

# SMALL WOODEN PATTERNS FOR MODEL ENGINEERING

by Syd Pipe (Australia)

## Part IV

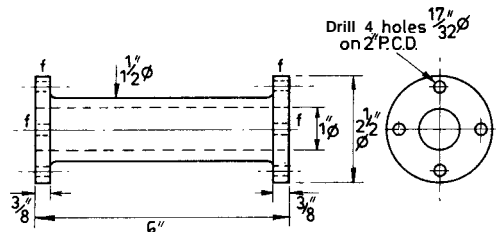
### Split Patterns

Thus far the examples of patterns have been ones which were cast in the drag only, with the sprue and risers in the cope. Many castings have part cast in the drag and part in the cope. Use is also made of intermediate boxes for deep castings and special boxes are made if warranted. Patterns for castings with portions in both cope and drag are often made in one piece. When this is done a section through the pattern must be selected from which draft is obtained to permit withdrawal from the mould (or other complications can be applied). The outer edge of the selected section is known as the parting line and will correspond with the mating surfaces of drag and cope. This parting line may follow the contour of the pattern and the area it encloses may not have a plane surface. This parting line will have to be found by the moulder and the half mould surface worked back to the moulding box. Moulding thus is time consuming and adds to the price of the casting. However, sometimes it is unavoidable.

When the parting line encloses a plane surface, or the surface is not too convoluted, the pattern can be made in sections, with the joint surface a datum face for each. This type of construction simplifies the moulder's job and quite often makes the pattern easier to construct, the simplest being when the mating surfaces are plane. A cylinder is a good example of how the moulder's job can be eased. If cast horizontally it obviously has natural draft on either side of a diameter. To cast it from a solid pattern the moulder would have to find the parting line. He has several options. One is to bury the pattern completely in the inverted drag box, ram up, turn over the box, then cut away the sand from the edge of the box to the parting line, place the cope in position and complete the mould. Or he could take the cope box and make an "oddside" by ramming up sand until the box was nearly full, scraping out a bed for the pattern to the depth he judges the parting line to be, filling the box, screeding off, and if necessary cutting back to the parting line. He then fits the drag

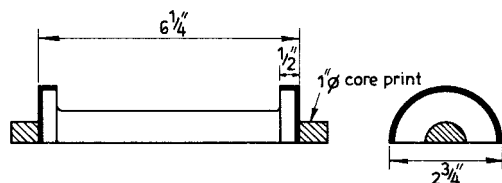
box and rams it up, separates the boxes, inverts the drag, knocks the sand out of the cope box (the sand surface adjacent to the pattern is probably not perfect), replaces the cope box and completes the mould. Takes time. If the pattern was split for its length along a diameter, one half could be placed on a bench top or "turnover board", the drag box inverted over it and rammed up. The drag is then turned over, the other half of the pattern positioned, the cope placed and the mould completed.

Fig. 5 shows typical split pattern equipment for producing a casting for a short length of pipe. The figures 6 to 9 show how the pattern could be constructed. The core box will be treated separately later, as in this case a standard foundry core could be



TRANSFER PIPE  
matl. cast iron

Fig. 6



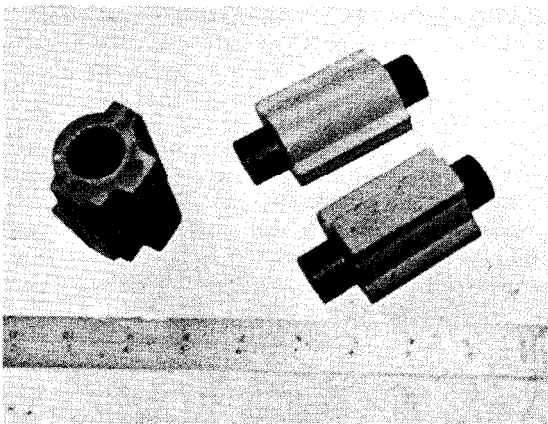
Pattern makers layout for each half pattern.  
Machining allowance shown full black.  
Core prints hatched

Fig. 7



used. These are stocked in lengths at most foundries in a range at 1/8 in. increments.

To make up the pattern select two pieces of wood 10-1/2in. by 1-3/4 in. by 7/8 in. and four pieces 3 in. by 1-1/2 in. by 3/4 in. Draw a layout as shown in Fig. 7 to full size with machining allowance of 1/8 in. as shown in solid black and with core prints 1 in. long at each end. Dress the large pieces of timber on both faces and one edge. On one piece mark the centre lines along and across it, then mark the finished length (including the core prints). See Fig. 8(A). To enable



Split pattern and casting for eccentric straps.

the two halves to be correctly located dowels should be used. For long casting runs these would be metal dowels and dowel plates, but for a few off they can be of hardwood made and fitted as per sketch. In order that the pieces of any split pattern are not mismatched when being moulded, it is good practice to offset the dowels from one or both centrelines to ensure a gross mismatch if not correctly mated. To fit the dowels, hammer brads into one piece of wood for about 1/4 in. as close to the ends of the pattern as

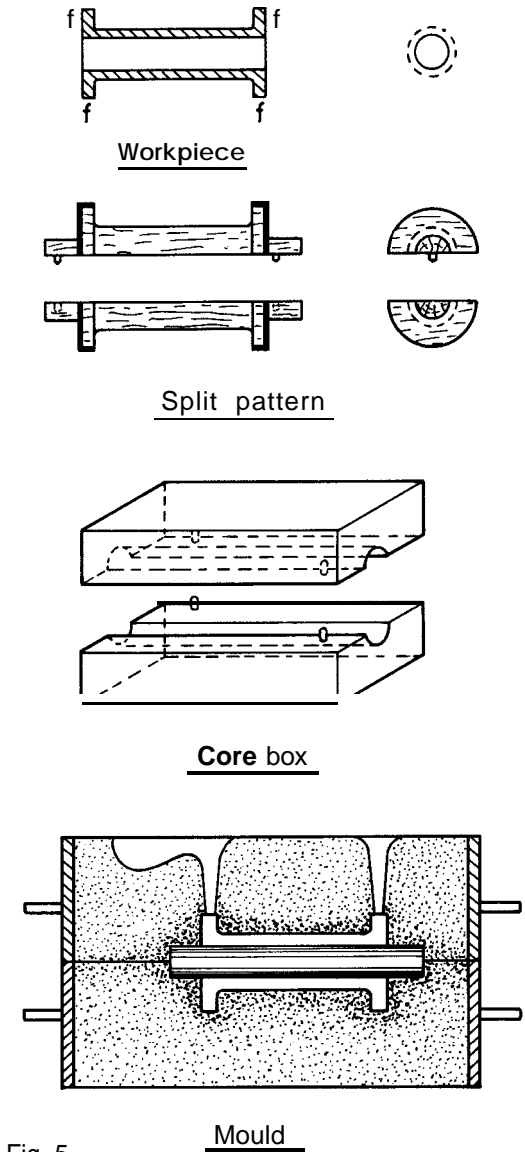
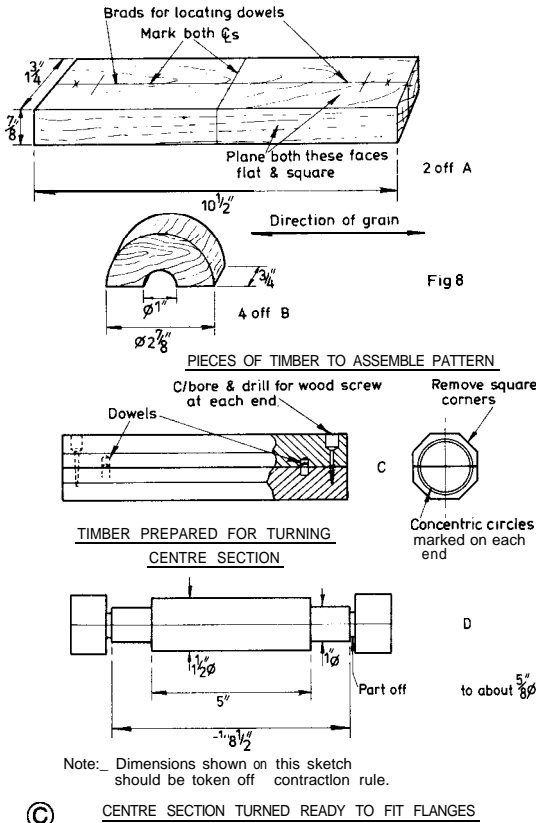
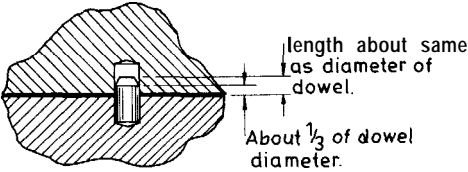


Fig. 5  
PATTERN EQUIPMENT AND MOULD FOR  
PIPE SECTION  
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practicable. Nip the heads off the brads, leaving about 1/16 in. protruding. The second piece of wood is now matched with the first by placing the planed faces opposite each other with the planed edges and an end of each coincident, and pressing the brad ends into the second piece of wood. Remove the brads and using the brad holes as centres drill for the dowels, using a dowelling bit.

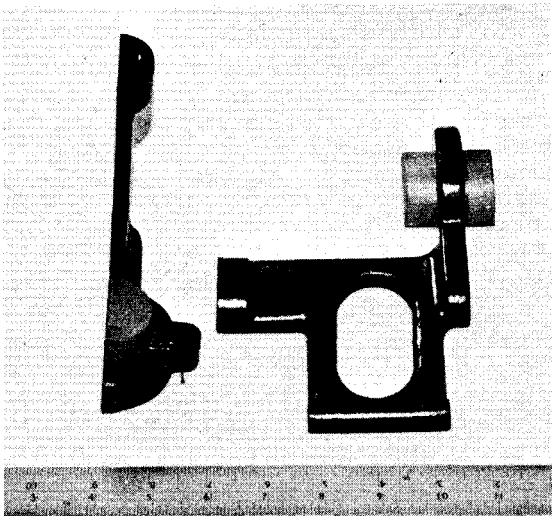
In the waste at each end of one piece drill and counter bore for the woodscrews as shown. In soft woods such as jelutong or sugar pine do not drill a



**RECOMMENDED DIMENSIONS FOR  
WOODEN DOWELS**

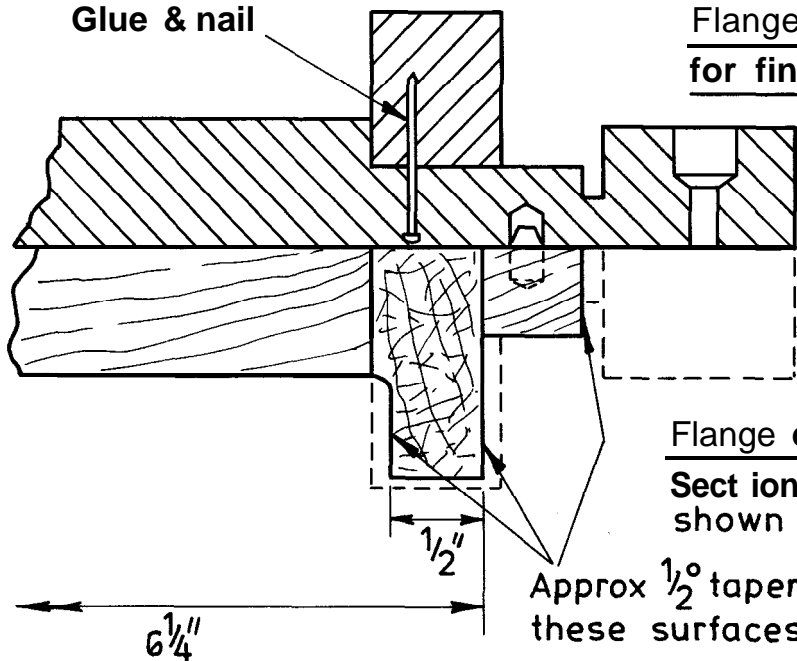
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pilot hole in the second piece, screw directly into the wood for maximum holding. Sand the ends reasonably square and flat, then mark the centrelines across each end. From the point where the centreline crosses the joint line scribe a couple of concentric circles at each end. As a precaution against splitting during turning dress off the corner as shown.



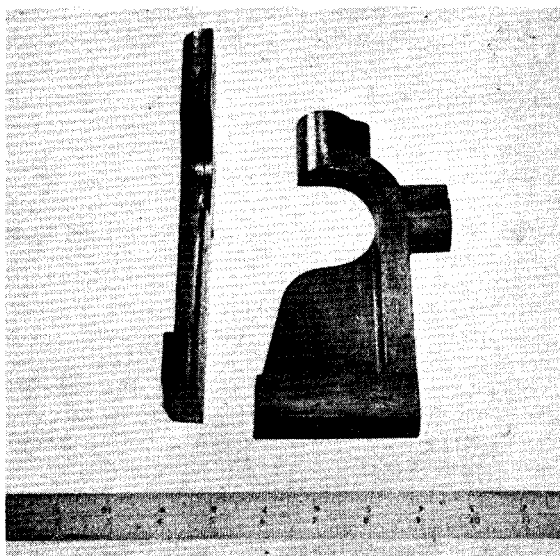
**Split pattern for a pantograph arm.**

Open the centres with a bradawl or similar and carefully centre the piece in the lathe. Take a cut to run out at each end. If the circumference thus cut is not concentric with the circles previously scribed bump the end over and repeat the cut until concentricity is achieved. This ensures that the joint will be on the diameter.



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**Fig. 9**



**Split pattern for a Travelling Steady rest; note "fillets" in corners.**

Turn the workpiece to a rough cylinder larger than the finished diameter. If the reader is unfamiliar with wood turning techniques, it is suggested he obtain a reference book on the subject. With the workpiece spinning, make a pencil mark at the centre of its length. It is not important that this coincide with the previous centreline. That one has served its purpose. On either side of this line at 2-1/2 in. make two more marks, another two at 4-1/4 inches. Set a pair of outside calipers to 1 in. dia. and with the edge of the parting tool at the 2-1/2 in. line cut squarely into the piece to 1 in. diameter. With a little practice this can be done quickly by holding the calipers in one hand against the workpiece and using the parting tool with the other hand. The calipers will slip over the work when the desired diameter is almost reached, leaving just a little material for later sanding. Repeat this cut at about 1/2 in. intervals toward the 4-1/4 in. marks. Outside the 4-1/4 in. marks part down squarely to about 5/8 in. diameter. Do the same at the other end.

Reset the calipers to 1-1/2 in. dia. contraction and make a series of cuts about 1/2 in. apart across the 5 in. central section. With the flat scraper held parallel to the axis of the work carefully cut down to the bottoms of the grooves in each section. After a little practice, truly cylindrical sections can be turned by this method, with only light sanding to bring the piece to size and finish. Until this proficiency is reached leave a witness before the bottom of the grooves are reached, then with sandpaper wrapped longways on a piece of flat timber as wide as practicable sand back to the bottom of the grooves.

Prepare the two sets of flanges by dressing the mating faces square in the direction of the grain. Clamp these faces together, mark a centreline and the outside diameter. Drill a 1 in. dia. hole on the junction of the centreline and the joint. Separate and cut around the circumference. A Forstner bit is ideal for drilling the 1 in. hole. Drill through until the bit point just breaks through the lower surface. Reverse the work piece and complete the drilling. This ensures a clean edge at each surface. If you are using flat power bits, clamp the workpiece firmly with a piece of waste wood beneath it and drill through into the waste. Should your drill not cut to size it would be best to prepare the flanges first and step the diameter of the centre section to fit. Glue and nail the flange pieces to the centre sections. Turn up as shown in Fig. 9 and sand smooth. The ends of the core prints can be turned at a slight taper for draft on their ends, or by sawing off and dressing back at an angle on the sander.

Apply three coats of shellac, sanding between coats for a smooth finish. I find it convenient to remove the dowels before painting, then easing out the holes to size before replacing the dowels when the shellac has completely dried. The dowels are not painted. The pattern halves should fit so that there is no appreciable play when mated, but must separate freely when the mould is split, one half in the cope, the other remaining in the drag.

The reader will probably not wish to make up this pattern for the practice, but the techniques are applicable to many small split patterns of similar construction.

*Continued*

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