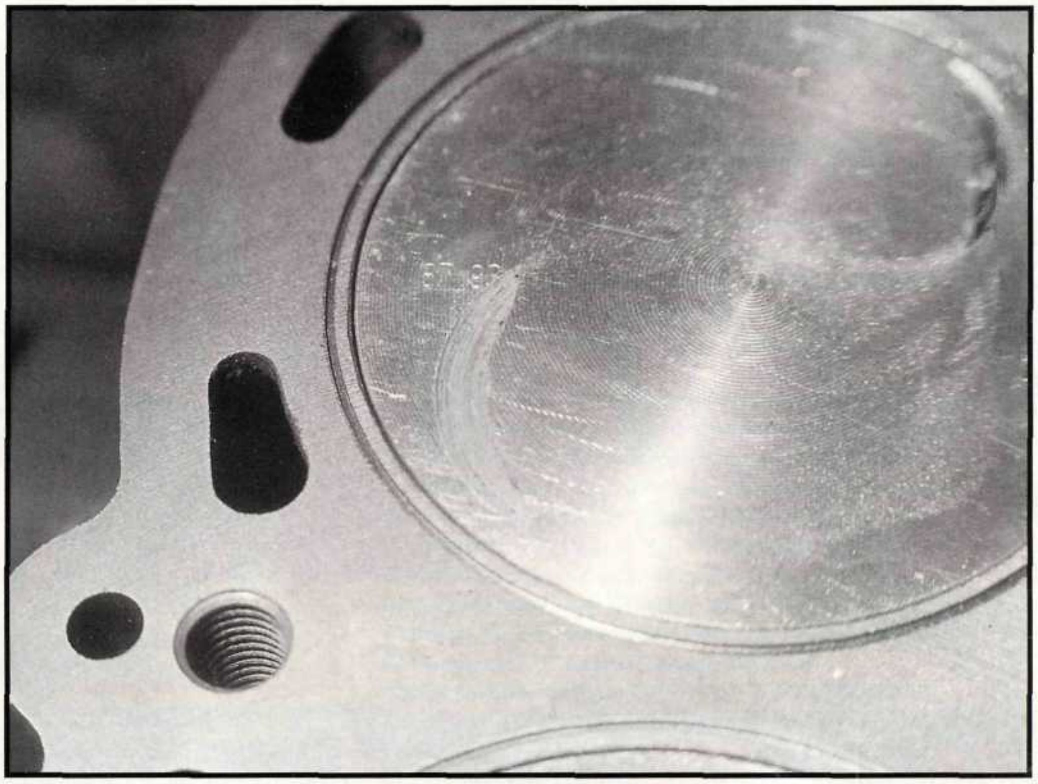
Walker's Workshop



After the piece on cam timing in a recent Walker's Workshop I've had a lot of enquiries about cams and cam fitting. Some people don't believe that it is that critical, others were confused by the whole business of lift at TDC or crankshaft degrees giving full lift on the cam. There is no difference between the two methods. Both systems aim to obtain the "best" cam timing for the engine set-up.

First let me explain how critical correct cam timing is. I was talking to Paul Blanchot of Vulcan Engineering recently and he told me of a problem one of his customers had with his Vulcan engine kit. Basically it was 10bhp down on the advertised power output. Not good, because Paul sells his engines with a warranty on power and this Crossflow wasn't coming up with the goods. The engine was returned and Paul stipped it down but could find nothing wrong, apart from the cam timing being out by just two degrees.

The engine was rebuilt and refitted, whereupon it delivered the power it was supposed to have. Just two degrees made all that difference. On the rolling road I have found that a change in cam timing of even smaller amounts on a race Pinto engine can be worth four to five bhp. If you look at the Triumph TR6 featured in the **CCC** clinic this month you will see that the timing cover is fitted with an access plate, to allow the cam timing to be swung. The idea came from a feature I did last year with a similar plate in the front of my Crossflow engine. It really is worth the effort.

It's all very well deciding you need cut-outs for valve clearance, but how do you work out exactly where they should be? CCC's Tech Ed offers a simple and logical procedure that may just solve your problem

When it comes to installing a cam you can also take advantage of a dummy build to see how far you can swing the timing before you hit the pistons with the valves. As a general rule (don't ring me if you blow your engine!) retarding is safer than advancing because most cams tend to run a bit advanced when installed at the manufacturer's recommended figure. Also the exhaust valve, being smaller than the inlet, often has more clearance.

The procedure is simple enough. Fit the cam and time it in but using light springs under the valves. Line up a dial gauge on the valve to be checked and set the engine to TDC on the overlap. Simply press on the valve to see how far it goes down before contacting the piston. Now rotate the engine a few degrees and check the clearance again. It only takes a few seconds to find the point of closest contact (assuming the valves don't actually hit the piston). Now swing the cam timing in either direction until you get to an unacceptable clearance. I like to see a minimum of 0.050in at the tightest point. If you have plenty of clearance regardless of a reasonable timing swing, something like six degrees either way, you can build the engine with confidence. However, should you have contact, or things are too close for comfort, you need cut-outs in the piston crowns.

On most engines this is generally regarded as a bit of a nightmare. Remember that apart from anything else, cut-outs reduce the compression ratio. With Crossflow engines you can mill away the offending piston material since the valves sit square to the bore. As an aside here, do remember that a cam that is specified as not needing cut-outs because the piston already has them as standard, might need a wider standard cut-out if you have fitted larger valves or moved the valve centres with a trick head.

On engines with inclined valves, raised piston crowns or the like, things get a bit more complicated. The easy option is to make up your own cutters using an old valve the size you are running, or preferably just slightly bigger. I grind them up on the bench grinder to the shape shown in the pics, then "sharpen" them with a back-cut using the die-grinder. If you want a real edge to them you can turn the face in a lathe after grinding.

Fit the valve in the head you plan to install them in and fit the valve stem into an electric drill chuck. Use a drill with some speed control: you don't want 3000+ rpm! Now just spin up the valve and touch it into the pistons. The result is a neatly-marked cut-out exactly where it is going to be when the engine is running. I leave the head gasket off, which takes the cut-out slightly outside where it would normally be once the gasket is fitted (because with no gasket to pack up the head, the valve angle will be lower, relative to the block).

You can measure the depth of the cut-out by checking cutter height before and after use. I don't bother but simply cut the

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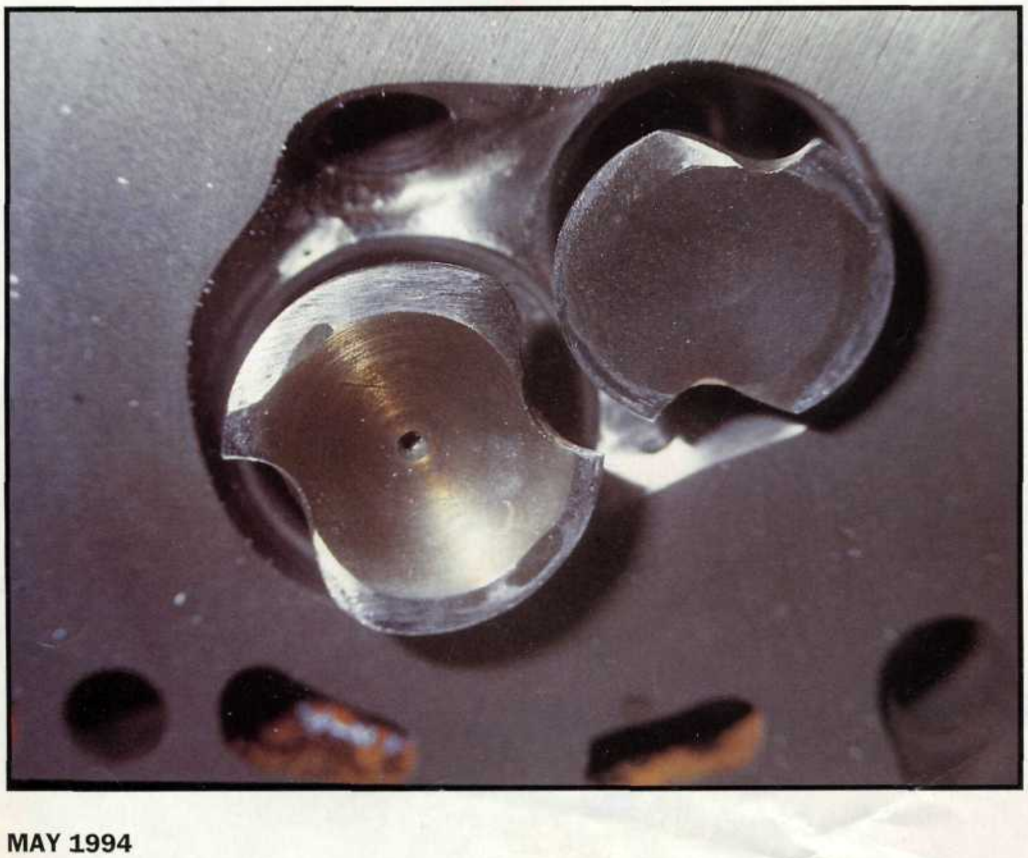
piston and visually check the width of the cut-out. When they all look the same width they are usually within a few thou of each other.

The beauty of this system is that the cut-outs are positioned exactly right for the head/piston position, and not placed where the valve ought to be. Perhaps from all this you can see that building an engine and installing a cam isn't quite as straightforward as some people might have you think. Dummy building, measuring and checking and double-checking take longer than the final assembly.

Basically I install the cam in the head and fit the inner valve springs only. After I have played with the follower selection or tipped the rockers to get the lifts in the ball-park I tip on the cam lube and get out the big electric drill. Using a 3/8 inch square drive in the drill I connect up a 17mm socket to the cam pulley retaining bolt and spin it up. Cam lube is poured over the lobes as the drill turns the cam over. The speed is equivalent to the engine ticking over. Ideally I would like to make up a rig with a bigger motor and a variable speed and perhaps a pumped lube system, but for now this set-up seems to work fine. After the parkerising has rubbed down you can see how the lobes are running-in to the followers. When all looks well the outer springs are added and the head installed. I still follow the normal start-up proceedure, but you now have a little extra insurance should you have trouble starting the engine and have to crank it over for some time before it fires up. ■

Dave Walker is an independent automotive engineer and his views are not necessarily those of the Editor

● **People worry about positioning cut-outs in the correct place and consequently end up with them larger than necessary. Why not turn a couple of old similar sized valves into 'cutters' (below), fit them into the head and with the aid of an electric drill (above) you will mark exactly the position on the top of the piston for the cut-outs (left)**



NEW SEAT CUTTER

Regular readers might remember how in love I was with the Serdi seat cutting system which I used for some time last year. Serdi UK now have something of a poor man's alternative on offer.

Basically this consists of a cutting head with a ball-and-pin drive system which fits into a milling machine, or possibly a pillar drill with a very slow speed. The head takes all the normal Serdi blades and carbide pilots. Having tried the system I must say that the results are not as good as a Serdi machine proper, but then they wouldn't be since you have no floating head for alignment. However, they are pretty close if you are careful how you use the system.

I find it a real boon for hogging out the seat and throat area somewhere close before I start porting. Once the head is ported I re-cut the seats with the Peg10 grinder. The Peg is very accurate and leaves a super ground finish, but it's slow. For a few hundred quid I now have, almost, the best of both worlds.

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