[redacted]

Draft Chapter 33B

AIR-INTAKE, REASSEMBLING

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

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

1. This chapter describes the assembly and motoring rig test of the air-intake and its associated gear driven assemblies. The first eight paragraphs are applicable to both the Ghost 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, in Chapter 38, to ascertain the limits permissible. The term "press" implies the use of a suitable hand or mechanical press.

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, cleaning up any burrs around the stud holes, stoning up gear teeth and splines, and polishing out scratches. Ball bearings, including new ones, must be washed in white spirit. After any work has been carried out, the component concerned 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 substituted. To renew damaged studs, a $\frac{3}{8}$ in. B.S.F. stud box T70473 and a $\frac{1}{4}$ in. B.S.F. stud box T70809 are required. Damaged studs may be removed, and serviceable replacements fitted, in acccordance with standard practice.

REPAINTING

6. As the intake will have been stripped of paint in preparation for crack detection, it must be repainted prior to assembly. Before commencing to repaint the casting, 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).

KEY TO FIG. 1

1 BEARING HOUSING
2 LOWER DRIVING GEAR
3 BALL BEARING
4 INTER-RACE SPACING COLLAR
5 BALL BEARING
6 BREATHER BANJO
7 OIL SPRAY PIPE APERTURE
8 CORE SUPPORT HOLE COVER
9 DRIVING GEAR BEARING
10 THRUST WASHER
11 STARTER DOG
12 UPPER DRIVING GEAR
13 SEALING RING
14 OIL DRAIN PIPE UNION
15 AIR BLEED APERTURE COVER
16 BREATHER TUBE CAP
17 BREATHER TUBE
18 SEALING RING
19 METERED OIL FEED DUCT

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

(2) Using blanking cover T74970 48 Mk. 1 or T78026 48 Mk. 2, blank off the top wheelcase face; secure the cover with two or three slave washers and nuts.

(3) Using blanking cover T74972 48 Mk. 1 or T78024 48 Mk. 2, blank off the centre housing face at the front of the air-intake; secure the cover with two slave washers and nuts.

(4) Using blanking cover T74971 48 Mk. 1 or T78025 48 Mk. 2, blank off the face at the bottom of the air-intake; secure the cover with two or three slave washers and nuts.

(5) Using the blanks, made from local resources described in Chap. 21, blank off the two air-intake openings. Alternatively, transport blanking covers Part No. 92599 (starboard air-intake) and 92600 (port air-intake) may be used, but there is the disadvantage that the rims of the air-intakes will not receive a coat of paint.

(6) Coat all exposed threads with grease and, using adhesive tape, improvised blanks and plugs as appropriate, blank off the air bleed apertures, the two oil spray apertures and the oil drain and feed union holes.

(7) Spray the casing with approved primer and allow to air dry.

(8) Spray the casing with the approved finishing coat and allow to air dry.

(9) Remove the blanks.

ASSEMBLY—48 Mk. 1 only (*fig. 1*)

Upper driving gear

9. Untie the component parts; care must be taken that the components are not mixed with those of the lower driving gear.

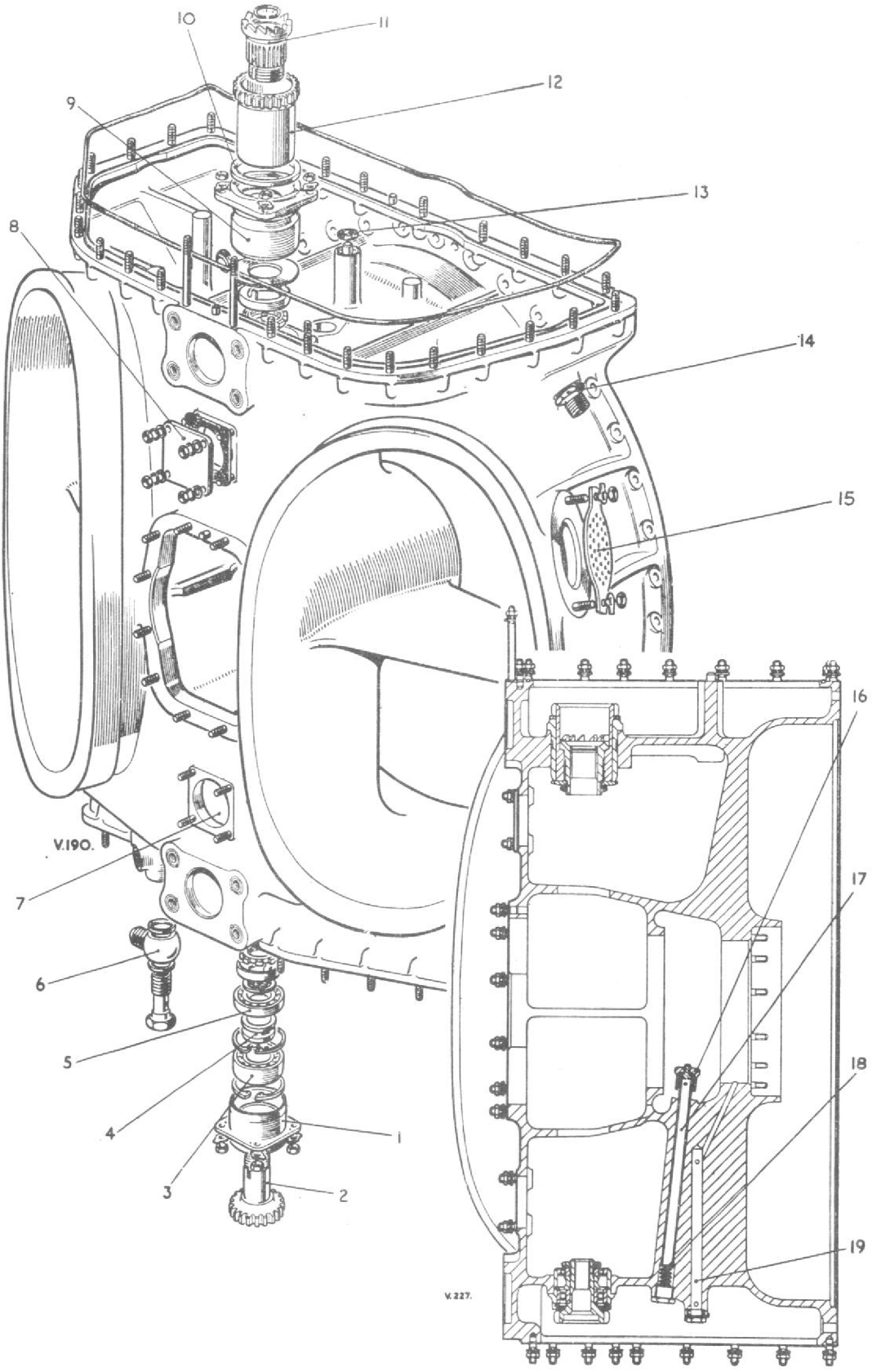


Fig. 1. Air-intake (48 Mk. 1.)

Issued by Amendment No. 128
November, 1956

(1) Place the upper driving gear, gear downwards, on press block T74760.

(2) Position the thrust washer over the shaft of the gear.

(3) Using adapter T74761, press the thrust washer on to the shaft until it abuts the teeth of the gear. Remove the gear from the press block.

(4) Assemble the upper driving gear, gear downwards, to the starter dog.

(5) Position the starter dog and drive gear assembly, teeth downwards, on press block T74760.

(6) Transfer the press block and gear assembly to a bench vice.

(7) Position the drive gear bearing, flange downwards, over the shaft of the drive gear. Care must be taken that the drive gear is clean and free from burrs and sharp edges before fitting the bearing.

(8) Assemble the retaining washer, bevelled side facing up, a new cup locking washer (Part No. N2873) and the ring nut.

(9) Tighten the nut with serrated spanner T74911 (*fig.* 2).

(10) Using a dial test indicator, check that the end float is within the limits. If the end float is too great a new retaining washer (Part No. 91616) will be required; too little end float may be corrected by facing off the retaining washer. Ensure that the gear can rotate freely.

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

Lower driving gear

10. (1) Untie the component parts.

(2) Using Seeger circlip pliers, fit a new circlip (Part No. 13537) to the bottom recess in the bearing housing.

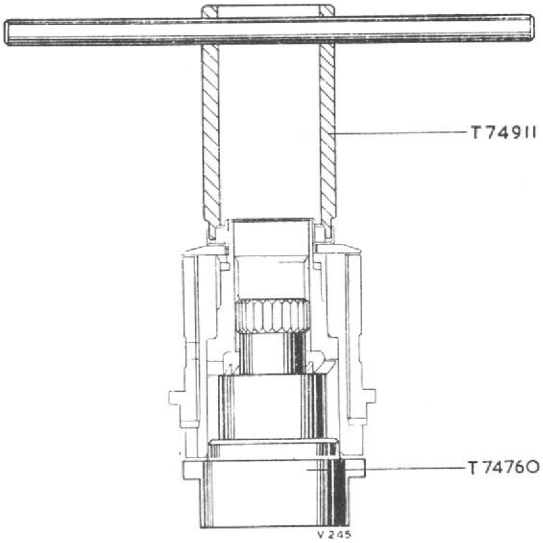


Fig. 2. Tightening the nut on the upper drive

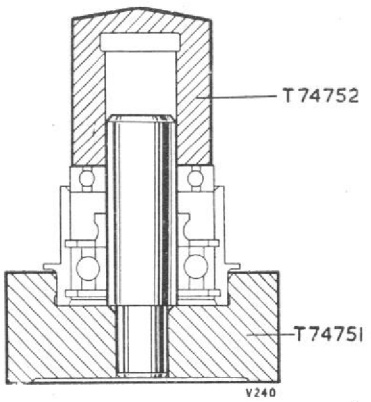


Fig. 3. Pressing the bearing into the housing

(3) Place the bearing housing, flange downwards, on press block T74751.

(4) Assemble the wider of the two ball bearings over the mandrel of the press block.

(5) Using adapter T74752, press the bearing into the housing.

(6) Using Seeger circlip pliers, secure the bearing with a second new circlip (Part No. 13537).

(7) Assemble the inter-race spacing collar and the narrower of the two ball bearings over the mandrel of the press block.

(8) Using adapter T74752, press the bearing into the housing (*fig.* 3).

(9) Remove the assembly from the press block.

(10) Place the lower driving gear, gear downwards, on press block T74753.

(11) Place the guide mandrel T74754 in the bore of the gear.

(12) Place the housing, flange downwards, over the guide mandrel and, using adapter T74752, press the housing on to the gear (*fig.* 4).

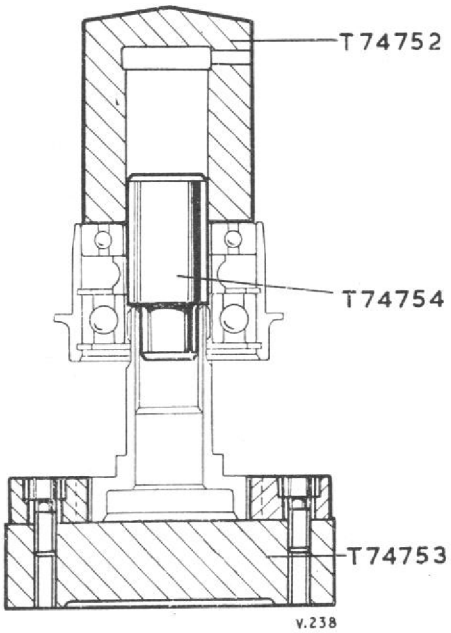


Fig. 4. Pressing the housing on to the gear

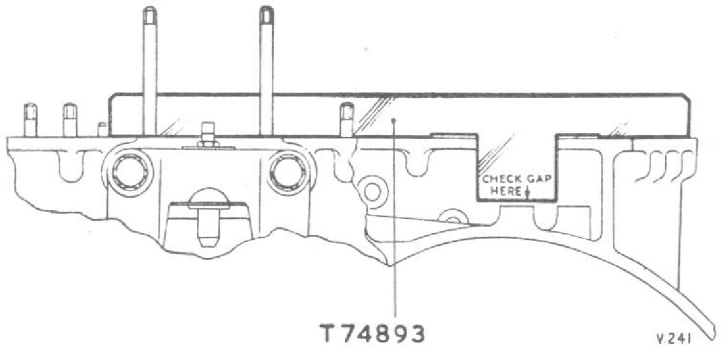


Fig. 5. Checking the height of the gear bosses

(13) Remove the adapter and guide mandrel and secure the gear assembly and the press block in a bench vice.

(14) Assemble the plain washer, a new cup locking washer (Part No. N2880) and the ring nut to the gear.

(15) Tighten the nut with serrated spanner T74755.

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

(17) Remove the assembly from the press block and ensure that the gear rotates freely.

Assembly of the air-intake

11. (1) Blow through all oilways with a compressed air jet.

(2) Using lifting sling T70454, place the air-intake on build stand T72381 shown in fig. 3, Chap. 24B, and secure it with eight equally-spaced slave nuts and bolts.

(3) Check the height of the four gear bosses in the top wheelcase aperture with gauge T74893 (*fig.* 5). Using feeler gauges, check the gap between the gauge and each gear boss, which must be within the limits of 0·002 in. to 0·018 in. When Mod. No. 893 is embodied, this check must be made with the steel plugs in position in the bosses; these plugs are screwed into the bosses and will not normally be removed during reconditioning.

(4) Assemble the four protection plates over the air bleed apertures and secure them with eight new tab-washers (Part No. N4551) and $\frac{1}{4}$ in. B.S.F. nuts; lock the nuts.

(5) Assemble the upper drive gear assembly to the air-intake and secure it with four new tab-washers (Part No. AGS518E) and $\frac{1}{4}$ in. B.S.F. nuts; lock the nuts.

(6) Assemble a new sealing ring (Part No. N4606) over the hollow dowel in the centre boss of the air-intake.

(7) Position a new sealing strip (Part No. 46133) in the groove of the top wheelcase face.

Top wheelcase—backlash checks

12. The following operations assume that the top wheelcase has previously been assembled as described in Chapter 33D.

(1) Remove the blanks from the top wheelcase.

(2) Assemble the top wheelcase to the air-intake, securing it to alternate studs with slave washers and nuts.

(3) Using locking bridge T74894, lock the spare drive idler gear through the starter aperture in the wheelcase.

(4) Position the backlash checking tool T74896 in the bore of the upper driving gear.

(5) Clamp a dial test indicator on the starter adapter flange and locate the stylus on the scribed line of the backlash tool.

(6) Check that the backlash from the driving gear to the spare drive idler gear is within the limits (*fig.* 6).

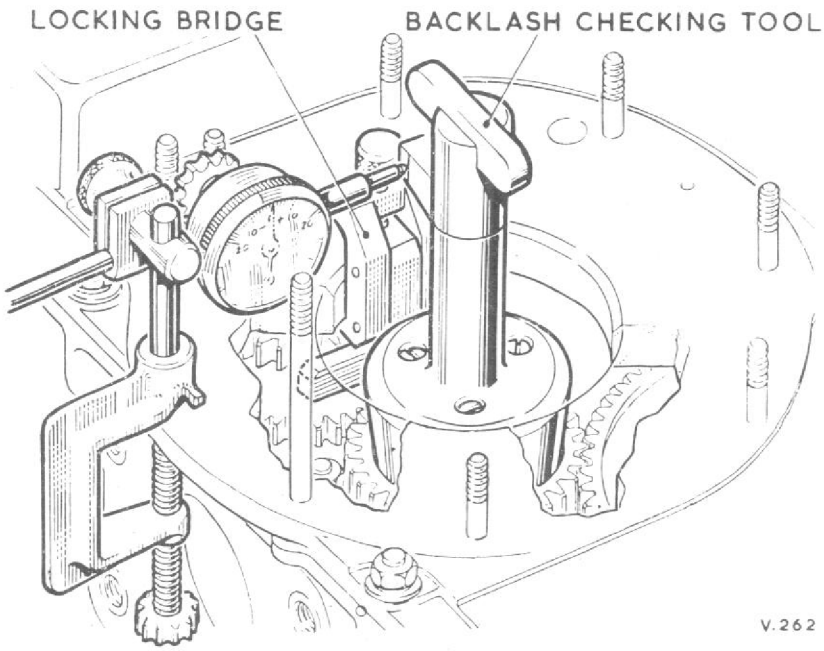


Fig. 6. Top wheelcase backlash checks

(7) Transfer the locking bridge to lock the starter and generator idler gear.

(8) Check that the backlash from the driving gear to the starter and generator idler gear is within the limits.

(9) Remove the locking bridge, the backlash tool and the dial test indicator.

(10) Remove the blanking plates from the spare vacuum pump drive gear, the air compressor gear, and the two generator driving gears.

(11) Clamp a dial test indicator to convenient positions on the top wheelcase and check that the end float of the respective driving gears is within the limits.

(12) Refit the blanking plates.

Bottom wheelcase—backlash checks

13. The following operations assume that the bottom wheelcase has been previously assembled as described in Chapter 33E and the sump as described in Chapter 33F.

(1) Assemble the lower driving gear assembly to the air-intake.

(2) Secure the assembly with four new tab-washers (Part No. AGS518E) and $\frac{1}{4}$ in. B.S.F. nuts; lock the nuts.

(3) Remove the blanks from the bottom wheelcase and sump assembly.

(4) Lock the idler and oil pump driving gear by assembling the locking clamp T74897 through the small core hole in the air-intake bottom wheelcase aperture.

(5) Remove the cover from the vertical drive shaft position on the wheelcase.

(6) Position the bottom wheelcase assembly on the air-intake.

Note . . .
To facilitate meshing of the gears the backlash tool T74898 must be inserted in the lower driving gear and used to rotate the gear as the wheelcase is pushed into final position.

(7) Secure the wheelcase with four equally-spaced slave washers and nuts.

(8) Tighten the handle of the locking fixture to lock the idler gear in the wheelcase.

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

(10) Check that the backlash between the driving gear and the idler gear is within the limits (*fig.* 7).

(11) Remove the backlash tool and refit the cover to the vertical drive shaft.

(12) Remove the dial test indicator, the bottom wheelcase, and the locking fixture.

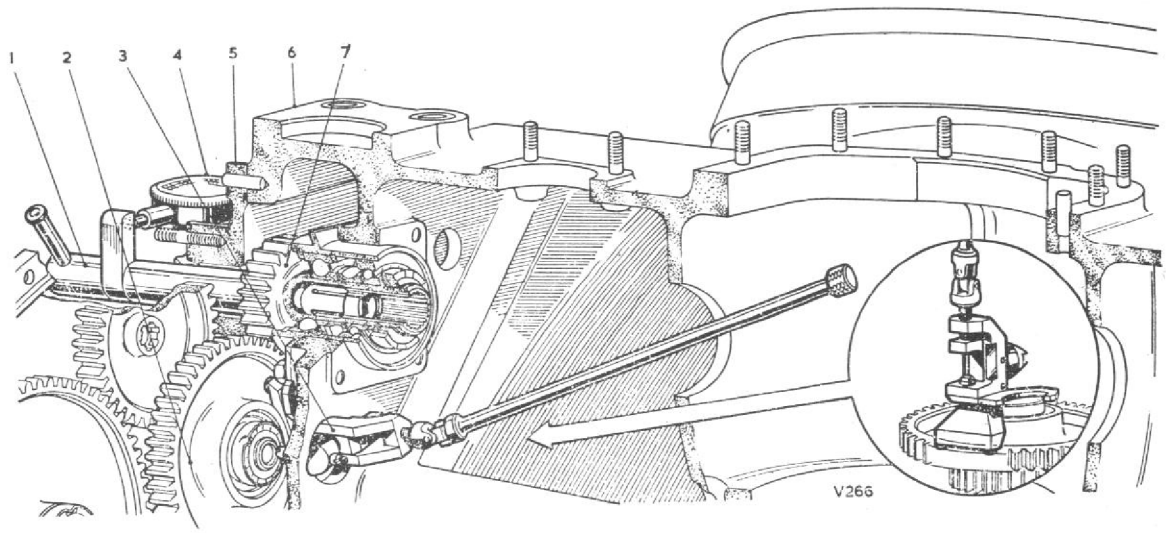
Breather tube

14. The following instructions deal with the assembly of the breather tube and oil pipes.

(1) Position a new sealing ring (Part No. N4601) over the unthreaded end of the breather tube.

(2) Assemble the breather tube, threaded end first, into its bore in the air-intake.

(3) Pre-mod. 432 only. Assemble the breather cap to the threaded end of the tube and secure with a plain washer and castellated nut; lock the nut with a new split pin (Part No. AGS784–2). When Mod. No. 432 is embodied, screw the breather cap on to the tube and lock with a new split pin (Part No. SP9–C10).



1 BACKLASH CHECKING TOOL
2 IDLER AND OIL PUMP DRIVING GEAR
3 LOCKING FIXTURE
4 DIAL TEST INDICATOR
5 BOTTOM WHEELCASE
6 AIR-INTAKE
7 LOWER DRIVING GEAR

Fig. 7. Bottom wheelcase backlash checks

(4) Assemble the spring to the opposite end of the tube and secure with the breather plug.

(5) Assemble a new tab locking washer (Part No. N1578) and the plug in the vertical bore of the metered oil feed tube.

(6) Pre-mod. 431 only. Assemble the metered oil feed tube to the horizontal bore.

Note . . .
When Mod. No. 431 is embodied the oil tube is deleted.

(7) Fit a new washer (Part No. 1081) to the banjo pillar and screw the pillar into the front bearing oil feed.

(8) Assemble two new washers (Part No. AGS1138A), the banjo and the cap-nut to the banjo pillar.

Air-intake oil test

15. A pressure test of the front bearing lubrication oil circuit must be carried out as follows:—

(1) Screw the bung T72389 into the front bearing housing bore to blank off the oilway.

(2) Connect oil tank trolley T73891 to the front bearing oil feed banjo and, using clean filtered oil to the correct specification, apply a pressure of 10 lb. per sq. in. Maintain this pressure for two minutes during which time examine the connections and plugging for leaks; no leakage is permissible.

(3) Remove the bung and ensure that an unrestricted flow through the circuit, with no pressure build up at the supply connection is obtained.

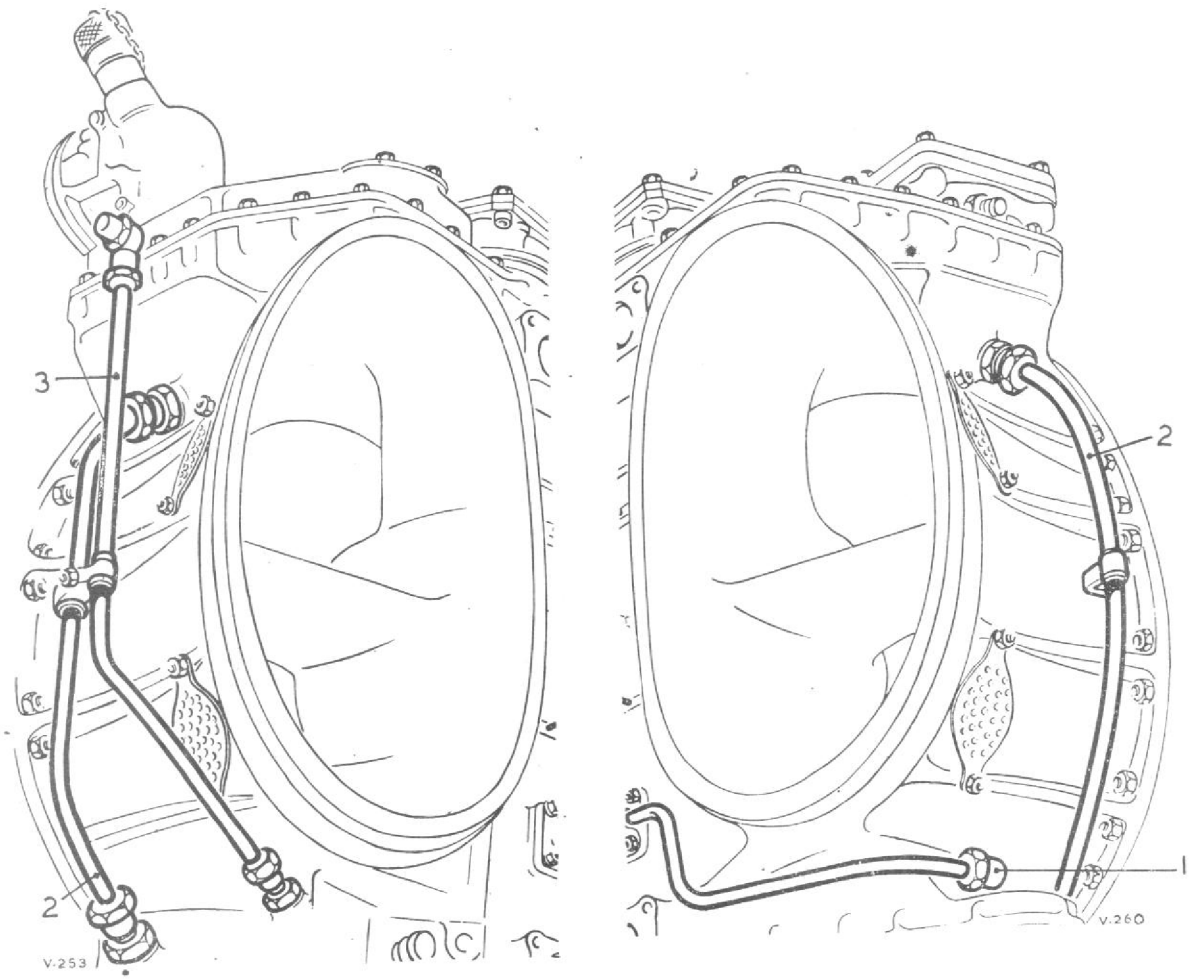
(4) Disconnect the oil tank trolley.

(5) Wire-lock the breather plug to the locking hole in the air-intake with 22 s.w.g. stainless steel locking wire.

(6) Lock the tab-washer to the plug in the metered oil tube.

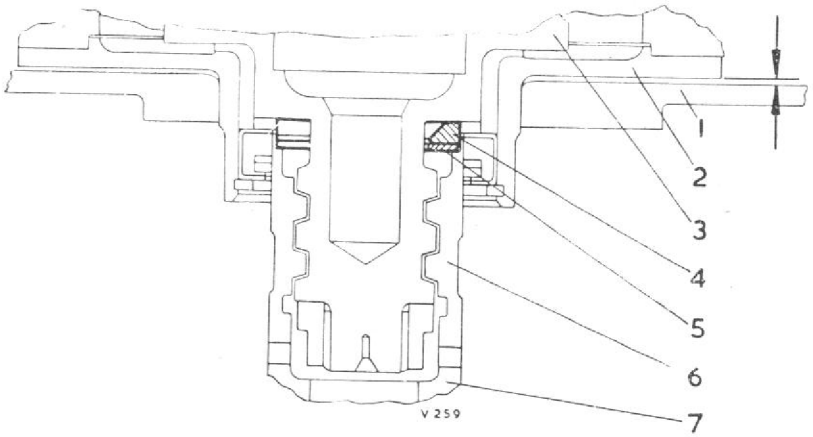
Pipes and unions (*fig. 8*)

16. (1) Using new washers (Part No. N1464), screw the four oil drain unions into the air-intake casing.



1 OIL SPRAY PIPE 2 OIL DRAIN PIPES 3 OIL FEED PIPE

Fig. 8. Pipe positions on the air-intake



1 TOP WHEELCASE
2 BOTTOM COVER
3 STARTER ADAPTER
4 SLIP DISC
5 SLIP DISC
6 STARTER DOG
7 STARTER DOG, UPPER DRIVING GEAR

Fig. 9. Checking the gap between the starter adapter and the top wheelcase

(2) Using a new washer (Part No. N1464), screw the oil feed union into the air-intake casing.

(3) Using new washers (Part No. AGS1186D), secure the banjo to the breather at the front of the air-intake with the banjo bolt.

(4) Using a new joint washer (Part No. N1421), secure the oil spray pipe to the lower of the two faces on the front of the air-intake and secure with four slave washers and nuts.

(5) Using a new joint washer (Part No. N1421), secure the cover to the upper of the two air-intake faces with four plain and spring washers and $\frac{1}{4}$ in. B.S.F. nuts.

(6) Assemble the nipples to each end of the port oil drain pipe and secure the pipe to the oil drain unions in the casing.

(7) Repeat operation 6 for the starboard pipe.

Preparation of the air-intake for motoring rig-test

17. (1) Align the dowel with the hole in the centre housing front flange and secure the centre housing to the air-intake with slave washers and nuts.

(2) Pass the lower drive shaft through the lower drive gear into the centre housing and check for freeness.

(3) Position a new joint strip (Part No. 46133) to the groove in the bottom wheelcase face and secure the wheelcase to the air-intake with slave washers and nuts fitted to alternate studs.

(4) Pass the upper driving shaft through the upper driving gear into the centre housing and check for freeness.

(5) Assemble the compressor drive shaft, with the air compressor drive assembly, to the compressor driving gear and secure it with six plain and spring washers and $\frac{1}{4}$ in. B.S.F. nuts.

18. The starter adapter must be assembled to the top wheelcase and the following checks carried out to determine the thickness of the adjusting shim to be fitted between the lower face of the adapter and the top wheelcase.

(1) Remove the eight screws and the bottom cover from the starter adapter.

(2) Run out the starter dog to the fully engaged position and insert a disc(s), selected from the range of slip discs T76183 to T76196, behind the dog so that the dog is held in the fully engaged position.

(3) Secure the bottom cover to the starter adapter with the eight screws.

(4) Assemble the starter adapter to the top wheelcase so that the starter dog bottoms on the dog in the air-intake.

(5) Hold the adapter in the down position and, using feeler gauges, measure the gap between the cover face of the adapter and the top wheelcase (*fig.* 9). Ascertain the end float of the planet gear carrier recorded on the relevant work sheet and add this to the measured gap. Refer to the Table of Fits and Clearances in Chapter 38 and add to this total but in two seperate summations — (A). The minimum permissible axial clearance between the starter dog teeth, and (B) the maximum permissible axial clearance between the starter dog teeth. The thickness of the adjusting washer must lie between these two totals.

(6) Check the thickness of the adjusting shim and correct if necessary.

(7) Remove the starter adapter from the top wheelcase.

(8) Remove the bottom cover from the starter adapter and take out the slip disc(s).

* (9) Place the bottom cover, flange downwards, on press block T75300.

** Op. 9 to 13 will only be necessary if the original seal has been rejected and removed.*

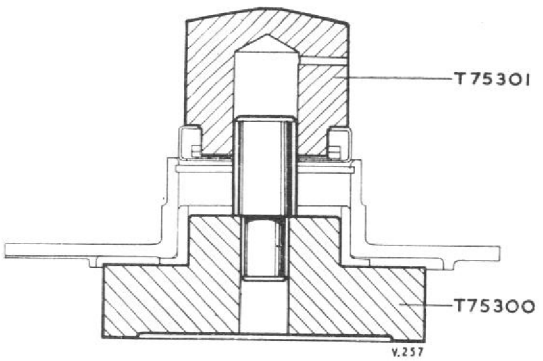


Fig. 10. Pressing a replacement seal into the bottom cover of the starter adapter

* (10) Position a new seal (Part No. 96505) on adapter T75301.

* (11) Position the seal and adapter over the mandrel of the press block, and press the seal into the cover (*fig.* 10).

* (12) Using Seeger pliers, secure the seal with a new circlip (Part No. N4227).

* (13) Remove the bottom cover from the press block.

(14) Using guide mandrel and adapter T75302, assemble and secure the bottom cover to the starter adapter.

(15) Assemble the starter adapter with the correct size adjusting shim, determined during Op. 5, to the top wheelcase and secure it with six plain and spring washers and $\frac{1}{4}$ in. B.S.F. nuts.

(16) Assemble the nipples to each end of the oil feed pipe and secure the pipe to the union in the air-intake casing and the banjo on the top wheelcase.

(17) Blank off the remaining unions.

(18) Remove the assembly from the build stand using lifting sling T72380.

Assembling the air-intake to the motoring-over rig

19. To enable the air-intake to be accommodated on the rig, adapter ring T75297 must be fitted to the mounting plate.

(1) Assemble drive coupling T74969 to the centre housing drive shaft and, using locking plate T74967 and key T74968, lock the ring nut.

Note . . .

A tube spanner (fig. 11), made from local resources to the dimensions detailed in Chap. 21, will assist this operation.

(2) Using lifting sling T70454 (*fig.* 12), mount the air-intake on the studs of the adapter ring and secure with six equally-spaced slave washers and nuts.

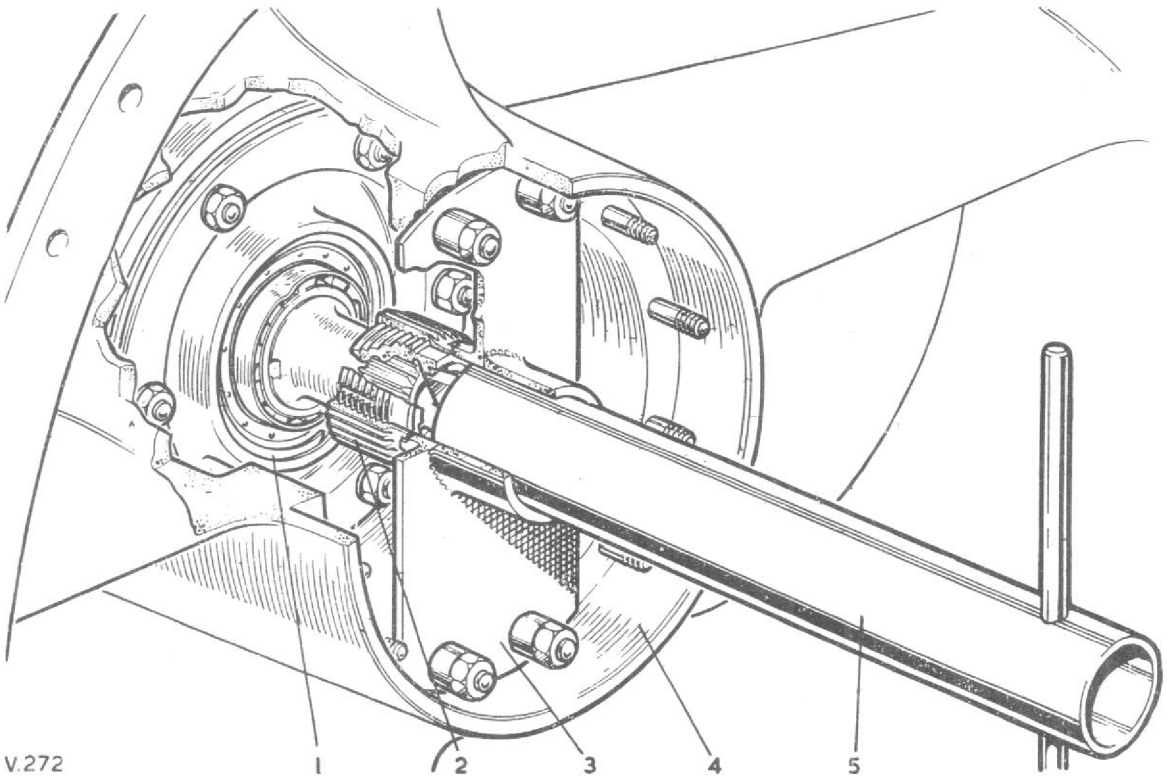
Note . . .

Sling T70454 does not provide a good C.G. *for the air-intake, and to facilitate ease of handling, a sling adapter (fig. 12) can be manufactured from local resources to the dimensions detailed in Chapter 21. The adapter is fitted to the starter adapter, after removal of the blanking cover, with the lifting eye to the rear.*

(3) Remove the lifting sling or the sling adapter, and refit the blanking cover if removed.

(4) Connect a pipe from the top pressure gauge union on the mounting plate to the oil pressure gauge banjo on the top wheelcase (1 *in fig.* 13 *and* 14).

(5) Connect a pipe from the union on the mounting plate to the metering pump banjo on the sump (2 *in fig.* 13 *and* 14).



1 CENTRE HOUSING
2 DRIVE COUPLING
3 GUIDE PLATE
4 AIR-INTAKE
5 SPANNER

Fig. 11. Tightening the drive coupling ring nut with locally made tube spanner

(6) Connect a pipe from the bottom pressure gauge union on the mounting plate to the union on the pressure oil gallery at the bottom of the sump (3 *in fig.* 13 *and* 14).

(7) Connect a pipe from the cooling oil pipe banjo on the sump to the oil spray pipe on the air intake (4 *in fig.* 13 *and* 14).

Note . . .

A restrictor assembly is incorporated in the test rig to simulate the oil flow conditions which would normally be obtained through the rear bearing cooling annulus.

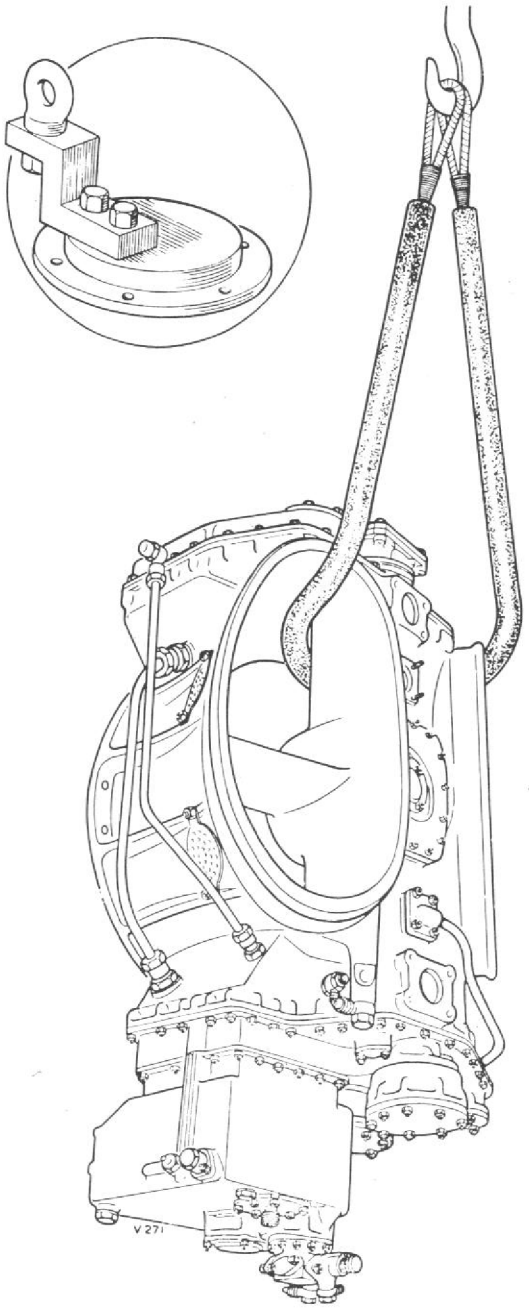


Fig. 12. Lifting the air-intake using sling T70454. Inset shows sling adapter for alternative method of slinging

(8) Connect a pipe from the top aperture at the front of the air-intake to the oil restrictor on the sump. The connection at the restrictor end should not be made until an initial run has been made (5 *in fig.* 13 *and* 14).

(9) Insert a temperature bulb in the adapter on the oil pressure filter cover (6 *in fig.* 13 *and* 14).

(10) Fill the sump with clean filtered oil, of the correct specification, pre-heated to 45 +5 deg. C. to the correct level as indicated by the sight glass.

(11) Secure two blanking plates T72396 to the fuel pump faces, and a perspex blank to the hydraulic pump and the vacuum pump mounting faces on the bottom and top wheelcases respectively.

Note . . .

It will be necessary to manufacture the perspex blanks from local resources to the dimensions detailed in Chapter 21.

(12) Secure blank T75298 to the tachometer drive face on the top wheelcase.

(13) Remove the blanking covers from the starter, the generator and alternator, and the compressor mounting faces on the top wheelcase and leave the apertures open.

Motoring rig-test

20. (1) Run the rig and check that oil is reaching the compressor drive mounting face, the starter mounting face, and the oil restrictor on the oil pump cover.

(2) When oil flows stop the rig; blank off the compressor and starter mounting faces and connect the pipe from the top aperture in the front of the air-intake to the oil restrictor.

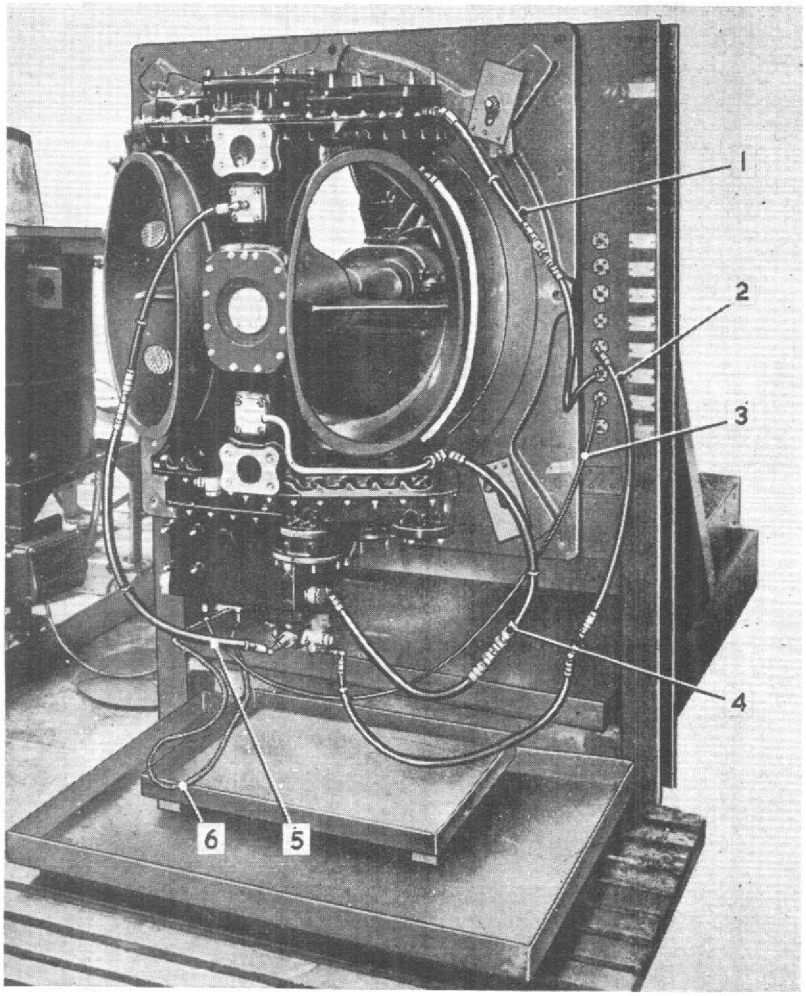
(3) Run the rig at a main-shaft speed of 3,000 r.p.m. When conditions are stable and the oil temperature has attained 45 +5 deg. C., carry out the following checks.

(4) Check that the oil pressure indicated on the pressure gauge connected to the top wheelcase is between 17 and 22 lb. per sq. in.

(5) Check by looking through the perspex blanks that the oil feed is reaching the tachometer generator and vacuum drive bearings.

(6) Check that the oil seals on the generator and alternator drives are functioning correctly; oil should not exude from these drives.

(7) Set the main bearing metering pump at notch 10. Operating the valve on the panel, adjust the delivery of the pump until a pressure of 5 lb. per sq. in., indicated on the gauge connected to the metering pump banjo, is obtained. Check that the delivery of the pump is not less than 18 c.c. (0·0317 pints) in six minutes timed against a stop watch and measured in the graduated tube on the panel.



1 TOP PRESSURE GAUGE UNION ON THE MOUNTING PLATE TO THE OIL PRESSURE GAUGE BANJO TOP WHEELCASE

2 UNION ON MOUNTING PLATE TO THE METERING PUMP BANJO

3 BOTTOM PRESSURE GAUGE UNION ON THE MOUNTING PLATE, TO THE UNION ON THE PRESSURE OIL GALLERY

4 COOLING PIPE BANJO TO THE OIL SPRAY PIPE

5 TOP APERTURE IN AIR-INTAKE TO OIL RESTRICTOR

6 TEMPERATURE BULB

Fig. 13. Pipe connections from the motoring rig to the air-intake port side

Note . . .

A pump not giving the correct delivery at the limit of notch 10 must be replaced with a standard serviceable pump. Before rejecting the pump, ensure that the oil supply duct is not blocked, possibly by displacement of the sealing ring.

(8) Examine the assembly for oil leaks; no leakage is permissible.

(9) Increase the mainshaft speed to 8,500 r.p.m. with the oil temperature stabilised at 45 ± 5 deg. C. Using adjusting tool T74176, adjust the relief valve and check that a pressure of 62·5 lb. per sq. in. is indicated on the gauge connected to the top wheelcase.

(10) Re-adjust the relief valve to give an oil pressure of 55 lb. per sq. in. at the top wheelcase and check that the pressure, indicated on the pressure gauge connected to the oil gallery on the bottom of the sump, does not exceed 67·5 lb. per sq. in.

21. Run an endurance test of 30 minutes at 8,500 r.p.m., during which time carry out the following checks.

(1) Operating the valve on the panel, adjust the delivery of the metering pump until a pressure of 20 lb. per sq. in., indicated on the gauge connected to the pump, is obtained. Check that the delivery of the pump is not less than 51 c.c. (0·0897 pints) in six minutes timed against a stop watch and measured in the graduated tube on the panel.

(2) Check that the oil seals on the generator and alternator drives are functioning correctly; oil should not exude from these drives.

(3) Examine the assembly for oil leaks; no leakage is permissible.

Note . . .
During the endurance test the oil temperature may be permitted to rise, but must not exceed 80 deg. C.

(4) Lock the adjustment of the metering pump by passing a wire tightly through the lock spring (*fig.* 15).

(5) Drain the oil from the sump and disconnect the pipes previously fitted for the purpose of the rig tests.

22. (1) Using lifting sling T70454, or preferably the locally made sling described in para. 19, remove the air-intake from the rig and transfer it to build stand T72381; secure the air-intake with slave nuts and bolts.

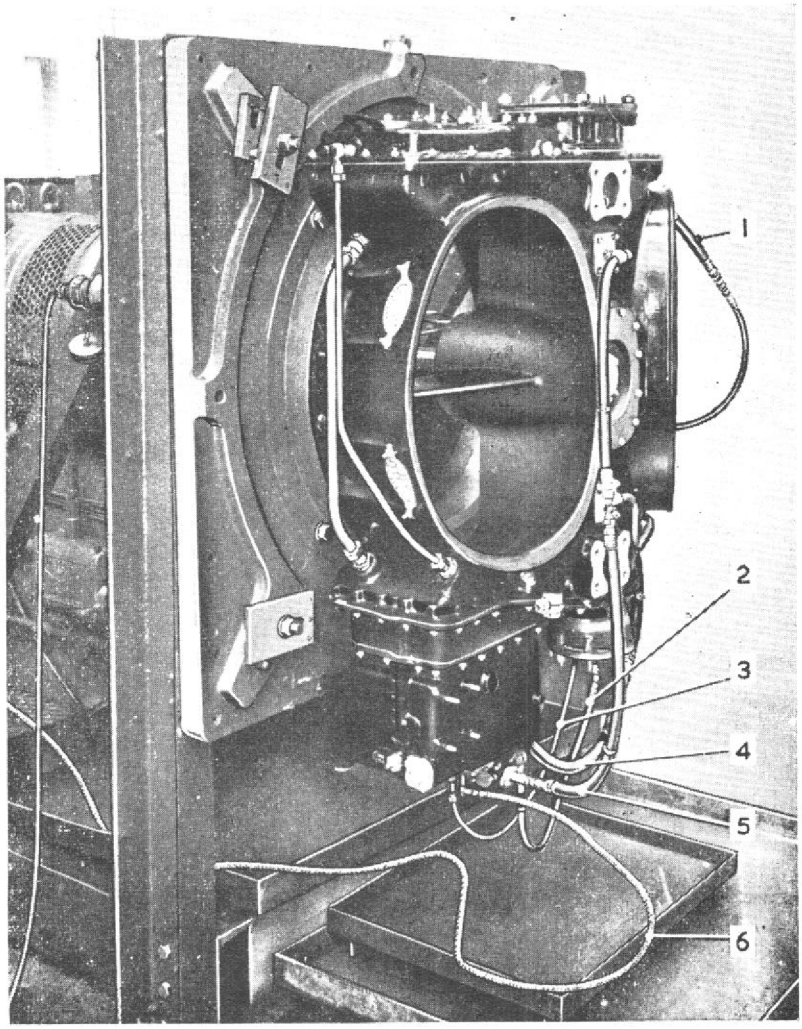
(2) Refit the blanks previously removed for the purpose of the rig test. Unscrew and remove the drive coupling from the centre housing drive shaft.

Note . . .
If the coupling is firmly mated to the shaft it will be necessary to manufacture an extractor from local resources to the dimensions detailed in Chapter 21.

(3) Remove the top wheelcase assembly and the drive shaft.

(4) Remove the bottom wheelcase and sump assembly, and the drive shaft; do not separate the wheelcase from the sump.

(5) Remove the centre housing from the air-intake.



1 TOP PRESSURE GAUGE UNION ON THE MOUNTING PLATE TO THE OIL PRESSURE GAUGE BANJO TOP WHEELCASE

2 UNION ON MOUNTING PLATE TO THE METERING PUMP BANJO

3 BOTTOM PRESSURE GAUGE UNION ON THE MOUNTING PLATE, TO THE UNION ON THE PRESSURE OIL GALLERY

4 COOLING PIPE BANJO TO THE OIL SPRAY PIPE

5 TOP APERTURE IN AIR-INTAKE TO OIL RESTRICTOR

6 TEMPERATURE BULB

Fig. 14. Pipe connections from the motoring rig to the air-intake starboard side

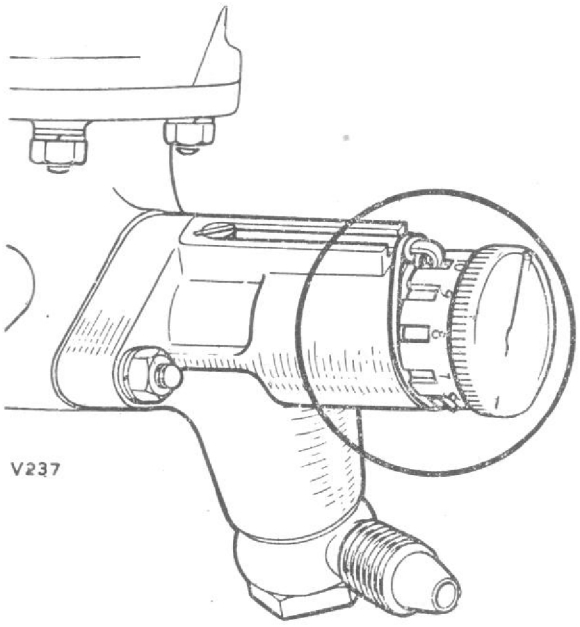


Fig. 15. Metering pump locking

(6) Remove the upper and lower vertical gear assemblies from the centre housing as described in Chapter 23.

(7) Examine the gears visually for plucking, burrs, and condition; rectify as necessary.

(8) Replace the gear assemblies, as described in Chapter 33C.

(9) Examine, as far as possible, the gears in the top and bottom wheelcases.

(10) Remove the oil suction and pressure filters; examine and clean both filters. The pressure filter must not be immersed in kerosine, gasoline, or any similar cleaning fluids, and care must be taken that foreign matter is not transferred to its inner surface. Replace the filters.

(11) Remove and dismantle the oil restrictor as described in Chapter 23.

(12) Inspect for cleanliness and, if necessary, thoroughly wash in clean kerosine. Using a new split pin (Part No. SP9–C8), re-assemble the restrictor as described in Chapter 33F.

(13) Ensure that the split pin does not protrude past the shoulder on the restrictor as shown in fig. 16.

(14) Remove the transparent blanks and refit the blanking plates removed for the purpose of the rig test.

(15) Using blanking plate T74974, blank off the top wheelcase.

(16) Using blanking plate T74975, blank off the starter mounting face on the top wheelcase.

(17) Using blanking plate T74770, blank off the bottom wheelcase.

(18) Using two blanking plates T74765, blank off the two fuel pump faces.

(19) Blank off the following faces of the air-intake, the top wheelcase face using blank T74970, the bottom wheelcase face using T74971, the centre housing aperture using blank T74972, and the oil spray face with blank T74973.

ASSEMBLY—48 Mk. 2 only (*fig. 17*)

Upper driving gear

23. Untie the component parts; care must be taken that the components are not mixed with those of the lower driving gear.

(1) Assemble the buffer ring to its retaining ring.

(2) Assemble the buffer ring assembly to the bearing housing.

(3) Place the bearing housing, flange uppermost, on press block T77239.

(4) Assemble the ball bearing over the guide mandrel of the press block and using adapter T77240 press the bearing into the housing (*fig.* 18).

(5) Assemble the outer spacing ring over the guide mandrel of the press block on to the bearing.

(6) Position the outer race of the roller bearing, serial number outwards, to adapter T77241.

(7) Place the adapter with the outer race over the guide mandrel of the press block and press the race into the housing; remove the adapter (*fig.* 19).

(8) Position the bearing retaining ring to the sleeve of the adapter T77240.

(9) Position the adapter to the ball bearing as before and compress the buffer ring; the loading on the adapter must be maintained until this operation is completed.

(10) Release the sleeve from the adapter and use it to tap the outer race of the roller bearing home (*fig.* 20).

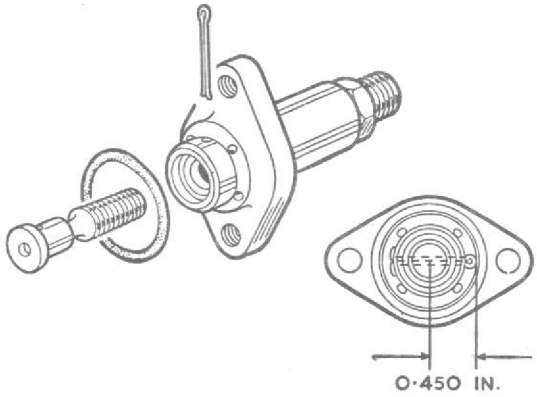


Fig. 16. Oil feed restrictor locking

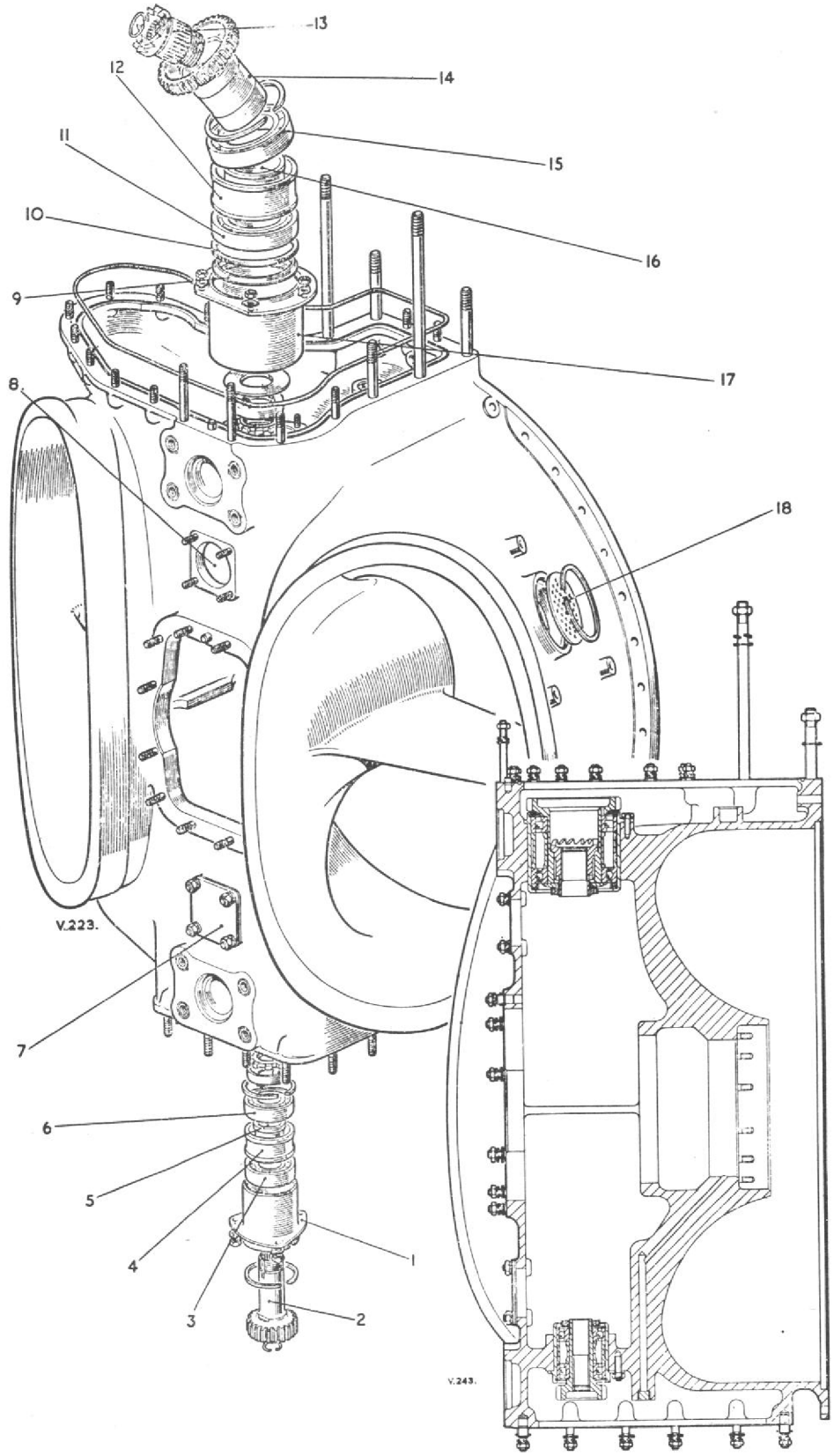


Fig. 17. Air-intake (48 Mk. 2)

KEY TO FIG. 17

1 BEARING HOUSING
2 LOWER DRIVING GEAR
3 ROLLER BEARING
4 OUTER SPACING RING
5 INNER SPACING RING
6 BALL BEARING
7 CORE SUPPORT HOLE COVER
8 OIL SPRAY PIPE APERTURE
9 RETAINING RING
10 BUFFER RING
11 BALL BEARING
12 OUTER SPACING RING
13 STARTER DOG
14 UPPER DRIVING GEAR
15 ROLLER BEARING
16 INNER SPACING RING
17 BEARING HOUSING
18 AIR BLEED APERTURE COVER

(11) Return and lock the sleeve in the upper position on the adapter.

(12) Slide the bearing retaining ring down and assemble to the housing.

(13) Assemble the inner spacing ring and the inner race of the roller bearing to the housing. Remove the assembly from the press block.

(14) Place the starter dog, gear teeth downwards, on press block T74760.

(15) Assemble the upper driving gear, teeth downwards, to the starter dog and press the driving gear on to the dog.

(16) Place the guide adapter T77242 into the bore of the starter dog.

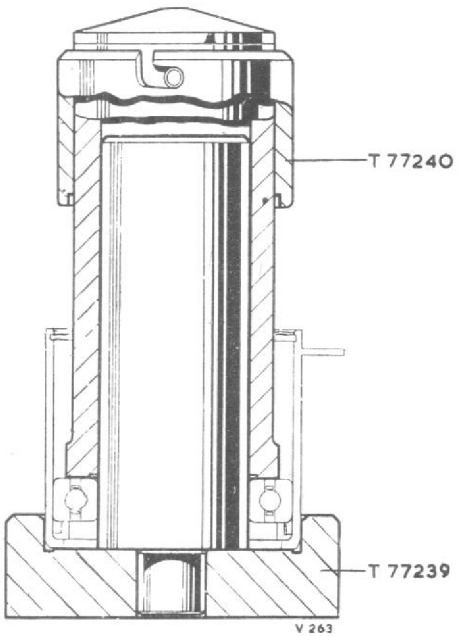


Fig. 18. Pressing the ball bearing into the housing

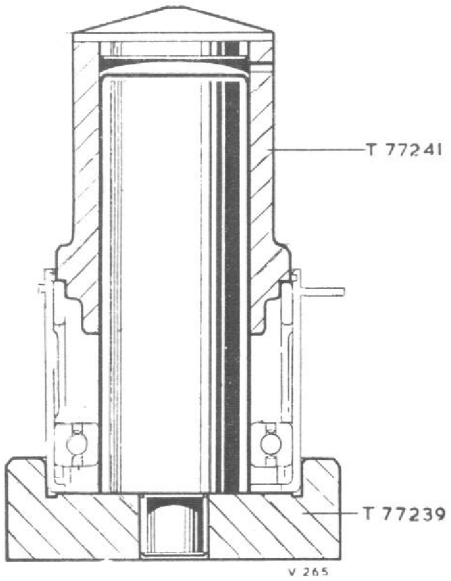


Fig. 19. Pressing the outer race of the roller bearing into the housing

(17) Position the bearing assembly, flange downwards, over the guide adapter and using adapter T77241 press the bearing assembly on to the gears (*fig.* 21).

(18) Transfer the press block and the assembly to a bench vice.

(19) Assemble the thrust washer, a new cup locking washer (Part No. N2873) and the ring nut.

(20) Tighten the nut with serrated spanner T74911.

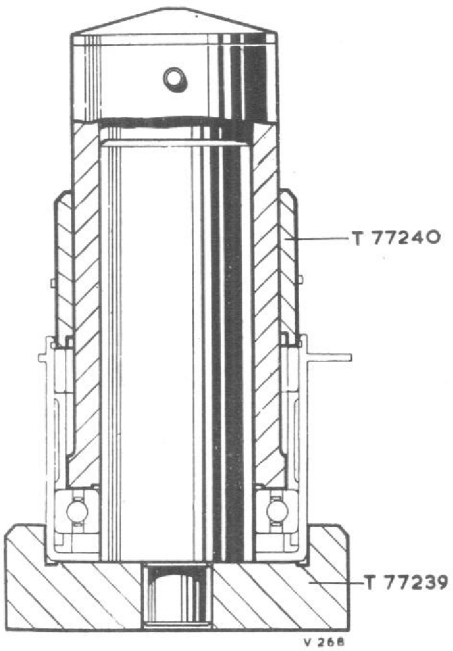


Fig. 20. Outer race of roller bearing tapped into position by the adapter sleeve

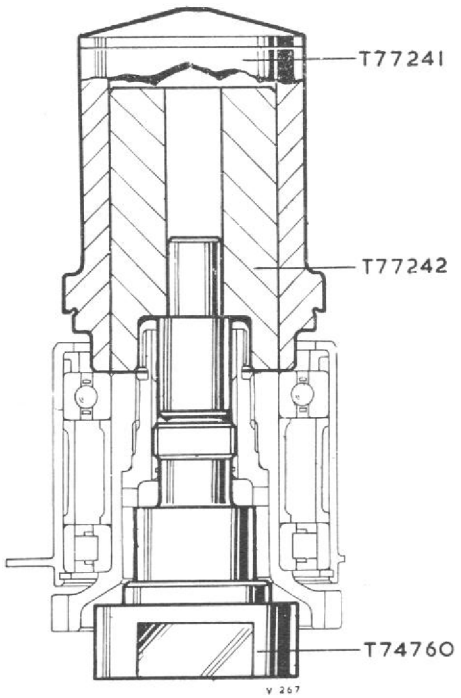


Fig. 21. Pressing the bearing assembly on to the gears

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

Lower driving gear

24. (1) Untie the component parts.

(2) Assemble one of the bearing retaining rings to the bearing housing at the opposite end to the flange.

(3) Place the bearing housing, flange uppermost, on press block T77230.

(4) Assemble the ball bearing to the housing over the guide mandrel of the press block.

(5) Using adapter T77232, press the bearing into its housing.

(6) Position the outer spacing ring to the bearing over the guide mandrel of the press block.

(7) Position adapter ring T77234 to the housing.

(8) Assemble the outer race of the roller bearing, serial number outwards, to the bore of the adapter ring.

(9) Using adapter T77232, press the outer race into the housing.

(10) Secure the race with the second retaining ring.

(11) Assemble the inner spacing ring and the inner race of the roller bearing, serial number outwards, to the housing.

(12) Place the lower driving gear, teeth downwards, on press block T77231.

(13) Place guide adapter T77233 into the bore of the gear.

(14) Position the bearing assembly to the gear, with the flange of the housing downwards, over the guide adapter.

(15) Using adapter T77232, press the bearing assembly on to the gear.

(16) Transfer the press block and the assembly to a bench vice.

(17) Assemble a new cup locking washer (Part No. N2880) and the ring nut.

(18) Using spanner T77615 and a suitable torque-meter wrench, tighten the nut to the torque figure specified in Chapter 22.

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

Assembly of the air-intake

25. (1) Blow through all oilways with a compressed air jet.

(2) Using lifting sling T70454, place the air-intake on build stand T72381, illustrated in fig. 3, Chapter 24B, and secure it with eight equally-spaced slave bolts and nuts.

(3) Assemble the four protection plates to the air-bleed apertures and secure each with a new retaining ring (Part No. 60275).

(4) Using a new washer (Part No. AGS1138B), screw the front bearing oil feed union into the port side of the air-intake.

(5) Using a new joint washer (Part No. N1421), secure the cover to the bottom aperture in the front of the air-intake with four plain and spring washers and $\frac{1}{4}$ in. B.S.F. nuts.

(6) Assemble the upper drive gear assembly to the air-intake and secure with five new tab-washers (Part No. AGS518E) and $\frac{1}{4}$ in. B.S.F. nuts; lock the nuts.

Top wheelcase—backlash checks

26. The following checks assume that the top wheelcase has been previously assembled as described in Chapter 33D.

(1) Remove the blanks from the top wheelcase.

(2) Assemble the generator casing to the top wheelcase and secure it with slave nuts.

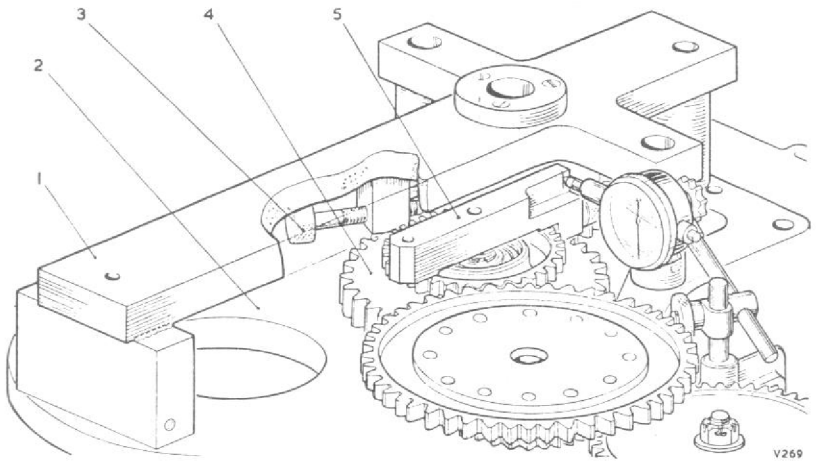
(3) Locate the dummy air-intake bridge piece T77243, over the idler gear spindle, in the dowel holes of the bottom face of the wheelcase and secure it with slave nuts.

(4) Tighten the screw on the bridge piece so that it locks the generator drive idler pinion.

(5) Clamp backlash checking tool T77244 onto the tachometer and generator drive idler gear.

(6) Clamp a dial test indicator to the wheelcase and locate the stylus on the scribed line of the backlash checking tool.

(7) Check that the backlash between the tachometer and generator idler gear and the generator idler pinion is within the limits (*fig.* 22).



1 DUMMY AIR-INTAKE BRIDGE PIECE
2 TOP WHEELCASE
3 SCREW LOCKING THE GENERATOR DRIVER IDLER PINION
4 TACHOMETER AND GENERATOR IDLER GEAR
5 BACKLASH CHECKING TOOL

Fig. 22. Generator idler pinion backlash check

(8) Remove the dial test indicator, the backlash tool, the bridge piece, and the generator drive assembly from the wheelcase.

(9) Position a new joint strip (Part No. 95607), with the ends cut at an angle to make a scarf joint, to the groove in the top wheelcase face.

(10) Secure the top wheelcase to the air-intake with slave washers and nuts fitted to alternate studs.

(11) Secure the locking fixture T77235 to the wheelcase through the starter aperture and lock the tachometer and generator drive gear.

(12) Position the backlash checking tool T77236 in the bore of the upper driving gear.

(13) Clamp a dial test indicator to the top wheelcase flange with the stylus located on the scribed line of the backlash tool.

(14) Check that the backlash between the tachometer and generator drive gear and the upper driving gear in the air-intake is within the limits (*fig.* 23).

(15) Remove the dial test indicator, the backlash tool, and the locking fixture.

(16) Assemble a new joint strip (Part No. 95391), with the ends cut at an angle to make a scarf joint, to the generator casing face.

(17) Assemble the generator drive assembly to the top wheelcase and secure with four equally-spaced slave washers and nuts.

Sump—backlash checks

27. The following checks assume that the sump has been previously assembled as described in Chapter 33F.

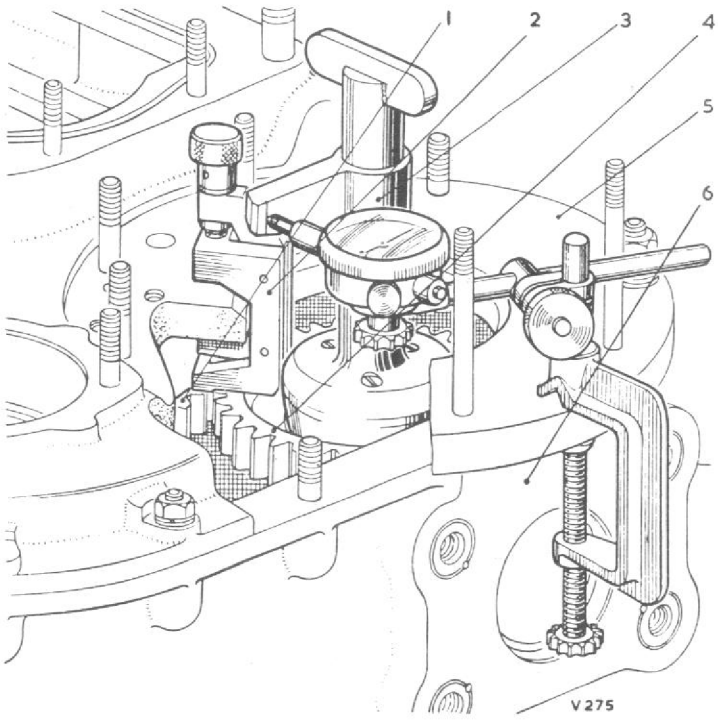
(1) Secure the lower drive gear assembly to the air-intake with three new tab-washers (Part No. AGS518E) and $\frac{1}{4}$ in. B.S.F. nuts; lock the nuts.

(2) Remove the blanks from the sump.

(3) Passing the Bowden cable through the cored hole in the starboard side of the air-intake sump aperture, clamp the locking fixture T77237 on the lower drive gear housing.

(4) Align the dowels in the air-intake flange with the holes in the sump and assemble the sump to the air-intake.

(5) Secure the sump with equally-spaced slave washers and nuts.



1 TACHOMETER AND GENERATOR DRIVE
2 LOCKING BRIDGE T77235
3 BACKLASH CHECKING TOOL T77236
4 UPPER DRIVING GEAR
5 TOP WHEELCASE
6 AIR-INTAKE

Fig. 23. Top wheelcase backlash checks

(6) Pass the backlash checking tool T77238 through the bottom aperture in the front of the air-intake and position it in the bore of the lower driving gear.

(7) Screw up the control screw on the Bowden cable of the locking fixture to lock the vertical drive gear.

(8) Clamp a dial test indicator to the air-intake centre housing mounting face, with the stylus located on the scribed line of the backlash tool.

(9) Check that the backlash between the lower driving gear in the air-intake and the vertical drive in the sump is within the limits (*fig.* 24).

Note . . .

Due to the geometry of the tool a reading equivalent to four times the actual backlash will be obtained.

(10) Remove the dial indicator, the backlash tool, the sump, and the locking fixture from the sump.

Air-intake oil test

28. A pressure test of the front bearing lubrication oil circuit must be carried out as follows:—

(1) Screw the bung T72389 into the front bearing housing bore, to blank off the oilway.

(2) Connect oil tank trolley T73891 to the oil feed union in the lower port side of the air-intake and, using clean filtered oil to the correct specification, apply a pressure of 10 lb. per sq. in. Maintain this pressure for two minutes, during which time examine the connections and plugging for leaks; no leakage is permissible.

(3) Remove the bung and ensure that an unrestricted flow through the circuit, with no pressure build up at the supply connection, is obtained.

(4) Disconnect the oil tank trolley.

(5) Using a new joint washer (Part No. N1421), fit the oil spray pipe to the top aperture in the front of the air-intake and secure it with four slave washers and nuts.

(6) Blank off the nut on the end of the spray pipe with tape.

Preparation of the air-intake for motoring rig-test

29. (1) Align the dowel with the hole in the centre housing front flange and secure the centre housing to the air-intake with slave washers and nuts.

(2) Pass the lower vertical drive shaft through the drive gear into the centre housing.

(3) Using Seeger circlip pliers, secure the drive shaft with a new circlip (AGS2030–16).

(4) Position a new joint strip (Part No. 96139), with the ends cut at an angle to make a scarf joint, to the groove in the sump face.

(5) Assemble the sump to the air-intake and secure it with slave washers and nuts on alternate studs.

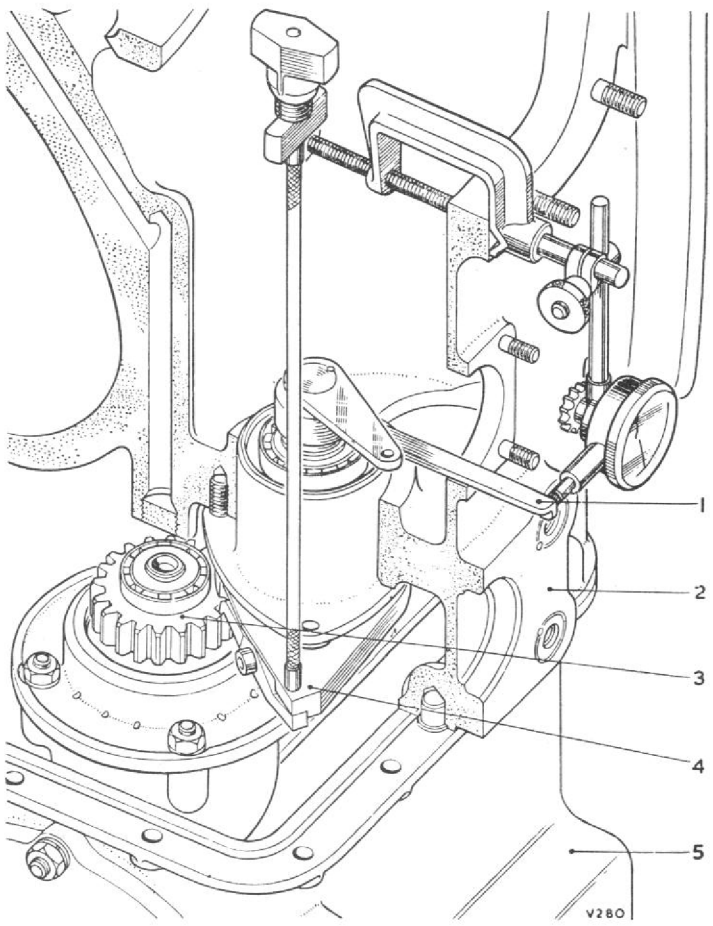
(6) Pass the upper vertical drive shaft through the upper drive gear into the centre housing.

30. The starter adapter must be assembled to the top wheelcase and the following checks carried out to determine the thickness of the starter casing adjusting shim to be fitted between the lower face of the adapter and the top wheelcase.

(1) Remove the eight screws and the bottom cover from the starter adapter.

(2) Run out the starter dog to the fully engaged position and insert a disc(s), selected from the range of slip discs T76183 to T76196, behind the dog so that the dog is held in the fully engaged position.

(3) Secure the bottom cover to the starter adapter with the eight screws.



1 BACKLASH CHECKING TOOL T77238
2 AIR-INTAKE
3 VERTICAL DRIVE GEAR
4 LOCKING FIXTURE T77237
5 SUMP

Fig. 24. Sump backlash checks

(4) Assemble the starter adapter to the top wheelcase so that the starter dog bottoms on the dog in the air-intake.

(5) Hold the adapter in the down position and, using feeler gauges, measure the gap between the cover face of the adapter and the top wheelcase (*fig.* 9). Ascertain the end float of the planet gear carrier recorded on the relevant work sheet and add this to the measured gap. Refer to the Table of Fits and Clearances in Chapter 38, and add to this total, but in two separate summations, (A) the minimum permissible axial clearance between the starter dog teeth and (B) the maximum permissible axial clearance between the starter dog teeth. The thickness of the adjusting washer must lie between these two totals.

(6) Check the thickness of the adjusting shim and correct if necessary.

(7) Remove the starter adapter from the top wheelcase.

(8) Remove the bottom cover from the starter adapter and take out the slip disc(s).

* (9) Place the bottom cover, flange downwards, on press block T75300.

* (10) Position a new seal (Part No. 96505) on adapter T75301.

* (11) Position the seal and adapter over the mandrel of the press block, and press the seal into the cover (*fig.* 10).

* (12) Using Seeger pliers, secure the seal with a new circlip (Part No. N4227).

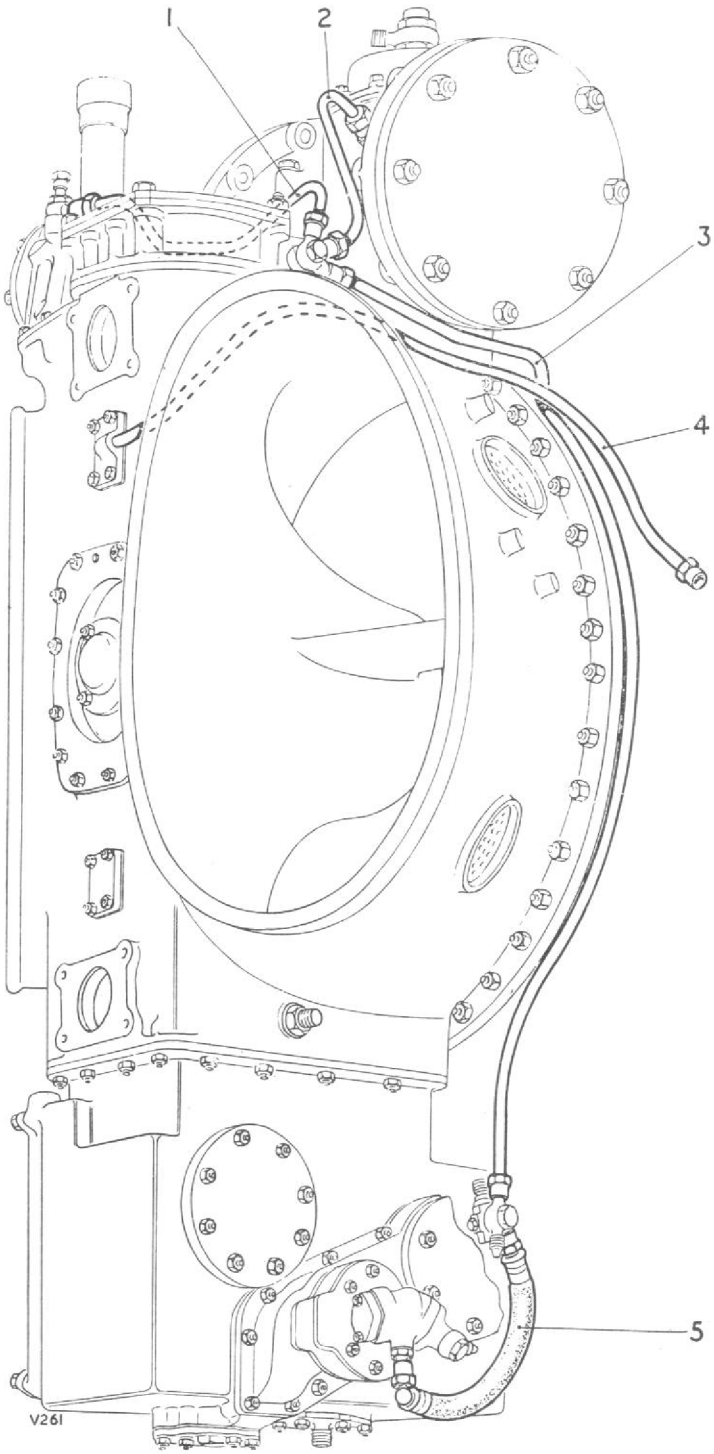
* (13) Remove the bottom cover from the press block.

(14) Using guide mandrel and adapter T75302, secure the bottom cover to the starter adapter.

(15) Assemble the starter adapter with the correct size adjusting shim, determined during Op. 5, to the top wheelcase and secure it with four plain and spring washers and $\frac{1}{4}$ in. B.S.F. nuts.

Pipes

31. Assemble the pipes detailed as follows to the positions shown in fig. 25.



1 OIL PIPE, TOP WHEELCASE TO COMPRESSOR
2 OIL PIPE, TOP WHEELCASE TO GENERATOR
3 OIL PIPE, SUMP TO TOP WHEELCASE
4 OIL SPRAY PIPE
5 METERING PUMP FEED (RESTRICTOR) TO OIL PUMP COVER

Fig. 25. Pipe positions on the air-intake

**Op. 9 to 13 will only be necessary if the original seal has been rejected and removed.*

(1) The pipe from the oil pump cover to the restrictor.

(2) The pipe from the sump to the top wheelcase.

(3) The pipe from the top wheelcase to the air compressor housing.

(4) The pipe from the top wheelcase to the generator casing.

(5) Remove the assembly from the build stand, using lifting sling T72380.

Assembling the air-intake to the motoring-over rig

32. To enable the air-intake to be accommodated on the rig, adapter ring T78265 must be fitted to the mounting plate.

(1) Assemble drive coupling T74969 to the centre housing drive shaft and, using locking plate T74967 and key T74968, lock the ring nut.

Note . . .

A tube spanner (fig. 11), made from local resources to the dimensions detailed in Chap. 21 will assist this operation.

(2) Using lifting sling T70454 (*fig.* 12), mount the air-intake on the studs of the adapter ring and secure it with six equally-spaced slave washers.

Note . . .

Sling T70454 does not provide a good C.G. for the air-intake, and, to facilitate ease of handling, a sling adapter (fig. 12) can be manufactured from local resources to the dimensions detailed in Chap. 21. The adapter is fitted to the starter adapter with the lifting eye to the rear.

(3) Remove the lifting sling or the sling adapter.

(4) Connect a pipe from the front bearing oil feed to the oil filler (1 *in fig.* 26 *and* 27).

(5) Connect a pipe from the transfer cock union on the mounting plate to the oil spray on the air-intake (2 *in fig.* 26).

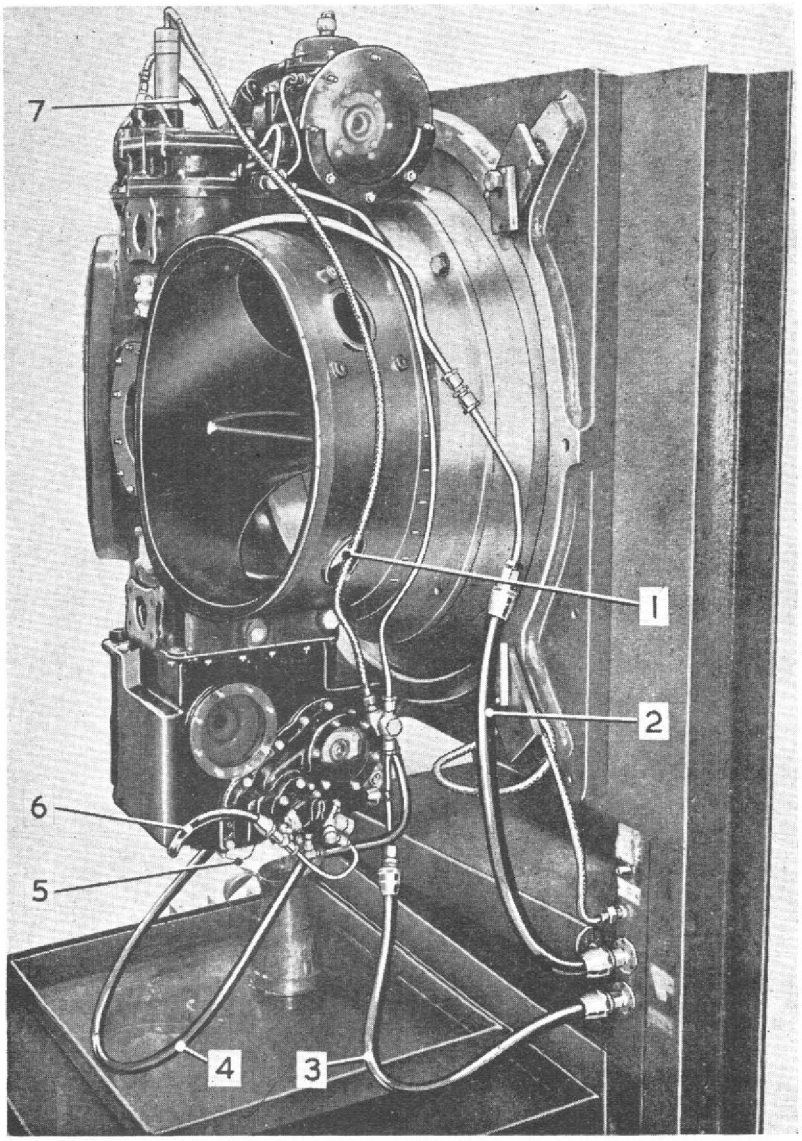
Note . . .

A restrictor assembly is incorporated in the test rig to simulate the oil flow conditions which would normally be obtained through the rear bearing cooling annulus.

(6) Connect a pipe from the transfer union on the mounting plate to the main oil delivery banjo on the sump (3 *in fig.* 26 *and* 27).

(7) Connect a pipe from the transfer union on the mounting plate to the oil restrictor banjo pillar on the sump. To do this a suitable tee-piece must be fitted in the rear bearing cooling oil feed (4 *in fig.* 26 *and* 27).

(8) Insert a temperature bulb in the adapter on the oil pressure filter cover (5 *in fig.* 26 *and* 27).



1 FRONT BEARING OIL FEED TO OIL FILLER
2 TRANSFER UNION MOUNTING PLATE TO OIL SPRAY PIPE
3 TRANSFER UNION ON MOUNTING PLATE TO MAIN OIL DELIVERY BANJO
4 BOTTOM PRESSURE GAUGE UNION ON MOUNTING PLATE TO OIL RESTRICTOR BANJO PILLAR
5 TEMPERATURE BULB
6 UNION ON MOUNTING PLATE TO REAR BEARING OIL FEED BANJO
7 TOP PRESSURE GAUGE UNION ON MOUNTING PLATE TO REAR BEARING OIL FEED BANJO

Fig. 26. Pipe connections from the motoring rig to the air-intake port side

(9) Connect a pipe from the union on the mounting plate to the rear bearing oil feed banjo (6 *in fig.* 26 *and* 27).

(10) Connect a pipe from the top pressure gauge union on the mounting plate to the oil pressure gauge banjo on the top wheelcase (7 *in fig.* 26 *and* 27).

(11) Fill the sump with clean filtered oil, of the correct specification, pre-heated to 45 ±5 deg. C., to the correct level as indicated by the sight glass.

(12) Secure transparent blank T75289 to the tachometer drive face.

(13) Remove the blanking plates from the starter and compressor mounting faces and leave the apertures open.

(14) Prime the generator drive bearing assemblies with clean filtered oil, of the correct specification, pre-heated to 45 ±5 deg. C. To do this remove the generator drive casing cover and pour approximately a quarter of a pint of oil through the inner drive bearing of each assembly.

(15) Secure a locally-made perspex blanking plate to the fuel circulating pump face.

Note . . .

It will be necessary to manufacture the perspex blank from local resources to the dimensions detailed in Chap. 21.

(16) Prime the two hydraulic pump drive bearings with approximately a quarter of a pint of clean filtered oil, of the correct specification, pre-heated to 45 ±5 deg. C.

Motoring rig-test

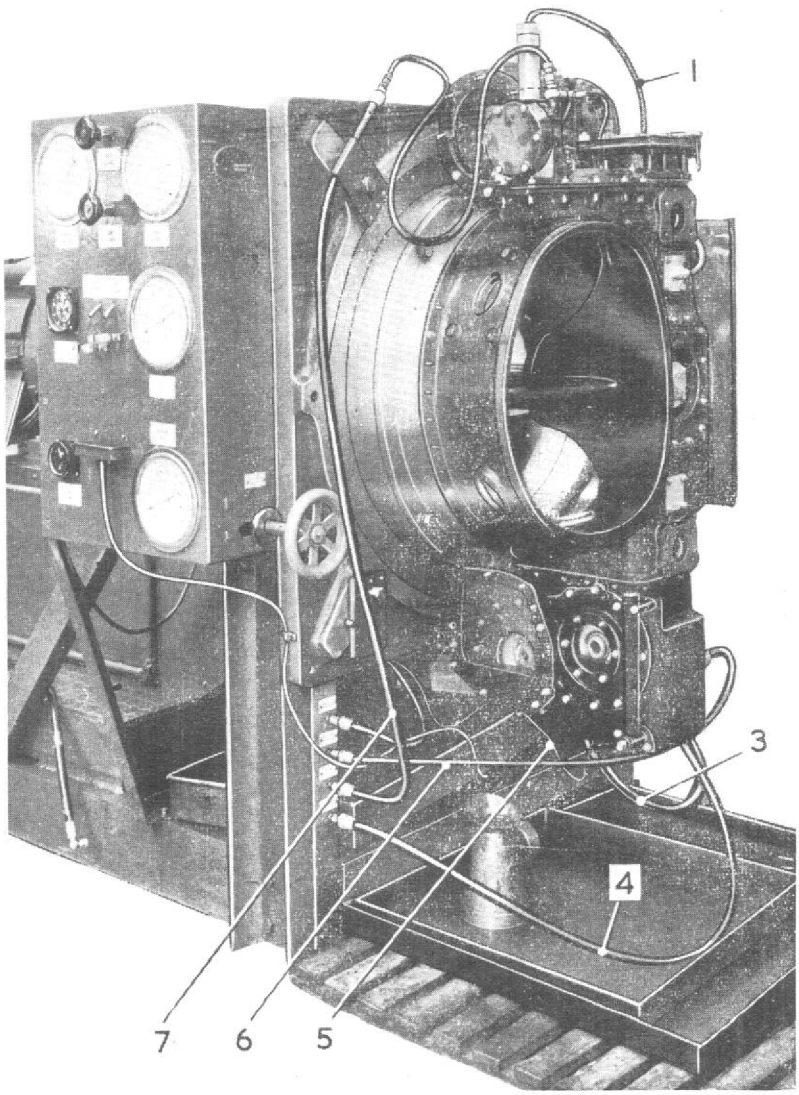
33. (1) Run the rig and check that oil is reaching the compressor drive and starter drive mounting faces.

(2) When oil flows stop the rig and blank off the compressor and starter drive mounting faces.

(3) Run the rig at a mainshaft speed of 3,000 r.p.m. When conditions are stable and the oil temperature has attained 45 ±5 deg. C., carry out the following checks.

(4) Check that the oil pressure indicated on the pressure gauge connected to the top wheelcase is between 10 and 15 lb. per sq. in.

(5) Check by looking through the perspex blanks that the oil feed is reaching the tachometer generator and the fuel circulating pump drive bearings.



1 FRONT BEARING OIL FEED TO OIL FILLER
3 TRANSFER UNION ON MOUNTING PLATE TO MAIN OIL DELIVERY BANJO
4 BOTTOM PRESSURE GAUGE UNION ON MOUNTING PLATE TO OIL RESTRICTOR BANJO PILLAR
5 TEMPERATURE BULB
6 UNION ON MOUNTING PLATE TO REAR BEARING OIL FEED BANJO
7 TOP PRESSURE GAUGE UNION ON MOUNTING PLATE TO REAR BEARING OIL FEED BANJO

Fig. 27. Pipe connections from the motoring rig to the air-intake starboard side

(6) Set the rear bearing metering pump at notch 10. Operating the valve on the panel, adjust the delivery of the pump until a pressure of 5 lb. per sq. in., indicated on the gauge connected to the metering pump banjo, is obtained. Check that the delivery of the pump is not less than 17·5 c.c. (0·0305 pints) in six minutes timed against a stop watch and measured in the graduated tube on the panel.

Note . . .

A pump not giving the correct delivery at the limit of notch 10 must be replaced with a standard serviceable pump. Before rejecting the pump ensure that the oil supply duct is not blocked, possibly by displacement of the sealing ring.

(7) Examine the assembly for oil leaks; no leakage is permissible.

(8) Increase the mainshaft speed to 8,500 r.p.m. with the oil temperature stabilized at 45 ±5 deg. C. Using adjusting tool T74176, adjust the relief valve and check that a pressure of 35 lb. per sq. in. is indicated on the gauge connected to the top wheelcase.

Re-adjust the relief valve to give an oil pressure of 25 lb. per sq. in. at the top wheelcase and check that the pressure, indicated on the pressure gauge connected to the oil restrictor banjo pillar on the sump, does not exceed 27·5 lb. per sq. in.

34. With an oil pressure of 25 lb. per sq. in. at the top wheelcase, run an endurance test of 30 minutes at 8,500 r.p.m., during which time carry out the following checks.

(1) Operating the valve on the panel, adjust the delivery of the metering pump until a pressure of 20 lb. per sq. in., indicated on the gauge connected to the pump, is obtained. Check that the delivery of the pump is not less than 49·5 c.c. (0·0865 pints) in six minutes timed against a stop watch and measured in the graduated tube on the panel.

(2) Examine the assembly for oil leaks; no leakage is permissible.

Note . . .

During the endurance test the oil temperature may be permitted to rise, but must not exceed 80 deg. C.

(3) Lock the adjustment of the metering pump by passing a wire tightly through the lock spring (*fig.* 15).

(4) Drain off the oil from the sump and disconnect the pipes previously fitted for the purpose of the rig test.

35. (1) Using lifting sling T70454, or preferably the locally-made sling described in para. 32, remove the air-intake from the rig and transfer it to build stand T72381; secure the air-intake with slave nuts and bolts.

(2) Refit the blanks previously removed for the purpose of the rig test.

(3) Remove the top wheelcase assembly and the drive shaft.

(4) Remove the sump and the drive shaft.

(5) Remove the centre housing from the air-intake.

(6) Remove the vertical gear assemblies from the centre housing described in Chapter 23.

(7) Examine the gears visually for plucking, burrs, and condition; rectify as necessary.

(8) Replace the gears, as described in Chapter 33C.

(9) Examine, as far as possible, the gears in the top wheelcase and the sump.

(10) Remove the oil suction and pressure filters; examine and clean both filters. The pressure filter must not be immersed in kerosine, gasoline, or similar cleaning fluid, and care must be taken that foreign matter is not transferred to its inner surface. Replace the filter.

(11) Unscrew the union nut at the restrictor end of the pipe, from the oil pump cover.

(12) Remove the banjo bolt, the double banjo, the oil-feed restrictor assembly and the three washers.

(13) Dismantle the oil-feed restrictor assembly by removing the retaining bolt and the ring seal from the periphery of the restrictor housing. Hold the housing in one hand and shake the restrictor, which resembles a stud heavily centred at each end, out through the outlet into the other hand.

(14) Examine the restrictor and thoroughly wash it in clean kerosine.

(15) Reassemble the restrictor into the housing and secure it with the ring seal and retaining bolt.

(16) Using the banjo bolt and washers, refit the restrictor, facing upwards, and the banjo to the sump.

(17) Re-connect the pipe from the oil pump cover to the restrictor.

(18) Remove the transparent blanks and refit the blanks previously removed for the purpose of the rig test.

(19) Using blanking plate T77215, blank off the top wheelcase.

(20) Using blanking plate T74975, blank off the starter mounting face on the top wheelcase.

(21) Using blanking plate T77247, blank off the sump.

(22) Using blanking plate T77184, blank off the fuel pump adapter on the sump.

(23) Using blanking plate T77183, blank off the circulating pump adapter on the sump.

(24) Blank off the following faces of the air-intake, the top wheelcase face using blank T78026, the sump face using blank T78025, and the centre housing aperture with blank T78024.

LIST OF CONSUMABLE PARTS

36. The following is a list of consumable parts which will be required during assembly of the air-intake.

48 Mk. 1 engines only

Part No.	Description	Quantity
N2873	Cup-washer, upper drive gear	1
13537	Seeger circlip, lower drive gear housing	2
N2880	Cup-washer lower drive gear	1
N4551	Tab-washer, air bleed protection plates	8
AGS518E	Tab-washer, upper drive gear	4
N4606	Sealing ring, air-intake	1
46133	Sealing strip, air-intake top wheelcase	1
AGS518E	Tab-washer, lower drive gear	4
N4601	Sealing ring, breather tube	1
AGS784–2	Split pin, breather tube Pre-Mod. 432	1
SP9–C10	Split pin, breather tube Mod. 432	1
N1578	Tab-washer, oil feed tube	1
N1081	Plain washer, banjo pillar front oil feed	1
AGS1138B	Plain washer, banjo front bearing oil feed	2
N1464	Plain washer, oil drain unions	4
N1464	Plain washer, oil feed union	1
AGS1186D	Plain washer, banjo breather	2
N1421	Joint washer, oil spray pipe	1
N1421	Joint washer, core support hole	1
46133	Sealing strip, bottom wheelcase	1
96505	Seal, starter assembly	1
N4227	Seeger circlip, starter assembly	1

48 Mk. 2 engines only

Part No.	Description	Quantity
N2873	Cup-washer, upper drive gear	1
N2880	Cup-washer, lower drive gear	1
60275	Retaining ring, air bleed aperture covers	4
AGS1138B	Plain washer, front bearing oil feed union	1
N1421	Joint washer, core support hole cover	1
AGS518E	Tab-washer, upper driving gear	5
95607	Joint strip, top wheelcase	1
95391	Joint strip, generator casing	1
AGS518E	Tab-washer, lower drive gear	3
N1421	Joint washer, oil spray pipe	1
AGS2030-16	Seeger circlip, lower vertical drive shaft	1
96139	Joint strip, sump	1
96505	Seal, starter	1
N4227	Seeger circlip, starter	1
SP9–C8	Split pin, restrictor	1

LIST OF TOOLS

37. The following tools are required for assembly of the air-intake.

48 Mk. 1 engines only

Tool No.	Description
T70473	Stud box, $\frac{3}{8}$ in. B.S.F.
T70809	Stud box, $\frac{1}{4}$ in. B.S.F.
Standard	Arbor press
T74760	Press block upper drive gear
T74761	Adapter, upper drive gear
T74911	Serrated spanner, upper drive gear
T74751	Press block, lower drive gear housing
T74752	Adapter, lower drive gear housing
T74753	Press block, lower drive gear
T74754	Guide mandrel, lower drive gear
T74755	Serrated spanner, lower drive gear
T72380	*Superseded by T70454*
T72381	Build stand, air-intake
T74893	Checking gauge, air-intake
T74894	Locking bridge, top wheelcase
T74896	Backlash checking tool, upper driving gear
T74897	Locking clamp, bottom wheelcase
T74898	Backlash checking tool, lower driving gear
T72389	Screw bung, air-intake
T73891	Oil tank trolley
T76183–196	Slip discs, starter adapter assembly
T75300	Press block, starter adapter assembly
T75301	Adapter, starter adapter assembly
T75302	Guide mandrel and adapter, starter assembly
T75297	Adapter ring, motoring rig
T74969	Drive coupling, motoring rig
T74967	Locking plate, drive coupling
T74968	Locking key, drive coupling
T70454	Lifting sling, air-intake
T72396 (2 off)	Blanking plate, fuel pump face
*	Blanking plate, hydraulic pump face
T75298	Transparent blank, tachometer drive face
*	Transparent blank, vacuum pump face
T74176	Adjusting tool, relief valve
T74970	Blank, top wheelcase, air-intake
T74971	Blank, bottom wheelcase, air-intake
T74972	Blank, centre housing, air-intake
T74973	Blank, oil spray, air-intake
T74974	Blank, top wheelcase
T74975	Blank, starter face, top wheelcase
T74770	Blank, bottom wheelcase
T74765 (2 off)	Blank, fuel pumps, bottom wheelcase
T74976	Blank, starter adapter

*Manufacture from local resources until provisioned.

48 Mk. 2 engines only

Tool No.	Description
T70473	Stud box, $\frac{3}{8}$ in. B.S.F.
T70809	Stud box, $\frac{1}{4}$ in. B.S.F.
Standard	Arbor press
T77239	Press block, upper drive bearing housing
T77240	Adapter, upper drive bearing housing
T77241	Adapter, upper drive roller bearing
T74760	Press block, upper drive starter dog
T77242	Guide adapter, upper drive starter dog
T74911	Serrated spanner, upper drive
T77230	Press block, lower drive, bearing housing
T77232	Adapter, lower drive, bearing housing
T77234	Adapter ring, lower drive, bearing housing
T77231	Press block, lower drive
T77233	Adapter, lower drive
T77615	Serrated spanner, lower drive
Standard	Torquemeter wrench BES1400
T72380	*Superseded by T70454*
T72381	Build stand, air-intake
T77243	Dummy intake bridge piece, top wheelcase
T77244	Backlash checking tool, generator
T77235	Locking fixture, top wheelcase
T77236	Backlash checking tool, upper drive gear

48 Mk. 2 engines only—*contd.*

Tool No.	Description
T77237	Locking. fixture, sump
T77238	Backlash checking tool, lower drive gear
T72389	Screw bung, air-intake
T73891	Oil tank trolley
T76183–96	Slip discs, starter assembly
T75300	Press block, starter assembly
T75301	Adapter, starter assembly
T75302	Guide mandrel and adapter, starter assembly
T78265	Adapter ring, motoring ring
T74967	Locking plate, drive coupling
T74969	Drive coupling, motoring rig
T74968	Locking key, drive coupling
T70454	Lifting sling, air-intake
T75298	Transparent blank, tachometer drive face
*	Transparent blank, fuel circulating pump face
T74176	Adjusting tool, relief valve
T78026	Blank, top wheelcase, air-intake
T78025	Blank, sump, air-intake
T78024	Blank, centre housing, air-intake
T77215	Blank, top wheelcase
T74987	Blank, starter face, top wheelcase
T77247	Blank, sump
T77184	Blank, fuel pump adapter
T77183	Blank, circulating pump adapter
T74976	Blank, turbine starter

*Manufacture from local resources until provisioned.