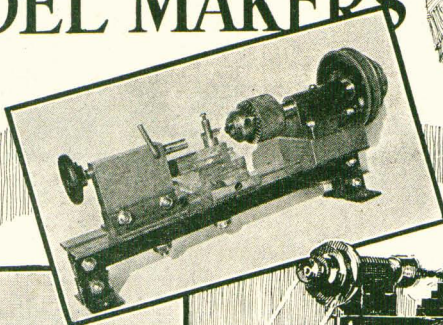
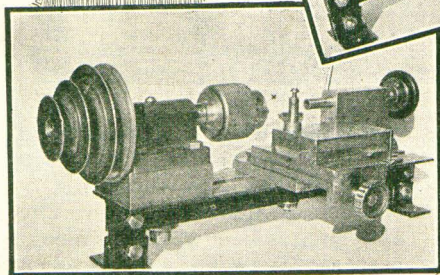


# A Metal-Turning LATHE for MODEL MAKERS

by  
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## Part I

THIS metal-turning lathe, the front and rear views of which are shown in the photos above, has a capacity of diameters up to  $4\frac{1}{2}$  in. and a maximum distance between centers of about  $5\frac{1}{2}$  in. The tools required to build it are a hacksaw, breastdrill, files, clamps and a few drills, taps and dies.

Assemble the legs and feet of the bed, shown in Fig. 1, and then assemble these to the top angles, with the whole in an inverted position on a good flat surface. Clamp together and drill the bolt holes through the three pieces at one time, bolting before removing the clamps. Have the holes a snug fit for the bolts. This procedure will insure the bed top being true and flat. The cone pulley and a chuck, of about  $\frac{1}{2}$ -in. capacity, can be purchased from the stores selling the small popular woodworking machines and accessories. If you build the headstock shown in Fig. 2, it will be well to buy one of the small polishing-head spindles that are already threaded with the special thread to fit the chuck, together with a collar to fit. The spindle is cut off to the required length.

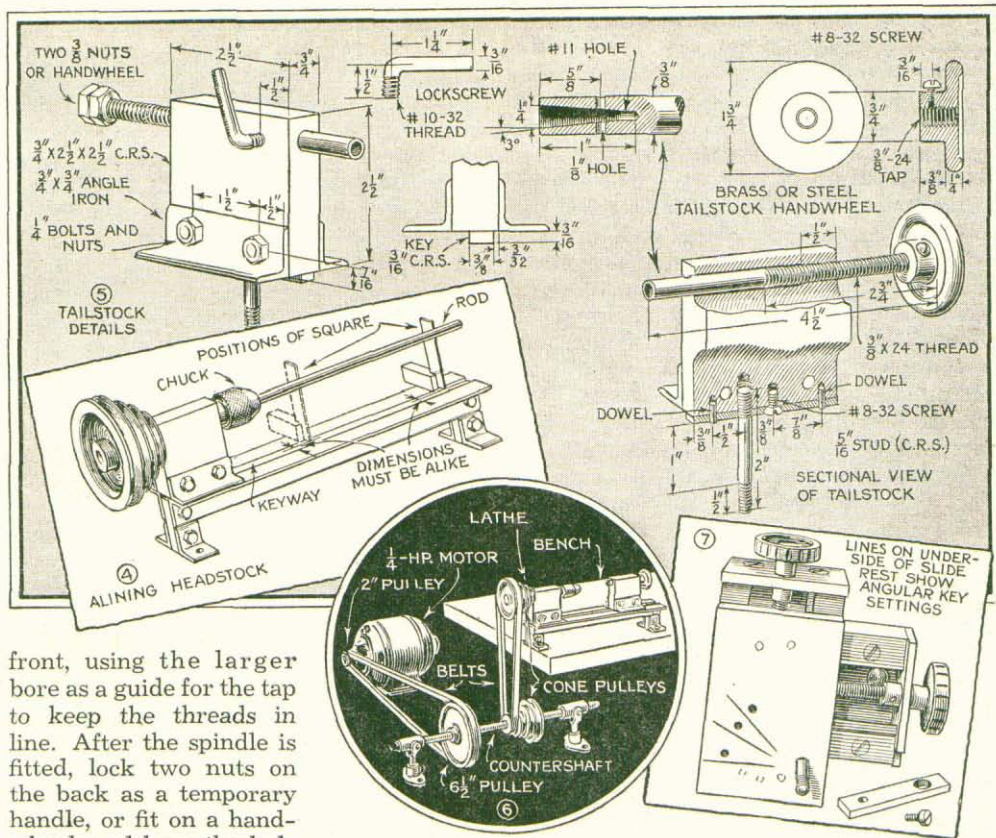
Only a few hand tools are needed to build this lathe, the headstock itself being used for turning and drilling other parts

Be sure that the spindle hole is parallel to the bottom surface, and ream it to fit the spindle without shake. The washers shown should be of brass if the head is steel, and steel if the head is bronze. They may be left off until you can turn them up yourself after completing the machine. Making the head of bronze gives the best spindle bearing. The headstock may be made of an old bearing of suitable proportions, blocking it up to the required height and fitting any available chuck to it, or it can be made up specially from  $2\frac{1}{2}$  by  $2\frac{1}{2}$  by  $\frac{3}{4}$ -in. piece of cold-rolled steel. An oil hole or cup should be provided on the top to oil the spindle. Bolt the completed headstock to the left end of the bed with a  $\frac{3}{8}$ -in. bolt,  $1\frac{1}{2}$  in. long, and a washer, and line it up with the spindle parallel to the bed slot. A good method of checking this alignment is indicated in Fig. 4. A straight rod, about  $\frac{1}{4}$  in. in diameter and 10 in. long, is clamped in the chuck so that it does not show eccentricity when the spindle is revolved. A square, standing on the bed, is









front, using the larger bore as a guide for the tap to keep the threads in line. After the spindle is fitted, lock two nuts on the back as a temporary handle, or fit on a handwheel, and bore the hole in the front end of the spindle. The taper is reamed with a  $\frac{1}{4}$ -in. drill or reamer ground to the required angle.

The slide rest is shown in Fig. 3. The angular faces of the parts composing the dovetail slides are beveled with a file and should be smooth and flat. All the slide-rest screw and dowel holes can be drilled, using the lathe and tailstock as a drill-press. The outside beveled pieces are attached to the undersides of the respective plates, and these, with the gibs and adjusting screws in place, are used as gauges for the mating inner parts. The sides of the inner dovetail parts are filed parallel, which is determined when these pieces will slide through the gauge with the same feel all the way. Blue paint will aid, used in the manner of fitting bearings. The assembly of the lower slide is completed first, and the inner dovetail part of the upper, or cross, slide is fastened on at  $90^\circ$ , using a square to set it and omitting the dowels at this time. Complete the upper-

slide assembly, and, as in the case of the tailstock, the handwheels can be temporarily omitted by locking two nuts as a substitute, until the wheels can be turned up on the completed lathe.

The final setting of the slides at  $90^\circ$  is done with the slide rest on the lathe, by feeding the cross slide across under a scribe, set up and clamped solidly to either headstock or tailstock, so that it scratches a line on the top surface of the cross-slide plate. A line is then scribed by hand on the same surface accurately at right angles to the first. Next, with the scribe set up as an indicator on the second line, feed in the lower slide so the second line follows under the point. If the setting is correct, the point should follow the line. Play in the screw holes should permit the slides to be moved by light taps of a hammer, until lined up properly, after which they are doweled. The key should be filed from a piece wider than  $\frac{3}{8}$  in. so that it will fit snugly in the bed slot, and drilled

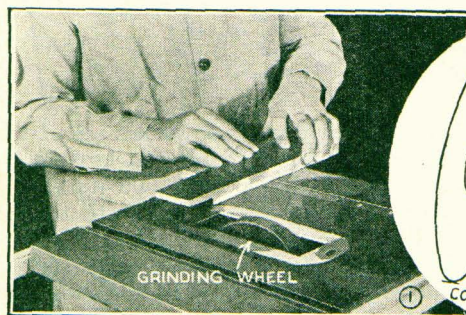


for a snug fit on the stud. Angles are obtained by rotating the key around the stud, and the screw holes for holding the key at different locations can be laid out close enough. The indicator lines must be carefully located by adjusting the slide around until it will turn a piece of rod the same diameter for the whole travel of the cross slide. At this setting, lock the key with the screw and scribe the line along the side of the key for the zero angle. From this line, set the key at whatever other angles you may expect to use, and scribe the other lines. For clearness of illustration, only two angle settings are shown, but these may be as many as one for each degree, by putting two arcs of staggered screw holes in the base to obtain half-hole spacing, and slotting the holes in key. The toolpost is easily made from a flat-head machine screw of  $\frac{5}{16}$ -in. diameter, long enough so that the threads are removed when cut to the  $1\frac{3}{8}$ -in. length. Make the slot in this by drilling a series of

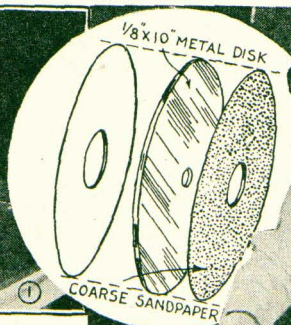
holes and complete by filing out the metal between. File the head of the post so it is slightly below the surface of the metal around the countersunk hole. The small segment can be cut from a large washer of  $1\frac{3}{4}$ -in. diameter,  $\frac{1}{8}$  in. thick, and should move freely in the post slot. Make a tool bit by grinding up a piece broken from a  $\frac{1}{8}$ -in. square file and clamp it temporarily in the post to turn up the small round concave spacer. Assemble the post complete and drive in the pins at each end of the segment to act as retainers.

The turning of the three handwheels makes the final step in completing the machine. File the grooves in the rims of the slide-rest handles, and pin them in place, allowing free turning without play. Any shake at this point will cause chattering on heavy cuts. The tailstock wheel is held with a setscrew, and a slight depression is drilled on the spindle for this screw to enter. Tools and fittings for this lathe are described on the following pages.

## Circular Saw Serves as Grinder and Sander



When you have a limited number of power tools in your shop, your circular saw can be used for some grinding and sanding jobs. For example, if you need a shallow rabbet ground accurately on a piece of flat steel, just substitute a grinding wheel for the saw blade, lower the arbor or raise the table the desired height and grind the rabbet. If you have no disk sander, you can use the saw as one. Just cut a metal disk to the required size and drill the center to fit over the saw arbor. Then cement fine sandpaper on one side and coarse on the other. This gives you a sander with a



machined table and a miter gauge for sanding the edges of work at an angle or so they are square.