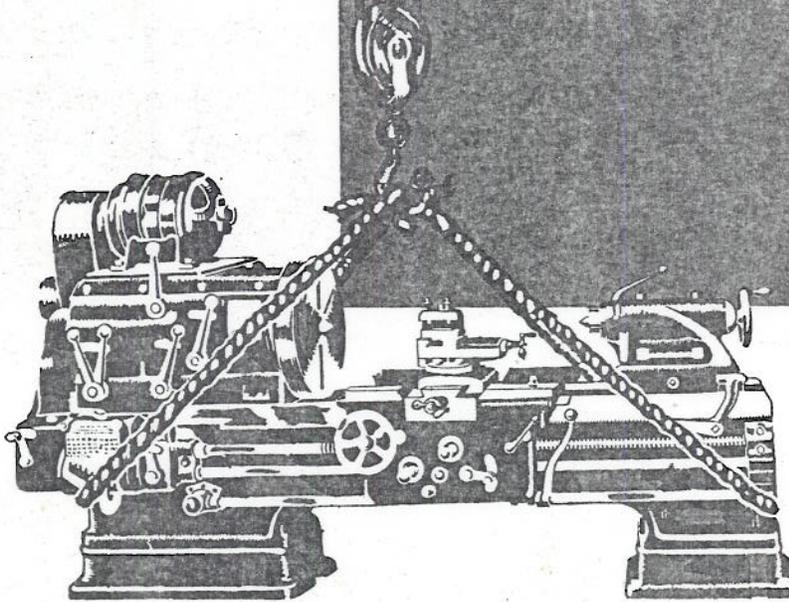


1130

MONARCH LATHES

Bul. 127



— Their Installation
— Their Maintenance

THE MONARCH MACHINE TOOL CO. - SIDNEY, OHIO

A Word at the Start

SINCE correct installation, leveling and maintenance of a lathe are so essential to its successful operation, this book was prepared in order that Monarch Lathes, thru their proper installation and maintenance, might give complete satisfaction to users. Please read the suggestions carefully - and, when you have finished, pass this book on to those men who will have to do with either the setting up or the operation of Monarch Lathes.

We are vitally interested in the successful performance of every Monarch Lathe. As we guarantee absolute satisfaction to every buyer, we ask you to do your part by giving your Monarch Lathes that careful attention which all high grade tools deserve.

Please bear in mind that the instructions and suggestions in this book are based on long experience with thousands of Monarch Lathe installations in leading plants throughout America. If you will be guided by these instructions, you will receive one hundred per cent satisfaction from the service your Monarch Lathes give you.

Should you experience difficulty in the successful operation of any Monarch Lathe that you cannot overcome by carefully following the suggestions in this booklet, we urge you to report your trouble to the Dealer who sold you the lathe, or to us direct -
BECAUSE ---

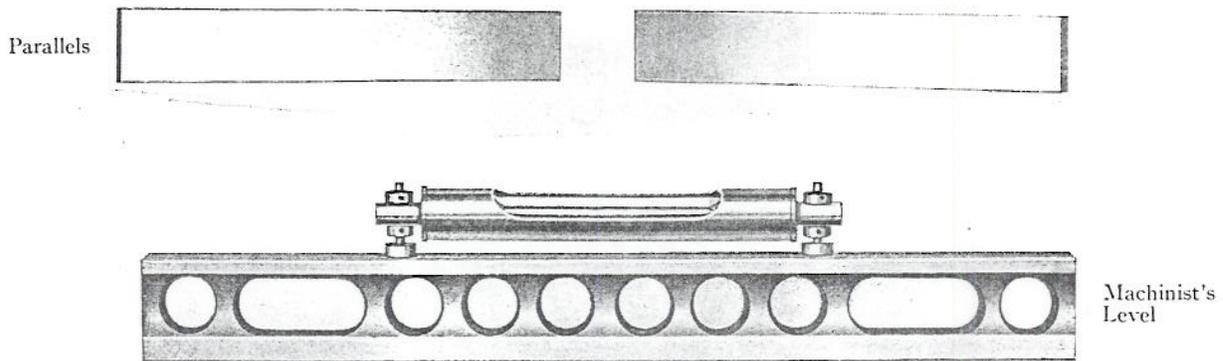
"We guarantee every Monarch Lathe to give complete satisfaction to the purchaser"

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO, U. S. A.

Proper Leveling is Important

The first step in proper placement of a lathe is the preparation of a solid foundation, which should be of concrete. If the floor is of wood blocks, blocks should be removed under the legs of the lathe in order to set the lathe directly on the concrete. It is practically impossible to properly level the lathe and keep it level, where the foundation is wood, unless the floor is very substantial and extremely well braced.

If a lathe is mounted on a wooden floor supported by ordinary joists, it will be absolutely impossible to keep the lathe perfectly level, as floors of this type constantly change owing to weather conditions and the settling of the building. Therefore, it will pay you to install your Monarch Lathe on a solid concrete foundation. Such a foundation will pay dividends in more accurate finished work and longer lathe life.



The Tools that are Required

The choice of a level in setting up a lathe is of utmost importance. Nothing but the most accurate machinist's level, long enough to reach clear across the bed, should be used. A precision level with graduated vial should be used in all instances. Such a level must be carefully handled at all times in order to maintain its accuracy. Even an accurate machinist's level must be carefully checked at the time it is used to be sure the level has retained its accuracy and is not out of adjustment. Thousands of dollars have been

needlessly spent by machine tool manufacturers in proving to users that even their machinist's levels have become inaccurate and not fit for use in the proper leveling of a lathe.

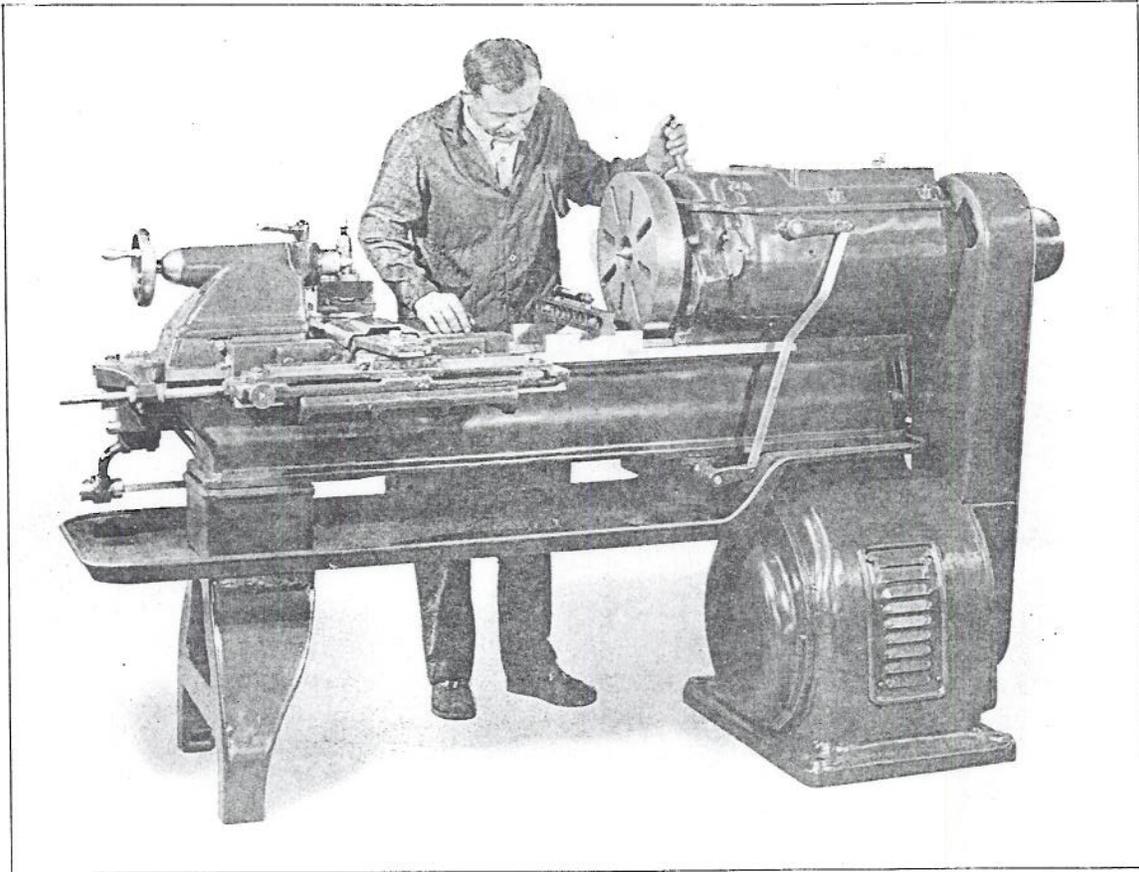
In addition to the proper type of level, a pair of accurate parallels will be required for the proper leveling of a Monarch Lathe. The parallels should be placed on the front and rear flats of the bed. Be sure to have the parallels and flats of the bed perfectly clean and free from dirt.



Never Use this Type of Level

An ordinary carpenter's level has no use in a machine shop in the installation of a lathe or any other machine

tool. It is not sufficiently accurate and should never be used in the installation of a Monarch Lathe.



How to Level the Bed

The bed must be leveled exactly as illustrated in the above photograph—placing the level across the bed directly in front of the headstock.

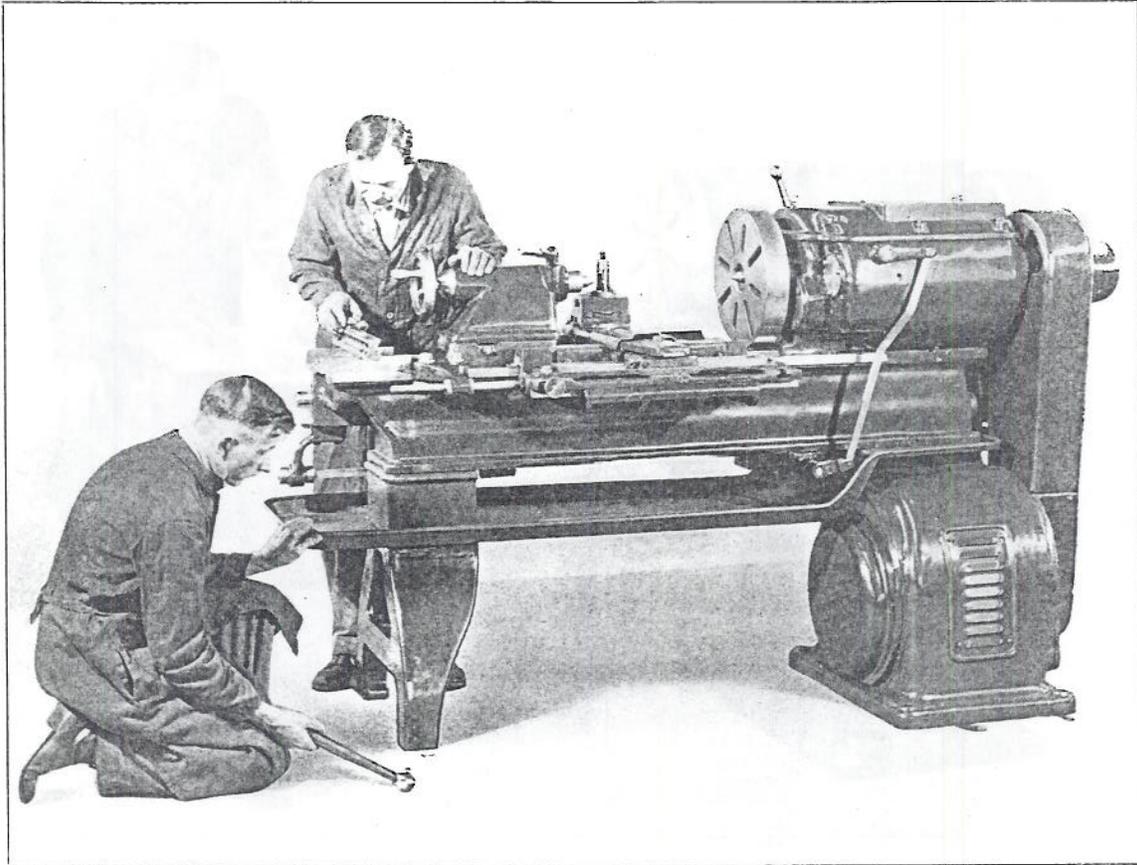
Tapered steel wedges should be driven underneath the corner of the legs to assist in proper leveling.

Note that the use of **steel** wedges is urged. Wooden wedges should not be used as a permanent installation because—**when the wood wedge becomes wet it expands**—when it becomes dry, it contracts, thereby

destroying the accurate leveling of the lathe.

The weight of the lathe will also eventually cut through any wooden wedge. To be certain of lasting accuracy, always use tapered steel wedges.

It is not necessary to level the bed lengthwise. The accuracy of the lathe is not affected even if the tailstock end of the bed is higher or lower than the headstock end. Leveling any machine tool is done only to remove twist and to insure accurate alignment.



Proper Leveling at Both Ends is Necessary

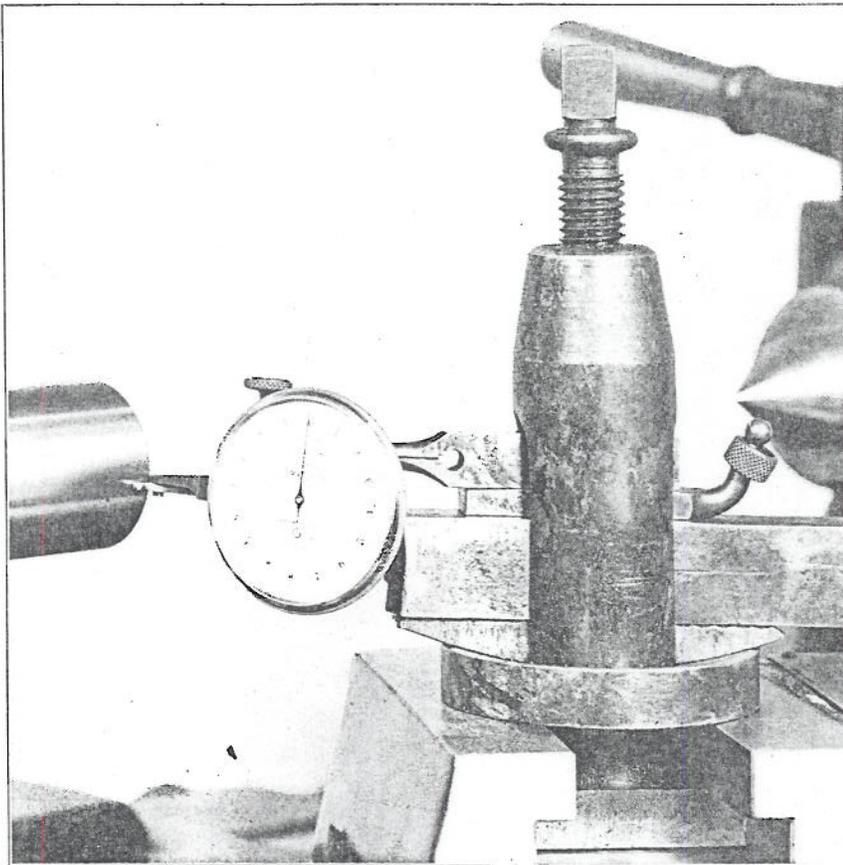
The lathe bed must be level not only in front of the headstock but at the tailstock end as well. If there is a center leg under the bed, the lathe must be leveled directly above the center leg also.

After the lathe is properly leveled as indicated by an accurate reading of the level at all points along the lathe bed, it can be permanently fastened to the floor by lag screws,

studs or other means. When placed on a concrete floor, it is advisable to pour lead or cement between the legs and the floor and allow it to set.

With the lathe now perfectly level and securely fastened to the floor—ready for operation—repeat the leveling process to be sure you are absolutely right before turning a wheel.

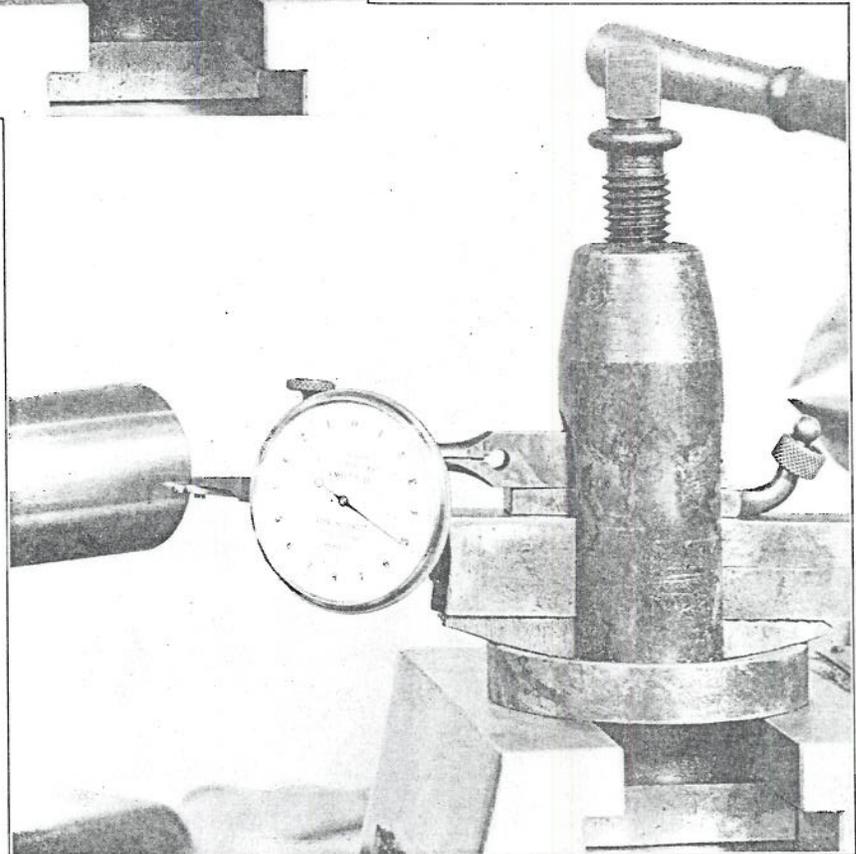
Proof of Accurate Leveling

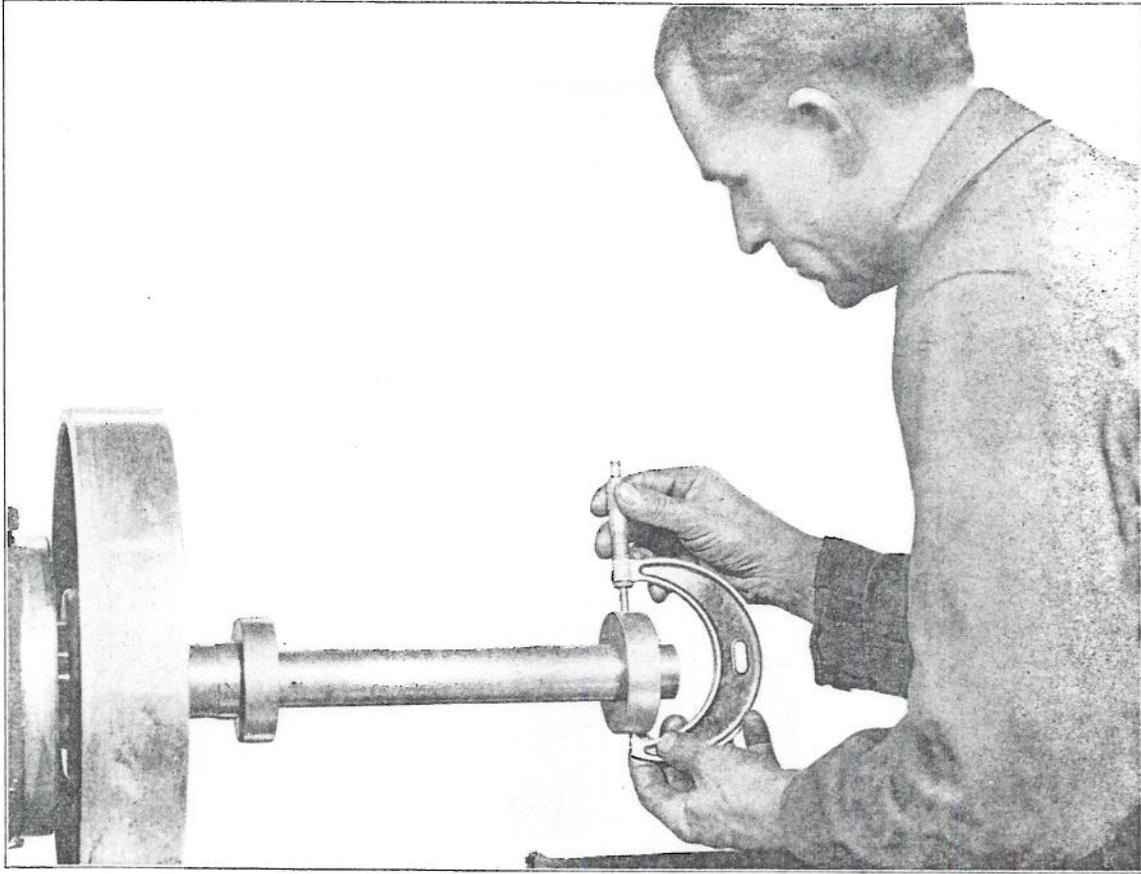


(A)—An Accuracy Test Sheet showing the exact condition of the Monarch Lathe when it left our plant is placed in the front of this book. This Accuracy Test Sheet should never under any circumstances be torn out.

If the lathe has been properly installed and if it is in proper adjustment, a dial test indicator, placed at the end of the 20" ground test bar fitted in the tapered hole of the spindle, should duplicate the accuracy test shown on the test sheet.

(B)—If the lathe is not accurately leveled, and has not been properly installed on a solid foundation, inaccurate readings as shown in the photograph at right will invariably result. It will pay you to test your lathe for accuracy at frequent intervals. Such testing before a piece of work is put on the lathe will help eliminate waste — and make for more accurate work.



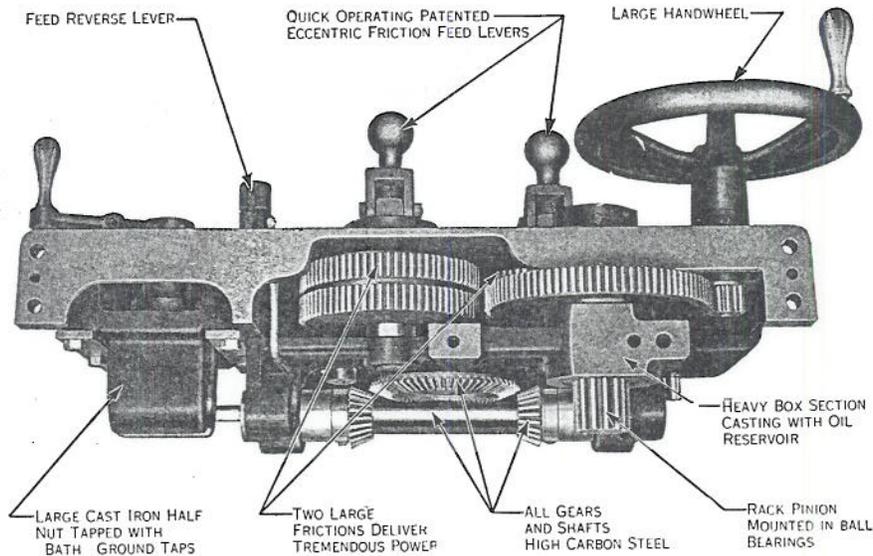


Another Test for Accuracy

If you do not have an accurate dial test indicator such as is shown in the photograph on the previous page, use the following method: Place in the spindle a bar of steel with a tapered end which will accurately fit the taper of the spindle. Press cast iron rings on the bar about 12 inches apart. Take a very light cut on the cast iron rings with the finest feed, then check with micrometer the diameter of both rings. This will indicate the accuracy of the lathe in turning and boring—as well as

the accuracy of the spindle alignment with the bed. In making this test, the bar should not be supported by the tail center.

In leveling the lathe, bear in mind that it is not absolutely necessary to level the lathe lengthwise. If the bed of the lathe is properly leveled as illustrated above and on the preceding pages, it will be perfectly accurate even though one end of the lathe is lower or higher than the other end.



Interior view of Monarch Apron, showing friction length and cross feeds controlled by eccentric levers. All gears are high carbon steel forgings.

Care and Lubrication of Apron

Your lathe will return you good service in proportion to the care you give it. Lubrication is very important—and economical. Frequent lubrication of every part of the lathe will lengthen its life and lower the cost of maintenance.

Study the lubrication chart shown on pages 10 and 11. Do not trust to your memory after reading the oiling chart once or twice, but constantly refer to the chart to see that you are not overlooking any points where lubrication is required.

The illustrations on this page show the interior details of the apron and the friction feed lever. **Be sure to oil the apron feed levers and bushings twice a week.**

In Fig. B at right, note figure 5 and 6 indicating adjusting nuts to keep the friction in proper adjustment.

Fig. A—The oil hardened rack pinion is mounted on anti-friction bearings. Makes carriage run smoothly—and eliminates wear.

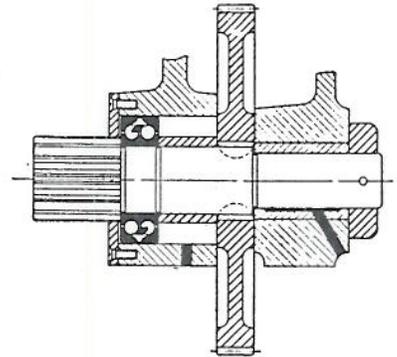
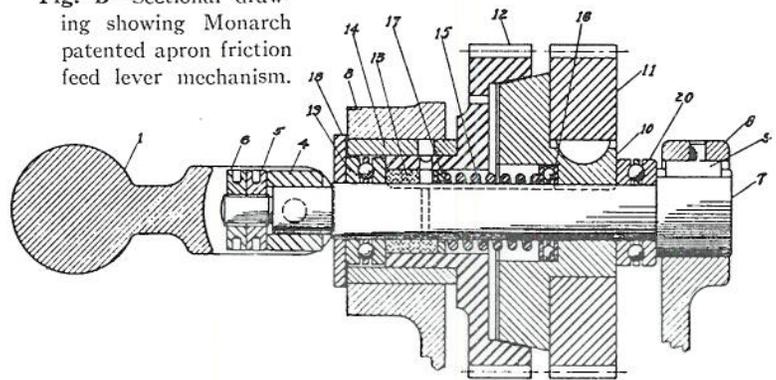
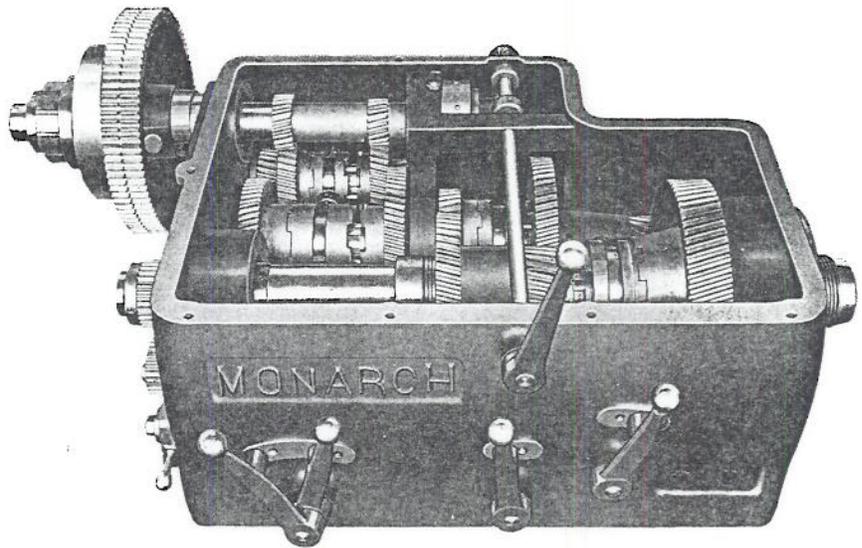


Fig. B—Sectional drawing showing Monarch patented apron friction feed lever mechanism.

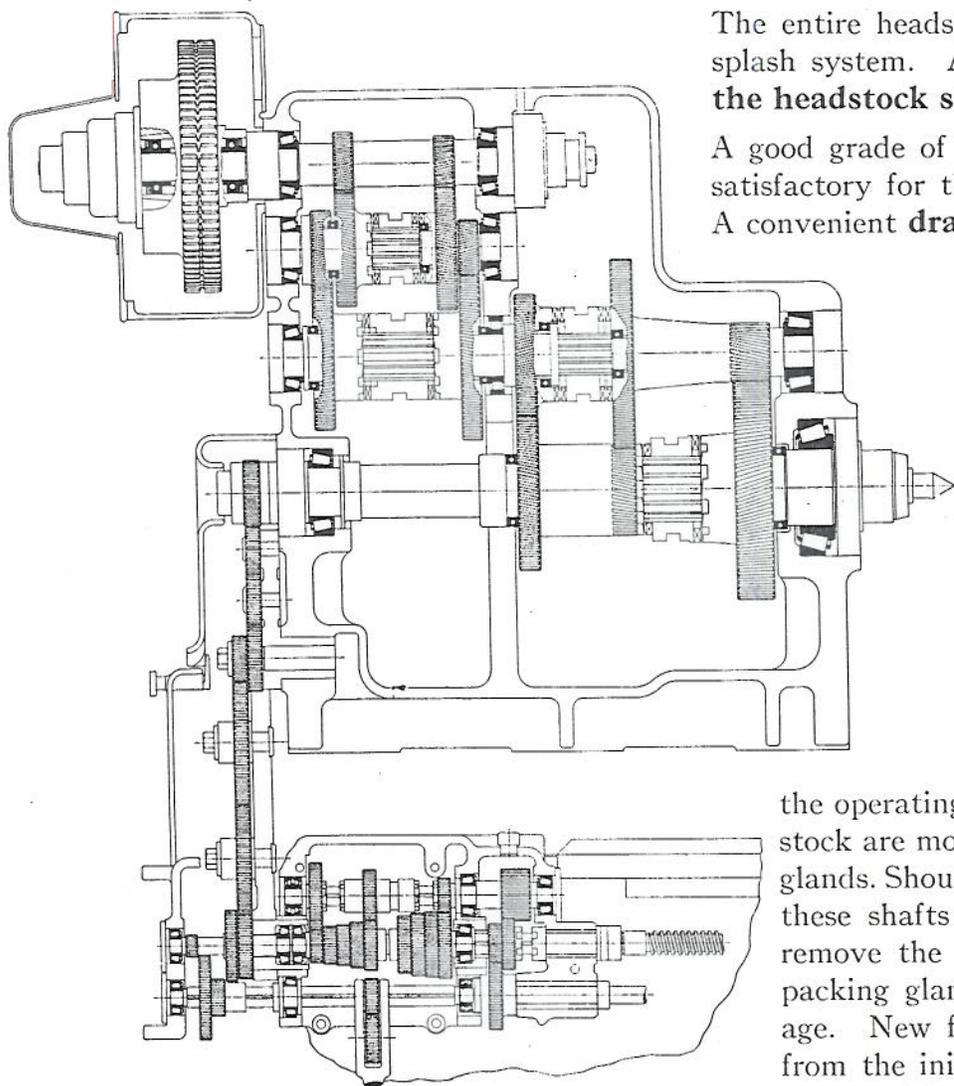


The Headstock

The photograph at the right shows the interior construction of a 16-speed Monarch Helical-geared Timkenized Lathe headstock. The line drawing below gives complete details of the shafts, gears and bearings.



Headstock Lubrication



The entire headstock mechanism is oiled by the splash system. **An oil gauge on the front of the headstock shows the proper oil level.**

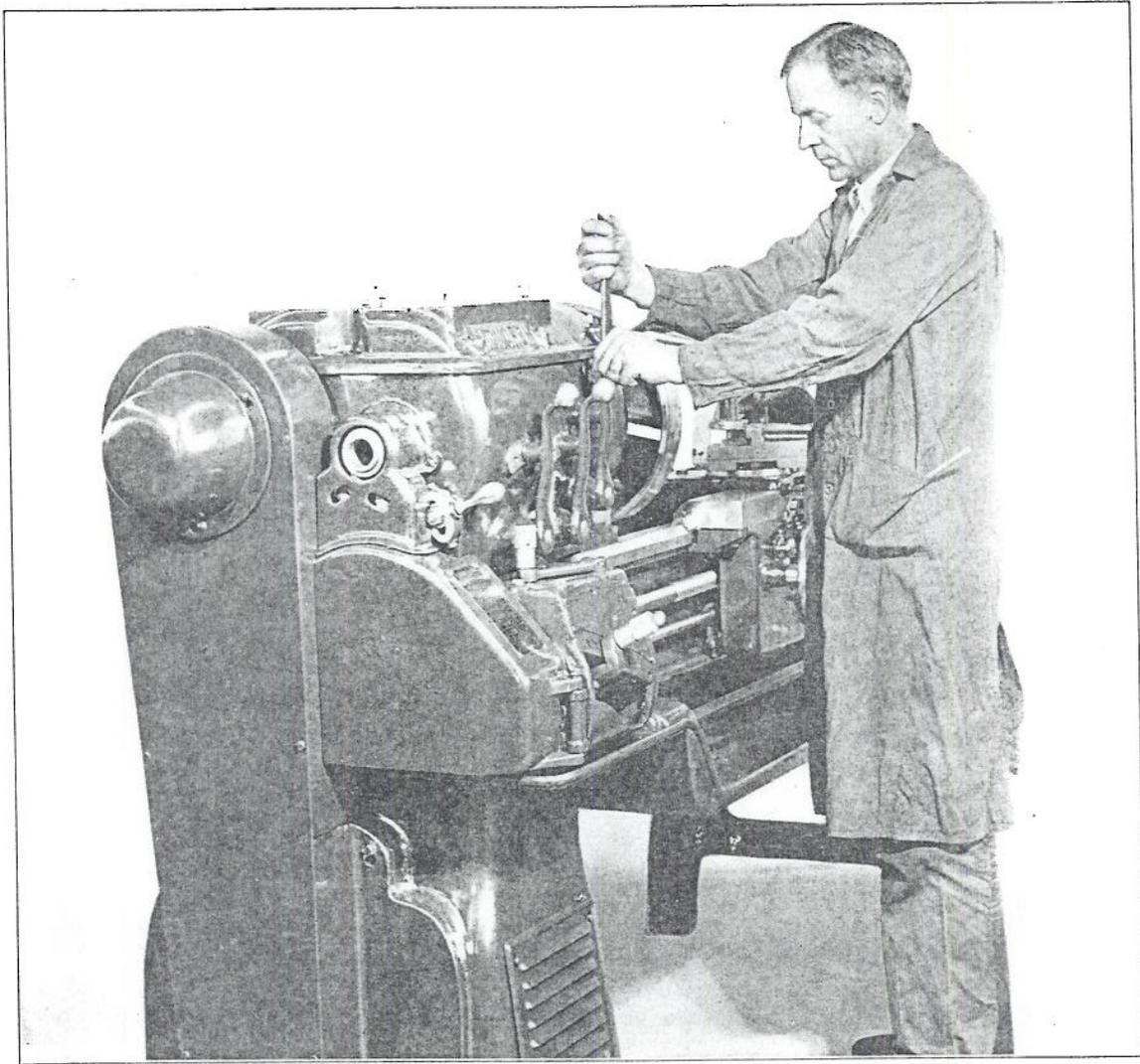
A good grade of light or medium machine oil is satisfactory for the lubrication of the headstock.

A convenient **drain plug in the bottom of the headstock** is provided for draining the oil from the headstock. At least once a year, all oil should be drained from the headstock and the headstock flushed with kerosene in order to clean out dirt and sediment. Re-fill with fresh oil.

Splash oil filtered thru felt lubricates the Timken spindle bearings.

Every precaution has been taken to prevent oil leakage from the headstock. The shafts on which

the operating levers on the front of the headstock are mounted are provided with packing glands. Should there be any oil seepage around these shafts on the front of the headstock, remove the operating lever and tighten the packing gland nut. This will prevent leakage. New felt packing will prevent leaking from the initial driving shaft, should it ever occur. Also see page 14.



Proper Method of Changing Spindle Speeds

The photograph above illustrates the proper method of changing spindle speeds on a Monarch Lathe. With one hand on the clutch lever, disengage the driving clutch and move the headstock lever to change spindle speeds. After disengaging the drive clutch, move the headstock lever forcibly into the new position. Do not allow it to remain in the neutral position.

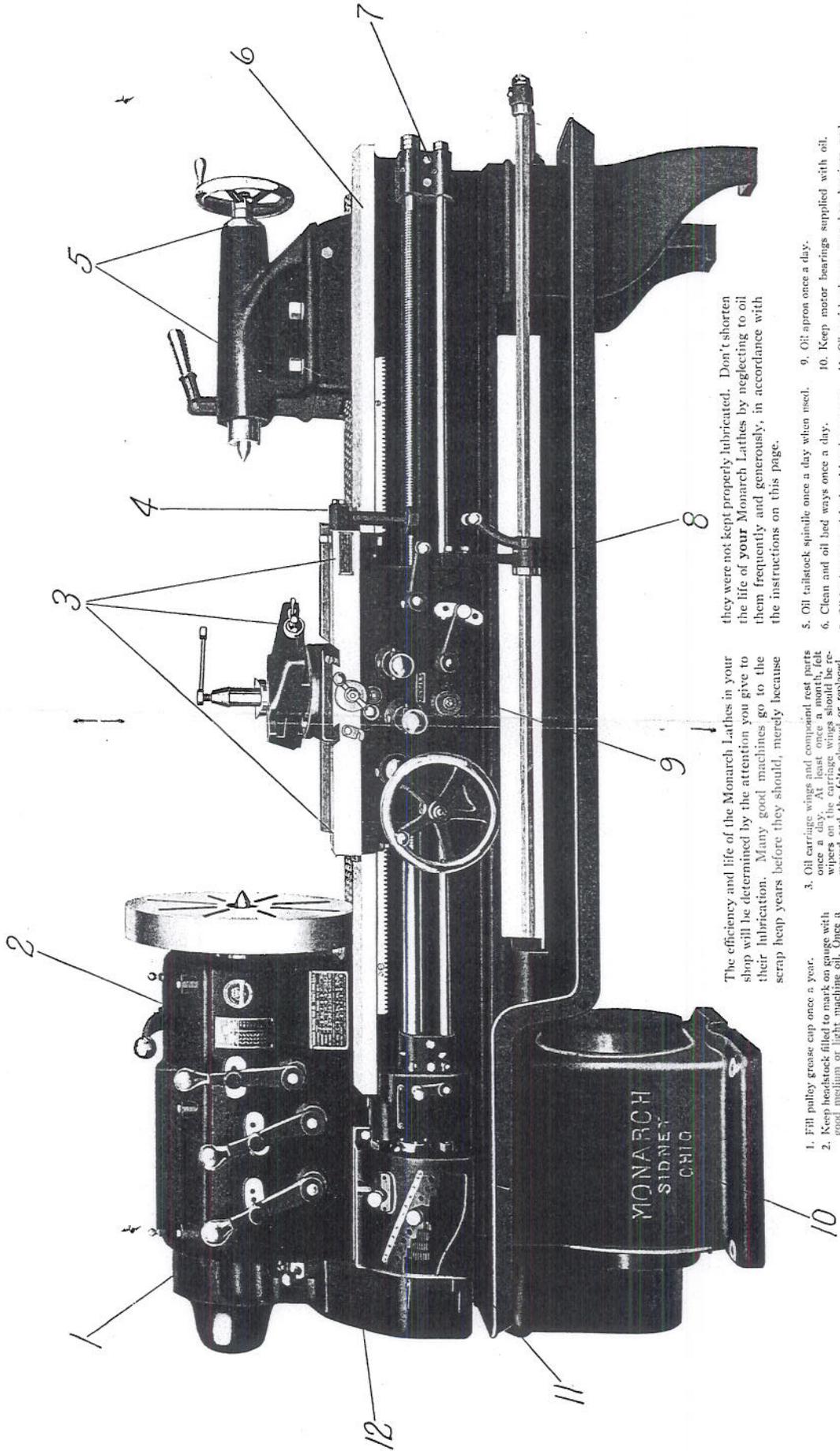
By looking at the photograph above and the drawings shown on the opposite page, you will see that the operating levers on the front of the headstock slide the heavy jaw clutches inside the headstock. These clutches are

beveled off to permit ready engagement.

Spindle speed changes must be made with the spindle running in the forward direction. The beveled clutches prevent ready engagement when spindle is running backward.

All the clutches and gears inside the Monarch headstock are made of $3\frac{1}{2}$ per cent nickel steel, oil hardened. They will never break under ordinary usage. However, when there is a chuck or some other heavy load on the spindle, changing from low to high speed without disengaging the driving clutch may result in breakage. **Always disengage the driving clutch when changing spindle speeds.**

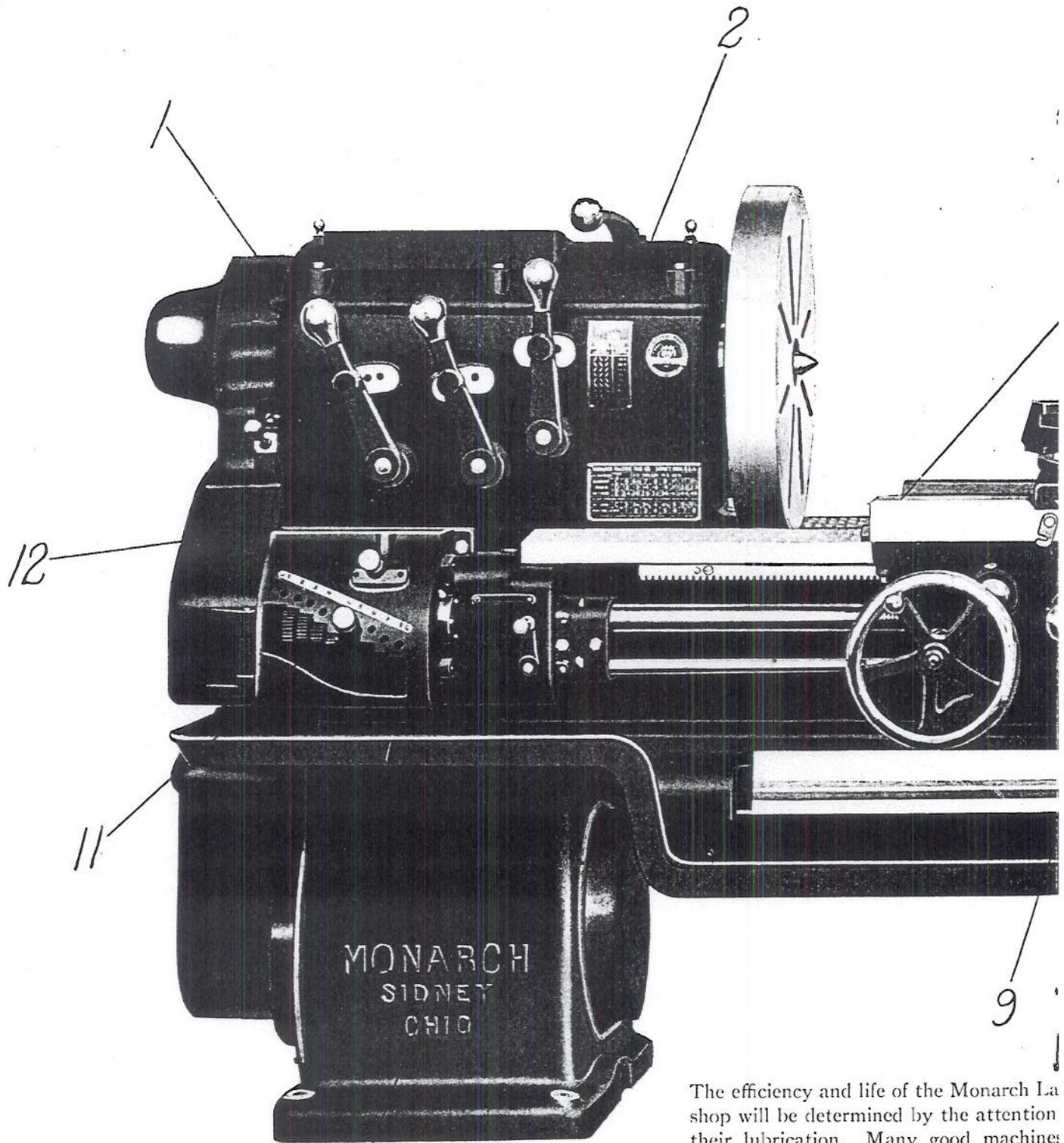
OILING CHART



The efficiency and life of the Monarch Lathes in your shop will be determined by the attention you give to their lubrication. Many good machines go to the scrap heap years before they should, merely because they were not kept properly lubricated. Don't shorten the life of your Monarch Lathes by neglecting to oil them frequently and generously, in accordance with the instructions on this page.

1. Fill pulley grease cup once a year.
2. Keep headstock filled to mark on gauge with good medium or light machine oil. Once a year, old oil should be drained. Headstock should be flushed with kerosene to remove any dirt or sediment and then re-filled with new or filtered oil.
3. Oil carriage wings and compound rest once a month, felt on the carriage wings should be removed and the felts cleaned or replaced.
4. Oil taper attachment sliding surfaces when in use.
5. Oil tailstock spindle once a day when used.
6. Clean and oil bed ways once a day.
7. Oil lead screw and feed rod bearings once a day.
8. Oil apron levers, bushings, twice a week.
9. Oil apron once a day.
10. Keep motor bearings supplied with oil.
11. Oil quick change gear box bearings and tumbler gears once a day.
12. Oil end gearing once a day.

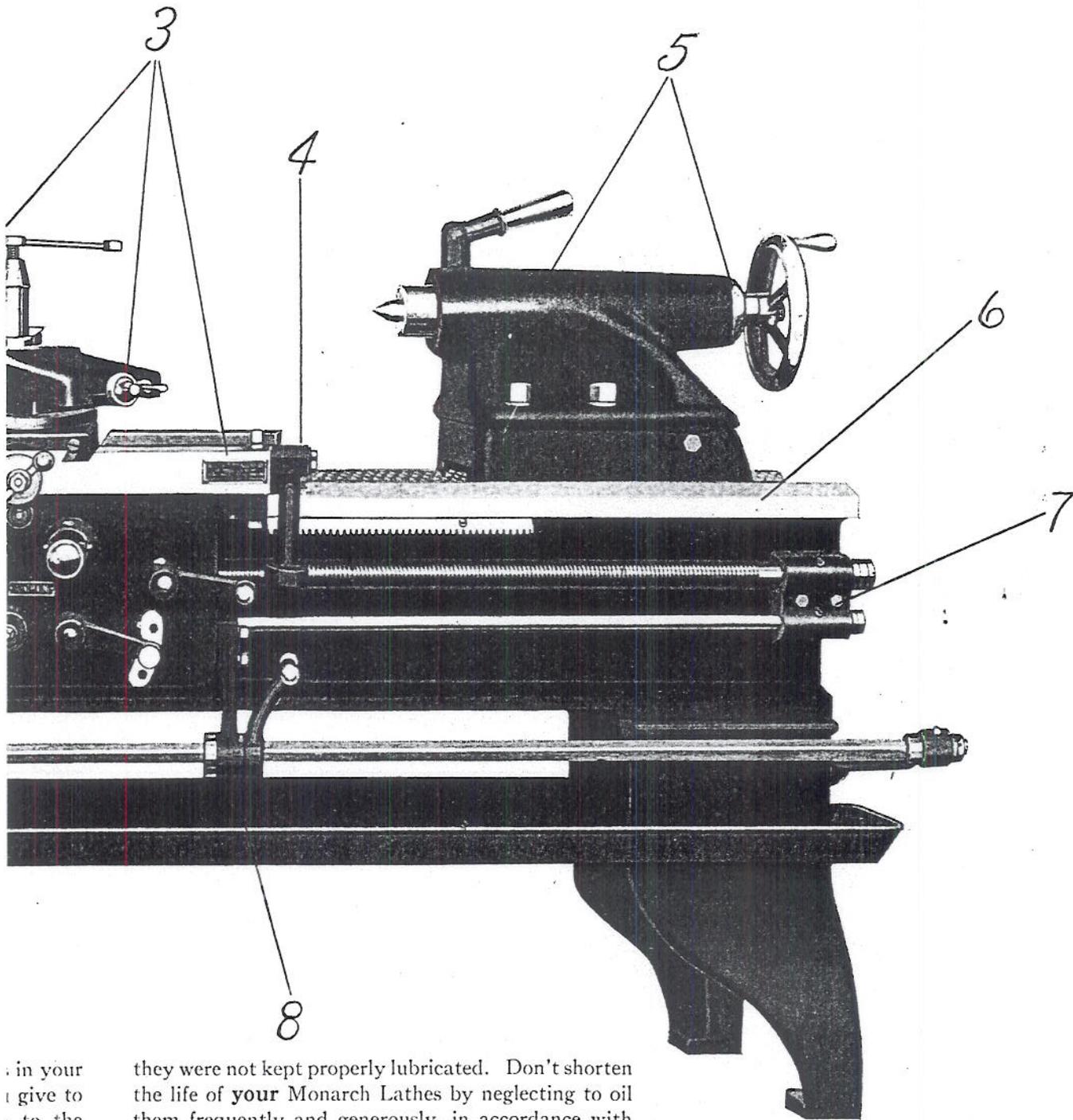
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3. Oil carriage wings and comp once a day. At least once wipers on the carriage wing moved and the felts clean
4. Oil taper attachment sliding in use.

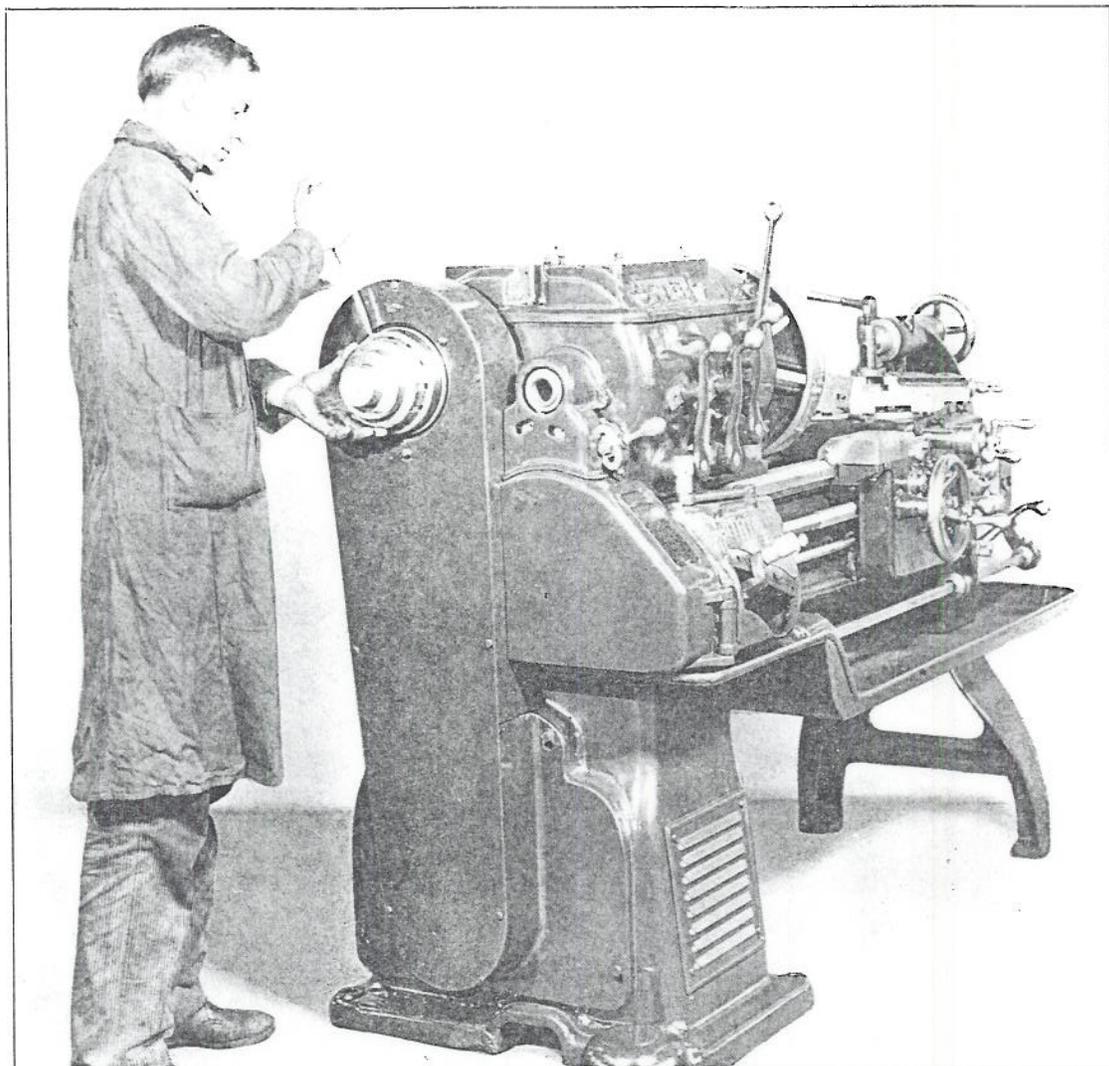
CHART



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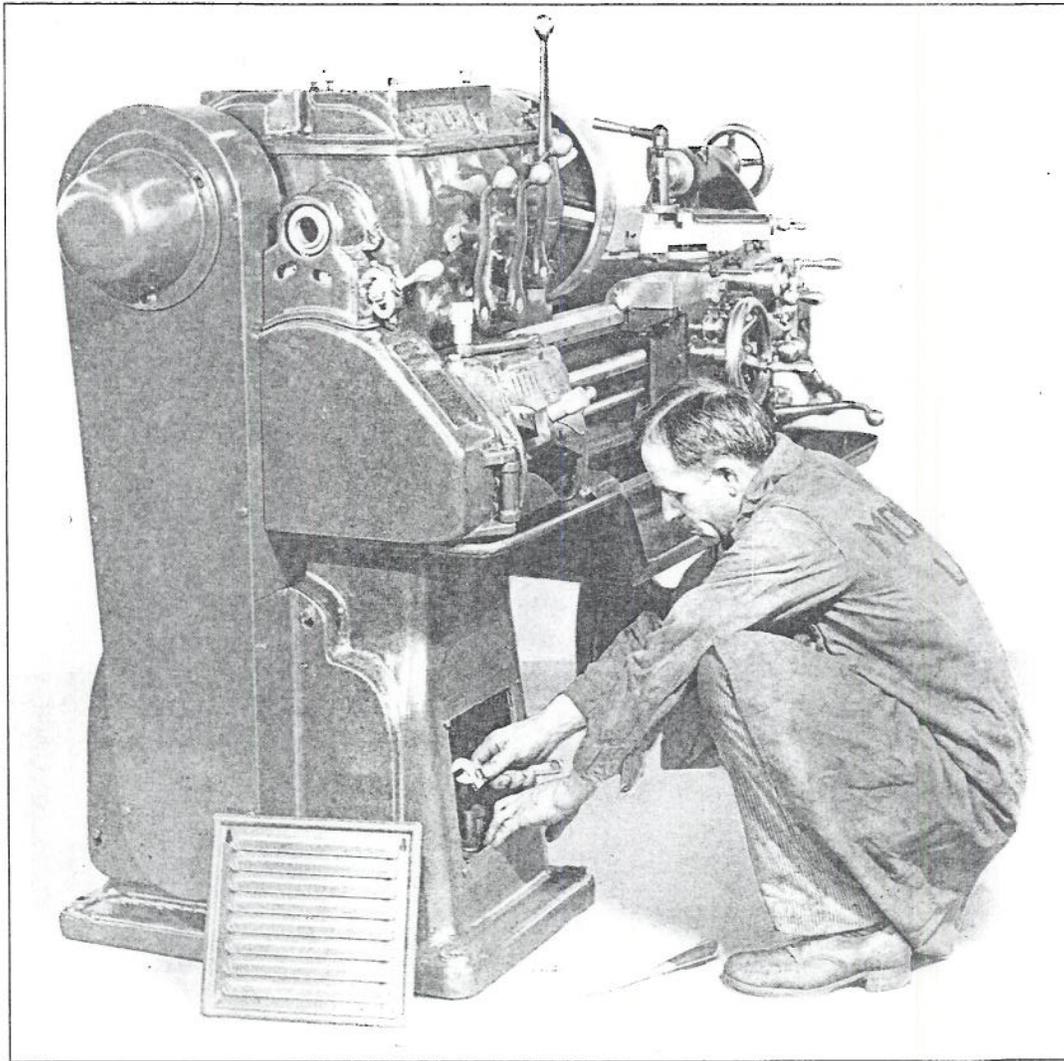
How to Adjust the Driving Clutch

The Monarch Edgemont Multiple Disc Clutch is extremely powerful and will not slip even when it is adjusted for very easy engagement.

To adjust the clutch, remove cast-iron guard covering. Then, with a screw driver, loosen the set screw in the adjusting ring and turn the adjusting plate to the **right to tighten**—or to the **left to loosen**. Usually, one or

two notches will be sufficient for adjustment. After adjusting clutch be sure to tighten set screw in notch.

Should the clutch fail to release quickly, disassemble it and clean all oil and grease from the friction surface. Use cup grease for lubricating the ball bearing in pulley.



Adjusting Motor Belts or Chain

Where the motor is mounted inside the cabinet leg, it is secured to a hinged plate which is adjusted from the front.

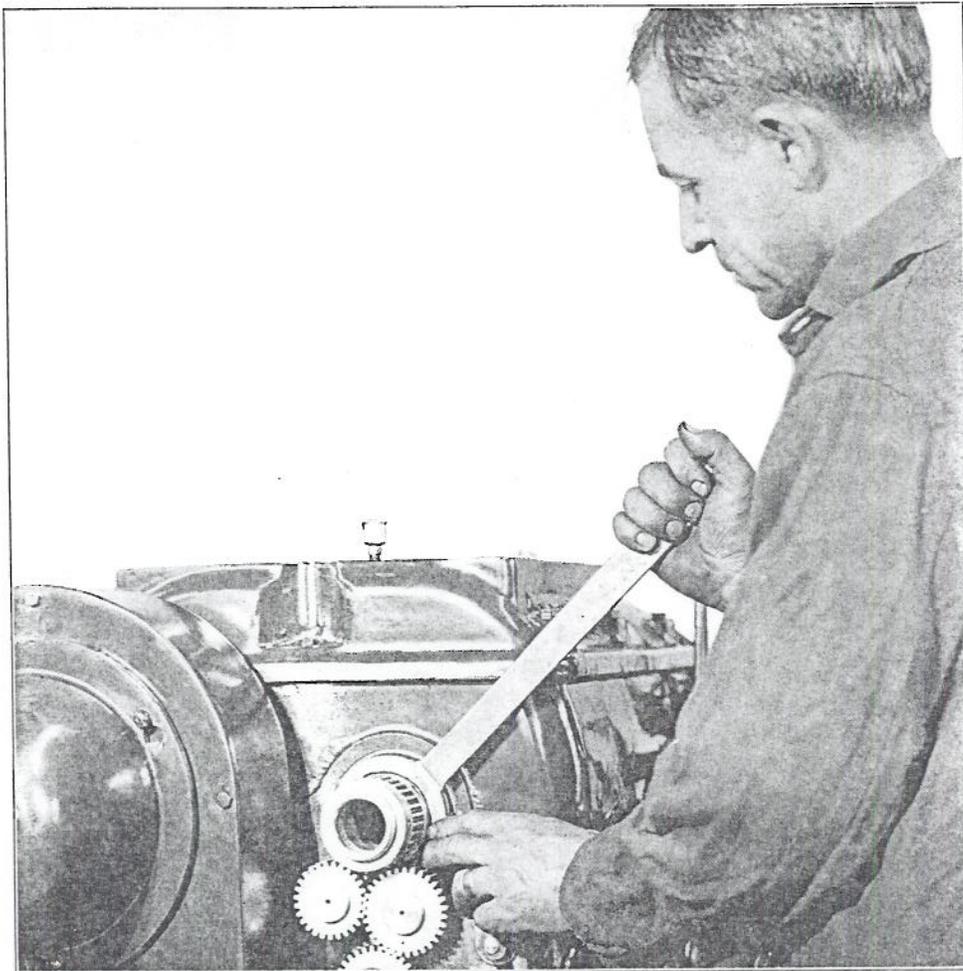
To adjust the belt or chain tension, proceed as follows: Remove the louvre as shown in

photograph above and lower the motor plate to tighten multiple "V" belts or chain. Be careful not to adjust belt tension too tight. If there is too much tension, raise motor plate a trifle. After proper adjustment is secured be sure to fasten the plate securely.

Oiling Motor

Motor bearings can usually be reached either from the front or the back of the headstock leg by removing the louvres. Be sure to **keep the motor bearings properly oiled.**

Do not put so much oil in the pulley end bearing of motor that surplus oil will run out on the "V" belts. Oil absolutely ruins multiple "V" belts.



How to Tighten Packing Glands

In order to retain the oil, packing glands are provided on both ends of the spindle. Packing glands are also provided at the pulley end of the initial drive shaft where it comes out of the headstock. Packing glands are also supplied for the shafts on which are mounted

the headstock spindle speed change levers.

Should oil ever leak from any of these points, packing gland nuts can be tightened by using a spanner wrench as shown in the photograph above.

Clean Lathe Every Day

In cleaning working parts of the lathe, **do not** use compressed air. Why? Compressed air drives particles and chips under the bearing surfaces—scoring and quickly ruining the bearings.

To properly clean working parts, use a duster, brush or cloth. Make this daily cleaning of

the working parts of your lathe a part of your daily routine. **Never** allow the dirt to cake.

The practice of laying tools and other objects across the ways is bad because the working parts are often injured in this way. In time, the efficiency of the lathe is greatly reduced.



Removing Plate and Chuck from Spindle Nose

Monarch Geared - head Lathes should be equipped with a reversing switch for the motor so that spindle can be run backwards. This is especially desirable on a lathe equipped with a threaded spindle nose. To remove plate and chuck, operate spindle at slowest speed. With one hand, hold a block of wood on the back flat of the bed to engage either a jaw of the chuck or a bolt in the face plate. Place the other hand on the clutch lever and operate the lathe **slowly** in reverse.

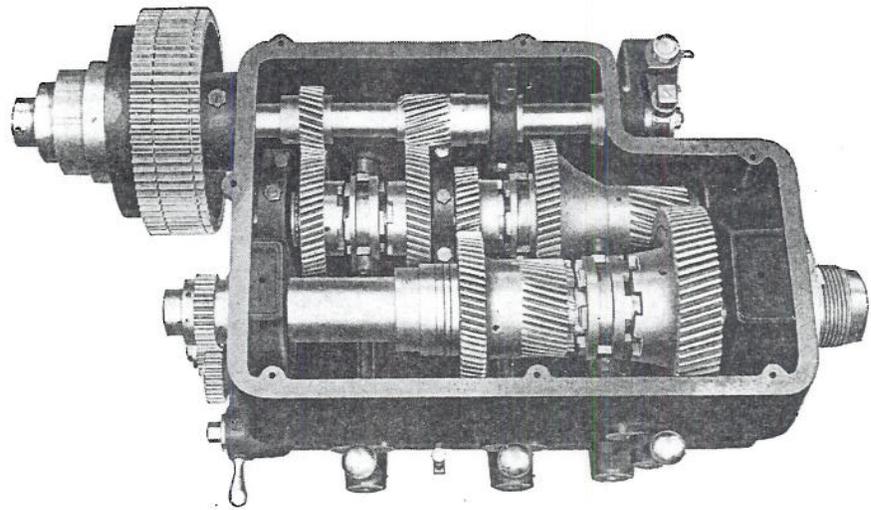
This method will readily and safely loosen the face plate or chuck. After a few turns of the spindle to loosen the chuck or face plate, disengage the clutch and remove chuck by hand. A piece of wood under the plate or

chuck will prevent it from falling and marring the bed ways.

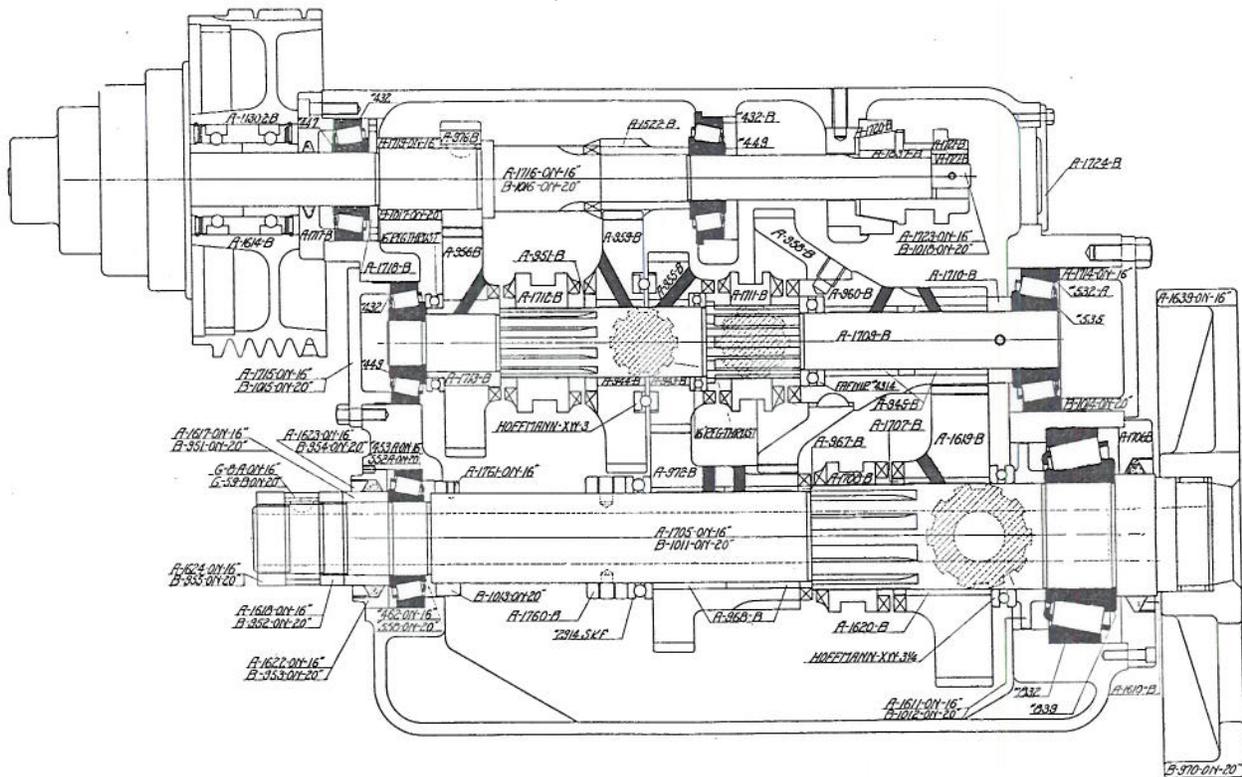
In putting chuck or face plate on the spindle nose, extreme care should be used in cleaning every particle of dirt from the threads of the plate and from the spindle nose. After cleaning, use a liberal supply of clean oil on both the spindle nose and the threads of chuck or face plate before putting on the chuck or face plate. When this is done, the plate and chuck can be more easily removed from the spindle nose when necessary.

Reversing the spindle as illustrated in the photograph above is always the easiest way of removing these units from a threaded spindle nose.

The photograph at right shows an inside view of the Monarch 8-speed Helical-geared Timkenized Headstock illustrating the gearing arrangement and heavy double jawed clutches on the spindle and intermediate shafts. In changing spindle speeds, the levers on the front of the headstock slide these double jawed clutches to engagement with the gears.



When changing spindle speeds always disengage the driving clutch.



The above illustration shows details of the construction of a Monarch Helical-geared Timkenized Headstock with eight spindle speeds.

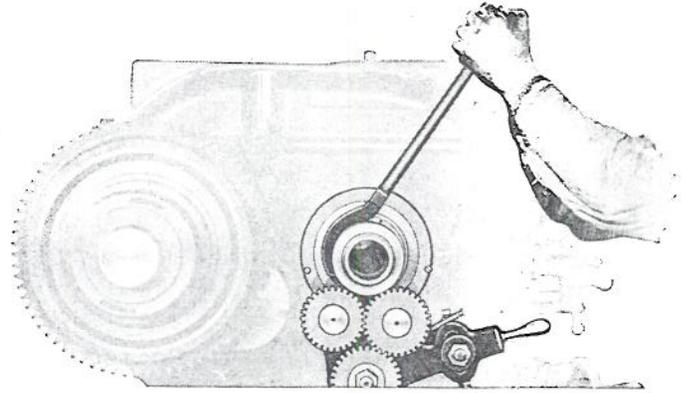
Adjusting the Spindle

The spanner wrench shown in the illustration at right is furnished with each Monarch Helical-gearred Timkenized Lathe. The spanner wrench nut which is threaded on the spindle, between the spindle gear and the headstock, is the adjusting nut; it is the only means of adjusting the spindle in its tapered bearings. Should the spindle become loose in its bearings or show a tendency to chatter, proper adjustment should be made at once.

After tightening adjusting collar, be sure to tighten the locking nut on the end of the spindle in order to hold the adjusting nut permanently in place.

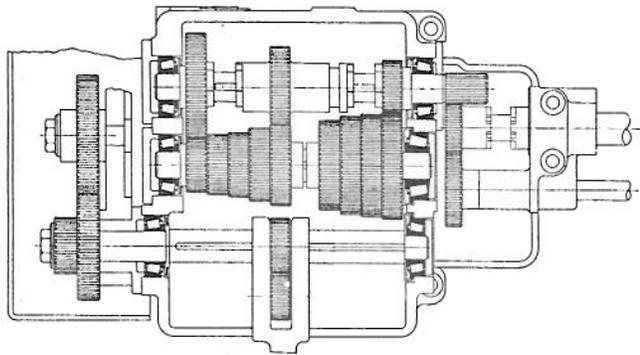
If the spindle is to be operated regularly at fast spindle speeds, it will **not** be necessary to have the spindle adjusted so tightly in its bearings. However, if the lathe is used on heavy chucking work, the adjusting collar should be kept tight in order to remove any possibility of chatter.

In making the adjustment, use both hands on the wrench and exert considerable pres-

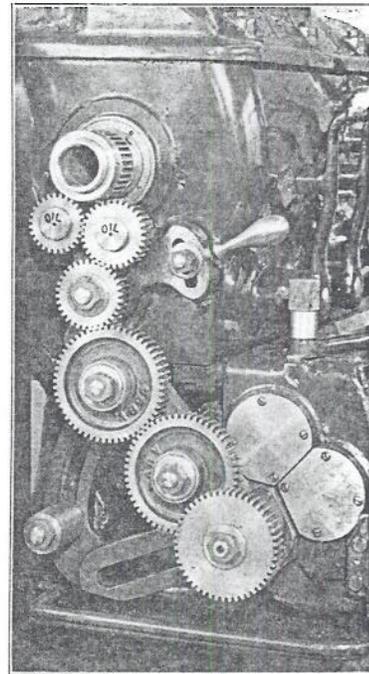


sure—imposing an initial load pressure on the bearings, thereby removing all play of the spindle in its bearings.

Owing to the fact that there is little or no wear on the Timken bearings, it will not be necessary to make frequent adjustment of the spindle.



The above illustration shows the type of quick change gear box used on Monarch 14", 16", 18" and 20" lathes. Keep the Timken bearings well lubricated. Oil the tumbler gears on the inside of the gear box every day when lathe is in use. See oiling chart, pages 10 and 11.



By the use of compound gears, it is possible to chase odd leads not included in the regular thread range. We will gladly supply the formulae on receipt of serial number of lathe and the leads desired.

Monarch Quick-change Gear Box

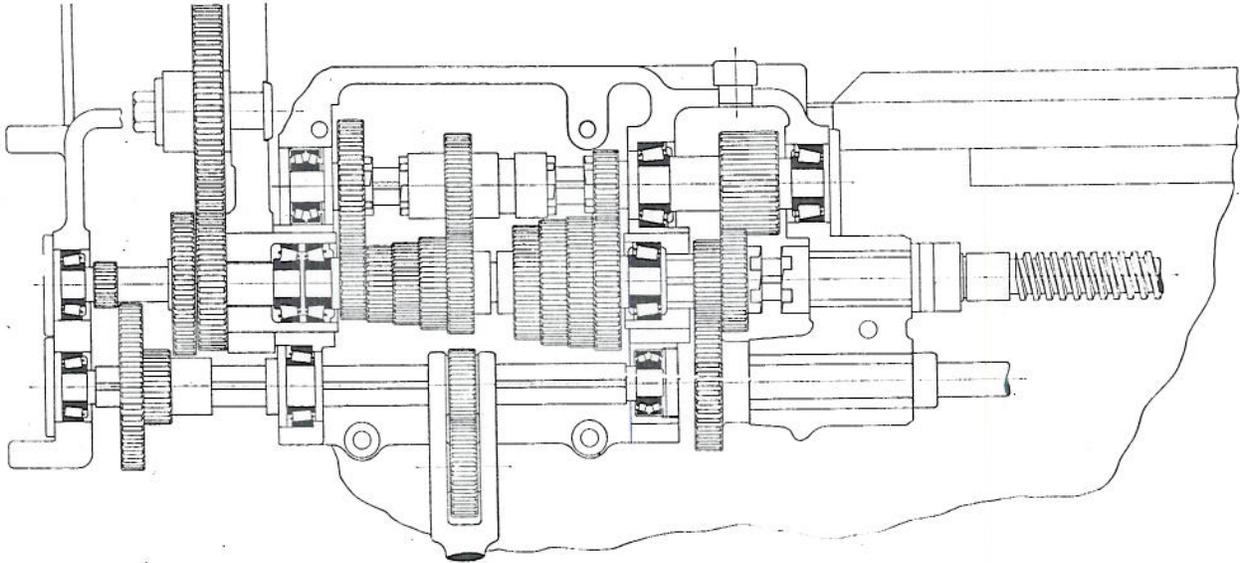
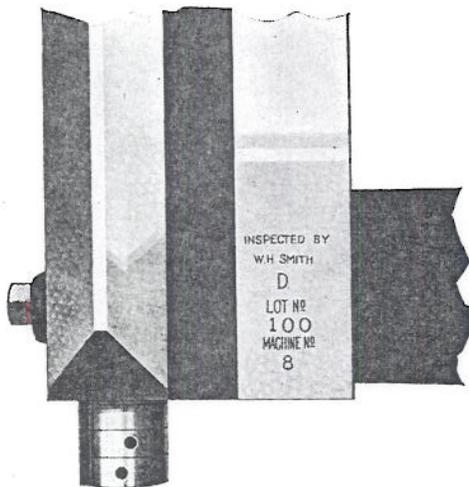


Illustration above shows the Timkenized quick-change gear box used on Monarch Lathes. Keep the bearings well lubricated

and do not fail to oil the tumbler gears. Refer to Oiling Chart on pages 10 and 11.

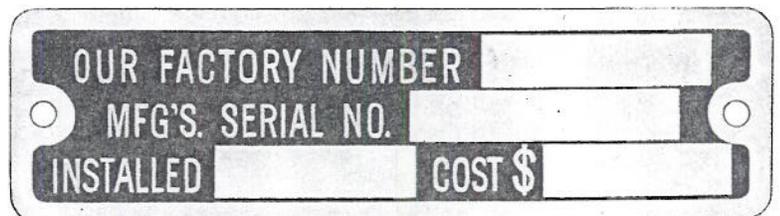
When Ordering Repair Parts Always Refer to Serial Number on Bed

Each Monarch Lathe, when completed and finally inspected, is stamped with a serial number and the inspector's name. These markings will be found at the tailstock end of the lathe bed as shown by the photograph below.



In ordering repair parts or accessory units for Monarch Lathes, it is necessary to give us the serial number of the lathe. Give both lot number and machine number.

We keep a complete record of each lathe and the parts supplied with it, filed under the serial number of the lathe. To avoid confusion and error, it is essential that the factory serial number of the lathe be given when ordering any parts or accessories.



All machine tools in the Monarch plant have plates attached, as illustrated above. We have found this beneficial in many ways.

Monarch Lathes
Helical Gears - Timken Bearings
SMOOTHER... QUIETER... MORE POWERFUL

How to Use the Taper Attachment

The drawings below show details of the Monarch taper attachment and telescopic cross feed screw.

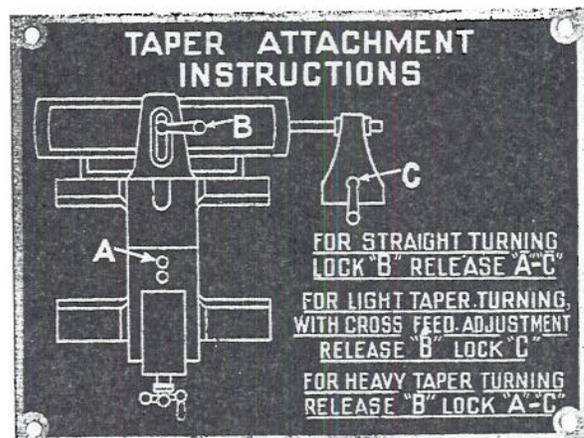
In using the taper attachment the following instructions must be carefully observed. For straight turning, lock the bar support clamp screw (B) and release bar clamp (A) and bed clamp (C). The compound rest can be positioned before tightening bar clamp screw (A). For all taper turning, release (B)—then lock (A) and (C).

The cross feed screw is anchored at the back. Ball thrust bearings are provided to take the thrust of the cross feed screw.

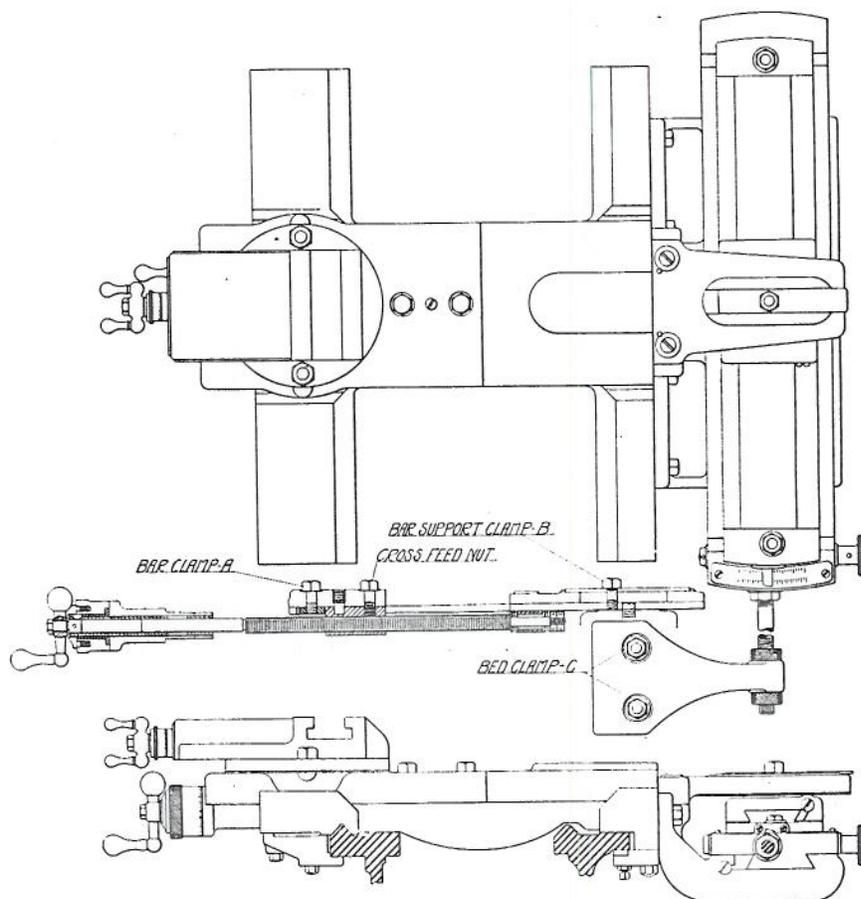
The adjusting nut on the end of the cross feed screw must be kept tight to prevent back lash.

Bar clamp (A) must always be tightened when using the taper attachment. Bar support clamp (B) must always be **locked in straight turning**, and **unlocked in taper turning**.

Taper adjustment gib screws must be kept in proper adjustment. Sliding surfaces of the taper adjustment must be kept clean and properly oiled.



An instruction plate is attached to each Taper Attachment for the convenience of the operator.



Questions and Answers

Q.—The lathe chatters. How can I stop it?

A.—There are a great many causes of chatter. We suggest the following procedure. First, see that the lathe is properly leveled exactly as described on preceding pages of this book. If proper leveling of the lathe bed does not eliminate chatter, then examine the spindle bearings. If the spindle is Timkenized, merely tighten the adjusting collar on the end of the spindle. See page 17. If the spindle has plain bearings, it will be necessary to readjust the bearings, and, unless the spindle has a perfect bearing in its boxes, some hand scraping must be done in order to remove the high spots and give the spindle a perfect bearing in its boxes. Make sure that the adjustment is sufficiently tight to prevent radial play, yet not tight enough for the spindle to heat when operated at normal speeds.

Readjust carriage gibs and compound rest gibs to remove any undue lost motion or play. Also see that the headstock is bolted down tightly to the bed and that no dirt has accumulated under the tailstock to prevent it having a solid bearing on the bed.

Frequently, work chatter is mistaken for lathe chatter. Make sure that the chatter is not the result of springing of the work, improper grinding, or setting of the tool.

Any experienced lathe operator, by making a careful analysis of the cause of chatter, will have no trouble in determining the exact cause and eliminating it.

Q.—The lathe chases a drunken thread. What causes this?

A.—A so-called drunken thread is an alternate thick and thin thread which is caused by end movement of the lead screw. Examine the thrust collars where the end thrust of the lead screw is taken and see that the thrust collars are tight and properly adjusted. If the thrust collar or the shoulder against which the thrust is taken is not faced or ground perfectly true and at right angles to the lead screw, end motion or cam motion of the lead screw will result.

End movement of the lathe spindle may cause an uneven thread. If the spindle is Monarch-Timkenized there will be no end movement. If spindle is mounted in plain bearings, the thrust collars on spindle are probably not ground true and flat.

Q.—The lathe turns taper on work held in a chuck.

A.—First, see that the lathe bed is absolutely level and not on a twist. Check over the chuck fitting, making sure that the chuck plate fits perfectly in the chuck recess—that the adapter plate fits the spindle

nose and that the chuck body and jaws run true. Do not assume that the spindle of the lathe is in perfect alignment with the bed until after re-leveling and checking as previously suggested.

Q.—The lathe turns taper on work held between centers.

A.—See that the lathe bed is absolutely level and not on a twist. Then determine whether the tailstock center is in perfect alignment with the head center. If the carriage and compound rest gibs are properly adjusted, the lathe should again turn perfectly true on work between centers.

Q.—The lathe bores taper.

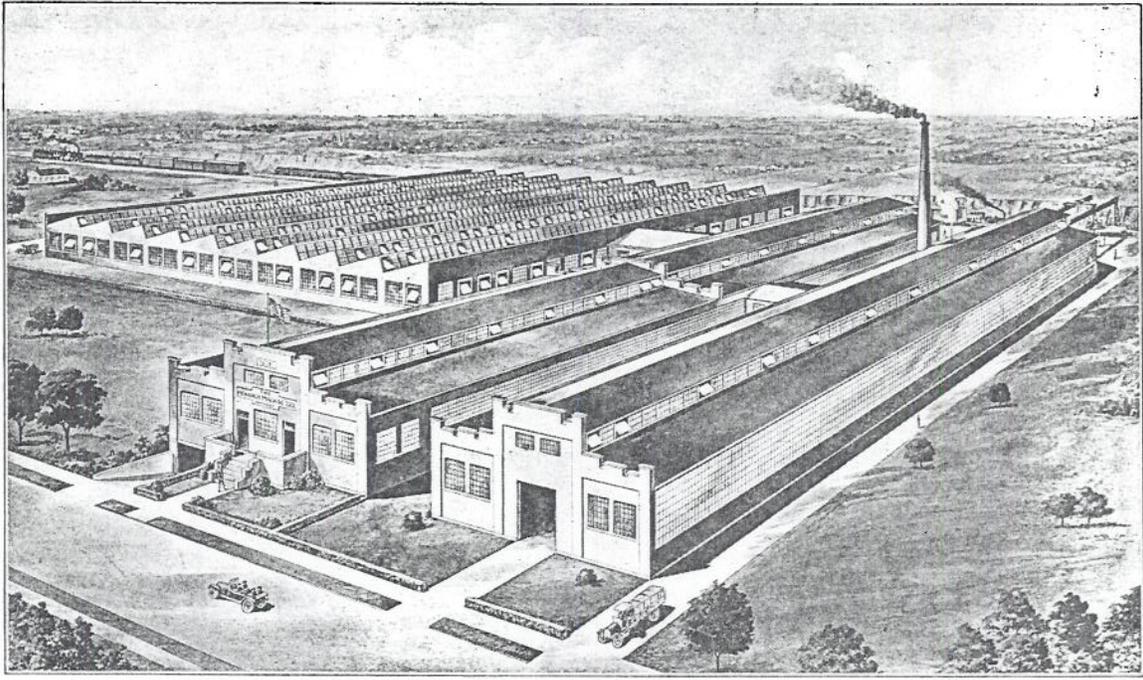
A.—Carefully re-level the bed exactly as illustrated in front of book. See that the spindle is properly adjusted in its bearings. Make certain that the chuck or face plate properly fits the spindle nose and runs true on it. Make allowance for natural tool wear in boring long holes. If, after following the above instructions, the lathe does not bore true, check alignment of spindle with ways of bed as suggested before.

Q.—The lathe turns correct tapers according to graduation on swivel on work held between centers, yet bores an incorrect taper, which does not correspond to the graduations on the swivel.

A.—In boring, the tool thrust is in the opposite direction from turning. First make sure that the lathe is perfectly level and the bed not on a twist. Then tighten the bar clamp screw (A), thereby removing tool thrust from the cross feed screw. Be sure that taper attachment gibs are properly adjusted and the bearing surfaces cleaned and properly oiled. See that carriage gibs are properly adjusted as well as compound rest gibs. If above instructions are followed and the spindle is in perfect alignment with the bed, no further trouble should be experienced.

Q.—The lathe faces convex or concave.

A.—First, find out whether the bed is properly leveled and not on a twist. See that spindle is perfectly adjusted in its bearings. Make certain that the chuck or face plate properly fits the spindle nose and runs true. Be sure that the carriage and compound rest gibs are properly adjusted. If after carrying out above suggestions, the trouble is not eliminated, check the alignment of the spindle with the bed ways as described earlier in this book.



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