



Joint-Making Machines

A review
of router-driven
tools that make
quick work
of mortise-and-
tenon joints

BY
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STANDISH

Compared with more fundamental equipment such as jointers, mortise-and-tenon machines, or jigs, are woodshop luxuries. They can feature ingenious and sophisticated designs, but in the end, like dovetail jigs, they are adjuncts to routers. Jigs are not cheap either: The models surveyed here are priced from a little over \$400 to about \$700, router not included. With some forethought and care in the making, serviceable shop-made versions are fairly straightforward and inexpensive to construct. So why buy a factory-made one?

A proper jig serves two basic woodworking functions: securing a workpiece and guiding a cutter. The jig should perform without surprises and without

LEIGH FMT JIG

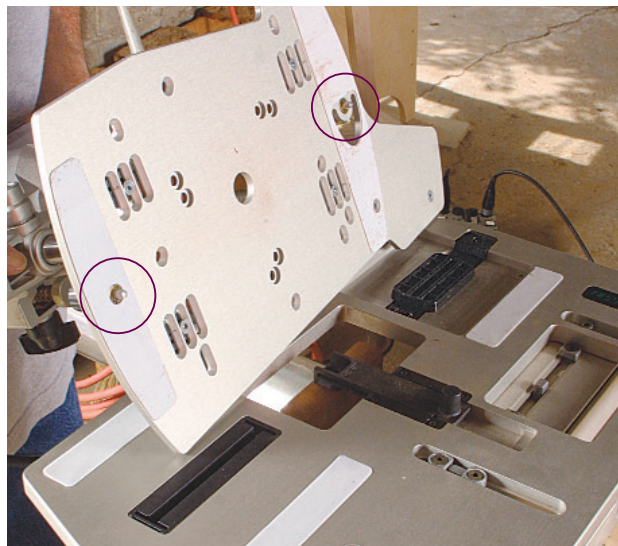
Price: \$689

Source: www.leevalley.com

800-663-8932

The FMT in the name stands for frame mortise and tenon, and this machine was specifically designed for making these joints. Leigh's pin-and-template guide system is as close to foolproof as I can imagine anyone could make it. The auxiliary baseplate has two tapered pilot pins that engage slots in a template for mortising, and they ride the perimeter of the same template to mill matching tenons. Raising or lowering the pins alters the fit of the joint in repeatable 0.001-in. increments. Templates provided with the standard unit allow for more than 20 sizes of mortise-and-tenon joints; additional guides are available individually or in sets, which will give you up to 50 different sizes of joints to cut. For angled work, such as that often found in chairs, the clamping plate can be swiveled up to a setting of 30°.

At about 18 in. wide by 12 in. deep by 9 in. high, the Leigh jig is compact to the point of being portable, and its looks—sporting an exceptional level of finish and engineering—are not deceiving. In operation, this jig was exceptionally smooth and precise. Also, the owner's manual was refreshingly comprehensive, clear, and concise.



Guidance system is finely tuned. Visible on the left and right of the underside of the baseplate are the two tapered pins that engage grooves in the two black plastic inserts fitted into the top of the table. By changing the inserts you can cut various sizes of matching mortises and tenons.



Align the workpiece. Scribe pencil lines on the workpiece at the center-line of the joint. Align them with crosshairs on the sliding black plastic alignment gauge.



Secure the workpiece. Two cam clamps accommodate any thickness up to 3 in. and any width up to 5 in. The stock length is limited by how high the jig is mounted off the floor.

**Watch it
on the Web**

To see a joint-making machine in use,
go to www.finewoodworking.com.

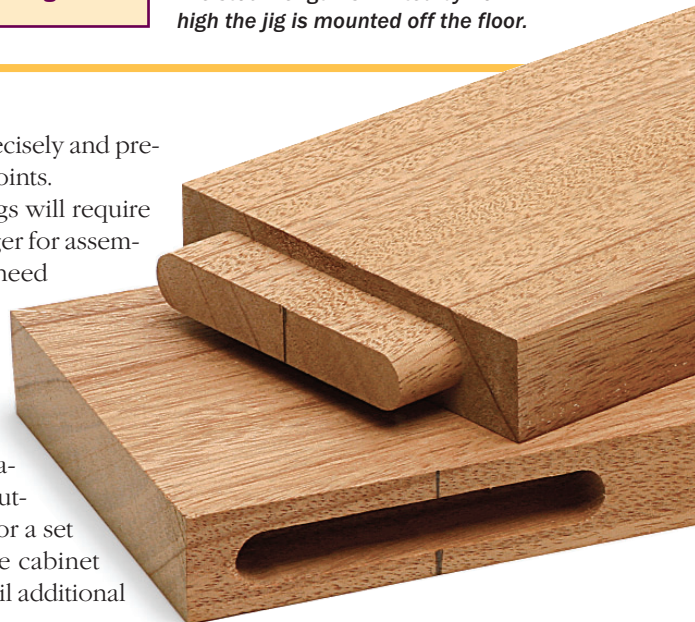
fail. Also, a jig should enhance the advantages of machine joinery by adding control (and thus precision) and speed to the process. The jigs in this article meet all of these demands, allowing you to cut a mortise-and-tenon joint in the time it takes to hone a chisel. Although some of them also feature ways to cut other joints (through-, half-blind, and sliding dovetails; box joints; dados; fancy pin-and-crescent joints), for this review I wanted to learn only

how well the jigs could cut basic mortise-and-tenons—the most commonly used joint in furniture and cabinetry.

The makers of these machines have already done much of the head-scratching for you (How to center the cut? Will the clamps interfere? Is the router adequately supported?). The streamlined clamping arrangements of these very different designs drastically reduce stock-handling hassles, and their refined adjustment mecha-

nisms allow precisely and predictably fitted joints.

All of these jigs will require an hour or longer for assembly, and you'll need several times that to familiarize yourself with how they work. Some particular operations, such as cutting the joints for a set of different-size cabinet doors, will entail additional



time for individual setups. Regardless of your woodworking style or mechanical aptitude, the latter prep work typically is measured in minutes, while the machining itself takes even less time. Results, of course, will vary. But with a good router and a sharp bit, you reasonably can expect to produce between one and four consistently crisp mortises or tenons per minute with any of these jigs.

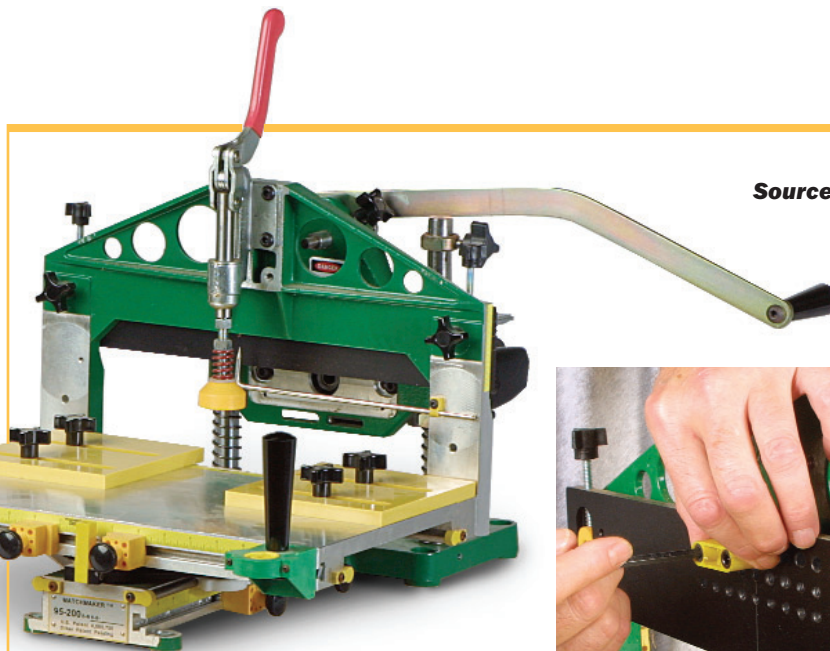
Testing procedures

I tested these jigs with a 15-amp Elu plunge router, run at the same speed setting, using the same solid-carbide spiral upcut bit. I machined mortises and single tenons, approximately 1 in. by 3 in. in profile, with all of these jigs. Material for the test samples came from the same bundle of mahogany-like substitute decking purchased from a local lumberyard. I tested these machines by cutting roughly two dozen mortises and two dozen tenons on each of them.

I then measured the results with a dial caliper. Manufacturers of polyvinyl acetate adhesives (most conventional white and yellow glues) usually recommend tolerances within 0.005 in. for optimum performance. Shooting for this level of accuracy may seem pretty ambitious, but attaining such precision goes a long way toward justifying the use (and, not incidentally, the purchase) of one of these jigs, even for relatively small-scale production work. The majority of all of the test samples measured within 0.002 in. of their intended dimensions—well within the tolerances recommended by adhesive manufacturers.

The choice is not only budget-driven

In a survey like this, it's customary to choose a winner, but on this score I feel a bit like a bus



MATCHMAKER

Price: \$699

Source: www.woodworker.com

800-645-9292

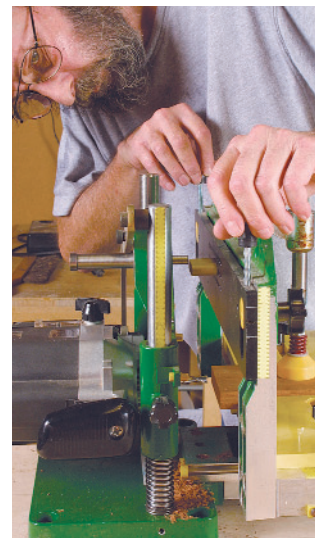
Mortising with the MatchMaker will be familiar to anyone who's ever used an industrial-level horizontal mortising machine. The design is similar to that of the JDS Multi-Router (see p. 56). For mortises, the workpiece carriage is levered in and out and left to right along roller bearings on guide rods, moving against a router that is mounted horizontally in a fixed position. For these X and Y axes movements, you can use a simple tapered handle or a pivoting joystick, depending upon the range of motion required to cut a given joint. The tapered handle provides a larger range of motion.

For tenons, the router carriage is freed so that its integral stylus, or guide pin, can bear against a template, and the router is moved up and down on a Z axis with a sturdy, pivoting handlebar. The operation is like a cross between a duplicating lathe and a pantograph, and although it takes a bit of getting used to, it's more complicated in the telling than in the milling. The tenon templates are made to be 0.003 in. to 0.005 in. smaller than their nominal size. The manufacturer (Woodtek) recommends fine-tuning the fit of the joint by wrapping one or two layers of cellophane tape around the stylus.

The MatchMaker is the only jig that I surveyed that mills tenons with the workpiece oriented horizontally. As a result, it will accommodate long workpieces, such as bed rails and aprons for large dining tables, without the operator having to modify or adapt the machine in any way.



Secure a template to cut a tenon. The yellow plastic template is fastened into threaded holes in the yoke assembly with two Allen-head screws.



Locate the tenon cut. Vertical adjustments in the yoke assembly will affect where a tenon is cut on the workpiece. The steel stylus shown here is mounted at a fixed distance from the cutter, and you can use either the small or large end of the stylus to follow the template, which affects the size of the cut.



Center the workpiece on the sliding table. A toggle clamp holds the workpiece tight to the sliding table, and two yellow plastic plates bear against the edges of the workpiece to prevent any lateral movement.



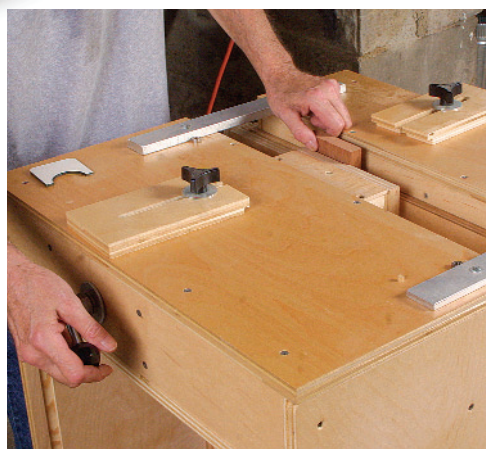
QUICKTENON

Price: \$418

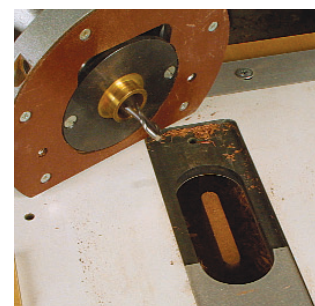
Source: www.quicktenon.com; 301-746-8092

In the midst of handsomely finished, powder-coated or anodized-metal, and precision high-tech plastic extrusions, stands the modest-looking QuickTenon. Bare bones it is, but in the best sense. It is essentially a freestanding plywood table with a built-in side vise and a sliding phenolic plate. A router-mounted collar guide tracks against the center slot of this plate, whose left-to-right travel is limited by adjustable stop blocks. Placing shim stock (or an automotive feeler gauge) between block and plate makes for simple, accurate, and virtually instantaneous adjustments. This fixture also is designed to mill dovetails, such as for a table's apron-to-leg joints, and flipping a small sub-plate allows you to change from making the usual round-end tenons—matching the profile of its router-bored mortises—to square ones, such as you'd want for through-tenon work.

Built-in vise holds the workpiece in place. The crank (at left in photo) controls a plywood box that pushes against the workpiece to hold it secure. The top surface of the workpiece should be flush with the top of the plywood table.



Adjust the plate to center the cut. The phenolic plate rides left to right on four loose bearings that rest on the plywood tabletop and is held in place by the two aluminum bars on both ends.



Round or square tenons. By varying the shape of the adjustable inserts in the phenolic plate, you can cut either round or square tenons.

WOODRAT

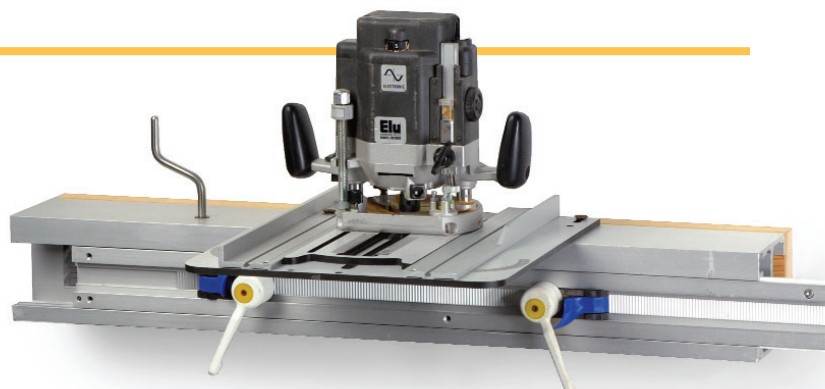
Price: \$545

Source: www.woodrat.com; 866-966-3728

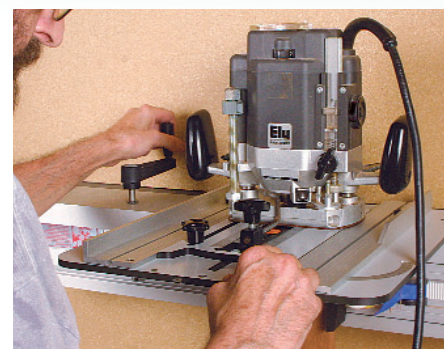
Although you can make a stand for this fixture, the recommended wall-mounting (the manual provides details) is better because it's simpler, sturdier, and saves floor space. Unique to the WoodRat is a power feeder that moves the workpiece side to side against the router bit, which is mounted vertically overhead. Although the power feeder is a hand-cranked system, it's a smooth and sure way of climb cutting. Workpieces are held in place against an aluminum angle by a locking cam lever that slides along a slotted track. The slotted track, aluminum stop, and brass gauge blocks and spacers all speed up the setup time required for making joints with this jig. An overhead plunge router is mounted to a sliding plate that can be moved front to back.

The WoodRat produces square-edged tenons and rounded mortises, so you'll have to either round off the corners of the tenons by hand or chisel out the mortises to get matching profiles in the finished joint.

The manufacturer also offers a smaller version of this jig, called the LittleRat, with similar but more limited cutting capacities. It's available for about 40% less money, but the sizes of the workpieces you can process with it are smaller.



Cam clamp holds the stock in place. A cam clamp slides along a slotted track and presses the workpiece against a sturdy piece of aluminum angle.



Climb cuts are cleaner. You can virtually solve the problem of chipout on the leading edge of the router cut by moving the workpiece in a clockwise direction around the cutter.

driver sent to test Ferraris against Porsches. For machine joinery, all of these jigs are impressively precise and almost laughably fast once you overcome the initial learning curve.

The Leigh (p. 53) and the QuickTenon (p. 55) are faster in setting up, fine-tuning, and machining mortise-and-tenon joints. The MatchMaker (p. 54) and the WoodRat (p. 55) sacrifice some of this lightning speed in the interest of greater joinery versatility, such as cutting dovetails and louvers. And because the MatchMaker is the only one of these machines that mills tenons with the workpiece oriented horizontally, it will accommodate much longer workpieces more easily than any of the other machines.

Anyone accustomed to routers will feel at home with the Leigh and the QuickTenon. The MatchMaker and the WoodRat initially may seem a bit foreign, but the former's long levers and the latter's stock-feeding system offer exceptional cutter control.

The Leigh, which is easily stored away when not needed, and the WoodRat, which requires minimal floor space, will appeal to woodworkers whose shop space is at a premium.

In the end, I think any of these jigs is worth considering for the combination of speed and precision they offer. Such classic shop variables as available space and the scope or style of work that you do make it difficult to provide a one-size-fits-all recommendation. If you're thinking of buying one of these tools, you might want to remember this: All of these machines come with an unconditional 30-day (or better) guarantee, which would give you a month in which to be your very own final arbiter. □

Michael Standish does custom trim carpentry and cabinetwork jobs in a garage shop just south of Boston.



Handle controls each axis. With the Multi-Router, you have a separate handle for each of the X,Y,Z movements this machine will execute. Van Benten has used this machine in a production shop for more than 10 years, and he reports that the linear bearings on which the tables ride still work flawlessly.

ning on ground steel rods attached to ground aluminum tables. The table motion is absolutely effortless, and there is no discernible play in the bearings. The rods have flexible, movable collars and easy-to-adjust stops. In our shop, we clamp pieces as large as bed rails to the table with minimal outboard support, and we get joints that are uniform and repeatable.

The tables come from the factory drilled out with a series of holes to accommodate either manual or pneumatic clamps. If you have a compressor, the air clamps are much faster and stronger than the manual clamps. They hold the work with unbelievable tenacity and facilitate very quick changing of parts.

The holes in the horizontal table allow instant setup for basic angle cuts. Hard plastic buttons fit in the holes in various patterns to create standard angles. We use this feature to mill the ends of large parts for multisided frames, after cutting the parts to approximate size on the bandsaw. The resulting joints are perfect, without the problems you get when using a tablesaw. The setup for angled cuts is not any more difficult than the setup for straight cuts.



Templates guide the cut. This machine comes with 42 different templates and inserts to use with various sizes of router bits. A steel stylus on the vertical router table traces the patterns, which are mounted on the horizontal table.

The JDS Multi-Router is in a class by itself

BY JOSEPH VAN BENTEN

Price: \$2,595

**Source: www.thejdscompany.com
800-480-7269**

Soon after I started to make furniture for a living, a quick and accurate way to make mortise-and-tenon joints became a necessity. In 1992, when I first saw the Multi-Router, made by the JDS Company, I bought one on the spot. This essentially is a small milling machine, powered by a portable router, with a table that moves on X and Y axes. The workpiece is clamped to this table. There is also a vertical table, to which the router (equipped with a spiral-upcut bit) is mounted horizontally, and this table provides a Z-axis motion.

The beauty of this machine is in its construction. The range of motion is supplied by linear roller bearings run-

ning on ground steel rods attached to ground aluminum tables. The table motion is absolutely effortless, and there is no discernible play in the bearings. The rods have flexible, movable collars and easy-to-adjust stops. In our shop, we clamp pieces as large as bed rails to the table with minimal outboard support, and we get joints that are uniform and repeatable.

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Another feature of the Multi-Router is a stylus mounted on the vertical table that contacts and traces patterns mounted on the horizontal table. The stylus arrangement requires considerable setup time, and it does allow some objectionable flex in the cutting. Varying the pressure against the stylus can have an impact on the thickness of a milled part.

We use this machine to make mortises, tenons, and loose-spline joints. After 12 years of use, this machine is holding up beautifully. As a matter of fact, it has outlasted three routers. □