SECTION 6

FRONT SUSPENSION

CONTENTS

SERVICE BULLETIN

RECORD SHEET

No.	Subject	Date	Signature

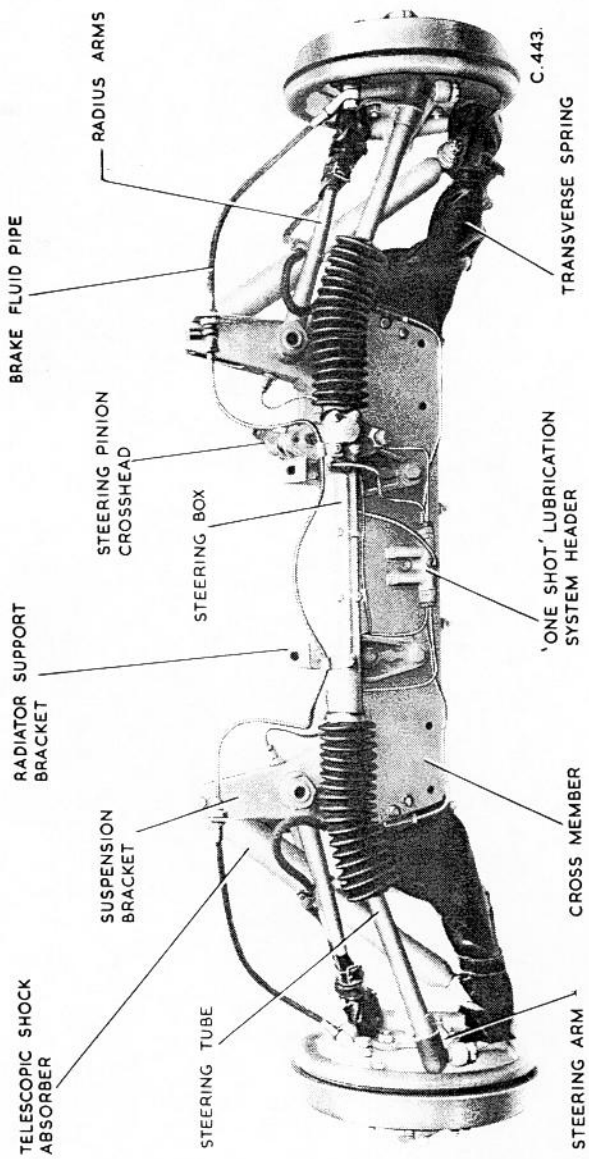


Fig.1 Front suspension unit.

F R O N T S U S P E N S I O N

DESCRIPTION

General

The front suspension unit, illustrated in Fig. 1, consists of No. 1 cross-member with integral suspension brackets, a transverse leaf spring, telescopic shock absorbers and the hub and stub axle assemblies. The cross-member, which is bolted direct to the chassis frame, also carries the two radiator mounting brackets and provides the mountings for the steering box and the header of the "One-shot" lubrication system.

The transverse leaf spring passes through the cross-member where it is located by the round head of the centre bolt in the spring, which fits in a locating bore in the base of the cross-member. The spring is bushed at its outer ends and is secured between two "U" pieces and yokes by bolts and nuts. Right-hand and left-hand safety links and straps are fitted between the ends of the spring and cross-member at the front. The inner ends of the links and the outer ends of the straps are secured by a single high tensile steel bolt and split-pinned nut to the extensions of each spring leaf outer clip, see Fig. 5.

The ends of the spring and the radius arms are attached to the swivel pins of the stub axle assemblies, (see Fig. 3), the transverse leaf spring acting as the lower links, and the radius arms forming the upper links. These joints are enveloped in protective gaiters. The swivel pin is bushed at its upper end to complete the upper link and fits in the bushed stub axle, while a bracket for the lower link is keyed to a taper at the bottom end of the swivel pin. The swivel pin end-float is controlled by shims fitted between its bottom bracket

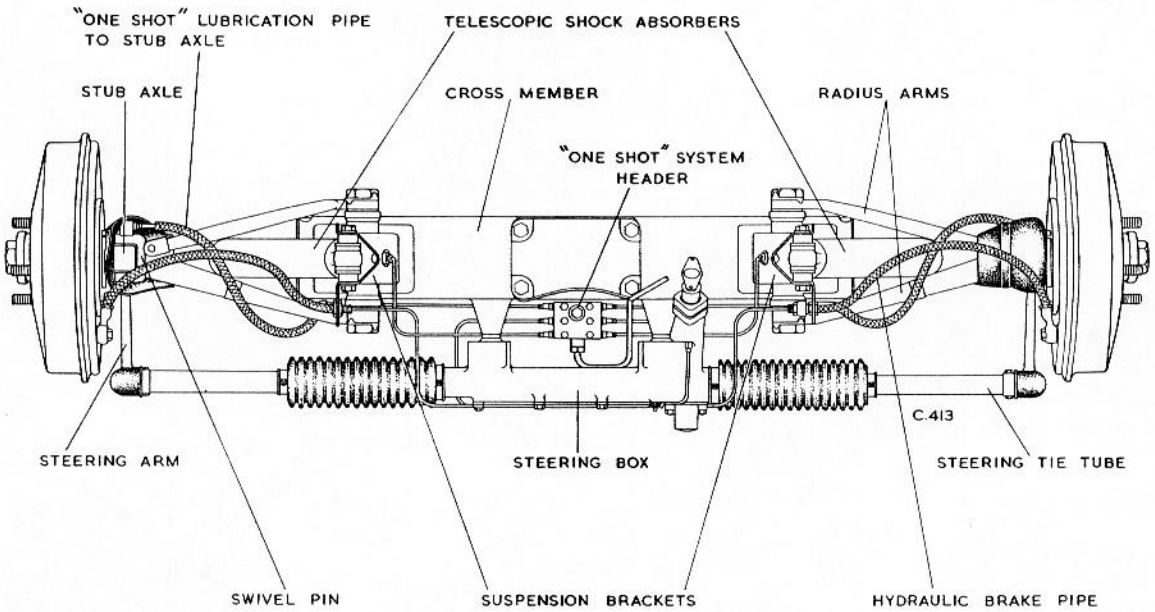


Fig. 2 Plan view of front suspension unit.

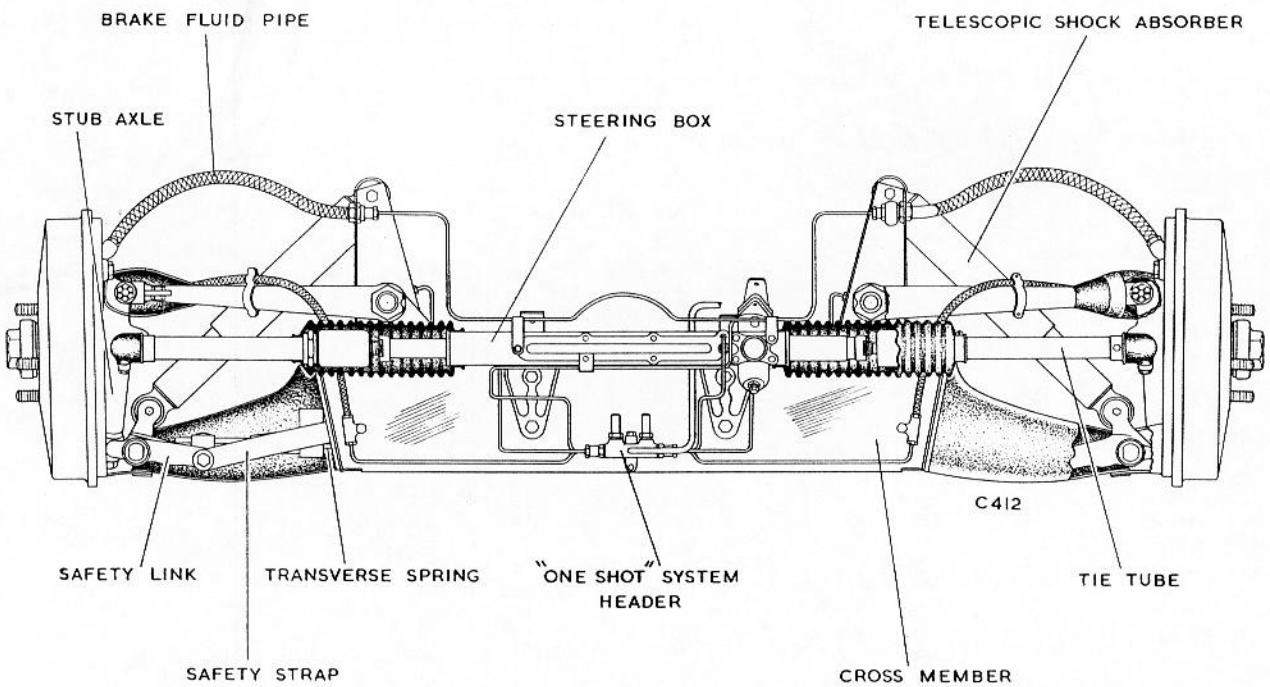


Fig. 3 Front view of front suspension unit.

and the stub axle, a thrust washer being fitted at its upper end. The brake drum back plates are bolted to flanges on the stub axles, the stub axles each carrying the two ball bearings for the wheel hubs.

Telescopic shock absorbers

These units are fitted between the suspension unit brackets attached to the cross-member, and the bottom brackets of the stub axle swivel pins. Arnolt-Bristol cars are fitted with a complete set of "Armstrong" telescopic shock absorbers or a complete set of "Girling" telescopic shock absorbers. The two types are as follows:-

"Armstrong"

Front suspension	Rear suspension
Type - AT7 - 1185	Type - AT7 - 1186
Setting - $\frac{850/75}{75/650}$	Setting - $\frac{1150/75}{75/900}$

Distributors in the U.S.A.:-

The Armel Co., 6, Ohio Avenue, Port Washington, N.Y.	British Auto Parts, Inc., 1455,. Bush Street, San Francisco, California.

"Girling"

Front suspension	Rear suspension
Part No. DAS.6/54NF	Part No. DAS.9/35NF

Agents in the U.S.A.:-

Lucas Electrical Services, (Inc.), 653, Tenth Ave., (Corner 46th St.), and New York.	8163, Melrose Avenue, Los. Angeles, California.

No servicing of these units in the accepted sense is needed; in the event of failure, fit replacement units. Occasional inspection is desirable to see that the rubber bearing bushes at the top and bottom of the units are in good order; if they are worn or perished, fit replacement bushes.

GENERAL DATA

Type	Independent transverse spring.
Tracking	Toe-in 3/16in. (4·76 m.m.) to $\frac{1}{8}$in. (3·18 m.m.) measured at the rims at kerb side weight.
Laden wheel camber angle.. ...	Zero to + $\frac{1}{2}^{o}$, spring camber with 1,120 lb. (508·02 kg.) load supported by two front tyres.
End-float of swivel pin... ...	0·000in. to 0·003in. (0·000 to 0·08 m.m.), adjusted by shims.
Diametrel clearance of swivel pin	0·0002in. to 0·002in. (0·005 m.m. to 0·05 m.m.).
Torque loading of swivel pin securing nut..	40 to 50 lb.ft. (59·526 to 74·41 kg./m.).
End-float of transverse leaf spring link...	0·000in. to 0·007in. (0·000 to 0·18 m.m.).
Diametral clearance of bottom link pin	0·0012in. to 0·0042in. (0·03 m.m. to 0·1 m.m.).
Torque loading of steering arm securing nuts...	50 to 60 lb.ft. (74·41 to 89·29 kg./m.).
Diametral clearance of top link pin.	0·0005in. to 0·0027in. (0·013 m.m. to 0·07 m.m.).
Torque loading of transverse spring securing bolt nuts. ...	38 to 42 lb.ft. (57·55 to 62·5 kg./m.).
End-float of suspension bracket fulcrum pin..	0·002in. to 0·004in. (0·05 m.m. to 0·1 m.m.).

MAINTENANCE

After every 5,000 miles (8,000 k.m.).

Check the torque loading of the four transverse spring securing bolt nuts.

Periodically

It is advisable occasionally to check the front wheel tracking (see page 23) as any excessive maladjustment will cause uneven tyre wear and affect the steering of the car.

REMOVING AND REFITTING SUSPENSION

Removing

1. Check that the handbrake is on, then raise the front of the car sufficiently to place stands beneath the main chassis members, then remove the jack.
2. Disconnect the cross head of the steering pinion from the coupling of the steering column.
3. Remove the wheels, see Section 10.
4. Remove the radiator, see Section 2.
5. If an anti-roll bar is fitted, disconnect the clamps on the radius arms, then move the bar to a position where it does not impede progress.
6. Disconnect the main pipe of the "One shot" system from the connection on the front engine mounting bracket on the left-hand side of the chassis.
7. Disconnect the main brake pipe at the three-way connection on the left-hand suspension bracket.
8. Position a garage jack and carefully support the whole of the front suspension.

9. Support the engine.

10. Finally remove the four bolts and the four set-screws holding the cross-member to the chassis frame.

11. Manoeuvre the assembly clear of the car.

Refitting

1. Jack up and manoeuvre the unit into its correct position.

2. With a plain washer fitted beneath the heads, enter the two long bolts (the outer bolt from the front and the inner from the rear) through the two upper securing bolt holes in each side of the cross-member and the front flange of each main chassis member; fit a washer to each and screw on the four nuts finger tight. Fit tabwashers to the heads of the four shorter bolts and screw them into position from the rear. Tighten the nuts and bolts securely, then lock the nuts with split pins and the bolts with the tabwashers.

3. Connect the main brake fluid pipe to the connection on the left-hand suspension bracket. Reconnect the main pipe of the "One shot" system to the connection on the left-hand front engine mounting bracket, bleeding the pipe as described in Section 11.

4. Where applicable, position the anti-roll bar and secure the clamps to the radius arms.

5. Reconnect the steering column flexible coupling.

6. Refit the radiator, see Section 2.

7. Refit the road wheels, see Section 10.

8. Jack up the car, remove the chassis stands and engine support then lower the car to the ground.

9. Bleed the brake system as detailed in Section 8 and check the front wheel tracking and alignment as detailed in page 23.

DISMANTLING AND RE-ASSEMBLING

The dismantling and assembling will be facilitated if a fixture similar to that illustrated in Fig. 4 is made and bolted to the bench. The top holes in

the cross-member locate on the studs of the fixture and the cross-member is retained by four 7/16in. B.S.F. nuts. The assembly is then held rigidly and in its normal position.

Dismantle as follows:-

1. Remove the protective gaiters.

2. Dismantle the right-hand and left-hand tie tube assemblies from the steering box rack/stub axle assemblies as detailed in Section 9.

3. Disconnect the "One shot" system flexible pipes fitted between the two adaptors on the front of the cross-member and the stub axles. Disconnect and remove the rigid pipe fitted between the header and the adaptor on the front of the cross-member, the unions on the suspension brackets and the two unions on the steering box. Remove the main feed pipe fitted between the front left-hand engine mounting bracket and the header then remove the header.

4. Withdraw the split pins and remove the nuts and bolts securing the right-hand and left-hand safety straps to the cross-member and leaf spring clips. Remove the safety straps and segregate the bush, washers and distance pieces with their respective bolts.

5. Remove the steering box from the front of the cross-member as detailed in Section 9.

6. Withdraw the split pin and remove the nut and bolt securing the upper end of each telescopic shock absorber to the suspension brackets. Retain the distance pieces, rubber grommets and distance spool.

7. Disconnect the right-hand and the left-hand radius arms from the stub axle swivel pins by withdrawing the split pin and removing the nut and the top pin. Take care not to damage the "Enots" adaptor screwed into the head of each pin. Next withdraw the split pin, unscrew the nut, withdraw the bottom pin from the stub axle bottom bracket and the ends of the transverse spring, and remove the right-hand and left-hand stub axle assemblies. Take care not to lose the safety links and the rear distance washer, and segregate them until required.

8. Disconnect the telescopic shock absorbers from the right-hand and left-hand bottom brackets as described for the upper end in operation No. 6.

9. Remove the $\frac{5}{8}$in. bolt from the radius arm at the stub axle end then unlock and remove the rear nut from the attachment bracket

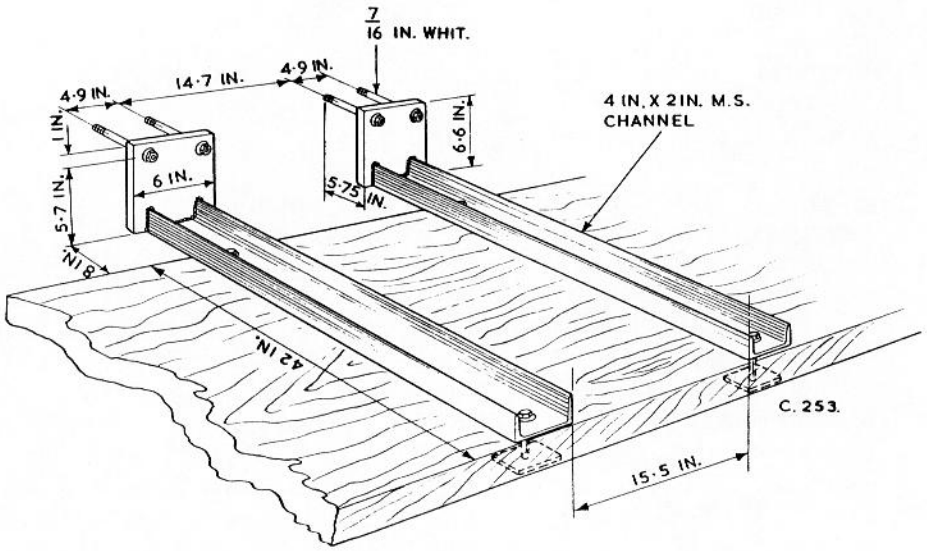


Fig. 4 Dismantling and assembling fixture.

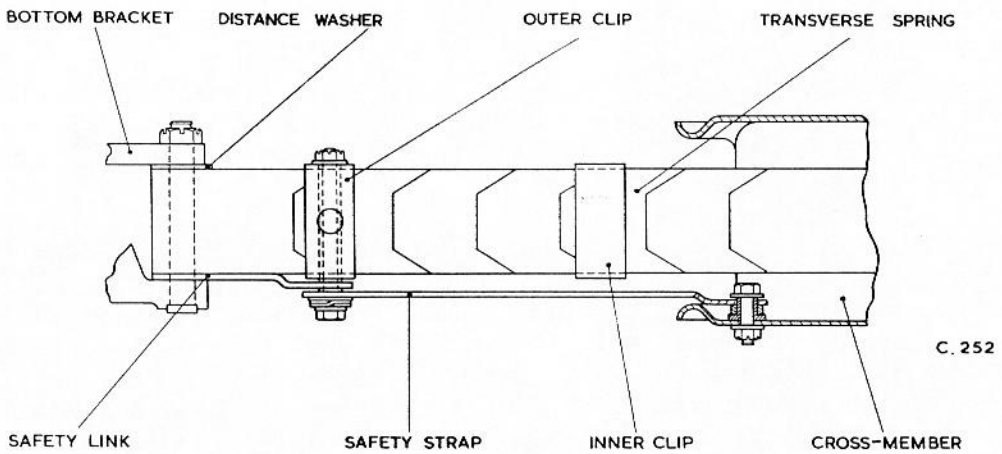


Fig. 5 Link and safety strap.

fulcrum pin. Tap out the swivel pin together with the major arm. Label the thrust washers fitted to each end of the pin, then hook out and discard the oil seals at each end of the suspension bracket bearing.

10. Remove the locknuts from the four transverse spring securing bolts then withdraw the bolts through the apertures in the top of the cross-member. Remove the two yoke bars from the top of the spring then withdraw the spring from the cross-member, followed by the "U" pieces.

Further dismantling of the hub assemblies and the steering box unit are described in Section 10 and 9 respectively. The method of dismantling the stub axle assembly is described on page 17.

Assemble the front suspension assembly as follows:-

1. Bolt the cross-member to the bench fixture, see Fig. 4.

2. Assemble each suspension bracket unit as follows. Fit a new felt seal to the front recess of the bracket bearing then, with the correct thrust washer fitted against the major arm, insert the fulcrum pin. Place another new felt seal over the end of the pin into the bearing recess, followed by the second thrust washer and the minor arm. Fit the lockwasher and nut and tighten securely. Check that the end-float is within the limit given in the General Data. If necessary, obtain the correct end-float by selective assembly of the rear thrust washer. These are available in the following thicknesses:-

0·151 in.	(3·84 m.m.)	0·163 in.	(4·14 m.m.)
0·155 in.	(3·94 m.m.)	0·167 in.	(4·24 m.m.)
0·159 in.	(4·04 m.m.)		

When satisfactory, lock the fulcrum pin nut.

3. Place the two "U" pieces into position over the bolt holes on each side of the locating bore inside the cross-member.

4. Insert the transverse spring through the cross-member, and taking care not to displace the "U" pieces, align the centre bolt of the spring with the locating bore in the base of the cross-member.

5. Place the yoke bars over the spring and in line with the two "U" pieces, then fit the four retaining bolts from the top and screw on the nut. Lightly and evenly tighten the nuts until the round head of the spring centre bolt is drawn into the locating bore but do not finally tighten until the assembly is fitted to the car chassis, see page 21.

6. Fit the shock absorbers at this stage. Fit the distance tube and rubber grommets to the small end of the shock absorber,

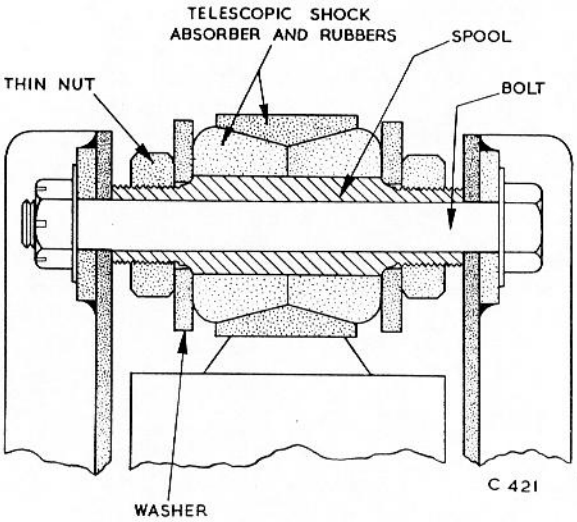


Fig.6 Shock absorber lower attachment.

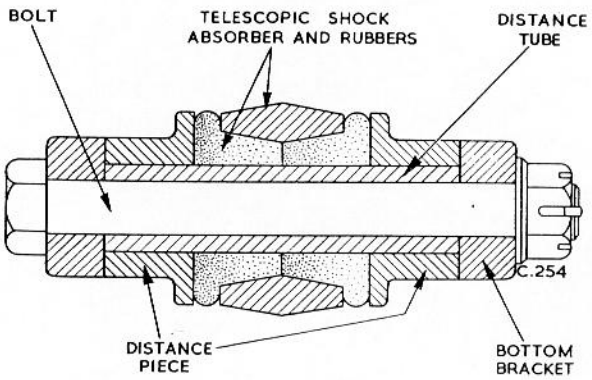


Fig.7 Shock absorber upper attachment.

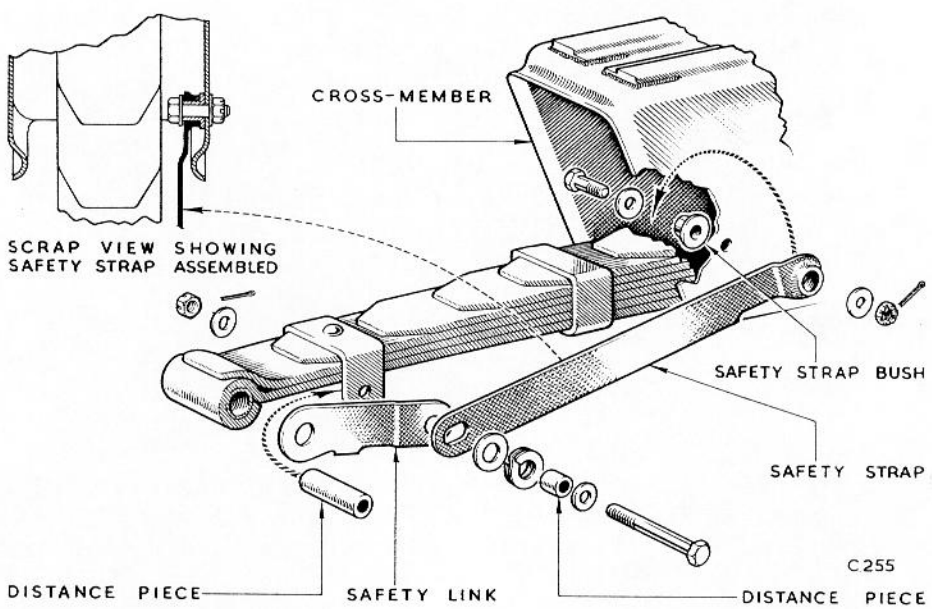


Fig.8 Safety strap attachment.

followed by the two distance pieces as shown in Fig. 6, then compress sufficiently to enter the eye of the stub axle bottom bracket. Fit the $\frac{5}{8}$in. B.S.F. bolt from the rear, screw on the nut, then tighten securely and lock with the split pin.

7. Fit the stub axle assembly to the suspension assembly by inserting the lug on the upper end of the swivel pin into the end lugs of the radius arms, then insert (from the rear) the top pin; flats on the pin locate it correctly. Screw on and tighten the nut and lock with a split pin.

8. Fit the bottom bracket over the end of the transverse spring and insert the safety link between the bracket and the spring at the front. Assemble the distance washer between the bracket and the spring see Fig. 4. The washers are available in the following thicknesses:-

0·113 in. (2·87 m.m.)	0·127 in. (3·23 m.m.)
0·120 in. (3·05 m.m.)	0·134 in. (3·41 m.m.)

Select a washer to give a clearance within the limits quoted in the General Data on page 8, then using the thread protector and lead-in TFN 5001, insert the bottom pin from the front locating it by means of the flats, then screw on and tighten the nut and lock with a split pin. It is preferable to insert a bottom pin with the lead-in as, apart from any slight misalignment of the various bores, it also helps to locate the various washers.

9. Fit the distance spool, rubber grommets, washers and nuts to the larger upper end of the shock absorber; tighten the nuts. Fit the assembled upper end of the shock absorber to the suspension bracket, insert the bolts, then fit a plain washer and slotted nut; tighten the nut and lock with a split pin.

10. Assemble the steering box assembly to the front of the cross-member as detailed in Section 9.

11. Assemble the right-hand and left-hand safety straps. If the bush has been removed from the safety strap, refit it with its flange to the front, then place the safety strap into position in the cross-member so that the bush flange abuts the inside of the member as shown in Fig. 8. With a plain washer fitted beneath the head, insert the bolt from the inside. Fit a plain washer and slotted nut, tighten securely and lock with a split pin.

Note:- The safety straps are "handed" and must be fitted with the cut-away portion to the bottom as shown in Fig. 8.

Align the elongated hole of the safety strap with those of the safety link and leaf spring bracket. Fit a 5/16in. (7·94 m.m.) plain washer and the small distance piece on to the bolt

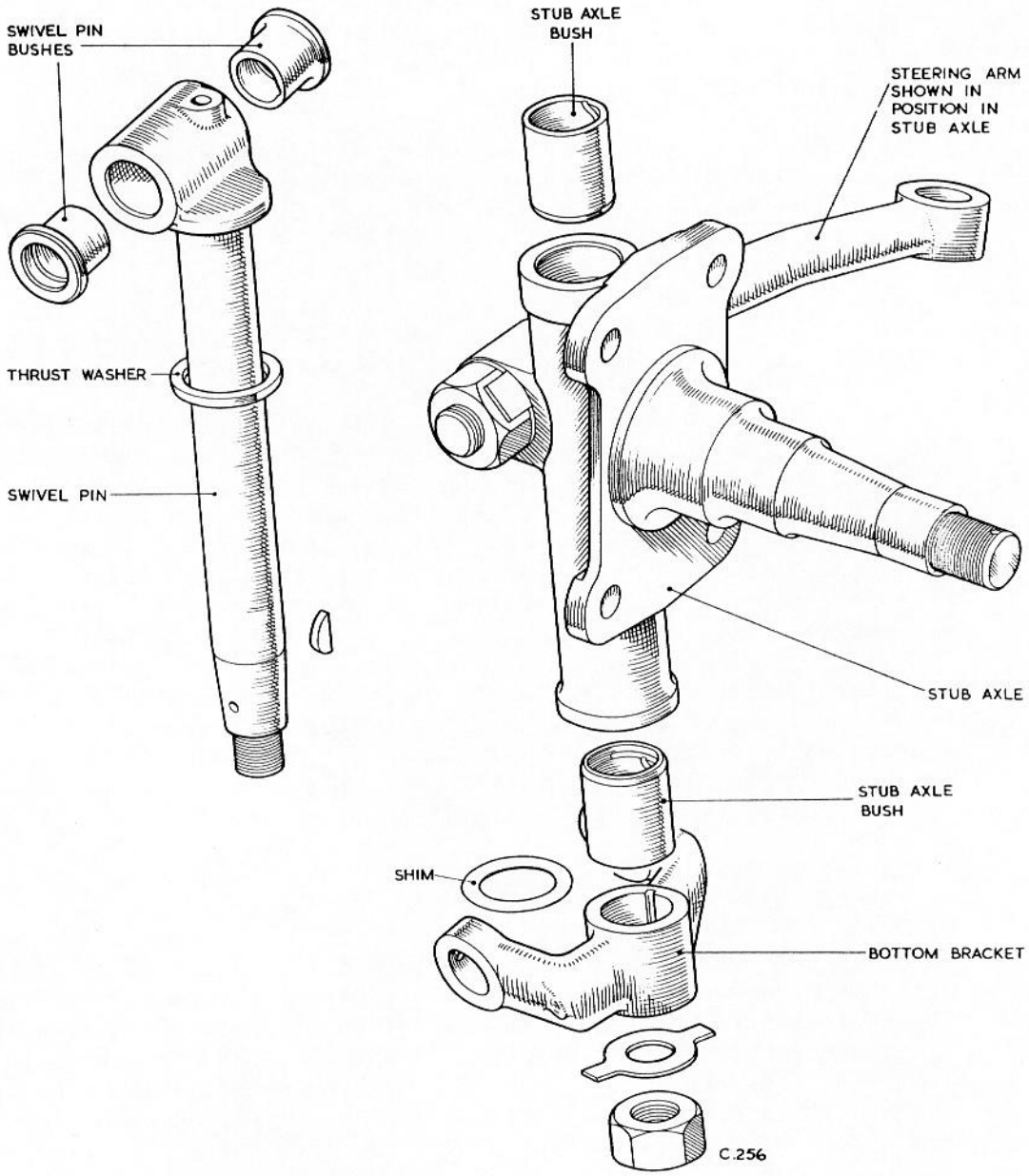


Fig. 9 Stub axle assembly.

followed by the 7/16in. (11·11 m.m.) spring and plain washers, then with the long distance piece interposed between the lugs of the leaf spring clip, enter the bolt from the front. Fit a 5/16in. (7·94 m.m.) plain washer and nut, tighten securely and lock with a split pin, see Fig. 8. Check that there is a clearance between the safety strap and cross-member.

12. Assemble the header of the "One shot" system by means of a $\frac{1}{4}$in. B.S.F. bolt and shake-proof washer, to its location on the front of the cross-member; tighten the bolt securely.

13. Connect up the rigid pipes between the header and the steering box and the two adaptors on the front face of the cross-member, and the unions on the suspension brackets. Connect the flexible pipes between the adaptors and the stub axle swivel pins. Support each flexible pipe by means of clips to the front radius arms. Fit the main feed pipe to the header and the left-hand front engine mounting bracket.

14. Assemble the right-hand and left-hand tie tube assemblies between the steering box rack and the steering arms on the stub axle assemblies, as detailed in Section 9.

15. Operate the "One shot" lubrication pedal until oil is seen to emerge from the various bearings, then fit the protective gaiters.

REPLACEMENTS

Stub axle bushes

If the stub axle bushes or the top link bushes in the swivel pin require replacement, remove the stub axle from the car as follows:-

1. Check that the handbrake is ON, then place a garage jack centrally beneath the front cross-member and raise the front of the car sufficiently to lift the wheels off the ground. Avoid damage to the lubrication and hydraulic pipe lines.

2. Remove the wheel as detailed in Section 10.

3. Disconnect the flexible brake pipe at its union on the brake drum backplate.

4. Disconnect the steering assembly tie tube at the steering arm ball joint as detailed in Section 9.

5. Remove the gaiters that envelope the upper and lower swivel pin links.

6. Disconnect the flexible pipe of the "One shot" system from the top pin.

7. Release the washer tab, unscrew the nut at the bottom of the swivel pin and withdraw the bottom bracket. Remove the shims and the woodruff key and segregate them until required. Withdraw the swivel pin, taking care not to lose the thrust washer from beneath the head.

To remove and refit the bushes in the stub axle, proceed as follows:-

1. Extract the existing bushes.

2. Remove any burrs from the top and bottom of the bores and thoroughly clean the bores.

3. One end of each bush is chamfered to facilitate insertion; this also ensures that the bush is fitted with the spiral oil groove in its bore the correct way up. Press in the new bushes until flush with the faces of the bores.

4. Using the special reamer TFN.4578, finish ream both bushes in position.

5. Lightly polish the swivel pin and trial-fit, see General Data.

To remove and refit the swivel pin bushes, adopt the following procedure:-

1. Extract the existing bushes.

2. Thoroughly clean the bores.

3. Press in the new bushes. Ensure that the bush flanges abut the location end faces.

4. Measure the diameter of the top pin and, using a suitable reamer, ream both bushes in position to obtain the diametral clearance quoted in the General Data on page 8. If the top pin is worn, fit a new one.

5. Using a suitable facing cutter, spot face both bushes in position to the dimensions given in Fig. 10.

Re-assemble in the reverse order for dismantling. Make sure that the thrust washer is refitted beneath the head of the swivel pin (i.e. with its

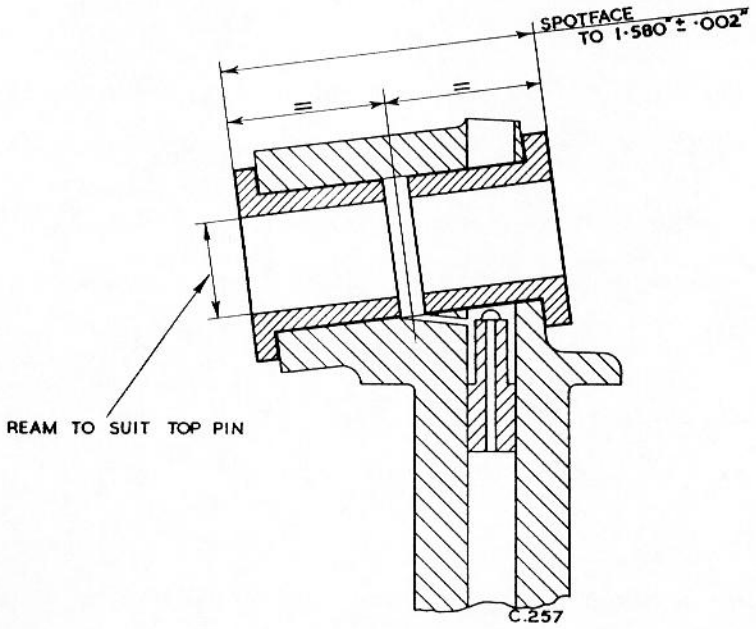


Fig. 10 Overall dimension of swivel pin bushes.

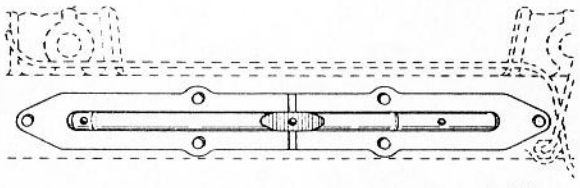


Fig. 11 Steering box location bolt in central position.

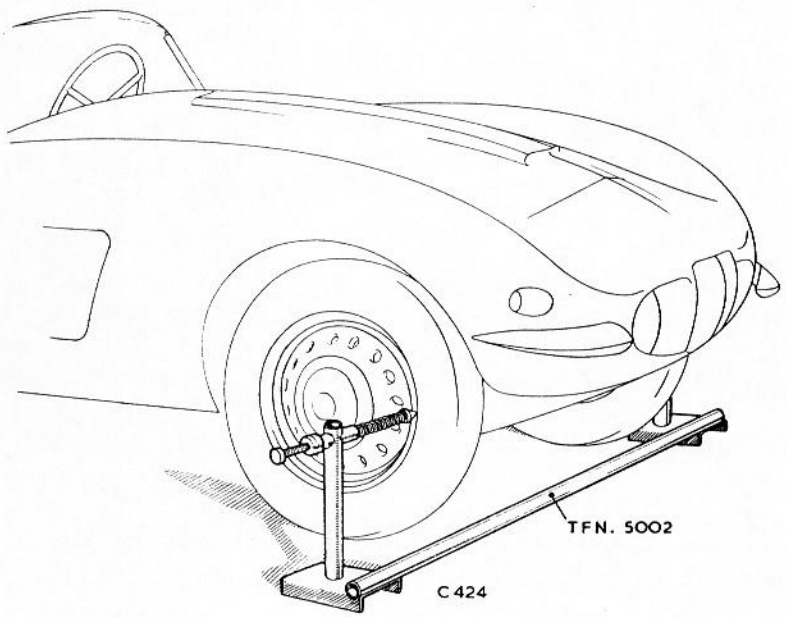


Fig. 12 Checking front wheel tracking.

chamfer against the pin head) and that the correct shims are fitted between the bottom bracket of the swivel pin and stub axle. Check that the swivel pin end-float in the stub axle is within the limits quoted in the General Data on page 8; if necessary, adjust as required by fitting or deleting shims, which may be obtained in thicknesses of 0·010 in. (0·25 m.m.) and 0·005 in. (0·13 m.m.). When satisfactory, bleed the brake system as detailed in Section 9, and check the front wheel tracking and alignment as detailed on page 23.

Transverse leaf spring

If it is necessary to remove the transverse leaf spring, proceed as follows:-

1. Check that the handbrake is ON, then raise the front of the car just sufficiently to lift the wheels off the ground and support its weight by placing axle stands under the chassis on each side. Avoid damage to the lubrication and hydraulic pipe lines.
2. Remove both front wheels as detailed in Section 10.
3. Remove the stub axles as described on page 17.
4. Remove the four transverse spring securing bolt locknuts and standard nuts at the base of the cross-member, then withdraw the bolts through the apertures in the top of the member.
5. Remove the two spring yokes from the top of the spring inside the cross-member.
6. Remove the spring from the cross-member by lifting one end of the spring and, using a hide mallet on the lifted end, tap the spring through the cross-member until it can easily be withdrawn at the opposite end.
7. Remove the two "U" pieces from inside the cross-member.

To refit the transverse leaf spring, proceed as follows:-

1. Place the two "U" pieces in the approximate positions in the cross-member.

2. Insert one end of the spring in the cross-member as far as it will go. Lift the protruding end and, using a hide mallet, tap the spring through the cross-member until it is in position (i.e. when the centre bolt head is located over the locating bore in the base of the cross-member).

3. Place the two spring yokes in position on the spring and insert the four spring attachment bolts through the holes provided at the top of the cross-member, taking care that each bolt is inserted through the spring yoke and "U" piece, then screw on the four 7/16in. B.S.F. standard nuts. Lightly tighten the nuts until the centre bolt of the spring is drawn into the anchorage hole, but do not tighten finally until the spring is in the normal position (i.e. with the weight of the car on the wheels) see operation 6.

4. Assemble the safety straps and stub axles.

5. Replace the front wheels as detailed in Section 10 and lower the car.

6. Tighten the four standard spring attachment bolt nuts to the torque quoted in the General Data on page 8, then lock with the locknuts. Check the tracking as described on page 23.

Transverse spring bushes

Proceed as follows:-

1. Extract the existing bushes.

2. Thoroughly clean the bush locating bores in the ends of the spring.

3. Press in the new bushes.

4. Clean up the bush end faces with the locating faces, then measure the diameter of the bottom pin and, using a suitable reamer, ream the bush in position to obtain the diametral clearance quoted in the General Data on page 8. If the bottom pin is worn, fit a new one.

Steering arms

The steering arms are "handed" and they must therefore be fitted to their correct stub axles. Upon replacement, ensure that the key is a tight fit in the

arm and in the keyway; always replace a damaged key with a new one. After replacement, torque tighten the securing nuts to the figure given in the General Data then check the tracking as described on page 23.

Telescopic shock absorber

To remove the telescopic shock absorbers, proceed as follows:-

1. Check that the handbrake is ON, then jack up and support the front of the car. Avoid damage to the lubrication and hydraulic pipe lines.

2. Remove the relevant front wheel.

3. Withdraw the split pin and remove the nut and bolt securing the lower end of the shock absorber to the stub arm swivel pin bracket. Withdraw the shock absorber from the bracket and remove the distance pieces, rubber grommets and distance tube.

4. To disconnect the shock absorber at its upper end from the suspension bracket, remove the split pin, nut, washer and bolt; withdraw the shock absorber. Remove the nut from the spool, see Fig. 7, followed by the washer then withdraw the spool, followed by the grommets.

The refitting procedure is as follows:-

1. Fit the distance tube and rubber grommets to the small end of the shock absorber, followed by the two distance pieces, flanges inwards. Compress the end assembly sufficiently to allow it to be inserted into the bottom bracket. Fit the bolt from the rear, fit a plain washer, and screw on and tighten the nut.

2. Fit the rubber grommets to the upper end of the shock absorber, then fit the spool, complete with one nut and washer. Fit the other washer and nut and tighten the nut. Place the shock absorber in position in the suspension bracket, fit the bolt from the rear, assemble the washer and nut, then tighten the nut.

3. Refit the front wheel and lower the car.

TRACKING AND WHEEL BASE CHECKS

To adjust the front wheel tracking, proceed as follows:-

1. Detach the steering box cover by removing the six nuts and spring washers, and ensure that the locating bolt is centralised in the guide slot, see Fig. 11.

   Note:- An alternative method of centralising the rack is to align its shoulder with the machined end of the steering box casting at the end remote from the steering column, see Fig. 2 of Section 9.

2. Using the tracking bar TFN.5002, measure the front and rear edges of the wheel rims at hub level as shown in Fig. 12. Revolve the wheel and check in three positions. The wheels must be parallel with each other within a tolerance of $\frac{3}{8}$in. to 3/16in. (3·18 m.m. to 4·76 m.m.).

3. To adjust, detach the rubber telescopic sleeves from the ends of the tie tubes and steering rack on each side, and slide them clear, then slacken the locknut, and turn the ball bolt connecting the tie tube to the rack until the correct position is obtained. Ensure that the rack remains in the central position during the adjustment.

   Note:- Do not unscrew the ball bolts so that their threads clear the inspection holes at each end of the steering rack, see Fig. 13.

Check and adjust the wheel base as follows:-

1. Remove the embellisher caps from the front and rear wheels followed by the two dust caps from the front wheels.

2. Make the diagonal check given on page 32 of Section 7. When satisfactory, check the distance between the centres of the hubs as shown in Fig. 14, using the trammel TFN.5068; this should be the same on both sides of the car.

3. If adjustment is required, check that the steering is in the central position. Assuming that the toe-in has been set correctly, slacken the locknut and turn the ball bolts connecting the tie tube to the rack. To maintain the toe-in while correcting the wheel base, turn the ball bolts in equal increments, screwing one in and the other out. It is usually possible to see in which direction to turn by the amound of thread visible. When the wheel base has been corrected, again check the toe-in and finally lock the ball bolts.

4. Replace the two dust caps, the four embellisher caps, the steering box cover (if removed), and the telescopic rubber sleeves.

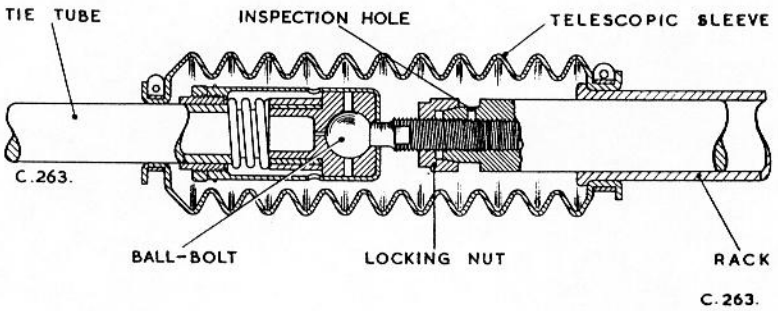


Fig. 13 Tie tube adjustment.

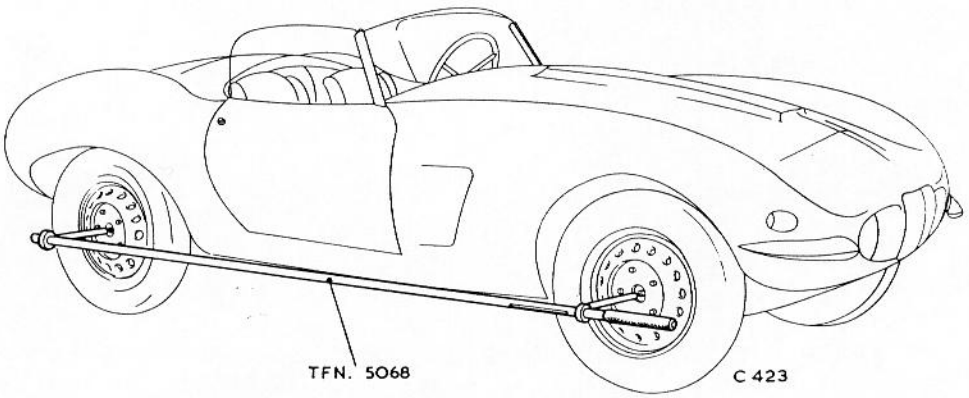


Fig. 14 Checking wheel base.

ANTI-ROLL BAR

This is a torsion bar which can readily be fitted to the front suspension of the Arnolt-Bristol car. It is illustrated in Fig. 15 and is mounted on two pads provided on the underside of the chassis frame. The extremities of the bar are coupled to clamps attached to the radius arms. The whole installation is a complete assembly and no parts are rendered redundant as a result of its fitment.

To fit the bar, refer to Fig. 15, which is self explanatory. Note that the torque loading on the clamping nut is 18 lb.ft. (26·78 kg/m.).

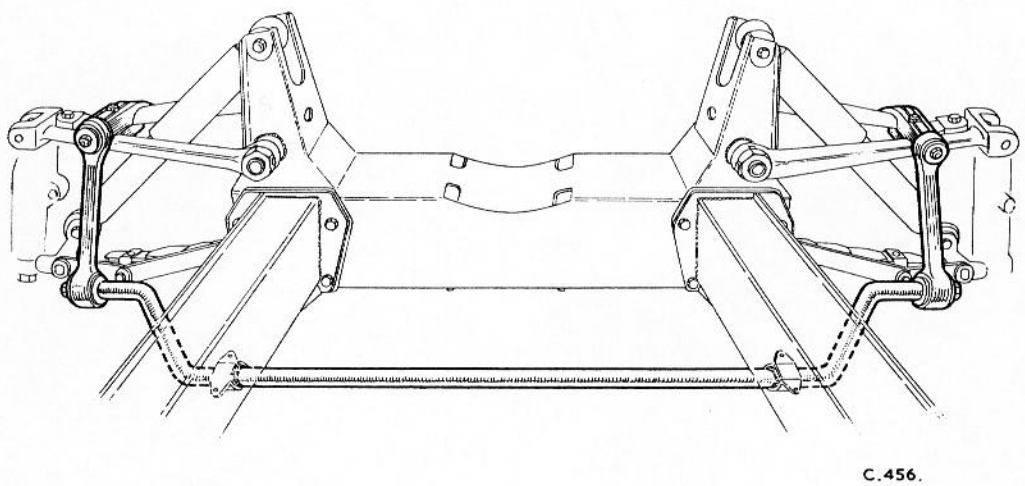
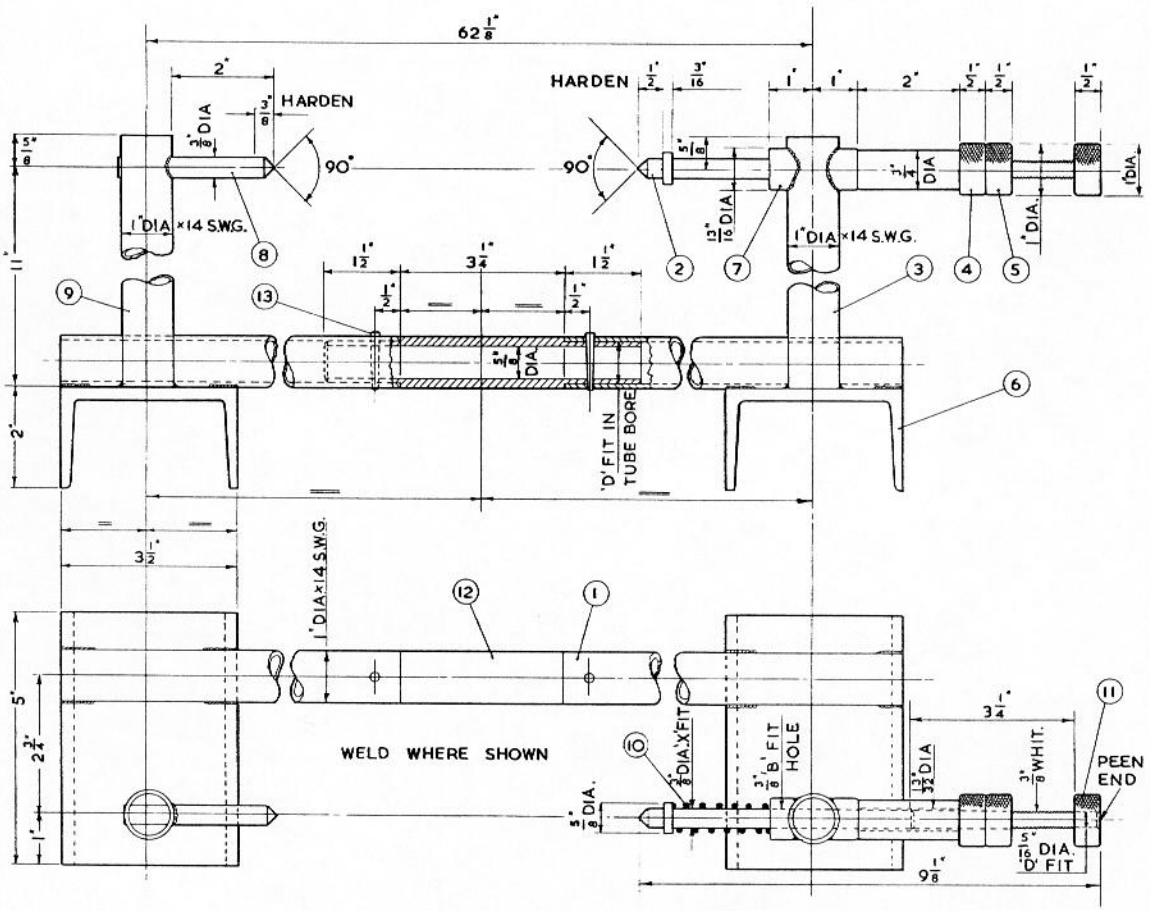


Fig. 15 Anti-roll bar.

SPECIAL TOOLS

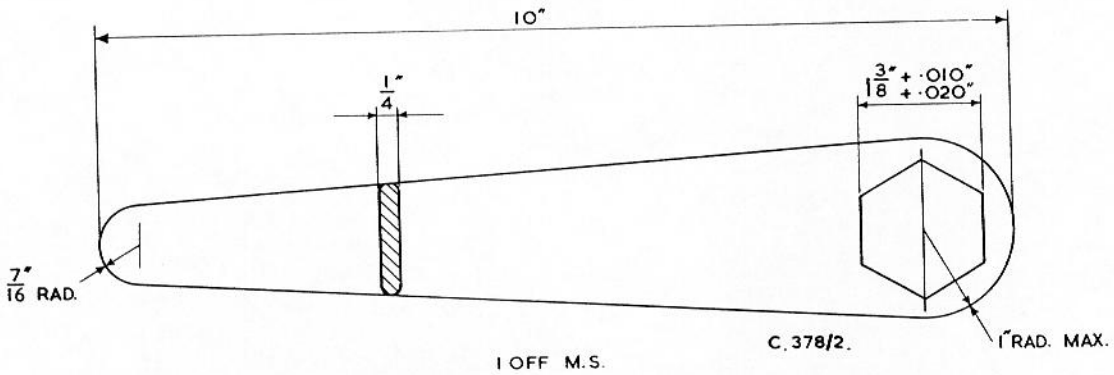


ITEM	DESCRIPTION	NO. OFF	MATERIALS
1	FIXTURE END TUBES	2	MILD STEEL
2	ADJ. TRACK PIN	1	" "
3	PILLAR-TRACK PIN	1	" "
4	KNURLED LOCKNUT	1	" "
5	" " "	1	" "
6	FIXTURE.-BASE	2	M.S. CHANNEL
7	CARRIER	1	MILD STEEL

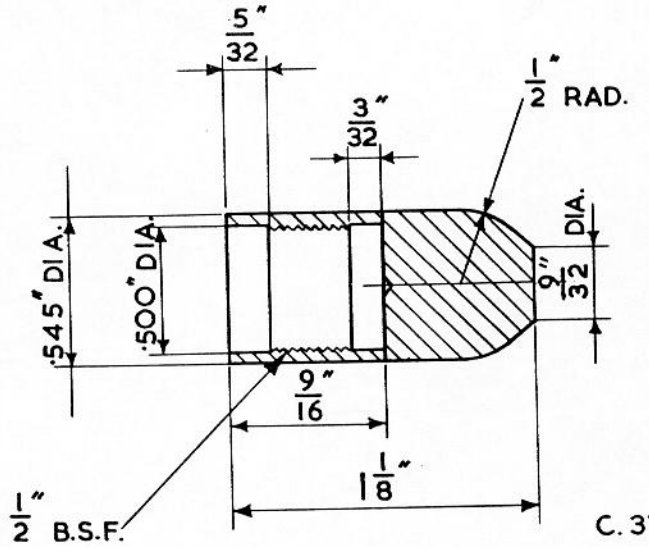
ITEM	DESCRIPTION	NO. OFF	MATERIALS
8	TRACKING PIN.	1	MILD STEEL
9	PILLAR-TRACK PIN	1	" "
10	SPRING	1	TO SUIT
11	KNURLED SCREW	1	MILD STEEL
12	CENTRE TUBE	1	" "
13	No.0 TAPER PINS	2	" "

C.378/1.

TRACKING BAR T.F.N. 5002

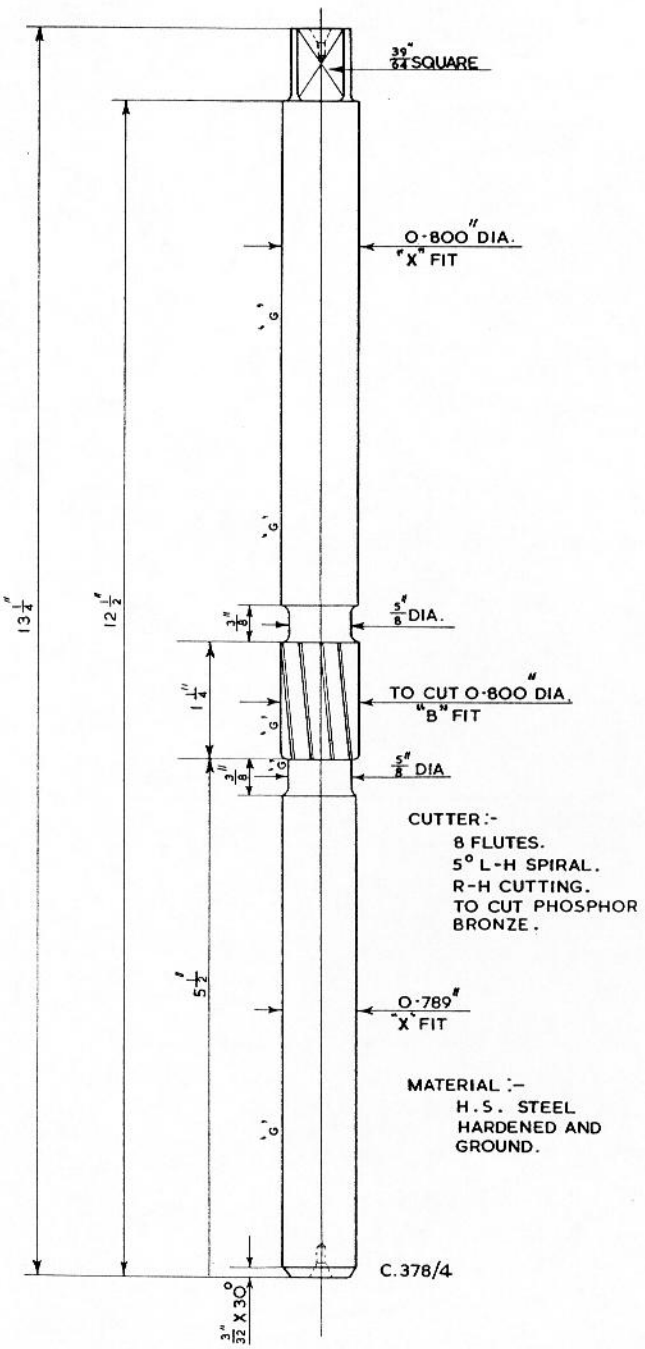


SPANNER T.F.N. 5035

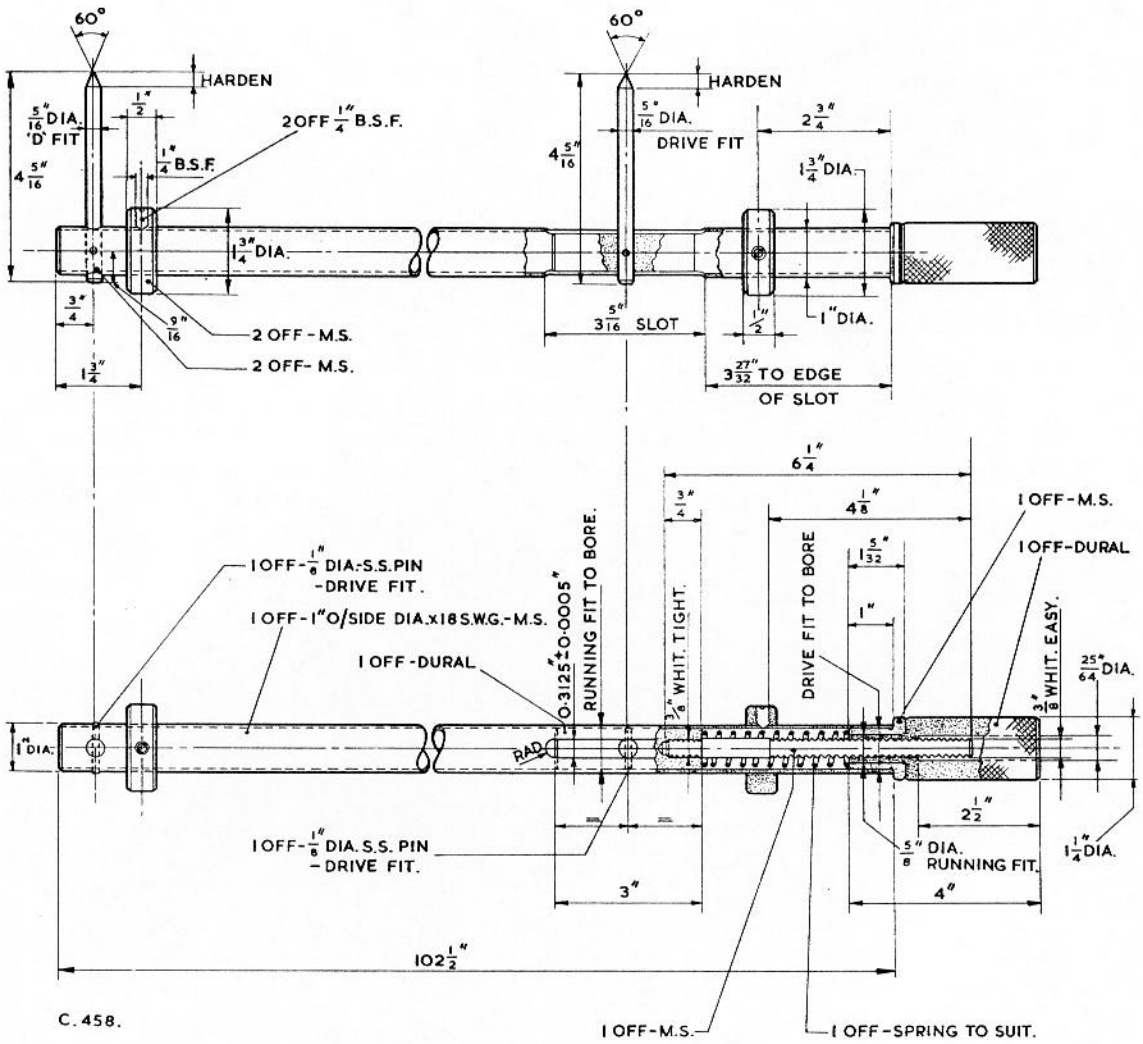


M.S.
CASE-HARDEN

THREAD PROTECTOR AND LEAD-IN T.F.N. 5001



PILOTED REAMER FOR STUB AXLE BUSHES.T.F.N.4578.



PARALLEL TRAMMELS. T.F.N.5068.