

Chapter 2

POWER UNIT

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Introduction

1. This chapter gives a guide to the methods of removing the engine together with its propeller, oil tank, accessories and cowling. The instructions are given mainly in pictorial form, but it will be found that the removal points of the propeller, the fuel pumps and, to a certain extent, the oil tank are not illustrated; they are, however, fully covered in the text. The removal of the fuel tanks is covered in Chapter 1 of this Section, whilst particulars regarding the use of blanks and further details of the removal operations will be found in AP 1500B, Vol.1, Part 1.

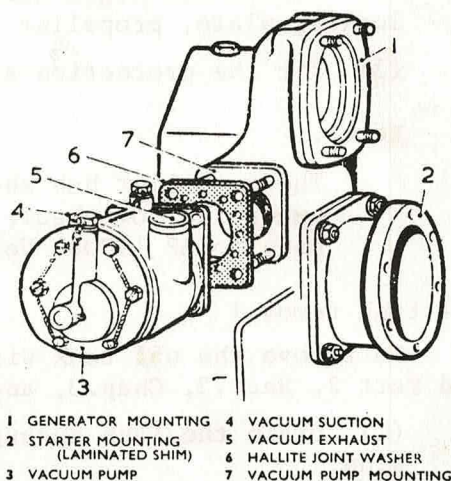


Fig.1. Accessory mounting faces

2. Only the removal procedure is given in detail as, generally, the assembly procedure is the reverse of that for removal. The sequence of operations, given in the text and the keys to the illustrations, is the recommended order for dismantling although, in some cases, it will be obvious that it is not necessary to adhere rigidly to this order.

3. If the engine that is being removed is likely to be out of use for some time, it is important that it should be inhibited against corrosion in accordance with current instructions.

Accessories removal

4. The location of the accessory mounting faces are shown in fig.1 which, as far as the removal operations are concerned, is self explanatory. It should be noted, however, that the laminated shim between the starter and the engine, and the Hallite joint washer under the vacuum pump flange, should remain with the engine after removal of the relevant units.

Propeller removal

5. Before removing an engine from the airframe, the propeller must be removed; the procedure is as follows:-

- (1) Remove the split pin, slotted nut and washer from the spinner bolt and remove the spinner.
- (2) Remove the eight hub-bolt nuts and washers and withdraw the locking plate, propeller and spinner fairing.
- (3) Fit the protection sleeve on to the front of the crankshaft.

Note...

The propeller hub should not be removed from the shaft except for overhaul, in which case, reference should be made to AP 1500B, Vol.1, Part 1, Sect.2, Chap.4.

Oil tank removal

6. To remove the oil tank with the engine in situ, refer to fig.4 and Part 2, Sect.3, Chap.3, and proceed as follows:-

- (1) Drain the tank through the wire-locked plug on its port side.
- (2) Disconnect the oil return pipe (11), the oil feed connection (10) and the tank vent connection (15) at the engine.

- (3) Disconnect the breather drain pipe (26) by disconnecting the couplings at its extreme ends (19 and 28) and at the vacuum pump (20), fuel pump (24) and the induction manifold drain (27).
 - (4) Remove the bottom cowling panel (fig.3).
 - (5) Remove the two bolts which secure the air scoop to the firewall on the port side.
 - (6) After carefully marking the position of the lever to facilitate reassembly, remove the two 4-BA bolts which secure the starboard throttle operating lever on the engine and swing the lever and rod forward to avoid possible damage to the tank.
 - (7) Pre-Mod.H81. Support the tank and remove the two screws above and the two screws below (not illustrated) which secure the tank support brackets to the firewall.
- Mod.H.81. Support the tank, undo the locknut at the bottom end of each retaining cable and, holding the cable by the hexagon on the swaged end, slacken off the adjuster until it can be released from the support.
- (8) Manoeuvre the tank forward and downwards and withdraw it, carefully, from the starboard side.

Cartridge starter removal

7. To remove the Plessey cartridge starter, proceed as follows:-

- (1) Move the release lever on the breech to the open position, then withdraw barrel assembly. Close the release lever.

Note...

Where any cartridges remain in the barrels they should be removed using extractor, Pt.No. MK 19696.

- (2) Cut the locking wire, then unscrew the pulley retaining ring nut; remove the remaining locking wire from the anchor screw.
- (3) Release and unwind the control cable from the pulley, then remove the pulley cover and ring nut from the cable.
- (4) Cut the locking wire, then remove the exhaust tube and clip assembly from the exhaust port.
- (5) Disconnect and remove breech support stay.
- (6) Remove the starter attachment bolts, washers and nuts, then remove the starter complete with breech and shims (if fitted).
- (7) Refit the pulley cover and secure with retaining ring nut.

(8) Refit barrel assembly:-

(a) Move the release lever on the breech to the open position, then locate the barrel assembly, index wheel towards the rear beam, in the slots provided in the guide plates.

(b) Rotate the barrels until a groove in the face of the index wheel is aligned with the slot in the rear guide plate, then push the barrel assembly fully home and secure with the release lever.

Assembly notes

8. When re-assembling or renewing an engine or any associated component, reference should be made to Part 2, Sect. 3, Chap.3 of this publication for general servicing information, and to AP 1500B, Vol.1, Sect.3, for the complete assembly instructions of all components excepting the oil tank.

9. Ensure that nuts are wire-locked where appropriate, clips tightened and that bonding is secure.

Propeller

10. After re-installation, the propeller should be checked for looseness on its hub, by rocking the propeller on its shaft. After any necessary adjustment, ensure that the hub bolts are locked correctly; refer to AP 102P-1200-16A, Part 1, Sect.1, Chap.1.

Oil tank

11. When a replacement engine or oil tank is being fitted, the oil system must be flushed out with oil, OM-21 (Ref.No.34D/9100563) and, after tightening and wire-locking the drain plug, the tank refilled with fresh oil of the grade specified in the Leading Particulars. Before fitting oil tank ensure that a 19in. length of $\frac{1}{4}$ in. dia. rubber (introduced by Mod.H81) is in position on the lower flange of upper bulkhead stiffener. If loose or detached secure with resin (Ref.No.33H/2245977).

- 1 FUEL SUPPLY FROM FILTER
- 2 FUEL DRAIN
- 3 FUEL PUMP PRIMING
- 4 FUEL DELIVERY TO CARBURETTOR

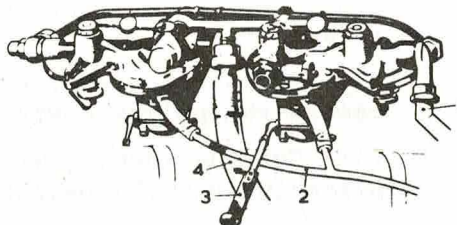


Fig.2. Fuel pump connections

12. Oil tanks (Ref. No. 26AE/773 or 26AE/1505786) which are bowed along the rear face by not more than 0.25 in. may be refitted providing that a minimum clearance of 0.06 in. can be maintained between the tank seam and bulkhead. Where necessary, to obtain the minimum clearance, the single packings Pt. No. C1-E 561 under the oil tank supports (Mod. H 252) may be increased to two packings.

13. To fit the packings at each support proceed as follows:-

(1) Remove and retain the four oil tank supports from the firewall. Discard the attaching nuts and bolts.

(2) Refit the four supports inserting one or two packings Pt No. C1-E 561 under each support as required.

(3) Secure the supports using new bolts Pt. No. AS 1242/4C (Ref. No. 28D/1007976), AS 1242/5C (Ref. No. 28D/1013172) or AS 1242/6C (Ref. No. 28D/1204937) to suit the number of packings used.

(4) Secure bolts with new nuts Pt. No. A 27/CP (Ref. No. 28M/9403520) and lock by peening.

On fitment of the oil tank it may be necessary to lightly dress back the oil cooler air duct locally to avoid fouling the engine mounting frame.

Cartridge starter installation

14. The procedure for fitting a replacement cartridge starter is as follows:-

(1) Remove all transit/storage materials, masking and all blanking caps.

(2) Remove locking wire from the exhaust tube retaining nut and remove exhaust tube.

(3) Remove barrel assembly (para.7(1)).

(4) Remove the locking wire from the breech cover retaining ring nut, then remove the nut and cover. Unwind the cable, if fitted, and remove from the pulley.

(5) Check that the distance between the engine starter mounting face and the tips of the engine jaw teeth is within the limits 1.687 in. to 1.717 in. If the dimension obtained is less than 1.687 in. it is permissible to increase the dimension to within the specified limits by interposing shims between the starter and engine mounting faces.

Note...

The shims must fit accurately over the whole area of the engine mounting face.

(6) Position the starter:-

(a) Offer up the starter complete with shims if required, clutch jaw first and aligned to the engine mounting, so that the breech pulley is in line with the true run of the operating cable.

(b) Hold this position and check that starter mounting flange bolt holes align with the holes in the engine mounting face and that one breather hole in the starter housing is above the horizontal centre line of the starter. If not, i.e. both holes are on centre line, turn unit clockwise, viewed on combustion chamber, one hole of the starter mounting flange.

(c) Fit two attachment bolts, at diametrically opposed positions, and secure starter. Blank starter lower breather hole with A44/B8 screw.

(d) To adjust the pulley operating cable alignment, if required, use spanner, Pt. No. K2192, and slacken starter cylinder lock ring, then turn the cylinder in an anti-clockwise direction, viewed on combustion chamber, until the breech pulley and true cable run are aligned. Tighten cylinder lock ring.

CAUTION...

The maximum amount the cylinder may be unscrewed is 60 deg.

(e) Fit remaining starter attachment bolts and fully tighten all nuts in diametrical sequence.

(7) Position the breech assembly:-

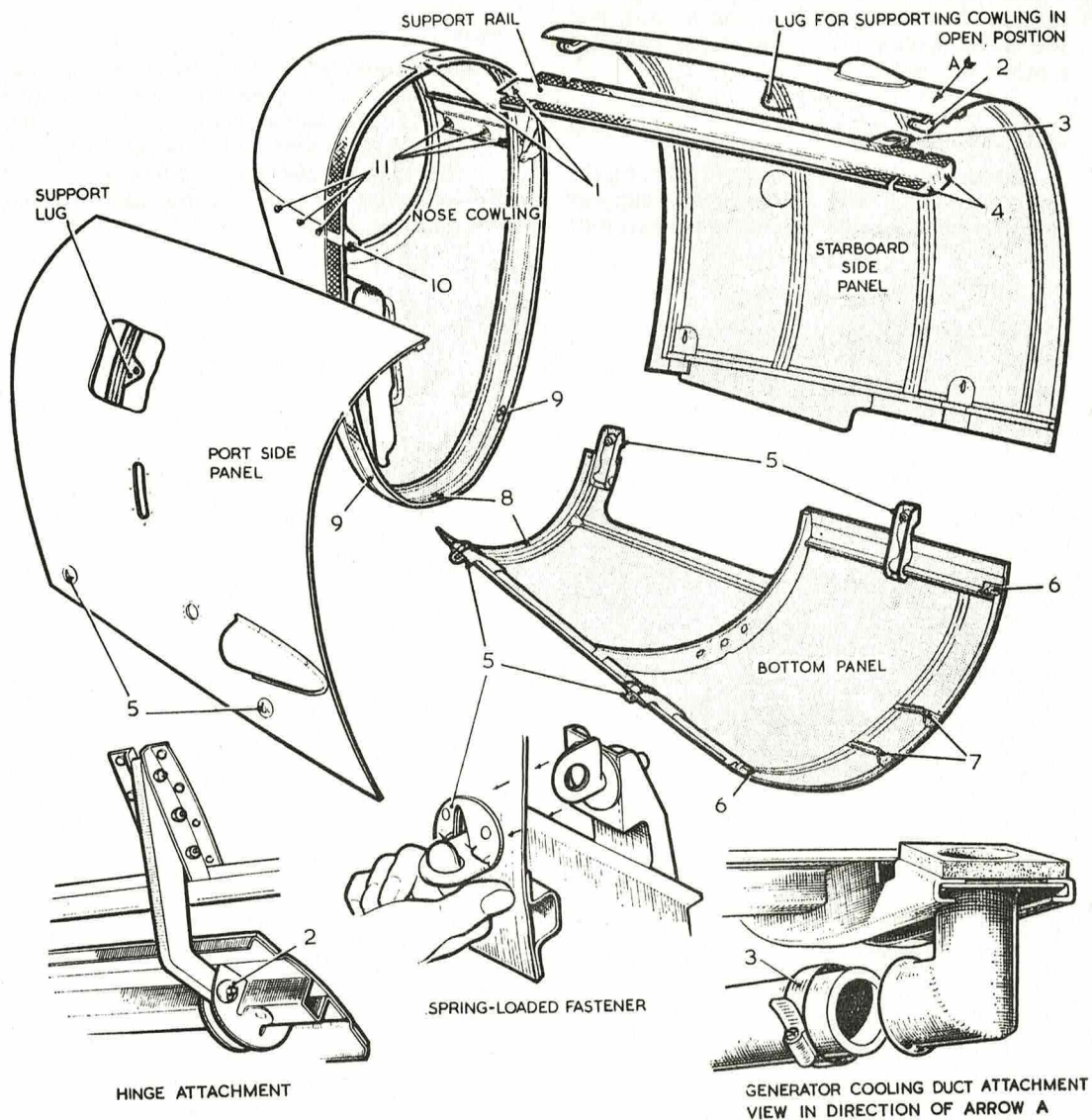
(a) Check there is sufficient clearance around the breech assembly for the release lever to be operated and the barrel assembly to be inserted and removed.

(b) If necessary, rotate breech assembly to obtain satisfactory clearance and access by holding the breech nose with spanner, Pt. No. K 2897, and slackening the lock nut using spanner, Pt. No. K 2193. On obtaining required position, tighten lock nut.

CAUTION...

Do not allow the breech nose to be slackened off the starter inlet port threads during this operation.

- (8) Fit the exhaust tube and clip assembly to the exhaust port and tighten retaining nut. Wirelock retaining nut to breech locknut with 22 swg. wire (Ref.No.30A/9437135).
- (9) Fit and secure breech support stay.
- (10) Connect operating cable:-
 - (a) Position the ring nut on the cover, then thread the operating cable through the cover slot.
 - (b) Connect the cable, long leg of nipple end towards ratchet wheel, to the pulley and wind on a minimum of two to three turns.
 - (c) Turn the cover and locate the two lugs in the cover plate holes to a position where the cable, when operated, will not foul and chafe on the cover slot edges.
 - (d) Fully tighten the ring nut and wirelock to special anchor screw in rear beam, using 22 swg. wire.
 - (e) Fit barrel assembly (para.7 (8)).



REMOVAL SEQUENCE

Side and bottom cowling

1. Operate the spring-loaded fasteners (5) and lift up each *side* panel, in turn; remove the two split pins (2) and hinge pins. Remove the side panels carefully, and, as with all cowling, ensure that they are placed where they will not be liable to damage or distortion.

2. Remove the two outboard bolts (6) and the two screws (9) at each end of the *bottom* panel; support the panel and remove the two inner bolts (7) at the rear and the single remaining screw (8) at the front; lower the panel.

Fig. 3. Cowling and support rail

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Support rail

3. Detach the hose from the generator cooling duct by disconnecting the clips (3); remove the two nuts (4) at the firewall and the three screws (1) at the nose cowling; remove the rail.

Nose cowling

4. Assuming that the propeller (para. 5), the bottom cowling, side cowlings and support rail have been taken off, remove the two nuts

and bolts (10) from the connection to the engine mounting. Withdraw the nose cowling as one unit.

Note . . .

If removal of the propeller is not required, the nose cowling must be removed in two parts. The bottom part is released first, at the three screws (11) on each side. The top part can then be freed from the engine mounting by removing the two nuts and bolts as above.

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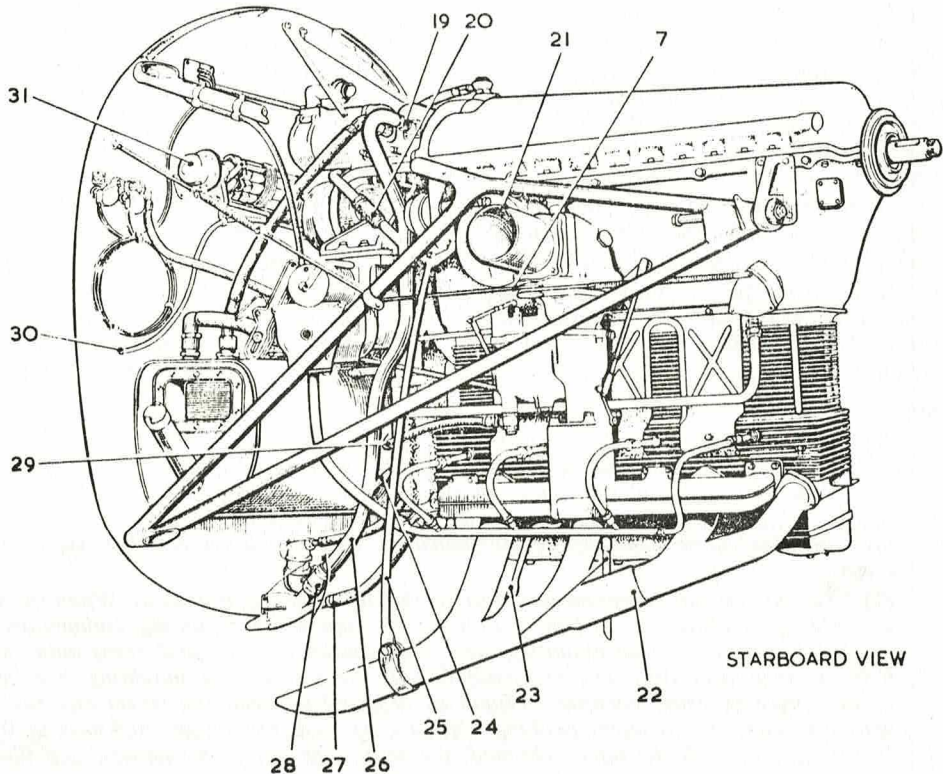
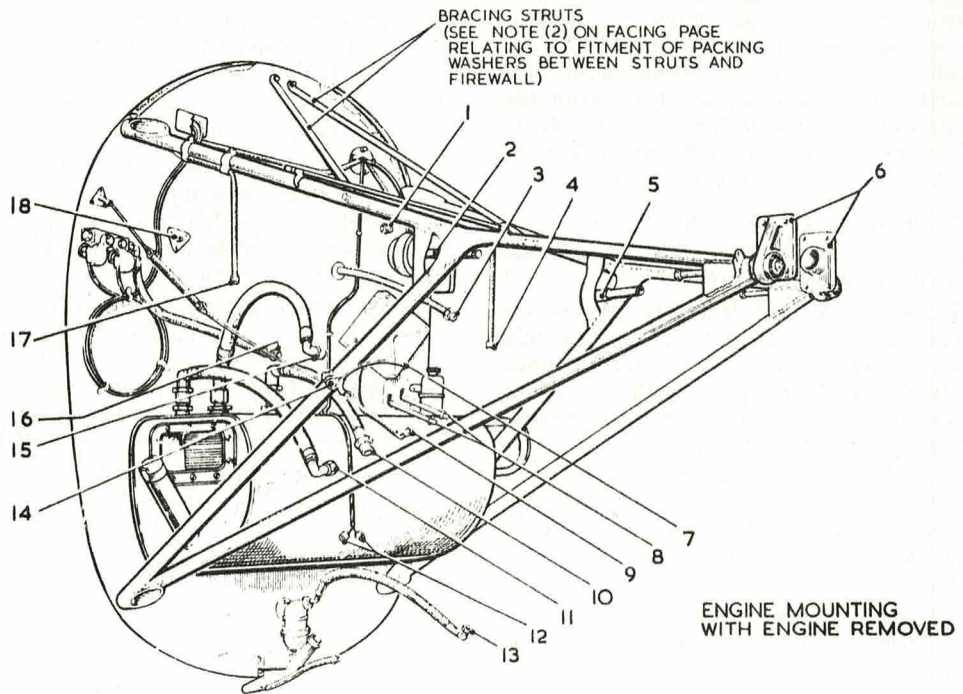


Fig. 4. Engine installation break points

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KEY TO FIG. 4 (ENGINE INSTALLATION BREAK POINTS—ENGINE REMOVAL)

During the following removal operations, as each item is uncoupled, it is important to ensure that the open ends of all connections are blanked off and the blanks, or aperture covers, left in place until immediately before a component is ready for reconnection. A detailed list of these vulnerable blanks is given in A.P.1500B, Vol. 1, Sect. 3, Chap. 1. Proceed as follows:—

1. Remove the propeller (para. 5).
2. Remove all the cowling and the cowling support rail (fig. 3).
3. Drain the oil from the engine, oil tank and pipelines. Ensure that the fuel cock is OFF (or the tank and pipelines are drained); it is advisable to drain fuel from the carburettor by removing the main and power jets.
4. Disconnect the throttle and mixture connecting rods (8) from the pick-up levers on the engine on the port side.
5. Remove the induction manifold drain (27) after disconnecting at the front end of the rubber hose.
6. Remove the breather-drain pipe (26) after disconnecting the couplings at its extreme ends (19 and 28), at pipe (20), and pipe (24) at the fuel pumps (fig. 2).
7. Disconnect, at the fuel pumps, the delivery pipe (29) and the supply pipe (13) which leads from the filter. Remove the pumps by removing the four nuts and spring washers (not illustrated) which secure them to the crankcase.
8. Disconnect the oil pipe (10) at the suction filter and the oil return-to-tank pipe (11) at the engine connection.
9. Disconnect the oil tank vent pipe connection (15), the oil thermometer bulbs (12) and pressure hose (16) at the engine.

Note . . .

(1) When re-assembling, refer to para. 7 and 8 of the main text, fig. 5 and, in the case of the Plessey starter control (instruction 13), note that the end cover on the starter should be removed and the cable, in the cockpit hand assembly, adjusted so that the operating pawl in the starter is 0.08 in. to 0.10 in. clear of the notch. After adjustment, lock the steel grub screw by centre punch in the screwdriver slot and replace the end cover.

(2) The engine may be removed complete with its mounting if desired. When subsequently assembling mounting to airframe, bolt at the four main mounting connections, fitting a special washer between mounting strut and firewall at top connections only; wire-lock bolts to structure. With engine installed, bolt the two engine mounting bracing struts to the airframe using packing washers as required between the struts and firewall and split pin nuts; fit sufficient packing washers, up to a maximum thickness of 0.084 in. to ensure that with the nuts tightened, the struts are not under tension and there is no straining of the firewall and No. 1 former.

10. Disconnect the tachometer drive (3) at the engine; the generator suppressor connection (9) at the generator and the magneto earthing cables (4 and 17) at the magnetos.

11. Disconnect the vacuum pump pipe at the firewall union (1).

12. Remove the carburettor intake duct (21); disconnect air temperature control cable (7) from the pulley and rotate the fairlead (14) through 90 deg. on the engine mounting.

13. Disconnect and remove the exhaust pipe (30) from the Plessey starter (31); slacken the grub screw in the trigger starter ring (starboard side of front cockpit) and pull the cable through the firewall (at 18) from the forward side.

14. Disconnect the inlet and outlet pipes (23) of the induction manifold heater muff; remove the exhaust manifold tie-rod (25) and remove the exhaust manifold (22) from the cylinder heads.

15. Take the weight of the engine on the sling (A.P.1500B, Vol. 1), ensure that all connections have been uncoupled and lifting cables are free from obstructions.

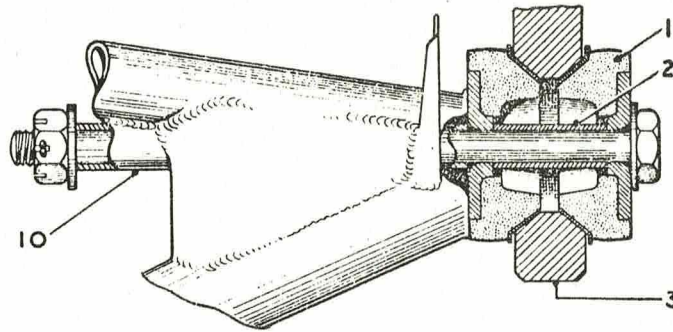
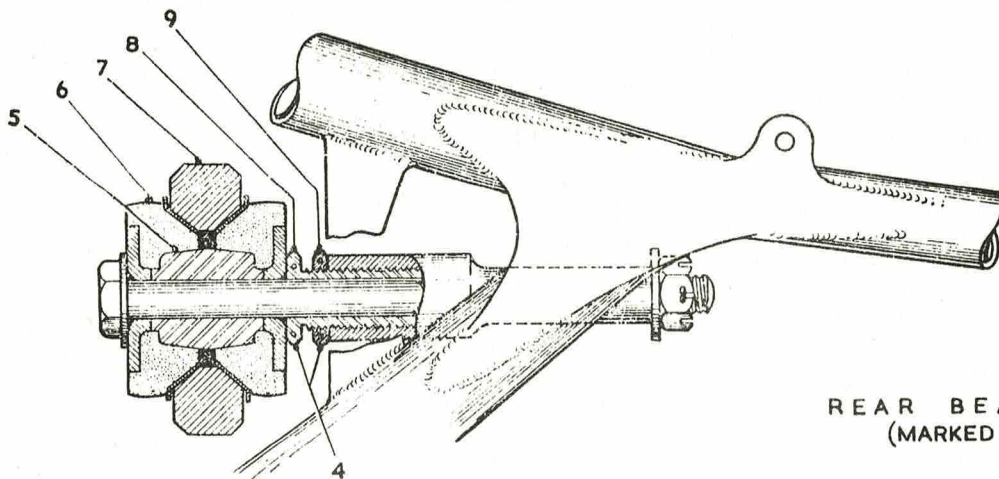
16. Remove the port rear engine-bearer (at 5) foot and then the horizontal bolts of the remaining three bearers (2 and 6).

Note . . .

The front and rear engine bearers are illustrated in fig. 5.

17. Withdraw the engine carefully, forward and upwards. Avoid letting the engine swing owing to the small clearances at the carburettor and magneto. Finally, mount the engine on a stand.

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FRONT BEARERS
(MARKED F)REAR BEARERS
(MARKED R)

- | | |
|-----------------------|---------------------|
| 1 SHEAR RUBBERS | 6 SHEAR RUBBERS |
| 2 DISTANCE PIECE | 7 ENGINE BEARER |
| 3 ENGINE BEARER | 8 ADJUSTING SLEEVE |
| 4 WIRE-LOCKING POINTS | 9 LOCK-NUT |
| 5 SNUBBER | 10 TUBE ON MOUNTING |

ASSEMBLY PROCEDURE

When assembling the engine bearer shear rubbers, proceed as follows:—

- 1 Fit all the front bearer rubbers (1) and tighten the bolts.
- 2 Insert the *forward* rubbers of the rear bearers and *unscrew* the adjusting sleeves (8) until the rubbers are firmly held against the bearers (7) but without any sign of distortion.
- 3 Screw down the lock-nuts (9) against the mounting and lock with wire.
- 4 Insert the snubbers (5) and remaining rubbers and tighten the bolts.
- 5 Secure all the four nuts with split pins.

Fig. 5. Front and rear engine bearers

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