OPERATOR'S MANUAL

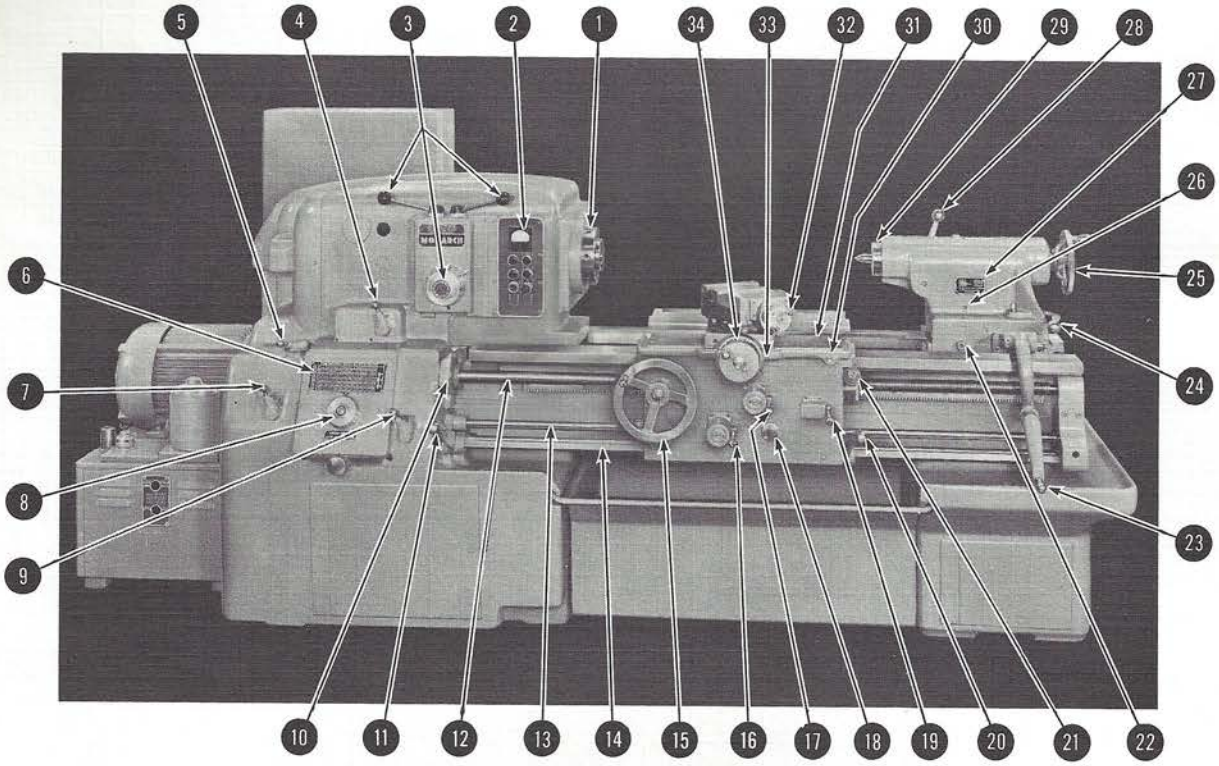
Monarch

TURNING MACHINES

ACCURACY • ECONOMY • LONG LIFE

612 LATHE

MONARCH MACHINE TOOL CO.
SIDNEY, OHIO U. S. A.



OPERATING LEVERS AND CONTROLS

1	Headstock spindle
2	Electrical switch grouping
3	Headstocks control dial and levers
4	Leadscrew reverse lever
5	Upper compound lever
6	Feed-thread index plate
7	Lower compound lever
8	Gearbox setting dial
9	Feed-thread lever
10	Tumbler lever
11	Spindle control lever
12	Leadscrew
13	Feedrod
14	Control rod
15	Apron handwheel
16	Carriage power feed lever
17	Cross slide power feed lever
18	Carriage and cross slide feed directional knob
19	Halfnut closure lever.
20	Spindle control lever
21	Chasing dial
22	Tailstock transport pickup block
23	Tailstock conveyor
24	Tailstock quick clamping lever
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29	Tailstock spindle
30	Tailstock transport plunger
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32	Compound rest dial and handle
33	Thread chasing stop
34	Cross feed dial and handle

INTRODUCTION

Your Monarch lathe will produce more and better work with less operator fatigue.

It has inbuilt precision of the kind which has made Monarch the accepted standard in the lathe field for many years. It is provided with the higher speeds and with the ease of operating effort so necessary for maximum productiveness.

Give your 612 lathe the care which a precision tool deserves. Follow the suggestions and instructions contained in this handbook and you will be rewarded by superlative performance over the years.

RECEIVING AND CLEANING

After the lathe has been uncrated down to the skids, remove the packing list from the parts box and check the shipment. Any shortage or discrepancy found should be reported immediately to The Monarch Machine Tool Company, Sidney, Ohio. Always, when referring to the machine, mention the serial number. This is stamped on the identification plate attached to the front of the tailstock. The lathe should remain on the skids until it is moved as close as possible to the point of installation.

From the time the lathe is uncrated until all of the "anti-rust" compound is removed none of the working parts such as the carriage, tailstock and levers should be moved. The vigorous application of a brush and cloths soaked in trichlorethylene or similar solvent removes this compound quickly. After the lathe has been thoroughly cleaned apply a thin film of oil to the bed ways.

LIFTING

Be sure to exercise great care when lifting and moving the machine. Serious damage can result if the lathe is dropped or the leadscrew and control rods at the front of the bed are bent.

Caution: Be sure to select cables with sufficient strength for the job, and always balance the load before lifting.

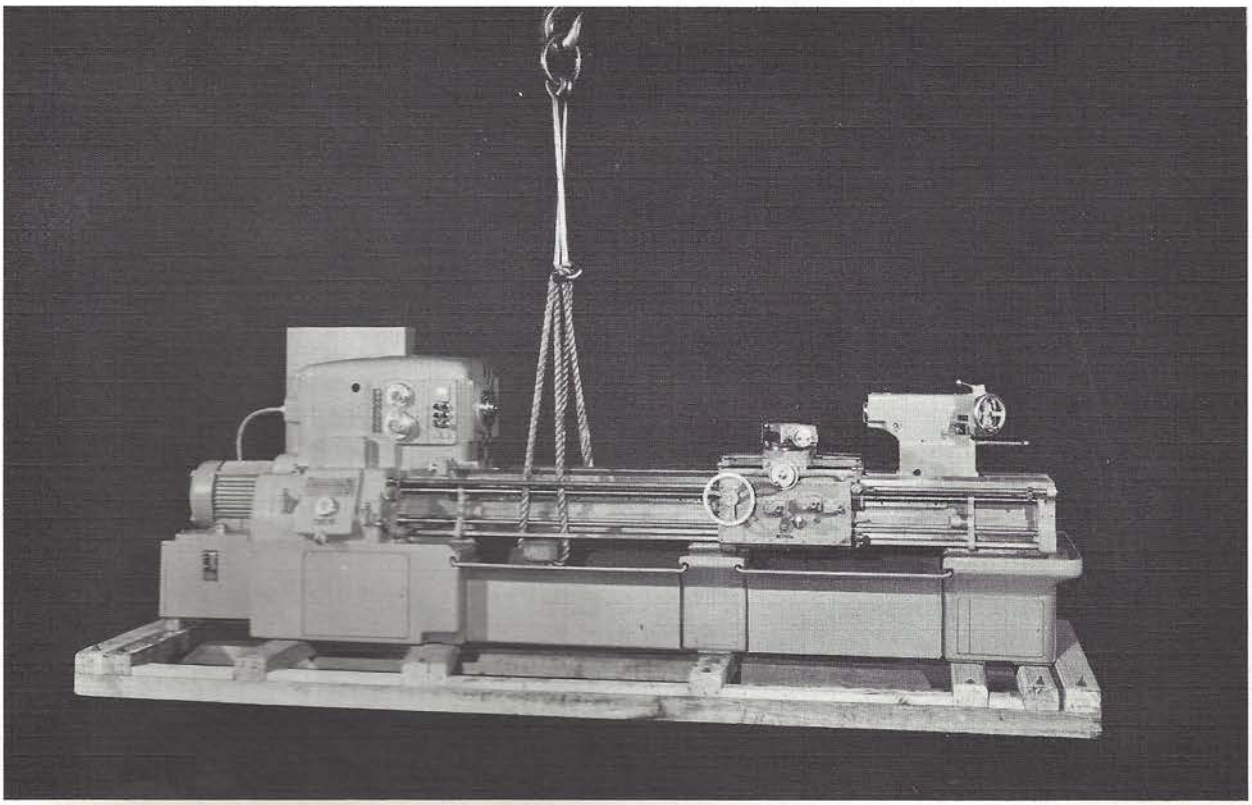


FIGURE 2 MANNER OF LIFTING 612 LATHE

INSTALLATION

In order for the machine to turn, bore and face accurately the bed must at all times be free from twist and distortion. A good solid foundation is a "must" for a precision machine tool. Preferably, it should be of heavy concrete. If this is not possible, it is essential that the floor be rigidly supported.

The next step is leveling and too much stress cannot be laid on the importance of doing this with the utmost care. Use a good machinist's level and two parallels. Place the parallels on the front and rear flats and lay the level square across the parallels. Do this at both ends of the bed.

Inside the cabinet legs, and readily accessible by opening the doors, are the leveling screws. Eight or more round, countersunk leveling plates are supplied with the machine. Place a leveling plate under each leveling screw and adjust the screws until the lathe is level at both ends. The machine should be checked for level about once a week for the first two months. After that it should be checked every two months or so depending upon the nature of the foundation.

Viewed from the outer end, main drive motor rotation should be clockwise.

LUBRICATION

More than any other single factor, adequate lubrication will guarantee long, trouble-free operation of the machine. This subject is fully covered later in this manual.

OPERATION

To benefit fully from the operational ease which has been built into the Monarch 612 lathe and to avoid damage, the operator should familiarize himself completely with the functions of the various controls. These are explained mechanism by mechanism in the section which follows.

HEADSTOCK

On the front of the headstock are a dial and two levers for selecting the entire range of 36 spindle speeds. Figure 3.

Dial (A) is the speed selector dial and is turned by the knurled knob.

Lever (B) selects between the high range and low range speeds, both of which are shown on dial (A).

Lever (C) has shift and run positions. Moving lever (C) from run to shift position prepares

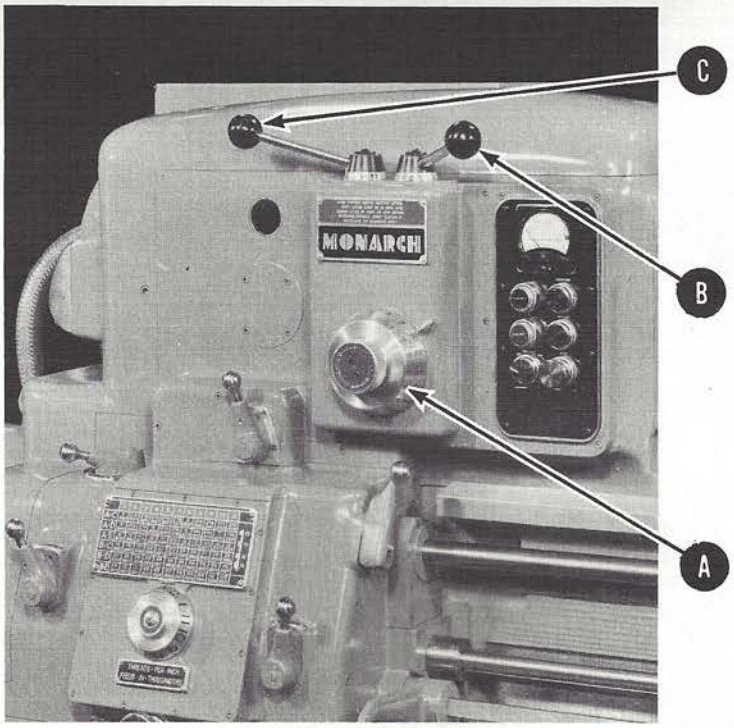


FIGURE 3 SPEED DIAL, 612 LATHE

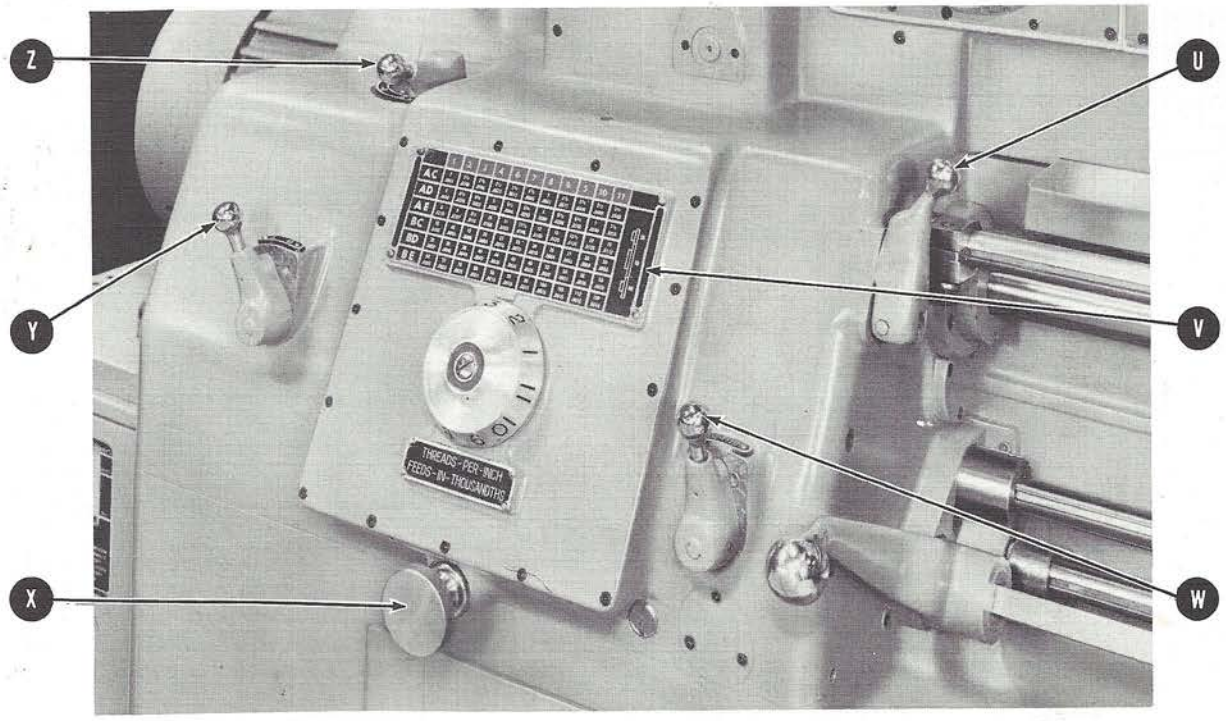


FIGURE 4 GEAR BOX CONTROL LEVERS

the shift mechanism so that dial (A) can be rotated to select a new speed. When a new speed selection is made, moving lever (C) to the run position shifts the necessary gears to establish the correct gear ratio to obtain the selected speed.

If the gears occasionally fail to easily engage, the main drive clutch is drifted by lightly pressing down the clutch control lever.

The upper belt sheave guard covers the main drive clutch. This clutch is adjusted by removing this guard, lifting the locking pin in the adjusting ring and turning the adjusting ring. Turning the ring clockwise tightens the clutch. The locking pin must be re-engaged before the clutch is run. The clutch should be tightened until the operator experiences a definite detenting action of the apron control lever. Caution must be used not to tighten excessively as the control lever may hang up before reaching the fully engaged position which could result in continuous engagement of both clutch and brake or of clutch and drift clutch. The clutch may have to be adjusted as often as every month depending on duty cycle. "Feel" at the operating lever is the best method of determining proper adjustment.

To free the spindle from the rest of the gear train place lever (B) in neutral position. This permits easy rotation of the spindle by hand and also acts as a safety when chucking or measuring work pieces since the spindle cannot be started accidentally while lever (B) is in the neutral position.

GEAR BOX

Large, easily read index plate (V) Figure 4 shows the wide range of threads and feeds obtainable by moving levers (Y) and (Z) in conjunction with knob (X). To set for a particular thread or feed, move tumbler lever (U) to the right and down. Turn knob (X) until number opposite index mark corresponds to number at top of column on index plate which contains the feed or thread desired. Lift and lock lever (U). Set levers (Y) and (Z) according to plate.

Lever (Y) can be positioned only on "A" or "B" setting while lever (Z) can be positioned on "C", "D" or "E" setting. Lever (W) selects either the feed rod for turning operations or the leadscrew for thread chasing operations. When shifting lever (Y) to position "A" it is necessary to jog the spindle except at very low speeds, because position "A" is the high speed side of the gear box.

The regular thread range of Monarch 612 machines is from 2 to 120 threads per inch with feeds from .0013" to .082" per revolution on the Model 1610 and .0011" to .068" per revolution on the Models 2013 and 2516. Due to the extreme range it is seldom necessary to change end gears except for special threads.

APRON

Figure 5 indicates the functions of the various controls provided to impart the necessary movements to the cutting tool. (A), the apron handwheel, moves the cutting tool manually parallel to the bed. Cross slide handwheel, (B), moves the tool manually at a right angle to the bed. Compound rest handwheel (C) moves the tool manually at any angle to the bed.

Spindle rotation is started and stopped by means of lever (D) which operations may also be performed at the headstock end of the machine where a similar lever is attached to the control rod. (E) is the carriage power feed control lever which, when pushed downward, causes the carriage to move at the preselected feed either toward the headstock or the tailstock. Cross slide power feed control lever (F) when pushed downward, causes the cross slide to move at the preselected feed either toward or away from the operator.

Note: When using levers (E) and (F) it is unnecessary to apply a great amount of pressure. If they do not engage about halfway down, they are in need of adjustment.

Feed directional knob, (G), is shown in neutral position. In the in position the carriage feeds toward the tailstock and the cross slide feeds in. When in the out position, the carriage feeds toward the headstock and the cross slide feeds out.

If threads are to be chased, the carriage is engaged to the leadscrew by means of halfnut control lever, (H). It is illustrated in its disengaged position and should be straight down for full engagement. Always have knob (G) in its neutral position before attempting to engage lever (H). When lever (H) is partly or fully engaged lever (E) cannot be engaged. This is a safety feature intended to prevent damage to the lathe should the operator inadvertently attempt to engage lever (E) while lever (H) is also engaged.

Thread chasing dial (J), which has four graduations 90° apart, is used for determining when to engage the halfnut during thread chasing operations. On any even thread where the lead being chased is divisable by four the halfnut may be engaged at any point without reference to the dial. For any full number of threads such as 18, 22, 23 and so on (not divisable by four) the halfnut may be engaged at any one of the four graduations. When chasing half threads, the halfnut may be engaged at any two opposite graduations -- No. 1 and No. 3 or No. 2 and No. 4. The chasing of quarter threads requires the halfnut be engaged at the same graduation each time.

(K) is the carriage locking stud, used to lock the carriage to the bed ways when cutting with the cross slide.

Plunger (L) can be manually depressed to engage in socket (G), Fig. 8, to transport the tailstock by carriage motion.

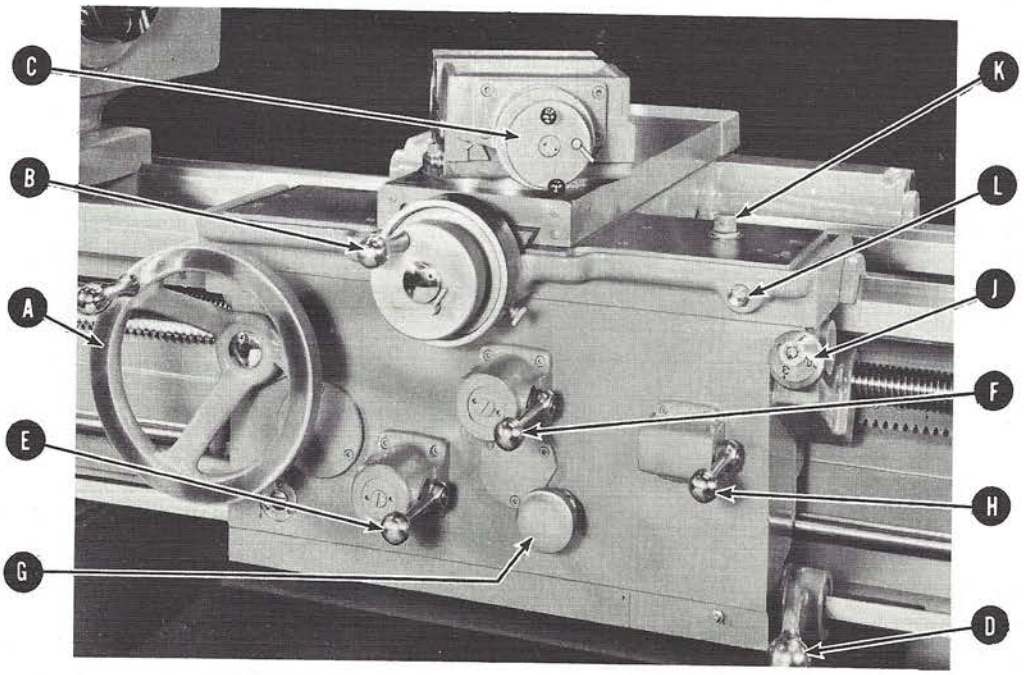


FIGURE 5 FRONT OF APRON, CARRIAGE AND COMPOUND REST

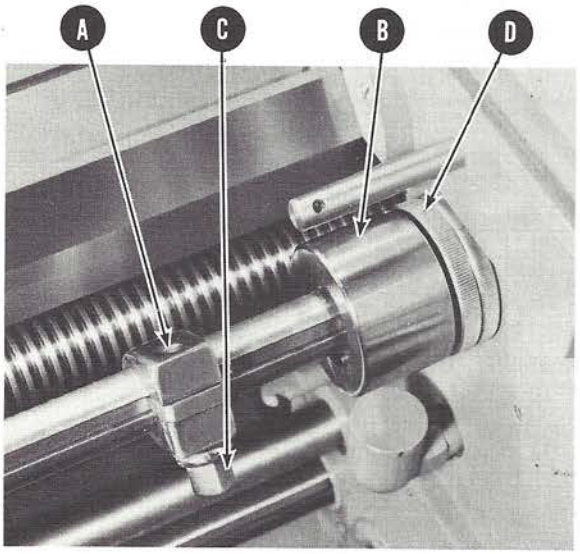


FIGURE 6 AUTOMATIC LENGTH STOP AT LEFT HAND SIDE OF APRON

APRON CONTROLLED LEADSCREW REVERSE

A leadscrew reverse lever on the right end of the apron is found on Models 1610T, 2013T and 2516T. Control of leadscrew reverse from the apron is particularly convenient during thread chasing operations -- for example, chasing threads with odd leads where the halfnut should not be disengaged; speed chasing of short threads, and, in connection with the automatic length stop, chasing threads up to a shoulder or in a blind hole.

On Models 1610, 2013 and 2516 the leadscrew reverse lever is found on the front of the headstock directly above the gearbox.

Figure 6 shows the automatic length stop and adjusting collar at the left hand side of the apron. This stop is a time saver not only when chasing threads but also for ordinary turning operations. A similar stop on the right hand end of the leadscrew reverse control rod provides an automatic stop with the carriage moving toward the tailstock. To set stop (A), position the threading or turning tool to the required point on the work; then with the leadscrew reverse lever in neutral position, place stop (A) against adjusting collar (B) and tighten stud (C). Collar (B) is for the final close adjustment and is locked in place with nut (D).

To prevent damage to the leadscrew reverse mechanism, do not reverse at spindle speeds above 340 R. P. M. It may be disengaged at any spindle speed.

CROSS FEED DIAL AND THREAD CHASING STOP

Cross feed diameter dial (A), Figure 7, is graduated to read in one thousandths of an inch. There are two sets of numbers. The set nearest the operator is for reading when the cross slide is feeding toward the front of the machine. The second set of numbers is used when the cross slide is feeding toward the rear of the machine. The dial is graduated to read direct, that is, .001" on the dial equals .001" on the diameter or the bore of the work.

The cross feed dial is unlocked by means of lever (B) whenever it is necessary to move the dial for repositioning in relation to the tool. Thread chasing stop (C) is used to eliminate the slow and tedious operation of repositioning the tool to zero or some other reading on the cross feed dial, after each cut. With the thread chasing stop, the operator need not look at the dial when repositioning the tool. It is necessary only to run the cross slide in to the stop and proceed with the next cut. When the thread chasing stop is engaged (by turning the knob all the way in), there are three complete turns of the cross feed handwheel between the in and out stop positions at which two points the diameter dial always reads the same.

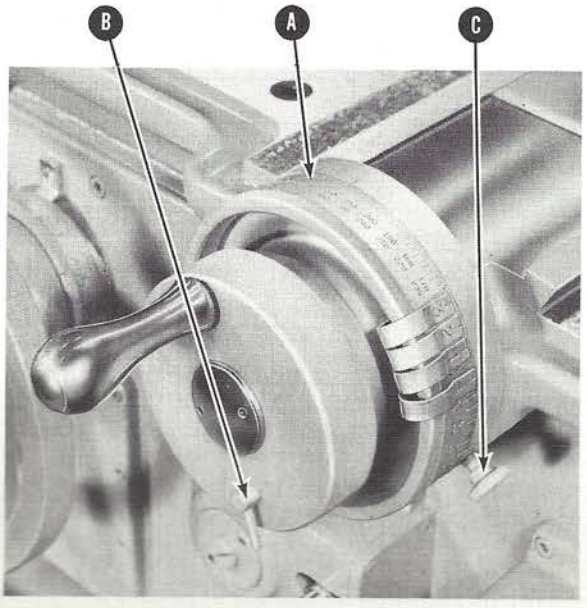


FIGURE 7 CROSS FEED MICROMETER DIAL

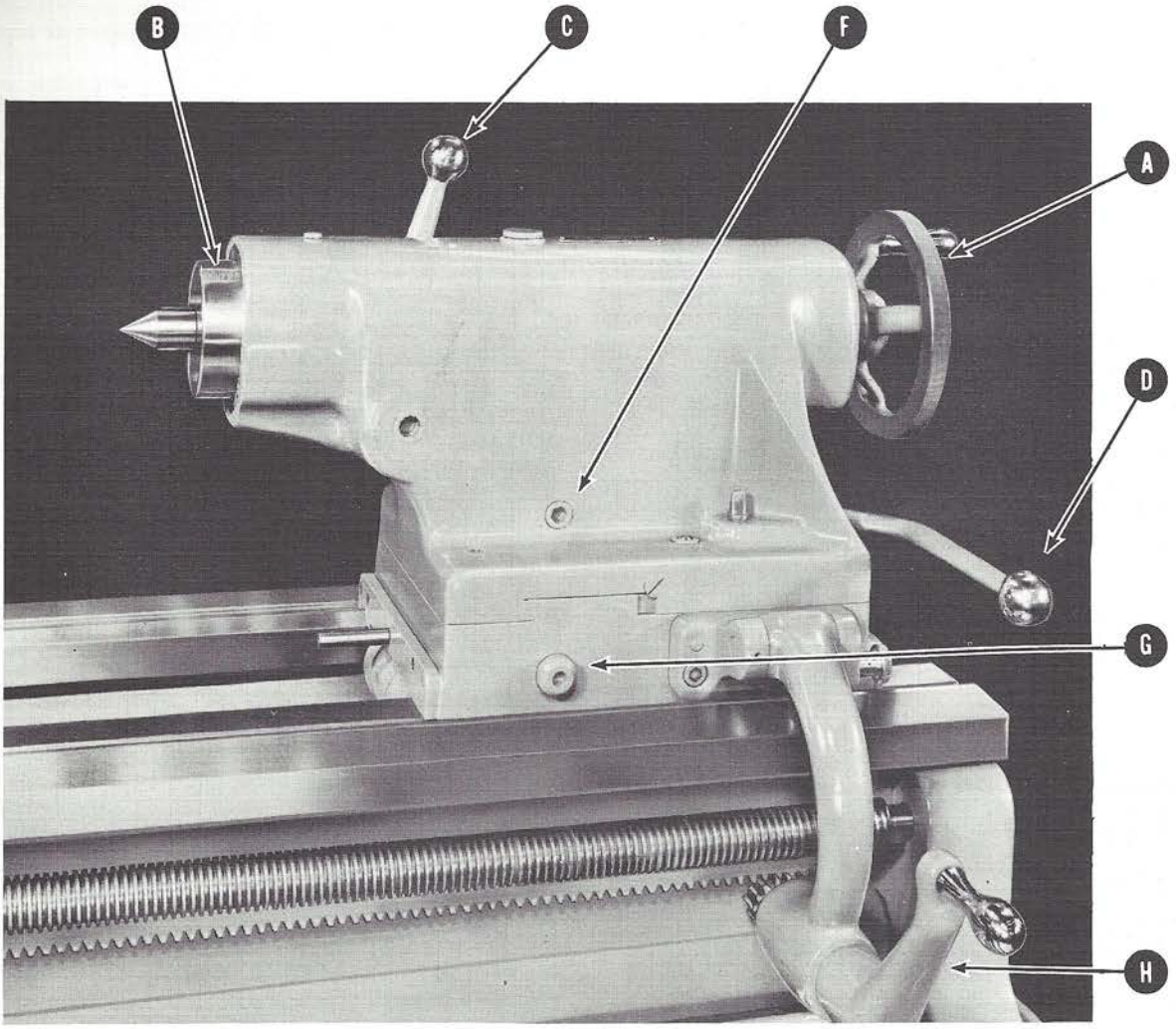


FIGURE 8 QUICK CLAMPING TAILSTOCK - 612 LATHES

TAILSTOCK

The tailstock on any lathe is primarily a work supporting device but it may be used to perform other important functions such as drilling, reaming and tapping.

Tailstock handwheel (A), Figure 8, is used to traverse or feed spindle (B) in or out. The dead center spindle shown is supplied as standard. In the optionally available spindle of the anti-friction type, a tang lock makes drilling possible. To remove the center or drill, crank the spindle back into the tailstock until it is automatically ejected.

Lever (C) locks the spindle in position. This should always be done before the start of the cut. (D) is a clamping lever which quickly clamps the tailstock to the bed for such operations as drilling and reaming.

Clamping lever (D) is supplemented by a clamping nut which should be tightened when turning work between centers or in any case when there is a considerable amount of pressure against the tailstock.

Aligning screw (F) is used to bring the tailstock to true center with the headstock. On machines not equipped with a taper turning attachment, it is sometimes utilized to move the tailstock off center for taper turning. There are two of these screws, the other being at the rear of the tailstock.

Socket (G) is engaged by the carriage plunger (L) (Fig. 5) for transporting the tailstock. Conveyor mechanism (H) is also used for transporting the tailstock.

TAPER ATTACHMENT

Following are the steps in the setting of the Monarch anti-friction taper attachment.

1. Position the carriage so the turning tool is about 1" from the end of the work.

2. Push slide (A), Figure 9, all the way in toward the headstock, position bed clamp (B) as illustrated, tighten lever (C) and lock camlock (D).

3. Set swivel (E) at required taper by turning stud (F) and reading the vernier dial (G).

   Move the "O" on the inner (vernier) scale to the graduation on the outer scale that is nearest to, but less than, the required setting. Then select the vernier graduation representing the amount to be added and move this graduation to alignment with the next graduation on the outer dial. When working to the right of the "O" on the outer dial, use the vernier graduations to the left of "O" and when working to the left of "O" on the outer dial use the vernier graduations to the right of "O". The vernier graduations represent 64ths of an inch or, on the degree scale, 5 minutes.

4. Lock nut (H) at the right hand end of the swivel and a similar nut on the underside of the swivel at the left hand end. Loosen stud (J).

5. Adjust and lock backlash eliminator (I).

6. Now, turn the taper by feeding the tool to depth in the usual manner.

To disconnect the taper attachment for straight turning, loosen backlash eliminator (I), tighten stud (J), loosen camlock (D) and lever (C). Slide bracket (B) to extreme tailstock end of bed.

The Monarch taper attachment can be used to turn tapers, bore tapers or chase tapered threads. Maximum taper per foot is 4" and maximum length at one setting is 18".

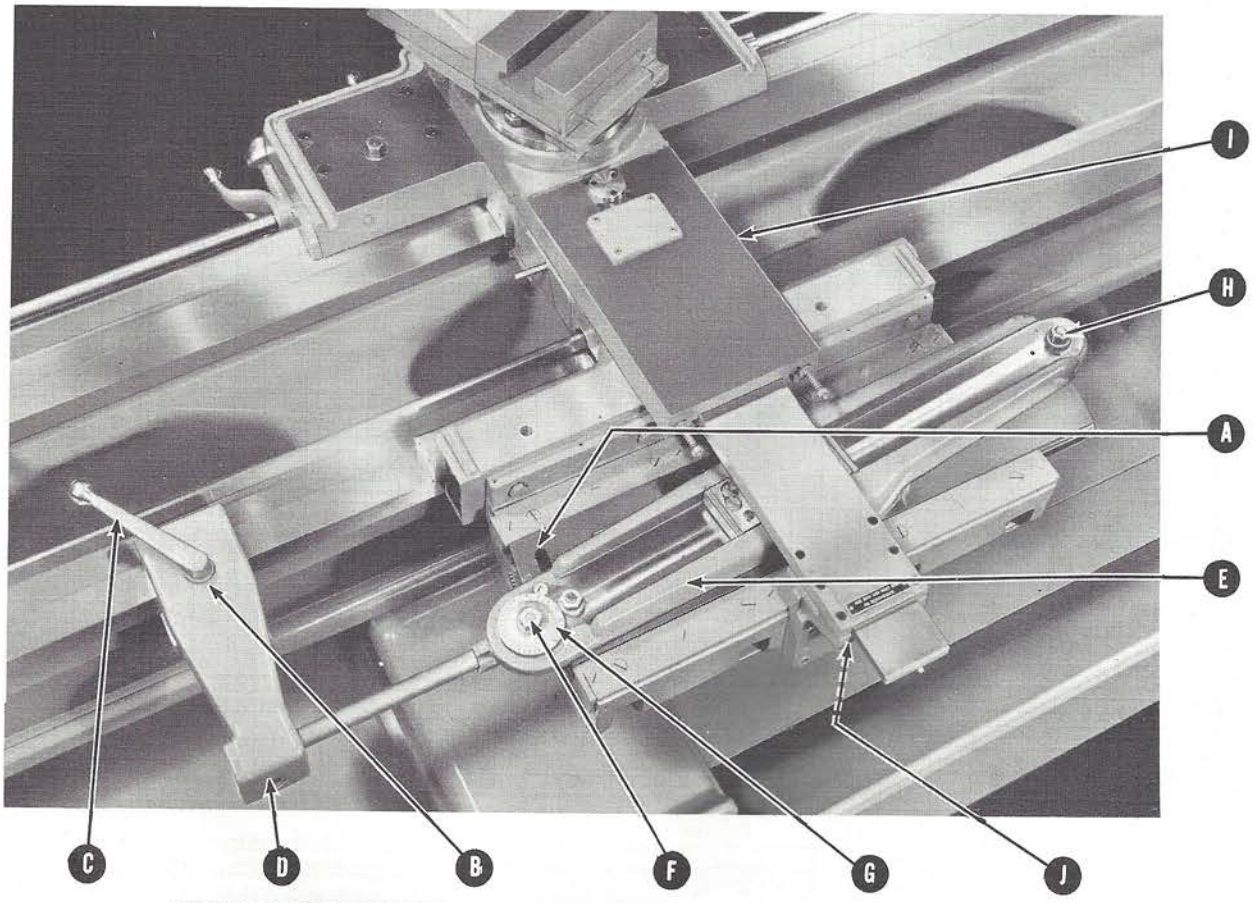


FIGURE 9 TOP VIEW OF MONARCH BALL BEARING TAPER ATTACHMENT

CAMLOCK SPINDLE

The spindle on Monarch 612 lathes is known as the camlock spindle because of the method of attaching chucks, plates and fixtures.

There are six camlocks in the spindle nose. Two of them, (A) Figure 10, clearly show in the illustration. The small indicating line on camlocks (A) indicates that they are in the unlocked position because these lines are parallel with the spindle face. Arrows (B) show the direction in which the camlocks should be rotated for tightening. When this is done, it is important that the camlocks be tightened evenly. Do this gradually, rotating the spindle from one to the other until all the locks are tight.

It is equally important that the cam studs, the face of the spindle and the back of all chucks, plates and fixtures be free from dirt and burrs before mounting takes place.

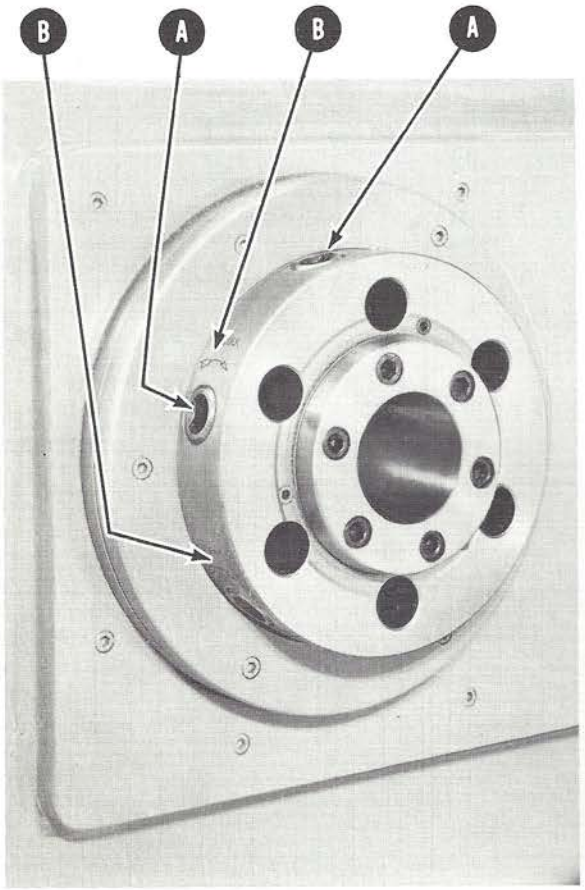


FIGURE 10 612 LATHE AMERICAN STANDARD CAMLOCK SPINDLE NOSE

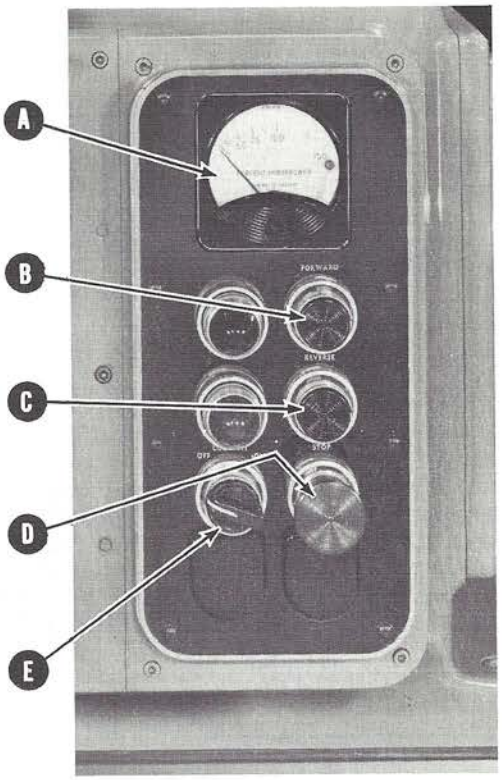


FIGURE 11 ELECTRICAL CONTROL PANEL

ELECTRICAL CONTROL PANEL

The electrical control panel, Figure 11, is located on the front of the headstock. It is within easy reach of the operator at all times with the control buttons clearly marked for quick identification. (A) is the horsepower meter, (B) forward, (C) reverse, (D) stop, (E) coolant pump starter.

CARE AND ADJUSTMENT

The proper care and adjustment of your Monarch lathe is very important for maintaining the accuracy and ease of operation which have been carefully designed and built into the machine.

A good machinist is judged by the appearance and condition of the tools with which he works. The Monarch 612 lathe has very fine finish which is easy to keep clean. Occasional wiping with a clean, dry cloth or kerosene soaked cloth will keep the finish looking bright and new for a long while.

All adjustments are expertly made at the factory before shipment of the machine. Occasionally, however, certain further adjustments may have to be made.

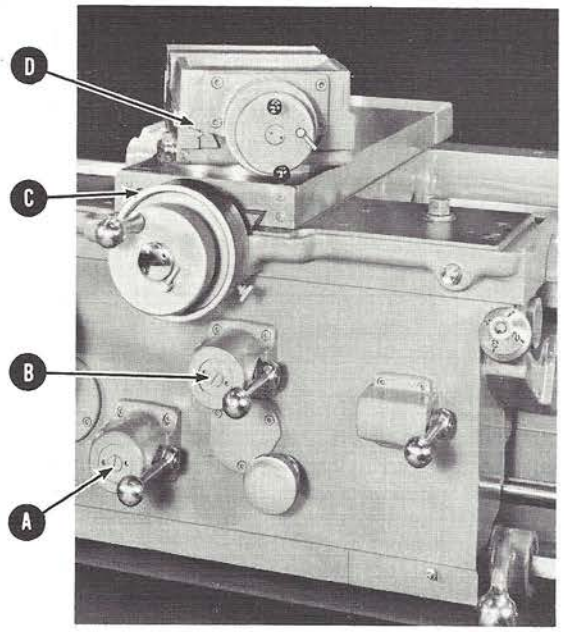


FIGURE 12 APRON AND SLIDE ADJUSTMENT SCREWS

APRON AND SLIDES

The longitudinal feed friction clutch is adjusted by turning screw (A), Figure 12, either in or out so the lever is moderately tight about halfway down toward the apron from the neutral position shown. The cross feed friction clutch is similarly adjusted by means of screw (B).

Screws (C) and (D) are for adjustment of the cross feed slide and compound slide gibs. There is a similar screw adjustment at the rear of each slide. The gibs should be adjusted to give a slight drag to the slides. If the adjusting screws are drawn too tightly against each end of the gibs, they may create a bad bearing surface by throwing the gibs out of line.

SPINDLE CLUTCH AND BRAKE

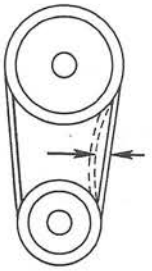
The spindle brake is of the multiple disc type, hydraulically actuated. It is self adjusting and continuously lubricated. Clutch adjustment is described in the headstock section, page 5.

VEE BELTS

The main drive motor is mounted on the hydraulic tank (A, Figure 13).

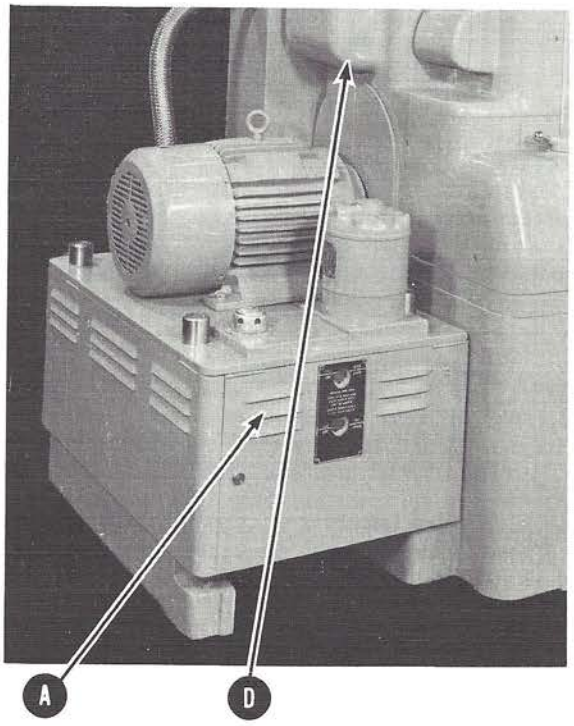
A screw (B) on each of the four support columns locks the tank in position. To adjust vee belt tension loosen these 4 screws and rotate elevating screw wheel (C).

Vee belt tension should be maintained as shown.



The belts can be inspected by removing clutch guard (D), Figure 13.

Reasonable pressure against a single belt should move it 3/8" to 1/2".



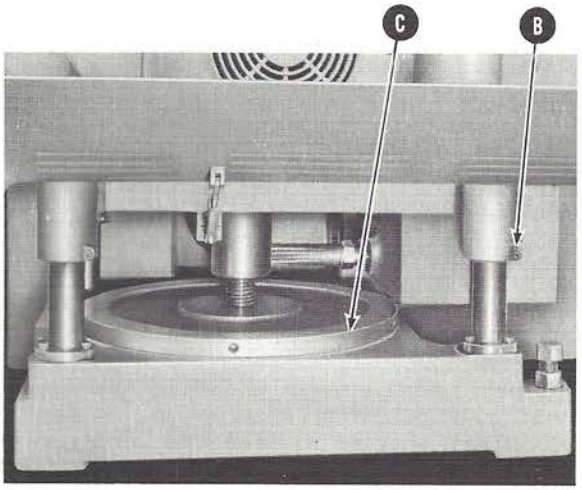


FIGURE 13 HYDRAULIC TANK AND ELEVATING SCREW WHEEL

LUBRICATION PROCEDURE

PREPARATION FOR OPERATION AND RUN-IN

When you first receive your 612 lathe you will find that an anti-rust compound has been applied to all outside machined surfaces. After removing the compound as suggested in the section on Receiving and Cleaning (Page 3) apply a thin film of a medium grade oil to bedway surfaces. Also check the level of the oil in the hydraulic power unit and apron. The lathe should then be thoroughly oiled and greased according to the lubrication chart.

Following the operation of the lathe for the first ninety days or approximately 750 hours, it is recommended practice to drain the apron, and flush with a light clean flushing oil and refill it to the proper level with the recommended lubricant.

The hydraulic power unit reservoir should not be flushed with flushing oil, but should be drained; the cover removed so that it can be wiped clean with a clean, lint-free cloth; the cover replaced; the suction filter element replaced. Following this the reservoir should be refilled to the proper level with the recommended hydraulic oil.

PERIODIC OIL LEVEL CHECK

Oil reservoir levels should be checked at least twice a week.

CAUTION: Turn off the main drive motor when checking oil reservoir levels.

On the oil gauge for each unit is a line which indicates the correct oil level. Never permit the level to fall very far below this line as lack of lubrication can result in damage to the machine in a relatively short period of time. Over-filling should also be avoided since it results in oil wastage and may cause a certain amount of overheating due to excessive churning of the oil.

REQUIRED OIL CHANGES

It is recommended that once every six months the oil be drained from the apron and power unit, and that they be cleaned and refilled as previously described.

At the same time the apron lubricating pump should be removed and the felt filter disc inspected. If the disc is not clean it should be replaced with a new one and the pump reinstalled.

The pump can be reached by removing the pump cover from the bottom of the apron.

The hydraulic power unit filter should also be replaced at this time.

CORRECT HAND OILING

Before the lathe is started each working day, all oil cups and hand oiling points should be oiled according to the chart.

The use of the pneumatic type of oil can with plunger operation rather than the ordinary spring bottom type is recommended since it permits better oiling at many points and gives better control over quantity of oil used. Refer to chart for detailed hand-oiling instructions.

IMPORTANT: When refilling or adding oil to lubrication reservoirs take every precaution to prevent dirt or chips from getting into the system, since foreign matter of this nature can quickly clog the pump filters. Also avoid using lubricants which tend to be absorbed extensively by the filter discs, thus clogging and reducing the flow of oil through the system. For the same reason do not use the so-called "dripless" oils or grades containing graphite, soap or other foreign substances.

USE OF GREASE GUN

Be sure to eliminate air pockets by operating the gun a few times before using.

Be sure to clean all grease fittings before using grease gun.

Be careful not to over-lubricate since the high pressures exerted by a grease gun may cause over-filling of bearings or damage to seals.

CARE OF HYDRAULIC SYSTEM

It is very important that extreme precautions be taken to prevent water, dirt and grit from entering the hydraulic system.

The pump, valves and operating pistons of the hydraulic system are sensitive to both the characteristics and the condition of the hydraulic oil used. With the right oil they will operate smoothly, perform faithfully, respond quickly and require little attention. Efficient operation depends largely upon:

1. Use of the correct oil.
2. Scheduled maintenance of the system as previously outlined.

IMPORTANCE OF CLEANLINESS

It is extremely important that lubricants and lubricant containers be handled carefully. Careless handling can quickly defeat the best lubrication procedure. Cleanliness is primarily a matter of systematic handling and proper storage facilities, which include well marked containers used for the same lubricant at all times.

1. Wipe all filler openings carefully before adding oil.
2. The use of a fine screen or mesh is recommended when refilling the hydraulic system.
3. Replace all covers, filler plugs, etc. immediately after oiling or filling.
4. Clean all pressure fittings before using grease gun.

SPECIFIC LUBRICANTS

The below listed lubricants are satisfactory for the applications shown on the following lubrication chart.

SPEC.	SOURCE	LUBRICANT
MG-2	Socony-Mobil Oil Co.	Mobilux #2
	Shell Oil Co.	Alvania #2
	Standard Oil Co. (Ohio)	Sohiotran #2
	Sun Oil Co.	Prestige #42
MO-12	Socony-Mobil Oil Co.	Vactra Heavy-Medium
	Shell Oil Co.	Hydraulic Oil 33
	Sun Oil Co.	Solnus 300
MO-14	Sun Oil Co.	Sunoco Way Lubricant #80

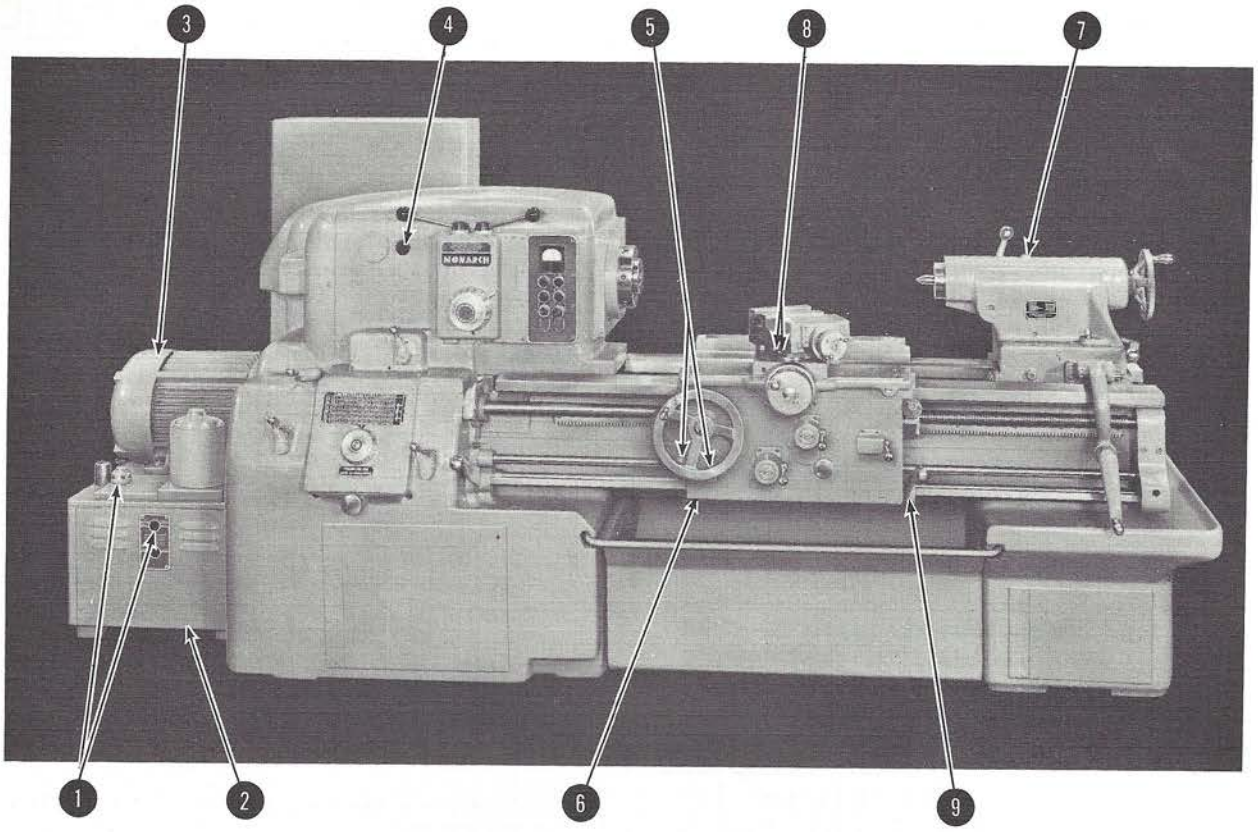
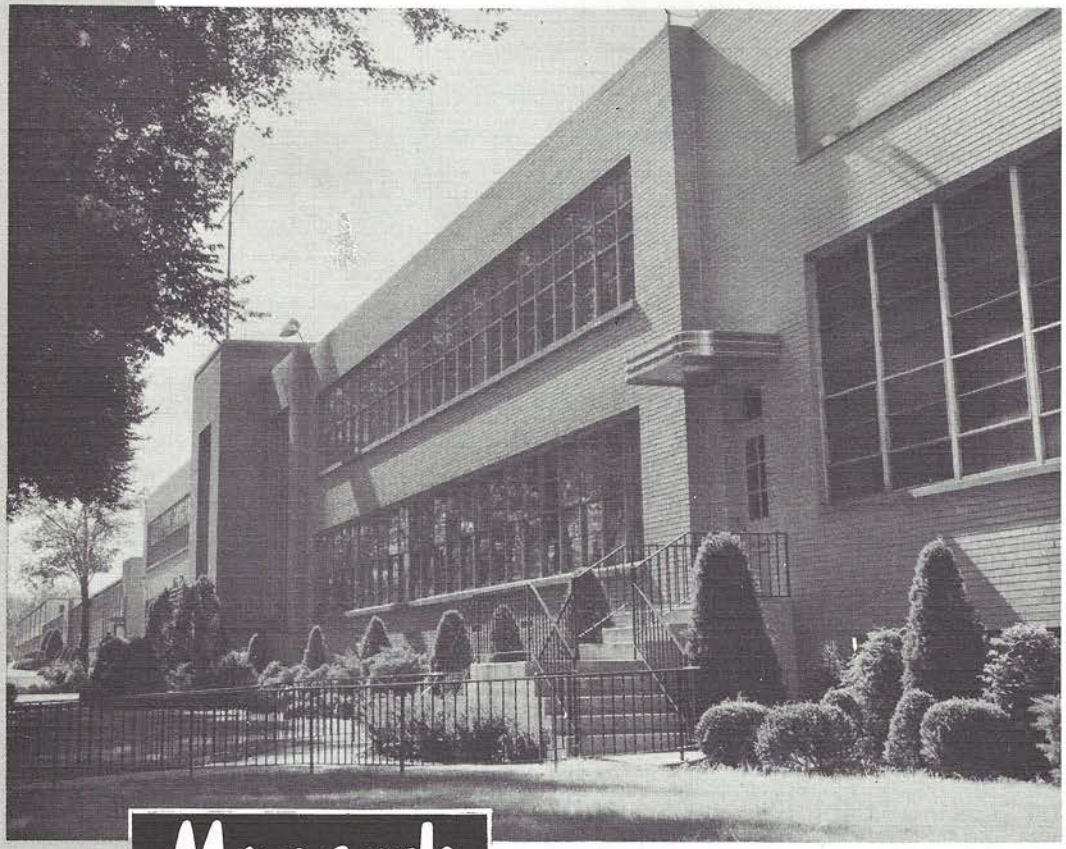


FIGURE 14 MONARCH 612 LATHE

Reference Number	Part	Capacity	Monarch Lubricant Spec.	Schedule
1	Hydraulic Power Unit Reservoir Filling Point and Oil Level Gauge (Unit Also Furnishes Oil for Lubrication of Headstock and Gear Box)	4 Gals.	MO-12	Check oil level at least twice a week. Drain every 6 months at point (2) (back of cover) and clean. Also replace filter.
3	Main Drive Motor		MG-2	On those makes of motors fitted with grease fittings grease every 12 months. Use caution to prevent blow out of seals.
4	Viewing Port for Visual Inspection of Headstock Mist Lubrication			Observe mist each shift.
5	Apron Reservoir Filling Point and Oil Level Gauge	1 Qt.	MO-14	Drain (point 6) and flush twice a year. Check level each shift.
7	Tailstock		MO-12	Oil weekly.
8	Compound Rest		MO-14	Oil weekly.
9	Apron Control Rod Bearings		MG-2	Grease monthly.
	Taper Attachment		MO-14	Oil weekly when in use.
	Traveling Rod Supports (Where Used)		MO-14	Oil weekly.
Rear of lathe, at headstock end.	Rapid traverse gear motor drive.	1 Pt.	MO-12	Drain every 6 months, flush and refill with fresh oil. Grease rear motor bearing yearly with MG-2.



THE Monarch TURNING MACHINES STORY . . . . .

With industry confronted by costs that continue to climb, manufacturers everywhere are demanding machines capable of working metals faster, more accurately and more economically. Providing turning equipment that will answer these requirements is Monarch's constant aim.

To develop and manufacture lathes that will solve the latest problems of industry, Monarch has built up one of the best equipped shops in the nation, manned by skilled machine tool craftsmen.

Of equal importance is the research, development and experimental division. From the drawing boards and machines of the men in this group, new machines are always emerging . . . machines to meet new needs or to better fulfill existing requirements.

This involves the development of machine tools with higher machining speeds, greater operating convenience, improved electrical and electronic controls and automatic features that will provide ever-improved output. New development at Monarch is conducted as a separate year-round research program. It is established in its own building located adjacent to the main plant.

Through research and development, and through constant improvement of manufacturing facilities and maintenance of rigid quality control, Monarch will continue to furnish the industrial field with the very finest in turning machines.

SMALL AND MEDIUM SWING LATHES

10" Model EE Precision Toolmaker's and Manufacturing
Series EE, Model 1000 Precision
Monarch 612—for manufacturing and toolroom use
Series 62 Dyna-Shift—for manufacturing and toolroom use

HEAVY DUTY LATHES

Series 80 Dyna-Shift
Series 90 Dyna-Shift
Series 170 Missile Master

PRODUCTION LATHES

The Mona-Matics—Models 20-H, 21-H and 21
The Mina-Matic
The Hydra-Slide
Numerical Control

Monarch TURNING MACHINES

TRACER CONTROLS

The Monarch "Air-Gage Tracer"
The Monarch Air-Tracer Pak
Rotary Profile Tracer Lathe
Monarch-Keller Contour Turning Lathes

SPECIAL PURPOSE LATHES

The Speedi-Matic—Model B
Roll Turning
Series 180 Ultra-Precision Contouring
60" Right Angle—Models F and 0
Machinability Test

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