Len Paterson of the Cylinder Head Shop, Wimbledon, London, tackles a T120 eight-stud head on his French made Serdi 100

Triumph head fix

Ever since the first days of Triumph eight-stud alloy head production in the early Fifties they were prone to cracking. Engineer Len Paterson explains how they can be repaired and what's involved in fitting new valve seats

pics Phil Masters

IN THE LATE Fifties and Sixties Triumph owners and dealers were usually given one of the following explanations for cracks appearing in eight-stud alloy heads: 1 Incorrect tightening sequence. 2 Pulled head down too tight. 3 Head not torqued down to correct pressure.

Even today many people still attribute the most likely cause to one of the above statements. But the problem was actually due to their method of manufacture.

Since those first production days and up to the 650 unit twins of the early Seventies almost every Triumph alloy head had a cast-in seat, and thus the valve seat was an integral part of the cylinder head. The production advantages were that it was impossible for a cast-in valve seat to fall out because it was of an inverted cone shape. The top of the seat, where you find the 45-degree angle cut, was about one millimetre smaller than the bot- ▶

Crack in head clearly visible. See next pages for how repairs can be effected

<| tom of the seat. However, the downside was fatigue caused by using less head metal.

Look at Picture 1 and you can see clearly that part of the high cast in-seat is actually forming part of the wall of the inner bolt hole. On some castings the inverted cone seat swings into the bolt hole housing, thus making it extremely prone to cracking. Pre-unit 650 and full hemi 500 eight stud heads from 1965 to 1972 are the worst for cracks.

The heads less likely to crack are the ones where the cast-in seat has swung away from the inner bolt hole, but the chances of all four seats being so positioned after the casting process are unlikely.

Even if you are fortunate enough to find an eight-stud head that has not cracked, the chances of it staying that way are as slim as the alloy between the inner bolt housing and the outside diameter of the cast-in seat.

Don't despair. Any Triumph alloy head can be repaired and, if the procedures illustrated in the sequence here are followed correctly, your cylinder head will be far stronger than new, it will flow more gas, it will run cooler and run on any fuel, and there will be a year-round improved power curve.

However, before undertaking any repairs, you should first decide on what want from your Triumph – more economy, increased performance or maximum strength?

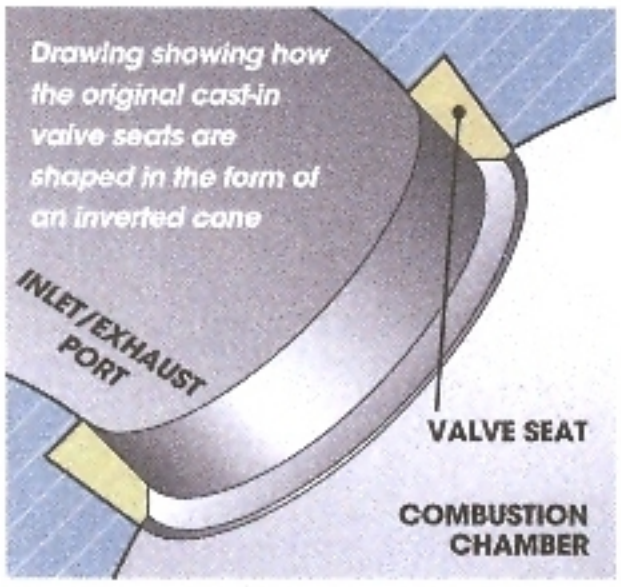
■ **PERFORMANCE:** use 650/750 unit inlet and exhaust valves. These will give a tremendous increase in gas speed and a big gain in bottom and mid-range power.

■ **ECONOMY:** use the original inlet valve and 650/750 unit exhaust valve. The bigger the exhaust valve the better. It will help to keep the heat of lead-free fuel down, and should eliminate pinking problems.

■ **MAXIMUM STRENGTH:** use the original valves on both inlet and exhaust. These are smaller and allow you to strengthen your repair by using a smaller outside diameter seat. There may be some risk of pinking but you can reduce this by flowing the exhaust ports to remove all casting obstructions. The three-angle seat (diagram 5) will also help.

Remember to recalibrate your carburettors to suit the higher flow characteristics of the improved throat and three-angle seat.

If you have done the job right, you will need to revise the mixture via the slide and needle jet. If you can get it tested on a dealer's rolling road to get the carburation spot-on you will find it money well spent. ■



Top torque tips

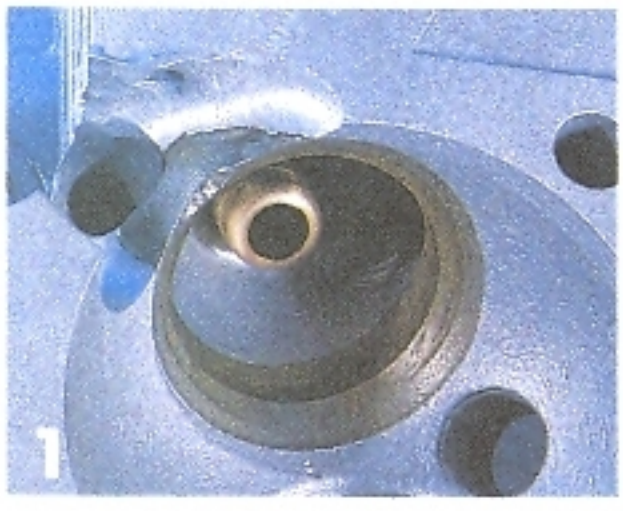
Eight-stud head:	23lb-ft
Nine and ten-stud head:	3/8in bolts 25lb-ft
	5/16in bolt 23lb-ft

Tighten bolts/studs down in recommended sequence. Consult a specialist if you are uncertain. Torque down head again after ten miles, then after 50,150, 500 and 1000 miles. Engine must be cold when resetting/checking. Remember to readjust the valve clearances each time.

Benefits to your machine

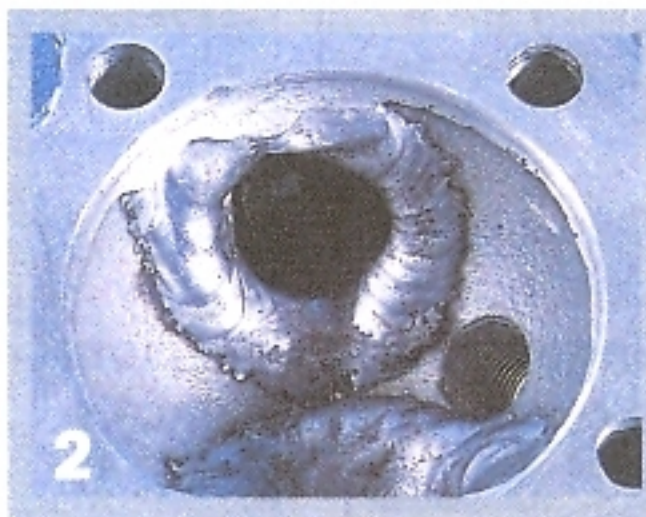
1. Cylinder head far stronger than new
2. Faster
3. More fuel efficient
4. Will run on any fuel including LPG (liquid petroleum gas)
5. Lead-free seats will not rust if left standing because of their material content
6. Lead-free seats will retain their sealing quality for longer because of their hardness
7. Improved port/throat and seat angle give marked low and mid-range power increase
8. Cheaper to run
9. Fun to ride factor improved enormously
10. Resale value/appeal improved. However, initial cost could outweigh gains if the bike is hardly used

How to repair

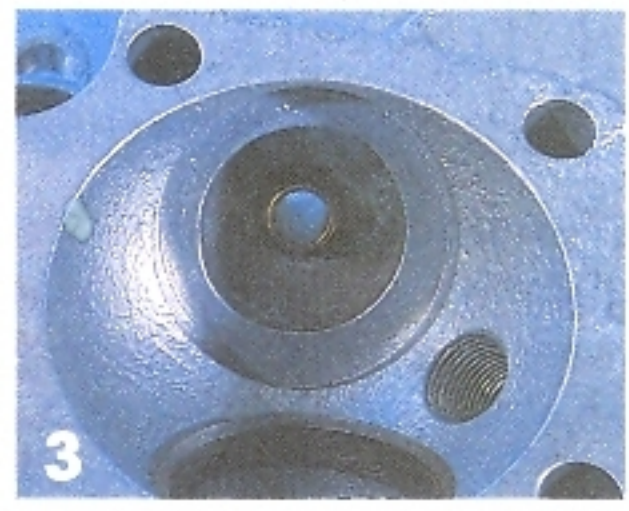


Machine or grind out all four cast-in seats. Remove all traces completely. Do all four seats even if they are not all cracked because the heat of welding can tip the balance on those that are borderline

Prepare cracks for welding by cutting as far as possible into the crack with a carbide or HSS cutter. Don't use a stone cutter because it can contaminate the alloy in some cases. Vapour blast or bead blast or chemically clean all areas to be welded.



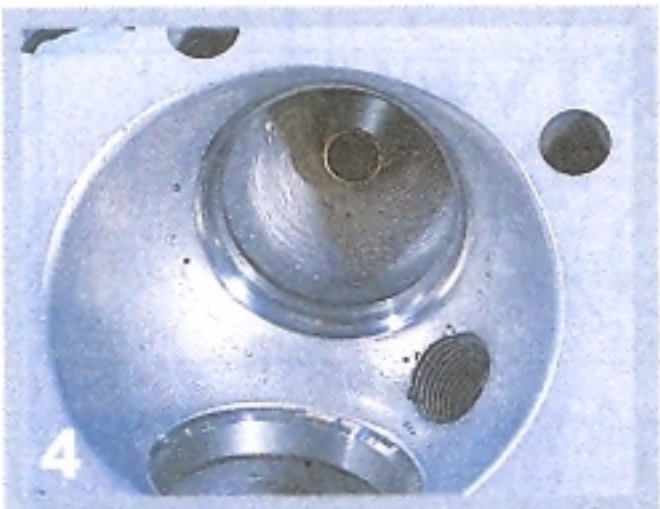
Fill up completely the entire seat housing. At this point you can also replace alloy that has been cut away during previous seat cutting operations and even build up the gasket face to its original height. To obtain a high flowing profile on the inlet port ensure that you not only fill up the seat housing, but weld into the port approx 5mm further than the original seat bottom and decrease the port diameter at the point by 5mm or more.



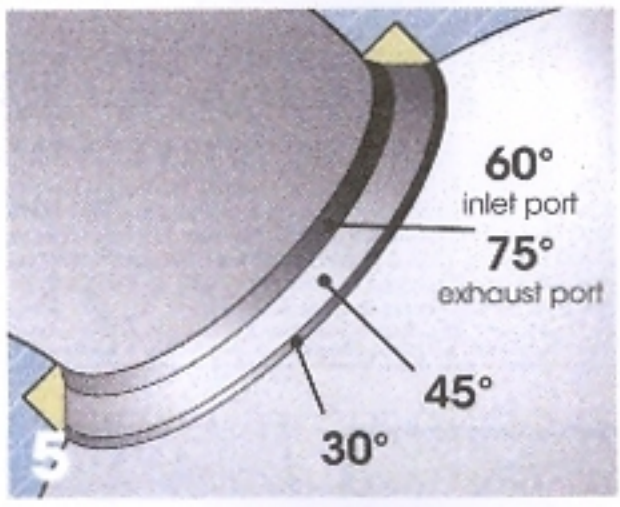
Reshape the hemispherical chambers to their original profile. Rebore bolt hole housings and reshape around pushrod tube housings if any weld has spilt over, otherwise the pushrod tube will be obstructed.

Counterbore each seat housing to a maximum depth of 8mm and to a measured interference fit of a minimum of 0.0035in and a maximum of 0.0045in. Choose a lead-free material seat of 1.5mm - 3mm bigger than the valve you are using.

Crack between exhaust valve seat and stud has been machined away (left) ready for welding. Crack in other chamber waiting to be done



Heat cylinder head to 220 degrees Centigrade and freeze insert if possible. If not, coat with Vaseline prior to inserting into the housing. It is an important part of the fitting process to have a good piloted mandrel to fit the seat.



Cut top of seat using 30-degree cutter and blend to combustion chamber. Cut three-angled seat (it is assumed your valve guides are unworn) to following specifications for street use. Inlet seat: cut 30-degree top, 45-degree seat (min width 0.030in, max 0.060in) 65-degree throat (min 8mm deep). Exhaust seat: 30-degree top, 45-degree seat (min width 0.040in, max 0.075in) 75-degree throat (minimum 8mm deep). Blend excess weld from bottom of throat to original port shape. Take great care not to touch 45-degree seat face. Skim and shape head face to obtain flat surface. Make sure that the welding process has not warped top of head (rocker box gasket faces). Skim if necessary.

Tips on fitting the head

Fit the completed head onto the barrel with head gasket and pushrod tubes in place. Mix and match pushrod seals/O-rings to obtain a minimum gap of 1/6in and a maximum gap of 1/8in equally at the front and back of head joint. This will give you a leak-free top end provided your pushrod tube flanges are straight. Smear a fine film of good quality instant gasket onto both sides of your head gasket. Put a smear of graphite grease under headbolt washers and on the shank but not on the thread of the headbolt.

■ Len Paterson has extensive experience working on all types of engines and Triumph in particular. A specialist in lead-free conversions he owns the Cylinder Head Shop, 28-30 Broadway Court, Wimbledon SW19 1RG. Tel 0208 946 2434. Fax 0208 879 3833.