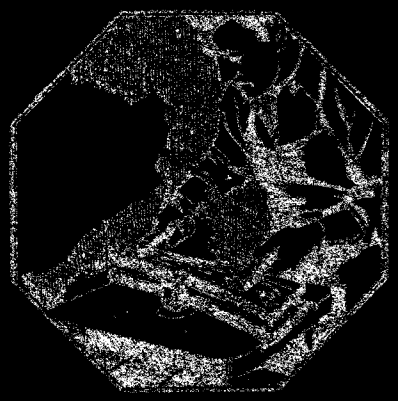
Book No. 4535

GETTING THE MOST OUT OF YOUR SHAPER

- A COMPLETE SHOP MANUAL ON MODERN SHAPER PRACTICE



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GETTING THE MOST OUT OF YOUR SHAPER

A DELTA-CRAFT PUBLICATION

Edited by
SAM BROWN

A Complete Handbook Covering all Branches of Shaper Operation in the Home Workshop with Over Two Hundred Photographic Illustrations and Line Drawings.

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The Shaper... Top Ranking Production Tool for the Small Shop and Capable of a Score of Different Operations, Some of Which are Impossible in Any Other Manner. Photo Above Illustrates Cabinet Model with ¾ Inch Spindle. The Machine Should be Located in an Unobstructed Working Space.

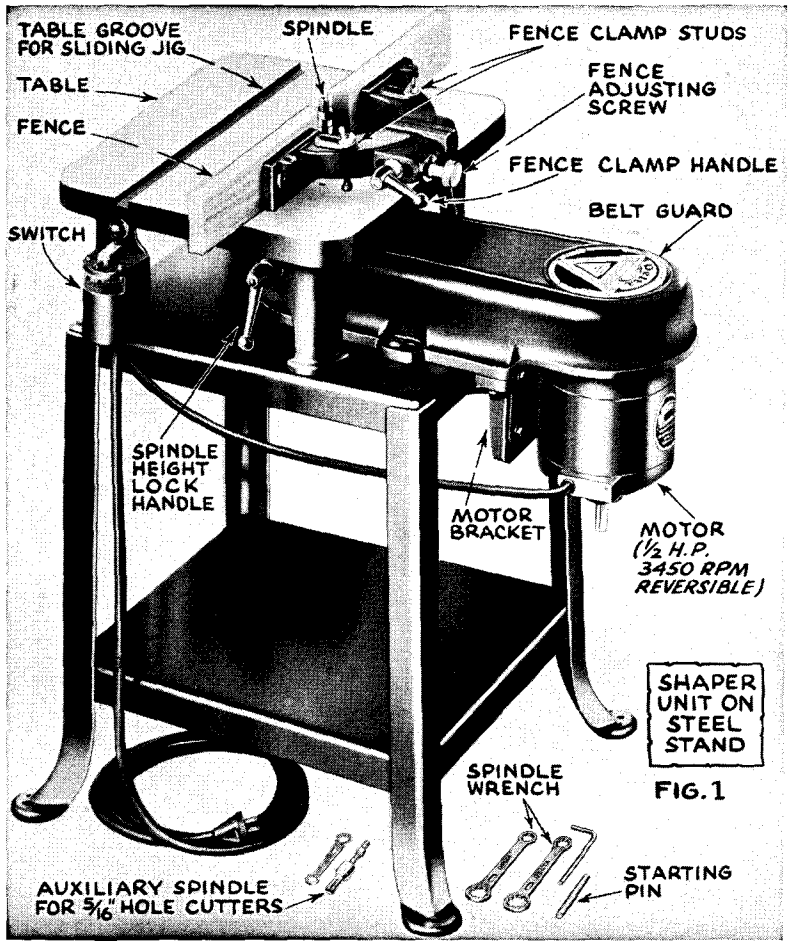


FIG. 1

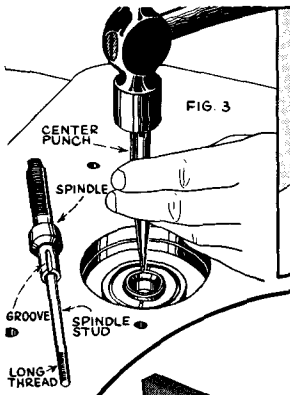


FIG. 3

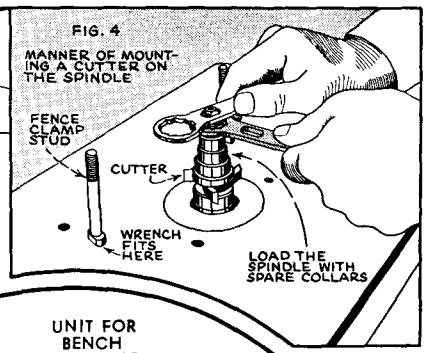


FIG. 4
MANNER OF MOUNTING A CUTTER ON THE SPINDLE

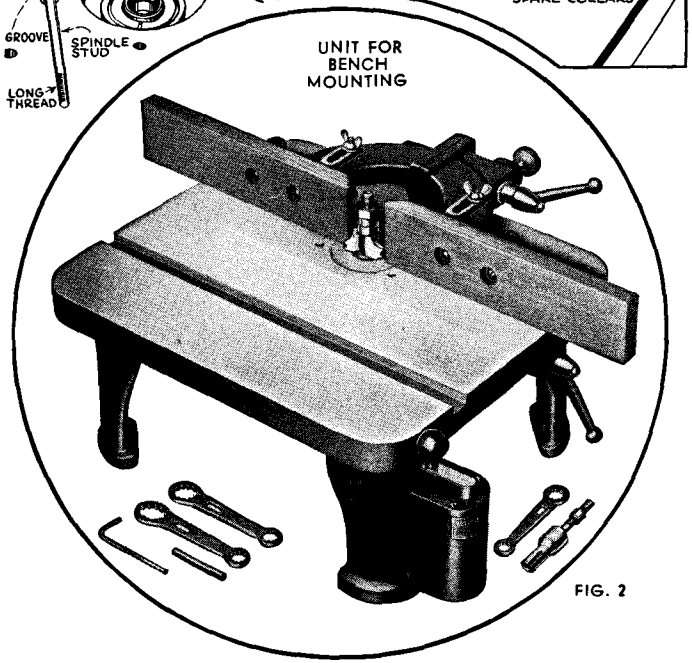
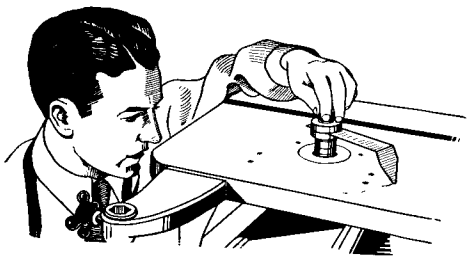


FIG. 2



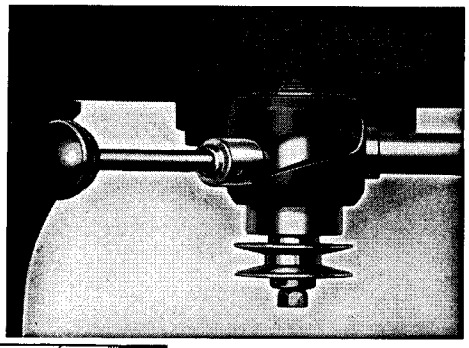
CHAPTER ONE

THE SHAPER and its ADJUSTMENTS

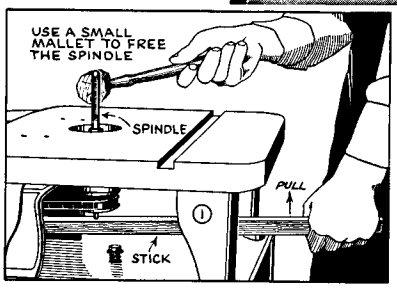
The Shaper.—The shaper is a vertical spindle, differing from the drill press in that it is built primarily to withstand side thrust. The spindle is generally hollow so that auxiliary spindles can be fitted to it, much the same as drills are fitted in a drill chuck. An adjustment is provided so that the spindle can be raised or lowered, and a second adjustment locks the spindle at any desired height above the table.

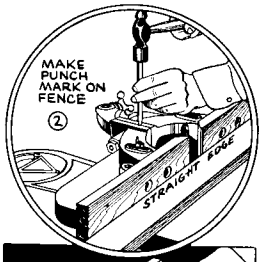
Power and Speed.—The medium-size shaper using ½ inch hole cutters works nicely with a ½ h.p. motor. Where large knives mounted between slotted collars are used, ¾ to 1-h.p. will give best results. The motor must be a 3450 r.p.m. type in order to give the shaper spindle the required speed. Pulleys are generally about a 3 to 1 ratio, so that the actual spindle speed runs slightly over or under 10,000 r.p.m. The motor should be reversible since an opposite direction of rotation may often be required. In some units the motor is reversed by means of a lever fitted directly to the motor; other units employ a reversing switch fitted to the side of the shaper stand and wired to the motor.

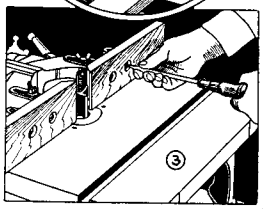
Auxiliary Spindles.—There are four auxiliary spindles—the stub spindle for cope cutters, the 5/16 inch diameter spindle for cutters having this size hole, the ½ inch diameter spindle for ½ inch hole cutters and the ¾ inch spindle for ¾ inch hole cutters. The latter can be used only on the heavy-duty cabinet model shaper. Each spindle is fitted with a tie-rod, threaded at both ends. One end of the rod is fitted to the spindle while the opposite end is capped with a tapered nut after passing through the hollow main spindle. The shank of each spindle is fitted with a keyway. This engages a ball or key inside the main spindle to prevent it from turning. A light punch mark on the rim of the main spindle, as shown in Fig. 3 on the opposite page, is an aid to locating the auxiliary spindle. Once in place, the spindle can be fitted with the necessary collars and cutters, as shown in Fig. 4 on opposite page. Because of accurate fitting, it may be necessary to use the method shown in Fig. 1 on this page to remove the auxiliary spindle.



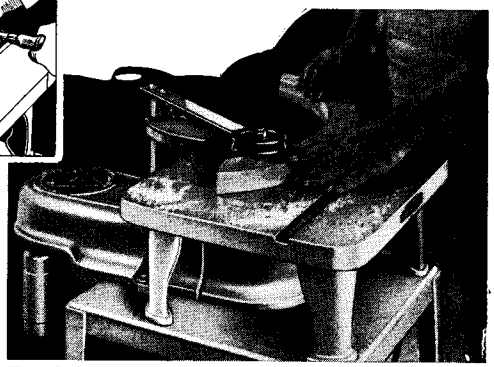
Above, spiral spindle-raising mechanism of light-duty shaper.



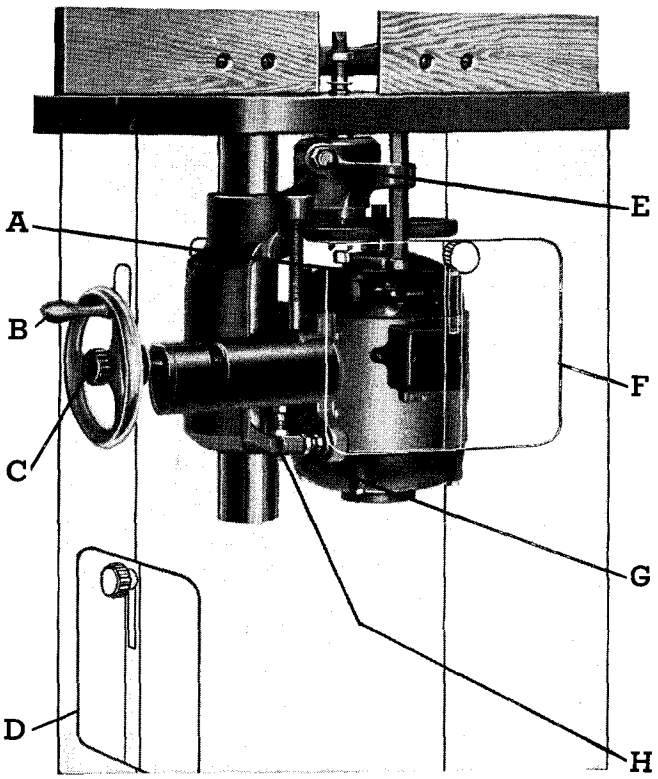




The Adjustable Fence.—The fence is fitted to the shaper table by means of two studs and wingnuts. Adjustment of either half of the fence can be made when required. For most work, the two halves of the fence should be in line. A punch mark across the two parts, as shown in Fig. 2, is a useful index in re-setting.



The Circular Guard Should Be Used Whenever Possible When Shaping Directly Against Guide Collars.



MECHANISM OF HEAVY-DUTY SHAPER

A—Spindle Tie-Rod Nut
B—Spindle Height Handwheel
C—Spindle Lock Knob
D—Cleanout Door
E—Bearing Clamp Screw
F—Removable Panel
G—Belt Tension Adjustment
H—Spindle Stop Screw

returning mouldings across the ends of narrow strips.

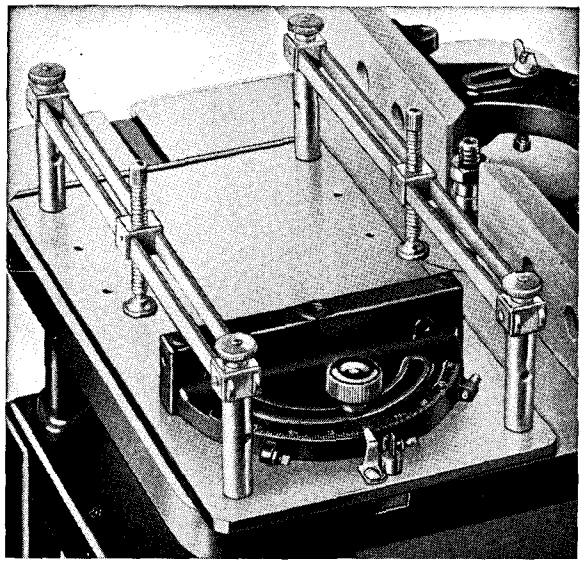
Heavy-Duty Shaper.— A phantom view of a typical heavy-duty cabinet type shaper is shown at left. A machine of this size, swinging a ¾ inch diameter spindle, should be powered with a ¾ to 1½ h.p. motor. The construction of this machine differs from the lighter model previously described, the main points of departure being the spindle raising mechanism and mounting of motor, as shown in photo at left. The standard spindle for this machine is ¾ inches in diameter and has a travel of 3 inches. The spindle is fitted inside the main spindle, as previously described, and this method of mounting permits the use of ½ inch diameter and other auxiliary spindles. The table size is 27 by 28-inches, which can be increased to 27 by 36-inches by the addition of a back wing.

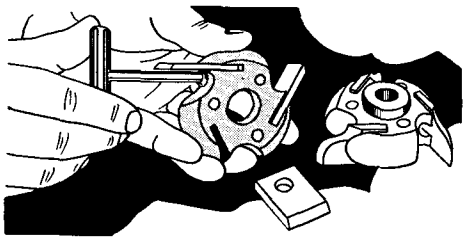
Left, phantom view of heavy-duty shaper. Below, the sliding jig.

The wood face pieces of the fence are adjustable in or out to accommodate various sizes of cutters. The opening should never be any more than is required to clear the cutter. Changes in the setting are made by loosening the bolts, pushing the wood facings to the required position, and retightening, as shown in Fig. 3 on the previous page.

Ring Guard. — The ring guard should always be used when shaping curved work directly against collars. Besides offering protection, the guard provides a hold-down, pressing the work down on the table surface.

Sliding Jig. — The sliding jig shown in the lower photo is an essential part of any shaper. Its purpose is to clamp the work securely so that it can be advanced to the cutter. It is used chiefly in

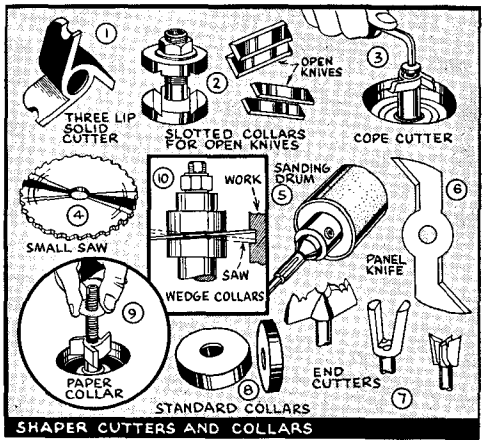


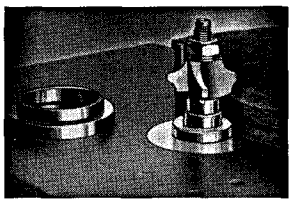


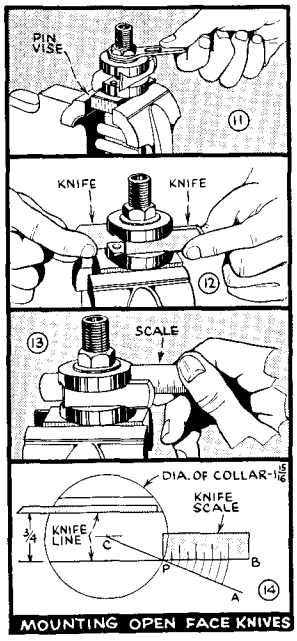
CHAPTER TWO

CUTTERS and COLLARS

Shaper Cutters and Collars.—A wide variety of knives, saws, collars, etc., are used in shaper operation, a typical group being as shown in the drawing at the right. Fig. 1 shows the standard three-lip cutter with ½ in. spindle hole. These are available in a wide variety of shapes and are undoubtedly the safest and most practical type of knife for average work in the small shop. Similar cutters with 5/16 in. hole can also be used by substituting an auxiliary spindle of the proper diameter. A second type of commonly used cutter is the open face knife clamped between two slotted collars, as shown in Fig. 2. The blank knives are easily ground to any required shape. The drawing in heading shows a three-knife cutterhead. A variety of ready-machined knives can be obtained, any set of which can be mounted in this head. The center hole is ¾ inch, but a bushing permits mounting on a ½ inch spindle.





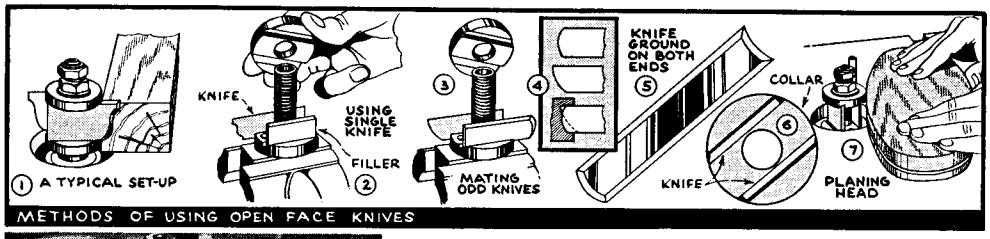


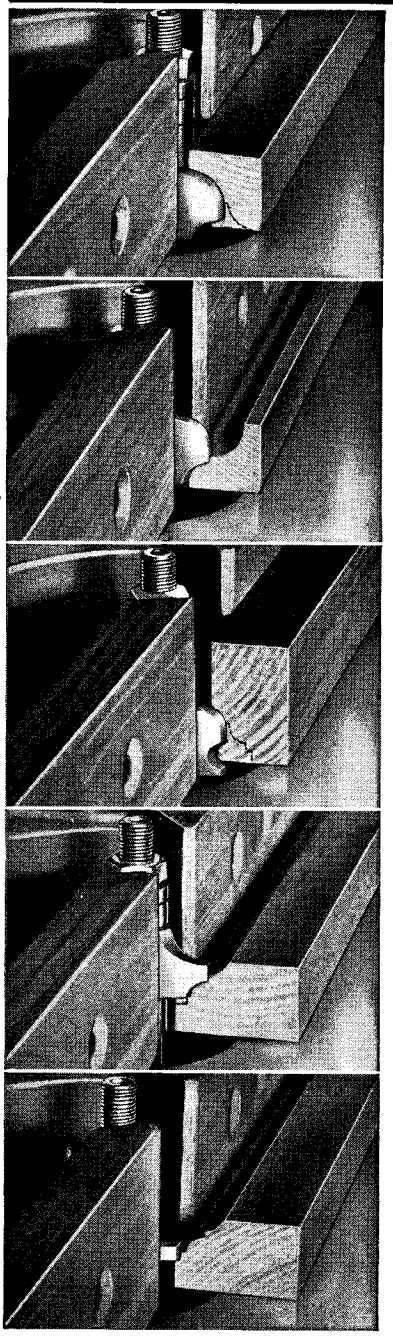
Above, Examples of Shaper Cutters. Left, Stationary Collars and Manner of Mounting Open Knives.

Fig. 3 shows a cope cutter and the special spindle on which it is carried. A small saw, Fig. 4, is a useful accessory for grooving and rough cutting. No. 5 is the familiar sanding drum. Fig. 6 shows a wing cutter, used for making raised panels and similar work. A group of end cutters are pictured in Fig. 7. These, as the name implies, travel vertically and make an end cut.

Standard shaper collars, Fig. 8, are from ⅛ to ½-in. thick and of various diameters to permit control over the depth of cut. Paper collars are often used as shims to build up a standard collar to some required exact size, as shown in Fig. 9. Collars of special size or construction are often made up to suit the work, a common example being the wedge collars shown in Fig. 10. A saw clamped between these collars (they can be made from hardwood) will cut a more or less wider groove than the saw thickness depending on the wedge angle of the collars. Stationary collars, which fit into the table opening, as shown in the photo, and ball-bearing collars (these are simply ball races which fit over the spindle) are often used instead of standard collars to eliminate scoring, especially in production work.

Mounting Open Face Knives.—Open face knives are perfectly safe to use, but only when they are properly mounted. The first step in mounting a set of knives is shown in Fig. 11. The cutter head is placed on the pin vise, and the nut is turned down to lightly clamp both knives. The ends of the two knives are then gripped between the fingers and pulled outwards. Both knives should slide with an equal



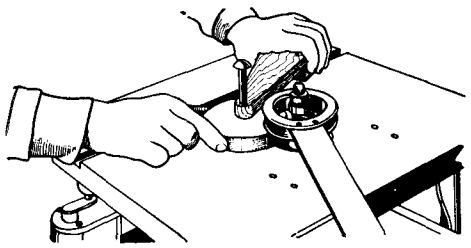


Above, Various Methods of Using Open Knives Between Slotted Collars. Left, How Cuts Are Combined to Produce Moulded Shapes.

tension—if one pulls more readily than the other, it is an indication that the knives are not of the same width, and *knives of unequal width should never be used together between slotted collars.* It can readily be seen that if one knife is a trifle narrower than the other, the wider of the two will be clamped firmly while the other will be loose and apt to fly out when the machine is set in motion. However, providing both knives are clamped evenly, the knife projection can then be measured, setting both knives to project exactly equal, as shown in Fig. 13, after which the nut is turned down tight. An ordinary thin steel rule can be used as a gauge, but the dimensions will read about 1/32 in. off. If a knife scale for exact measuring is required, it can be made as shown in Fig. 14. First draw a circle of the same diameter as the collar—$1\frac{1}{16}$ in. On this, lay out the knife lines. Project one of the knife lines to the point B. From the center of the circle, draw a line through point P to point A. On line PA, lay off $\frac{1}{8}$ in. marks from a common rule, starting at P. With C as a center, extend these marks to line PB, these marks being the exact dimensions for the knife scale.

Methods of Using Open Face Knives.—Open face knives can be used in a number of different manners, as shown in the drawing above. Fig. 1 shows a standard set-up, two blank knives ground to the required contour being held between the collars. For light cutting, or where the run is not long, one knife alone is often used, as shown in Fig. 2, a short blank piece of steel being used in the other slot as a filler. It is important, of course, that the filler be the same exact width as the knife. Odd knives of the same width but of different shapes are sometimes mated, as shown in Fig. 3. The moulding which would be cut in the example is shown in Fig. 4. Mating is often useful, but should not be practiced unless both knives are approximately of the same weight. Grinding knives at both ends, Fig. 5, is widely practiced, and is especially good for cuts requiring a male and female joint. Straight knives ground to the same diameter as the cutterhead, as shown in Fig. 6 and Fig. 7, are often used for outline planing.

Combining Cuts.—Knives are sometimes made to cut a required moulding in one pass of the work. More often, however, two or three passes are required, using standard shapes. The photos at the left show typical examples of how cuts are combined to shape moulded edges.



CHAPTER THREE

METHODS of OPERATION

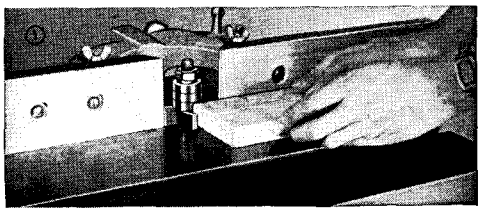
Four Main Methods.—There are four main methods used in shaper operation: (1) shaping with guides, (2) shaping against collars, (3) shaping with an outline pattern, (4) shaping with forms. Each of these methods is widely used, and each is adapted for a particular type of work. In the brief description of each method which follows, and in the illustrations, the same cut is shown for each, but this would not, of course, apply in actual work.

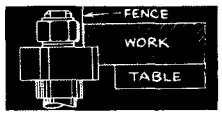
Shaping with Guides.—Guides are fastened to the shaper table and form a support for the work as it is advanced to the cutter. The most common type of guide is the standard fence, as shown in Fig. 1. In addition to this, there are a great number of other straight fences, also concave and convex fences for curved work and special fences for odd shapes. Shaping with a guide is the safest and most satisfactory method of working, and this method should always be used when the work permits. As can be seen in the diagram, the fence is the controlling factor in limiting the depth of cut.

Shaping Against Collars.—Work which cannot be shaped against a guide is usually shaped against a collar. In this method of working, the rim of the collar rides against the work and limits the depth of cut. This is one of the most useful methods used in shaping, its only drawback being that the revolving collar will slightly score or burn the work. This fault is not a serious objection since the scoring is usually light when the work is handled properly.

Shaping with an Outline Pattern.—This is similar to shaping against collars, except that a pattern and not the work rides against the collar. Scoring is thus eliminated, and the same pattern can be used for any number of like pieces. This latter feature makes this method preferable for many shaping jobs where pieces must be produced in quantity.

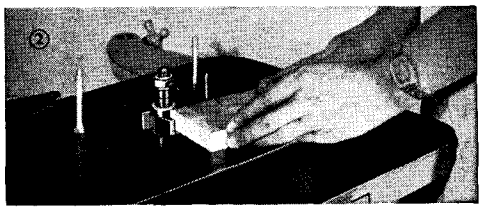
Shaping with Forms.—A form is any devise in which the work is held so that it can be advanced to the cutter. The most common form is the sliding jig, and it is this form which is shown in the picture,

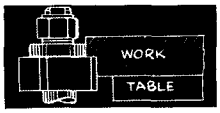




SHAPING WITH GUIDES

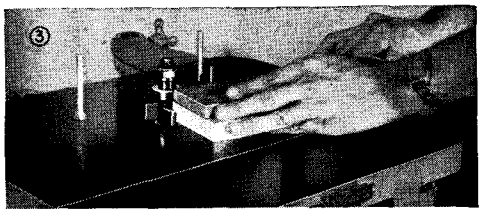
This method is most used for straight work, the guide limiting the depth of cut.

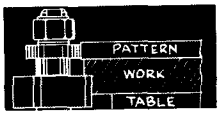




SHAPING AGAINST COLLARS

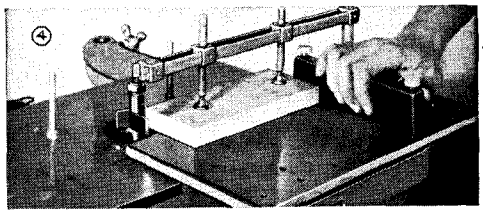
In this method of working, the diameter of the collar controls the cut.

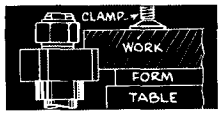




SHAPING WITH PATTERN

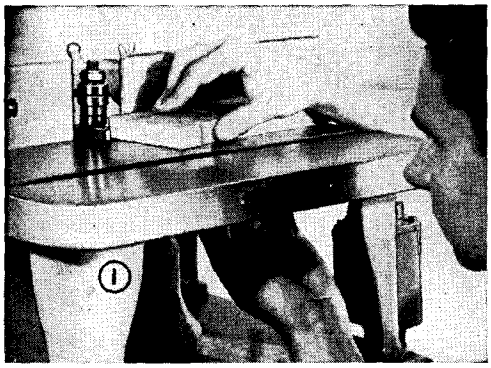
The pattern rides against the collar to limit the depth of cut.

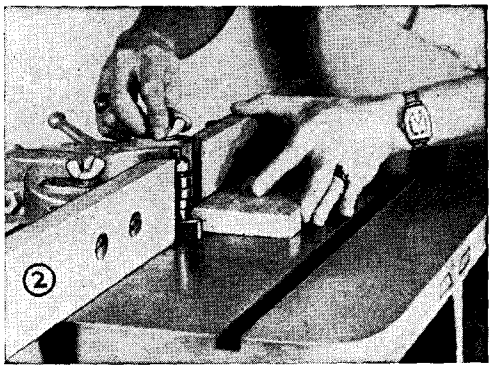




SHAPING WITH FORM

The form holds the work in position so that it can be advanced to the cutter.





The Work is Held Against the Cutter so That Proper Spindle Height and Fence Settings Can Be Made.

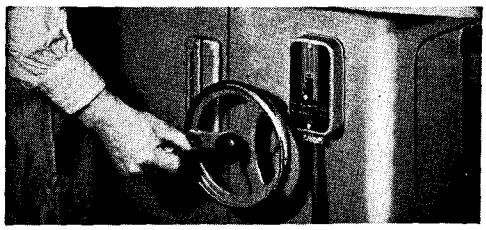


Fig. 4. (The supporting arm has been painted out to show the cut more plainly.)

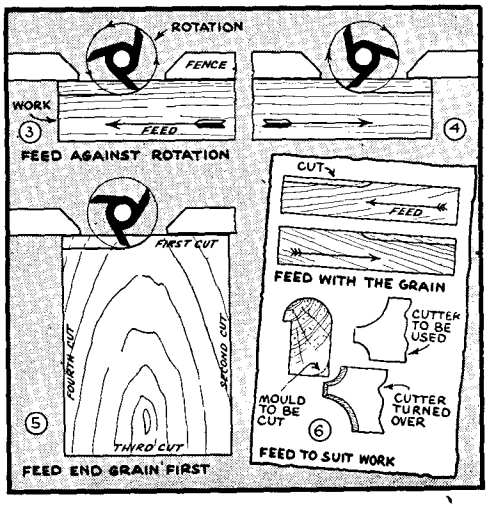


Diagram Above Shows Fundamentals of Feed in Relation to Rotation of Cutter.

Setting the Cutter. — In making any moulded edge, the pattern is usually marked on the end of the work. The proper cutter is then mounted on the spindle, after which the spindle is raised or lowered to the proper height. This is done with either the spiral adjustment, Fig. 1, or with the spindle-raising handwheel, Fig. A, depending on the machine. The fence is then located to give the right depth of cut, as shown in Fig. 2. Where collars are used, the collar is checked against the work in a similar manner.

Rotation and Feed. — The recommended spindle speed for small cutters is 10,000 r.p.m. The shaper is usually fitted with a reversing switch so that the cutter can rotate in either direction. Whatever the direction, the work must be advanced INTO and AGAINST the cutter. Feeding from the right side of the machine is preferred by most workers, the rotation of the cutter being counter-clockwise, as shown in Fig. 3. When the work is fed from the left side, the cutter rotates in a clockwise direction, as shown in Fig. 4.

When returning mouldings or cutting all edges of a piece, the first cut should be made on end grain, each edge being taken in turn so that the final cut is with the grain, as shown in Fig. 5.

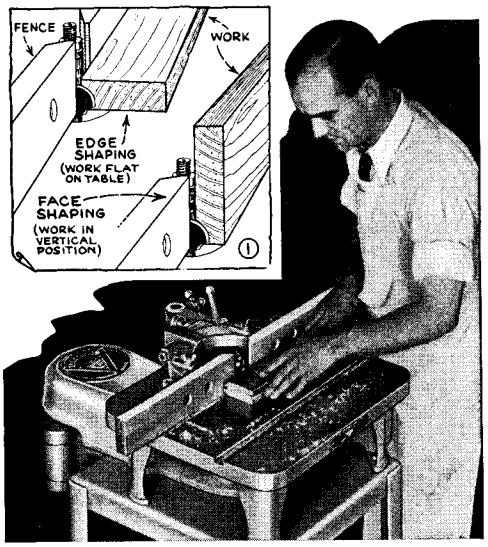
The direction of feed should be such that the cutter will cut with the grain, as shown by the two examples at the top of Fig. 6. This is of minor importance if the shaper is a high-speed machine, but of increasing importance with slower speed spindles.

The feed is often fixed by the nature of the work. That is, in planing a straight edge, the worker could feed from either the left or right side of the machine. On some shapes, however, the cut can only be made in one direction. An example is shown in Fig. 6. Here we have a moulding on which it is required to make the cut shown by the dotted line. The cutter to be used and its position on the spindle as viewed from the right side of the machine is shown at the top of the diagram. It is apparent that the work cannot be fed from the right. Now, by turning the cutter over, and feeding from the left side of the machine, the required mould can be cut. Many cuts of this nature make it apparent why the shaper must have a reversing switch for satisfactory operation.

CHAPTER FOUR

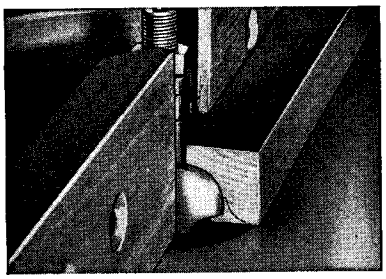
SHAPING with GUIDES

Definition.—A shaper guide is any wood or metal fixture or fence which can be clamped or otherwise fastened to the shaper table in such a position as to form a guide for the work. The most common guide is the straight fence. It can be adjustable or non-adjustable, and varies considerably in construction, as will be seen in the following paragraphs. Curved fences are also used extensively as guides for circular and segment work. In every case, the guide is fixed, the work sliding along it to meet the cutter. When the work is advanced with its edge against the fence, the operation is known as *edge shaping;* when the work is advanced with its face against the fence, the operation is called *face shaping,* as shown in Fig. 1. Edge shaping is always preferred because of the better bearing surface thus afforded.



Above, Using the Standard Adjustable Guide for Straight Shaping.

The Adjustable Fence.—The small shaper is usually fitted with an adjustable fence of the type pictured and described in Chapter I. The whole fence is readily adjusted in relation to the spindle to expose the cutter to the proper depth for the moulding required, as can be seen in the center photo. A second adjustment permits either half of the fence to be advanced or retracted. For average work where a portion of the original edge of the work is not touched by the cutter, as shown by the examples at the top of Fig. 3, both the front and rear fences are in a straight line. The distance which the fence is set back from the cutting circle is the *depth of cut,* as shown in the diagram.



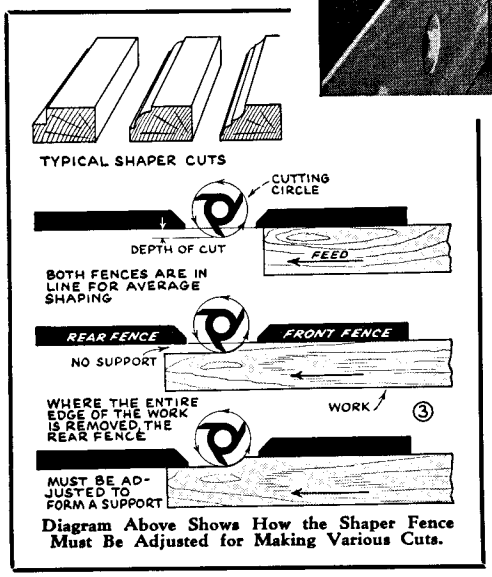
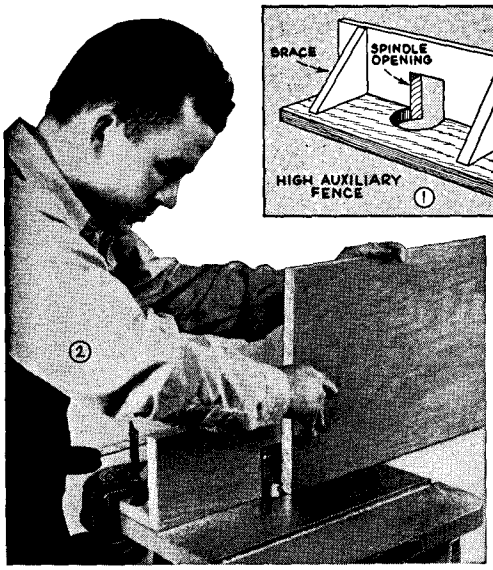


Diagram Above Shows How the Shaper Fence Must Be Adjusted for Making Various Cuts.

Where the shaping operation removes the entire edge of the wood, as, for examples, in jointing or making a full bead, it can readily be seen that the shaped edge will not be supported by the fence when both fences are in line. In this case, the work is advanced to the approximate position shown in the center diagram, Fig. 3, after which the shaper is stopped and the rear fence advanced to lightly contact the



The High Fence Simplifies Face Shaping of Wide Stock; Center, Construction of Long and Miter Fences.

wood. It can be seen that the rear fence is thus in line with the cutting circle, and this adjustment can be made, if desired, before the actual shaping operation begins.

The High Fence.—Wide stock which must be face shaped is sometimes difficult to guide along the comparatively low standard fence, and to secure a better bearing surface most operators prefer the high auxiliary wood fence shown in Figs. 1 and 2 above. The construction is quite simple, as shown in the diagram, the base affording a landing so that the fence can be clamped to the shaper table.

The Long Fence.—The long fence is somewhat similar, as shown in Fig. 3, except that the base forms a table for the work. This fence makes a better support for long work, and also allows the fastening of stop blocks for fluting, reeding, etc., which the shorter standard fence does not always permit. Long work in a "one-man" shop should always be handled in this manner.

The Miter Fence.—Work to be mitered or beveled on the shaper is advanced past the cutter on a suitable miter fence, a typical form of construction being shown in Fig. 4. Where the edge of the work is already beveled, the fence is constructed with the fence proper in a vertical position, as shown in the top circle inset. Where the edge of the work is square, the fence is vertical in relation to the table of the complete unit. Made in this manner, the fence supports the work both before and after leaving the cutter. By using hinges and a simple quadrant, the fence or table, or both, could be arranged to assume any required angle, an important feature in shaping segment work. A jig of this nature is described in Chapter 8. The lower photo shows a typical miter fence in action beveling an edge of one of the pieces in a built-up column.

The Segment Fence.—The segment or circular fence is a useful guide in shaping segment or circular work. The work must be a true circle or a segment of a true circle, the fence being useless for curved work which is not circular. Fig 1 on the opposite page shows the set-up of a segment fence for making an inside cut. The guide is simply a flat piece of stock clamped to the shaper table. The radius of the fence and the work must be exactly the same. The work is advanced to the cutter in the same manner used for straight work.

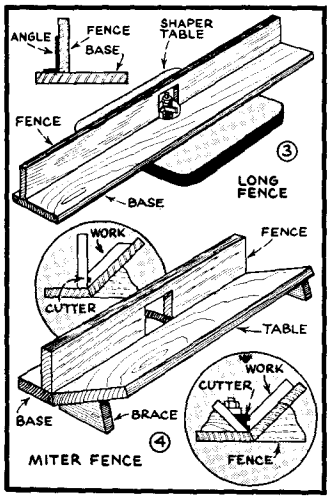
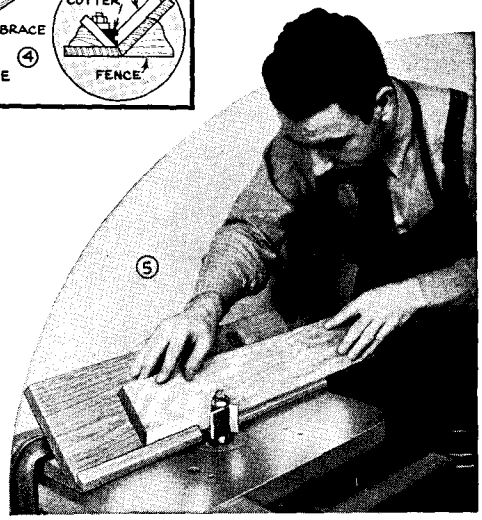
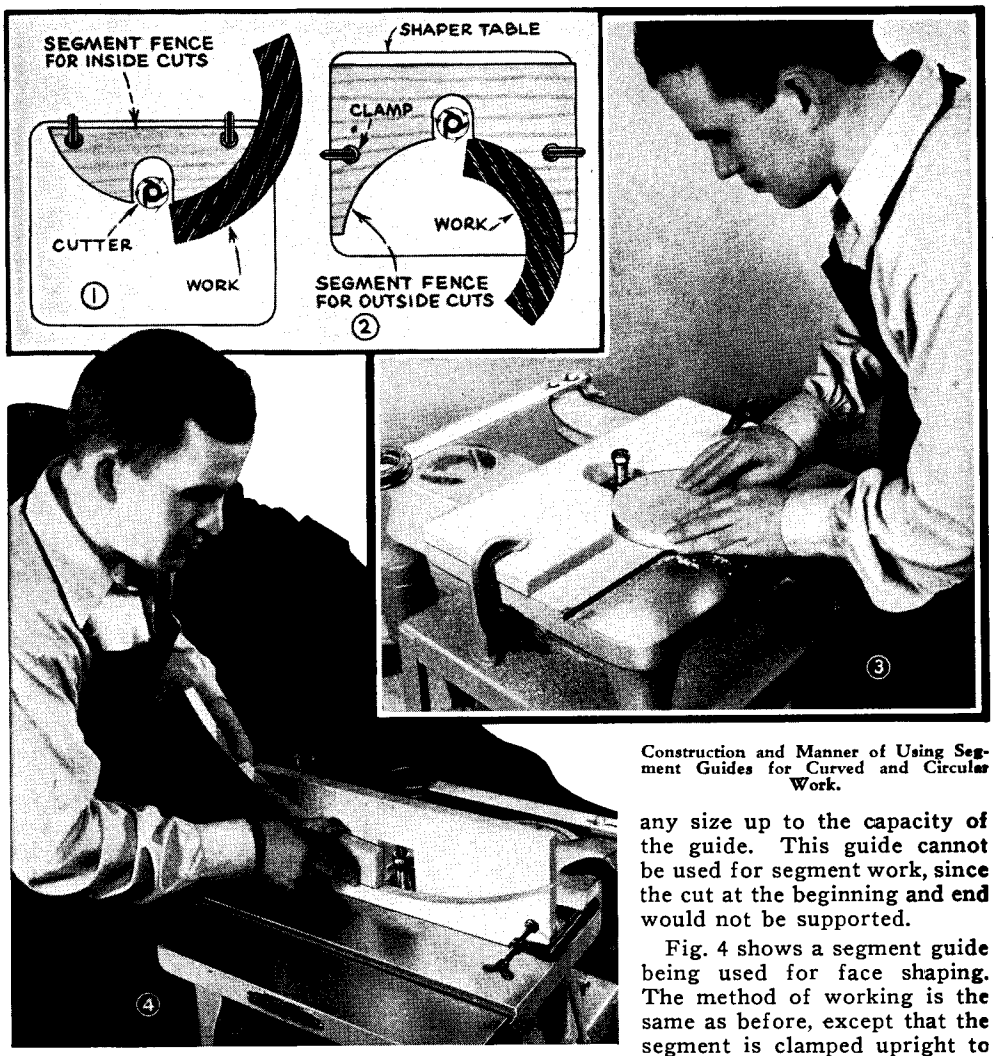


Photo Below Shows Miter Fence Being Used in Beveling an Edge.





Construction and Manner of Using Segment Guides for Curved and Circular Work.

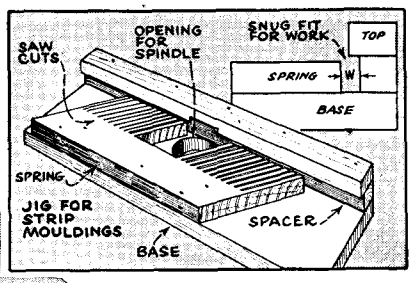
Where the whole edge of the work is removed, the after portion of the guide must be made the required distance fuller to contact the work.

A segment fence for outside cuts is shown in Fig. 2. It can be seen that both fences can be cut from a single board. It must be remembered, however, that a new fence is necessary for every new-diameter work, and that the fence must be cut to the same radius as the work. Smoothness of both guide and work is required for satisfactory operation.

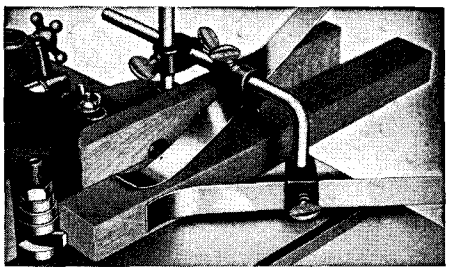
An excellent guide which can be used for a wide variety of different-diameter circles is shown in Fig. 3. This consists of a flat guide with a 90° vee opening cut in the center. A little consideration will show that the sides of this opening will afford two contact points for circular work of any size up to the capacity of the guide. This guide cannot be used for segment work, since the cut at the beginning and end would not be supported.

Fig. 4 shows a segment guide being used for face shaping. The method of working is the same as before, except that the segment is clamped upright to the high fence. The photo shows the end of the cut, the worker having gradually changed his position from the side to the rear of the machine to permit readier handling of the stock, such body movements being necessary in many shaper operations.

Other Guides.—Other guides, fences, shoot-boards, etc., can be made up as the need for them arises. For general work, the standard adjustable fence serves every purpose. For faster production work or increased safety in operation, the auxiliary fence will often work out to better advantage. The few examples shown here do not exhaust the subject, but are simply intended to illustrate the general principles of design to serve as a basis for making other guides. Many of the guides become permanent fixtures and should be



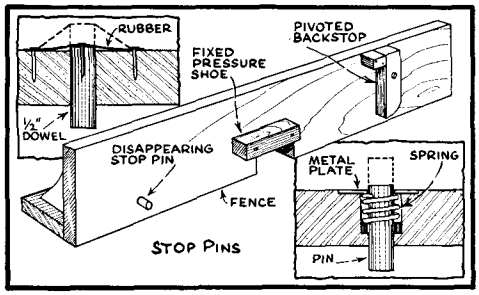
Strip Jig Above and Photo to Right Show How Hold-downs Are Used in Shaper Work.



saved; others may be discarded after the job for which they were made has been completed. Permanent jigs should be well-made, sanded and varnished. Instead of being clamped to the table, they can be readily constructed to fasten with the same studs which are used to hold the standard fence in position.

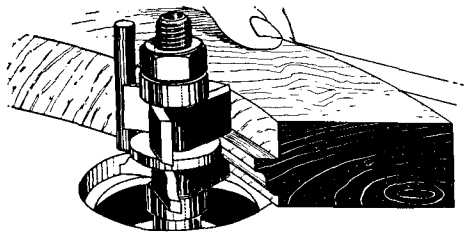
Hold-downs.—Any device which holds the work against the fence or the shaper table is known as a *hold-down*. There are many different styles of hold-downs—wheels, weighted arms, spring tensioners, etc.—all of which serve the same general purpose of keeping the work in close contact with the table or fence. Very often the hold-down is built into and is a part of the guide, a typical example being the guide shown at the top of the page. This shows a jig for narrow mouldings, commonly called *strip mouldings*, which is so constructed that the work is at all times supported against the impact of the cutter, the wood spring holding the work *in* while the top piece of the jig holds it *down*. The same effect is secured through the use of standard shaper hold-downs—thin, steel springs which can be readily adjusted to fit any size of average work. Any hold-down is more effective when it supports the work at a point slightly behind the point of cutting, as shown in the center photo. Suitable mountings on the standard shaper fence permits the hold-down to be used at either end to correspond with the direction of feed. Mountings for the standard hold-downs can be readily fitted to most auxiliary guides, or these guides can be fitted with wood springs or the simpler fixed pressure shoe, as shown in the lower drawing. Some form of hold-down should be used whenever possible.

Stops.—Stops must be used to control the travel of the work in doing such operations as grooving, fluting and reeding, where the cut does not extend the full length of the work. The simplest method is to use scrap pieces of wood, clamping these to the fence at the required positions. Where production work is being done, a more permanent set-up is usually desirable, something on the order of the guide shown in the drawing. The stop or stops on the front or infeed portion of



Above, Production Guide Fitted With Pressure Shoe and Stops; Two Styles of Disappearing Stops Are Shown.

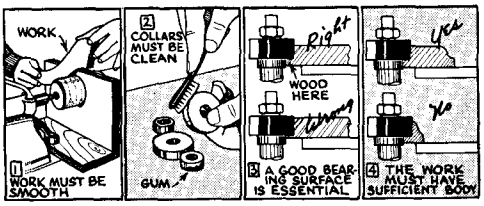
the guide are usually of the disappearing type, since this style does not interfere with ordinary straight shaping when the stop is not used. Two styles of disappearing stops are shown in the diagram, one using a rubber band and the other a spring to project the stop forward through the fence. The backstop is usually pivoted or hinged so that it can be swung out of the way when not in use. It is evident that each set of stops is used for just one particular operation, and is of no use for anything else.

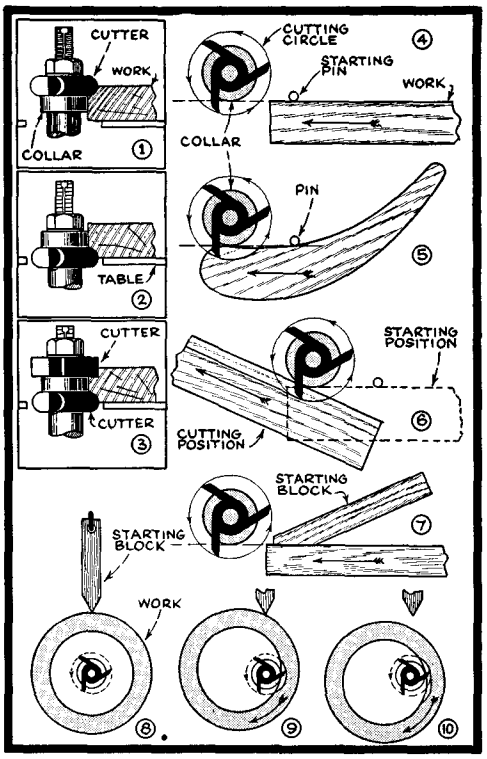


CHAPTER FIVE

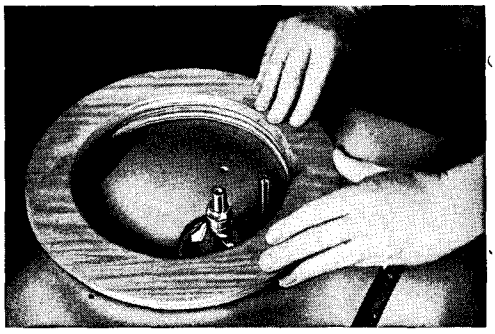
SHAPING with COLLARS

Working Conditions. — Certain conditions must always prevail when work is shaped directly against guide collars: (1) Collars must be smooth and true, free from all gum or other substances. They should be inspected frequently during long runs since some woods will deposit a layer of hard pitch on the rim of the collar as thick as 1/16 in., and this in a very few hours. The gum is easily removed with a stiff bristle brush and benzine or gasoline. (2) The edge of the work to be shaped must be smoothed to net size. It can be seen that any irregularity in the surface which rides against the collar will be duplicated on the moulded surface. (3) A portion of the edge of the work must remain untouched by the cutters in order that the collar will have a sufficient bearing surface. (4) The work must be fairly heavy in proportion to the cut being made. Under no circumstances should short work of light body be shaped against collars. These four rules—smooth work, clean collars, riding edge, and body of the work—are shown in the diagram, and it is important for good work and for safety in operation that they be strictly observed when doing shaper work of this nature.

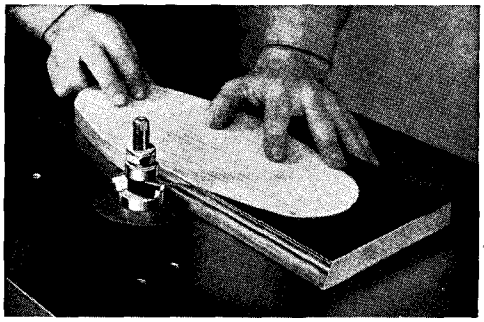




Position of Collar.—The collar may be used either above, below, or between two cutters, as shown in Figs. 1, 2, and 3. The advantage in having the cutter uppermost, Fig. 1, lies mainly in the fact that the progress of the cut can thus be observed at all times. Where the collar is uppermost, Fig. 2, the cut cannot be seen, yet this method offers some advantage in that the cut is not effected by slight variations in the thickness of the stock; also, accidental lifting of the work will not gouge the wood as would be the case in the first method described. The collar-between-cutters is a method frequently used where both edges of the work are to be moulded.



Starting the Cut.—Practically all shapers are fitted with a steel fulcrum or starting pin, and this pin must be used as a support when starting the cut. If the work were to be advanced to the cutter without this side support, it would invariably be kicked back. It is important that the cut be started right, that is, the wood must be advanced



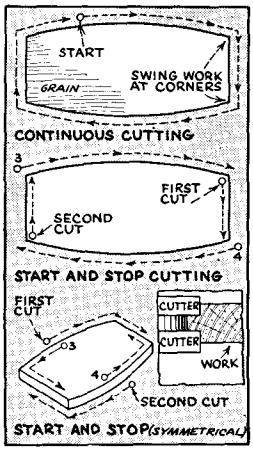
Above, using a sliding starting block. Right, path of shaper cutter.

along an imaginary line running from the edge of the collar to the side of the starting pin, as shown in Figs. 4 and 5. After the cut has been started, the work is swung free of the starting pin and rides only against the collar. Besides the regular steel starting pin, many workers use wood starting blocks, Fig. 7 on the previous page being an example. Figs. 8, 9 and 10 show a wood starting block set up for running an inside cut.

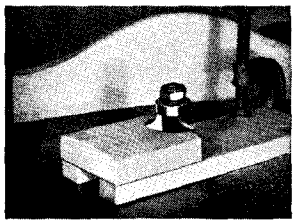
Sliding Start Block.—A wood form having the moulding previously cut on it can be used instead of a starting pin, as shown in photo above. After the cut is started on the work, the block may be pushed aside.

Path of Cutting.—Shaping is usually done with one continuous cut, the work being manipulated to turn corners, etc. Start and stop cutting is also used, the order of the cuts being as shown in the center diagram. Where the moulding is symmetrical, the method shown at bottom of diagram can be used. Cuts 1 and 2 are made in the directions shown, after which the work is turned over for cuts 3 and 4. This method eliminates running off the end grain.

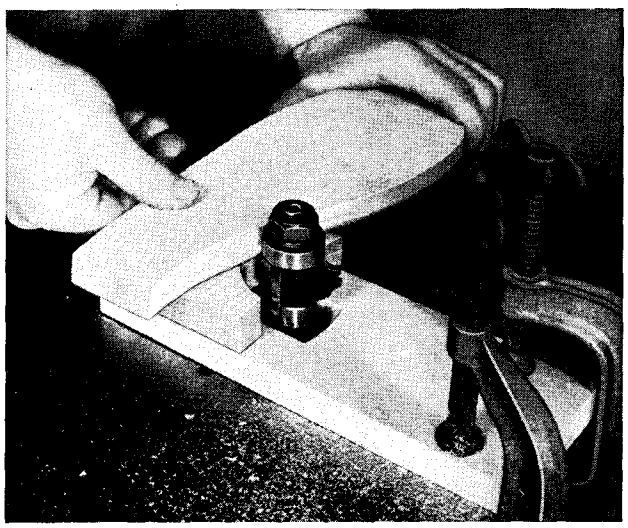
Compound Curves. — Work with compound curves must sometimes be shaped, an example being the head rail on a chair. The small photo shows the set-up. This is simply a block of wood, with the top surface cut to a curve a little sharper than the curve of the work. This guide block is nailed to a second block, the under block being clamped to the shaper table. The crown of the guide block should be in line with the center of the spindle. The spindle is usually raised as far as it will go for work of this kind, and the cutter is mounted high, with just room enough above for the guide collar and nut. The height is necessary, of course, in order that the ends of the piece being shaped will clear the table.

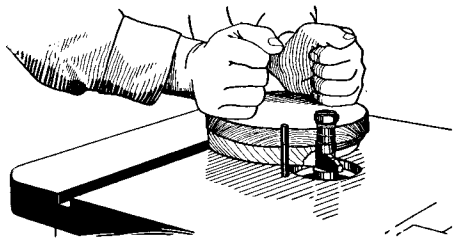


Shaping is done much the same as if the work were a flat piece of wood. The top of the guide block limits the face cut, while the spindle collar limits the edge cut. The work is pushed straight across the table, being tilted slightly so that the work at the cutting point is always approximately level with the table. Overcutting is impossible. On some curves it may be necessary to go over the work twice in order to get a full shape. Notice that the knife is set to cut on the underside of the work. Do not attempt freehand shaping with overhaning cutters as this is both dangerous and liable to produce inaccurate work. Operated as described, that is with the cutter under the work, the cut is always accurate and the operation safe.



A wood guide block is necessary when shaping compound curves.





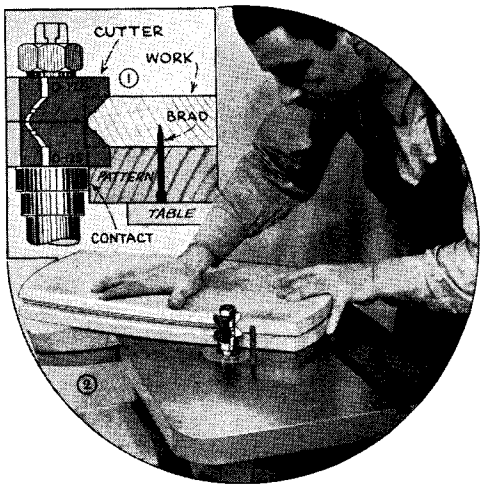
CHAPTER SIX

SHAPING with PATTERNS

Advantages.—Shaping with the use of patterns offers two outstanding advantages: (1) It permits the working of the entire edge of irregular curved objects, an operation which is impossible in any other manner. (2) It provides one of the cleanest and fastest methods of doing production work possible on any machine.

The Pattern.—The average pattern is made from wood, the usual stock being ¾ or ⅞ in. thick. Small patterns are usually cut from solid stock; larger ones are best built up from suitable pieces of hardwood. Production patterns are often made from fiber in order to better withstand the continual riding against the guide collar, but for average work hardwood serves nicely. The shape of the pattern is the exact outline of the work which is to be moulded. The edges must be smooth and clean, and should be oiled to permit smooth running. Softwood patterns for production work should be edged with strip fiber, as shown in Fig. 3.

The work which is to be shaped is roughly sawn about ⅛ to ⅛-in. oversize, and is fastened to the pattern by means of anchor points. The simplest anchor point is the brad or nail — others are made from glazier's points, screws or bolts, as shown in the sketch. A flat point is preferable to a round point. Flat points should be inserted in the pattern in such a manner that they will fit lengthwise with the grain.



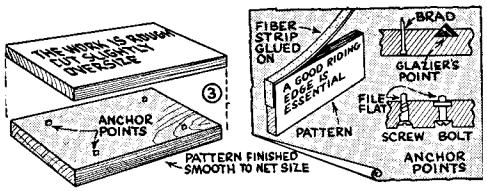


Photo Above Shows Outline Pattern in Use; Diagram Shows Manner of Assembly to Work.

Above, Using a Built-up Outline Pattern for Shaping the Edge of a Small Table Top.

Examples of Work.—A typical example of work done with an outline pattern is shown in Figs. 1 and 2 above. The pattern in this case is a solid piece of ¾ in. stock, carefully smoothed to net size. The pattern, with the work attached, is advanced to the cutter the same as for shaping against guide collars. The pattern rides a suitable-diameter collar to control the cut to the proper depth, the surplus wood on the work being removed as the moulding is