Jointer Talk

Getting along with home-shop machines

by Jim Cummins

There are two jointers in my shop, a fairly new 6-in. Rockwell and an old 4-in. Sears. Neither one has an adjustable outfeed table, so setting the knives has been a trial-and-error chore that I used to put off as long as I could. Three years ago, I decided to set up the Sears for finishing work, particularly to get some good surfaces on a series of small boxes I was making in my spare time *(FWW #43,* pp. 32-38).

Following directions I'd read somewhere, I set each knife a hair higher than the outfeed table, then turned the jointer on. I put a fine, flat India stone on the outfeed table and slowly passed one end of it over the whirling cutterhead. This process, called jointing, removed a tiny bit of metal to lower each knife edge exactly even with the outfeed table. Of course, it blunted the knives at the same time, leaving a little hairline flat instead of a cutting edge. To resharpen each knife, I lowered the infeed table and laid an 8-in. hard Arkansas stone on it so that the stone rested on the knife bevel. Then I clamped the cutterhead so that the stone, moved by hand in a series of tight circles along the length of each knife, was at the proper angle to hone the flat away, as shown in the photo at the bottom of the page. The infeed table was protected by a sheet of paper under the stone.

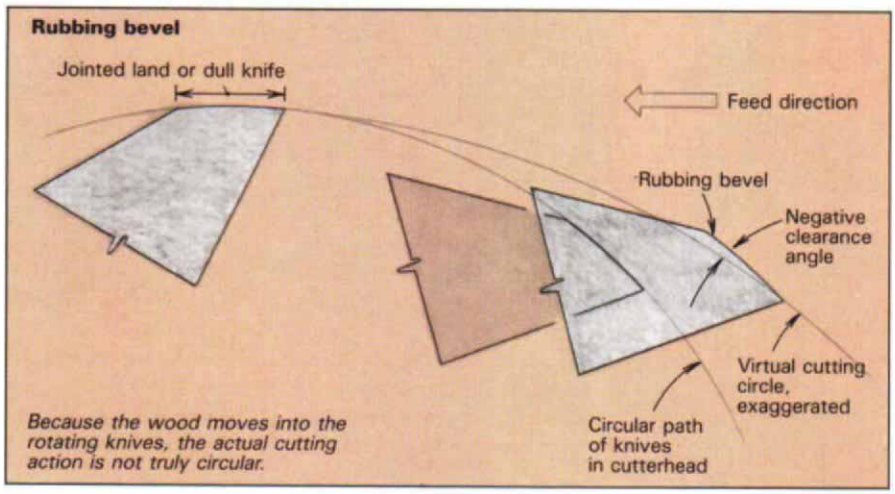
This procedure forms a small secondary bevel. The cutting edge has a little more steel behind it than a single-bevel knife, and is, therefore, a little more durable. It took almost an hour to set, joint and hone the knives, but it proved worth it—the edges lasted much longer than they ever had before (partly, I'm sure, because I had more respect for the machine and took some care about what I was feeding it). One benefit came as an unforeseen bonus. The machine was set up so well that I began to sense how my own work habits subtly influenced its performance.

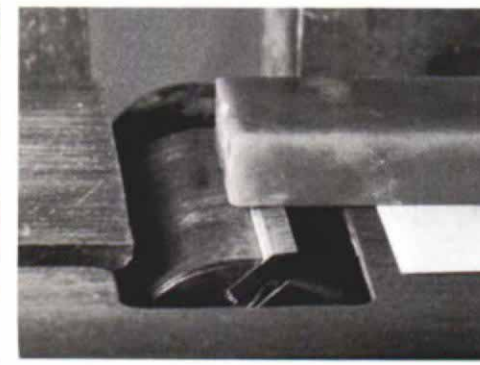
After a while I could walk up to that venerable, rackety old jointer with absolute confidence. On my good days I can surface bird's-eye maple box lids without tear out—I double-tape the lid to a heavier piece of wood that damps out vibration and acts as a push stick. Then I feed ever so slowly, imagining each knife taking a separate delicate slice, getting maybe three hundred cuts per inch. The waste box under the jointer slowly fills with slivers of wood as fine as featherdown.

With anything but super-sharp blades, such a method would be all wrong. In general work, if the feed rate is too slow the blades will rub the work and cause friction that burnishes the wood, as shown in figure 1. Such a surface may look all right, but it won't finish well or glue reliably—the surface fibers will have been pounded flat, overcompressed and overheated. A really dull set of knives can leave burn marks, but the wood can be damaged and chemically altered long before that point.

Usually, the first sign of dulling comes when I'm trying a slow feed on a hard wood, and the work rides up, resulting in a tapered cut. This is the point where I have to decide what's most important: a flawless surface or a straight joint. The blades are probably still sharp enough for general work, but I'll have to feed the work harder and faster. This usually cures the problem for a while. The surface will show some washboard marks, but at least glue joints will be straight and chemically unaltered.

The other choice is to change the blades. Nowadays, since I discovered the gadget described in the box on the facing page,





To double-bevel knives, first level the cutting edges with a stone placed flat on the outfeed table and the jointer running, then hone them sharp as shown, with the cutterhead clamped steady. This gives a lasting edge.

this is no great chore. But it wasn't always that way I went through the stone-and-hone routine once with my 6-in. jointer, but within half an hour one of my helpers put a nick in the knives and I swore: "Never again." Instead, I devised a method that uses a pane of glass to set the knives. Coincidentally, the same idea appeared in Methods of Work in *FWW* #41, submitted by Joe Robson of Trumansburg, N.Y

First you set the infeed table level with the outfeed table, checking alignment with a straightedge. Then you put a new knife in position, tightening the locking screws just enough to allow the knife to slide if pushed. You pull the knife up a little higher than the table and span the cutterhead opening with a pane of glass, holding the glass flat against both tables. Rotating the cutterhead backwards by hand brings the knife in contact with the bottom surface of the glass and pushes it down exactly the right amount. Then you remove the glass and tighten the screws, snugging each one down a little at a time, working from the center out, until all are evenly tight (otherwise you can bow the knife) Talking about distortion, don't take all the old knives out at once, but change one at a time so the tensions in the cutterhead stay balanced.

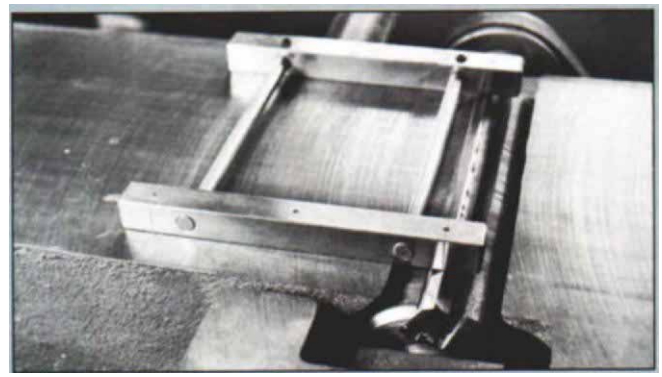
As a final check when all knives are set, you can press the glass down directly over the cutterhead as you turn the machine by hand. The glass will flex enough to let you feel each knife "drag" on it. If one knife drags more than the others, you should reset it. The accuracy of this method depends on how carefully you set up the sliding fit of the knives. Too loose, and they'll be pushed down too far. Too tight, and they'll be too high. The screws must be set evenly across the width of each knife, too, or one corner will end up higher than the other. The drag test will show you where adjustments are needed, and they usually are.

If your jointer has an adjustable outfeed table, you can set knives entirely by drag. Take a straight, light piece of scrap about 1 ft. long and lay it over the cutterhead. Rotate the cutterhead so the knife grabs the stick and moves it forward onto the infeed table. Mark the distance on the stick. When all knives move the stick the same distance, tested at various places across their width, their height is the same. You then adjust the height of the outfeed table to get a straight cut. The method is accurate, though tedious, and it won't work very well on jointers with fixed outfeed tables—unless you want the knives set high.

High knives do have one application, they produce what's known as a sprung joint, one slightly open in the middle. A tabletop joint with the right amount of spring would let you slip a cigarette paper between the boards at the middle. At glueup, the clamps easily pull this tight. The advantage is that the joint at each end of the tabletop is slightly overcompressed and therefore less liable to crack open in a dry spell. You can get a sprung joint either by setting the knives a few thousandths high in the first place or, on some jointers, by loosening the outfeed-table clamp screws, which causes the table to sag a bit.

Never having had an adjustable outfeed table myself, I have never been able to take advantage of the feature—when I want a sprung joint I take a pass or two with a block plane. Yet I know people who subscribe to arcane and magical outfeed table settings. Me, I like the machine to be level and parallel, with the knives exactly flush with the outfeed table. As long as the machine is at the same setting all the time it will be predictable.

The first step in jointing is to check the stock. The edge of the wood has to be roughly straight before a jointer can do its job. If the edge is severely convex, I take a pass or two just in the middle. Then it will ride right. The same goes for a badly concave edge, or a board with too much taper—I nip away the offending



This new magnetic jig sets knives accurately, holding each in alignment as the gibs are tightened. A set of knives can be changed and set perfectly in less than ten minutes.

Magna-Set makes it easy

In a book once, I saw a photo of a man adjusting jointer knives with a large horseshoe magnet. He laid the magnet on the outfeed table, with the poles above the cutterhead. Next he rotated the cutterhead so that the cutting edge of a knife was at top dead center, and the magnet held the knife up in position while he locked the gibs. "Bingo!" I said, and started looking all over for a large horseshoe magnet. But such magnets are obsolete, and I eventually gave up the search, falling back on my old methods and putting off changing knives as long as I could.

Yet an ingenious inventor, George Hessenthaler of Quest Industries (Box 7768, Murray, Utah 84107), has come up with a $40 gadget that, instead of one large magnet, uses six small ones to imitate a giant, adjustable horseshoe. I tested the device, called Magna-Set, on my 6-in. Rockwell the other day, using it to move two of the knives sideways a little in opposite directions (this trick misaligns the little nicks in the knives and gives a smooth surface again). The job took just five minutes, and the jointer works great.

Here's the procedure: First, you figure out where top dead center is. The easiest way to determine top dead center is to look straight down at the cutterhead, and rotate it until the cutting edge is centered over the cutterhead shaft where it enters the bearings.

With top dead center as a reference, you scribe permanent lines on your jointer to index the jig. The jig is held flat to the outfeed table by four of its six little magnets, and the other two hold the blade in alignment while you tighten up. It's dead easy. Without affecting accuracy, you can even slide the two arms of the jig sideways if you need more room for your tools. The standard jig will slide open to span a 6-in.-wide jointer table, and there are optional rods that extend the reach as far as 12 in.

Can you use Magna-Set to set the knives a little high to make a sprung joint? Sure, there are two ways: either raise the jig with a sheet or two of plastic wrap, or experiment with different jig positions until you find one that works, then scribe a second reference line (any position other than with the knives at top dead center will leave them high).

This invention is so simple, straightforward and accurate that I may start changing jointer knives for the sheer fun of it. George Hessenthaler deserves as much credit as the guy who invented the self-piloting router bit. *—J-C.*

ends before taking a full-length cut. I check the quality of these roughing cuts to see if I've guessed right about grain direction.

When jointing faces, except when feeding very thick or very thin pieces, I use the push blocks that came with the Rockwell. They have comfortable hand grips and a flat, non-slip bearing area. I begin a full cut with controlled pressure on the infeed table, trying to guide the work level over the cutterhead onto the outfeed table. As soon as enough of the work is over the outfeed table I apply downward pressure directly over the cutterhead with one push block (to help prevent vibrations), and with the other block I press down just beyond the cutterhead. The idea is to register the cut against the outfeed table as soon as the jointed surface is long enough to bear properly As the work moves along, I simply keep exchanging hand positions, taking care to keep the feed rate even and not to let the work ever stop.

If you are routinely getting edges that are concave or convex even though your knives are sharp, first check that your tables are parallel, and correct them according to your owners' manual if they're not. Then think about knife height—if knives are too high, you'll get a concave cut, and vice versa. But if your knives are level with the outfeed table, try adjusting the way you feed the work before you experiment with different settings.

Be conscious of the back pressure from the knives as they cut; if it diminishes, it means the stock is riding up and you'll have to take another pass at a faster feed rate. Listen for telltale "snick" or "pop" noises caused by thick chips tearing out ahead of the cut, if you slow the rate of feed your final surface may still be all right. Take note of everything: When a jointer is working right it sings a harmony of knives whacking away, motor shouldering the load, feathery chips flying against the chute and bearings humming under pressure. It pays to listen for such music—I've found that sharp senses are as important as sharp blades. □

Jim Cummins is an associate editor of Fine Woodworking.

Face bevels

by Galen J. Winchip

If you experience tear out and chipping on your jointer (or planer), even though the blades are sharp, here's an idea borrowed from industry that may eliminate the problem.

Most jointers are designed to handle both hardwoods and softwoods and have a rake angle of about 30°, as shown in the sketch. For softwoods, such an angle works fine, but it's too acute for many hardwoods—when you cut against the grain, the wood splits ahead of the cut, chipping and tearing the surface. Hardwoods are best worked with a steeper rake angle, in the range of 10° to 20°. This more scraping cut leaves a smooth surface.

Rake angles in this range can be achieved by a process called back-beveling or face-beveling, and there's no major surgery required on the machine. All you need is a thin bevel on the flat face of each knife. It doesn't have to be any deeper than the thickness of the chip you're taking—realize that this is not the depth of cut, but the thickness of the individual chips that go into making a full cut. A bevel of 1/64 in. will certainly do the job, and a bevel half that wide would probably work fine.

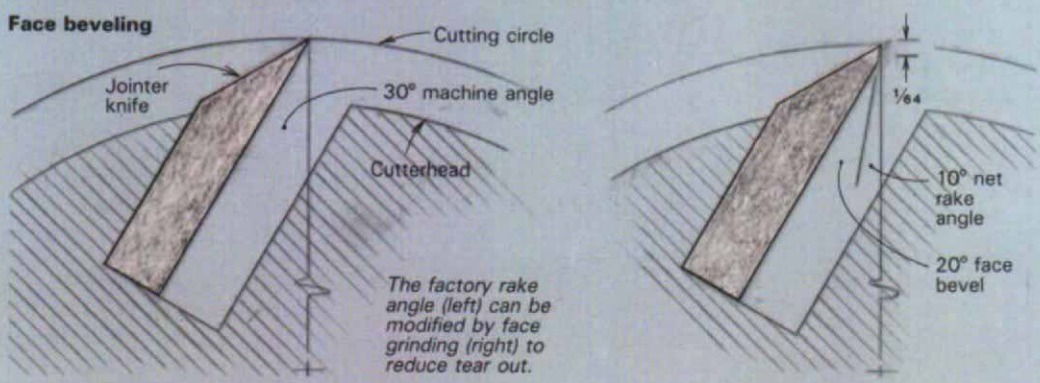
To determine the proper bevel angle, you will need an accurate drawing of the cutterhead and knives in your machine. After you have worked out the necessary angles, you can ask your sharpening shop to grind both the sharpness bevel and the face bevel. I do not recommend that anyone grind jointer knives without special wet-grinding equipment. Dry-grinding in the home shop produces microscopic heat fractures at the cutting edge. Even home-shop honing can be done wrong. It is best to work the stones perpendicular to the edge, not parallel to it, otherwise the cutting edge is weakened by the scratch lines.

Cutting speed, surprisingly, has no effect on the cutting process in wood—think what a good job a hand plane can do. High speed tools such as routers make smooth cuts not because the cutter is moving faster, but because the faster speed means that the chips are thinner. The same applies to a jointer. Chip thickness depends on cutterhead speed, the number of knives, the depth of cut and the rate of feed. The thinner the chips, the less tear out.

Face beveling your jointer knives is the same idea as choosing a cabinet scraper instead of a hand plane. Some woods are more prone to chipping and tearing than others, but for most work, you'd probably want the plane. Consequently, face bevel your knives only if you have chipping and tearing problems. There is no optimal rake angle for all work, unless it's the 30° angle that manufacturers already use. While you can modify this for special cases, don't overdo. For example, a rake angle of 5° will let you surface bird's-eye maple with no tearout, but the tradeoff is that it will take a lot of force to feed the machine, you'll have to take a shallow cut and reduce the feed rate, and the process will be noisy as well as a large load on your jointer. These drawbacks will apply to any other woods you may run over the machine, but there won't be any corresponding gain in surface quality.

Lastly, for good jointer performance, learn to feel your jointer work. The human being is the most variable and important part of the cutting process. □

Face beveling



The factory rake angle (left) can be modified by face grinding (right) to reduce tear out.

Galen Winchip teaches computer-aided design and manufacture at Illinois State University, Normal, Ill.