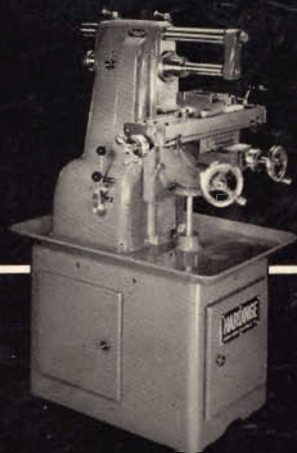


HARDINGE

**Maintenance and
Operation Manual
for
High Speed Precision
Milling Machine**



*Read Instructions Carefully
Before Using Machine*

HARDINGE BROTHERS, INC.
ELMIRA, NEW YORK

OPERATORS' INSTRUCTIONS FOR HARDINGE TOOL ROOM MILLING MACHINE

DESCRIPTION OF DETAILS

UNFOLD ILLUSTRATION, PAGE 15, FOR DETAIL NUMBERS

SPEED PLATE — Detail 1

The speed plate shows the eight different speeds available with the motor belt on indicated pulley steps. For example, if spindle speed of 110 r.p.m. is desired, place the motor belt on the smallest step on the motor step pulley and the largest step on the countershaft step pulley with the "High-Stop-Low" (Detail 2) in the right-hand or "Low" position. The "Forward-Stop-Reverse" (Detail 3) should be placed in either the "Forward" or "Reverse" position, depending upon the direction of rotation wanted.

HIGH-STOP—LOW LEVER — Detail 2

The "High-Stop-Low" lever is connected to a two speed controller located under switch cover (Detail 46). As indicated on the machine, the motor and the spindle will run at "Low" speed with the lever in the extreme right-hand position, at "High" speed if in extreme left-hand position and will stop in "Stop" or middle position.

FORWARD-STOP-REVERSE LEVER — Detail 3

This lever is connected to a switch, mounted on the same panel as the two speed controller and located under the switch cover (Detail 46). The lever has three positions—"Forward", "Stop" and "Reverse". With the lever placed in the left-hand position, the spindle will run forward. If the lever is in the right-hand position, spindle will rotate in the reverse direction. With the lever in the middle or "Stop" position, the spindle will stop. To stop the machine, move either the "High-Stop-Low" lever (Detail 2) or the "Forward-Stop-Reverse" lever (Detail 3) to the center position.

STEP PULLEY GUARD — Detail 4

(Furnished only with machine equipped with power feed for longitudinal table travel.)

The step pulley guard is hinged for ease in changing the power feed belt. The power feed is driven by a vee belt, connecting the spindle inside the column to a shaft carrying a four step pulley. This pulley drives a mating four step pulley which is mounted on a shaft connected to the power feed box through telescopic tubing and shaft. Both of the four step pulleys are under this guard. There are two belts furnished—one vee belt and one round belt. The round belt is to be used as a crossed belt when the direction of feed is to be reversed. For feeds available with belt on different steps, see page 15.

SPINDLE LOCK — Detail 5

The spindle lock consists of a pin with a knurled head. The pin is held in desired position by a spring and a ball.

DRAW SPINDLE — Detail 6

The draw spindle is used to secure the arbor (Detail 11) and collets in position. It has a ball thrust bearing to eliminate undue torque strain on the accurate spindle and has a notched handle. Use draw spindle spanner wrench furnished with machine when tightening or loosening arbor or collets.

OVERARM — Detail 7

The overarm is 2" in diameter and is hardened, ground and lapped to fit the bore in the column. A tapered seat is provided at the front end to securely fasten the overarm bracket (Detail 12). The overarm can be locked at any position by use of the overarm clamps (Detail 8).

OVERARM CLAMPS — Detail 8

The overarm clamps are used to lock the overarm or the vertical milling attachment support at any desired position.

KNEE GIB ADJUSTING SCREW — Detail 9

All gibs are of the taper type. If necessary, adjust knee gib with this screw and lock gib in place with screw at the other end of gib.

SADDLE LOCK HANDLE — Detail 10

This handle locks the saddle securely at any position on the knee.

ARBOR — Detail 11

Arbors are available for cutters having either 7/8" or 1" holes. The arbor has a 5C HARDINGE Collet shank to fit the spindle which is ground to take the 5C HARDINGE Collet or arbor directly, without the use of any adapting arrangement.

OVERARM BRACKET — Detail 12

The overarm bracket provides an enclosed, precision ball bearing support for greater rigidity and to permit higher spindle speeds. The bracket may be attached to or detached from the arbor simply by the use of the overarm clamps (Detail 8). The overarm bracket bearing is greased and sealed and will not require any additional lubrication during its life.

TRANSVERSE FEED SCREW OILER — Detail 13

The transverse feed screw oil cup should be filled once a day with one of the machine oils specified—see oiling instructions pages 7 and 8. Similarly located oilers are also provided for the table screw and vertical feed screw shaft.

TRANSVERSE FEED SCREW DIAL — Detail 14

The large, adjustable transverse feed screw dial is graduated accurately in 100 divisions, each division being .001 of an inch. The dial is 3" in dia-

meter and provided with large figures for easy reading. Similar dials are provided for the longitudinal and vertical feed screws.

LOCK NUT FOR TRANSVERSE FEED SCREW DIAL — Detail 15

The lock nut is adjustable and knurled and its large size makes adjustment a simple operation.

TRANSVERSE HANDWHEEL BUSHING — Detail 16

The transverse handwheel bushing is provided to engage or disengage the transverse handwheel (Detail 17). To engage handwheel, slide bushing towards handwheel—to disengage, slide bushing towards dial. When saddle is in desired position and handwheel is disengaged, the operator may work freely around machine without danger of bumping handwheel and thereby possibly changing the set-up.

TRANSVERSE FEED SCREW HANDWHEEL — Detail 17

The balanced transverse feed screw handwheel with handle affords ease in operation of saddle which has a transverse travel of 5-1/2".

TRANSVERSE FEED SCREW NUT ADJUSTMENT — Detail 18

The double nut for the transverse screw is enclosed in a bracket. Adjustments may be made by removing knee cover (Detail 45) and by turning the lock nut to the left with a 3/16" pin wrench, turning bronze nut to right for adjustment, then locking adjustment by turning lock nut to right.

VERTICAL FEED SCREW HANDWHEEL — Detail 19

The vertical handwheel is also a balanced handwheel with handle and incorporates the same features as the transverse handwheel arrangement.

OIL CUPS FOR VERTICAL SLIDE — Detail 20

One oil cup on each side of the dovetail provides facilities for oiling of the vertical slide. Oil once a day with one of the oils specified in the oiling instructions—see page 7.

KNEE LOCK — Detail 21

The knee lock is a positive lock operated without the aid of wrenches.

VERTICAL FEED SCREW NUT ADJUSTMENT — Detail 22

Turn lock nut to left, then turn bronze vertical feed screw nut to right for tightening adjustment. Lock adjustment by turning lock nut to right.

OIL SUMP — Detail 23

Cast integral with oil pan. If machine is equipped with coolant facilities, oil can be easily changed by opening door in pedestal and removing the plug in the bottom of sump.

COLLET BOARD — Detail 24

The collet board is rigidly fastened to the door of the pedestal. With the door open, all collets can easily be identified. Space is provided for sixteen 5C HARDINGE Precision Collets.

TOOL SHELF — Detail 25

This space provides clean, convenient storage for accessories.

MOTOR BELT ADJUSTMENT — Detail 26

To adjust motor belt, loosen lock nut and raise motor base by using adjusting screw until the motor belt has a deflex of about 1". Start motor and lower motor base by means of adjusting screw until the smoothest running position is found. Tighten lock nut, being sure that adjusting screw is resting on its support.

MOTOR RAISING LEVER — Detail 27

By moving this lever forward, the motor is raised to permit rapid shifting of the motor belt to any one of the four steps on the motor and drive-shaft pulleys. The lever is self-locking in either position.

SPINDLE BELT ADJUSTMENT SCREW — Detail 28

To adjust spindle belt, loosen the two lock screws. Move countershaft down, keeping it level until belt has a deflex of about 1", then tighten the two lock screws.

SADDLE GIB ADJUSTMENT — Detail 29

To adjust saddle gib, loosen saddle gib screw nearest to column and tighten the gib screw on opposite end to required adjustment. Then tighten the gib screw nearest to column.

SWIVEL DRAW BOLTS — Details 30 & 43

(Furnished only with swivel saddle type equipment.)

The two equally spaced draw bolts securely lock the swivel slide in any desired position.

LONGITUDINAL FEED SCREW HANDWHEEL — Detail 31

This balanced handwheel affords easy and rapid feed for longitudinal travel of table. The table travel is 14" with hand feed or 11-1/2" with power feed arrangement.

TABLE STOPS — Details 32 & 38

The two table stops are adjustable in a tee slot along the entire length of the table. They are also provided with screw adjustment for final accurate setting.

TABLE GIB ADJUSTMENT — Detail 33

To adjust table gib, loosen the gib screw on the rear of the saddle and tighten the front screw shown on illustration. When correct adjustment has been made, tighten the rear gib screw.

POWER FEED STOPS — Detail 34

(Furnished only with machine equipped with power feed for longitudinal travel of table.)

The power feed table stops are used only with the power feed attachment and are adjustable along the same slotted groove in table as standard stops (Details 32 & 38).

EXPANSION PLUG — Detail 35

All column castings are drilled for installation of coolant facilities. If coolant equipment is not ordered at the time the machine is ordered, an expansion plug is inserted in hole to prevent the entrance of dirt and other foreign matter.

REAR COLUMN COVER — Detail 36

This cover is removed only when replacing belts.

To replace spindle belts: Remove the draw spindle and arbor from spindle. Loosen countershaft adjusting screw (Detail 28) and remove spindle drive belts from countershaft. Remove rear column cover (Detail 36). Remove locking set screw and dog point screw from spindle drive pulley. Then, remove the three hollow cap screws from the front spindle cap. Then, place small wooden blocks between the face of the pulley and the column casting and tap the rear of spindle with rawhide or wooden mallet to start it from column—then pull spindle assembly complete with bearings out of the column from the front of the machine. Remove original belts from spindle pulley. Apply new belts to pulley. Before reassembling, clean bearing seats in column with a clean cloth and wipe any dirt or foreign matter from spindle assembly. Do not wash the spindle assembly as the bearings are grease packed and washing will dissolve the grease.

OIL CUPS — Detail 37

These oil cups and the one in the back of the table provide for oiling of the longitudinal feed screw nut, the transverse feed screw nut, the table and the carriage slides. Line up the scribed line on the table with the line on the saddle before oiling and leave the table and carriage in this position a few minutes after oiling to allow the oil to reach its destination. Oil every day, using one of the oils specified at the end of these instructions.

TABLE STOP — Detail 38

See Detail 32.

LONGITUDINAL FEED SCREW NUT ADJUSTMENT — Detail 39

Turn lock nut to left with a 3/16" pin wrench. Then turn slotted bronze nut to right until proper adjustment is made. Turn lock nut to right to tighten.

REAR CAP FOR TABLE — Detail 40

On machines with swivel table, this cap is removed when universal spiral index head with gear arrangement is used.

POWER FEED TRIP AND BOX — Details 41 & 42

(Furnished only with machines equipped with power feed for longitudinal travel of table.)

The trip provides an accurate throw-out for the horizontal power feed. The trip automatically returns to proper position when the hinged part of power feed box (Detail 42) is pushed upward. Another feature is the trip handle which provides a handy throw-out for use in case of emergency.

SWIVEL DRAW BOLT — Detail 43

See Detail 30.

TRANSVERSE STOP — Detail 44

An easy-to-set, adjustable stop is provided for transverse table travel. It is also properly located for the convenience of the operator.

KNEE COVER — Detail 45

Remove when adjustments are to be made to transverse screw nut (Detail 18) or for occasional greasing of the bevel gears for the vertical screw.

SWITCH COVER — Detail 46

Enclosing the drum controllers, the switch cover protects the switch parts from dirt and oil. For lubrication of switch contacts and fingers, use only pure vaseline as ordinary grease and oil are non-conductive.

COUNTERSHAFT BEARINGS — Detail 47

The countershaft bearings are supplied with grease for a period of six months of ordinary service. At periodical regreasing, remove the two small round head screws located on the bearing shield and use a tube with a nozzle. Use tubes with a medium grease for best results. Be sure to replace the two screws in each bearing to prevent the entrance of dirt.

MOTOR BEARINGS — Detail 48

The motor bearings are ball bearings and are greased at the factory for a period of six months of ordinary use. Regrease periodically with a medium grease, taking care that not too much grease is used.

BELT TAKE-UP — Detail 49

When all adjustment is used up at Details 26 and 28, there is additional take up at Detail 49. Lower motor plate desired amount by unscrewing each of the two nuts on the bottom of the two eye-bolts; then tighten the two upper nuts.

OILING INSTRUCTIONS

SPINDLE BEARINGS

The spindle bearings are grease-packed and sealed before leaving the factory. They are completely enclosed and do not require any additional lubrication for the life of the bearings.

NOTE: The spindle on a new machine will usually run quite warm for a period of time if run at high speed. This, however, is no cause for concern as it is only surplus grease that is working its way out.

OVERARM BEARING

The overarm bearing is greased and sealed and does not require any additional lubrication for the life of the bearing.

BEVEL GEARS FOR VERTICAL SCREW

The bevel gears are greased at the factory and do not require additional greasing for a long period of time. To inspect or lubricate, remove cover on the side of the knee and use a medium grease.

FEED SCREW BEARINGS

Oil daily, using any one of the recommended oils specified at the end of these instructions. Oil cups are located behind the dials.

FEED SCREW NUTS AND SLIDES

The oil cups on the front and the one on the back of the table provide for oiling of the longitudinal feed screw nut, the transverse feed screw nut, the table and the saddle slides. Line up the scribed line on the table with the line on the saddle before oiling and leave the table in this position a few minutes after oiling to allow the oil to reach its destination. Oil every day, using one of the oils specified at the end of these instructions.

VERTICAL SLIDE

Use oil cups on top of the knee, close to the column. Use one of the oils as specified at the end of these instructions and oil once a day.

COUNTERSHAFT BEARINGS

The countershaft bearings are supplied with sufficient grease for a period of six months of ordinary service. To lubricate, remove the two small round head screws located on the bearing shield and use a grease tube with a nozzle. Use tubes with a medium grease for best results. Be sure to replace the two screws in each bearing to prevent the entrance of dirt or other foreign matter.

MOTOR BEARINGS

The motor bearings are ball bearing and are greased at the factory for a period of six months of ordinary use. Grease periodically with a medium grease, taking care that not too much grease is used.

ELECTRIC CONTROLS

For lubrication of contact points and fingers, use only pure vaseline as ordinary grease and oil are non-conductive.

RECOMMENDED OILS

TRADE DESIGNATION:	SUPPLIED BY:
"Texaco Spindle Oil B"	The Texas Company
"Spinesso No. 38"	Standard Oil Company of New Jersey
"Gulfgem Oil C"	Gulf Refining Company

HARDINGE INDEX CENTERS

SEE ILLUSTRATION ON PAGE 10 FOR DETAIL NUMBERS

SPINDLE LOCK — Detail 1

The spindle should be locked when milling, applying or removing jaw chucks from the spindle, and tightening or loosening the collet draw spindle. Very little pressure is required to lock the spindle rigidly because of the precision character of the head. By locking the spindle, all strain is removed from the index pin and plate.

BODY CLAMP BOLTS — Detail 2

To swing the body to an angular setting, loosen the two socket head clamp bolts and swing the body to the desired setting—then lock by tightening the two screws. To duplicate angular settings, refer to Detail 4.

STOP PLATE CLAMP BOLTS — Detail 3

These bolts clamp the stop plate and should be used as described in Detail 4.

STOP PLATE — Detail 4

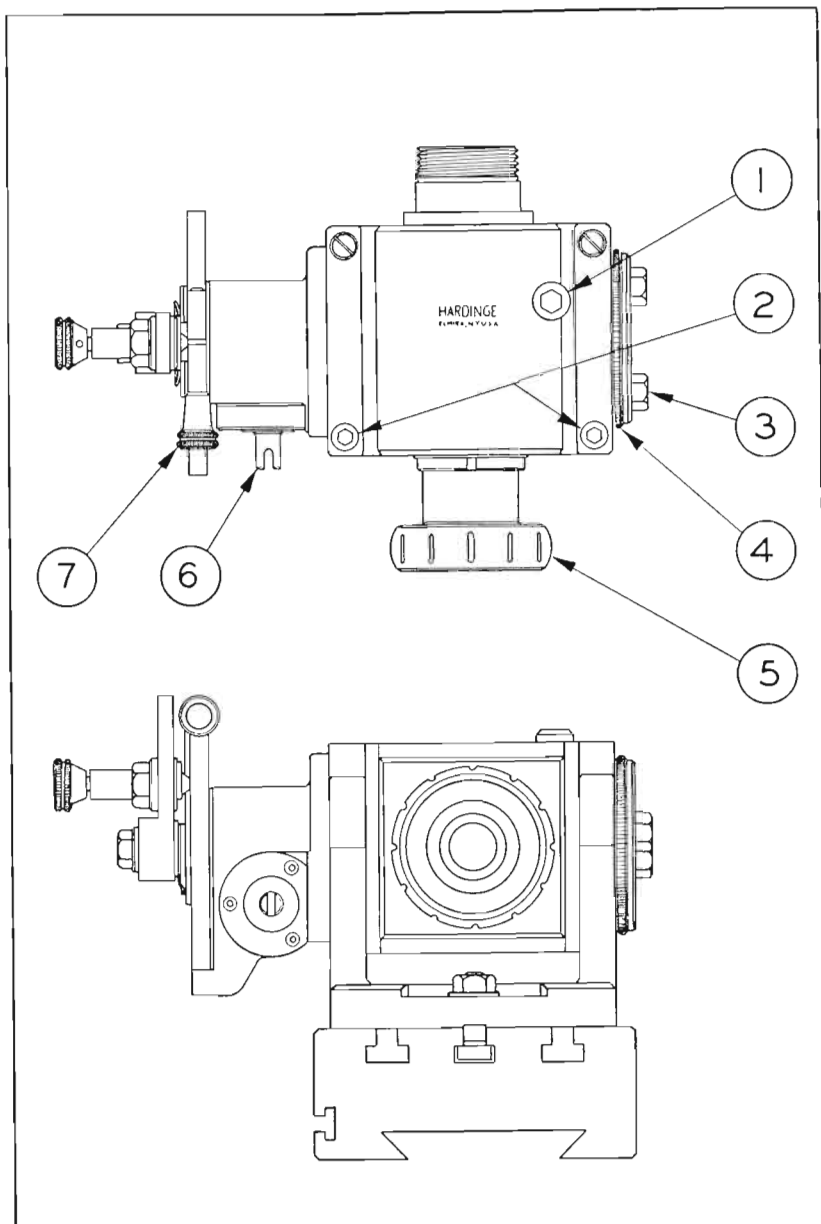
The stop plate is provided for duplicating angular settings of the dividing head. It is used when the work is held in a collet vertically and the head must be swung to the horizontal position to chuck a duplicate piece of work. The first piece of work is milled to the required angularity, then the clamp bolts for the stop plate are loosened and the plate turned against the positive stop. The clamp bolts are then locked.

DRAW SPINDLE HANDLE — Detail 5

The draw spindle handle is used to tighten or loosen the collet. It is made in two parts so that the handle may be removed in order to swing the head to a vertical position and hold work in a collet. The work is chucked in the collet while the dividing head spindle is in the horizontal position. Remove the handle by pulling it straight out quickly after which the head can be swung to a vertical position.

WORM SHAFT — Detail 6

The worm shaft is provided on universal spiral index centers only and is driven from the gear arrangement when milling spirals.

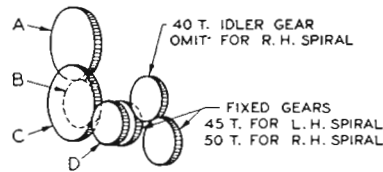


INDEX PLATE CLAMP — Detail 7

Loosen this clamp and remove the clamp ring when changing index plates. To align previously milled surfaces of work held in collet or chuck, loosen the clamp and turn the index plate with crank until work is in proper alignment—then lock index plate with clamp. The clamp ring must be loose when milling spirals with HARDINGE universal spiral index centers.

CAUTION: ALWAYS PLACE INDEX PIN BETWEEN HOLES ON THE INDEX PLATE AND LOCK THE SPINDLE BEFORE TIGHTENING OR LOOSENING COLLETS AND APPLYING OR REMOVING JAW CHUCKS. UNLESS THIS IS DONE, THE ACCURACY OF THE INDEX PLATE AND PIN WILL BE IMPAIRED.

TABLES OF ANGLES AND COMPOUND GEARING FOR CUTTING SPIRALS



DIAMETER OF WORK IN INCHES																					
LEAD	A Over	B Over	C Over	D	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	
.600	30	80	40	100	33 1/4																
.750	30	80	50	100	27 3/4																
.875	35	80	50	100	24 1/4	41 3/4															
.900	30	80	60	100	23 1/2	41															
1.066	40	75	50	100	20 3/4	36 1/2															
1.143	40	70	50	100	19	34 1/2															
1.333	40	60	50	100	16	30 1/4	41 1/2														
1.400	30	60	70	100	15 3/4	29 1/4	40														
1.440	30	50	60	100	14 3/4	28	38 1/2														
1.500	30	60	75	100	14 1/2	27 1/2	35 3/4														
1.680	30	50	70	100	12 3/4	25	34 3/4	43 1/4													
1.800	30	50	75	100	12 1/4	23 1/2	33 3/4	41													
2.100	35	50	60	80	10 1/4	20 1/2	29 1/2	37	43 1/4												
2.560	40	50	60	75	8 3/4	17	24 3/4	31 1/2	37 1/2	43 1/4											
2.740	40	50	60	70	8 1/4	16	23 1/4	29 3/4	35 1/2	40 3/4											
3.000	30	50	100	80	7 1/2	14 3/4	21 1/2	27 1/4	33 1/4	38 3/4	42 1/2										
3.200	30	50	100	75	6 3/4	13 1/4	19 3/4	25 3/4	31 1/4	36	40 1/2	44 1/4									
3.360	60	50	70	100	6 3/4	13	19 1/4	25	30 3/4	35	39 3/4	43									
3.420	30	50	100	70	6 1/2	13	19	24 3/4	29 3/4	34 1/2	38 3/4	42 1/2									
3.500	35	50	100	80	6 1/2	12 3/4	18 3/4	24 1/4	29 1/4	34	38 1/2	42									
3.600	60	50	75	100	6 1/4	12 1/4	18 1/4	23 1/2	28 1/2	33 1/4	37 1/4	41 1/4									
3.720	35	50	80	60	6	11 3/4	17 1/2	23	28	32 1/2	36 1/2	40 1/2									
4.000	60	30	50	100	5 1/2	11	16 1/2	21 1/2	26	30 1/2	34 1/2	38	44 1/2								
4.200	60	40	70	100	5 1/4	10 1/2	15 3/4	20 1/2	25 1/4	29 1/2	33 1/2	37	43 1/4								
4.285	50	35	75	100	5	10 1/4	15 1/4	20 1/4	24 1/4	28 3/4	32 3/4	36 1/4	42 1/2								
4.480	70	50	80	100	5	10	14 3/4	19 3/4	23 3/4	27 3/4	31 3/2	35	41 1/4								
4.500	60	40	75	100	4 3/4	9 3/4	14 3/4	19 1/4	23 3/4	27 3/4	31 3/2	35	41								
4.666	70	30	40	80	4 3/4	9 1/4	14	18 1/2	22 3/4	26 3/4	30 3/4	34	40 1/4								
4.800	75	50	80	100	4 1/2	9	13 1/2	17 3/4	22	25 3/4	29 3/4	33	39	44 1/4							
5.000	75	30	40	80	4 1/2	8 3/4	13 1/4	17 1/2	21 1/2	25 1/4	28 3/4	32 1/4	38	43 1/4							
5.240	60	40	70	80	4 1/4	8 1/4	12 3/4	16 3/4	20 1/2	24	27 3/4	31	37	42							
5.480	60	35	80	100	4 1/4	8 1/4	12 1/4	16 1/4	19 3/4	23 1/4	26 1/2	29 3/4	35 1/2	40 1/2							
5.600	70	40	80	100	4	8	12	15 3/4	19 1/4	22 3/4	26 1/4	29 1/4	35	40	44 1/4						
5.625	60	40	75	80	4	8	11 3/4	15 1/2	19 1/4	22 3/4	26	29 1/4	35	40	44 1/4						
5.830	70	30	50	80	3 3/4	7 3/4	11 1/2	15	18 1/2	22	25 1/4	28 3/4	34	39	43 1/4						
6.000	75	40	80	100	3 3/4	7 1/2	11	14 3/4	18	21 1/4	24 1/2	27 3/4	33 1/4	38 1/4	42 1/2						
6.250	75	30	50	80	3 1/2	7 1/4	10 3/4	14 1/4	17 1/2	20 3/4	23 3/4	26 3/4	32 1/4	37	41 1/4						
6.400	60	30	80	100	3 1/2	7	10 1/2	13 3/4	17	20 1/4	23 1/4	26 1/4	31 1/2	36 1/4	40 3/4	44 1/2					
6.720	70	25	60	100	3 1/4	6 1/2	10	13	16 1/4	19 1/4	22 1/4	25	30 1/4	35	39 1/4	43					

NOTE

The first column shows leads. Second, third, fourth and fifth columns show gearings, while the balance of the columns shows angular far settings of the table for the leads and diameters involved

NOTE
The first column shows leads. Second, third, fourth and fifth columns show gearing, while the balance of the columns shows angular settings of the table for the leads and diameters involved.

DIAMETER OF WORK IN INCHES																						
LEAD	A	B	C	D	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3		
7.200	75	25	60	100	3 1/4	6 1/4	9 1/4	12 1/4	15 1/4	18	21	23 1/2	28 1/2	33 1/4	37 1/4	41	44 1/2					
7.466	70	30	80	100	3	6	9	12	14 3/4	17 1/2	20 1/4	22 3/4	27 3/4	32 1/4	36 1/4	40	43 1/4					
7.680	80	25	60	100	3	5 3/4	8 3/4	11 1/4	14 1/4	17	19 3/4	22 1/4	27	31 1/2	35 1/2	39 1/4	42 1/2					
8.000	75	30	80	100	2 3/4	5 1/2	8 1/2	11	13 3/4	16 1/4	19	21 1/2	26 1/2	30 1/2	34 1/2	38 1/4	41 1/2	44 1/2				
8.400	70	40	60	50	2 3/4	5 1/4	8	10 1/2	13 1/4	15 3/4	18	20 1/2	25	29 1/4	33 1/4	36 3/4	40	43				
8.531	80	25	50	75	2 1/2	5 1/4	8	10 1/2	13	15 1/2	17 3/4	20 1/4	24 3/4	29	32 3/4	36 1/4	39 3/4	42 3/4				
9.000	75	40	60	50	2 1/2	5	7 1/2	10	12 1/2	14 3/4	17	19 1/4	24	28	31 3/4	35 1/4	38 1/2	41 1/4	43 3/4			
9.140	80	25	50	70	2 1/2	5	7 1/4	9 3/4	12 1/4	14 1/2	17 1/2	19	23 1/4	27 1/4	31	34 1/2	37 3/4	40 3/4	43 1/2			
9.333	70	40	80	60	2 1/2	4 3/4	7 1/4	9 1/2	11 3/4	14	16 1/2	18 1/2	23	27	30 1/2	34	37 1/4	40 1/4	43			
9.600	80	40	60	50	2 1/2	4 3/4	7 1/4	9 1/2	11 3/4	14	16	18 1/4	22 1/4	26 1/4	29 3/4	33 1/4	36 1/4	39 1/4	42	44 1/2		
10.000	75	40	80	60	2 1/4	4 1/2	6 3/4	9	11	13 1/2	15 1/4	17 1/2	21 1/2	25 1/4	28 3/4	32 1/4	35 1/4	38 1/4	40 3/4	43 1/4		
10.240	80	25	60	75	2 1/4	4 1/4	6 1/2	8 3/4	10 3/4	13	15	17	21	24 3/4	28 1/4	31 1/2	34 1/2	37 1/2	40 1/4	42 1/2		
10.656	40	60	100	25	2	4	6 1/4	8 1/4	10 1/4	12 1/4	14 1/4	16 1/2	20 1/4	24	27 1/4	30 1/2	33 1/2	36 1/2	39	41 1/2		
10.666	70	35	80	60	2	4	6 1/4	8 1/4	10 1/4	12 1/4	14 1/4	16 1/2	20 1/4	24	27 1/4	30 1/2	33 1/2	36 1/2	39	41 1/2		
10.963	80	35	60	50	2	4	6	8 1/4	10	12	14	16	19 3/4	23 1/4	26 3/4	29 3/4	32 3/4	35 1/2	38 1/4	40 3/4		
10.970	80	25	60	70	2	4	6	8 1/4	10	12	14	16	19 3/4	23 1/4	26 3/4	29 3/4	32 3/4	35 1/2	38 1/4	40 3/4		
11.200	70	40	80	50	2	4	6	8	10	11 3/4	13 3/4	15 3/4	19 3/4	23	26 1/2	29 1/2	32 1/2	35 1/2	38	40 1/4		
11.424	75	35	80	60	2	4	6	7 3/4	9 3/4	11 1/2	13 1/2	15 1/4	19	22 1/2	25 3/4	28 3/4	31 3/4	34 3/4	37	39 1/2		
11.666	70	40	100	60	1 3/4	3 3/4	5 3/4	7 1/2	9 1/2	11 1/4	13 1/4	15 1/4	18 3/4	22	25 1/4	28 1/4	31 1/4	34	36 1/2	39		
12.000	75	40	80	50	1 3/4	3 3/4	5 1/2	7 1/4	9 1/4	11	12 3/4	15	18 1/4	21 1/2	24 3/4	27 3/4	30 3/4	33 3/4	35 3/4	38		
12.495	75	40	100	60	1 3/4	3 1/2	5 1/4	7	9	10 3/4	12 1/2	14	17 1/2	20 3/4	23 3/4	26 3/4	29 1/2	32 1/4	34 3/4	37		
12.800	80	30	60	50	1 3/4	3 1/2	5 1/4	7	8 3/4	10 1/2	12	13 3/4	17	20 1/4	23 1/4	26 1/4	29	31 3/4	34	36 1/2		
13.333	80	40	100	60	1 1/2	3 1/4	5	6 1/2	8 1/4	10	11 1/2	13 1/4	16 1/2	19 1/2	22 1/2	25 1/2	28	30 1/2	33	35 1/2		
14.000	70	40	100	50	1 1/2	3 1/4	4 3/4	6 1/2	8	9 1/2	11 1/4	12 3/4	15 3/4	18 1/2	21 1/2	24 1/4	26 3/4	29 1/4	31 3/4	34		
14.280	75	35	100	60	1 1/2	3 1/4	4 3/4	6 1/4	7 3/4	9 1/4	11	12 1/2	15 1/2	18 1/4	21	23 1/2	26 1/4	28 3/4	31 1/4	33 1/2		
15.000	75	40	100	50	1 1/2	3	4 1/2	6	7 1/2	8 3/4	10 1/2	11 1/2	14 1/2	17 1/4	20 1/4	22 3/4	25 1/4	27 3/4	30	32 1/4		
15.240	80	60	100	35	1 1/2	3	4 1/2	5 3/4	7 1/4	8 3/4	10 1/4	11 1/4	14 1/4	17 1/4	20	22 1/2	25	27 1/4	29 1/4	31 1/4		
16.000	80	40	100	50	1 1/2	2 3/4	4 1/4	5 1/2	7	8 1/4	9 3/4	11 1/4	13 1/4	16 1/4	19	21 1/2	23 1/2	26 1/4	28 1/2	30 1/2		
17.142	75	35	80	40	1 1/4	2 1/2	4	5 1/4	6 1/2	7 3/4	9	10 1/4	13	15 1/2	17 3/4	20 1/4	22 1/4	24 1/4	26 1/4	29		
17.776	80	60	100	30	1 1/4	2 1/2	3 3/4	5	6 1/4	7 3/4	8 3/4	10	12 1/2	14 1/2	17 1/4	19 1/2	21 1/4	23 1/4	26	28		
17.920	70	25	80	50	1 1/4	2 1/2	3 3/4	5	6 1/4	7 1/2	8 3/4	10	12 1/4	14 1/4	17	19 1/4	21 1/4	23 1/4	25 1/4	27 1/4		
18.284	80	35	100	50	1 1/4	2 1/2	3 3/4	5	6	7 1/4	8 1/2	9 3/4	12	14 1/4	16 1/4	19	21 1/4	23 1/4	25 1/4	27 1/4		
19.200	75	25	80	50	1	2 1/4	3 1/4	4 1/2	5 1/2	7	8	9 1/2	11 1/4	13 1/4	16	18 1/4	20 1/4	22 1/4	24	26		
20.000	60	30	100	40	1	2 1/4	3 1/2	4 1/2	5 1/2	6 3/4	7 3/4	9	11 1/4	13 1/4	15 1/4	17 1/2	19 1/2	21 1/2	23 1/4	25 1/4		
21.328	80	50	100	30	1	2 1/4	3 1/4	4 1/4	5 1/4	6 1/4	7 1/4	8 1/2	10 1/2	12 1/4	14 1/2	16 1/4	18 1/4	20 1/4	22	23 3/4		
22.400	80	40	70	25	1	2	3	4	5	6	7	8	10	12	13 1/2	15 1/4	17 1/4	19 1/4	21	22 3/4		
22.856	60	30	100	35	1	2	3	4	5	6	6 3/4	7 3/4	9 3/4	11 1/4	13 1/4	15 1/4	17 1/4	19	20 3/4	22 1/4		
23.333	70	40	100	30	1	2	3	4	5	5 3/4	6 3/4	7 3/4	9 3/4	11 1/4	13 1/4	15 1/4	17	18 3/4	20 1/4	22		
24.000	75	25	80	40	1	2	3	3 3/4	4 3/4	5 1/2	6 1/2	7 1/2	9 1/4	11 1/4	12 3/4	14 3/4	16 1/2	18 1/4	19 3/4	21 1/2		
25.000	75	40	100	30	1	1 3/4	2 3/4	3 1/4	4 1/2	5 1/2	6 1/4	7 1/4	9	10 3/4	12 1/4	14 1/4	15 3/4	17 1/4	19	20 3/4		
25.600	80	25	100	50	1	1 3/4	2 3/4	3 1/4	4 1/4	5 1/4	6 1/4	7	8 3/4	10 1/2	12 1/4	13 3/4	15 1/2	17	18 3/4	20 1/4		
26.660	80	40	100	30	3/4	1 1/4	2 1/4	3 1/4	4 1/4	5	6	6 3/4	8 1/2	10	11 1/4	13 1/4	14 1/4	16 1/2	18	19 1/2		
28.000	70	40	100	25	3/4	1 3/4	2 1/2	3 1/4	4	4 3/4	5 3/4	6 1/2	8	9 1/2	11 1/4	12 3/4	14 1/4	15 3/4	17 1/4	18 3/4		
28.570	75	35	100	30	3/4	1 1/2	2 1/2	3	4	4 3/4	5 1/2	6 1/4	7 3/4	9 1/2	11	12 1/4	14	15 1/4	16 3/4	18 1/4		
30.000	75	40	100	25	3/4	1 1/2	2 1/4	3	3 3/4	4 1/4	5 1/4	6	7 1/4	9 1/4	10 1/2	11 3/4	13 1/4	14 1/4	16	17 1/2		
32.000	80	40	100	25	3/4	1 1/2	2	2 3/4	3 1/2	4 1/4	5	5 1/2	7	8 1/2	9 3/4	11	12 1/2	13 3/4	15 1/4	16 1/2		
34.284	75	35	100	25	3/4	1 1/4	2	2 1/2	3 1/4	4	4 3/4	5 1/4	6 1/4	7 3/4	9	10 1/2	11 3/4	13	14 1/4	15 1/4		
36.569	80	35	100	25	1/2	1 1/4	1 3/4	2 1/2	3	3 3/4	4 1/4	5	6 1/2	7 1/4	8 1/2	9 3/4	11	12	13 1/4	14 1/4		
37.333	70	30	100	25	1/2	1 1/4	1 3/4	2 1/2	3	3 1/2	4 1/4	4 3/4	6	7 1/4	8 1/4	9 1/2	10 3/4	11 3/4	13	14 1/4		
40.000	75	30	100	25	1/2	1	1 1/4	2 1/4	2 3/4	3 1/4	4	4 1/2	5 1/2	6 3/4	7 3/4	9	10	11	12 1/4	13 1/4		
42.656	80	30	100	25	1/2	1	1 1/2	2 1/4	2 3/4	3 1/4	3 3/4	4 1/4	5 1/4	6 1/4	7 1/4	8 1/4	9 1/2	10 1/2	11 1/2	12 1/2		

INDEX TABLE FOR HARDINGE PLAIN OR SPIRAL DIVIDING HEADS
WITH SEVEN INDEX PLATES STARTING SERIAL NO. 001-C AND AFTER.

DIVISIONS	CIRCLE	TURNS	HOLES
2	ANY	2	—
3	39	1	13
4	ANY	1	—
5	20	—	16
6	18	—	12
7	49	—	28
8	20	—	10
9	27	—	12
10	20	—	8
11	66	—	24
12	39	—	13
13	39	—	12
14	49	—	14
15	75	—	20
16	48	—	12
17	17	—	4
18	18	—	4
19	19	—	4
20	20	—	4
21	21	—	4
22	66	—	12
23	23	—	4
24	18	—	3
25	75	—	12
26	39	—	6
27	27	—	4
28	49	—	7
29	29	—	4
30	75	—	10
31	31	—	4
32	48	—	6
33	66	—	8
34	17	—	2
35	70	—	8
36	18	—	2
37	37	—	4
38	19	—	2
39	39	—	4
40	20	—	2
41	41	—	4
42	21	—	2
43	43	—	4
44	66	—	6
45	90	—	8
46	23	—	2
47	47	—	4
48	48	—	4

DIVISIONS	CIRCLE	TURNS	HOLES
49	49	—	4
50	75	—	6
52	39	—	3
54	27	—	2
56	70	—	5
58	29	—	2
60	75	—	5
62	31	—	2
64	48	—	3
66	66	—	4
68	17	—	1
70	70	—	4
72	18	—	1
74	37	—	2
75	75	—	4
76	19	—	1
78	39	—	2
80	20	—	1
82	41	—	2
84	21	—	1
86	43	—	2
88	66	—	3
90	90	—	4
92	23	—	1
94	47	—	2
96	48	—	2
98	49	—	2
100	75	—	3
108	27	—	1
116	29	—	1
120	90	—	3
124	31	—	1
132	66	—	2
140	70	—	2
148	37	—	1
150	75	—	2
156	39	—	1
164	41	—	1
172	43	—	1
180	90	—	2
188	47	—	1
192	48	—	1
196	49	—	1
280	70	—	1
300	75	—	1
360	90	—	1

FEEDS OBTAINABLE WITH POWER FEED ATTACHMENT
ON HARDINGE TOOL ROOM MILLING MACHINE

WORM SHAFT PULLEY

DRIVING PULLEY



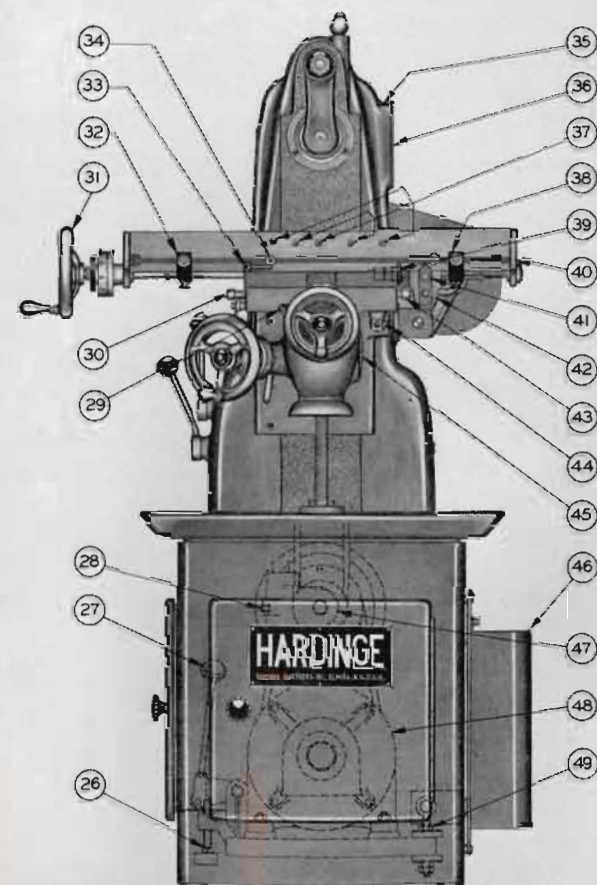
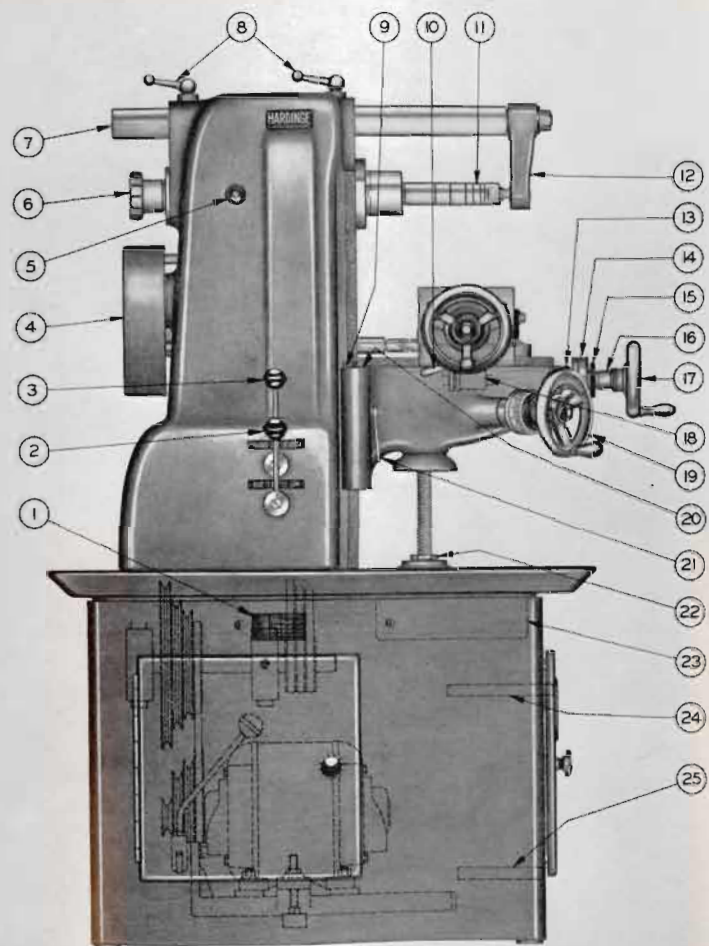
FOR REVERSE FEED, USE CROSSED ROUND BELT

Belt on Driving Pulley Step	Feed in Inches per Rev. of Spindle	FEEDS IN INCHES PER MINUTE AT GIVEN SPINDLE SPEEDS R. P. M.							
		110	220	400	600	800	925	1200	1850
1	.007	.770	1.540	2.800	4.200	5.600	6.475	8.400	12.950
2	.004	.440	.880	1.600	2.400	3.200	3.700	4.800	7.400
3	.002	.220	.440	.800	1.200	1.600	1.850	2.400	3.700
4	.001	.110	.220	.400	.600	.800	.925	1.200	1.850

FOR MACHINES WITH SERIAL NUMBERS AFTER 22296,
USE THE FOLLOWING CHART

		1.100	2.200	4.000	6.000	8.000	9.250	12.000	18.500
1	.010	1.100	2.200	4.000	6.000	8.000	9.250	12.000	18.500
2	.005	.550	1.100	2.000	3.000	4.000	4.625	6.000	9.250
3	.002	.220	.440	.800	1.200	1.600	1.850	2.400	3.700
4	.001	.110	.220	.400	.600	.800	.925	1.200	1.850

HARDINGE BROTHERS, INC., ELMIRA, NEW YORK, U. S. A.



HARDINGE PRECISION TOOL ROOM MILLING MACHINE

