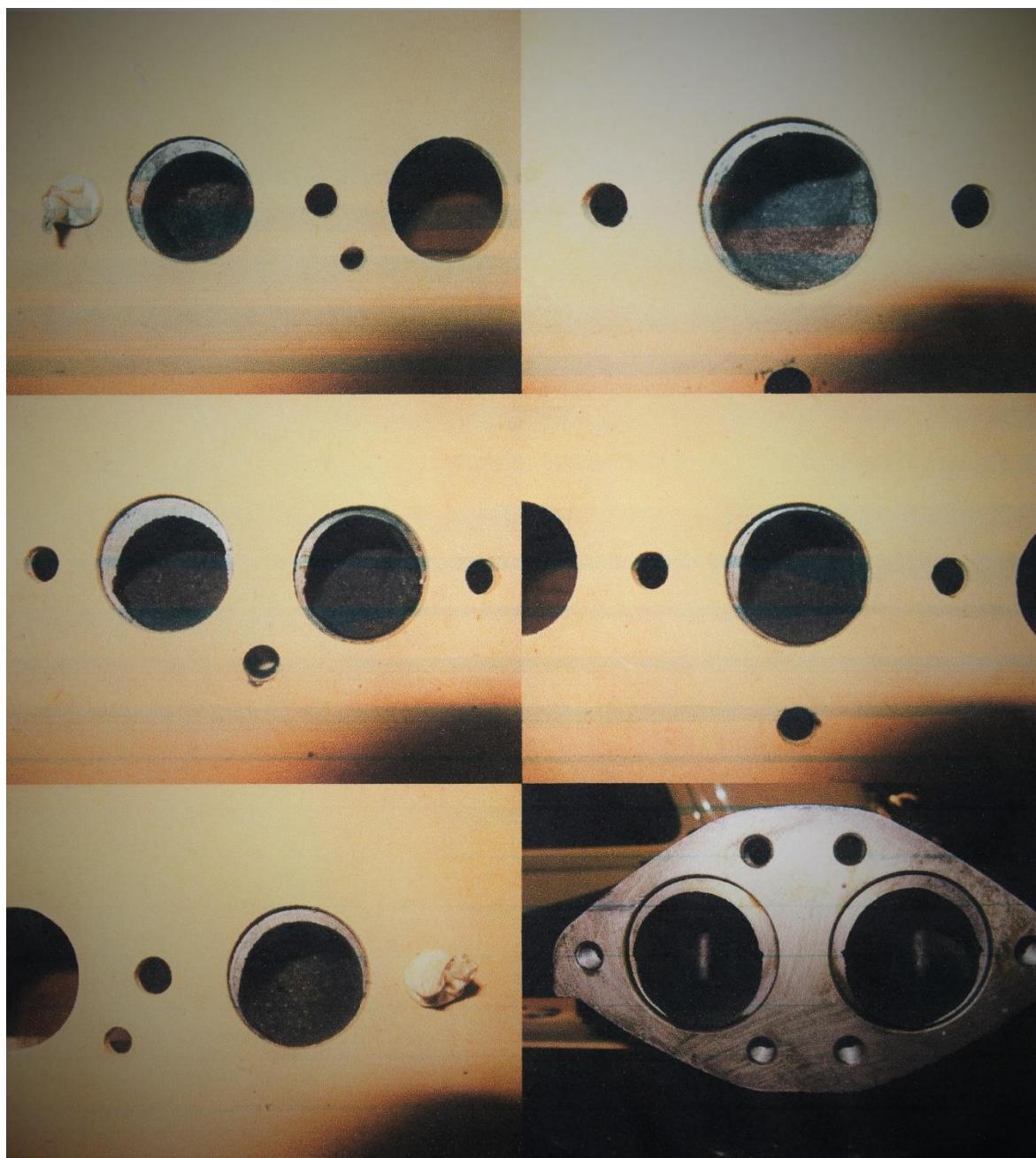


An Exhausting Challenge

by Peter Stringer

This is the story of yet another trial I have encountered during the restoration of a Big 6.

The area of concern was the exhaust manifold or should I say the lack of one. What was left of the original attached to the cylinder head was about 3 inches followed by bits of 35 x 35 RHS joining to bits of 50 x50 RHS with lots of cracks at all the joins between. As this heap of scrap was obviously beyond salvage it was disposed of and a new one ordered (not the cheapest I might add). In due time the new one arrived and looked quite impressive on the outside so I turned it over and got quite a shock. None of the ports was anything like round, the best one could say was there was a hole! The bottom end wasn't any better.



From the pictures you can see the mismatch between what the ports should have been and what I got. But there was more (I will explain about the MDF template shortly), after positioning the manifold on the cylinder head you could see that the mould on the right hand side must have moved a bit during casting because there was a progressive misalignment with the stud positions so that by the time you got to the last one you were lucky to have the stud come through the hole.



At this point I decided to check the match of the gasket to the cylinder head ports.



Not Happy! What to do?

Well the first step was to very carefully measure the position and sizes of the ports and studs with a vernier gauge and then draw them up in Auto Cad. After exporting the file in DXF format I was able to cut out a template on the CNC at work and compare. It took about six attempts before I was happy with the match. In the process it became apparent that a way had to be found to locate the position of the exhaust manifold on the head without the intake manifold being attached as only the intake manifold has locating pins. At each end of the exhaust manifold there is a 11mm dia. stud hole so I had a collar made to fit over the 7mm stud and into the 11mm hole to create a locating pin at each end. The right hand end had to be made eccentric for obvious reasons.



So now I had a template that matched the cylinder head ports and could be matched in position onto the exhaust manifold. This gave me the result seen in the first pictures and a good idea of what had to be ground away. So with my new Makita die grinder I set to work and an hour later the job was done.



All to do now was fit the intake manifold to the exhaust and check with the template how the alignment was for the intake ports, easy! Well fitting was easy, aligning wasn't. On the 4 cylinder engines the intake manifold sits at right angles to the cylinder head face so adjusting the position up and down or left and right if you could doesn't move its position as it sits against the cylinder head. On the Six the junction is at 45 deg. When I bolted the two manifolds to the cylinder head there should have been a uniform 2mm gap between where the two manifolds attach to each other to allow for a gasket. What did I have, well it varied from about 0.6mm to about 1.6mm diagonally. Next head ache. So working on the assumption that the original old intake manifold was made better than the new exhaust manifold I took measurements of the gap variations and headed down to my tool maker who had just taken possession of a very good quality second hand milling machine that he was very proud of and gave him the challenge to regrind the angled face on the exhaust manifold. It took two runs with nothing to spare at the end, not perfect but good enough. With the two manifolds now firmly bolted together I had the faces reground as they were a bit out of alignment. A check with the template showed things were still ok, all I needed now was a matching manifold gasket. As it turned out I actually had one albeit made of MDF, not exactly hi temp stuff. However with the DXF file, I gave this to Associated Gaskets and for the princely sum of \$70 they cut one by water jet technology, (and all in one piece) piece of cake!

Onward a restoring we go!

