

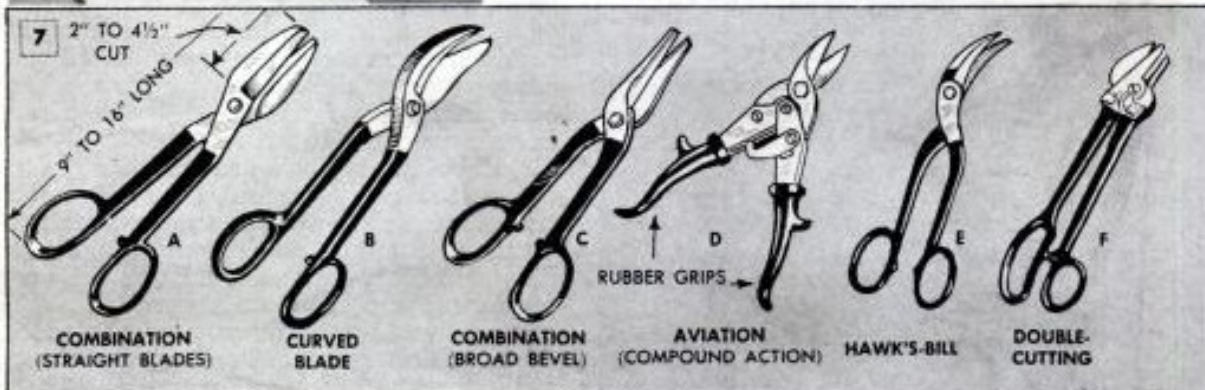
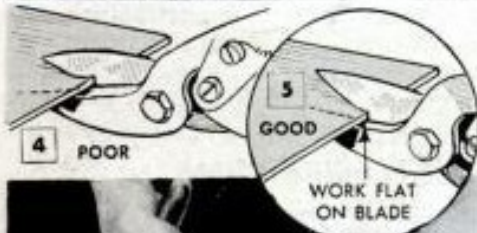
# HOW TO CUT

# Sheet Metal

By Sam Brown



Snips should be held square with work, except aviation type which cut best with right tilt. Below, vise mounting aids in cutting thick stock

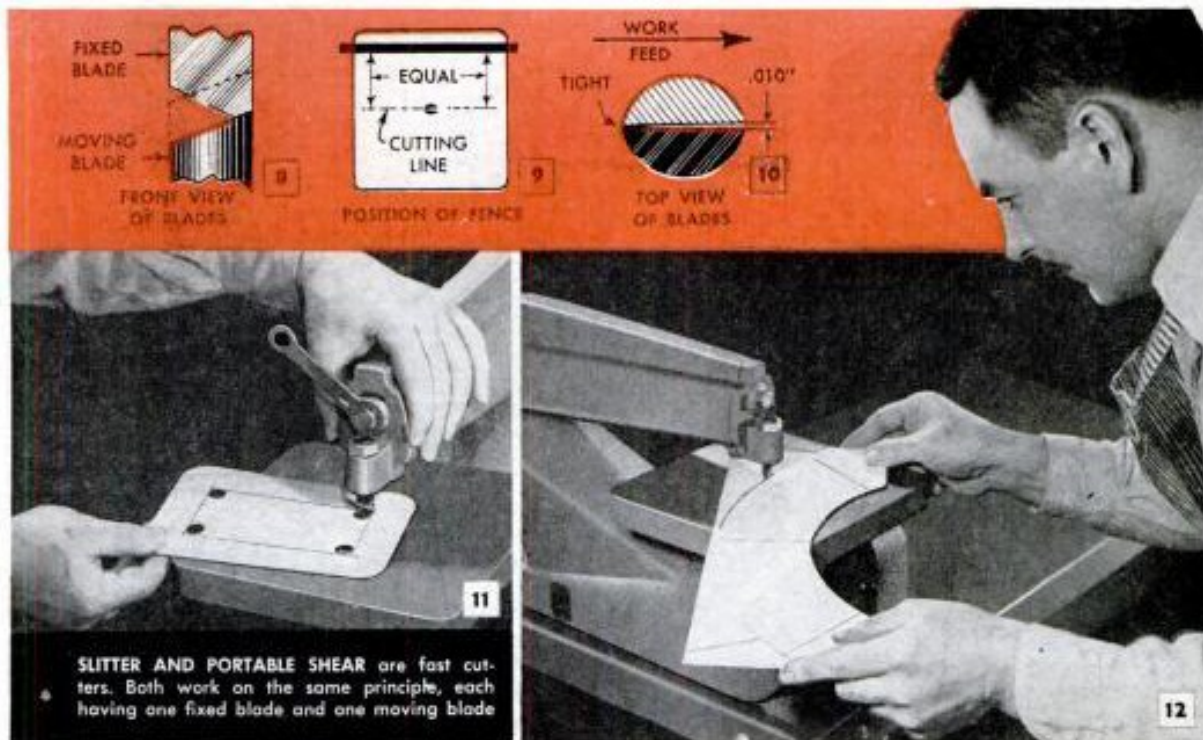


**JUST AS IN** woodworking, the fundamental process in working with sheet metals is cutting the stock to specified dimensions or shapes. In some instances, such as making ornamental cutouts and plain overlays, the whole job is confined to cutting operations, but more often cutting is simply a preliminary step to bending, spinning, hammering and other operations needed to complete the project.

**Snips are basic tools:** Whatever other sheet-metal cutting tools you may have, there is always need for a pair of snips. Several popular styles are shown in Fig. 7, of which the combination snips, A and C, are favorite all-purpose tools for straight or curved cutting. Aviation-pattern snips with compound leverage are rapidly gaining in popularity. These snips make a clean cut with much less hand pressure than required for regular snips. When using snips, the blades should be held at right angles to the work, as shown in Fig. 2. If you run off the line, a slight tilt to the right, Fig. 1, will free the work pressure and allow the blades to return to the line.

Snips with a broad cutting bevel, C and D, Fig. 7, work best if tilted a little to the right throughout the cutting operation. Fig. 5 shows how the right tilt locates the lower face of the work flat on the blade. When cutting heavy materials with snips, a one-handed action with the free handle held in vise, Fig. 3, will give extra power.

**Slitter and portable shear:** These two are power tools and both work on the same principle, having one fixed and one moving blade, as shown in Figs. 8 and 13. The slitter is a bench tool. In a small unit, it is powered with a 1/4-hp. motor which is belted to the machine with driving and driven pulleys of the same size, giving 1725 strokes per minute. It is a fast-cutting machine

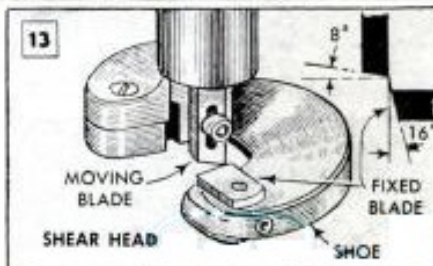


SLITTER AND PORTABLE SHEAR are fast cutters. Both work on the same principle, each having one fixed blade and one moving blade

when properly operated but requires some practice in manipulating the work and adjusting the blades. The blades will cut best if set tight on the infeed side and slightly open at outfeed side, as shown in the top view, Fig. 10. The feed rate should be smooth and uniform and the operator must guard against any tendency to lift the front edge of the work as this will invariably cause jamming.

It is practical to fit a plywood table over the regular metal table and in this way gain needed work surface for large pieces. Although straight cutting with a fence is fast and accurate, it is important that the fence be set parallel with the flat side of the blades, Fig. 9. If the fence is only slightly out of line, the work may jam.

The cutting head of the portable shear is detailed in Fig. 13 and the shear is pictured in Fig. 14. This is a convenient, fast-cutting tool and the most important point in operating technique is to keep the work flat on the fixed blade. It will make inside cuts but requires a rather large hole in the stock to admit the shoe. Neither shear nor slitter is capable of



<i>Tool Data</i>	SNIPS	SLITTER	PORTABLE SHEAR	PORTABLE NIBBLER	HAND PUNCH	RING SHEAR	BAND SAW	JIG SAW
THICKNESS CAPACITY	21 GA. (.032")	20 GA. (.035")	18 GA. (.049")	18 GA. (.049")	20 GA. (.035")	20 GA. (.035")	ABOUT 3"	ABOUT 3/4"
CUTTING SPEED per Min.	ABOUT 24"	UP TO 120"	UP TO 120"	UP TO 80"	UP TO 40 STROKES	UP TO 120"	UP TO 120"	ABOUT 30"
MINIMUM RADIUS	ABOUT 3/4" (AVIATION)	ABOUT 3"	ABOUT 3"	ABOUT 2"		ABOUT 3/8"	1/2" (1/8" BLADE)	WILL MAKE ANY CUT
KIND OF WORK	GENERAL	GOOD FOR FAST ROUGH WORK	GENERAL	STRAIGHT AND CURVES —GOOD FOR NOTCHING	HOLES AND SHORT STRAIGHT CUTS	GOOD FOR CIRCLES AND RINGS	GENERAL— FAST CUTTING	INTRICATE CUTOUTS— INSIDE CUTS

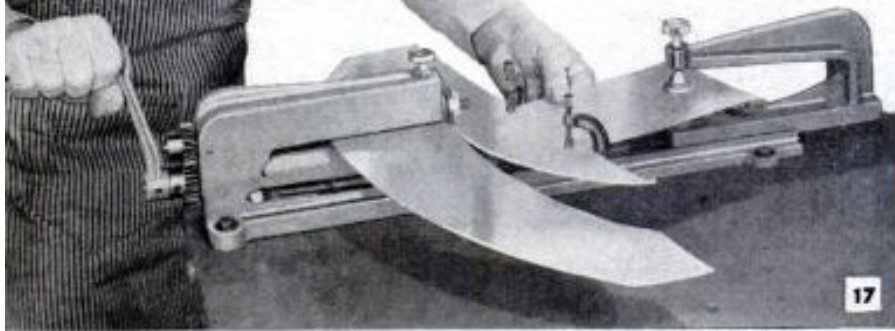


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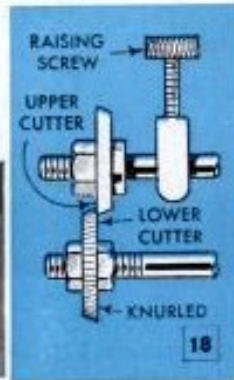


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Ring shear does perfect circle work needed for plates and lamp shades. Photo below shows extension strip clamped to work to provide a pivot for swinging large segment



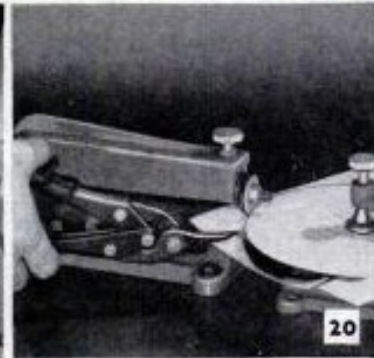
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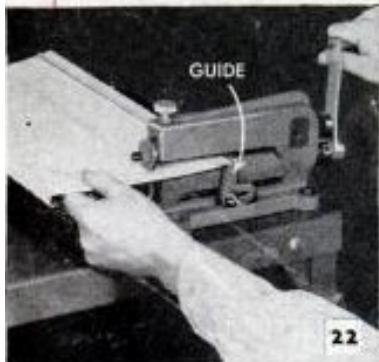


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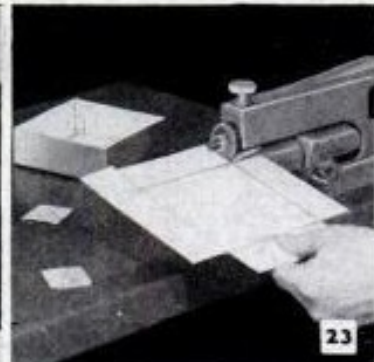


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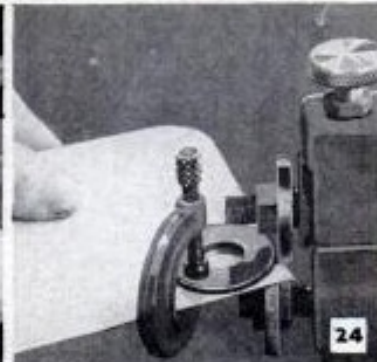
Circles are cut by using a pivot, which is an accessory to the shear. Cut may be started at edge of work, as in bandsawing, or top cutter can be forced through work at any point. To prevent distortion, inside cuts are made with minimum overlap of the cutters. On outside cuts, snip away the waste as cut progresses



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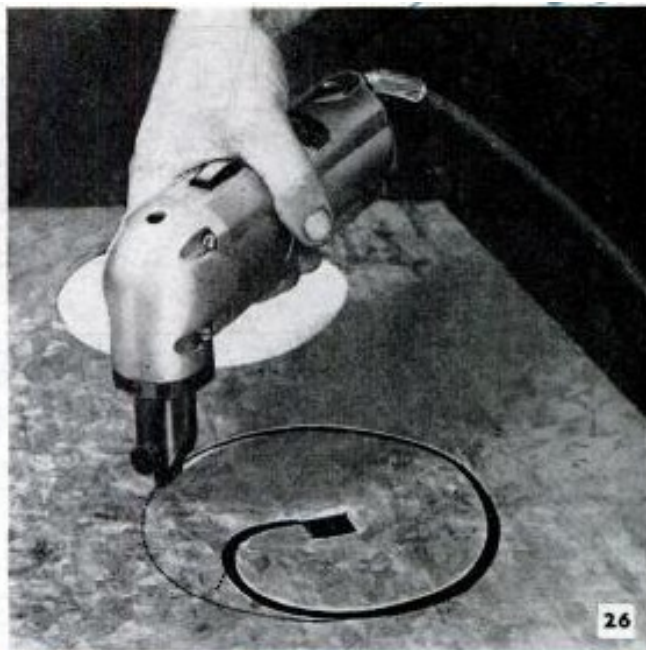
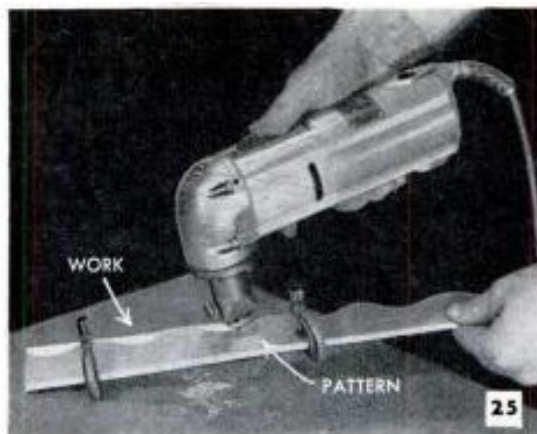


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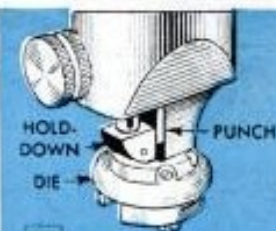
Straight cuts can be made freehand by following a pencil line, but a better way is to improvise a guide as in left-hand photo. Center photo shows how notches are cut to form box corners. Right-hand photo shows how a curved guide can be used to form a true radius. In this case, an ordinary washer served the purpose



making sharp curves. Such work must be done by making a series of tangent cuts to the dimension line and cutting away the waste.

**Ring shear:** One of the best tools for cutting sheet metal is the ring-and-circle shear, Fig. 17. It cuts fast, is noiseless and does perfect work in cutting circles and rings, needed for many metal projects. Fig. 18 shows the cutting head, consisting of two hardened steel wheels which are interchangeable. The knurled wheel will leave a slight track on the work but the interchangeable feature permits mounting this wheel to run on the waste stock.

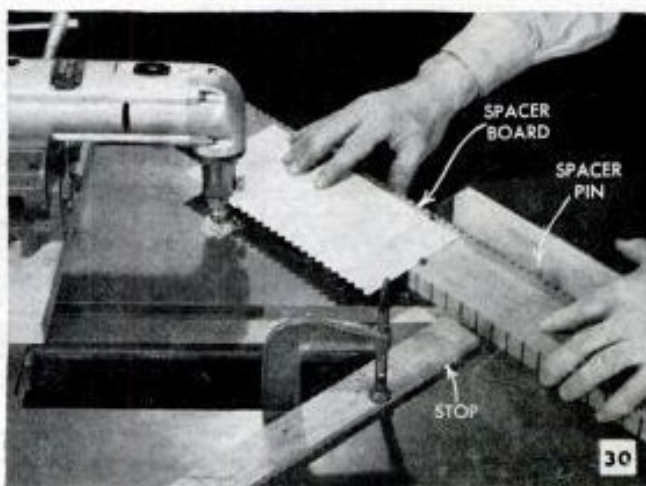
When cutting a circle, the work is clamped in the pivot jig, after which the raising screw is turned to force the cutter through the work, Fig. 19. After that, you just turn the crank. It usually is advisable to cut away the waste, or off-fall, in sections, Fig. 20. Inside cuts are made in the same manner, as shown in Fig. 21. When used with the guide, Fig. 22, the ring shear



A portable nibbler can be used freehand or with a pattern as in the upper left-hand photo. Square housing permits unit to be mounted in vise as in photos

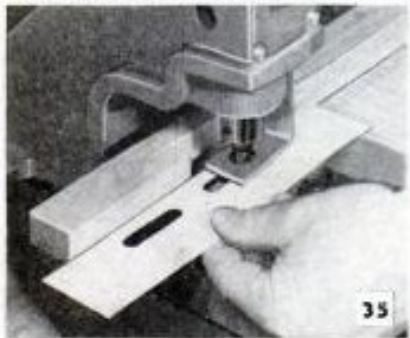
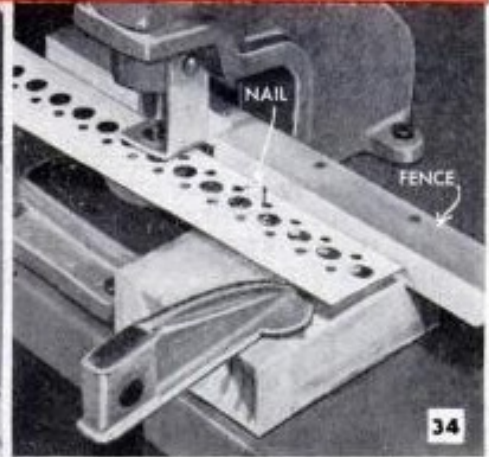
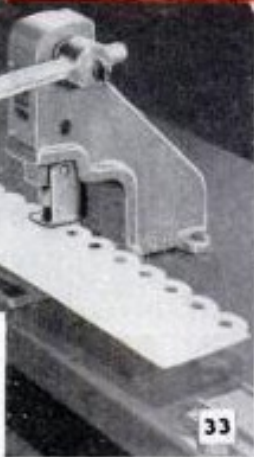
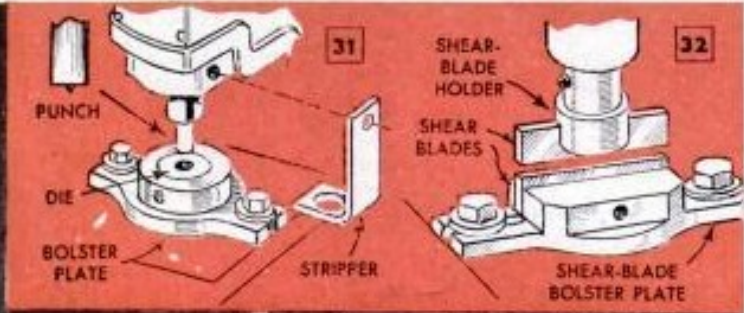


Used with a spacer board and stop on circular-saw table, the nibbler can be set up to make a variety of attractive notched borders. Work is held in place with thumbtacks





Hand-operated punch makes clean, round holes for rivets or decorative effects. Square dies are available for certain type punches, also accessory shear blades in various sizes



A hand punch does accurate slotting



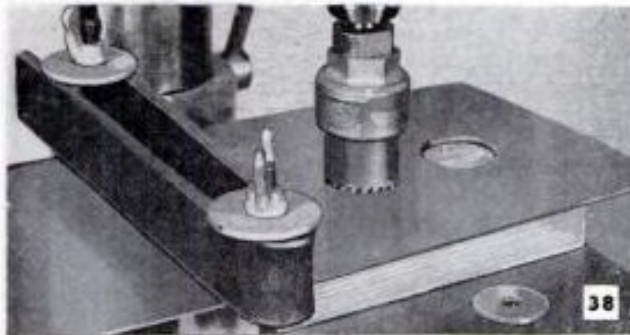
Above, cutting in from edge with shear. Below, notching edge with shear blade



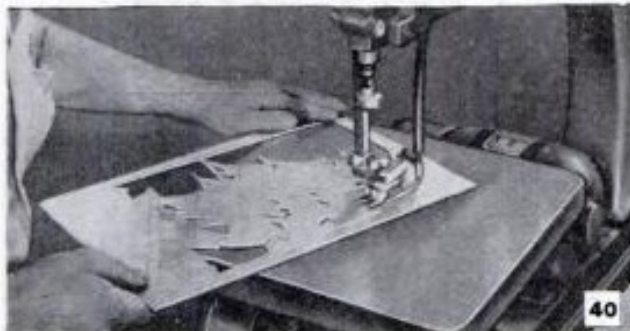
does clean, straight cutting. Fig. 23 shows a notching operation and Fig. 24 shows how a pattern can be used. In this instance a washer serves as a guide for rounding corners.

**Portable nibbler:** Punching tools, which include the nibbler, Fig. 26, and the hand punch, Fig. 33, work with the least distortion of the material and make the cleanest edge of all metal cutters. The portable nibbler is simply a power-operated punch. As shown in Fig. 27, the die is carried on an extension of the frame, while the punch oscillates rapidly up and down through the die. In the portable tool, the most popular type of punch is a rectangular shape measuring  $\frac{1}{16} \times \frac{1}{4}$  in., with rounded edges. The slight serrations left by this type of punch are so small that the edge requires a minimum of finishing. Because of its easy portability, the nibbler is widely used in cutting large patterns and cutouts on sheet sizes which are impractical to handle on a bench machine. But it does the smaller, more intricate jobs equally well. Cutting without distortion and with no exposed parts, it will work circles down to the size of a dime. Inside cuts can be made with a 1-in. starting hole, as in Fig. 26. The use of a metal or wood pattern is practical and fast repetitive work can be done in this manner, the edge of the cutterhead riding the pattern as in Fig. 25. Many portable nibblers have a square motor housing to permit vise mounting. A good setup of this kind can be made on the circular-saw table, as shown in Fig. 28. With the work thumb-tacked to a spacer board, the saw-table setup is ideal for ornamental notching, as shown in Figs. 29 and 30.

**Hand-operated punch:** This is one of the handiest tools in the shop and does a variety of jobs with suitable accessories. Its prime job is to punch round holes in sizes from  $\frac{1}{8}$  to  $\frac{1}{2}$  in., advancing by sixteenths. Fig. 31 shows the setup. Each punch has a tiny point at



Hole saw is useful drill-press accessory for cutting clean holes. Also is used with portable drill



Jigsaw is best for intricate cutouts in sheet metal. A 15-tooth blade does rapid work in medium stock



Bandsaw used as friction saw cuts fast and accurately on sheet metals of all kinds up to  $\frac{1}{8}$  in. thickness

the center, and this centers on punch marks made on the work. Instead of prick-punching each center mark, it is possible in repeat patterns to use a fence and guide pin, as shown in Fig. 34. After the first 4 in. of the pattern have been punched out in the usual manner, succeeding holes can be worked very rapidly. Employing a series of punched holes with the work guided along a fence, the hand punch does excellent slotting, as shown in Fig. 35. Unlike a similar operation done with drills on the drill press, the holes can be as closely spaced as desired, without distortion or runover.

A handy accessory for the hand punch is a set of shear blades, Fig. 32. With these you can do straight-line cutting, notching and internal cutting. The shear-blade bolster plate can be used in either of two positions, as shown in Figs. 36 and 37, to suit the work.

**Bandsaw and jigsaw:** More familiar to the average worker, these power tools do excellent work in metal. Ordinary wood or metal-cutting bandsaw blades run at woodcutting speeds can be used to cut aluminum up to  $\frac{1}{16}$  in. thick. For fast cutting of heavier black and galvanized sheet metal up to  $\frac{1}{8}$  in. thick, the technique of friction sawing on the bandsaw is excellent. This is done with a regular metal-cutting blade, 18 teeth per inch, run at 2800 to 3000 f.p.m. Galvanized sheet stock can be cut in this

way as fast as the hand can push the work, Fig. 39. For conventional bandsawing of sheet metal, the speed should be reduced to approximately 200 f.p.m., using a 24 or 32-tooth blade.

The jigsaw cuts much more slowly than the bandsaw but is the best tool for making intricate cutouts involving short-radius curves. The fastest cutting is obtained with a hardened and set metal-cutting blade with about 15 teeth per inch. For finer but slower work, 30 or 32-tooth blades should be used. Medium speed can be used for soft metals. But use only the slow speeds for sheet steel.

**Other equipment:** The tools described fall far short of covering the full line-up of sheet-metal cutting tools. A worth-while extra is a set of hole saws, which can be used in an electric portable drill or drill press, Fig. 38, for cutting accurate holes in sheet metal. Of the various methods, snips, ring shear and punch are the 1-2-3 selection—assuming that you already have jigsaw and bandsaw. ★ ★ ★

### Tapping Holes in Sheet Metal

Tapped holes in sheet metal will grip screws more securely if the metal is punched instead of drilled. The use of a prick punch forms a burr which produces a "thickness" several times that of the metal itself, thus accommodating additional threads.