

Lathe Milling Attachment

By L. C. MASON

Milling attachment in use on 7-in. lathe for milling out parts in the manifold of a model 4-cylinder gas engine. One holding clamp removed for clarity.

BY CLEVERLY stacking cold-rolled flat stock together, T-slots and slide for this lathe milling attachment are made without costly machinery. In fact, only two tools, a drill press and lathe, are needed to make the attachment. Shown mounted on the cross slide of a lathe (Fig. 1), the attachment features a swivel base and tilting slide which has T-slots for clamping the work securely in place. Although this attachment was made for a 7-in. Atlas lathe, the overall dimensions could be increased 25% for use with a 9 or 10-in lathe.

Start by cutting the stock size cold-rolled flat stock for T-slot pieces A, B, C and D in Fig. 3 to 3-in. lengths. Then lay out and drill the #21 holes. Pieces A and B, and C and D can be clamped together when drilling so that they will line up properly when assembling later. Next, hacksaw the slide plate E in Fig. 3 to shape and trim up the cut edges with a file. Lay out and scribe lines on the slide plate for locating pieces B and D. Be sure these lines are square with the sides of the slide plate. Clamp the B and D pieces to the slide plate and drill the 12 #21 holes. Then open the holes with a #9 drill and countersink the holes on the back of the slide plate to sink 10-32 *fh* screws just below the surface. Tap the #21 holes in pieces A and C with 10-32 NF threads.

Now cut the back plate pieces (F and G in Fig. 3) to length. Since stock size cold rolled

does not come $2\frac{3}{16}$ and $1\frac{11}{16}$ in. wide, you will have to machine them. Clamp them on the lathe faceplate with a 90° angle block and turn the $2\frac{3}{16}$ -in. piece about $\frac{1}{64}$ in. undersize. Set these pieces aside for the moment, and make up and drill pieces H, J and K in Fig. 3. Note that the ends of piece H are filed to take the brass gib L, which should also be made up at this time.

To assemble, first clamp piece J to the back and right side of the slide plate. The top and bottom screws securing piece J will run into the B pieces, so bolt these pieces on the front of the slide plate. Spot drill the slide plate through the #9 holes in piece J, then remove it and drill through with a #21 drill. Tap 10-32.

To be certain of getting piece H parallel with piece J, place piece F between them. Be sure that the gib, piece L, is between pieces H and F also. Clamp piece H to the slide plate and test piece F to see that, it slides up and down smoothly. Then spot drill the slide plate through the holes in piece H and drill and tap as you did for piece J. Assemble the K pieces with the F piece in place.

Now, place piece G, the other back plate you machined to $1\frac{11}{16}$ in. wide, on piece F between the K pieces. There should be $\frac{1}{32}$ in. clearance on each side between the K pieces. Clamp the G piece in place, and drill the $\frac{3}{16}$ in. rivet holes deep enough to spot drill the hole locations on

the F piece. Then remove the pieces and continue drilling the holes through the F piece. Countersink the rivet holes on the F and G pieces a good 1/16 in. and fasten with rivets cut from 3/16 in. dia. soft steel rod. Heat rivets red hot before setting. When cool, file or grind flush at both ends.

Your next step is to true up the front, or top surfaces of the T-slot pieces A and C so that they will be parallel with part G of the back plate that fastens to the angle on the lathe cross slide. First remove pieces H, J and K on the back of the slide plate. Then permanently fasten T-slot pieces A, B, C and D to the slide plate. File projecting 10-32 screws flush with A and C pieces. Reassemble the riveted back plate to the slide with pieces H, J, K and L. Tighten the screws so that the back plate will not slide. Now clamp the assembly to the lathe faceplate, so that the back plate is against the faceplate and T-slot pieces facing outward. Take a series of light cuts off the surfaces of pieces A and C, which will true up the front and compensate for any difference in the thicknesses of the flat bar stock.

For the feed screw, make up piece M in Fig. 3 and fasten to the top of the slide plate with two 10-32 *fh* screws as in Fig. 2. Do not drill the 1/4-in. hole in piece M at this time. Also make the nut, piece N in Fig. 3, and fasten to the top of piece G with two 10-32 *fh* screws.

Since the holes for the feed screw through pieces M, N and the back plate must be aligned and parallel with the slide ways, clamp the assembly in the upright position on the drill press table so that the front of the slide plate and right side of the slide way is parallel with the drill bit. If the drill press has a tilting table, be sure to square the table with the drill bit first. Using a #21 drill, bore a hole through piece N and M, and into the back plates about 1/4 in. in depth. The hole should land right between the riveted back plates. Remove the #21 drill, chuck a 1/4-in. drill and bore through piece M only. Then, without removing the assembly from its clamped position on the drill press table, take off pieces M and N and bore a 9/32-in. hole 35/8 in. deep into the riveted back plates. While you have piece N off tap the #21 hole with 10-32 threads and reassemble to the back plate.

Turn the feed screw, O in Fig. 3, from 3/8-in. steel rod, reducing the thread little by little until you have a shakeless fit with the nut. Note that the other end of the screw is threaded 1/4-28 for the handle and dial. Turn the dial, P in Fig. 3, and scribe the graduations on the bevel with a screw-cutting tool bit turned sideways in the

tool holder set at center height. Twenty-five divisions on the dial will indicate slide movement of .002 in. for each division. A 25-tooth gear fastened on the lathe spindle was used for indexing. Scribe every fifth line (.01) the full width of the bevel. Make the handle pieces Q and R as detailed in Fig. 3, and turn the thrust washers from bronze or brass.

Before assembling the feed screw to the slide and back plate, turn the mounting bolt 5 in. (Fig. 3). Use a stock $\frac{1}{2}$ -20 hex. nut with the bolt. Then remove the back plate from the slide and bore the $\frac{1}{2}$ -in. hole, countersinking the widest of the back plates to the same taper as on the mounting bolt. Try to arrange the work so that the taper on the bolt and back plate can be turned without changing the angle of the lathe compound rest.

When assembling the feed screw to bearing block M on the slide plate, place a thrust washer on the feed screw shaft at each side of block M. Then screw on the dial and handle on the feed screw, allowing just enough play for easy turning. With the handle and dial locked together like locknuts, hand solder or braze the handle to the dial. Drill a $\frac{1}{16}$ -in. hole through the handle and feed screw and drive a pin through it. Scribe an index mark on the slide plate as on E in Fig. 3.

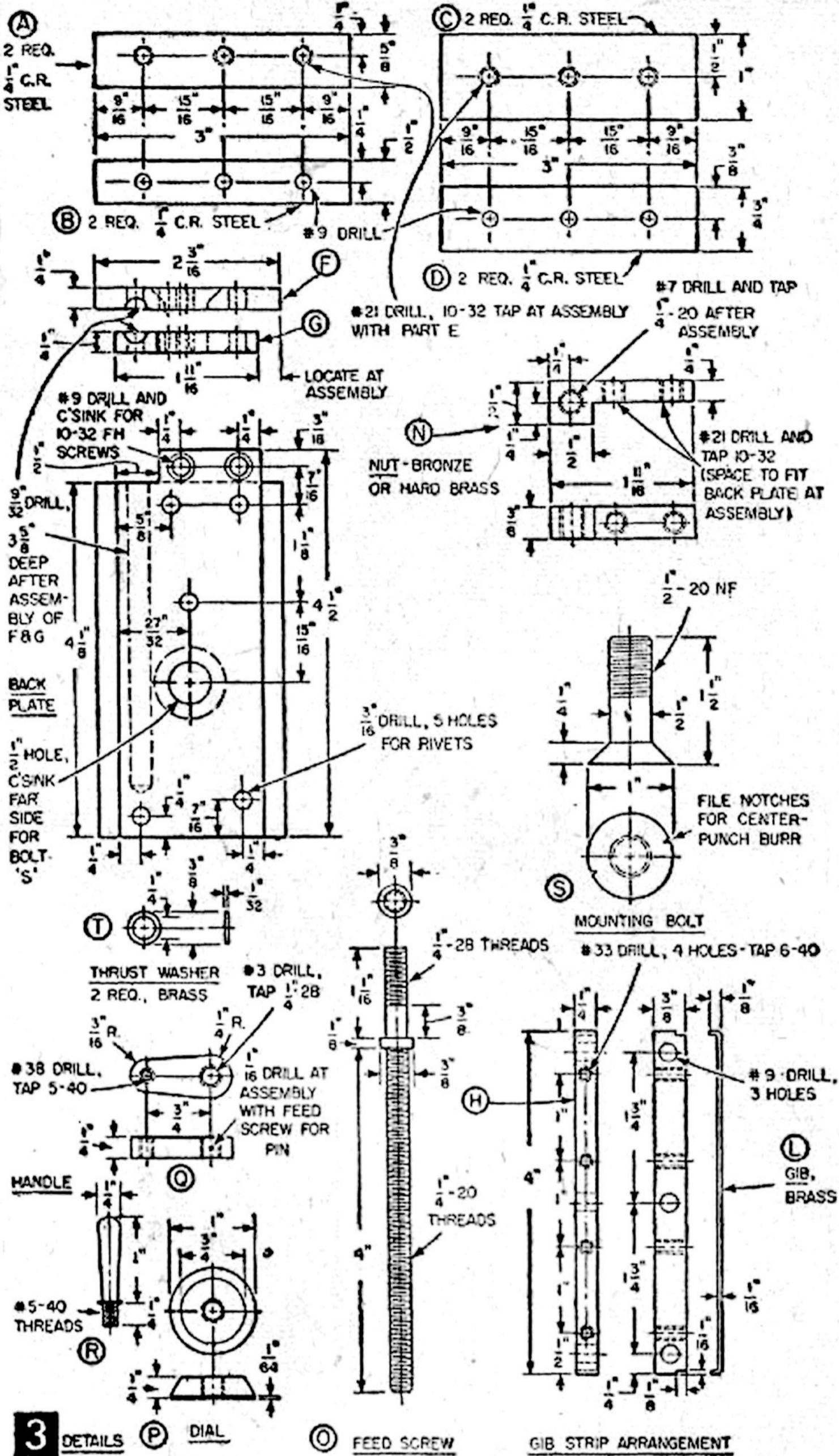
When assembling the mounting bolt to the back plate, file notches in the bolt heads as in Fig. 3. Then, after inserting the bolt in the back plate, raise burrs with a centerpunch at the edge of the hole to fill the filed notch. This will keep the bolt in place and prevent its turning. Now place the back plate in the slide ways, engage the feed screw and work it back and forth a few times to test the slide ways. If the K pieces are too tight, place a paper shim under each for clearance. If too loose, file or grind down the thickness of pieces H and J. Adjust the gib screws for a smooth sliding fit without play.

The completed milling attachment mounts on a 3-in. length of $\frac{3}{8}$ x 3 x 3-in. angle iron bolted to lathe cross slide in place of the compound rest as in Fig. 1. The size of this angle iron will vary depending upon the make and model of the lathe it is to be used with. Regardless of the size of angle iron needed, first face off the two outside surfaces of the angle by clamping it on the lathe face plate with an angle block. Then cut a $\frac{1}{4}$ in. thick steel plate and rivet it to the inside surface of one leg of the angle as in Fig. 2. Again clamp the angle to the lathe face plate and bore a hole through the angle and $\frac{1}{4}$ -in. plate large enough to fit on the compound mounting lug on the lathe cross slide. Clamp the angle iron to the lug in the same

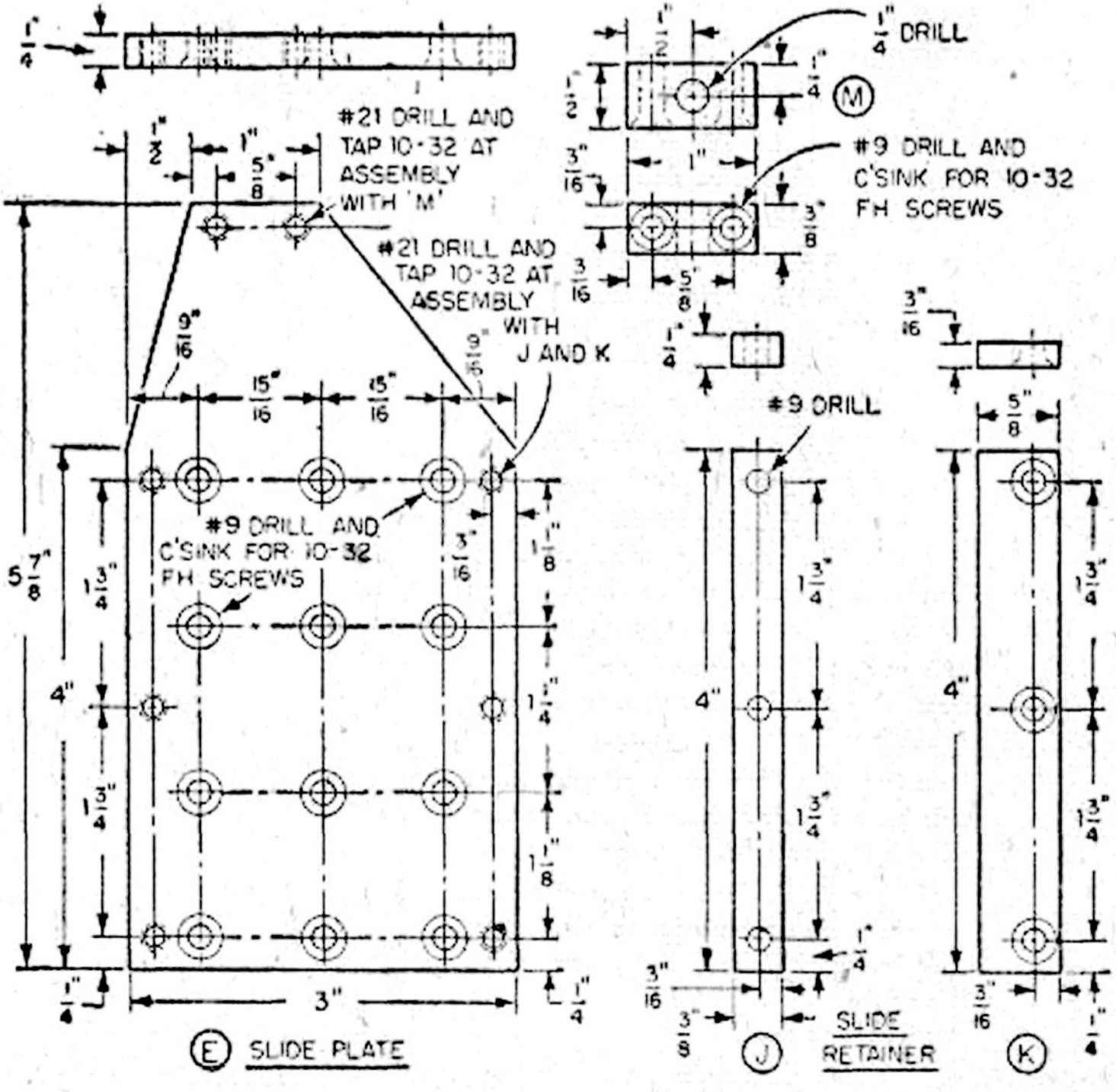
way the compound rest was clamped, drilling and tapping needed holes in angle iron, to take the plunger pins and clamp screws used to fasten the compound rest.

To drill the $\frac{1}{2}$ -in. milling attachment mounting hole in the angle, clamp it so that the vertical face is exactly at right angles to the lathe bed ways and bore with a drill chucked in the lathe headstock. This will place the pivot point of the attachment on the lathe centerline which is advantageous for some types of milling operations. Work to be milled is clamped against the ma-

chined surface of the slide as in Fig. 1. Use $\frac{1}{4}$ in. squarehead machine bolts with heads placed in T slots for clamping.



3 DETAILS



MATERIALS LIST—MILLING ATTACHMENT

All Dimensions in Inches

No. Req.	Size and Description	Use
2	3/16 x 5/8 x 4 cold rolled steel	K
2	1/4 x 3/8 x 4 cold rolled steel	H and J
2	1/4 x 1/2 x 3 cold rolled steel	B
2	1/4 x 5/8 x 3 cold rolled steel	A
2	1/4 x 3/4 x 3 cold rolled steel	D
2	1/4 x 1 x 3 cold rolled steel	C
1	1/4 x 1/2 x 1 1/4 cold rolled steel	Q
1	1/4 x 3 x 5 7/8 cold rolled steel	E
1	1/4 x 2 1/4 x 4 1/8 cold rolled steel	F
1	1/4 x 1 3/4 x 4 1/2 cold rolled steel	G
1	3/8 x 1/2 x 1 cold rolled steel	M
1	1 dia. x 2 1/2 cold rolled steel	P and S
1	3/8 dia. x 8 cold rolled steel	O and R
1	3/8 x 3 x 3 x 3 long angle iron	mounting angle
1	1/4 x 2 x 3 cold rolled steel	mounting angle
1	3/16 dia. x 7 mild steel rod for rivets	
1	3/8 x 1/2 x 1 3/4 bronze or hard brass	N
1	1/16 x 1/4 x 4 1/2 hard brass	L
14	10-32 x 7/8 fh machine screws	
	10-32 x 3/4 fh machine screws	
	6-40 x 5/8 headless flat-point socket setscrews	
	6-40 hex. nuts	
	1/2-20 hex. nut	

