

plate, depending on the size of former being used. If desired, the maker could substitute a slotted piece of bar instead of the eccentric, thus providing a right angled edge, when appropriate, to assist alignment.

### Swivel column

I used two 60mm pieces of 12.7mm square steel and brazed them together as it was all I had to hand. I would recommend a solid piece 25 x 12 millimetres. Mount in a 4-jaw chuck (or drilling vice, providing the set up is rigid enough) and drill and ream 10mm dia. 6mm from the end and 40mm deep to fit the mounting column. Drill and ream two 6mm dia. holes 30mm apart in the side of the column; these will take the actuating bars. You might also use this column as the drilling jig for the moving and end columns. Tip - the alignment is important, as the column has to move along the actuating bars easily, so if you use square bar for the columns instead of the round ones shown in the photos you can drill and ream all three together to ensure accuracy.

### Moving column

Made from 12.7mm round or square bar, 70mm long. Turn

down a shoulder on one end to 8mm dia. x 12mm long. Tap M4 thread 5mm deep to accommodate a countersunk fixing screw.

### Bush

Turn a 10mm dia. bronze or brass bush 12mm long x 8mm bore to fit the shoulder. If not already done, drill and ream two holes to match and line up with those in the swivel column. Tap M3 or M4 to accommodate a short socket head locking screw or bolt; a slotted screw won't be man enough for the job and the blade will slip whilst tightening it, while your other hand is in the way!

### Rotating former and retaining washer

The rotating former is 18mm dia. steel, 14mm long, drilled/reamed 10mm dia. to take the bush. Bore one end 12mm dia. just over 2mm deep, so that the former can spin freely when the retaining washer is fitted. Turn a groove 1mm from the same end, 5mm radius, 0.5mm deep. The retaining washer is made from 12mm dia. steel or brass, 2mm thick. Drill 4mm clearance and countersink it so that the screwhead is just below flush when all is assembled.



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### Fixed column

Made from 12.7mm round or square bar, 70mm long. If not already done, drill and ream two holes to match and line up with those in the other two columns.

### Actuating bars

Use two pieces of 6mm dia. bar 120mm long. I used stainless as it is nice and strong and doesn't go rusty! Slide the swivel column assembly onto the bars; glue, braze or Loctite

into the fixed columns when you are happy with the fit.

### Formers

I have not drawn any, as the size, shape and material will vary, up to around 50mm dia. so long as they have a 10mm bore, and can accommodate a full half of a diameter of any tube to be bent. Any less and you will 'neck' the tube, especially at small diameters and radii. A groove is not needed for solid bar. You will need to make radius tools, either from HSS or hardened and tempered Silver Steel. The clever ones out there might like to make a tangential tool holder for cutting perfect brass formers. I might even be persuaded to write an article on this subject!

### Using the machine

To use, once the appropriate former is in place, undo the locking screw and slide the moving column outward to provide clearance for the tube being bent. Insert the tube between the eccentric and the former, slide the moving column up to the tube, and lock up. Put finger pressure on the eccentric lever, combined with a steady pull towards you on the actuator, and you will produce nice easy bends. **Photograph 3** shows various bits of metal bent with the bender.

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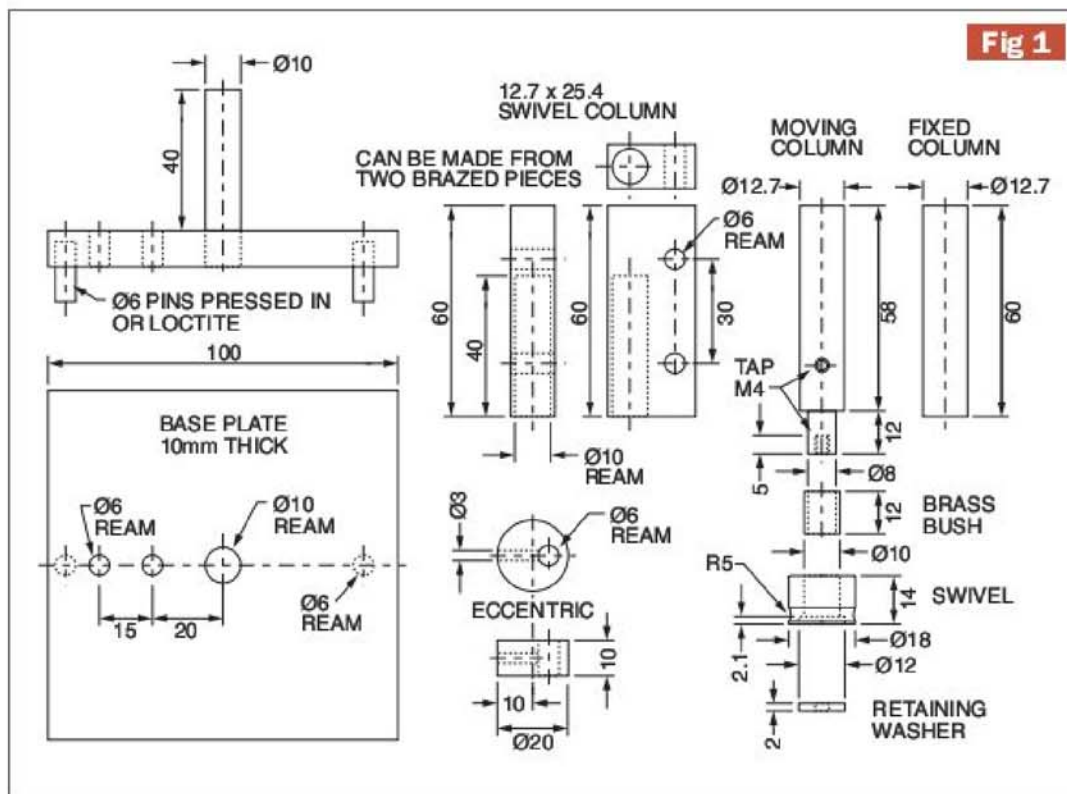


Fig 1