

Richard Longman luck or genius?

Longman inclined valve cylinder-heads—
split Weber carburettors

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Longman has been a name synonymous with Minis, and over the past few years, the firm of Richard Longman & Co., has probably done more than anyone else to extract the maximum amount of power from the five port cylinder head engine.

To achieve this, many subtle developments have taken place, each in the usual Longman style, having been thoroughly checked out on an engine dyno. Such thoroughness is just one of the factors which, in my opinion, makes the Longman units the number one engines of their type in the country.

Race track performances show that the five port engine properly prepared, is every bit a match for far more expensive and more exotic fuel injected cross-flow headed eight pointers. The latest tweak to come out of the Longman establishment (11, 13 Purewell, Christchurch, Hants. BH23 1FH. Tel: Christchurch 6569), puts the five port engines right on a par with those fuel injected motors with four inlet and four exhaust ports.

What is this tweak that we can attribute so much to? Well, it's simple in essence, but not quite so simple to carry out in practice, a mere $3\frac{1}{2}^\circ$ from the vertical towards the inlet side of the head. This achieves two things: 1) It puts more of the combustion chamber in the area of the spark plug, and 2) the gases entering and leaving the chamber have less of an abrupt turn to make.

At first sight you wouldn't think that $3\frac{1}{2}^\circ$ is going to make that much difference. Not so friends: in fact that slight angle makes a world of difference. Just take a look at a power curve and see for yourself. Usually at this stage of tune on a full race engine, you are fighting for one or two horses, so when you achieve in excess of half a dozen in one fell swoop, it's something worth looking into, there is, however, more to these heads than just the inclined valve. So let's start off from square one.

George Toth, Richard Longman's head man, will start the preparation of one of these super heads by first selecting a good basic casting. The head usually used as the raw material is the 1275 GT head casting number 12G940. The first operation after having removed the guides from this casting is to set it up on a jig and machine the valve guide ar jles in at the correct $3\frac{1}{2}^\circ$ from the vertical, but whilst this is done the centres of the valve guides are also moved. This is necessary because of the extra large inlet valve employed on this head, being 1.485" as opposed to the normal 1.401" of the standard valve. Now anyone who is familiar with S heads knows that the standard valves already get very close and you can see with putting a valve in over $\frac{1}{16}$ " bigger, they certainly will touch, as well as the fact that the wall between the inlet and exhaust ports would collapse because of lack of metal. So offsetting of the valves outwards is a necessary operation to accommodate this much bigger inlet. Once the boring of the inlet guide bores has been accomplished, a sleeve is pressed in so as to return them to their standard size. This is so that standard size guides can be used, although George Toth does not actually fit standard guides back in the head. Inconell bronze guides made to tighter limits are normally used. Before the guides are fitted, however, all the

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David Vizard looks at Longman's inclined valve cylinder-heads while Fred Game studies the man's split Webers, both in an attempt to discover why they're so successful. If nothing else, they found out that luck just doesn't come into it.

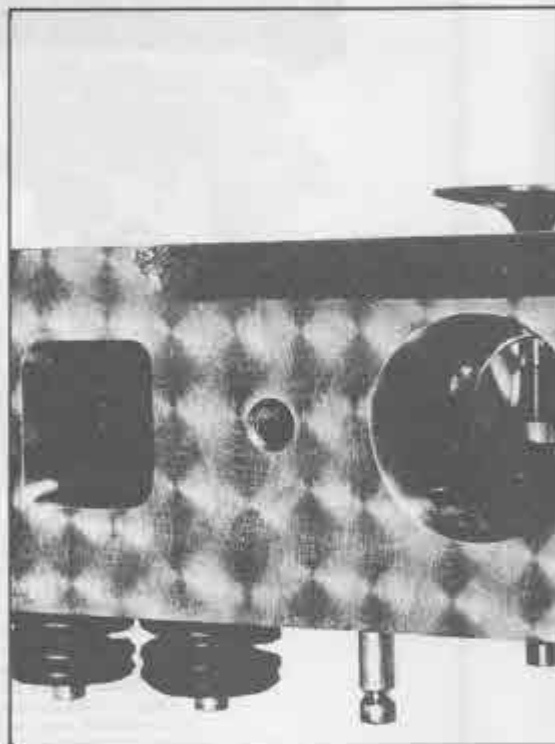
head grinding is done and here it's the shape, not polish, that counts. Having done more than one or two cylinder heads myself, I can vouch for the fact that George's artistry in shaping those ports and chambers is certainly amongst the best I have ever seen.

The valve guide boss on the roof of the port blends very smoothly into the guide itself. One way and another you can see that a great deal of attention has been lavished on the inlet port, and especially in the area where the two ports join and pass between the pushrod holes, and here it's quite essential that you get the maximum area to feed those big inlet valves.

Once all the porting and chamber reshaping has been done, the seats are cut then the special over-size valves are carefully lapped into their seats and checked out with engineer's blue and with this the final trimming of the valve seats to take off all the sharp edges before and after is done.

The next job is to 'cc' out the combustion chambers and make any corrections that may be necessary to get them all reading the same. While all this is going on, of course, the amount that needs to be taken off to get the desired compression ratio on the particular motor that the head is going on is sorted out. Which really leaves the head skimming to the last operation. With the special guides fitted the head is then built up using special valve springs which give a full lift open pressure of 210 lbs and these springs prove strong enough to delay valve bounce until over 9,500 rpm.

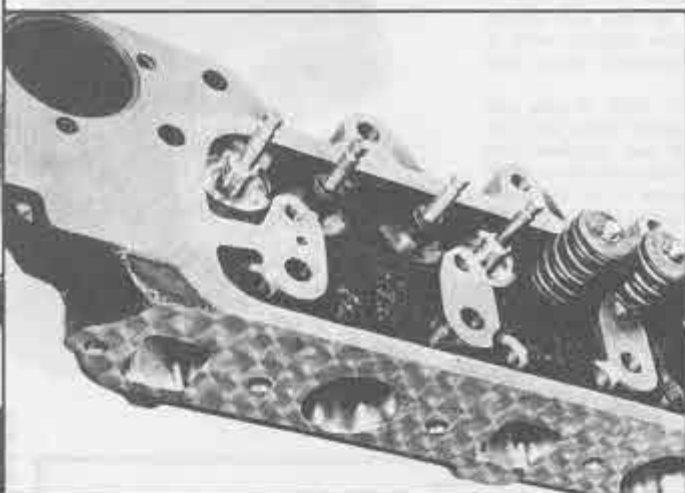
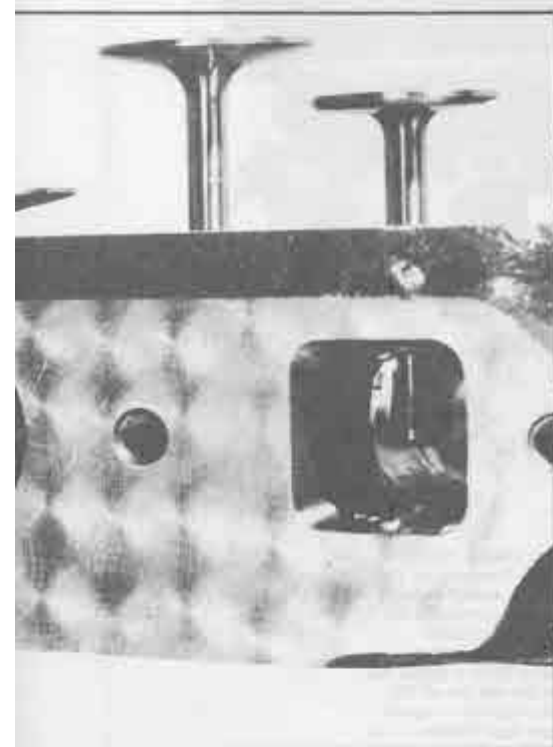
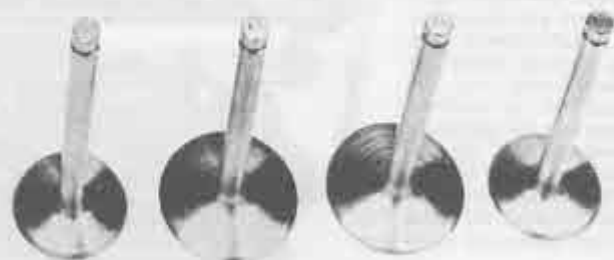
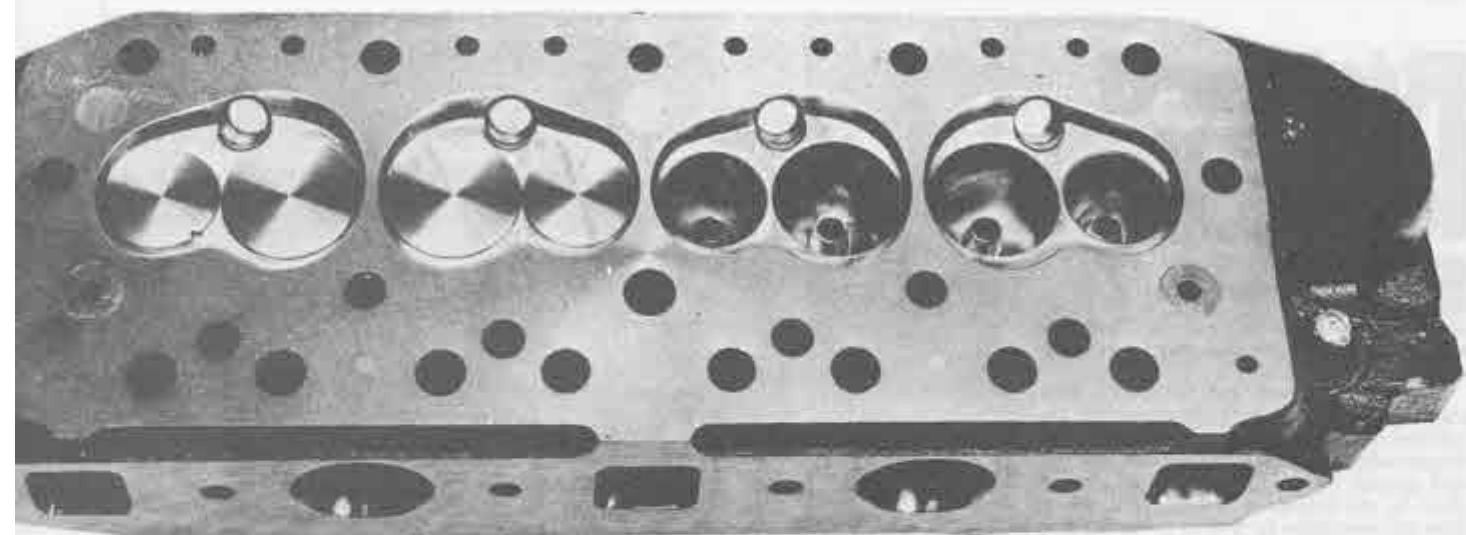
On paper, then, this cylinder head looks like a good bet. At £■■■■ it's well priced by today's standards for competition equipment, and if you are running a 1275 it's just a case of bolting it on. However, George Toth was quick to point out that with smaller engines such as 850's and 1,000's, it is necessary to notch the pistons because head skimming has to be taken to a far greater degree to get the right compression ratio. Without notched pistons, those valves will soon cease to seal and the pistons cease to reciprocate. (He means they'll hit each other! — Ed.) Which isn't going to be too nice if you want to go fast.



SPLIT WEBERS

Thank you David — and now to the other part of the Longman speciality treatment, the bit that is very obvious as soon as the bonnet is opened. No prizes for guessing ... it's 'split your Weber time' with Richard Longman himself wielding the hatchet.

If, like me, you look upon a 45 DCOE as an item of sculpture rather than a hunk of metal that merely vapourises liquid petrol into a volatile fuel/air mixture, it might at first seem sacrilegious to take a hacksaw and cut away one of the venturi. However, if



Working clockwise, we commence with the heading shot which is . . . would you believe a head? Below it are those nice big valves David refers to, with the strong springs and guides in the shot taken from above. The other, tapered, end can be seen in the tunnel-like shots of the inlet and exhaust ports.

you don't do this simple and brutal operation, the carbs can't be mounted close enough to ensure that they are absolutely in line with the inlet ports and the whole point of the exercise would be lost. Actually, I have seen a couple of installations where the builder has used the right-hand choke of one carb and the left-hand choke of the other, so that the body projects in the direction of the brake and clutch reservoirs instead of towards the centre, but I believe that a certain amount of repositioning of the reservoirs had to be undertaken in each case.

For the purpose of the exercise, any series of 45 DCOE can be used — if you don't know what I mean, next time you

come across a side-draught Weber look at the coding on the float-chamber cover. It should have something like 45 DCOE 8 (or 9, or 13, 18, 19 or whatever) the last figure denoting the series to which that particular carb belongs. Regardless of whether he has got two carbs of the same series or not, Richard matches the carbs very carefully — this is the first part of the skill requirement bit — making minor modifications and adjustments to the chokes, butterflies, floats and valves until they are identical in all respects. Then comes the aforementioned hacksaw operation, where the choke is cut away for clearance reasons. This is probably the least critical of all the things that have to be done, but I ought to stress the care that must be taken to ensure that no swarf particles find their way into any of the galleries on the side of the carb that is still operational.

Unfortunately, because of the very nature

of the job, it was impossible for us to photograph how the galleries from the pump jets and idles were blocked off. However, Roger 'The Lens' did get a shot of the main and slow-running jets after they had been soldered up (see the arrows in the photograph) which should give you an idea of how it's done. Ordinary soft solder is used as this will take perfectly to the brass body of the jet itself.

Thanks to the rose-jointed supported throttle linkage, no other form of interconnection between the spindles that locate the butterflies is required, so the spindle on the sectioned carb is cut away to within a quarter of an inch of where it passes into the redundant choke.

Apart from jetting the Webers to suit the capacity of engine to which they will be fitted (although Richard — quite fairly — wasn't too forthcoming on the ones he uses, I can't see them being a lot different to the

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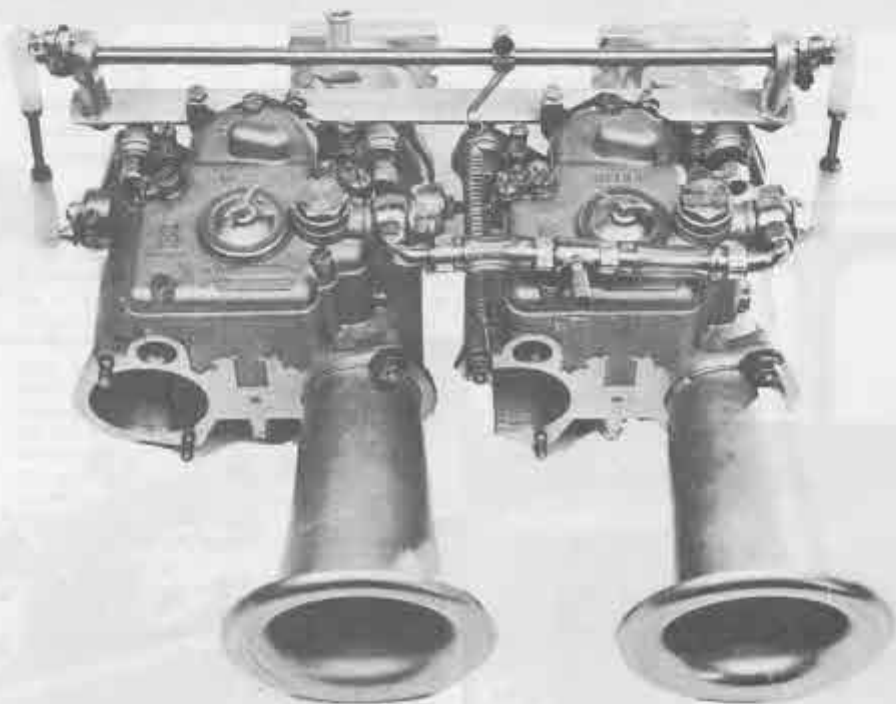
jet sizes utilised in a single 45 DCOE installation) the carbs themselves need no further attention.

Carefully matched and smoothed inlet stubs connect the split Webers to the cylinder-head manifold face, via double 'O'-ringed sandwich plates and a normal manifold gasket. Additional, unitary support is given by the linkage mounting itself, which links the two carbs by way of the studs that retain the intake trumpets. The mounting is composed of a piece of half inch angle aluminium, to each end of which is fixed a 3/16 bore spherical bearing, through which the rod that the crank levers clamp onto. The throttle cable attaches to a centrally mounted lever which also has the additional mandatory return spring required by the RAC scruters. Two further levers at the extreme ends of the rod transmit the action (!) down to the standard arms on the carbs by way of some very neat brass and nylon ball-joints.

To finish the installation off, all that is necessary is to plumb up the fuel tubing and suitably embellish the Webers with a pair of Mr Longman's beautiful, spun alloy intake trumpets.

What does it all cost? Well, if you just went in and bought a ready done set, the price would be £■■■. If you supplied one carb it would bring this figure down to £■■, whilst a request for Richard to do the work and supply the bits for converting a pair of 45's which you already own would set you back only £■■.

The results that you would get for your money are difficult to evaluate. He doesn't believe in quoting 'paper power'. One thing I do know is that if you're racing an 850, 1000 or 1300 Mini and haven't got at least a Longman head and carb set-up, you need to take an awful lot of brave-pills to keep up with the guys who have. ■



Aren't those trumpets lovely (hanging on the narrow end of them is the subject matter for the entire article) unfortunately they won't fit on a single 45. On the left are all the bits required — apart from two Webers — to do the 'split' conversion, whilst below are shown the two soldered up jets referred to in the text.

