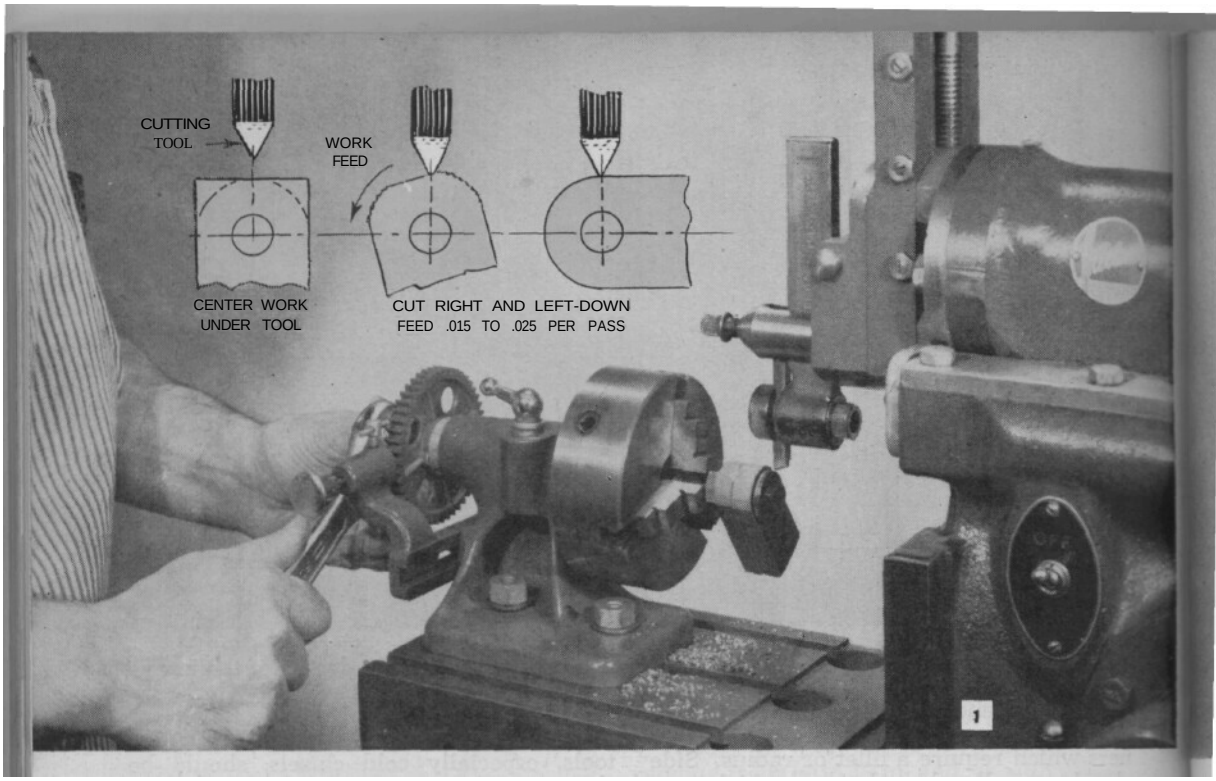


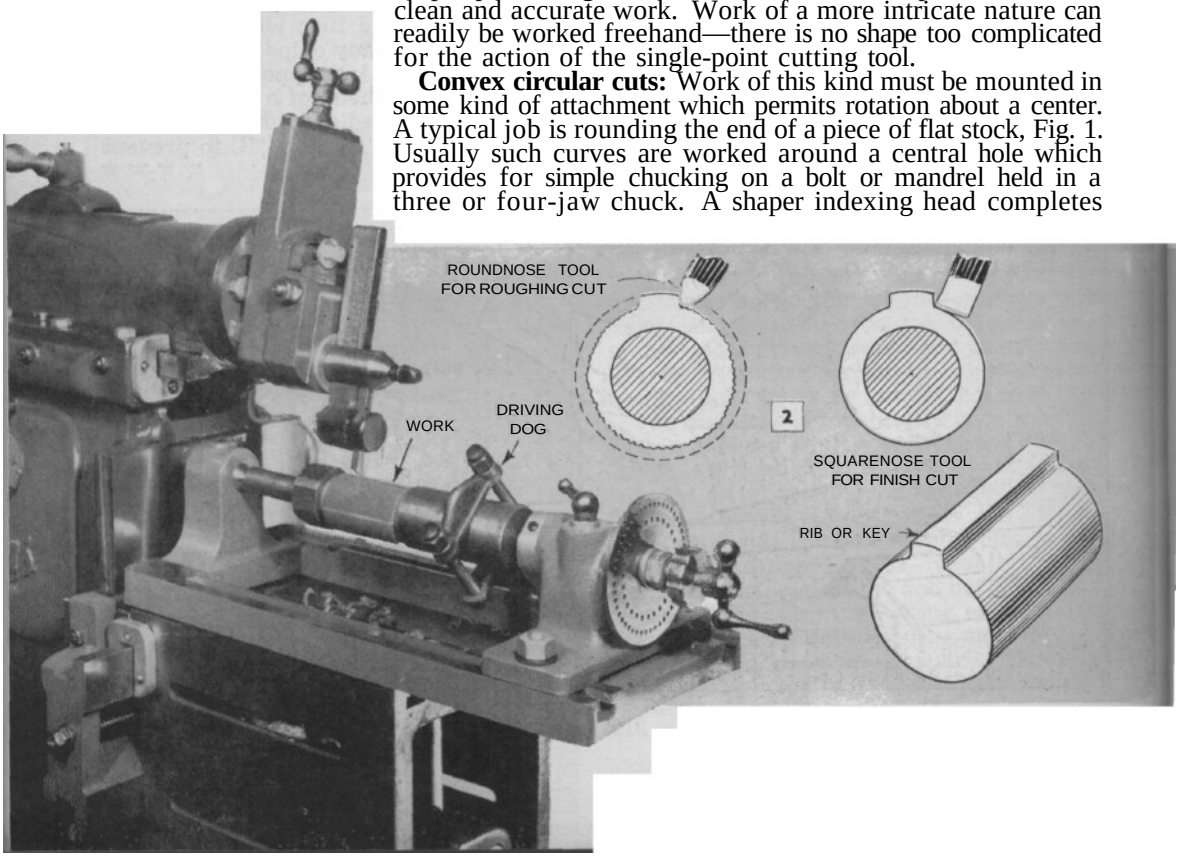
CONTOUR WORK WITH

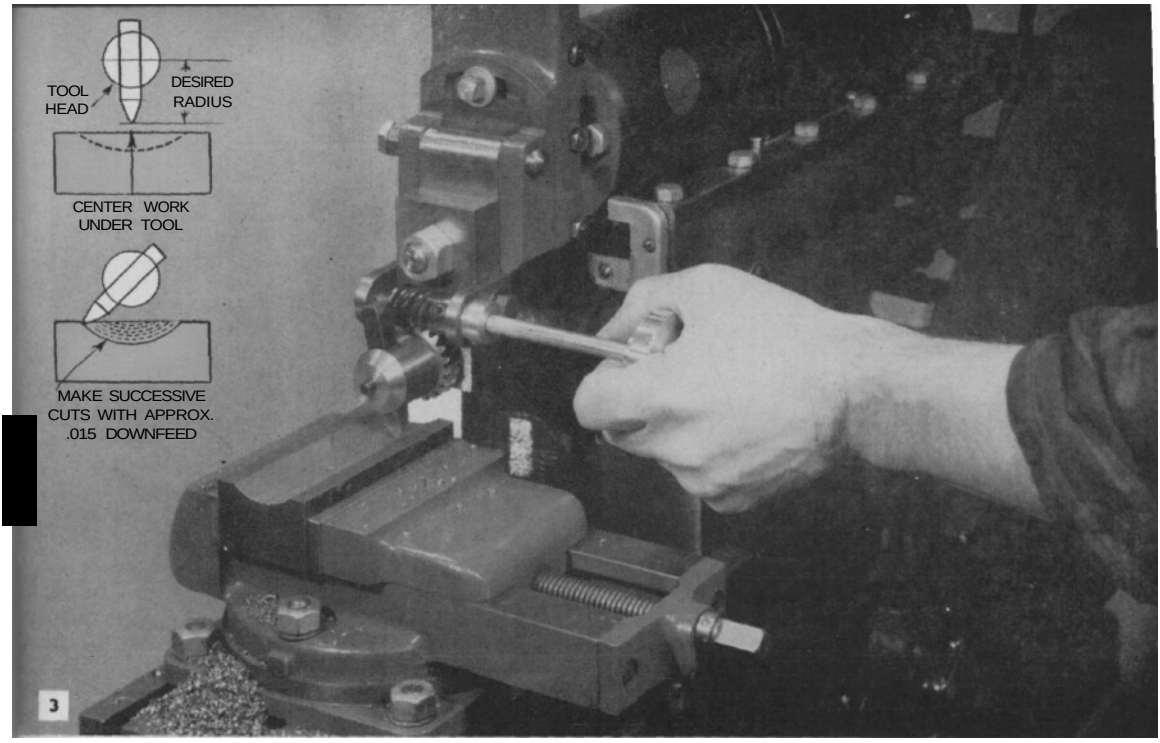
By

Sam Brown

ALTHOUGH primarily a machine for cutting flat surfaces, the metal shaper often gets first call when it comes to machining contours. Many cuts of this kind are circular in shape, permitting the use of mechanical setups which assure clean and accurate work. Work of a more intricate nature can readily be worked freehand—there is no shape too complicated for the action of the single-point cutting tool.

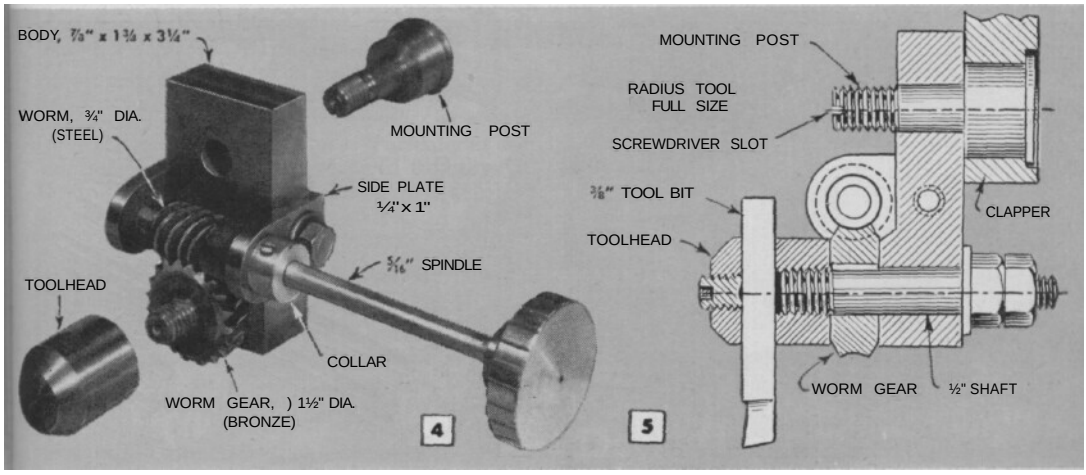
Convex circular cuts: Work of this kind must be mounted in some kind of attachment which permits rotation about a center. A typical job is rounding the end of a piece of flat stock, Fig. 1. Usually such curves are worked around a central hole which provides for simple chucking on a bolt or mandrel held in a three or four-jaw chuck. A shaper indexing head completes

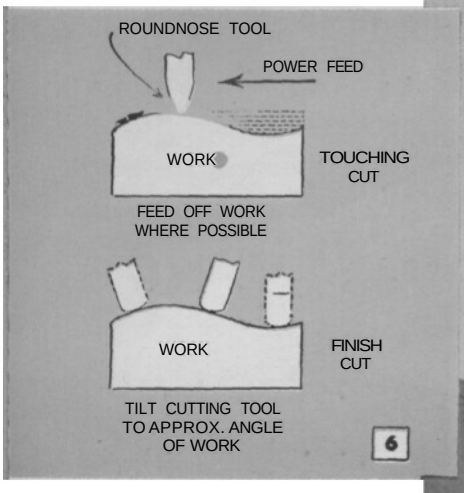


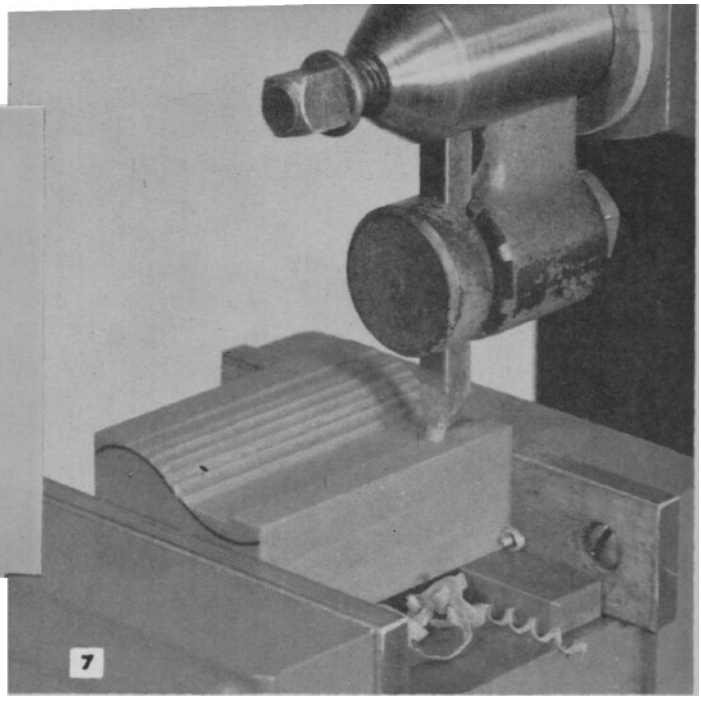


A METAL SHAPER

the setup. The indexing pin is locked out since it plays no part in the operation. The spindle lock is tightened until the spindle turns with a slight drag when turned with a wrench. Then with the shaper running, feed the work by means of a wrench applied to the end of the spindle, Fig. 1. Cuts can be made both right and left, using a downfeed of about .015 per pass for steel and considerably more for aluminum and plastics. The manual feed with wrench is done on the backstroke and is quite easy to do once you pick up the rhythm of the ram running at 50 to 80 strokes per minute. Almost perfect work can be done by using a roundnose tool bit for both roughing and finishing. Alternately, you can change to a flatnose cutter; this will form a fairly good surface even when the manual feed with wrench is somewhat irregular. Going over the work twice on the final cut gives extra smoothness. If the work is too long to swing over the shaper table, the index head should be mounted in the left-hand table groove. This will allow the work to hang alongside the shaper table, permitting





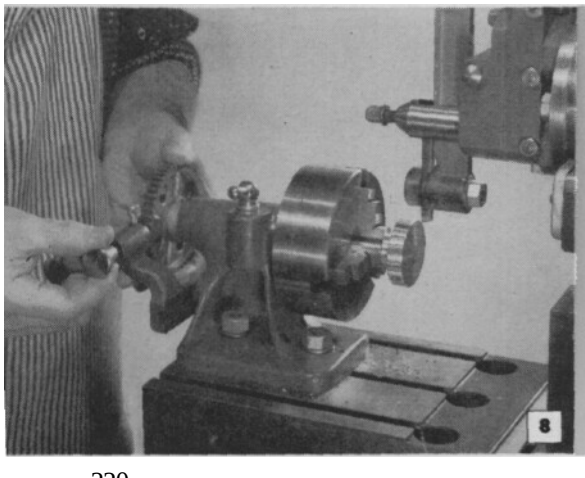


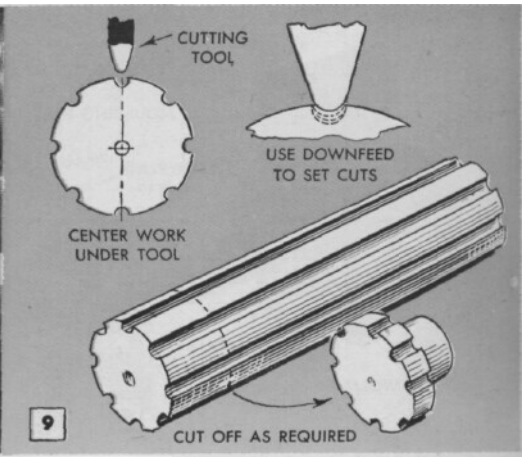
the handling of pieces up to about 3 ft. long. A gain of about 2 in. in work swing can be obtained by mounting the index head on raising blocks or on top of the rotary index table.

Some workpieces may be too long to allow direct chucking, and in this case you mount the work between centers or on a mandrel mounted between centers just as in a lathe. The shaper indexing-center attachment is used for work of this kind, Fig. 2. As before, the manual feed is applied by means of a wrench on the end of the spindle. Initial turning and boring of the work to fit the mandrel is done on the lathe. Odd-shaped work can be mounted on an angle plate or face plate in much the same fashion as for lathe work.

Radius tool: An attachment for making concave cuts is commonly called a radius tool. A shop-made tool, Figs. 3, 4 and 5, will handle concave cuts from ¾-in. to about 2½-in. radius. The construction of the radius tool is a fairly simple machine job. The attachment is bolted to the toolpost clapper as in Fig. 3. The projection of the cutter must be exactly the required radius, Fig. 3, and the work must be centered under the tool head. The traverse feed is made manually by turning the handle of the radius tool; a downfeed of about .015 per pass is used for work in steel.

Freehand work: Much of the contour work done on the shaper is a freehand operation, dependent on the eye and skill of the operator. Figs. 6 and 7 picture and detail a typical job. The required shape is plainly marked on the end of the work. Using a roundnose cutter, the excess metal is removed by means of successive stepcuts. In work of this kind the automatic power feed is used for each pass; the operator's part of the job lies in setting the downfeed.



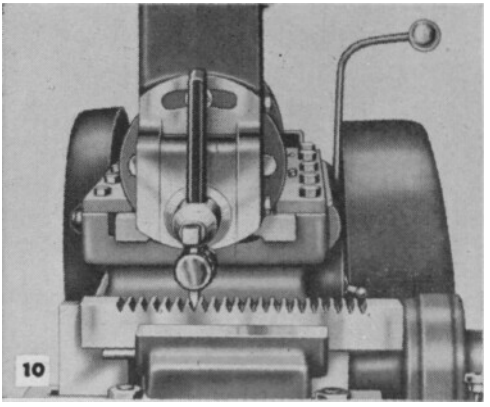


It is always good practice to feed off the work as this eliminates the danger of overcutting. However, the concave portion of the cut (at right-hand end) does not permit this technique. In cases like this where the traverse feed must stop with the cutter within the work, it is best to disengage the power traverse and use only manual crossfeed for better control—it is all too common with power feed engaged to take just one stroke too much and overcut the line.

Because freehand cutting is largely a stepcut operation, the work is certain to show tool marks. Better smoothness of cut can be obtained by selecting tool bits which approximate the shape of the work for final cuts. Tilting the cutter bit is often helpful. However, with nothing more than a roundnose bit and a sharp eye, the work can be made smooth enough to clean up with a minimum amount of filing.

Formed cutters: The quickest method of producing curved shapes is to use a cutter of the exact shape required. This system has limitations on light-duty machines because the relatively large contact area of the formed cutter often leads to chattering and poor cutting action. If you are working steel you can cut no more than ¼" in. wide with a formed cutter, Figs. 8 and 9. Wider cuts can be made in aluminum, and plastics machine readily with formed cutters up to 1 in. wide. These cutters can be ordinary wood-shaper or molding-head cutters, Figs. 12 and 13. When using the 3-lip cutter, Fig. 12, it should be positioned on the left side of the shank so that any tendency to turn on the threaded spindle will tighten the nut.

Formed cutters are excellent for cutting small rack or gear teeth, Fig. 10. When the teeth are large, excess metal should be roughed out by cutting first on one side of the tooth and then on the other. Spacing for rack teeth is controlled by the micrometer feed on the shaper table. The spacing for gear teeth or handwheel grooves, Fig. 9, is obtained by using the indexing head, Fig. 8. Gear blanks and handle stock can be worked in long lengths to be sawed apart as needed, Fig. 11. Alternately, in short-run production work, many workpieces can be bolted, soldered or clamped together to form a sandwich which is then machined in one operation. * * *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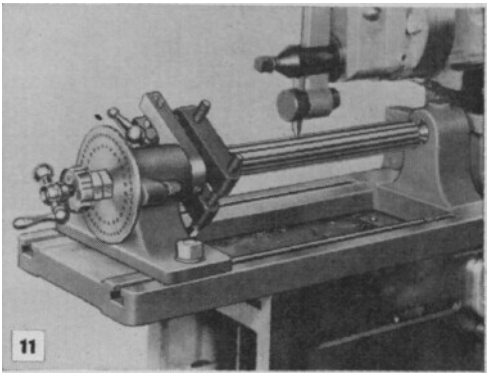
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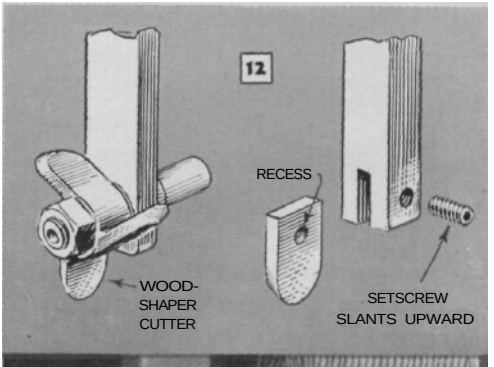

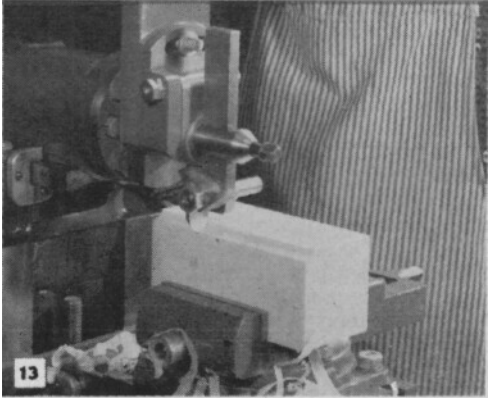
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