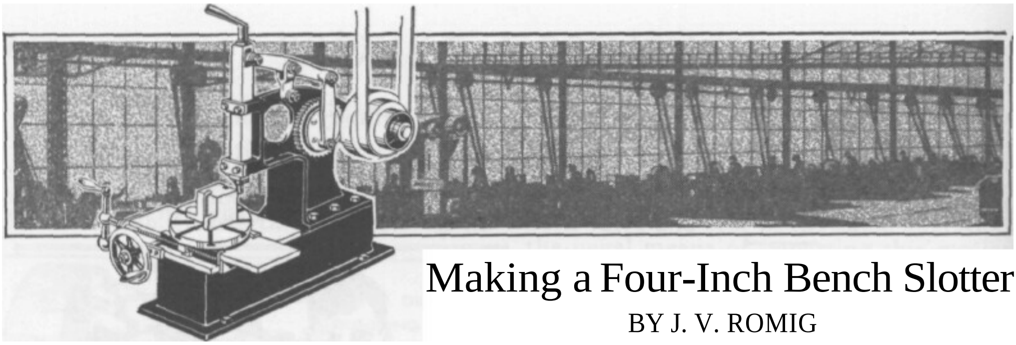


Making a Four-Inch Bench Slotter

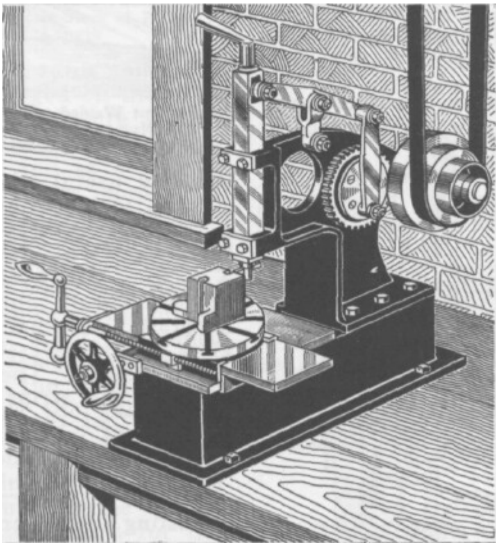
BY J. V. ROMIG

THE bench slotter described in this article will prove a useful addition to the equipment of the small workshop or mechanical laboratory. It is designed to be made with as little labor and expense as possible, so as to bring it within the reach of those who possess only a lathe and the usual hand tools, and who do not wish to have much of the work, if any, done outside their own shop.

The two straight movements of the slotter table, together with the circular one, permit the production of shapes that cannot easily be machined on the shaper or planer, as, for example, circular arcs and parts, in combination with straight portions. Narrow grooves and keyseats in wheels and levers are also easily cut, with the work lying on the table, while, on the shaper or planer, work of this character would require angle brackets and projecting tools. In addition to these advantages, the layout lines on the work are always in plain view, and working closely to them is rendered much easier than on planer or shaper. The only castings necessary are the bed, frame, table, and cone pulley; the rocker arm, link, and connecting rod may also be made in cast iron, if desired, or built up from cold-rolled steel, or forged.

The pattern making involved is simple, and should present no difficulties to those accustomed to the use of woodworking tools. Care should be taken to allow enough stock for shrinkage and machining, and to provide plenty of draft and good fillets in all corners. If in doubt how the pattern should be made, consult the foundry where the pieces are to be cast; many valuable hints can be picked up there, and the advice given may make a big difference in the cost of the parts.

The bed is made of box section, and is shaped or planed true and smooth on its upper face; a rough cut should be taken over the bottom flange also, so that the machine will bed firmly and truly on the top of the bench.



Perspective View of the Finished Slotter: This will Prove a Valuable Machine in the Small Shop, and One Well Worth the Time Spent in Its Construction

The frame casting, a perspective view of which is shown in Fig. 6, is planed or shaped true on the bottom, and the ram slots shaped out close to size and square with the bed, on all surfaces. The frame is fastened to the bed with 3/8-in. capscrews.

The ram is made from a 13½-in. length of 1¼-in. cold-rolled steel, carefully straightened and squared, and trued to a surface plate or good straightedge, by scraping. The ram slots are scraped to a good sliding fit on the ram, and the 3/8 by 2½-in. cold-rolled steel plates, that hold the ram in place, fitted and scraped also. The ram is drilled from one end with a .625-in. drill to a depth of 13.125 in., and a .469-in. hole is drilled to meet this hole from the other end. From the end of the latter hole, a ¾-in. slot, 2 in. long, is cut through the ram, and the clamp pin, made as shown in the detail in Fig. 4, fitted in place. The slot in the pin is made .625 in. long by .563-in. wide, so as to allow plenty of clearance for the tool-clamp rod.

This rod is turned down from a 15-in.

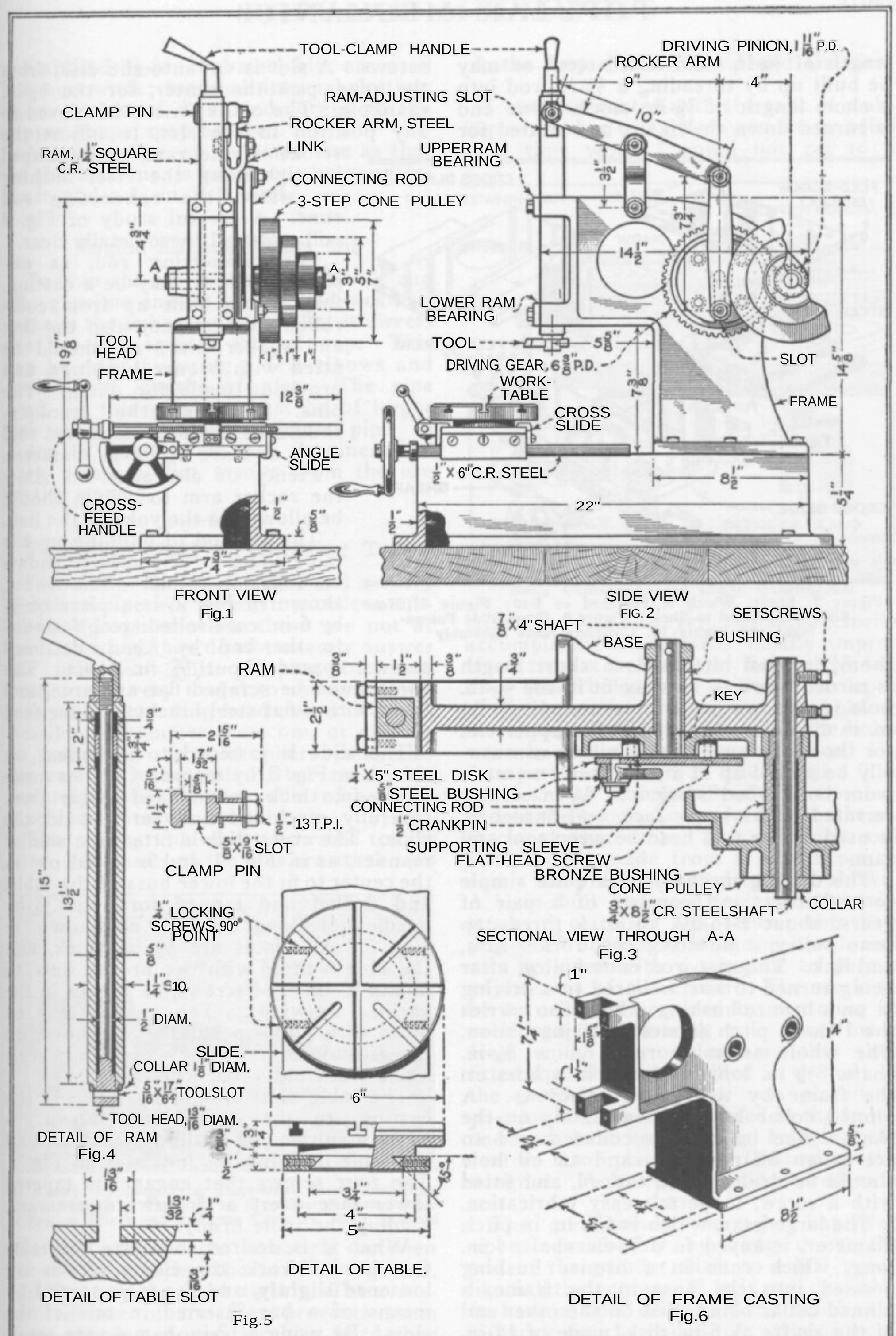


Figure 1, Front Elevation of Completed Machine; Figure 2, Side Elevation; Figure 3, Sectional View, Showing Details of Driving Mechanism; Figure 4, Section of Ram, Detail of Clamp Pin and Tool Head; Figure 5, Plan and Part Section of the Table and Dimensions of Slot; and Figure 6, Perspective View of Frame Casting length of .875-in. cold-rolled steel, or may be built up by threading a ½-in. rod into a short length of .875-in. stock. One end is turned down to .812-in., and slotted for the ¼-in. tool bits used; a short length is turned down to an easy fit in the .625-in. hole in the ram, and the remainder is ½ in. in diameter, threaded at the upper end for the tool-clamp handle, which can usually be picked up at a junk store, or made from cold-rolled stock. A .125-in. collar, serrated on its lower face, and hardened, is used on the tool head between tool and ram.

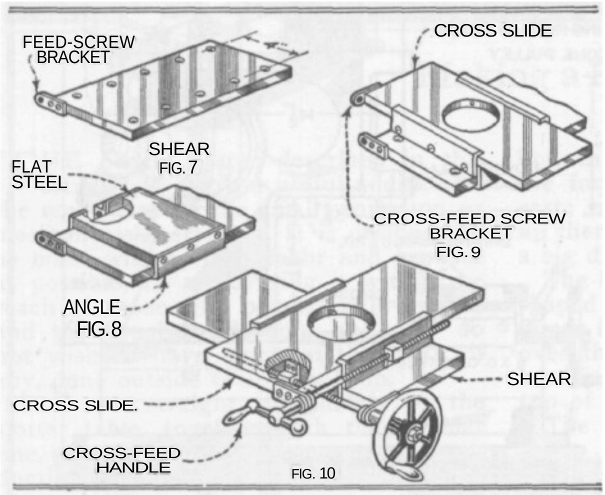


Figure 7, Shear, Which is Fastened to Bed; Figure 8, How Slide is Attached to Shear; Figure 9, Cross-Slide Fastenings; and Figure 10, Complete Slide Assembly

The driving mechanism is quite simple to construct, and consists of a pair of gears, about 1-to-3¼ ratio, a three-step cone pulley, connecting rod, rocker arm, and link. The cast-iron cone pulley, after being turned to size, is bored to a driving fit on a bronze bushing, which also carries the 1.688-in. pitch diameter driving pinion. The whole assembly runs on a ¾-in. shaft, 8½ in. long, fastened in a boss on the frame by two .375-in. setscrews. A pinned collar holds the assembly on the shaft. The bushing is counterbored to act as an oil reservoir, and an oil hole should be drilled in it, tapped, and fitted with a screw, to permit easy lubrication.

The large gear, which is 6.375in. in pitch diameter, is keyed to a .875-in. shaft, 4 in. long, which runs in a bronze bushing pressed into the boss in the frame, a pinned collar being used on the other end of the shaft. A 5-in. disk, made of ¼-in. plate, is fastened to the gear by flat-head screws, the disk being held out from the gear by four sleeves, fitting over the screws. A slot is cut into the disk, from the edge, past the center, for the ½-in. crankpin. The crankpin can be moved to any position in the slot, to adjust the stroke of the ram, and clamped by tightening the steel bushing on which the connecting rod runs. A careful study of Fig. 3 will make all these details clear.

The connecting rod, as explained before, may be a casting, forging, or built up from cold-rolled steel, as may also the link and rocker arm; all should be fitted with bronze bushings, and provision made for oiling. The pins, including the crankpin, should be made of hardened tool steel, and are ½ in. in diameter.

Plenty of clearance, to allow the rocker arm to swing, should be allowed in the yoke of the link.

The method of building up the table slides is very clearly shown in Figs. 7 to 10. The shear, shown in Fig. 7, is a piece of ½ by 6-in. cold-rolled steel, fastened to the bed by ¼-in. flat-head screws, spaced about ½ in. apart. The shear must be scraped flat and true, and fitted with a flat steel bracket for the feed screw.

The slide is fastened to the shear, as shown in Fig. 8, by means of angles made of .188-in. thick sections of angle iron, carefully machined and screwed to the slide. The cross slide is fitted in a similar manner, as in Fig. 9, and is bored out in the center to fit the lower boss of the table, and drilled and tapped for four ¼-in. headless locking screws, as shown in Fig. 5. All plates are ½ in. thick, and the slide is fitted with two bronze nuts, to fit the .375-in. feed screws, as shown in the various drawings. The screws may be fitted with built-up handles, as shown on the cross-feed screw, or with handwheels made from old valve wheels.

The table slots should be cored in the casting, to the dimensions shown, to avoid a subsequent milling operation, and the table machined as indicated in Fig. 5. The four screws that engage its tapered lower face exert a downward pressure, holding the table firmly.

When it is desired to rotate the table for circular work, the clamp screws are loosened slightly, and the table turned by means of a bar inserted in one of the slots. By using a 12-in. bar, a very sensitive feed may be obtained. For taper cuts, the work is lined up with shims of the proper thickness.

Standard ¼-in. tool-steel bits are used for most work; for small internal slotting, ¼-in. tool steel, bent and forged to the proper shape, may be used.

A cone pulley, of the same size as that on the machine, is keyed on the counter-shaft, and a ¾-in. belt used.