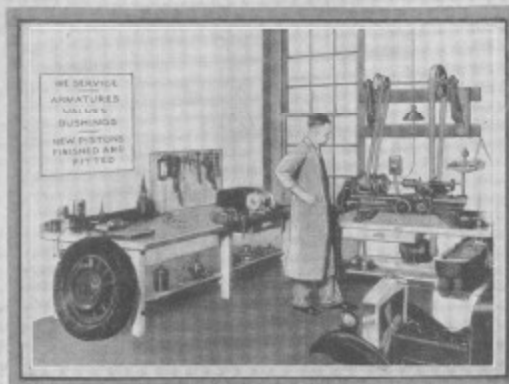


Latest Shop Practice

For Servicing

Trucks, Buses and Automobiles



Interior View of a Modern Service Shop

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Electrical Work	Pages 8-9
Bushings	Pages 10-13
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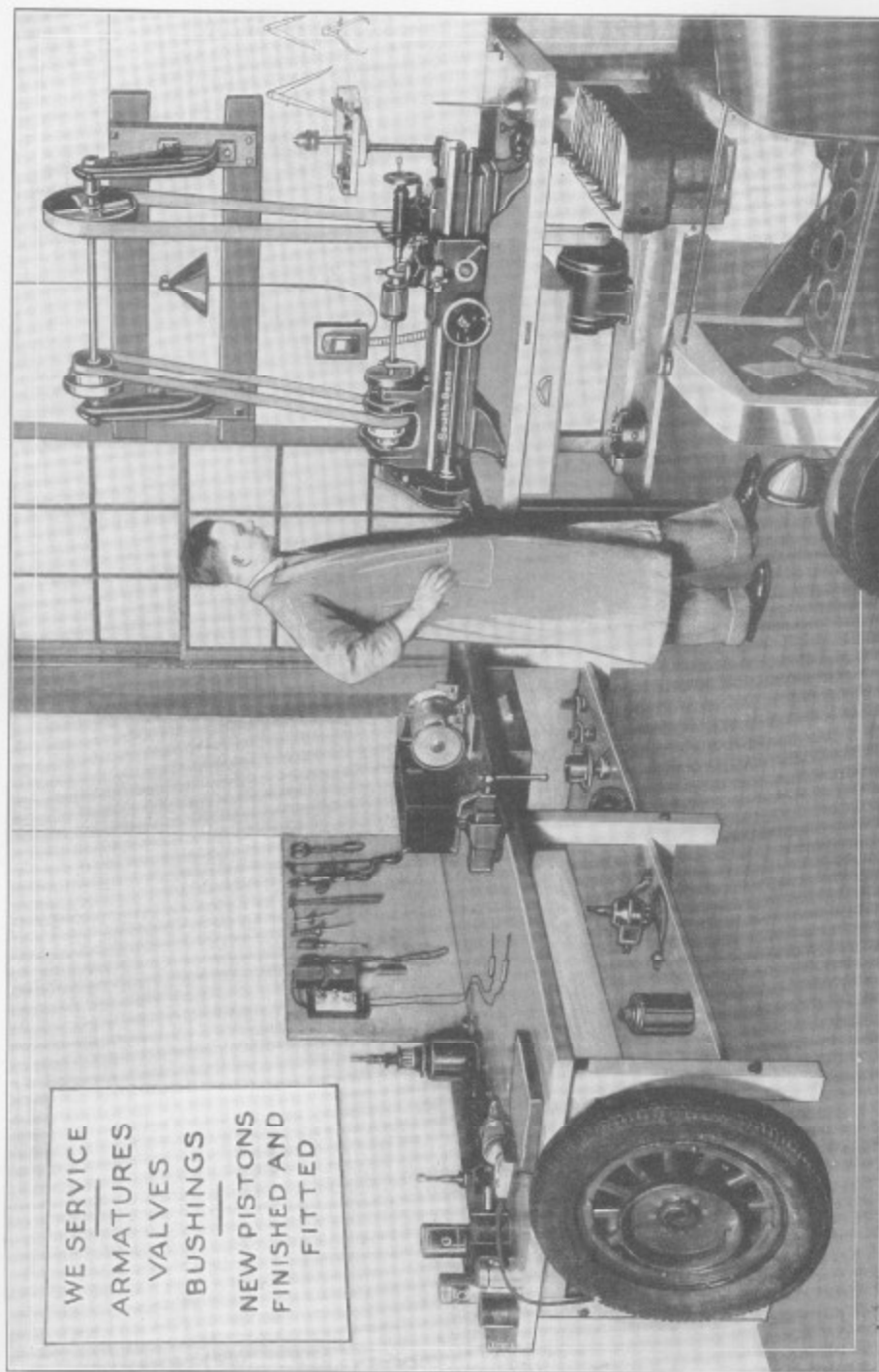
Bulletin No. 30

January 1931

SOUTH BEND LATHE WORKS

343 East Madison Street

SOUTH BEND, INDIANA, U. S. A.



WE SERVICE
ARMATURES
VALVES
BUSHINGS
NEW PISTONS
FINISHED AND
FITTED

INTERIOR VIEW OF A MODERN SERVICE SHOP

Equipped with No. 1022-YB Simplex Motor Driven Lathe and No. 9-A Attachment and Tool Assortment, Price.....\$303.65

For details and itemized list of equipment see pages 28 and 29.
(Lathe has a $\frac{1}{4}$ H. P. motor driven from an ordinary lamp socket.)

The Latest Shop Practice, Methods and Equipment

for the Correct Servicing of

Armatures
Valves

Bushings
Pistons

This Shop Equipment:

- Is recommended by Automobile Manufacturers
- Is recommended by Truck Manufacturers
- Is recommended by Bus Manufacturers
- Is used by 5,000 successful Service Shops
- Does work most accurately
- Is quicker and simpler than old methods
- Eliminates single-purpose machines
- Brings new business
- Keeps the work in your own shop
- Gives your customer confidence that his work will be done accurately and economically
- Can be purchased on Easy Payment Terms.

Latest Methods for the Modern Mechanic

—The purpose of this book is to show for the first time the approved and most practical way to service armatures, reface valves, make bushings and fit semi-machined pistons. These parts, all of which are originally made on the lathe, must be serviced with precision and accuracy. Over 90% of the work in the small shop is on the armature, valve, bushing and piston.

No. 2 Book on Larger Work

—We are printing another book, showing the latest shop practice for the correct servicing of flywheels, brake drums, crankshafts, connecting rods, etc. If interested, write for a copy.

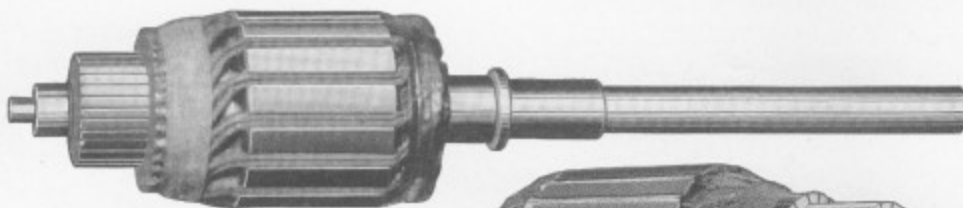


Fig. 1. Starting Motor Armature

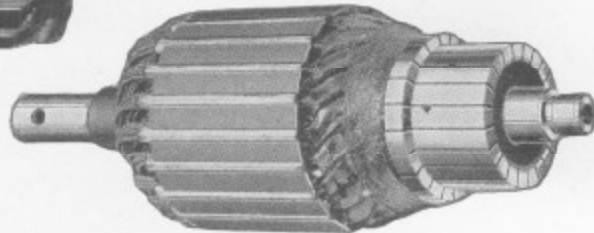


Fig. 2. Generator Armature

Servicing Armatures

Truing the Commutators of Generator and Starting Motor Armatures

The correct way to true the commutators of starting motor and generator armatures is to mount the armature between the centers of a back-gear, screw cutting lathe and take a cut over the face of the commutator. The lathe is equipped with various spindle speeds and the power feeds required for truing the commutator accurately and quickly. The average time required for each job is from two to three minutes.

After an armature has been in service for some time the commutator becomes worn and the mica insulation projects above the copper segments as the mica is harder than the copper. This prevents good contact between the brushes and the commutator and causes arcing and burning of the copper segments. The only remedy is to machine the surface of the commutator true in the lathe. This will restore the original smoothness and accuracy of the commutator surface and the armature will be just as good as new. Perfect contact is assured between the brushes and the surface of the commutator.

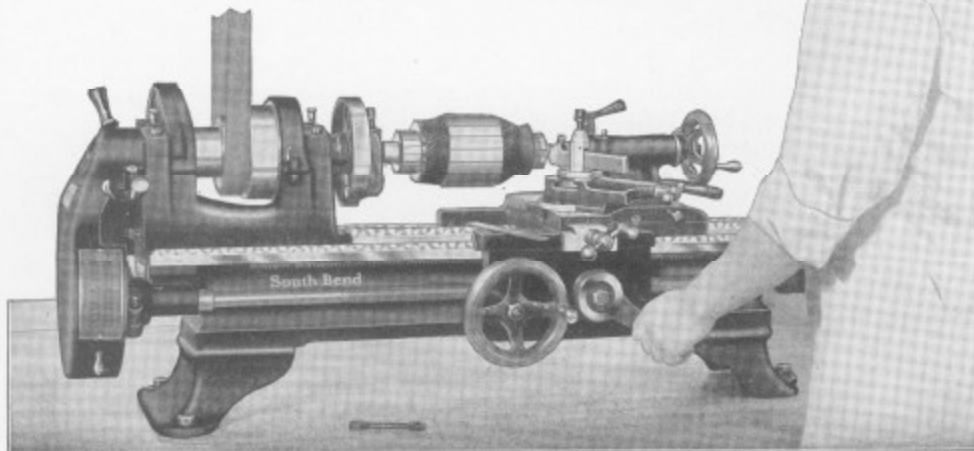


Fig. 3. Truing the commutator of a motor generator armature in a 9-inch Junior South Bend Lathe

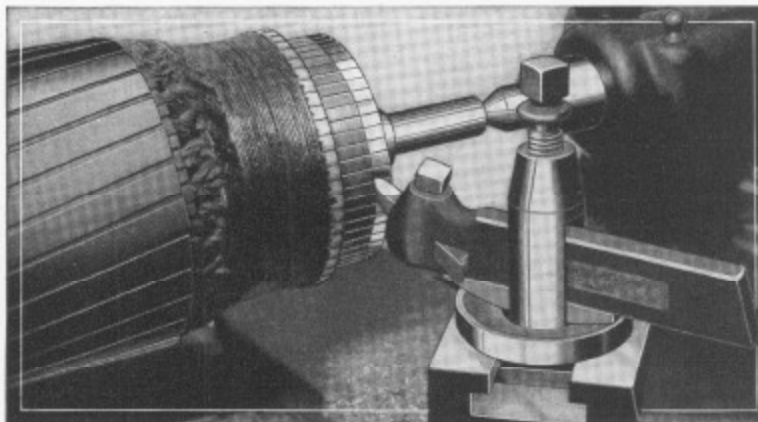


Fig. 4. Close-up of a Commutator Being Trued in the Lathe

Truing Armature Commutators in the Lathe

The illustration above shows an armature mounted between the lathe centers for truing the commutator. The round nose tool bit is set on center and is being fed from right to left across the commutator.

Attaching Lathe Dog to Shaft—Wrap a piece of brass around the shaft to prevent possible damage in tightening the set screw of the lathe dog. Examine both center holes of the armature shaft to be sure that they are clean and free from burrs. Place a drop of oil in the center hole for the tailstock center.



Fig. 5. Use Sheet Brass Around Armature Shaft to Prevent Damage

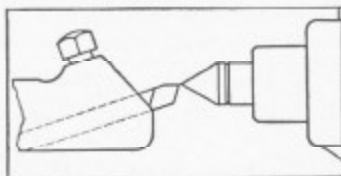


Fig. 6. Set Cutting Edge of Lathe Tool Exactly on Center

Setting the Tool Bit on Center—Adjust the tool bit so that the point of the tool is exactly in line with the point of the lathe center. Use a round nose tool bit ground flat on top with no back slope and plenty of front clearance (about 10 degrees). Notice the illustration.

Turning the Commutator—Hone the cutting edge of the tool bit to a keen edge and use a fine automatic longitudinal feed. Feed the tool toward the headstock, taking a light chip. The lathe spindle should run at about 350 to 400 R.P.M. This speed is obtained on the 9-inch South Bend Lathe by disengaging the back gears and placing the belt on the center step of the cone pulley, using direct cone drive. Turn the commutator down just enough to produce a smooth, true surface.

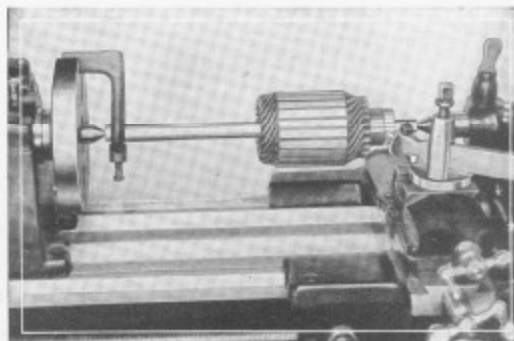


Fig. 7. Truing the Commutator of an Armature

Undercutting Mica Insulation of Generator Armature Commutators

After truing the commutator of a generator armature the mica insulation between the segments should be undercut. This prevents the brushes from coming in contact with the mica as the copper wears, thus affording better service.

The commutators of starting motors are not usually undercut because the high amperage current required in starting would be apt to cause arcing.

A recess $\frac{1}{32}$ -inch deep cut close to the shoulder of the generator commutator as in Figure 8 will make the mica undercutting operation much easier.

Undercutting the Mica by Hand—

In the small shop the mica insulation is generally undercut by hand. This method is very satisfactory where only a few armatures are machined each day.

To undercut the mica insulation between the segments of the commutator use a hack-saw blade with the set of the teeth ground off so that it will cut a slot the width of the mica. The teeth of the saw blade should point toward the handle. The mica should be undercut to a depth of about $\frac{1}{32}$ inch, keeping the slot regular in shape and the edges free from mica. See Figure 10.

Polishing the Commutator—After undercutting the mica insulation the rough edges must be polished off smooth. This is best done by running the lathe at a high speed and polishing with a fine grade of sandpaper wrapped around the commutator. Never use emery cloth for the polishing operation as emery dust lodged between the segments of the commutator will cause a short circuit.

Mica Undercutting Machines—

There are many excellent devices on the market for undercutting mica, which will save time in the shop having sufficient business to justify the investment. We can supply a rotary type electric mica undercutting attachment for the lathe. See page 37 for description and price.

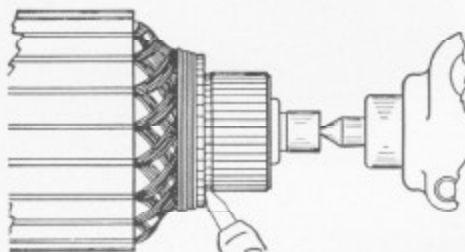


Fig. 8. Recessing Commutator for Undercutting Mica Insulation

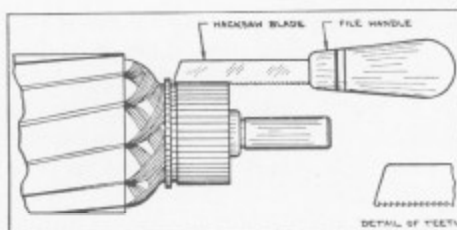


Fig. 9. Undercutting Mica with Hack-saw Blade Ground to Correct Width



Fig. 10. Correct and Incorrect Method of Undercutting Mica Insulation

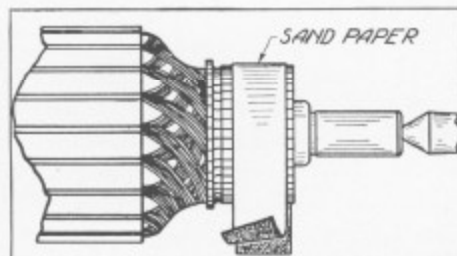


Fig. 11. Polishing the Commutator After Truing and Undercutting

Armature Shafts Without Center Holes

Drilling Center Holes in Armature Shafts — Some armature shafts do not have center holes, but it is a simple job to center them in the lathe. One end of the armature shaft is held in the universal 3-jaw chuck and the other end is supported by the "V" shaped rest which is adjusted for correct height by centering on the diameter of the tailstock center.

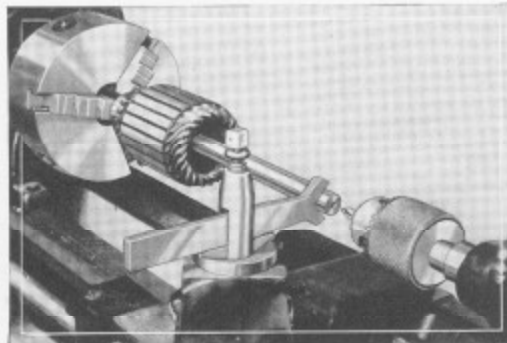


Fig. 12. Drilling Center Hole in an Armature Shaft

The operation of centering shaft is performed by bringing the "V" support in contact with the end of the shaft, while it is revolving. Feed the center drill into the work, using the hand-wheel of the tailstock. Use just enough pressure with the "V" support to back up and steady the shaft, allowing the drill to find the dead center. Use oil on drill and "V" support.

Restoring Damaged Center Holes in Armature Shafts—If the center holes of an armature are damaged, mount one end of the armature in a 3-jaw universal chuck and mount the other end of the shaft in the center rest on the lathe and adjust its jaws in contact with the shaft. Set a slender, sharp pointed forged tool in the tool post exactly on center. With the compound rest set at 60 degrees, take light cuts at high speed, removing only enough stock to true up the center hole. Keep the jaws of the center rest well oiled.

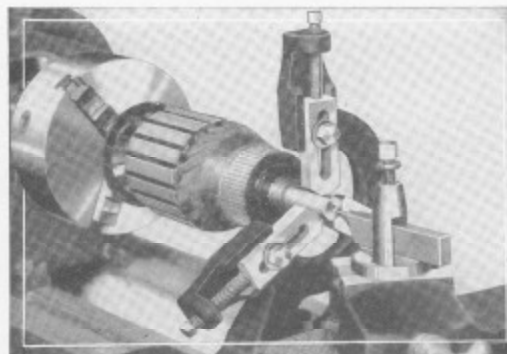


Fig. 13. Restoring a Damaged Center Hole in an Armature Shaft

Special Centering Collets—Special centering collets are sometimes used in mounting armatures having no center holes in the ends of the shaft. The armature is driven by a 3-jaw universal chuck and the tailstock end is supported by the centering collet. However, for the small shop it is an easy matter to drill center holes in ends of uncentered armature shafts. Prices of collets on request.

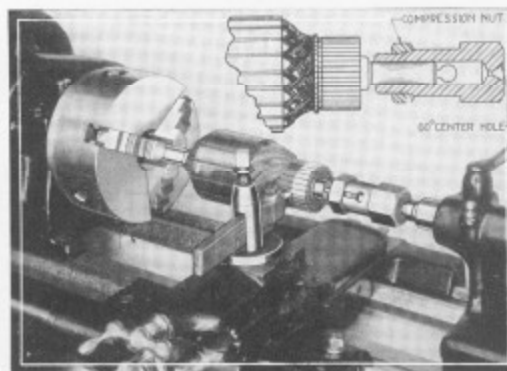


Fig. 14. A Centerless Armature Mounted in the Lathe with a Special Centering Collet

Ford Generator Armature—

The 1930 Model "A" Ford Generator Armature is mounted in the lathe for machining the commutator, as shown in Figure 15. This armature is mounted without removing the ball bearing and end cap, by placing the lathe dog on the shaft at the commutator end and supporting the other end on the tailstock center. The tool bit is held in a left hand offset tool holder and is fed from left to right. This method is used because the tapered end of the shaft is too short to attach a lathe dog for driving the work.

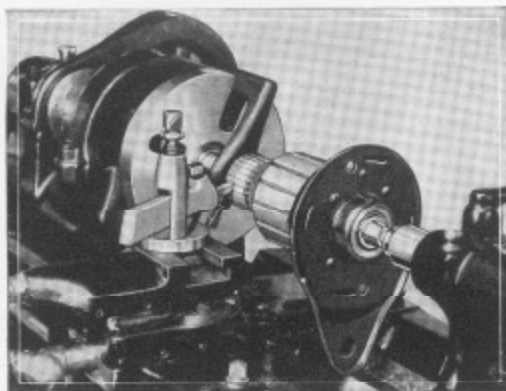


Fig. 15. Ford Generator Armature with End Cap Attached, Mounted in Lathe for Truing

Ford Powerhouse Type Armature—

The Ford 1928 Model "A" generator armature, known as the power house type armature, is so constructed that the armature

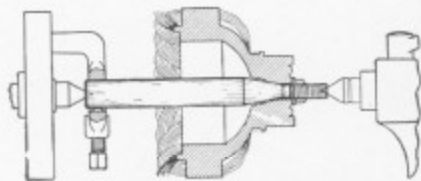


Fig. 16. Ford 1928 Armature Mounted on Special Mandrel

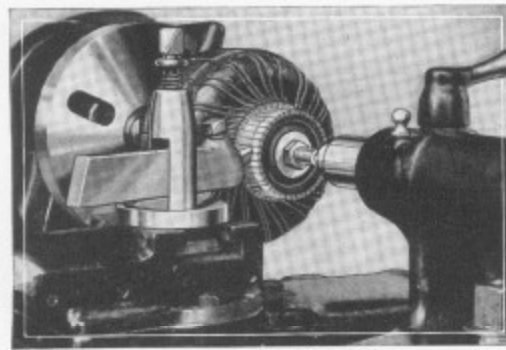


Fig. 17. Power House Type Ford Armature Mounted on Special Mandrel for Truing Commutators

shaft is not removed from the car with the armature. In order to machine the commutator it is necessary to make up a special tapered mandrel with a nut to hold the armature against the tapered section. When the armature is mounted on this mandrel the commutator may be machined in the usual manner. The illustrations show the method of mounting and machining the commutator of this type of armature.

Armature with Slotted Shaft—Some generator armatures are made with a milled slot in one end of the shaft which eliminates the center hole. This type of armature is centered in the opposite end and can be mounted with the slotted end in the 3-jaw universal chuck and the commutator end on the tailstock center, as shown in Figure 18. The ball bearing must be removed and the chuck jaws grip the shaft on the bearing seat. The slotted portion of the shaft is generally not sufficiently accurate for chucking.

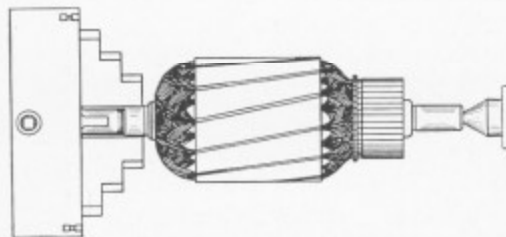


Fig. 18. Generator Armature with Slotted End Mounted in Lathe for Machining Commutator

Straightening Bent Shafts—To straighten a bent armature shaft, place the armature between centers in the lathe and spin by hand. Mark the "high spot" on the shaft with chalk. Remove armature from lathe and support the ends on two pieces of brass set on an anvil or other firm support. Strike the shaft on the "high spot" with a lead or brass hammer.

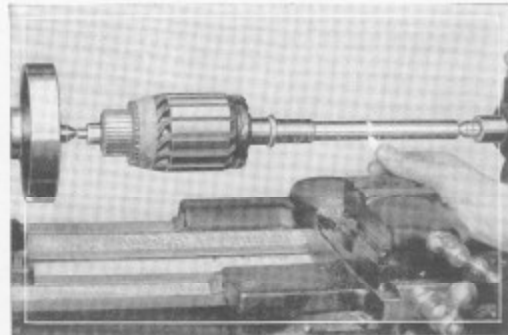


Fig. 19. Marking the "High Spot" on a Bent Armature Shaft with Chalk for Straightening

Place armature in lathe, test and mark again. This operation should be repeated until the shaft runs true. Another method of straightening is to use a dial test indicator instead of chalk for locating the "high spot."

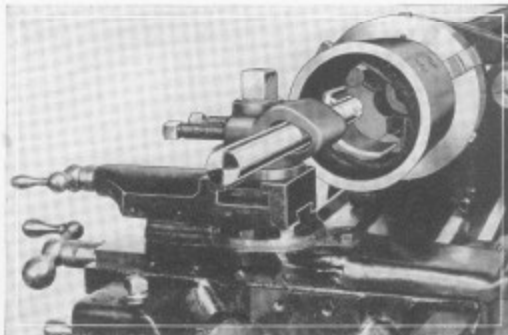


Fig. 20. Boring Field Pole of Generator in a Chuck in the 9-inch South Bend Lathe

Truing Field Poles—Occasionally it is necessary to true up the field poles of the generator or starting motor, due to the fact that the bearings have become loose, permitting the armature to strike the field poles.

To true up and smooth the field poles, the generator or motor frame is mounted in the lathe in a 3-jaw chuck, gripping the machined surface on inside of the frame. Then tap the outer end into position so that it runs true on the inside diameter. A light cut should be taken to true the field poles concentric with the inside diameter of the frame.

Sometimes field poles are so badly damaged that it is necessary to install new ones. The usual practice is to install the new field poles in frame and then place the unit in a lathe and true up field poles so that they will be round and concentric with the bearings before assembling with the generator.

Servicing Magnets in the Lathe

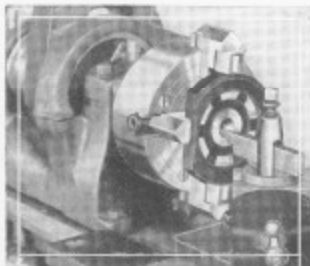


Fig. 21. Facing Contact Points of a Worn Magneto Distributor

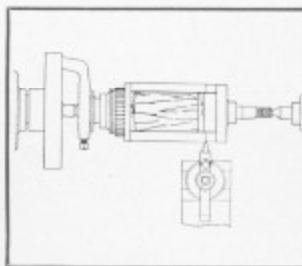


Fig. 22. Truing the Field Poles of a Shuttle Type Magneto Armature

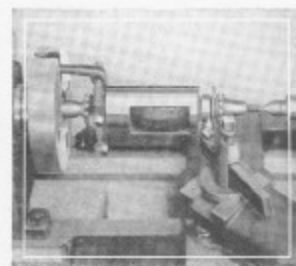


Fig. 23. Truing the Collector Ring of a Shuttle Type Magneto Armature

Making Bushings in the Lathe

In Various Sizes and Types from Bronze, Brass and Steel

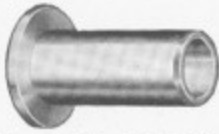


Fig. 24. King Pin Bushing

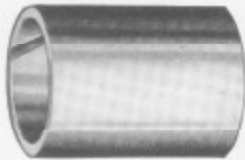


Fig. 25. Wrist Pin Bushing



Fig. 26. Starter Clutch Bushing

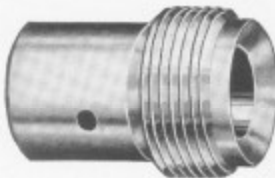


Fig. 27. Water Pump Bushing



Fig. 28. Steering Arm Bushing

In the servicing of automobiles, buses and trucks, replacement bushings are frequently required. The best method for obtaining these replacement bushings is to make them on a screw cutting lathe, as outlined on the following pages. A replacement bushing can be made on the lathe in a very short time at a small cost. The operations required in making bushings are very simple.

The shop that is equipped to make its own bushings is in a position to render its customers prompt service, and the expense of carrying a large stock of finished bushings, is eliminated. So many different sizes and types of bushings are required that it is very costly to carry replacement bushings in stock. Usually the shaft is worn as well as the bushing, necessitating an under-sized hole.

Bushings can be made on the lathe of any material such as bronze, brass, steel, etc., and of any size or shape required.

Important Bushings That Can Be Made on the Lathe

Starter Motor Bushings
Wrist Pin Bushings
Valve Stem Guide Bushings
Valve Rocker Arm Bushings
Fan Shaft Bushings
Wrist Pin Bushings
Brake Control Lever Bushings
Cam Shaft Bushings
Valve Tappet Guide Bushings
Steering Arm Bushings
Pump Bushings
Packing Glands
Spring Shackle Bushings

King Pin Bushings
Drive Shaft Bushings
Brake Shoe Cam Roller
Steering Gear Eccentric Adjusting Bushings

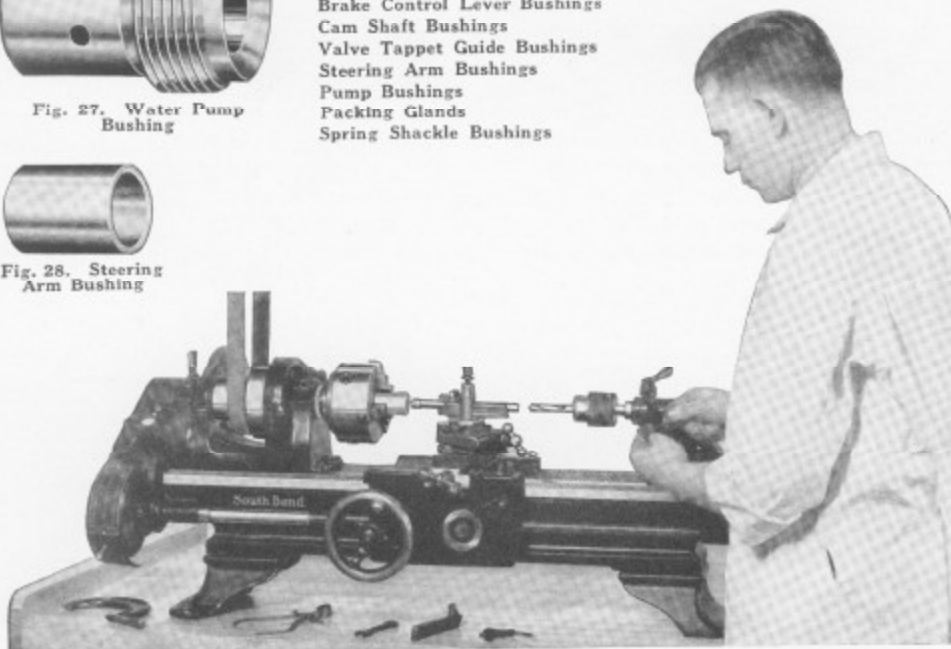


Fig. 29. Making a Replacement Bushing on a 9-inch Junior South Bend Lathe

How to Make a Bushing in the Lathe

The operations in making a bushing are fundamentally the same regardless of the size or type of bushing. The illustrations below show the operations in their proper sequence.

Truing Up Work in the Lathe Chuck

Select a piece of stock of the same material as the bushing to be replaced, about one-eighth inch larger in diameter and one-eighth inch longer than the original bushing. Mount the stock in a lathe chuck. If the work does not run true, chalk the "high spot" as shown in illustration and adjust work in jaws so it will run true.

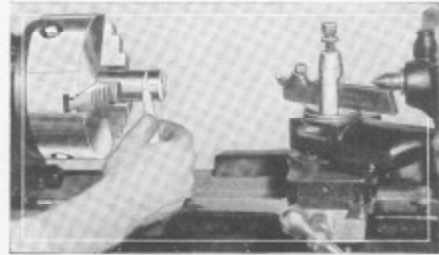


Fig. 30. Truing Up Rough Stock in Lathe Chuck

Facing the End of the Work

Face the end of the work smooth, being careful to adjust the cutting edge of the tool so that it is exactly on center, otherwise a small projection will be left in the center of the stock which will cause the center drill to run off center.

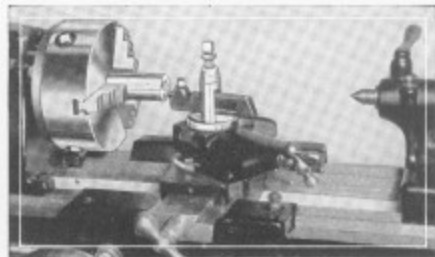


Fig. 31. Facing End of Bushing

Centering the Work

Mount a drill chuck in the tailstock spindle of the lathe and center drill the end of the stock using a combination center drill and countersink. The work is center drilled to start the large drill and to prevent it from running off center. Feed the center drill into the revolving stock by turning the tailstock hand-wheel, very carefully at first.

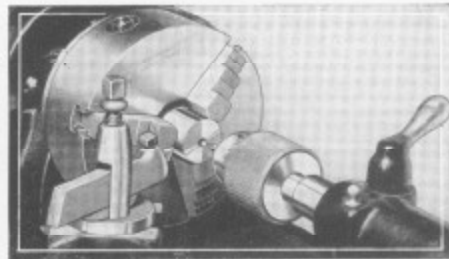


Fig. 32. Centering Bushing to Start Drill Straight

Drilling the Hole

Place a drill in the drill chuck and drill through work allowing at least one-sixteenth inch on the inside diameter of the hole for boring and reaming. Withdraw drill from work frequently to remove the chips which accumulate. If drilling a large hole, run lathe at slow speed with back gears in mesh and feed drill into the work slowly. If making a steel bushing, use oil on the drill point.



Fig. 33. Drilling Hole Through Bushing

Boring the Hole

Mount a boring tool in the tool post of the lathe and rough bore the hole to within .010 inch of the finished diameter. If a reamer of the correct size is available the hole may be finished by reaming. However, if a reamer is not available the hole can be finished almost as well by careful boring.

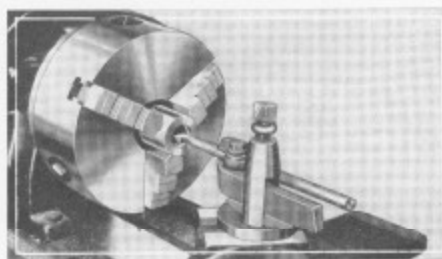


Fig. 34. Boring the Hole in the Bushing

Reaming the Hole

Ream the hole to size using a slow spindle speed. (If a reamer is not available, finish bore the hole to fit the shaft.) Feed in about $\frac{1}{4}$ inch, then stop the lathe and test the diameter of the hole with the shaft. If the shaft enters the hole too freely or is too tight the tool should be adjusted so that the proper diameter will be obtained.

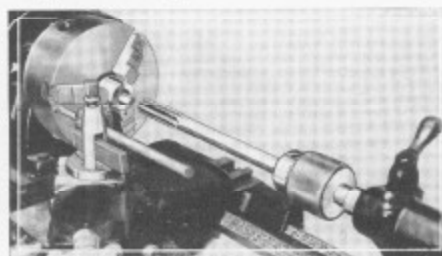


Fig. 35. Reaming the Hole to Size

Facing the Ends

Remove the work from the chuck and press it on a mandrel. Be sure to oil the mandrel well so that the bushing can be easily removed. Place between centers and face both ends, taking a smooth finishing cut and making the bushing exactly the same length as the old bushing.

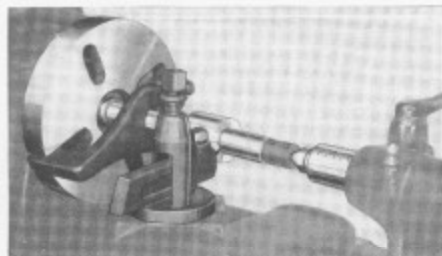


Fig. 36. Facing the Ends of the Bushing

Turning the Diameters

Turn the outside diameter of the bushing to the correct size. In taking the finishing cuts turn only about $\frac{1}{4}$ inch on the end of the bushing, then test the diameter. If the diameter is incorrect adjust the cutting tool, take another trial cut and test again. Take the finishing cut across the entire length.

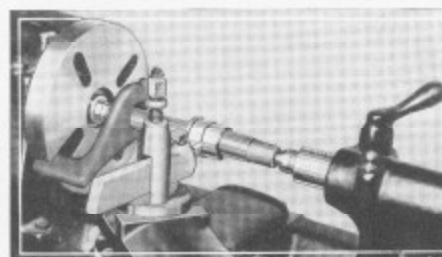


Fig. 37. Turning the Diameters of the Bushing

Filing and Polishing

Using a fine mill file and with the lathe running at a speed so that the work will make two or three revolutions for each stroke of the file. File just enough to make it smooth. If too much filing is done the work will be uneven and inaccurate. A very fine finish can be obtained by polishing with fine emery cloth and oil after filing.



Fig. 38. Filing and Polishing the Bushing

Making a Short Bushing Complete in the Chuck

Small short bushings are made from bar stock held in the chuck, as shown in Figure 39. The bar should extend far enough from the chuck so that the bushing may be machined complete and then cut off without changing the position of stock in the chuck.

Most of the operations are exactly the same as those shown in the preceding illustrations except in the turning of the outside diameter and cutting-off operation.

Turn the outside diameter of the bushing to the correct size, and complete all operations without removing the bushing from the chuck.

When the bushing is completed and the outside diameter filed and polished smooth, it may be cut off, using a cutting-off tool, as shown in above illustration. Set the cutting edge of the tool exactly on center and adjust the tool so that the bushing will be the correct length when cut off.

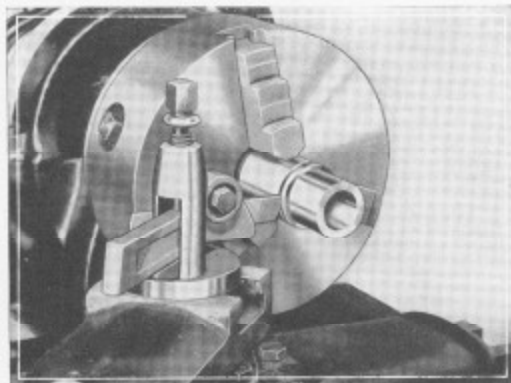


Fig. 39. Cutting Off a Bushing that Has Been Machined Complete Without Removing from the Chuck

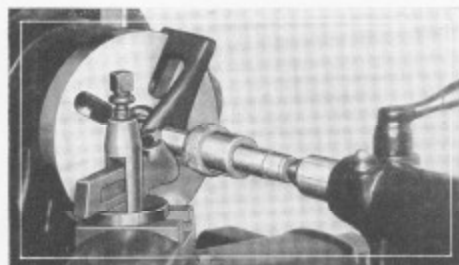


Fig. 40. Cutting a Screw Thread on a Bushing
The 9-inch South Bend Lathe is equipped with change gears and lead screw for cutting all standard screw threads. See handbook "How to Run a Lathe" for information on thread cutting.



Fig. 41. Drilling an Oil Hole in a Bushing
With the aid of a crotch center and a drill chuck the lathe can be used for all kinds of drilling. There are many bushing jobs requiring drilled oil holes, etc.

Bronze Bushing Stock

Most bushings are made of bronze cast in bars of various diameters and in a standard length of 12 inches. For the convenience of our customers we are supplying the best quality bronze bushing stock we are able to obtain. The market price of bronze varies considerably from time to time and the price quoted below is subject to change without notice.

Bronze Bushing Stock. Price per lb., F.O.B., South Bend, Ind. 40c

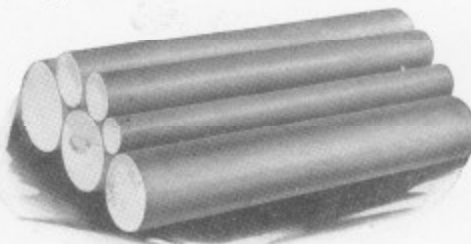


Fig. 42. Bronze Bushing Stock in 12-inch Bars
Average Weight of Bronze Bushing Stock

Size Bar	1x12 in.	1½x12 in.	2x12 in.	2½x12 in.
Wght. Lbs.	2¼	6¼	11	18

Refacing Valves

Of Automobiles, Trucks, Buses and Tractors

The experienced machinist knows that the lathe is the practical machine for refacing valves because it enables him to do the work with greater accuracy and speed than it could be done by any other method. The cutter bit of the lathe produces a smooth, velvety surface that can be lapped in with greater ease and speed than a ground surface. It is possible to obtain a gas-tight seat with little or no hand lapping.

Lathe Refaces All Types of Valves

Automobile Valves	Airplane Engine Valves
Truck Valves	Stationary Gas Engine Valves
Bus Valves	Chrome-Vanadium Valves
Cast Iron Valves	Marine Engine Valves
Steel Valves	Faces End of Model "A" Ford
Alloy Valves	Valve Stem for Clearance



Fig. 43.
An Automobile
Valve

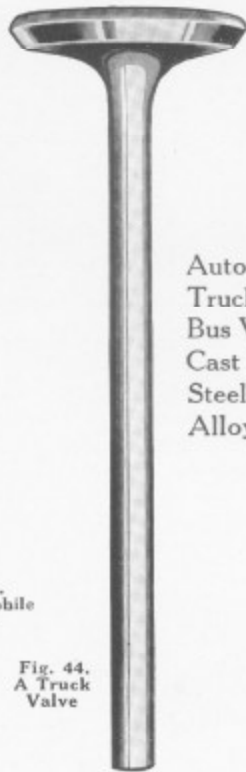


Fig. 44.
A Truck
Valve

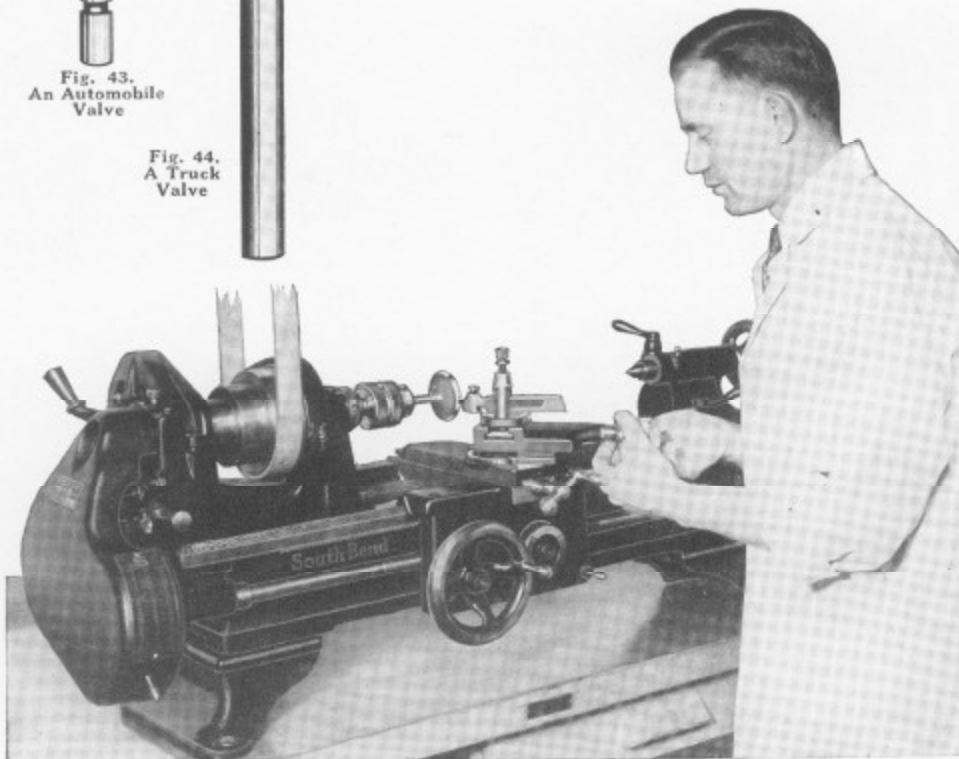


Fig. 45. Refacing Automobile Valves on a 9-inch Junior South Bend Lathe

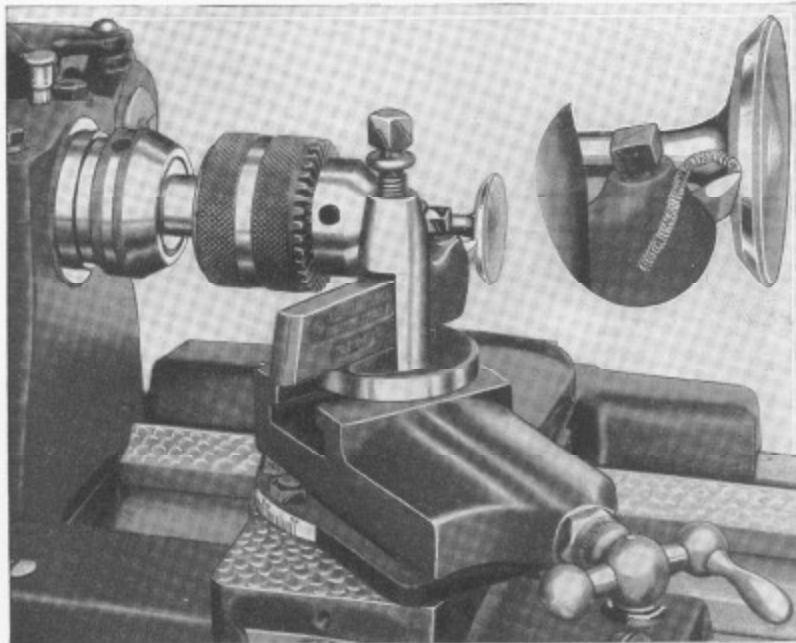


Fig. 46. Close-up of Refacing a Valve on a 9-inch South Bend Junior Lathe

Refacing a Valve

Mount the valve in the chuck as shown in above Figure 46. In mounting the valve in the valve chuck, the jaws should grip the valve stem on the surface that slides in the valve guide bushing as shown in Figure 48, page 16. The valve should be inserted in the chuck as far as possible without permitting the jaws to overlap the section of the valve stem that does not operate in the valve guide. This will produce smooth and accurate work.

Be Sure Valve Stem Runs True. If it is not true, test and straighten it, following instructions shown in Figure 53, page 17. Swivel the compound rest to 45 degrees as shown below in Figure 47. Fasten a tool holder in the tool post. Insert a round nose cutting bit in the tool holder as in Fig. 46.

Set the Cutting Edge of the Tool Bit even with the point of the lathe center, see page 18. Place the spindle cone belt on the second step of the cone and engage the back gears. Start the lathe. Move the cross-slide back so that the start of the cut will be at outer rim of valve head.

Lock the Lathe Carriage to the bed with the carriage lock collar screw. Adjust the tool bit for the correct depth of cut with the cross feed screw and feed the tool across the valve face by turning the compound rest screw with a uniform motion, taking a light chip off the valve face, as shown in Figure 46.

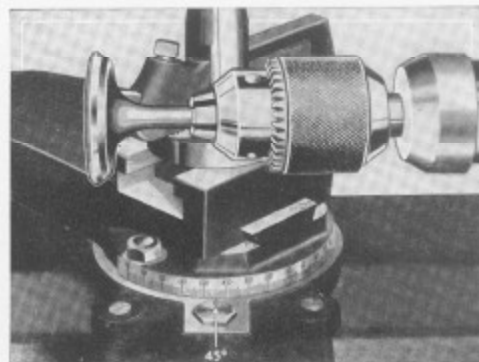


Fig. 47. Compound Rest Set at 45° Angle

Hollow Spindle Valve Chuck Accurately Centers Valves for Refacing

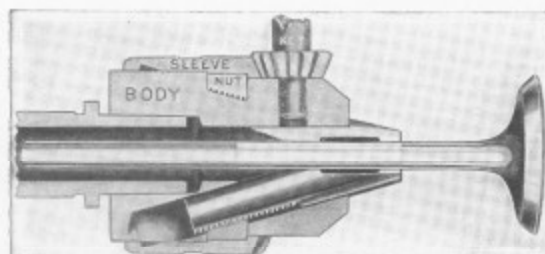


Fig. 48. Jaws of Chuck Are Relieved in Center and Grip Valve Stem Where It Fits Valve Guide

same section of the stem that fits the valve guide bushing and hold it concentric with the axis of the lathe spindle. The valve chuck has a hollow spindle, which permits the valve stem to pass through the chuck.

Chuck Holds Valve Same as Valve Guide Bushing

The hollow spindle valve chuck holds the valve exactly the same as the valve is held by the valve guide bushing when it is assembled in the engine. By holding the valve in this manner and taking a cut across the valve face, it is machined concentric with that portion of the valve stem which fits the valve guide. When the valve is replaced in the engine it will fit perfectly and will require very little, if any, lapping.

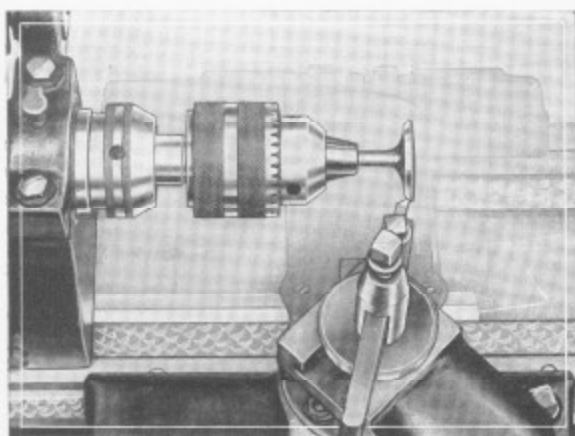


Fig. 49. Refacing a Truck Valve in the Lathe

Truck, Bus and Tractor Valves

All truck, bus and tractor valves may be refaced by turning in the lathe with the greatest accuracy and precision. These valves are refaced the same as automobile valves. The time required for refacing each valve is from 2 to 3 minutes. One or two cuts may be taken, depending upon the condition of the face of the valve.

This hollow spindle valve chuck, used for holding the valve when refacing, is both durable and accurate. It is made by one of the foremost manufacturers of chucks and is the result of years of experience.

The jaws of this chuck are unusually long and are relieved in the center. The chuck is so constructed that it will accurately grip the valve on the

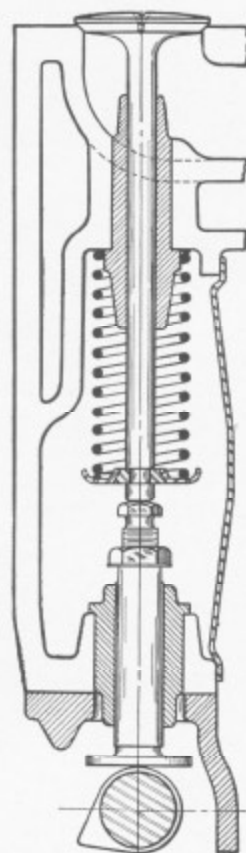


Fig. 50. A Properly Refaced Valve Assembled in the Engine with the Valve Stem Fitting the Valve Guide and the Valve Face Fitting the Valve Seat Perfectly

Refacing a Valve of an Airplane Engine

Refacing the airplane valve is the same as refacing any automobile, bus or truck valve and the operations are performed in the same manner and with the same tool equipment.

The illustration at right shows an airplane valve held in a valve chuck and being refaced as described on page 15. The time required for refacing an airplane valve runs from three to four minutes.

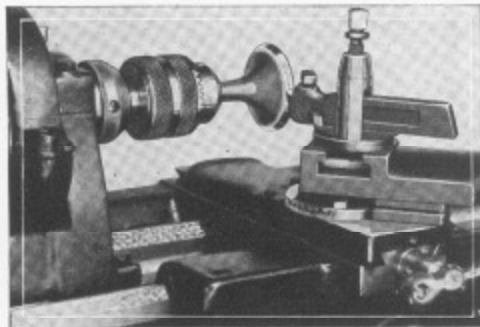


Fig. 51. Refacing an Airplane Valve in the Lathe

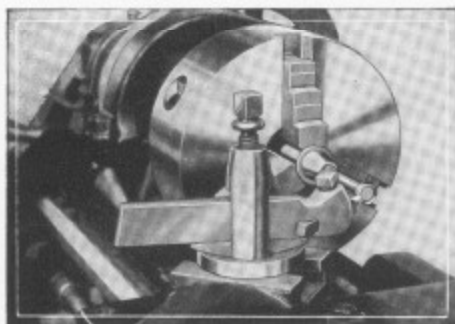


Fig. 52. Facing the End of a Ford Model "A" Valve Stem for Tappet Clearance

Facing End of Ford Valve Stem for Clearance—A Model "A" Ford Valve is adjusted for clearance by facing the end of the valve stem, as shown in Figure 52. This illustration shows the valve held in the 3-jaw universal chuck, and the lathe tool adjusted for facing the end of the valve stem. A split valve guide must be used in chucking to support stem.

It is possible to adjust the lathe tool with the compound rest feed screw graduations for facing any amount required from a fraction of a thousandth up. This permits the mechanic to face off the end of the valve to any degree of accuracy required.

Straightening Bent Valve Stems—

If the valve stem is badly bent or if the valve head has warped so that it is not square with the valve stem the valve should be straightened before being refaced. The best method for straightening the valve is to chuck the end of the stem and support the valve head with the tailstock center of the lathe. The center in the valve head should be thoroughly cleaned of all carbon deposits to assure the valve head running true. Start the lathe spindle, running the lathe at a fairly high speed and hold a piece of chalk against the valve stem where it appears to run out the most. This will mark the high side of the stem.

To straighten the stem, place it on an anvil or smooth metal block and tap the high side with a mallet. Place the valve in the lathe again and repeat the testing and straightening operation until the valve stem runs true. With a little practice valves can be very quickly and accurately straightened in this manner, and many valves that would otherwise be discarded can be refaced.

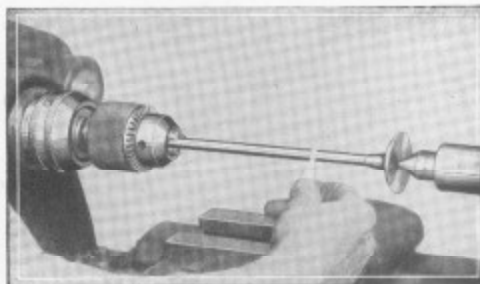


Fig. 53. Testing and Straightening a Valve in the Lathe

Notes on Valve Work

The South Bend Method of refacing valves by turning in the lathe is a great improvement over older methods, because it produces a better job in half the time. Another advantage is that the valve which has been refaced accurately in a lathe will require but very little hand lapping to secure a perfect seat.

- 1—The average time required for refacing a valve in the lathe is two minutes.
- 2—Refacing a valve requires three operations, (a) place valve in chuck; (b) take one or two light cuts with lathe tool; (c) remove valve from lathe.
- 3—Don't let your lathe tool extend too far from the tool holder when taking a cut. See the illustration below for correct setting.
- 4—Use a round nosed tool honed to a sharp edge when refacing valve. This produces a smooth finish.
- 5—To adjust the tool bit on a lathe, slide the tool post wedge back and forth until the cutting point is at the correct height.
- 6—All angular or taper work should be done with the cutting point of the tool even with the center points of the lathe.
- 7—Always straighten a badly bent or warped valve stem before refacing. See page 17.
- 8—Don't throw used valves away unnecessarily. A used valve, if straight and true, is better than a new valve because it is seasoned.
- 9—The methods of refacing valves as described in this book insure the greatest accuracy, precision and economy. This is proved correct after a practical experience of more than five years.
- 10—Don't let your lathe stand idle. It handles many other jobs besides valve work. After the valves are finished, use the lathe for armatures, bushings, pistons, etc.
- 11—Valves made of all metals including cast iron, nickel steel, semi-steel, silchrome steel, and other alloys can be machined quickly and accurately on the lathe.
- 12—For truing valves, adjust the cutting edge of the lathe tool so that it lines up exactly with the point of the tailstock center. This is necessary in order to get the correct taper on the valve face. See Fig. 54.

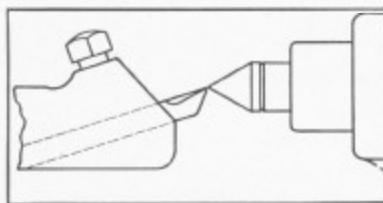


Fig. 54. Set Cutting Edge of Lathe Tool Exactly on Center

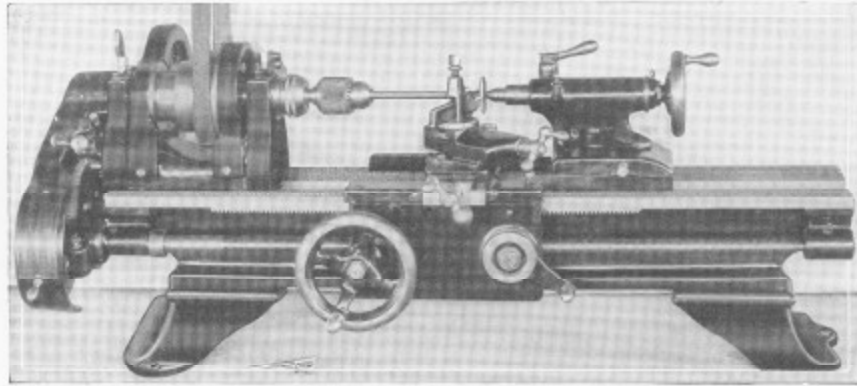


Fig. 55. Refacing a Valve with Stem Held in Chuck and Valve Head on Center

Refacing Valve with Valve Head Supported on Tailstock Center

The illustration shows another method of refacing valves in the lathe. The end of the valve stem is held in the valve chuck and the valve head is supported on the tailstock center. This method is considered very practical and is preferred by many mechanics although it requires more time.

In order to support the valve head on the tailstock center for refacing, the valve must be centered. If there is no center in the valve head, the center hole can be drilled in the same manner as shown in Figure 12, page 7.

The valve stem should also be tested to be sure that it is not bent or warped. If the valve stem is not straight and true it should be straightened according to the instructions given on page 17.

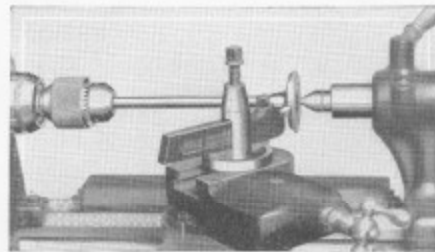


Fig. 55A. A Close-up Showing Valve Being Refaced

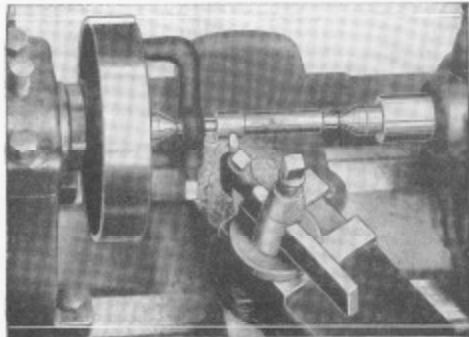


Fig. 56. Making a Valve Guide Bushing

Valve Guide Bushings can be made in the lathe very quickly and economically. The operations required in making a replacement valve guide bushing are the same as for making all other bushings, as shown on pages 10 to 13 inclusive.

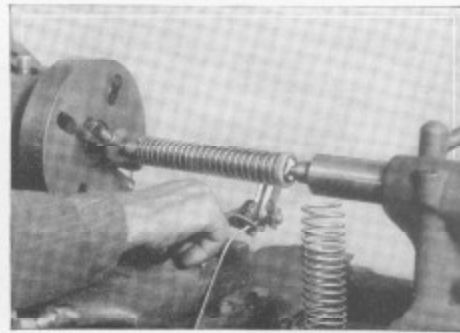
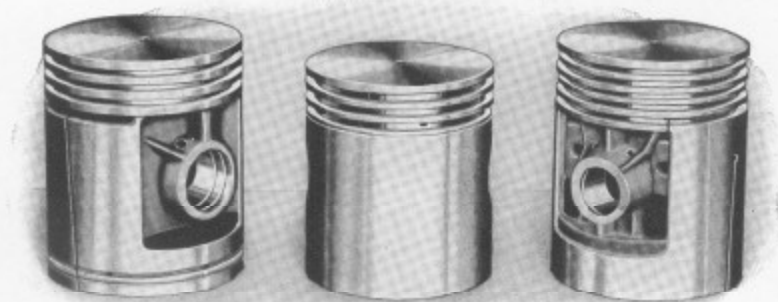


Fig. 57. Winding a Valve Spring

Coiled Springs are used on valves and for other purposes, and can be made in the back-gear, screw cutting lathe, as illustrated above. They can be made in any size from steel or brass spring wire, to meet any shop requirement.



Aluminum Piston

Cast Iron or Semi-Steel Piston

Invar Strut Piston

Fig. 58. All Types of Pistons Can Be Finished Quickly and Accurately in the Lathe

Finishing Semi-Machined Pistons

All sizes and all types of pistons for automobiles, buses, trucks and tractors can be finished more quickly and accurately in the lathe than in any other type of piston finishing machine. The lathe has the necessary range of spindle speeds and automatic feeds for doing the work with speed, accuracy and economy.

Machining the piston is better than grinding because by using a fine feed the cutting tool produces a smooth, accurate finish and leaves the pores of the metal open. It is therefore obvious that a turned piston will lubricate itself and the cylinder walls better because the open pores in the piston absorb and retain the oil.

The action of the grinding wheel on the surface of the piston closes up the pores and produces a hard glazed surface which does not absorb the oil readily and wears the walls of the cylinders more rapidly than turned pistons.

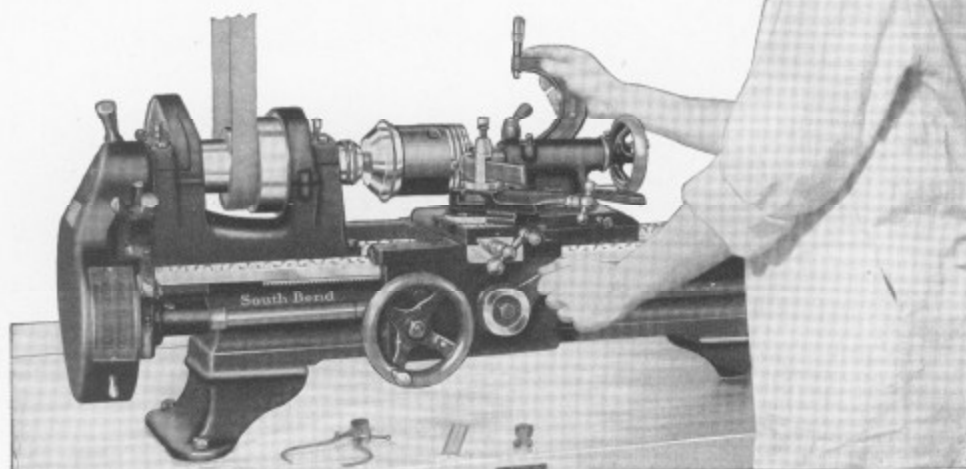


Fig. 59. Taking a Finishing Cut on a Semi-Machined Piston in a 9-inch Junior South Bend Lathe

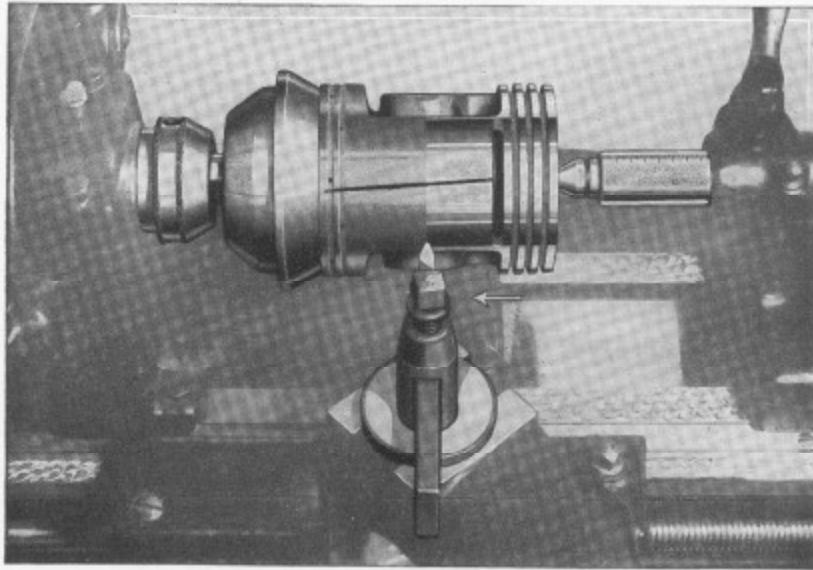


Fig. 60. Finishing an Aluminum Alloy Semi-Machined Split Skirt Piston

When taking the finishing cut on pistons of all types the direction of the cutting tool is from right to left or toward the headstock, as shown by the arrow in above illustration.

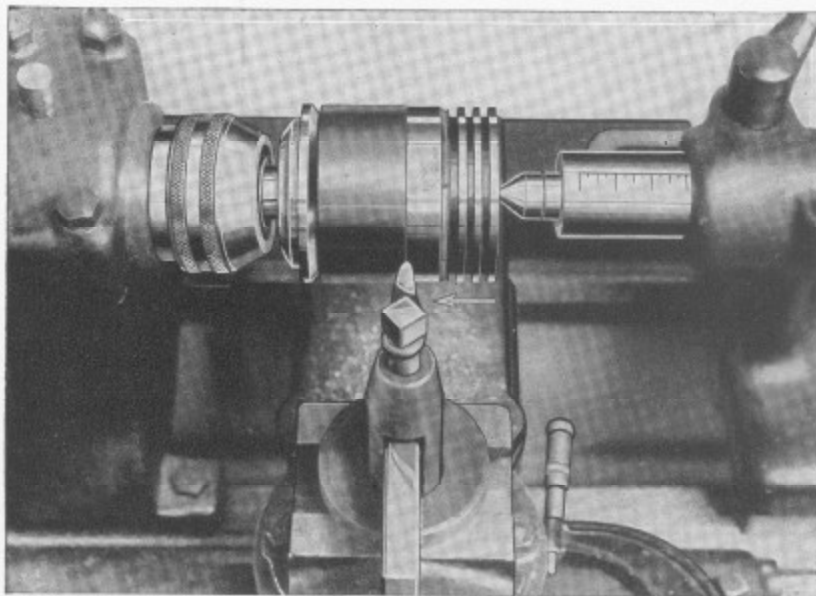


Fig. 61. Finishing a Semi-Machined Cast Iron or Semi-Steel Piston in the Lathe

The finishing cut leaves the surface of the piston perfectly round and smooth. The direction of the tool for the finishing cut is always from right to left as shown by the arrow in above illustration.

Finishing Semi-Machined Pistons in the Lathe

The method of mounting and the operations required for finishing both aluminum alloy and cast iron semi-machined pistons are the same. Each operation is illustrated and explained below in the proper sequence as they should be performed and apply to both types of pistons.

Reaming the Piston Skirt—The bevel in the piston skirt must be reamed as shown in Fig. 62, to correct inaccuracy due to warping in seasoning. The piston skirt reamer is mounted on the No. 44 piston adapter shank which fits in the taper of the headstock spindle. Engage the back gears to lock the spindle, as the reamer does not revolve. The piston is turned by hand and is fed against the reamer by turning the tailstock hand wheel a small amount for each revolution of the piston. Remove only enough stock to correct the inaccuracy of the piston skirt bevel.

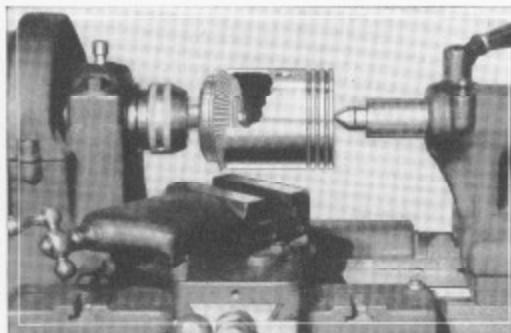


Fig. 62. Reaming the Bevel in the Skirt of a Semi-Machined Piston

Mounting the Piston in the Lathe—To mount the piston in the lathe for machining, select a cone adapter ring of the correct size to fit the piston skirt. Adjust the driving dog of the No. 44 piston adapter so that it will strike the center of the wrist pin boss, as shown in Fig. 63. The tailstock spindle should be extended far enough to permit removal of the piston without changing the position of the tailstock.

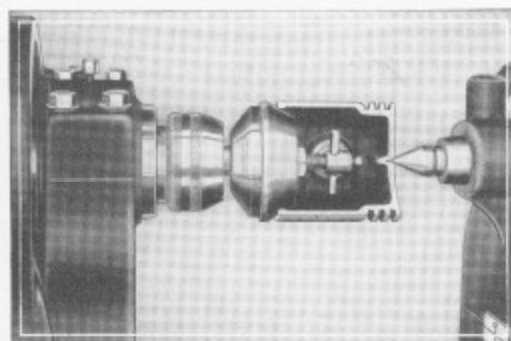


Fig. 63. A Semi-Machined Piston Mounted in the Lathe on a No. 44 Piston Adapter

Taking a Trial Cut—When the piston is mounted in the lathe, take a light trial cut across its entire length to check the alignment of the centers. Measure the diameter of the piston skirt at each end with a micrometer caliper, as shown in Fig. 64. If one end is smaller than the other, loosen the tailstock clamping bolt and adjust the tailstock set-over screws until the trial cut produces the same diameter throughout the entire length of the piston. Information on reading micrometer calipers is given in the handbook "How to Run a Lathe."

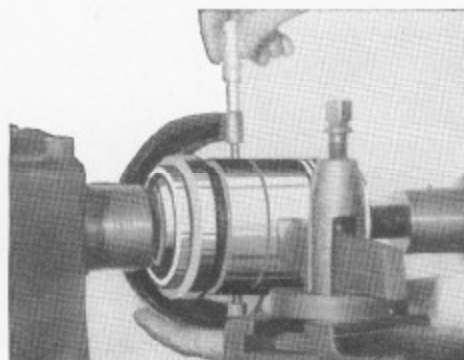


Fig. 64. Measuring Piston with Micrometer Caliper to Check Alignment of Centers

Finishing Semi-Machined Pistons in the Lathe

Taking the Roughing Cut—When taking the roughing cut the feed of the cutting tool is from left to right or toward the piston head, as shown in Fig. 65. This prevents the possibility of spreading the skirt by forcing it against the cone adapter. Allow .015 in. on the diameter of the piston for the finishing cut. The roughing cut is taken over the entire length of each piston in the set without changing the setting of the cutting tool or the position of the tailstock on the lathe bed.

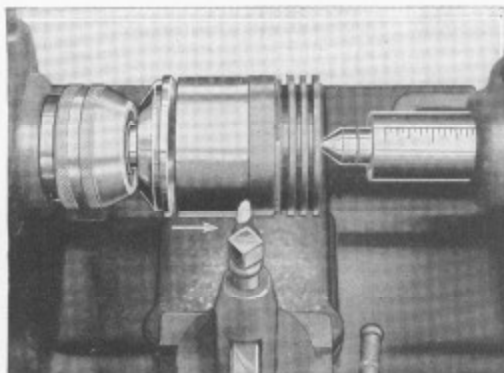


Fig. 65. Rough Turning a Semi-Machined Piston, Feeding the Lathe Tool from Left to Right

Taking the Finishing Cut—After the roughing cut has been taken on all pistons in the set, grind and oil stone the edge of the cutting tool. Adjust the tool bit by taking trial cuts until the exact diameter required for the finished piston is obtained. See pages 24 and 25 for calculating piston clearance. Finish turn the outside diameter of all pistons in the set without changing the adjustment of the tool. The direction of the cutting tool in taking the finishing cut should be from right to left as shown in Fig. 66. Light cuts are taken and the pressure of the cutting tool will not be sufficient to distort the piston skirt.

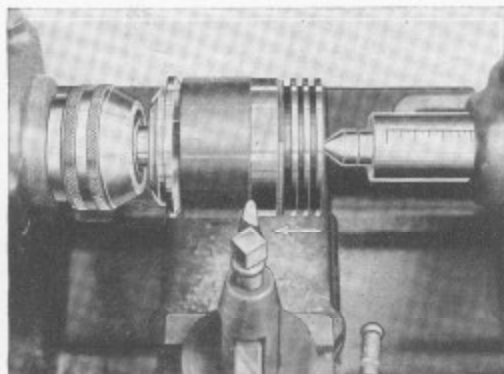


Fig. 66. Finish Turning a Semi-Machined Piston, Feeding the Lathe Tool from Right to Left

Finish Turning the Piston Ring Lands—The piston ring lands are finished as shown in Fig. 67 by setting the cutting tool, feeding from right to left and finishing one land on each piston of the entire set in turn without changing the adjustment of the cutting tool, then the next land on each piston, etc., as previously explained in the rough and finish turning operations. See pages 24 and 25 for calculating the correct clearance for each land of the piston.

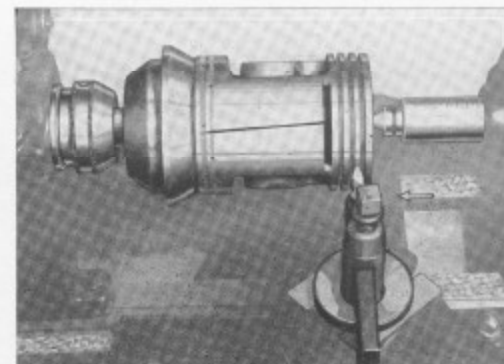
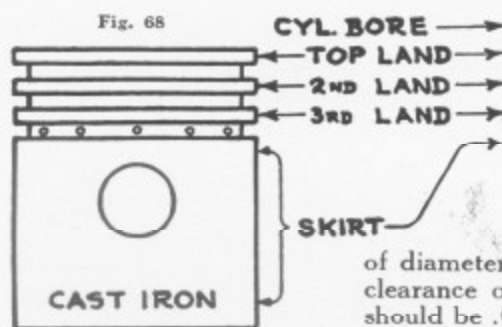


Fig. 67. Finish Turning the Piston Ring Lands of a Semi-Machined Piston

Clearance for All Types Cast Iron or Semi-Steel Pistons



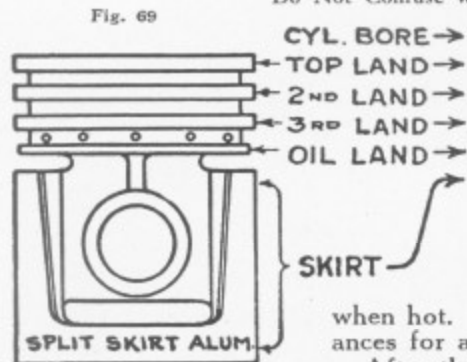
2½ to 3	3 to 3½	3½ to 4	4 to 4½	4½ to 5	5 to 5½	5½ to 6
.011	.013	.015	.017	.019	.021	.023
.008	.009	.011	.012	.014	.016	.018
.006	.007	.008	.009	.010	.011	.012
.002¼	.003¼	.003¾	.004¼	.004¾	.005¼	.005¾

The amount of clearance for cast iron or semi-steel pistons shown in the tabulation, is based on each inch of diameter of the piston. For example the skirt clearance of pistons up to 4 inches in diameter should be .001 inch for each inch diameter of the cylinder bore.

On four land pistons the fourth ring land clearance is the same as the third land. The skirt clearance rule given applies to pistons with or without skirt rings below the wrist pin.

Clearance for Aluminum Alloy Split Skirt Pistons

Do Not Confuse with Invar Strut Pistons



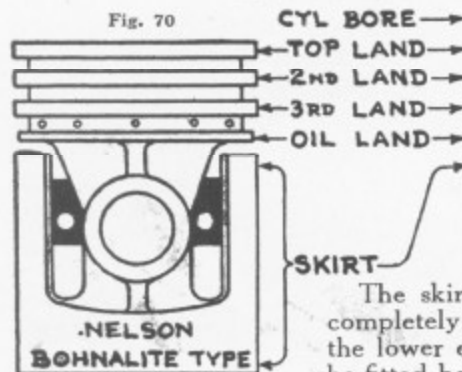
2½ to 3	3 to 3½	3½ to 4	4 to 4½	4½ to 5
.022	.026	.030	.034	.040
.014	.017	.020	.023	.026
.014	.017	.020	.023	.026
¼-inch less than Standard Cylinder Bore Diameter				
.002¼	.003¼	.003¾	.004¼	.004¾

Aluminum alloy pistons require more ring land clearance than cast iron pistons because they expand more when hot. The tabulation shows the proper clearances for aluminum alloy split skirt pistons.

After the skirt and lands have been finished and the wrist pin fitted, remove the metal tacks at top and bottom of the vertical slit in the skirt with a hacksaw blade.

Clearance for Invar Strut Pistons

Do Not Confuse with Aluminum Alloy Pistons



2½ to 3	3 to 3½	3½ to 4	4 to 4½	4½ to 5
.022	.026	.030	.034	.040
.014	.017	.020	.023	.026
.014	.017	.020	.023	.026
¼-inch less than Standard Cylinder Bore Diameter				
.002	.002¼	.002½	.002¾	.003

Care should be taken not to confuse the skirt clearances of aluminum alloy and Invar strut pistons.

The skirt of the Invar strut alloy pistons is not completely slotted and the metal tack is removed at the lower end of skirt only. The wrist pins should be fitted before the metal tack is removed.

Measuring the Diameter of the Cylinder Bore

Checking the Condition of the Cylinder Bore—The illustration, Fig. 71, shows the application of the dial indicator type cylinder gauge checking the condition of a worn cylinder bore. By a sliding and rotary motion of the gauge in the cylinder bore any inaccuracy or out-of-roundness that exists is registered on the indicator dial in thousandths of an inch. By this method the mechanic determines whether or not it is necessary to hone or rebore the worn cylinder before fitting new pistons.

Measuring the Diameter of a Reconditioned Cylinder Bore—The correct way to measure the diameter of a finished cylinder bore is to use an inside micrometer as illustrated in Fig. 72. The exact diameter of the cylinder bore is transferred to the outside micrometer and the proper amount of piston clearance is subtracted from that measurement. (See piston clearance charts on page 24.) The result is the correct diameter to finish-turn the piston.

The piston clearance is calculated to offset the expansion of the piston when heated and varies according to the size and type of piston. For example, if a cast iron piston is to have .001-inch clearance per inch in diameter on the skirt and is to fit a cylinder exactly 3.000 inches in diameter, the piston skirt would be turned .003 inch undersize or 2.997 inches in diameter.

Checking the Piston Clearance—Fig. 73 shows the method of using a feeler gauge to check the clearance between the finished piston and the cylinder bore. When using the feeler gauge the area of contact is distributed over a larger area than when using micrometer. To offset this, use a feeler not over $\frac{3}{8}$ inch wide and .001 inch thinner than the amount of clearance desired. That is, if .003 inch of clearance is desired, use a feeler gauge .002 inch thick to check the clearance.

Before measuring cylinder bore, be sure that it is free from scale or carbon, especially where the points of the measuring instruments touch the side wall.

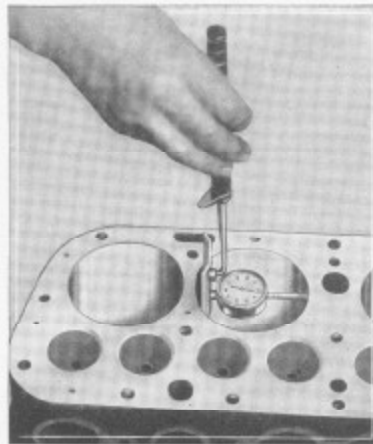


Fig. 71. Application of Cylinder Gauge Checking Cylinder Bore for Wear

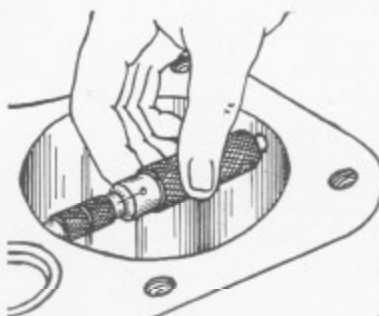


Fig. 72. Measuring Finished Cylinder Bore with Inside Micrometer

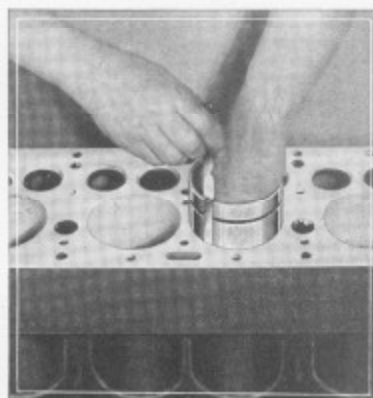


Fig. 73. Checking the Piston Clearance with a Feeler Gauge

Refinishing Oversize Pistons

Standard oversize pistons may be finish machined to a smaller diameter if desired. The work is done in the same manner as described on pages 22 and 23 under the fitting of semi-machined pistons. Oversize pistons not having a center hole in the head should be centered as described below.

Center Drilling the Piston—The piston is held against the piston adapter centering ring by passing the wrist pin through the eye bolt driver which is screwed into the adapter shank, drawing the piston up tight. The piston is tapped into position so that the head runs true. The center hole is drilled with a center drill held in a drill chuck in the tail stock spindle. See Fig. 74. After the center hole is drilled in the head the piston is mounted on the No. 44 adapter and machined by exactly the same method as is used for finishing semi-machined pistons. (See pages 22 and 23.)

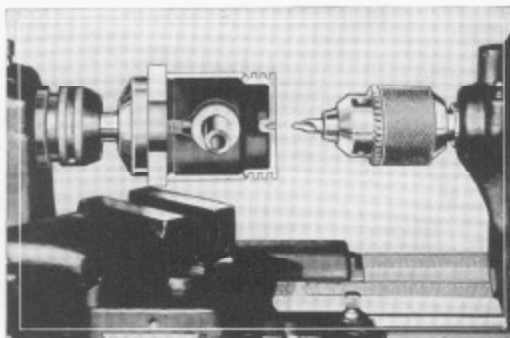


Fig. 74. Drilling Center Hole in an Oversize Piston on the No. 44 Piston Adapter

Aluminum Slit Skirt Pistons—The method of mounting and machining oversize aluminum alloy slit skirt pistons is the same as previously explained for semi-machined pistons of the same type, except that the end of the slot in the skirt is soldered with aluminum solder before the operations are performed. This prevents spreading the skirt when the piston is machined. The solder is removed with a hack-saw blade when the piston is finished and the wrist pin has been fitted.

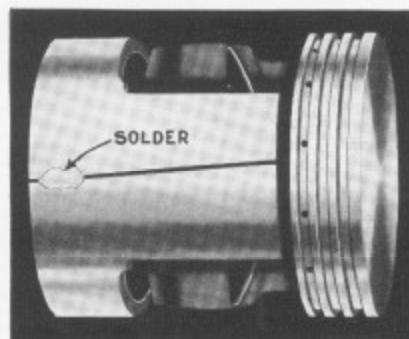


Fig. 75. End of Slot in Piston Skirt Soldered to Prevent Spreading When Machining

Reaming Wrist Pin Holes—The lathe is ideal for driving wrist pin hole reamers. The reamer is held in the 3-jaw Universal Chuck. Using the back gear drive with the belt on the center step of the spindle cone the reamer is driven at slow speed and the piston fed over the reamer by hand, as shown in Fig. 76.

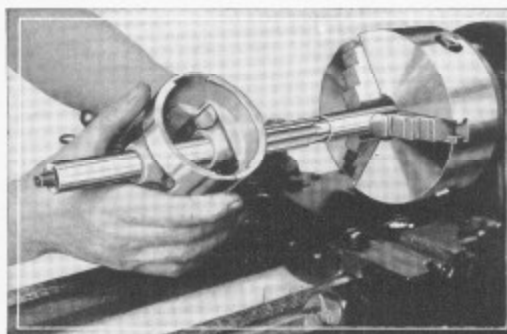


Fig. 76. Line Reaming the Wrist Pin Hole in an Aluminum Alloy Slit Skirt Piston

Self-Centering Piston Adapters for Mounting All Types of Pistons on the Lathe

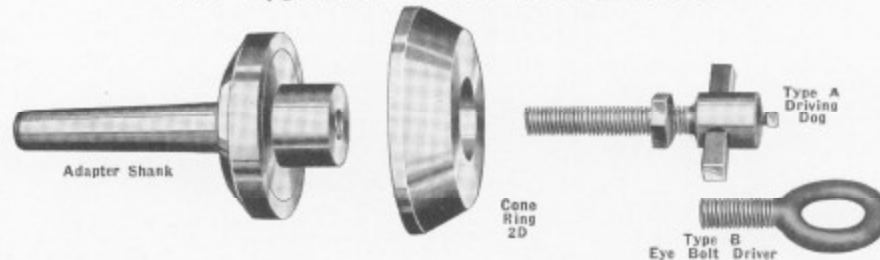


Fig. 77. The No. 44 Self-Centering Piston Adapter

The No. 44 Self-Centering Cone Ring Piston Adapter with No. 2D cone ring and two driving dogs, type A and type B, is shown above. One end of the adapter has a tapered shank to fit the lathe spindle. The other end is machined to receive the adapter rings. The driving dog screws into the threaded hole in the end of the adapter shank and can be adjusted to drive any piston. The type A driving dog is used for pistons with center hole in head. The type B driving dog is for mounting oversize pistons to drill center holes in the head when it is necessary to remachine them to a smaller diameter. The piston adapter shank when fitted with the proper adapter rings will hold all types of semi-machined and finished oversize pistons for machining in the lathe.

No. 44 Self-Centering Piston Adapter Shank with one No. 2D Cone Ring and one Type A Driving Dog. Price.....\$12.00
Type B Eye Bolt Driver......50

Types of Adapter Rings Furnished



Fig. 78. Cone Rings

Fig. 79. Centering Ring

Prices of Cone Rings and Centering Ring

Cone Rings		Centering Ring	
Cat. No.	Price	For Pistons Outside Dia.	
1D	\$2.50	2 1/2 to 3 1/4 in.	The above centering ring fits the No. 44 piston adapter shank and is 5 1/2 inches in diameter. This centering ring is used for holding oversized pistons when it is necessary to drill a center hole in the piston head. Price No. 1Q Centering Ring....\$2.50
2D	2.50	3 1/4 to 3 3/4 in.	
3D	2.50	3 3/4 to 4 1/4 in.	
4D	2.50	4 1/4 to 5 1/4 in.	

Piston Skirt Reamers



Fig. 80. Piston Skirt Reamers

Prices of Piston Skirt Reamers

Reamer No.	For Pistons Outside Dia.	Price, Each Reamer
1R	2 1/2 to 3 1/4 in.	\$ 7.50
2R	3 1/4 to 3 3/4 in.	9.00
3R	3 3/4 to 4 1/4 in.	11.00
4R	4 1/4 to 5 in.	13.00

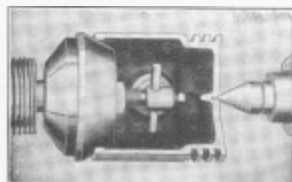


Fig. 81. Cross Section View Shows Piston Adapter and Adjustable Driver

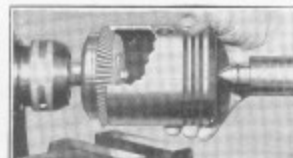


Fig. 82. Reaming Piston Skirt with Reamer Mounted on Piston Adapter Shank

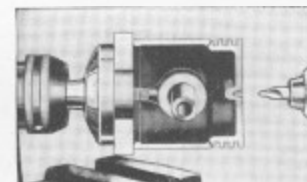
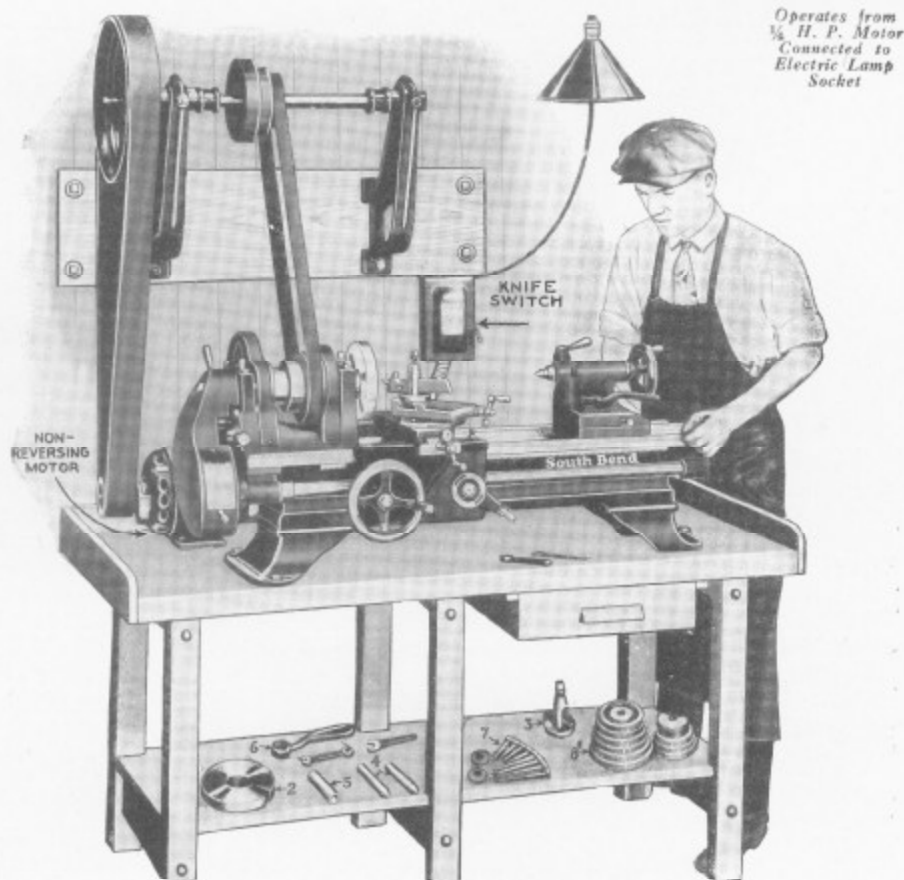


Fig. 83. Drilling Center Hole in Piston Head Using Eye Bolt Driver and Centering Ring



This is the Lathe and Equipment shown in Shop on page 2

9-inch Junior Simplex Motor Driven Bench Lathe

Back Geared, Screw Cutting, Precision Type

The 9-inch Junior Bench Lathe, illustrated above, is the same as the lathes shown elsewhere in this booklet doing various automobile servicing jobs on armatures, valves, bushings and pistons. Complete specifications and features of this lathe are given on pages 30 and 31 of this booklet. The same lathe is also shown on page 2 as a part of the shop equipment. Other forms of drive are illustrated on page 33.

The Simplex Motor Driven Lathe is arranged so that a simplex countershaft is mounted on the wall directly behind the lathe. A $\frac{1}{4}$ H.P. motor is used to drive the lathe by means of leather belting. A knife switch controls the starting and stopping of the motor. The motor can be mounted on the bench or fastened to the wall depending upon where the customer wants it.

Lathe Equipment Included in Price consists of Simplex Wall Countershaft and following equipment, illustrated on the lower shelf of bench: 2—Face Plate; 3—Tool Post, Complete; 4—2 Lathe Centers; 5—Spindle Sleeve; 6—Wrenches; 7—Lag Screws and Washers; 8—Change Gears for Cutting Screw Threads and for Carriage Power Feeds. Installation plans and instruction book "How to Run a Lathe" are furnished with the equipment. Bench for lathe is extra.

The Price of the 9-inch Junior Simplex Motor Driven Lathe is shown in the tabulation below. The prices of the motor, switch and other parts are listed separately so that purchaser can select what he needs, omitting motor, switch, or other parts he already owns.

Prices of 9-inch Junior Simplex Motor Driven Bench Lathes

Size and Catalog No. of Lathe	9"x3' No. 1022-YB	9"x3½' No. 1022-ZB	9"x4' No. 1022-AB	9"x4½' No. 1022-RB
9-inch Junior New Model South Bend Bench Lathe with Simplex Wall Countershaft and Lathe Equipment.....	\$169.00	\$175.00	\$182.00	\$190.00
Price of Motor Drive Unit				
$\frac{1}{4}$ H.P. Motor, 1750 R.P.M., Non-Reversing, (1-phase, 60-cycle, A.C.) and motor pulley.....	\$26.50	\$26.50	\$26.50	\$26.50
Switch, enclosed Knife Type.....	2.50	2.50	2.50	2.50
Conduit and Wiring.....	4.00	4.00	4.00	4.00
Belting Motor to Countershaft 2" wide by 8¾' long...	2.75	2.75	2.75	2.75
Belting Countershaft to Lathe 1½" wide by 6¾' long...	1.25	1.25	1.25	1.25
Total Price, Lathe and Equipment as illustrated above..	\$206.00	\$212.00	\$219.00	\$227.00

Attachment and Tool Assortment No. 9-A

For Servicing Armatures, Valves, Bushings and Pistons on the 9-inch Junior Lathe

The following list of attachments and tools have been selected for servicing armatures, valves, bushings, and pistons for all makes and models of trucks, buses and automobiles. This assortment will fit and can be used on all 9-inch Junior Lathes, Countershaft Driven or Motor Driven types with floor legs or bench legs, as described throughout this bulletin. If desired, you can omit one or more of the attachments and tools when buying the lathe and purchase these items later. They can be fitted in your own shop and do not have to be fitted at the factory. They can be placed on the lathe any time after shipment is made.

Armature Truing Equipment

1—Turning Tool (L. H.), with High Speed Cutter Bit.....	\$ 2.40	
3—Malleable Lathe Dogs, 1/2 in., 3/4 in. and 1 1/4 in.....	2.20	\$ 4.60

Bushing Equipment

1—Boring Tool and Cutter Bit for Medium Work.....	4.40	
1—1 1/8-in. Straight Shank Twist Drill.....	.90	
1—3/4-in. Fluted Chucking Reamer.....	1.50	
1—Cutting-off Tool (R. H.).....	2.60	9.40

Valve Refacing Equipment

1—Hollow Spindle Valve Chuck 5/8-in. capacity, fitted to lathe.....	12.50	
1—Stellite Cutter Bit for Refacing Unusually Hard Valves.....	.85	13.35

Piston Work Equipment

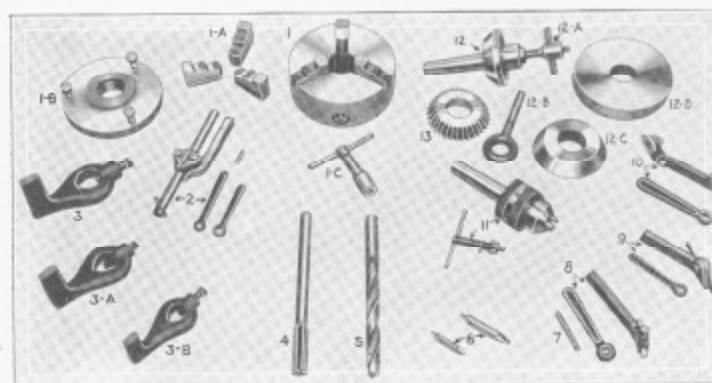
1—Piston Adapter with Driving Dog, 1 Eye Bolt Driver, 1 Cone Ring for Pistons 3 1/4-in. to 3 7/8-in. diam., and 1 Center Ring 5 7/8-in. diam.....	15.00	
1—Piston Skirt Reamer for Pistons 3 1/8-in. to 3 3/4-in. diameter.....	9.00	24.00

Chuck and Tool Equipment Required for Above Work

1—6-in., 3-Jaw Universal Chuck.....	35.00	
1—Chuck Back, fitted to Chuck and Lathe.....	7.00	
1—Threading Tool for Cutting Screw Threads.....	3.75	
2—Combination Center Drills, 1/8 in.; 5/16-in. diameter.....	.55	46.30

Total Cost of Attachment and Tool Assortment f.o.b. South Bend..... **\$97.65**

This attachment and tool assortment can be purchased on easy payments when ordered with any 9-inch Junior Lathe described in this booklet. The assortment is not sold on easy payments when ordered separately. For more complete information refer to Easy Payment Booklet described on page 39.

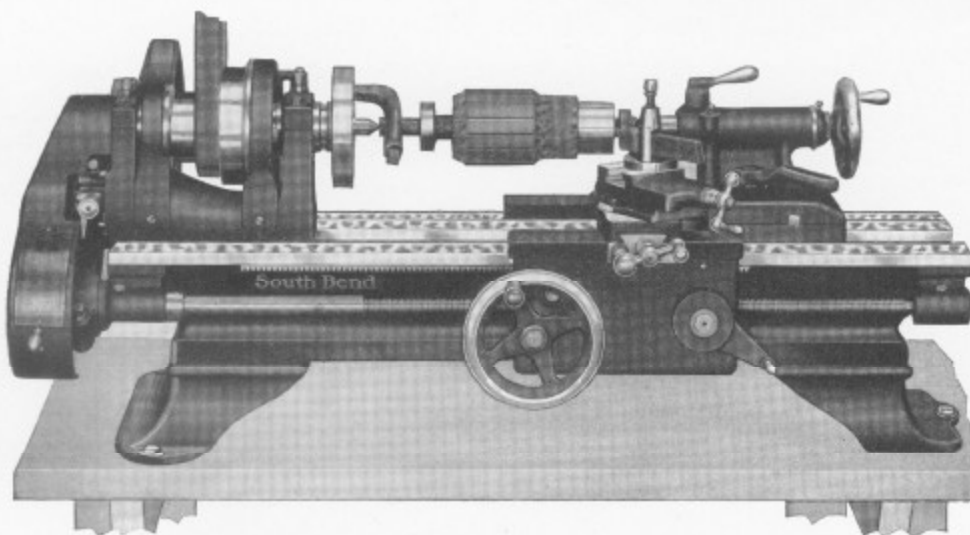


NAME OF PARTS

- 1—3-Jaw Universal Chuck
- 1A—Reverse Chuck Jaws
- 1B—Chuck Back Fitted to Chuck and Lathe
- 1C—Wrench for Chuck and Wrenches
- 2—Boring Tool, Cutter Bit and Wrenches
- 3, 3A, 3B—Lathe Dogs
- 4—Chucking Reamer
- 5—Twist Drill
- 6—Center Drills
- 7—Stellite Cutter Bit
- 8—Turns Tool and Wrench
- 9—Cutting-off Tool and Wrench
- 10—Threading Tool & Wrench
- 11—Valve Chuck and Wrench
- 12—Piston Adapter
- 12A—Driving Dog
- 12B—Eye Bolt Driver
- 12C—Cone Ring
- 12D—Centering Ring
- 13—Piston Skirt Reamer

Fig. 83. Attachment and Tool Assortment No. 9-A for Auto Service Shop

Any item listed in the Attachment and Tool Assortment not wanted, may be deducted from the total. For example, if you do not wish to do piston work deduct \$24.00.



9-inch Junior New Model South Bend Bench Lathe

Back-Geared, Screw Cutting Precision Bench Lathe—Double Friction Countershaft Drive

The No. 22 9-inch Junior Back-Geared, Screw Cutting Lathe illustrated above is assembled from the units of our regular No. 30 9-inch Standard Change Gear Lathe that we have been manufacturing for 25 years—the same headstock, tailstock, bed and carriage—all are identical on the No. 22 Lathe with those of the No. 30 Lathe. The same accuracy and precision, hand-scraping and inspection that the entire line of New Model South Bend Lathes receive are also given to the No. 22 9-inch Junior Lathe.

The Headstock Is Back-geared. The three-step cone provides six spindle speeds—three direct cone drive and three back gear drive. This provides a wide variety of spindle speeds for the machining of all kinds of metals. The headstock spindle has a $\frac{3}{4}$ -inch hole, which permits machining valves held in the hollow drill chuck, universal chuck, or a draw-in collet chuck.

The Automatic Longitudinal Feed on the carriage permits the taking of roughing and finishing cuts on armatures, pistons and bushings. The use of the automatic feed on the finishing cut produces a smooth, velvety finish.

FEATURES OF 9-INCH JUNIOR LATHE

Back geared Headstock, six spindle speeds.
Hollow Spindle, made of special carbon steel.
Spring Latch Reverse for feeds and threads.
Phosphor Bronze Spindle Bearings.
Patent Oil Cups lubricate spindle bearings.
Graduated Compound Rest swivels to any angle.
Tailstock set-over for taper turning.
Carriage Lock for accurate facing.
Micrometer Collars on cross feed and compound rest screws.
Precision Lead Screw for cutting threads.
Graduated Tailstock Spindle.
Change Gears for Threads and Feeds.
Index Plate for Thread Cutting.
Automatic Longitudinal Feed.
Wrenchless Bull Gear Clamp.
Steel Rack for Hand and Power Feed.
Half Nut for Thread Cutting.
Forged Steel Adjustable Tool Post.
Tailstock Spindle Lock.
Semi-Steel Seasoned Bed.

The Lead Screw permits cutting right and left screw threads on bushings, armature shafts, and other parts that it is necessary to thread. See screw thread cutting jobs on page 36.

Fine Turning Feeds. Each 9-inch Junior Lathe is furnished with a large turning gear along with the regular set of change gears to permit the use of a very fine turning feed. The standard set of change gears can also be used to produce a variety of coarser feeds.

Cutting Screw Threads—An index plate is attached to the 9-inch Junior Lathe and shows the proper change gears to use to cut all standard screw threads from 4 to 40 per inch, right or left, as follows: 4, 5, 6, 7, 8, 9, 10, 11, 11½, 12, 13, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 36, and 40.

SOUTH BEND ENGINE LATHES		
1/2" DIA.	1" DIA.	2" DIA.
4	64	32
5	64	40
6	64	48
7	64	50
8	32	32
9	64	72
10	32	40
11	32	44
11½	32	46
12	32	48
13	32	52
14	32	56
16	32	64
18	32	72
20	32	80
22	16	44
24	16	48
26	16	52
28	16	56
30	16	60
32	16	64
36	16	72
40	16	80

Index Plate

SPECIFICATIONS OF 9-INCH JUNIOR LATHE

Swing Over Bed.....9¼ in.
Swing Over Carriage.....6¼ in.
Hole Through Spindle.....¾ in.
Thread Cutting Range.....4 to 40 per in.
Spindle Speeds.....39, 64, 110, 200, 348, 596 R. P. M.
Countershaft Speed.....235 R. P. M.
Countershaft Friction Clutch Pulley.....6½ in. x 2½ in.
Width of Cone Pulley Belt.....1½ in.
Size of Spindle Nose.....1½ in. diam., 8 Threads
Head and Tailstock Spindle Centers.....No. 2 Morse Taper
Collet Capacity.....¾ in. to 1½ in.
Lead Screw, Acme Thread.....¾ in. diam., 8 Pitch
Angular Travel of Compound Rest Top.....17½ in.
Travel of Tailstock Spindle.....2¼ in.
Horsepower Motor Required.....¼ H. P.
Size of Lathe Tool Shank.....1½ in. x 1½ in.
Size of Turning Tool Cutter Bits.....¾ in. x ¾ in.
Tailstock Set Over.....¾ in.
Compound Rest Base Travel.....7½ in.
Back Gear Ratio.....5.4 to 1

Net Factory Prices of 9-inch Junior New Model Bench Lathe, Including Countershaft and Equipment

Cat. No. of Lathe	Swing Over Bed	Length of Bed	Between Centers	Hole Thru Spindle	Swing Over Carriage	Power Required	Weight Crated	Code Word	Net Factory Price
22-YB	9¼ in.	3 ft.	18 in.	¾ in.	6½ in.	¼ HP.	375 lbs.	Bhox	\$169.00
22-ZB	9¼ in.	3½ ft.	23 in.	¾ in.	6½ in.	¼ HP.	400 lbs.	Bmatx	175.00
22-AB	9¼ in.	4 ft.	29 in.	¾ in.	6½ in.	¼ HP.	425 lbs.	Bleax	182.00
22-RB	9¼ in.	4½ ft.	36 in.	¾ in.	6½ in.	¼ HP.	450 lbs.	Broil	190.00

If Floor Legs are wanted instead of Bench Legs add \$10.00 to above prices.

General Description of All 9-inch Junior Lathes

The 9-inch Junior Back-Geared, Screw Cutting Lathe, illustrated on page 30, is the only Junior Lathe we make and is the same lathe that is shown in every illustration throughout this booklet. The mechanical parts and features of all 9-inch South Bend Junior Lathes are identical, regardless of whether the lathe is equipped with long legs or bench legs, countershaft drive or motor drive. We make this lathe in these different types because the installation conditions vary in the different shops. Some shops prefer the bench lathe; some the floor leg; some the motor drive and some the countershaft drive lathe.

The Attachment and Tool Assortment described and listed on page 29 has been selected for use with all 9-inch Junior Lathes, Countershaft Driven or Motor Driven, with floor legs or bench legs. The tools and attachments making up this assortment will fit any 9-inch Junior Lathe. If desired, the customer can omit a part of the attachment and tool assortment when buying the lathe and purchase these items later. They need not be fitted at the factory but can be placed on the lathe at any time after shipment is made.

The Compound Rest of the 9-inch Junior Lathe is graduated in 180 degrees on the base so that it can be swiveled to any angle for refacing valves, turning tapers, and other similar jobs. The graduations permit swiveling the compound rest to turn valves to 45° angle, 30° angle or any other angle.

The Weight of the 9-inch South Bend Junior Lathe, as shown in the tabulation on page 30, is an indication of the lathe's strength, power, accuracy and value. It is a practical metal working lathe for the machining of armatures, valves, pistons, bushings and many other jobs.

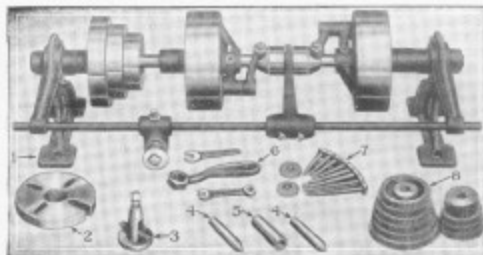
The 9-inch Junior Lathe with Overhead Countershaft Drive, illustrated on page 30, is the same lathe that is shown in the front of this booklet on pages 4 to 27 for machining armatures, valves, bushings and pistons of automobiles, trucks, buses and tractors. It is also practical for general machine work and screw thread cutting. All of the jobs illustrated in this booklet can be machined on this lathe, also on the lathes with the various drives as shown on pages 28 and 33.

The Lathe with Overhead Countershaft Drive is driven by a double friction countershaft, which is bolted to the ceiling and connected by belt to the lineshafting that is operated by motor. An erection plan showing how to set up the 9-inch Junior Bench Lathe with overhead countershaft drive is shown on page 32.

We Recommend the overhead countershaft driven lathe for the shop that is already equipped with lineshafting from which other machines are being operated. But for the shop not equipped with lineshafting, we recommend the Simplex Motor Driven Bench Lathe shown on page 28. Both lathes are exactly the same, except in the form of drive.

Accuracy Tests on the 9-inch Junior Lathes are made often during the process of manufacture of the different parts and before being assembled sixty-four different tests are made. After being assembled the final test of the lathe is made under its own power to test the spindle alignment before shipping the lathe to the customer.

Our Guarantee is that each 9-inch Junior Lathe is accurate and mechanically perfect. We will ship a 9-inch Junior Lathe anywhere in the United States for a thirty-day trial in your own shop.



Countershaft and Equipment Included in Price of Countershaft Driven Lathe

Lathe Equipment included in price of the 9-inch Junior Lathe consists of Face Plate; Tool Post complete; two Lathe Centers; Spindle Sleeve; Change Gears for thread cutting and for carriage power feeds; Lag Screws; Washers; Wrenches; Installation Plans; and instruction book, "How to Run a Lathe." In addition, each lathe comes equipped with the necessary countershaft or motor drive arrangement to be driven from an overhead lineshaft or from its own motor, depending upon which type is ordered.

All Metals such as cast iron, steel, wrought iron, brass, bronze, copper, aluminum, and the various alloy steels can be machined on the 9-inch Junior Lathe. It also can be used for the working of wood, hard rubber, fiber, etc.

The Price of the Bench Lathe in the various bed lengths is shown in the tabulation on page 30. The popular selling size is the 3-foot bed length and is usually installed by the service station shop servicing trucks, buses and automobiles. Some shops, however, have longer work and prefer the 3½-foot, 4-foot or 4½-foot bed lengths, which give a greater distance between centers.

Attachments. 9-inch Junior Lathes may be fitted with Attachments, such as Draw-in Collet Chuck, Spring Collets, Taper Attachment, Milling and Keyway Cutting Attachment, etc.

The Hard Maple Wooden Bench illustrated with the 9-inch Junior Lathe on page 30 is not included in the price but can be furnished at extra cost. Prices on application. If you wish to make your own bench, we will supply the blue prints of detail drawings without charge.

Erection Plan for the 9-inch Junior New Model Bench Lathe—Overhead Countershaft Drive

The cut shows the erection plan of a 9-inch Junior Bench Lathe with overhead countershaft drive. The overhead countershaft drive is popular in the shop equipped with overhead countershaft drive. The principal dimensions of lathe and bench show the space required for the lathe.

Installation Plans and Blue Prints

Countershaft Drive Lathes

The drawing at the right is a reduced cut of a large blue print 12x18 inches, which we furnish you, showing how to install your lathe, sizes of pulleys to use on your lineshaft and motor, speed of motor, speed of lineshaft, height of bench, etc. One blue print shows the bench type lathe and another shows the floor type lathe.

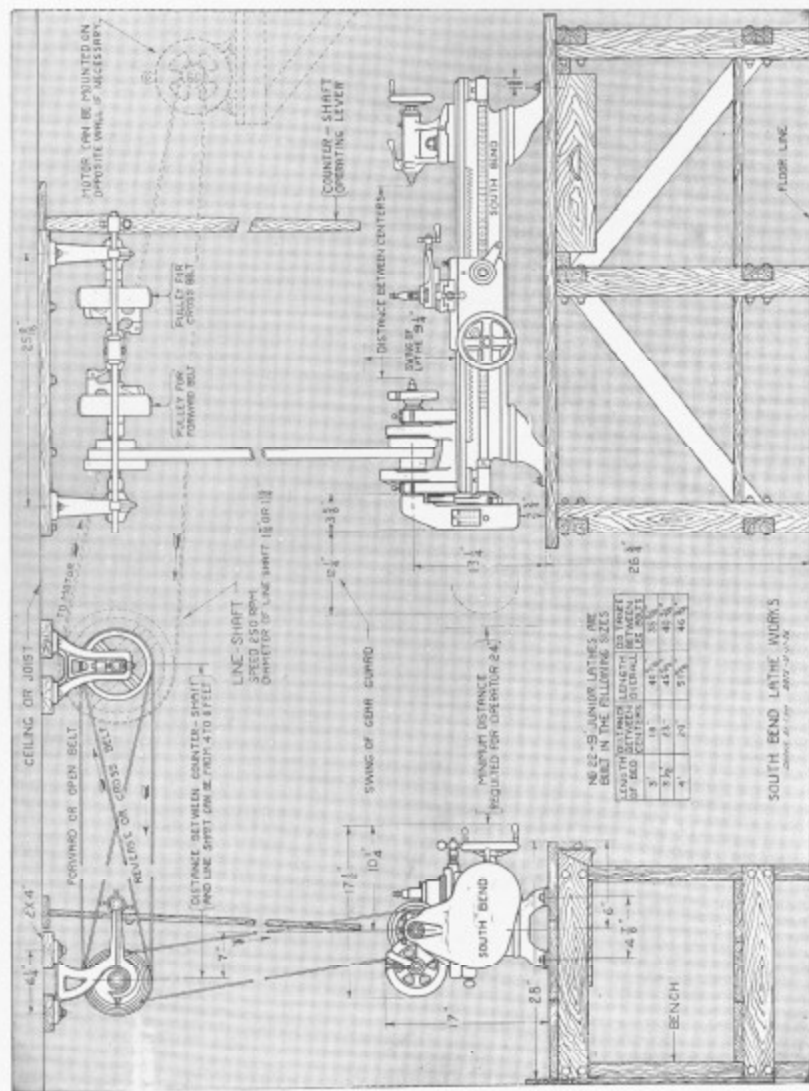
Belting

The belts from the lineshaft to the lathe countershaft should be 2-inch single ply leather belting. The belt from the countershaft to the lathe should be 1 1/4-inch single ply leather belting. We can furnish you a high grade of belting at the following prices and ship it with your lathe. Be sure to specify the exact length.

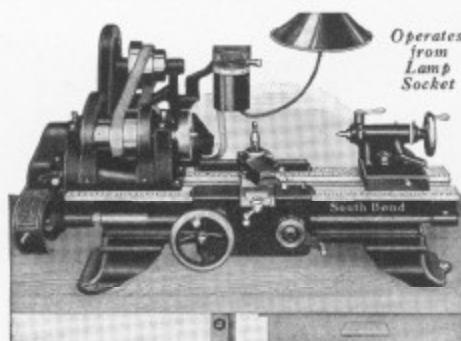
1 1/4-inch Single Ply Leather Belting (Countershaft to Lathe).....25c per foot
2-inch Single Ply Leather Belting.....40c per foot

Motor Drive Lathes

We also furnish you blue prints and instructions showing how to set up and install the various drives shown on pages 28 and 33. These include necessary wiring diagrams for connecting to your electric current, sizes of electric fuses required and instructions on how to anchor your lathe to the floor or bench.



9-inch Junior V-Belt Motor Driven Bench Lathe



9-inch Junior V-Belt Motor Driven Bench Lathe

The above illustration shows the 9-inch Junior V-Belt Motor Driven Bench Lathe connected with the electric lamp socket and ready for operation.

The 9-inch Junior V-Belt Motor Driven Bench Lathe is the same lathe as is shown on page 30, except that it is equipped with a motor drive unit mounted on the bench back of the lathe, which drives the countershaft cone through a V-belt.

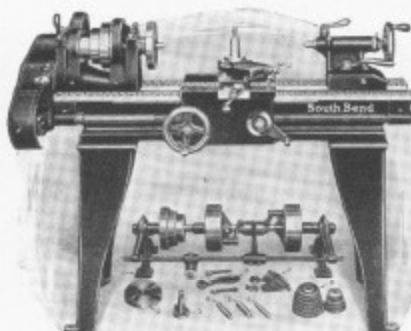
Electrical Equipment consists of: $\frac{1}{4}$ H.P. reversing motor; reversing switch, drum type; wiring between motor and switch; metal conduit; wiring diagram; V-belt between motor and countershaft, flat leather belt between countershaft cone pulley and headstock spindle cone pulley.

Lathe Equipment: Face Plate; Tool Post, complete; 2 Lathe Centers; Spindle Sleeve; Wrenches; Lag Screws and Washers and Change Gears for cutting screw threads and for carriage power feeds; Installation Plans and Instruction Book "How to Run a Lathe," as illustrated on page 31.

9-inch Jr. V-Belt Motor Driven Bench Lathe

Cat. No. of Lathe	Swing Over Bed	Length of Bed	Size of Motor	Weight Crated	3 Phase 60 Cycle A.C. Motor	1 Phase 60 Cycle A.C. Motor	Direct Current Motor
1222-Y	9 $\frac{1}{4}$ in.	3 ft.	$\frac{1}{4}$ H.P.	470 lbs.	\$251.00	\$266.00	\$259.00
1222-Z	9 $\frac{1}{4}$ in.	3 $\frac{1}{2}$ ft.	$\frac{1}{4}$ H.P.	500 lbs.	257.00	272.00	265.00
1222-A	9 $\frac{1}{4}$ in.	4 ft.	$\frac{1}{4}$ H.P.	530 lbs.	264.00	279.00	272.00
1222-B	9 $\frac{1}{4}$ in.	4 $\frac{1}{2}$ ft.	$\frac{1}{4}$ H.P.	560 lbs.	272.00	287.00	280.00

9-inch Junior Countershaft Driven Floor Leg Lathe



9-inch Junior Countershaft Driven Floor Leg Lathe

The 9-inch Junior Countershaft Driven Floor Leg Lathe is exactly the same as the lathe shown on page 30, except that it is furnished with the long legs for floor use, instead of short legs for bench use.

Lathe Equipment Included in Price of lathe consists of Double Friction Countershaft; Face Plate; Tool Post, complete; 2 Lathe Centers; Spindle Sleeve; Wrenches; Lag Screws and Washers; Change Gears for cutting screw threads and for carriage power feeds; Installation Plans and Instruction Book "How to Run a Lathe," as illustrated on page 31.

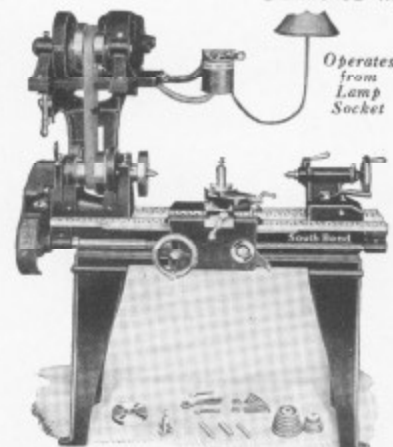
9-inch Junior Countershaft Driven Floor Leg Lathe*

No. of Lathe	Swing Over Bed	Length of Bed	Between Centers	Power Required	Weight Crated	Code Word	Price F.O.B. South Bend
22-Y	9 $\frac{1}{4}$ in.	3 ft.	18 in.	$\frac{1}{4}$ H.P.	440 lbs.	Rhmt	\$179.00
22-Z	9 $\frac{1}{4}$ in.	3 $\frac{1}{2}$ ft.	23 in.	$\frac{1}{4}$ H.P.	465 lbs.	Rmelo	185.00
22-A	9 $\frac{1}{4}$ in.	4 ft.	29 in.	$\frac{1}{4}$ H.P.	490 lbs.	Rhmt	192.00
22-R	9 $\frac{1}{4}$ in.	4 $\frac{1}{2}$ ft.	36 in.	$\frac{1}{4}$ H.P.	515 lbs.	Bryan	200.00

*If bench legs are wanted instead of floor legs deduct \$10.00.

9-inch Junior Silent Chain Motor Driven Lathe

Furnished with Bench Legs or Floor Legs



9-inch Junior Silent Chain Motor Driven Lathe

The 9-inch Junior Silent Chain Motor Driven Lathe is the same as the lathe illustrated and described on pages 30 and 31, except that it is equipped with floor legs instead of bench legs and the South Bend Silent Chain Motor Drive, instead of the countershaft drive.

Electrical Equipment Included in Price of lathe consists of: $\frac{1}{4}$ H.P., 1200 R.P.M. reversing motor; reversing switch, drum type; wiring between motor and switch; flexible metal conduit; wiring diagram and leather belt.

Lathe Equipment Included in Price consists of: Face Plate; Tool Post, complete; 2 Lathe Centers; Spindle Sleeve; Wrenches; Lag Screws and Washers; Change Gears for cutting screw threads and for carriage power feeds; Installation Plans and Instruction Book "How to Run a Lathe," as illustrated on page 31.

9-inch Jr. Silent Chain Motor Driven Floor Leg Lathe*

No. of Lathe	Swing Over Bed	Length of Bed	Size of Motor	3 Phase 60 Cycle A.C. Motor	1 Phase 60 Cycle A.C. Motor	Direct Current Motor
322-Y	9 $\frac{1}{4}$ in.	3 ft.	$\frac{1}{4}$ H.P.	\$283.00	\$298.00	\$291.00
322-Z	9 $\frac{1}{4}$ in.	3 $\frac{1}{2}$ ft.	$\frac{1}{4}$ H.P.	289.00	304.00	297.00
322-A	9 $\frac{1}{4}$ in.	4 ft.	$\frac{1}{4}$ H.P.	296.00	311.00	304.00
322-R	9 $\frac{1}{4}$ in.	4 $\frac{1}{2}$ ft.	$\frac{1}{4}$ H.P.	304.00	319.00	312.00

*If bench legs are wanted instead of floor legs deduct \$7.50.

Sharpening Lathe Tool Cutter Bits

For More Complete Information See Book "How to Run a Lathe"

Careful grinding of the lathe tool cutter bit is essential to good lathe work. The cutter bit must be ground so that when it is mounted in the tool holder it will have clearance both at the front and at the side so that the cutting edge is free to advance without the heel of the tool rubbing against the work.

The side and end clearances of the cutting edge depend on the nature of the work to be machined, soft machine steel requiring a sharper edge than cast iron or hard bronze. The cutting tool will produce a smoother finish if the cutting edge is honed with a small oil stone.



Fig. 84. Top View of Round Nose Turning Tool



Fig. 85. Side View of Round Nose Turning Tool

Round Nose Turning Tool

The round nose turning tool is used for a wide variety of work, including piston turning, valve refacing, armature truing, etc. It may be fed either to the right or to the left and may be used for facing.

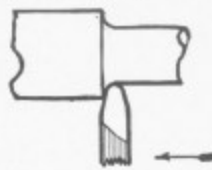


Fig. 86. Round Nose Turning Tool

Right Hand Turning Tool

The right hand turning tool is similar to the round nose turning tool except that the top is ground with side slope away from the left hand cutting edge. This tool is used for heavy turning.

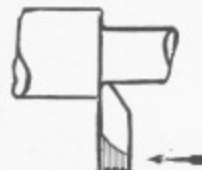


Fig. 89. Right Hand Turning Tool

Right Hand Side Tool

The right hand side tool is used for facing the ends of shafts, facing shoulders, widening piston ring grooves, etc. The point of the tool must be ground so that it will clear the lathe center.

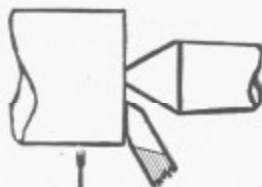


Fig. 87. Right Hand Side Tool

Right Hand Corner Tool

The right hand corner tool is used for finishing corners. The angle of the tool point should be slightly less than 90 degrees. A left hand corner tool is made just the reverse of the right hand corner tool.

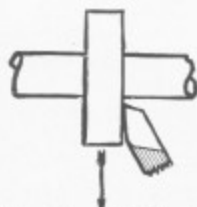


Fig. 88. Right Hand Corner Tool

Cutting Off Tool



Fig. 90. Cutting Off Tool in Holder

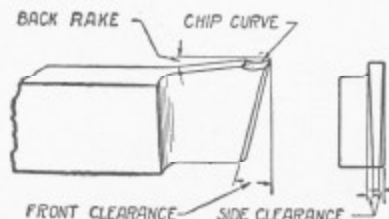


Fig. 91. Rake and Clearance for Cutting Off Tool

The cutting off tool is used for cutting off stock and for necking operations. In sharpening this tool, it is ground only on the front and top. Note that the cutting edge of the tool is on a center line with the work.

Sharpening Lathe Tool Cutter Bits

For More Complete Information See Book "How to Run a Lathe"

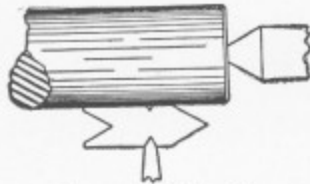


Fig. 92. Setting the Threading Tool

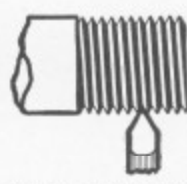


Fig. 93. Application of Threading Tool

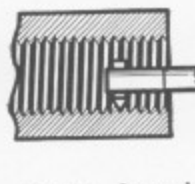


Fig. 94. Internal Threading Tool

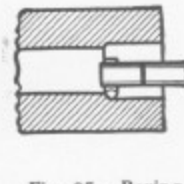


Fig. 95. Boring Tool

Thread Cutting Tool

The thread cutting tool is used for cutting all U. S. Standard and S. A. E. Screw Threads. The point of the threading tool should be ground to fit exactly in the 60-degree angle of thread tool gauge. The gauge is shown fitted to point of tool and parallel with face of work to be threaded.

Internal Threading and Boring Tools

The internal threading and boring tools are similar to the external threading tool and the round nose turning tool, except that they must be smaller and the heel of the tool bit must be ground away to clear the inside of the hole.

Position of Lathe Tool Cutter Bit

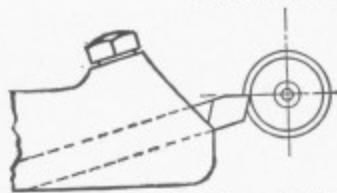


Fig. 96. Tool Bit Set on Center

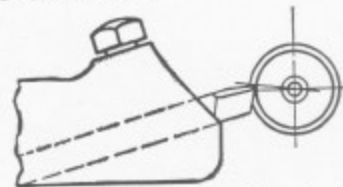


Fig. 97. Tool Bit Set Above Center

Tool Bit on Center

The cutting edge of the lathe tool bit is placed on center for screw thread cutting and all taper and angular turning, such as valve refacing. It is also placed on center for machining tenacious metals, such as copper and bronze, as in machining armature commutators.

Tool Bit Above Center

For all ordinary straight turning the cutting edge of the tool bit is placed above center about 5 degrees, or $\frac{1}{8}$ inch for each inch in diameter of the work. This is to facilitate free cutting of the tool. In placing the tool above center care must be taken that the heel of the tool bit does not rub against the work.

Spindle Speeds for Turning

The 9-inch Junior South Bend Lathe is equipped with a three-step cone pulley and back gears giving it six spindle speeds, ranging from 39 to 596 R.P.M. These speeds are shown in the upper chart on the right.

The recommended spindle speeds for turning cast iron, mild steel, brass and aluminum are shown in the lower chart. In machining work of a certain diameter, select the spindle speed nearest the speed recommended in the lower chart for turning that diameter. For example, if a cast iron piston 3 inches in diameter is to be machined find the recommended spindle speed by referring to the lower chart, which is 76 R.P.M. The nearest spindle speed is 64 R.P.M., which is the speed which should be used.

If the cutting edge of the tool bit does not stand up the spindle speed is too fast for the material being machined and the next slower spindle speed should be used.

In taking roughing cuts, use a rather coarse feed and heavy chip. Take as many roughing cuts as are required to reduce the work nearly to the finished size, then finish carefully and accurately, removing only a small amount of stock at each cut. To produce a smooth finish use a round nose tool bit with the cutting edge honed on an oil stone.

9-INCH LATHE SPINDLE SPEEDS

Cone Pulley Step...	Large	Middle	Small
Back Gears In.....	39	64	110
Back Gears Out....	208	348	596

SPINDLE SPEEDS FOR TURNING METALS

Diameter of Work Inches	Revolutions per Minute			
	Cast Iron 60 F.P.M.	Mild Steel 90 F.P.M.	Brass 150 F.P.M.	Aluminum 200 F.P.M.
1	229	344	573	764
1½	153	229	382	510
2	115	172	287	382
2½	92	138	229	306
3	76	115	191	254
3½	65	98	164	218
4	57	86	143	191
5	43	69	115	153
6	38	57	95	127

F.P.M. = Feet per minute at tool point.

Screw Thread Cutting and Other Machine Jobs

Handled on the 9-inch Junior Lathe in the Auto Service Shop



Fig. 98. Cutting a Screw Thread



Fig. 99. Acme Screw Thread

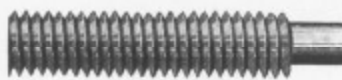


Fig. 100. National Coarse Thread



Fig. 101. Right Hand Double Screw Square Thread



Fig. 102. Internal National Coarse Thread

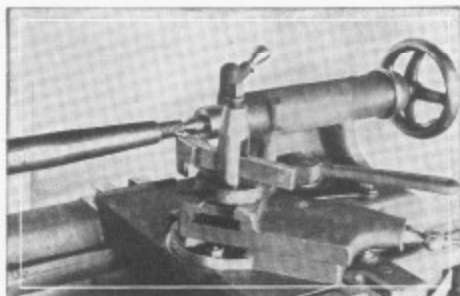


Fig. 103. Chasing a Thread on an Automobile Axle in the Lathe

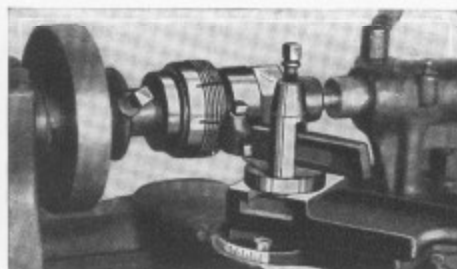


Fig. 104. Cutting a Screw Thread on a Bearing Retaining Collar

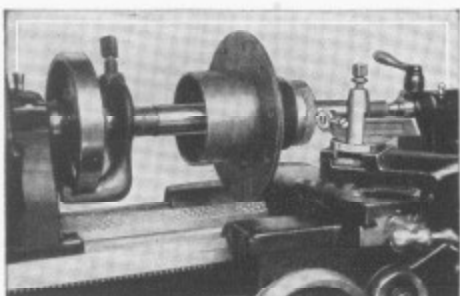


Fig. 105. Threading a Wheel Hub Mounted on a Mandrel Between Lathe Centers

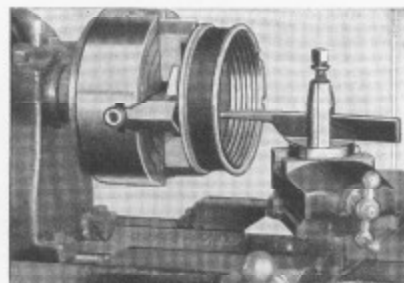


Fig. 106. Chasing the Threads on a Hub Cap Held in a Chuck in the Lathe

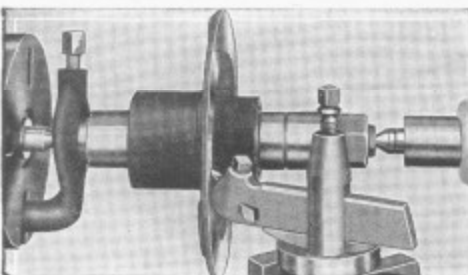


Fig. 107. Truing Hub Flange of Wood Wheel Mounted on a Mandrel Between Lathe Centers



Fig. 108. Drilling a Steel Bar Held Against Drill Pad in Tailstock

Electric Grinder for South Bend Lathes

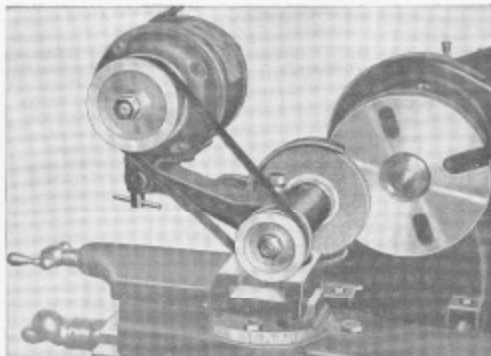


Fig. 109. Electric Grinder Mounted on Compound Rest of Lathe

The electric grinder attachment for the lathe, illustrated at the left, can be used for grinding and sharpening various types of valve reamers and cutters, straight and spiral reamers, hardened steel bushings, etc. This grinder operates from an electric lamp socket and clamps on the compound rest of the lathe.

The electric grinder can also be used for finishing pistons and refacing valves by grinding. However, we do not recommend the grinder for either of these jobs, because turning, as explained in the forepart of this book, is much simpler, quicker and more practical. Price includes grinder with $\frac{1}{2}$ H.P. motor; one Aluminum grinding wheel, $4 \times \frac{1}{2}$ inches (grain 46, grade "M") for work up to $4 \frac{1}{2}$ inches in diameter; extension cord, switch and clamp for mounting grinder to compound rest of lathe. Specify electric current when ordering.

Electric Grinder, for 9-inch Lathes, Cat. No. 15-I\$75.00

Adjustable Fixture for Holding Industrial Diamond and Cutter Stems, Cat. No. 19.....\$8.00

No. 18 Industrial Diamond, $\frac{1}{2}$ Carat.....8.00

Sharpening Valve Seat Reamers and Cutters

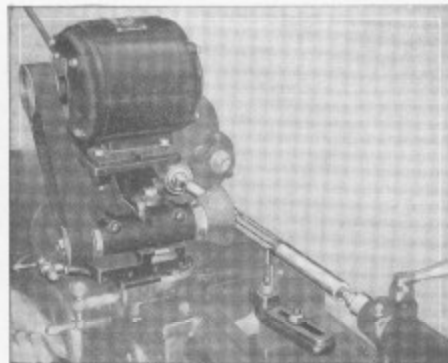


Fig. 110. Sharpening a Straight Reamer

The electric grinder can be used for sharpening straight reamers, spiral reamers, taper reamers, milling cutters, keyseat cutters, etc. This grinder is further illustrated and described in book "How to Run a Lathe."



Fig. 111. Sharpening Valve Seat Reamer

The valve seat reamer above is mounted between centers in the lathe. The grinder is mounted on the compound rest at the proper angle and fed by turning the compound rest handle. The spring stop locates each cutting blade in succession in position to be ground.

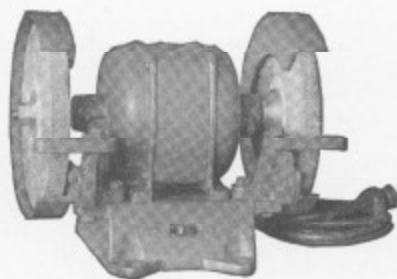


Fig. 112. 8-inch Motor Drive Bench Emery Grinder

This is the same grinder as is shown in the shop illustrated on page 2. The grinder operates from lamp socket and comes fully equipped with two 8×8 -inch grinding wheels—one fine and one coarse, extension cord, plug and switch, wheel guards and adjustable tool rests and a $\frac{1}{2}$ H.P. 110-volt, 60-cycle, 1 phase motor, 1,800 R.P.M. 8-inch Motor Drive Bench Emery Grinder, Catalog No. 4.....\$35.00

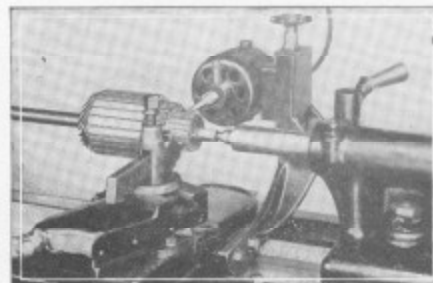


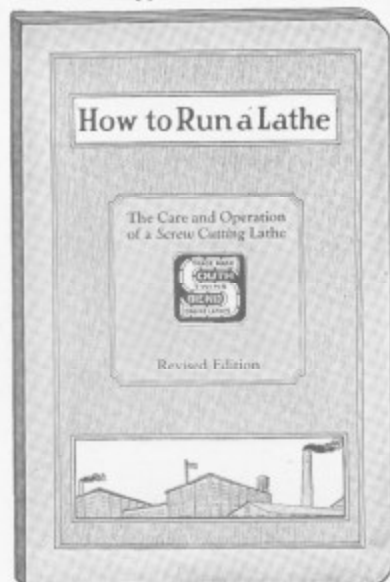
Fig. 113. Electric Mica Undercutter, Rotary Type

The Electric Mica Undercutter is practical for relieving mica insulation between segments of various size commutators. It is bolted to the saddle of the lathe and does not interfere when truing the commutator, as the undercutter spindle can be raised out of the way through the vertical adjustment.

Electric Mica Undercutter for 9-inch Lathes, Catalog No. 527.....\$50.00

"How to Run a Lathe," a Valuable Reference Book

A Copy of This Book Is Included with Each 9-inch Junior New Model Lathe

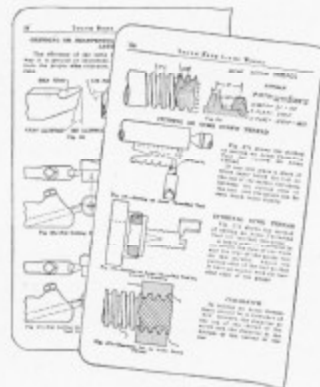


Size 5 1/4"x8"—160 Pages
300 Illustrations

Competent authorities say that this is one of the most complete books written on the subject of the back-gear, screw cutting lathe. It contains one hundred and sixty pages and more than three hundred illustrations, all devoted to the erection, installation and operation of the screw cutting lathe.

Four hundred different types of lathe jobs in modern machine shop practice are illustrated and described in this book. More than one million of these books have been published in the last twenty-three years. One of these books will be found in the equipment of each South Bend Lathe.

Price of additional copies, each, 25 cents. Mailed postpaid anywhere in the world. Coin or stamps of any country accepted.



Two Sample Pages

Partial List of Contents

Care of the Lathe—

Cleaning, Oiling, Adjusting, Leveling, etc.

Application of Lathe Tools—

Turning, Facing, Threading, Forming, etc.

Grinding Lathe Tools—

Clearance, Rake and Angle for Cast Iron, Soft Steel, Tool Steel, Brass, etc.

Setting Lathe Tools—

Height, Angle, etc., for various metals.

Cutting Speed of Metals—

Cast Iron, Steel, Brass, etc.

Centering—

Locating and Countersinking Centers, Center Drills, Countersinks, etc.

Care of Lathe Centers—

Hard and Soft Centers, Alignment of Centers, Truing Centers.

Machining on Centers—

Turning and Facing, Rough and Finish Turning, Use of Follower Rest and Center Rest.

Drilling in the Lathe—

3-Jaw Universal Lathe Chuck, Drill Chuck in Head Stock Spindle, in Tail Stock Spindle, Drill held on Tail Stock Center.

Grinding of Drills—Proper Angle, etc.

Thread Cutting—

U. S. Standard Threads, Acme Standard, Square Threads, External and Internal Threads, Multiple Threads, Right and Left Hand Threads, etc.

Taper Turning and Taper Boring—

Using Tail Stock Set-over, Taper Attachment, Compound Rest.

Chucking—

Showing application of Independent Chucks, Universal Chucks, Combination Chucks and Drill Chucks. Truing work in Chuck. Holding work for turning, boring and threading in the Chuck.

Face Plate Work—

Face Plate used as a Driver. Centering work on Face Plate. Face Plate used as a Chuck. Angle Iron on Face Plate.

Draw-in Collet Chuck Attachment—

Use in production on small accurate work.

Tool Room Lathes—

Showing application of the Taper Attachment, Thread Dial, Draw-in Chuck, Oil Pan, Oil Pump.

The Lathe as a Screw Machine—

Showing the use of the Tool Post Turret, Saddle Turret, Turnstile Turret, Hand Lever Turret, Hand closing Lever for Draw-in Chuck.

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Keyseating, Facing, Squaring a Shaft, etc.

Grinding in the Lathe—

Internal and External Grinder, Electric Grinder, Belt Driven Grinder.

Miscellaneous Lathe Operations—

Illustrated and described.

Interesting Booklets for the Mechanic

9-inch Junior Lathe Catalog No. 22

A Popular Lathe for Auto Repair Work

The 9-inch Junior Lathe Catalog is a 20-page booklet, 8½"x11", with over 100 illustrations, describing the 9-inch Junior New Model South Bend Back-Geared, Screw Cutting Lathe, in the various types and sizes, each of which is shown, explained in detail and priced. This is an interesting booklet for the shop owner and mechanic who needs a small back-geared, screw cutting lathe. It gives complete features and specifications of the 9-inch Junior Lathe shown in the Model Auto Service Shop on page 2 and as described on pages 30 and 33. The illustrations in this catalog tell the story a hundred times better than words.

A line of attachments, chucks, tools and accessories practical for use on the 9-inch Junior Lathe are also shown with descriptions and prices.

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Silent Chain Motor Driven Bench Lathes	Draw-in Collet Chuck Attachment
Horizontal Motor Driven Bench Lathes	Grinding Attachments
Self-Contained Motor Driven Bench Lathes	Examples of Practical Jobs for the Junior Lathe
Simplex Motor Driven Bench Lathes	Chucks, Tools and Accessories



Size 8½"x11", 20 Pages

General Catalog No. 91-A

Complete Information on South Bend Lathes

Our new General Catalog, No. 91-A, illustrates, describes and prices the entire line of 96 sizes and types of New Model South Bend Back-Geared, Screw Cutting Lathes, from 9-inch swing to 24-inch swing, Countershaft and Motor Drive. Each size of lathe is fully described with its features and specifications.

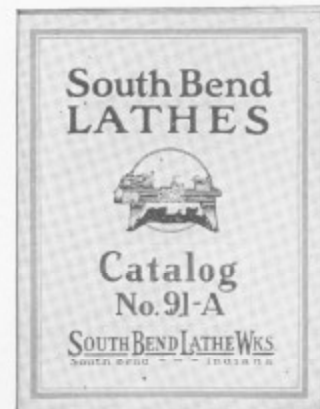
A full line of Attachments, Chucks, Tools and Accessories for use on South Bend Lathes is also shown.

This catalog is 6"x9", has 104 pages and more than 300 two-color illustrations. It is a reference book of considerable value to anyone who is interested in mechanical equipment.

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Easy Payment Plan Booklet No. 91-P

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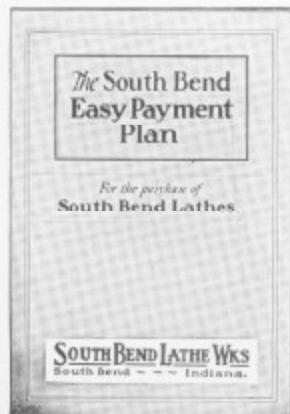
Any South Bend Lathe can be purchased on the Easy Payment Plan by making a down payment of 20% of the total order, the balance to be paid in twelve equal monthly payments beginning one month after shipment is made. Simply select the equipment from the catalog at the prices shown in any of our catalogs or booklets and send in the order. Shipment will be made immediately on receipt of down payment.

Example of Easy Payment Order

1—No. 22-YB, 9-inch x 3-foot Junior New Model South Bend Bench Lathe, Countershaft Drive (complete with Countershaft and Equipment as illustrated and described on page 30 of this booklet).

Price F.O.B. South Bend, Indiana.....	\$169.00
Down Payment (20% of \$169.00).....	\$ 33.80
Balance (\$169.00 less \$33.80).....	135.20
Monthly Payments (\$135.20 divided by 12).....	\$11.27
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