In which ROYCE CREASEY blows the normal joint (cylinder to cylinder head, of course).

The Gaske

□ In a recent article in *Classic Mechanics* I described a brutally effective way of reducing heat input to the exhaust port and valve on most British engine designs. The major objection to this modification is the considerable and unavoidable alteration of the machine's original appearance so I am pleased to be able to describe an alternative which, although limited to some single-cylinder engines, is hardly discernible.

The original modification relied on reducing heat input, but clearly a similar effect might be obtained if heat dissipation could be improved. A simple way of doing this is to provide extra finning in the immediate vicinity of the exhaust valve and in good thermal contact.

All air-cooled engines have substantial finning about the exhaust valve area but on many British designs a large proportion of that finning is thermally insulated from the valve area by a device known as a head gasket. These things are frequently identical in design to a car head gasket, being a layer of asbestos sandwiched between two thin copper skins, and their inclusion in an air-cooled engine means that the cylinder fins can contribute almost nothing to dissipating heat from the exhaust port area.

A simple and obvious solution is to dispose of the gasket, a step which may seem a touch radical to traditional thinkers and was certainly too much for British motorcycle manufacturers. Even Velocette couldn't resist fitting a copper ring on their singles, although this, of course, acts as an effective conductor of heat between cylinder and head. You may have noticed that Velocettes rarely burn their valves.

The necessity for a gasket is indicative of the poor quality of British production: companies using decades-old equipment simply could not attain the degree of accuracy needed for there to be a good fit between head and barrel. European companies of that period, like Ducati, had either achieved a satisfactory standard of accuracy or fitted a simple alloy shim, soft enough to lock into rugosities in the mating faces and ensure good heat transfer. Examples of the later solution include machines built by Bultaco and Montesa.

Fortunately, the degree of accuracy required for a gasket-less fit between head and barrel can be achieved, on a single-cylinder engine, entirely by hand. This necessitates hours of physical labour, but for those of you not locked into the puritan work ethic, most of the work can be done by machining.

The engine I have most frequently dealt with in this way is the good old Bullet, although its head barrel interface is similar to most other singles and the requirements therefore identical. Having removed the head and thrown away the gasket, you will note that there is a raised ring or spigot on the top face of the barrel which fits into a similar recess in the head. The job is to make the top face of this spigot fit perfectly into the mating face of the head, while keeping the rest of the joint surfaces just clear.

If the barrel and head faces outside this ring do not pass any oil – either for rocker feed or drainage – the clearance can be substantial. The Velocette system is a good example of this. More commonly, however, the inner faces fail to make contact because you've just thrown away the gasket that filled up the space.

It is a simple matter to have either the head or barrel machined so that all the joint faces are touching. Ideally, the inner face alone should just touch but, as you will have to hand finish the job, a couple of thou either way don't matter too much. The barrel is usually the easiest part to pick up in a lathe but first of all you must ensure that the piston will not protrude from the barrel.

Hand-finishing is accomplished by using fine grinding paste on the inner spigot and coarse grinding paste on the outer faces if they need to seal oil. The head is then rotated on the barrel, just like a valve grinding job. Keep on replacing the coarse grinding paste and diluting the fine grinding paste until you have a fine matt surface on the spigots, indicating 100% contact. This should be checked with engineer's blue.

After cleaning off all the grinding paste, the engine can be assembled with no further attention to the inner faces. Outer faces which must pass oil, such as the Bullet, can easily be sealed with RTV which neatly cures the well-known tendency for oil to run up head studs and out through the leaking gaskets. When I first did this mod sometime in the Sixties, RTV was unknown and I achieved equally permanent results using a gasket for the outer faces made from a page of the Daily Mirror.

As well as the cosmetic advantages with this modification of eliminating any head/barrel joint oil leaks, it also becomes impossible to blow the head gasket and exhaust valves – even Bullet exhaust valves lose their tendency to burn out. You can, in fact, gauge the difference by looking at this valve before and after.

The official design causes the valve to overheat on the edge nearest the barrel. This is quite clear from the colouration of the valve and is an indication of the advantages of a valve which is free to rotate (as on Velocette). Once the head has been ground to fit the barrel without a gasket the valve colouration is much more even, although, of course, as it no longer burns out it may be years before you remove the head to look. In the meantime, you can adopt an expression of benign amusement every time a Triumph owner complains about head gaskets.