

4 x 9 INCH

Universal Semi-Automatic

THREAD MILLING MACHINE



**OPERATING INSTRUCTIONS
PARTS LIST**

THE HANSON-WHITNEY MACHINE COMPANY

HARTFORD, CONNECTICUT

U. S. A.

4 x 9 INCH

Universal Semi-Automatic

THREAD MILLING MACHINE

OPERATING INSTRUCTIONS — PARTS LIST

KNOW THE MACHINE: A thorough knowledge of the machine is of the utmost importance. Do not attempt to operate it until its various functions are clearly understood. Every precaution has been taken to prevent injury through faulty manipulation, but regardless of this, serious injury may result from improper handling.

It is a high grade accurate production tool. Mechanisms which enter into its construction, while simple, differ somewhat from other machines. Years of severe service have proven that they are absolutely dependable and very durable. With reasonable care, excellent results may be expected, both as regards continued accuracy and durability.

All points regarding which there is a possibility of misunderstanding are reviewed in this pamphlet. The explanations offered, coupled with a careful study of the machine, should make all mechanisms and operating features perfectly clear.

PURPOSE OF THE MACHINE: The purpose of this machine is the milling of threads in one revolution of work. Internal and external threads, either right or left hand, any length within capacity of machine, are handled in this way.

MULTIPLE CUTTER: A multiple thread milling cutter is used. The cutter in all cases must be at least one pitch longer than length of thread to be milled.

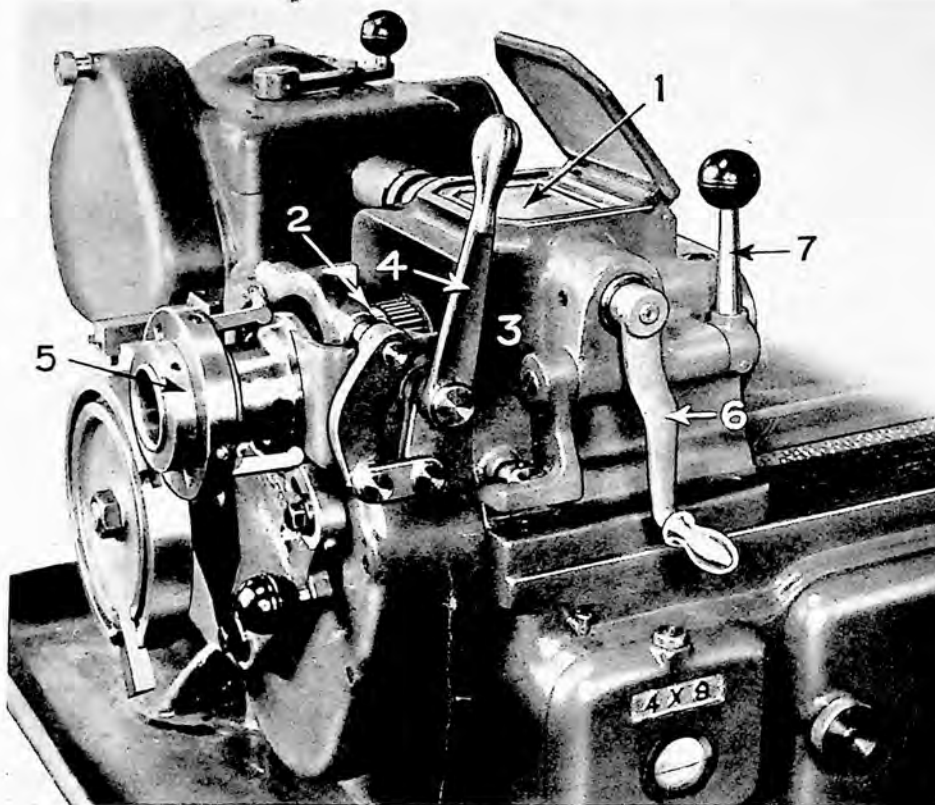
SEMI-AUTOMATIC: In operation, machine functions automatically with exception of loading work. The automatic cycle of operations consists of travelling carriage from loading to working position; advancing cutter to depth of thread, where it remains during one revolution of work; removing cutter from work and returning carriage to loading position. Carriage is advanced one thread during cutting period which gives required lead to thread. All non-cutting travel of carriage and cutter head is through rapid traverse.

Serial 405

4 x 9 inch

THE HANSON-WHITNEY MACHINE COMPANY

HARTFORD, CONNECTICUT



WORK HEAD DETAILS

WORK HEAD: Oil Reservoir (1) should be filled twice daily. This furnishes lubrication for internal parts of head and also provides oil bath for worm and worm wheel.

End play of spindle is controlled through Adjusting Nut (2). Test adjustment occasionally, as end play in spindle is directly conducive to defective work.

Adjustment of Main Spindle Bearing is accomplished by removing the required amount from seat surface of Half Box (3). This must be done with care. Correct adjustment permits box bolts to be set firmly without binding spindle, as slight freedom between spindle and bearing surface must be allowed for lubrication. This adjustment should be necessary only after several years usage.

Lever (4) operates collet mechanism. Adjusting Nut (5) controls tension on closing device. Crank Handle (6) operates work spindle by hand for setting purposes. Lever (7) engages power feed for automatic operating cycle.

End of spindle has hardened and ground tapered seat for accommodating appliances. Hardened seat projects beyond spindle flange for locating fixtures.

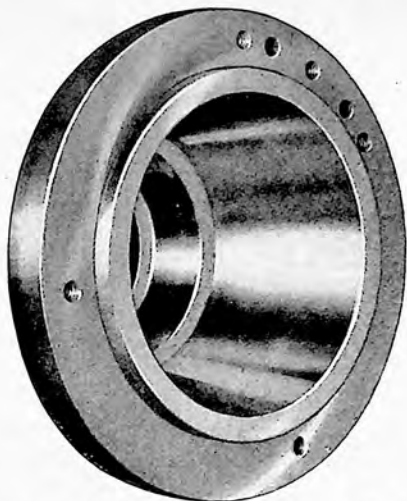
MASTER COLLET: Acts as holder for four hardened and ground

jaws. Jaws come into direct contact with tapered seat in spindle, consequently as collet is drawn back, closing action of jaws is parallel. A very accurate, powerful collet, giving uniform pressure on work entire length of jaws, is obtained with this construction.

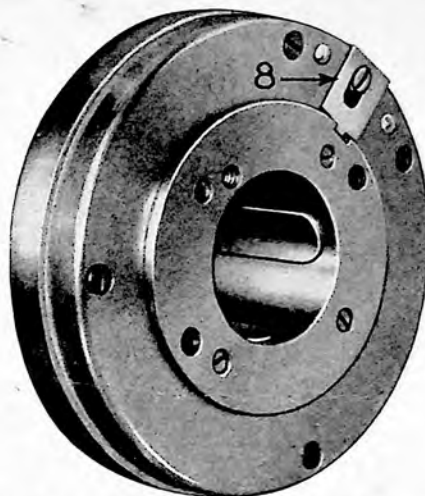
Master Collet has 2 inch capacity. Reducing Bushings are used for intermediate sizes. Long work up to capacity of 2 inch collet can be passed through spindle.

In assembling to machine, screw collet onto draw-back plunger as far as possible and then lock with Pawl (8) shown on Page (3). Lock prevents collet from changing its position in spindle and adjustment for pressure will remain constant until intentionally altered.

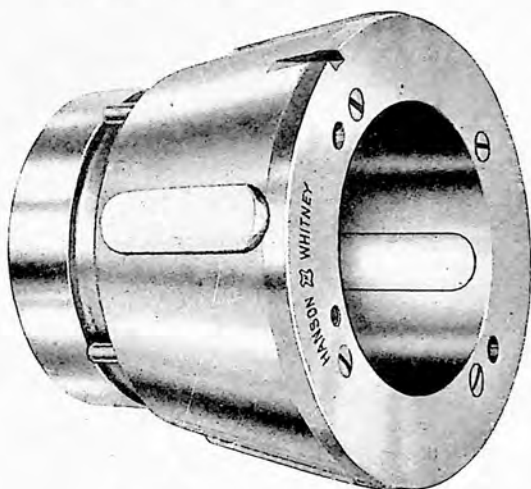
CENTER CHUCK: WORK DRIVER AND CENTER: In cases where it is desirable to hold work on centers, either a Center Chuck or Work Driver and Center shown on opposite page can be used. Both of these appliances provide the necessary head center together with dependable work driving means. They are held in spindle by collet mechanism in the same manner as master collet. Driving jaws in Center Chuck are full floating. Work Driver and Center permit the use of lathe dogs for work driving, a suitable adjustable driving block being provided for this purpose.



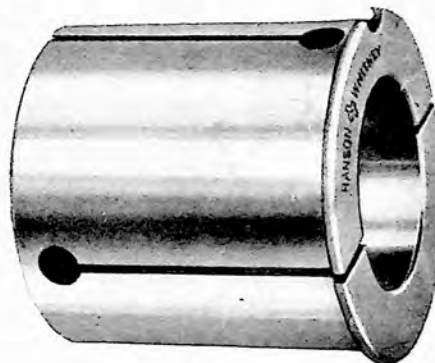
SPINDLE END, Showing Hardened Seat



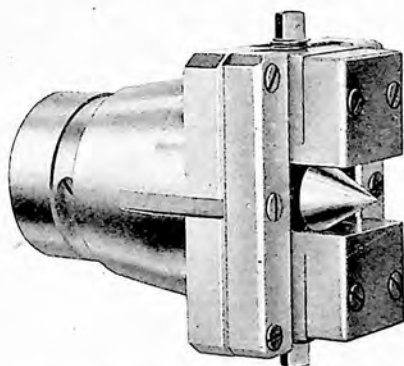
SPINDLE END, Lock Ring and Master Collet in Position



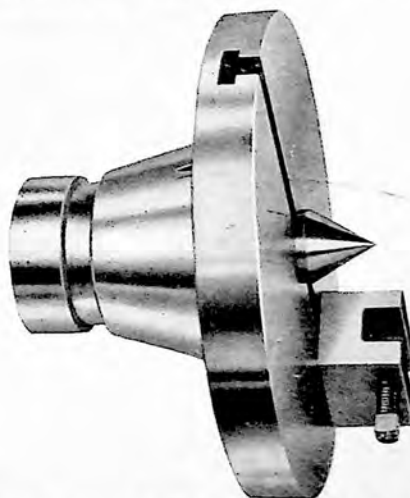
MASTER COLLET, 2 inch capacity



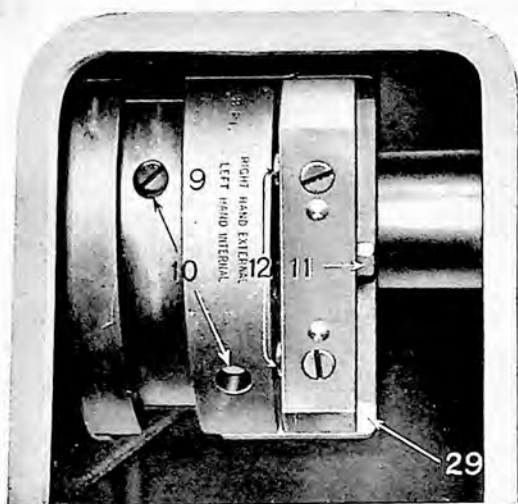
REDUCING BUSHINGS, for intermediate sizes



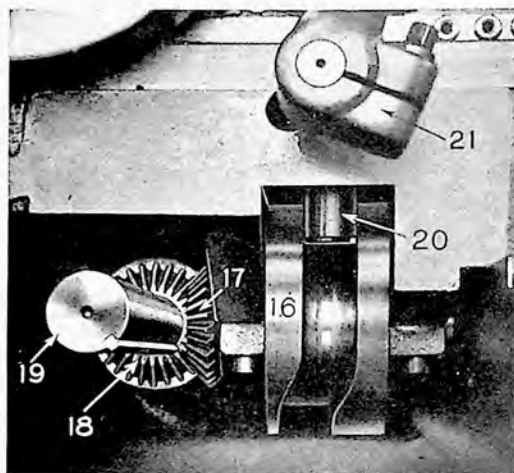
CENTER CHUCK, 1½ inch capacity



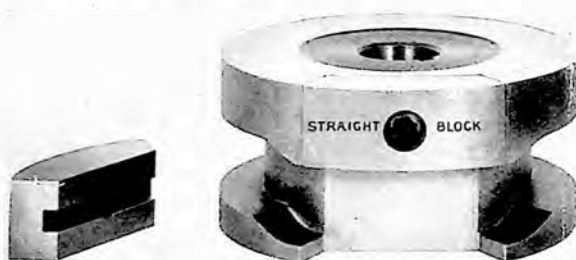
WORK DRIVER AND CENTER, 6 inch diameter



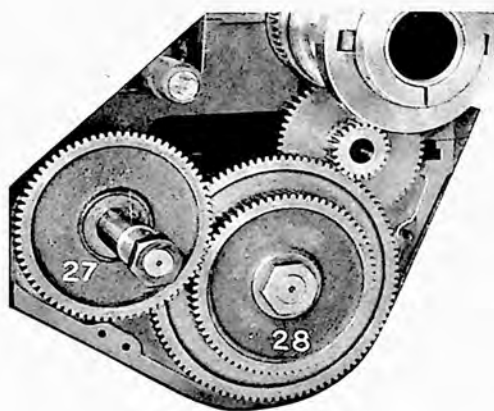
Longitudinal Cam Details



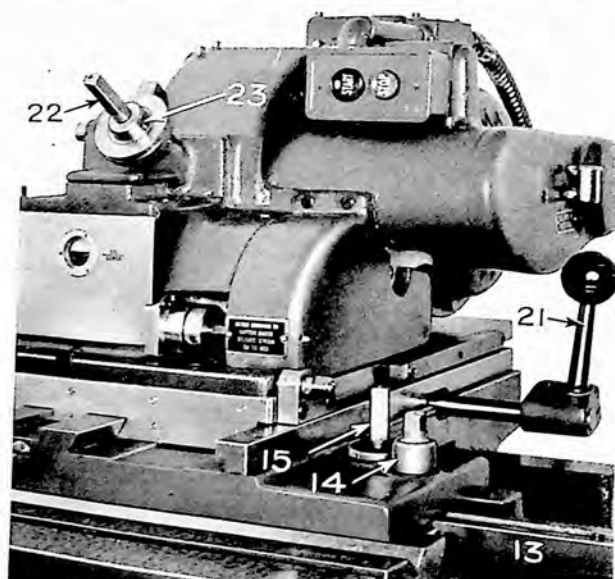
Transverse Cam Details



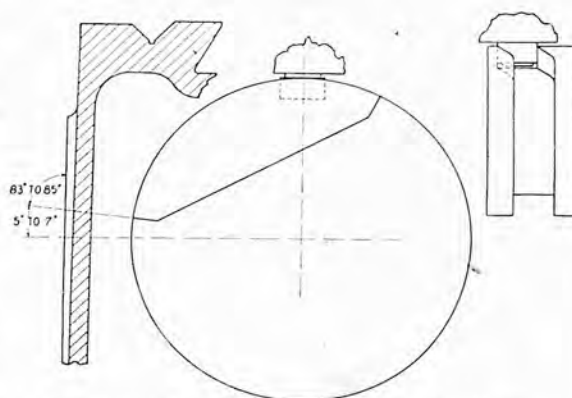
Transverse Cam Showing Cam Block. Straight and Taper Threading Require Different Blocks



Spur Timing Gears



Carriage Adjustment Details



Position of Cams When Timing Gears Are Meshed

CARRIAGE TRAVEL: Both longitudinally and transverse is governed by cams. In some particulars cams function alike. They are driven from head spindle through gearing. During complete automatic cycle of operations work spindle rotates six times, and during this period cams rotate but once. Both convey rapid traverse to all movements during non-cutting periods.

LONGITUDINAL CAM: Is mounted within bed and is accessible through door at front. Section of cam which functions during actual cutting period governs lead of thread, and must advance carriage one pitch. This section is therefore replaceable to suit pitch required.

Cam Section (9) is disassembled by removing screws (10) and bolt (11). In assembling Cam Section, it is important that it rest against stops (12). Bolt (11), which maintains this relation, must be firmly set before Screws (10) are permanently tightened. Failure to properly locate cam against stops results in defective lead being produced in product.

A cam section for right hand external threads also serves for left hand internal threads and vice versa.

Maximum Lead that can be milled, Right Hand External or Left Hand Internal 1/5 inch. Right Hand Internal or Left Hand External 1/5 inch.

Complete throw of regular cam is 3". Cam with 4 1/2" throw can also be furnished for work which requires this additional travel.

Carriage is connected with cam through Rack (13) to which is attached cam roll. Rack is clamped to carriage through Binder (14). Carriage adjustment for position is accomplished by releasing Binder (14) and rotating Pinion (15).

TRANSVERSE CAM: (16) is located under carriage. It is driven by Bevel Gears (17) and (18) through Driving Shaft (19). Connection to Cutter Head Slide is through Roll and Stud (20) which is attached to Cross Feed Nut. Cross Feed Nut is clamped to Cutter Head Slide by Binder (21).

Complete throw of Regular Cam is .150 inch. Cams can be furnished with throws 1/16 and 9/16 inch for special conditions.

In the milling of Straight or Taper Threads the cam requirements are not exactly the same. In Taper Milling provision must be made in the cam to compensate for the taper. To accomplish this, that portion of the cam which functions during the actual cutting period is made a removable section, known as a Cam Block. Straight milling requires a Straight Block and taper milling a Taper Block. This permits the same cam being used for either straight or taper milling by using the proper block. Regular equipment includes Straight Block only.

Throw of cam is constant but position of Cutter Head Slide in relation to cam can be varied. This is controlled through Feed Shaft (22) which is connected to Cross Feed Screw through Bevel Gears.

More complete instructions regarding handling of transverse adjustment are given on Page (11) under heading Setting Machine.

If for any reason, Cam (16) or Gears (17) and (18) are to be

removed, Carriage is travelled through Pinion (15) until these parts project beyond the bed and become accessible for removal.

To disassemble Cross Feed Nut and Cam Roll, remove Binder (21). Remove Collar (24) and Screw Bearing (25) shown on Page (6). Feed Shaft (22) can then be slipped out from rear by removing Collar (23). Cross Slide (26) shown on Page (6) can then be pushed forward by hand until Cross Feed Nut and Cam Roll are exposed.

TIMING OF CAMS: The Two cams are timed in relation to each other and this feature is of vital importance. There is seldom occasion for disturbing timing, but should this become necessary, the re-timing must be correctly accomplished, otherwise the machine will not function properly.

Timing is controlled through Bevel Gears (17) and (18) and Spur Gears (27) and (28). These gears are marked so that they can be replaced in a known position which makes timing operation simple if original gears are still available. The tooth of one gear and a space of the other is marked with a zero and these must mate.

If original timing gears are to be replaced with new ones, the following method must be adhered to:

Assemble Bevel Timing Gears (17) and (18). These are always marked with zeros and should be assembled mated.

Spur Timing Gear (28) is mounted on Longitudinal Cam Shaft. This can be assembled and disregarded for the moment.

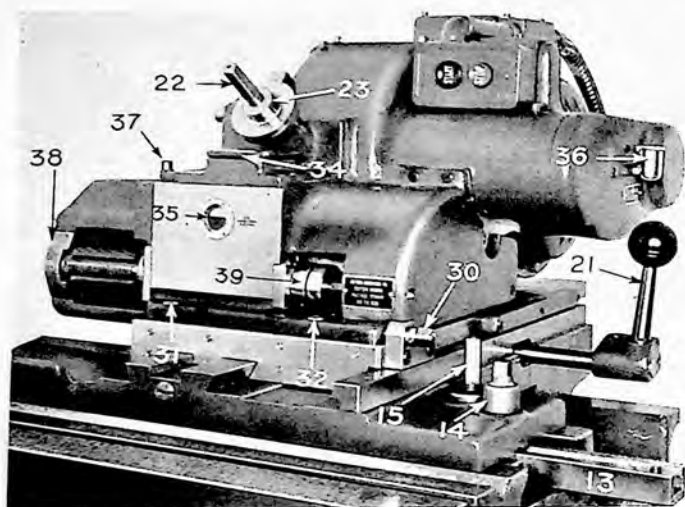
Spur Timing Gear (27) is mounted on Transverse Cam Shaft. It is attached to shaft by a taper pin. Hub of gear must be drilled for taper pin and its location must be carefully determined so as to align with hole in shaft. The position of pin in relation to gear teeth need not be considered. Pin must fit both members and hole can be reamed to accommodate a larger pin if necessary. Shaft can be removed from machine during this operation. Be certain that pin is in place firmly.

In returning Shaft together with Gear (27) to machine, allow gear to project beyond Gear (28), so that gears together with cam shafts, can be rotated for position by hand.

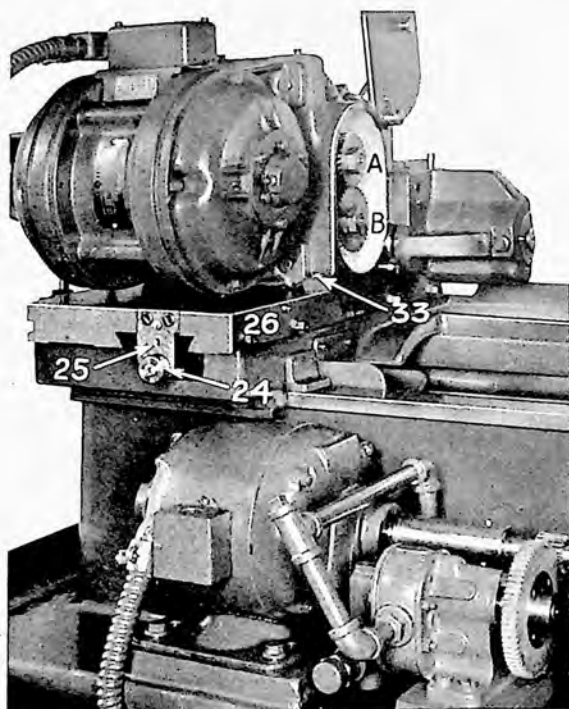
Rotate Gear (27) in right hand direction until Transverse Cam has advanced Cutter Head to maximum forward position. Place an indicator against face of Cutter Head and adjust indicator to zero. Rotate Gear (27) in left hand direction until Cutter Head recedes a few thousandths. Again rotate Gear (27) in right hand direction until indicator reads at zero. Allow this setting to remain undisturbed.

The object is to locate Transverse Cam Roll at the beginning of high cam dwell as shown on sketch. Cam dwell referred to retains Cutter Head in forward position during actual cutting period and is therefore rather long.

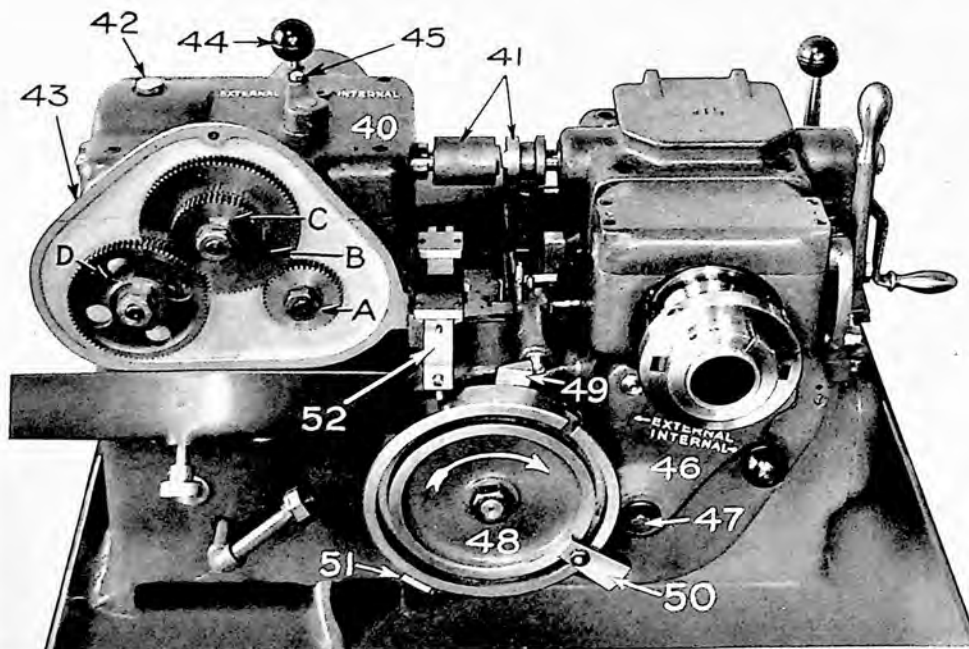
Rotate Gear (28) until Surface (29) on Longitudinal Cam is between 5 and 7 degrees above center as shown on sketch. Gears (27) and (28) can now be meshed. The slight radial adjustment necessary to permit meshing is accomplished through Gear (28). Be certain that radial position of Gear (27) is not disturbed and that Surface (29) remains within 5 to 7 degrees above center, after operation is completed. Mark Gears (27) and (28) with zeros to permit mating without the necessity of this timing operation.



Cutter Head Front View



View Showing Method of Mounting Motors for Cutter Head and Work Head Drives, also Pump and Pump Drive



Work Head Feed and Drive Details

CUTTER HEAD is an integral unit mounted directly on the cross slide. Proper location is maintained by a Central Stud fixed in bottom of head which engages a mating seat in the slide. The head pivots on this stud and four screws bind it stationary with the slide.

This construction permits slight radial adjustment of head for setting cutter parallel with work. Adjustment is accomplished through Adjusting Screw (30) after front Binding Screws (31, 32) and rear Binding Screw (33) have been released.

To remove head from machine, Feed Shaft (22) must first be removed. To accomplish this, disassemble Collar (24) and Screw Bearing (25), after which Feed Shaft (22) can be slipped out from rear by removing Collar (23). Remove Adjusting Screw (30) and the four Binding Screws. Head can now be removed but should be lifted carefully until free of stud on which it pivots.

CUTTER HEAD DRIVE: Cutter Head is independently driven by constant speed motor through spiral gearing. Motor is attached directly to back of head in a manner that combines both drive and head into one integral unit. Power from motor to gearing is transmitted through fully enclosed, silent chain drive.

CUTTER SPEEDS: Speed changes are controlled through Change Gearing (A and B). Six change gears comprise the set as follows: 18-24-29-37-42 and 48 teeth. Cutter Speed Table is shown on Page (9). This table records feet per minute for various diameter cutters.

LUBRICATION, CUTTER HEAD AND DRIVE: The inside of head forms an oil reservoir from which all internal parts of head are lubricated with the exception of four ball bearings. These are hand lubricated through oil cups in top of head. Oil reservoir is supplied through Oil Well (34). Proper oil level is indicated on Oil Gage (35). A higher level results in oil being wasted. Oil level should not be permitted to drop below observation glass on oil gage.

Oil Cup (36) lubricates silent chain. It should be filled twice daily.

Oil Cup (37) on Arbor Support is important. This lubricates Arbor Support Bearing (38). This bearing is very durable when properly lubricated. Improper lubrication results in excessive wear, in which case bushing must be replaced, as defective support is very injurious to cutter.

CUTTER SPINDLE ADJUSTMENT: End play in cutter spindle should not be tolerated. It is directly conducive to defective work and furthermore is very injurious to cutter. Adjustment is accomplished through Split Nut (39). This adjustment should be carefully tested at certain intervals.

WORK HEAD DRIVE: Work Spindle is driven by worm and worm gear. The power is transmitted from Feed Box (40) to work spindle through Clutches (41).

Spindle in turn drives both longitudinal and transverse cam

shafts. Feed changes therefore affect both spindle and cams alike.

Reverse and Rapid Traverse Mechanism also form a part of the Feed Box. Rapid Traverse remains constant irrespective of feed.

Feed changes are controlled in Feed Box by Change Gears. Fourteen gears comprise the set as follows: 32-38-43-44-50-57-64-64-71-78-85-88-90 and 96 teeth.

Table of Feeds is shown on Page (9). Correct locations for gears are noted as A-B-C-D.

FEED BOX LUBRICATION: Feed Box is provided with Force Feed Lubrication throughout the entire unit. The interior of box forms a reservoir which is filled by removing Screw (42). Oil Gage (43) indicates proper oil level. A higher level results in oil being wasted. Oil should not be permitted to drop below observation glass on oil gage. Force Feed System of lubrication is further illustrated and described on Page (8).

EXTERNAL AND INTERNAL THREADING: In changing from external to internal threading, spindle rotation is reversed. Cams rotate in one direction only.

Direction of spindle rotation is controlled from feed box through Lever (44). Two stations in box. External and Internal are clearly marked. Lever (44) engages either station and is locked in position by Bolt (45).

Swivel (46) also controls external and internal threading and its position must correspond with Lever (44). Swivel is held in place by two bolts, the Lower Bolt (47) serving as a pivot. By releasing bolts, swivel can be adjusted radially either to external or internal position. Adjustment of swivel for the desired position must be in direction of arrow, as indicated on swivel.

RIGHT AND LEFT HAND THREADING: The milling of Right and Left Hand threads should not be confused with the procedure required for External and Internal milling. Right or Left Hand milling is controlled entirely by the Lead Cam.

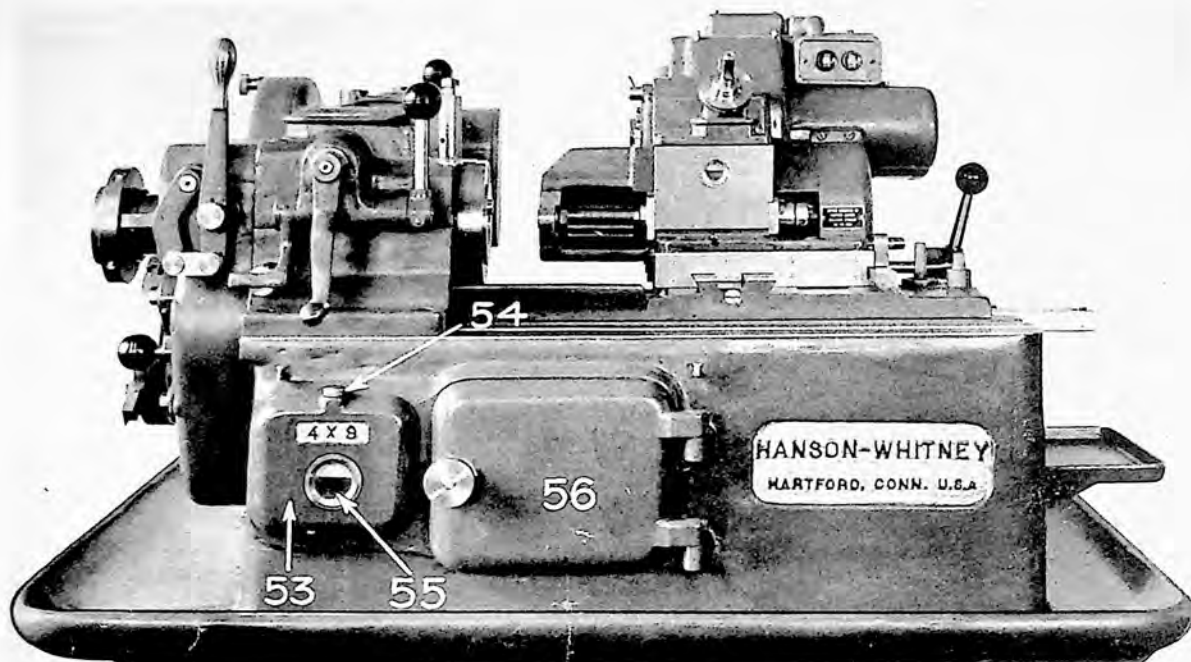
As previously stated, each lead or pitch requires its own Lead Cam and this applies to right or left hand threads. Right hand external cams are also suitable for left hand internal and left hand external for right hand internal threads.

AUTOMATIC CONTROL: Automatic Cycle is controlled by Dogs mounted on Dog Wheel (48). Dog Wheel rotates in direction of Arrow, one revolution of wheel completing automatic cycle of machine.

Knock-off Dog (49) disconnects power from head, bringing carriage to rest in extreme backward or loading position. This dog is never disturbed after having been correctly located.

Rapid Traverse Dog (50) and Feed Dog (51) as the names imply, control Rapid Traverse and Feed functions of Feed Box. These dogs reciprocate Shaft (52) from which shifting action is conveyed to the Feed Box.

The method for correctly locating all dogs is given on Page (11) under heading "Setting Machine."



Force Feed Lubricating System

LUBRICATION OF MACHINE: Several important lubricating features have been mentioned in description of units. In addition to these, attention is directed to the Force Feed Lubricating System as applied to Carriage and Feed Box Units. This system provides automatic lubrication for all carriage and cross slide bearing surfaces. It also provides complete automatic lubrication for feed box unit.

Lubricant is supplied from Reservoir (53), within which pump is located. Reservoir is filled by removing Screw (54). Oil Gage (55) indicates proper oil level. A higher level results in oil being wasted. Oil should not be permitted to drop below observation glass on oil gage.

To gain access to pump, the reservoir can readily be removed

by the following method. It is held in place by two bolts within bed. These must be removed and two oil supply pipes must also be disconnected, after which reservoir is free for removal. Both the bolts and pipes are accessible through Door (56).

IMPORTANT: Use only a clean mineral oil of the proper viscosity. Never use so-called dripless oil or oil containing graphite, soap or other foreign substance. Capacity of reservoirs and grades of oil recommended are as follows:

Cutter Head	— 1 quart	No. 20 S.A.E.
Carriage	— 1 "	" 30 "
Feed Box	— 1 "	" 10 "
Headstock	— 1 pint	" 10 "
Coolant Tank	10 gallons	

COOLANT EQUIPMENT: Thread Milling requires liberal fluid supply and fluid equipment is proportioned accordingly. The pump is gear driven and is of sufficient capacity to provide an abundant supply of fluid. Method of mounting and driving pump is shown on Page (6).

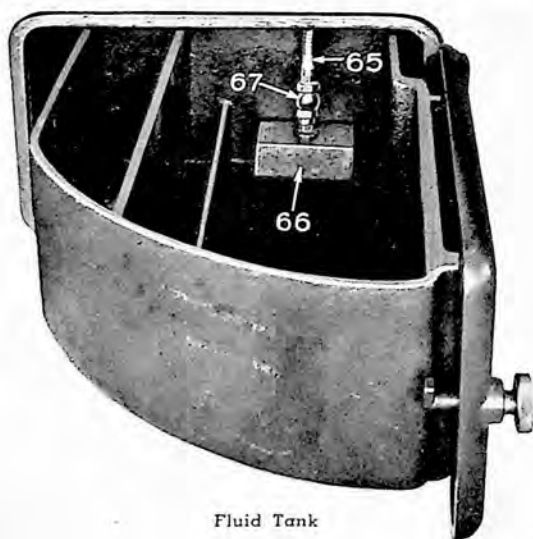
Storage Tank is mounted on a door in base of machine, which when opened swings tank outward to an accessible position for servicing. Tank has two compartments, settling and supply. Fluid is withdrawn from supply compartment through Flexible Tube (65) to which is attached Strainer (66). Flexible Tube permits strainer to be readily removed for cleaning.

Note location of Check Valve (67). Failure of pump to hold prime requires removal of foreign matter from check valve.

Chips accumulate rather fast in Thread Milling. They should not be allowed to interfere with return of fluid to tank.

As regards proper fluid, the generally accepted practice applies to this machine. Fluid that tends to gum up machine should not be used.

An important feature in connection with the fluid equipment is the automatic control, which permits fluid to function only during operating cycle. The valve through which this is accomplished is located in a position to permit its operation from the cycle control mechanism.



Fluid Tank

METHOD OF SETTING MACHINE: Machine is hand operated during setting operation. Power should be applied only when so stated.

Carriage should be at rest in loading position. Cutter Head must be withdrawn sufficiently through Cam Feed Shaft (22) so that cutter will clear work under all conditions. Power Feed Clutch (41) must be disengaged.

1. Mount work correctly, select and mount proper Lead Cam and Cutter. Be certain that cutter is placed with cutting face upward.

2. Press Plunger (57) inward against spring and rotate Crank Handle (6) slightly, in right hand direction until Dog (49) has passed Plunger. This permits hand operation of spindle through Crank Handle (6). Exercise care so that power feed is not engaged through Clutch (41) during this operation.

3. Rotate Crank Handle (6) in right hand direction until carriage has travelled extreme limit in head direction. Allow carriage to rest in this position.

4. Adjust carriage through Binder (14) and Pinion (15) until cutter is in correct position longitudinally on work. Do not neglect to set binder after adjustment.

5. Continue rotation of Crank Handle (6) in right hand direction until cutter head has advanced to maximum inward position. Allow cutter head to rest in this position. Transverse cam roll is now on high dwell of cam, which maintains forward position of cutter head during actual milling operation.

6. Release Binder (21) and advance cutter head towards work by rotating Feed Shaft (22) in right hand direction. Advance cutter head until a tissue paper held between work and cutter is cut. Apply power to rotate cutter during this operation. Set Binder (21) firmly and allow head to rest in this position.

7. Locate Feed Dog (51). Shaft (52) must be in the outward, feed position. Locate dog so that high point of dog contacts Stud (58). In operation, cutter head approaches work on rapid traverse until feed dog engages feed. If feed is engaged too soon, time is lost. If it is engaged late, cutter comes into contact with work on rapid traverse, which is injurious to cutter. Correct location of dog is therefore important.

8. Do not disturb setting of cutter head. Return carriage to extreme backward loading position by rotating Crank Handle (6) in right hand direction. Allow carriage to rest in this position. Machine has now been operated a complete cycle by hand. Dog Wheel (48) has completed one revolution and Dog (49) is again in

contact with Plunger (57) which prevents further operation of spindle by hand. If for any reason this should be required, Operation (2) would again have to be performed.

9. Dial (60) is mounted under spring tension and can be located in any position desired. Locate dial on zero. Determine single depth of thread to be cut. Release Binder (21). Withdraw cutter head one full turn by rotating Feed Shaft (22) in left hand direction. Advance cutter head by rotating Feed Shaft (22) in right hand direction, one full turn plus single depth of thread desired. Set Binder (21) firmly and do not neglect this. The withdrawing of head an additional full turn is important as this absorbs all back-lash. Never attempt to adjust head for depth, no matter how slight, without first taking out back-lash in the manner mentioned.

10. Knock-off Dog (49) and Rapid Traverse Dog (50) are permanently located when machine leaves factory and need not be changed. If for any reason their location has been disturbed, they can be reset in the following manner:

Knock-off Dog (49) disengages power feed from work head through Clutch (41). This takes place when carriage is in extreme backward, loading position. Carriage can be located in this position and dog set accordingly.

Rapid Traverse Dog (50) is set so that rapid traverse is engaged the moment milling operation has been completed. As threads meet, there is a slight overlap feed travel before cutter head starts to recede from work. Dog is set so that rapid traverse is engaged an instant after head starts to recede. Rapid traverse becomes operative through the depression of Plunger (59) by the dog. Its location is important. If not correctly set the same condition results as with Feed Dog described under Operation (7).

11. Machine is now ready for milling operation. Power may be applied and power feed engaged through Lever (7).

Do not neglect to set cutter parallel with work through radial adjustment of cutter head as described on Page (7), under heading Cutter Head.

12. The question of correct speeds and feeds naturally arises in this connection. No set rule can be given to govern these. They are controlled by nature of material and degree of finish required.

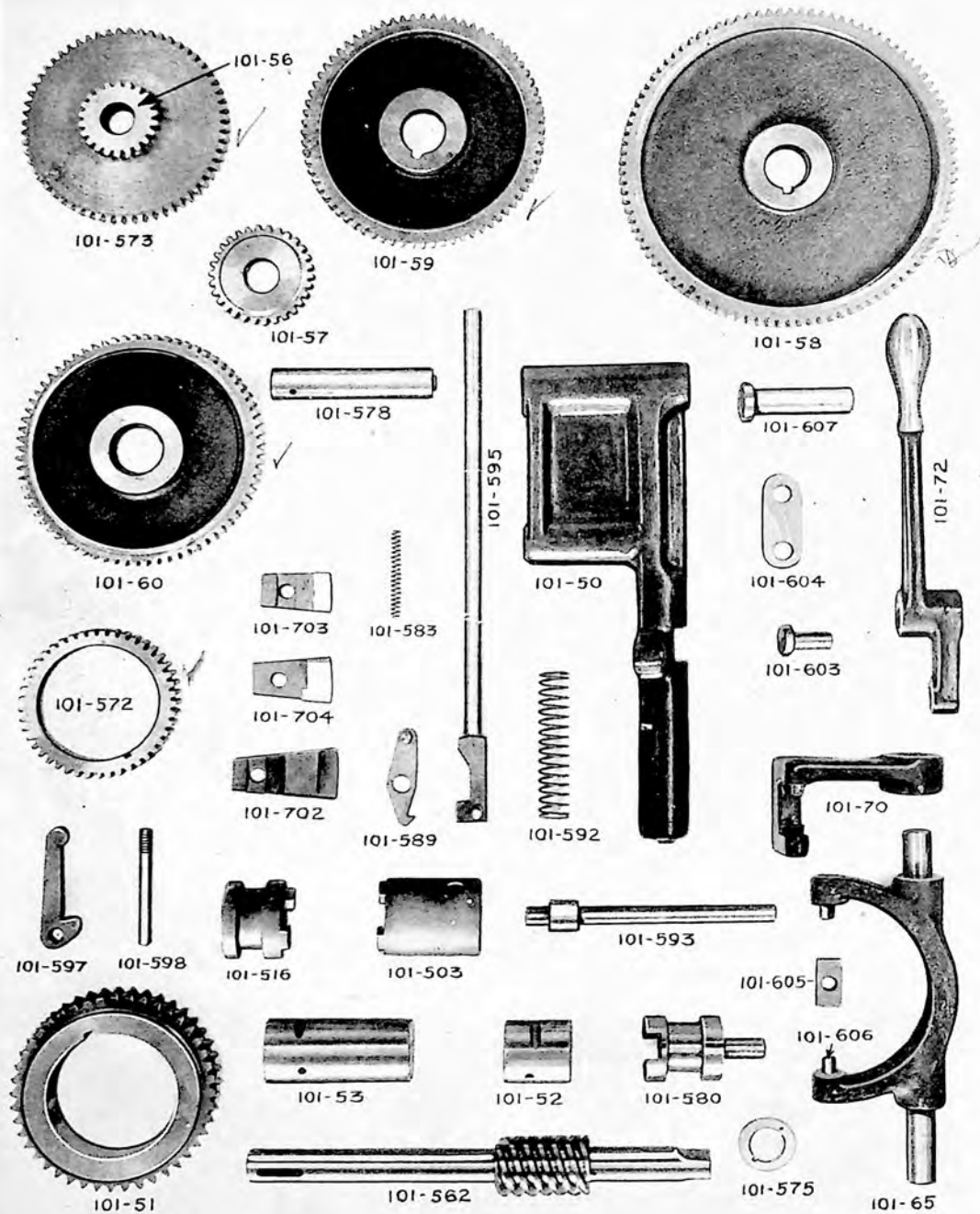
The speed must be gaged from the action of cutter. Excessive speed causes cutter to wear too rapidly. In production milling a common practice is to use a speed which will permit cutter to serve five hours without resharpening. The importance of keeping cutter sharp cannot be too strongly emphasized.

The degree of finish is largely determined by the feed used. For a given cutter speed, the slower the feed the better the finish. Any desired result can be obtained in this particular by selecting proper speeds and feeds.

CUTTER HEAD PARTS

Specify Serial Number of Machine when Ordering Parts

101-81	Flywheel
101-86	Intermediate Gear Shaft Bushing (Front)
101-87	Intermediate Gear Shaft Bushing (Rear)
101-137	Spindle Bearing (Front)
101-138	Spindle Bearing (Rear)
101-610	Cutter Spindle
101-611	Intermediate Gear Shaft
101-612	Cutter Driving Shaft
101-613	Change Gear Shaft (Lower)
101-614	Change Gear Shaft (Upper)
101-615	Spindle Thrust Collar
101-616	Spindle Collar
101-617	Spindle Nut
101-618	Spindle End Nut
101-619	Spindle Ring
101-620	Draw-back Rod
101-621	Flywheel Pinion
101-622	Driven Sprocket (25 Teeth)
101-623	Driving Sprocket (17 Teeth)
101-624	Flywheel Pinion Nut
101-625	Change Gear Shaft Nut
101-643	Flywheel Gear
101-648	Lower Change Gear Shaft Spring
101-982	Spindle Intermediate Gear
A	Silent Chain (Whitney No. G-104— $\frac{3}{8}$ " Pi.—1" Width—62 Links)
B	Speed Change Gears
	101-88 (48 Teeth) 101-630 (29 Teeth)
	101-90 (42 Teeth) 101-629 (24 Teeth)
	101-89 (37 Teeth) 101-628 (18 Teeth)
C	External Cutter Arbor Support (Specify Overall Length)
D	Cutter Arbor Support Block
E	Cutter Arbor Support Block Cap
F	Cutter Arbor Support Block Bushing (Small)
G	Cutter Arbor Support Block Bushing (Large)
H	Hex. Nut $\frac{3}{4}$ "—10 Pi.—R. H.— $\frac{1}{2}$ " Thick
I	Hex. Nut $\frac{5}{8}$ "—11 Pi.—L. H.— $\frac{3}{8}$ " Thick
J	Hex. Nut $\frac{3}{4}$ "—10 Pi.—L. H.— $\frac{3}{4}$ " Thick
K	Hex. Nut $\frac{5}{8}$ "—11 Pi.—R. H.— $\frac{3}{8}$ " Thick
L	Ball Bearing No. 6205-Z
M	Oil Retainer (1 $\frac{1}{4}$ " Hole—2.0472" O. D.— $\frac{7}{16}$ " Wide)



Head Stock Drive Parts

HEAD STOCK DRIVE PARTS

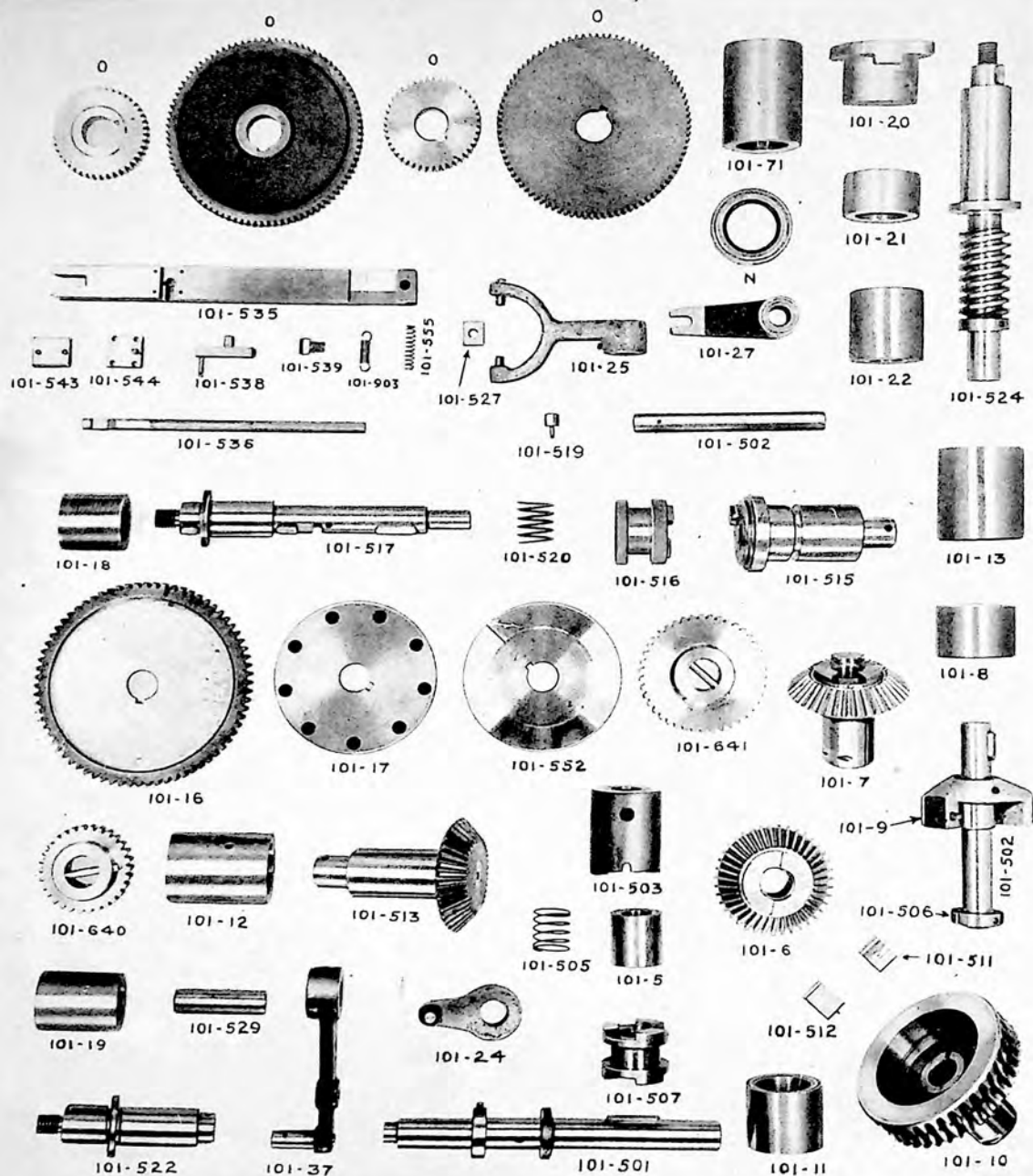
Specify Serial Number of Machine when Ordering Parts

101-50	Knock-off Lever
101-51	Worm Gear
101-52	Worm Shaft Bearing (Front)
101-53	Worm Shaft Bearing (Rear)
101-56	Intermediate Pinion (22 Teeth)
101-57	Reverse Gear (30 Teeth)
101-58	Cam Shaft Gear (99 Teeth)
101-59	Dog Wheel Drive Gear (72 Teeth)
101-60	Dog Wheel Gear (72 Teeth)
101-65	Spindle Spool Yoke
101-70	Starting Lever Yoke
101-72	Spindle Spool Operating Lever
101-503	Knock-off Clutch (Long)
101-516	Fast Clutch
101-562	Worm Shaft
101-572	Spindle Gear (45 Teeth)
101-573	Spindle Intermediate Gear (60 Teeth)
101-575	Worm Thrust Collar
101-578	Spindle Intermediate Gear Stud
101-580	Crank Stud
101-583	Crank Plunger Spring
101-589	Knock-off Pawl
101-592	Knock-off Spring
101-593	Knock-off Spring Rod
101-595	Knock-off Rod
101-597	Fingers
101-598	Finger Pins
101-599	Finger Ring
101-601	Chuck Operating Tube Nut (2½" 16 Pi.)
101-602	Spindle Spool
101-603	Spindle Spool Yoke Lever Link Pins
101-604	Spindle Spool Yoke Lever Link
101-605	Spindle Spool Shoe
101-606	Spindle Spool Shoe Pin
101-607	Spindle Spool Operating Lever Stud
101-702	Fast Clutch Dog
101-703	Slow Clutch Dog
101-704	Knock-off Dog



101-48 Gear Swivel



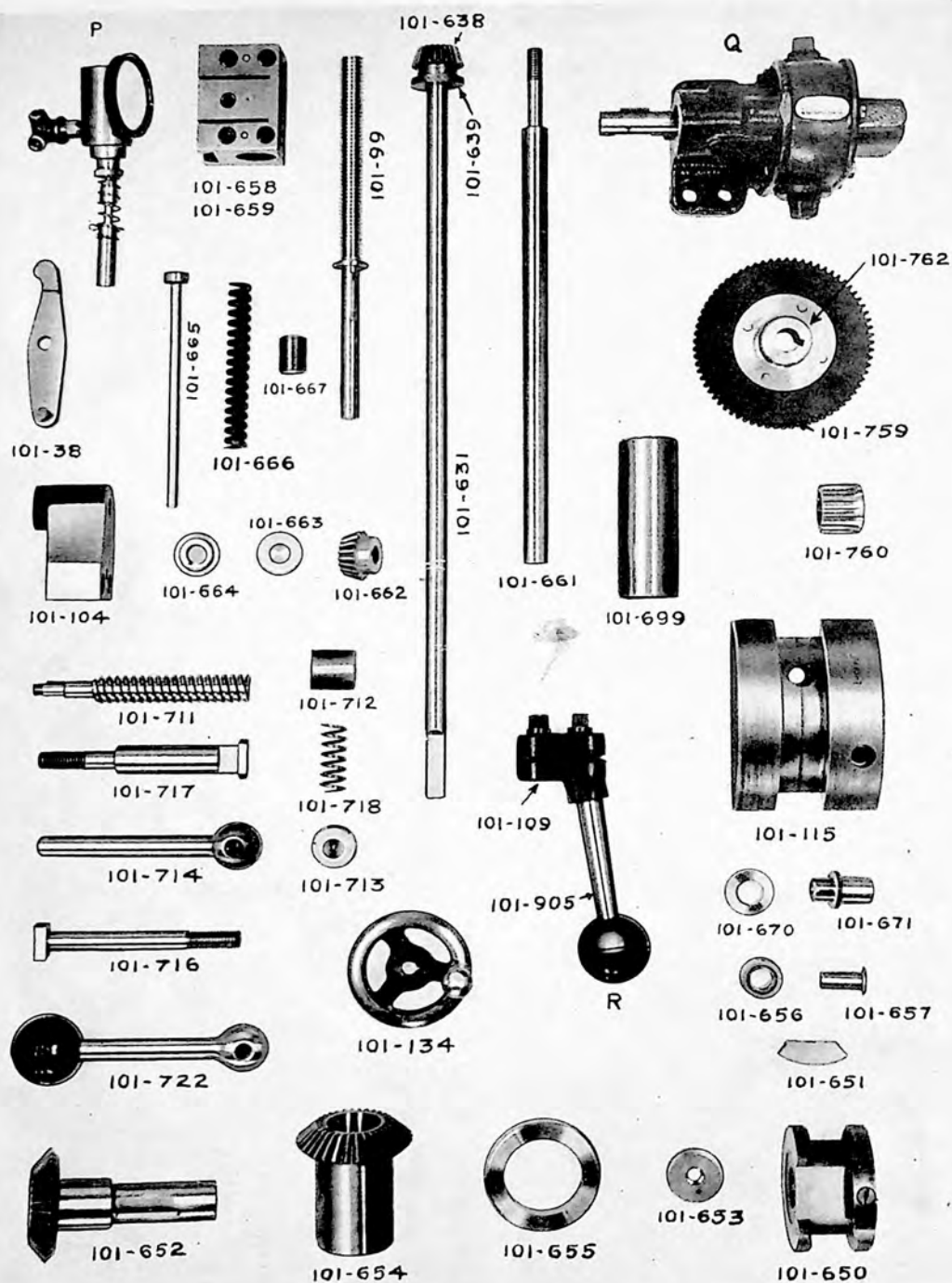


Feed Box Parts

FEED BOX PARTS

Specify Serial Number of Machine when Ordering Parts

101-5	Reverse Shaft Bearing	101-515	Spur Gear Shaft Clutch
101-6	Reverse Gear	101-516	Fast Clutch
101-7	Reverse Gear (Long)	101-517	Fast Clutch Shaft
101-8	Reverse Gear Bearing	101-519	Friction Shoes
101-9	Silent Pawl Plate	101-520	Fast Clutch Spring
101-10	Worm Gear	101-522	Change Gear Shaft
101-11	Worm Gear Bearing	101-524	Feed Worm Shaft
101-12	Reverse Driving Gear Bearing	101-527	Clutch Shoes
101-13	Clutch Bearing	101-529	Reverse Lever Shaft
101-16	Spur Gear (72 Teeth)	101-535	Clutch Control Rod
101-17	Spring Carrier	101-536	Latch Rod
101-18	Clutch Shaft Outer Bearing	101-538	Control Rod Latch
101-19	Intermediate Gear Shaft Bearing	101-539	Latch Pin
101-20	Stuffing Box	101-543	Rod Cover (Small)
101-21	Stuffing Box Bushing	101-544	Latch Retainer
101-22	Worm Shaft Bearing (Small)	101-552	Clutch Face
101-24	Clutch Lever	101-555	Latch Rod Spring
101-25	Fast Clutch Yoke	101-640	Spur Gear (Upper—30 Teeth)
101-27	Fast Clutch Lever	101-641	Spur Gear (Lower—42 Teeth)
101-37	Reverse Lever	101-903	Knock-off Pawl Spring
101-71	Worm Shaft Bearing	N	Oil Seal No. 60500
101-501	Reverse Shaft	O	Feed Change Gears
101-502	Worm Gear Shaft	101-28 (96 Teeth)	101-35 (57 Teeth)
101-503	Knock-off Clutch (Long)	101-29 (90 Teeth)	101-36 (50 Teeth)
101-505	Clutch Spring	101-30 (88 Teeth)	101-545 (43 Teeth)
101-506	Reverse Shaft Collar	101-31 (85 Teeth)	101-546 (44 Teeth)
101-507	Reverse Clutch	101-32 (78 Teeth)	101-547 (38 Teeth)
101-511	Silent Pawl Shoe	101-33 (71 Teeth)	101-548 (32 Teeth)
101-512	Silent Pawl	101-34 (64 Teeth)	
101-513	Drive Gear		



Cutter Drive: Carriage: Tailstock Parts

CUTTER DRIVE: CARRIAGE: TAILSTOCK PARTS

Specify Serial Number of Machine when Ordering Parts

101-38 ✓	Oil Pump Operating Lever
101-99	Slide Screw
101-104	Slide Adjusting Screw Bracket
101-109	Slide Adjusting Block Shaft Handle Mount
101-115	Lead Cam (Specify Pitch—R. H. or L. H.—External or Internal)
101-134	Handwheel
101-631	Slide Adjusting Shaft
101-638	Slide Adjusting Bracket Gear
101-639	Slide Adjusting Bracket Washer
101-650	Cross Cam (Specify Throw)
✓ 101-651	Cross Cam Block (Straight)
101-652	Cross Cam Gear
101-653	Cross Cam Shaft Washer
101-654	Cross Cam Driving Gear ✓
101-655	Cross Cam Driving Gear Collar
101-656	Cross Cam Roller (See Note)
101-657	Cross Cam Roller Pin (See Note)
101-658	Slide Adjusting Block (See Note)
101-659	Slide Adjusting Block Plate (See Note)
101-661	Slide Adjusting Block Binder
101-662	Adjusting Screw Gear
101-663	Adjusting Screw Collar, R. H.
101-664	Adjusting Screw Collar, L. H.
101-665	Slide Adjusting Block Plunger
101-666	Plunger Spring
101-667	Plunger Spring Screw
101-670	Lead Cam Roller (See Note)
101-671	Lead Cam Roller Stud (See Note)
101-699	Coupling
101-711	Center Adjusting Screw
101-712	Center Adjusting Screw Nut
101-713	Center Tee Bolt Bushing
101-714	Binder
101-716	Binding Tee Bolt
101-717	Center Tee Bolt
101-718	Center Tee Bolt Spring
101-722	Center Binder
101-759	Pump Gear (See Note)
101-760	Pump Drive Gear
101-762	Pump Gear Flange (See Note)
101-905	Knob Rod
P	Lubricating Pump
Q	Fluid Pump
R	Rubber Knob

NOTE

Parts listed below should be ordered together. This is due to integral construction or mutual wear of parts.

101—(656-657)
101—(658-659)
101—(670-671)
101—(759-762)

SPECIFICATIONS

Length of Bed	33"
Swing Over Carriage	6"
Distance, Collet to Tailstock Center	12"
Distance thread can be cut from Collet	9"
Hole through Spindle	2"
Collet Capacity	2"
External Capacity, 4" diameter with 2" Cutter	
Internal Capacity, 4" Max. diameter with 2" Cutter	
Internal Capacity, 3/4" Min. diameter with 1/2" Cutter	
Max. Lead, Right Hand External or Left Hand Internal 1/5"	
Max. Lead, Left Hand External or Right Hand Internal 1/5"	
Cam Throw, Longitudinal Cam, Regular 3"; Optional 4 1/2"	
Cam Throw, Transverse Cam, Regular .150"; Optional 1/16", 9/16"	
Taper Hole in Cutter Head Spindle No. 6 Jarno	
Taper Hole in Tailstock Spindle No. 6 Jarno	
Shank Cutters have No. 6 Jarno Taper	
Shell Cutters have 3/4" hole, 5/32" x 3/32" keyway	
Floor Space	37" x 48"
Net Weight, Regular Equipment	2850 lbs.

REGULAR EQUIPMENT

Machine with Regular Headstock; Tailstock;
 Draw-back Collet Mechanism with 2" Master Collet;
 Cutter Head with Arbor and Arbor Support for Cutters 3" long;
 One Lead Cam for any pitch specified;
 Coolant Equipment including Pump, Storage Tank and Piping;
 Complete Electrical Equipment with Start and Stop Push Button Control,
 1 H.P. Constant Speed Motor 1750 R.P.M. for Cutter Head,
 1/2 H.P. Constant Speed Motor 1750 R.P.M. for Work Head.