

STEERING

SERVICE INSTRUCTION LEAFLET

ISSUED BY
BENTLEY MOTORS (1931) LTD.



BM/N 1

SB/VA. 1/SF.

Subject: TO FIT A NEW CROSS STEERING TUBE - BENTLEY
3 $\frac{1}{2}$ or 4 $\frac{1}{4}$ litre.

Date of Issue 28th March, 1949.

GENERAL:

New cross steering tubes, G-100438a, are supplied with one end piece, G-100439, unbrazed to the tube because there is usually a variation in the width between the ball end pin centres of the cross steering levers from one chassis to another.

CAUTION:

It is of the utmost importance that no attempt must be made to weld the loose end piece to the tube or braze it with the use of an oxy-acetylene welding plant. The tube and end piece are made from 3 $\frac{1}{2}$ % nickel steel, and this is susceptible to burning and crystallization, the loose end piece must therefore be brazed to the tube by using a coal gas flame or a large paraffin blow lamp.

PARTS NORMALLY SUPPLIED:

<u>Part No:</u>	<u>Title:</u>	<u>No.Off:</u>	<u>Part No:</u>	<u>Title:</u>	<u>No. Off:</u>
G100438a	Cross steering tube.	1	K4819	Taper Pins	2
G100439	End piece(loose)	1	K4602	Split Pins	6
(G100431	Cotter pin	2	(K4608	Split pins	2
(In case the original ones are damaged during removal.			(For ball end pins.		

TO FIT A NEW CROSS STEERING TUBE:

- (i) Remove the cross steering tube complete with ball end pins from the car and collect the locating washer fitted to the underside of each cross steering lever.
- (ii) Slacken off the steering joint nut (9, Fig.1), of the original tube from one to two flats and remove the two clamping bolts from the end of the tube and then carefully remove the tapered cotter pin (5) situated between the clamping bolts.
- (iii) Unscrew the steering joint nut from the sleeve (12) and remove all parts from the end of the tube taking care to note the position of any packing washers (shims) that may be found to be fitted. Slide or lightly tap the steering joint nut down the tube which will expose the retaining ring (3) fitted beneath it. Remove the retaining ring and the nut. Repeat for the opposite side of the tube. Keep right-hand and left-hand parts removed in separate containers and thoroughly clean all parts.
- (iv) The next operation is to assemble all the parts removed (with the exception of the cotter pins) from the original tube to the new tube and loose end piece in order to set a gap of .008" to .015", (as shown at point 'A' Fig.1), at each end of the tube as described below and then drill and ream the tube to take the tapered cotter pins also described below.

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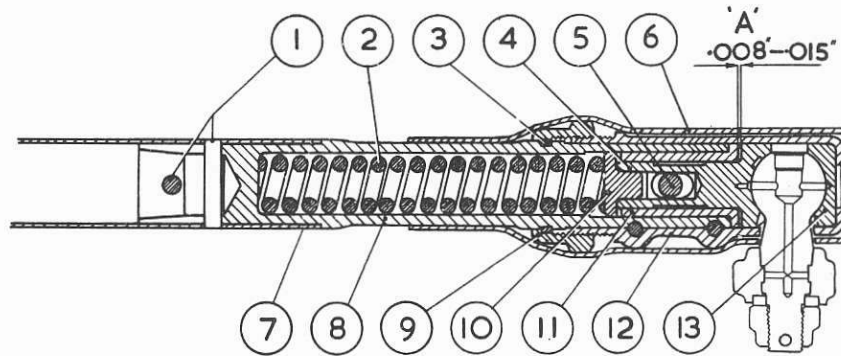


FIG. 1. SECTION THROUGH CROSS STEERING TUBE JOINT.

- | | |
|----------------------------------|------------------------------|
| 1. Taper Pins. | 8 . Cross steering tube end. |
| 2. Spring. | 9 . Nut. |
| 3. Retaining ring. | 10. Plunger. |
| 4. Ball pad-inner. | 11. Bush-ball pad. |
| 5. Cotter pin. | 12. Sleeve-steering joint. |
| 6. Leather cover-steering joint. | 13. Ball pad - outer. |
| 7. Cross steering tube. | |

- a) Place one of the steering joint nuts (9) on the tube or the loose end piece and then fit the retaining ring (3) in the groove provided.
- b) Place the spring (2) into the tube and assemble to the tube the remainder of the parts (including any packing washer/s should they have originally been fitted) in their proper sequence (See Fig.1) including the ball pin.

NOTE: When assembling the steel bush (11) to the tube, it must be placed (rotationally) so that the hole in it will be in line with the cotter pin holes in the sleeve (12) in order to allow a clear passage when drilling the tube to take the cotter pin.

With the outer ball pad (13) in position in the sleeve, slide the sleeve into position on the tube. Engage the threads of the steering joint nut with those of the sleeve and screw up the nut until there is a gap of .008" to .015" at point 'A' Fig.1.i.e., between the rear face of the inner ball pad (4) and the corresponding face of the steel bush (11) into which the ball pad is fitted. This clearance is necessary so that the spring can operate freely. Having obtained the correct gap, then fit the two clamping bolts in position and tighten up the nuts but do not split pin them at this stage. The heads of the bolts must be fitted in the location provided on the sleeve.

- (c) Repeat for the opposite end of the tube.

NOTE: The 2-BA nuts of the clamping bolts have a spherical seating, whereas the nuts for the cotter pins are standard.

- (d) From the cotter pin holes in the sleeve, mark off the tube and drill two holes i.e. one on either side of the tube to take the cotter pin. Drill one hole .281" dia. (9/32") and the other .218" (7/32"), and finally ream with a 1 in 20 taper, broach or reamer to allow $\frac{1}{8}$ " draw on the tapered cotter pin. Fit the cotter pin. (See "Note" below).

Continued:

- (e) Repeat for the opposite side of the tube.

NOTE: The nuts of the clamping bolts at the brazed end of the tube should now be checked for tightness and then split pinned, also tighten up the nut of the cotter pin and secure with a split pin. Ascertain that the steering joint nut is tight, but it should not be overtightened.

Tighten up the nut of the cotter pin in the loose end of the tube, but do not split pin the three 2-BA nuts at this stage because all parts on the loose end piece will have to be removed prior to the brazing operation.

- (v) The next operation is to temporarily fit the cross steering tube to the car in order to adjust the tube for correct length to give a toe-in of $\frac{1}{8}$ " to the front wheels. Proceed as follows:-
 - (a) Jack up the front of the car until the tyres only make light contact with the ground.
 - (b) With the nuts of the cotter pins facing towards the front of the car, temporarily fit the cross steering tube. The locating washer as fitted to the underside of each of the cross steering levers must be correctly positioned. The castellated nut of the ball end pins need not be fully tightened up at this stage.
 - (c) Check the toe-in of the front wheels. It is usually found when fitting a new cross steering tube that there is too much toe-in. If the toe-in exceeds $\frac{1}{8}$ ", then it will be necessary to shorten the end of the tube by degrees until the correct amount of toe-in has been obtained.

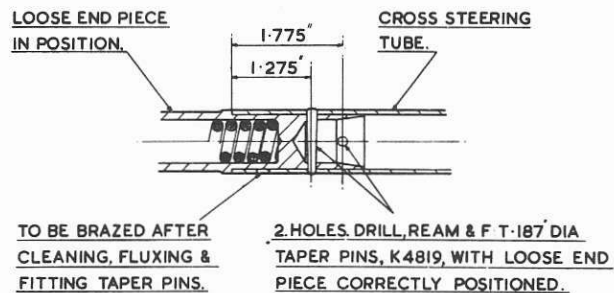


FIG. 2.

- (vi) Having adjusted (filed) the tube to correct length, remove all parts from the loose end piece of the tube including the steering joint nut and its retaining ring and peg and braze the loose end piece to the tube as follows:-
 - (a) Thoroughly clean the inside of the tube and the loose end piece and apply flux as necessary to both parts and then insert the end piece into the tube as far as it will go and rotate until the two grooves in it for the clamping bolts are in line (parallel) with the two similar grooves on the opposite end of the tube. With the end piece in this position, drill and ream

Continued:

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for the two taper pins (K4819) as detailed on Fig. 2, (the taper pins have a taper of 1 in 48 on dia:) and braze the end piece to the tube using a coal gas flame or a large paraffin blow lamp.

NOTE: A feeder hole, .160" dia. is drilled in the tube for brazing purposes. Do not drill through this hole into the end piece.

- (b) Finish off ends of taper pins flush with tube after brazing and clean up tube as necessary.

- (vii) Place the steering joint nut (9) in position on the tube and refit its retaining ring (3). Re-assemble all remaining parts to the tube and split pin the three 2-BA nuts and check the steering joint nut for tightness.

- (viii) Fit the tube to the car (with nuts of cotter pins facing to front of car), again making sure that the locating washers as fitted beneath the cross steering levers have been correctly positioned. Fully tighten up the two castellated nuts of the ball end pins and secure with the new split pins (K4608) supplied. Refit the leather covers.

FRICION (LOAD) TEST:

The friction of the cross steering tube should be tested by clipping a 10" lever to the centre of the tube to determine the load required to twist the tube on the ball pins. This load should be from 8 to 9-lbs. applied to the end of the lever at a 10" radius. The load should be equally divided per ball pin i.e. 4 to 4½-lbs. on each pin. If it is found that there is insufficient load, then make a packing washer or washers .010" thick and fit behind the spring/s. If the load is found to be too high, then remove any packing washers that may have been fitted originally; if none have been fitted, then reduce the large (inner) face of the steel plunger (10) by .005" at a time.

Finally inspect that no split pins have been omitted.