

NO SPECIAL CORES FOR THESE

MANY of the castings employed in model engineering can be cast from solid patterns, or with plain cores which do not involve the need for special coreboxes. But it does not follow that the extra work involved in the making of coreboxes should be avoided at all costs. If they help the moulder, or improve the fidelity or general quality of the casting, they may be considered well worth while.

Economy in metal is not usually of first importance in small castings, though waste of any kind is always bad. The cost of the castings depends more upon the time or difficulty involved in moulding than upon their weight, or the price of the metal.

Whereas in a large and heavy casting it is often desirable, or even

can be laid flat on a moulding board, and the box be placed over it, filled with sand, and rammed. After inversion, the other half of the pattern is then laid in place, and the top box is filled and rammed. In this way, major moulding operations are reduced from three to two.

Split patterns need to be fitted with pegs or dowels to set the two halves in correct alignment with each other. The dowels may be of wood or metal; they can be bought ready-made from dealers in foundry requisites. They should be fitted before the final-operations on the pattern, in case the holes to take them may not line up perfectly. It is usual for them to be positioned unsymmetrically, so that the halves of the pattern are not fitted the wrong way round in relation to each other.

To produce round patterns, in which the main shaping is by turning, pieces should be trued up to form the two halves, and temporarily fix them together during the operations. You can do this by using small screws with the heads sunk well below the subsequently finished surface: the holes can afterwards be enlarged to take the dowels.

Professional patternmakers often prefer to glue the halves together with a thin sheet of paper between; while they are held firmly enough for tooling, they can be easily separated by the insertion of a sharp chisel at the joint line. In either instances the workpiece must be exactly centred in the lathe chuck or between centres for the turning operation.

When the dowels are fitted, they should be easy enough for the halves to be separated without trouble, but not so easy as to allow of any appreciable displacement. It is generally possible to lift split patterns from the mould by the projecting dowels in one half, or the holes in the other, but sometimes we need a special means of lifting them without affecting the impression in the mould. The moulder using solid patterns often has to drive a spike into them: this method, especially if it is repeated a few times, may mar the surface of the casting or damage the pattern itself.

Another way to reduce the work of the moulder is to join two or more patterns together; to connect them so that they can be cast from a single pouring gate or runner. Small patterns are obviously difficult to mould singly, and it is usually convenient for a number of them to be put in one moulding flask. When they are joined up in a group or "spray," the manipulation is easier and takes less time than individual patterns. Sometimes the complete set of castings for a model can be grouped. To produce castings for a twin engine, having right and left-handed components, the patterns may be "siamesed" so as to make opposed pairs of parts.

Multiple castings which are made in this way and have to be sawn apart afterwards should have the dividing line well defined, by a notch or V-groove, so that you are unlikely to make mistakes in parting them.

Castings may be marred by the well-intentioned but misguided attempts of the moulders to cut away runners and so forth. To be on the safe side, tell them that no fettling is required.

I will give some examples of patterns suitable to be made in solid form or split on the centre line. They do not represent actual examples, and are not necessarily drawn to scale; they are intended only to show general principles of pattern design.

Fig. 6 represents a bearing bracket or endplate such as may be used for an electric motor or dynamo. If the rectangular recess and the bore of the bearing housing are well tapered, they can be cast without the need for coring. The pattern is laid flat on the moulding board, and the first half of the mould is made right away. As the ends of the recess are open, some trimming of the mould will be necessary when it is inverted. The sand is cut away at an angle so that the impression made in the second box will lift out without fouling.

Connecting rods for model engines can be made in the form of castings when the load which they will encounter can be kept within reasonable limits, though for really high performance you may have to

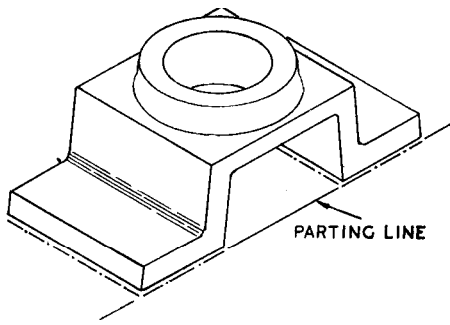
FOR THE SCHOOLS

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necessary, to complicate patterns and introduce several special cores to save metal, these measures are rarely helpful with small castings, and may make them more costly by increasing the work-of-the moulder.

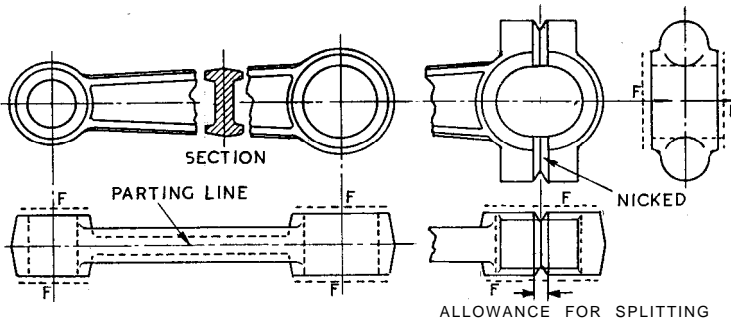
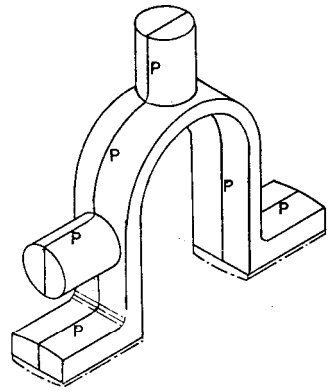
One of the simplest and most practical ways of saving time in moulding is to split the pattern at a well-defined parting line-as near the centre as possible. This method does away with the need of using a false or oddside box in the moulding operation.

With solid patterns, except when the parting line is on one flat face, or there is only shallow relief, a box is prepared by filling it with sand and then scooping out a cavity in which the pattern can be imbedded up to the parting line. After the top box has been placed in position and rammed up, the assembly is inverted and the false box is removed and emptied or discarded, before a proper mould is made for the second half. With split patterns, one half



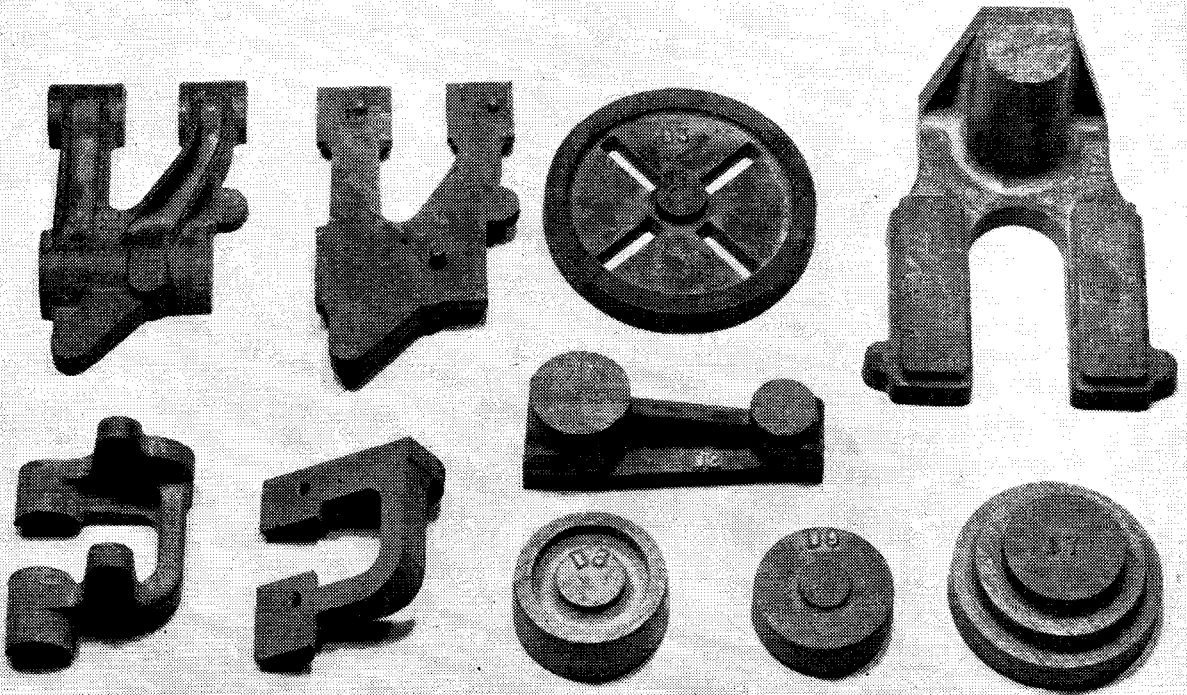
Right, Fig. 8: Pattern for governor bracket of a steam engine

Left, Fig. 6: Shallow-recessed pattern which is suitable for a bearing end-plate, as on an electric motor or a generator



Left: Connecting-rod pattern with solid and split big ends

Below: Set of patterns for ME drilling machine. Note both halves of the split spindle head and the countershaft bracket (Working Precision Models)



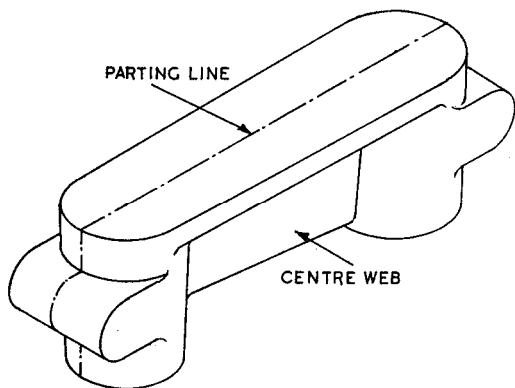


Fig. 9: Bracket pattern with clamp bosses

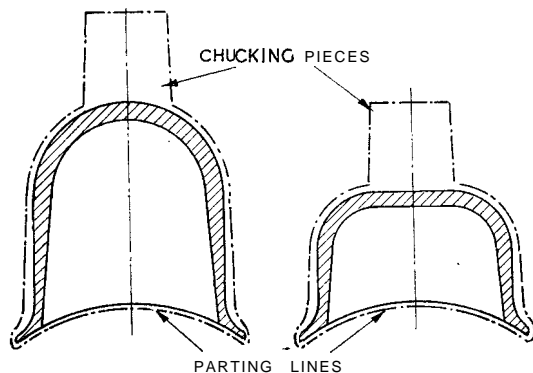


Fig. 10: Patterns for two dome covers

machine them from solid steel or high-tensile light alloy. The machining operations thus involved are often complicated (unless you can get drop forgings). Castings, when they can be used, allow the later work to be greatly simplified.

The pattern shown in Fig. 7, in two forms, with solid and split big end bearings, may well be split on the centre line, though it is somewhat fragile in small sizes and solid patterns are more usual. With accurately made patterns and careful moulding, the "ideal" shape, with barrel-shaped bosses and H-girder shank, can be produced more easily than by any other means which you are likely to have. The eyes may be left solid, though you will often find it better to reduce the section of the metal by making deep indentations on both sides of the pattern.

If the big end is to be split, allowance must be made for the metal to be removed in cutting, and the parting line should be indicated by a deep nick, as shown. In machining the casting, you should drill and tap the bolting holes before cutting off the caps and truing the joint faces,

so that the parts can be temporarily **fixed together** for boring and facing the eye.

The pattern in Fig. 8, for the governor bracket of a steam engine, incorporates bearings for a horizontal drive shaft and a bevel-gear vertical shaft. It may be made either solid or split. The parting line is at **P**, and a slight taper or rounding-off both ways from this line is provided for draught. Not uncommonly, castings of this kind have a centre web all round the bow, so as to produce a T-section, giving extra rigidity with relatively light construction. Machining allowance is commonly provided on the underside of the feet and the ends of the bosses.

The way in which moulding can be influenced by minor details in design is indicated by the bracket pattern in Fig. 9, in the form shown, the pattern is moulded half in each box, split on the parting line, and tapered away from this point on both sides. The clamping bosses at the ends prevent it from being moulded with the main boss ends down, unless the parting line is stepped, which is generally undesir-

able. But if the clamping bosses can be shifted upwards, so that their tops are level with the flat top surface, the pattern, in an inverted position, can be moulded from the moulding board, in one box only. The rounding-off of the top of the clamping bosses, if this is essential, will then need to be done after the casting has been made. Such alterations are not always practicable, but their possibilities should always be borne in mind.

On the whole, deeply recessed or hollow castings are best made with the aid of a corebox, but if the internal shape is simple, and the moulder is co-operative, the inside shape can sometimes be cast direct from a simple pattern. The two locomotive dome covers illustrated in Fig. 10 show what can be done; clearly, the deeper of the two is likely to be more difficult and the moulder may need to employ some means of reinforcing the internal impression and of providing it with adequate venting. As the castings are generally curved on the underside to fit the boiler barrel, the parting line must conform to this, and an oddside box will have to be made.

As the outside of the castings must usually be machined, a chucking piece may be provided, and held in the chuck for dealing with as much of the surface as is accessible. If possible, the mouth of the bore may be skimmed out true, so that after the chucking piece has been cut off it may be mounted on a spigot for the machining of the top surface. Machining castings of this sort is always a problem. We cannot carry the work to its logical conclusion as we are unable to machine the outward curve of the rim by plain ing and must usually file it.

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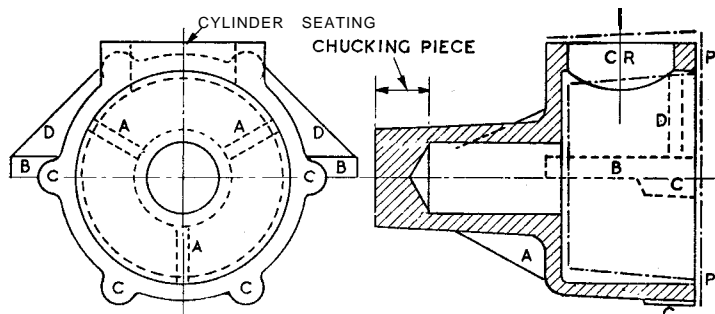


Fig. 11: Crankcase pattern for casting without separate core

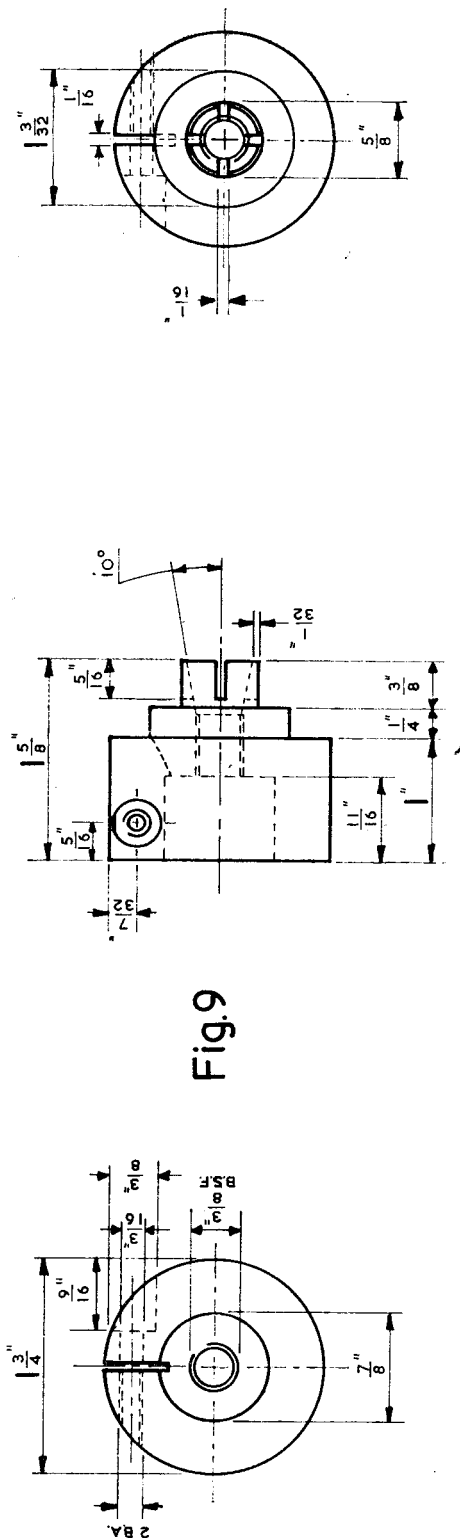


Fig. 9

Fig. 10

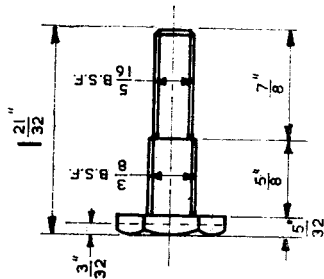
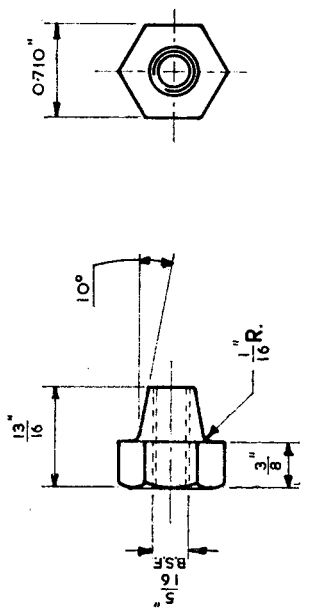


Fig. 11



NO SPECIAL CORES . . .

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The crankcase of a small i.e. engine or air compressor can sometimes be cast without a corebox by suitable attention to details of design. With a good internal taper as shown in Fig. 11, the main cavity can be

cast direct from the pattern, the front face of which is the parting line. The outside contour of the body and bearing housing must taper away from this point, and also the bolting lugs C, the top cylinder seating (with machining allowance), and any stiffening ribs A or bearers B. If side ribs D are needed, they

should be close to the parting line, or flush with it if possible.

It is not often practicable to cast the bore of the bearing housing by this method, and drilling the casting from solid is the only alternative; the chucking piece should not be drilled through, as its rigidity must be maintained for all the main

machining operations to be carried out at one setting. You must bore the cylinder register CR from solid, together with the facing of the top seating, by mounting on an angle plate, square with the machined front face.

★ *To be continued on April 4*