METAL-TURNING LATHE

Built from Stock Parts

by Frank Beatty

USING STANDARD PARTS and stock materials that are available almost anywhere, you can build this metal-working lathe with only a few tools. Because of simplification of the assembly in order to make the unit easy for anyone to build, the lathe as pictured and detailed cannot be rated as a precision tool. It is simply designed to do practical work within reasonable limits. As detailed, the lathe swings 4¼″ over the bed and takes 10″ between centers. Standard pipe and fittings are used to form a frame on which the headstock, tailstock and bed are fitted.

The first step is to assemble the pipe and fittings. Do this before any other parts are made or stock cut to dimension. The reason for this first step is that in the manufacture of standard pipe there are allowable variations and some changes in dimensions of lathe may be necessary because of these variations. The pipe assembly consists of one 14″ length of l½″ pipe, two close nipples, two tees, two floor flanges and one pipe plug (optional) for closing the tee at the headstock end of the assembly.

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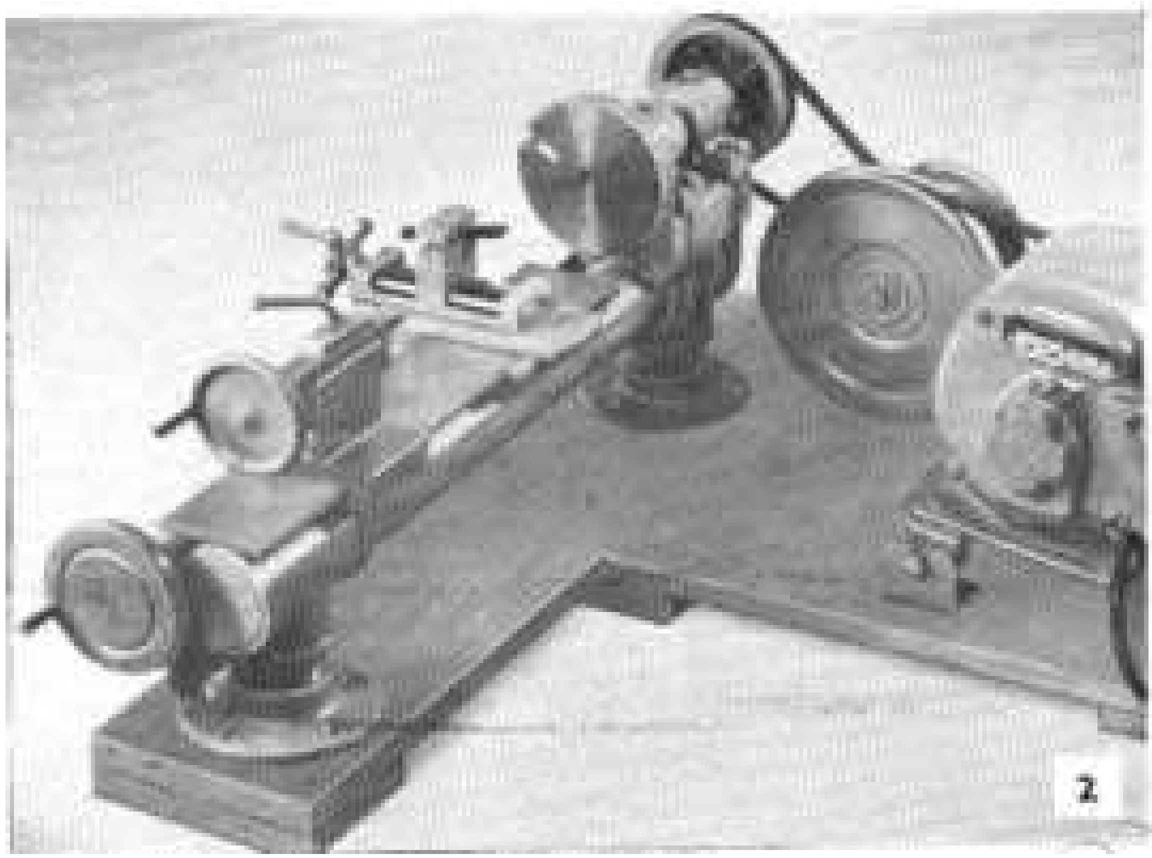

Screw the parts tightly together and then mount on a hardwood base as in Figure 5. Later, when the countershaft, motor and motor mount are added to the assembly, a second piece is attached to the first, making an L-shaped base as pictured in Figs. 1 and 2.

Also at the onset it should be noted that the spindle-thread characteristics are not given. The reason for this is that chucks are available to fit spindles threaded ½"-24, ½"-20 and ¾"-16. You can use a ½" or ¾" spindle and have it threaded to take any one of these chucks. The original lathe spindle was threaded ½"-20 and is suitable only for light work. A solid spindle is, of course, much simpler and less expensive to make or have made than is a hollow spindle with a #0 or #1 Morse taper. For turning work between centers, the solid spindle requires a special 60° center with driving pin (Figure 5). This center and the spindle can be made in a machine shop at a very nominal cost.

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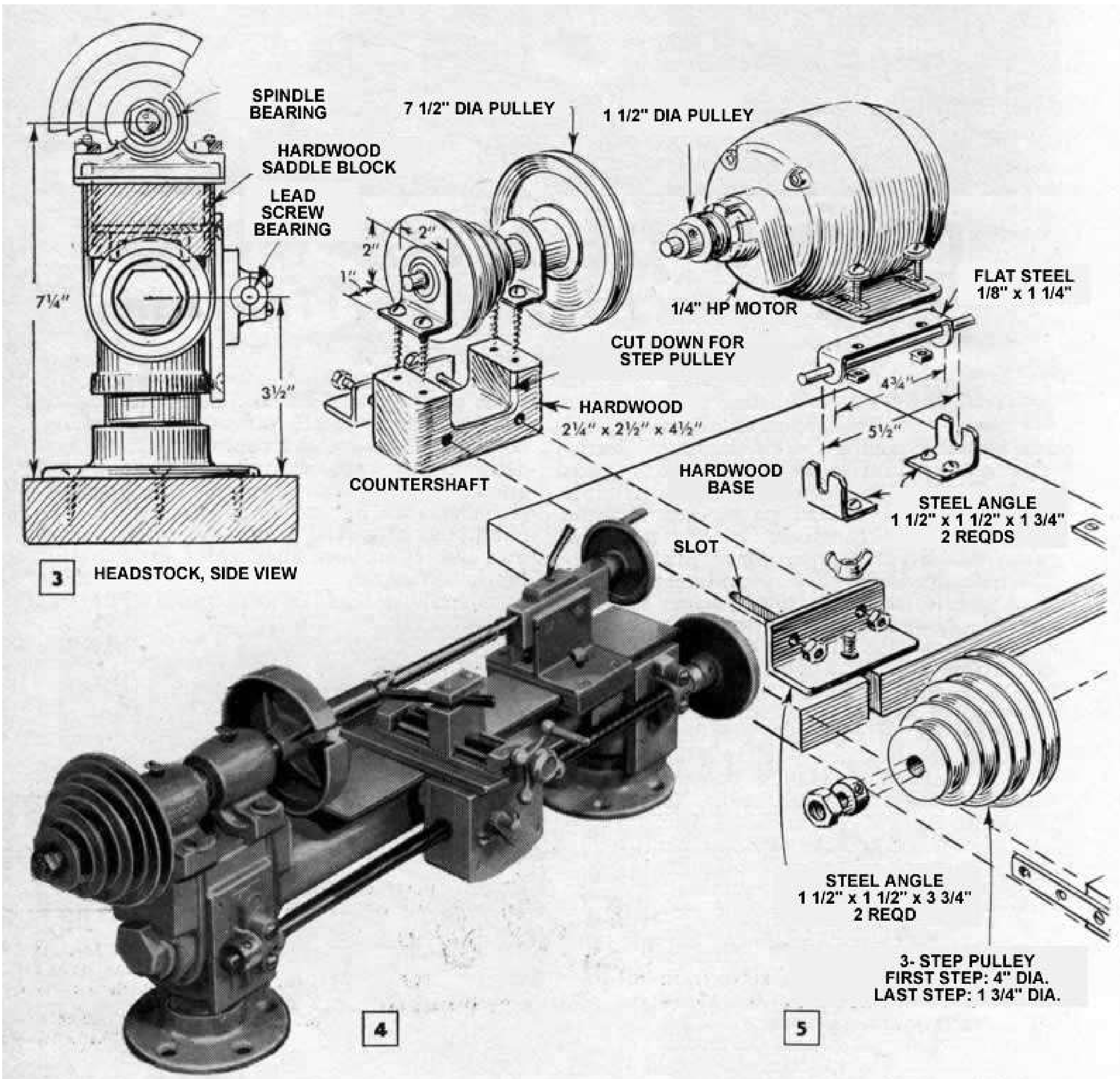

The headstock-spindle bearing (Figure 5) are held on the pipe tee by means of U-bolts and a saddle block of hardwood. One face of the saddle is shaped to the contour of the tee; the other is faced with a ⅛″ steel plate on which the pads of the pillow blocks rest. The purpose of the steel plate is to make it easier to align the bearing sleeves when the assembly is bolted in place. Cut the saddle about ⅛″ thicker (about 2½″) than indicated. Then assemble the parts temporarily.

Next, build up the tailstock, assembling from parts as indicated in Figure 5. Then, assemble the bed on pipe frame. Slide the tailstock on to the bed and check the alignment of the centers both vertically and horizontally. Any misalignment can be corrected by reducing the height of the saddle and by tapping the bed lightly to shift it on the fame. Once the centers are aligned, tighten the parts permanently in place.

The toolpost, toolpost slide and the actuating screw are shown in an exploded view at the lower right in Figure 5 and are shown in more complete detail in Figure 7, 8 and 9. In this assembly, the tool is moved in either direction by turning the handwheel at the end of the lathe bed. The actuating screw consists of the lead screw (A), the split nut (B) and the split-nut cam (C), Figure 5. These parts were purchased ready-made from the manufacturer of a 6″ metal-turning lathe. An alternate assembly for running the carriage right and left would be to attach a rack to the underside of the flat bed and fit a handwheel and pinion gear in the carriage apron, the pinion engaging the rack. This assembly would shift the carriage somewhat faster and for ordinary work would be quite as effective as the use of the lead screw.

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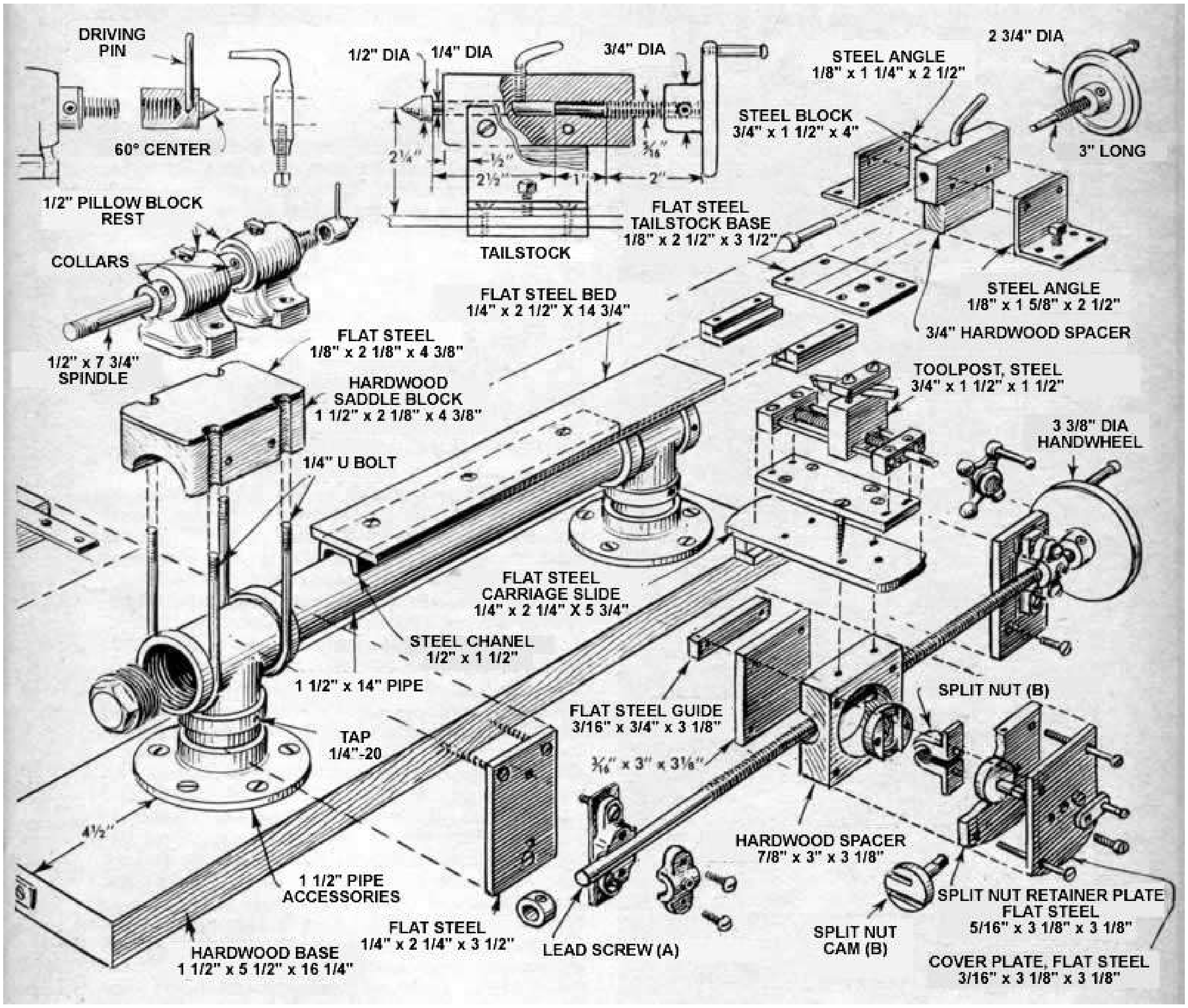

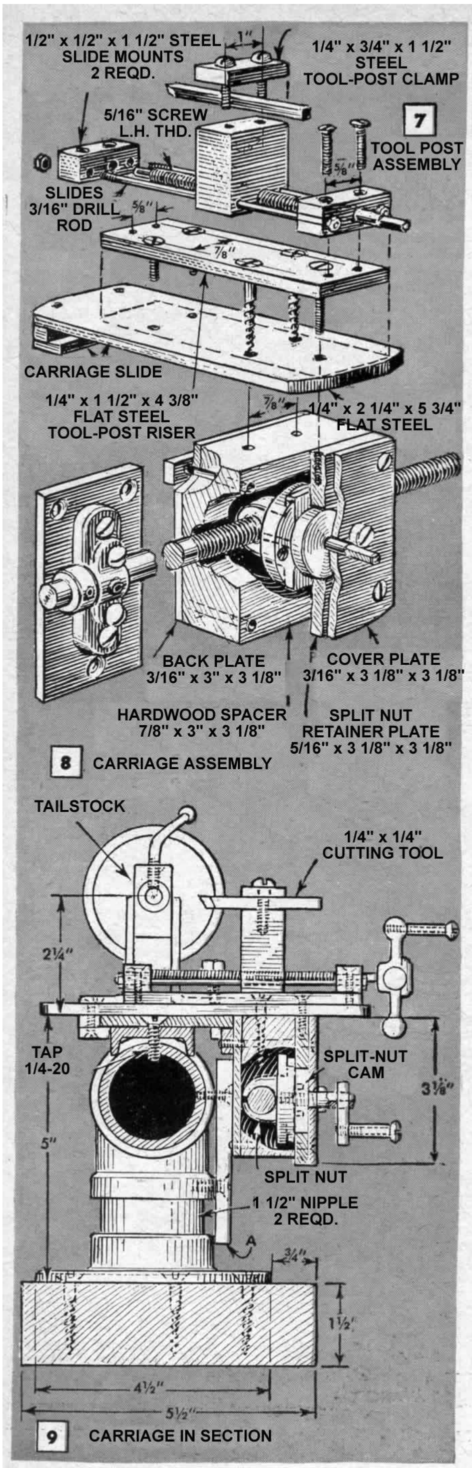

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Likewise, the tool post, detailed in Figure 7, can be supplanted by a standard tool post from a small lathe. It can be mounted by having a small block of tool steel T-slotted at a local machine shop and drilled and tapped for the guide rods and the screw. This assembly would, of course, allow more latitude in adjustment of the cutting tool.

In the original lathe, the carriage consists of two steel plates stacked, and an apron built up from three steel plates and a hardwood spacer; the latter also serving as a housing for the split-nut assembly. Figures 5, 7, 8 and 9 show quite clearly how the parts are assembled. Figure 9, the sectional view, shows the relationship of the parts when the carriage is fully assembled. Note in Figure 5 that the lead-screw-bearing plates are attached to the pipe tees with screws; the latter being turned into holes drilled and tapped into the pipe-tee flanges. These holes should not be drilled and tapped until the carriage is fully assembled with the lead screw in position. Only then can the bearing plates be accurately located.

Care must be taken to fit the carriage to die flat bed so that it moves along the full length of the bed without side play at any point. It is best to temporarily fit the parts tightly, then free them by polishing the edges and top of the bed with fine abrasive or with an oilstone. The same procedure should be carried out when fitting the parts of the tool-post assembly (Figure 7) and the tailstock (Figure 5). Hand fitting and hand stoning of the sliding parts give a smooth slow motion essential to the performance of the lathe and to accurate work. It is especially important that the tool post move throughout its entire travel without any tendency to rock on the supporting plate. It should move on the slides (rods) with a slight amount of friction and should seat firmly on the supporting plate.

The countershaft (Figures 1, 2 and 6) is detailed in Figure 5. It can be built from any parts at hand, or available, that will serve the purpose. Although the original countershaft was mounted in ball-bearing hangers, sleeve-bearing hangers will do quite as well. Standard shaft hangers having a range of adjustment sufficient to give clearance for the countershaft and drive pulley will eliminate the necessity of blocking up the hangers as detailed. Adjustable hangers can be bolted directly to the base. Construction time also can be saved by purchasing the cradle motor mount rather than making it up as detailed. Or, if desired, you can simply bolt the motor directly to the hardwood base and rely on the slotted motor base to provide adjustment for tensioning the belt. Pulleys of the diameters given will give ample speed range for turning nearly all metals. Use a motor of 1750 RPM.

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