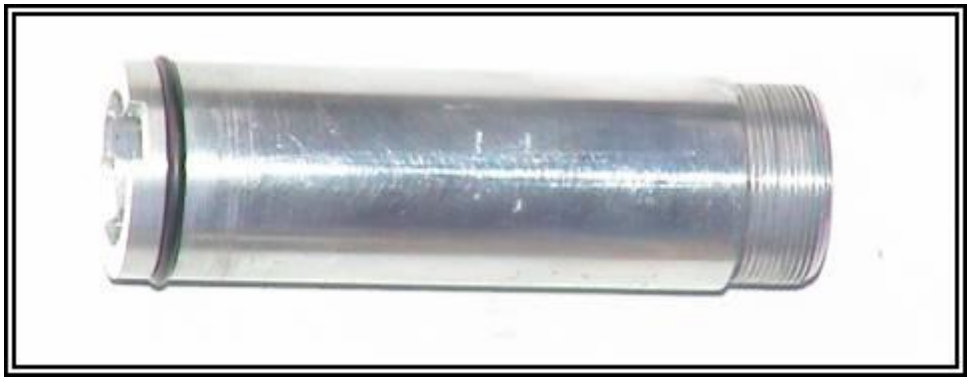
Standard Vanguard 2000 engine pushrod-tube conversion
by Paul Alting van Geusau

Most owners of the Triumph Roadster 2000 model know of, or have encountered themselves, oil leakage at the push rod tubes. This leakage, even when small, immediately gives a messy appearance and, because it drips down from the top of the engine, soon soils the whole engine.

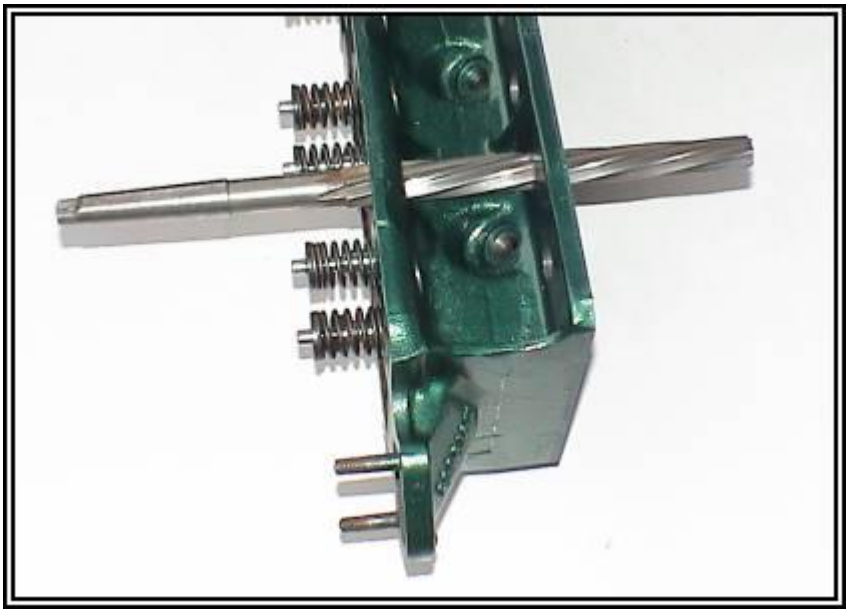
Cause of the leakage and known repair methods
The tubes are mounted in bores in the head and are held in place by their ends being radially and conically expanded. In principle, expanding of tube ends is a quite reliable manner to seal a tube to a bore; in fact most steam boilers are manufactured in this way. Therefore one would expect such a proven technique to be fully sufficient to prevent oil leakage for a low stressed component such as a push rod tube. However, the fact is that, probably due to insufficient thickness of the tubes, expanding of the pushrod tubes in the Triumph engine cannot guarantee that after many years of use the sealing surfaces stay tight. Of course new tubes can be installed but not only is it difficult to find a competent mechanic with the appropriate tool, the risk of leaking remains.
When looking for a solution, a search on the internet revealed that this problem is well known and a suggested solution for the very similar TR engines is to press lengths of standard size aluminium tubes into the bores, the latter being reamed to an undersize of the tube.
However, I doubt that this really solves the problem considering that when a tube is pressed into top and bottom bores of equal diameter there is a high risk of scoring the tubes. Furthermore the different expansion coefficients of the cast iron head and aluminium tubing means that the tubes tend to move in the bores, which in the end cannot guarantee oil tightness.
Another source suggested the use of a sealing compound, but although some sealing compounds give very good results, success largely depends on the circumstances of application and cannot be guaranteed for all applications.

Conversion proposed
It was decided to use aluminium tubing because of its easy availability and appearance, but to develop a more reliable mechanical solution, and preferably one with the option of replacement without being obliged to take the cylinder head off the engine.
Such objects are fulfilled by a tube having a screw thread at its bottom end and an O-ring sealing arrangement at its top. Sealing being assured by the O-ring, different expansion of head and tube does not matter: the O-ring can move in its bore without loosing its sealing capacity. The cylinderhead normally does not get hotter than 100 degrees Celsius so life of the O-ring is not negatively affected.
Standard 20 x 3 mm aluminium tubing was used. A ¾ inch x 32 tpi (about 19 mm outer diameter) screwthread was cut at one end and the other end was provided with a groove for the 20x2mm O-ring and a slit for engaging a tool for screwing the tube into the head (pic.1). The length of the tube must be carefully chosen so that when it is fully screwed into the head the O-ring is about halfway down the cylindrical part of the top bore. A small lathe is necessary to machine the tube.

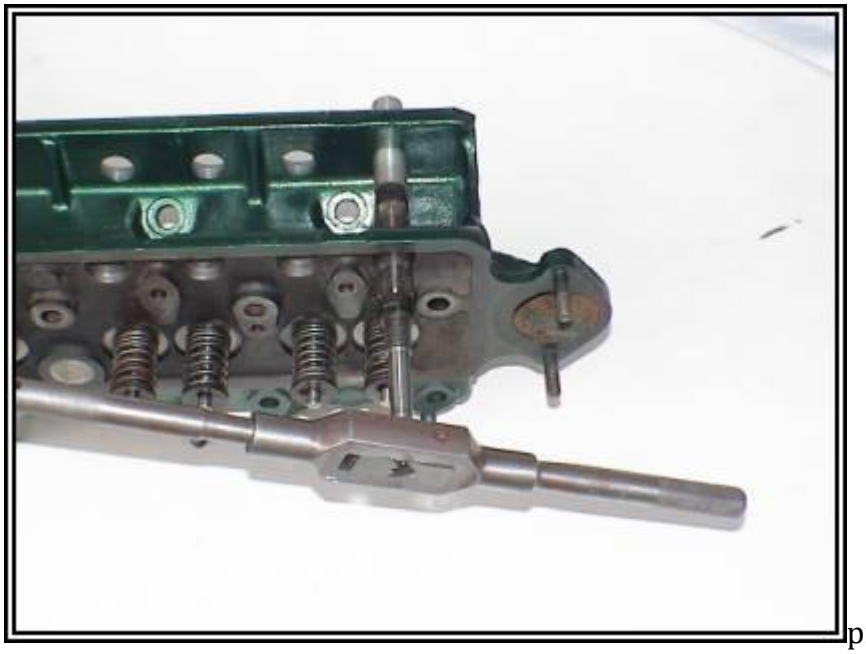

pic.1

The steps involved in the conversion are as follows:

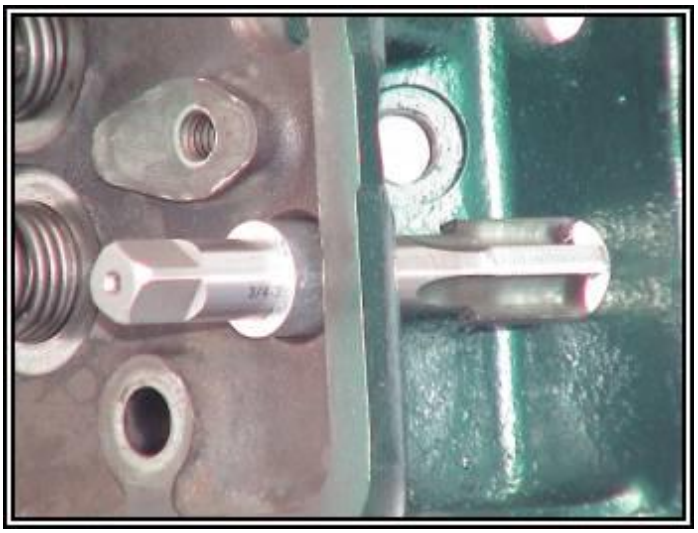
Since the top bore (about 19 mm diameter) is of larger diameter than the bottom bore (about 17mm diameter) a long conical reamer is used to enlarge the bottom bore to the size (about 18 mm) necessary for cutting a ¾ inch x 32 tpi thread (pic.2). This ensures that the two bores remain in-line.

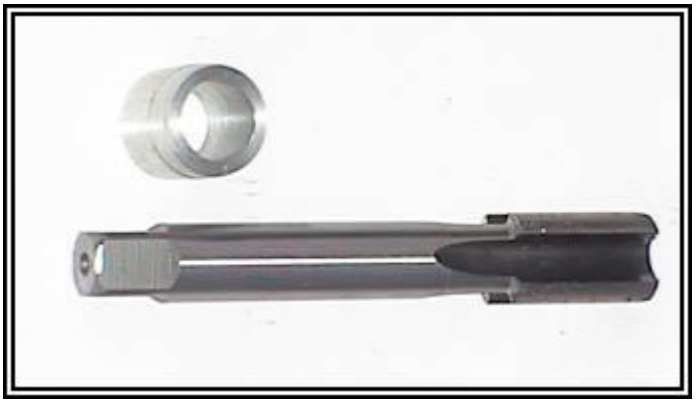

pic.2

When the lower bore has the appropriate size the top bore is reamed further to provide a sliding fit with the 20 mm tube and O-ring, using a standard cylindrical reamer with a pilot. Again, the two bores remain perfectly in-line (pic.3).


pic.3

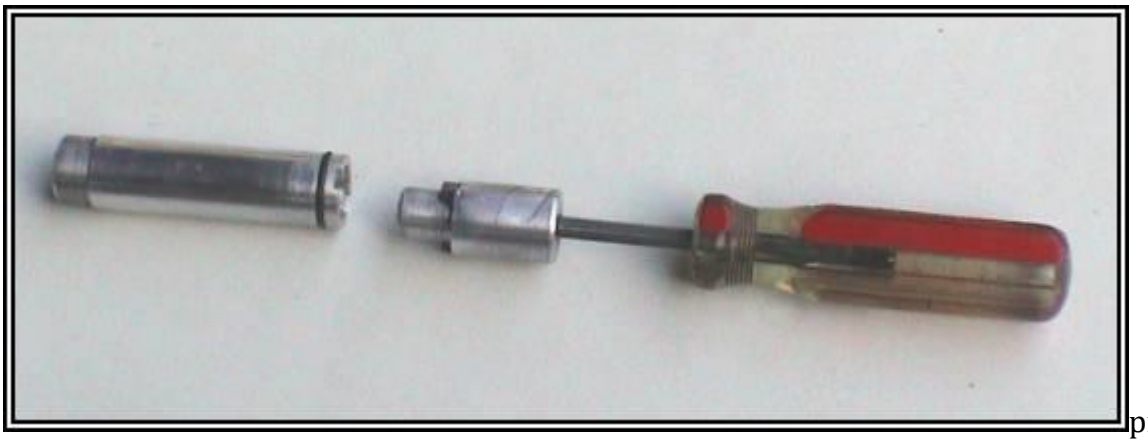
Next step is the cutting of the screw-thread in the bottom bore. For this step lining-up of the lower (threaded) bore and top (plain) bore has to be ensured by using a sleeve (to be machined on a lathe) to guide the tap (pics.4 and 5).

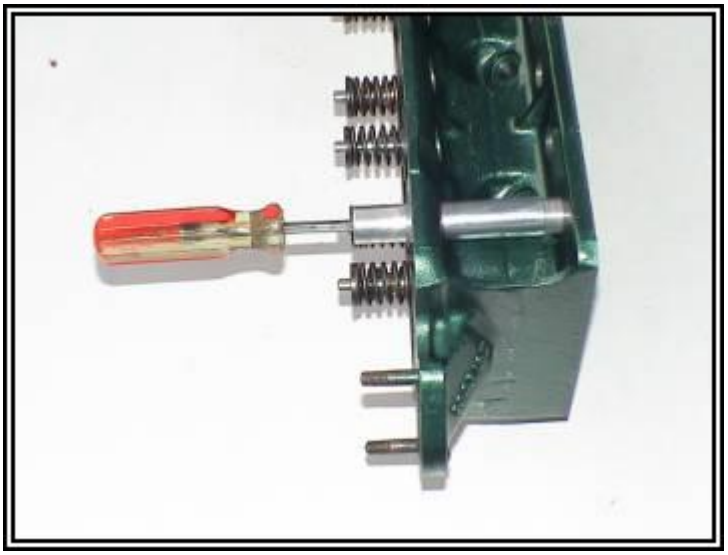

pic.4

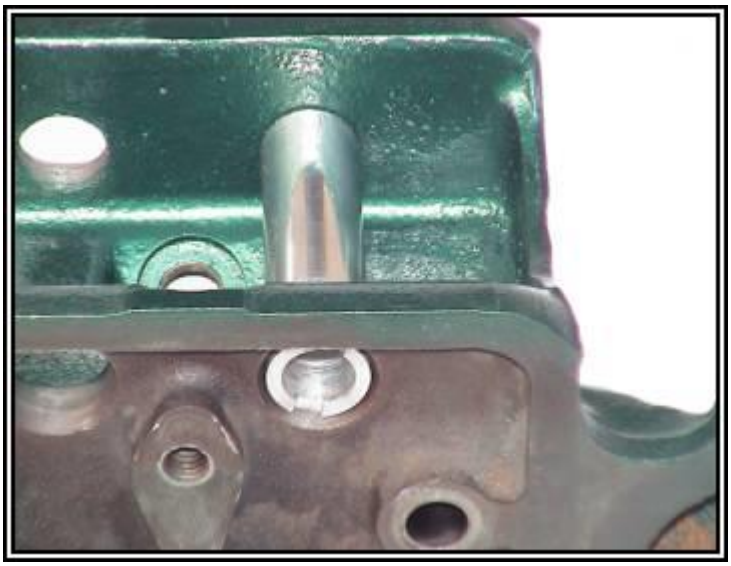

pic.5

Now the tubes can be screwed into the bores. A simple tool was made to facilitate this task (pics.6, 7 and 8). Some sealing fluid on the thread ensures also absolute tightness at

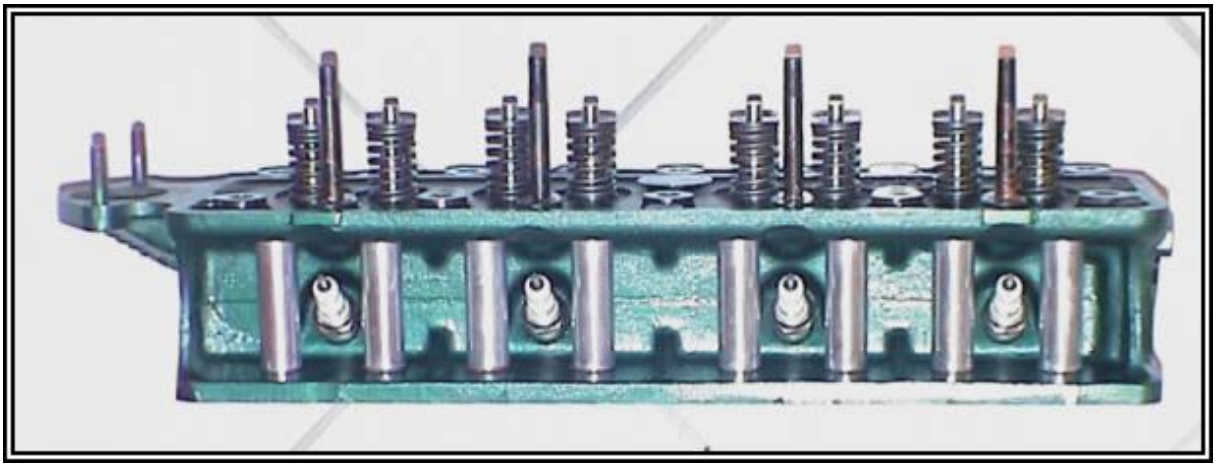
the lower part of the tube but, because of the fine thread chosen, this is not really necessary.


pic.6


pic.7


pic.8

Picture 9 shows the cylinderhead with all the tubes installed!



pic.9

- **Where to obtain the tools?**

The tools can be ordered for a very reasonable price from:

Tracy Tools Ltd
2 Mayors Avenue
Dartmouth
Devon TQ6 9NF

Tel: (01803) 833134 Fax: (01803) 834588
See also their home page on the internet: www.TracyTool.com