Draft Chapter 33F

OIL SUMP, REASSEMBLING

This draft chapter is issued for advance information pending the publication of the final chapter.

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LIST OF ILLUSTRATIONS

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GENERAL

1. Paragraphs 1 to 8 of these assembly instructions are applicable to both the 48 Mk. 1 and 48 Mk. 2 engines, thereafter the two marks are dealt with separately. Reconditioning is confined to operations whereby unserviceable parts are replaced by serviceable standard parts. Instructions for major repairs and rectification, and the processes essential to such repairs, are contained in Chapter 28D.

2. Consumable stores required to replace items automatically discarded during dismantling are listed at the end of the chapter. Tools are referred to in the text as they are used and are also listed at the end of the chapter.

3. Throughout the text, the phrase "within the limits" implies that reference must be made to the Schedule of Fits, Clearances and Repair Tolerances, Table of Fits and Clearances contained in Chapter 38 of this handbook to ascertain the limits permissible. The term "press" implies the use of a suitable hand or mechanical press. Reference to jointing compound assumes the use of Wellseal or a similar approved liquid jointing compound.

4. Before making any renewals prior to rebuilding, the inspection sheet must be read carefully and all work carried out as directed. Minor rectifications, which may not be entered on the inspection report, include renewing damaged or loose studs, cleaning up steel components with fine emery or on a buff, removing burrs and sharp edges, stoning up gear teeth and splines, and polishing out scratches. Ball bearings, including new ones, must be washed in white spirit, and immediately after washing must be oiled with clean approved engine oil to prevent corrosion. After any work has been carried out, the component in question must be resubmitted for inspection.

RENEWALS

5. With the exception of damaged studs no additional work, other than that required for normal assembly is necessary to renew any standard part; the defective parts rejected by inspection being discarded and new, serviceable or repaired parts being substituted. To renew damaged studs, a $\frac{1}{4}$ in. B.S.F. stud box T70809 and a 2 B.A. stud box T70965 are required. Damaged studs may be removed, and serviceable replacements fitted, in accordance with standard practice.

PAINTING

6. As the sump and the oil pump body and cover will have been stripped of paint in preparation for crack detection, they must be repainted prior to assembly. Before commencing to paint the castings ensure that the chromate finish is undamaged. Where the original chromate finish has been removed from small areas only, it may be rectified by the application of selenious acid; where large areas are affected the component must be re-chromated in accordance with D.H. process specification No. 167 contained in Chapter 32.

7. Primer and finishing coats must be applied in accordance with the requirements of D.H. process specification No. 168 (protection of magnesium rich alloy against corrosion).

8. (1) Degrease the castings by immersion in a trichlorethylene vapour degreaser; the casting should remain in the degreaser until it attains the temperature of the vapour.

9. The 48 Mk. 1 oil sump must be blanked, using slave washers and nuts, and painted in the following manner.

(1) Secure the oil pump body and the oil pump cover to the sump.
(2) Secure the metering pump blanking covers to the pump faces.
(3) Secure the pressure filter cover to the sump.
(4) Secure the suction filter cover to the sump.
(5) Coat all exposed threads with grease and, using adhesive tape and improvised blanks as appropriate, blank off the cooling oil pipe aperture, the relief valve aperture, the drain plug aperture, the sight glass aperture and the threaded union on the pressure filter cover.
(6) Spray the casings with approved primer and allow to air dry.
(7) Spray the casings with the approved finishing coat and allow to air dry.
(8) Remove the blanks and components fitted prior to painting.

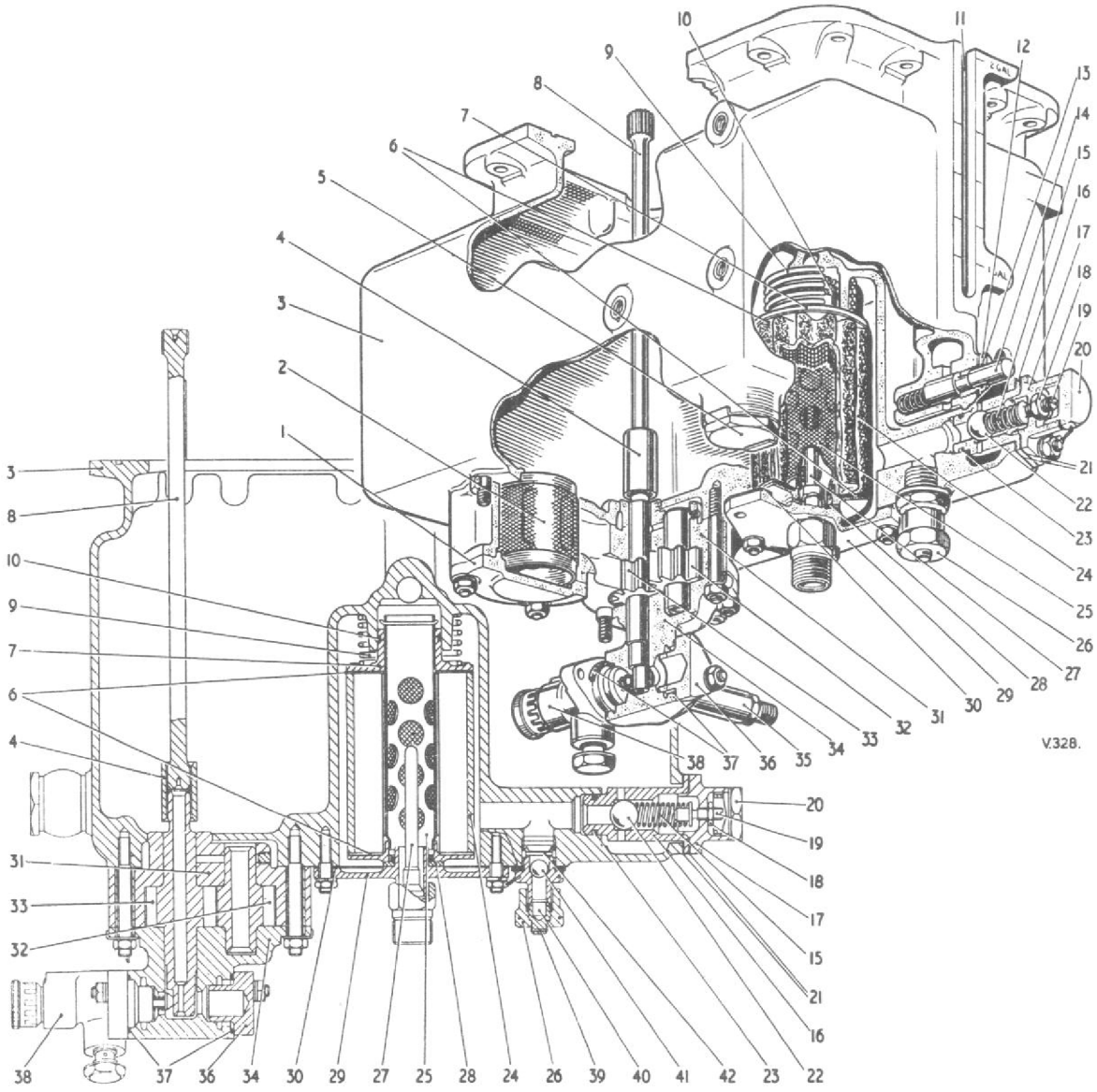
10. The 48 Mk. 2 oil sump must be blanked, using slave washers and nuts, and painted in the following manner:—

(1) Secure the pressure filter cover to the sump.
(2) Secure the low-pressure filter cover to the sump.
(3) Secure the oil and hydraulic pump mounting casing to the sump.
(4) Secure the oil pump body and the oil pump cover to the oil and hydraulic pump mounting casing.
(5) Secure the metering pump blanking covers to the pump faces.
(6) Secure the valve box assembly mounting plate to the sump.
(7) Secure a blank made from local resources to the dimensions detailed in Section 1, and the hydraulic pump adapter to the valve box mounting plate.
(8) Secure a blank made from local resources to the dimensions detailed in Section 1 to the circulating pump aperture.
(9) Coat all exposed threads with grease and, using adhesive tape and improvised blanks as appropriate, blank off the hydraulic pump drive aperture, the fuel pump drive aperture, the relief valve aperture, the sight glass aperture, the restrictor aperture, the threaded hole in the low-pressure filter cover, and the threaded union on the pressure filter cover.
(10) Spray the casings with approved primer and allow to air dry.
(11) Spray the casings with the approved finishing coat and allow to air dry.
(12) Remove the blanks and components fitted prior to painting.

ASSEMBLY—48 Mk. 1 only (*fig. 1*)

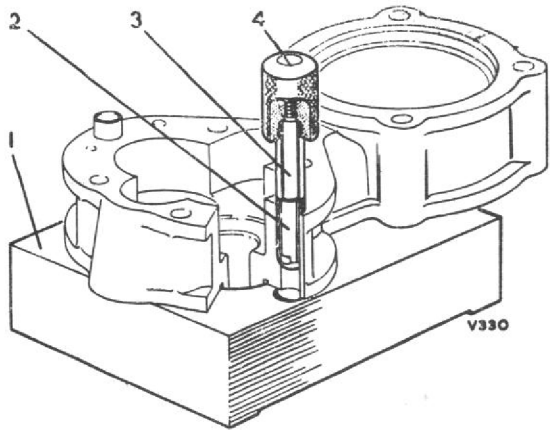
Oil pump

11. The dowels in the oil pump body will not normally be removed during reconditioning, but



1 SUCTION FILTER COVER
2 GAUZE SUCTION FILTER
3 SUMP
4 OIL PUMP DRIVE SHAFT SLEEVE
5 DRAIN PLUG
6 END PLATE WASHER
7 PRESSURE FILTER END PLATE
8 OIL PUMP DRIVE SHAFT
9 OVERLOAD VALVE SPRING
10 SEALING RING
11 OIL LEVEL SIGHT GLASS APERTURE
12 OIL LEVEL PLUNGER RETAINING PLUG
13 SEALING RING
14 OIL LEVEL PLUNGER
15 RELIEF VALVE SPRING
16 RELIEF VALVE HOUSING
17 RELIEF VALVE CAP
18 LOCK NUT
19 RELIEF VALVE ADJUSTING STOP
20 RELIEF VALVE PLUG
21 SEALING GASKETS
22 RELIEF VALVE
23 SEALING RING
24 PRESSURE FILTER ELEMENT
25 PRESSURE FILTER SUPPORT TUBE ASSEMBLY
26 UNION NUT
27 OIL TEMPERATURE THERMOMETER
28 WASHER BONDED TO FILTER COVER
29 PRESSURE FILTER COVER
30 JOINT WASHER
31 OIL PUMP BODY
32 OIL PUMP DRIVEN GEAR
33 OIL PUMP DRIVING GEAR
34 OIL PUMP COVER
35 OIL RESTRICTOR
36 BLANKING COVER ON UNUSED METERING PUMP FACE
37 SEALING RINGS
38 METERING PUMP
39 SPLIT PIN
40 BLANKING NIPPLE
41 BALL
42 RETAINING PIN

Fig. 1. Oil sump assembly (48 Mk. I)



1 PRESS BLOCK T74782
2 DOWEL
3 GUIDE MANDREL T74783
4 ADAPTER T74784

Fig. 2. Pressing a dowel into the oil pump body

should it be necessary they must be fitted as described in Op. 1, 2 and 3.

(1) Place the oil pump body on press block T74782.

(2) Position the dowel in guide mandrel T74783 and screw adapter T74784 on to the guide mandrel.

(3) Press the dowel into the oil pump body (*fig.* 2).

(4) Remove the oil pump body from the press block.

(5) Wash out all oilways in the oil pump with clean hot oil and check for free flow.

(6) Assemble the oil pump driven gear and the driving gear to their respective positions in the oil pump body.

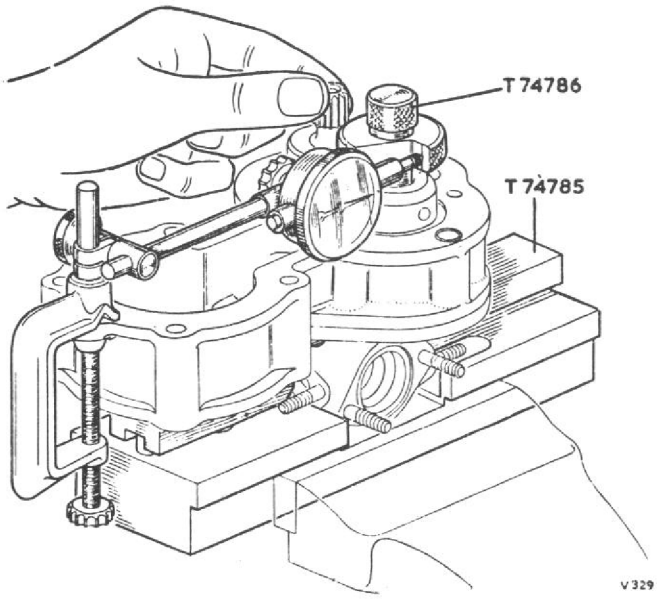


Fig. 3. Oil pump gear backlash check

(7) Position the oil pump cover to the oil pump body and secure with two plain and spring washers and nuts.

(8) Ensure that the gears rotate freely.

(9) Place the pump assembly on vice block T74785.

(10) Clamp a dial test indicator to a convenient position on the vice block, and check that the end float of the two gears is within the limits.

(11) Position backlash checking tool T74786 in the bore of the driving gear.

(12) Re-position the dial test indicator and locate the stylus on the scribed line of the backlash checking tool.

(13) Lock the oil pump driven gear and check that the backlash between the driven gear and the driving gear is within the limits (*fig.* 3).

(14) Oil the gears with clean approved engine oil.

Oil pump to the sump

12. (1) Wash out all oilways in the sump with clean hot oil and check for free flow.

(2) Fit a new Klingerit joint washer (Part No. 605344) to the oil pump face on the sump.

(3) Position the oil pump assembly to the sump and secure it with six new tab-washers (Part No. N1592) and nuts on the pump flange, and a plain washer, spring washer and nut on the suction filter housing flange.

(4) Assemble the suction filter in its housing.

(5) Position the suction filter retaining cover to the sump and secure with four plain and spring washers and nuts.

Pressure filter to the sump

13. (1) Fit a new washer (Part No. 94039) to the filter support tube.

(2) Position a new filter element (Part No. 22772), another new washer (Part No. 94039) and the end plate over the support tube.

(3) Secure the end plate with 14 S.W.G. soft iron locking wire, bend the wire over, ensuring that the ends do not project beyond the outside diameter of the end plate boss (*fig.* 4).

(4) Fit a new sealing ring (Part No. N6892) to the groove in the end plate.

(5) Position the overload valve spring over the boss at the far end of the pressure filter housing.

(6) Position the pressure filter assembly in the housing with the support tube located in the bore of the boss at the far end of the housing.

(7) Position a new joint washer (Part No. 29915) and the pressure filter cover to the sump with the spigot on the cover locating in the bore of the support tube.

(8) Secure the cover with a lock-wire tab adjacent to the plug hole, and six spring washers and nuts.

(9) Screw the oil thermometer bulb into the cover.

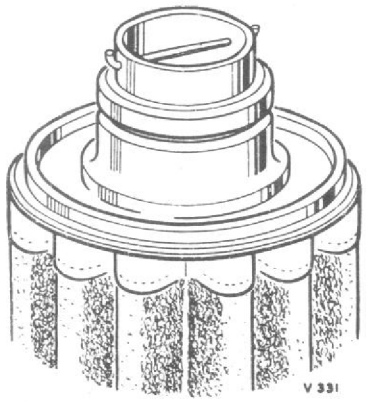


Fig. 4. The pressure filter end plate locking

Relief valve to the sump

14. (1) Fit a new sealing ring (Part No. N4601 Pre-mod. 413 or N4635 when this modification is embodied) to the relief valve housing.

(2) Assemble a new sealing gasket (Part No. 603389) and the housing into the relief valve aperture.

(3) Assemble the ball and spring in the relief valve housing.

(4) Assemble a new sealing gasket (Part No. 603389) and the relief valve cap, complete with its stop and locknut, into the housing.

(5) Secure the cap with a plain washer, a lock-wire tab, and two spring washers and nuts.

(6) Position a new washer (Part No. N1494) and the plug to the relief valve cap.

Oil level plunger and small detail parts to the sump

15. (1) Position a new sealing ring (Part No. N4602) into the bore of the oil level plunger retaining plug.

(2) Position the spring and the oil level plunger into its aperture and secure with a new tab-washer (Part No. N4466) and the retaining plug; lock the plug.

(3) Position a new tab-washer (Part No. N3703) and the drain plug to the bottom of the sump; do not lock the plug.

(4) Using new washers (Part No. N1486), secure the cooling oil pipe banjo union to the port side wall of the sump with the banjo bolt.

(5) Using a new washer (Part No. AGS1138C), secure the oil priming union into the bottom of the sump adjacent to the pressure filter.

(6) Fit the blanking nut to the union.

Metering pump and restrictor to the sump

16. (1) Assemble a new sealing ring (Part No. 94043) to the spigot on the metering pump, ensuring that it does not obstruct the oil inlet duct.

(2) Rotate the main oil pump spindle until the cam is at bottom dead centre (position of no lift) relative to the metering pump.

(3) Insert the metering pump spigot into the bore in the oil pump cover and hold it in position against the load of the spring so that the flange on the metering pump firmly abuts the pump cover.

(4) Still holding the pump in position, secure it with two plain and spring washers and nuts.

(5) Assemble the restrictor into its housing and secure with a new split pin (Part No. SP9–C8) inserted through the housing and the restrictor; if the split pin holes do not align, turn the restrictor in the housing through 180 degrees.

(6) Ensure that the split pin does not protrude beyond a 0·450 in. radius from the centre of the restrictor as shown in Chap. 33B, fig. 16.

(7) Position a new sealing ring (Part No. 94043) and the oil restrictor to the front face of the oil pump cover.

(8) Secure the restrictor with two plain and spring washers and nuts.

(9) Position a new sealing ring (Part No. 94043) and blank to the remaining two faces on the oil pump cover.

(10) Secure each blank with two plain and spring washers and nuts.

(11) Using new washers (Part No. N1502), screw the metering pump banjo bolt into the boss formed on the metering pump body.

(12) Fit a new circlip (Part No. 26066) to the recess in the oil pump drive shaft sleeve.

(13) Position the sleeve and oil pump drive shaft to the oil pump drive, rotate the shaft and check for freeness.

(14) Lay the shaft in the sump.

(15) Secure transport blank T74781 to the opening at the top of the sump with four slave bolts and nuts.

(16) Blank off the banjo union and the sight glass aperture with tape.

ASSEMBLY—48Mk. 2 only *(fig. 5, 6, 7 and 8)*

Fuel pump drive bearing housing

17. Before assembling any component to the sump, wash all the oilways with clean hot oil and check for free flow.

(1) Place the fuel pump drive bearing housing on press block T77163.

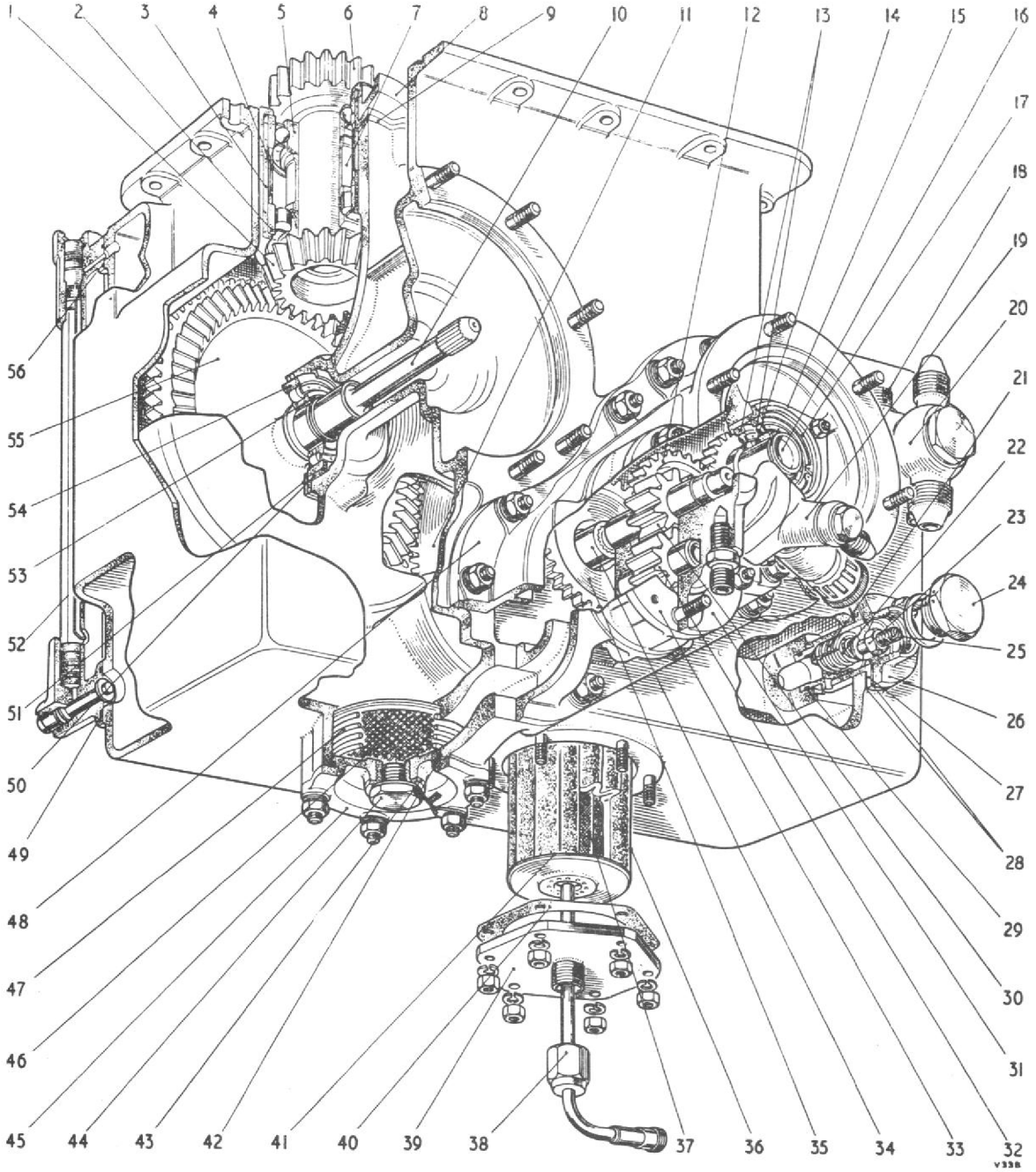
(2) Position the outer race of the roller bearing, serial number downwards, on adapter T77164.

(3) Position the adapter over the mandrel of the press block and press the outer race into the housing.

Note . . .

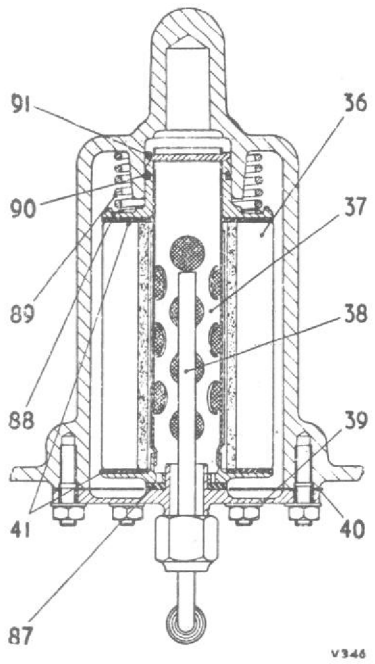
To enable inspection to check that the race is correctly fitted, it is essential that the serial number on the race is in-line with the extractor cut-outs in the housing.

(4) Position the fuel pump bearing housing, and its retaining plate to the front aperture in the starboard side of the sump.



1 ACCESSORIES DRIVE BEVEL GEAR
2 ROLLER BEARING
3 ACCESSORIES DRIVE BEARING HOUSING
4 OUTER DISTANCE PIECE
5 ANGULAR CONTACT BEARING
6 ACCESSORIES DRIVE DRIVEN GEAR
7 INNER DISTANCE PIECE
8 BEARING HOUSING CAP
9 ADJUSTING WASHER
10 FUEL PUMP DRIVE QUILL SHAFT
11 CIRCULATING PUMP DRIVING GEAR
12 OIL PUMP DRIVE IDLER GEAR
13 BALL BEARING
14 BEARING SPACER
15 HYDRAULIC PUMP DRIVE BEARING
16 HYDRAULIC PUMP DRIVE GEAR
17 SEEGER CIRCLIP
18 OIL RESTRICTOR
19 METERING PUMP
20 OIL FEED BANJO
21 RELIEF VALVE PLUNGER
22 RELIEF VALVE SPRING
23 LOCK NUT
24 RELIEF VALVE PLUG
25 ADJUSTING SCREW
26 RELIEF VALVE CAP
27 RELIEF VALVE HOUSING
28 SEALING GASKET
29 SEALING RING
30 OIL PUMP DRIVING GEAR
31 OIL PUMP COVER
32 OIL PUMP DRIVEN GEAR
33 OIL PUMP BODY
34 OIL PUMP DRIVE SLEEVE
35 OIL PUMP DRIVE GEAR
36 PRESSURE FILTER ELEMENT
37 PRESSURE FILTER SUPPORT TUBE ASSEMBLY
38 OIL TEMPERATURE THERMOMETER
39 PRESSURE FILTER COVER
40 FILTER COVER JOINT WASHER
41 END PLATE WASHER
42 SEALING RING
43 LOW PRESSURE FILTER COVER FERRULE
44 LOW PRESSURE FILTER COVER PLUG
45 LOW PRESSURE FILTER COVER
46 LOW PRESSURE FILTER
47 LOW PRESSURE FILTER SPRING
48 OIL AND HYDRAULIC PUMP MOUNTING CASING
49 SEALING RING
50 FUEL PUMP DRIVE BEARING HOUSING
51 FUEL PUMP DRIVE BEARING HOUSING RETAINING PLATE
52 OIL LEVEL SIGHT GLASS ASSEMBLY
53 CIRCLIP
54 ROLLER BEARING
55 FUEL PUMP DRIVING GEAR
56 SEALING RING

Fig. 5. Oil sump assembly (48 Mk. 2)



36 PRESSURE FILTER ELEMENT
37 PRESSURE FILTER SUPPORT TUBE ASSEMBLY
38 OIL TEMPERATURE THERMOMETER BULB
39 PRESSURE FILTER COVER
40 JOINT WASHER
41 END PLATE WASHER
87 WASHER BONDED TO FILTER COVER
88 PRESSURE FILTER END PLATE
89 OVERLOAD VALVE SPRING
90 SEALING RING
91 SOFT IRON RETAINING WIRE

Fig. 6. Scrap section of the oil pressure filter

(5) Secure it with four new tab-washers (Part No. AGS518E) and nuts; lock the nuts.

Hydraulic pump drive bearing housing

18. (1) Place the hydraulic pump drive bearing housing on press block T77167.

(2) Position the angular contact bearing over the mandrel of the press block with the face of the outer race which is marked *thrust* facing uppermost.

Note . . .
Reference should be made to Chapter 22 before carrying out this operation.

(3) Using adapter T77168, press the bearing into its housing.

(4) Assemble the adjusting washer and the hydraulic pump drive bearing housing on the mounting plate.

(5) Assemble the retaining plate to the bearing housing and secure it with four new tab-washers (Part No. AGS518E) and nuts; do not lock the nuts.

Fuel pump driving gear

19. (1) Place the fuel pump driving gear, bevel gear uppermost, on press block T77165.

(2) Position guide adapter T77169 into the bore of the gear.

(3) Position the inner race of the roller bearing, serial number facing uppermost, over the guide adapter.

(4) Using adapter T77164, press the bearing on to the gear.

(5) Secure the race with a new circlip (Part No. AGS2031–12).

(6) Reverse the gear on the press block so that the bevel gear faces down.

(7) Position guide adapter T77170 into the bore of the gear.

(8) Position the valve box assembly mounting plate over the guide adapter.

(9) Using adapter T77166 press the mounting plate on to the gear (*fig.* 9).

(10) Secure the race with a new cup locking washer (Part No. N2880) and the ring nut.

(11) Using spanner T77175, tighten but do not lock the nut.

Circulating pump drive bearing housings

20. (1) Place the small bearing housing on press block T77163.

(2) Position the outer race of the roller bearing on adapter T77164.

(3) Position the adapter over the mandrel of the press block and press the outer race into the housing.

(4) Assemble the circulating pump bearing housing and its retaining plate to the rear aperture in the starboard side of the sump.

(5) Secure it with four new tab-washers (Part No. AGS518E) and nuts; lock the nuts.

(6) Place the large bearing housing, flange uppermost, on press block T77171.

(7) Position the ball bearing over the mandrel of the press block.

(8) Using adapter T77168, press the bearing into the housing.

(9) Secure the bearing with a new retaining ring (Part No. 60559).

(10) Assemble the housing to the rear inside face of the valve box assembly mounting plate and secure with four new tab-washers (Part No. AGS518E) and nuts; lock the nuts.

Circulating pump driving gear

21. (1) Position distance sleeve T77172 over the mandrel of press block T77165.

(2) Place the circulating pump driving gear, counterbore uppermost, on the press block.

(3) Position guide adapter T77173 into the bore of the gear.

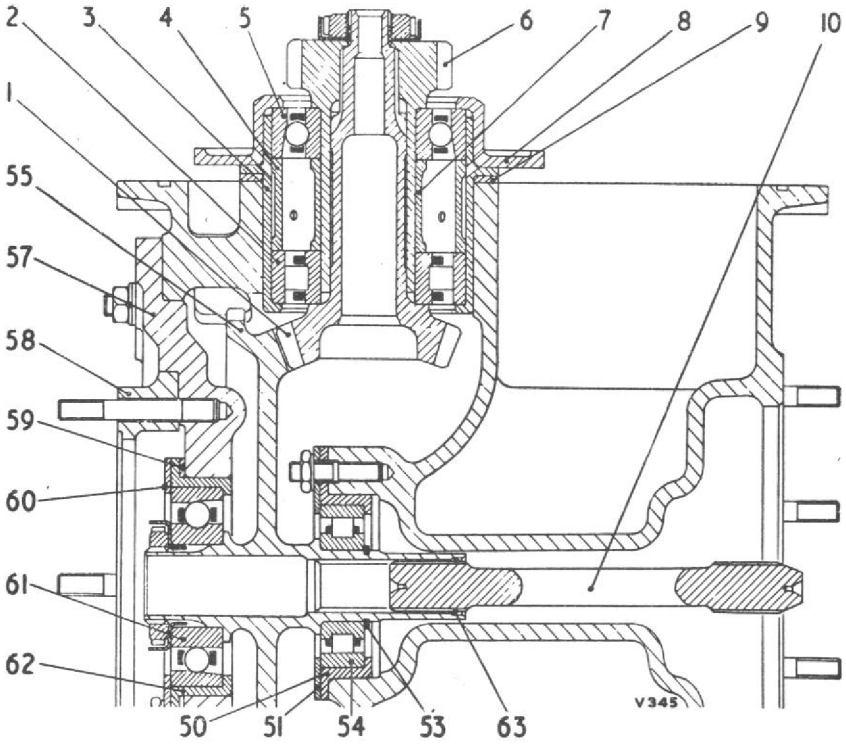


Fig. 7. Scrap section of the fuel pump drive gear and vertical accessory drive gear

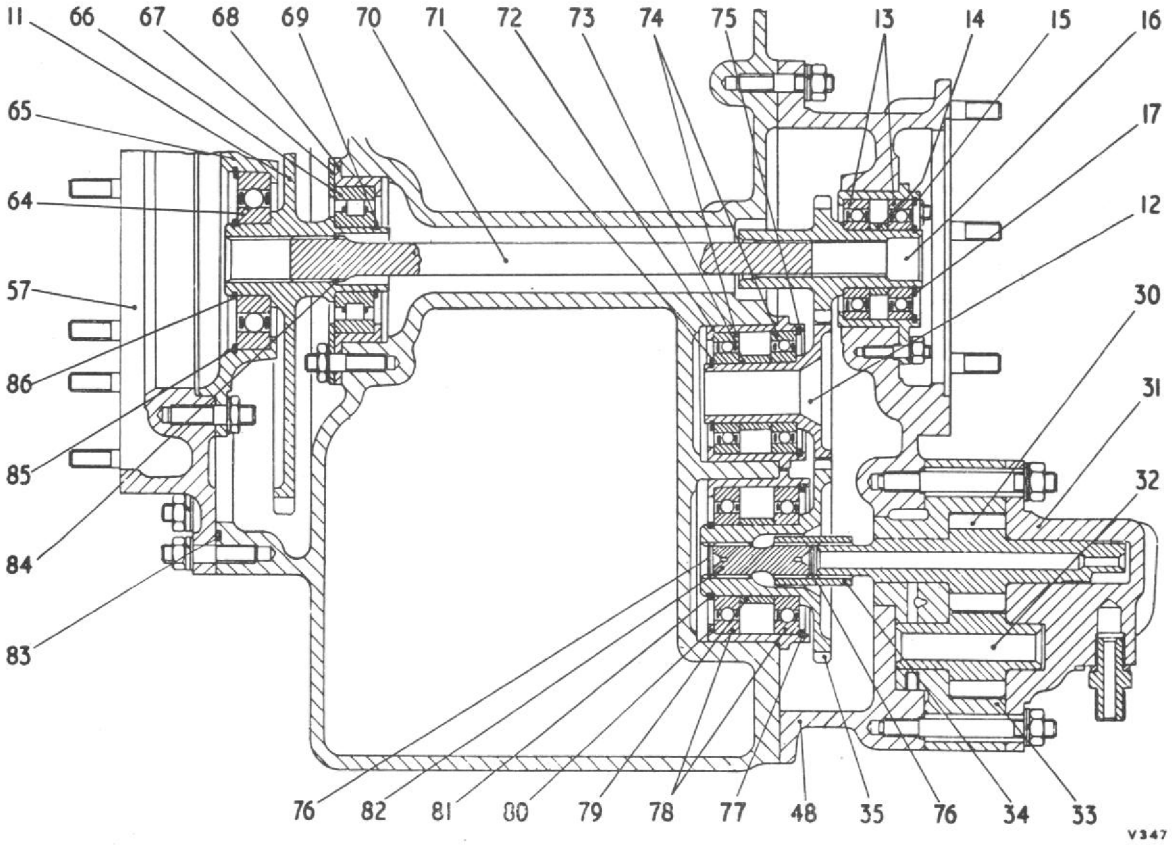


Fig. 8. Scrap section of the circulating pump drive gear and the oil and hydraulic pump drive gear

KEY TO FIG. 7

1 ACCESSORIES DRIVE BEVEL GEAR
2 ROLLER BEARING
3 ACCESSORIES DRIVE BEARING HOUSING
4 OUTER DISTANCE PIECE
5 ANGULAR CONTACT BEARING
6 ACCESSORIES DRIVE DRIVEN GEAR
7 INNER DISTANCE PIECE
8 BEARING HOUSING CAP
9 ADJUSTING WASHER
10 FUEL PUMP DRIVE QUILL SHAFT
50 FUEL PUMP DRIVE BEARING HOUSING
51 FUEL PUMP DRIVE BEARING HOUSING RETAINING PLATE
53 CIRCLIP
54 ROLLER BEARING
55 FUEL PUMP DRIVING GEAR
57 VALVE BOX MOUNTING PLATE
58 HYDRAULIC PUMP ADAPTER
59 ADJUSTING WASHER
60 HYDRAULIC PUMP DRIVE BEARING HOUSING RETAINING PLATE
61 ANGULAR CONTACT BEARING
62 HYDRAULIC PUMP DRIVE BEARING HOUSING
63 CIRCLIP

KEY TO FIG. 8

11 CIRCULATING PUMP DRIVING GEAR
12 OIL PUMP DRIVE IDLER GEAR
13 ROLLER BEARING
14 BEARING SPACER
15 HYDRAULIC PUMP DRIVE BEARING HOUSING
16 HYDRAULIC PUMP DRIVE GEAR
17 SEEGER CIRCLIP
30 OIL PUMP DRIVING GEAR
31 OIL PUMP COVER
32 OIL PUMP DRIVEN GEAR
33 OIL PUMP BODY
34 OIL PUMP DRIVE SLEEVE
35 OIL PUMP DRIVE GEAR
48 OIL AND HYDRAULIC PUMP MOUNTING CASING
57 VALVE BOX MOUNTING PLATE
64 BALL BEARING
65 CIRCULATING PUMP DRIVE BEARING HOUSING (LARGE)
66 ROLLER BEARING
67 CIRCULATING PUMP DRIVE BEARING HOUSING RETAINING PLATE
68 CIRCULATING PUMP DRIVE BEARING HOUSING (SMALL)
69 CIRCLIP
70 HYDRAULIC PUMP QUILL SHAFT
71 SEEGER CIRCLIP
72 OIL PUMP DRIVE IDLER BEARING HOUSING
73 BEARING SPACER
74 BALL BEARING
75 RETAINING RING
76 CIRCLIP
77 RETAINING RING
78 BALL BEARING
79 BEARING SPACER
80 OIL PUMP DRIVE GEAR BEARING HOUSING
81 CIRCLIP
82 OIL PUMP DRIVE QUILL SHAFT
83 JOINT STRIP
84 CIRCLIP
85 RETAINING RING
86 RETAINING RING

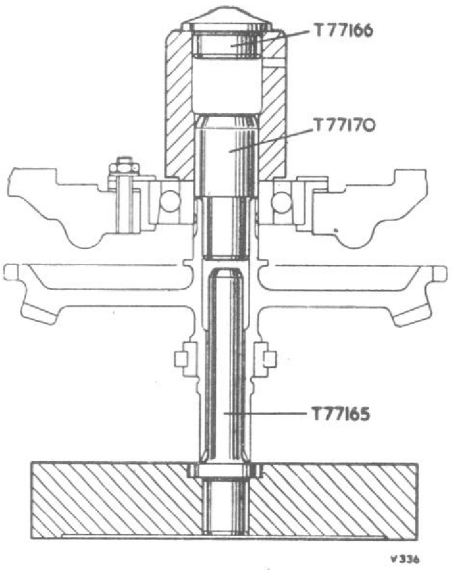


Fig. 9. Pressing the valve box mounting plate on to the fuel pump driving gear

(4) Position the inner race of the roller bearing over the guide adapter and, using adapter T77164, press the bearing on to the gear.

(5) Secure the race with a new circlip (Part No. AGS2031–12).

(6) Reverse the gear on the press block, leaving the distance sleeve in position.

(7) Position guide adapter T77174 into the bore of the gear.

(8) Position the valve box mounting plate over the guide adapter.

(9) Using adapter T77166, press the mounting plate on to the gear (*fig.* 10).

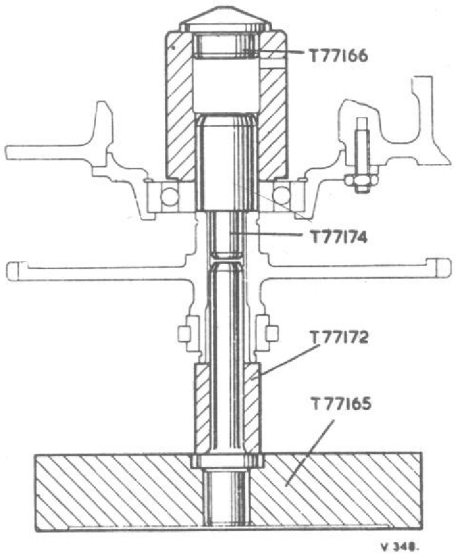
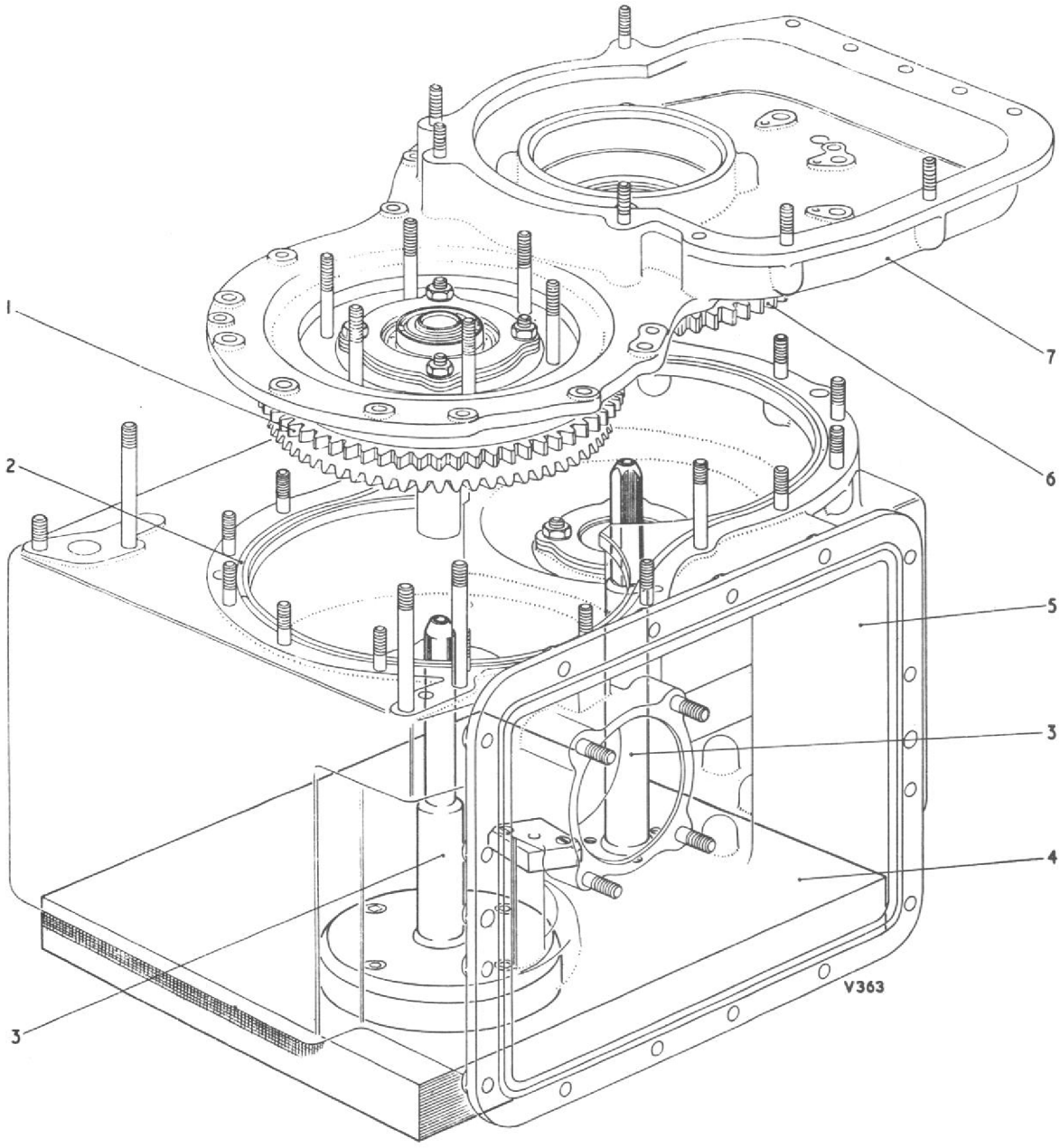


Fig. 10. Pressing the valve box mounting plate on to the circulating pump driving gear



1 FUEL PUMP DRIVING GEAR
2 JOINT STRIP
3 FIXTURE, GUIDE MANDREL
4 FIXTURE T77176
5 SUMP
6 CIRCULATING PUMP DRIVING GEAR
7 VALVE BOX MOUNTING PLATE

Fig. 11. Assembling the valve box mounting plate to the sump

Note . . .
When pressing the mounting plate on to the circulating pump driving gear, ensure that the gear teeth mesh with the fuel pump driving gear.

(10) Secure the circulating pump driving gear with a new circlip (Part No. 60367).

Valve box mounting plate to the sump

22. (1) Place the sump, port side downwards, on fixture T78649.

(2) Position a new joint strip (Part No. 96139), with the ends cut at an angle to make a scarf joint, to the valve box mounting plate face on the starboard side of the sump.

(3) Cement the strip at the joint and the bends of the groove with Wellseal or a similar approved jointing compound.

(4) Pack the caged rollers on the hydraulic and circulating pump drive shafts with grease and ensure that the rollers are pressed against the inner races, thereby avoiding a foul between each outer race and the rollers when the valve box mounting plate is fitted to the sump.

(5) Fit the valve box mounting plate assembly to the sump, with the guide mandrels on the fixture located in the bore of each gear (*fig.* 11).

(6) Secure the mounting plate with four new tab-washers (Part No. AGS518E), thirteen plain and spring washers, two slave packing washers and seventeen nuts as shown in fig. 12; do not lock the nuts.

(7) Remove the sump from the fixture.

Vertical accessories drive gear

23. (1) Place the accessories drive gear bearing housing, flange uppermost, on press block T77156.

(2) Position the outer race of the roller bearing, serial number outwards, on adapter T77157.

(3) Position the adapter over the mandrel of the press block and press the outer race of the bearing into the housing.

(4) Position the outer distance piece and the angular contact bearing, with the face of the outer race which is marked *thrust* facing uppermost, over the mandrel of the press block.

Note . . .
Reference should be made to Chapter 22 before carrying out this operation.

(5) Using adapter T77160, press the outer distance piece and the bearing into the housing.

(6) Place the driven gear on press block T77159.

(7) Position guide adapter T77158 into the bore of the gear.

(8) Position over the guide adapter, the housing assembly with the flange downwards, the inner distance piece and the inner race of the roller bearing, serial number outwards.

(9) Using adapter T77157, press the housing on to the gear (*fig.* 13).

(10) Place the bevel gear on vice block T77161.

(11) Position the driven gear assembly over the shaft of the bevel gear, mating the splines on the bevel gear shaft with the splines in the bore of the driven gear.

(12) Position a new cup locking washer (Part No. N.3199) and the ring nut to the shaft.

(13) Using spanner T79293 and torquometer wrench TQ352 tighten the nut to the torque figure specified in Chapter 22.

(14) Lock the nut by lightly tapping the cup-washer into the serrations of the nut at two opposite positions.

(15) Position the bearing housing cap to the housing.

Gear meshing

24. The shims used during the previous engine build should have been retained with the appropriate gear assemblies during the various stages of reconditioning, and unless new components have been fitted, the original meshing of the gears should be readily obtained.

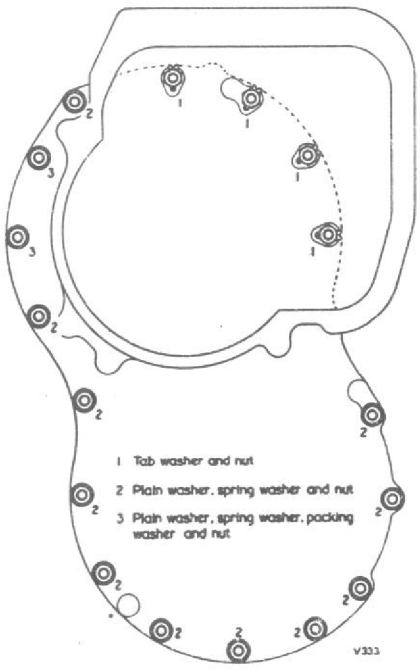


Fig. 12. Positioning of nuts and washers securing the valve box mounting plate

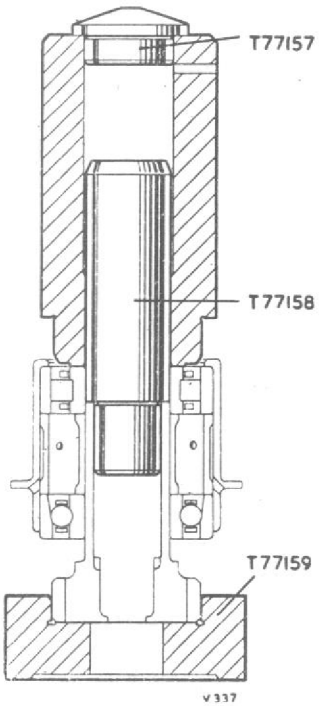


Fig. 13. Pressing the vertical accessory drive assembly on to the driven gear

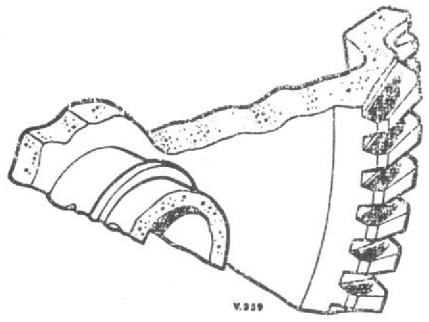


Fig. 14. Example of marking blue on a correctly meshed gear

25. During the assembly the meshing and backlash of the bevel gears must be checked simultaneously and adjusted if necessary. All backlash checks must be made at three angular positions. An excellent guide to the correct meshing is the quietness of the dry gears when rotated by hand. When correctly adjusted the back angle faces (or large end of the teeth) of the two gears should be aligned.

26. Adjustment is made by one of the gears being moved inwards and the other outwards, the desired positioning being obtained by adding shims to, or peeling shims from, the laminated shim packs which are situated beneath the fuel pump drive and the vertical accessory drive gear housings.

Note . . .

When building a sump with a new fuel pump drive gear and vertical accessory drive gear, the assembly should be made with adjusting washers of 0·060 in. nominal thickness.

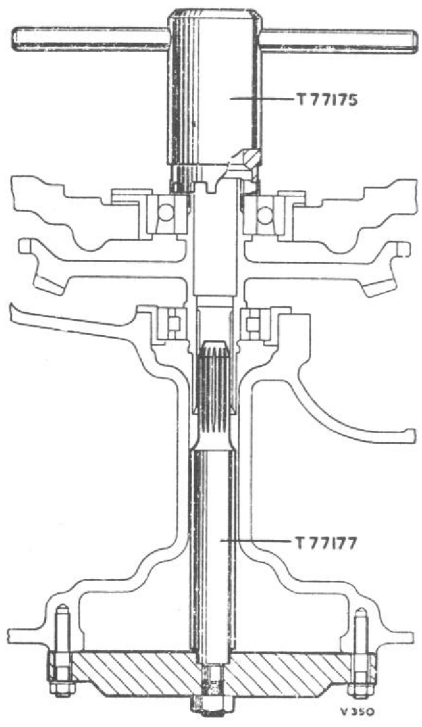


Fig. 15. Tightening the ring nut on the fuel pump driving gear

27. Whilst the correct gear meshing is being obtained, the backlash must also be checked and adjusted. To minimize wear it is advisable to keep the backlash reading as near as possible to the bottom limit, making allowance for the other requirements which have to be satisfied. The gears must also be held apart so that the condition under which they normally run under load is simulated, and in assemblies with double bearings the shafts should be tapped with a mallet to ensure that the bearings seat in the running position. To increase the backlash, both gears should be moved away from each other, and to decrease it, they should be moved towards each other. Experience will dictate the amount that each gear should be moved to obtain simultaneous backlash and meshing adjustment.

28. Marking blue must be used on the gear teeth to check that the gear meshing is accurate. The marking blue must be painted on all the teeth of the accessory drive bevel gear with a small brush, and the gears rotated with a rocking motion until all the driven gear teeth have been marked. For correct marking of the driven gear each tooth should be marked over approximately 60 per cent of its total length starting from the " toe " or small end. The first 45 to 50 per cent of the tooth should be heavily marked, and the rest lightly marked as shown in fig. 14.

Fuel pump and vertical accessory drive gear backlash checks

29. (1) Position locking fixture T77177 through the bore of the fuel pump drive gear, with the serrations on the fixture located in those of the gear.

(2) Secure the opposite end of the locking fixture to the fuel pump face studs with slave washers and nuts.

(3) Using spanner T77175, tighten the ring nut on the fuel pump driving gear; do not lock the nuts (*fig.* 15).

(4) Remove the locking fixture.

(5) Position locking fixture T77178 to the other end of the fuel pump driving gear.

(6) Secure the bridge of the locking fixture to the studs with slave washers and nuts.

(7) Screw up the centre screw on the locking fixture and lock the fuel pump driving gear.

(8) Position backlash checking tool T77179 in the bore of the circulating pump driving gear.

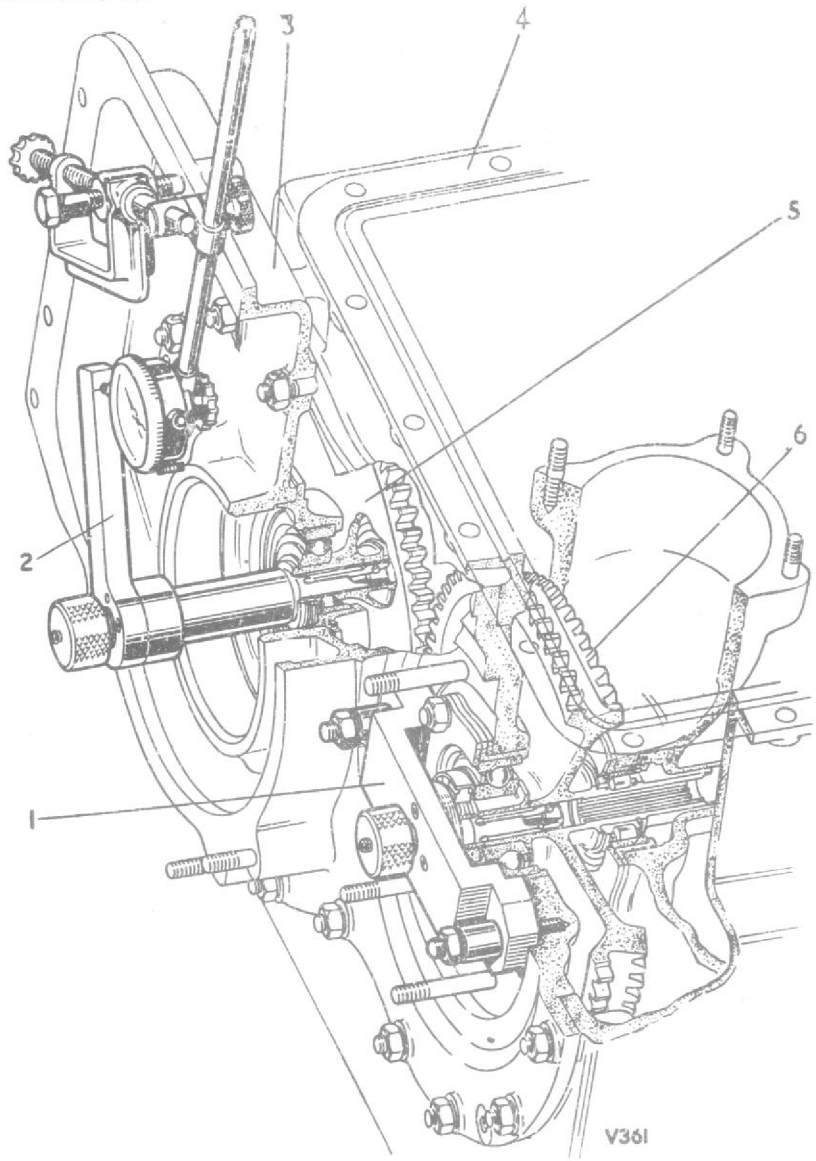
(9) Clamp a dial test indicator to a convenient position on the sump, and locate the stylus on the scribed line of the backlash checking tool.

(10) Check that the backlash between the fuel pump driving gear and the circulating pump driving gear is within the limits (*fig.* 16).

(11) Remove the backlash checking tool.

(12) Using a small brush, paint all the teeth of the bevel gear on the vertical drive gear with marking blue.

(13) Assemble the adjusting washer and the vertical drive gear assembly to the sump and secure with slave washers and nuts.



1 LOCKING FIXTURE T77178
2 BACKLASH CHECKING TOOL T77179
3 VALVE BOX MOUNTING PLATE
4 SUMP
5 CIRCULATING PUMP DRIVING GEAR
6 FUEL PUMP DRIVING GEAR

Fig. 16. Checking the backlash between the fuel pump drive and the circulating pump driving gear

(14) Position backlash checking tool T77180 to the accessory drive driven gear.

(15) Clamp a dial test indicator to a convenient position on the sump and locate the stylus on the scribed line of the backlash checking tool.

(16) Using push rod T77181, push the fuel pump drive bevel gear outwards, then lock it with the locking fixture T77178 previously fitted in op. 5, as shown by the inset in fig. 17.

Note . . .

This op. must be repeated on the second and third check at different angular positions.

(17) Check that the backlash between the accessory drive bevel gear and the fuel pump drive bevel gear is within the limits (*fig.* 17).

Note . . .

Due to the geometry of backlash checking tool T77180 a reading equivalent to twice the actual backlash will be obtained.

(18) Release the fuel pump driving gear, remove the vertical accessories drive, and check the gear meshing.

Adjustment of backlash and meshing

30. (1) Position locking fixture T77177 through the bore of the fuel pump driving gear, with the splines on the fixture located in the gear splines.

(2) Secure the opposite end of the locking fixture to the fuel pump face studs with slave washers and nuts.

(3) Using spanner T77175, unscrew the ring nut on the fuel pump driving gear.

(4) Remove the locking fixture.

(5) Using push rod T77181, push the fuel pump drive bevel gear outwards and remove the housing and adjusting washer.

(6) Re-assemble the housings with the previously selected adjusting washers and check the backlash and meshing as described in para. 25.

(7) Lock the ring nut by lightly tapping the cup-washer into the serrations of the nut at two opposite positions.

(8) Remove the locking fixture.

Vertical accessory drive gear assembly to the sump

31. (1) Remove the vertical accessory drive gear assembly and thoroughly clean off the marking blue.

(2) Liberally oil the accessory and fuel pump drive gears and bearings with clean approved engine oil.

(3) Re-fit the vertical accessory drive assembly to the sump with the previously selected adjusting washer and secure it with four new

tab-washers (Part No. AGS518E) and nuts; lock the nuts.

(4) Lock the nuts on the valve box mounting plate and the bevel gear ball bearing housing.

(5) Secure blanking cover T77182 to the top face of the sump and blanking cover T77183 to the circulating pump face with slave washers and nuts.

(6) Assemble a new joint washer (Part No. 97300) and the adapter to the hydraulic pump drive face and secure with two 2 B.A. set-screws.

(7) Secure transport blank 49237 to the adapter with six plain and spring washers and nuts.

(8) Secure blanking cover T77184 to the fuel pump drive face with slave washers and nuts.

Oil pump drive gear assembly

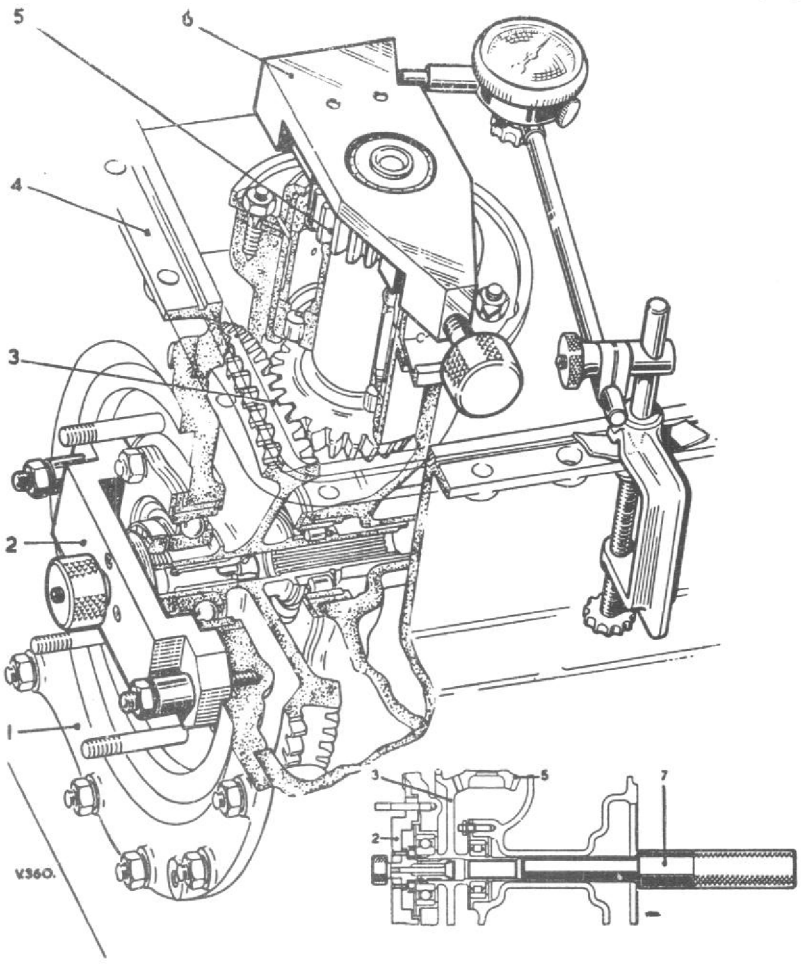
32. (1) Place the oil pump drive housing, flange uppermost, on press block T77152.

(2) Position the ball bearing over the mandrel of the press block.

(3) Using adapter T77151, press the bearing into the housing.

(4) Position the spacer and the second ball bearing over the mandrel of the press block.

(5) Using adapter T77151, press the bearing into the housing.



1 VALVE BOX MOUNTING PLATE
2 LOCKING FIXTURE T77175
3 FUEL PUMP DRIVE GEAR
4 OIL SUMP
5 VERTICAL ACCESSORIES DRIVE GEAR
6 BACKLASH CHECKING TOOL T77180
7 PUSH ROD T77181

Fig. 17. Checking the backlash between the accessory drive bevel gear and the fuel pump drive bevel gear

Note . . .

When pressing the second bearing into position care must be taken not to apply excessive loading to the bearing already assembled.

(6) Remove the housing from the press block and secure the bearing with a new retaining ring (Part No. 60549).

(7) Place the oil pump driving gear on press block T77155.

(8) Position guide adapter T77154 in the bore of the gear.

(9) Position the housing assembly, flange downwards, over the guide adapter.

(10) Using adapter T77153, press the housing on to the gear.

(11) Remove the assembly from the press block and secure the gear with a new circlip (Part No. 60367).

(12) Fit a new circlip (Part No. 26066) in the bore of the gear.

Oil pump drive idler gear assembly

33. (1) Place the bearing housing, flange uppermost, on press block T77145.

(2) Position the ball bearing over the mandrel of the press block.

(3) Using adapter T77144, press the bearing into the housing.

(4) Position the spacer and the second ball bearing over the mandrel of the press block.

(5) Using adapter T77151, press the bearing into the housing.

Note . . .

When pressing the second bearing into position care must be taken not to apply excessive loading to the bearing already assembled.

(6) Remove the housing from the block and secure the bearing with a new retaining ring (Part No. 60539).

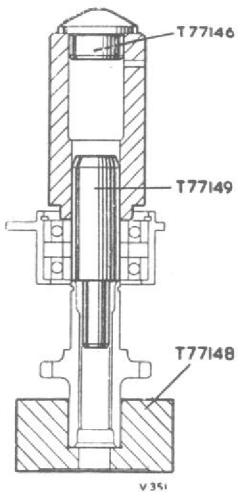


Fig. 18. Pressing the hydraulic pump drive bearing housing on to the hydraulic pump drive gear

(7) Place the oil pump idler gear on press block T77147.

(8) Position guide adapter T77150 in the bore of the gear.

(9) Position the housing assembly, flange downwards, over the guide adapter.

(10) Using adapter T77146, press the housing on to the gear.

(11) Remove the assembly from the press block and secure the gear with a new Seeger circlip (Part No. AGS2031–8).

Oil pump drive idler gear and oil pump drive gear to the sump

34. (1) Position the oil pump drive gear assembly to the port side of the sump and secure with three new tab-washers (Part No. AGS518C) and nuts; do not lock the nuts.

(2) Position the oil pump drive idler gear assembly to the port side of the sump and secure with two new tab-washers (Part No. AGS518C) and nuts; do not lock the nuts.

Oil pump drive idler gear and oil pump drive gear backlash checks

35. (1) Position backlash tool T77186 in the bore of the drive gear.

(2) Clamp a dial test indicator to a convenient position on the sump and locate the stylus on the scribed line of the backlash checking tool.

(3) Lock the idler gear and check that the backlash between the oil pump drive gear and the oil pump drive idler is within the limits.

Hydraulic pump drive gear

36. (1) Place the hydraulic pump drive bearing housing, flange uppermost, on press block T77145.

(2) Position the ball bearing over the mandrel of the press block.

(3) Using adapter T77144, press the bearing into the housing.

(4) Position the spacer and the second ball bearing over the mandrel of the press block.

(5) Using adapter T77144, press the bearing into the housing.

Note . . .

When pressing the second bearing into position care must be taken not to apply excessive loading to the bearing already assembled.

(6) Remove the housing from the press block and secure the bearing with a new retaining ring (Part No. 60539).

(7) Place the hydraulic pump drive gear on press block T77148.

(8) Position guide adapter T77149 into the bore of the gear.

(9) Position the housing assembly, flange uppermost, over the guide adapter.

(10) Using adapter T77146, press the housing on to the gear (*fig.* 18).

(11) Remove the assembly from the press block and secure the gear with a new Seeger circlip (Part No. AGS2031–8).

(12) Assemble the hydraulic pump drive to the oil and hydraulic pump mounting casing and secure with three new tab-washers (Part No. AGS518C) and nuts; do not lock the nuts.

Hydraulic pump drive backlash check

37. (1) Using locking fixture T77187, lock the oil pump drive idler gear.

(2) Assemble the mounting plate to the sump and secure with slave washers and nuts.

(3) Position backlash checking tool T77188 in the hydraulic pump drive gear bore.

(4) Clamp a dial test indicator to a convenient position on the sump and locate the stylus on the scribed line of the backlash checking tool.

(5) Check that the backlash between the oil pump drive idler gear and the hydraulic pump drive gear is within the limits (*fig.* 19).

Note . . .

Due to the geometry of backlash checking tool T77188, a reading equivalent to twice the actual backlash will be obtained.

(6) Lock the nuts on the hydraulic pump drive gear.

(7) Remove the mounting plate and the locking fixture.

Oil and hydraulic pump mounting casing to the sump

38. (1) Fit a new circlip (Part No. N4245) to the circulating pump end of the hydraulic pump quill shaft, and another new circlip (Part No. N4200) to the hydraulic pump end).

(2) Pass the shaft through the rear horizontal bore in the sump and locate it in the bore of the circulating pump driving gear.

(3) Position a new sealing ring (Part No. N4634) over the oil transfer pipe, and assemble the pipe into the sump.

(4) Liberally oil the oil and hydraulic pump drive gears and bearings with approved engine oil, care being taken that the mounting face on the casing is kept free from oil.

(5) Apply a thin coating of jointing compound to the mating face on the sump.

(6) Assemble the oil and hydraulic pump mounting casing to the sump with the quill shaft located in the bore of the hydraulic pump drive gear.

(7) Secure the casing with thirteen plain and spring washers and nuts, evenly tightened.

Oil pump

39. The assembly of the 48 Mk. 2 oil pump is identical to the 48 Mk. 1 described in para. 11 except the use of vice block T74786 required to perform op. 9 which must be replaced by vice block T77162.

Oil pump to the sump

40. (1) Screw the metering pump oil feed union and a new washer (Part No. AGS1138A) into the oil pump cover.

(2) Fit a new circlip (Part No. 26066) in the oil pump drive sleeve bore.

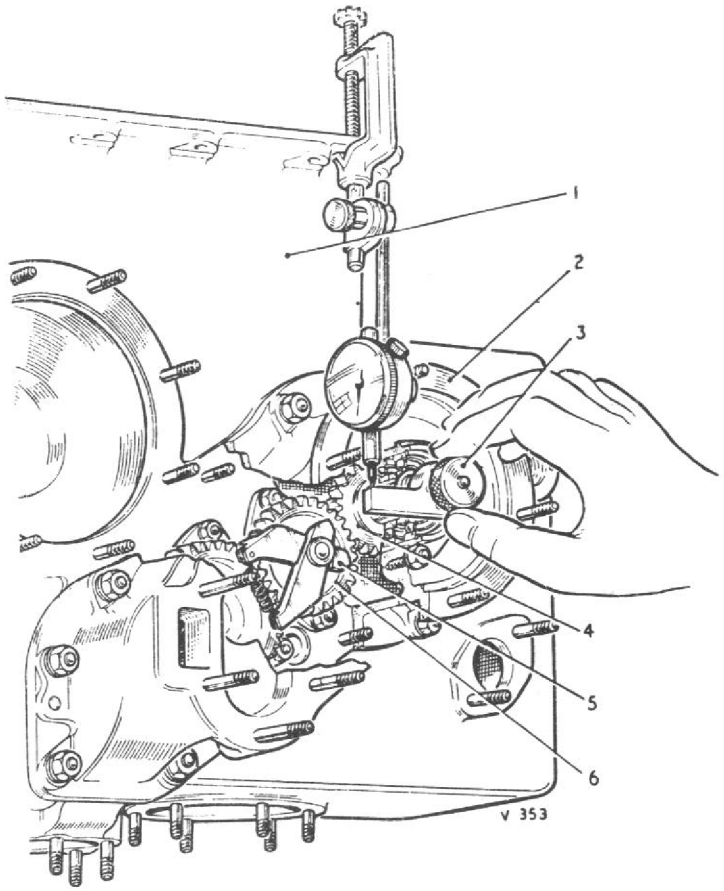
(3) Assemble the oil pump sleeve and quill shaft in the bore of the oil pump drive gear.

(4) Fit a new sealing ring (Part No. N4634) over the oil transfer pipe.

(5) Fit a new asbestos fibre washer (Part No. 606241) to the oil pump face on the mounting plate.

(6) Assemble the oil pump to the mounting plate, with the oil transfer pipe located in the counterbore in the oil pump, and secure with six plain washers, the lockwire-tab and seven spring washers and nuts.

(7) Secure transport blank 49237 to the hydraulic pump drive face with five plain and spring washers and nuts.



1 SUMP
2 OIL AND HYDRAULIC PUMP MOUNTING PLATE
3 BACKLASH CHECKING TOOL T77188
4 HYDRAULIC PUMP DRIVE GEAR
5 LOCKING FIXTURE T77187
6 OIL PUMP DRIVE IDLER

Fig. 19. Checking the backlash between the hydraulic pump drive gear and the oil pump drive idler gear

Metering pump and restrictor to the sump

41. (1) Assemble a new sealing ring (Part No. 94043) to the spigot on the metering pump, care being taken that it does not obstruct the oil inlet duct.

(2) Rotate the main oil pump spindle until the cam is at bottom dead centre (position of no lift) relative to the metering pump.

(3) Insert the metering pump spigot into the bore in the oil pump cover and hold it in position against the load of the spring so that the flange on the metering pump firmly abuts the pump cover.

(4) Still holding the pump in position, secure it with two plain and spring washers and nuts.

(5) Assemble a new sealing ring (Part No. 94043) and the blanking cover to the rear face on the oil pump cover and secure with two plain and spring washers and nuts.

(6) Using new washers (Part No. N1502), secure the banjo union to the metering pump with the banjo bolt.

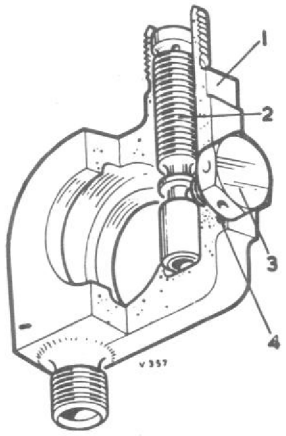
(7) Assemble the restrictor into the restrictor housing and, using a new sealing ring (Part No. N4633), secure with the retaining bolt (*fig.* 20).

(8) Using three new washers (Part No. AGS 1138D), assemble the oil feed banjo and the oil restrictor housing to the banjo bolt.

(9) Screw the banjo bolt into the rear port side of the sump, with the restrictor aligned to face upwards.

Relief valve to the sump

42. (1) Fit a new sealing ring (Part No. N4635) on the relief valve housing.



1 RESTRICTOR HOUSING
2 RESTRICTOR
3 LOCKING SCREW
4 SEAL

Fig. 20. Restrictor assembly

(2) Lightly oil the housing with clean engine oil and, using a new sealing gasket (Part No. 603389), assemble the housing to the relief valve aperture.

(3) Assemble the plunger and spring in the relief valve housing.

(4) Using a new sealing gasket (Part No. 603389), assemble the relief valve cap, complete with the stop and locknut, into the housing.

(5) Secure the cap with a plain washer, a lock-wire-tab, and two spring washers and nuts.

(6) Using a new washer (Part No. N1494), screw the plug into the relief valve cap.

Cut-off valve and sight glass (*fig. 21*)

43. If the cut-off valve is being renewed it must be lightly lapped to its housing as described in op. 1, 2 and 3.

(1) Assemble valve guide T77246 in the bore of the sight glass housing.

(2) Smear the valve seating with fine grinding compound and lightly lap the valve to the housing to form a seating.

(3) Remove the valve and valve guide and thoroughly clean.

Note . . .

It is important that all traces of grinding compound are removed from the component parts.

(4) Fit a new washer (Part No. N3636) and a new sealing ring (Part No. N5328) in the annulus of the plunger bore.

(5) Apply a thin coating of jointing compound to the internal threads on the plunger.

(6) Assemble the cut-off valve spring and the plunger to the housing.

(7) Lightly load the spring by depressing the plunger and assemble the valve in the housing at the opposite end.

(8) Screw the valve into the plunger.

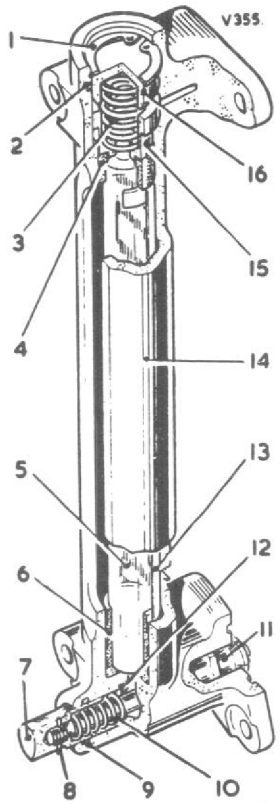
(9) Secure the plunger by inserting a new taper pin (Part No. SP28–E4) in the hole and peening the small end over to retain.

(10) Position the guide sleeve T77142 in the sight glass bore of the housing.

(11) Smear a little grease or tallow on a new sight glass seating (Part No. 94041) and, using inserting tool T77140, insert the seating into the bore (*fig.* 22).

Note . . .

Ensure that the seating bottoms in the bore.



1 SEEGER CIRCLIP
2 SEALING RING
3 SIGHT GLASS SPRING
4 SIGHT GLASS SEATING
5 SIGHT GLASS
6 SIGHT GLASS SEATING
7 PLUNGER
8 TAPER PIN
9 SEALING RING
10 CUT-OFF VALVE SPRING
11 CUT-OFF VALVE
12 WASHER
13 SIGHT GLASS SCREEN
14 SIGHT GLASS HOUSING
15 SIGHT GLASS SPRING SEATING
16 RETAINING CUP

Fig. 21. Cut-off valve and sight glass assembly

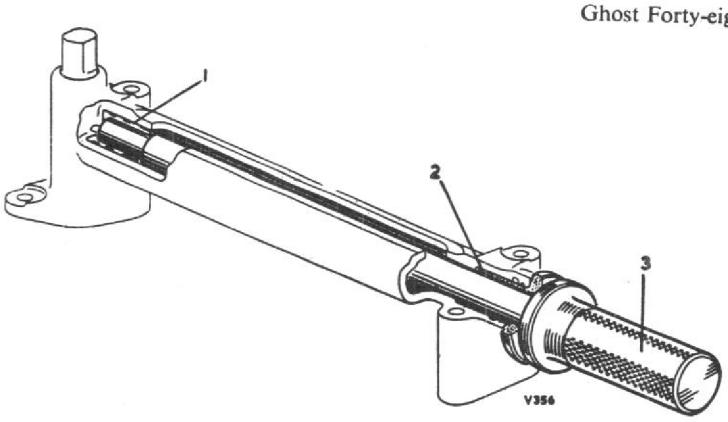
(12) Assemble the sight glass screen to the rear of the sight glass bore, with the leg on the screen located in the slot on the housing.

(13) Smear each end of the sight glass with a little grease or tallow and assemble it into the housing with the inner end located in the seating at the bottom of the bore.

Note . . .

Care must be taken not to dislodge the screen.

(14) Smear a little grease or tallow on a new sight glass seating (Part No. 96142) and, using inserting tool T77141, insert the seating into the housing.



1 SIGHT GLASS SEATING
2 SLEEVE T77142
3 INSERTING TOOL T77140

Fig. 22. Inserting the seating into the sight glass housing

Note . . .

Ensure that the seating and sight glass locate and bottom correctly.

(15) Remove the inserting tool and guide sleeve.

(16) Assemble the sight glass spring seating in the housing bore.

(17) Fit a new sealing ring (Part No. N4636) in the housing bore.

(18) Secure compressor tool T77143 to the flange holes on the housing with slave washers and nuts.

(19) Lightly grease the retaining cup and assemble it with the sight glass spring into the housing bore.

(20) Screw down the centre plug on the compressor tool to depress the cup just sufficient to make the circlip groove accessible.

(21) Fit a new circlip (Part No. 2030–24) to the groove.

(22) Remove the compressor tool.

Sight glass assembly to the sump

44. (1) Fit a new sealing ring (Part No. N1494) to the groove in the top flange on the sight glass housing and another new sealing ring (Part No. N4632) to the groove in the bottom flange.

(2) Assemble the housing to the sump and secure with plain and spring washers and nuts.

Note . . .

Care must be taken not to displace the sealing rings.

Pressure filter

45. The assembly of the 48 Mk. 2 pressure filter is identical to the 48 Mk. 1 described in para. 13 except for the lockwire-tab required in op. 8, which is deleted.

Low-pressure filter to the sump

46. (1) Assemble the low-pressure filter and spring to the sump.

(2) Fit a new sealing ring (Part No. 96138) to the low-pressure filter cover.

(3) Assemble the cover to the sump and secure with five plain washers, a lockwire-tab and six spring washers and nuts.

(4) Position a new washer (Part No. AGS1138D) and the plug to the low-pressure filter cover.

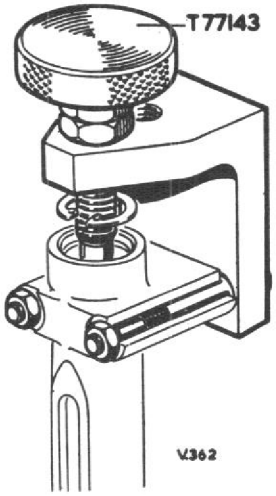


Fig. 23. Using compressor tool to depress the sight glass cup

LIST OF CONSUMABLE PARTS

47. The following is a list of consumable parts which will be required during assembly of the oil sump.

48 Mk. 1 only

Part No.	Description	Quantity
N1592	Tab-washer, oil pump assembly	6
94039	Washer, filter support tube	2
22772	Filter element, pressure filter	1
N6892	Sealing ring, end plate	1
29915	Joint washer, pressure filter cover	1
N4601	Sealing ring, relief valve Pre-mod. 431	1

Part No.	Description	Quantity
N4635	Sealing ring, relief valve Mod. No. 431	1
603389	Sealing gasket, relief valve	2
N1494	Washer, relief valve	1
N4602	Sealing ring, oil level plunger	1
N4466	Tab-washer, oil level plunger	1
N3703	Tab-washer, drain plug	1
N1486	Washer, cooling oil pipe banjo	2
AGS1138C	Washer, plug	1
94043	Sealing ring, metering pump	1
SP9–C8	Split pin, oil restrictor	1
94043	Sealing ring, oil restrictor	1
94043	Sealing ring, oil pump cover blanks	2
N1502	Washer, metering pump banjo	2
26066	Circlip, oil pump drive shaft sleeve	1
605344	Joint washer, oil pump	1
	48 Mk. 2 only	
AGS518E	Tab-washer, fuel pump bearing housing	4
AGS518E	Tab-washer, hydraulic pump bearing housing	4
AGS2031–12	Circlip, fuel pump driving gear	1
N2880	Cup locking washer, fuel pump drive	1
AGS518E	Tab-washer, circulating pump bearing housing	4
60559	Retaining ring, circulating pump bearing housing	1
AGS518E	Tab-washer, circulating pump bearing housing	4
AGS2031–12	Circlip, circulating pump driving gear	1
60367	Circlip, circulating pump driving gear	1
96139	Joint strip, valve box mounting plate face	1
AGS518E	Tab-washer, valve box mounting plate	4
N3176	*Deleted*	
N3199	Cup locking washer, vertical accessories drive.	1
AGS518E	Tab-washer, vertical accessories drive gear assembly	4
97300	Joint washer, hydraulic pump adapter	1
60549	Retaining ring, oil pump driving gear	1
60367	Circlip, oil pump driving gear	1
26066	Circlip, oil pump driving gear bore	1
60539	Retaining ring, oil pump drive idler gear	1
AGS2031–8	Seeger circlip, oil pump drive idler gear	1
AGS518C	Tab-washer, oil pump drive assembly	3
AGS518C	Tab-washer, oil pump drive idler gear	2
60539	Retaining ring, hydraulic pump drive gear	1
AGS2031–8	Seeger circlip, hydraulic pump drive gear	1
AGS518C	Tab-washer, hydraulic pump drive gear	3
N4245	Circlip, hydraulic pump quill shaft	1
N4200	Circlip, hydraulic pump quill shaft	1
N4634	Sealing ring, oil transfer pipe	1
AGS1138A	Washer, metering pump oil feed union	1
26066	Circlip, oil pump drive sleeve	1
N4634	Sealing ring, oil transfer pipe	1
94043	Sealing ring, metering pump	1
94043	Sealing ring, oil pump cover blank	1
N1502	Washer, metering pump banjo union	2
N4633	Sealing ring, restrictor housing	1
AGS1138D	Washer, oil feed banjo	3
N4635	Sealing ring, relief valve housing	1
603389	Sealing gasket, relief valve housing	2
N1494	Washer, relief valve	1
N3636	Washer, cut-off valve plunger	1
N5328	Sealing ring, cut-off valve plunger	1
SP28–E4	Taper pin, cut-off valve plunger	1
94041	Seating, sight glass	1
96142	Seating, sight glass	1
N4636	Sealing ring, sight glass housing	1
2030–24	Circlip, cut-off valve plunger	1
N1494	Sealing ring, sight glass housing flange	1
N4632	Sealing ring, sight glass housing flange	1
94039	Washer, filter support tube	2
22772	Filter element, pressure filter	1
N6892	Sealing ring, end plate	1
29915	Joint washer, pressure filter cover	1
96138	Sealing ring, low-pressure filter cover	1
AGS1138D	Washer, low-pressure filter cover	1
606241	Joint washer, oil pump	1

LIST OF TOOLS

48. The following tools are required for assembly of the oil sump.

48 Mk. 1 only

Tool No.	Description
T74782	Press block, oil pump
T74783	Guide mandrel, oil pump
T74784	Adapter, oil pump
T74785	Vice, block, oil pump
T74786	Backlash checking tool, oil pump driving gear
T74781	Blanking cover, oil sump

48 Mk. 2 only

T77163	Press block, fuel pump bearing housing
T77164	Adapter, fuel pump bearing housing
T77167	Press block, hydraulic pump bearing housing
T77168	Adapter, hydraulic pump bearing housing
T77165	Press block, fuel pump drive gear
T77169	Guide adapter, fuel pump drive gear
T77164	Adapter, fuel pump drive gear
T77170	Guide adapter, fuel pump drive gear
T77166	Adapter, fuel pump drive gear
T77175	Serrated spanner, fuel pump drive gear
T77163	Press block, circulating pump bearing housing
T77164	Adapter, circulating pump bearing housing
T77171	Press block, circulating pump bearing housing
T77168	Adapter, circulating pump bearing housing
T77165	Press block, circulating pump drive gear
T77172	Distance sleeve, press block T77165
T77173	Guide adapter, circulating pump drive gear
T77164	Adapter, circulating pump drive gear
T77174	Guide adapter, circulating pump drive gear
T77166	Adapter, circulating pump drive gear
T78649	Fixture, sump
T77156	Press block, vertical accessories drive housing
T77157	Adapter, vertical accessories drive housing
T77160	Adapter, vertical accessories drive housing
T77159	Press block, vertical accessories drive housing
T77158	Guide adapter, vertical accessories drive gear
T77161	Vice block, vertical accessories drive gear
T77272	*Deleted*
T79293	Serrated spanner, vertical accessories drive gear
Standard	Torquemeter wrench TQ352
T77177	Locking fixture, fuel pump driving gear
T77175	Serrated spanner, fuel pump driving gear
T77178	Locking fixture, fuel pump driving gear
T77179	Backlash checking tool, circulating pump driving gear
T77180	Backlash checking tool, accessories drive gear
T77181	Push rod, fuel pump drive bevel gear
T77182	Blanking cover, sump top face
T77183	Blanking cover, circulating pump face
T77184	Blanking cover, fuel pump face
T77152	Press block, oil pump drive housing
T77151	Adapter, oil pump drive housing
T77155	Press block, oil pump driving gear
T77154	Guide adapter, oil pump driving gear
T77153	Adapter, oil pump driving gear
T77145	Press block, oil pump drive idler gear
T77144	Adapter, oil pump drive idler gear
T77147	Press block, oil pump drive idler gear
T77150	Guide adapter, oil pump drive idler gear
T77146	Adapter, oil pump drive idler gear
T77186	Backlash checking tool, oil pump drive idler
T77145	Press block, hydraulic pump drive housing
T77144	Adapter, hydraulic pump drive housing
T77148	Press block, hydraulic pump driving gear
T77149	Guide adapter, hydraulic pump driving gear
T77146	Adapter, hydraulic pump driving gear
T77187	Locking fixture, oil pump idler gear
T77188	Backlash checking tool, hydraulic pump driving gear
T74782	Press block, oil pump
T74783	Guide mandrel, oil pump
T74784	Adapter, oil pump
T77162	Vice block, oil pump
T74786	Backlash checking tool, oil pump driving gear
T77246	Valve guide, sight glass housing
T77142	Guide sleeve, sight glass housing
T77140	Inserting tool, sight glass seating
T77141	Inserting tool, sight glass seating
T77143	Compressor tool, sight glass housing