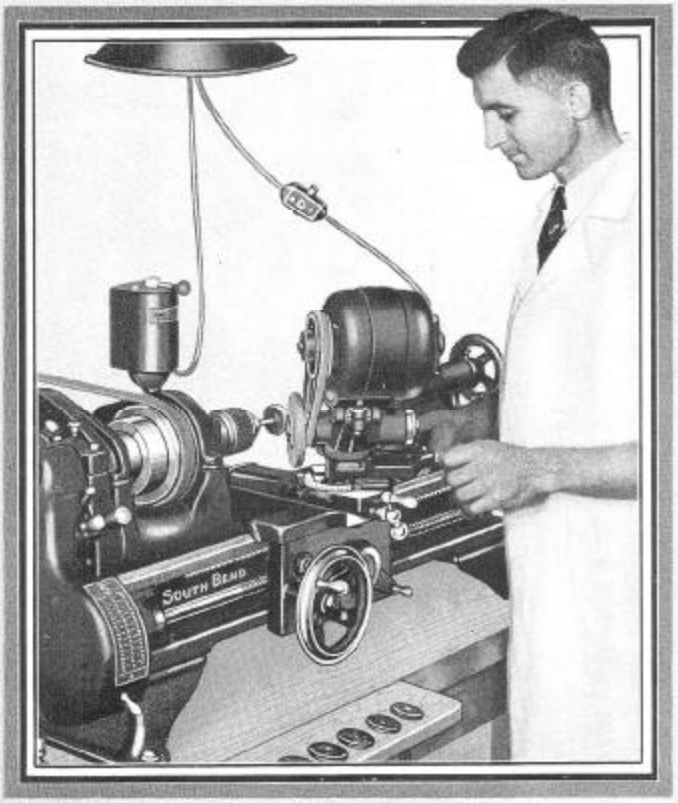
Bulletin No. 1

How to Grind Valves

IN THE

Auto Service Shop



Grinding a Valve in the Lathe

A Valve Grinding and General Purpose Lathe

For grinding and servicing valves of all sizes, makes and types used in the engines of automobiles, buses, trucks and airplanes.

In addition to outlining the latest shop practice and methods used in service shops for servicing valves, this bulletin also shows the application of the lathe for servicing armatures, bushings, pistons, connecting rods and for tool and machine work.

South Bend Lathe Works

401 East Madison St., - - South Bend, Indiana, U. S. A.

Lathe Builders for 26 Years . . . More than 55,000 Users

- - 1937

Valve Servicing Jobs Handled in The 9-inch Junior Lathe

Drawings Show Points at which Valve and Its Parts Require Servicing

The drawings below of the cylinder block in cross section show the valves of the "L" head valve engine and "overhead" valve engine and their relative parts in position as they appear in the cylinder block. When the car is in operation on the road the valves operate with great precision in the motor, therefore the servicing of the valves requires care and accuracy.

A study of the drawings herewith will clearly show the mechanic the importance of the servicing operations and the necessity of perfect alignment of the valve head, stem and tappet with the cam shaft. The valve and all its operating mechanism must be kept in perfect condition in order that they can operate with precision in their contacts. These contacts are: The valve face, valve seat, valve guide bushing, valve spring, valve stem end, valve tappet, cam shaft, and rocker arm. Servicing of all these various units can be done on the New 9-inch Junior South Bend Electric Valve Grinding Lathe, as illustrated and described on pages 3, 8 and 9. Illustrations showing how to do each of these jobs are shown throughout this bulletin.

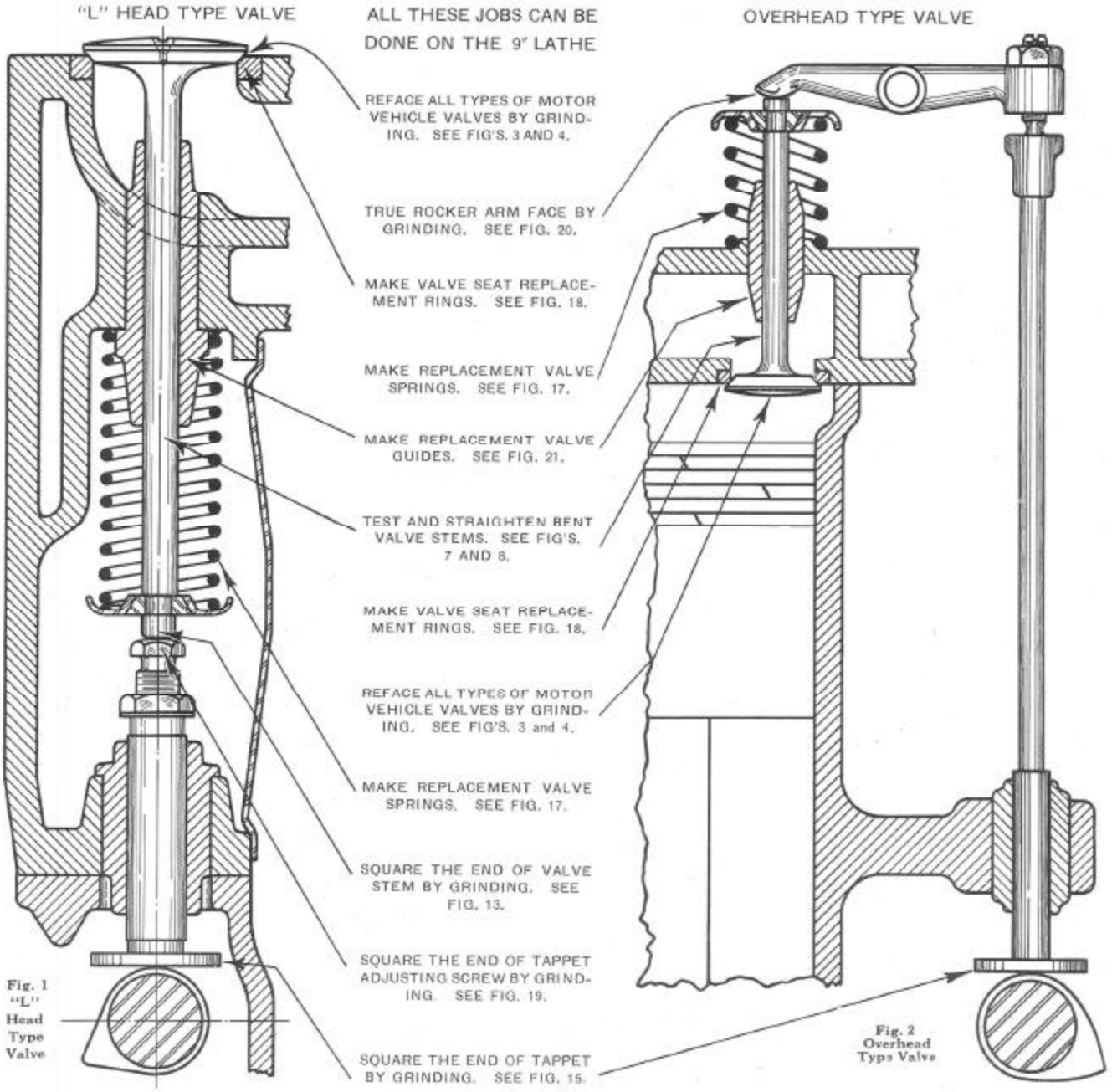


Fig. 1 "L" Head Type Valve

Fig. 2 Overhead Type Valve

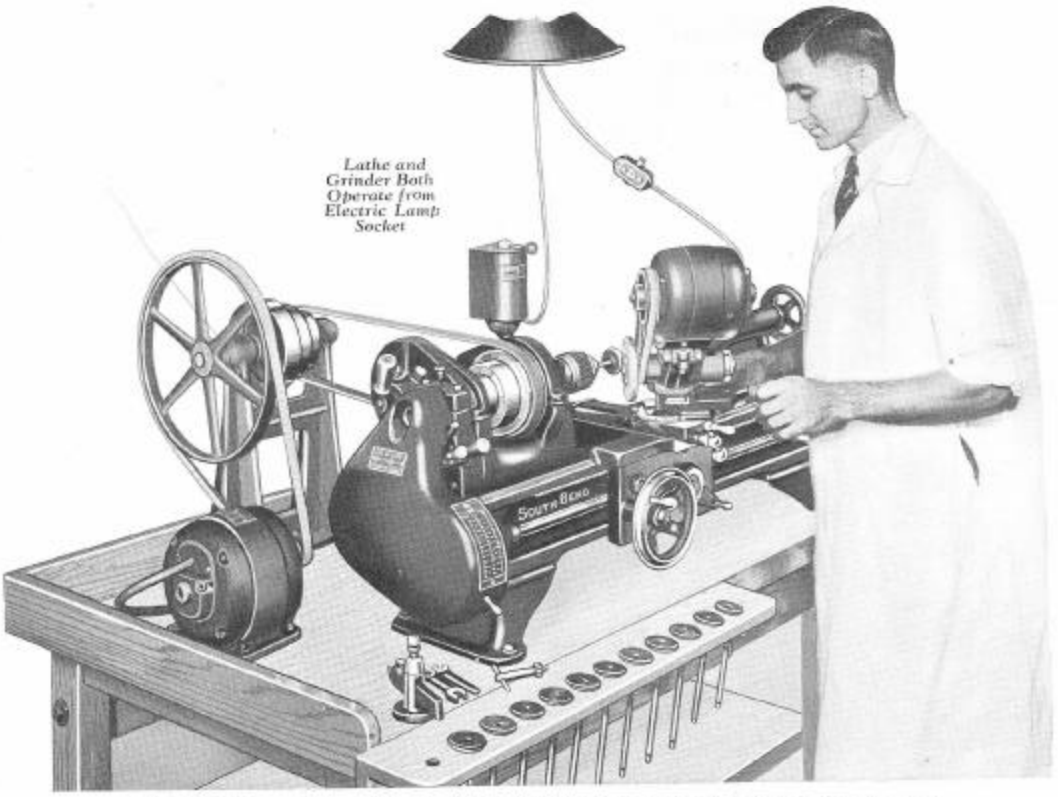


Fig. 3. Grinding a Valve in the New 9-inch Junior South Bend Electric Valve Grinding Lathe.

How to Grind Valves in the Auto Service Shop

On the New South Bend Electric Valve Grinding Lathe

The illustration above shows the New 9-inch South Bend Electric Valve Grinding Lathe set up for grinding valves. This lathe will accurately reface valves made of steel, cast iron and alloys, both intake and exhaust valves for all motor vehicles.

The lathe spindle has six speeds which enable the operator to vary the speed of the valve head when grinding valves of different materials and hardness to secure a smooth finish.

The lathe and grinder are operated by two electric motors, each of which is ¼ H.P.. Power is secured by connecting to the nearest lamp socket. Both motors may be operated from the same electric outlet.

The valve is held in a precision 3-jaw valve chuck which accurately centers the valve when gripping it. See figure 6, page 4. The grinding wheel is fed by hand across the face of the valve by turning the crank handle on the compound rest of the lathe. The depth of the grinding cut is controlled by the cross feed screw which has a micrometer collar reading in thousandths of an inch.

The grinding wheel is 4-in. in diameter, ½-in. face and of the correct grit and grade for valve face grinding. The wheel may be removed without interfering with end adjustment of grinder spindle. Other sizes and shapes of grinding wheels may be placed on the grinder for reamer and cutter sharpening.

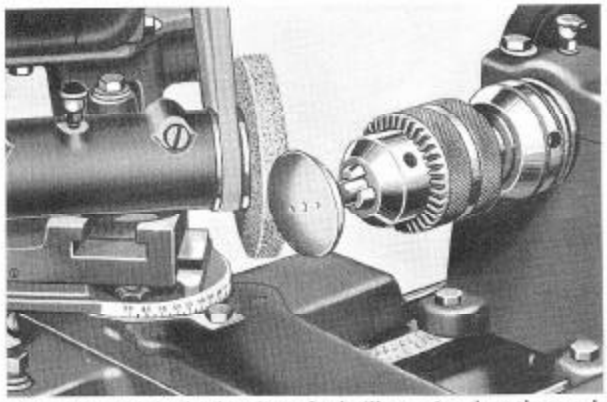


Fig. 4. Close up of Valve Grinding. In the illustration above the guards for the grinding wheel and belt have been removed in order to give a better view of the emery grinding wheel.

The illustration Fig. 4 is a view from the rear of the lathe to show the correct angle for setting the grinder. This angle is shown by the graduation in degrees on the base of the compound rest, any angle desired can be obtained.

Grinds Valves at Any Angle Required

The electric grinder can be swiveled to any angle required for valve face grinding, as shown in Fig. 4. The graduations on the compound rest are used to set the grinder in the correct position for refacing valves at 45-degrees or any other angle required. The compound rest is locked securely in position and all the valves in the set refaced with the one set-up.

Instructions for Grinding Valves

Complete instructions for setting up and grinding the valve and for servicing all parts of the valve will be found in the service manual illustrated and described on page 7 of this bulletin. A copy of the valve manual will be found in the lathe equipment to enable the operator to do the work with precision and accuracy.

Time Required to Grind a Valve

The time required to grind a valve face depends on the size and condition of the valve. A set of twelve valves can usually be ground in about fifteen minutes.

The New 9-inch Junior South Bend Electric Valve Grinding Lathe is a powerful, accurate tool and will be most valuable to any mechanic for all kinds of valve servicing operations and for general machine and tool work around the shop, requiring turning or grinding, or both. For further details, see pages 8 to 11.

Spindle of Grinder Used on New South Bend Valve Grinding Lathe

A Heavy Duty Precision Unit for All Accurate Grinding Operations

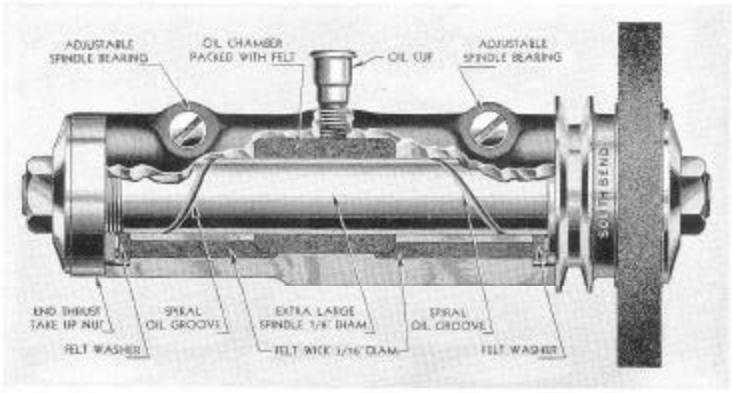


Fig. 5. Cross Section of Spindle of Valve Grinder Showing Construction of Bearings, End Adjustment, Bearing Take-up and Felt Wick Oiling System.

The spindle of the new valve grinder is ⅜-in. in diameter and runs in substantial bearings as shown in Fig. 5 at left. A large oil reservoir has an improved felt wick oiling system which provides a constant film of oil over the entire bearing surface of the spindle while it is revolving. Thrust collars, also wick lubricated, at both ends of the spindle, take the end thrust in either direction. Bearings are adjustable for wear, permitting close adjustment. Spindle operates at 4000 R.P.M., providing the correct surface speed to produce a smooth accurate finish.

V-Belt Drive from Motor to Spindle

Power for the grinding spindle is transmitted by "V" endless belt from the motor. Motor is ¼ H.P., 1725 R.P.M. for operation from 1-phase, 60-cycle, 110-volt, A.C. providing a powerful, smooth running wheel, free from chatter and vibration. The grinder may be operated from the same electric lamp socket that operates the lathe. A belt guard covers grinding wheel and V-belt.

Precision Chuck Used to Hold Valves in the Lathe

The 3-Jaw Precision Valve Chuck used to hold the valve is threaded direct to the spindle nose of the lathe, see Fig. 6. This chuck is hollow and will take all types and sizes of valve stems up to ⅜-in. in diameter, including Ford valves with mushroom end stems. The hardened chuck jaws are accurately ground and provide a long, firm gripping surface for the valve stem.

The valve chuck automatically centers the valve stem concentric with the axis of the lathe spindle. The valve is held in the chuck jaws on the valve guide bearing surface. This assures the valve being accurately refaced concentric with the valve stem where it is held in the guide, so that when replaced in the engine, the valve face will seat in the cylinder block perfectly.

The three chuck jaws operate simultaneously for gripping or releasing the work when the sleeve surrounding the body of the chuck is turned by hand or with the pinion wrench furnished.

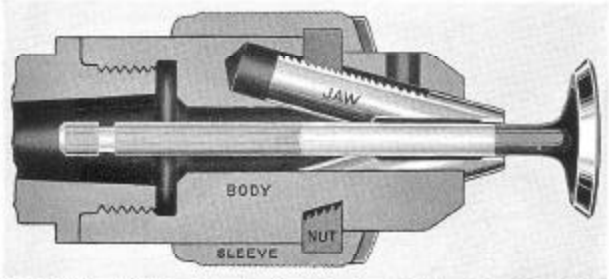


Fig. 6. Cross Section Showing Construction of 3-Jaw Precision Valve Chuck Threaded to Spindle Nose of Lathe. This chuck handles valves with stems up to ⅜-in. in diameter.

Testing and Straightening Valve Stems in the Lathe

All valves should be tested before they are refaced to determine if the valve stem is warped. If the valve does not run true, the valve head will be ground thin on one side, and may not clean up. After placing the valve in the valve chuck, the lathe spindle is started and a piece of chalk held so that it touches lightly against the revolving valve face as shown in Fig. 7. If the valve head runs true a chalk mark will show all the way around the valve, but if the valve stem is bent, the chalk mark will appear only on one side of the valve face.

The best method for testing and straightening the valve stem is shown in Fig. 8. The end of the valve stem is held in the valve chuck and the valve head runs on the tailstock center. The exact point where the stem is bent is easily located when the lathe is started and is marked with the chalk as shown in the illustration.

Valves having no center hole in the head may be tested in the valve chuck as shown in Fig. 7. The valve is then removed from the lathe and placed on an anvil or other flat surface. One or two light blows with a lead or brass hammer, at the point indicated by the chalk mark, will usually straighten the valve stem.

After straightening, the valve should be replaced in the lathe and tested again to be sure that it runs true. If the valve does not run true, repeat testing and straightening until a satisfactory degree of accuracy is obtained.

Manual No. 1, "How to Grind Valves," contains detailed information on the proper methods to use in testing, truing and straightening valves of all kinds and types. See page 7 for complete description and illustration of this Manual.

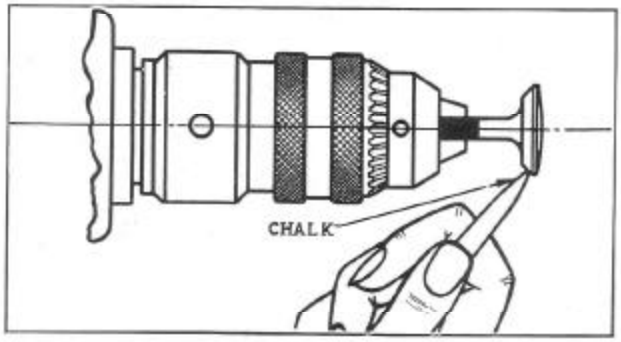


Fig. 7. Testing a Centerless Valve in the Precision 3-Jaw Chuck to See if the Valve Head Runs True with the Valve Stem.

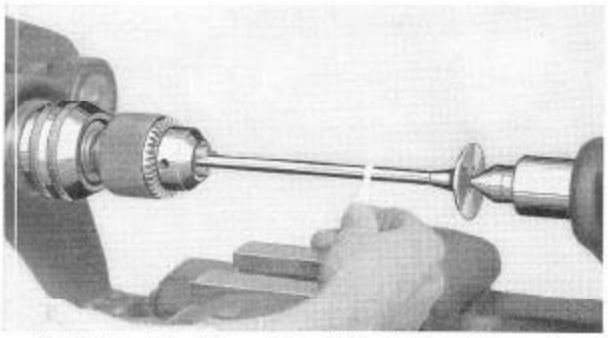


Fig. 8. Valve Head Supported on Tailstock Center for Locating the Exact Point where Valve Stem is Bent.

Various Grinding Operations in Valve Service Work

Using the New 9-inch South Bend Electric Valve Grinding Lathe

The illustrations below show a variety of grinding jobs that can be done on the 9-inch South Bend Back-Geared, Screw Cutting Lathe. All of the jobs illustrated and described on this page were handled on the 9-inch lathe, which is also illustrated on pages 3, 8 and 10. In addition to handling this work, the 9-inch lathe will also take care of all the other jobs shown throughout this bulletin.

Complete information and instructions for doing each of the operations illustrated below, are shown in the Manual No. 1, "How to Grind Valves," which is included with each South Bend Electric Valve Grinding Lathe. This Manual is illustrated and described on page 7 of this bulletin.

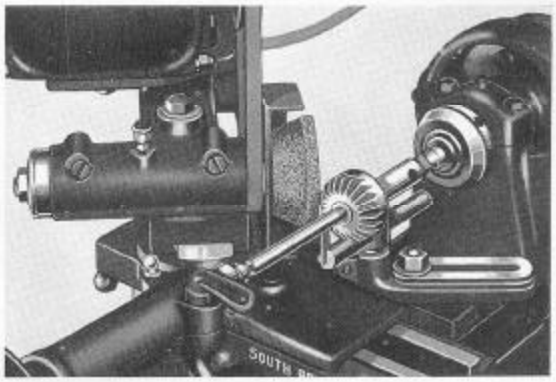


Fig. 9. Sharpening a Valve Seat Reamer in the Lathe.

Valve seat reamers of any angle, valve seat counterboring cutters, valve guide reamers, straight and taper reamers and adjustable reamers can be ground quickly and accurately in the Valve Grinding Lathe.

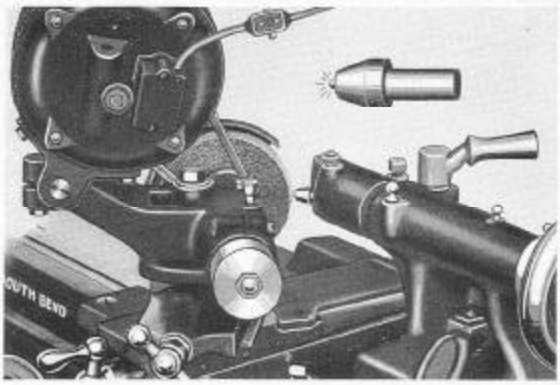


Fig. 12. Truing Grinding Wheel with Diamond Dresser.

The ½ carat diamond mounted in a steel shank is held in a special fixture clamped to the tailstock spindle of the lathe for convenience in truing the grinding wheel. The fixture remains on the lathe.

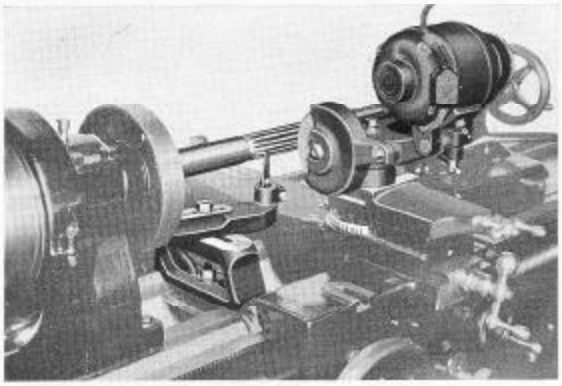


Fig. 10. Sharpening a Straight Reamer in the Lathe.

Fig. 10 illustrates the lathe and grinder set up for grinding a straight reamer. In this set-up the regular grinding wheel is used, however the cup wheel, as shown in Fig. 9, may be used, if preferred; either type wheel will produce a satisfactory job.

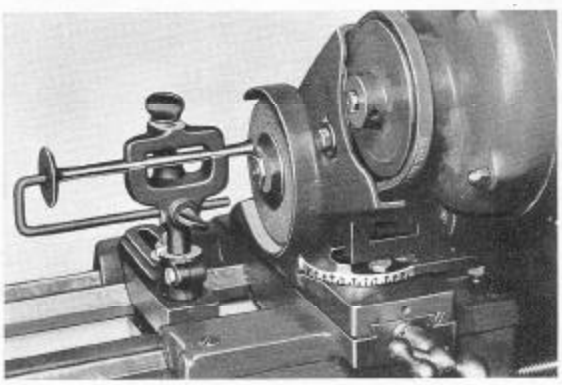


Fig. 13. Grinding the End of a Ford Valve Stem.

The V-block valve stem clearance grinding fixture shown in the illustration is used for squaring the ends of worn valve stems and for grinding Ford mushroom end valves for clearance adjustment. Fixture clamps on the inner ways of the lathe bed.

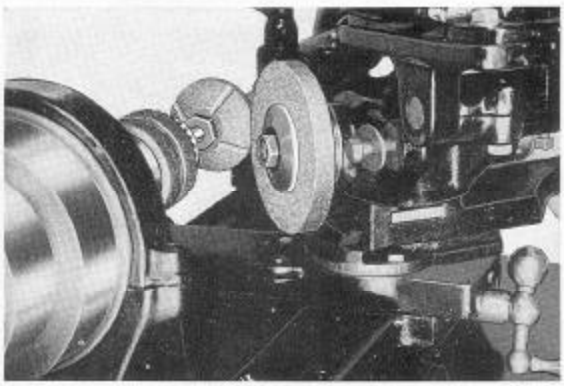


Fig. 11. Truing a Valve Seat Hone by Grinding in the Lathe.

Valve seat hones can be trued at any angle by using the grinder as shown in Fig. 11. The diamond dresser may also be held in the tool post and fed across the hone while it is held in lathe chuck, for truing.

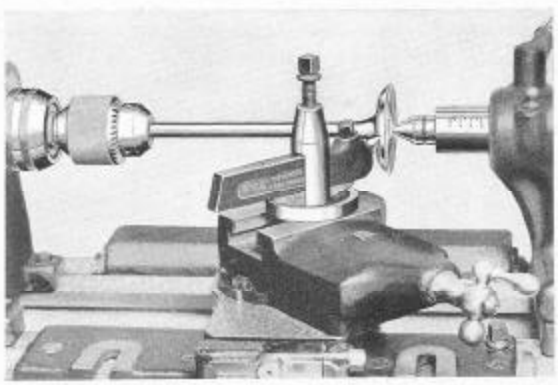


Fig. 14. Making a Replacement Valve.

Complete replacement valves may be machined in the lathe to suit all requirements. The valve may be made of bar steel, an old shaft, or other suitable material. No special equipment is required.

Important Valve Service Jobs Done on the Lathe

Using the New 9-inch South Bend Electric Valve Grinding Lathe

The illustrations below show set-ups of several valve service jobs that may be taken care of in the shop equipped with the 9-inch South Bend Electric Valve Grinding Lathe. All the operations illustrated and described on this page as well as those shown on pages 3, 4, 5, 10 and 11 were handled on this lathe. Complete information on how to do this work is given in the Instruction Manual No. 1, "How to Grind Valves," a copy of which is supplied free with each 9-inch South Bend Valve Grinding Lathe. See page 7.

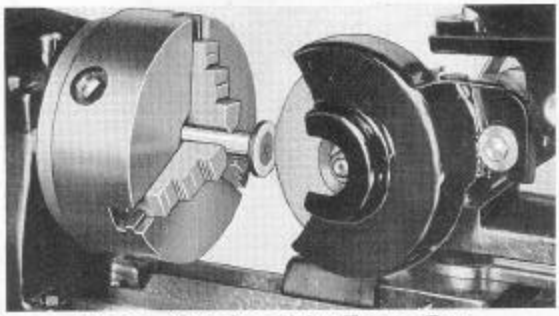


Fig. 15. Grinding Valve Tappet Face.

Worn valve tappets can be ground true on the face as shown above. The tappet is held in a three-jaw Universal lathe chuck and revolves while the grinding wheel is fed across the end of the tappet.

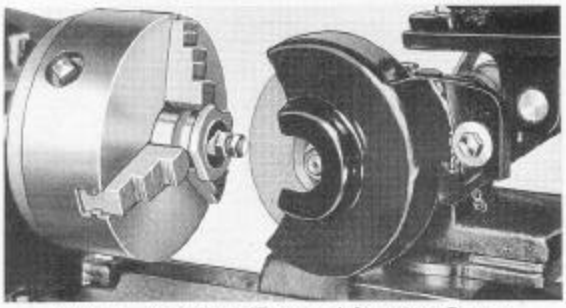


Fig. 19. Squaring Tappet Adjusting Screw.

Tappet adjusting screws that have become worn may be ground square on the end as shown above. The valve chuck may also be used for doing this job on tappet adjusting screws up to 5/8" in diameter.

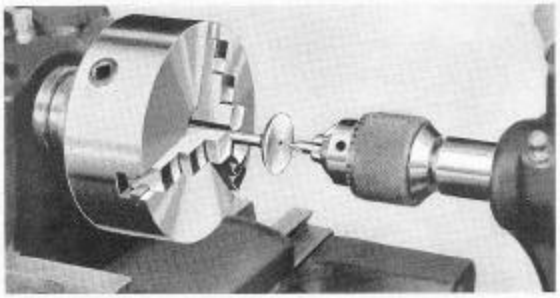


Fig. 16. Centering a Valve Head.

Valves having no center in the Head can be centered by placing the valve in a 3-Jaw Universal chuck as shown in the illustration above. Valves may also be held for centering in the precision valve chuck.

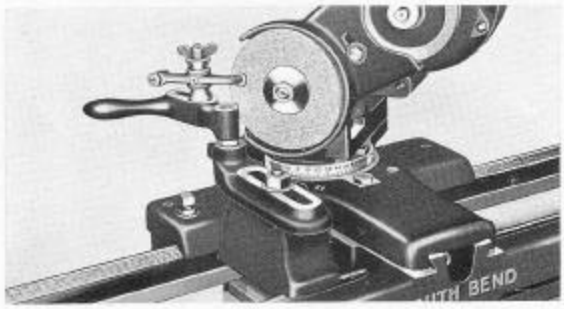


Fig. 20. Truing Rocker Arm Face.

Worn rocker arms can be accurately ground on the curved face as shown above. The fixture is adjustable for all sizes of rocker arms and with different degrees of curvature.

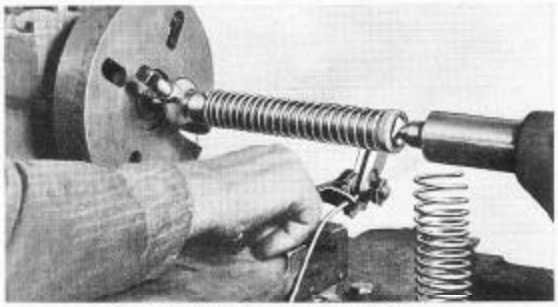


Fig. 17. Winding a Valve Spring.

Valve springs of all sizes and types can be wound in the lathe as shown in the above illustration. A special spring winding tool is used to guide the wire on the mandrel about which it is being wound.

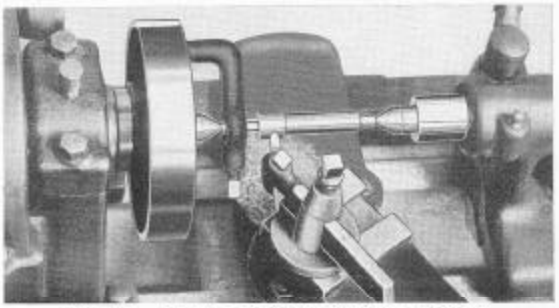


Fig. 21. Making a Valve Guide Bushing.

Replacement valve guides for orphan cars or for emergency repairs and guides for oversize or undersize valve stems can be turned out of cast iron or soft steel as shown above.

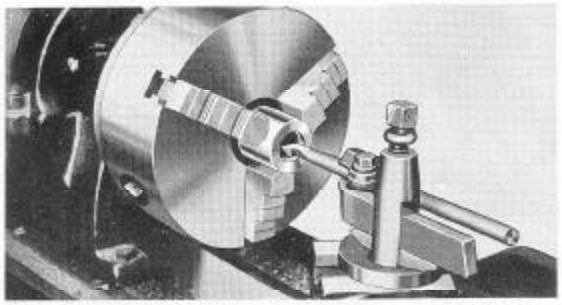


Fig. 18. Making Valve Seat Replacement Rings.

Replacement valve seat rings for all automobiles, buses, trucks, tractors, and gasoline engines, can be made in the lathe quickly and accurately from any suitable material.

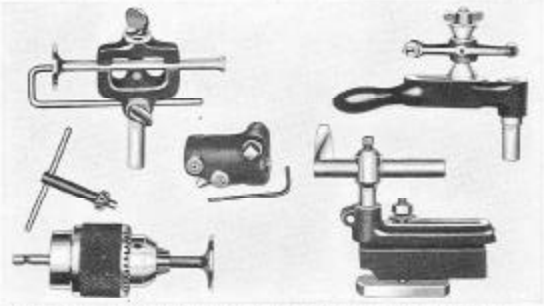


Fig. 22. Valve Grinding Equipment for Lathe.

The valve servicing equipment consists of valve chuck, reamer and cutter stop, tappet grinding fixture, valve stem grinding fixture, diamond holder and diamond dresser, as priced on page 8.

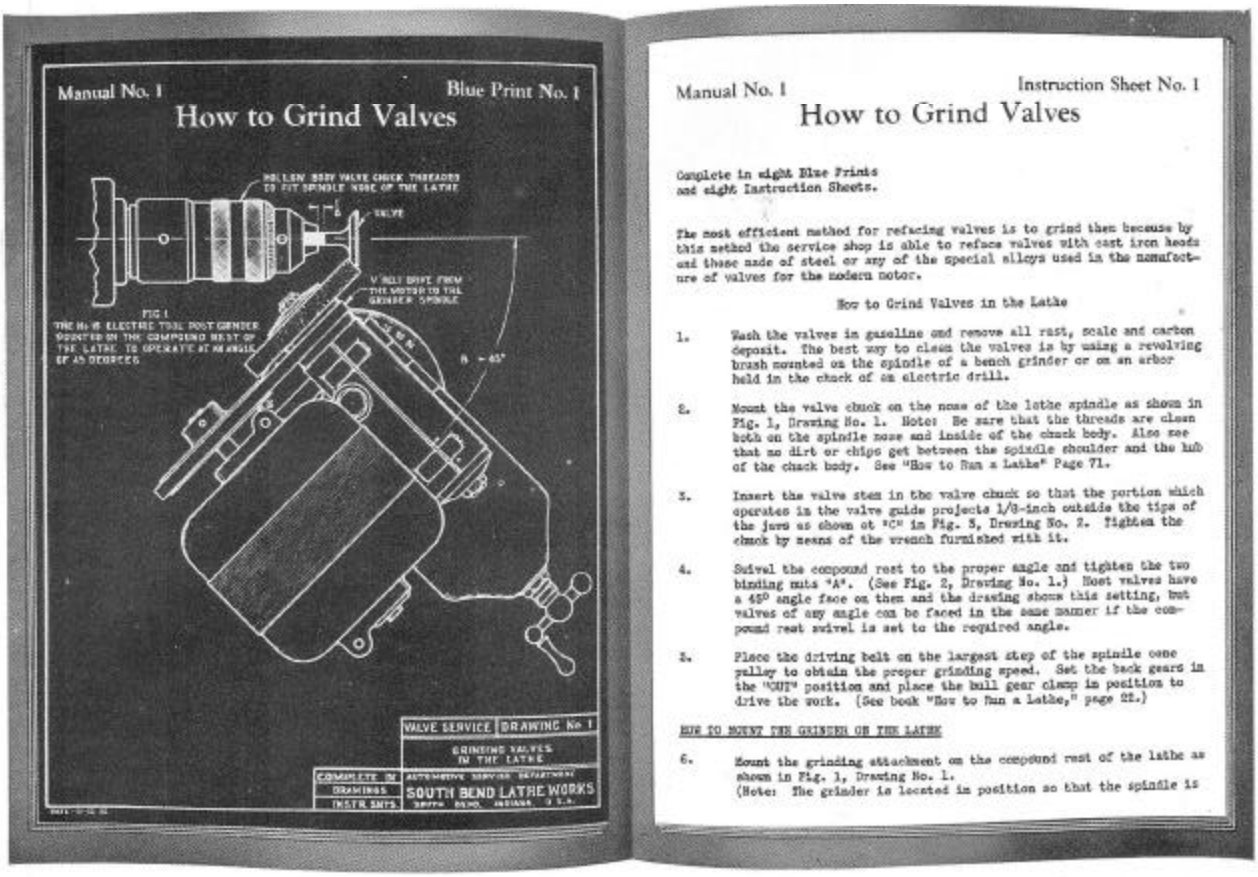


Fig. 23. The Illustration above Shows Service Manual No. 1, "How to Grind Valves." This Manual contains 10 Blue Prints, 8½" x 11", and 10 Instruction Sheets 8½" x 11".

Valve Service Manual Shows How to Do The Work

Supplied Free with the 9-inch South Bend Valve Grinding Lathe

Job Instruction Manual No. 1, "How to Grind Valves," as illustrated above, consists of ten blue prints and ten typewritten job instruction sheets, 8½" x 11". The blue prints illustrate the various operations described in the job instruction sheets and show how to set up the lathe for doing all the various valve service jobs described in this bulletin.

Valve Service Manual No. 1 shows how to do all the following jobs:

How to Grind Valves, all sizes and types.
How to True a Grinding Wheel.
How to Test a Valve for Trueness.
How to Grind a Valve Seat Reamer.
How to Grind Reamers of all types.
How to Square the End of Valve Stem by Grinding.
How to Grind Valve Tappet Face.
How to Square the End of Tappet Adjusting Screw.
How to Grind a Rocker Arm Face.
How to Make a Valve Guide Bushing.
How to Center Centerless Valves.
How to Test and Straighten Bent Valve Stems.
How to True a Valve Seat Hone.
How to Grind the End of a Ford Valve Stem for Tappet Clearance Adjustment.
How to Make a Replacement Valve.
How to Make a Valve Seat Replacement Ring.

This manual on Valve Grinding, and ten additional manuals on other automotive repair jobs have been prepared in our organization by experts who have had wide experience in the automotive service field. These manuals are prepared for the use of South Bend Lathe owners, to assist them in doing their work with accuracy and precision. We are proud of the reputation of the South Bend Lathe and have brought out these manuals in order to keep our users posted on the latest shop practice on motor service work. We are interested in the success of all South Bend Lathe users and are always willing to give our trade the benefit of our experience in this work.

Instruction Manual No. 1, "How to Grind Valves," bound in a heavy serviceable cover is included, free of charge, with the regular equipment of every South Bend Electric Valve Grinding Lathe. To anyone who is not a user of one of these lathes, the price of the manual is $2.00 per copy, mailed postpaid, to any address

Book "How to Run a Lathe" Supplied with Lathe

The book, "How to Run a Lathe" illustrated and described on page 12 of this bulletin is included with each South Bend Lathe. This book is of great value to the mechanic. It shows the correct cutting speeds for metals of all kinds, the correct feeds for machining metals, and much other important information on the operation of a lathe. This book makes it possible to produce the Service Manuals in their complete and concise form, because by using the book, "How to Run a Lathe" as a reference in connection with these manuals, much detail may be omitted from the manuals themselves.

Instructions on the Grinding of Lathe Tools. With each 9-inch South Bend Electric Valve Grinding Lathe is supplied a manual consisting of five blue prints and seven typewritten job instruction sheets describing how to grind cutter bits for turning, facing, boring, cutting-off, cutting screw threads, also showing angle of rake, clearance, etc., for all materials such as cast iron, steel, silichrome steel, chrome nickel steel, brass, bronze, copper, fibre, hard rubber, etc.

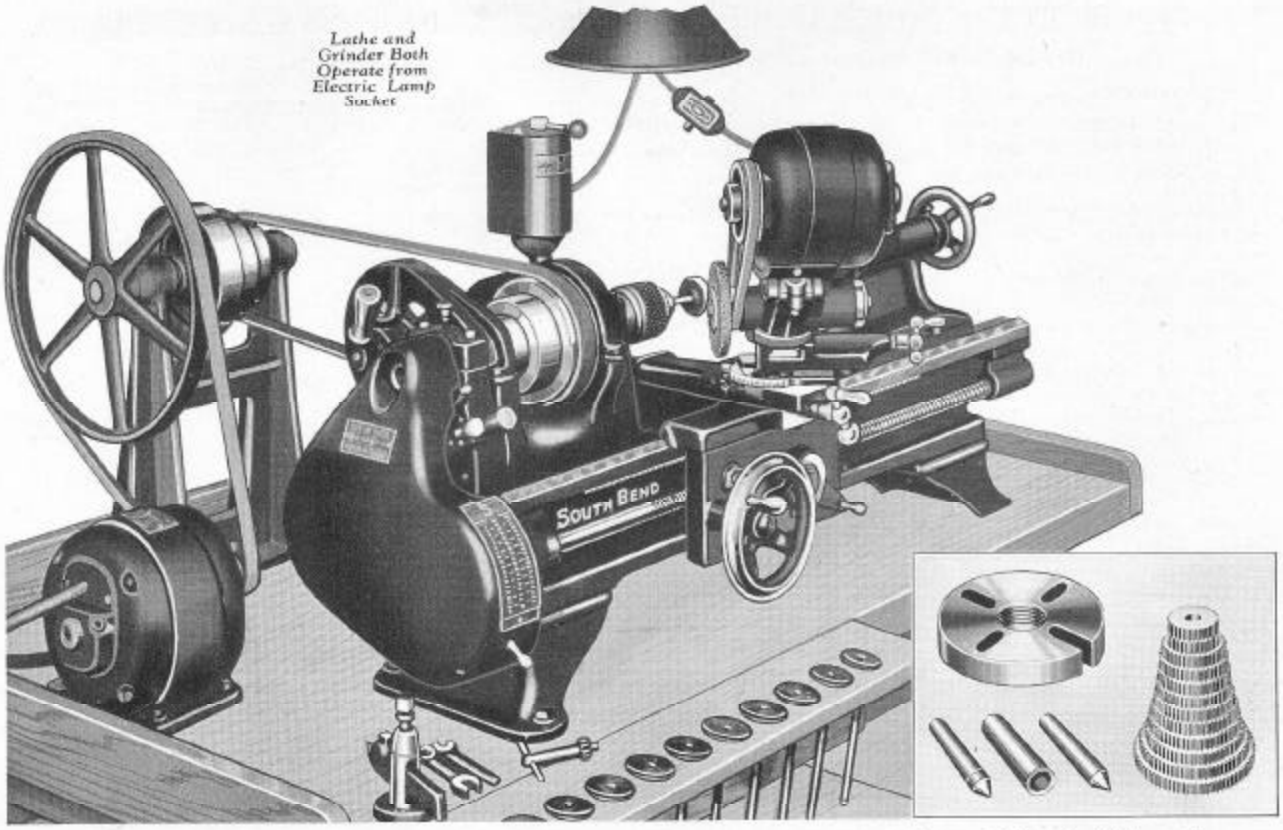


Fig. 24. The New 9-in. x 3-ft. Junior South Bend Electric Valve Grinding Lathe in Operation Refacing a Valve. Small Illustration Shows the Face Plate, Change Gears, Lathe Centers and Spindle Sleeve as listed in Regular Equipment for Lathe.

The New 9-inch South Bend Electric Valve Grinding Lathe

A Universal Tool For The Automotive Repair Shop

The New 9-inch South Bend Electric Valve Grinding Lathe illustrated above will reface all sizes and types of motor vehicle valves quickly and accurately. This is the same lathe that is illustrated and described on page 3 and is used in handling all of the jobs shown throughout this bulletin. This lathe has the power to reduce the diameter of a steel shaft ¼" in one cut.

Regular Lathe Equipment included in price of the New 9-inch Junior South Bend Electric Valve Grinding Lathe consists of: V-Belt Countershaft as shown above (for use on bench, wall or ceiling); graduated compound rest; face plate; tool post, ring and wedge; two 60° lathe centers; spindle sleeve; change gears for screw thread cutting and automatic longitudinal screw feed to carriage; wrenches; lag screws; washers; installation plan; book, "How to Run a Lathe," and Manual No. 1, "How to Grind Valves." Bench for lathe is not included in price.

Screw Thread Cutting. The 9-inch Junior Lathe is supplied with a set of independent change gears which provide for cutting standard screw threads from 4 to 40, per inch, right or left-hand, including 11½ pipe thread. A metal index chart, as illustrated at right, is attached to the lathe and shows the screw threads obtainable.

SCREW THREAD CUTTING CHART

GEARED SCREW FEED LATHE

8"-9"-11"

THREADS PER INCH	STUD GEAR	SCREW GEAR
4	64	32
5	64	40
6	64	48
7	64	56
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

Metal Index Chart on 9-inch Lathe.

Valve Servicing Equipment priced in the tabulation below includes all the attachments and accessories required for doing the valve servicing operations shown in this bulletin, such as; refacing valves, grinding ends of valve stems, rocker arm grinding, reamer sharpening, etc. Prices are itemized below so that the equipment wanted can be selected and the accessories and tools not wanted may be eliminated. See Fig. 22, page 6.

Price of 9 in. Lathe and Motor Drive Equipment

1—9-in. x 3-ft. Junior South Bend, Screw Cutting Electric Valve Grinding Bench Lathe complete with graduated compound rest, V-belt countershaft and other regular lathe equipment as listed at left. No. 422-Y. Shipping weight crated, 375 pounds..... **$164.00**

Motor Drive Equipment for 9-inch Lathe

1—¼ H.P. Motor, Start-and-Stop split-phase reversing type, 1725 R.P.M. (1-phase, 60-cycle, A.C. 110-volt)...	$10.00	
1—V-Groove Pulley for ½" motor shaft.....	.50	
1—V-Belt, motor to drive unit.....	.75	
1—Reversing Switch (drum type).....	5.00	
1—Stand for supporting reversing switch.....	1.50	
1—Flat Leather Belt (1¼" x 53") countershaft to lathe..	1.15	18.90
Total Price of 9-inch Lathe and Motor Drive Equipment...		**$182.90**

Price of Valve Service Equipment for 9" Lathe

1—Electric Grinder with ¼ H.P. Motor, 110-volt, A.C. 1725 R.P.M., switch, extension cord, Grinding Wheel 4" x ½", and V-belt, No. 14-B.....	50.00	
1—Precision Valve Chuck, ⅝-in. capacity, fitted to lathe, No. 907-A.....	9.00	
1—Diamond for truing grinding wheel, No. 406.....	4.50	
1—Diamond Holding Fixture, No. 504-B.....	2.25	
1—Holding Fixture and Spring Stop for reamer and cutter grinding, No. 19.....	8.00	
1—V-Block for holding valves when grinding end of stem for clearance, No. 545.....	3.00	
1—Rocker Arm Grinding Fixture, No. 703.....	3.00	79.75

Notes on the South Bend Methods of Automotive Servicing

In the New 9-inch Junior South Bend Electric Valve Grinding Lathe

VALVE servicing in the modern automotive repair shop is no longer confined to lapping the valve to the valve seat and adjusting the tappets. The modern shop is expected to do all the service work that is shown in this bulletin. The lathe is the only tool that will take care of all these jobs. The methods of refacing valves as described in this bulletin insure the greatest accuracy, precision and economy.

Thousands of Machinists during the past three years have entered the automotive service field as mechanics or have established shops of their own. Many of these machinists received their training in the automobile plants; they know that the back-geared, screw cutting lathe is the ideal tool for the motor service shop, because the parts to be serviced were originally made on the lathe; it is obvious, therefore, that the lathe is the ideal tool to service these parts.

In This Bulletin We Show the grinding method of refacing valves in the South Bend Electric Valve Grinding Lathe. Some mechanics prefer to turn the soft intake valves. This can be done in the lathe with an ordinary turning tool as shown in Fig. 14 on page 5. It is easy to produce a fine, smooth finish on soft valves by turning. The exhaust valves, however, should be refaced by grinding, as most of them are too hard to turn, and grinding produces a smooth finish on a hard surface.

Attachments and Fixtures shown throughout this bulletin for handling the automotive service work, can be fitted to the lathe in a few moments and just as quickly removed when the job is finished. Fitting a fixture or attachment to the lathe is just as simple as fitting and removing a lathe chuck.

Motors for the lathe and grinder are suitable for 1-phase, 60-cycle, A.C. If direct current motors are wanted, add $13.00 to price of lathe and $13.00 to price of grinder, as quoted on page 8.

When Ordering specify current, voltage, phase, cycle and number of wires. Do not specify 110-220-volt motor, as we cannot furnish motors with double voltage rating.

We Guarantee every South Bend Lathe to be accurate and mechanically perfect, to give you entire satisfaction and the service you have a right to expect.

We will replace, free of charge, anywhere in the United States, any part that proves defective, either in material or workmanship, within one year from the date of purchase.

We will ship a South Bend Lathe anywhere in the United States for a free fifteen-day trial in your own shop. If for any reason you are dissatisfied you may return the lathe in good condition at our expense and we will refund the amount you have paid including transportation charges.

Other Automotive Jobs Machined on the 9-inch South Bend Lathe

(See Equipment on Page 11)

Armature Servicing
- Truing Commutators, both Centered and Centerless Shaft Type
- Undercutting Mica
- Testing Armature Shafts
- Straightening Armature Shafts
- Restoring Damaged Center Holes
- Cutting Old Wire from Armatures
- Centering Armature Shafts

Piston Servicing
- Finishing Semi-Machined Pistons
- Regrooving Pistons
- Honing Piston Pin Bushings
- Lapping Piston Pin Bushings
- Reaming Piston Pin Bushings
- Grinding Pistons
- Reaming Piston Skirts
- Centering Pistons

Bushing Servicing
- Making Bushings of all kinds, including plain bushings, threaded bushings, etc., of bronze, steel, cast iron, fibre, bakelite, etc.

Connecting Rod Servicing
- Boring a Rebabbited Connecting Rod
- Aligning Connecting Rods
- Reaming Connecting Rod Pin Bushing
- Honing Connecting Rod Pin Bushing
- Lapping Connecting Rod Pin Bushing

Tool Work and General Machine Work

Features and Specifications of the 9-inch Junior Electric Valve Grinding Lathe

A Back-Geared, Screw Cutting Precision Lathe for the Auto Service Shop

Back-Geared Headstock is hand-scraped to bed, has three-step cone and takes 1¼-inch belt. Six changes of spindle speeds are provided, three direct and three back-geared, ranging from 39 to 596 R.P.M. Headstock has quick-acting wrenchless bull gear lock and spring latch reverse for feeds and threads.

Headstock Spindle is made of special alloy steel, finish ground, has ¾" hole its entire length. Collet capacity 1/64" to ½". Size of spindle nose 1½" diam., 8 threads. Lathe centers are No. 2 Morse Taper.

Headstock Bearings are phosphor bronze, line bored and lapped to a perfect bearing and are adjustable for wear. An improved oiling system lubricates bearings.

Saddle of carriage is strong and has a wide bridge. The carriage has long hand-scraped bearing surfaces on front and rear V-ways of bed and is provided with an adjustable gib. A locking device is provided for facing and cutting-off work. The cross feed screw has a micrometer collar graduated in thousandths.

Compound Rest is graduated to 180 degrees, swivels to any angle and has an angular travel of 1⅞". The compound rest screw is fitted with a micrometer collar graduated in thousandths of an inch. The slide is hand-scraped and has an adjustable gib. A forged steel tool post is provided and takes tool holder shank 11/32" x 13/16" for cutters ¼" x ¼".

Tailstock is hand-scraped to bed; has set-over for taper turning; graduated spindle; improved spindle lock; self-ejecting center.

Precision Lead Screw, ¾" diameter, eight Acme threads per inch, for cutting accurate screw threads and for automatic longitudinal geared screw feed to carriage.

Lathe Bed is 50% steel, heavily constructed and reinforced by box braces. Three V-ways and one flat way accurately planed and hand-scraped, align and support headstock, carriage and tailstock.

Automatic Feed. The 9-inch Lathe has automatic longitudinal geared screw feed to carriage and provides a wide range of feeds from fine to coarse. Automatic feeds are obtained by clamping the half-nuts on the lead screw.

V-Belt Countershaft furnished with lathe can be supplied for mounting on bench, wall or ceiling. Bench mounting type is furnished unless otherwise specified.

In Case You Wish to Use Your Own Motor instead of the motor supplied with the Lathe, you may do so. We can furnish a pulley for your motor if you will specify the diameter of shaft, speed of motor, and type of belt to be used.

Prices of 9-inch Junior South Bend Electric Valve Grinding Lathe

	9" x 3' Cat. No. 422-Y Net Factory Price	9" x 3½' Cat. No. 422-Z Net Factory Price	9" x 4' Cat. No. 422-A Net Factory Price	9" x 4½' Cat. No. 422-R Net Factory Price
9-inch Junior South Bend Electric Valve Grinding Bench Lathe, complete with Graduated Compound Rest, V-Belt Countershaft (for bench, wall or ceiling) and other Regular Lathe Equipment as described on page 8	$164.00	$170.00	$177.00	$185.00
Price of Motor Drive Equipment for 9" Lathe				
½ H. P. Start-and-Stop Type Reversing Split-Phase Motor, 1725 R. P. M., (1-phase, 60-cycle, A. C. 110-volt)	10.00	10.00	10.00	10.00
V-Groove Pulley for ½" Motor Shaft	.50	.50	.50	.50
V-Belt, Motor to Drive Unit	.75	.75	.75	.75
Reversing Switch (Drum Type)	5.00	5.00	5.00	5.00
Stand for Supporting Reversing Switch	1.50	1.50	1.50	1.50
Flat Leather Belt, 1¼" x 53" (Countershaft to Lathe)	1.15	1.15	1.15	1.15
Price, Lathe and Equipment, Complete	$182.90	$188.90	$195.90	$203.90
Weight of Lathe and Motor Drive Equipment Complete, Crated for Shipment	416 lbs.	441 lbs.	466 lbs.	491 lbs.

Distance Between Centers: Lathe with 3' bed, 16⅜"; 3½' bed, 21⅜"; 4' bed, 27⅜"; 4½' bed, 34⅜". Bench for lathe is extra, prices on request.

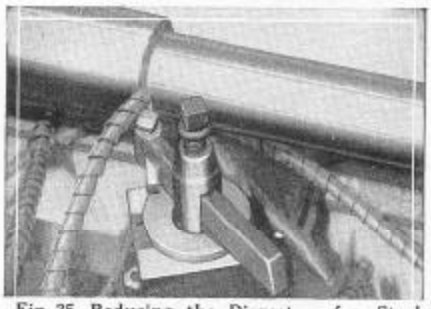


Fig. 25. Reducing the Diameter of a Steel Shaft ¼ in. in one cut

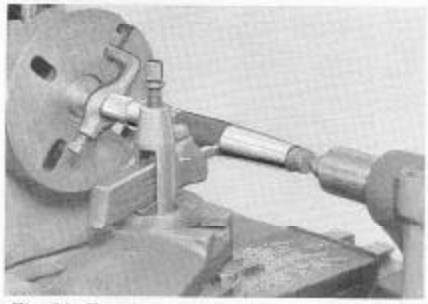


Fig. 26. Turning a Taper on an Axle Shaft with Tailstock Set Over

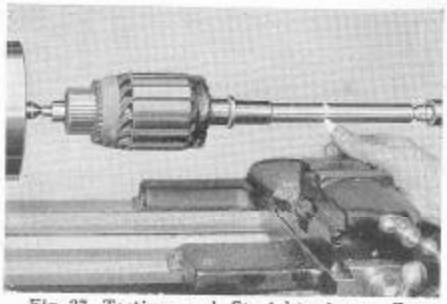


Fig. 27. Testing and Straightening a Bent Armature Shaft in the Lathe

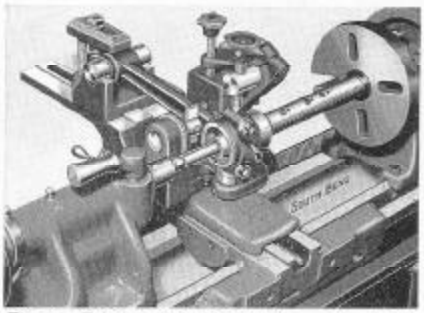


Fig. 31. Boring a Rebabbitted Connecting Rod in the Lathe

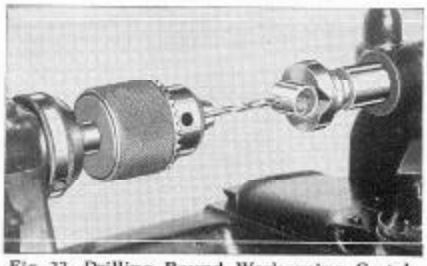


Fig. 33. Drilling Round Work using Crotch Center in Tailstock of Lathe

Fig. 35. Lathe used as Drill Press for Drilling Hole in Flat Piece of Work

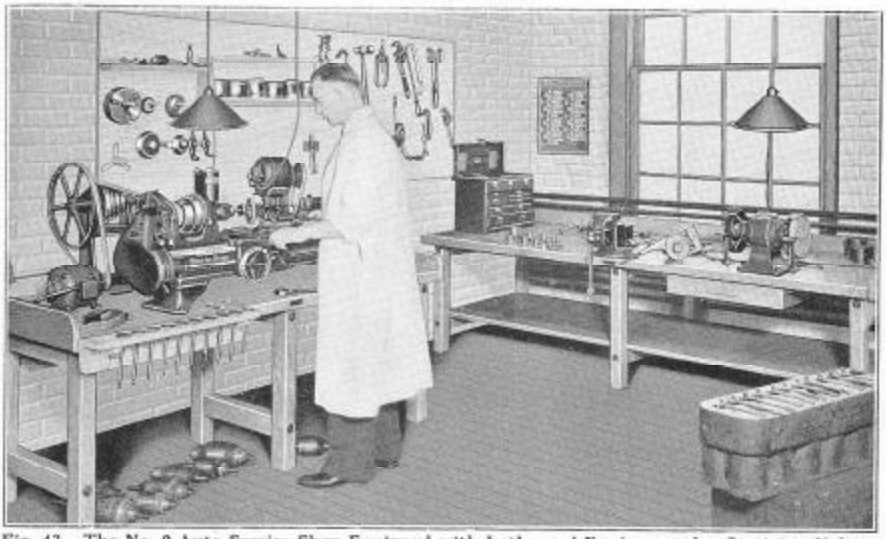


Fig. 43. The No. 9 Auto Service Shop Equipped with Lathe and Equipment for Servicing Valves, Pistons, Armatures, Bushings, Connecting Rods, etc.

The No. 9 Automotive Service Shop

For Small Service and Repair Jobs on the Automobile, Truck and Bus

The Completely Equipped Shop. The auto service shop illustrated above is completely equipped for small service and repair jobs on the automobile, truck and bus. The lathe shown is the 9-in. x 3-ft. Junior South Bend Lathe, as illustrated and described on pages 3, 8 and 9 of this bulletin. In addition to the lathe, the shop has the equipment for servicing valves as itemized on page 8, also the equipments for servicing armatures, bushings, pistons and connecting rods, as itemized and priced on page 11.

Shop Handles All These Jobs. All the jobs shown throughout this bulletin were handled on the 9-inch Junior Lathe as shown in the above shop. This lathe in addition to grinding and servicing valves is practical for truing armature commutators, undercutting mica, finishing pistons, making bushings, cutting screw threads, drilling, boring, tapping, sharpening reamers of all kinds, making tools, reaming, and hundreds of other auto service jobs.

Attachments May Be Added Later. The shop that intends to install the 9-inch Lathe need not buy all of the attachments and equipments at the time of its purchase. At any time later, after the lathe has been installed, attachments, tools and accessories for handling various classes of work may be added, when required.

Over 5,000 Auto Service Shops Equipped. The 9-inch Junior South Bend Back-Geared, Screw Cutting Lathe, illustrated in this bulletin, is the lathe that has become so popular in auto repair shops, garages, electrical shops and truck service shops. More than 5,000 automotive shops in the United States are using this lathe on auto service work.

Fig. 37. Chuck and Tool Assortment for Making Handy Shop Tools and for General Machine Work.

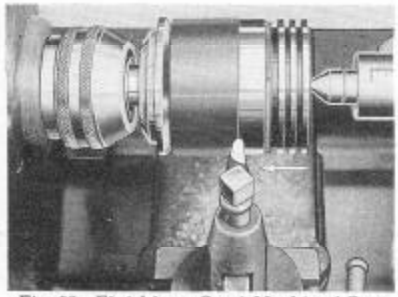


Fig. 38. Finishing a Semi-Machined Cast Iron Piston Mounted on the Piston Adapter

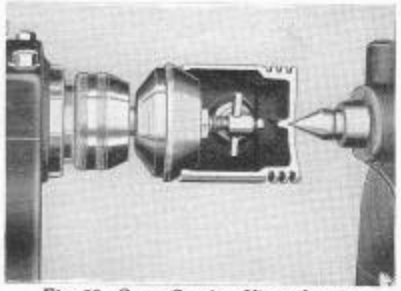


Fig. 39. Cross Section View showing Application of the Piston Adapter

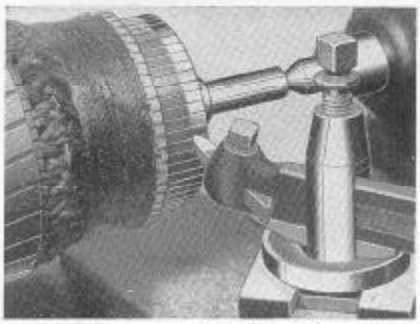


Fig. 28. Armature Commutators of Generators and Starting Motors are Accurately Trued.

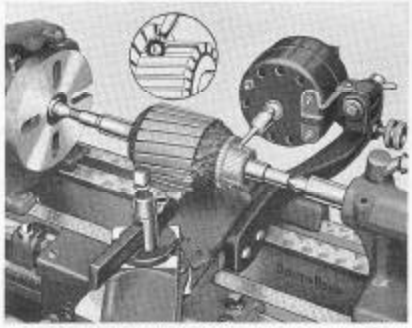


Fig. 29. Undercutting Mica with Rotary Electric Mica Undercutting Attachment.

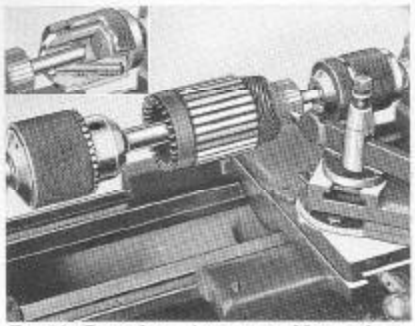


Fig. 30. Centerless Armature Mounted in Lathe using Tailstock Adjustable Bushing.

Equipments for Servicing Armatures, Bushings, Pistons, and Connecting Rods in the 9-inch Lathe

Equipments for 9-inch Lathe. Below we list and price individual equipments consisting of chucks, tools and fixtures for servicing armatures, bushings, pistons and connecting rods. These equipments may be fitted to the 9-inch Junior South Bend Lathe as illustrated and priced on page 8, and as shown in the No. 9 Automotive Service Shop on page 10.

Omit Items Not Wanted. All the equipments, attachments and accessories, or any combination of them may be ordered with the 9-inch Junior South Bend Lathe, also any item in the equipments can be eliminated if the shop has no use for them. The shop wishing to specialize in any one job can select the attachments and tools suitable for that work and eliminate the others.

Armature Commutator Truing Equipment for the 9" Lathe

1—Headstock Driving Chuck with Taper Arbor and Key for centerless armature shafts up to ¾" diam., complete. No. 907-B	$ 7.35	
1—Tailstock Adjustable Support Bushing for centerless armature shafts from ⅜" to ¾" diam., with No. 2 Morse Taper Shank. No. 361-B	8.10	
1—Straight Shank Turning Tool with H. S. steel cutter. No. 849-S	2.20*	
1—Electric Rotary Mica Undercutter for 110-volt, 1-phase, A.C. current, complete with five cutters, assorted widths. No. 544-B	25.00	$42.65

Bushing Equipment for the 9" Lathe

1—3-Jaw Universal Lathe Chuck, 5" cap., fitted to lathe. No. 741	$26.50	
1—3-Jaw Drill Chuck, ½" cap., with arbor fitted to lathe. No. 326	5.85	
1—Right-Hand Cutting-Off Tool with H. S. steel cutter. No. 881-R	2.35	
1—Straight Shank Turning Tool with H. S. steel cutter. No. 849-S	2.20*	
1—Boring Tool, Style "D", with ¼" bar. No. 505-A	2.50	
1—Malleable Lathe Dog, ½" cap. No. 2-M	.50	
1—Malleable Lathe Dog, 1" cap. No. 6-M	.70	
2—Comb. Center Drills and Countersinks, @ $0.20 each. No. 898-B	.40	$41.00

Piston Finishing Equipment for the 9" Lathe

1—Piston Adapter with driving Dog and No. 1-D Cone Ring for pistons 2¾" to 3⅛" diam. No. 44-A	$ 9.00	
1—Cone Ring for pistons 3⅛" to 3⅜" diam. No. 2-D	1.75	
1—Piston Skirt Reamer for pistons 2½" to 3⅛" diam. No. 1-R	6.00	
1—Piston Skirt Reamer for pistons 3⅛" to 3¾" diam. No. 2-R	6.50	
1—Straight Shank Turning Tool with H.S. steel cutter. No. 849-S	2.20*	$25.45

Connecting Rod Boring Equipment for the 9" Lathe

1—Connecting Rod Boring Attachment consisting of holding jig, V-block and adjustable clamping device for connecting rods up to 11¾" between centers and 4⅛" across bolt lugs. No. 1229	$30.00	
1—Boring Bar with cutter bits for boring, facing, filleting, and turning outside of bearings from 1¼" to 2½" diameter. No. 461-B	12.00	
3—Centering Cones for boring bar. No. 908	4.50	$46.50

*These items appear in two or more equipment lists and need not be duplicated when ordering.

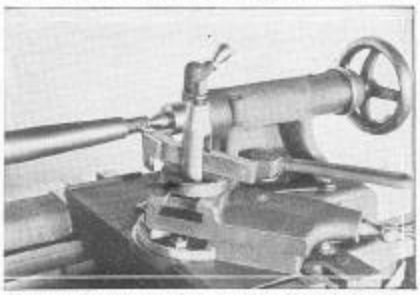


Fig. 32. Cutting a Screw Thread on an Axle, Screw Thread Range of Lathe, 4 to 40 per inch.

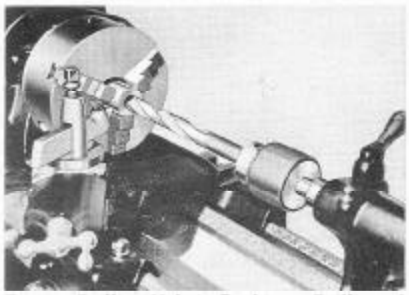


Fig. 34. Drilling Hole in Bushing. Drilling of All Kinds can be Done in the Lathe.

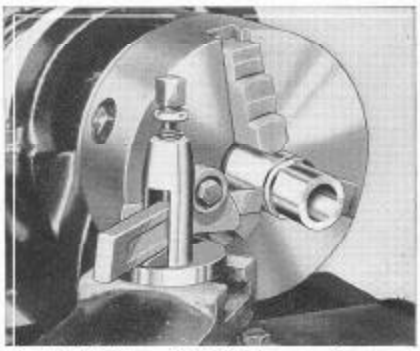


Fig. 36. Cutting-off a Bushing, made complete, in one set-up, in Chuck.

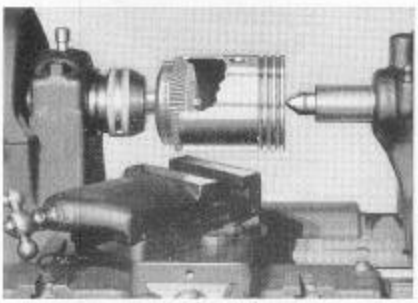


Fig. 40. Reaming the Skirt of a Piston. Reamer is held on Piston Adapter Shank.

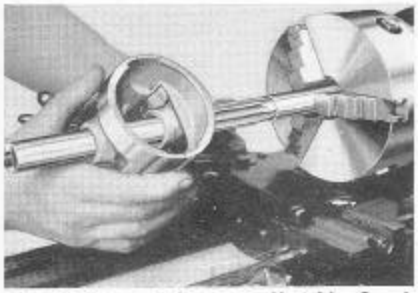


Fig. 41. Using Lathe as a Variable Speed Reamer Driver Reaming Wrist Pin Hole.

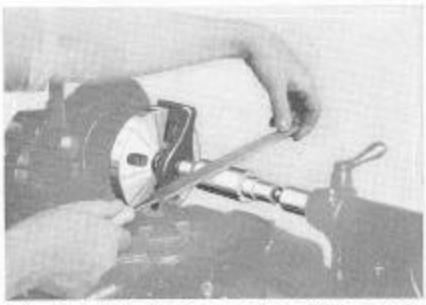


Fig. 42. Lathe is Practical for Filing, and Polishing Bushings, Shafts, Parts, etc.

Bulletins on Auto Service Work

Illustrated Automotive Service Bulletins, Size 8¼" x 11", 18 Pages, 40 Illustrations.

To Assist the Mechanic in the Motor Service Shop

About ten years ago, we devoted a room in our factory to be used as a laboratory for research on improved methods and equipment for automotive service and maintenance of all makes of automobiles, buses and trucks.

Our experience in this work has enabled us to publish a series of automotive service bulletins, of which this Bulletin "How to Grind Valves", is a sample. Each Bulletin contains about eight pages, 8½" x 11", and 40 illustrations on the latest shop practice and equipment for doing the work quickly and accurately.

Copies of these bulletins will be mailed on request to any address, postpaid, no charge.

"How to True and Undercut Armature Commutators," Bulletin No. 2 describes and illustrates the modern methods and equipment for truing armature commutators, undercutting mica, testing and straightening bent armature shafts, etc.

"How to Replace Flywheel Starter Gears," Bulletin No. 3 contains many valuable suggestions on turning down flywheels and fitting new starter gears.

"How to True Brake Drums," Bulletin No. 4 describes in detail how brake drums of all kinds are turned true. Also explains the South Bend Method of mounting wheels and hubs.

"How to Replace Differential Ring Gears," Bulletin No. 5 describes methods for removing the old differential ring gear, truing the ring gear seat and fitting the new steel ring gear accurately and quickly.

"How to Bore Rebabbitted Connecting Rods," Bulletin No. 6 illustrates the latest methods and equipment for boring rebabbitted connecting rods.

"How to Make Replacement Bushings," Bulletin No. 7 explains methods and equipment for making replacement bushings of brass, bronze, steel, cast iron, etc.

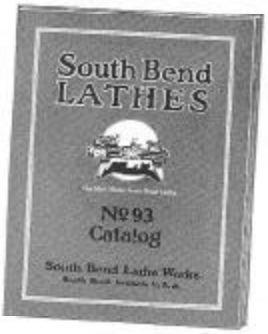
"How to True Crankshaft Bearings," Bulletin No. 8 describes methods for testing and truing throw bearings and main bearings of crankshafts, etc.

"How to Finish Semi-Machined Pistons," Bulletin No. 9 describes methods for finishing semi-machined pistons, also reaming and honing wrist pin hole, etc.

"How to Make Handy Shop Tools," Bulletin No. 10. This bulletin illustrates and describes how to make arbors, mandrels and other handy tools from salvaged material in the lathe; it also shows how to fit chucks, etc.

General Catalog No. 93

On South Bend Lathes, Attachments, Chucks, Tools and Accessories



The new 72-page General Catalog No. 93, size 8½" x 10¾", illustrates, describes and prices the 1933 line of New Model South Bend Back-Geared, Screw Cutting Lathes, from 8-inch swing to 36-inch swing and in bed lengths 2-ft. to 12-ft.

A valuable reference book for any machinist who is interested in modern industrial methods and latest shop practice in the machining of metals of all kinds.

A complete line of attachments, chucks, tools and accessories for each size South Bend Lathe is shown in this catalog.

A copy of this catalog will be mailed on request, anywhere in the world, postpaid, no charge.

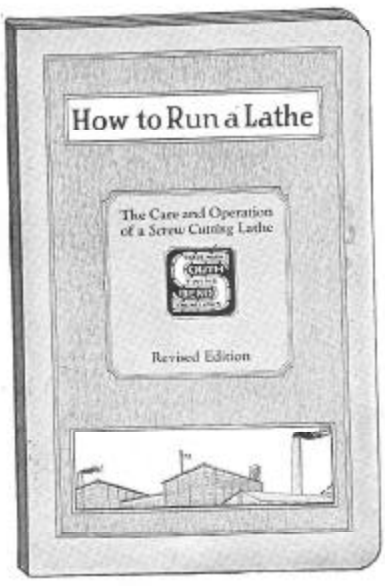
Easy Payment Terms

For Use Only in the United States of America, Alaska and Canada

For the convenience of our customers, we have an Easy Payment Plan that can be used when buying any size South Bend Lathe with attachments, chucks or tools. This plan gives you an opportunity to pay for the lathe while using it. To determine the down payment and monthly payment on your order, see tabulation below.

Schedule of Easy Payment Terms

If Total Price of Your Order Amounts to	Amount to Add for Financing	Amount of Down Payment	Payment Each Month	Approx. No. of Monthly Payments
$175.01 to $200.00	$11.50	$40.00	$13.00	12
200.01 to 225.00	13.00	45.00	15.00	12
225.01 to 250.00	14.50	50.00	17.00	12
250.01 to 275.00	16.00	55.00	18.50	12
275.01 to 300.00	17.50	60.00	19.50	12
300.01 to 325.00	19.00	65.00	22.00	12
325.01 to 350.00	20.50	70.00	24.00	12
350.01 to 375.00	22.00	75.00	26.00	12
375.01 to 400.00	24.00	80.00	28.00	12
400.01 to 450.00	25.50	85.00	31.00	12
450.01 to 500.00	29.00	95.00	34.00	12



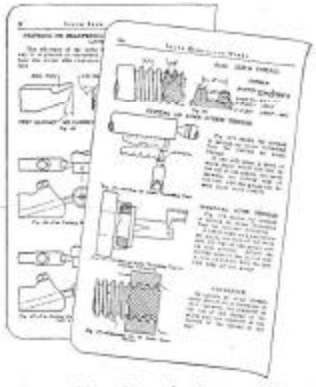
"How to Run a Lathe"—30th Edition

For the Mechanic and Apprentice

"How to Run a Lathe" is an authoritative manual covering the fundamental operations of the modern back-geared, screw cutting engine lathe. It contains 160 pages, 5¼" x 8", and more than 300 illustrations showing the most modern and practical methods for handling over 400 machine operations on the lathe.

More than one million two hundred and fifty thousand copies of this book are in use throughout the world. Used as a text book in the shops of vocational schools, trade and industrial schools, also by apprentice and mechanics in machine shops of all kinds. A copy of this book is included with the equipment of each South Bend Lathe.

Mailed anywhere in the world, postpaid, price 25 cents. Coin or stamps of any country accepted.



Two Sample Pages

PARTIAL LIST OF CONTENTS

How to Set Up the Lathe
Care of the Lathe
How to Lay Out a Shop
How to Level a Lathe
How to Hang a Countershaft
Calculating Size and Speed of Pulleys
How to Lace a Belt
Grinding and Setting Lathe Tools
Cutting Screw Threads
Turning and Boring Tapers
Grinding and Milling Work
Chucks and Face Plates
Cutting Speeds and Feeds on All Kinds of Metals
Operating Automatic Feeds
Reading Micrometer Calipers
Using Outside and Inside Calipers
Locating Center Holes
Aligning Lathe Centers
Drilling, Boring, Reaming, Tapping
Use of Compound Rest
Table of Decimal Equivalents
Table of Metric Measures
300 Other Shop Kinks

South Bend Lathe Works

401 East Madison Street, South Bend, Indiana, U. S. A.

(Established 1906 - - - Lathe Builders for 26 Years)

IXOM-12-24-'32

Printed in U. S. A.