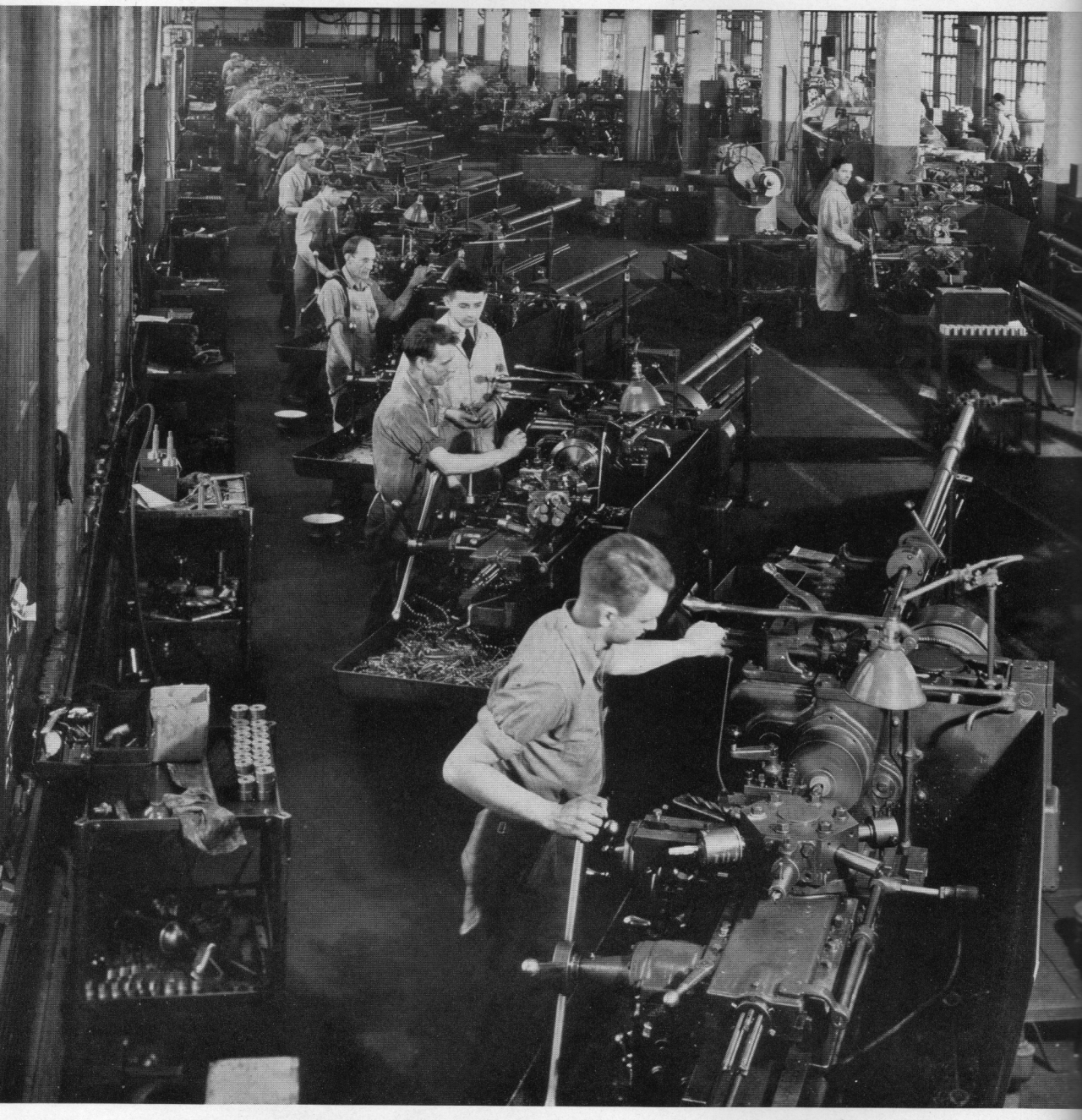


Proper care of the machine results in better work and longer accurate machine life.

Chapter 4

CARE AND MAINTENANCE

With machines designed as they are today, an operator does not spend much time in servicing and taking care of his turret lathe, but the few things that he does have to do are very important.

The care of a turret lathe must begin as soon as it gets inside the shop. The uncrated machine should be kept on its skids until moved to its final location. None of the slides should be moved until the slushing oil is thoroughly removed and the slides have been properly lubricated. Before shipping, the slushing oil is put on all bright parts to protect them, and because dirt and grit that falls on the machine during shipment is caught by this oil, it must be thoroughly removed by washing the machine with kerosene.

Complete instructions for moving, cleaning, leveling, and lubricating the machine are included in a Service Manual sent with each new machine.

Once a machine has been properly set up and put into operation, there are only five things that an operator has to do:

1. Keep the machine clean.
2. Keep it properly lubricated.
3. Keep it level.
4. Adjust clutches.
5. Adjust gibs to take up wear.

There are, of course, occasionally more serious repair jobs to be done to the machine resulting from accidents or from failures of working parts. These repairs are usually taken care of by the maintenance or millwright department, rather than by the operator himself.

Cleaning the Machine — Many shops have a definite rule that a machine must be cleaned at least once a week. This will take only a few minutes and will prevent the lacquer paint from becoming stained and the bright metal parts from becoming rusted. Wipe the machine thoroughly with a clean rag soaked with kerosene. If the machine is in an atmosphere where bright parts rust quickly, wipe them with a rag soaked with clear mineral oil. Never use caustic cleaners or cleaning compounds on the machine. They will ruin the finish.

Chips should be removed frequently, and they should not be allowed to pile up in the pan or on working parts of the machine. When cleaning chips from the machine, use a hand brush or a rag, *do not use compressed air.* Compressed air will drive small chip particles into the bearings and cause very serious trouble.

The coolant reservoir should be cleaned out at least once a month to remove the dirt and fine chips that settle in the bottom of the reservoir. This will not only

prolong the life of the coolant pump, but will also improve the finish of work machined by roller and "V" type back rest bar turners.

Lubrication — Never operate a turret lathe until it has been completely oiled and greased. This applies to machines that have been standing idle for any length of time as well as to new machines. Before any of the slides or units are moved, and before power is applied, all bearing surfaces should be wiped with a clean rag and the machine carefully oiled and greased according to the manufacturer's instructions.

When starting the machine for the first time after it has been completely oiled, move all slides and turrets by hand. By doing this, you will be sure that all units are free and in proper condition before applying power.

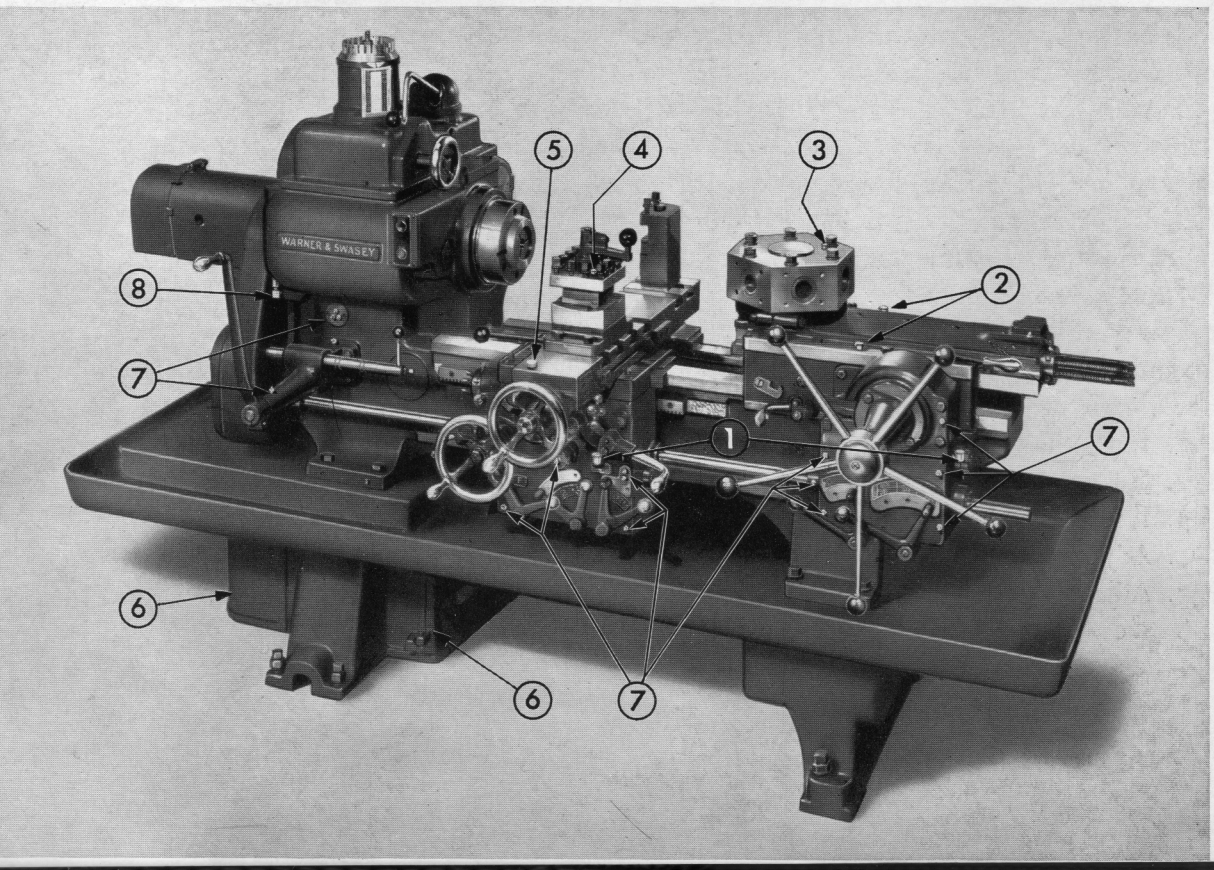
After the machine has been put into operation, it must be lubricated regularly, and the operator should follow a schedule. If your machines do not have a plate showing a lubrication schedule, the following information gives a basis for lubrication schedules for Warner & Swasey machines.

Ram Type Machines (see Fig. 37) — *Once each day.* — Fill the worm troughs of the aprons with oil (1). Oil turret slide (2). Oil the hexagon turret (3). Oil the square turret (4). Oil the cross slide and the bed ways (5).

When oiling the cross slide on ram type machines, it is important that you run the slide in all the way. Then fill the plunger pump *four* times, forcing the oil down each time by means of the plunger. This delivers oil to the front and rear bed ways, the cross feed screw and nut, as well as the cross slide ways.

Once each week. — Open the door of the

Fig. 37 — Lubrication points on the ram type turret lathe.



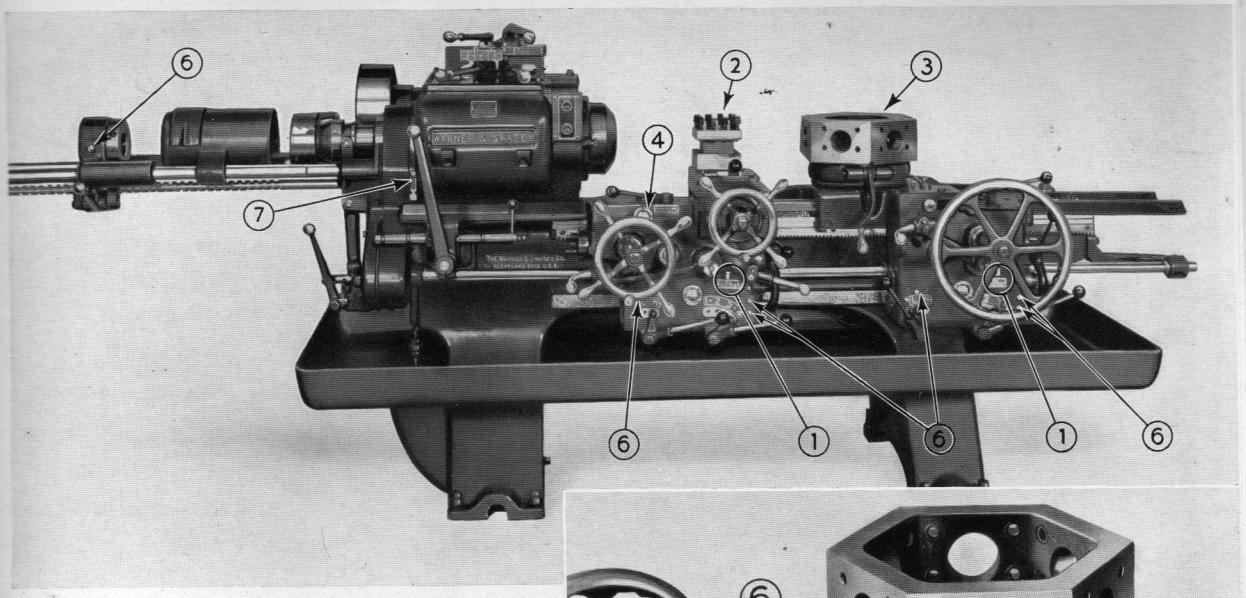


Fig. 38 — Lubrication points on the saddle type turret lathe.

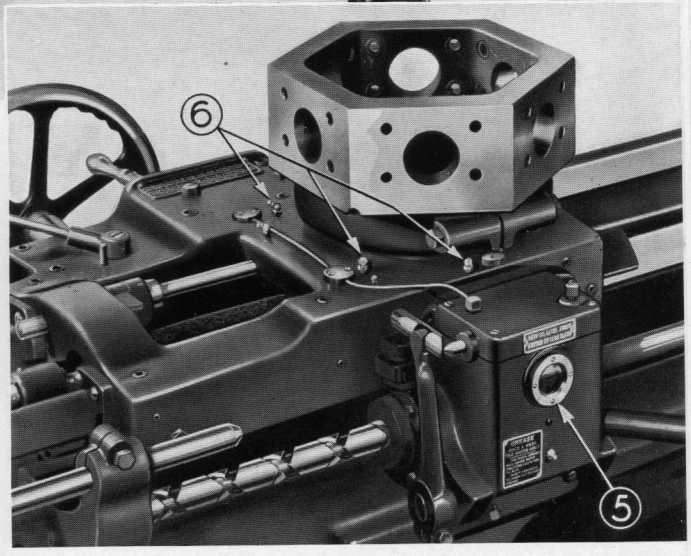


Fig. 39 — Automatic pump reservoirs on rear of hexagon turret saddle.

pedestal motor base (6) and oil or grease the motor bearing.

Grease all of the nipples (7) on the machine, including those on the chuck, using a pressure grease gun.

Twice each year. — Drain all the oil from the head, flush it with clean oil and refill with turbine oil to the gauge level line on the gauge glass (8). This operation should be done when the machine is not running, except for the short time when the head is being flushed with a clean oil.

Saddle Type Machines (see Figs. 38 and 39) — *Once each day.* — Fill the worm troughs (1) of the aprons with oil. Oil the square turret (2). Oil the hexagon turret (3). The oiler for the hexagon turret is located on the inside of the hollow hexagon turret.

Once each week. — Oil the motor bearings at the rear of the headstock. Fill the automatic pump reservoirs on the cross slide carriage (4), Fig. 38, and the hexagon turret saddle (5), Fig. 39. Use a pressure grease gun on all the nipples on the machine (6), including the chuck.

Twice each year. — Drain all the oil from the head, flush it with clean oil and

refill with turbine oil to the gauge level line on the gauge glass (7). Also drain, flush and refill the automatic pump reservoirs of the cross slide carriage (4), Fig. 38, and the hexagon turret saddle (5), Fig. 39.

Oils and Greases — The turbine oil for filling the headstock should be of a good grade, with a viscosity of 200 seconds Saybolt at 100° F. If it is impossible to get this oil, use standard Pennsylvania automobile engine oil SAE 10 or 10W.

Oil for the other points on the machine should be a good grade of engine oil, unless otherwise specified on a tag or instruction plate fastened to the machine. The grease for the pressure gun should be No. 1 consistency "roller bearing" grease, unless otherwise specified on the machine.

Oil for the Headstock — In addition to the schedule given, the oil in the headstock should be checked periodically — about once a month. The oil level in the headstock should be kept *on the gauge line*, never above or below it, and measured when the machine is not running.

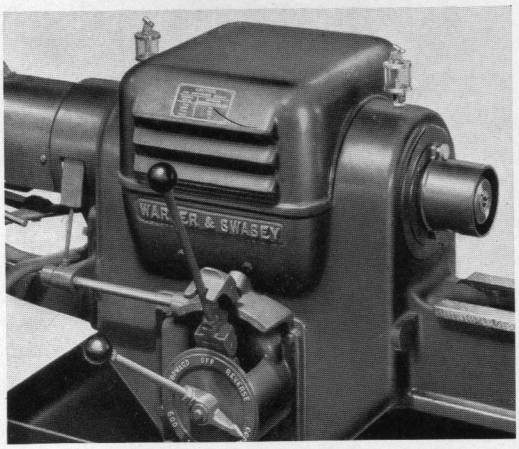


Fig. 40 — Electric spindle machines have sight feed oilers at both ends of the headstock.

Machines that are equipped with hand hole covers on the headstock have a vent hole in one of these covers. Keep this vent hole open — otherwise the vapor inside the head will build up enough pressure to force the oil to leak out.

Electric spindle machines, Fig. 40, have sight feed oilers at both ends of the headstock. These oilers are designed to hold enough oil for several days, so regulate the drip accordingly. A drop of oil every five minutes will generally be sufficient for these spindle bearings.

If the responsibility for the lubrication of the machine is placed with the operator, he must be very careful to see that all instructions are carried out regularly. In the case of Warner & Swasey Turret Lathes, the preceding instructions will form a general guide, but it is not possible here to list all specific instructions for lubrication. If the operator will carefully examine the machine and notice any special plates regarding lubrication, there should be no trouble due to the lack of lubrication.

Leveling for Alignment — Any modern type of turret lathe must be leveled to bring it into proper alignment after placing it on a foundation. The accuracy of the machine is built into it at the factory with the bed aligned in a certain position. If the operator is to obtain the same accuracy and alignment in his machine, he must see that the bed is placed in the same position as when the machine was being built.

When we refer to the leveling of a turret lathe, we are actually referring to

the removal of the twist in the bed. This twist results from setting the machine on four legs on an uneven foundation. The leveling of the machine is accomplished by adjusting one or more of the legs to remove the twist in the bed so that it is straight and parallel with the spindle.

Even though a machine is properly installed, it must be rechecked and releveled occasionally because buildings and floors settle due to changes in temperature and changes in season. A machine that is out of line or twisted is difficult to operate and will not bore or turn true. Also the bearings will wear unevenly, and if operated in this condition for some time, it may become impossible to relevel it so that it will produce accurate work.

The original leveling of the machine and the checking of the machine after it has been installed may be done by the operator, but ordinarily this work is performed by the maintenance or the millwright department. Whenever your machine cuts taper with cutters held in either the square turret or the hexagon turret, it should be checked, and, if found out of alignment, should be releveled.

A Firm Foundation — In order to properly level a machine and to make sure that it will stay level, it is most important that it have a firm foundation. In selecting a foundation, remember to take into consideration not only the weight of the machine itself, but the weight of all the tools that will be on the machine, and the weight of the material that will be placed around the machine while it is being operated.

When it is necessary to locate a machine on an upper floor, it should be placed with the head as near as possible to a supporting wall, or close to or directly over a pillar or floor beam where the floor is most rigid.

Wooden floors form a very poor foundation for machine tools. They warp and compress too easily under heavy weight. It is difficult to keep a heavy machine resting on wood in proper alignment. For this reason, the wood overlays on concrete floors should be removed, and the space filled with concrete, and the machine set directly on this concrete.

Regardless of the type of floor used, the machine should always be bolted down solidly with lag screws. Do not under any circumstances embed the feet of a turret lathe in concrete.

If the feet of the turret lathe are equipped with leveling screws, set the machine on $\frac{1}{4}''$ or $\frac{1}{2}''$ steel plates that have holes drilled through them so that the lag screws can go through the plates into the floor. Never set a machine that has adjustable leveling screws directly on wood or concrete.

If the machine does not have leveling screws, use flat metal shims to adjust when leveling. Do not use shingles or wooden shims, because they will compress and allow the machine to go out of line.

Use a Sensitive Level — The leveling or untwisting operation on a turret lathe requires the use of a very accurate level. A common carpenter's or machinist's level is not sufficiently accurate. A sensitive, graduated-tube spirit level reading

Fig. 41 — The proper type of sensitive level to use in leveling a turret lathe.

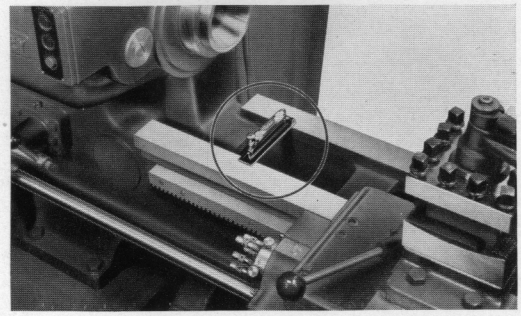


Fig. 42 — Place the level at right angles to the center line of the bed at the headstock.

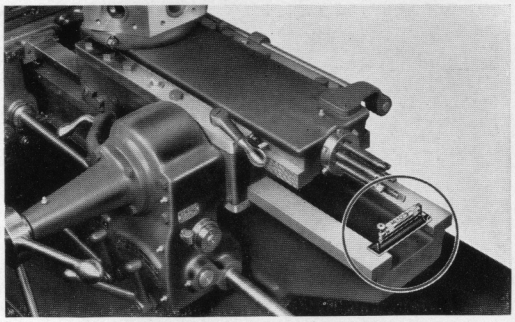


Fig. 43 — Place the level at right angles to the center line of the bed at the outer end of the ways.

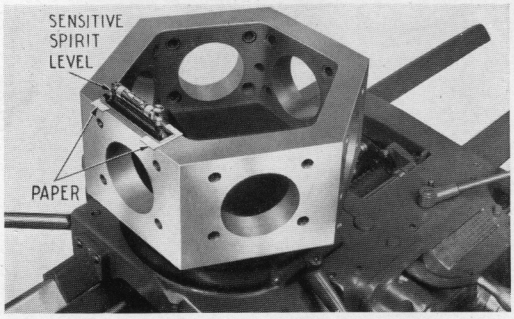


Fig. 44 — Place the level across the turret with two small pieces of thin paper underneath the level as shown.

to 10 seconds of arc per graduation (.0006 inch per foot) is required. The level should have a short base and a long tube and should be of the adjustable type shown in Fig. 41. If a level is not long enough to span the ways or the turret, use an accurate parallel beneath it.

Leveling a Ram Type Machine — The procedure for leveling a ram type turret lathe is as follows:

(a). Loosen the lag screws holding the right end leg to the floor. *Do not* loosen the lag screws on the left end (headstock) leg.

(b). Place the level across the bed at right angles to the center line of the bed near the headstock (see Fig. 42). Adjust the level until the bubble is in the center — allowing *at least one-half minute* for the bubble to come to rest.

(c). Without changing its adjustment, move the level to the outer end of the ways and place it again at right angles to the center line of the bed (see Fig. 43). Now bring the bubble to the center by adjusting the leveling screws on the right hand leg of the machine. If the machine does not have leveling screws, use steel shims under the leg.

(d). Repeat operations (b) and (c) until the bubble readings at the two positions come within less than one division of each other.

(e). Tighten the lag screws and repeat operations (b) and (c) as a final check.

Leveling a Saddle Type Machine — The procedure for leveling a saddle type turret lathe is as follows:

(a). Loosen the lag screws holding the right end leg to the floor. *Do not* loosen the left (headstock) leg.

(b). Place the level across the turret, as shown in Fig. 44. Use two small pieces of thin paper underneath the level to prevent it from slipping when the turret is moved. Be sure that the level rests firmly and that it will not rock as the turret is moved.

(c). Move the saddle by hand to the extreme headstock end of the bed, bringing it as close to the spindle nose as it will go. Adjust the bubble to center, allowing *at least one-half minute* for the bubble to come to rest.

(d). Move the saddle by hand to the right end of the bed. Now, without adjusting the level, bring the bubble to center by adjusting the leveling screws in the right end leg. If the machine has no leveling screws, use steel shims under the legs.

(e). Repeat operations (c) and (d) until the bubble readings at the two positions come within less than one division of each other.

(f). Tighten the lag screws on the right end leg and repeat operations (c) and (d) as a final check.

IMPORTANT: — Never disturb the bolts which hold the bed to the pan and the legs. These bolts have been carefully set at the factory and their setting should not be changed.

Adjusting Clutches — All clutches in the machine should be adjusted so that when engaged they will pull the heaviest load that is required, and when disengaged they will be completely free. Clutches that are allowed to slip will quickly wear and require replacement.

There have been many types of clutches used in turret lathes, and they are provided with a means of adjustment. If the method of adjustment is not described in a service manual, a careful study of the parts will usually show how an adjustment should be made.

Adjustment of Gibs — All sliding units on turret lathes are provided with gibs, so that as the bearing surfaces wear, adjustments can be made to keep the machine tight and accurate. Most of these gibs are tapered and can be adjusted by means of screws at the end of the gib. If the gibs are not tapered they will be adjusted by a series of screws along the side of the gib.

Gibs should be adjusted so that the sliding units are tight enough to get the accuracy required. If they are too tight, the slides will be hard to operate, and if they are too loose, the accuracy of the machine will be lost. When adjustment of the gibs to provide accuracy causes the slide to bind in one position and to be free in another, the sliding units have worn and should be refitted. This, of course, is a job for the maintenance crew rather than the operator.

Lockbolts and Turret Clamps — The operator should know that lockbolts and turret clamps must operate properly to obtain accuracy. The lockbolts in the square turret and hexagon turret must work freely, and the spring that operates these bolts and forces them into the lockbolt bushings must be strong enough to position the turret before the clamping ring operates. Probably no part in the turret lathe is more important than the lockbolt spring, Fig. 45, because all of the accuracy of indexing depends upon the proper operation of this spring.

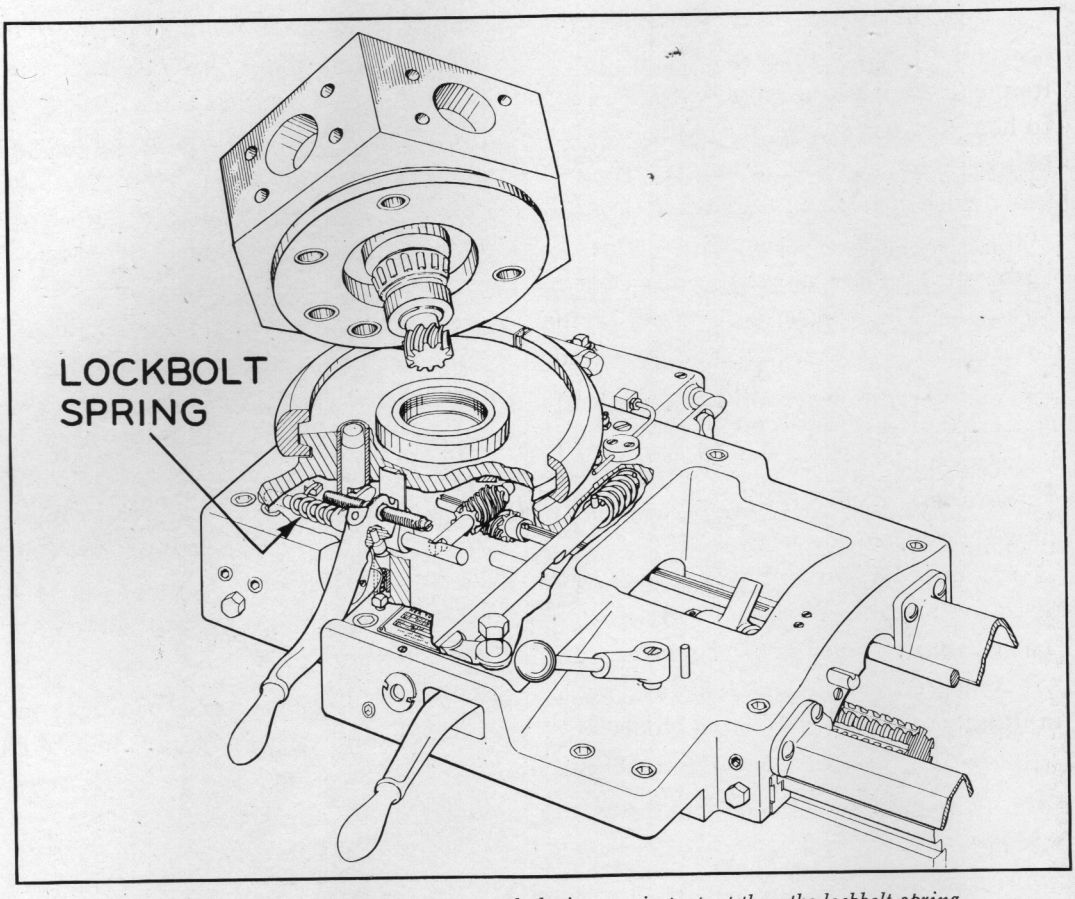


Fig. 45 — Probably no part in the turret lathe is more important than the lockbolt spring.

If the lockbolt moves slowly due to a weak spring, or because the oil has gummed due to dirt that has worked into the lockbolt mechanism, the turret will not repeat its index accurately, and the machine will not cut the same size on different pieces.

In cases where turrets do not index accurately, the first thing to check is whether the lockbolt is moving freely. If the action is sluggish due to the oil becoming sticky, move the turret so that the oil hole inside the turret is approximately over the lockbolt and fill the oil hole with kerosene, allowing it to soak down into the lockbolt itself. Move the lockbolt up and down to help the kerosene work into the bearing. In many cases this will free up the lockbolt without even removing the turret.

In some cases it is necessary to remove the turret and thoroughly clean the lockbolt in order to obtain free action. Whenever this is done, it is a good idea to check the lockbolt spring to be sure that it hasn't broken or lost its strength. These lockbolt springs are made to special specifications, but are very inexpensive. New springs should always be obtained from the manufacturer. Do not attempt to make new lockbolt springs for your machine.

While the turret lockbolt locates the turret and determines the accuracy of its position, it should not be relied upon to hold the turret in place while cuts are being taken. All turret lathes are provided with either hand-operated or automatic clamps which securely clamp the turret to its base and take the cutting strains. A good method of checking the turret clamp to see if it is properly adjusted is to clamp the turret in an off-center position when the lockbolt is not engaged and then see if the turret can be turned. It should require your full weight to move the turret.

Tools and Equipment — Just as the operator should take pride in keeping his machine clean and properly oiled and adjusted, he should also take pride in taking care of the many tools and items of equipment that are used on his machine. Most plants provide each turret lathe operator with a tool stand, so that he has a place for his tool box and so that cutters, collet bushings, tool holders, etc., that are not in use at the moment, can be arranged in orderly manner.

In the following chapters in this book, we discuss principles of tooling and the importance of the proper use of tools in order to allow the operator to quickly set up his machine and to produce the greatest amount of work possible. In order to do this, the machine must be kept in proper condition, and it is very important that all of the accessories are in proper condition and kept in an orderly manner so that they can be quickly located for use on the machine.