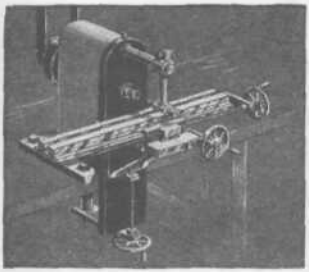


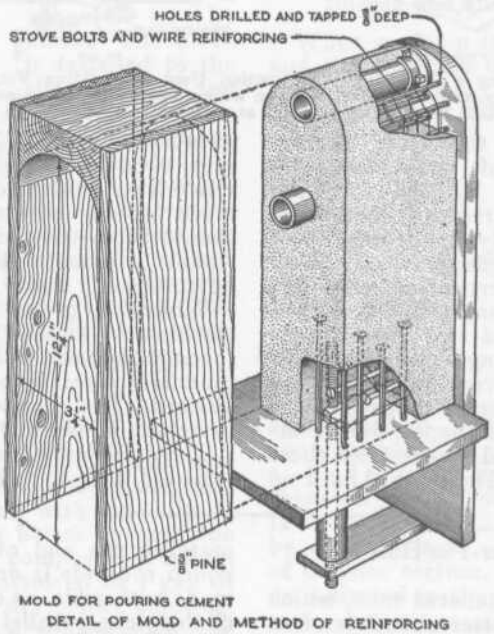
A SMALL BENCH MILLER

By J. V. Romig

DURING the late war, machines which required massive castings in their design were built with beds of cement or concrete, simplifying the work of construction, and providing a means of making very heavy machines with a minimum of large castings. This method can be adapted to the use of the mechanic in the small shop, and by using a combination of cement and cold-rolled steel, small machines can be constructed sufficiently strong to stand a considerable amount of heavy work, while eliminating entirely a body casting.

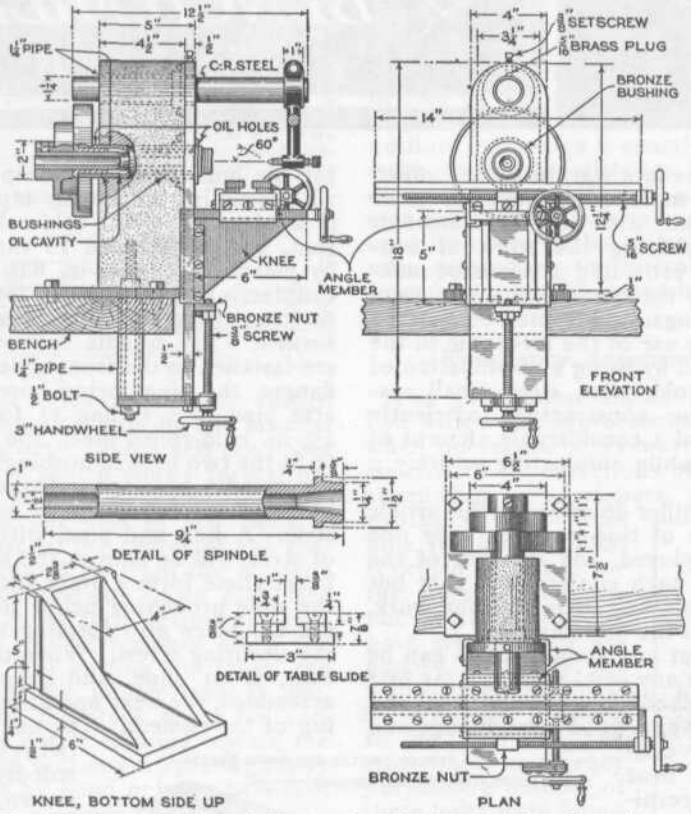
The bench miller described in this article is an example of this method; only one casting is employed, and the rest of the machine is of such construction that but few simple tools, and little machine work, are required in the building of it.

The steel, flat and round, which can be obtained from any steel merchant, is first carefully checked for straightness and parallelism, using a good straightedge and a micrometer caliper; if any bent spots are discernible, straighten carefully, and if thick spots occur in the slides, scrape them off until a level surface is obtained. The holes in the front slide and base should then be laid off and drilled, including the holes for the spindle and overarm, and the 1/4-in. holes for the anchor bolts. These anchor bolts are 1/4-in. stove bolts of varying lengths, as shown in the smaller drawing, and are placed so that the heads will be staggered, to distribute the hold and strains more evenly in the cement. The holes for the bolts are 3/8 in. deep, and tapped with a 1/4-in. bottoming tap. The base is a piece of 1/2-in. cold-rolled steel, or iron, and is fastened to the front slide by means of two 1/4-in. flat-head screws, countersinking the slide for the heads, so that they will be flush with the surface. The spindle and overarm pipes are fastened to the front slide by means of flanges, the pipes being bored—the overarm pipe to a sliding fit for a piece of 1 1/4-in. cold-rolled steel, the spindle pipe to fit the two bronze bushings which form the spindle bearings. These pipes must be fitted absolutely square with the front slide. A bolt and pipe, with a flat piece of steel, will be seen at the bottom of the base; these form a brace for that part of the slide projecting below the bench top, the flat piece also forming a bearing for the elevating screw. When this brace, the base, front slide, and pipes have been assembled, the next operation is the pouring of the cement. The anchor bolts are interwound with soft-iron wire, as shown, and the form is placed in position, and clamped rigidly. A mixture of 1 part cement to 3 parts clean, sharp sand has proved ideal for this purpose; during the pouring, the spaces between the screws, and all edges and corners, must be thoroughly poked with a knife, or other sharp-pointed tool, to insure that the cement reaches every part. After pouring, level off the surface, and then lay the assembly aside to season; this is a very important part of the construction, the cement being wetted at least twice a day



The Main-Body Casting is Poured in a Mold Made of Soft Pine, the Top of the Front Slide being Shaped to Conform to the Contour of the Casting

for a period of about a week. While the cement is thus seasoning, the screws, slides, spindle, knee, and various other component parts may be made up. The spindle should be turned and bored, using a No. 2 Morse taper in the nose, and cutting the thread for the chuck, which is 1/16-in. pitch; bronze bushings are used for the bearings, being turned to make a press fit in the spindle pipe. A three-step cone pulley is turned to the dimensions shown, and is fastened to the spindle by a safety setscrew. A simple pattern is built for the knee casting, which is made of soft gray iron, and machined as indicated. On the top of the knee is the main carriage slide; it is machined very carefully on the edges and faces, and must be perfectly square in all directions. On the vertical sides of this slide are screwed the angle members, two for the table slide and two for the carriage slide. These angle members are made of 3/16-in. angle iron, filed and fitted with great care, a cut being taken through the inside fillet, on the shaper, before fitting; 1/4,-in. round-head screws hold them to the carriage slide. The table is built up of cold-rolled steel, as shown in the detail drawing, the various pieces being held together with 1/4 in. flat-head screws. This job can best be done by using a few rivets to hold the assembly, while performing the drilling and tapping operations. The T-slot in the table permits the use of 3/8-in. bolts, to hold a vise, or the various fixtures used on the machine.



By Adapting a Method of Construction Used in Building Very Heavy Machinery, to the Needs of the Man with a Small Shop, Machines Such as the One Shown may be Built at a Considerable Saving in Cost

All screws used on the vertical, longitudinal, and crossfeeds, are turned out of cold-rolled steel, and run in brass or bronze nuts, fastened to the slides with round-head screws. The equipment necessary, such as arbors, centers, and a small vise with a homemade swivel base, can be made up as required. A good chuck should form part of the equipment, and should be fitted with a flange threaded to fit the spindle nose.

While foot power may be used with the machine, a small 1/4-hp. motor, driving through a countershaft and cone pulley mounted directly over the machine, is advised. The cone pulley should be of the same size as the one on the miller.

The builder of this miller will have a splendid little tool, at small cost.