OPERATOR'S INSTRUCTION BOOK

CINCINNATI

TOOLMASTER MILLING MACHINES

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This Booklet should be Filed in the Tool Crib and Issued by Tool Check only

THE CINCINNATI MILLING MACHINE CO.,
CINCINNATI 9, OHIO, U.S.A.

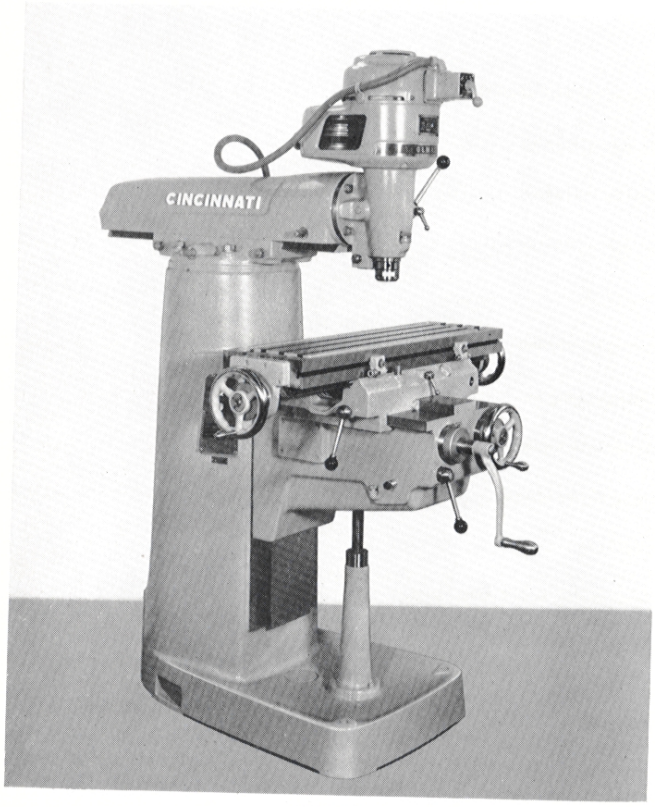


Figure 4
Cincinnati Toolmaster Milling Machine Style 1-A with Manual Feed to Quill

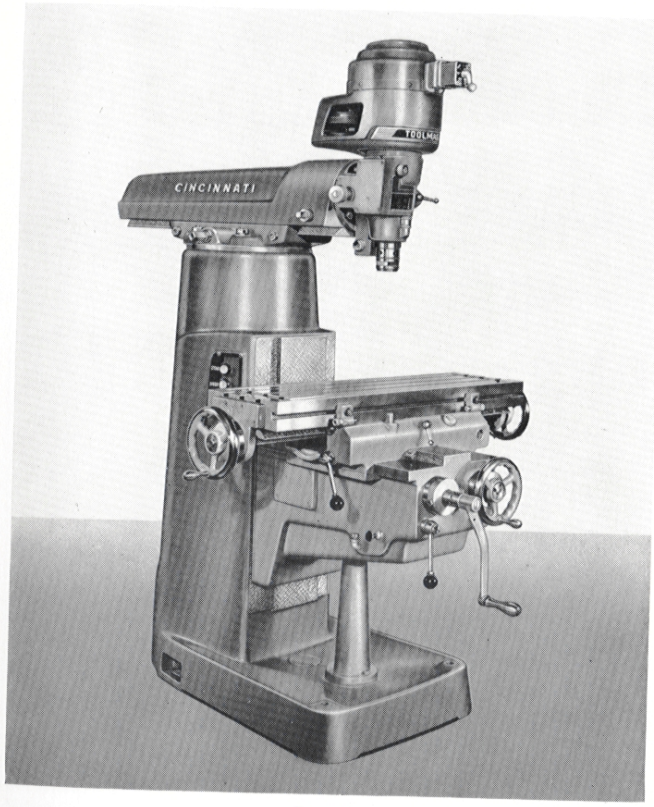


Figure 5
Cincinnati Toolmaster Milling Machine Style 1-B with Power Feed to Quill

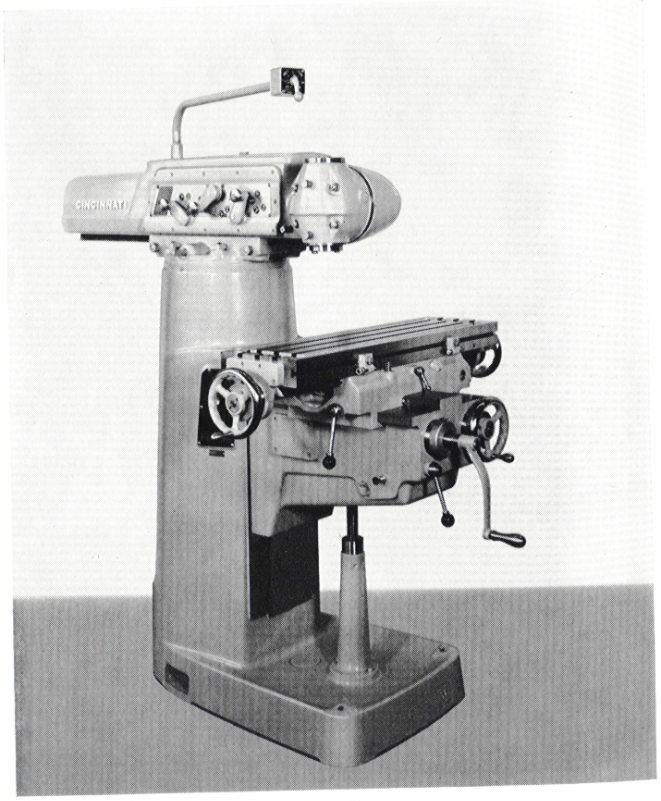


Figure 6
Cincinnati Toolmaster Milling Machine Style 1-C with Heavy Duty Head (Adapter is at extra cost)

	1A	1B	1C
RANGE			
Longitudinal table traverse	16″	16″	16″
Cross	10″	10″	10″
Vertical — Knee	17″	17″	17″
— Quill	3½″	3½″	—
Spindle nose to top of table — Max.	19¼″	19¼″	22¾″
— Min.	0″	0″	5¾″
Throat distance, center of spindle to column face — Max.	22¼″	22¼″	24⅞″
— Min.	4¼″	4¼″	4⅞″
Face of column to c. l. center T-slot in table — Max.	16¼″	16¼″	16¼″
— Min.	6¼″	6¼″	6¼″
TABLE			
Working surface	36″ x 10″	36″ x 10″	36″ x 10″
Size	36″ x 10″	36″ x 10″	36″ x 10″
T-Slots (number and size)	Three — 11/16″	Three — 11/16″	Three — 11/16″
Distance between T-slots	2 5/16″	2 5/16″	2 5/16″
SPINDLE			
Spindle nose	Collet chuck type	Collet chuck type	No. 40 Standard
Spindle speeds — Number	8	8	8
— Range, rpm (must be specified on order)	108 to 2825, 140 to 3800 or 215 to 5650 rpm	108 to 2825, 140 to 3800 or 215 to 5650 rpm	100 to 1530 (100, 140, 215, 310, 490, 700, 1070, 1530 rpm)
Nos. 1A and 1B Machines: 108 to 2825 range — 108, 185, 285, 475, 650, 1125, 1700, and 2825 rpm; 140 to 3800 range — 140, 240, 375, 630, 860, 1500, 2270 and 3800 rpm; 215 to 5650 range — 215, 370, 570, 950, 1300, 2250, 3400 and 5650 rpm			
Reverse	Yes	Yes	Yes
DRIVE			
Type	V-belt	V-belt	Gear
Motor	¼ hp—108 to 2825 rpm 1 hp—140 to 3800 rpm 1 hp—215 to 5650 rpm	¼ hp—108 to 2825 rpm 1 hp—140 to 3800 rpm 1 hp—215 to 5650 rpm	2 hp.
FLOOR SPACE			
Area	64⅝″ x 79½″	64⅝″ x 79½″	64⅝″ x 80¾″
SHIPPING DATA			
Net weight	2300 lbs	2350 lbs	2500 lbs
Shipping weight, domestic	2700 lbs	2750 lbs	2900 lbs
Shipping weight, export	3200 lbs	3250 lbs	3400 lbs
Size of case, export	76″ x 69″ x 59″	76″ x 69″ x 59″	76″ x 69″ x 59″
Cubic contents, export	179 cu. ft.	179 cu. ft.	179 cu. ft.
CODE NAMES	**TOOLA**	**TOOLB**	**TOOLC**

Machine	X With Shop. Attach.	X Without Shop. Attach.	Y With Shaping Attach. Min.	Y With Shaping Attach. Max.
1A	33½	37⅛	15½	23⅞
1B	33½	37⅛	15½	23⅞
1C	36¼	38¼	15½	26¾

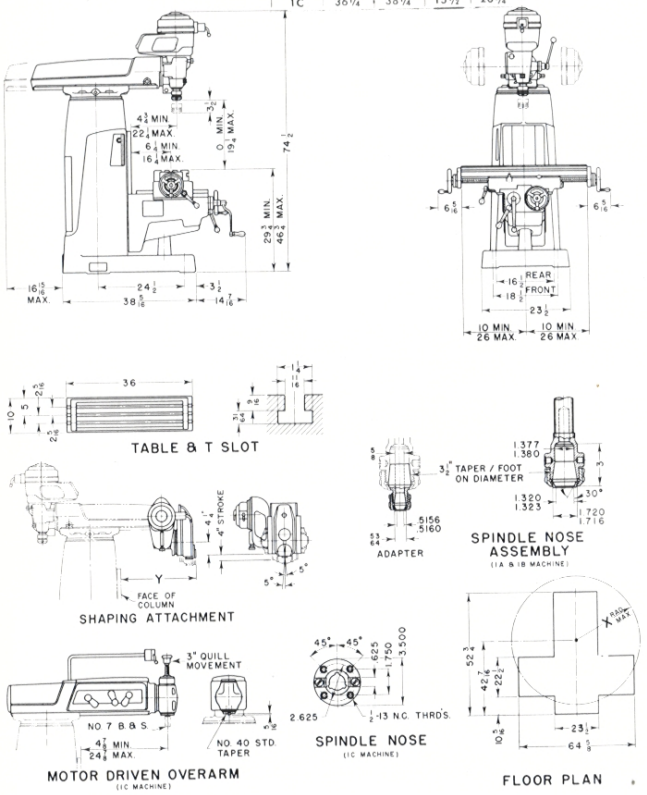


Figure 8
Dimensional Drawing Toolmaster Milling Machine

STANDARD EQUIPMENT

SUPPLIED WITH THE MACHINE

Style 1A

Manual Feed to Quill — Two table-stop dogs with micrometer adjustment.
Spindle Lock — Anti-backlash device on table feed screw.
Complete electrical equipment for 50 or 60 cycle, 2 or 3 phase, 220 to 550 volts AC and wired in accordance with "Machine Tool Electrical Standards" Spindle drive motor, ¾ or 1 hp pancake type.
Set of wrenches.

Style 1B

Power Feed to Quill — Two table-stop dogs with micrometer adjustment.
Spindle Lock — Anti-backlash device on table feed screw.
Complete electrical equipment for 50 or 60 cycle, 2 or 3 phase, 220 to 550 volts AC and wired in accordance with "Machine Tool Electrical Standards" Spindle drive motor, ¾ or 1 hp pancake type.
Power feed to quill, .002″ and .006″ per rev.
Set of wrenches.

Style 1C

Heavy Duty Head — Two table-stop dogs with micrometer adjustment.
Anti-backlash device on table feed screw.
Complete electrical equipment for 50 or 60 cycle, 2 or 3 phase, 220 to 550 volts AC and wired in accordance with "Machine Tool Electrical Standards."
Heavy duty single swivel head with 2 hp built-in motor and eight speeds: 100, 140, 215, 310, 490, 700, 1070 and 1530 rpm.
Set of wrenches.
Draw-in bolt.

INSTALLATION INSTRUCTIONS

To obtain accurate results from a milling machine over a long period of time, three external requirements must be met. First, the foundation upon which the machine sets must be heavy enough to maintain stability and flatness under the weight of the machine. Second, the machine must be firmly anchored in place to the foundation. Third, the machine must be carefully leveled and then checked occasionally to be sure that level is maintained.

Foundation. If the floor upon which the CINCINNATI TOOLMASTER Milling Machine will be located is made of substantial wood or concrete, fairly flat, and sufficiently heavy enough to withstand the weight of the machine, no special foundation will be required. For floors of lesser stability and strength, a foundation should be built up equal to or better than this floor specification.

Lifting the Machine. The Toolmaster machines may be lifted by a crane with a rope or cable sling around the overarm turret (Figure 10). Tighten the turret and overarm clamping bolts before lifting.

Before lifting, adjust the saddle to the rear of the knee to balance the weight.

If wire cables are used to lift the machines, protect the machined surfaces with leather padding or wood blocks.

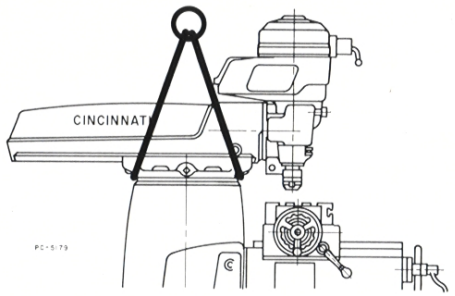


Figure 10
Lifting the Machine

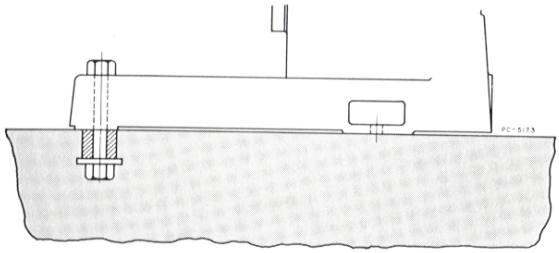


Figure 11
Bolting the Machine to a Concrete Floor

Bolting the Machine to the Floor. When preparing for this operation, notice that center distances of bolt holes given on the "floor plans" are approximated. If the floor is concrete, drill the bolt holes about 6″ in diameter. Insert the hold-down bolt through a 1½″ pipe, as illustrated in Figure 11, and fill the pipe with dry sand. Lower the machine on two 1″ thick boards, and engage the nuts on two or three threads of the bolts. Fill the holes around the pipe with quick drying cement, thin enough to flow easily. When cement is dry, remove boards, level machine, and tighten hold-down nuts.

Leveling. After the machine has been moved to its proper location, it must be carefully leveled. Use an accurate micrometer level for the operation. A carpenter's level or the bulb in a machinist's combination square is not good enough. Drive steel wedges under the corners of the base until the table is level in both directions. Then drive additional wedges under the base to evenly distribute the weight of the machine, and recheck for level. It is necessary, of course, that the machine table and leveling instrument be absolutely clean and free of burrs to obtain the most accurate results.

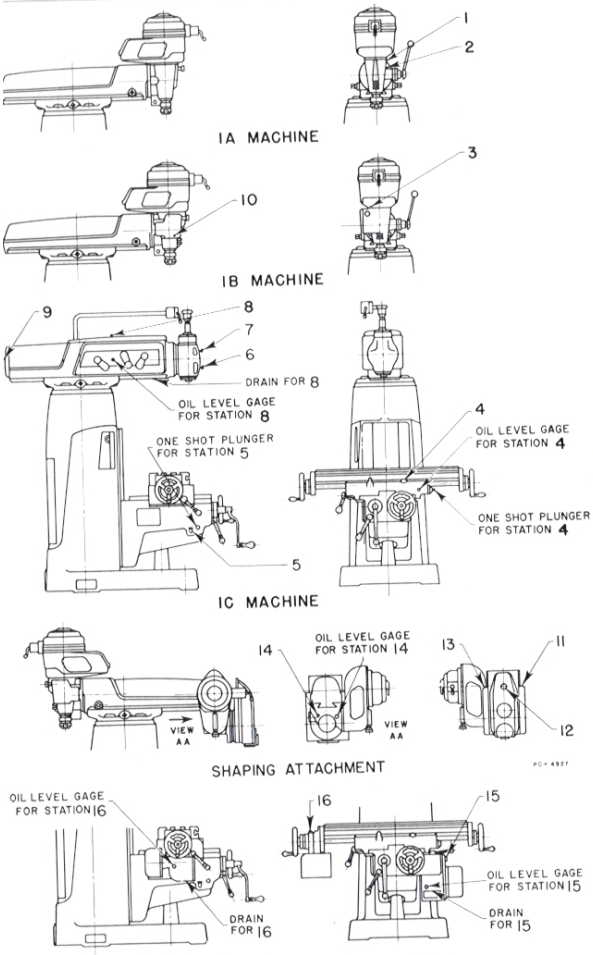


Figure 12 — Lubrication Diagram

Note — Station 5 and plunger may appear on opposite side of knee on earlier models. oil 1-B style head at station 10, swivel head 30 degrees to the right and fill until oil reaches el of hole.

LUBRICATING INSTRUCTIONS AND SPECIFICATIONS

See Lubrication Diagrams, opposite page

Thoroughly oil all moving parts as they are installed. Then lubricate all principal points as listed below before starting machine. Periodic and thorough lubrication with correct lubricant, as specified, will help maintain the long life and accuracy built into machine. The intervals listed are based on a normal eight-hour day.

PURCHASE LUBRICANTS FROM RELIABLE DEALERS!

When to Oil	Station Number	Instructions	Parts Lubricated	Specifications
Daily	1, 2, 3,	Oil with a bench oiler.	Pinion shaft, quill bearing, drive gears to power feed.	P-55. A rust and oxidation inhibited oil. Viscosity 200 – 220 S.U.S. at 100° F.
Twice Daily	11 and 13	Fill with oil can.	Shaping Attachment slide bearings.	P-55. Same as above.
Check Daily	6 and 7	One, only, half turn of cup. Refill as required.	Spindle bearings.	P-43. Lithium base grease having consistency of National Lubricating Grease Institute Nos. 1 or 2.
Low Limit	4	Keep filled above low limit on gage. Use oil pot to fill. Pull out plunger and allow it to return itself (3 times daily).	Saddle-table bearings, saddle-knee bearings, longitudinal screw and nut, cross screw and nut.	P-55. Same as above.
	5	Keep filled to level of opening. Use oil pot to fill. Pull out plunger and allow it to return itself (3 times daily).	Knee-column bearing, elevating screw and nut, elevating screw bearing and spiral gears in elevating mechanism.	P-55. Same as above.
	8, 14, 15, 16	Keep filled above low limit on gage. Use oil pot to fill.	Change gear bracket (heavy duty head), shaping attachment drive bearings, change gear brackets (Power feed to saddle and table).	P-55. Same as above.
Weekly	10	Keep filled to level of opening. Use oil pot to fill.	Quill, — Power Feed Mechanism.	P-55. Same as above.
	12	Inject about ⅓ ounce of grease through nipple with hand gun (2 to 3 shots).	Shaping Attachment — Both ends of pitman arm.	P-37. A calcium base grease having a consistency of National Lubricating Grease Institute Nos. 2 or 3.
Periodically	9	Apply one or two shots with a grease gun.	Spindle motor bearings.	P-43. Same as above.

P-37, P-43 and P-55 are The Cincinnati Milling Machine Co. Specification Numbers.

LUBRICATION

r the machine has been installed in accordance with the information given e "Installation Instructions" and the data sheet which accompany the ma-e, it must be thoroughly lubricated before being placed in operation.

not start the machine until all stations have been filled with the proper unt of correct lubricants, as shown in the specifications, pages 12 and 13.

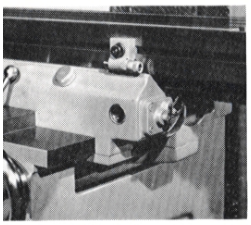


Figure 14
Oil-Shot Plunger

When lubricating the machine, note in particular the saddle-table oil-shot lubrication system, Stations 4 and 5 (page 13). The oil level in this reservoir must be above the low limit at all times. If the oil is completely exhausted, air will get into the system, and it will be necessary to operate the plunger several times to be sure that all the air is eliminated. Pull the handle out to the full length of its ce and allow it to *return itself* to its original position.

ie machine is located in an exceptionally dusty atmosphere, as sometimes id near cutter sharpening machines, the table dovetail, knee-column bearing, saddle-knee bearing should be wiped clean twice a day. After cleaning, apply o the bearing surfaces.

STARTING THE MACHINE FOR THE FIRST TIME

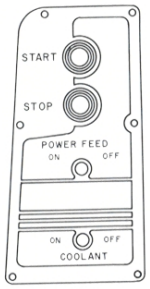


Figure 15A
Push Button Panel

After the machine has been properly installed and lubricated, and the protective slushing oil washed off, it is ready to start. Push start button on push button panel, Figure 15A, to supply power to machine electrics. Turn the starting switch to the "forward" position, momentarily start the motor and immediately notice the direction of rotation of the spindle. With the spindle motor toggle switch in the "forward" position, the spindle should run in a clockwise direction to allow use of "right-hand" milling cutters (Figure 15B). Should the spindle be rotating counter-clockwise, with the switch in the forward position, reverse any two leads of (D-1A) D-2A and D-3A in the electrical circuit to correct this condition (see precautionary measures, page 29).

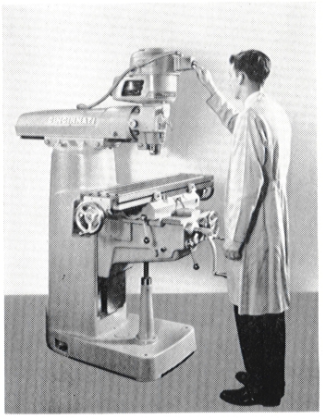


Figure 15B
Starting the Spindle

Run the machine for a half hour or so to insure a protective film of oil over all bearings and apply oil frequently during this period. Do not fill the oil reservoirs while the machine is running.

Note in particular, the saddle-table oil-shot lubrication system, Figure 14. The oil level in this reservoir must be above the low limit at all times. If this unit is allowed to run dry, air will enter the system and it will be necessary to operate the plunger pump several times to expel the air.

Pull the plunger out the full length of its stroke and allow it to coast back or return itself. Do Not Push.

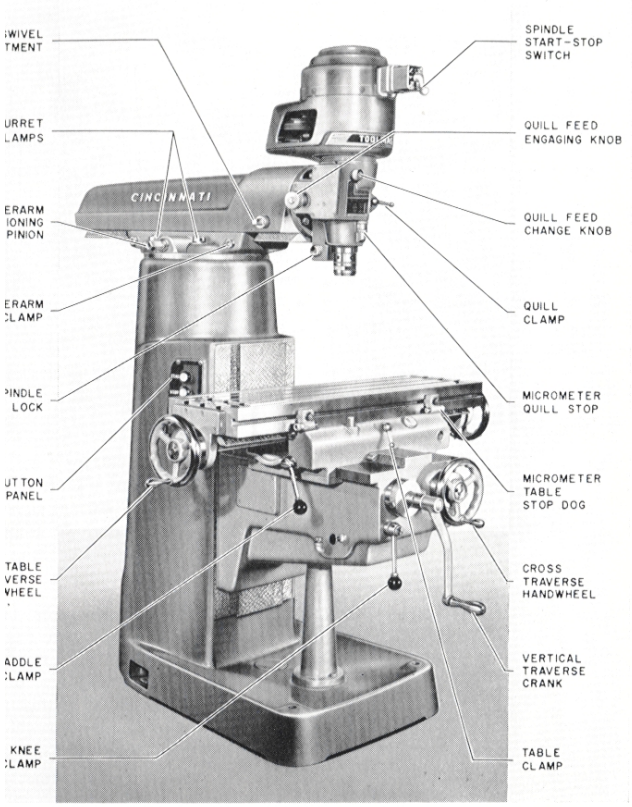


Figure 16
Functional Diagram

OPERATING INSTRUCTIONS

(These instructions, in general, refer to 1A and 1B machines except where otherwise specified.)

Starting the Machine — If machine is equipped with power feed units, place directional feed levers in neutral or stop positions as shown in Figure 17B. If power feed unit is supplied, turn motor toggle switch (on push button panel) to off position. Check belt adjusting knob, Figure 20B, for tightness to insure maximum drive of belts to spindle sheave. Set the spindle motor switch to the off position.

Figure 17A
Push Button Panel

To initiate power to the electrical system, push the master start button on the side of the column. To start the spindle, move the spindle motor switch to the forward position. Control of the spindle's rotation is accomplished from this switch at all times. To stop the spindle drive motor, move the spindle switch to its off position.

Power feed units (table and saddle) are driven independently of the spindle or main electrical system and can be turned off when not in use.

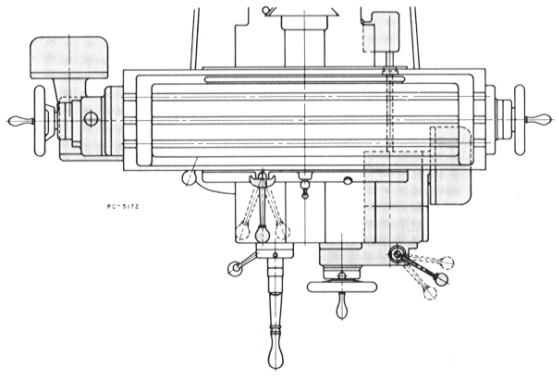


Figure 17B
Engaged and Neutral Positions of Power Feed Levers

:rometer Dials — All of the hand controls, table, cross and vertical, are ipped with adjustable micrometer dials. Any dial may be easily reset by sening the knurled thumb screw on the dial, and rotating it to the desired rking. To position the dial firmly in place, merely retighten the thumb screw.

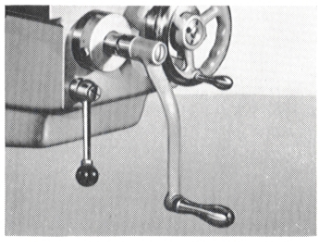


Figure 18A
Vertical Traverse Handwheel

nual Vertical Feed — Figure 18A shows the crank for moving and adjusting knee up or down. One full turn of the crank clockwise will raise the knee) of an inch. The micrometer dial is graduated into 100 equal spaces, re- ing in .001″ movement of the knee for each space.

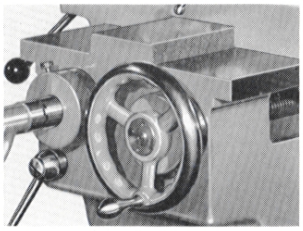


Figure 18B
Cross Traverse Handwheel

nual Cross Feed — The handwheel shown in Figure 18B is for moving the dle by hand across the top of the knee. One turn clockwise of the handwheel ves the saddle .200 of an inch towards the column. The micrometer dial is duated into 200 equal spaces with one space on the dial equivalent to .001″ vement of the saddle.

Manual Table Feed — The handwheel shown in Figure 19A is for positioning the table by hand. One rotation of the handwheel in a clockwise direction will move the table away from the operator .200 of an inch. The micrometer dial is graduated in 200 equal spaces, which is equivalent to .001″ movement of the table for each space.

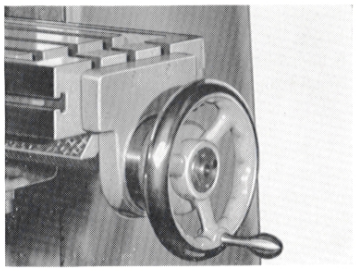


Figure 19A
Table Traverse Handwheel

Manual Feed to Head, 1A — Vertical movement of the quill is controlled by the hand feed lever shown in Figure 19B. The hand feed lever is adjustable and of directional design. Pulling downward on the lever results in the spindle moving in a downward direction. For adjustment, pull out on the hand feed lever for disengagement and engage the clutch teeth to a desired position.

The micrometer quill stop is supplied to enable the operator to accurately adjust or repeat a previous depth setting of the cutter (see micrometer quill stop, page 22). A hand crank, worm and wheel arrangement is provided to position the head for angularity. Merely loosen the four 7/8″ head bolts and rotate the hand crank until the head is indexed to the desired position.

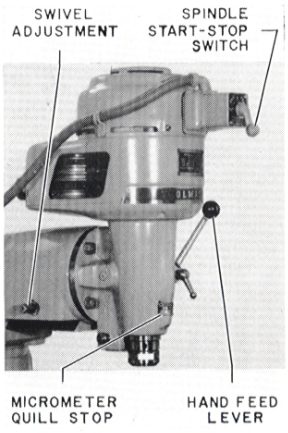


Figure 19B
Manual Feed Head—1A

wer Feed to Head, 1B — Power feed to
: head (available as the 1B style machine)
)btained by turning the quill feed engag-
; knob in a clockwise direction until
ht. When the length of traverse in power
d has traveled to a positive adjusted
p, the feed clutch will "slip," stopping
wnward motion of the quill. Turn the
d engaging knob counter-clockwise to
engage power feed and return the quill
hand.

hen the feed change "HI-LO" knob is in
"out or HI" position, a feed rate of
)6" per revolution is available. When the
d change "HI-LO" knob is in its "in or
)" position, a feed rate of .002" per
/olution is available.

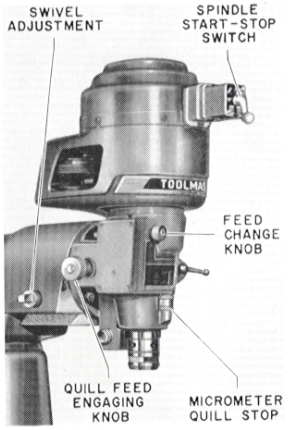


Figure 20A
Power Feed Head — 1B

anging Spindle Speeds — Move the
ndle motor switch to its off position to
)p the spindle motor. Turn the belt
justing knob until the attached pulley
eave is moved forward far enough to
ow sufficient clearance to reposition the
ive belts. Retighten the mechanism to
original setting, adjusting the belts tight
ough to insure maximum driving action
igure 20B).

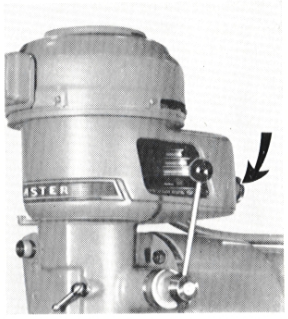


Figure 20B
Adjusting Motor Drive Belts

ie two pulley sheaves at the bottom or
se of the head allow for two belt changes,
., the high and low range drive. The two,
ar stepped pulley sheaves at the top of
e head will provide four changes of belt
sition; four changes of spindle speeds in
e high or low range (Figure 21A). These pulley combinations give you a
oice of eight spindle speeds. In the event the drive to spindle is through a
oth grip belt, it can be separately adjusted by loosening the half nut of clamp
lt on each side of belt housing and pushing housing to rear.

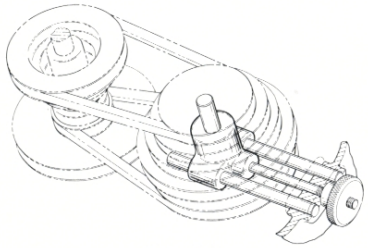


Figure 21A
Simplified Speed Change

SPINDLE SPEEDS

R. P. M. of Motors	Spindle Speed							
	Low Series				High Series			
900	108	185	285	475	650	1125	1700	2825
1200	140	240	375	630	860	1500	2270	3800
1800	215	370	570	950	1300	2250	3400	5650

Changing Spindle Speeds (1C style machine) — Spindle speed change levers provide the necessary means for changing the spindle speeds. Move the spindle pendant switch to the off position. Shift the change levers to their respective positions for the spindle speed desired (see chart). Push the control panel start button to energize the machine electrics. With the speed change levers in position, move the pendant switch to the on position to start the spindle. Do not attempt to change spindle speed while the spindle is running. The spindle motor switch must be in the off position before spindle speeds can be changed. The neutral change lever may only be used to facilitate set-ups.

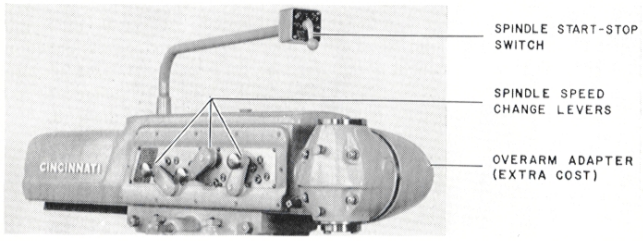


Figure 21B
Heavy Duty Head and Overarm

SPINDLE SPEEDS

Speed Change Levers										
	A	1	2	1	2	1	2	1	2	
	B	2	2	2	2	1	1	1	1	
	C	2	2	1	1	2	2	1	1	N
R. P. M.		100	140	215	310	490	700	1070	1530	N

ll Clamping and Spindle Lock — The
:r shown in Figure 22A is for clamping
quill. To lock or clamp the quill, turn
clamping device in a clockwise direction
il tight.

: spindle lock shown in Figure 22A is
igned to hold the spindle stationary
:n changing cutters. To lock the spindle,
ceed in the following manner:

. Position the quill to the upper limit
)f its vertical range. Turn the spindle
)ck knob counter-clockwise as far as
)ossible.

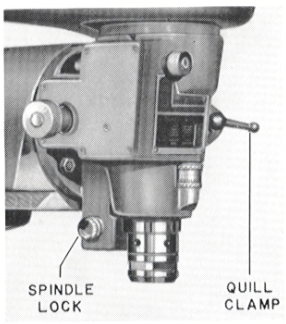


Figure 22A
Quill Clamp and Spindle Lock

. Adjust the quill in its vertical position until the multiple holes around the
pindle are in line with the locking pin. While maintaining slight finger
)ressure on the locking knob, turn the spindle by hand until the lock pin
eats in one of the spindle holes.

crometer Quill Stop — The micrometer dial shown in Figure 22B is for ad-
:ing the length of quill traverse over any portion of the vertical range. Turn
lock nut counter-clockwise to free the adjusting dial. To decrease the length
quill traverse, turn the knurled adjusting dial in a counter-clockwise direction
l lock in place for permanent positioning with the locking nut. One full turn
:he dial is equal to .100 of an inch. The micrometer dial is graduated into 100
ıal spaces, each space being equivalent to .001″ adjustment of the quill.

Figure 22B
Micrometer Positive Quill Stop

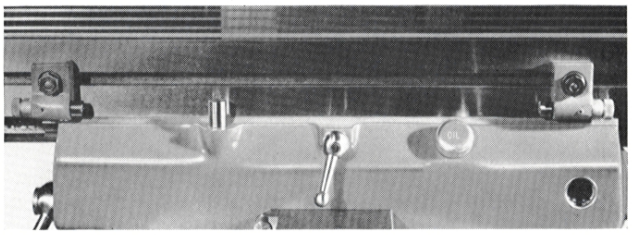


Figure 23A
Micrometer Table Stop Dogs

Micrometer Table Stop Dogs — Micrometer adjusting table stop dogs have been provided to give the operator a positive control over length of table traverse and allow him to accurately repeat or adjust this previous setting. The knurled adjusting thimble is graduated into thousands of an inch each space equivalent to .001″ movement of the stop dog spindle. Be sure ends of stop dog spindle and surface of positive stop pin are clean and free of dirt particles.

Anti-Backlash Device — The device for controlling backlash between the table feed screw and nut is shown in Figure 23B. Although lubrication is more than adequate to these two elements, some wear is inevitable due to the variety of milling set-ups that are possible, particularly that of climb or down milling. This anti-backlash device has incorporated within its design a simple means of adjustment to compensate for any excessive "play." (For adjustment, see page 27.)

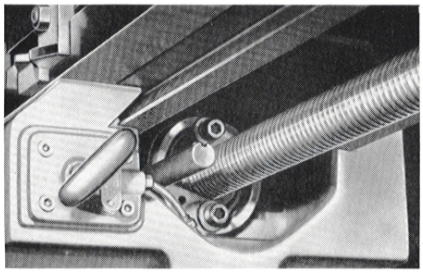


Figure 23B
Anti-Backlash Device

SETTING UP THE MACHINE

ıping Devices for Sliding Units — The table, knee and saddle housings may amped in position by tightening the levers shown in Figure 24. One lever on unit clamps that unit firmly in place. The sole purpose of these clamps is to ly hold the units rigid during the machining operation. For example, if e movement alone is being considered, tighten the knee and saddle clamping ces just prior to actual machining. By clamping these units firmly in place, rigidity of the machine as a whole will be increased and the tendency toward ation and subsequent chatter will correspondingly be reduced.

der no condition is there any justification for using these devices as a method ıdjustment for wear. Such a practice will result in rapid wear in the spots at ch the pressure is applied and the possibility of "pick-up" on bearing surfaces atly increased. Taper gibs are provided with just such adjustment in mind and ıuld be used to compensate for any unit wear. (See gib adjustments, page 25.)

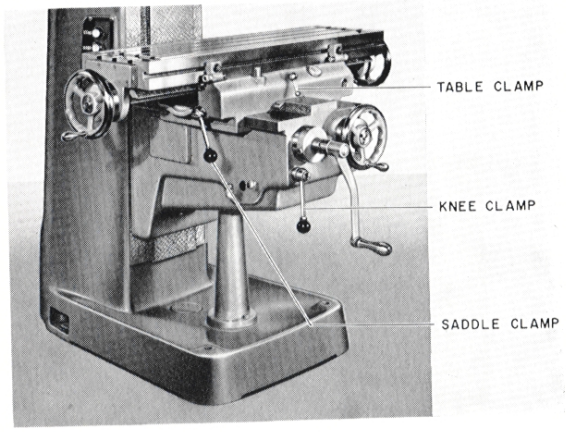


Figure 24
Unit Clamping Devices

Setting Up the Fixtures and Cutters — To avoid excessive wear to gibs caused by extreme overhang of the table, clamp the fixture or workpiece in the center of the table or as near the center as operating conditions will permit. If you are using a lathe dog for holding work, do not, under any condition, use the T-slots of the table for tightening the dog screw. Table T-slots are carefully machined to insure proper alignment of fixtures or work and should these T-slots become excessively marred, a new table must be purchased or the old one reconditioned to obtain accurate results.

Before mounting an end mill in the spindle of this machine, examine the shank and collet to be sure they are free from nicks or dirt particles. Place collet and end mill into spindle housing and tighten spindle nut. (See spindle lock, page 22.) If tapered type collets are used, remove the spindle lock nut and cutter and collet from spindle to facilitate cutter removal. To remove straight shank cutters from spindle, merely loosen spindle lock nut and pull cutter from position.

Overarm and Turret — A hand crank is provided to move the overarm. Two clamping nuts as shown in Figure 16 hold the overarm in place. The turret is swiveled manually and held in place by the clamping nuts shown in Figure 16.

ADJUSTMENTS

Adjusting the Gibs. Headless type taper gibs are provided to compensate for wear of the bearing surfaces between the sliding elements. Keep the bearing surfaces clean to avoid undue wear caused by dirt and grit.

1. See that the power feed engaging lever of the unit containing the gib to be adjusted is in the neutral position.
2. Turn the adjusting screw (Fig. 25) to tighten the gib. Try movement of the unit by hand. Alternately tighten the screw and try by hand until unit is fairly tight, back screw away two turns, and then advance one turn.

When adjustment of the gibs is necessary, they should never be drawn up so tightly as to prohibit free movement of the particular unit by means of the hand crank. Tight adjustment squeezes out the oil film, resulting in rapid wear.

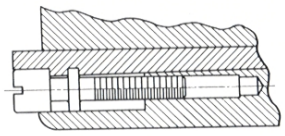
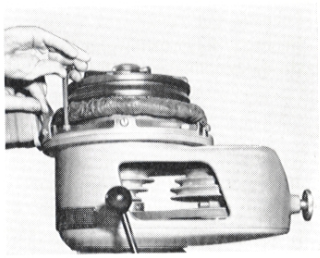


Figure 25
Section Through Headless Type Gib

placing Worn or Broken Belts — To replace worn, stretched or broken belts, vill be necessary to proceed in the following manner:

Figure 26A — Illustration at the left shows the ease with which the motor cover can be removed.

Figure 26B — The ability to remove the motor from its housing with the maximum in convenience is shown below.



Turn the belt adjusting knob until the movable pulley sheave is in its full forward position.

Loosen the slotted holding screws around the cover on spindle motor and lift the cover from the motor housing.

From the top of the spindle motor bracket remove four $\frac{3}{8}$-16 allen head screws which hold the motor in place.

Lift the front of the motor up, until sufficient clearance is available, to slip new belts between sheaves.

Place the new belt in the approximate position desired to avoid any error in limiting clearance necessary for proper assembly.

Tighten the motor in its original position.

Replace the motor cover.

Adjust belts for operating conditions.

Adjusting the Anti-Backlash Device—There should be no need to adjust the anti-backlash device unless previously mis-adjusted or dismantled. If necessary to adjust the device, proceed in the following manner, with the machine stopped.

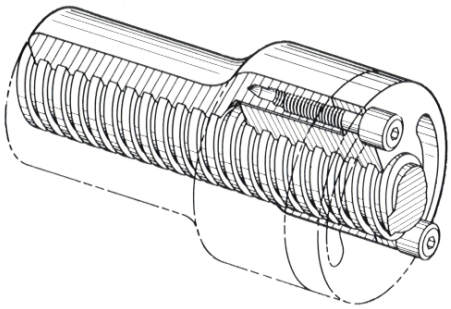


Figure 27
Anti-Backlash Device

1. If the machine is equipped with power feed to the table or saddle, place the feed levers in their neutral position. (Fig. 17B)

2. Loosen the two $\frac{3}{8}$ inch screws, holding the backlash nut in place.

3. Turn the adjusting nut clockwise by hand until the nut bottoms against the housing and lock in place.

4. Turn the table traverse handwheel and try to determine by "feel" whether the device has been adjusted correctly. This nut should not be adjusted so tightly as to make it difficult to move the table, but on the other hand, there should not be a noticeable amount of play in the lead screw.

   Should the adjusting nut be turned through the entire range of its adjustment, remove the two locking screws and place them in the tapped holes that will appear at the opposite ends of the slots.

RECOMMENDED CUTTING FLUID

MCOOL®, made by the Products Division of the Cincinnati Milling Machine ›mpany is a cutting fluid resulting from a mixture of CIMCOOL Concentrate d water. CIMCOOL is recommended because of outstanding advantages, rticularly in reducing heat at the tool point, freedom from rancidity, cleanli- ss, freedom from rust, and absence of vapors, hot chips and slippery film.

›e amount of CIMCOOL Concentrate varies with the nature of the job require- ›nts. The table below lists the starting dilutions of CIMCOOL to use when lling various materials.

RECOMMENDED CIMCOOL MIXES

MATERIAL	AVERAGE MILLING CUTTERS	FORM AND LOW CLEARANCE CUTTERS
ild Steel alleable Iron rought Iron onze	CIMCOOL S–2 1:40	CIMCOOL S–2 1:25
ıst Iron ee note 1)	Cimplus 1:100 CIMCOOL 1:40	CIMCOOL S–2 1:40
ass ft Bronze uminum ee note 2)	CIMCOOL S–2 1:40	CIMCOOL S–2 1:25
ıst Steel ol Steel and other high tensile strength steels	CIMCOOL S–2 1:25	CIMCOOL S–2 1:20

ote 1—Ordinarily cast iron may be milled dry. If the cutter is small and the cut relatively deep, when T-slotting or rounding out key ways, an air blast from the compressed air line will keep e cutter sufficiently cool and will also clear out the chips. If the part deforms from the heat of achining, is too hot to handle, or greater cleanliness and better dust control are desired, use implus or CIMCOOL S–2, the latter being used where greater lubricity is required.

ote 2—Brass, soft bronze and aluminum are normally milled dry. If the part deforms from e heat of machining or is too hot to handle, use CIMCOOL S–2.

IMCOOL may also be used with carbide tipped cutter; however, a large quantity of fluid ıould be supplied to insure uniform cooling and to avoid cracking the carbide tips.

ENERAL INSTRUCTIONS. Never mix CIMCOOL with other cutting fluids. Clean cutting ıid system and tank thoroughly with CIMCOOL machine cleaner before using.

lways add a pre-mixture of CIMCOOL Concentrate and water when replenishing the cutting ıid supply.

/hen making a CIMCOOL mixture if Cimplus is to be added, it should be added to the water rst and CIMCOOL S–2 second. Never should CIMCOOL S–2 and Cimplus be mixed together ı their concentrated form.

PRECAUTIONARY MEASURES

1. Do not start the machine until all the oiling stations have been filled with the proper amount of correct lubricants, as shown in the specifications (page 13).
2. The feed change lever should not be moved unless all feed levers are in their neutral positions.
3. The electrical compartment door should never be removed except by an experienced maintenance man for electrical control repair work.
4. Check the direction of motor rotation by shifting the forward and stop switch in rapid succession. You can use the eraser on the end of a lead pencil to feel the direction of rotation if you can't see it. If the direction of rotation does not agree with a right-hand cutter when running in the forward position, reverse any two of the incoming "line" leads on AC circuits. (See wiring diagram.)

PREVENTIVE MAINTENANCE

1. Establish a schedule for periodic inspection.
2. Check belt tension — if too tight — bearings will soon wear out.
3. Check for proper belt alignment with a straight edge.
4. Be sure motor mounting bolts are tight.

YOU CAN:

1. Check the fuses and disconnect switches to locate possible open circuits. (Consult your electrician.)
2. If overload relays continually interrupt operation:
   (a) Be sure they are not being heated by an outside source of heat, such as the sun.
   (b) Check the load on motors with an ammeter. Overloading can be caused by bad bearings, excessive belt tension or bearings too tight.
3. Isolate the source of trouble by determining which portion of the machine cycle is more apt to be at fault. Trace it back from the functions of the machine.

ACCESSORIES AND ATTACHMENTS

Precision Measuring Equipment

ngitudinal — Cross-rtical — An ideal at-:hment when the per-:tion in precision is sired.

ın be supplied singly in combinations, in-ıding suitable measur-g rods and dial indi-tors.

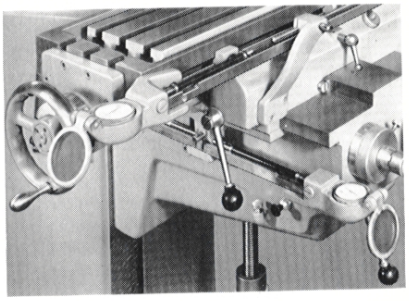


Figure 30
Precision Measuring Equipment

STRAIGHT CYLINDRICAL AND TAPER COLLETS

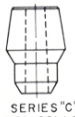
Collet "A" Series	"D" Dim.
1	1/8"
2	3/16"
3	1/4"
4	5/16"
5	3/8"
6	7/16"
7	1/2"

With Collet Adapter

Collet "C" Series	"D" Dim.
1	3/8"
2	7/16"
3	1/2"
4	5/8"
5	3/4"
6	7/8"
7	1

Without Collet Adapter

SERIES "C" AND M/M COLLET



SERIES "C" TAPER COLLET

SERIES "A" COLLET ADAPTER

SERIES "A" COLLET

Collet "C" Series	Taper
158153	#5 Brown & Sharpe
158152	#7 Brown & Sharpe
158151	#2 Morse
158150	#3 Morse

Without Collet Adapter

Collet "C" Series	M/M
1	3
2	4
3	5
4	6
5	7
6	8
7	10
8	13
9	14
10	15
11	16
12	18
13	20
14	22
15	24
16	25
17	26
18	28
19	30
20	32

Without Collet Adapter

PLAIN AND SWIVEL VISES

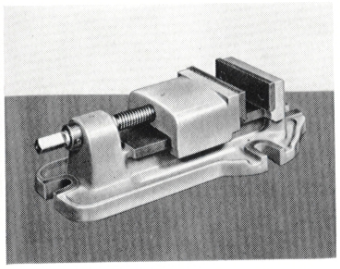


Figure 31A
Plain Vise

The plain vise is illustrated in Fig. 31A. With the exception of a swivel plate under the body, swivel vises are the same as plain vises. When ordering a vise, give width of T-slot in the table of the machine on which it is to be used.

SPECIFICATIONS FOR PLAIN AND SWIVEL VISES

Size	Depth Jaws	Width Jaws	Jaws Open	Overall Height		Net Weight	
				Plain	Swivel	Plain	Swivel
No. 2	1 9/16"	5"	3 1/4"	3 13/16"	5 7/16"	44 lbs.	60 lbs.

UNIVERSAL VISE

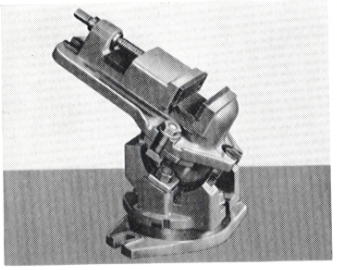


Figure 31B
Toolmakers Universal Vise

The universal vise is illustrated in Fig. 31B. This vise is for general tool room work, easily adjusted and of rigid construction. Can be swiveled in vertical plane up to and including 90 degrees — 360 degrees in a horizontal plane.

SPECIFICATIONS FOR UNIVERSAL VISE

Size	Depth Jaws	Width Jaws	Jaws Open	Overall Height	Net Weight
No. 2	1 9/16"	5"	3 1/4"	10 7/8"	104 lbs.

erarm Adapter—The swivel
ıd will mount on face of the
:rarm or on a 90 degree
ivel housing (overarm adapt-
whichever suits your needs
both swiveling 360 degrees.

e double swivel adapter
own (Figure 32A) is supplied
th the 1-C machine only,
ferent style adapters being
ailable for the 1-A and 1-B
achines. The 1-C swivel head
:orporates a No. 40 Std.
ber—with 3″ quill feed unit—
No. 7B & S. taper is supplied.

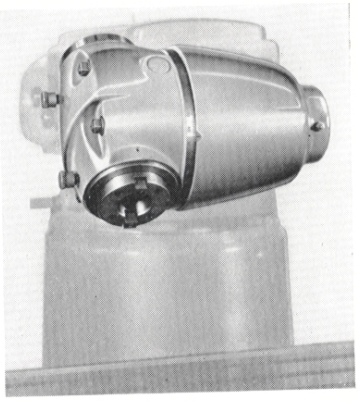


Figure 32A
Overarm Adapter

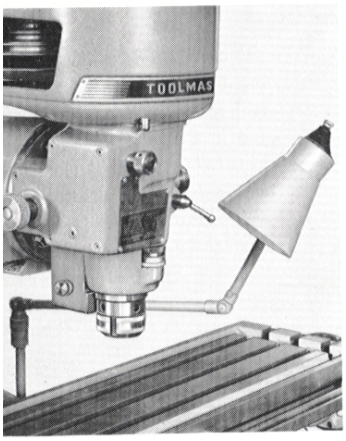


Figure 32B
Cutter Illuminating Attachment

Cutter Illuminating Attachment—Shadows that are cast over work and cutter under normal shop lighting often cause the operator to stare and squint at the work when those "set-ups" mean everything. Not only the danger of costly mistakes is evident, but operator fatigue due to excessive eyestrain is greatly increased.

The cutter illuminating attachment gives the operator a generous "beacon of light" that can be swiveled to any desired position. This attachment is independently controlled — turn it on or off as desired.

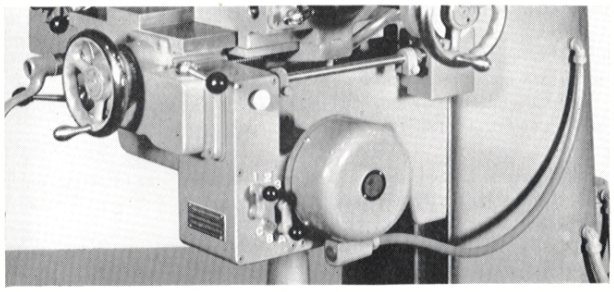


Figure 33A
Power Feed to Saddle

Power Cross Feed — Nine feed rates varying from $\frac{3}{4}$″ to 15″ per minute are standard with this unit enabling the operator to perform semi-production work. Feed changes are accomplished by shifting the feed change levers to the indicated positions shown on the feed chart.

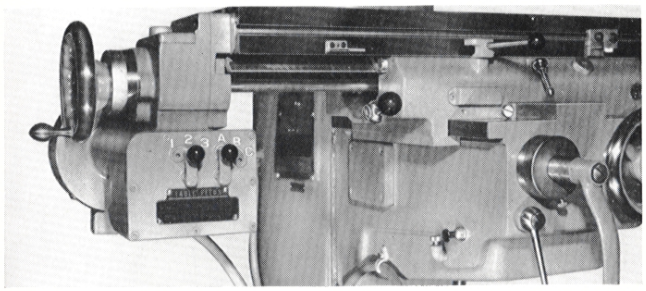


Figure 33B
Power Feed to Table

Power Table Feed — Nine feed rates are available with the unit and can be easily changed by shifting the feed change levers to their indicated positions as shown. Feed rates vary from $\frac{3}{4}$″ to 15″ per minute, a feature giving the Toolmaster a quality of semi-production.

SADDLE AND TABLE FEEDS

Feed Change Levers	1A	1B	1C	2A	2B	2C	3A	3B	3C
Inches Per. Min.	.75	1.1	1.7	2.4	3.4	5.2	6.6	10	15

tting Attachment—This attachment mounts on the back end of the cross-ram l is extremely useful for jobs which require secondary operations of slotting light shaping. The swivel turret permits it to be quickly swung into position ɔve the workpiece on the machine table. Thus a single set-up of the work on : table will suffice for a wide range of operations without requiring additional -ups with subsequent loss of time and chance for error.

e attachment is carried on a single swivel type of mount to permit angular sitioning in a longitudinal plane. The swivel is equipped with a graduated ıle to simplify accurate positioning.

ɨividually motor driven, this attachment has a single vee-belt and pair of -step sheaves to provide six speeds of 46, 67, 87, 123, 177 and 250 strokes per nute with a standard ½ hp, 3 phase, 60 cycle motor.

ıe ram of the attachment is adjustable and can be set for strokes up to a 4 inch ıximum at any angle within 360 degrees. The tool holder can be accurately volved 360 degrees with an angular tool adjustment of 10 degrees. Solid and ıpper box tool holders are included.

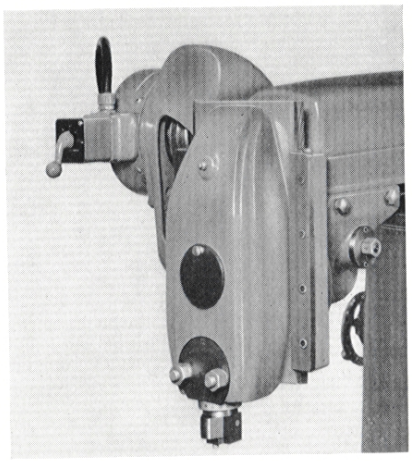


Figure 34
Slotting Attachment

ORDERING REPAIR PARTS

You will receive quicker service when ordering repair parts if you will adhere to the following procedure:

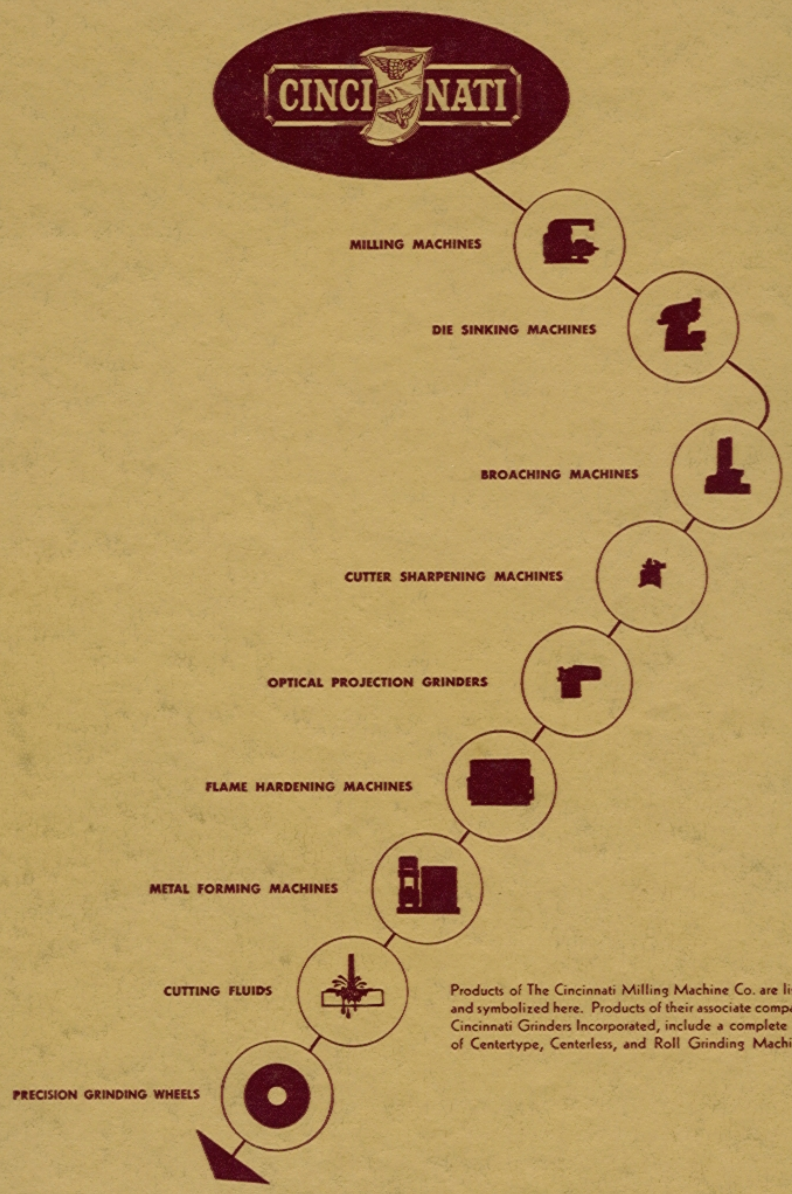
1. **State amount wanted.**

2. **Give part number and name or description of part, and where obtained.**
   (a) Parts catalog.
   (b) Part number stamped on part.
   (c) Prior invoice.

3. **Give complete serial number of machine.** The serial number is stamped on the face of the column.

4. **Specify each individual piece required.** If only certain parts of a unit are required, never use the word "complete"; it always raises the question as to how much of the unit to supply. In some cases, due to the nature of the parts, it will be less costly to you for us to supply additional related pieces, especially if part wanted is obsolete.

5. **Specify how and where to ship.** Do not say "Ship quickest way." Be definite and state the agency desired, that is: — Air Mail, Parcel Post, Special Delivery, Express, Motor Freight, Rail Freight, etc.



Products of The Cincinnati Milling Machine Co. are listed and symbolized here. Products of their associate company, Cincinnati Grinders Incorporated, include a complete line of Centertype, Centerless, and Roll Grinding Machines.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U.S.A.

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