

DIAGRAM SEQUENCE SHOWING TYPICAL ART FOUNDRY SAND MOULDING PROCEDURE

NOTE: The diagrams on the following pages are designed to offer a general overview of sand moulding procedures, selected details have been simplified or omitted to aid clarity.

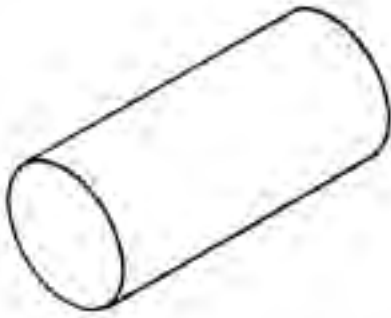


Fig 1

The artist supplies a substantial pattern. This example shows the design in the form of a simple cylindrical solid. The following steps describe the production of a hollow metal cast based on this pattern.

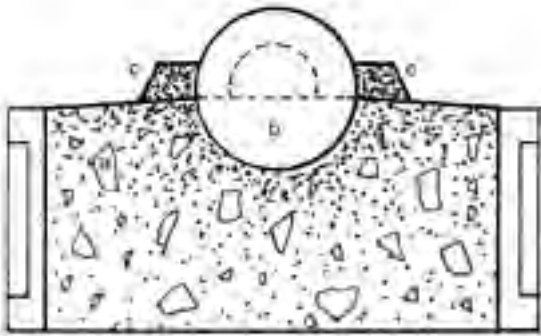


Fig 2
End View

The sand moulder part fills a flask with lumps of previously spent sand (a). A layer of freshly milled sand is layered over this 'packing' and the pattern (b) is nested in. Sand is then smoothed off to the pattern parting line, vented and 'gassed off'. Any sand pieces are moulded with an all round taper (draw) and set hard (c), these accommodate any undercut, overhang or otherwise awkward feature on the pattern's surface.

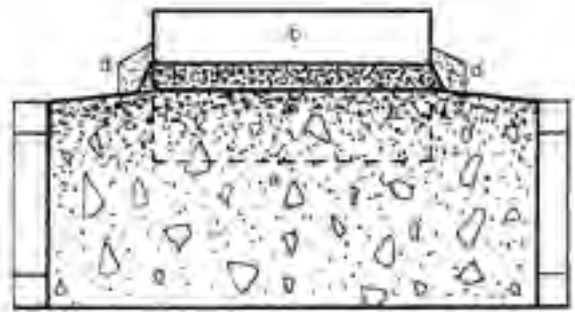


Fig 3
Transverse View

Temporary sand pieces are moulded at the ends of the pattern (d). These will eventually form a journal in the mould to support a core (NB. Steel bars set into the later introduced core may be used as an alternative or additional support). Once all pieces have been moulded the pattern and exposed sand are dusted with a fine parting powder. The moulder may also cut thin shim 'separators' out of grease proof paper to fit over the sand pieces and parting line (but not the pattern). The parting powder and paper shim prevent the upper parts of the sand mould from adhering to the lower.

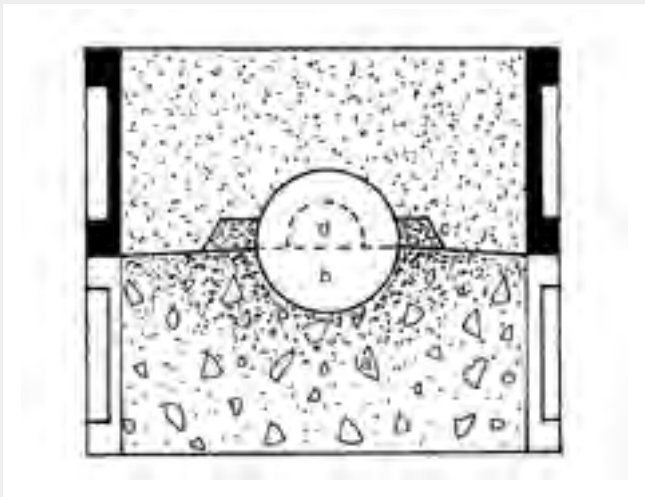


Fig 4
End View

A second flask is located and secured over the partially moulded pattern, then filled with freshly milled and compacted sand before being set hard. The mould is effectively inverted, so this upper flask will eventually become the lower 'drag' (dark border).

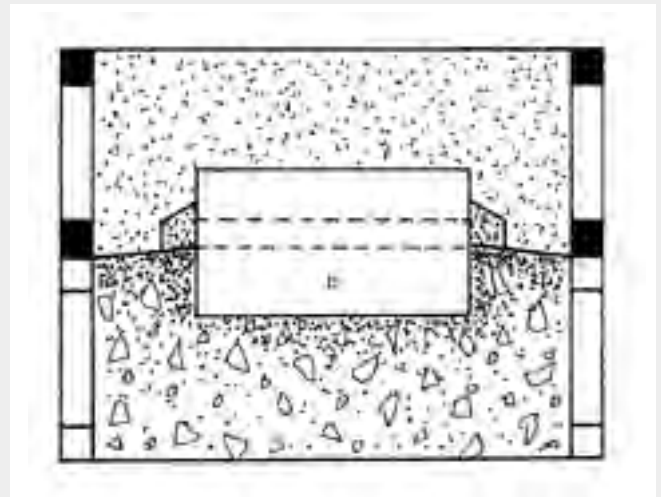


Fig 5
Transverse View

(The location of the 'loose' moulded pieces is represented here by dotted line)

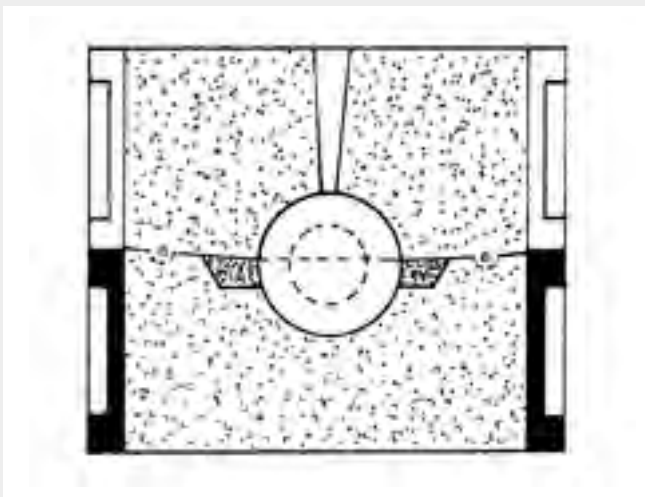


Fig 6
End View

The mould is inverted 'right way up', and the first flask containing spent sand is removed and discarded. If location pins have not be already set into the drag, some form of registration is cut into the upper surface of the parting line (e). This can be done by milling a groove or depression into hardened sand with a rotary tool.

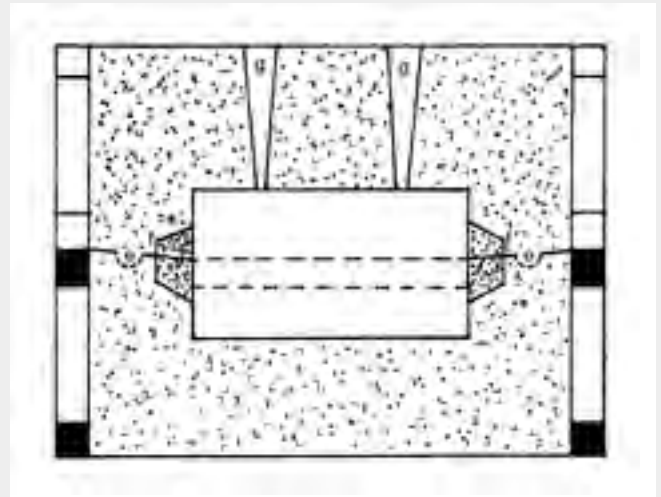


Fig 7
Transverse View

The upper pieces of the journal extension are piece moulded (f), and tapered formers are located on the pattern to provide a simple runner/riser system (g). The upper flask (cope), is relocated and filled with fresh sand (after dusting the pattern with parting powder).

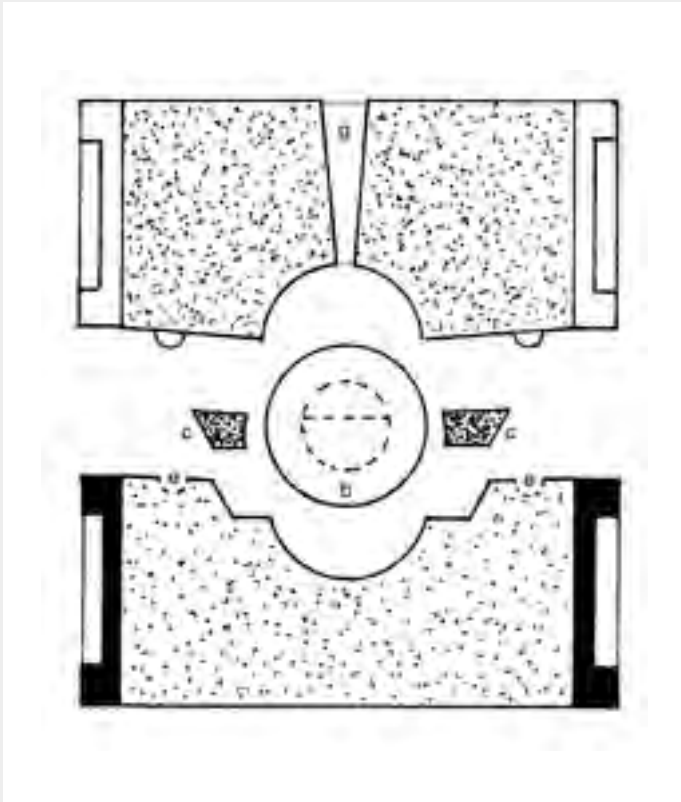


Fig 8
End View

Once sand has hardened, the cope is lifted off the drag (NB. in some instances it may be easier to first invert a secured cope and drag before stripping out the contents). The inlet formers are removed from the cope and the upper sand pieces (f) used for forming the journal extension are discarded. If there are a large number of sand pieces in the mould, these may be registered by cutting a mark into the sand piece and outer mould before removal.

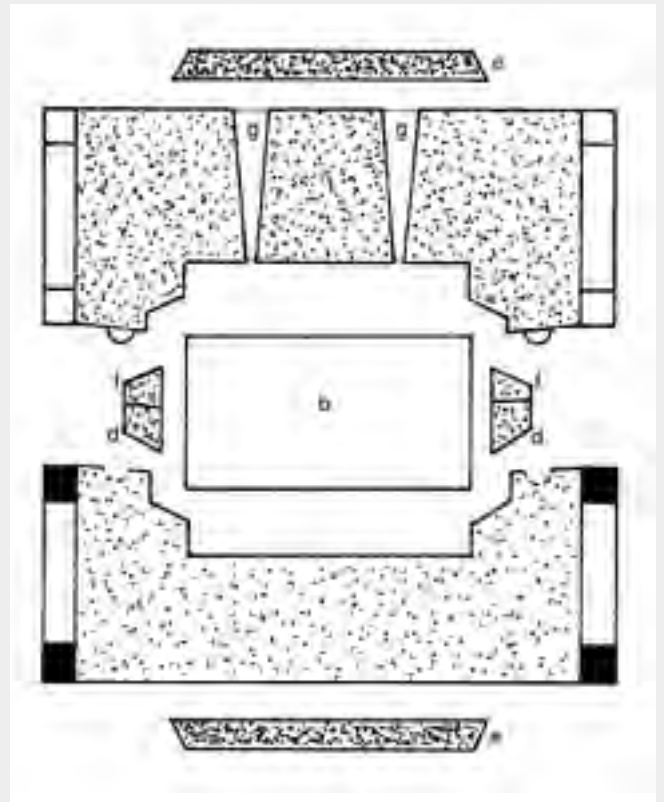


Fig 9
Transverse View

The master pattern (b) and sand pieces (e) are carefully stripped from the drag. This is aided by the gentle tapping of the flask with a mallet, the moulder may also use tools designed to locate into the pattern or sand piece and lever it out. The lower journal extensions (d) are discarded, as is any paper shim and the mould and sand pieces dusted off carefully with compressed air and cleaned.

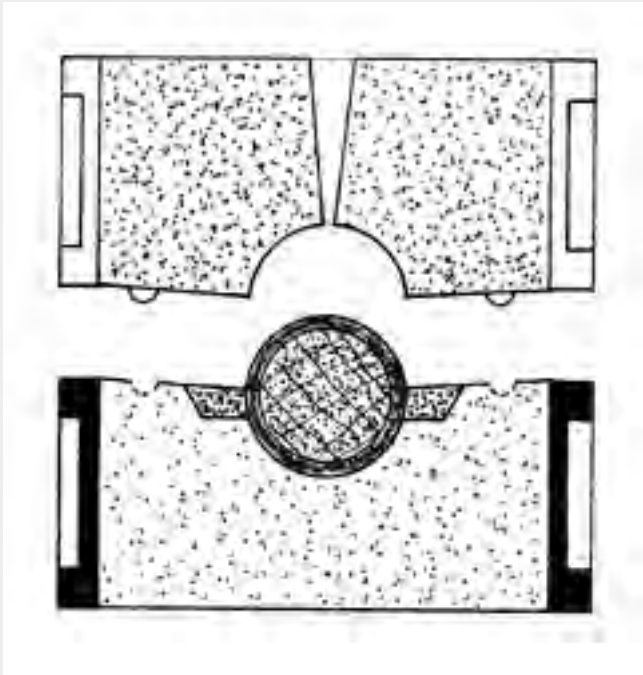


Fig 10
End View

The loose sand pieces are carefully relocated in the drag, and a layer of flexible foam at least 5mm thick is laid in the lower mould cavity (but not the core print) left by the removed pattern. Core sand and breakdown powder are mixed and compacted into the drag's cavity (including the print). This can be repeated for the cavity in the cope, and the two core halves set hard and glued together. If preferred, sand is built up in the drag to approximate the depression in the cope; the sand mass is dusted with an indicator (parting) powder, and the drag repeatedly lowered by crane until an accurate impression of the core is formed. The moulder then pares a thickness of sand off the upper part of the core, to match that of the lower (lined) section (leaving any core print journal uncut).

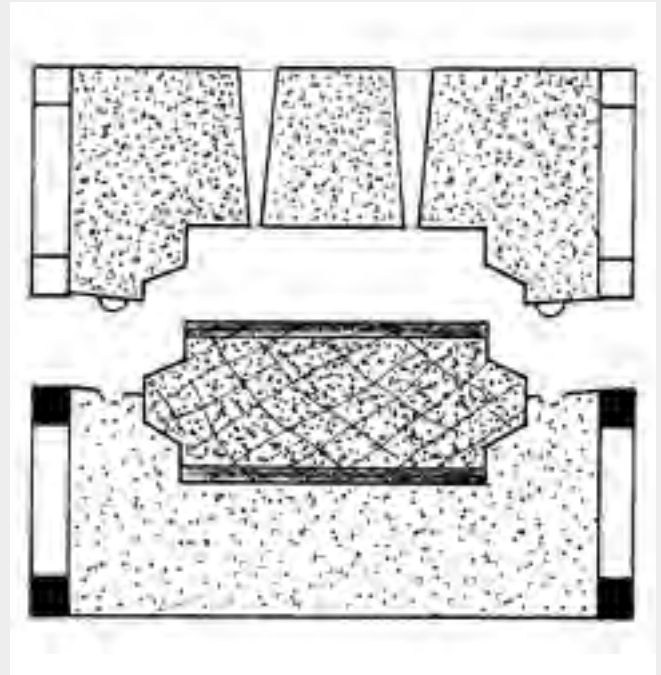


Fig 11
Transverse View

In addition to the journal or 'core print', large cores are often supported by steel bar armatures. These bars may be extended into the outer sand mould, or have lifting hooks inserted through the core for handling. A flexible nylon core vent may also be incorporated and run to an out-let in the flask. One set hard, the core is removed from the flask and cleaned (along with the mould cavity) to remove any loose debris, the foam thickness is now discarded. The mould cavity (including the faces of moulded) pieces, core and runner/riser inlets are treated liberally with a dressing to prevent sand burn. Proprietary dressings are best, though a simple version can be made by mixing (methylated) spirit and carbon black together. Once impregnated into the sand, the spirit is set alight with a naked flame and burnt off to leave a protective deposit.

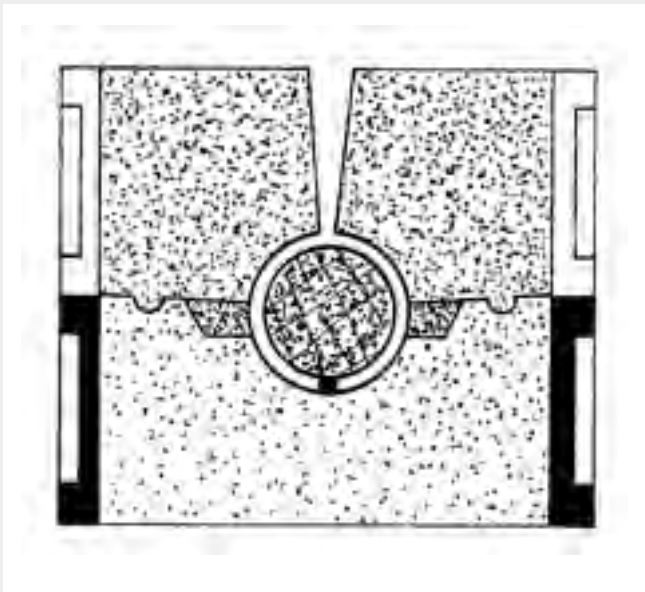


Fig 12
End View

Before the core is replaced, chaplets (small metal plates of the same alloy as the cast material) may be strategically placed in the mould cavity. These help reduce any relative movement between the core and the surrounding mould.

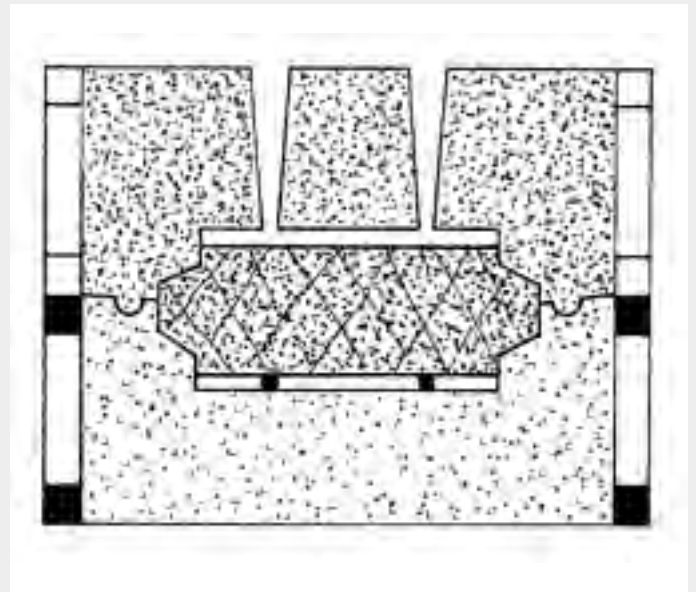
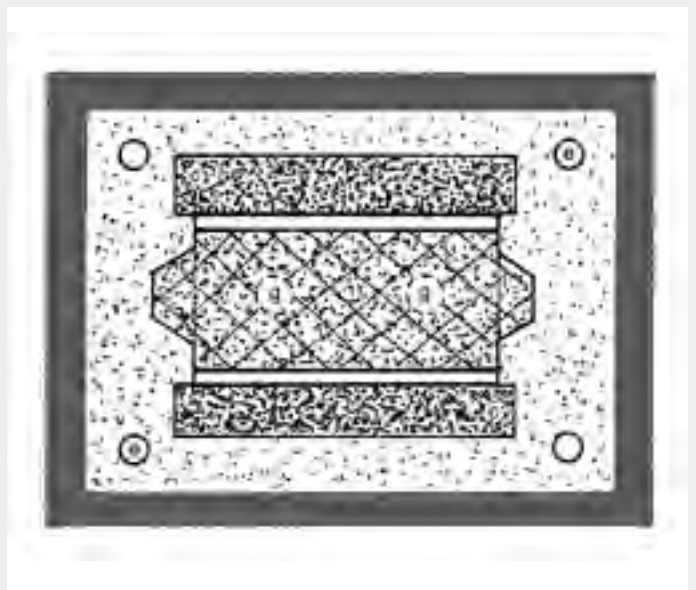


Fig 13
Transverse View

The core is replaced in its journal print and the cope is brought down to locate on the drag. If desirable, a glue can be spread over the parting line to help secure the mould (glue may also be used earlier to secure loose sand pieces into the parent mould).

Fig 14
Plan View

Showing location of runner and riser (g), registration depressions/pegs (e), sand pieces (c), cavity, core & core journals.



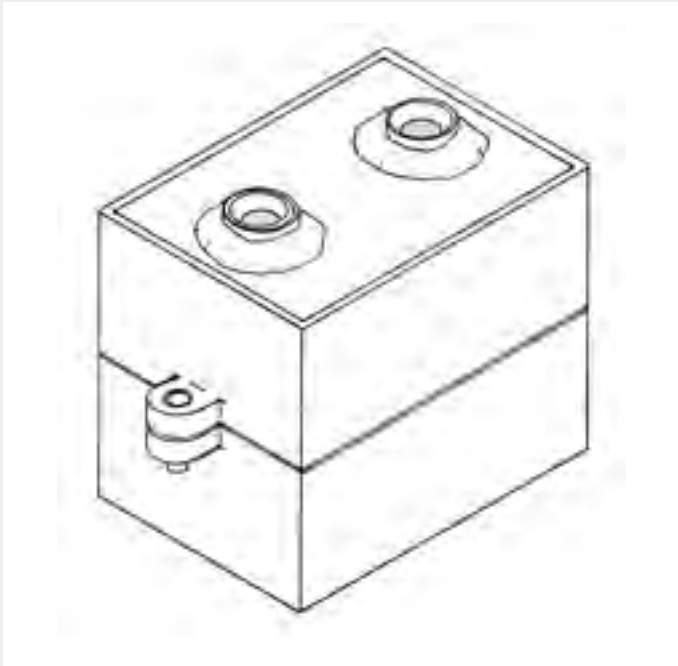


Fig 15

Closed box prepared for pouring. The cope is secured to the drag, and provision is made for a pouring cup and riser. The founder will often place weights (such as spare ingots), on top of the mould. Weighting help prevents the mould from lifting under the pressure of entering metal.

Fig 16

The form of the completed cast. The running system is removed, together with the core material and any surface flashing caused by metal penetrating into the piece parts. The founder has created a hollow cast from a solid pattern form. Compare this method with the method typically used by the commercial founder to create the same cast form ([click below to view](#)).

