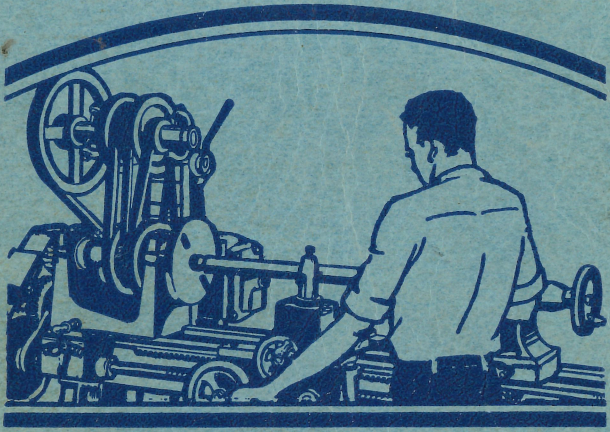
METALCRAFT SCREW CUTTING LATHE



INSTRUCTIONS FOR OPERATING AND LIST OF ATTACHMENTS

Sears, Roebuck & Co.

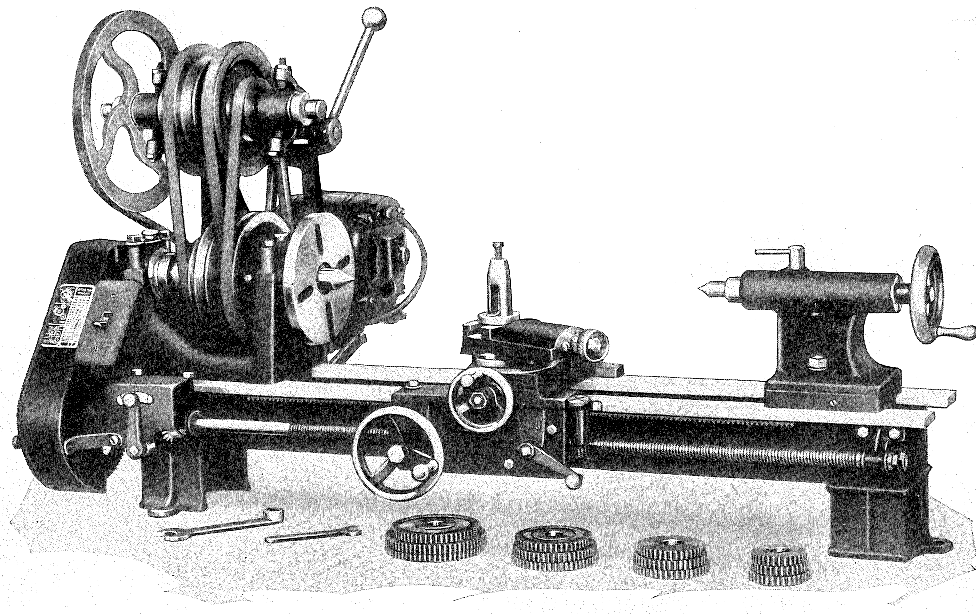
The World's Largest Store

METALCRAFT BENCH LATHE

Universally Used in the . . .

Home Workshop
Automobile Repair Shop
Manufacturing Plant
Electric and Radio Shop
Manual Training School
Model Shop

Operating Instructions and List of Attachments



CONTENTS

INTRODUCTION

The lathe has been justly termed the "Heart of the Workshop". It possesses greater versatility than any other machine—practically every machining operation can be performed on a lathe. For this reason it is the most universally used and universally useful item of equipment in any shop—large or small.

Because of its versatility, a lathe is the ideal machine for the **home workshop.** Many home craftsmen make their lathe pay for all the equipment in the shop. The market for small models and mechanical appliances is tremendous. Why not let this market pay for your equipment—and besides provide spending money for yourself? Besides original construction, a great deal of repair work can be done on your own car, truck, tractor, or home appliances, with a lathe.

In the **automobile repair shop** countless money saving and profit making jobs can be performed on a lathe—turning armatures, making bushings, boring bearings, truing valves, facing plates, yokes, etc. With the compound rest, valves of any angle can be faced. These jobs, plus all the regular turning and thread cutting operations that so often are sent out to a better equipped shop, make the lathe a profitable investment for any garage.

Every **manufacturing plant and machine shop** should have at least one of these lathes. Its convenient size and ready adaptability make it ideal for the experimental laboratory, maintenance department, tool room, or production bench. No line shafting power is required—the lathe is a complete unit in itself. Set it up anywhere—plug the cord in a lamp socket and it is ready to go.

The **electric** or **radio shop** will find many uses for a lathe—making motor pulleys or bushings, turning armatures, etc. Frequently there is a need for a dial or knob of peculiar size or shape. This sort of thing can be splendidly done on a lathe. A few special operations such as this, besides the regular duties of a lathe, will soon make it pay for itself in time saved and increased versatility of the shop.

For the **commercial model shop, patent attorney's laboratory,** and the like, the convenient size and economical running cost of this lathe render it invaluable. Its capacity is great enough to handle all work ordinarily encountered, yet the whole assembly may be set up on a bench, out of the way. Complete wood working equipment is available. The rigid stability and accuracy of this lathe make it a splendid machine for use in the construction of delicate models.

Vocational and manual training schools everywhere have hesitated about installing a number of lathes only because of their heretofore prohibitive cost. Here is an answer to that demand. A real lathe, constructed of the finest materials by skilled mechanics, offered at a price within the reach of everybody.

See this lathe—watch it run if possible. Examine the fine, workmanlike parts that make it turn out work more accurately than has been dreamed of in an inexpensive lathe up to now. Notice particularly the Vee belt drive—the most modern method of transporting power—that eliminates the necessity for complicated back gearing. With this type of drive the speeds are changed rapidly and simply with the power OFF. This is an added safety factor that means much, especially if inexperienced operators are running the lathe. There is little chance of catching a finger or part of one's clothing in these belts. Compare the lathe and all it offers with any other at anywhere near the same price—and then decide.

The Workshop. There are three natural factors to consider before choosing the location of the workshop—humidity, temperature, and lighting. These are relatively simple, yet they are important if the shop is to operate at maximum efficiency. A little careful thought in selecting the most suitable location will be rewarded by increased ultimate efficiency.

The bench upon which the lathe is mounted should be of solid construction to avoid possible vibration. Two inch planking is generally used for the top, supported by good, solid legs. Make it large enough to hold all tools without crowding. Arrange everything systematically and keep your tools in their places. Bolt all power driven tools to the bench.

Parts of a Modern Lathe. Fig. 1 shows the parts of a modern lathe. Study this; use it as a reference while reading the following directions.

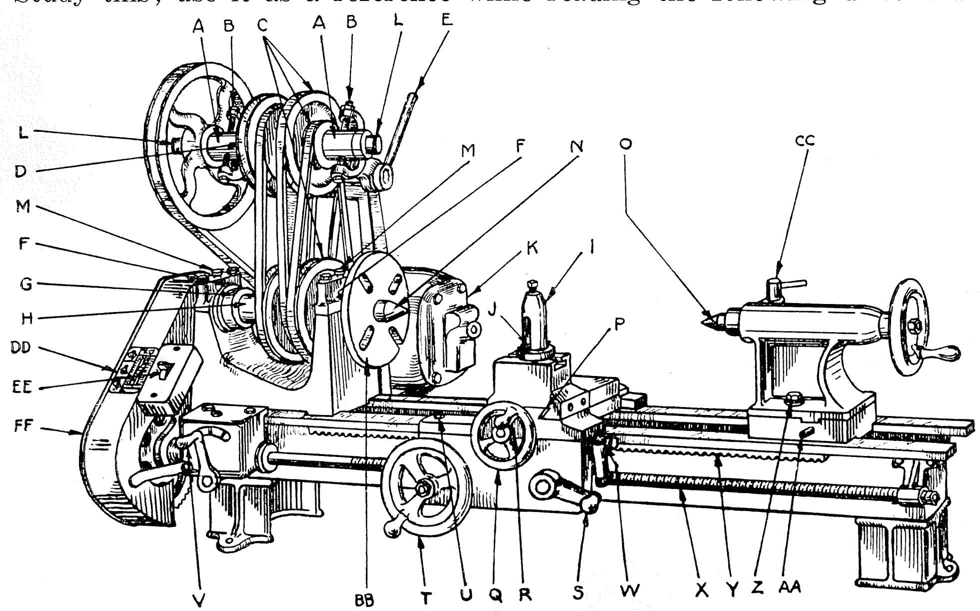


Fig. 1. PARTS OF A MODERN LATHE

A—Countershaft Bearing
B—Countershaft Adjusting Screw
C—Compound Drive Pulleys
D—Clutch Shift Collar
E—Belt Tension Lever
F—Spindle Bearings
G—Spindle Thrust Washer
H—Spindle
I—Tool Post
J—Tool Post Rocker
K—Motor
L—Countershaft Grease Cups
M—Spindle Bearing Oil Cups
N—Headstock Center (live)
O—Tailstock Center (dead)
P—Cross Feed Gib.
Q—Cross Feed Hand Wheel
R—Micrometer Collar on Cross Feed Screw
S—Half Nut Lever
T—Carriage Hand Wheel
U—Carriage Lock
V—Reverse Gear Lever
W—Threading Dial
X—Lead Screw
Y—Carriage Rack
Z—Tailstock Lock Nut
AA—Tailstock Set-over Screw
BB—Face Plate
CC—Tailstock Spindle Lock
DD—Threading Chart
EE—Motor Switch
FF—Gear Guard Cover

OPERATING INSTRUCTIONS

LOCATING CENTERS.

There are several ways of finding the centers of the work. Probably the easiest method, and the one most generally used, is illustrated in Fig. 2. An ordinary pair of spring dividers are used. Hold one point of the dividers against the edge of the stock and draw four lines as shown. Make a prick punch at the center of the enclosure formed by these lines. Test centers by hand revolving the work between lathe centers and marking high spots with chalk. When you are sure the centers are correct they must be drilled and countersunk. If a drill press or centering machine is not at hand, use a centering tool. (See Fig. 20.) Place this in the collet or drill chuck in the live center of the lathe and run the work to be centered against it until it is drilled and countersunk to the proper depth. Repeat this for both ends. The work is now ready to be turned. Improper centering will destroy the lathe centers. These centers should be carefully taken care of as upon them depends to a large extent the accuracy of the lathe. Keep the tailstock center points well lubricated at all times with one of the lathe center lubricants on the market or with a mixture of oil and white lead. Before placing the work on the centers, slip a lathe dog on one end. Make sure the dog is sufficiently large not to touch the center of the face plate, (See illustrations) as tension here tends to push the work off center. Adjust the tailstock so that there is no end play between centers yet so that the work is free to turn.

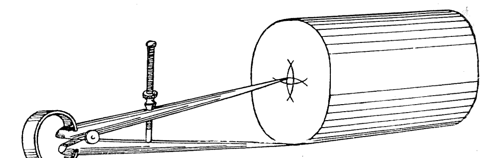


Fig. 2

CENTERING WORK IN A CHUCK.

The independent, four jaw chuck will be found the most satisfactory type for most work. Centering work in a chuck of this sort, first place it so that it seems about in the center. Run the lathe at a moderate speed and test the centering by holding a piece of chalk so that it touches only the high spots. Readjust the chuck until the chalk touches evenly all the way around. Before putting a chuck on a lathe spindle, always remember to clean the threads of both the chuck and the spindle.

Remember: A few extra minutes spent in carefully starting work may save hours and valuable material later.

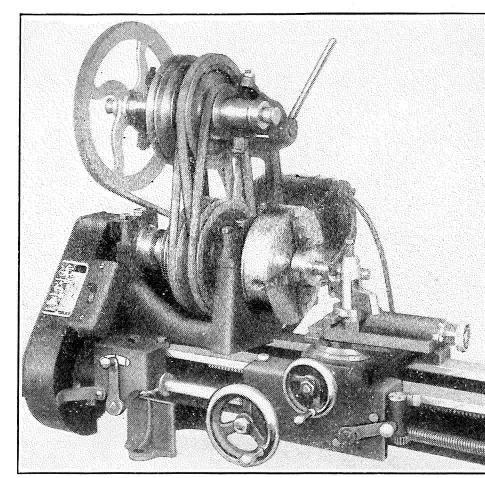


Fig. 3

CUTTING TOOL BITS. There is not enough space here to describe all the different kinds and shapes of cutting tools and their uses. It is wise if the unskilled purchase already formed tools for the particular operations he wishes to perform. Tool bits are not expensive and the purchase of a set of these will probably prove the cheapest and most satisfactory way out in the long run. (See Figs. 20 and 22.)

SHARPENING TOOLS. **Keep your cutting tools sharp at all times.** This is essential if good, clean work is to be done. A dull tool will leave a jagged, untrue piece of work. Sharpen the tools on a grinding or emery wheel and finish with an oil stone. Do most of the grinding on the top of the tool to retain the original shape as much as possible. Be sure the tool is ground with clearance so that only the cutting edge will touch the work. Be careful not to heat the tool so that it loses its temper. It is a good idea to have a skilled mechanic help grind your tools until you are familiar with the operation.

ANGLE OF TOOL TO WORK. The angle of the cutting tool to the work varies according to hardness of the metal being cut. The accompanying drawings (Figs. 4 to 6) show in general the proper angles to be used for the different classes of metals. Refer to these drawings before taking a cut until you are sure you know the proper angle for each metal.

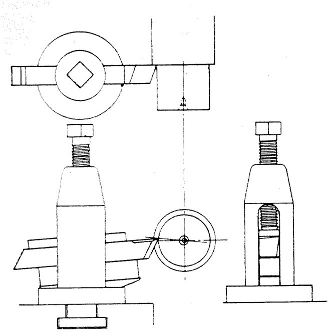


Fig. 4—Cutting Mild Steel or Cast Iron

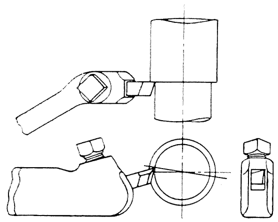


Fig. 5—Cutting Carbon Steel

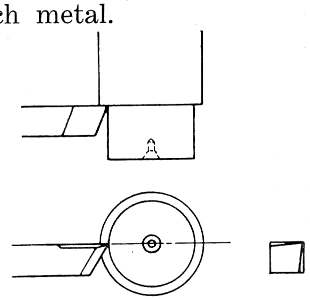


Fig. 6—Cutting Brass or Soft Metals

CUTTING SPEEDS. The speed a cut is taken varies according to the kind of metal being cut and the kind of cut—whether roughing or finishing. Brass may be cut faster than steel and a light cut faster than a heavy one. To change speeds; pull release lever "E", Fig. 1, toward front, arrange belts on cone pulleys to desired speed. Sliding collar "D" to right engages compound drive mechanism, to left, direct drive. Slowest speeds are in compound drive.

BELT TENSION. It will be noticed that there are two flat spots on the cam of the belt tension lever. For ordinary work the first step gives sufficient tension. When more power is necessary, for taking heavy cuts, the belts may be tightened by pushing the lever back to the second step.

FACING. Before starting a facing operation, it is wise to clamp the carriage to the bed, unless a carriage stop is used. This prevents it from moving away from the work. Arrange the cutting tool as shown in Fig. 7, so that the cutting edge is the only part that can touch the work throughout the operation. Note that the point reaches the work at just about the center, and at an angle of between 30 and 45 degrees. Feed the tool from the center toward the outside diameter. Take light cuts.

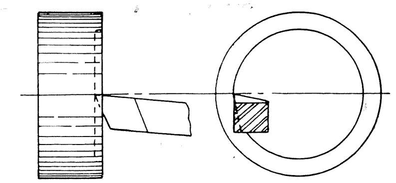


Fig. 7

TURNING LONG WORK—The Steady Rest. When turning long work, especially of small diameter, it is necessary to support it along its length. For this purpose a steady rest is essential. (See Figs. 8 and 26). Before placing this steady rest in position, locate the work between centers and turn lightly a concentric spot where the rest is to be placed. Now locate the steady rest, clamping it to the bed, and turn the screws down until they just touch the work. **Make sure there is no excessive pressure.** Too great a pressure on the jaws causes heating and resultant scoring of the work.

It is only necessary to loosen one jaw to remove work from the steady rest.

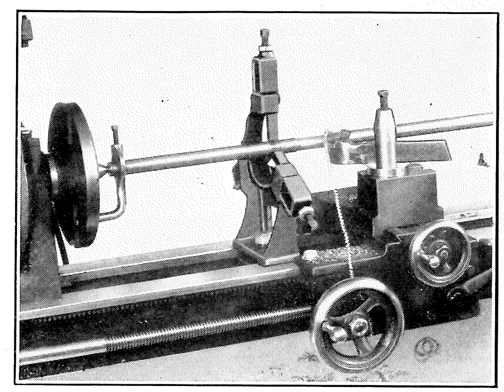


Fig. 8

BORING. For boring, and all inside work, a special tool is used. (See Figs. 9 and 20.) This tool should be set in the tool holder parallel to the lathe bed, the point just below center of the work and at a slight upward angle. Because of the tendency boring tools have to spring, light cuts should be taken, especially as the finished size is approached. Sometimes a straighter hole is bored if the tool is fed in both directions—in and out. It is always good policy when boring on a lathe to caliper the work often.

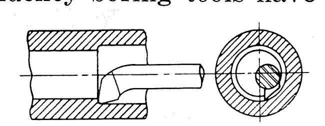


Fig. 9

CUTTING OFF. For cutting off, a special tool (See Fig. 10) is used. This tool is relieved from the back with the maximum width at the cutting edge to insure proper clearance throughout the operation. The tool must be set exactly at the center of the work and solidly clamped in the tool post. Take the size cut that seems to work the best; too light cuts may result in chattering while cuts that are too heavy will jam the lathe and very likely break the tool. The proper depth of this cut and the speed of the lathe depend, of course, upon the material of the work. When the work has been severed, finish off the ends with a facing tool.

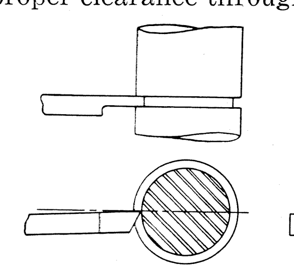


Fig. 10

TAPER TURNING. Taper is expressed by the difference in diameter per unit length; ½″ per foot, etc. To turn a taper of given dimension, move the tailstock off center, by means of screws provided for this purpose, **half** the amount of taper desired. For example: given a piece of round stock 12″ long; taper desired, ½″ to 1 foot. Move the tailstock ¼″ off center, place the work between the lathe centers and proceed with the turning operation in the usual manner. To check taper for accuracy, reduce to taper per inch; for example: ½″ to 1 foot is the same as .04166″ to 1 inch.

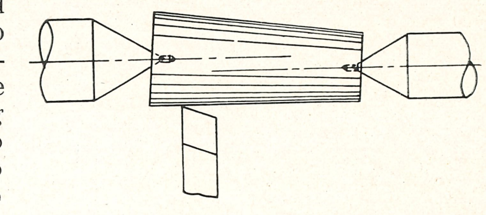


Fig. 11

Take a light cut and check with micrometer to see if proper amount of taper is present. Readjust tailstock to correct any error. For taper turning the tool must be as near center as possible.

KNURLING. Occasionally it is desired to knurl a handle, etc., on a lathe. For this purpose a special knurling tool (See Figs. 12 and 28) is used. Place this tool in the tool post and run it up against the work as near the center as possible. Start on the right end. Force the tool into the work slightly, set the longitudinal feed, and let it feed across the work. Do not remove the tool, but force it into the work a little more and let it feed back to the starting point. Repeat this process until knurling is finished. Use plenty of oil on the tool during the operation.

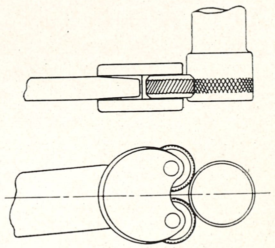


Fig. 12

THREAD CUTTING. After some practice, threads of any description can be cut on this lathe. The following explains only the U.S.S., or National Coarse Thread, as this is the most common. To cut accurate threads, it is of primary importance that the cutting tool be ground to the proper angle. For this purpose a thread gauge of the type shown in Fig. 13 is employed. Place the gauge along the work as shown and run the tool into the triangular notch. Inaccuracies can be immediately detected and remedied. The point of the tool should be exactly at the center of the work. (See Fig. 14.) Consult feed chart for proper gear arrangement. See that the threading dial is in mesh. Before starting to cut a thread read the following carefully: Cutting any

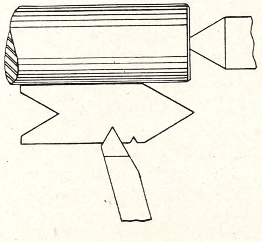


Fig. 13

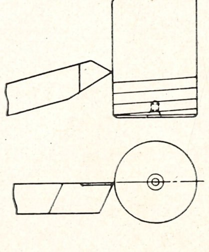


Fig. 14

even thread, engage the feed lever with the line on the carriage corresponding to **any line** on the threading dial; for cutting odd threads, use either of the **numbered** lines on the dial; for cutting half threads, use one of the numbered lines, but be sure to use the **same number** for each cut. If the above directions are not followed carefully the result will be a split thread. It is a good idea after the first cut has been made to measure the number of threads per inch as a final check. (See Fig. 16.) If everything is found to be correct go ahead with the cutting until the proper depth is reached. This is best determined by actually trying the nut on the thread.

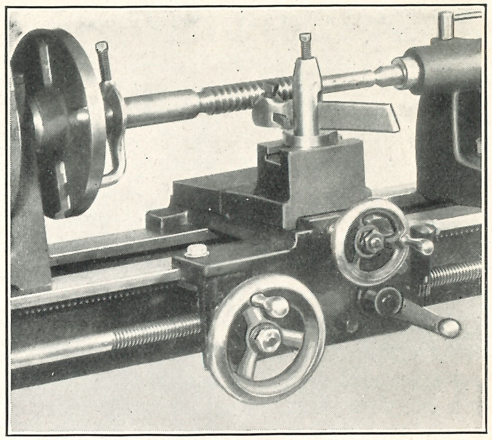


Fig. 15

Inside threads are cut in much the same manner except that an inside threading tool must be used. First of all caliper the hole to be sure that it is absolutely true. Test the angle of the threading tool in the manner shown in Fig. 17. The same rules apply for inside threading that apply to boring. Light cuts must be taken because of the tendency of the tool to spring. The tool should be ground so that it is used parallel to the lathe bed and as near the center of the work as possible. Threading tools are kept on center to insure a properly angled thread.

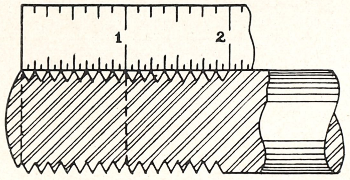


Fig. 16

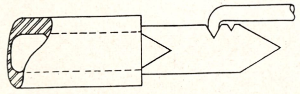
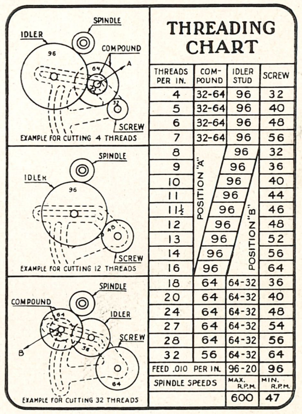


Fig. 17



THREADING CHART

THREADS PER IN.	COMPOUND	IDLER STUD	SCREW
4	32-64	96	32
5	32-64	96	40
6	32-64	96	48
7	32-64	96	56
8	POSITION "A"	96 POSITION "B"	32
9		96	36
10		96	40
11		96	44
11½		96	46
12		96	48
13		96	52
14		96	56
16		96	64
18	64	64-32	36
20	64	64-32	40
24	64	64-32	48
27	64	64-32	54
28	64	64-32	56
32	56	64-32	64
FEED .010 PER IN.		96-20	96
SPINDLE SPEEDS		MAX. R.P.M.	MIN. R.P.M.
		600	47

Fig. 18

UNIVERSAL CHUCK. (See Figs. 19 and 25.) This Chuck was developed especially for use on this lathe. It is threaded to fit the spindle and capably replaces expensive draw-in collets. With it small diameters from ⅛″ to ⅝″ can be mounted in the lathe and turned, etc.

COMPOUND REST. (See Figs. 19 and 27.) With a compound rest the cutting tool may be fed to the work at any angle. This makes possible the cutting of tapers beyond the range of the regular taper attachment. This type rest is also of valued assistance in thread cutting. For cutting U.S.S. thread, for example, set the rest at 29 degrees. Grind and set the tool in the usual manner and run it up to the work with the cross slide screw. Mark a line across the dial on screw with chalk and return feed screw to this line after each cut. Do feeding in with the compound rest. In this method the cutting tool cuts on only one side and produces a cleaner thread. There is also less chance of chipping off end of cutting tool.

The compound rest listed on our accessory page is especially built for use on this lathe. It is graduated in thousandths of an inch for precision work.

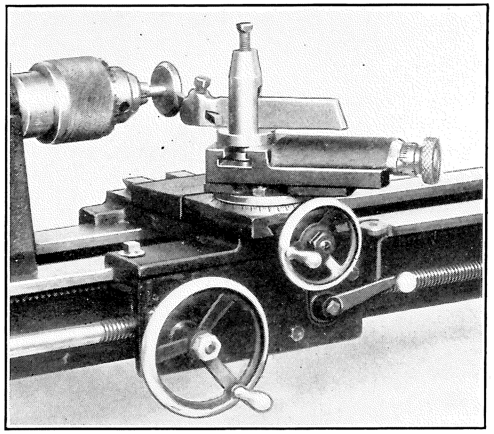


Fig. 19

CARRIAGE STOP. (See Fig. 31.) This stop is particularly useful for facing operations where absolute accuracy is required. Micrometer graduated. To use: Take a light truing cut on the work to be faced, set the stop against the carriage and clamp it in position. Now adjust the micrometer exactly the amount of stock it is desired to remove, run the carriage against the stop and start the cutting. Precision is assured. **Don't run carriage against stop with power feed on.**

WOOD TURNING. A metal working lathe is especially well adapted to wood turning because of the additional accuracy and rigidity that is necessarily present in a machine of this kind. All that is necessary to make an excellent wood working machine of this lathe is the addition of a small amount of inexpensive equipment. (See accessories.) To turn wood: locate the piece to be worked between special centers, locate the hand tool rest in position, run the lathe at fast speed with special pulleys, and holding the chisel in the right hand with the left used as steadier, turn the work to desired size or shape. Unless automatic feeds are required, the feed gears should be disconnected from the spindle.

CONCLUSION. Without doubt some prospective owners have never had the opportunity to run a lathe. This fact should not deter him from obtaining one if it is possible. The fascinating as well as lucrative operations that can be performed on this machine make it an investment never to be regretted. It is not difficult to learn to run a lathe. With some practice, anybody can become an expert operator. In the preceding pages we have attempted to describe the various operations in the simplest manner so that the beginner can start to do real work as

soon as the machine is set up. Do not be discouraged if at first your work is not all you had hoped for. Every machinist knows that some amount of practice is necessary before precision work can be turned out. Although the fundamental directions have all been included in this manual, remember that no written instruction can take the place of actual practice on the lathe itself. There are a number of splendid instruction books—far more complete than this—on the market, but by just "sticking to" experimenting on your machine, you will gain more information than any book will ever give you.

SPECIFICATIONS

Swing over Bed	9″
Swing over Carriage	6″
Capacity between Centers	18″
Length of Bed	36″
Headstock Spindle—Hollow, ¾″ hole; 1½″ diam., 8 U.S.F. threads; nose has No. 3 Morse taper.	
Tailstock Spindle—2¾″ travel; ½″ set over for taper turning; nose has No. 2 Morse taper.	
Speeds in Direct Drive	220 - 370 - 600
Speeds in Compound Drive	47 - 80 - 130
Lead Screw	8 Acme threads per inch
Feed per Revolution	.010″
Thread Cutting Range	4 to 32 per inch
Size of Tool Holder	⅜″ x ⅞″
Weight less Motor	145 lbs.

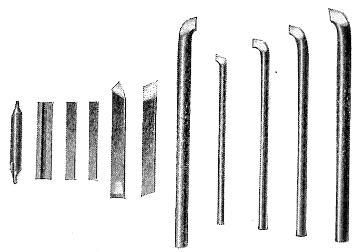


Fig. 20

Complete Set Tool Post High Speed Cutting Tools and Spacers, including 5 Boring Tools; 1 ⅜″ Turning Tool; 1 ⅜″ Threading Tool; 3 Spacers.

No. 6719

Combination Countersink and Drill

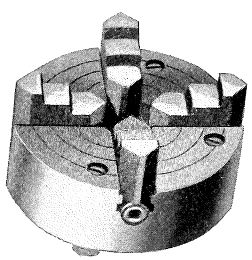


Fig. 23

4-Jaw Independent Chuck
with Adapter Plate
6″ Capacity
No. 6712

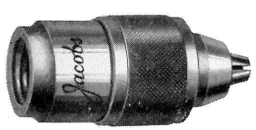


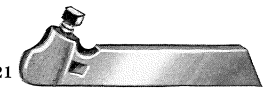
Fig. 25

Universal Chuck with
Adjusting Wrench
Threaded to fit
Headstock Spindle

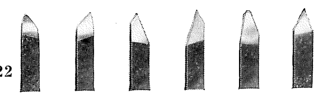
No. 6713

Special Arbor
to adapt No. 6713
to Tailstock

No. 6714

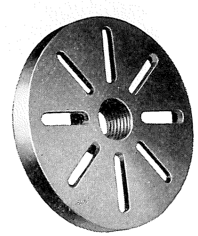
Fig. 21


L.H. Offset Tool Holder
for ¼″ Tools
No. 6717

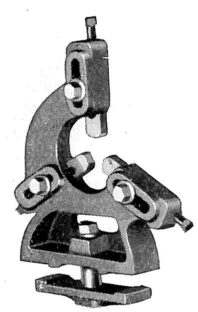
Fig. 22


A B C D E F

A—R.H. Turning Tool, ¼″
B—L.H. Turning Tool, ¼″
C—R.H. Facing Tool, ¼″
D—L.H. Facing Tool, ¼″
E—R'd Nose Turn'g Tool, ¼″
F—Threading Tool, ¼″

Fig. 24


Large Face Plate
Diameter 8½″
No. 6716

Fig. 26


Steady Rest
Capacity 2⅞″
No. 6715

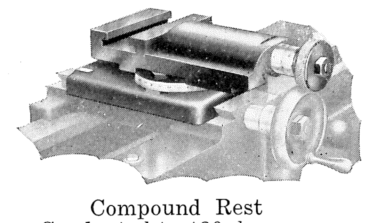


Fig. 27

Compound Rest
Graduated to 180 degrees
No. 6711

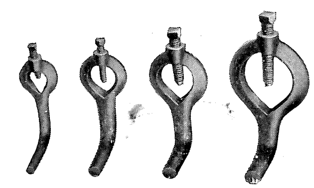


Fig. 29

Drop Forged Lathe Dogs
Set of Four ½″ to 1½″
No. 6720

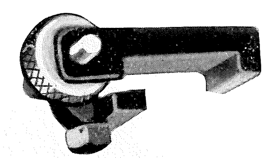


Fig. 31

Carriage Stop
Micrometer Adjustment
No. 6721

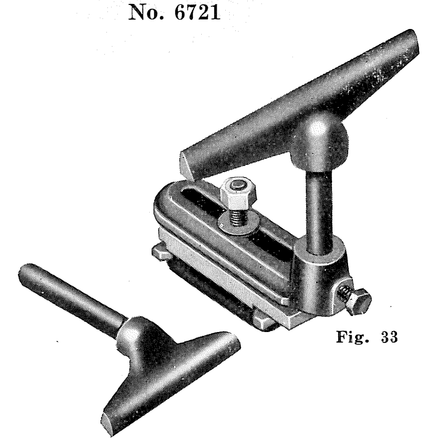
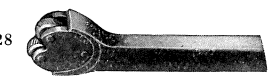


Fig. 33

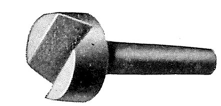
Wood Working Hand Rest
with Base and Two Rests
No. 6723

Write for information, prices, etc., on high speed, wood working pulleys.

Fig. 28


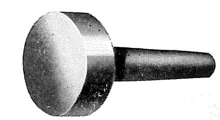
Knurling Tool
with one set of knurls

No. 6718

Fig. 30


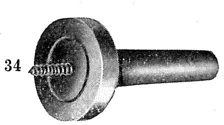
Crotch Center

No. 6726

Fig. 32


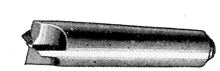
Drill Pad

No. 6722

Fig. 34


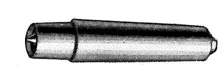
Screw Center

No. 6727

Fig. 35


Spur Center

No. 6724

Fig. 36


Cup Center

No. 6725

Decimal Equivalents of Parts of an Inch

1/64	.015625	11/32	.34375	43/64	.671875
1/32	.03125	23/64	.359375	11/16	.6875
3/64	.946875	3/8	.375	45/64	.703125
1/16	.0625	25/64	.390625	23/32	.71875
5/64	.078125	13/32	.40625	47/64	.734375
3/32	.09375	27/64	.421875	3/4	.75
7/64	.109375	7/16	.4375	49/64	.765625
1/8	.125	29/64	.453125	25/32	.78125
9/64	.140625	15/32	.46875	51/64	.796875
5/32	.15625	31/64	.484375	13/16	.8125
11/64	.171875	1/2	.5	53/64	.828125
3/16	.1875	33/64	.515625	27/32	.84375
13/64	.203125	17/32	.53125	55/64	.859375
7/32	.21875	35/64	.546875	7/8	.875
15/64	.234375	9/16	.5625	57/64	.890625
1/4	.25	37/64	.578125	29/32	.90625
17/64	.265625	19/32	.59375	59/64	.921875
9/32	.28125	39/64	.609375	15/16	.9375
19/64	.296875	5/8	.625	61/64	.953125
5/16	.3125	41/64	.640625	31/32	.96875
21/64	.328125	21/32	.65625	63/64	.984375
				1	1.

DONT'S FOR MACHINISTS

from "Machinery"

Don't abuse but use tools.
Don't gamble with danger; too many have tried it and lost.
Don't use one mandrel to drive another one out of a piece of work.
Don't rap the chips out of your file on the lathe shears.
Don't change chucks or jaws without cleaning out the spindle nose.
Don't use a file without a handle in a lathe.
Don't try to cut threads on steel or wrought iron dry; use lard oil or a cutting compound.
Don't leave a chuck wrench in a chuck; always remove it.
Don't try to straighten a shaft on lathe centers, and expect that the centers will run true afterward.
Don't blow filings or chips in among the running parts of a machine.
Don't set the cutting points of a lathe or planer tool any farther out from the tool post than is absolutely necessary.
Don't try to knurl a piece without oiling it.
Don't forget that the closer you can get your tool-rest to the work, the better it is.
Don't oil or clean a machine while it is in motion.