Description Installation Operation Maintenance of your LEVIN® Lathe

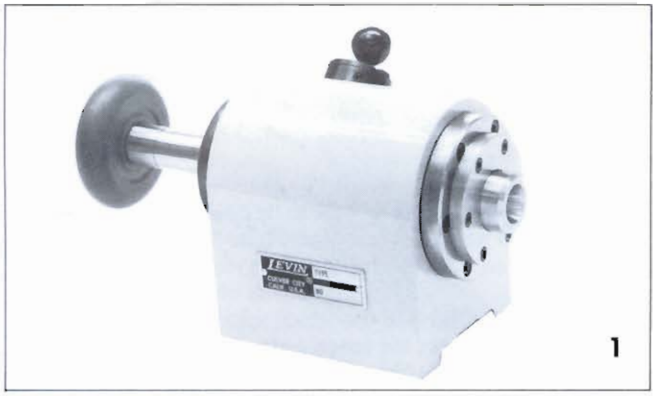
Louis Levin & Son, Inc.

INTRODUCTION

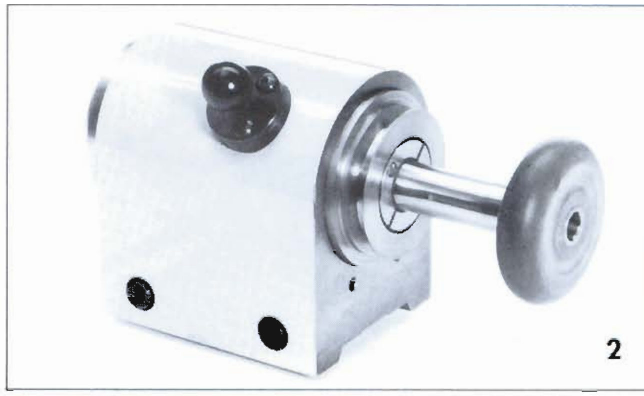
The LEVIN instrument lathe resembles a typical machinists' bench lathe in style. It is an outgrowth of the conventional watchmakers' lathe and is designed for working on small parts similar in size to those found in watches, clocks, and a wide variety of parts used in modern instruments and meters. The size of the lathe gives it the required sensitivity for efficiently handling small precision work where the customary dimensional tolerances and surface finishes would be difficult, if not impossible, to achieve on larger lathes. Basically, a lathe is a device for revolving a piece to be worked on and a device for removing material from the revolving work. When a tool is passed across the work in a manner such that it will remove material, the process is called turning. The work is held by any one of a number of means. It can be mounted on a collet, a chuck, or between centers and driven by means of a driving dog. Other means for holding and revolving the work are also available.

The instrument lathe is designed to have the strength and power that is required for turning any type of machinable material. As new materials were developed to meet the requirements of modern space age equipment, Levin lathes also changed. For example, prior to 1940, most watchmakers' lathes were driven by a 1/10 HP universal motor. By the mid 1950's, these machines, now made more rugged, were being powered by 1/8 HP motors. In the 1960's the motors were up to 1/3 HP and had changed from universal motors to D.C. shunt motors with SCR controls having I.R. drop compensation and torque control. When one considers that the size and nature of the work has not changed, it becomes apparent that the modern materials being machined are rapidly decreasing in the ease with which they can be machined.

This trend has required constant change by the lathe builder to increase the strength of the lathe without decreasing its sensitivity or accuracy. To effectively use a modern instrument lathe, the machinist must have a good understanding of the construction and operation of his machine. He must also know how to properly maintain it in first class working order. The following information will be helpful to those who want to obtain maximum utilization from their Levin instrument lathes.



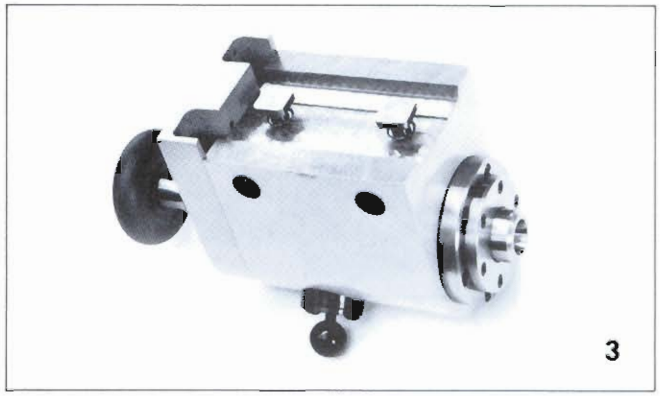
1



2

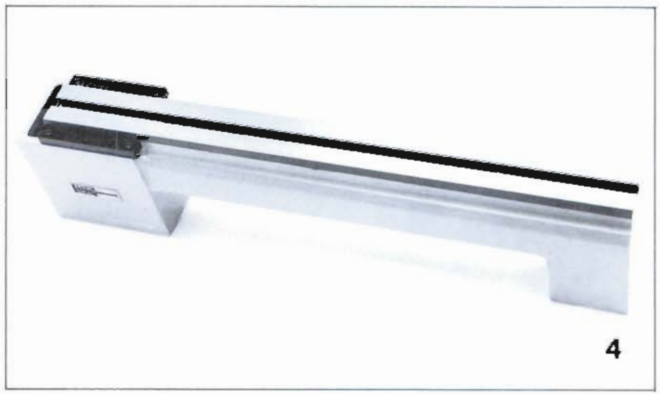
GENERAL DESCRIPTION

Figure 1 illustrates a headstock with the belt guard removed. The black plunger extending out of the central portion of the casting operates the spindle locking mechanism. By depressing this button and manually rotating the headstock spindle in either direction, the plunger will engage a locking collar located inside the headstock. This locks the spindle to permit the tightening of the drawbar. By lifting the button, the spindle is released. This spindle locking mechanism should never be used to stop the spindle and never engaged while the spindle is rotating under power.



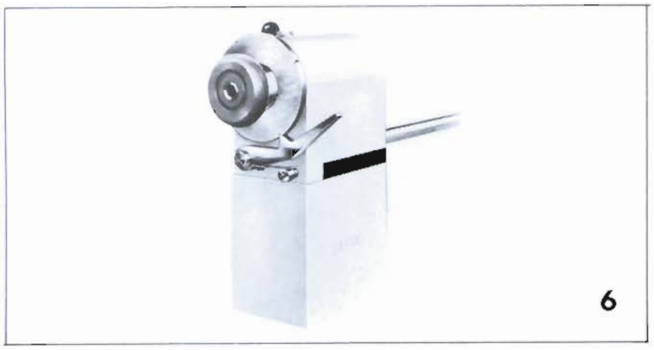
3

Figure 2 illustrates the rear portion of the headstock with the belt guard removed. It is only necessary to remove 2 cap screws in order to remove the belt guard for the purpose of changing belts. Figure 3 shows the spindle locking button and the 2 eccentrics used to adjust the binding bolts which hold the headstock securely clamped to the lathe bed. The underside of the headstock, figure 3, shows the 2 binding bolts and the reference ways. If for some reason, new binding bolts are required, the underside of the bolt must be machined such that with the eccentrics adjusted to lower the binding bolts to their maximum, the binding bolts just fit in the mating T-slot of the lathe bed, figures 4 and 5. The precisely fitted ways on headstocks and tailstocks must always be protected against knicks, scratches, and burrs. Any damage to these surfaces may drastically damage the precise alignment of these components.



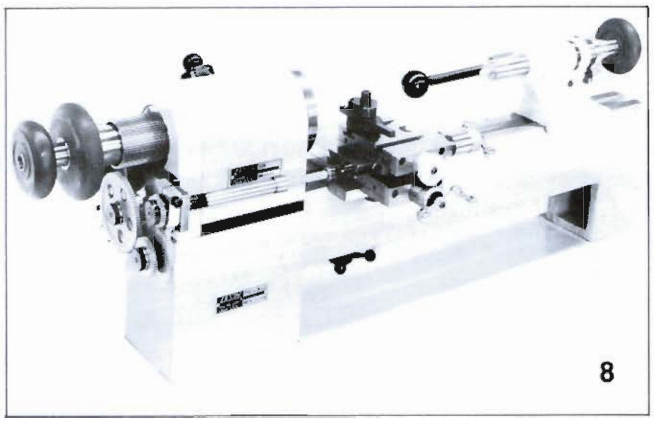
4

5



6

7

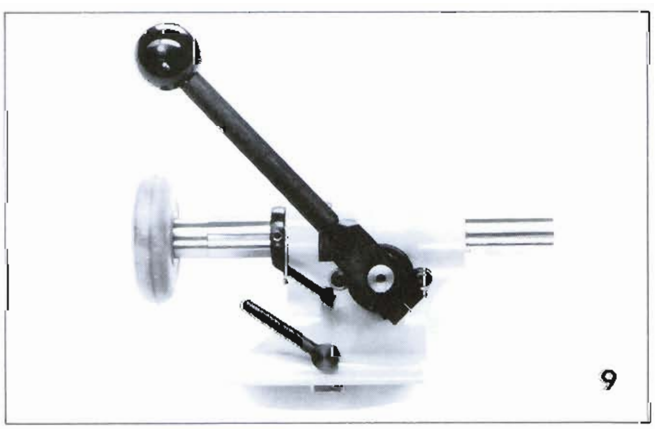


8

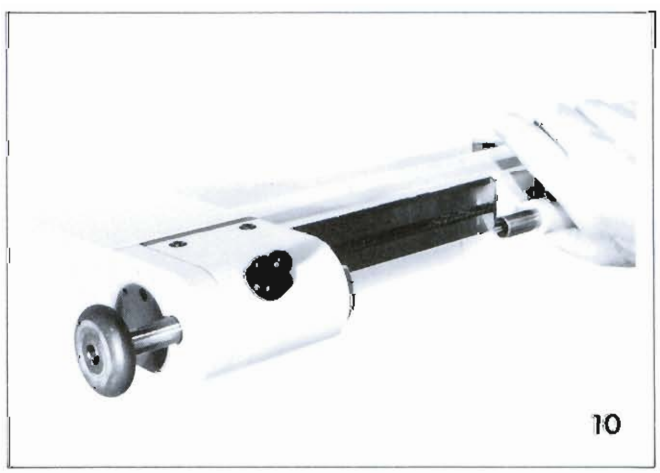
Of the various devices which can be mounted on the rear end of the headstock, three are illustrated. Figure 6 shows the mounting arrangement of an Index Latch, Index Plate Hub, and Index Plate. By mounting a plate with the desired number of equally spaced radial positions, one can index the headstock spindle thru the number of positions contained on the index plate. Figure 7 illustrates the mounting of a Lever Operated Collet Closer. A useful accessory for production work; it permits opening and closing of a collet by simply moving the lever rather than rotating the drawbar. In figure 8 the headstock is shown geared to a Screw Cutting Attachment. Only one of these attachments may be employed at a time, but all are interchangeable between headstocks of the same size and type.

A lever operated, collet holding tailstock is illustrated in figures 8 and 9. Figure 9 shows the back side of the tailstock. The black collar around the spindle on the rear of the casting is a spindle stop. It can be adjusted and locked in any position along the rear extension of the tailstock spindle. When the spindle is advanced by means of the large lever, the stroke is determined by the position of the locking collar. This locking collar may be replaced by a Micrometer Stop which provides a fine adjustment of the maximum stroke position. The middle lever in figure 9 is used to lock the tailstock spindle in any desired position. The lower lever is used to release and tighten the binding bolt whenever repositioning the tailstock along the lathe bed.

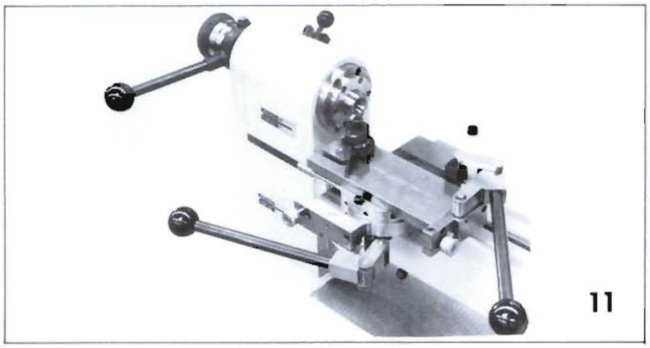
Whenever the tailstock is to be repositioned, the bed ways should be wiped completely clean, removing all foreign matter including dust and lint. A light oil film is then applied to the ways and the tailstock released by means of the lower lever in figure 9. Then the tailstock should be elevated slightly, as shown in figure 10, and moved to the desired position. It is then locked into position. Do not slide the tailstock along the bed ways unless the ways of the bed and tailstock are absolutely clean and there is a clean oil film on both. Failure to observe these precautions may scratch or otherwise damage the mating surfaces.



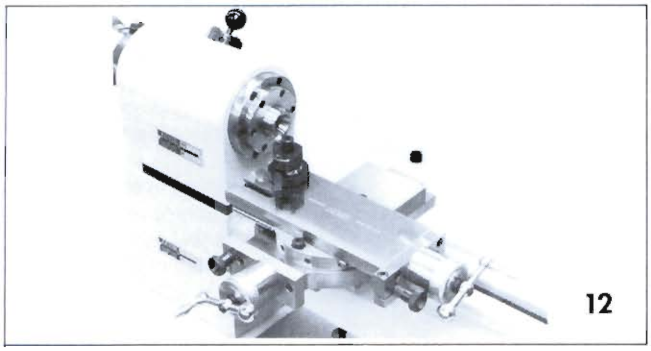
9



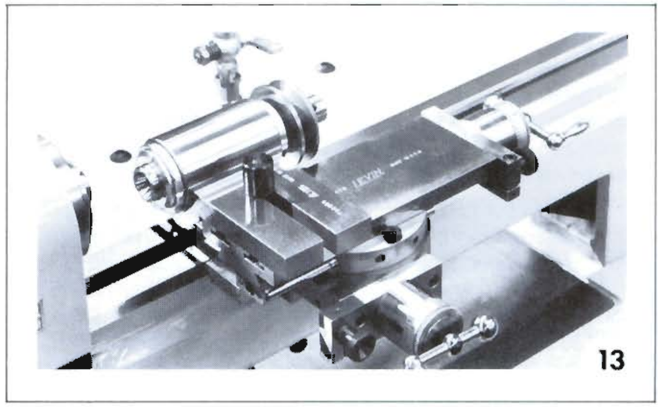
10



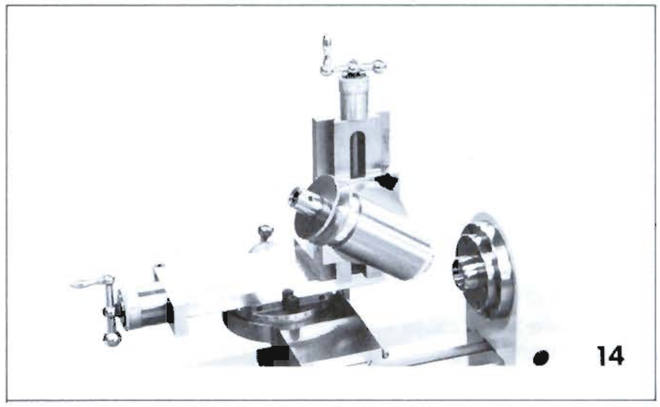
11



12



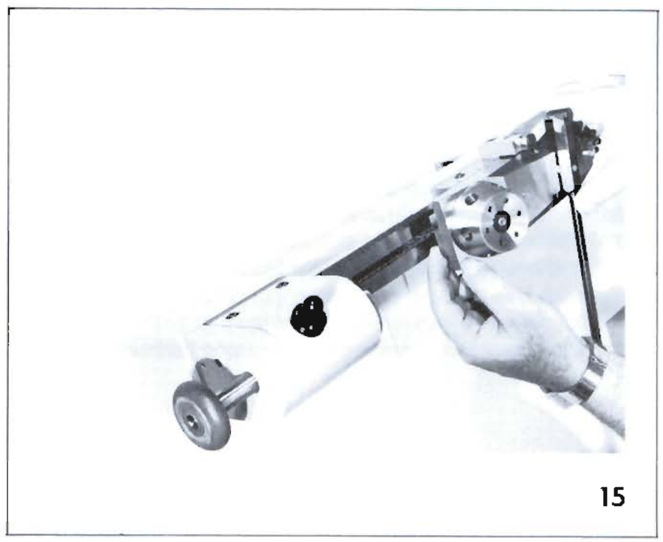
13



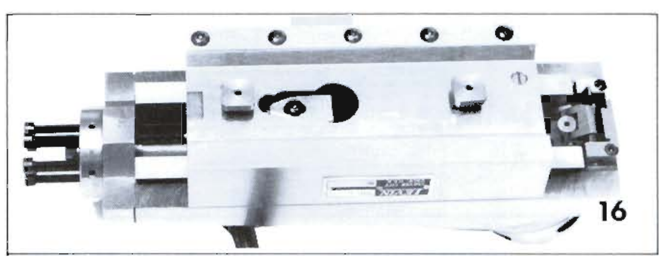
14

All slide rests are provided with a T-slot running along the bottom of the base. A T-bolt, nut, and collar assembly is included with the lathe. This bolt is long enough to project through the center of the lathe bed. By engaging the T-bolt in the T-slot of the slide rest, and similarly mounted tools, the slide rest can be adjusted to any position on the lathe bed and secured in that position by simply tightening the wing nut on the end of the T-bolt. This is located on the underside of the lathe bed.

Figures 11 and 12 show the mounting arrangement of two types of compound slide rests. Figures 13 and 14 illustrate the features of this attachment. The application of the turret attachment to the lathe bed is similar to that of the tailstock. Again, cleanliness of the ways is a critical factor. Because of the weight of the turret attachment, it can easily be handled as shown in figure 15. In this manner, one can exercise good control so as to not slide the attachment on the ways until both binding bolts, shown in figure 16, have engaged the T-slot in the lathe bed.



15



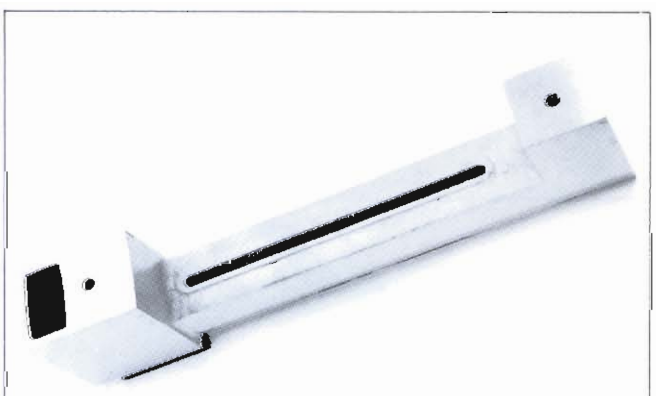
16

INSTALLATION

When a new Levin instrument lathe is received, it is important that one be cognizant of the fact that it is high precision equipment. As such, every aspect of handling, uncrating and set-up must be done with care to avoid damage to the equipment and to preserve the precision built into the machine at the time it was shipped. The machine should be unpacked with care. Each of the individual components of tooling should be carefully unwrapped and placed on a clean surface which will not in any way damage the surfaces of the parts resting on that surface.

All unpainted surfaces have been treated with special preservatives to prevent rust and corrosion. The preservatives can easily be removed without damage to the equipment if they are wiped clean using a soft cloth, dampened, but not saturated, in petroleum benzine or any other good solvent which will not attack the painted surfaces. Immediately after wiping the surfaces clean with solvent, the surfaces should again be wiped with an oily cloth to prevent the formation of rust. They should then be put away in a suitable closed cabinet in a manner such that each item is easily accessible and can be removed from the cabinet without danger of striking any other component stored in the cabinet. Under no circumstances should the lathe or any other accessory tooling be sprayed with oil or rust preventatives due to the danger of forcing the oil or preventative into spindle bearings and slides where it can cause damage. Compressed air should not be used for cleaning the machine because it can force small chips into areas where damage to the machine will result.

Once the entire machine and all components and tooling have been thoroughly cleaned, the assembly and set up of the equipment can begin. If the lathe you have received is to be mounted on your own cabinet or bench, make certain that the mounting surfaces are clean, flat, level, and that the cabinet or bench is stable enough to prevent undue vibration. Using 3/8 - 24 bolts, secure the lathe to the mounting surface. The distance between centers of the mounting holes on a double pedestal lathe bed is 15.062" (Figure 17). In bolting the lathe to the mounting surface, care should be taken to insure that the bolts will not loosen in time due to compression of the materials used in supporting the lathe bed.



17

If your lathe has been furnished on a Formica Top Steel Bench, it need only be made level and stable, either by installing a set of leveling bolts, leveling feet or by using shims. Lathes furnished on welded steel cabinets include a set of leveling feet. A machinists' level should be placed on the bed ways and the machine adjusted until the bed is level and any warp or twist removed.

On Bench Model lathes or lathes furnished with a remote mounted motor drive unit, the motor drive speed control is provided with a cord set intended for connection to a standard non-locking, 2 Pole, 3-Wire, Grounding receptacle connected to a 115V, 60 Hz, 1ϕ, A.C. supply. On Cabinet Model lathes, provision is made either for the connection of a 3-Wire cord set or to connect conduit. Access to the junction box is made through the louvered panel on the left side of the cabinet. The access hole accepts standard 1/2" electrical fittings and is located on the rear face of the left hand pedestal at a distance of 21-1/2" above the floor and 3-1/4" to the right of the left hand side of the pedestal.

1

COMPONENT DESCRIPTION

HEADSTOCK (Figure 1)

The headstock of the lathe is the work carrier. It is usually provided with a hollow spindle in which many work-holding accessories such as collets, step collets or chucks may be placed. In addition, provision is made for mounting a variety of face plates and special work-holding devices on or in the spindle. A drawbar holds all of the accessories that fit in the spindle. The threaded end of the work-holding device engages the threads in the drawbar. When the conventional drawbar is rotated in a clockwise sense, it draws the work-holding device into the spindle. This action of tightening or releasing the drawbar causes the work-holding device to slide back and forth in the spindle. The work-holding device is accurately located by the throat and cone in the spindle, and these two areas are, therefore, subject to undue wear if proper precautions are not observed. The wear is minimized by making the spindle hard. But, even so, the operator must understand what forces are applied to the spindle when the work-holding device is tightened by means of the drawbar. Failure to understand these relationships will usually result in damage to the spindle and, consequently, to the accuracy of the headstock.

When a piece of work is secured firmly in a collet by tightening the drawbar, it places the spindle under a considerable amount of stress. The effect is as though one took a long, slender rod and rested one end on the floor and pressed down on the other end while the rod was in a vertical position. When the force applied to the rod becomes great enough, the rod will begin to buckle. This is exactly what happens if the lathe spindle is not strong enough to withstand the force applied in tightening a collet or other work-holding device in the headstock spindle. If this happens, it will cause premature wear on the spindle bearings and destroy the accuracy of the headstock. Consequently, particular attention should be paid to the instructions relating to the mounting of work-holding devices.

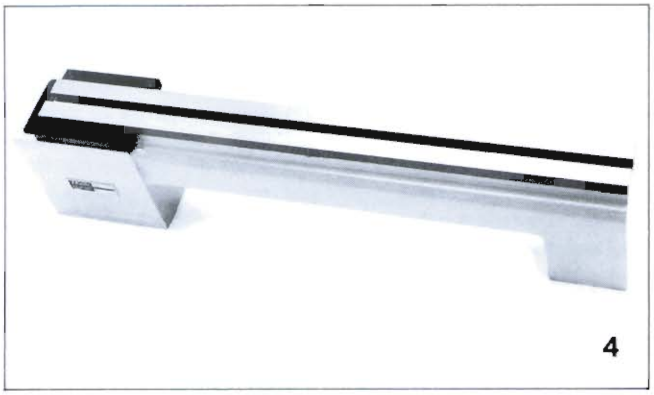
Many attachments are designed to mount on the rear end of the lathe spindle. They include such items as indexing mechanisms, lever-operated collet closers, stock feed mechanisms, air-operated collet or chuck closers, etc. These items are accurately located by being keyed to the spindle and by precisely fitting over the spindle or locating against the end of the spindle. It is important, therefore, that care be taken in handling and maintaining the rear spindle surfaces free from damage; clean and unscratched. In addition, care must be taken not to clamp any devices to either end of the spindle with excessive force as this can deform the spindle and damage the bearings. A careful examination of the method of attachment of the various devices to either end of the spindle will readily indicate that only minimal force is required to hold them in position securely. It is obvious that all mating surfaces should be thoroughly cleaned before mounting and should never require a force fit.

A glance at the assembly drawing of a Levin headstock shows what appears to be a very thoughtfully constructed assembly. This fact, plus the inspection certification provided with the lathe indicating the actual and permissible runout of the spindle should be sufficient to discourage almost anyone from attempting to disassemble and service the headstock. To properly replace bearings in a Levin headstock requires special equipment, tooling and machining facilities. Before even considering opening a Levin headstock, one would be well advised to consult the factory regarding the proper methods for correcting any problems encountered in it's operation. There is considerably more to assembling and handling these high precision parts than meets the eye, and one can do irreparable damage to the assembly if the parts are not handled correctly.

TAILSTOCK (Figure 18)

The tailstock of the instrument lathe serves a dual purpose. It may be used as a support for long work which is done between centers, or as a tool carrier. In order to give the tailstock maximum utility, the spindle is made to hold collets or it accepts taper shank tools. Those models which have collet-holding spindles are equipped with a drawbar and they have a lever-operated rack and pinion feed system for sensitively controlling the advance and retraction of the spindle. Those which accept taper shank tools have a screw feed mechanism for the advance and retraction of the spindle. By retracting the spindle all the way, the taper shank tool is automatically released from the spindle. The screw-type tailstocks also have an adjustment for off-set which can be used for some types of taper turning operations. Tailstocks may be moved to any position on the lathe bed and securely clamped to the bed by means of a bed-locking mechanism, consisting of a lever operated eccentric and binding bolt.

18



4

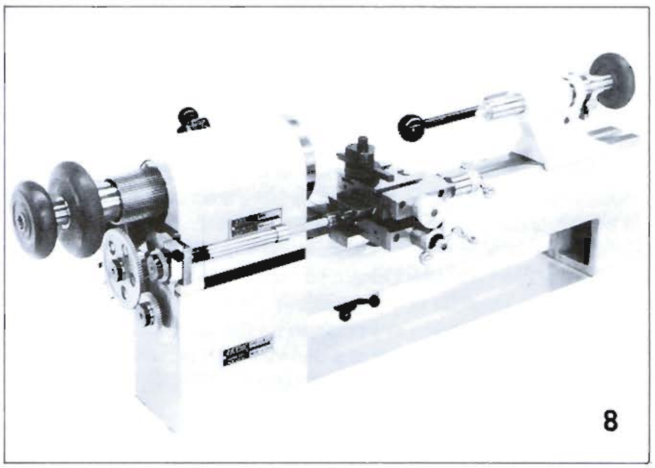
LATHE BED (Figure 4)

The lathe bed is essentially a straight bar to which is fastened the headstock, tailstock and various accessories. The bed is accurately ground so that all accessories clamped to the bed will maintain their proper alignment with respect to one another. In spite of the apparently large mass of metal making up the lathe bed, it is in reality quite flexible when exposed to the high forces applied when bolting the bed to a lathe bench or other rigid surfaces. It can easily be twisted or bent by an amount sufficient to cause serious misalignment of the components clamped to the bed. It should always be bolted to an absolutely flat, rigid surface. After it is secured, the actual alignment of the components should be checked to insure that they at least conform within permissible limits established by the factory. If they do not, it is probably that the surface to which the bed is clamped is not flat enough, or it may be that the surface deformed during the clamping operation. In either case, one must make certain that the bed is actually straight with no warp or twist after it is bolted down.

19

HAND RESTS (Figure 19)

A hand rest, or T-rest, as it is commonly known, is used to support a hand-held tool such as a graver. For convenience, most machinists use a tip-over T-rest. It is particularly useful when it is necessary to measure the work frequently. The rest can be swung out of the way so that a micrometer or other measuring instruments can be applied. It is shown in figures 19 .

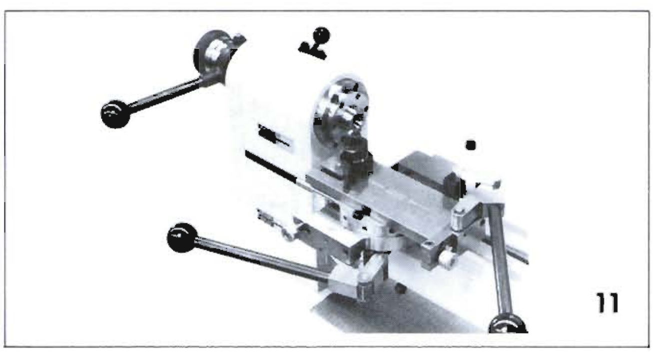


8

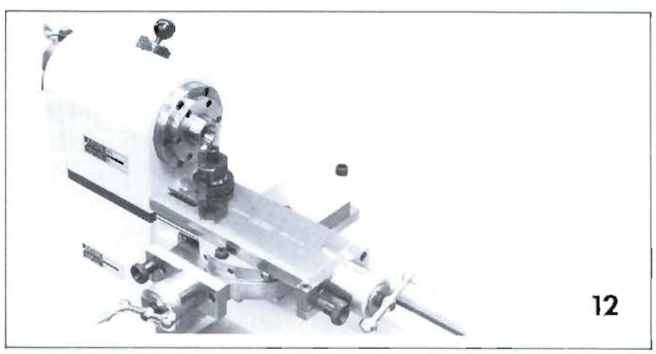
COMPOUND SLIDE REST (Figures 8, 11 and 12)

Where accurate surfaces are to be turned or faced, it is necessary to use a compound slide rest in order to accurately guide the cutting tool along a straight line for a predetermined distance. Compound slide rests are made with either two or three slides. The motion of the slides can be controlled either by means of a leadscrew or through the use of a lever feed mechanism. On slide rests equipped with leadscrews, each leadscrew is equipped with an adjustable dial. If one wants to reduce the diameter of a piece by a given amount, the slide is advanced toward the work until the tool just touches the work. The dial is then set to zero and the tool fed into the work as much as is desired. The dial will indicate directly the reduction in radius of the work, or in a facing operation, the reduction in thickness. In this way, it is at all times possible to start turning with the dial at zero.

On slide rests equipped with lever feed mechanisms, adjustable stops are provided to permit repetitive operations at the same position. This is particularly useful in production operations. All slide rests are designed to swivel in order to turn precise angles.

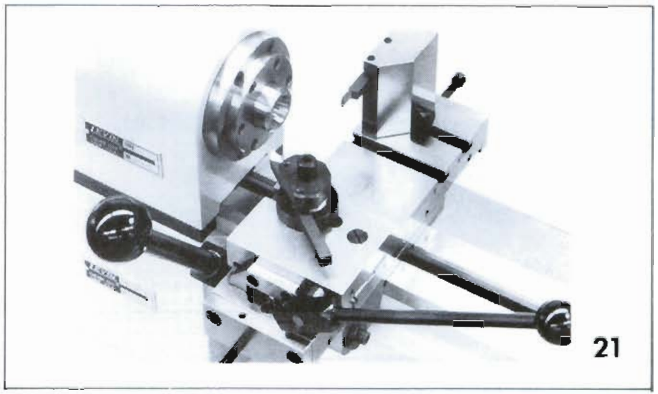


11



12

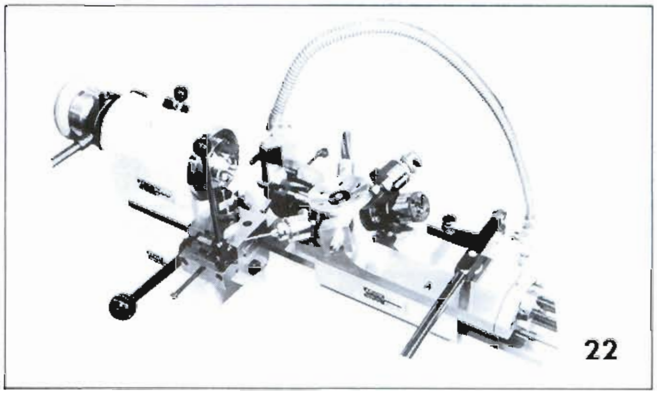
All slide rests are provided with a T-slot running along the bottom of the base. A T-bolt, nut, and collar assembly is included with the lathe. This bolt is long enough to project through the center of the lathe bed. By engaging the T-bolt in the T-slot of the slide rest, and similarly mounted tools, the slide rest can be adjusted to any position on the lathe bed and secured in that position by simply tightening the wing nut on the end of the T-bolt. This is located on the underside of the lathe bed.



21

DOUBLE TOOL CROSS SLIDE (Figure 21)

A special form of compound slide rest is called a double tool cross slide. It generally carries two cutting tools and it's motion is generally restricted to traverse across the lathe bed. However, there are models which also contain either one or two movable slide assemblies which permit traverse along the bed axis in addition to the motion across the bed. Either or both of these movable slides may be swiveled to turn angles. Generally, the movement of all slides is controlled through a lever-operated rack and pinion feed system. On some models, however, the motion across the bed is controlled by a screw feed. Figure 22 illustrates a typical mounting arrangement for this tool.

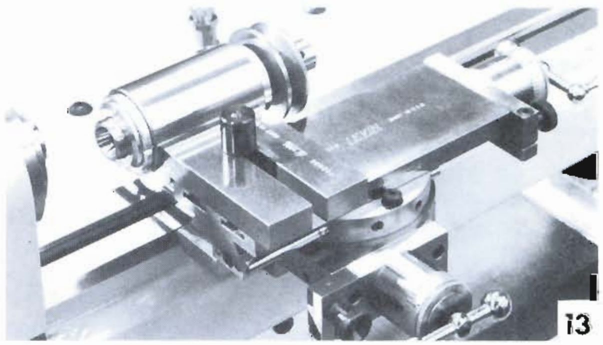


22

GRINDING ATTACHMENT (Figure 13)

This is a special accessory which mounts on the top slide of a compound slide rest. It is a precision tool which is suitable for many different applications. By mounting an appropriate grinding wheel in the spindle, either O.D. or I.D. grinding can be accomplished. In addition, the tool can be used for various boring applications by mounting appropriate carbide burrs in the spindle. Figure 13 shows this device mounted on a compound slide rest.

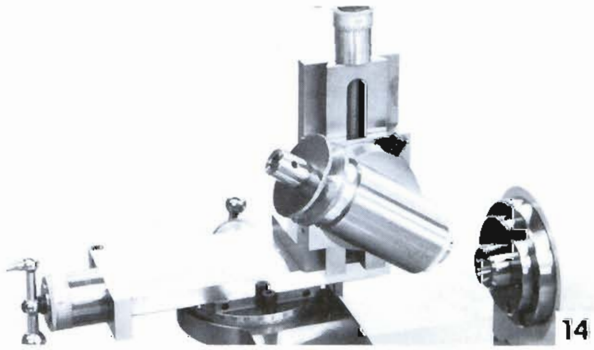
When using this attachment for grinding, it is always necessary to dress the grinding wheel while it is revolving in the spindle. This operation should always be done wet and all exposed slides and ways should be shielded to protect them from the abrasive material removed both during the dressing operation and the grinding operation. Appropriate shields can be easily fabricated from sheet rubber or various transparent plastics.



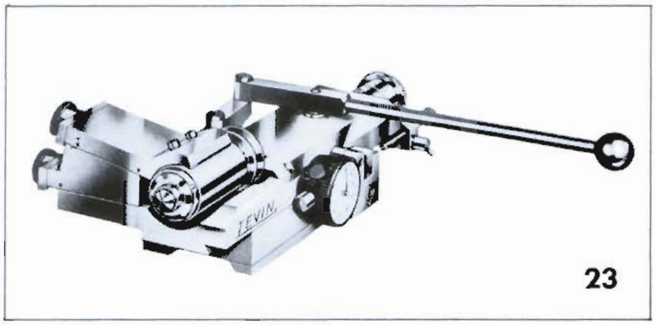
13

MILLING ATTACHMENT (Figure 14)

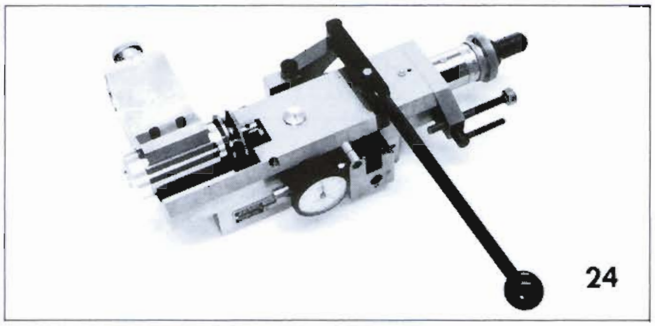
A milling attachment consists of a vertical slide assembly which can be mounted on the top slide of a compound slide rest. This vertical slide assembly carries a spindle assembly which can be set on any angle. The milling attachment can be use for a wide variety of machining operations requiring the use of a revolving cutting tool. A typical arrangement is illustrated in Figure 14.



14

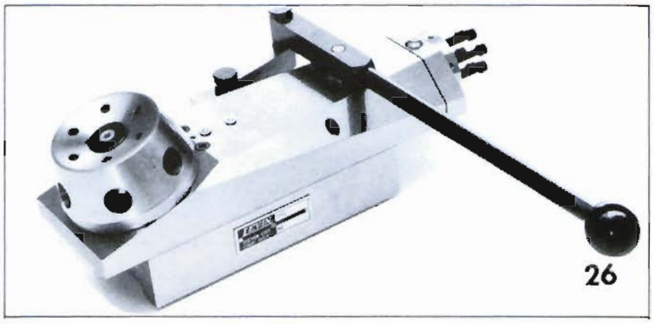


23

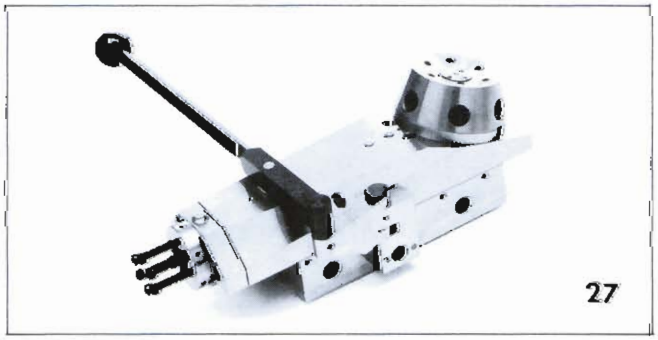


24

25



26



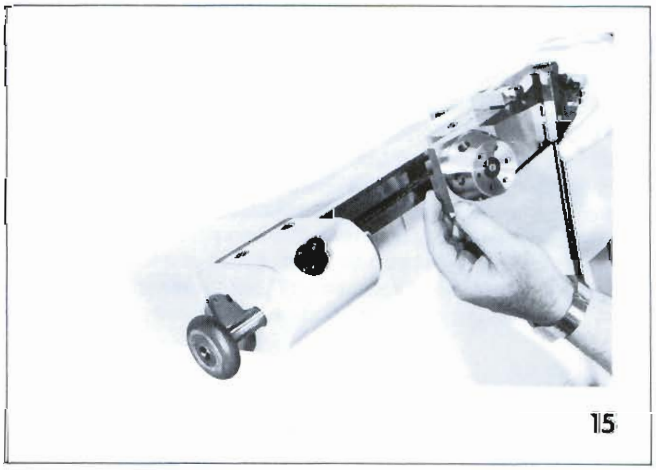
27

MICRO-DRILLING ATTACHMENT (Figure 23)

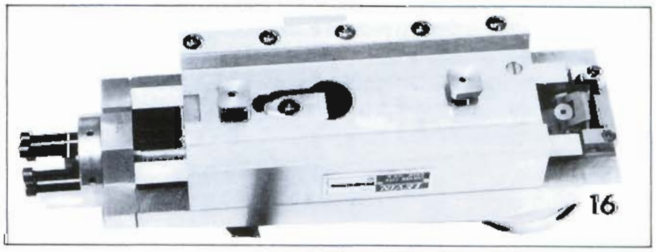
This is an extremely accurate and sensitive accessory, designed for drilling accurate holes under 1/8" in diameter. Holes as small as 0.0006" can be drilled using the attachment. The unit, shown in Figures 24 and 25 are fundamentally a specialized type of tailstock having a high precision, collet-holding, revolving spindle assembly which can be accurately adjusted such that the axis of rotation of this spindle is coincident with the axis of rotation of the headstock. In addition, a long dovetail slide assembly permits feeding the entire spindle assembly toward the headstock while the spindle revolves. The drill feed is accomplished by turning a feed screw handwheel while maintaining forward pressure on the slide handle. In this way, the drill cannot be forced as it cannot possibly be advanced any faster than the handwheel is turned. Rapid retraction of the slide can be made at any time to clear chips and the slide can then be rapidly advanced to exactly the same position it had just prior to retraction. By a slight rotation of the handwheel, one can easily bring the drill point up slightly short of the point where retraction occurred. Consequently, it is possible to prevent the drill from either rubbing on the bottom of the hole or striking the bottom of the hole. This feature is critically important when drilling small holes in materials which have a tendency to work-harden.

TURRET ATTACHMENT (Figure 26)

The 6-position, self-indexing turret is provided with independently adjustable stops for each turret position. Sensitivity and accuracy have been built into this unit to make it suitable for production work on the smallest of parts. All turret holes have been bored to size from the headstock of the lathe to provide the ultimate in alignment. A wide variety of standard turret tools are available for use in the turret. Because of the small physical size of the tooling and it's design, it is possible to build up many specialty tools for a wide variety of work. Figures 15, 16, 26 and 27 illustrate the features of this attachment. The application of the turret attachment to the lathe bed is similar to that of the tailstock. Again, cleanliness of the ways is a critical factor. Because of the weight of the turret attachment, it can be easily handled as shown in figure 15. In this manner, one can exercise good control so as to not slide the attachment on the ways until both binding bolts, shown in figure 16, have engaged the T-slot in the lathe bed.



15



16

STEADY REST (Figure 28)

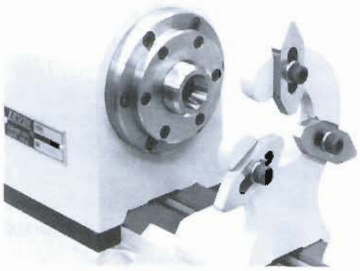
The steady rest is a device which clamps to the lathe bed and is used to support long work which cannot be rigidly held in a collet or chuck. The three adjustable jaws are hardened and will support work up to 1" in diameter. When properly mounted and adjusted, this tool can be used to hold extremely small diameters.

WORK-HOLDING DEVICES (Figures 29-37)

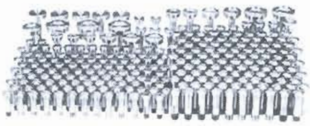
Many standard types of work-holding devices are available for Levin lathes. These include draw-type collets for holding work as small as 0.004" in diameter. Collets are available in any size up to 1.000" in diameter. They can be obtained as step collets; they can be solid or split with 2, 3, 4 or 6 slots; and they are available with special configurations to meet specific applications. These collets are closed around the work by tightening the drawbar and drawing the collet into the spindle.

Scroll-type and independent jaw chucks are available for holding larger work up to 2-1/2" in diameter. These have reversible jaws for holding both externally and internally. The 6-jaw bezel chucks are particularly useful for supporting thin discs or rings.

Many other types of work-holding devices are available and illustrated in the current edition of the Levin catalog. Their variety is such as to make it possible to hold almost any shape part accurately.

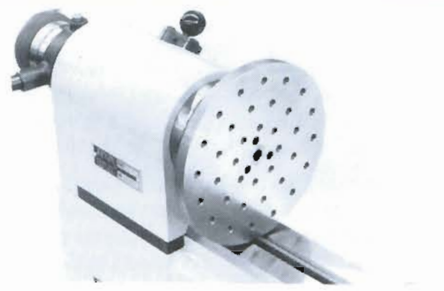


28

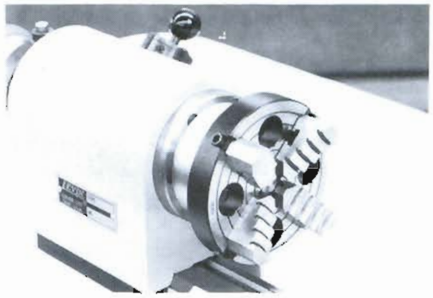


29

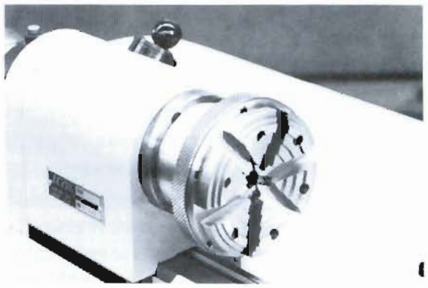
30



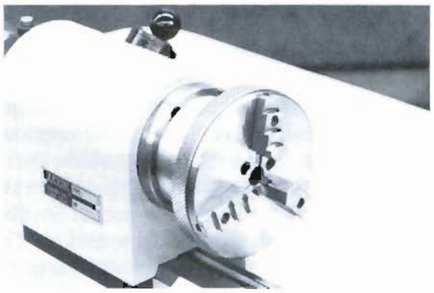
31



32



33



34

35

36

37

Some attachments are provided with a T-slot in their base. These attachments can be mounted to the lathe bed by means of a T-bolt, nut, and collar assembly. The T-bolt passes through the slot in the center of the lathe bed and is secured by tightening the wing nut under the lathe. The collar is positioned between the wing nut and the bottom of the lathe bed. To mount attachments using the T-bolt, nut and collar assembly, carefully insert the T-bolt in the T-slot of the attachment and adjust the unit into position. Usually, there is an adjustable guide, attached to the T-slot of the attachment, which rests against the angle on the bed. This guide can be moved to provide for gross adjustment of the position of the tool. Once the approximate position is established, tighten the wing nut securely. Compound slide rests and wheel truing attachments are among the tools which use this method of attachment.

Another group of tools, including double tool cross slides and steady rests, are furnished with a long bolt attached to the bottom of the tool. This bolt is inserted through the slot in the lathe bed and the device secured in position by applying a collar and wing nut to the threaded portion of the bolt extending through the bottom of the lathe bed. These tools have an adjustable guide to enable the operator to accurately fit the base of the tool to the lathe bed.

TOOL HOLDERS

Cutting tools may be held in the headstock, tailstock, slide rests and on many of the standard lathe attachments. Many different types and sizes of tool holders are available to fit the various lathe components. These are illustrated in the current edition of the Levin catalog.

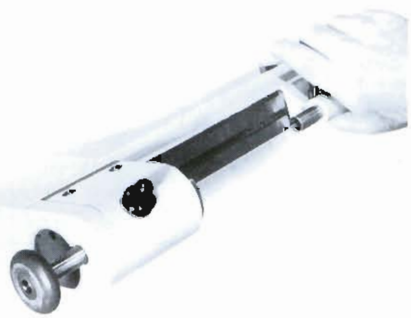
SET UP

ATTACHING TOOLING TO THE LATHE BED

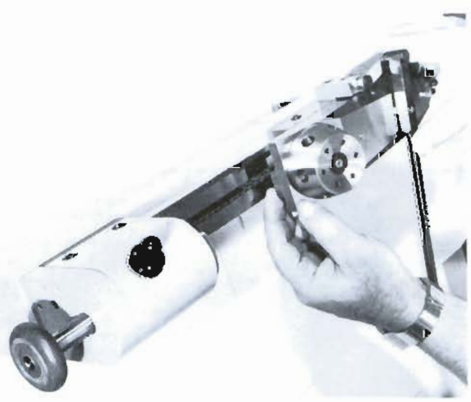
Three methods are used to secure various pieces of tooling to the lathe bed. Headstocks, tailstocks, turret attachments, and micro-drilling attachments are all clamped to the lathe bed by engaging adjustable binding bolts in the T-slot of the lathe. When mounting any of these devices, first make certain that both the lathe bed and the bottom of the device are absolutely clean and free of burrs that may have been raised by scratching the reference surfaces. Small burrs may be removed by using a hard Arkansas stone and oil. Remember to thoroughly clean the surface after stoning off a burr.

The next step is to lower the binding bolts to their maximum position by means of the eccentrics located on the rear side of the device. By rotating the eccentrics, the binding bolts are either raised or lowered. Then, as shown in figures 10 and 15, place the attachment on the lathe bed making sure that: (1) the bed has an oil film on it, (2) that it is not bumped against the bed, and (3) that it is maintained slightly elevated off of the bed ways.

Move the attachment forward until the base of the attachment is fully over the bed ways and the binding bolts are engaged in the T-slot. Lower the attachment onto the ways and gently slide it to the desired position. Lock it in place by rotating the binding bolts until they are snug.



10



15

ATTACHING TOOLING TO THE HEADSTOCK

Several devices can be mounted on the rear end of your headstock: a lever collet closer, an index latch, and a screw cutting attachment. These items can be bolted to the belt guard on the headstock using the holes provided for that purpose. The rear end of the headstock spindle is provided with a keyway used to engage the accessory with the spindle. Therefore, this exposed portion of the spindle should always be protected from damage and maintained free of rust by keeping it coated with a film of light oil.

When mounting any collets, chucks, arbors, or face plates in the headstock spindle, it is important that one insure that these devices are absolutely clean and that the conical surface inside the spindle, the collet seat, is clean. The smallest particle of foreign matter on these surfaces can produce unacceptable errors in runout. When locking any item in the spindle, engage the keyway of the collet shank with the internal key in the spindle and then push the tool all the way in. With the spindle locking plunger engaged to prevent spindle rotation, tighten the drawbar. However, never tighten the drawbar on a split collet or split chuck if the collet or chuck is empty. This can damage or break the tool.

When mounting large work holders, 3, 4, or 6-jaw chucks, face plates, or solid arbors, always make certain the drawbar has been tightened securely before mounting the work on the work holder. Then, when mounting the work in these tool holders, be sure you do not apply excessive rotational forces. The key in the spindle is easily sheared if excessive rotational forces are applied which will cause the arbor to rotate in the headstock spindle.

MOUNTING TOOLING IN THE TAILSTOCK

The procedure and precautions for loading tooling and work in the tailstock are essentially the same as for the headstock. When using the tailstock, it is important to recognize that it is not common to find it necessary to shim some of the tools in order to achieve precise tool alignment. While the factory alignment standards shown on Form 199-73 are extremely close, the tailstock is often used in conjunction with tooling whose inherent accuracy is not of the same order of magnitude. For example, if one mounted a theoretically perfect No. 0 Jacobs' drill chuck in the tailstock and mounted a perfect 1/8" drill, holding the drill just behind the flute, the point of the drill could be as much as 0.001" off center. Allowing for the normal manufacturing tolerances in tooling used in the tailstock, the necessity to shim tooling becomes apparent when one looks at the very long overhang involved in the use of such tools. Where tailstock tooling must be precisely located, a turret or drilling attachment is used. Both of these attachments provide for a more accurate means of centering tooling and the cutting tools they hold.

OPERATION

The electrical controls of Levin Lathes are simple to understand and easy to operate. After the machine is connected to the power supply, the following sequence of steps will safely make the machine ready for operation:

1. Make certain that the headstock spindle lock is disengaged, that there are no loose parts that can fly out of the headstock during rotation, and by manually revolving the headstock, insure that it can rotate through 360° without interference from other tooling.
2. Set the Circuit Breaker reset switch to the "ON" position.
3. Turn the Speed Control knob to the "0" position.
4. Set the Power switch to the "ON" position. The red indicator light should turn on. If not, check to make sure there is power being applied to the unit and that the machine is properly connected to the power source.
5. Set the Direction Switch to Forward or Reverse as desired.
6. If your machine is furnished with a foot switch, and if the control panel has a Manual/Foot Mode Switch, set the switch to the "Foot" position and depress the Foot Switch. (In the "Manual" Mode, the Foot Switch is inoperable.)
7. With the Foot Switch depressed, rotate the Speed Control knob clockwise until the headstock spindle is revolving at the desired speed. On machines using the "Manual" Mode, simply rotating the Speed Control knob will cause the spindle to rotate.
8. Releasing the Foot Switch or, in the "Manual" Mode, setting the Direction Switch to "Brake," will apply a dynamic brake and bring the spindle to a controlled halt.
9. Without changing the Speed Control setting, depressing the Foot Switch, or switching the Direction Switch from "Brake" to "Forward" or "Reverse" while in the "Manual" Mode, will cause the headstock spindle to start and safely come up to the preselected operating speed.
10. The Direction Switch may safely be changed from one direction of rotation to the other while the Foot Switch is depressed. In the "Manual" Mode, the Direction Switch should be switched from one direction to the other, pausing in the "Brake" position until the spindle has come to a complete stop. On machines without a Mode Switch, this pause takes place automatically.
11. The "Pump" switch is only intended for use in operating coolant pumps furnished by Louis Levin & Son, Inc. It should not be used to operate other devices. When a coolant system is connected through this switch, the pump will start and stop with the action of the Foot Switch or the Direction Switch on machines equipped with a Mode Switch set to the "Manual" Mode.
12. Because these machines can be used for operations such as tapping and threading where a cutting tool is under load at the time the spindle is reversed, the circuit provides a slight jog of the spindle, a pause, and then controlled acceleration to the selected speed whenever the motor is started. It is normal for spindle rotation to begin at a setting between 10 and 20 on the Speed Control Dial.
13. These machines may be left with the "Power" switch in the "ON" position for extended periods of time without any danger to the circuitry or motor. It is a good practice, however, to always turn the switch to the "OFF" position whenever the machine is unattended.
14. Repairs to the electrical system of the machine should only be made by a qualified technician. Never open any electrical unit on this machine while power is being applied. Always disconnect the machine from the power source or shut off the power source before allowing service technicians to work on the machine.

SAFE OPERATING PROCEDURES

Levin lathes are intended for use in machining miniature and micro-miniature work. The small size of such work and the tooling associated with it often requires that the operators head and fingers are in very close proximity to point of operation of the cutting tools. It is essential, therefore, that proper operator training include the following rules:

1. Always wear approved safety glasses or other suitable eye protection to prevent small chips and coolant from being thrown into the eye. Where possible, the use of protective splash and chips shields is recommended.
2. Caution the operator that even though the parts and cutting tools being used may be very small and fragile, they may have extremely sharp edges capable of inflicting serious wounds if not properly handled or if accidently touched with any portion of the body.
3. Protection of the operator from possible injurious materials, substances, or vapors being injected or inhaled must be provided whenever such substances are used in or on these machines. The close proximity of the operator to the work area can make the use of such materials more hazardous than they might be on other types of equipment.
4. Always provide suitable operator protection and training whenever using any tooling or work which can or will fly apart if the machine is operated at excessive speed.
5. When using a Foot Switch to start and stop your machine, the switch should be positioned in a manner such as to avoid accidental operation by the operator. If there is any danger of an object falling on the switch, and thus starting the machine or if the operator can accidentally step on the switch, it should be protected with a suitable foot guard or replaced with a more suitable type of switch.

ROUTINE CLEANING

Machines of this type must be maintained properly in order to preserve their high degree of accuracy. Often, plants have rules governing the frequency and extent of cleaning to be performed by shop personnel on the plant equipment. This process may or may not be adequate for an Instrument Lathe. It is recommended that a few minutes be allotted each day to clean the lathe. The proper procedure is as follows.

Wipe the machine thoroughly with a clean cloth which has been dampened either in kerosene or a clear light mineral oil. Under no circumstances should one use any caustic cleaners or abrasive cleaning compounds for this purpose.

The chips from machines of this type can be microscopic in size and they should never be permitted to accumulate on the machine or in the chip tray. Because they can be very small, there is always danger of them being forced into working areas where they can cause damage. When cleaning chips off the machine or any of the working parts, it is helpful to use a fairly stiff paint brush. After brushing away most of the chips, the remaining chips can easily be wiped from the machine with a dry cloth. Under no circumstances should compressed air be used in cleaning the machine, or for that matter, cleaning any parts in or near the machine. Compressed air can force small chips into the bearings and other working areas and cause serious problems.

On machines equipped with a coolant system, be certain to clean the chips and dirt from the tank at least every 3-4 weeks. Again, remember that microscopic chips will tend to be recirculated by the coolant pump and these chips can cause serious problems if they are washed into certain mechanisms on the machine.

LUBRICATION

Most Levin lathes require only minor amounts of lubrication, but it is critical that they be lubricated regularly and as required by the nature of the machine and the operation. No machine or portion of the machine should ever be operated until it has been properly cleaned and lubricated. Before any slides or machine components are run or moved, all bearing surfaces must be wiped clean with a clean cloth. Even dust settling on the machine overnight can harm bearing surfaces if not properly removed before operating the machine or any tooling. After wiping all bearing surfaces clean, they should be oiled using a light weight lubricant. All oil ports and fittings should be lubricated with the lubricants prescribed in the machine lubrication chart.

ADJUSTMENT OF GIBS

The sliding ways on the machine and certain articles of tooling are furnished with adjustable gibs. These gibs are designed to compensate for wear on the slides and to maintain the slides free from shake. Either straight or tapered gibs are used. Straight gibs are adjusted by means of a series of screws along the side of the gib. Tapered gibs are adjusted by means of an adjusting screw at one end of the gib. Improper adjustment of the gibs is the principle cause of error in precision slides, so it pays to take the time to properly understand how to adjust a gib.

Common sense tells us that gibs should be adjusted until the sliding members are just tight enough to obtain the required accuracy under the applied loads. If they are too loose, the slide will float and its motion will be inaccurate. It will drift and move under the slightest load. If the gibs are too tight, the sliding members will be difficult to move and the excessive force required to move them may damage the leadscrews and leadscrew nuts.

When adjusting a gib, the slides should always be in a position such that they are supported throughout their length by the movable member. Failure to bring about this condition prior to making a gib adjustment may cause the gib to become bent or permanently damaged. Continued use of bent or damaged gibs will destroy the accuracy of the slide. If the gibs are properly adjusted, slide wear will be minimized. However, when with proper gib adjustment a slide is free in one position and binds in another, it is an indication that the slides are worn and that they should be refitted.