

Fig. 1: Parts of a file

Files in the Woodshop

They're often a good alternative to abrasives

by Henry T. Kramer

Files seem to be poor country cousins in a typical woodworker's shop, often neglected by even skilled craftsmen. But it's wrong to ignore a tool that can be so useful and that frequently is the best tool for shaping, smoothing or sharpening.

Files can true up all kinds of tools, especially new planes and spokeshaves. They sharpen saws, scrapers, cold chisels, axes and screwdrivers. Files can also smooth knicks and dents in everything from drill bits to drive shafts. They're efficient and economical alternatives to abrasives for shaping both wood and metal—they last a long time, and there's a size, shape and cutting grade for almost any carving or smoothing job you might encounter.

You may not consider a file a precision tool, but I've brought the badly hogged sole of a 22-in. jointer plane to within ± 0.00125 in. of dead flat with only three files. And it doesn't take as much time or experience as you might think. As in any woodworking or metalworking, the slogan is "Measure twice, cut once." Stress the word "cut": you'll never learn how to use a file properly until you realize it's a cutting tool, not one that abrades the work.

More than 650 types of files are available today, but I'll discuss only 10 groups of "American Pattern" files that include about 170 files useful to woodworkers. The American Pattern designation is a traditional one stemming from post-Civil War days when Americans first began manufacturing files on a large scale, instead of im-

porting them from Europe. These American Pattern files usually are coarser than their European or "Swiss Pattern" counterparts. I won't consider Swiss Patterns here, since they are finishing tools used by jewelers and modelmakers and too fine for most woodshop jobs, or circular-tooth files designed for soft, ductile metals such as copper, brass and aluminum.

The terms commonly used to describe files are fairly self-explanatory and probably already part of your vocabulary (figure 1). Most files have cutting teeth on both faces and both edges, but some have one or two smooth or "safe" edges so that they can be used in tight corners without accidentally damaging adjacent areas.

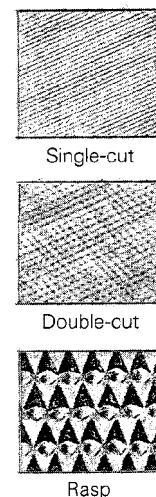
The "cut" of a file describes how its teeth are arranged. Single-cut files have one set of continuous, parallel teeth running in one direction. These files are designed primarily for sharpening or finishing metals. Double-cut files have inter-

secting sets of teeth forming sharp, diamond-shaped points designed to remove material faster. They'll cut wood quickly, though not as fast as a rasp, which has freestanding, clog-resistant teeth. Rasps and rifflers (small shaped rasps) are made primarily for woodworkers, carvers and farriers. Rasps come in several combinations of length and tooth grade, but all you really have to know is that in similar lengths and grades, the wood rasp is the coarsest, the cabinet rasp is a little finer, and the patternmakers' cabinet rasp is the finest. These cut wood rapidly, but leave a rough surface which can be smoothed with a wood file. In addition to regular rasps, there is also a tool called a shoe rasp, or four-in-hand, which is a combination of rasps and files that looks a lot more useful than it really is—its toothed surfaces are too short for an effective cutting stroke.

Any file can be used on wood, but you may find that the majority are too fine and clog up too quickly to be of much use. The coarseness of a file is controlled by two factors: the grade or size of tooth used, and the file's length. Today it's hard to find more than three grades of teeth: bastard, second-cut and smooth. Years ago, rough, coarse, dead-smooth and dead-dead-smooth grades were also available. The grade usually is stamped on the heel of the file, but this doesn't give you an exact gauge of the tooth size unless you also consider the length of the file. Within any one grade, a longer file has larger, coarser teeth than a shorter file, and fewer teeth per inch. There appears to be no industry-wide standard, but generally a file that's one grade finer and 2 in. longer has the same size teeth as its coarser, shorter counterpart. Thus, an 8-in. second-cut or a 10-in. smooth has the same size teeth as a 6-in. bastard. If you find a number on the heel of the file, it's a Swiss Pattern type; 00 is the coarsest and 6 the finest.

The two files designed for wood are the wood file (essentially a 10-in. coarse half-round) and the cabinet file, which has somewhat finer teeth than the wood file. Any double-cut bastard file, 10 in. or longer, can be effective, however, as long as you keep the teeth clean. Regardless of the type, a file's teeth face forward and won't cut anything when going backward—they'll just get dull. Don't move your file back and forth like a saw. Pick it up on the return stroke.

A file's name is based on several things: the shape of its cross section, such as flat, square, round or half-round; its use, such as for sharpening an auger bit or a chainsaw; or from traditions that no longer clearly speak for themselves—a mill file, for instance, is a single-cut flat file originally used for sharpening mill saws. The way in which files are identified in a catalog or a store may seem mysterious, but it's simply a



combination of the file's length, name and tooth grade. For example, you'd ask for a 16-in. flat bastard when you really want to rip off material and have a lot of working room, or a 4-in. mill smooth when you want the smoothest surface an American Pattern file can produce.

Taper files, for sharpening handsaws, are a special case. Tapers are made with only one grade of tooth, but the size of the tooth increases according to the degree of slimness and the length of the file. The four sizes are regular, slim, extra slim, and double extra or extra extra slim. To sharpen a saw without damaging the teeth, you must use the correct size file. For a 5- to 5½-pt. rip saw, I recommend using a 7-in. regular. For an 8-pt. crosscut saw, use a 6-in. slim, 7-in. extra slim or 8-in. double extra slim. For a 10-pt., a 5-in. or 6-in. extra slim does the job best. For an 11-pt., use a 5-in. extra slim or a 6-in. double extra slim. A 12-pt. calls for a 5-in. extra slim; a 12½- to 16-pt., a 5-in. double extra slim. The number of points on a saw equals the number of teeth per inch, plus one.

A table describing files of probable interest to woodworkers is shown at right. The metalworking files that a woodworker would likely find most useful are the 4-in., 6-in., 12-in. and 14-in. mill smooth; the 4-in. mill bastard; the 12-in. hand second-cut; the 12-in. hand bastard; the 14-in. flat second-cut; the 4-in. flat smooth; a 5-in. extra slim taper; and a 5-in. double extra slim taper.

I'm not suggesting that you immediately buy all these files, but as you learn how useful they can be, you'll probably want to, if you can find them. It's a vicious circle: merchants cannot be expected to stock files if there is no demand, and woodworkers can't be expected to demand tools they don't know about. If you do buy files, I recommend that you avoid foreign-made American Pattern files, which don't seem to amount to much. I've also found that files packed in plastic bubbles don't seem to be of the same quality as those sold in machinists' supply houses.

* * *

One of the first things you should do with a new file is put a handle on it. An uncovered tang is dangerous: you can drive it through your palm. If you want a removable handle, buy one with a threaded ferrule or built-in clamp. It's cheaper to make your own hardwood handles with ferrules of thin copper, brass or steel pipe. Once you've fitted a ferrule onto your handle blank, use a bit the size of the tang end to drill a hole slightly deeper than the tang's length. Then open the top half of the hole with a drill the size of the middle of the tang. Insert the tang in the hole, hold the file, and bang the end of the handle with a mallet or on a bench or other hard surface, driving the handle onto the tang. Another way to enlarge the hole is to take a worn-out file with the same size tang, heat the old tang to a red glow, and shove it down the hole. Keep a bucket of water nearby in case the handle catches fire.

You should use different files for wood, soft metal and steel. A file that has been used on a hard material will not cut as well on a softer one. So if you want to use a file on wood, don't use it on anything else. Except for small sharpening files, new files that will be used on steel should be broken in first, to eliminate any irregularities that might cause teeth to break off or dull. To do this, file for a total of about an hour on a soft metal such as brass or aluminum. Properly broken in, a file will last a long time, cutting about the same throughout its life. When it does go, this will happen quickly and you'll

FILES FOR WOODWORKERS

Name and cross section	Cut*	Description
Mill 	S	For sharpening sawblades and scrapers, shaping and smoothing wood and metal, drawfiling, fitting, and truing. These files are tapered in width and thickness. Every woodworker should have a selection of these.
Flat 	D	The standard machinists' file for shaping and quick removal of material. Tapers in width and thickness. Used for forming grooves, squaring holes and filing in sharp corners. Good for starting jobs that the mill file will finish.
Hand 	D	Same as the flat file, but tapers only in thickness. Has one safe edge, making it useful for filing in corners where one surface should not be filed. Good for rough, heavy work.
Warding 	D	Tapers to a fine point. Useful for getting into tight spots, such as when you are fitting plane irons and frogs.
Pillar 	D	Narrower than a flat or hand file. Has two safe edges and no taper. Useful for filing slots.
Half-round 	D	The flat side is useful for filing on flat and convex surfaces; the rounded back is good for filing on concave surfaces. You don't need a half-round often, but when you do, nothing else will do. The rounded backs of finer, shorter half-rounds have single-cut teeth.
Wood 	D	Essentially a coarse half-round. Specifically designed to resist dogging when used on wood. Available in 10-in. length only.
Cabinet 	D	Another file designed for wood. Thinner and with a shallower back and finer teeth than the wood file. Available in 8-in. and 10-in. lengths.
Taper 	S	For sharpening 60° teeth on handsaws.
Three-square 	D	A general-purpose file for working in angular corners of more than 60°.
Square 	D	A flat file with a square cross section.
Round (Rat-tail) 	S&D	A tapered file used for dressing the insides of holes and small-radius curves. Round files longer than 10 in., except the 12-in. smooth, have double-cut teeth. Others have single-cut.
Chainsaw 	S&D	Has special teeth designed for sharpening chainsaws. This file is not tapered.
Auger-bit 	S	A double-ended file with each end tapering to a point. Has safe edges on one end, safe faces on the other end. Very handy for sharpening the cutting edge and spurs of auger bits.

* S is single-cut; D is double-cut.

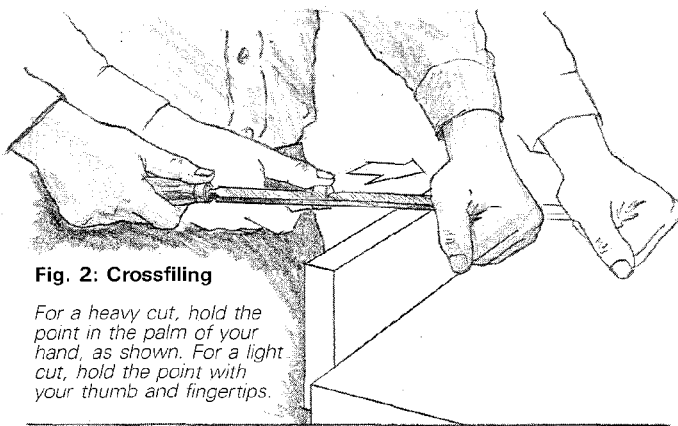


Fig. 2: Crossfiling

For a heavy cut, hold the point in the palm of your hand, as shown. For a light cut, hold the point with your thumb and fingertips.

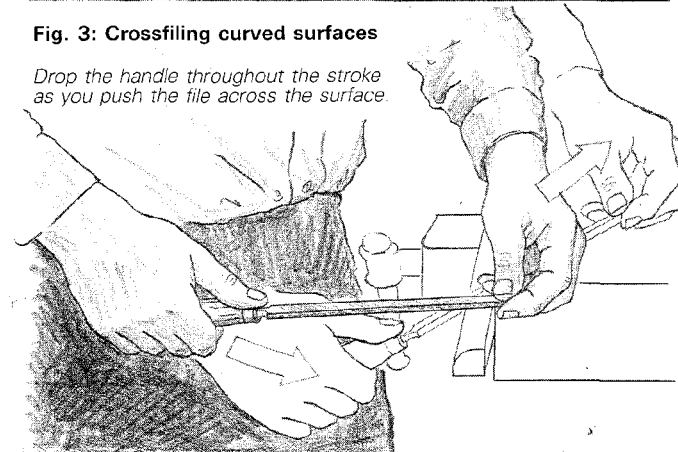


Fig. 3: Crossfiling curved surfaces

Drop the handle throughout the stroke as you push the file across the surface.

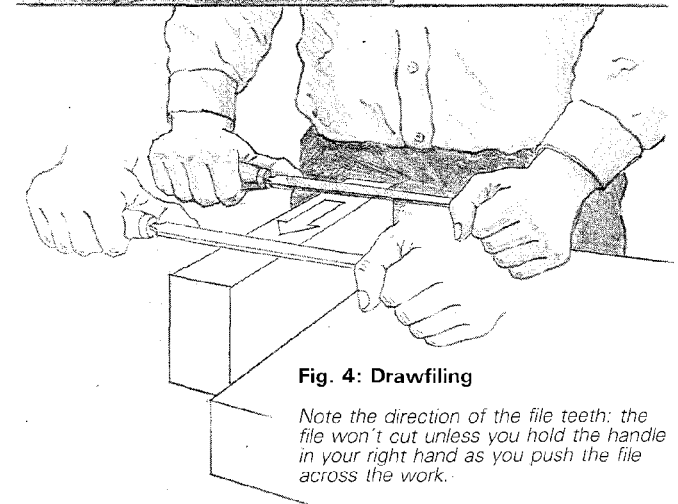


Fig. 4: Drawfiling

Note the direction of the file teeth: the file won't cut unless you hold the handle in your right hand as you push the file across the work.

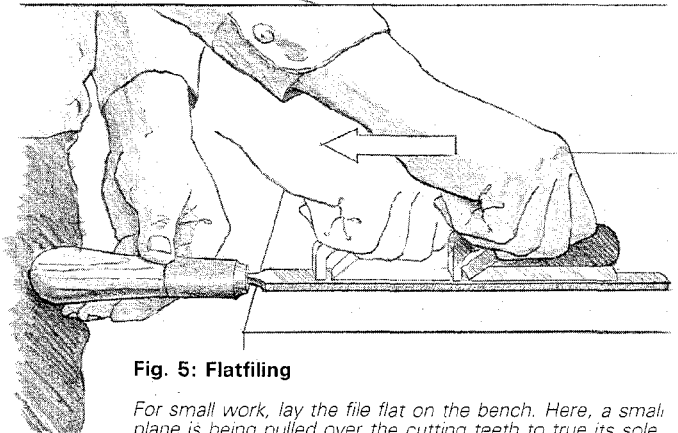


Fig. 5: Flatfiling

For small work, lay the file flat on the bench. Here, a small plane is being pulled over the cutting teeth to true its sole.

know it. Files can be resharpened, but it's impractical and dangerous in the small shop. It's best to buy a new file.

There are three common ways of filing: crossfiling, drawfiling and flatfiling. In crossfiling, which most people consider the only filing method, you usually push the file across the work, but it is sometimes done with the file held so that its long axis and the long axis of the work coincide (avoid this variation on narrow edges, or you're liable to round them). Clamp the work firmly at elbow height. Put one foot in front of the other, and stand up straight. Don't hunch over your work. For heavy filing, hold the handle of the file with your thumb on top and the point in the palm of your other hand (figure 2). To make a lighter cut, hold the handle the same way, but place the thumb of your other hand on the point and curl your fingers around the file. Think of your arms and shoulders as a parallel-motion machine swinging from the shoulders, and push the file across the work, maintaining a constant angle to the work. When filing a flat surface, first catch the vertical angle by rocking the file on the surface until it's flat. Do this each time you've stopped. On very thin material, hold the file at an angle to make a shearing cut, so the file teeth don't catch. From time to time, change the lateral angle of filing—errors in maintaining the vertical angle and any high spots will stand out clearly after only a stroke or two. If a wavy surface appears, try clamping the piece more securely, using less pressure on the file, or try a finer file.

Crossfiling with a taper file is a useful technique for notching a bar or other surface, say, to start a hacksaw cut. Notch an edge and file at a slight angle. You can crossfile a rounded or cylindrical surface if you drop the handle end of the file throughout the stroke (figure 3).

Drawfiling (figure 4), which usually is done with a single-cut mill file, is very useful to woodworkers. It's slower than crossfiling, but you'll find it easy to control the cut and produce a smooth surface. It also has the advantage of letting you file the entire surface in one continuous stroke. Drawfiling is a sharpening or finishing stroke, so don't use any more pressure than needed to feel the file cut.

Position the work so that its long axis runs away from your body, not from side-to-side. Hand position is important to ensure that the teeth are in a cutting position. If you're holding the file wrong, it won't cut—it'll just get dull. Grip the handle in your right hand, lay the file across the work at the desired angle, and grasp the point in your left. The file should be held at a right angle to the direction of the stroke. Now push. If you bear down too hard, the teeth will dig grooves and the file will walk to one side. If you are left-handed and feel uneasy with the handle in your right hand, or if the shape of the work requires it, you can hold the file handle in your left hand, but then you must use a pulling stroke. The rule is: Push stroke, handle in right hand; pull stroke, handle in left. To distribute wear evenly on the file, most workers move it slightly to the left or right between strokes.

If you want an even finer finish, wrap emery paper around the file and polish with the same drawfiling stroke. You may want to begin with 320-grit and work down to 400, then 600. Use a little light oil on the paper when sanding metal.

A good drawfiling exercise is squaring up a cabinet scraper with a 6-in. mill bastard and a 4-in. mill smooth (if you can't find the latter, use a 6-in. mill smooth or a 4-in. mill bastard, but go easy). First, use a straightedge to check that the scraper's long edge is flat or slightly convex, depending on your

Treatise on files and rasps

by Dick Burrows



BREAD RASP.

Ever try to use a rasp on bread? The practice was quite, fashionable among "many of the better class of English and French people" in the late 19th century when the Nicholson File Company published *A Treatise on Files and Rasps*.

High-class bakers of the day felt that bread baked quickly and hard was sweeter and tastier than bread prepared in the conventional way, once you got past the thick, singed crust. So they ordered a curved, nickel-plated rasp (above) with an enameled handle—just the thing to get rid of the crust and create lots of bread crumbs.

The bread rasp is just one of the unusual items described in the Nicholson

treatise, a catalog and description of files and rasps developed to meet the needs of every specialized trade and industry. The Early American Industries Association, which recently reprinted the book, calls the slim, 80-page volume a classic of hand-tool literature, and the engravings reproduced from the original volume add to the nostalgia. The work is a delight to those who favor hand tools and relish the history of tools.

Many of the files available when the book was published are no longer manufactured, but the information on using and caring for files is still pertinent. And the historical glimpses are especially informative in light of Nicholson's role as a

pioneer manufacturer of machine-cut files.

The text is concise, crisp and easy to follow. The files, rasps and scrapers are well illustrated, and their uses are clearly described. There are enough details—such as discussions of the lengths of file teeth needed for penetration in various types of metals, and the relationship between tooth angle and tool control—to satisfy most students. □

A Treatise on Files and Rasps may be ordered from the EALA, PO Box 2128, Empire State Plaza Sta., Albany, N.Y. 12220 (\$7.95 to EALA members; \$13.50 to non-members). Engraving reprinted courtesy of the EALA.

preference. Use the 6-in. mill to straighten the edge if needed. Then, holding the same file at a slight angle to the direction of the stroke and with the file's face flat on the side of the scraper, take off any hook left from the previous sharpening. Now drawfile the whole edge until it's square to the scraper sides. Start with the 6-in. tool and finish up with the 4-in. Crossfile lightly along the sides to remove any lip left by drawfiling, then burnish.

Flatfiling can be a useful technique for small work—work that generally is less than 3 in. long and no more than 1 1/4 in. wide, really too small to be handled easily with other hand-filing methods. Start by laying the file flat on a table or a bench. If the file is handled, let the handle hang over the edge, or put the file in a fairly large machinists' vise. Now draw the article to be filed over the cutting edges of the teeth. This is a handy way to flatten the sole of an ordinary thumb plane, and most rabbit planes are narrow enough to be flat-filed (figure 5). Most rectangular-section files have slightly convex faces, and some people may think that this would work against a flat surface. Actually, this convexity is intended to help achieve flatness when crossfiling, and it seems to have the same effect when flatfiling, especially if the work is reversed every four or five strokes.

Files look rugged, but like any other cutting tool, they need care. Keep them separated in racks, not thrown loose in a drawer or stuck in an old can. Given a chance, two files try to cut each other, with bad results for both.

Keep your files clean. A file card with a brush on its back is useful here. The card's stiff, short teeth work well on large-toothed files, and the short-bristle brush does the job on all

files, if used frequently enough. Generally, it's best to use the brush more frequently than you think necessary. Files clog or "pill or pin up" once in a while, and this condition can both mark the work and stop the cutting. To clean a file, try a medium-grade power-driven wire wheel, holding the file so that the wires run down the gullets of the teeth. Alternatively, you can make a pinning tool from 1/8-in. brass or hard copper rod. Hammer the end of the rod to the rough shape of a double-bevel chisel and file to a smooth, slightly round edge with sharp corners. The edge should be thin enough to touch the bottom of the gullets between the rows of teeth. Put on your magnifying glasses, take a deep breath and get comfortable, and pick each "pin" out, one by one.

In addition to cleaning the files, you should also clean the metal surfaces that you file. Filing can leave metal fragments in the pores of iron, which, as in the case of a plane sole, can be transferred to the wood. Don't trust your eye: the surface may look clean, but it's not. Clean it with an oiled rag. Besides, any newly filed metal surface needs a coating of light oil right away, unless you live in Death Valley. The best lubricants and rust preventives are things people like to argue about, but anything is better than nothing. I don't think that the files themselves should be oiled, because oil can make them slip and more prone to clogging. Files will rust, however, and when they do so badly, that's it. So keep them dry. At the first hint of rust, use the wire-brush wheel. □

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