

330. The Metal Shaper. The metal working shaper is used principally for machining flat surfaces. These

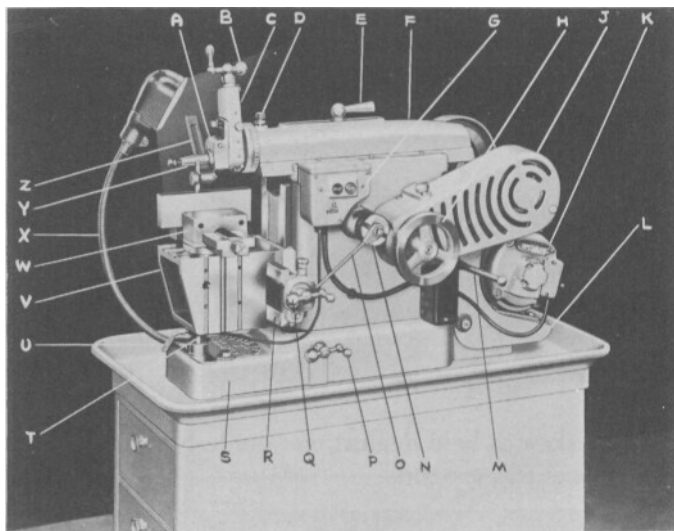


PHOTO COURTESY SOUTH BEND LATHE WORKS

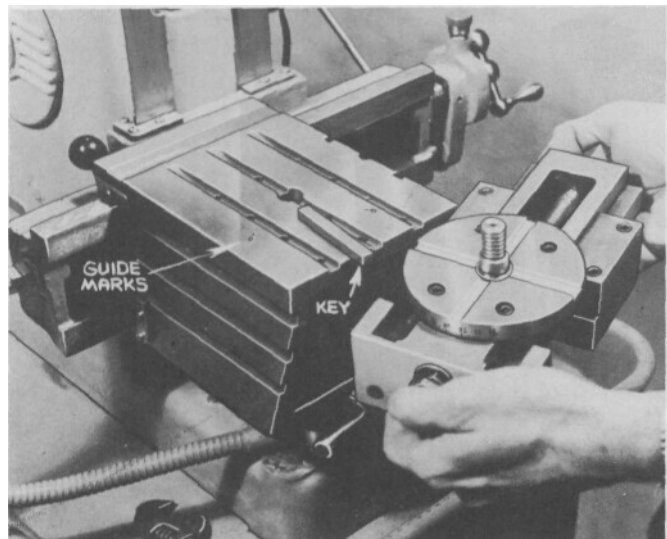
- |                           |                           |
|---------------------------|---------------------------|
| A. Clapper Box            | O. Feed Rod               |
| B. Down-feed Handle       | P. Table Elevating Crank  |
| C. Head                   | Q. Cross-feed Crank       |
| D. Head Swivel Lock Screw | R. Cross-rail             |
| E. Ram Clamping Handle    | S. Base                   |
| F. Ram                    | T. Work-table Support     |
| G. Switch Box             | U. Support Locking Handle |
| H. Hand Wheel             | V. Work Table             |
| J. Drive-pulley Guard     | W. Vise                   |
| K. Motor                  | X. Lamp                   |
| L. Motor Cradle           | Y. Tool Post              |
| M. Tension Release Lever  | Z. Tool Holder            |
| N. Eccentric              |                           |

surfaces may be any angle to one another. Irregular surfaces may also be machined on the shaper.

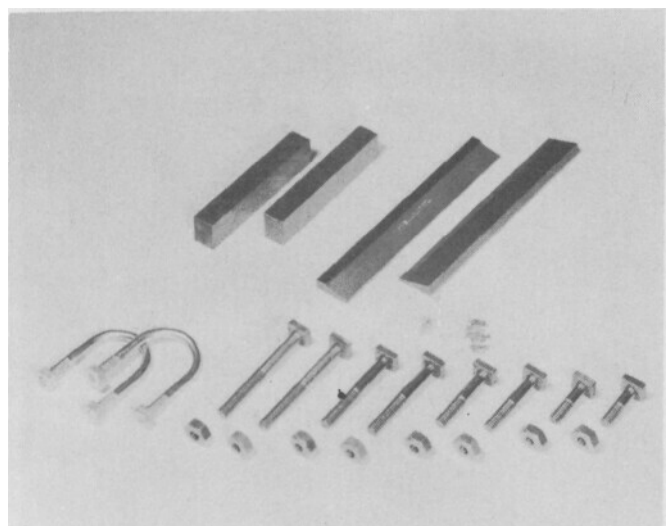
The body or column of the shaper carries a ram which reciprocates back and forth over the work which is clamped in the vise.

The size of the shaper is determined by the maximum length of stroke or travel of the ram. The one shown is a 7" shaper which requires a 1/2 H.P. motor at 1725 R.P.M.

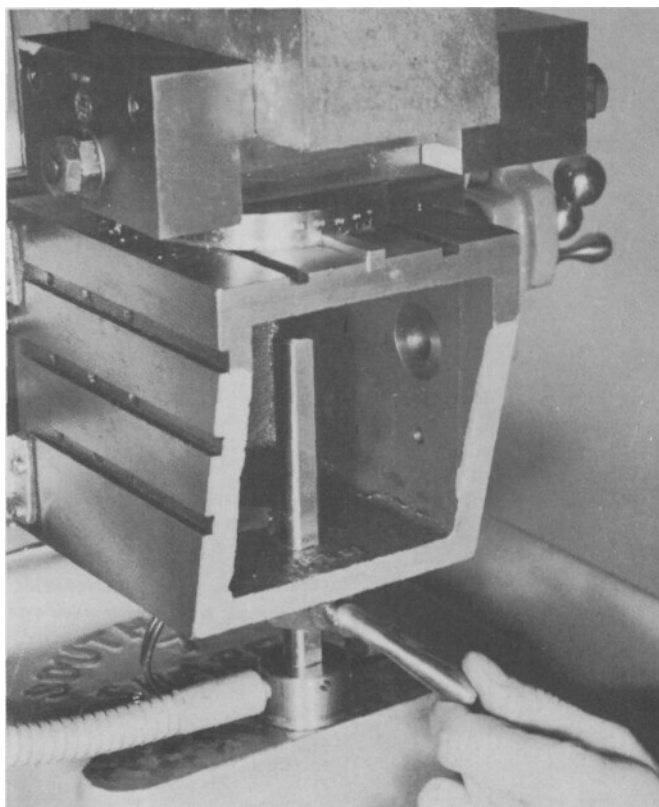
**331. Table.** The table is mounted on the face of the column. It can be raised or lowered by the table elevating crank and moved transversely by the cross-feed crank.



The table has three slots in the top and the left side parallel with the ram. The right side has two square slots and one vee slot which are vertical to the ram. The square slots are drilled for clamping purposes.

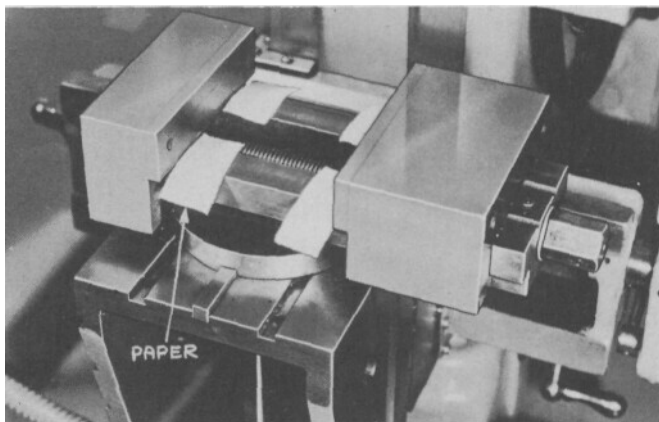


Large work and work which cannot be conveniently held in the vise is mounted on the table on suitable strips or parallels and clamped in place by hold-down bolts.

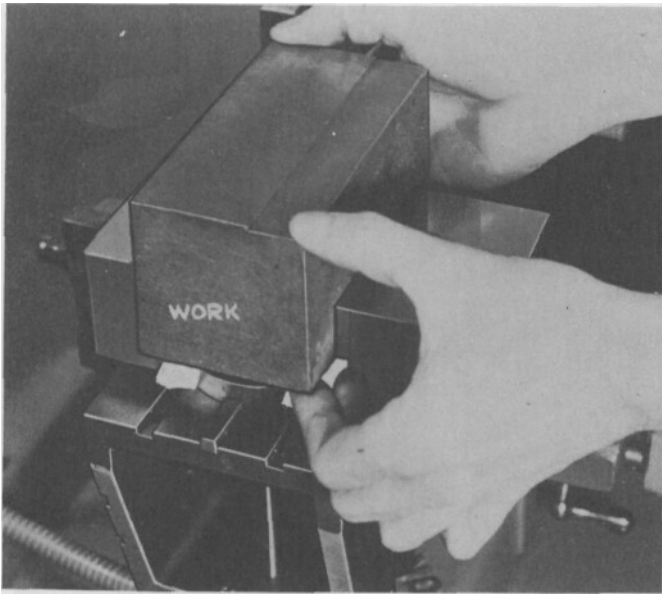


The table support is always lowered against the base and locked in position.

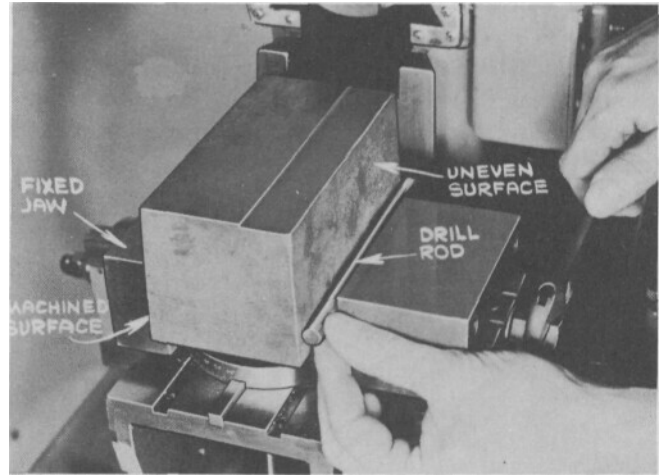
**332. Vise.** Most of the work is done in the vise. The vise is fastened to the table by means of a stud bolt inserted in a hole in the table. A key engages the table and base of the vise which permits the vise to be locked and clamped in an exact 90° position.



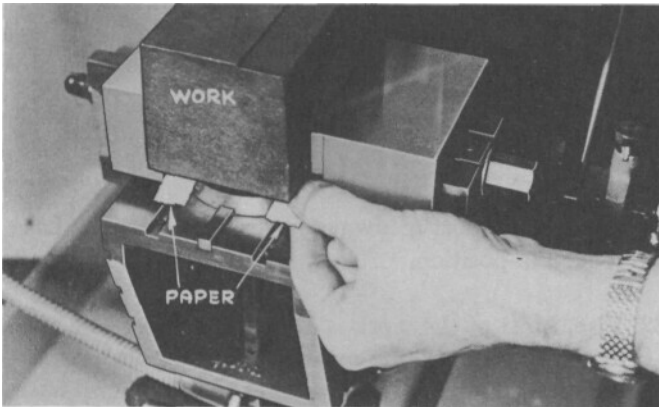
Work which is approximately rectangular is usually held in the vise. Open the vise jaws to slightly more than the size of the work. Lay four pieces of scrap paper on the ways of the vise.



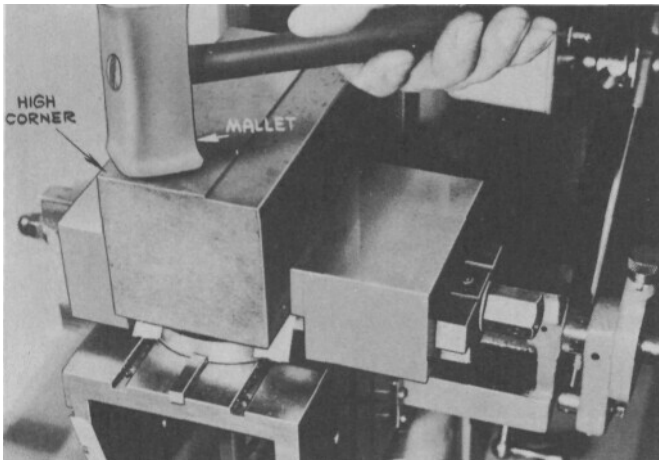
work must be firmly seated and clamped before a cut is taken.



Should one side of the work be irregular or rough it can be placed in the vise with the good face against the fixed jaw of the vise. A piece of small round stock can be placed against the other side and the vise clamped in the usual fashion.

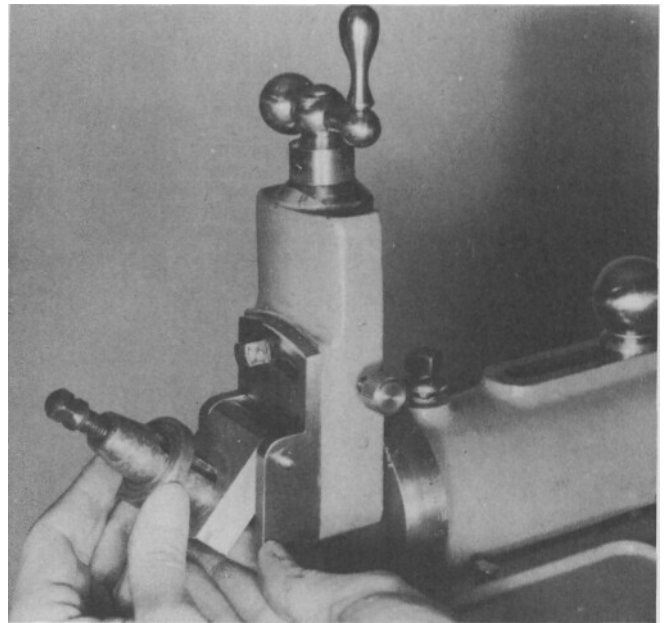


Clamp the work in position and test the seating of the work by pulling on the paper strips.



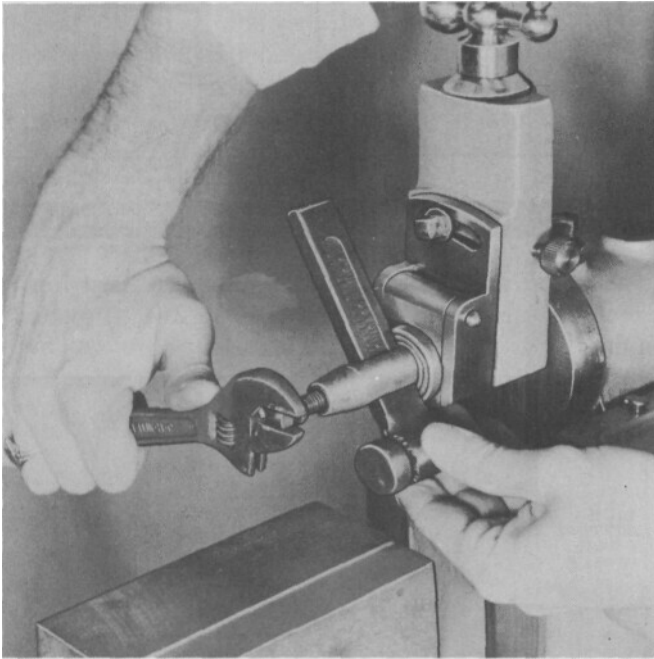
If one corner is high as indicated by a loose strip of paper, it should be tapped down with a lead mallet. The

**333. Head and Clapper Block.** The head is mounted on the end of the ram. It can be swung to any required angle and locked in position by tightening the head swivel lock screw. The head is controlled by the down-feed handle.

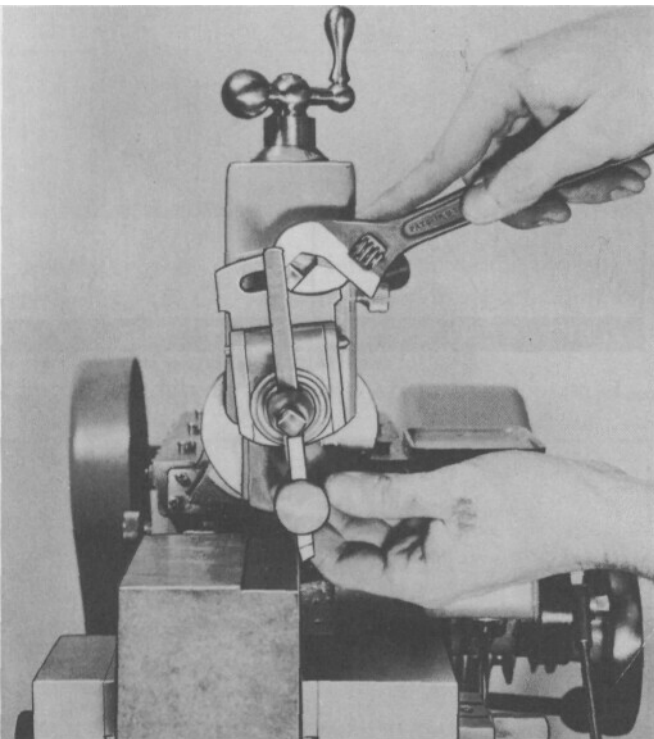


A clapper block is mounted on the face of the head. It may be swung slightly to the right or left and clamped in position by the square head screw.

The clapper fits snugly into the block during the cutting or forward stroke. It lifts and permits the tool to drag on the work on the back stroke.

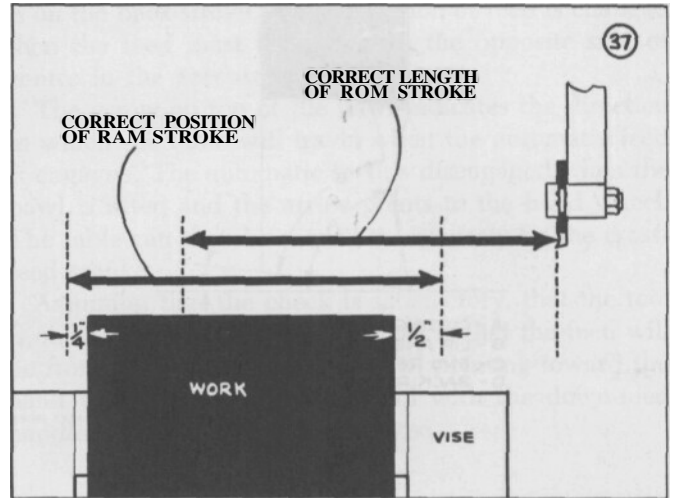


A tool bit in a tool holder is placed in the tool-post in the clapper and clamped in position.

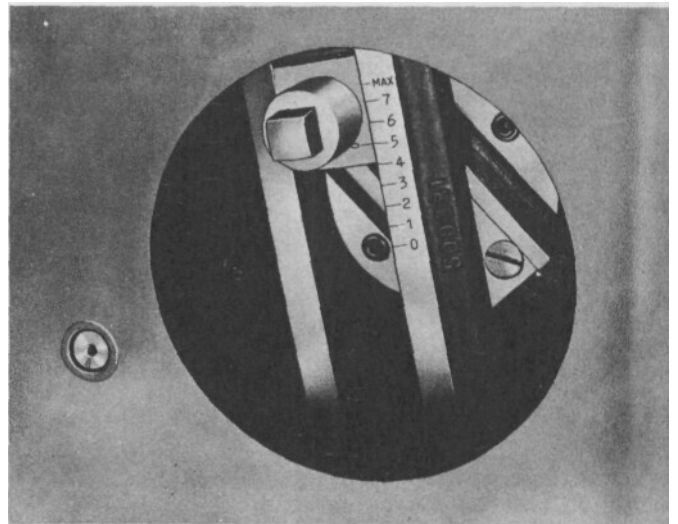


The clapper box should be swung to whichever position will permit the tool to swing up and away from the work on the back stroke.

**334. Stroke.** After the work is mounted the length of stroke must be adjusted. The stroke should be  $\frac{3}{4}$ " longer than the length of the cut with  $\frac{1}{2}$ " of this amount at the start of the cut. The  $\frac{1}{2}$ " allows the clapper to drop back into the block before a cut and the  $\frac{1}{4}$ " allows chip clearance at the end of the cut.



Turn the hand wheel until the two arrows on the hub of the eccentric line up with one another. (Section 337.)

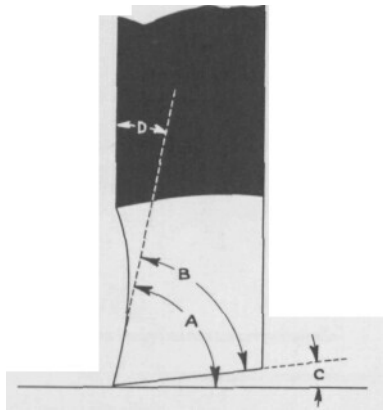


Remove the cover plate and loosen the lock screw. Move the sliding block until the marker indicates the length of stroke required for the job. Tighten the locking screw.

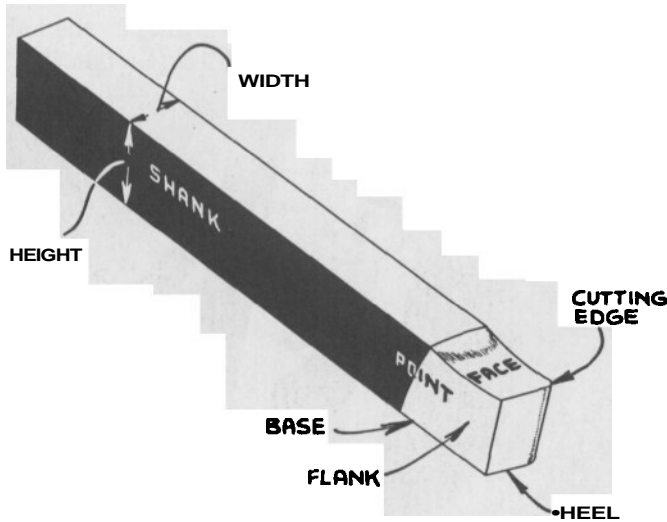
The stroke is now adjusted for length but it may not be in the correct position with respect to the work.

Loosen the ram clamping handle and push the ram into position by placing the tool  $\frac{1}{4}$ " over the front end of the work. Turn the hand wheel until the crank is in the extreme forward position and tighten the ram clamping handle.

335. Cutting Tools. Tool bits are ground to suit the work. The shank is gripped in the holder and the minimum amount of point exposed for practical requirements.



A - CUTTING ANGLE  
B - LIP ANGLE  
C - END RELIEF  
D - BACK RAKE



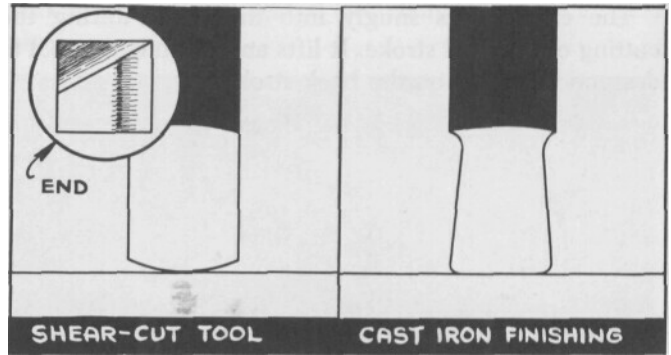
The face is that part of the point against which the chip rolls off the work.

The cutting edge is the edge which separates the chip from the work. This includes the side cutting edge, the nose radius, and the end cutting edge.

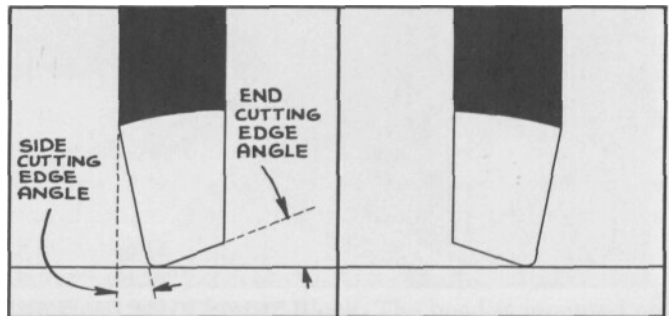
The shape of the tool is the shape of the tool as presented to the work.

The cutting angle is the angle between the face of the tool and the surface being machined.

The end relief is the angle which the point makes with the face of the work. It provides clearance.



A round nose tool is used to rough cut cast iron or steel. It is also used for a finish cut on steel. A tool with a flat end is popular for finishing cast iron.

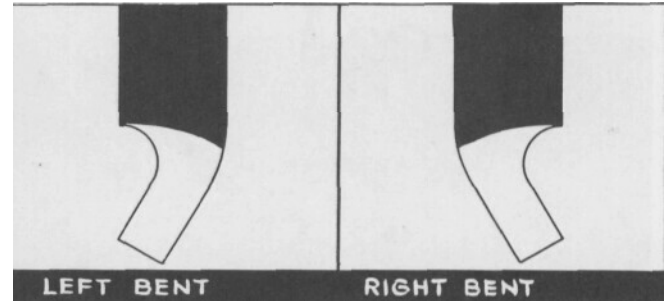


LEFT-CUT TOOL

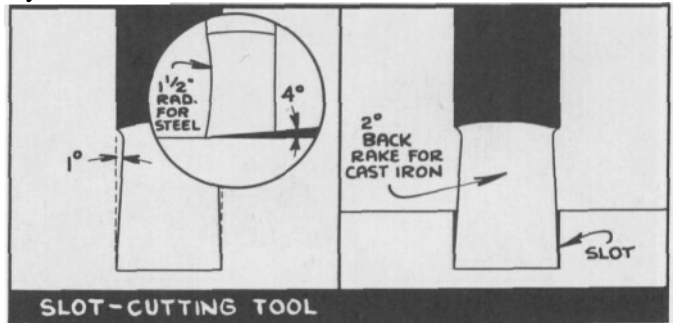
RIGHT-CUT TOOL

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A left-cut tool has the cutting edge on the left when looking at the face. A right-cut tool is the reverse.



Bent tools are made either left or right, as required by the work.



Tools may be ground for one special job, such as keyways in steel and cast iron.

**336. Checking.** After the work is mounted, stroke adjusted, and tool in position, the set-up should be carefully checked before a power cut is taken.

It is important that the surface being machined is as close as possible to the ram. In general, the face of the work should not be more than 2" below the bottom of the ram. The tool holder should be as close to vertical as possible. A short grip on the tool holder is most desirable.

The hand wheel is used and a complete cycle of operation forward and back stroke is completed. This precaution will prevent any damage to the work or the machine when the power is turned on.

**337. Feed.** A coarse feed is used for roughing cuts and a fine feed for finishing cuts.

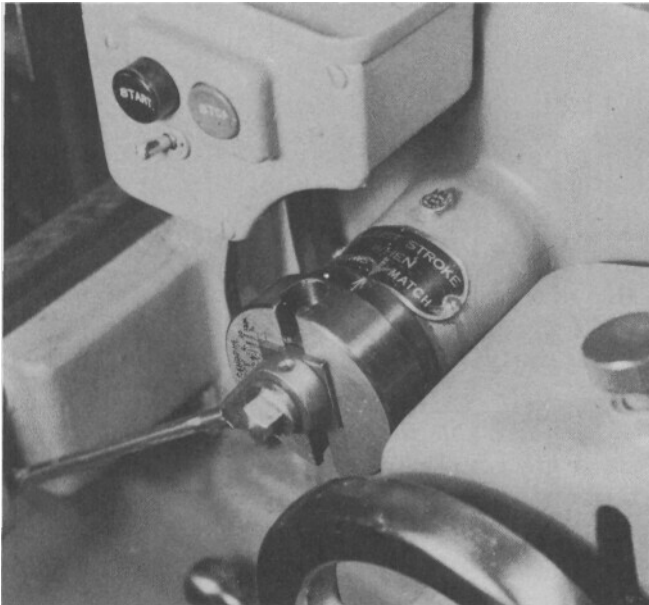


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Set the eccentric for .004" feed by releasing the locking screw, moving the scale to the correct position and re-tightening the screw. Put the eccentric slot in the feed crank in a vertical position.

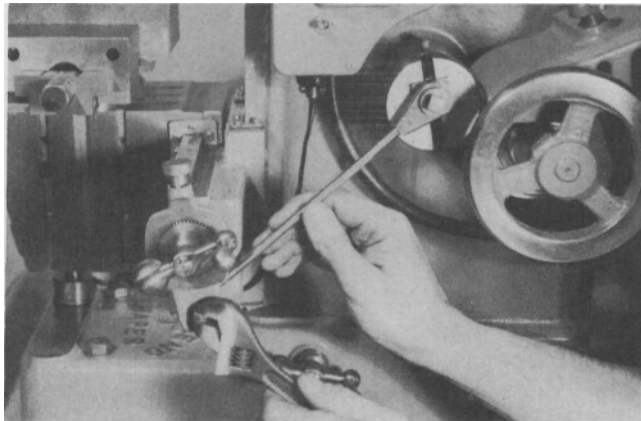


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Loosen the set screw, releasing the lower end of the feed rod. Line up the feed casting which holds the pawl and gear and turn it so that it is vertical and parallel to the slot in the feed crank.

The scale on the eccentric is marked in both directions. This is necessary to permit work being fed left to right or right to left. The feed must take place when the ram is on the back stroke. If the direction of feed is changed then the feed must be moved to the opposite side of centre in the eccentric slot.

The arrow on top of the pawl indicates the direction in which the table will travel when the automatic feed is engaged. The automatic feed is disengaged when the pawl is lifted and the arrow points to the hand wheel. The table can then be moved transversely by the cross-feed crank.

Assuming that the check is satisfactory, that the tool is on the right-hand side of the work, that the feed will be from left to right, and the pawl pointing toward the hand wheel, bring down the tool with the down-feed handle until a light cut is indicated.

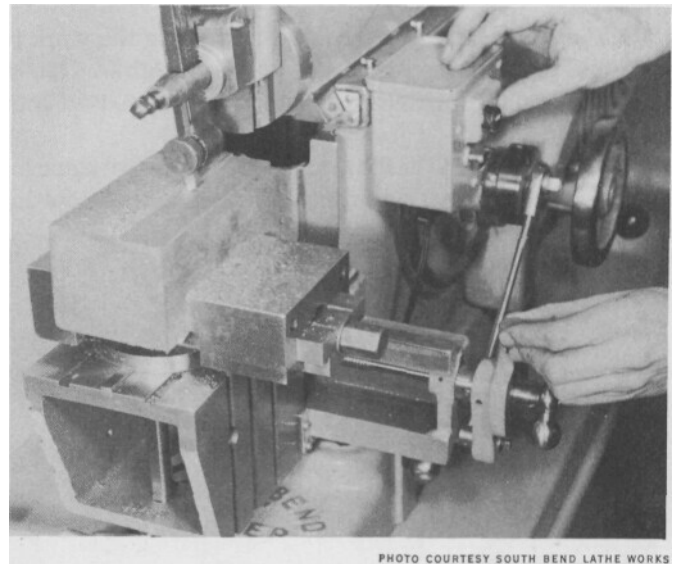


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Start the motor, lift and turn the pawl with the arrow pointing in the direction of feed (left to right), and drop it in place. If it becomes necessary to stop the machine, lift the pawl before stopping the machine. Unless this is done the cut might be on a forward stroke which would damage the cutting edge of the tool. The depth of cut can be adjusted by the down-feed handle and the entire surface machined. The table is returned by the cross-feed crank for the following cut.

**338. Roughing Cut.** Roughing cuts are made to prepare the surface for the finishing cut. One or more cuts may be required. If iron castings are being machined it is desirable that the cut get below the surface of the glazed

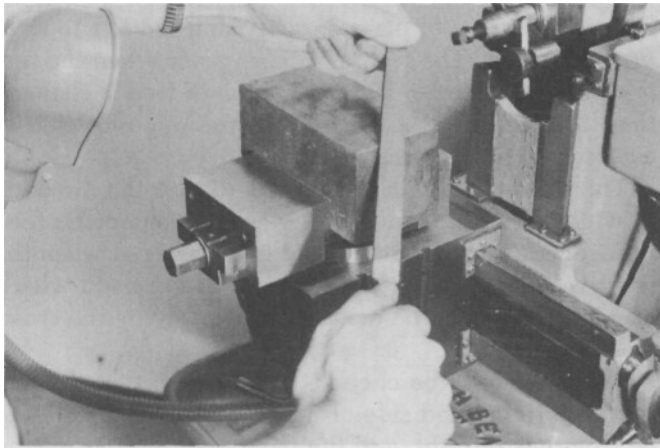


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skin. The edges of castings may break off and leave a ragged edge. This may be avoided by taking off the corners with a file. The machine must be stopped while this is done.

**339. Finishing Cut.** The finishing cuts bring the work to size and give the degree of smoothness required. Generally .015" is left for finishing, which may take two cuts.

**340. Vertical Cut.** Vertical cuts are used for squaring ends on long work, squaring shoulders and for cutting keyways.

Usually the work is stationary and the tool is fed by the down-feed handle.

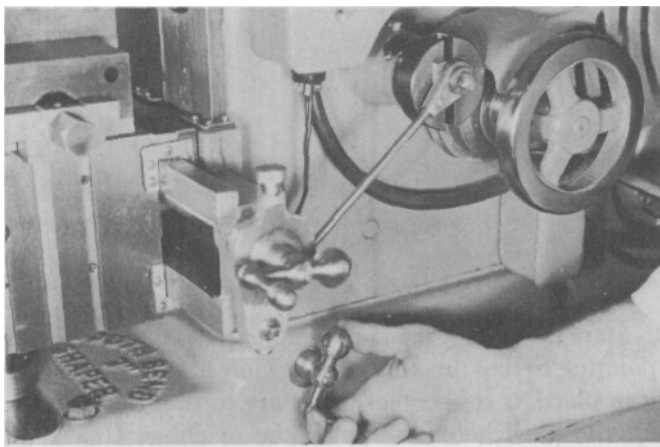


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Another method involves feeding the work to the tool by means of the table elevating crank. If this method is used care must be taken that the work does not foul the bottom of the ram.

**341. Bevel Cut.** This cut is made by swinging and setting the head to the desired angle and feeding the tool to the work by means of the down-feed crank.

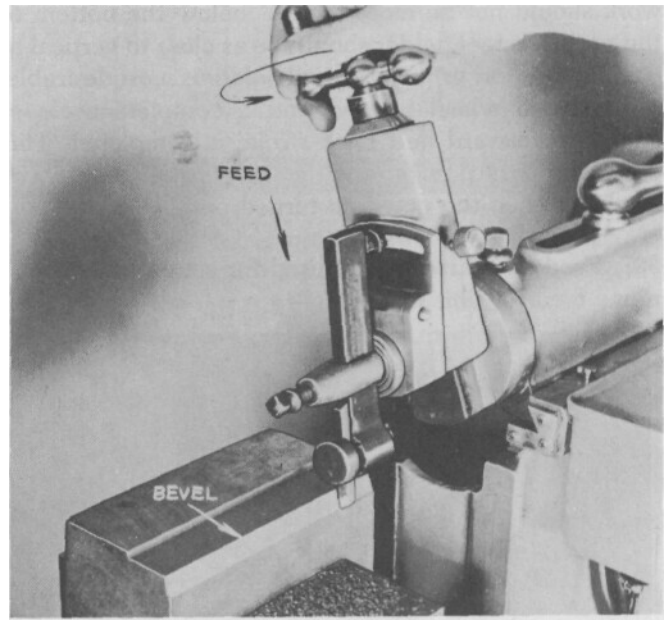


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**342. Serrated Cut.** Serrated cuts may be made by two sets of grooves. The work may be laid on a parallel in the throat of the vise.

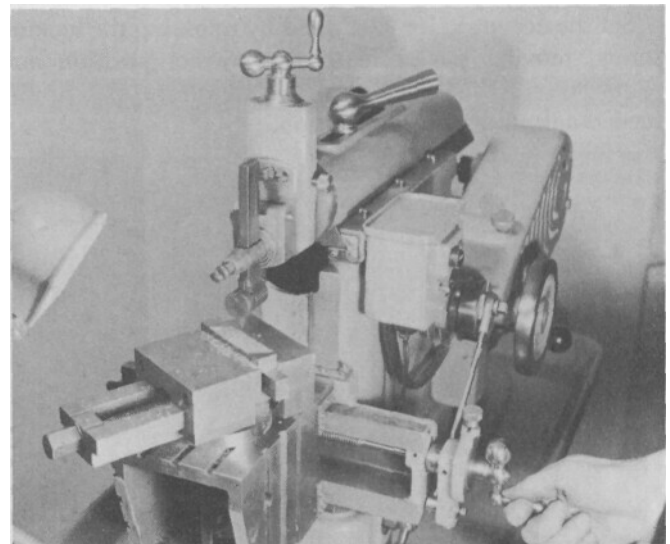
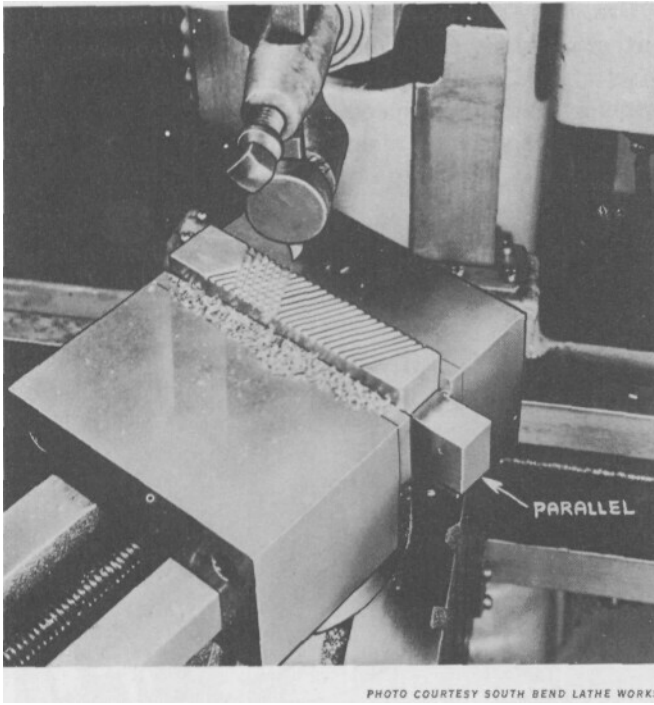
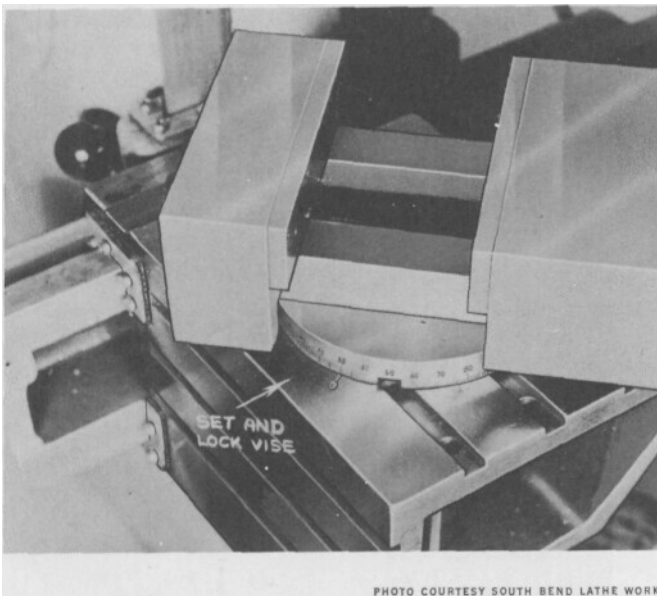


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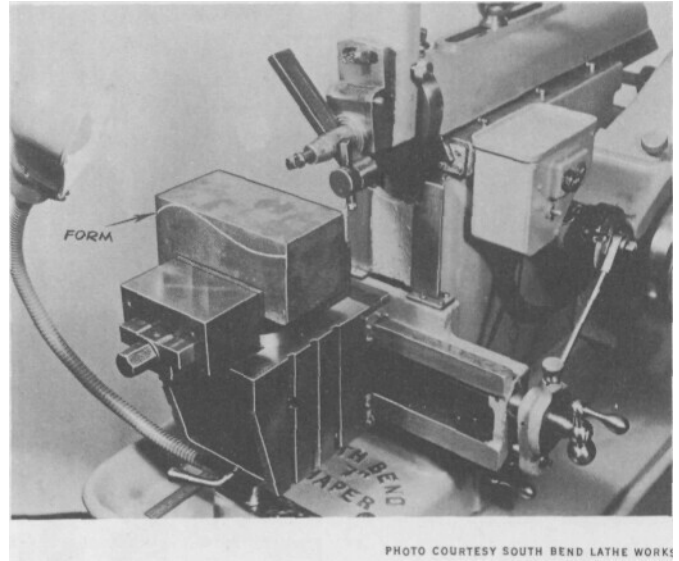


The vise is swivelled to some specific angle in either direction and locked in place. Slots are equally spaced by using the graduated dial on the cross-feed handle.

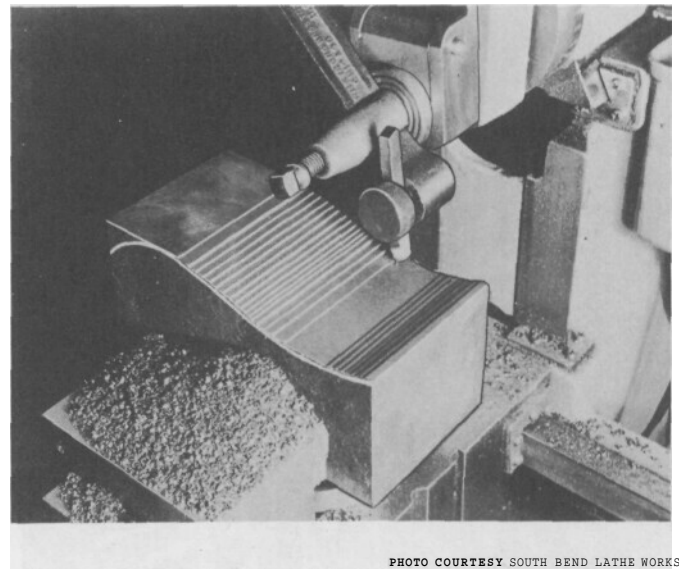


The depth of the slots is controlled by use of the down-feed handle.

343. Form Cut. Form cutting is a tedious process but it



offers unlimited scope for custom or special work. The shape is usually laid out on the end of the work.



Make a series of roughing cuts with a left-hand tool, Use automatic feed and work from left to right.



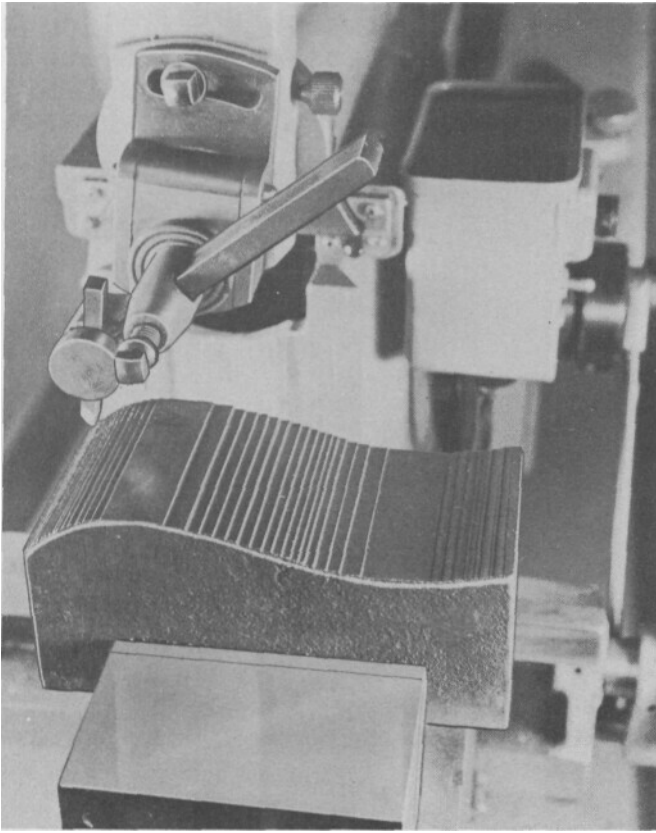


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Use a vee-shaped tool with a round nose and take further roughing cuts from right to left. Automatic feed is set at .002" per stroke. The belt is moved to set the machine at its lowest speed, the operator then follows or contours the work by manipulating the down-feed control up and down as required.

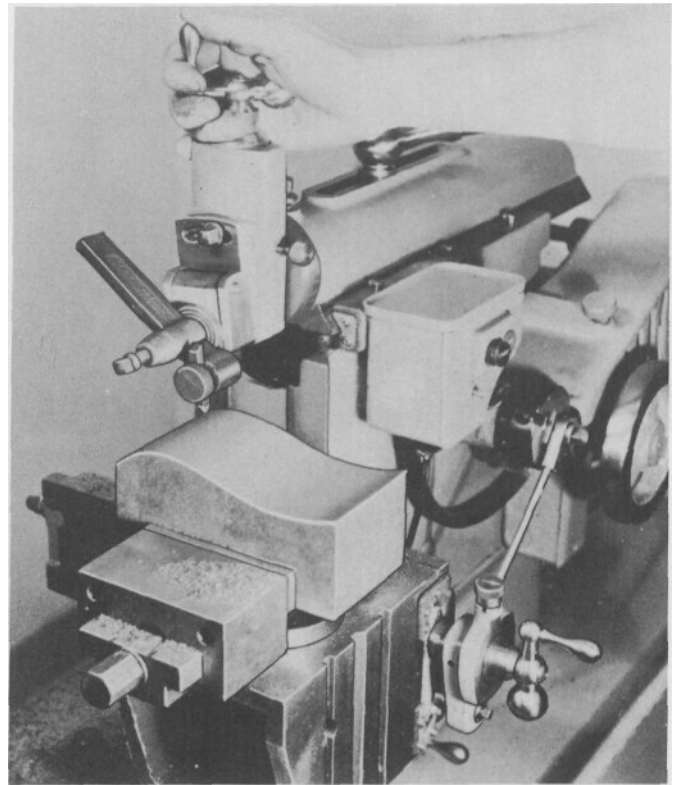


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Change over to a right-hand tool and work from right to left.

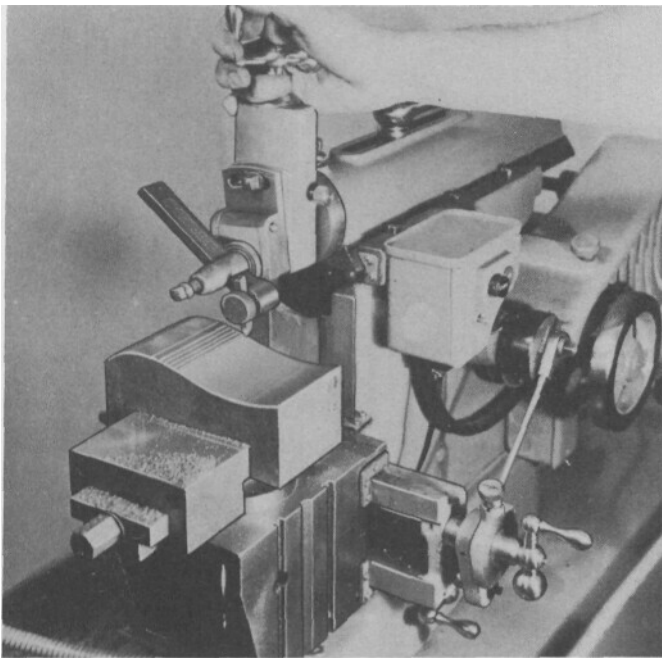


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After a few light roughing cuts the operator will become familiar with the controls. A finish cut can then be made with a tool which is less pointed.