FOR THE SCHOOLS

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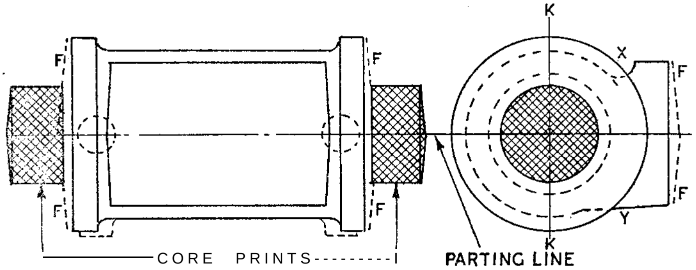
# IT CAN BE CHEAPER TO MAKE A CASTING

THE simple steam-engine cylinder block (Fig. 4) could possibly be cast in either of two positions. Much depends on details of its design. We might be able to part the mould on the line ***KK,*** instead of the parting line indicated-but only if the top and bottom of the steam chest were tapered away from the cylindrical surface as shown at Y. If it is recessed to reduce excess metal as at X, it can be cast only in the position shown.

Another point arises when bosses or other projections have to be added, such as for fitting drain taps. Two positions for such projections are shown; it is undesirable, though not entirely impracticable, to have them on the parting line, as this is likely to result in an unsightly flash, calling for a trimming operation on the casting. Full machining allowance is not usually necessary on boss faces: a small spot facing allowance should be enough. For all external surfaces and contours, the basic and almost invariable rule is that they must taper or slope away from the parting line.

The plain core for this casting is located by the prints at the two ends, the diameter of which should be to a standard dimension, usually in 1/8ths of an inch. But the length of the prints is immaterial, so long as they give adequate support to the core. The moulder will usually cut the core a little shorter than the full length of the impression in the mould, to avoid the risk of scraping down sand at the ends. thus preventing it from bedding down in the true position. Machining allowance in cored holes is generally greater than for outside surfaces? to compensate for possible mislocation.

A box casting with an open bottom can be cast from a simple pattern, provided that it has proper draught both inside and outside, as shown in Fig. 5. This represents the box bedplate for a horizontal steam engine, with raised seatings for the cylinder and bearing pedestals; sometimes further projections for mounting slide bars or other fittings are provided. Where possible, it is



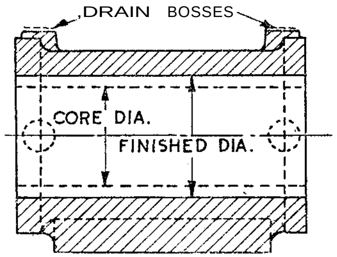




***Fig.* 4: *Pattern for cylinder of a steam engine, with prints for a plain core. The finished casting is shown in section***

sound practice to arrange the design so that these faces can all be machined (or chipped and filed) to the same level. It is not usually necessary to do more to the underside than to file off any high spots, so that the casting stands quite firmly on the surface plate or other flat surface.

This pattern serves as an object lesson in model design. Many small engines are quite uncharacteristic of full-size practice, as they are mounted on flat bedplates of stock material. Full-sized engines are nearly always mounted on a box bedplate, which provides much greater rigidity than a plain flat plate, for a given quantity of metal.

Examples of two engines of similar size, one made from stock materials and the other from castings, are the ME designs ***Theseus*** and ***Perseus;*** both work equally well, but the ***Perseus*** is the more realistic model and is cheaper and easier to build. This supports my contention that

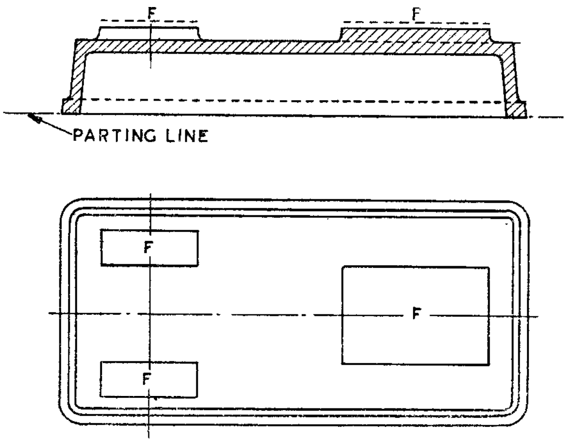
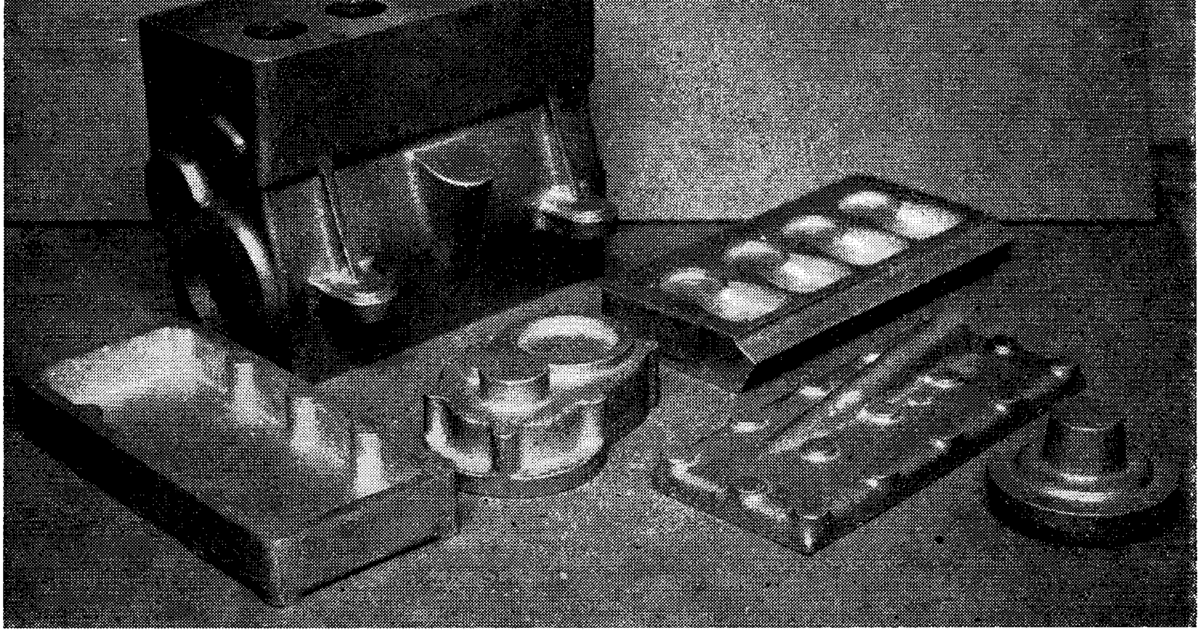



***Fig. 5: Pattern for the hollow box bedplate of a horizontal engine***



***Producing these castings for the Seal engine needed accurate detail work***

castings for model components are often well worth making, even if only " one off" is likely to be required.

Professional patternmakers usually carry out most of their work in wood, at least for original or prototype patterns, and this material is equally suitable for many of the patterns used for model castings. But it has disadvantages for intricate and delicate detail work, by reason of the grain structure of most kinds of wood, and there are several other materials which are more suitable in such cases. Wax patterns are often used for precision castings by the ***cire perduk*** or " lost wax " process, as the wax can be burnt out of a jointless investment mould. Dentists usually make the patterns from original plaster impressions: jewellers and silversmiths sometimes employ generally similar methods, but often display great skill in buildmg up and carving the wax to shape for special jobs. Such patterns are usually of quite small size, but in recent years the lost wax process has been adapted to quantity production of relatively large engineering castings, using patterns cast in metal dies. One of the advantages of this method, apart from the ability to reproduce detail and high precision. is that by using special refractory materials for the investment moulds, high tensile steel can be cast in them.

Metal patterns have obvious advantages for repetition work, being far more permanent and less liable to damage than wood. For some kinds of small jobs they are just as easy to make. Sometimes wooden patterns with extra shrinkage allowance are made specially to produce castings which are then cleaned up and used as master patterns. A metal of relatively low melting point, such as zinc alloy or type metal, is suitable for these patterns, and they are often soldered-or cemented to a pattern plate for use in machine moulding processes.

Certain types of plastic materials are suitable for small patterns, and can be employed to avoid the disadvantages of both wood and metal. Cast phenolic plastics, such as Catlin and acrylics, including Perspex, have been used to make highly durable and intricate patterns. The individual worker will naturally prefer to adhere to the materials, methods and tools to which he is accustomed, but one should never be afraid to experiment in either respect if there is a fair chance of obtaining any advantage thereby.

Patternmaking instructors often insist that only certain kinds of timber are suitable for this specific purpose, and moreover, that they must be of selected grade and aualitv. This is excellent wise counsel. provided that such material can be obtained without excessive difficulty or expense. But very often the particular kind or size of material is impossible to obtain at short notice, and one must make the best of what is readily at hand. The really essential thing is that the timber must be really well seasoned; good patterns can never be made from imperfectly matured and unstable timber which is liable to warp after cutting to shape.

Dealers in ordinary timber are, in my experience, rarely able to supply suitable material for patternmaking. as they concentrate mainly on constructional timbers, grown and seasoned as rapidly as possible for quantity output. I have found that jobbing cabinet makers and wheelwrights, or second-hand furniture dealers, are the most likely sources of supply.

Close-grained timbers are desirable for patterns, as they take a high finish from hand or turning tools, and require the minimum filling 'and finishing to produce a smooth surface which will not cling to the tool. Timber of twisted and unpredictable grain, which tends to tear or " rag " cannot be tolerated. Knots, cracks, and other blemishes are also to be avoided.

Of the soft woods! the most suitable are yellow pme, lime, and American whitewood. all of which are appropriate for straightforward work without too much detail. Hardwoods are obviously preferable for intricate work, and good quality mahogany is extensively used; but this is not easily obtained, and much of the so-called mahogany now available is relatively poor stuff. Where turning is involved, the best woods are beech and pearwood; other fruit tree woods, such as apple and cherry, are also very good but rather rare. Boxwood and lignum vitae machine almost like metal and are very durable.

***To be continued on March 21***