SMALL WOODEN PATTERNS FOR MODEL ENGINEERING

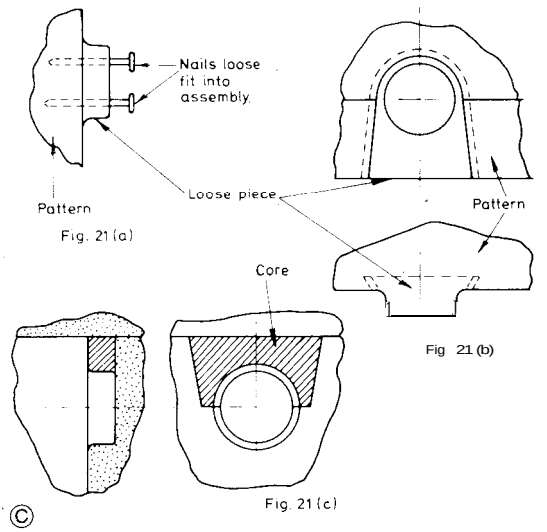
by Syd Pipe (Australia)

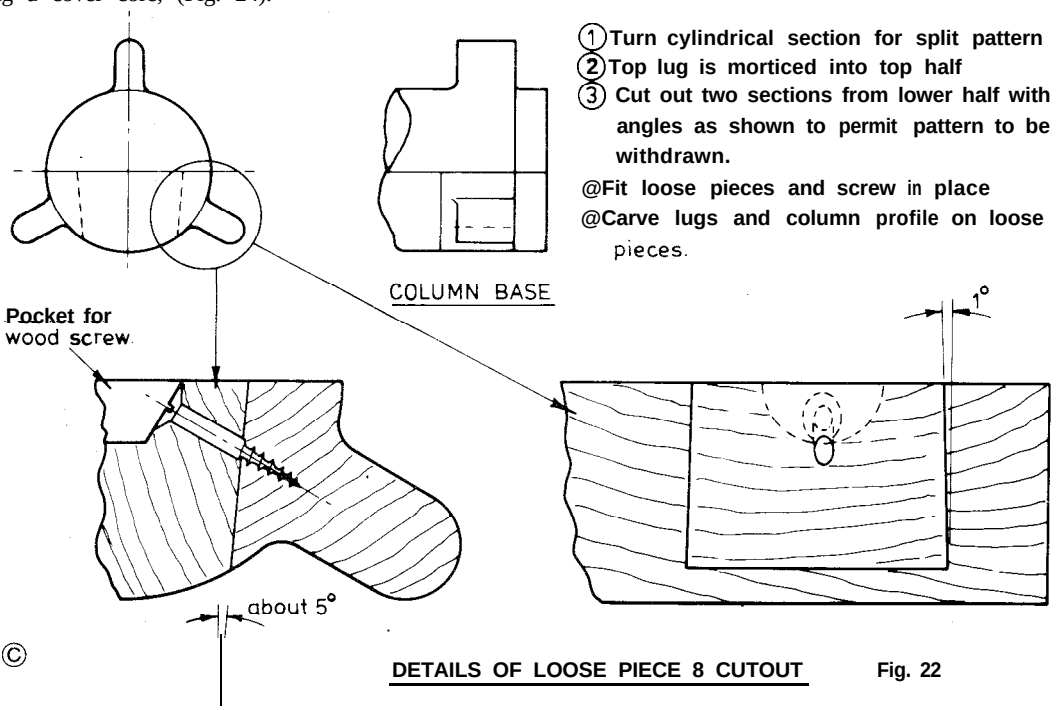
Part VI (Conclusion) *From page 523*

Loose Pieces and Follow Boards

Many castings incorporated bosses, flanges or other features in their design which necessitate special pattern construction to facilitate moulding. A common method of dealing with these features is by the use of "loose pieces". These are pieces, which are left in the mould after the main part of the pattern is withdrawn. They can then be withdrawn into the mould cavity and removed. Figure 21 (a) shows how a simple loose piece for a boss can be held with a couple of nails until sufficient sand is rammed up to hold it securely, when the nails arc removed and the ramming completed. In better class construction the piece would be dovetailed in such a way that they remain in the mould when the main section is withdrawn then subsequently removed. The alternativc to the loose piece for the particular application illustrated could be to run the boss out to the joint of the mould and provide a core. See Fig,. 21 (a, b & c). Figure 22 shows a method of moulding lugs to the base of a column cast horizontally. Figure 23 shows how the use of a loose core print can simplify mouldings. A flange which cannot bc positioned on the parting line can be moulded by making it loose and using a cover core, (Fig. 24).

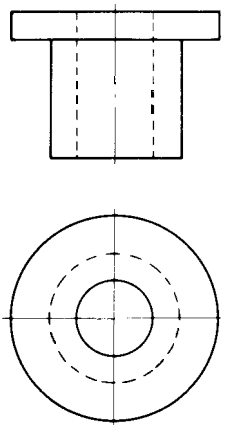
Follow boards are used to simplify the moulding of patterns which have irregular parting. lines. or which have protrusions which prevent it lying flat on the bench or turnover board, or cannot be constructed split. The latter is often the case in model making, when small patterns are the norm, and they have considerable detail worked into them. in which case the moulder has difficulty cutting down to the parting line. In commercial practice the follow board would usually cover the full area of the moulding box opening. For small patterns, follow boards can made to allow the pattern to be moulded into the drag and removed before the cope is placed. Examples are given in Fig. 25 (a. b & c).





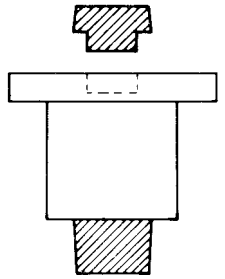
(1) Turn cylindrical section for split pattern
(2) Top lug is morticed into top half
(3) Cut out two sections from lower half with angles as shown to permit pattern to be withdrawn.
@Fit loose pieces and screw in place
@Carve lugs and column profile on loose pieces.

DETAILS OF LOOSE PIECE 8 CUTOUT **Fig. 22**



CASTING

Fig. 23



Loose top print allows casting to be moulded in the drag.

PATTERN

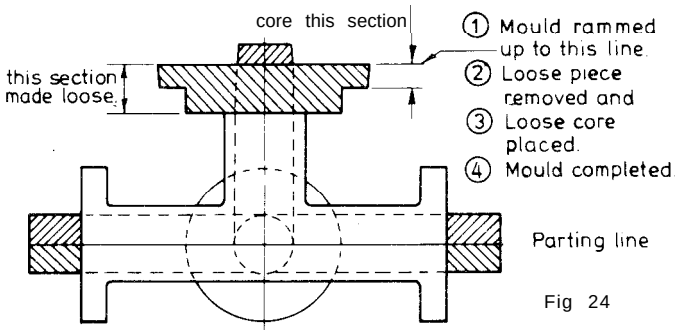


Fig 24

Note: The mould would probably be Inverted from the positions shown putting the loose core in the drag.

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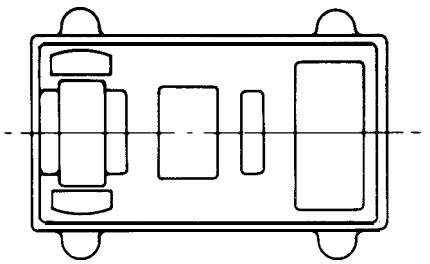
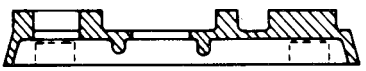
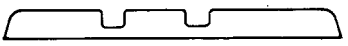


PLAN



SECTIONAL ELEVATION



FOLLOW BOARD

Fig. 25(a)

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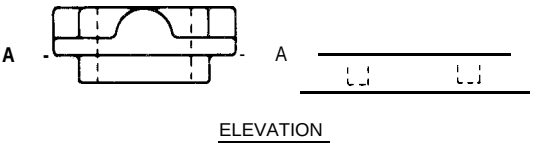
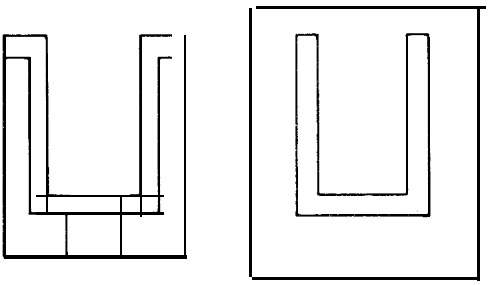
PATTERN FOR SMALL ENGINE BED

The follow board is mode to fit loosely into the hollow of the bed. The bed can be moulded in the inverted drag box. Turned over, the follow board removed. The cope placed and the mould completed.



ELEVATION

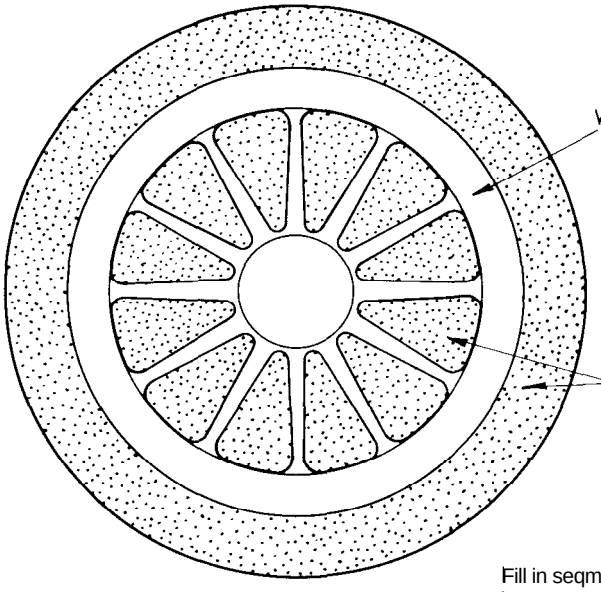


PLAN

Fig 25(b)

HORNBLOCK FOLLOW BOARD

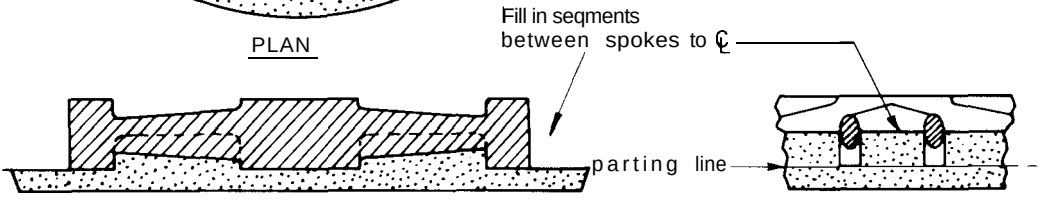
The pattern is too small to split conveniently if made with draft on either side of line 'A-'A' and the follow board used. The pattern can be cast in the drag, with the parting line following the contour left by the following board.



FOLLOW BOARD FOR SMALL WHEEL PATTERN

Fig 25(c)

PLAN



SECTIONAL ELEVATION

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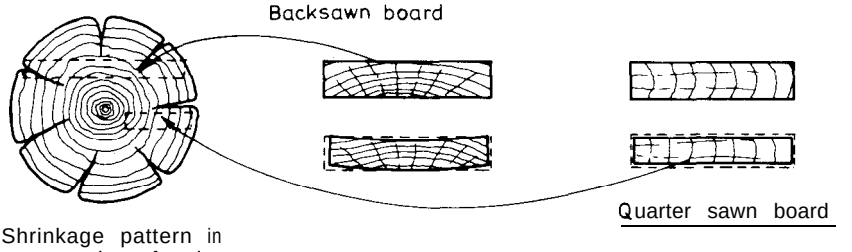
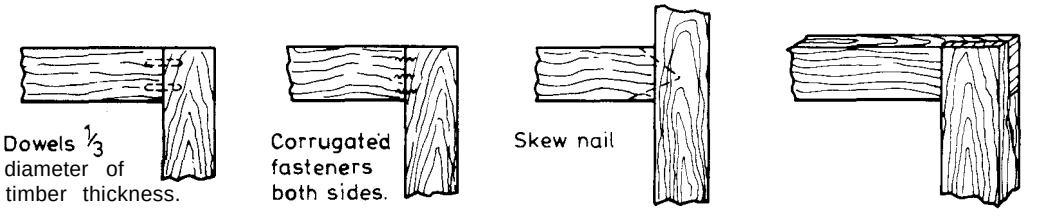


Fig. 26

Shrinkage pattern in cross section of a log. Growth rings tend to shorten

Back sawn boards tend to cup away from heart
Quarter sawn boards hold their shape better during shrinkage.



Butt joints — Not very strong — Halfed joint

Joint faces should be square and flat before gluing.

Fig. 27

Strong pieces can be nailed, screwed or dowelled for extra strength.

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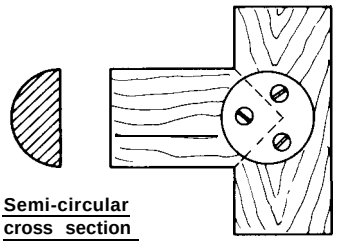
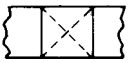


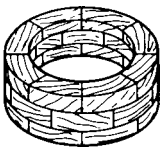
Semi-circular cross section



To mark cutting lines on semi-circular section lay off a square on the flat face and carry the marks at each corner to the edge of the curved surfaces. Take a piece of shim or stiff paper and lay an edge of it across the curved surface from one corner diagonally to the other. Mark along the edge. Repeat for the other diagonal. Cut, fit and glue up With a forstner bit or flat ended bit, bore a hole across the joint deep enough for a suitable piece of plywood. Fit the ply-glue and screw into place.

Tee joint in semi-circular section e.g. pump body half pattern

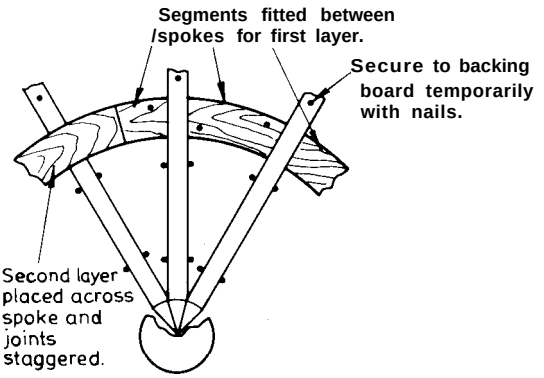
Fig. 28



To minimize waste, cut laminations from stock as shown. Stagger Joints for greatest strength. Allow sufficient material for clean up after glueing.

Hollow cylinders

Fig. 29



Spoked wheels Fig. 30

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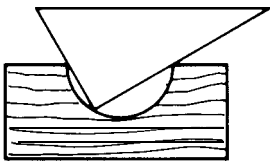
Timber and Joints in Patternmaking

The joints used by the joiner and the cabinet-maker are also used by the patternmaker. He does not, however have to pay as much attention to the aesthetics of his finished work as either of the former, his main concern being to make the joint as strong as practicable to withstand the rigours of foundry use. The model maker has the added problem that the work is in miniature, and the joint area

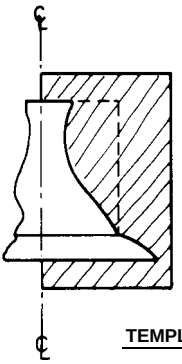
Checking semicircular groove with a setsquare. Hold the square at right angle to job surface & to axis of groove



The groove is semi-circular when the **sides of the square touch the edges of the groove and the point touches the curved surface in all positions as it is rotated.**

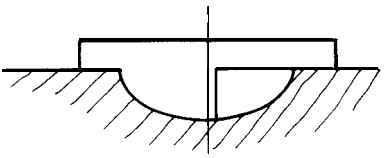
SEMI-CIRCULAR GROOVES SET SQUARE AS TEMPLATE

Fig. 31



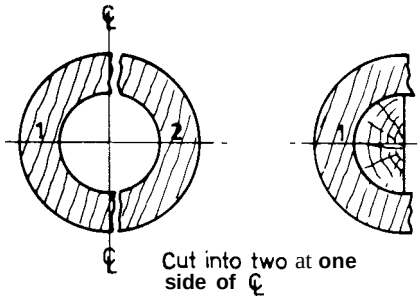
One or more templates may be required for turning or carving complicated shapes. Two would be sufficient for the surface shown One full, the **other with the centre cut out where dotted. Both would be worked from the ℄ and from the ends.**

TEMPLATES FOR CURVED SURFACES



Need not be full cross section Carry curve past ℄ and, mark at other edge Use top surface as datum face.

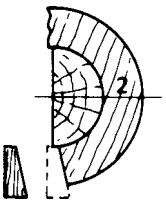
TEMPLATE FOR SEMI ELLIPTICAL GROOVE



Cut into two at one side of ℄

Turn up flange in one piece

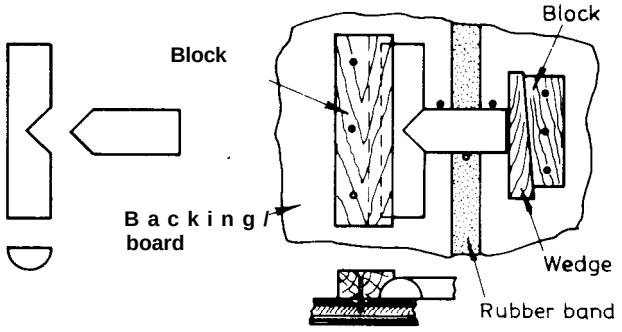
Fix to body of pattern and dress back flush.



Fix to body of pattern make up filler piece dress back.

Fig. 32

FLANGE FOR SPLIT PATTERN



To clamp awkward pieces this type of setup can be useful.
If complex, draw the outline in plan on a suitable board. Overlay it with a sheet of clear plastic film Nail clamping block down firmly. Drive in guide nails if necessary.
Should the pieces tend to lift secure with a strong rubber band,

GLUING UP

Fig. 33

consequently reduced. This has several effects, the smaller the joint the less able one is to use conventional methods, and the more difficult it becomes to manipulate the pieces to obtain accuracy.

Another problem to all woodworkers is the behaviour of timber itself. This of course varies from species to species of wood, and timber must be selected with characteristics which are conducive to achieving the desired end result. Those timbers listed earlier in this series have been recommended for patternmaking. This does not mean that other timbers and timber products should be passed over. In addition many of the behavioural problems which concern the worker with large pieces of timber become insignificant in small sizes, though even in small sizes any timber used should be well seasoned. The manner in which the log is sawn will determine the shrinkage in each board. The following sketches show this effect. Quarter sawn boards retain their shape best and should be selected when buying timber. Chipboard can be used successfully for patterns where one or two castings are required and finish is not important. Because the chips lie at random in the board the whole piece remains fairly stable under normal atmospheric conditions. Interior grades take up moisture readily, lose their size and shape as the glue degrades. If used, several extra coats of shellac are required or they can be given several coats of polyester or polyurethane paints. Thin sections of a pattern can be built up on plywood. Interior grade can be used but the edges need extra moisture protection to prevent delamination. For long runs or if the pattern is to be stored for long periods between use, it is desirable to use marine grades. End grain does not glue well and should be avoided when practicable. When impractical the joint should be strengthened using nails, dowels or other means. Screws do not hold well in end grain, nails are as effective especially if they can be driven at an angle.

To strengthen patterns for hollow work the construction can be laminated in segments, Fig. Spoked Wheels can be fitted and glued up, the rim laminated and the hub built up, Fig. 30. The job can be assembled on a flat board if a plastic film is laid between the board and the work to provide a barrier to prevent the glue adhering. A plastic film can be placed between the sections of a split pattern for the same purpose when pieces are to be matched and glued up.

Templates are often necessary for checking when turning or carving intricate sections. These can be made from plywood. hardboard, metal or cardboard. See Fig. 3 1.

Pieces like flanges for split patterns can conveniently be turned in one piece, sawn to one side of the centre line, the large piece fitted and dressed back to the split surface. This smaller piece fitted and a filler piece glued in and dressed to shape, Fig. 32.