FOR THE SCHOOLS

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COREBOX DESIGN

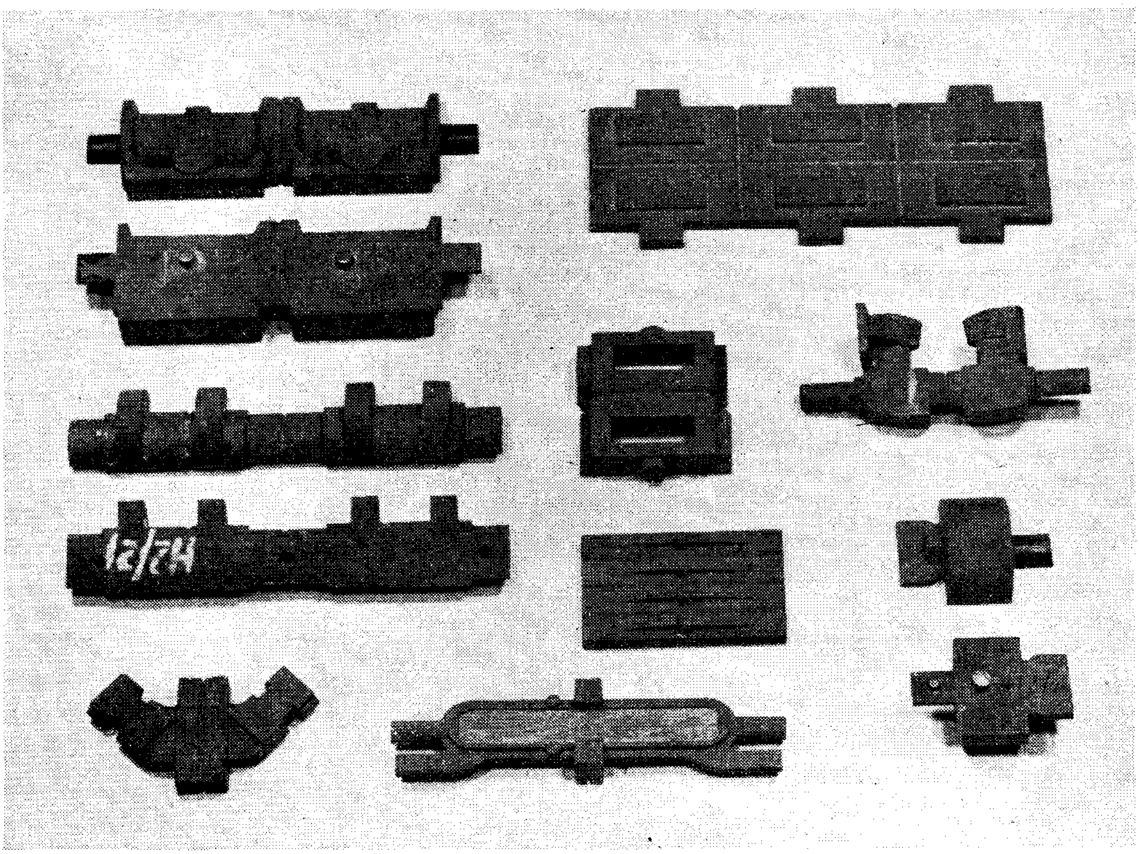
Two further examples of coreboxes for i.c. engine pistons in Fig. 18 show how the underside of the piston crown may be modified or given a special internal contour. In the upper drawing, the crown is ribbed to increase its strength and the internal heat dispensing surface. It is usual to place the ribs in angular relation to the gudgeon pin bosses; one of them may be brought down on to the top of the bosses to serve as a stiffener.

The spigot which forms the crown piece of the corebox must therefore be keyed so that it can be inserted only in one position; the simplest way for you to do this may be to fit a locating dowel in the flange of the crown piece.

With some coreboxes other methods may be found more convenient. The flange which determines the end location of the crown piece may be circular as shown, or rectangular and trimmed flush with the four sides of the complete box. Sometimes the crown piece is in the form of a plug fitted to a counterbore in the end of the box so that it does not need a locating flange.

In the lower drawing is the corebox for a two-stroke engine piston which incorporates a deflector on the outside of the crown. To avoid unnecessary weight and uneven thickness of metal, the inside of the crown must follow a more or less parallel contour to the outside. The crown piece is therefore shaped in the manner shown; the exact shape will, of course, depend on the piston design, and additional ribbing or other reinforcement may be added.

Besides locating the crown piece, you will need to locate the ***complete*** core in relation to the external pattern, so that the gudgeon pin



Set of patterns including siamesed and multiple groups, for the model of a period steam engine. (Woking Precision Models)

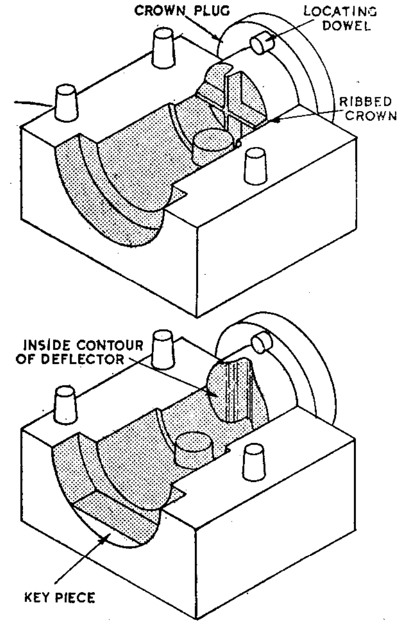


Fig. 18: ***Half-coreboxes for two pistons which have special internal contours***

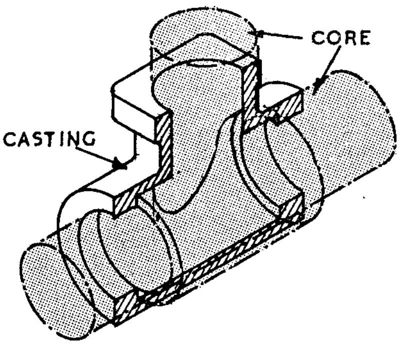


Fig. 19: T-shaped casting, chambered bore

bosses and the underside of the crown line up with the deflector position. Consequently the core must be keyed to the pattern in some way. A simple method is to cut a slice off the side of the core print, and fit a key piece of the same shape and size into the mouth of the corebox, as shown. This gives quite positive location-better, in fact, than some of the more complicated devices sometimes employed, which are theoretically sound, but not always ideal for dealing with material as fickle as core sand.

Many of the castings employed in small engineering practice are more or less complex variants of internally cored T-, L- or X-pieces. Their external shape need not concern us when the design of the coreboxes is considered, except when departures from straightforward contour are involved. A section of a casting with a chambered T-shaped core is shown in Fig. 19. The pattern, which is not shown as it may differ in external shape in particular instances, has three circular core prints, but the principle is not affected if it should be necessary to use cores of different shapes.

In the half-corebox for castings of this shape shown in Fig. 20, the central part has been chambered to save metal and avoid the need for machining the entire length of the main bore.

The term "corebox" is used loosely, and does not necessarily mean an enclosed box in the generally accepted sense. Sometimes the corebox is nothing more than a frame which is left open at top or bottom, or at both. This is practicable when these faces of the core

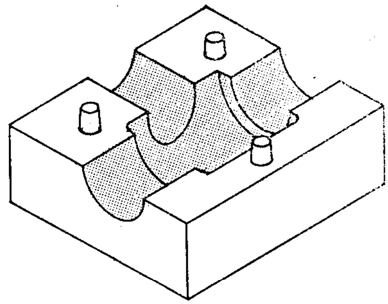


Fig. 20: Half-corebox for T-casting

are flat, and without detail relief. A typical example is the casting for a small steam engine steam chest. It differs from the one usually employed in full-size practice, where the main cylinder casting more often has a cored cavity on the side or top of the barrel. But while an integral casting of this kind reduces the number of individual parts in the assembly, it creates some difficulty when the port face of the cylinder is

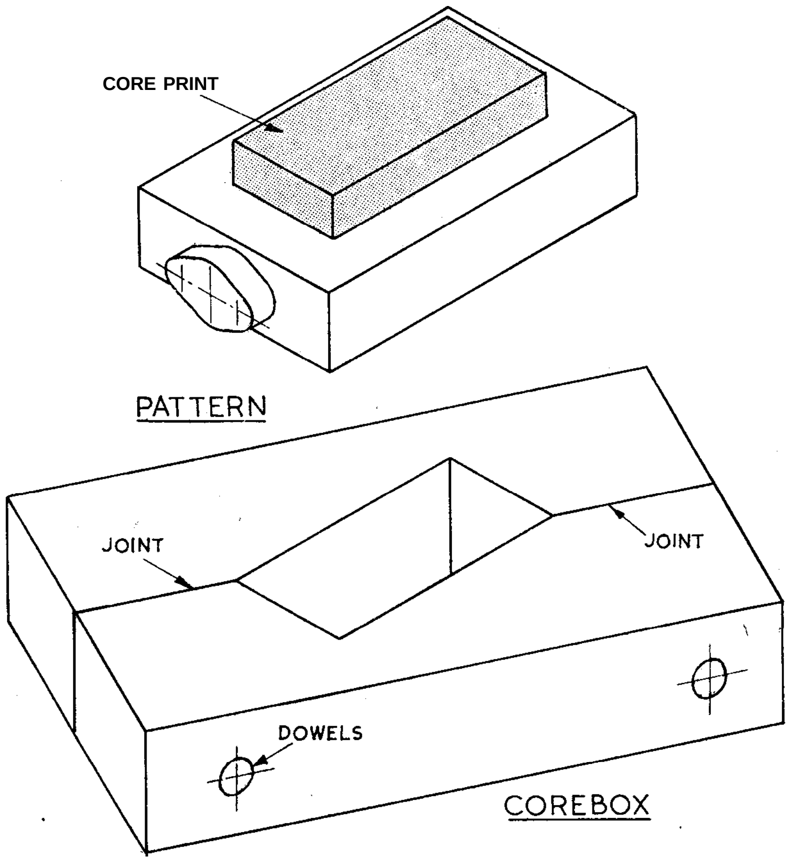
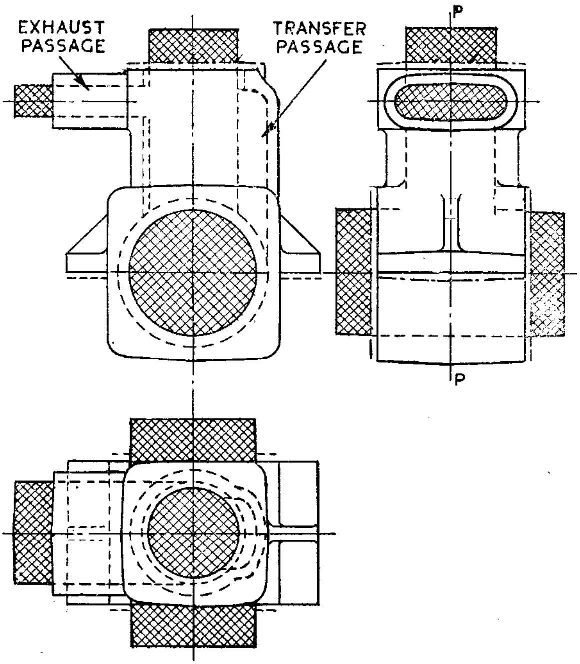


Fig. 21: Pattern and corebox for steam chest of a small engine



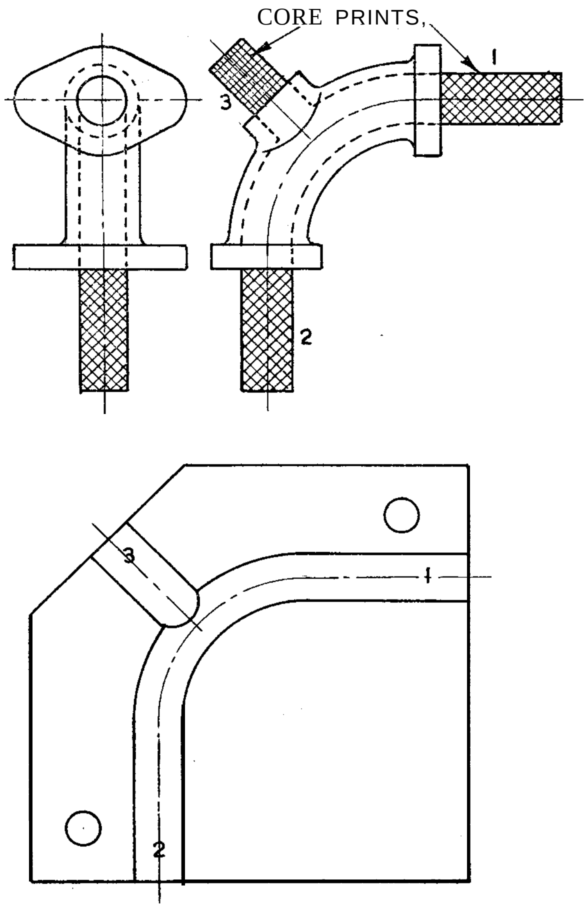


Fig. 23: Two-stroke engine body pattern

Right, Fig. 22: Pattern and half-corebox required for a right-angled pipe bend

machined by the means normally used in the small workshop.

In consequence, the " picture-frame " steam chest, with a flat cover plate on the outside face, has become almost universal for small steam engines. In the 1-1/2 in. scale ***Midge 0-4-O*** tank engine described before the war by George Gentry, the cylinder was designed in conformity with full-size practice, with an integral steam chest; but most of those who built the engine encountered the machining problem and adopted the separate steam chest

This chest can be cast without a core, if the recess is not too small and the sides are well tapered, with a high finish. As there is rarely overmuch room in a small steam chest when allowance is made for an adequate slide valve, and for sufficient thickness in the walls to take the fixing studs, it may then be necessary to square up the inside surfaces. Unless you have a slotting machine you can do this only by filing. For this reason, it is often better to core the inside : the pattern and corebox may be made as shown in Fig. 21.

The pattern requires a print on only one side, as the core can be laid horizontally and located in one half of the mould. If the flange for the gland is as illustrated, the parting line will be in the centre of the thickness, and a split pattern is desirable. By parting the corebox at the comers, the core is easily and cleanly released, without any risk of dragging, when the two parts of the box are separated.

As well as needing to design coreboxes, like patterns, with proper draught, and avoidance of undercuts, we also have to provide for packing the sand into them and for ramming it properly into all internal spaces. This is sometimes forgotten by amateur patternmakers; I have seen beautifully made coreboxes with no aperture in which to put the sand!

The examples shown give no difficulty, but sometimes the box must be complicated for the production of a good homogenous core. Print ends should be left open wherever possible to help you with the ramming.

Multi-part boxes are common in full-size practice, but are not so often essential in modelling. Coreboxes may be used, not only to produce hollow castings, but also to cope with difficulties which arise in recessed or undercut external surfaces of castings.

Some kinds of pipework in models can best be fabricated, but there are occasions when cored castings are to be preferred. A short pipe bend, with flanged ends, presents little constructional difficulty to a good coppersmith. But if a number of bends must be made to the same shape, castings are often better and more economical, especially as they allow a wide latitude in choice of material. Some who built the ME Aveling road roller ran into trouble with the very abrupt exhaust pipe

● ***Continued on page 503***

Seamew

Are the 5 cc. *Seamew* drawings included with the drawings for the *Seagull? When* did **ME publish Edgar T. Westbury's article on the** *Seamew?* I want to build the engine for a radio-control boat.-S.A.C.S., Chatham, Kent.

▲ ***The modifications to the*** SEAGULL 10 cc. ***engine needed to convert it to the 5 cc.*** **SEAMEW** ***single cylinder are included in the drawing, PE25, (6s.).***

An article on 21 December 1950 described certain modifications to the SEAGULL. ***This issue may be had from ME Back Numbers Department at*** **1s.** ***4d.***

Can You Help ?

Readerr who cm offer information to those whose queries appear below are invited to write c/o Model Engmeer. Letters will be forwarded.

Optical set

I recently came across an optical construction set which I had in about 1935 and which I now want to pass on to my son. Unfortunately it lacks'the instruction book.

As there are about eight lenses of one sort or another which can be used in many combinations, it would take a good deal of time to work out the basic principles again. The name of the set is "Construments."

I wonder if any reader can tell me where I can get a copy of the instruction book?-L.H., Carrington, Manchester.

Clock control spring

Could anyone give me the name and address of a firm from which I could buy a control (or balance) spring for the electric clock with a semi-free balance described by Stanley J. Wise in ME of 10 November 19491

Apparently Mr Phipps, from whom the spring was originally obtainable, is dead. I am at a loss to know how to obtain the type required.-C.C.A., Pinner, Middlesex.

Fishing reel

Has anybody ever designed a deep-sea fishing reel, one that could be used for shark or conger, with multiplying gears, variable check, quick release and so on?-G.B.S., Alveston, near Bristol.

FOR THE SCHOOLS — PATTERNMAKING

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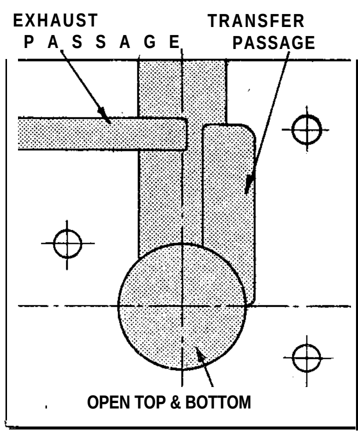
bend (necessary because of the limited space) and had to machine this part from the solid. It could, of course, be made quite easily in the form of a cored casting, in which the passage would be of a much better shape than could be produced by drilling.

The pattern and corebox for a Aanged right-angled pipe bend seen in Fig. 22 incorporates an extra branch connection-an advantage as it enables the core to be supported at a point where sagging may occur. Without it you have to make the main prints 1 and 2 substantially longer. The comer of the box is cut off to avoid the need of making the third print unduly long.

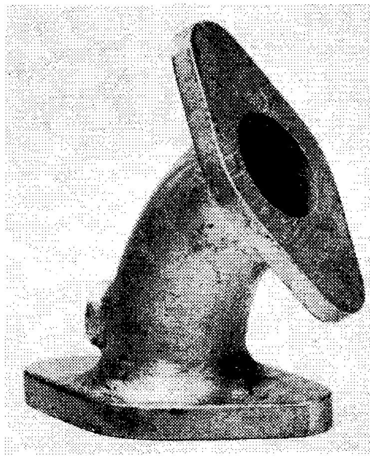
A casting for a pipe bend shown in the photograph is for a carburettor adaptation at an angle of about 60 deg. to the main induction manifold. It is much larger in diameter in relation to the radius of the bend, and would be quite tricky to fabricate in aluminium alloy.

In coring long and small diameter passages we must try to avoid fragile cores. If the passages can be kept straight and direct, a drilled hole may serve the required purpose equally as well as a core, even though it may not be correct according to full-size practice. Small cavities, grooves or slots can often be produced by simple machining, and this may be better than delicate coring operations. Such details are usually invisible or inconspicuous in the finished model, and only the ultra-meticulous constructor would insist on making them in the same way as full-size and to true scale.

On economic grounds alone, we



This half-corebon is for the body of a two-stroke engine



Short pipe-bend casting with the flanges at sixty degrees

have to keep patterns and coreboxes reasonably simple and straightforward. Elaborate work takes up the moulder's time, quite apart from any difficulty or risk in the casting operation, which may cause the work to be scrapped. It is often necessary to reinforce long slender cores by inserting wires or strips of metal while the corebox is filled.

An example of a cored casting involving internal contours which are more easily produced by coring than by machining is seen in Fig. 23. Here we have the body of a small two-stroke engine with the crankcase extended upwards to provide a housing for the lower part of the cylinder or liner. Basically, the casting is a variant of the T-piece in Fig. 19, where the interior is formed by two cylindrical cores at right angles to each other. But it is complicated by the addition of the two internal passages, for exhaust and transfer. The exhaust passage could be produced by drilling and filing, or by slot milling, but the other would be much more difficult to produce by hand or machine methods unless its cross section could be modified. With either, the excess metal, and the variation of wall thickness in the casting, would be undesirable.

It is fairly simple to produce both passages with a single corebox which has a groove and a recess in addition to the cylindrical bores, as in Fig. 24. The depth of these, in each half of the corebox, is half the width of the passage; the transfer passage is of concave cross section.

To be continued