



STEERING





SECTION Q.

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THE STEERING COLUMN AND BOX.

STEERING.

The steering is of the cam and roller type. A double toothed follower roller mounted in the jaws of the rocking shaft, engages with the cam. The cam portion takes the form of a modified worm gear. All working parts are carried in anti-friction bearings and are immersed in oil.

TO REMOVE STEERING COLUMN AND BOX.

- (i) Slacken off Jubilee clip securing the air silencer to the air intake. Remove the two nuts and spring washers securing air silencer to inlet manifold, and remove air silencer.
- (ii) Disconnect throttle control rod, (D, Fig.1) from lever (A) of the throttle connecting shaft.
- (iii) Remove bell-crank control lever (F) from its anchorage on the air intake casting by removing the nut and washers. Collect bush.

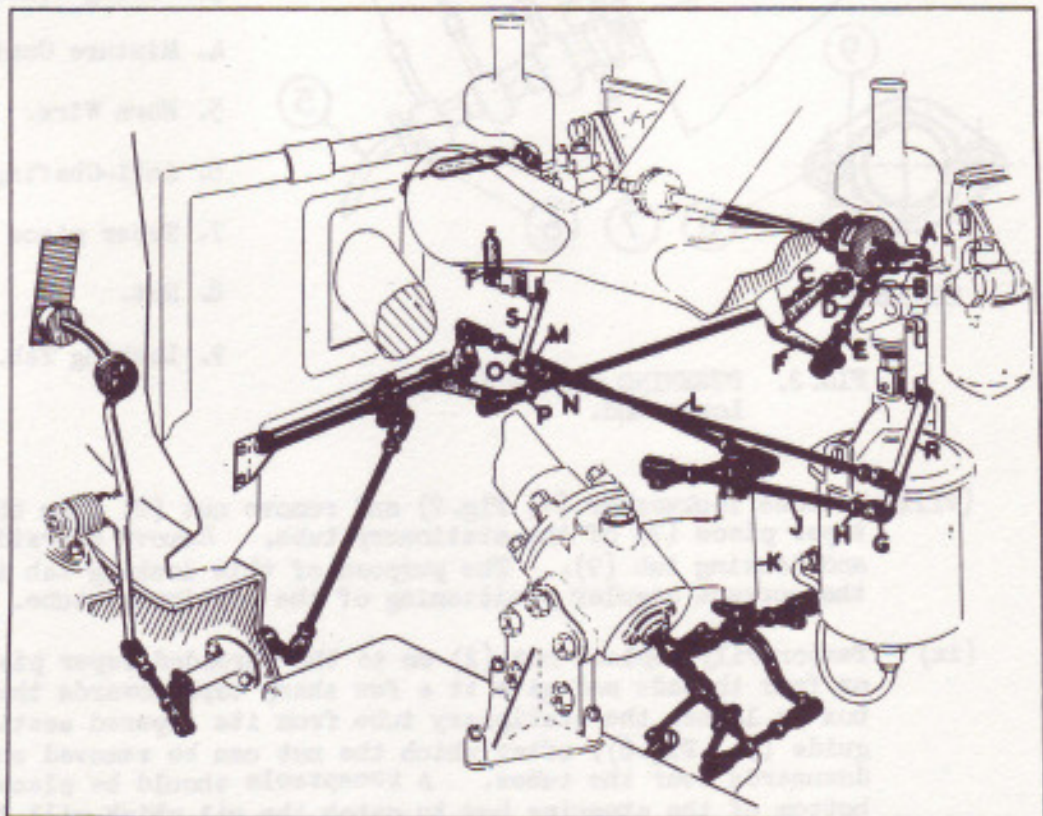


FIG. 1. CONTROL LEVERS AND RODS.



- (iv) Remove pin (G) from the jaw of the mixture control rod.
- (v) Disconnect petrol feed pipe from carburettors by removing the two banjo bolts complete with the C & A washers. Temporarily replace banjo bolts and washers in the float chamber covers, to retain the petrol filters.
- (vi) Remove the four nuts and spring washers securing carburettors to induction pipe, and remove carburettors.
- (vii) With the master switch on the instrument panel switched off, remove clip fastening the horn wire (5, Fig.2), to the off-side valance plate. Disconnect wire from its terminal on the horn relay, and remove same from the conduit tube. Remove anti-chafing bush (6) from the mixture control tube at the bottom of the steering column. Remove the pinch bolts from levers (3, 3a and 4, Fig.2), then slide them downwards off their respective tubes.

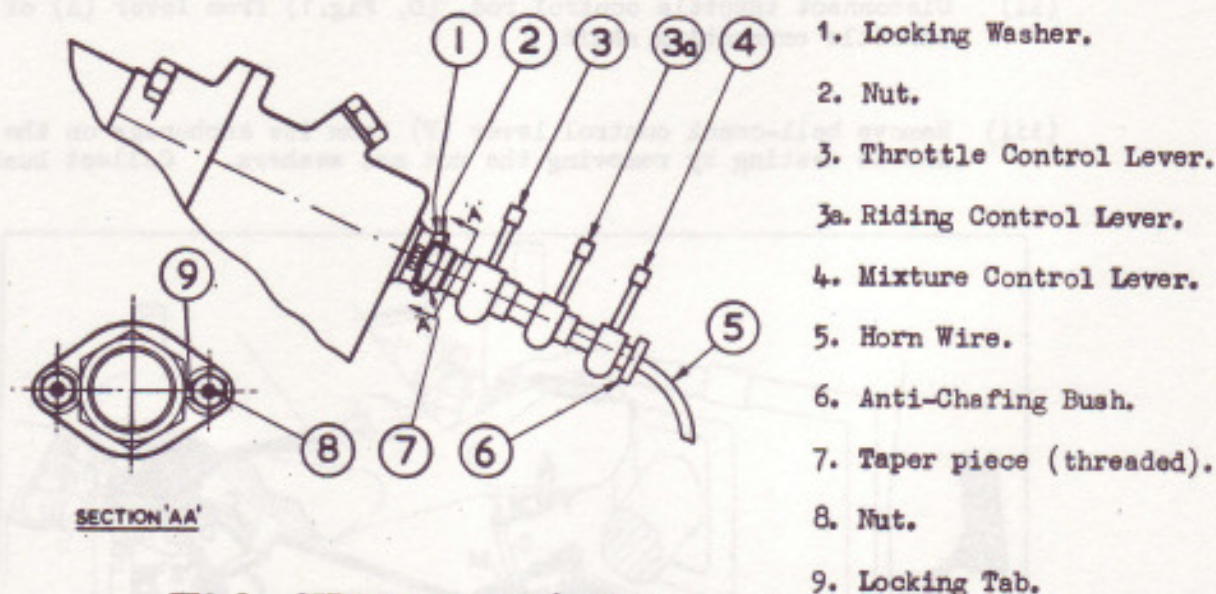


FIG. 2. STEERING COLUMN (BOX) - Lower End.

- (viii) Release lockwasher (1, Fig.2) and remove nut (2) from the threaded taper piece (7) of the stationary tube. Remove nearside nut (8) and locking tab (9). The purpose of this locking tab is to ensure the correct angular positioning of the stationary tube.
- (ix) Temporarily replace nut (2) on to the threaded taper piece three or four threads and give it a few sharp taps towards the steering box to loosen the stationary tube from its tapered seating in the guide (34, Fig.6), after which the nut can be removed and slipped downwards over the tubes. A receptacle should be placed at the bottom of the steering box to catch the oil which will flow from the box during the next operation.
- (x) Remove the control tube assembly complete, from the top of the steering column, taking care not to lose felt packing strip (65, Fig.8) from the stationary tube.



- (xi) Remove the five screws (14, Fig.3) from hub of steering wheel, then remove locking plate (13), nut (12) and washer (11). Lightly mark hub of the steering wheel and steering cam tube so that they can be refitted in the same relative position, and then remove the wheel from the tapered splines of the steering tube by means of the special extractor, Tool No.3243/T1006.

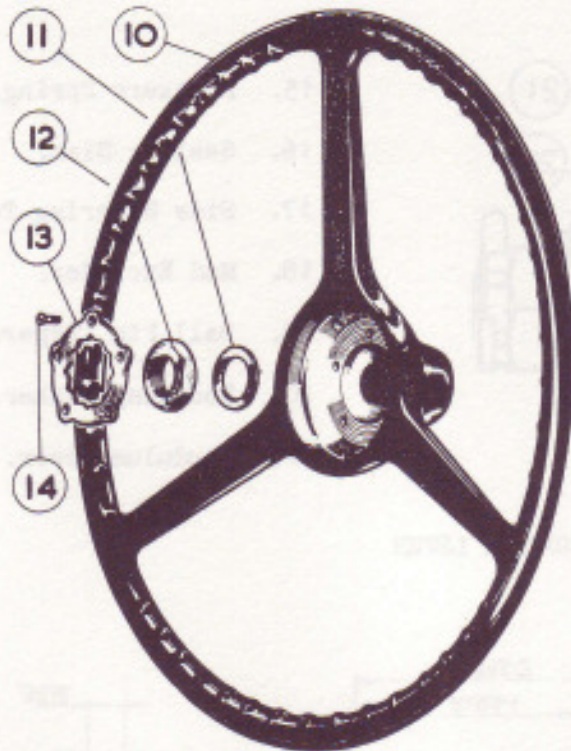


FIG. 3. STEERING WHEEL.

- | | |
|---------------------|--------------------|
| 10. Steering Wheel. | 12. Nut. |
| 11. Plain Washer. | 13. Locking Plate. |
| | 14. Screw. |

- (xii) Remove the two nuts and washers securing bracket (K, Fig.1) to steering box, and detach it from the box. Remove clip, attached to the oil feed pipe, from the stud of the steering box end cover

- (xiii) Remove the four screws and washers securing rubber gas seal (fitted around the steering column) and its retaining plate to the dashboard, then detach the gas seal from dashboard.

- (xiv) Remove the front R.H. under-shield.

- (xv) Jack up the front of the car - jack under and in the centre of the front 'pan' - then remove the side steering tube (17, Fig.4) from the pendulum lever (21). A suitable extractor can be made from the detail drawing shown in Fig.5, or the side steering tube can be removed from the pendulum lever, as described in subparagraph (b). If an extractor is available, proceed as follows:-

- (a) Remove split pin and nut from taper ball pin (19, Fig.4) at the bottom of the pendulum lever and also the locating washer (20). Place the extractor (Fig.5) in position and ease taper ball pin from pendulum lever. If the steering is turned on full R.H. lock, the ball pin will probably come clear of the pendulum lever. If not, it will be easily freed when the steering box and bracket are disconnected from the frame as described in subparagraph (xvi), i.e. after the removal of the three bolts (41, Fig.6). After disconnecting side steering tube, take care not to lose the flat pressure spring (15), sealing disc (16) and mud excluder (18).

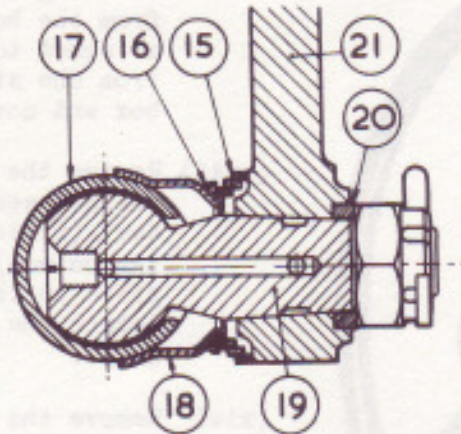
If an extractor is not available, then proceed as follows:-

- (b) Remove split pin, nut and locating washer as described in (a), then give the bottom of the pendulum lever a sharp tap upwards, i.e. at



right-angles to the axis of the ball pin. This should release ball pin. To carry out the above, the car should be placed on a ramp or over a pit.

A substantial steady block should be placed on the upper end of the pendulum lever to absorb the shock and a drift should be used on the lower end of the pendulum lever to prevent damage to adjacent parts.



- 15. Pressure Spring.
- 16. Sealing Disc.
- 17. Side Steering Tube.
- 18. Mud Excluder.
- 19. Ball Pin (Tapered).
- 20. Locating Washer.
- 21. Pendulum Lever.

FIG. 4. SECTION THROUGH PENDULUM LEVER BALL PIN.

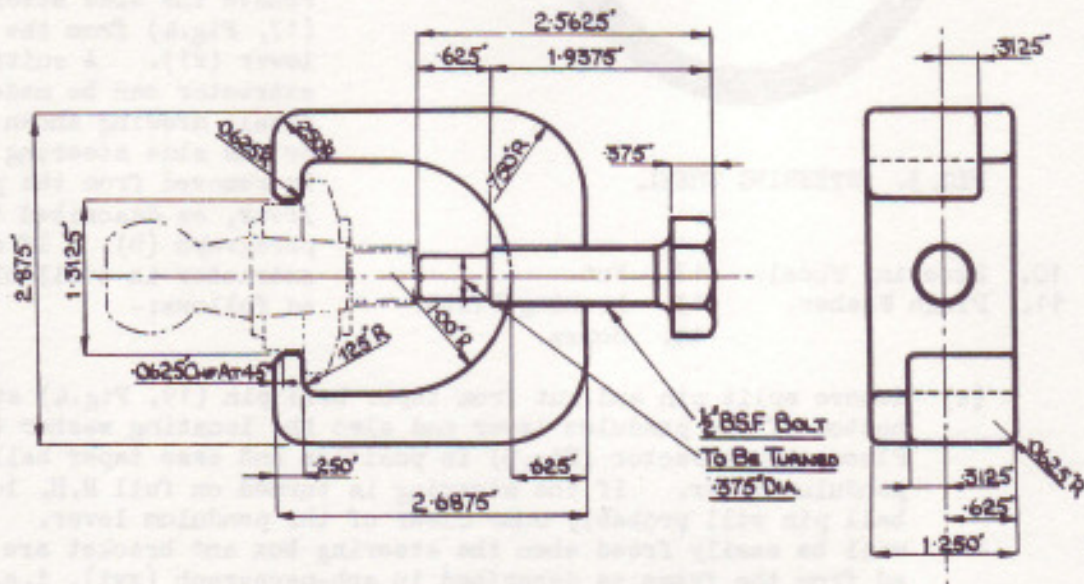


FIG. 5. DETAILS OF EXTRACTOR - PENDULUM LEVER BALL PIN.

- (xvi) Disconnect steering box complete with its mounting bracket (42, Fig.6), by removing the three nuts, plain washers, distance pieces and bolts which retain bracket to the frame.

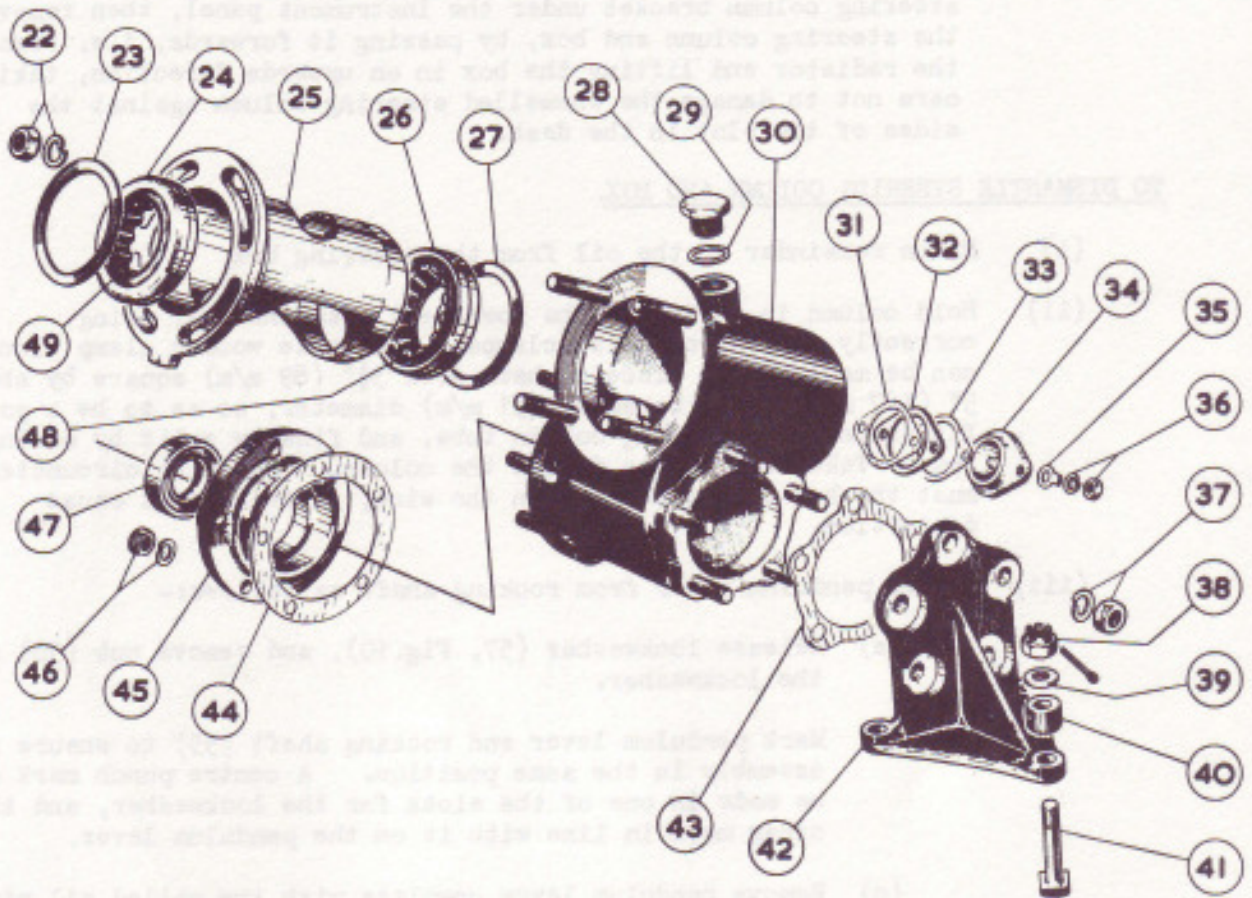


FIG. 6. "EXPLODED" VIEW OF STEERING BOX.

- | | |
|----------------------------------|-------------------------------|
| 22. Nut and Spring Washer. | 36. Nut and Spring Washer. |
| 23. Adjusting Washer (Range of). | 37. Nut and Spring Washer. |
| 24. Roller Bearing Cup. | 38. Nut. |
| 25. Adjusting Sleeve. | 39. Plain Washer. |
| 26. Roller Bearing Cup. | 40. Distance Piece. |
| 27. Adjusting Washer (Range of). | 41. Bolt. |
| 28. Oil Filler Plug. | 42. Bracket. |
| 29. Washer. | 43. Joint Washer. |
| 30. Steering Box. | 44. Joint Washer. |
| 31. Joint Washer. | 45. Cover. |
| 32. Adjusting Washer (Range of). | 46. Nut and Spring Washer. |
| 33. Joint Washer. | 47. Oil Seal. |
| 34. Guide. | 48. Roller and Cage Assembly. |
| 35. Locking Tab. | 49. Roller and Cage Assembly. |

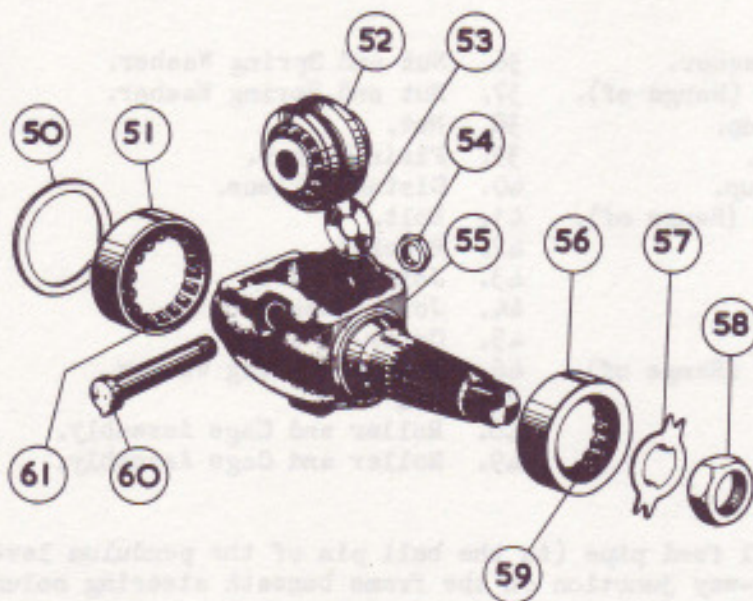
(xvii) Disconnect oil feed pipe (to the ball pin of the pendulum lever) from the four-way junction on the frame beneath steering column.



- (xviii) While steering column is being held, remove the two bolts from steering column bracket under the instrument panel, then remove the steering column and box, by passing it forwards, i.e. towards the radiator and lifting the box in an upwards direction, taking care not to damage the enamelled steering column against the sides of the slot in the dash.

TO DISMANTLE STEERING COLUMN AND BOX.

- (i) Drain remainder of the oil from the steering box.
- (ii) Hold column in a vice at the lower end near the box, using correctly shaped wood vice clamps. Suitable wooden clamp blocks can be made from a piece of hard wood $3\frac{1}{2}$ " (89 m/m) square by about 5" (127 m/m) long, bored 2" (51 m/m) diameter, so as to be a good fit around the steering column tube, and finally split by sawing in two. Take care not to damage the column. Under no circumstances must the box itself be held in the vice, as this would cause distortion.
- (iii) Remove pendulum lever from rocking shaft as follows:-
- (a) Release lockwasher (57, Fig.10), and remove nut (58) and the lockwasher.
 - (b) Mark pendulum lever and rocking shaft (55) to ensure re-assembly in the same position. A centre punch mark may be made in one of the slots for the lockwasher, and the other mark in line with it on the pendulum lever.
 - (c) Remove pendulum lever complete with the coiled oil pipe from the rocking shaft, by means of extractor Tool No.: 3243/T100.



50. Adjusting Washer
(Range of).
51. Roller Bearing Cup.
52. Cam Roller Assembly.
53. Adjusting Washer
(Range of).
54. Nut.
55. Rocking Shaft.
56. Roller Bearing Cup.
57. Lock Washer.
58. Nut.
59. Roller & Cage (Assembly).
60. Bolt.
61. Roller & Cage (Assembly).

FIG. 7. "EXPLODED" VIEW OF ROCKING SHAFT ASSEMBLY.

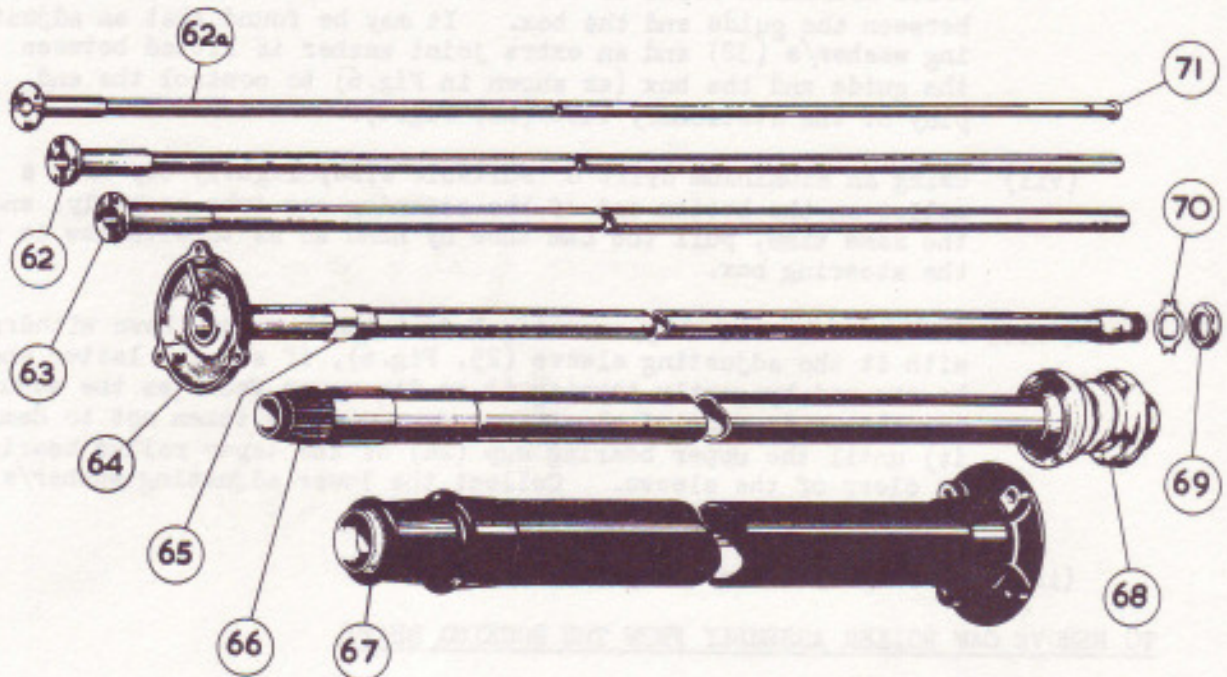


FIG. 8. "EXPLODED" VIEW OF STEERING COLUMN.

- | | |
|-----------------------------------|-------------------------------|
| 62a. Mixture Control Tube (Assy). | 66. Steering Cam Tube (Assy). |
| 62. Riding Control Tube (Assy). | 67. Steering Column (Assy). |
| 63. Throttle Control Tube (Assy). | 68. Steering Cam. |
| 64. Stationary Tube (Assy). | 69. Nut. |
| 65. Felt Packing Strip. | 70. Locking Washer. |
| | 71. Anti-Chafing Bush. |

NOTE:- Should there be evidence of an oil leakage past the oil seal (47, Fig.10) which would be indicated by the presence of oil inside the cover (73) and on the pendulum lever, or should the oil seal be found to be worn, then a new one should be fitted.

(iv) Remove rocking shaft from steering box as follows:-

Mark cover (45, Fig.10) and steering box, by lightly centre punching, to ensure re-assembly of cover in the same position.

Remove the three remaining nuts securing cover to the box, then remove cover complete with oil seal (47) and roller bearing (56). The rocking shaft can now be removed together with the roller and cage assembly (61).

(v) Remove the four nuts which retain steering column (67, Fig.8) to box and remove the steering column.



- (vi) Remove the remaining 2-BA nut securing stationary tube guide (34, Fig.6) to the box, carefully remove the guide by means of a small aluminium drift or screwdriver. A joint washer is fitted between the guide and the box. It may be found that an adjusting washer/s (32) and an extra joint washer is fitted between the guide and the box (as shown in Fig.6) to control the end play of the stationary tube (64, Fig.8).
- (vii) Using an aluminium drift of suitable size, lightly tap with a mallet on the bottom end of the steering cam tube assembly, and at the same time, pull the cam tube by hand so as to withdraw it from the steering box.
- (viii) The cam tube assembly, on removal from the box, may have withdrawn with it the adjusting sleeve (25, Fig.6), if so, the latter should be removed by gently tapping it on its upper face (as the adjusting sleeve is made of aluminium, care must be taken not to damage it) until the upper bearing cup (24) of the taper roller bearing is clear of the sleeve. Collect the lower adjusting washer/s (27) from the box.
- (ix) Thoroughly clean all parts.

TO REMOVE CAM ROLLER ASSEMBLY FROM THE ROCKING SHAFT.

It should only be necessary to remove the cam roller assembly (52, Fig.7) from the rocking shaft in the event of:-

- (a) Wear in the cam roller assembly.
- (b) End float of the cam roller assembly in the rocking shaft.
- (c) A "flat" on cam track of roller, caused by shock.
- (i) Remove the nut (54, Fig.7) from the bolt retaining the cam roller assembly to the rocking shaft. As the bolt end is peened over the nut, the peened over portion should be chipped away with a small chisel before attempting to remove the nut.

Remove bolt (60), the cam roller assembly and adjusting washer/s (53) from the rocking shaft. Discard the nut and bolt, owing to damage from the peening over operation, a new nut and bolt must be used for re-assembly.

- (ii) Thoroughly clean all parts.

TO FIT A NEW CAM ROLLER ASSEMBLY TO THE ROCKING SHAFT.

- (i) First, determine the thickness of the adjusting washer (53, Fig.7) required to ensure contact of the inner end faces of the two inner races of the cam roller assembly, in order to give the necessary pre-loading on the roller, as explained subsequently.
- (ii) It will be observed upon reference to Fig.9, that the inner race of the cam roller assembly is in two halves, held together by a

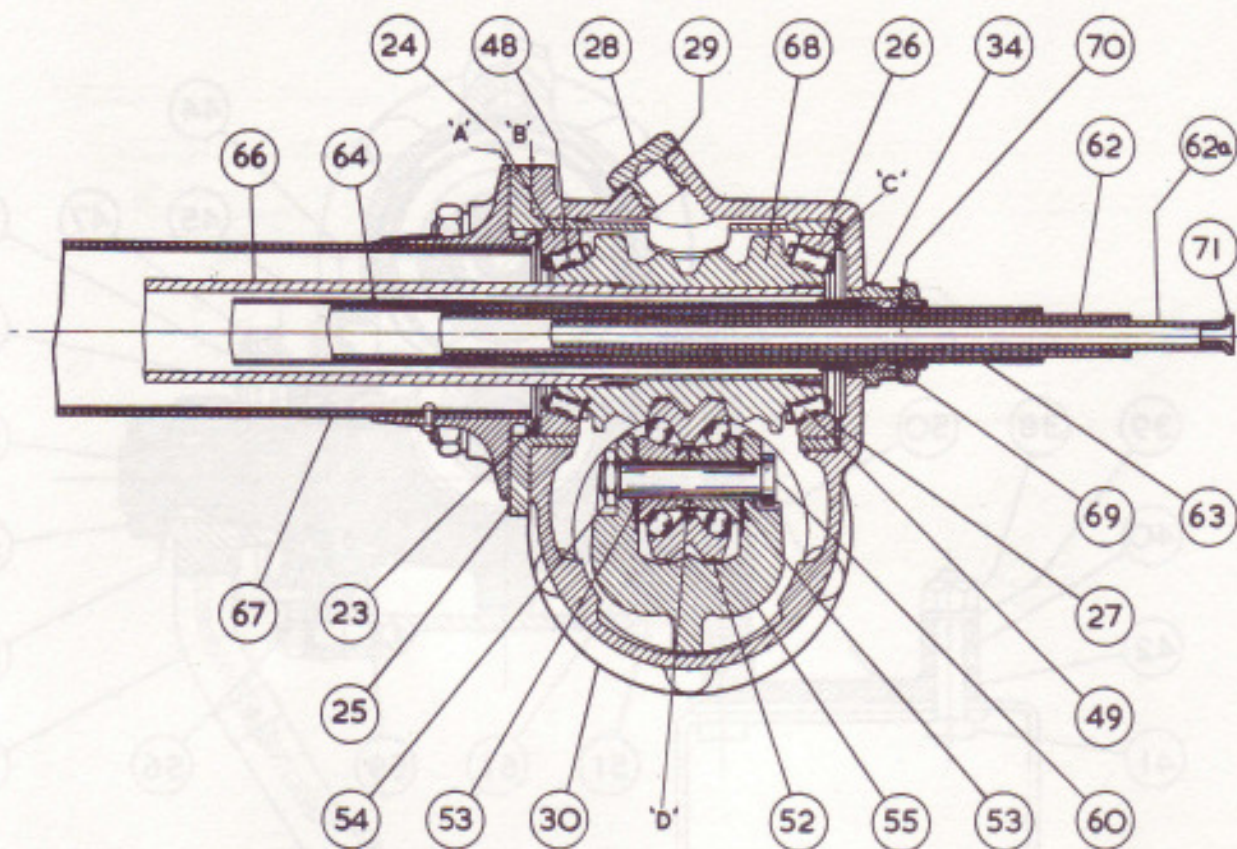


FIG. 9. SECTION THROUGH CAM AND ROLLER.

retaining ring (D). When the inner faces of the two halves of the inner race are brought into contact as explained below, this will give a pre-load on the roller of 2 to 8 ozs. (56 to 227 gr.) at a radius of 3" (76 m/m), and it will be found that the roller will be a little stiff to turn by hand. This pre-load is determined by the makers and cannot be altered.

- (iii) Before fitting cam roller assembly to rocking shaft, make and place on the bolt (60, Fig.7), a suitable temporary distance piece $7/16"$ (11 m/m) thick by about $11/16"$ (18 m/m) outside diameter by $7/16"$ (11 m/m) inside diameter, or failing this, make use of suitable plain washers. This is in order to compensate for the thickness of the walls of the rocking shaft. Pass the bolt through the inner races and then tighten up the nut so as to bring firmly into contact the inner faces of the two halves of the inner race.

NOTE:- As the original nut and bolt (54 and 60) were discarded after the dismantling operations, a new nut and bolt must be used, and ultimately fitted to the rocking shaft. With the nut tightened

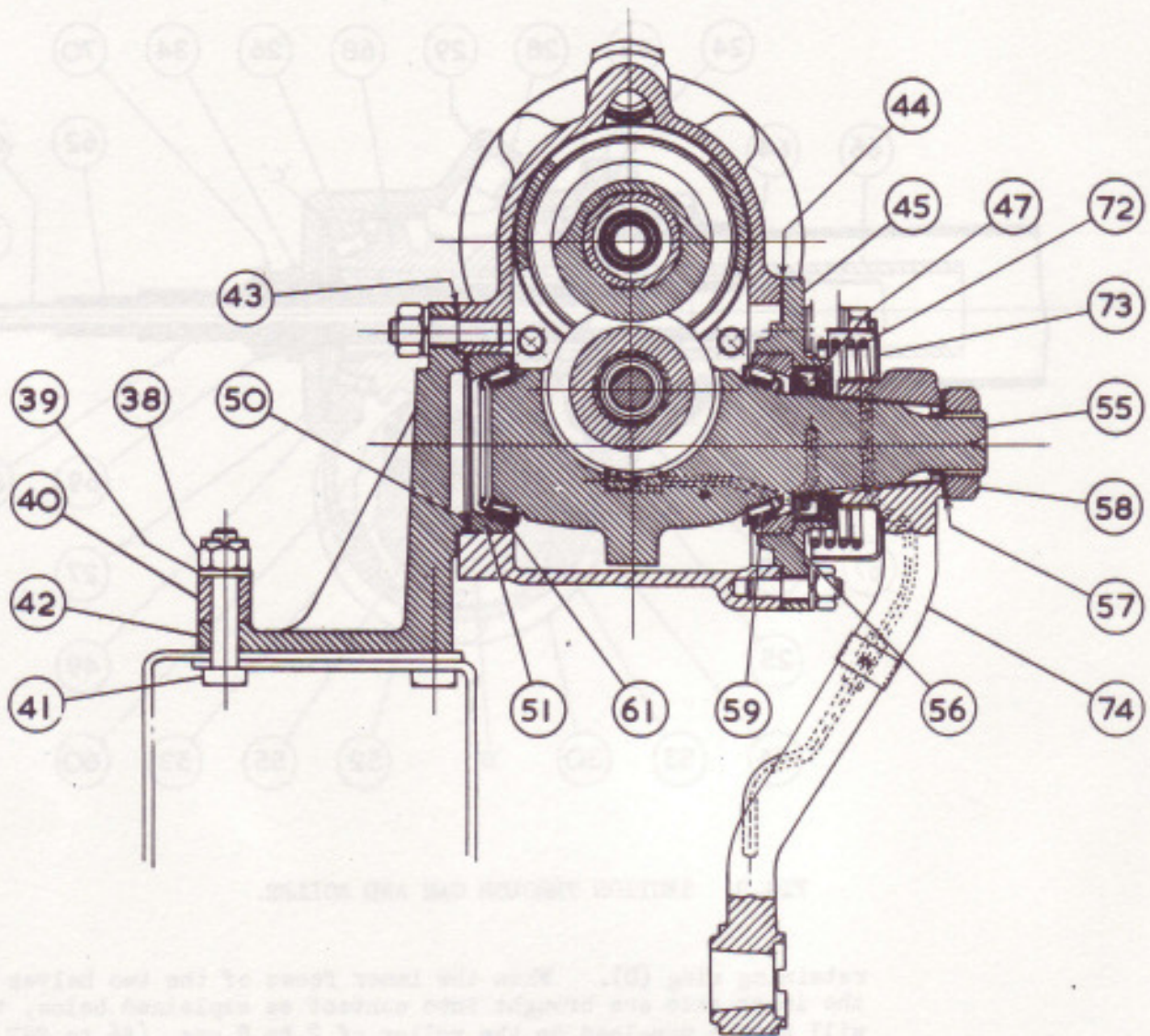


FIG. 10. SECTION THROUGH ROCKING SHAFT.

72. Coiled Oil Pipe. 73. Cover. 74. Pendulum Lever.

up, measure with the aid of a micrometer, the width across the outer faces of the inner races, which will probably be found to be within the range 1.257" plus or minus 0.003" (31.93 m/m plus or minus 0.08 m/m), then measure with the aid of a pair of inside calipers and a micrometer, the width across the inner machined faces of the rocking shaft gap which will probably be within the range 1.262" plus 0.005" (32.05 m/m plus 0.13 m/m).

The difference between the two measurements will determine the size (thickness) of the adjusting washer or washers required.

**EXAMPLE:**

- (a) Width across inner machined faces of
rocking shaft gap. 1.263" (32.08 m/m)
- (b) Width across outer faces of inner races. 1.258" (31.95 m/m)
- Difference equals: 0.005" (0.13 m/m)

The thickness of the washer required will therefore be 0.005" (0.13 m/m).

- (iv) Remove the bolt, distance piece or plain washers, fit the roller assembly into the rocking shaft ensuring that the adjusting washer/s makes the roller assembly a good push fit in the rocker shaft gap. Insert the bolt, making sure that the lug on the head is located in the recess provided in the rocking shaft and tighten up the nut. If more than one adjusting washer is required, they can both be fitted to the same side.
- (v) The roller should now be checked for freedom of rotation. It should be just a little tight to turn on account of the pre-load. If it spins freely, it indicates that the adjusting washer or washers are not of sufficient thickness to ensure contact of the inner races and the measuring operations described above should be repeated. When the preload is correct, finally tighten up nut and peen over end of bolt to lock.

TO FIT THE ROCKING SHAFT TO THE STEERING BOX TEMPORARILY IN ORDER TO CHECK THE PRE-LOAD OF THE ROCKING SHAFT.

- (i) Place one of the two roller and cage assemblies (59 or 61, Fig.10) on to the bearing cup (51), the bearing cup having been left in position in the steering box.
- (ii) Drop the rocking shaft into position in the box.
- (iii) Place the other roller and cage assembly on the rocking shaft and fit a new joint washer (44) to the cover (45).
- (iv) Should there have been evidence of an oil leakage past the oil seal (47) during the dismantling operations, or, should the oil seal be found to be worn, then fit a new oil seal to the cover. The seal must be fitted with the tip pointing towards the steering box as shown in Fig.10.
- (v) Carefully place the cover complete with bearing cup (56) and oil seal over the splined end of the rocking shaft (taking care not to damage the tip of the seal while entering it on to the shaft), ascertaining that the centre punch marking on the cover and box are in line. Fit a spring washer to the three short studs and temporary additional washers to the two long studs, and progressively tighten up the nuts to secure.
- (vi) Slip the pendulum lever on to the splines of the rocking shaft with the centre punch marking on lever end shaft in line.



- (vii) For checking the various pre-loads, a support will be required for the steering box, this should consist of a 6" (152 m/m) length of angle iron not less than $3\frac{1}{2}$ " x $3\frac{1}{2}$ " (89 m/m x 89 m/m) section and drilled to the same centres as the three frame bolt holes in the steering box mounting bracket (42, Fig.6). It will be preferable to drill the three holes in the angular support a little larger in diameter than those in the steering box mounting bracket. It is most important that the bracket is not used as a jig for drilling purposes because the holes in the bracket are reamed in order to be a good fit on the three retaining bolts (41).

The reason for this support is that under no circumstances must the steering box be held in a vice, as this would cause distortion. Any distortion to the box would alter the pre-loading and make correct adjustments impossible.

With the steering box (bracket) attached to the support by suitable bolts, place the support in a vice, and with both the rocking shaft and pendulum lever horizontal, check the pre-load at the end of the pendulum lever which should be within the limits of 3 to 12 ozs. (85 to 340 gr.). The best way to carry out this check, is as follows:-

- (a) First, have at hand six 2 oz. (57 gr.) weights. Circular weights with a small hole in the centre are the most suitable for the job.
 - (b) Ascertain the weight required to move the pendulum lever, attaching the weights to the end of the lever by means of a piece of hooked wire. If it is found that the pre-load is not correct, i.e. less than 3 ozs. (85 gr.), then it will be necessary to fit a thicker adjusting washer as follows:-
- (viii) Mark the mounting bracket (42, Fig.6) and steering box for re-assembly purposes, then remove the five nuts and washers (37), which retain the bracket to the box. Remove bracket, joint washer (43) and adjusting washer/s (50, Fig.10).

With a micrometer, measure the thickness of the adjusting washer/s removed, and select a washer/s 0.001" (0.025 m/m) thicker from the range available. It is usual for a change of this magnitude, i.e. 0.001" (0.025 m/m) to alter the pre-load by approximately 8 ozs. (227 gr.).

Place adjusting washer/s against the outer face of the bearing cup (51, Fig.10). Fit a new joint washer (43) and refit the bracket (42) to the steering box with the marking on the bracket and box in line with each other. Refit the spring washers and progressively tighten up the five nuts to secure. Check the pre-load at the end of the pendulum lever as previously described.

When the correct pre-load has been obtained, there will be no further need to disturb the adjusting washer/s or the five nuts securing the bracket to the steering box.



Remove the pendulum lever, the cover (45, Fig.10), taking care not to damage the new joint washer (44), as this washer must be retained so as not to upset the pre-load. Remove the rocking shaft from the box. The next operation is to centralise the cam with respect to the rocking shaft as described in the following paragraph:-

TO CENTRALISE THE STEERING CAM WITH THE ROCKING SHAFT.

- (i) Should the cam tube assembly upon removal from the steering box, have withdrawn with it the adjusting sleeve (25, Fig.6), then proceed as follows:-
 - (a) With all parts in a perfectly clean condition, lightly smear with grease the two outer machined diameters of the adjusting sleeve and fully enter it into position in the steering box, i.e. so that the two faces at point 'B', Fig.9, make contact.
 - (b) Lightly smear with grease the original lower adjusting washer (27) and with the steering box in a vertical position, place in position in the bottom of the box. If two adjusting washers were found to be fitted, then the thinner of the two washers must be fitted so that it is adjacent to the lower face of the lower bearing cup (26), because if the thinner washer was fitted behind the thicker washer, there would be a risk of it being trapped behind the gap (i.e. at point 'C', Fig.9) which exists between the inner end of the adjusting sleeve and the lower inner end of the steering box.
 - (c) Fit the lower bearing cup (26) in position against the adjusting washer/s taking care not to disturb the position of the latter for the reason explained.
- (ii) Place one of the two roller and cage assemblies (49 or 48) on to the lower bearing cup, and then place cam tube assembly on to the roller bearing. Place the other roller and cage assembly on to the cam and push or lightly tap the other bearing cup (24) squarely into position in the adjusting sleeve and on to the roller bearing.
- (iii) Select an adjusting washer (23) from the range available, too thick to enable the flange of the steering column to be pulled right down on to the adjusting sleeve. Place the adjusting washer (two washers can, if necessary, be fitted) against the outer face of the upper bearing cup (24) and then place steering column into position.

Replace the spring washers on the four studs, and nip up the steering column retaining nuts evenly, just sufficiently to make the cam tube moderately stiff to turn by hand before the steering wheel is slipped on.

There should now, at this stage, be a gap at point 'A', Fig.9, i.e. between the face of the flange of the steering column and the adjusting sleeve. It is possible, however, for the adjusting sleeve to "lift", creating the gap at point 'B', but this must be avoided, otherwise the lower adjusting washer/s (27) could slip out of position and become trapped at point 'C'. If there is no



gap at point 'A', then a thicker adjusting washer/s (23) will have to be fitted until a gap is obtained.

- (iv) Slacken the four steering column nuts just sufficiently to allow the adjusting sleeve to be rotated. A lug is provided on the sleeve for this purpose.

NOTE:- The purpose of the eccentric adjusting sleeve is for adjusting the mesh between the cam and roller. Looking at the steering box from the steering column end, rotating the sleeve in a clockwise direction, will "free" the cam from the roller, i.e. there will be slackness between the cam and roller. The sleeve is provided with elongated stud holes which also limit the amount by which it can be rotated in the box. Rotate the sleeve by the lug provided in a clockwise direction, so as to "free" the cam from the roller and then evenly nip up the steering column nuts again.

- (v) Temporarily refit the rocking shaft to the steering box as previously described, and secure in position by refitting the cover (45, Fig.10) securing the latter with the five retaining nuts and washers as necessary.

NOTE:- If the steering cam had not been "freed" from the roller by rotating the adjusting sleeve, then it would not be possible to refit the rocking shaft to the box. The next operation is to centralise the cam with the rocking shaft.

- (vi) With the support (angle iron) attached to the steering box mounting bracket as previously described, place the steering (support) in a vice and slip on the steering wheel.

Starting from one full lock position, rotate the wheel very slowly towards the other lock, and while this is being done, hold the end of the pendulum lever with the other hand, simultaneously lightly shaking it to and fro until the position of minimum slack between the cam and roller has been found. With the cam in this position and without moving it, again slacken back the four steering column nuts slightly, i.e. only just sufficiently to allow the adjusting sleeve to be rotated. Rotate sleeve in an anti-clockwise direction, until all slack between the cam and roller is just eliminated. Evenly retighten the four steering column nuts.

- (vii) The next step is to set the cam approximately in the straight ahead position, by rotating the steering wheel about one-and-seven-eighths of a turn from either lock. Now set the cam tube in the exact straight ahead position by rotating it slightly as required to bring the keyway in the cam tube (visible from the bottom end of the box) into its lowest position, i.e. nearest to the rocking shaft.

It will have been noticed that the tightest meshed position extends over possibly half a turn of the steering wheel. By suitably rotating the steering wheel, determine how much it has to be turned to move it from the straight ahead position to the centre of the tightest meshed position. If the tightest meshed position is to the right of the straight ahead position (turning the steering wheel to the right), a thinner adjusting washer/s (27, Fig.9) should be fitted to the lower roller bearing; if to the left, then a thicker



washer will be required. If it is found necessary to fit two washers to make up the desired thickness, then the thinner of the two washers must be fitted against the lower face of the bearing cup, for the reason explained in sub-paragraph (i) b. The washer/s should be lightly smeared with grease to keep them in position against the cup during the erecting operation. The amount by which the thickness of the washer could be changed may be roughly estimated on the basis that a change of 0.007" (0.18 mm) moves the tight place along half a turn of the steering wheel. When the centre of the tightest meshed place is at the straight ahead position, that is with the cam tube assembly keyway at its lowest point, and the rocking shaft in its central position, the next step is to adjust the pre-load on the cam bearings.

TO ADJUST THE PRE-LOAD ON THE CAM ROLLER BEARINGS.

- (i) The pre-load should be from 12 to 20 ozs. (340 to 567 gr.) measured at the rim of the steering wheel, and this operation should be carried out with the steering box mounted, so that the steering column is in a horizontal position. The pre-load is obtained by selecting from the range of adjusting washers (23, Figs. 6 & 9) available, a washer/s of suitable thickness to fit behind the lowest face of the steering column flange and the outer face of the upper bearing cup (24). Proceed as follows:-

- (a) Measure with feeler gauges the gap at two opposite points between the adjacent flange faces of the adjusting sleeve and the steering column flange (i.e. at point 'A', Fig.9) and make a note of the average gap.

Loosen the four nuts retaining the steering column to the box and rotate the adjusting sleeve (25) in a clockwise direction to produce slack between the cam and roller.

- (b) Remove the steering column and then remove the adjusting washer/s (23).
- (c) To determine the thickness of the adjusting washer/s required, measure with a micrometer the thickness of the washer/s removed, and subtract from this figure, the average gap, measured as described above.

EXAMPLE:

- (d) Total thickness of adjusting washer/s removed, say 0.088" (2.23 mm)
- (e) Average gap at point 'A', Fig.9, say 0.041" (1.04 mm)
- (f) Required thickness of adjusting washer/s to be fitted 0.047" (1.19 mm)

Theoretically, the fitting of a 0.047" (1.19 mm) thick adjusting washer should give zero pre-load, but owing to the possibility of very slight discrepancies in the manufacture of the washers, the adjusting sleeve and the flange of the steering column etc. it may be found that when checking the pre-load as described below, that



there is either too much or too little.

- (ii) Fit the new washer/s as determined above, then replace the steering column on to the box and fully tighten the four retaining nuts. Again slip on the steering wheel and attach a piece of string to the steering wheel rim, to this tie on 2 oz. (57 gr.) weights as required to determine the pre-load. During this operation, the imaginary line joining the upper end of the string to the centre of the steering wheel must be kept as near the horizontal as possible.
- (iii) If the weight required to move the steering wheel exceeds 20 ozs. (567 gr.), try decreasing the thickness of the upper adjusting washer/s by 0.001" (0.025 mm), but if the pre-load is below 12 ozs. (340 gr.), increase the thickness of the washer/s by 0.001" (0.025 mm) so as to bring the pre-load to within the limits of 12 to 20 ozs. (340 to 567 gr.).
- (iv) When the pre-load is correct, rotate the steering wheel to the straight ahead position, as previously described, and bring the cam into mesh by rotating the eccentric adjusting sleeve until the total pre-load is increased by 8 ozs. (227 gr.).

NOTE:- It is of course necessary to loosen the four steering column nuts before attempting to rotate the adjusting sleeve for mesh adjustments. It is equally necessary to fully retighten these nuts before checking the pre-load.

TO REFIT THE STEERING COLUMN AND BOX.

- (i) Before refitting the steering column and box, place a new joint washer (31, Fig.6) on to the bottom of the steering box, followed by the guide (34).

Should it have been found when dismantling the steering column and box, that an adjusting washer/s (32) was fitted between the guide and the box (as shown in Fig.6), then a new joint washer (31 and 33) must be fitted either side of the adjusting washer/s to prevent oil leakage. Secure the guide to the box by placing one of the two 2-BA spring washers and nuts on the off-side stud and tightening up. Do not at this stage fit the other 2-BA nut (8, Fig.2) or the locking tab (9).

- (ii) With the coiled lubricating pipe and its protection cover in position on the pendulum lever, fit the lever to the rocking shaft in the same angular position as originally fitted, i.e. with the centre punch mark on the lever in line with the mark on one of the two slots in the rocking shaft. Place a new lockwasher (57, Fig.10) on the shaft, securely tighten the nut (58) and bend over the tabs of the lockwasher to lock.

NOTE:- During the initial build and with the road wheels in track, the cam roller of the steering box is placed central with the cam, and the pendulum lever is set, 3° , from the vertical centre line towards the rear of the chassis.



- (iii) With the rubber gas seal and its retaining plate in position on the steering column, and with the lip of the retaining plate facing towards the steering box, place the steering column and box in position and then re-attach the side steering tube to the pendulum lever as follows:-

With the mud excluder (18, Fig.4), the sealing disc (16) and the flat pressure spring (15) in position on the ball pin (19), enter the pin into the pendulum lever. Place the locating washer (20) on to the threaded end of the ball pin, ascertaining that the flats and lugs of the washer correctly engage with the corresponding flats and slots on the pin and in the lever. The purpose of the locating washer, is to ensure alignment of the oil holes in the ball of the pin with the axis of the side steering tube. Screw on the nut sufficiently to hold the locating washer in position, but do not tighten up the nut at this stage.

- (iv) Line up the bolt holes of the bracket (42, Fig.6) with those in the frame and place the three bolts (41) in position. Refit to each bolt, the distance piece (40), plain washer (39) and nut (38), screwing on the nuts two or three threads only at this stage.
- (v) Replace steering wheel in position, care being taken to match the markings previously made, so that the spoke nearest the oil hole in the steering wheel hub is diametrically opposite to and in line with the keyway in the bottom of the cam tube, i.e. the steering wheel being fitted (with road wheels in track) so that the spoke nearest the oil hole in the hub is at the top. Fit the plain washer (11, Fig.3) and nut (12) and tighten up. Fit the locking plate (13) over the nut and secure with the five countersunk screws (14).
- (vi) With the felt packing strip (65, Fig.8) in position on the stationary tube and lightly greased, replace control tube assembly in position. Rotate the control tube assembly until the 0.200" (5.08 mm) diameter hole in the threaded taper piece (7, Fig.2) of the stationary tube is in line with the slot in the guide (34, Fig.6). Fit the locking tab (9, Fig.2) to the near-side stud on the bottom of the steering box and into the slot in the guide, making sure that it enters the hole in the threaded taper piece. The purpose of this locking tab is to ensure the correct angular positioning of the stationary tube. Fit the spring washer over the tab and secure with the remaining 2-BA nut (8).
- (vii) Place a new lockwasher (1, Fig.2) on to the threaded taper piece (7), tighten up the nut (2) and bend back the tabs of the lockwasher to lock.
- (viii) While the steering column is being held against the upper half of the steering column bracket under the instrument panel, tighten up the three nuts (38, Fig.6) which hold steering box mounting bracket to the frame, and secure each nut with a new split pin of the correct size.
- (ix) Now fully tighten the nut which retains the ball pin (19, Fig.4) to the pendulum lever and secure with a new split pin of the correct size.