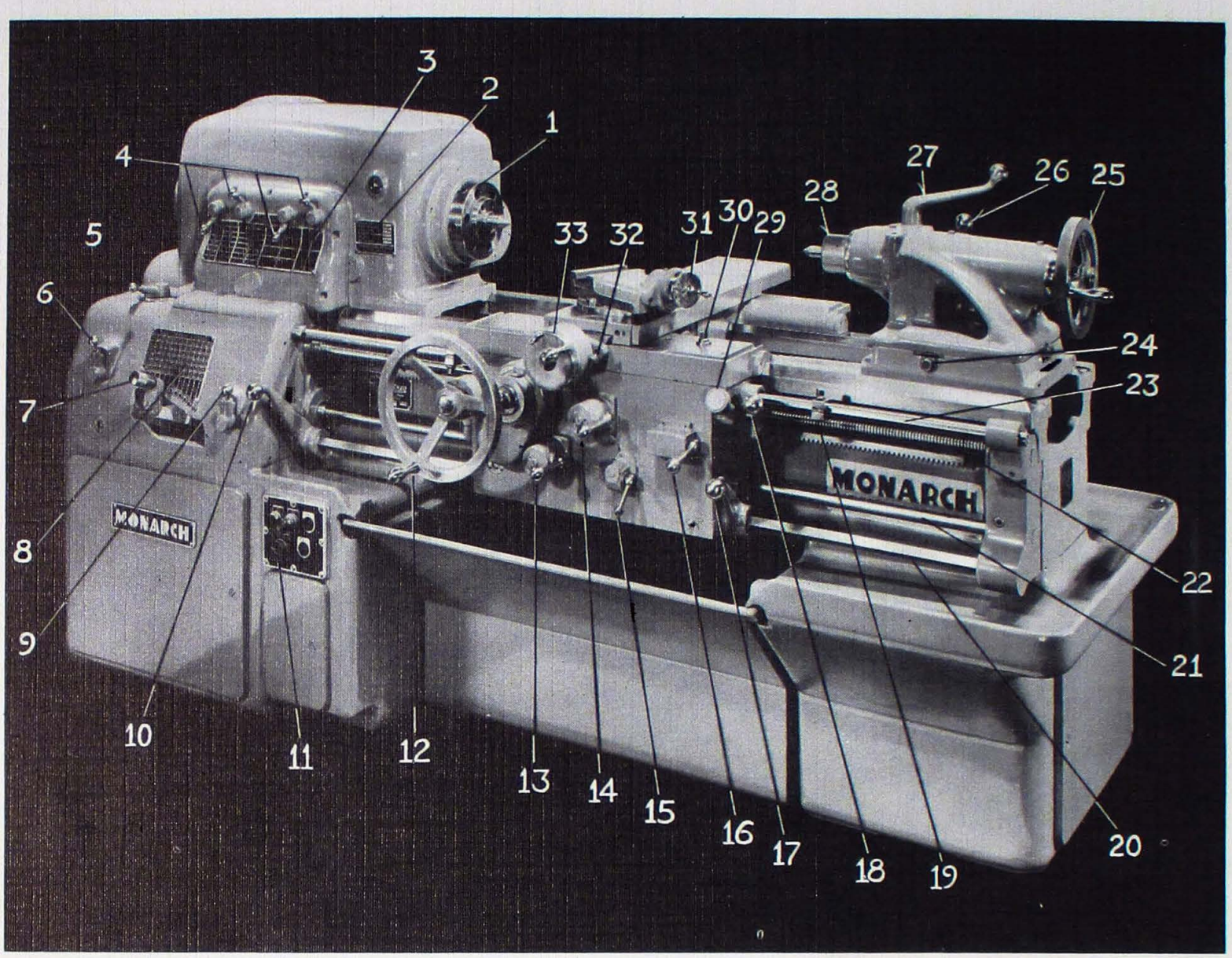
OPERATOR'S MANUAL

Monarch Engine and Toolmaker's Lathes Series 60

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

THE MONARCH MACHINE TOOL CO.
Sidney, Ohio, U. S. A.



NAMES OF LEVERS AND PARTS USED IN OPERATION

1. Headstock spindle.
2. Identification plate.
3. Spindle speed index plate.
4. Headstock spindle speed change levers.
5. Upper compound lever.
6. Lower compound lever.
7. Tumbler lever.
8. Feed-thread index plate..
9. Feed-thread lever.
10. Spindle control lever.
11. Electrical switch grouping.
12. Apron handwheel.
13. Longitudinal friction lever.
14. Cross-feed friction lever.
15. Feed directional control lever.
16. Half nut closure lever.
17. Spindle control lever.
18. Leadscrew reverse lever.
19. Reverse rod stop dog.
20. Control rod.
21. Feed rod.
22. Leadscrew.
23. Reverse rod.
24. Tailstock setover screw.
25. Tailstock handwheel.
26. Tailstock clamping lever.
27. Tailstock spindle binder lever.
28. Tailstock spindle.
29. Chasing dial.
30. Carriage binder clamp.
31. Compound rest dial and handle.
32. Thread chasing stop.
33. 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 Series 60 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 headstock and also on the tailstock end of the bed between the front "V" and the flat. 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 gasoline or naptha removes this compound quickly. After the lathe has been thoroughly cleaned apply a thin film of oil to the bed ways.

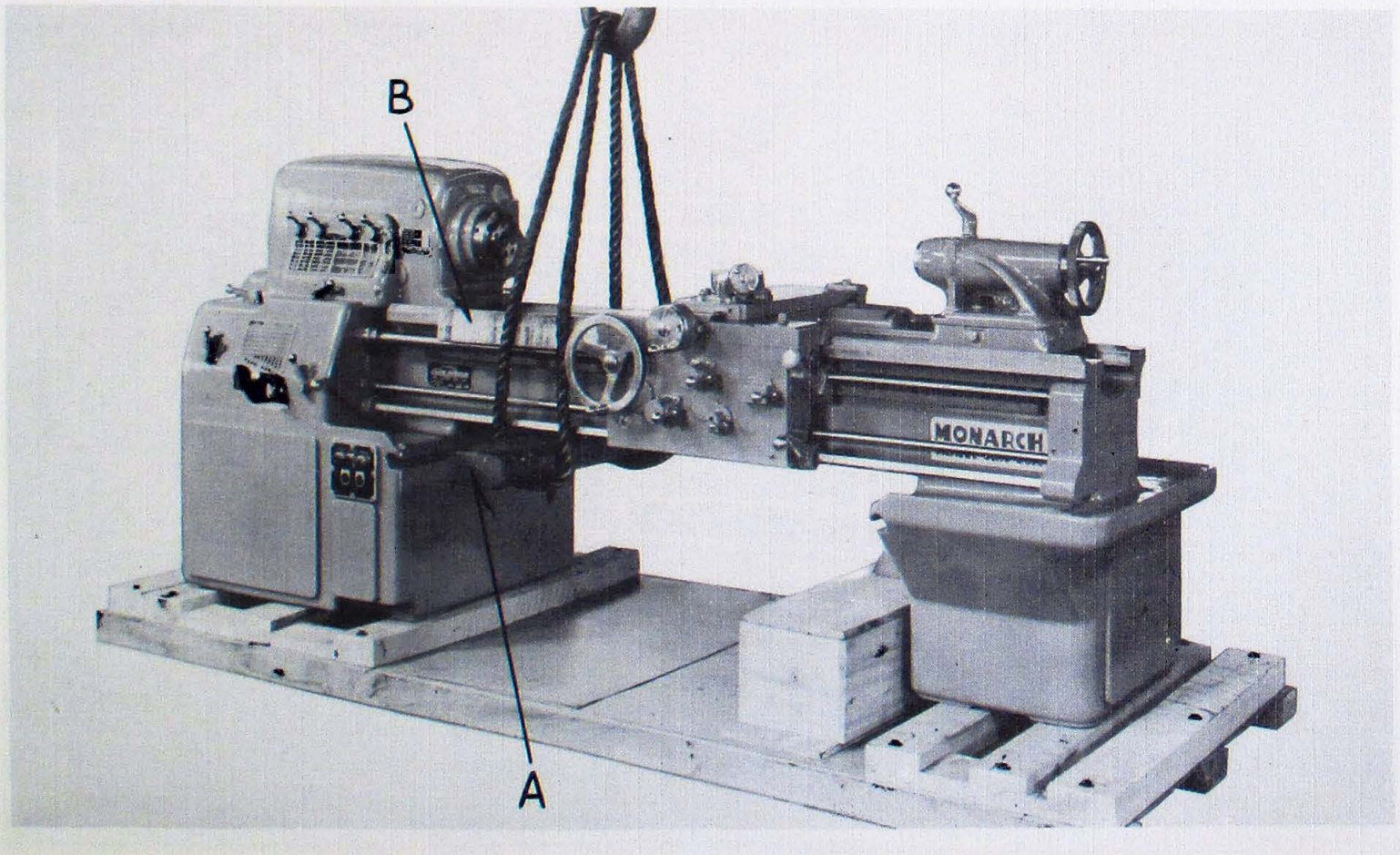
LIFTING

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.

Figure 2 indicates how to lift a Monarch Series 60 lathe. Block (A) which supports the load should be a piece of timber approximately 4" x 6" x 32", preferably oak. This is placed under the bed with a heavy rope, chain or steel cable looped around both ends. Block (B) should be approximately 4" square. It is inserted between the sling and the front of the bed to keep the sling from contact with the leadscrew and rods. Lift the lathe only a few inches off the floor and move it carefully.

Two cautions are in order here. Select a sling with plenty of strength for the job. And make certain always that the load is in balance before lifting.

Figure 2. Illustrating how to lift a Series 60 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.

LUBRICATION

More than any other single factor, adequate lubrication will guarantee long, trouble-free operation of the machine. This subject is fully covered in the separate lubrication handbook, next attached.

OPERATION

To benefit fully from the operational ease which has been built into the Monarch Series 60 and to avoid serious 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 four levers for obtaining the entire range of sixteen spindle speeds. See (A), (B), (C) and (D), Figure 3. Immediately below the levers is the spindle speed

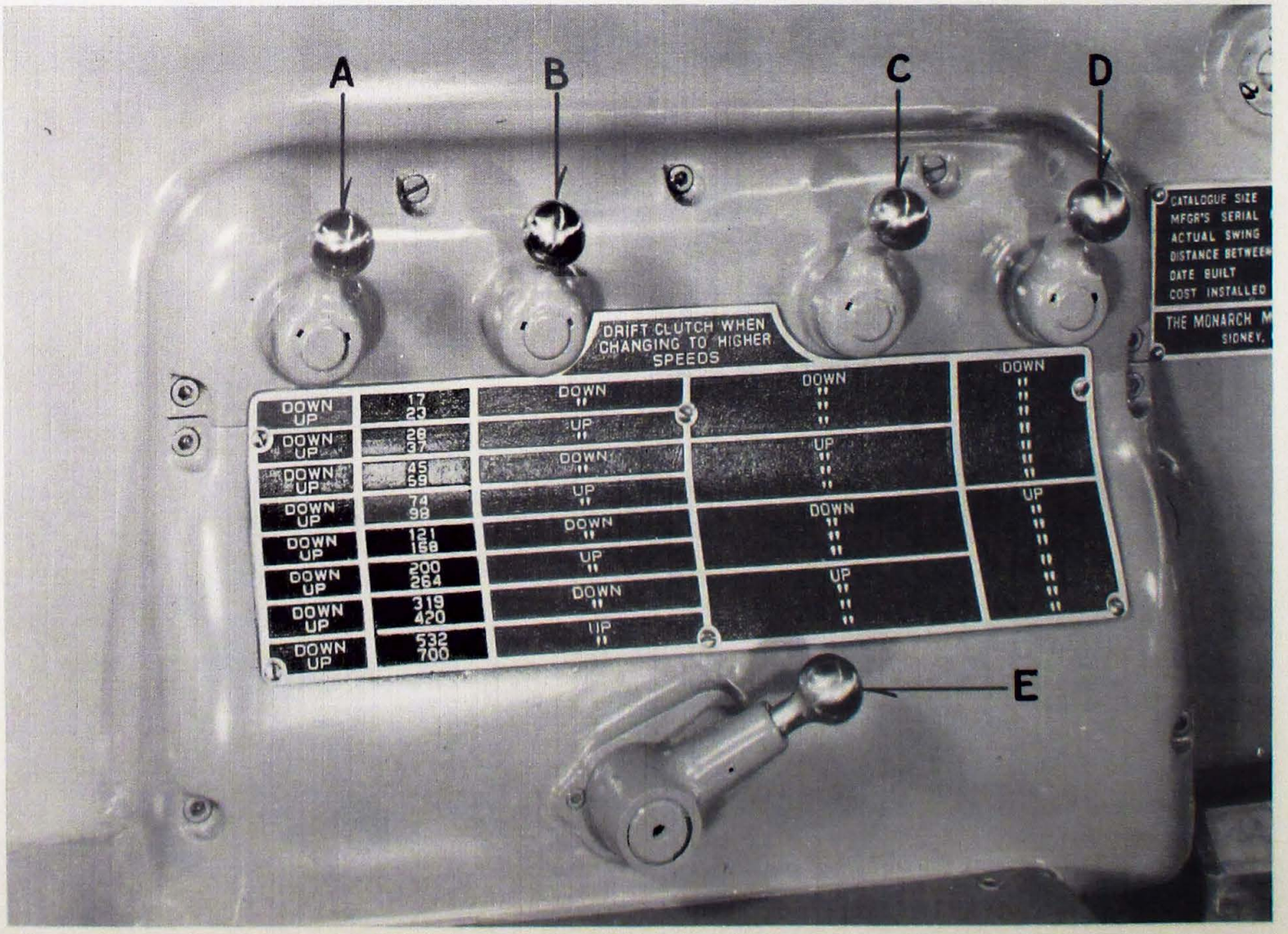


Figure 3. Control levers at front of headstock.

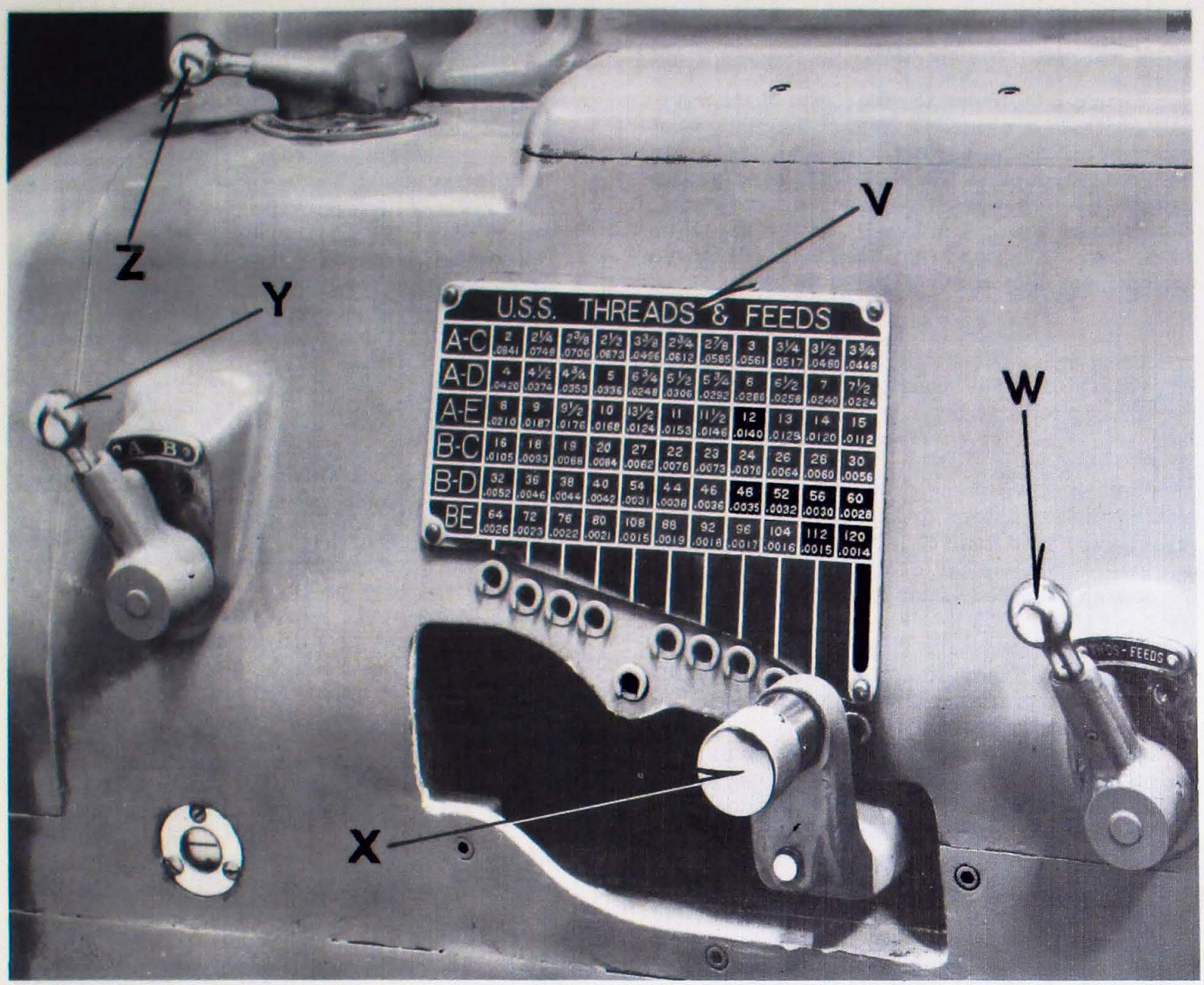


chart showing the lever positions for each speed. To shift the levers, rotate (A) and (C) in a counter-clockwise direction; (B) and (D) in a clockwise direction. Avoid undue strain and possible damage to the headstock by always drifting the spindle clutch when shifting levers (C) and (D) to a higher speed. Levers (A) and (B) can be shifted without drifting the clutch.

Selecting the required speed on the Monarch Series 60 is simplicity itself. Choose the speed needed, and read straight across for the lever positions. Note, by referring to the chart, that the lowest speed in the range is obtained with all four levers in their "down" position while the highest speed is with all four levers in their "up" position. After a short period of experience familiarizes the operator with the controls, he may stand at the carriage and determine the spindle speed quickly by the lever positions.

Immediately below the spindle speed chart is leadscrew reverse lever (E) found only on Series 60 engine lathes. It is used to reverse the rotation of the leadscrew for right or left hand threads.

Figure 4. Control levers at front of gear box.

GEAR BOX

Large, easily read index plate (V) Figure 4 shows the wide range of threads and feeds obtainable by moving levers (X), (Y) or (Z). Lever (X) is positioned in the hole directly under the thread or feed desired. Lever (Y) can be positioned only on an "A" or "B" setting while lever (Z) can be positioned only on a "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 drift the spindle clutch except at very low speeds, because position "A" is the high speed side of the gear box.

The regular thread range of Monarch Series 60 machines is from 2 to 120 threads per inch with feeds from .0014" to .084" per revolution. 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 (E) 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.

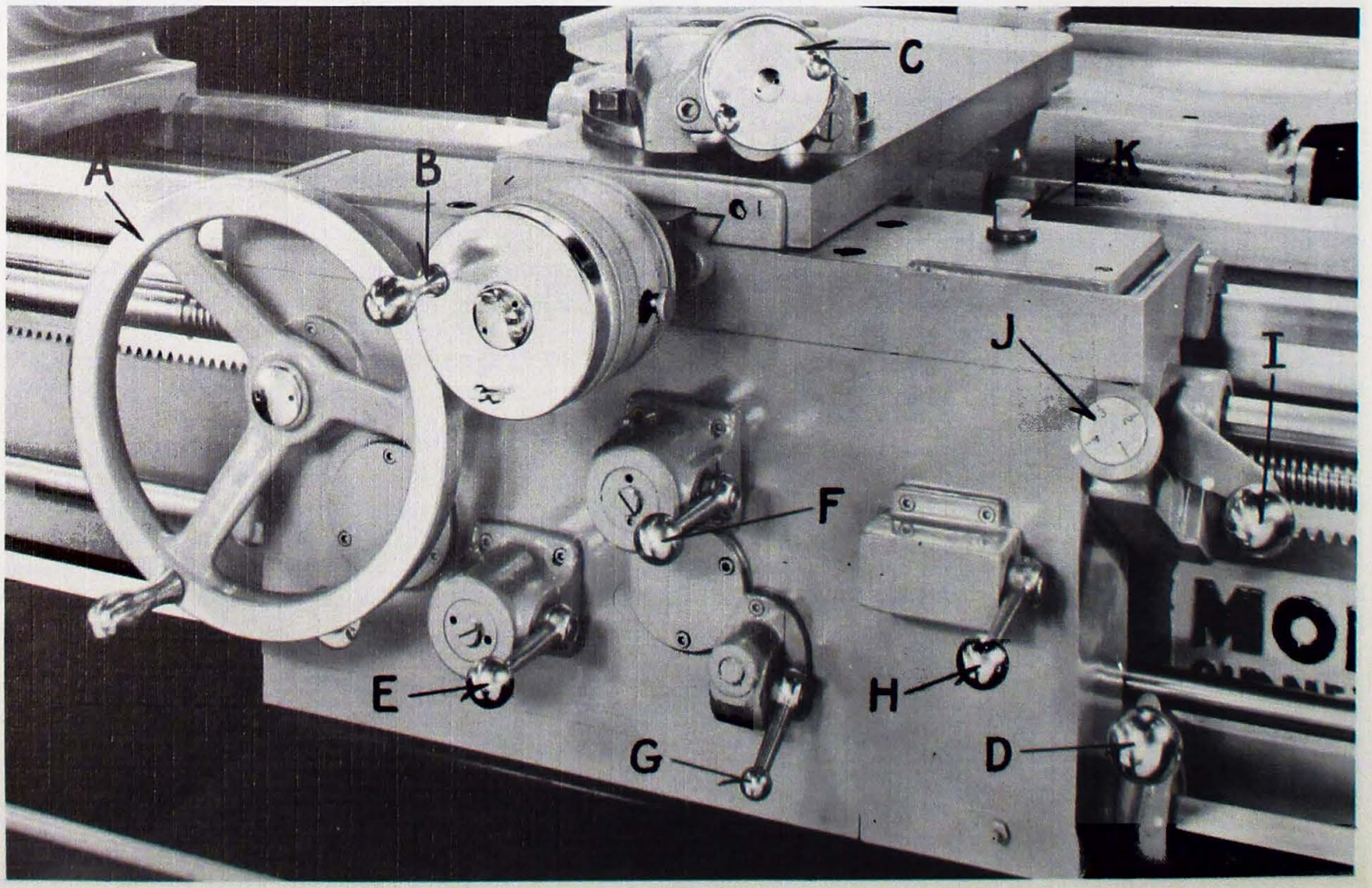
Feed directional lever, (G), is shown in neutral position. In the up or straight out position the carriage feeds toward the tailstock and the cross slide feeds in. When in the straight down position, the carriage feeds toward the headstock and the cross slide feeds out.

If threads are to be chased, the carriage is engaged to the leadscrew by means of half nut control lever, (H). It is illustrated in its disengaged position and should be straight down for full engagement. Always have lever (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 half nut during thread chasing operations. On any even thread where the lead being chased is divisable by four the half nut 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 half nut may be engaged at any one of the four graduations. When chasing half threads, the half nut 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 that the half nut 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.

Figure 5. Front close-up of apron, carriage and compound rest.



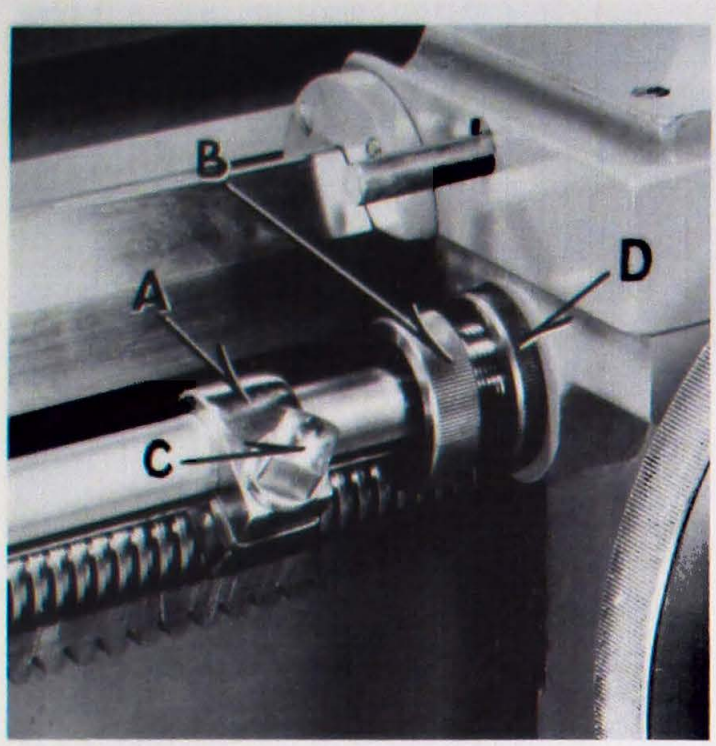


Figure 6. Automatic length stop at left hand side of apron.

APRON CONTROLLED LEADSCREW REVERSE

Leadscrew reverse lever (I) Figure 5 is found only on Monarch Series 60 Toolmaker's Lathes. Its functions are the same as lever (E) Figure 3 on the front of the headstock of all Series 60 Engine Lathes. Control of leadscrew reverse from the apron is particularly convenient during thread chasing operations--for example, chasing threads with odd leads where the half nut should not be engaged; speed chasing of short threads and, in connection with the automatic length stop, chasing threads up to a shoulder or in a blind hole.

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).

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 locked 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.

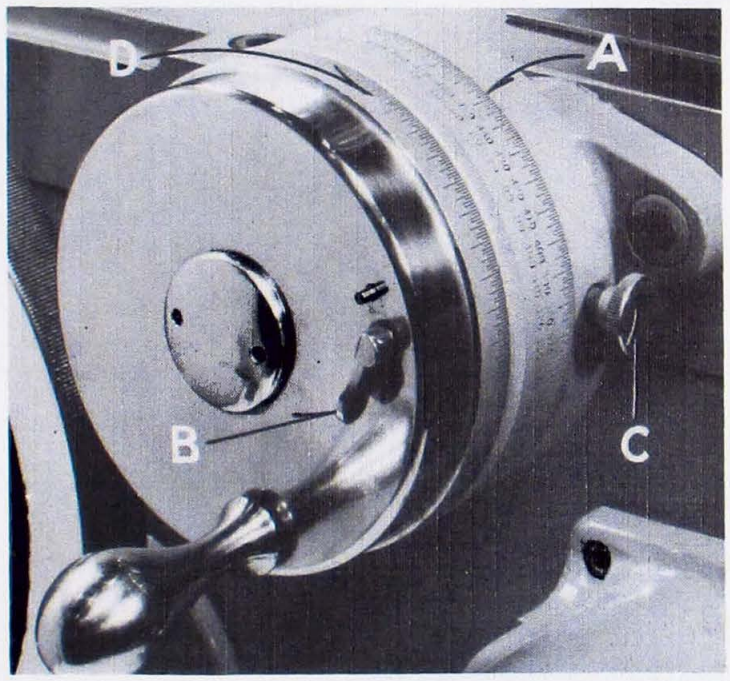


Figure 7. Close-up of cross feed micrometer dial.

Graduations (D) close to the front of the dial are used in conjunction with lock (B) for the purpose of imparting extra accuracy to the thread form during the finishing cut. This permits straight feed in of the tool instead of an angle feed in with the result that the finishing cuts are taken on both sides of the thread. The following is the procedure. Run the cross feed dial in to the stop. Then, unlock lever (B) which allows the cross slide to be moved in without disengaging stop (C). Each of the graduations (D) equals .001".

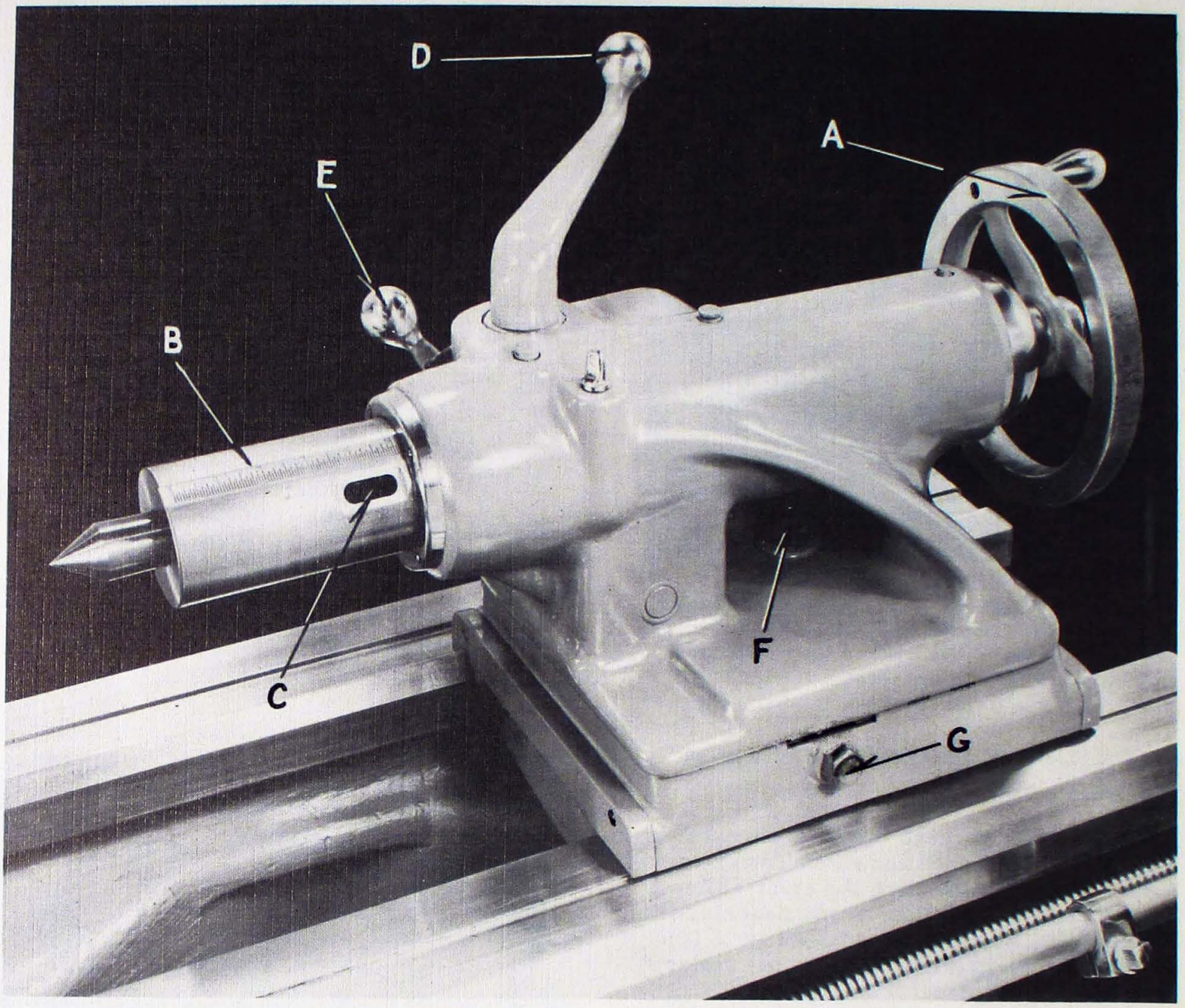


Figure 8. Quick acting type tailstock supplied on Series 60 Toolmaker's Lathes.

TAILSTOCK

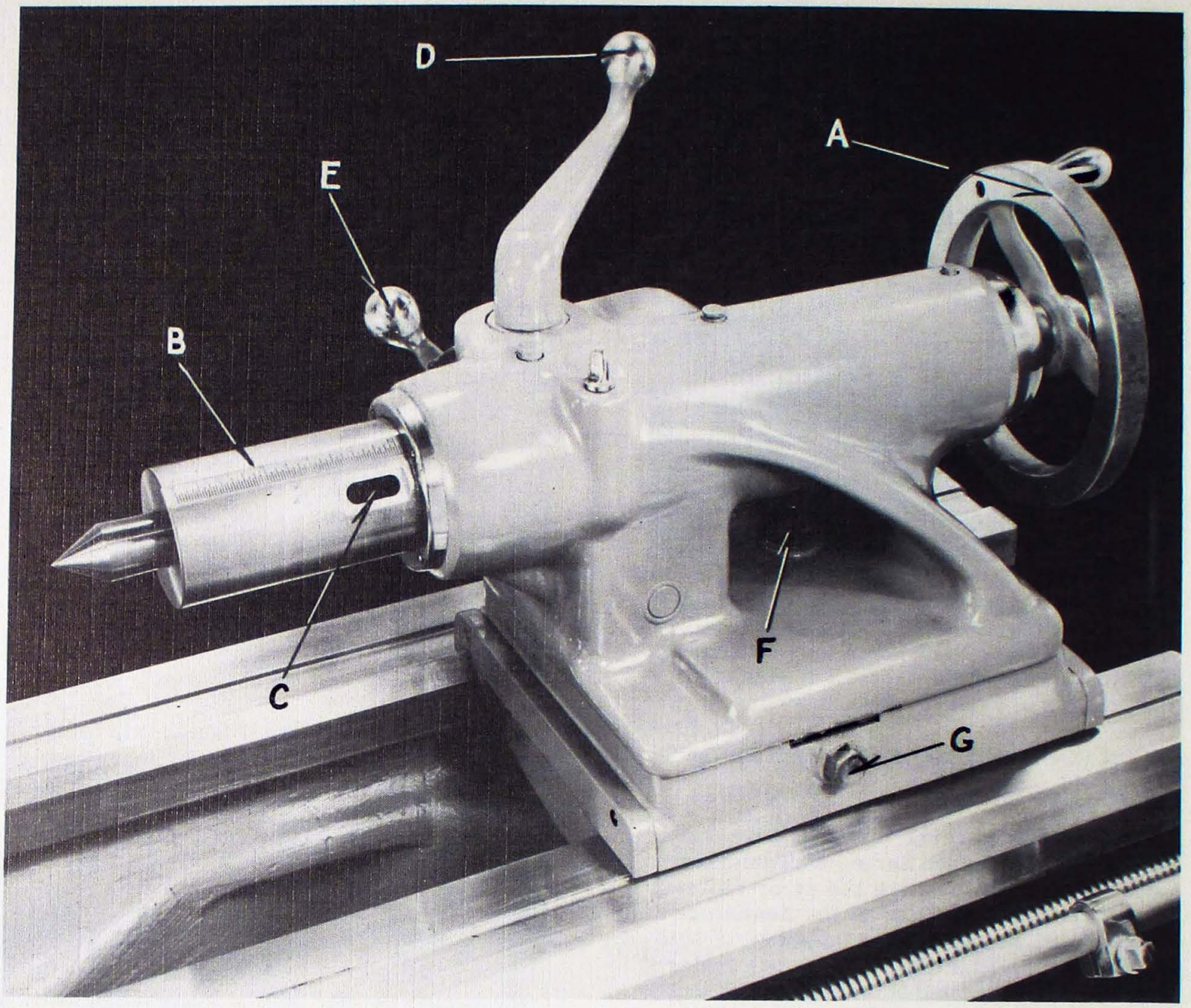
The tailstock on any lathe is primarily a work supporting device but it may be used to perform other important functions such as drilling, reaming and tapping.

Tailstock handwheel (A), Figure 8, is used to traverse or feed spindle (B) in or out. To permit accurate drilling to depth spindle (B) is graduated in inches. Tang slot (C) facilitates the removal of drills and reamers from the taper center hole. To remove the center, crank the spindle back into the tailstock until the center is automatically ejected.

Pulling lever (D) in a clockwise direction locks the spindle in position. This should always be done before the start of the cut. (E) is a clamping lever which quickly clamps the tailstock to the bed for such operations as drilling and reaming. It is a feature found on all Monarch Series 60 Toolmaker's Lathes but not on Series 60 Engine Lathes.

On 14" and 16" machines clamping lever (E) is supplemented by clamping nut (F) which should be tightened when turning work between centers or in any case when there is a considerable amount of pressure against the tailstock. On 18" and 20" machines there is an additional clamping nut on top of the tailstock. Series 60 Engine Lathe tailstocks, while not provided with quick clamping lever (E), have double the number of clamping nuts.

Aligning stud (G) 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 studs, the other being at the rear of the tailstock.



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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 knurled nuts (C) and hex nuts (D).

3. Set swivel (E) at required taper by turning stud (F) and reading the graduations at the hairline through magnifying lens (G).

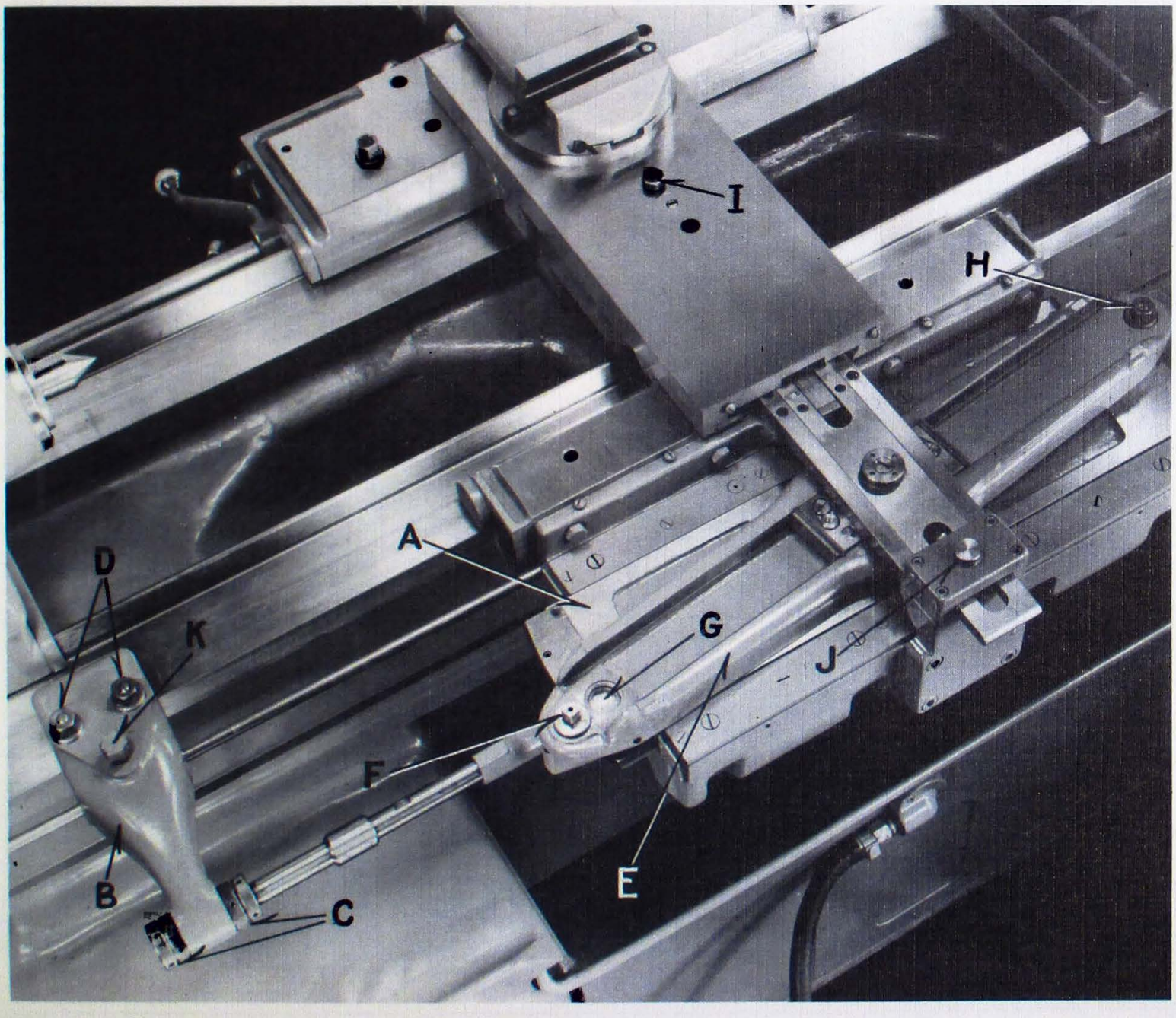
4. Lock nut (H) at the right hand end of the swivel and a similar nut on the underside of the swivel at the left hand end, tighten stud (I) and loosen stud (J).

5. Now, turn the taper by feeding the tool to depth in the usual manner with the compound slide.

To disconnect the taper attachment for straight turning, loosen stud (I), tighten stud (J), loosen nuts (D) and tighten stud (K). After the tightening of stud (K), bracket (B) will slide along the bed with the carriage. Therefore it does not have to be taken off unless extreme movement of the carriage would run it off the end of the 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 anti-friction bearing taper attachment.



CAMLOCK SPINDLE

The spindle on Monarch Series 60 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. Drawing, Figure 11, helps give a clearer conception of the Camlock spindle nose construction.

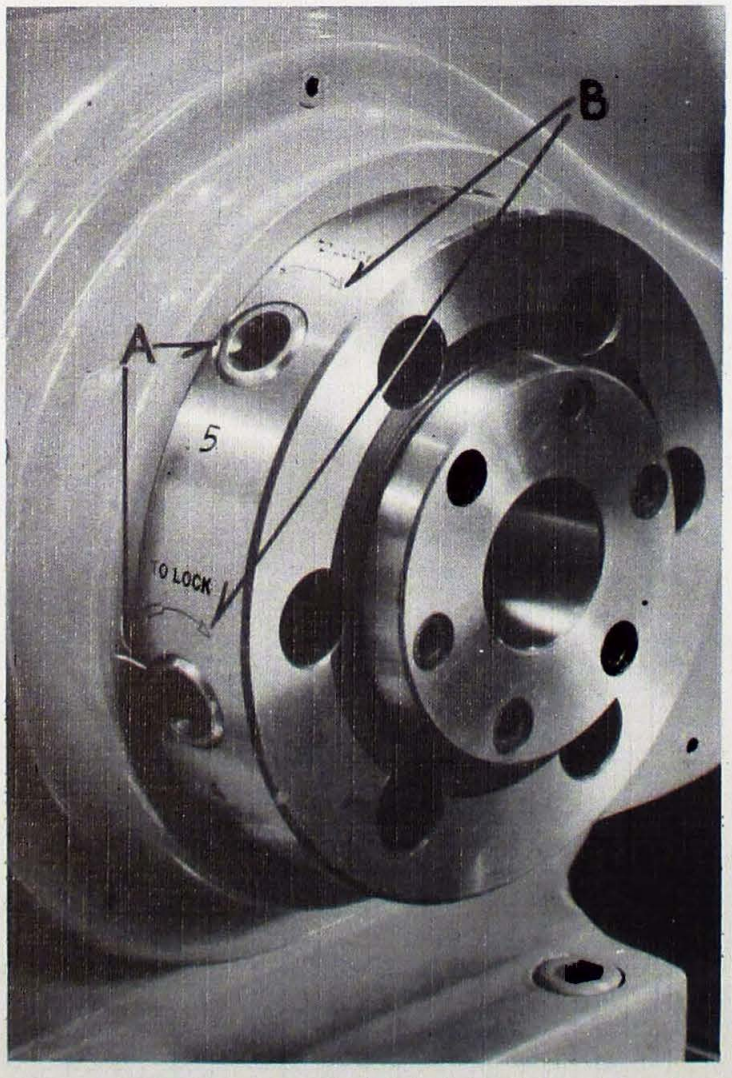


Figure 10. Series 60 American standard Camlock spindle nose.

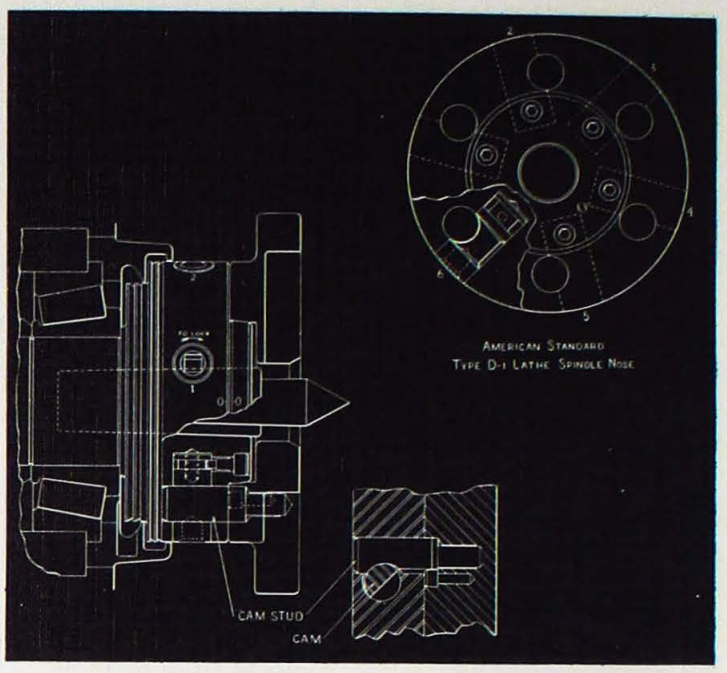


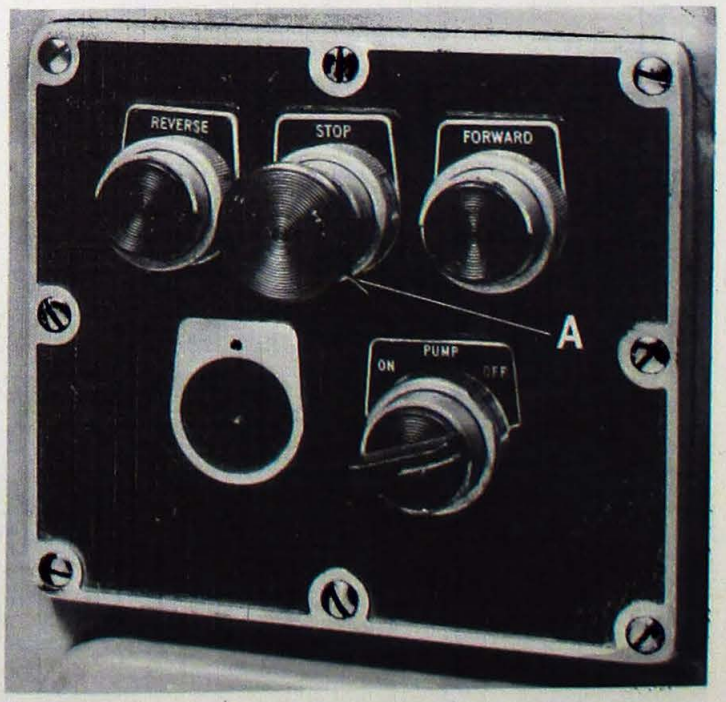
Figure 11. Drawing showing construction of Camlock spindle nose.

ELECTRICAL CONTROL PANEL

The electrical control panel, Figure 12, is located on the front of the left hand cabinet leg, directly below the gear box. It is within easy reach of the operator at all times with the control buttons clearly marked for quick identification.

Stop switch (A) is red in color and protrudes forward from the panel somewhat farther than the other buttons so as to make it possible to stop the machine quickly should this be necessary. This is a safety feature for the protection of both the operator and the machine.

Figure 12. Electrical control panel on left hand cabinet leg.



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 Series 60 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. The manner of doing this is described in the following pages.

HEADSTOCK SPINDLE DRIVE CLUTCH

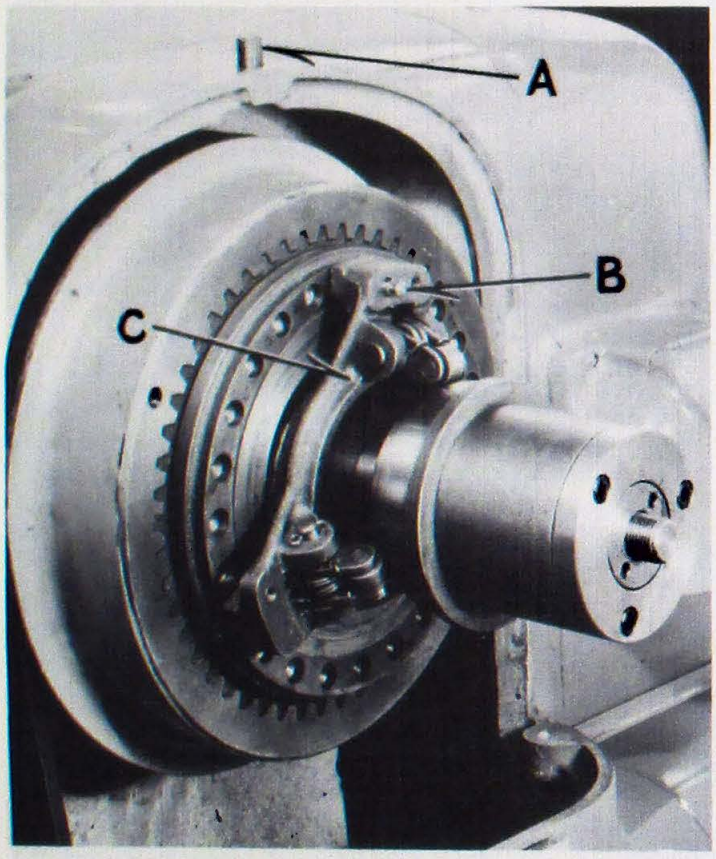


Figure 13. Cover removed to show spindle drive clutch.

The spindle drive clutch is readily accessible by the removal of the cover at the left hand end of the headstock. This cover may be lifted off after taking out stud (A), Figure 13.

The clutch consists of a multiple set of friction discs, which when properly adjusted deliver a positive drive for a long period with no attention required. If the clutch needs adjusting, pull pin (B) all the way out and turn spider (C) in a clockwise direction until pin (B) drops into the next locking hole. In case this does not give a sufficient amount of adjustment, turn the spider to the next hole, repeating the operation until the clutch control lever at the front of the machine snaps into position with a moderate amount of pressure.

In the event the clutch is too tight or too much pressure is required to engage it, repeat the procedure by turning spider (C) in a counterclockwise direction.

HEADSTOCK SPINDLE BEARINGS

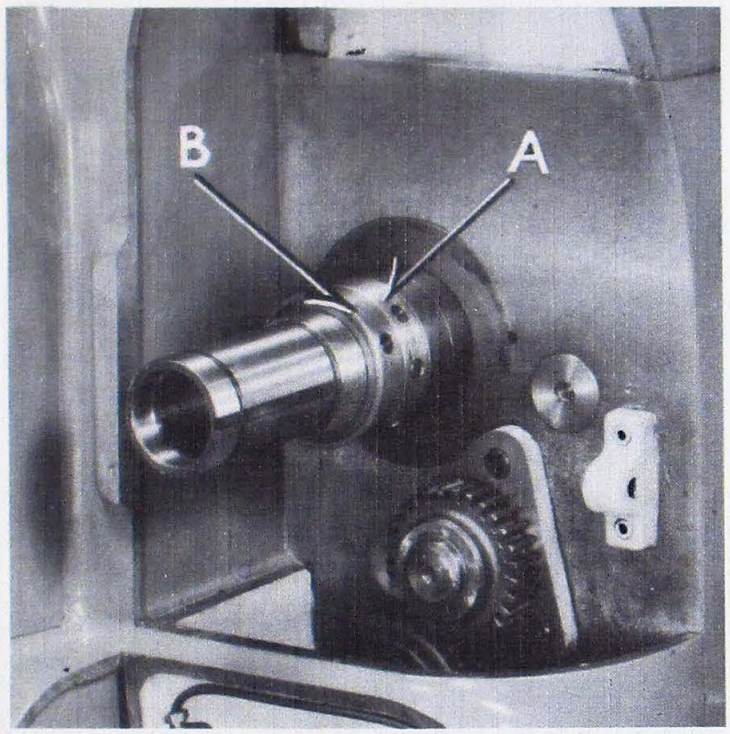


Figure 14. Cover removed to show left end of spindle.

After your lathe has been run for 200 hours or so, depending upon the nature of the work being performed, check the spindle for drag. To do this, shift all headstock levers to neutral position, that is, on a line parallel with the spindle. Then, turn the spindle by hand at the spindle nose and if there is very little or no drag, the bearings need adjusting.

This is done by loosening the set screws in nuts (A) and (B), Figure 14; loosening lock nut (B) and tightening adjusting nut (A) until there is a noticeable amount of drag on the spindle. Carefully avoid over-adjustment which will give too much drag. The new adjustment is secured by locking adjusting nut (A) in position with its set screw and tightening lock nut (B) as well as locking its set screw. Do this with care to avoid getting the bearings too tight.

HEADSTOCK SPINDLE BRAKE

Figure 15 is a top view of the headstock with the cover removed and with (A) showing the location of the spindle brake.

Figure 16 is a close-up of the spindle brake assembly out of the machine. To adjust the brake, lift locking spring (B) to clear the teeth of adjusting gear (A), turn gear (A) clockwise to tighten and counter-clockwise to loosen. Do not adjust the brake too tightly.

The spindle brake is engaged when the spindle start and stop lever at the front of the machine is all the way up. No upward pressure is required with the lever in the up position.

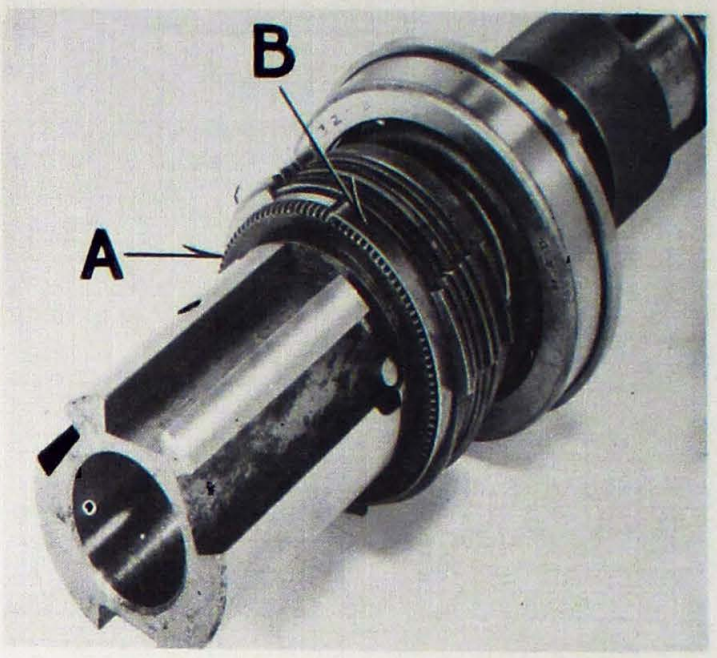


Figure 16 - above. Close-up of spindle brake assembly.

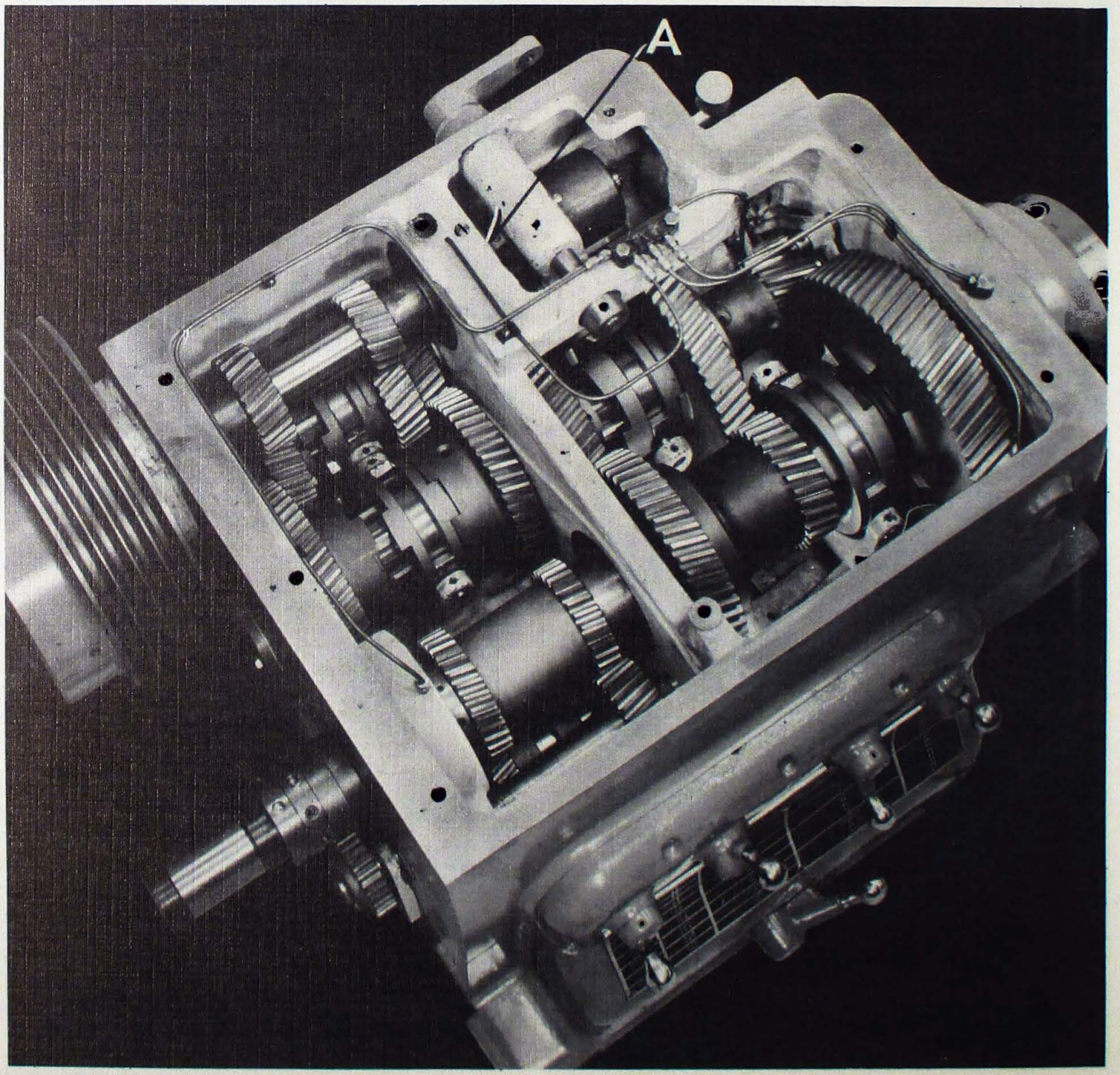


Figure 15 - below. Top view of headstock with cover removed.

APRON AND SLIDES

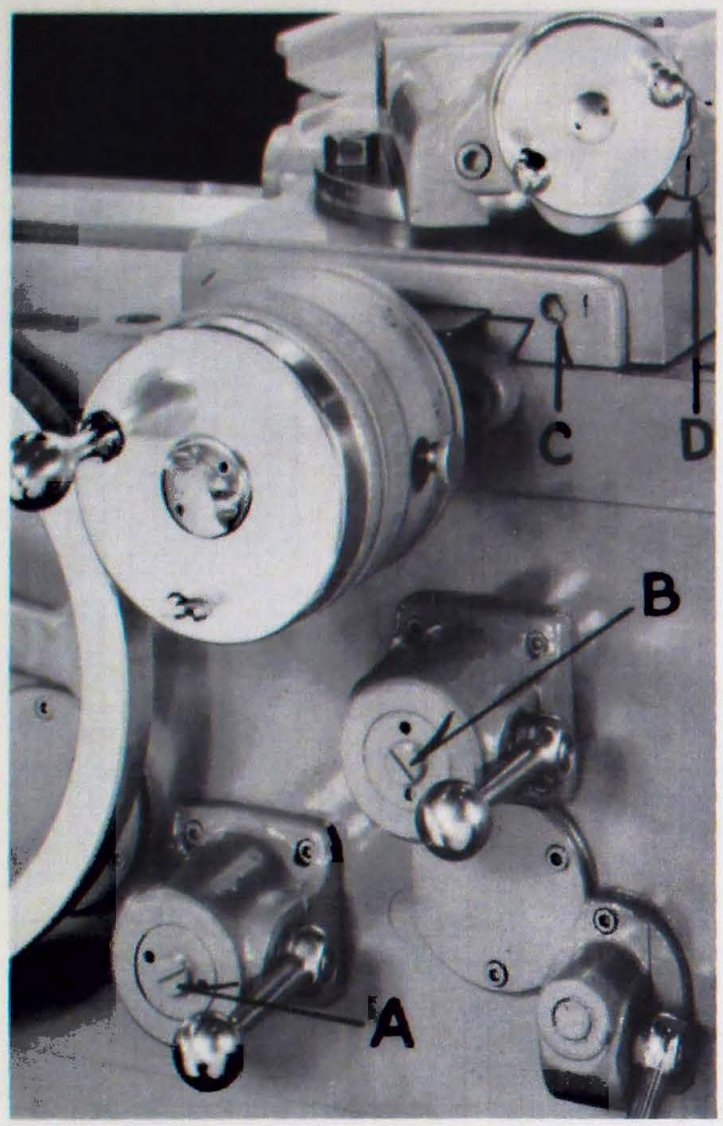


Figure 17. Apron and slide adjustments.

The longitudinal feed friction clutch is adjusted by turning screw (A), Figure 17, 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).

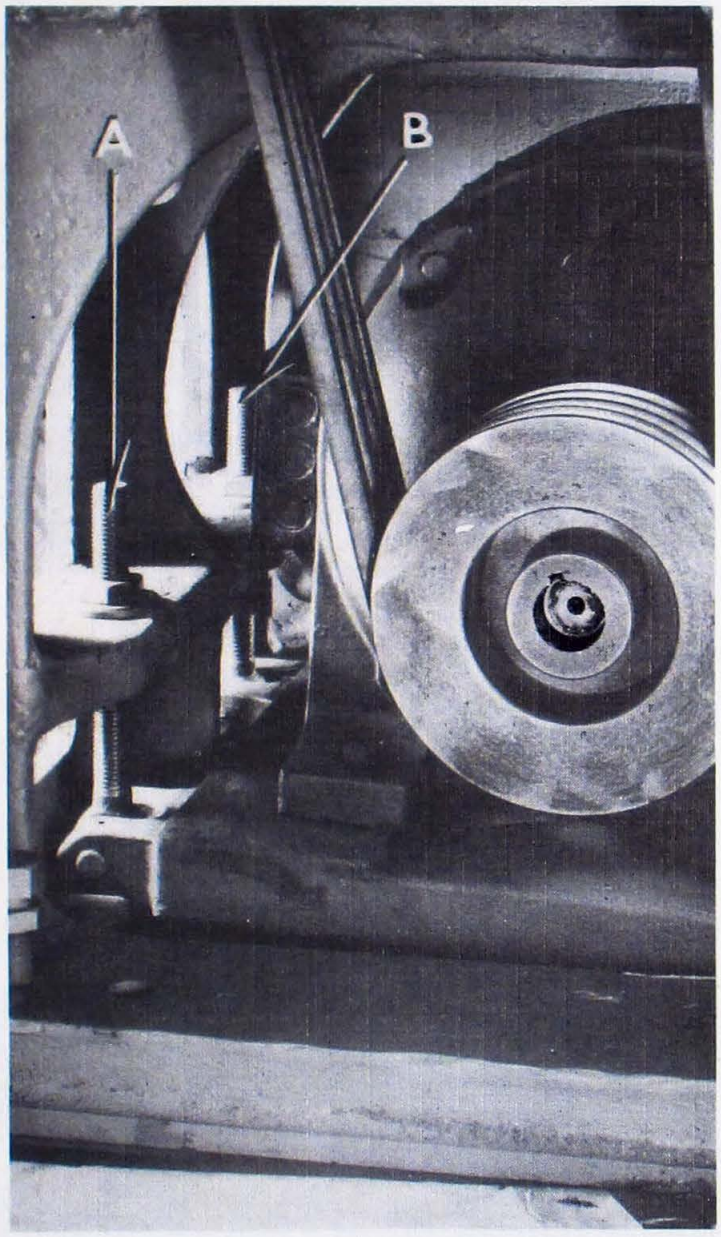
Screws (C) and (D) are for adjustment of the cross feed slide and compound slide gibs. There is a similar screw adjustment at the rear of each slide. The gibs should be adjusted to give a slight drag to the slides. If the adjusting screws are drawn too tightly against each end of the gibs, they may create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

VEE BELTS

The main drive motor is mounted on an adjustable base inside the left hand cabinet leg. This base is hinged at the front and supported at the rear by adjusting bolts (A) and (B), Figure 18.

To tighten vee belt tension, loosen the top nuts on each adjusting bolt and tighten the lower nuts. Reverse the operation to loosen the belt tension. Always be careful not to place too much tension on the belts. Adjusting bolts (A) and (B) may be reached easily by removing the two covers at the back of the cabinet base.

Figure 18. Cover removed to show main drive motor mounting.



THE MONARCH PLANT AT SIDNEY, OHIO

One of the most modern and best equipped machine tool plants in America