PETROL ENGINE PISTONS

by "Chuck"

Part II *Continued from page 595*

When serious work is being undertaken which, like pistons, demands a high quality of metal, it is a good idea to use a proprietary de-gassing agent. The founder provides himself with a metal plunger, shaped rather like a miniature, upturned, perforated basin at the bottom end of a long rod. Copper can safely be used for this. When the crucible is a small one little more than a pinch of this de-gasser is tossed onto the molten metal. It is submerged with the plunger and held at the bottom of the melt until the bubbling subsides. The dross is then skimmed away and the metal poured immediately. (For a useful de-gasser try Kemwell Ltd., Long Acre, Nechells, Birmingham 7.)

Casting

Operating the casting machine is comparatively simple. The inside of the mould, where metal will come into contact with it, is coated with blacking as aforesaid, and the core is assembled in the "box" provided on the base of the machine. The middle of the core is, of course, permanently anchored there. When the handle is lowered the outer cylinder of the mould positions itself automatically and, at the same time locks the separate parts of the core together. With the two side cores inserted to locate the gudgeon pins the die is ready for the metal.

Some pre-heating of the die, by means of a gas flame, is an advantage but, if this is not possible, the mould is poured once, cold,-probably a waster-when the die should have reached a temperature adequate for continued casting. More blacking can be brushed over the interior of the die from time to time during the session.

To ensure that the metal runs fully to the extremities of the mould a good "head" is needed and for that reason it is desirable to fill the tube right to the top. The "head" will shrink away and dimple as the casting cools. Using the equipment here outlined, the small pot holds enough material for two or even three pistons. But to "keep the pot a-boiling" so to speak, more metal is added, and the cleaning process repeated, each time the crucible is returned to the furnace.

Chuck's machine is quite easy to strip. To remove the casting the side cores are first given a twist with a pair of pliers and pulled out. The base of the machine can be held in the vice, although the iron loop is provided for holding down to a bench with one hand while the triangular pad under the handle is given a smart, upward tap with a hammer.

Mould and casting then swing upwards leaving the centre part of the core behind and the two side cheeks still loosely held in the casting by the gudgeon pin bosses. These are released, one at a time with pliers and dropped back into the "box" ready for the next assembly. The piston blank is now quite loose in the tube of the mould and can readily be ejected upwards. And so on until Chuck is unable to find anywhere on the workshop floor to put his feet for hot pistons!

The **Machine**

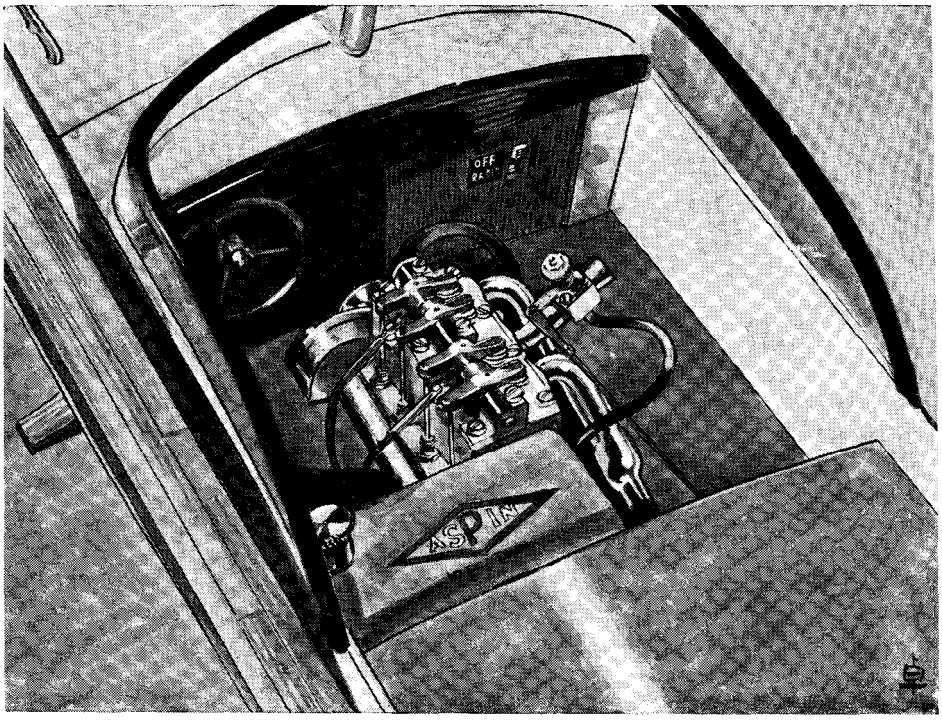
This instrument can quite readily be identified as a "Chuckism" by the character of it. The base is a crafty bit of work and is formed from two bits of angle iron welded web to web. The odd holes in the side and upper surface of the base are "scrap-box witnesses" and appear only in the photograph, which also showed Chuck's hand in the act of closing the die. (He has picked up some of the pistons off the floor now that they have cooled.)

The box to register the centre core is simply made from four sections of inch by inch mild steel angle, bolted to the base. The fore and aft angles are raised 1/4 in. higher than the side members, on another strip of mild steel, and they carry a 1/4 in. diameter pin to hold the middle section of the core in place.

For Mark II core, three lengths of 1 in. by 3/8 in. mild steel were used, but this time, in order to make withdrawal easier, the inner part was given a few degrees of taper by skimming in the four-jaw chuck. Each of the two cheek pieces were also shaped in the same way; but on the inside face only to correspond with the taper of the centre piece and thus restore the total core (at this stage) to a solid rectangle with a section 1 in. square.

The three pieces were then registered together and secured by two drilled and tapped holes. The whole was now returned to the four-jaw chuck for the preliminary turning of the core, including a parallel portion 1/2 in. deep, which serves as a register for the cylindrical body of the mould. This cylindrical outer part of the die was now bored to fit the register and the remainder of the interior tapered for draft.

Chuck can now think of a good reason for boring the whole of the die parallel. In the first



One of *"Chuck's"* twin-cylinder O.H.V. petrol engines installed in a model launch.

place he believes that the natural shrinkage of the metal would give sufficient clearance and, secondly, a parallel blank would be much easier to chuck for later machining than a tapered one.

So that all the parts of the mould could be permanently located together the whole was assembled and cross bored at a position relative to the core register. A pin in this hole could now be used for locking all parts together for the further location of the gudgeon pin bosses in the side cheeks of the core. The cheeks were then dealt with independently, drilled through, and the drillings opened out and radiused to the desired internal profile: a negative of each gudgeon pin boss.

Ventilation

It would be impossible to obtain sound castings from a die like this unless the core was vented to allow the escape of gases generated in the mould. The internal vents in this case were grooves milled with a 1 mm. slitting saw. They occur in the cheeks, just clear of the bosses, and open out into drilled holes running across the joint lines of the core.

The core is well polished before use and, from experience with Mk. I, Chuck knew that it was important that no part of the side cheeks can project further into the cast metal than does the centre part. His sketch will show that if, for example, the cheeks were only a gnat's whisker proud of the centre section, instead of them falling loosely away when the middle was drawn, they would anchor themselves on the lip of metal they had formed and would be impossible to remove without some damage. The safest plan was found to be that of filing away the extreme edges of the cheeks until the centre part was *visibly* proud all round.

The final sketch represents the cross section of a typical piston sawn through after machining. Try to obtain an internal profile like that by any other means!

STEAM IN AGRICULTURE

Continued **from page 663**

place that has the right environment and skilled professional attention that is necessary to record and maintain the sometimes fragile paperwork.

As a change from the excitement and bustle of rallies and other more active events, this exhibition is well worth a visit as an enjoyable and leisurely trip into the past, where some of the ingenuity of our Victorian forbears in designing and constructing machines to till the land can be seen. One can observe today the remaining few giants of steam still demonstrating the pedigree of design and development which lies behind them, shown so well in the exhibition.