out sideways and no grooves are needed to keep them within the slots.

The bending roller, *C*, cylindrical bending block, *A*, and the roller pivot are shown in Fig. 7. Where the bending radius on centre line of tube is greater than $\frac{3}{8}$ in., the block, *A*, must have a flat formed to clear the vice as shown. A spacer, *F*1, with a clearance hole is necessary between the block, *A*, and the link, *E*.

By making the roller, *E*, 0.005 in. less in width than the internal width of the fork-end of the lever, *D*, the small amount of play allows the roller to settle itself correctly on the work. The grooves should be a good fit on the work, but one cannot rely on tubes being perfectly circular. It is best to make them an exact fit to a rod, say, silver-steel. The final fitting should be done in the lathe with a round-nosed scraper until, with a good light behind and a short piece of rod held in the groove without shake, an even crack of light shows.

The roller pin

The depth of the grooves should be such that when the two are on the rod, the peripheries of the rolls remain about 0.005 in. apart, not more.

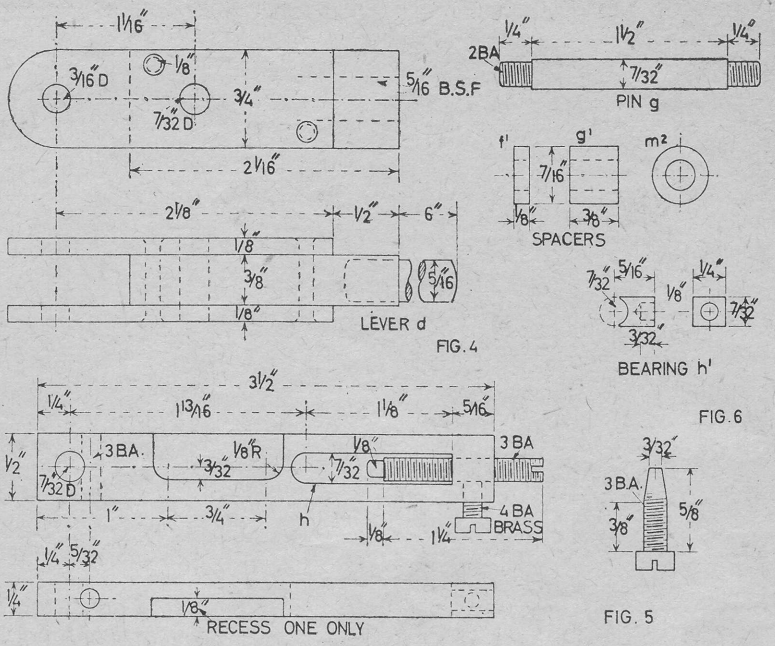
The roller pin can be adapted from a standard article of the kind but, if preferred, it can be a piece of silver-steel without a head. It should be a tight push fit in the holes in the lever, *D*, and the roller, *C*, should be a running fit on it without shake. If a plain rod, it should not be longer than the length given under the head, or it will be possible to push it through far enough for the tip to foul the side of the recess in the link, *E*.

Finally, the sleeves for holding the smaller sizes of work in the vice can be taken in hand. While a sleeve for each size, of $\frac{5}{16}$ in. external diameter, would be the easiest to manipulate in the vice, it would be difficult to make the thicker sleeves flexible enough and it also involves drilling a length of rod with a small hole concentrically throughout its length. It is better to use two or three thin concentric sleeves made from telescoping pieces of tube.

The following table gives the sizes of tube to employ in this manner for standard diameters of work below the largest size taken by the vice. Where the next thinner s.w.g. size would be too thin to clamp the work tightly, the next thicker must be used and reduced as indicated.

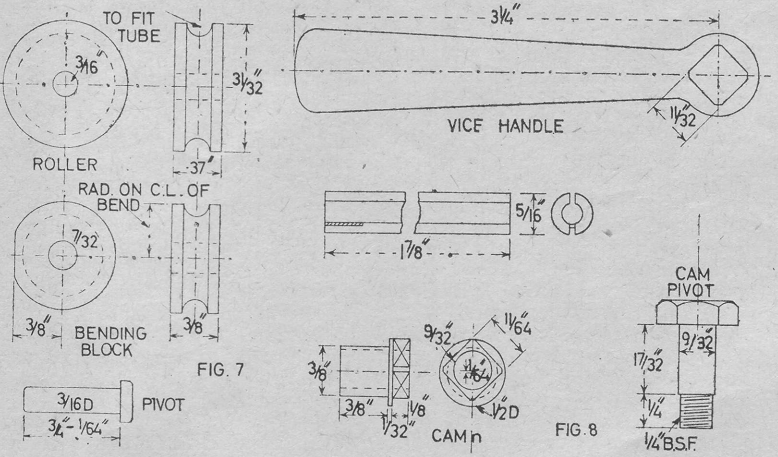
It is the inside of the tube which requires to be made larger to take the work or next size smaller sleeve, but it will be noted that the thickness is reduced by taking off the outside.

The sleeves are sawn lengthways at two diametrically opposite points, one cut not running the full length so as to leave the two halves joined. They should be longer than the vice so as to be easily manipulated when in position, and it is better if telescopic sleeves are progressively longer as they get smaller. Fig. 8 shows the detail and also shows how, in the case of a thick sleeve, the sawcut which does not run the full length must be continued on the surface as a groove in order to reduce the thickness at the attached part to a flexible amount. ▣



Figs. 4, 5 *and* 6: *The bending roller lever, links and bearing*

Figs. 7 *and* 8: *Details of the bending roller, cylindrical bending block, roller pivot and how the sleeves are sawn*



Size of work in inches		Size of brass tube dia.	s.w.g.	Correction on o/s dia.
9/32	0.281	5/16	28	
1/4	0.25	5/16	20 (size a)	—.008
7/32	0.218	5/16	18 (size b)	—.002
3/16	0.187	size a 1/4	28 (size c)	
11/64	0.172	size a 1/4	19	
5/32	0.156	sizes a and c 3/16	28	
9/64	0.141	sizes a and c 3/16	24	
1/8	0.125	sizes a and c 3/16	21	
7/64	0.109	sizes a and c 3/16	20	
3/32	0.094	sizes a and c 3/16	18	
5/64	0.078	size b 7/32	18 (size d)	
		1/8	28	
1/16	0.162	sizes b and d 1/8	20	—.008