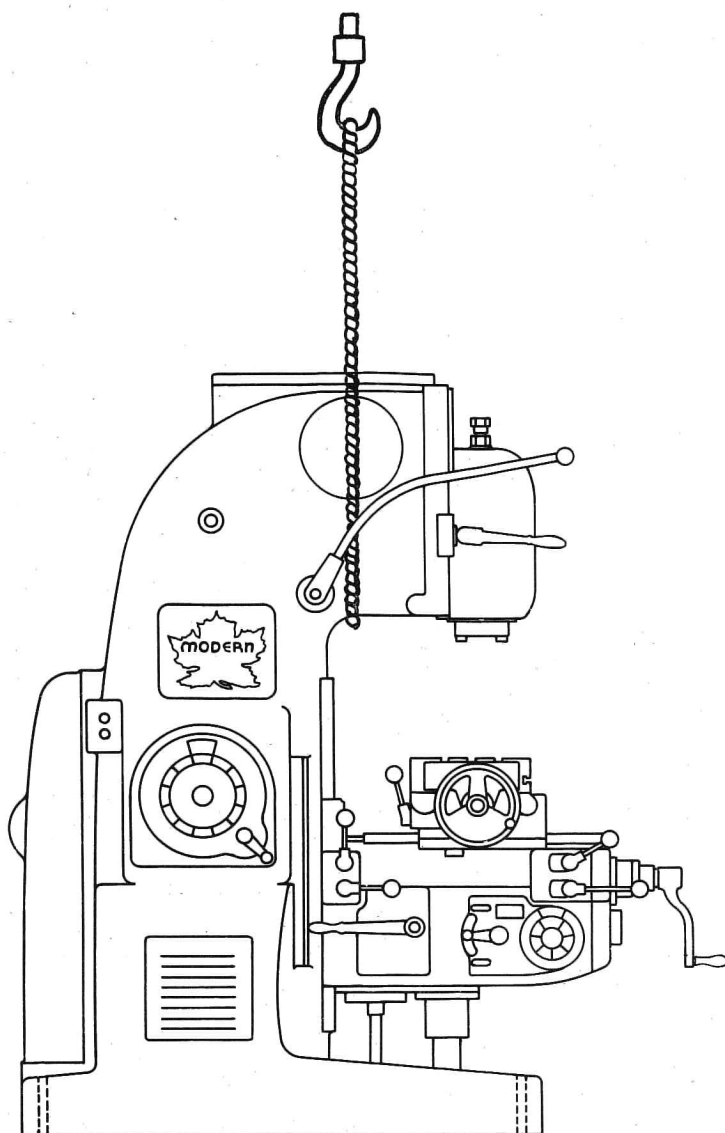
Cables: Modto Toronto

Telephone, ORchard 4401

HANDLING

Your Modern Vertical Milling Machine was thoroughly inspected before being skidded and crated for shipment and must be handled carefully to avoid damage to the various operating levers and handwheels. When installing this machine in your plant remember that you are handling a precision machine tool which was built to extremely close limits throughout - try to keep it that way and it will produce correspondingly accurate work.

If a crane is available for handling the machine, lift it with heavy rope slings as per illustration below. Protect both



the rope and painted surfaces with thick pads. Do not attempt to lift this machine with a crane having less than three tons capacity. Do not remove the skids until the machine is brought to its final position, especially if it is necessary to move the machine on rollers.

It will be noted that all unpainted parts of the machine are covered with a black anti-rust compound which must be thoroughly removed before moving the table, saddle or knee, on their respective slides. Use a wiper dipped in gasoline or naphtha to remove the anti-rust compound.

Check your delivery slip against the accessories that you ordered with the machine. If there is a shortage or error report it to Modern Tool Works immediately, giving the serial number of your machine which is stamped on the top face of knee at front end.

INSTALLATION

The machine should be installed on a good solid floor which is capable of supporting the weight safely. Refer to the Blueprint at left for the size of the base and the location and size of the anchor bolt holes.

After the machine is in position it must be levelled by the use of sheet metal shims under the four corners of the base. The underside of the base is machined to facilitate levelling and two crowbar slots are provided.

Use a precision level placed lengthwise and crosswise on the table of the machine and be sure all four corners carry an equal share of the weight so that the base will not be twisted when the anchor bolts are tightened.

Recheck the level of the machine at regular intervals.

LUBRICATION

The lubrication system of the Modern Vertical Milling Machines has been designed to give trouble-free service with a minimum of attention.

All gear trains either run in a bath of oil or are flooded by oil under pressure from a central oil sump. Only a limited number of oilers, on external parts of the machine, require attention at regular intervals. Otherwise the lubrication of the entire machine is automatic as long as the oil level is maintained in the various oil sumps.

Machines are shipped with lubricating oil drained from all oil sumps. Be sure to fill the oil sumps and oilers before starting the machine.

Follow the lubrication instructions listed in this manual.

The entire machine (except the motor) is lubricated with oil. Select a highly refined oil having a Saybolt Universal Viscosity of about 300 seconds at 100° F. - pour point 10°F. This is equivalent to S.A.E. Viscosity No. 20. Use this grade of oil in all oil sumps and oilers.

The oil capacities listed under "Lubrication Instructions" are based on the British Imperial Measure.

LUBRICATION INSTRUCTIONS

MAIN COLUMN GEAR HOUSING -
Capacity: $2\frac{1}{2}$ Gallons.

This gear Housing constitutes the upper half of the main column casting and houses the entire driving mechanism for the main spindle. Lubrication is provided to all bearings and gears by the use of a constant speed oil pump which is gear driven from the pulley shaft at the bottom of gear box. This pump lifts the oil from the sump to a header behind the inspection cover, and from there distributes it through a number

of copper lines to the main spindle bearings and gears. From these points the oil cascades down over all other gears and bearings and finally drains back into the oil sump.

Note: In order to prevent an excess accumulation of oil in the vertical spindle housing the machine is equipped with a suction pump which draws off all oil above a predetermined level in the housing. This suction pump is located in the upper main column just below the top inspection cover.

When checking the oil level in main column gear housing be sure the machine is not in operation as the oil level will drop appreciably when the pump is operating.

Every six months remove the drain plug, and drain all oil from the sump. Then pour in two gallons of kerosene or flushing oil and run spindle gear train for approximately five minutes. Drain and refill with fresh oil. Periodical flushing of this gear box is very important in order to keep the pressure oil lines free of sludge which is certain to accumulate due to breaking down of the oil.

Proper functioning of the oil pump is shown by the oil pump flow gauge. If at any time this gauge does not show a flow of oil when the spindle is running, stop the machine immediately and find the trouble.

RAPID TRAVERSE DRIVE GEAR HOUSING
Capacity: 5 Pints.

This gear housing is a long rectangular box in the column base which houses the horizontal pulley shaft and a pair of Gleason Spiral Bevel Gears which transmit power to the vertical splined shaft at front of column. Both shafts are mounted on anti-friction bearings which run in a bath of oil. The proper oil level is at center of horizontal shaft or four inches from top of filler pipe.

RAPID TRAVERSE DRIVE GEAR HOUSING (Continued)

A convenient drain plug is located near the floor on the right side of machine.

Do not attempt to flush this gear box - it has been provided with an extra large sediment sump which has ample capacity for the life of the machine. Use the same grade of lubricant previously specified and change every six months.

KNEE GEAR BOX -
Capacity: 1 Gallon

The knee casting is built in the form of an oil tight box which houses the entire feed and rapid traverse driving mechanism. The oil level is indicated by sight gauge. Lubrication is automatically provided by the rapid traverse driving shaft which dips into the oil and distributes it to all other gears and bearings within the knee. The rapid traverse shaft rotates at 600 RPM and is in motion whenever the main driving motor is operating. The knee lifting screw and its bearings are also automatically lubricated from the oil sump.

The knee is provided with two magnetic drain plugs - a 1/2 inch size in bottom of knee just to the right of knee lifting screw and a 1/4 inch size in the small auxiliary gear box at rear bottom of knee. Always remove both plugs when changing the oil and clean them thoroughly with a brush. The magnetic drain plugs attract and hold metallic particles which would otherwise continue to circulate in the oil.

Drain the oil in knee gear box every six months or oftener. Flush with kerosene or flushing oil for five minutes and refill with fresh lubricant. A large filler cap is provided. Never use an oil which is heavier than recommended as heavy oil will not distribute freely enough to reach the upper bearings. It will also cause dragging in the rapid traverse friction clutch.

EXTERNAL OILERS.

The top of knee apron is equipped with four flush-type ball valve oilers which provide lubrication to the vertical knee slide and column ways - OIL DAILY

Two similar oilers will be found at the top of front knee cover which supply oil to two internal oilite bushings - OIL MONTHLY

The knee lifting crank and cross feed handwheel are provided with screw-cap oilers - OIL DAILY.

One Zerk type grease fitting is located just below the Rear Vertical Feed Control Lever. - GREASE MONTHLY.

CAUTION:

When refilling the knee gear box always check to see that the oil is getting down to the auxiliary gear box at rear bottom of knee. This can be done by removing the 1/4 inch magnetic drain plug and adding oil to the knee until it starts to come out of the drain hole. Then insert the plug and the splash system will continue to feed oil down to the auxiliary gear box.

PLAIN SADDLE -
Capacity: 1 Quart

The oil sump in plain saddle provides bath lubrication for the table feed mechanism and table feed screw. Wicks feed oil down to the slide ways on top of knee.

Check the oil level DAILY and replenish when necessary through filler. The plain saddle is provided with a magnetic drain plug just above the filler in Saddle Side Gear Box. DRAIN FLUSH and REFILL EVERY SIX MONTHS.

SADDLE SIDE GEAR BOX - Plain & Universal -
Capacity: 1/2 Pint.

This gear box provides bath lubrication for a pair of right angle bevel gears which transmit power from the knee to the table feed screw. A wick feeds oil to the cross feed screw. Maintain the oil level within limits of the sight gauge. A magnetic drain plug is located at bottom of gear box.

DRAIN, FLUSH and REFILL EVERY SIX MONTHS.

TABLE:

The table is provided with two spring cap oilers - one in the front center and one at rear center, which supply oil to the table ways. OIL DAILY

The table feed screw-end bearings are also provided with spring cap oilers. OIL WEEKLY

The table hand wheel is provided with a screw cap oiler. OIL DAILY.

MOTOR:

All motors installed in our machines are equipped with grease lubricated anti-friction bearings. Under normal operating conditions the motor should be removed from the machine once each year and dismantled for cleaning and greasing.

Remove all old grease from the bearings by washing in a suitable solvent; then rinse in warm light oil and repack with a good grade of ball bearing grease. Do not fill the grease chambers on either side of the bearing more than half full as an excess of grease will cause heating and subsequent loss of the lubricating oil which is normally retained by the grease. Also smear a small quantity of grease in the sealing grooves of the bearing covers.

CAUTION:

Use extreme care to ensure cleanliness when assembling the bearings.

The removal and overhauling of motor should be supervised by a qualified electrician.

OPERATION OF MILLING MACHINE

Before starting the newly installed machine be sure to check the direction of rotation of main driving pulley as indicated by the cast arrow on outside of belt guard. This is very important as all directional feed clutches will only operate in one direction. The correct speed for driving pulley, 600 R.P.M., is also indicated on outside of belt guard.

The spindle speeds as indicated on the spindle speed dial are based on a constant pulley speed of 600 R.P.M. Similarly the feed and rapid traverse rates are also dependent on this constant speed.

The machine is equipped with a clutch engagement lever, conveniently located on the left hand, or control side, of the column. The clutch lever actuates a Twin-Disc clutch in the main driving pulley, and also engages the spindle brake when moved beyond the clutch disengaged position.

ADJUSTMENT OF SPINDLE DRIVE CLUTCH

The main driving pulley houses a standard Twin-Disc dry plate clutch which is convenient to adjust when the belt guard is swung open. Proceed as follows:

Disengage clutch. Pull lock pin and turn housing clockwise until operating lever requires a distinct pressure to engage clutch. Release lock pin into nearest hole.

Do not operate the machine with a slip-in clutch as it will cause heating and excessive wear. If the clutch is kept in proper adjustment it will give many years of satisfactory service. However, if new friction plates are ever required they may be obtained from the dealer who supplied your machine or from -

Consolidated Engines & Machinery Company,
200 Bay Street, Toronto, Canada.

Order Plates for Twin-Disc Clutch Model
No. CL 105

ADJUSTMENT OF RAPID TRAVERSE CLUTCH

The rapid traverse clutch is carried on the rapid traverse driving shaft in lower right side of knee. It is a Wet Type No. 22 "Maxitorq" Single Multi-Disc Clutch made by the Carlyle Johnson Machine Co., 52 Main Street, Manchester, Connecticut, U.S.A.

This clutch is actuated by the front and rear rapid traverse engaging handles. The clutch adjustment instruction plate is located on the cover plate which must be removed to make the adjustment. Proceed as follows:

Drive out the taper pin and loosen clamp screw in front handle and remove from shaft. Remove the cover plate and replace handle. Adjust clutch according to the instructions on cover plate but set it up tighter than stated so that it will not lock into the fully engaged position. By setting the clutch in this way it will automatically stop driving when pressure on the engaging handle is released.

INSTRUCTIONS RE SERVICE IF RAPID TRAVERSE DOES NOT OPERATE:

1. Check belt for slipping.
2. Check clutch.
3. If clutch drags, oil too heavy
or clutch gummed up
or gibs too loose.

POWER FEED SAFETY INTERLOCKS

The Cross Feed Handwheel, Knee Lifting Hand Crank and feed handwheel for vertical head are equipped with safety interlocks which prevent spinning when the power feed is engaged.

The interlocks prevent movement of the feed control levers when the hand feed clutches are engaged. The operator must always remember to disengage the hand feed clutches so that the feed control levers are free to move when required.

CAUTION:

If at any time it is necessary to remove either the Cross Feed Handwheel or Knee Lifting Hand Crank, be sure to see that the safety interlock balls are not dropped from the shafts.

REPLACING FEED "SAFETY" SHEAR PIN

The entire power feed and power rapid traverse drive is carried through a brass shear pin which is conveniently located at front of knee.

The shear pin is sufficiently strong to drive all normal feeds but will readily shear if the machine is jammed and thereby prevent breakage of vital machine parts.

To replace the feed shear pin remove the four screws in cover and remove the cover which will expose the broken pin.

Replace the pin with a new one made of 1/4 inch diameter brass rod. Lock the pin with a piece of iron wire and replace the cover.

VEE BELT ADJUSTMENT**Main Drive**

The five Vee belts from the motor to driving pulley are readily adjusted by means of a jack screw on the motor plate.

Keep the belts tight enough to prevent slipping and wipe off any traces of oil or grease that may accumulate on them.

Coolant Pump Drive

The coolant pump is mounted on a swinging bracket which provides a ready means of belt adjustment when the clamping nut is loosened. This belt should be slack enough to allow it to be run off readily when the coolant pump is not needed.

Rapid Traverse Drive

Two "Veelos" Adjustable Vee Belts are used to transmit power from the driving pulley down to the lower pulley shaft.

Adjustment of these belts is readily accomplished by the removal of one link from each belt.

Run the belts off the lower pulley to facilitate removal of the links when it becomes necessary.

VERTICAL HEAD CLAMP ADJUSTMENT

The clamp handle, located on the left side of the vertical head, is adjusted for wear by means of an eccentric pivot pin. To adjust, loosen the socket head cap screw in the clevis, and turn the eccentric pin.

After all the adjustment on the eccentric pin has been taken up, the pin may be removed and the clevis turned one half a revolution. This will allow the pin to be returned to start again.

The clevis is prevented from turning by means of a brass binding shoe held against the threads by a headless set screw.

A buffer plate has been provided for the handle to clamp against, so that the clamping of the handle will not move the gib and disturb the setting of the vertical head.

VERTICAL TURRET DEPTH STOPS

Four adjustable stop screws, contained in the index-type turret, are located on the right side of the vertical head. The turret, advancing downward allows the selected stop screw to come in contact with the indicator block. The dial indicator is thus actuated through a range of one inch allowing depth of feed readings to within .001 inch.

To adjust stop screws, unclamp knurled thumb screw, turn stop screw to depth required and reclamp.

Safety kick-out trips are provided for both maximum "Up" and "Down" positions. The "Down" kick-out trip actuates just before the dial indicator reaches the bottom of its stroke.

COUNTERBALANCE SPRING ADJUSTMENT

The vertical spindle housing is counterbalanced by means of two large clock type springs safely housed in a drum in the upper column casting.

The proper amount of counterbalance is set before the machine leaves the factory, but due to normal settling of the springs or when heavy tools are being used, further adjustment may be necessary. To do this, remove the six large socket head cap screws and with the aid of a $3/4$ inch dia. bar inserted in the holes provided, wind the drum in a clockwise rotation until the

required counterbalance is obtained.

GIB ADJUSTMENT

Vee type self-centering gibs are used on both the vertical head slide and the knee slide. Hexagon head cap screws are used for holding the proper amount of tension on the gib against the dovetail slide. These screws are prevented from turning too freely by means of brass binding shoes held against the threads by headless set screws.