A Shop-Made Bowl Lathe

You can add ways for spindle turning

by Donald C. Bjorkman

After building my disc sander *(FWW #23, July'80)* and getting so much use out of it, I decided to build a lathe I've wanted for a long time but have been unable to afford. As most of my turnings are bowls and I do not have room in my shop to keep a full lathe, I designed a large bowl lathe that can be expanded into a bed lathe. It has a 17-in. swing inboard, a 74-in. swing outboard and a 48-in. span between centers. As with the disc sander, the motor is positioned low, contributing to the stability of the machine, and it is enclosed in a cabinet to protect it from shavings and dust. A door allows access for easy speed changes, and the cabinet can be used to store tools or hold sandbags for ballast. The motor platform slides back and forth on the shaft that supports it, so that by using two four-step pulleys, 16 speeds are possible. For this system to work, the machine must be level, or the motor will creep on the support shaft. With the size pulleys chosen, the speeds range from approximately 500 RPM to 2,300 RPM. Although I have turned a piece containing 50 bd. ft. on a pattern lathe, I doubt that I will ever gamble with a 74-in. dia. item, as the outer edge at 500 RPM will be traveling at almost 10,000 FPM. Maybe I'll work up to it.

The frame is constructed of hard maple and all the joints are open mortise and tenon. The stress panels are ⅜-in. Baltic birch plywood, and the shaft and pulley cover is vacuum-formed plywood, the equipment and technique for which is discussed in *FWW #16*, May'79, pp. 52-57. The stress panels are glued into rabbets in the frame, except for the front panel which is screwed in place to allow complete access to the interior. The floor of the machine can also be removed so the corner braces can be bolted to the floor.

The sloping sides and perpendicular base of the machine require that the slot mortises in the base be cut on an angle. I

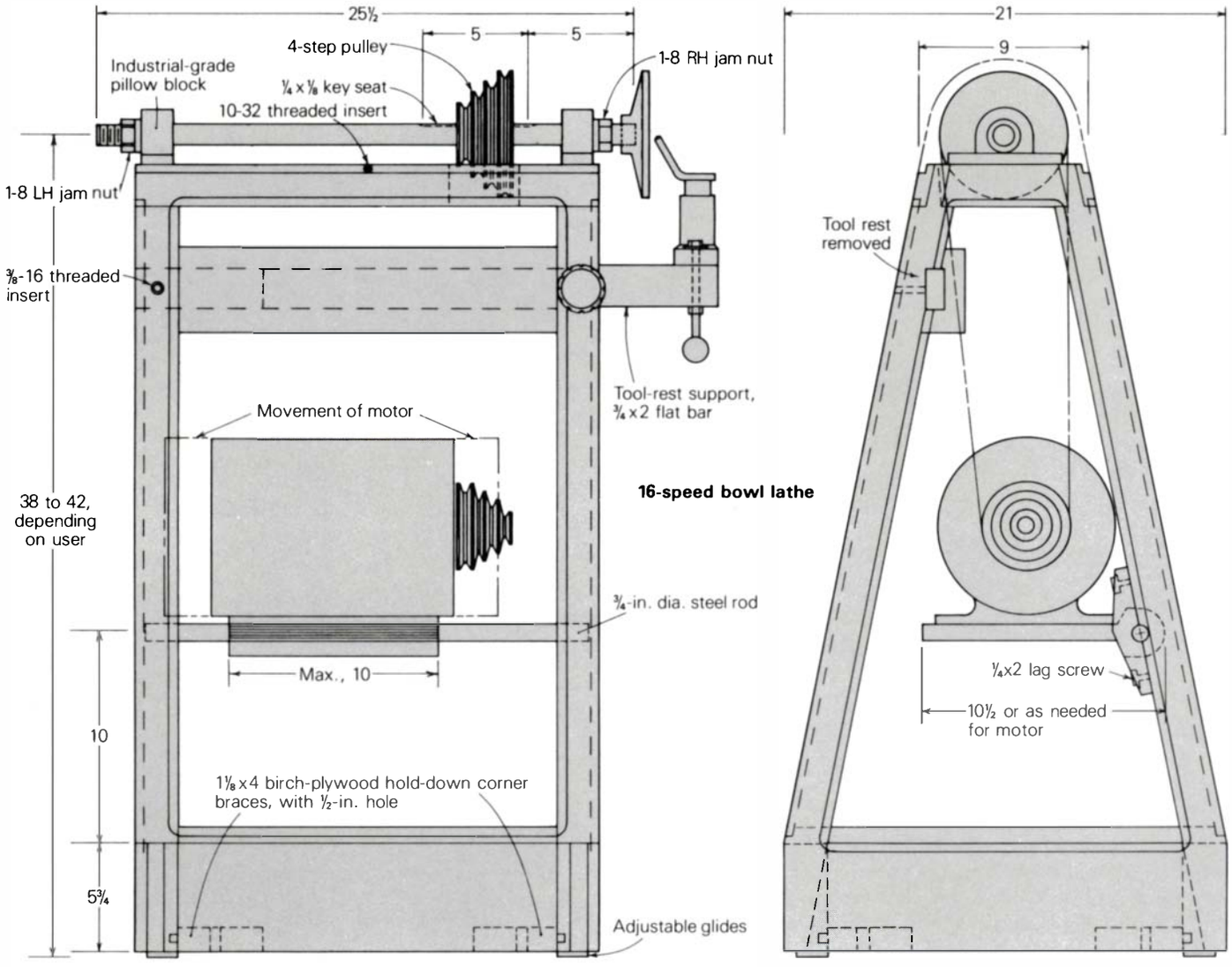
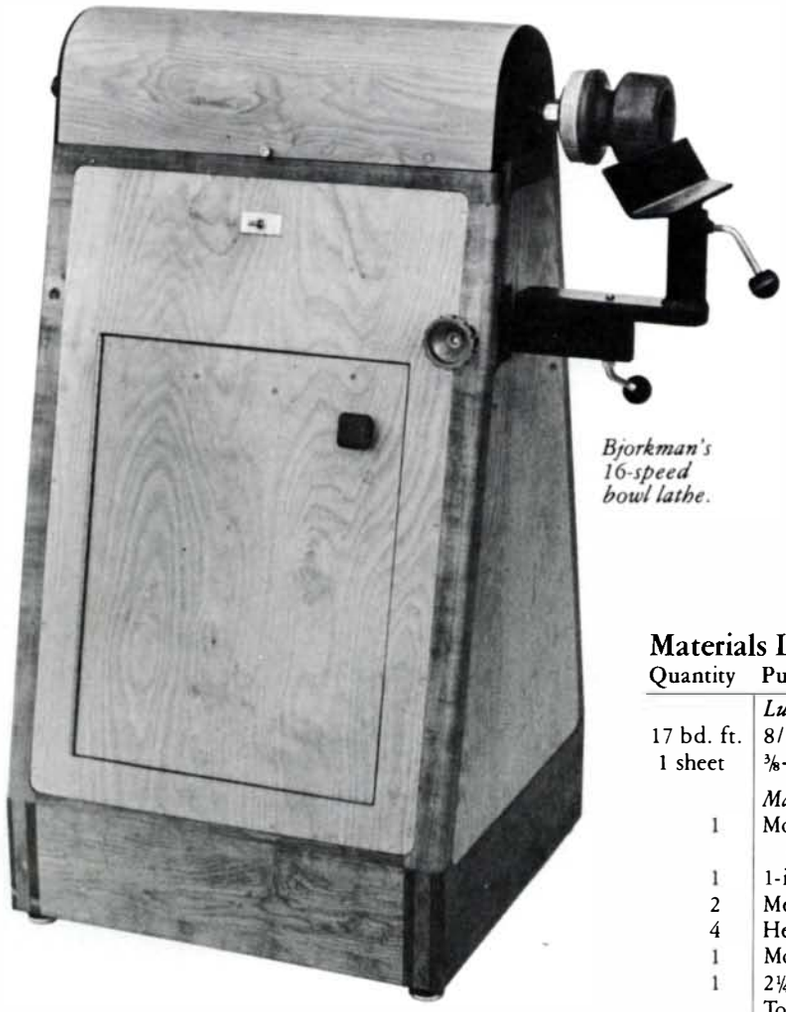
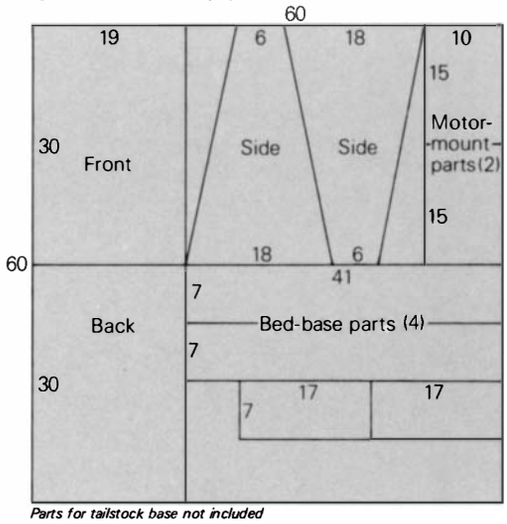


Photo and drawings: Donald C. Bjorkman



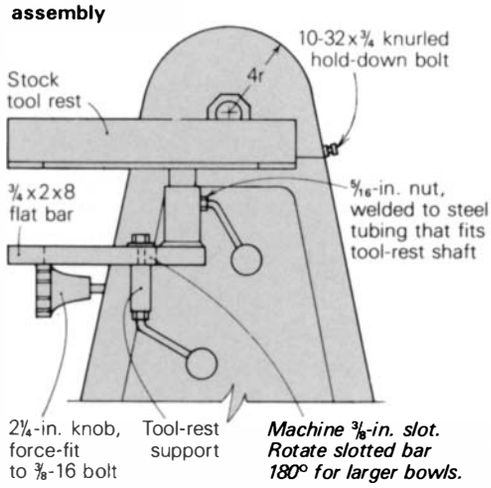
Bjorkman's 16-speed bowl lathe.

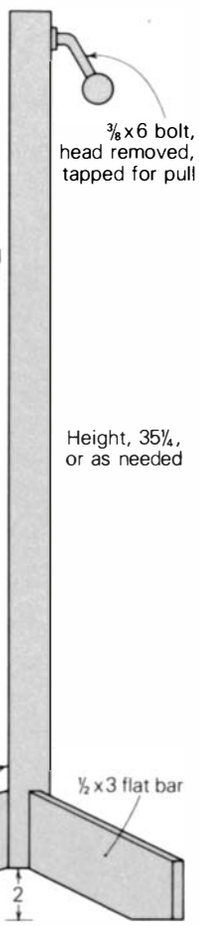
Layout of parts from sheet of ¾-in. Baltic birch plywood



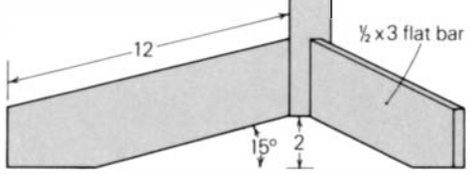
Parts for tailstock base not included

Tool-rest assembly



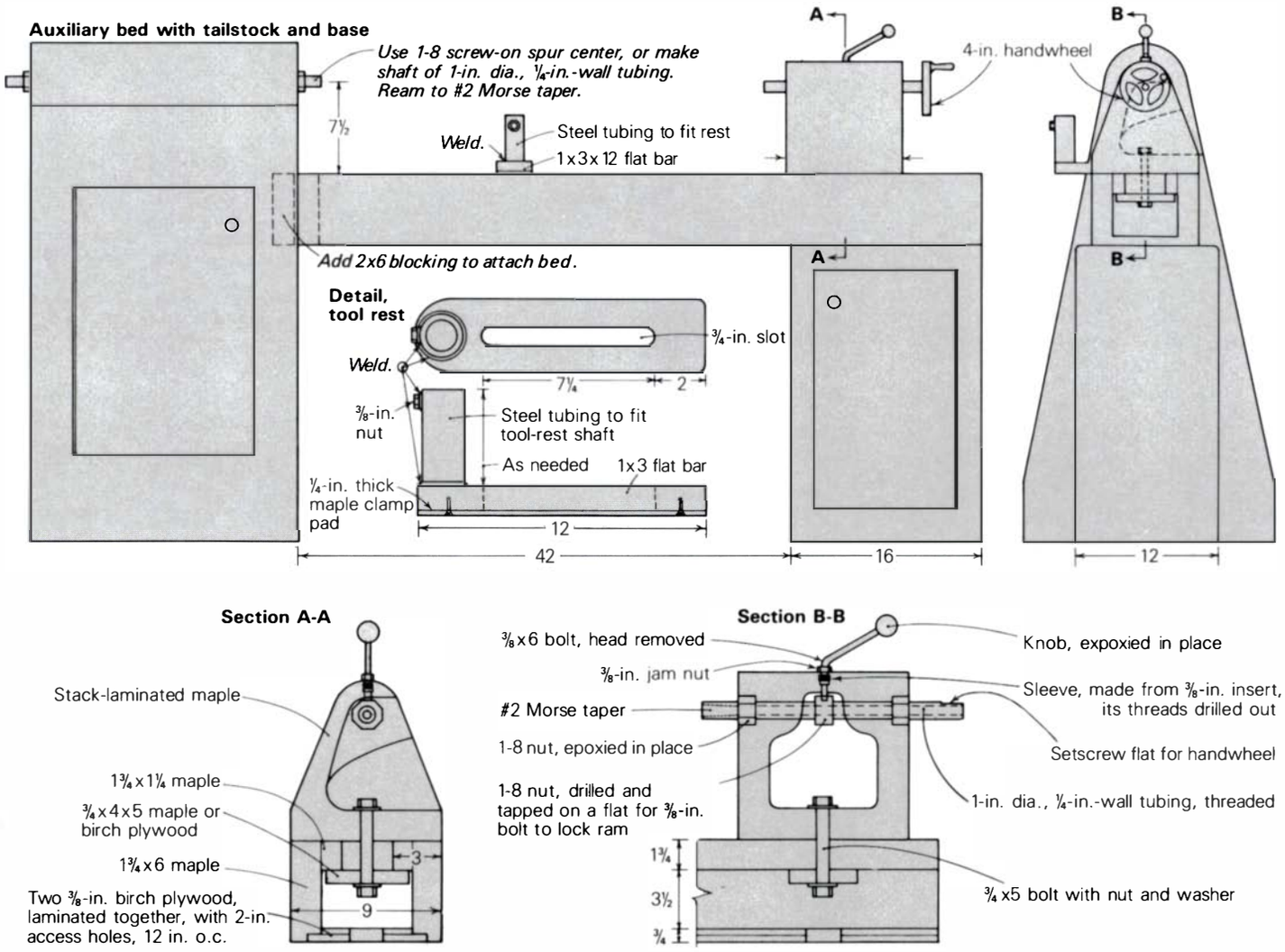


Three-legged tool-rest stand



Materials List

Quantity	Purchased parts	Approx. cost (Fall, 1980)
	Lumberyard	
17 bd. ft.	8/4 maple, 5 in. by 20 ft.	$ 35.00
1 sheet	⅜-in. by 60-in. by 60-in. Baltic birch plywood	28.00
	Machinery supplier	
1	Motor-shaft pulley, 1¾-in., 2⅞-in., 3⅜-in., 4-in. dia.	9.50
1	1-in. shaft pulley, 3-in., 4-in., 5-in., 6-in. dia.	16.00
2	Medium-duty self-aligning pillow blocks	45.50
4	Heavy-duty adjustable nut glides	4.00
1	Motor switch	9.00
1	2¼-in. locking knob	1.50
	Tool rest and faceplates as needed	
	Steel supplier	
25½ in.	1-in. dia. cold-rolled rod	2.50
20½ in.	¾-in. dia. hot-rolled rod	1.00
2	¾-in. by 2-in. hot-rolled flat bar, 8 in. & 24 in.	4.00
4 in.	Tubing sized to tool rest	.50
1	1-8 RH jam nut	1.00
1	1-8 LH jam nut	1.50
	Welding of tool rest	5.00
	Machining of shaft	15.00
	Hardware store	
2	10-32 threaded inserts	
2	⅜-16 threaded inserts	
8 ft.	14/3 SJ electric cord	
1	220 V electric plug	
1	5/16-18 by 4-in. hex bolt	
1	⅜-16 by 6-in. hex bolt	
4	5/16-18 by 1¼-in. hex bolts	
4	5/16-in. hex nuts	
4	5/16-in. lock washers	
8	5/16-in. flat washers	
4	¼-in. by 2-in. lag screws	
1	⅜-16 by 3½-in. hex bolt	
4	½-13 by 3-in. hex bolt for pillow blocks	
4	½-13 hex nut	
4	½-in. flat washers	
3	Ball-shaped wooden drawer pulls	
1	1 1/16-in. by 24-in. continuous hinge	
1	¼-in. by ¼-in. by 2-in. key for pulley	
1	½-in. by 50-in. V-belt	
2	10-32 by ¾-in. knurled finger bolts	
6	1¼ x 8 FH wood screws (Phillips)	
18	¾ x 6 FH wood screws (Phillips)	
1	Cabinet door catch	
	Total, miscellaneous hardware	24.50
	Total cost	$203.50



used the table saw and a simple tapered jig. When the frame is fully assembled, a ⅜-in. rabbeting bit and router cut the rabbets for the plywood panels to fit into.

The guide through which the tool-rest support slides consists of two 1½-in. by 4-in. pieces of maple that span the uprights of the frame. To form the ¾-in. by 2-in. channel in the guide, I grooved each piece and glued them together. To align the groove I wrapped the steel bar in wax paper and positioned it in the groove during glue-up. Then I cut the angle on the guide's face to match the slope of the sides of the machine. A 2¼-in. knob on a ⅜-in. bolt through a threaded insert in the machine frame locks the sliding section of the tool-rest support in place. The pivoting section of the support consists of an 8-in. length of flat bar steel welded to a 4-in. length of steel tubing. A ⅜-in. slot is machined in the flat bar for the ⅜-in. hold-down bolt to slide in.

You can make ways for spindle turning on this lathe from two pieces of 1¾-in. by 6-in. maple, 58 in. or however long you desire. Laminate a 1¾-in. by 1¼-in. piece of maple along the length of the top edge of each way to create the lip that the tailstock and tool rest clamp to. Reinforce the bed along its lower side with a double thickness of ⅜-in. birch plywood, rabbeted into the inside edge of each way. As you will not have plywood pieces long enough to extend the length of the ways, stagger the joints for strength. Drill 2-in. holes on 12-in. centers along the length of this plywood for access to the hold-down bolts on the tailstock and tool-rest support. By epoxying and/or flush-screwing a thin piece of maple to the bottom surface of the tool rest, you can prevent a metal-to-wood sliding contact, thus forestalling damage to the wooden ways. Secure the tail end of the bed to the tailstock pedestal by bolting through the plywood along the bottom of the bed. The tailstock itself is stack-laminated maple. When the 1-8 nuts that hold the ram are epoxied into the tailstock, be sure to have the ram screwed in place so that the nuts are indexed to each other. The same is true when drilling the hole into the flat of the nut that locks the ram. With the tailstock in place bolt the ways to the headstock through two maple attaching blocks, one between the ways, the other between the frames under the spindle. It is important that both the longitudinal and horizontal planes of the bed are parallel to the centerline of the spindle; if not, you could end up with tapered turnings. Sight through the headstock spindle and move the tailstock until it is aligned. Shim where the headstock attaches to the bed as needed. You can also adjust the mounting of the pillow blocks.

The dimensions given are for my lathe and may be modified, but if the machine is built much larger, one piece of plywood will not be enough for all the stress panels. Also note that the spindle size and tool-rest holder were chosen to accept manufacturer's stock units. When buying steel, consider purchasing enough to build an outboard tool-rest stand. The materials list includes parts for the bowl lathe only. As motor prices vary considerably, I have not figured the price of one in the costs, but a ¾-HP to 1-HP motor is recommended. □

Donald Bjorkman is professor of interior design at Northern Arizona University in Flagstaff.