



# STEERING

By John Thomason



www.tssc.org.uk/spitfire1500

# TRIUMPH Spitfire IV/1500 Register



This month's photo was sent in by Mike Hadley from Devon who sent in some nice period information with his IVR for his Valencia Blue Spitfire MKIV. Mike's car is one of the earliest cars on the database, which Mike bought new in December 1970 from S Hicks and Son Ltd., the Standard Triumph dealer in Truro. Mike still has the original bill of sale and the old style logbook as shown here. The other photo shows the old showroom and garages of S Hicks and Son as they are today. Apparently the circular corner elevation was a show area for the latest Triumph model. Mike recalls that his car never made it into the show area as he bought as soon as it arrived! Today the car has 163,000 miles on the clock and is currently undergoing a rebuild to restore it to its former glory.



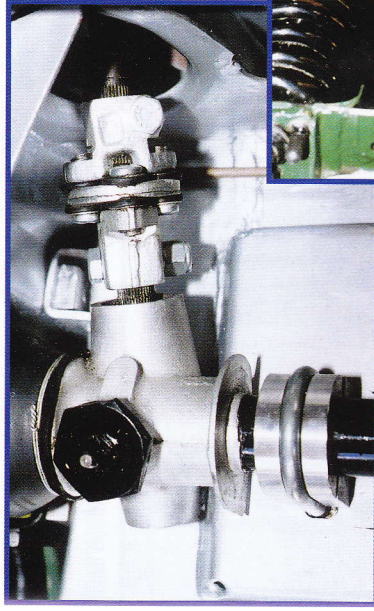
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# RACKS

## Steering

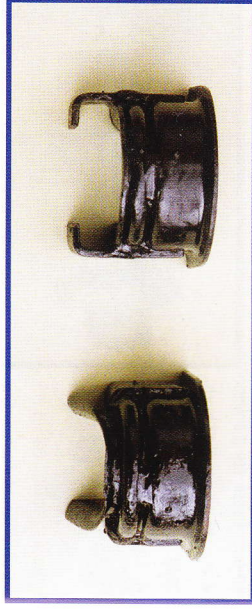
I recently had cause to rebuild a steering rack for my race car and not having covered it before in The Courier I thought a few notes may be of interest.

Sloppy steering can be an MOT failure, but before blaming it on the steering rack



**Fig 1 Solid rack mounts and steering coupling. On early cars, ensure that there is an earth lead between the 2 pinch bolts and another from the grease nipple to the chassis, otherwise the horn won't work**  
a couple other culprits could be to blame. Worn rubber steering rack mounting bushes, especially if softened by years of oil dripping onto them from the timing cover oil seal, can allow the whole rack to move sideways.

Solid Aluminium rack mounts Fig 1 are now very



**Fig 2 Two types of rack mounting brackets were used.**  
common and can return a lot of precision to the steering. Alternatively, if you wish to avoid some of the harshness of the aluminium mounts, the more modern

Polybush/Superflex mounts are available which are also impervious to oil contamination. On the subject of mounts, two types of bracket were used Fig 2. Any ideas why? - crash? - better support?

Another favourite is the steering coupling, in which again the small rubber bushes can suffer from oil contamination, leading to terrible backlash in the steering. Originally these bushes could be replaced but now the coupling is sold as a throw-away unit. Those little rubber bushes do a lot of hard work, especially on the heavier cars such as the Herald and six cylinder



**Fig 3 Check for wear in the bush in the end of the rack tube.**

cars, so be wary of cheap items in which I have known the rubber only last 6 months

Replacement of the standard item with a solid UJ taken from a Triumph 2000 is also possible, but this does remove any 'give' and any margin for misalignment from the system. Ideally solid UJs such as these should be used in pairs. Finally check for wear in the track rod end ball joints.

Before removing the rack from the car for

repair, apply full LH lock. Then grasping the rack at the inner ball joint Fig 3, try and lift the rack up and down. Any movement indicates wear in the bush in the end of the rack tube. It's easier to check for wear here whilst the rack is still on the car.

Removing the rack from the car is fairly straightforward provided you can split the track rod ball joints. A method I was shown whilst on the Peking to Paris Rally never fails. Whilst applying a lever (a trolley jack handle is ideal) between the track rod end and the steering arm, strike the end of the steering arm where the ball joint seats, sharply with a hammer. No more than 2 or 3 strikes and the ball joint will release. Make sure you hit the steering arm and not the edge of the brake disc though!

Before dismantling clean off all the years of oil and crud - you don't want it getting inside the rack and pinion. You will also need two 15/16" spanners and lots of rag - as soon as those gaiters come off, grease will get everywhere! Before removing the track rod ball joints and gaiters, make a note of the length of the track rod thread beyond the lock nut. During the rebuild if the lock nut is put back to this position and the same ball joints are used, then the original tracking should not be too far out of alignment.

There are three adjustments you can make to the rack.

### 1. Pinion End Float.

With the rack held in a vice grab the end of the pinion and try and pull it in and out. There should only be the tiniest of movement. Any more and shims need to be added.

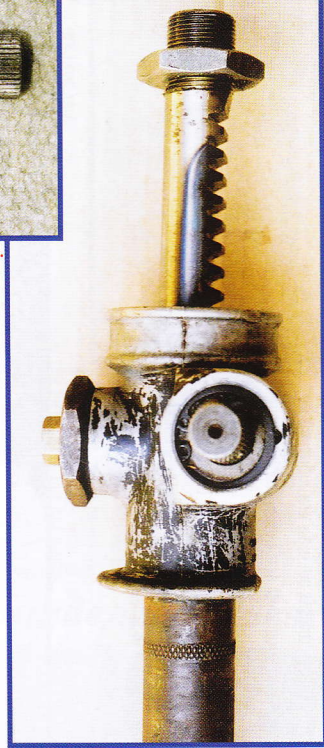


Fig 4. Circlip that holds the pinion in place) The pinion is removed by first removing the circlip Fig 4. Be very careful not to lose the small dowel pin as you withdraw the pinion.

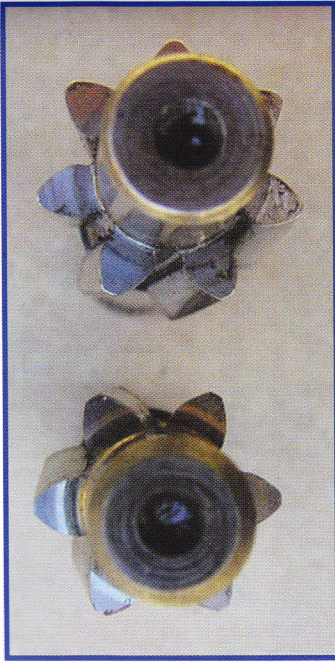


Fig 5. 4-cylinder cars use 6 tooth pinions, 6-cylinder cars have 7 tooth pinions.

Two types of pinion were fitted to 'our' cars. Fig 5. The 6 tooth pinion was fitted to the 4-cylinder cars to give them a 'faster' rack compared to the 7 tooth pinion of the 6-cylinder cars, which due to the extra weight of the 6-cylinder over the front wheels had a

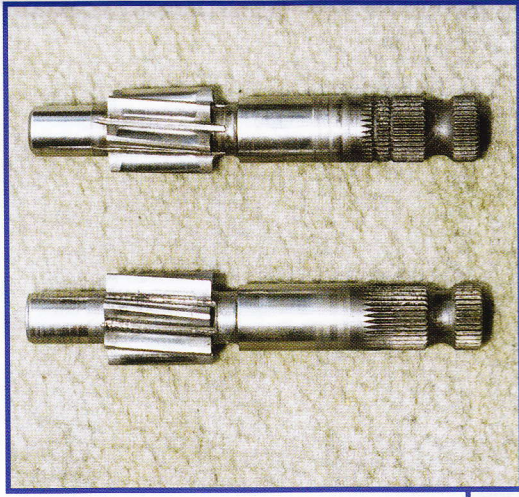


Fig 6. Grooves in the end of the pinion denote its intended use on a 6-cylinder car.

'slower' rack' to reduce steering effort. Hopefully, you have the correct rack fitted - there used to be a fear that you may get the wrong ratio back when exchanging units. A quick way of determining which is which without going through the process of counting the number turns from stop to stop, is to look at the end of the end of the pinion. A 6-cylinder rack will have 2 grooves in it, a 4-cylinder one,

none. Fig 6. All the other parts of the steering rack, including the rack were identical between the cars.

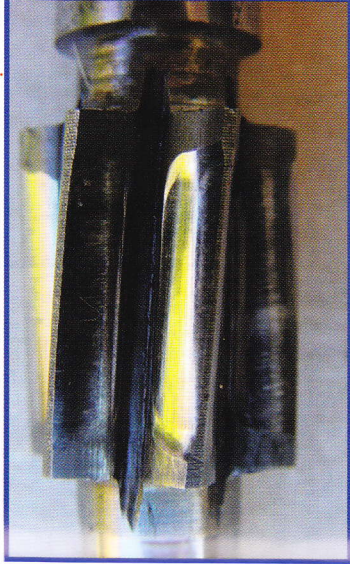


Fig 7. Excessive wear in the pinion.

Check the pinion for wear. It shouldn't look like Fig.7. This was taken from a Vitesse, the much lighter Spitfires are not usually as bad as this.

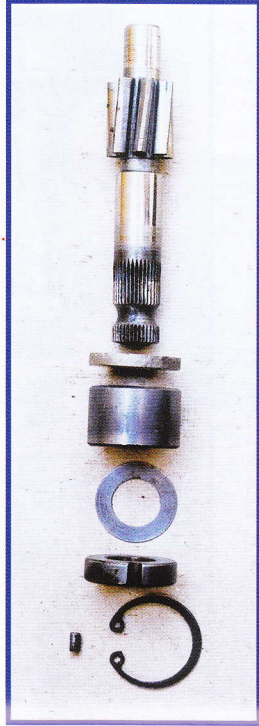


Fig 8. From left to right: circlip, dowel pin, retaining ring, shim, bush, thrust washer, pinion.

Fig 8 shows the correct sequence of components to be assembled. One end of the bush has a small groove in it to allow lubrication of the thrust washer. The retaining ring has an 'O' ring hidden away inside it to prevent the escape of grease every time you grease the rack. Insert shims as necessary, each time



Fig 9 From left to right: grease plug, cap nut, shim, spring, and plunger assembling to the housing, until you can only just detect pinion movement. Any movement is easier to detect if no

grease is used at this stage. Check the movement at various positions along the rack - most wear and hence clearance occurs at a point on the rack corresponding to just either side of straight ahead.

### 2. Pinion Back Lash

This is adjusted by the pinion plunger. A large 1 5/16" spanner is needed to remove the large cap nut. Fig 9 shows the components involved. In this case shims have to be removed to achieve the correct adjustment;

which is specified as a load of 2lbs applied at a radius of 7.9" being able to just rotate the pinion. With the rack in a vice, a pair of medium-sized mole grips gently clamped (not to damage the splines) to the pinion can be used. If the weight of the mole grips when horizontal, can rotate the pinion, then more shims need to be removed. If no more than light finger pressure on the end of the mole grips is required, then the adjustment is about right. Again

check at various points along the rack, but aim for the ideal at the point equivalent to straight ahead where wear is greatest. You will soon get to feel where this point is from the wear.

With the rack off the car, the chances are that the track rods are very loose not even being able to support their own weight. This is where you need the two big 1 5/16 spanners. Knock up the lab washer, and if you can get away with it, try and just undo the cup nut from the rack, leaving the sleeve nut locked to the lock nut on the rack. The only reason I say this, is that otherwise it can be difficult to rigidly hold the rack without causing damage, whilst re-tightening the sleeve nut during reassembly.

### 3. Tie Rod Inner Ball Joint.

Fig 10(overleaf) shows the parts involved in the adjustment of the inner ball joint end play (NB in this case the sleeve nut was removed from the rack). Two cups are shown, on early racks the cups were steel, later racks using plastic cups. Note also that the spring is not used at this stage. Removing shims will reduce the endplay. Assemble the component, ensuring that the cup nut and sleeve nut are tight together and then with the cup nut held in a vice try and articulate the end of the track rod. The official figure is a load of 1lb should move the end of the track rod. In practice it should be just a little stiff to move. However, make sure that the

cup, it soon frees up again. When happy tighten the lock nut and knock over the tab washer.

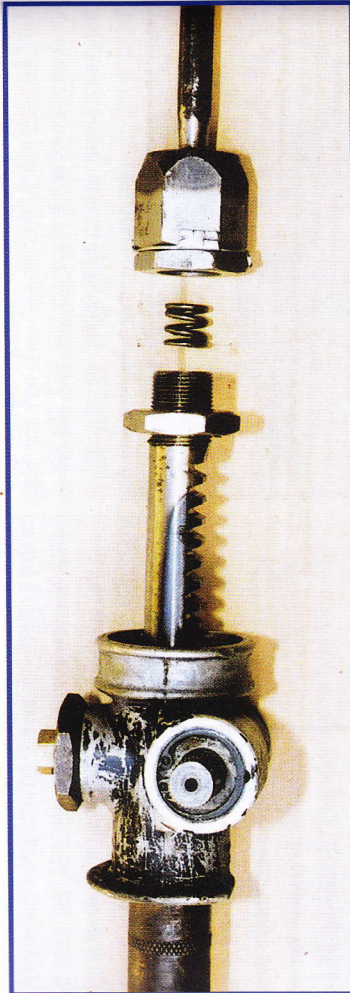
With adjustment complete, all that's left to do is refit the gaiters, but before doing so work as much grease as possible into the rack as possible, especially on the LH end, furthest away from the grease nipple. With the

gaiter in place, before finally securing it in place, insert a grease gun under the gaiter and squirt a few pumps of grease into the gaiter. With regard to securing the gaiter, most replacement



**Fig 10** From left to right: sleeve nut, tab washer, shim, cup (steel or plastic), track rod, cup nut

components are all well greased as a bit of friction in the ball joint and cup can give a false impression.



**Fig 11** (photo 5) Inner ball joint assembly ready for fitment to rack. NB spring.

Once happy with the adjustment, assemble the components back onto the end of the rack as in Fig 11. Don't forget to refit the spring at this stage. As the ball joint assembly is tightened onto the end of the rack, the spring will make the track rod become a lot stiffer.



**Fig 12** Locating hole for nylon button  
With a little use and as more grease is worked into the ball and

**Fig 13.** An irritating rattle which sometimes occurred in the rack-and-pinion steering was cured by the very simple expedient of drilling the rack tube and inserting a Nylon Button at the mounting point where resiliency of the rubber provided sufficient pressure to take up any play in the rack.

## Play in the Rack

### A point to ponder:

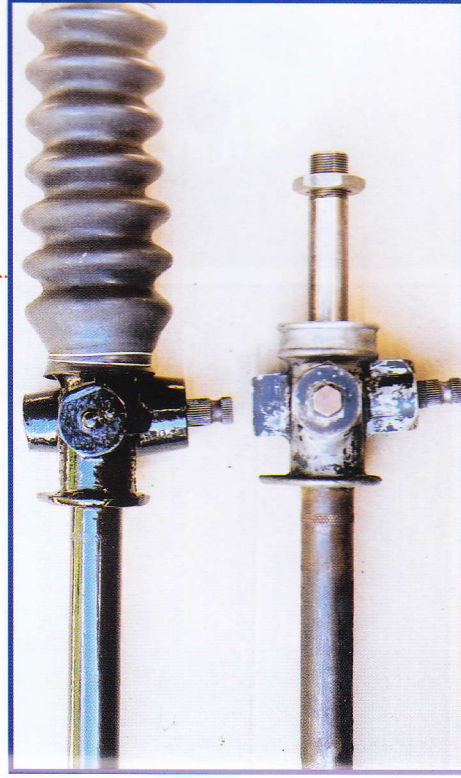
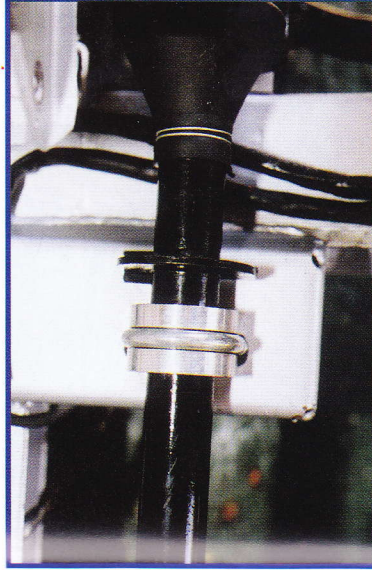
Having completed the rack, a friend of mine asked why I had spent time rebuilding the rack when I could have bought a reconditioned one for about £50. Had I done it to save £50 - well yes, but certainly not my time, or had I done it because I enjoy it - well partly - apart from getting covered in grease!

It did get me thinking though.

When I bought my first Spitfire as a student, I used to rebuild everything because the cars were simple and so easy to work on, and because I didn't have any money! Certainly in those days The Courier was full of articles

on how to rebuild this or that. Today there are certainly far more traders offering reconditioned parts at cheaper prices, and possibly the membership is older now with more money to spend. Certainly priorities change and time is precious and so I wonder then if the current trend is towards buying replacement parts. It's obviously better to spend the time saved

in place by the mount **Fig 14** Below



**Fig 15** shows 2 types of pinion housing that were used.

Any ideas why - different suppliers?

enjoying the car on the road rather than working in the garage - unless you enjoy tinkering!

even if you have lost the button you don't want dirt getting into the rack and if you use aluminium rack mounts it will not be held