

## Chapter 13

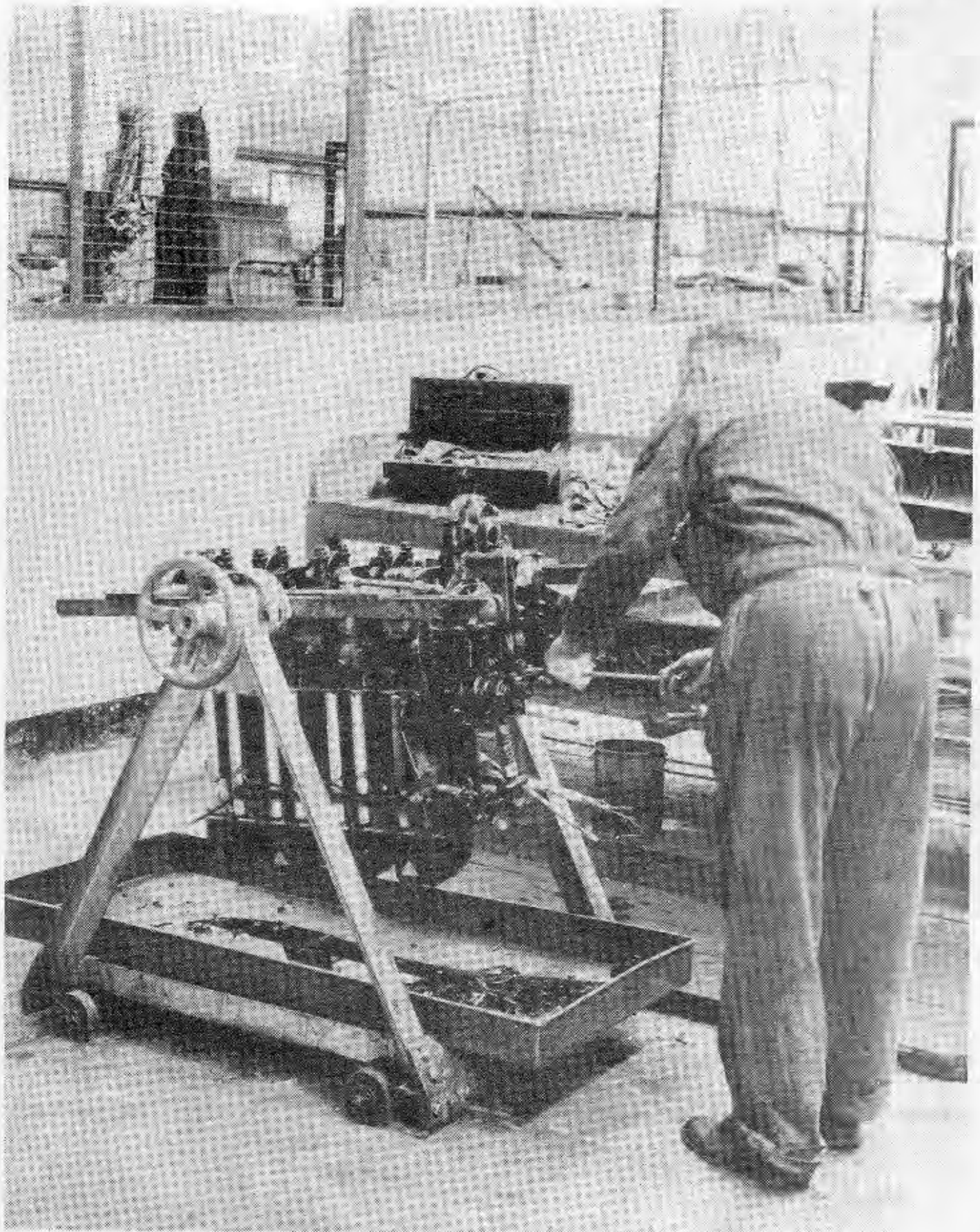
### DISMANTLING TO SUB-ASSEMBLIES

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**Fig. 1. Dismantling the engine**

*A stand to hold the engine during dismantling and reassembly can be made up from commercial steel sections. Wheels such as those on the stand illustrated allow it to be moved easily from one part of the shop to another. A tray to catch oil helps to keep the shop floor clean.*

## GENERAL

1. This chapter describes the dismantling of the engine to sub-assemblies. Each sub-assembly should be treated as a complete unit and care must be taken that small components do not become mixed or placed with the wrong assembly. To assist the work of dismantling and to ensure that the components are stripped in the easiest and quickest manner, the instructions are given in their correct sequence.

## UNPACKING THE ENGINE

2. The engine will be received in a wooden packing case (fig 1 of Chapter 5) which is provided with four slinging rings. Four large set bolts are situated at the bottom of the metal stiffening straps, two at each side. Remove these set-bolts and lift off the shell of the case, leaving the engine bolted to the stand attached to the base of the case. The operation of removing the shell should be carried out carefully to avoid fouling the engine. The engine log book, appropriate copies of the relevant issue or receipt vouchers and forms should be with the engine, and the following components may be attached to it, but not installed:—

- (1) Two sections of airscoop, wrapped in greaseproof paper, tied to the top cover.
- (2) Two carburettor jets (main and power), in a linen bag tied to the engine.

3. Carefully check the engine, and any loose components and equipment, against the Checking List. A shortage of any component should be recorded in the log book, and the relevant issue or receipt vouchers should be suitably endorsed.

## REMOVING ENGINE FROM PACKING CASE STAND

4. Remove any components or accessories which are secured to the stand and proceed as follows:—

OP. 1 Attach the engine lifting sling to the crane and engage the hooks on the sling with the two lifting rings provided on the top cover of the engine.

- 2 Take the weight of the engine on the crane and remove the bolts which secure the transport bearer arms to the stand.

OP. 3 Raise the engine slowly (avoid letting it swing which might cause damage through contact with the stand) until it is clear and at a convenient height for the operations described in para. 11 and 12.

## DISMANTLING THE ENGINE

5. Where the removal of washers, split pins and tab-washers is not specified, it is assumed that these and any other locking devices will be released by the operator before proceeding with dismantling.

6. Before a component is removed a check should be made to see if it is marked to indicate its position in the engine. It is essential that each component should be so marked before removal, unless its design ensures refitment in the correct position. Components which can be turned through 90 or 180 degrees, such as cylinder barrels and pistons, must be marked so as to ensure their correct refitment.

7. A close inspection of the components as they are removed, whilst burnt oil and signs of running are still visible, will often provide clues to the serviceability of the parts, and these clues may no longer be available once the parts have been cleaned and worked on. In the same way, a thorough scrutiny of the oil which is drained out, and of the filters, will sometimes provide evidence of scoring or wear in the form of metallic particles.

8. When components are difficult to remove or to separate due to the adhesion of jointing compound between them, or the close fitting of dowels or studs, light tapping with a rubber mallet around the periphery of the component should be sufficient to break the joint. In no circumstances should any form of wedge be inserted between the mating faces in an endeavour to part them.

9. The method of dismantling described throughout the text assumes that the extractors provided in the repair and dismantling kit will be used. In some instances, however, the fit of mating parts may render a tool unnecessary as the operation can be effected by hand.

10. Unless the component or accessory is being dismantled further immediately, all openings, unions, etc., should be blanked off directly they are exposed.

#### Draining out oil

11. Whilst the engine is suspended from the two lifting rings in the top cover, allow as much free oil as possible to drain out of the engine into suitable receptacles.

- OP. 1 Cut the locking wire and remove the drain plug and washer from the base of the oil suction filter.
- 2 *Mk. 1 variants.* Remove the rubber cap which blanks off the oil return connection.  
*Mk. 7.* Remove the three plain nuts and spring washers that retain the oil filter cover at the base of the settling tank. Remove the filter cover, joint washer, and gauze filter.
- 3 Cut the locking wire and unscrew the retaining screw, which is anchored to each of the valve gear covers. Remove each valve gear cover and empty it of oil. All four valve gear covers are identical, and as they are free to fall once the retaining screw is unscrewed, they should be supported by hand whilst this is done.

#### Removing airscoop and transport bearer arms

12. Whilst the oil is draining out of the engine, the following operations should be carried out.

- OP. 1 *If the airscoop is installed.* Remove the two locking pins from the two hinge pin clips at the front of the airscoop and draw the hinge pins out forward for about half their length whilst supporting the rear half of the airscoop. Remove the rear half of the airscoop and complete the withdrawal of the hinge pins to release the front half of the airscoop.
- 2 Remove the sixteen nuts securing the four transport bearer arms and secure four suitable workshop bearer arms, or feet, to the crankcase with the same nuts.

#### Assembling engine to erecting stand

13. A reversible erecting stand such as the one illustrated on page 112 is recommended, as the engine can then be turned over for the more convenient removal of components from the underside of the crankcase. A drip tray should be placed under the engine as oil will run out of it when it is inverted.

14. Lower the engine on to the erecting stand and secure it in position. Commence

dismantling with the engine on the stand in its normal attitude; that is, with the cylinders downwards.

#### Removing propeller boss

15. To hold the crankshaft stationary when unscrewing the front nut from the crankshaft and drawing off the propeller boss, a slave or damaged propeller is required. Alternatively a length of wood approximately 7 in. by 3 $\frac{3}{4}$  in. drilled to accommodate the propeller hub bolts, as shown in fig. 2, may be used.

- OP. 1 Extract the split pin, unscrew the slotted nut, and remove the plain washer, the dished washer, and the spinner or nosecap.
- 2 Extract the four split pins, unscrew the four slotted 2 B.A. nuts which secure the locking plates, and remove both locking plates.
- 3 Using the spanner T1400-129 and tommy bar T2300-232, unscrew the eight propeller bolt nuts and remove the twenty-four washers and the propeller boss plate, and the friction discs where applicable.
- 4 Fit the slave propeller or length of wood to the hub and secure it with the propeller boss plate, washers, and nuts.
- 5 Hold the crankshaft stationary and, using spanner T1900-383, or T800-5A where Mod. 903 is not embodied, and 30-inch tommy bar T1900-245, unscrew the front nut from the crankshaft.
- 6 Unscrew the extractor bolt until the threaded end is flush with the body of the extractor T1900-252, and

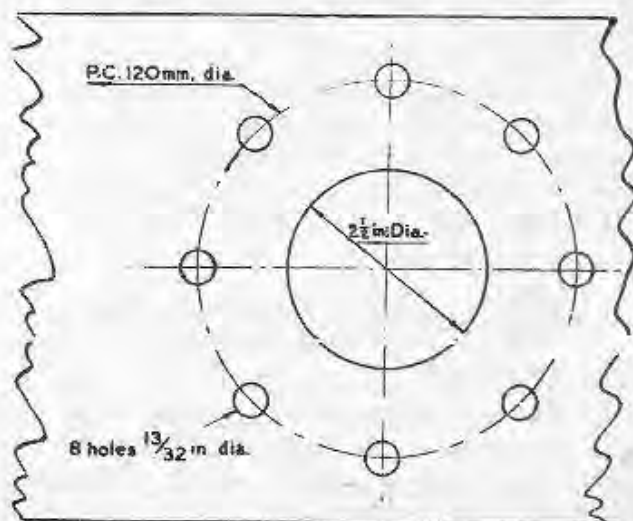


Fig. 2. Dimensions of propeller bolt holes

screw the extractor into the propeller boss as far as possible.

**Note . . .**

*Use extractor T1900-4 to draw off the Pre-mod. G903 type of propeller boss.*

- OP. 7 Using the tommy bar T2200-180 through the head of the extractor bolt, screw in the extractor bolt until the propeller boss is forced off the tapered end of the crankshaft.

**Note . . .**

*If the propeller boss will not start to come off, the head of the extractor bolt should be tapped with a hammer whilst pressure is applied to the tommy bar.*

- OP. 8 Separate the extractor from the propeller boss and remove the slave propeller or length of wood.

#### **Removing electric starter (Mk. 7 only)**

16. The starter adapter, which is secured to the mounting face on the timing gear cover, of the Mk. 7, is regarded as part of the engine and should always be transferred with it. The electric starter, however, will not normally be transferred with the engine. If the electric starter is installed, it should be removed at this stage as follows:—

- OP. 1 Remove the six plain nuts, spring washers, and bolts which secure the electric starter to the rear face of the starter adapter.  
2 Withdraw the starter spigot from the starter adapter and lift the starter clear of the engine.

#### **Removing unscreened H.T. cables (Mk. 1 variants)**

17. Turn the engine through 180 degrees so that the cylinders are uppermost and ensure that the erecting stand is properly locked in this position.

18. The starboard H.T. cables cannot be removed *completely* until the air-intake, carburettor, and induction pipe have been removed as described in para. 24. Therefore, at this stage, only the following operations should be performed:—

- OP. 1 Detach the four starboard H.T. leads from the terminals on the starboard distributor.  
2 Detach the four port H.T. leads from the terminals on the port distributor.

- OP. 3 Remove the two screws securing the red fibre cable guide to the airscoop back plate, unscrew the two nuts and bolts securing the H.T. cable tube to the brackets on the cylinder heads, and lift the H.T. cable assembly away from the engine.

#### **Removing screened ignition harness (Mk. 7)**

19. Invert the engine as instructed in para. 17. The port ignition harness cannot be removed *completely* until the push rods and push rod covers for all four cylinders have been removed as described in para. 27. Therefore, at this stage, only the following operations should be performed:—

- OP. 1 Unscrew the four nuts securing the starboard distributor screen cover and remove the cover.  
2 Detach the four starboard H.T. leads from the terminals in the distributor, unscrew the two nuts securing the ignition harness to the studs in the distributor screen, and draw the harness clear of the distributor.  
3 Remove the two nuts securing the ignition harness to the studs on the induction pipe and lift the harness clear of the engine.  
4 Detach the port ignition harness from the port distributor in a similar manner to that described for the starboard harness in OP. 1 and 2.

#### **Removing fuel pipe (engines with engine-driven fuel pumps)**

20. There is no fuel pipe on Mk. 1 variants which have been removed from Tiger Moth Mk. 2 aircraft which have gravity feed. In all other instances, engine-driven fuel pumps are fitted, and the fuel pipe between them and the carburettor must be removed as follows:—

- OP. 1 Remove the plain nut and spring washer which secure the rear pipe clip to the stud at the rear of the settling tank.  
2 Remove the nut, bolt, and spring washer which secure the fuel pipe clip to the airscoop back plate.  
3 Cut the locking wire, unscrew the union nut at each end of the fuel pipe and lift the pipe clear of the engine.

#### Removing airscoop back plate and top plate

21. The airscoop has been removed already; its back plate and top plate are removed as follows:—

- OP. 1 Remove the nut and bolt which secure the bracket at the top of the back plate to the rear end of the top plate.
- 2 Remove the two nuts and bolts which secure the bracket at the bottom of the back plate to the baffle on No. 4 cylinder head, and remove the back plate.
- 3 Remove the four nuts which secure the top plate to the studs in the crankcase, adjacent to the tappet guides, and remove the top plate.

#### Removing magnetos

22. Both magnetos are removed in the same manner which is as follows:—

- OP. 1 Extract the split pin and remove the shackle pin which couples the magneto control link to the magneto timing lever.
- 2 Cut the locking wire and unscrew the two set-bolts which secure the base of the magneto to the timing gear cover.
- 3 Remove the magneto, the flexible coupling, and the packing piece which is between the base of the magneto and its mounting on the timing gear cover.

#### Removing fuel pumps (engines with engine-driven fuel pumps)

23. There are no fuel pumps on Mk. 1 variants which have been removed from Tiger Moth Mk. 2 aircraft which have gravity feed. In all other instances, the engine-driven fuel pumps should be removed as follows:—

- OP. 1 Remove the four nuts and spring washers which secure the fuel pumps to the port side of the crankcase.
- 2 Draw the pair of fuel pumps off the studs in the crankcase.

#### Removing carburettor, air-intake, and induction pipe

24. The carburettor, air-intake, and induction pipe should be removed as a single sub-assembly as follows:—

- OP. 1 *Mk. 7 in which Gipsy Mod. G.1483 has been embodied.* Remove the plain nut and spring washer securing the return spring anchorage to the front scavenge filter.  
*Mk. 1 variants, and Mk. 7 when Mod. G.1483 has not been embodied.* Unhook the return spring from the hot and cold air-intake.
- 2 Remove the split pin, unscrew the plug at the forward end of the throttle control tube and release the control tube from the bell-crank on the air-intake.
- 3 Disconnect the altitude control tube from the bell-crank on the carburettor in a similar manner to that described in OP. 2.
- 4 *Mk. 1 variants when fitted with engine-driven fuel pumps and Mk. 7.* Remove the split pin and the shackle pin which couples the flooder cable to the lever on the carburettor. Remove the two plain nuts and spring washers which secure the flooder control bracket to the carburettor; alternatively release the cable guide by removing the two bolts, nuts, and spring washers which secure the cap to the bracket.
- 5 *Mk. 7 only.* Remove the bolt, nut, and washer securing the front scavenge pipe clip to the link on the lower flange of the carburettor and move the clip clear of the link.  
*Mk. 1 variants.* Release the Jubilee clips which secure the rubber connections at each end of the front oil drain pipe and remove the pipe.
- 6 Remove the two nuts, spring washers and bolts securing the clip, which clamps the Silentbloc bush at the top of the air-intake, to the steady bracket on the crankcase.
- 7 Remove the sixteen nuts and spring washers from the cylinder head inlet port studs, and carefully draw the complete sub-assembly clear of the engine.

#### Completing removal of starboard unscreened H.T. cables (Mk. 1 variants)

25. The starboard H.T. cables have been disconnected from the starboard distributor as described in para. 18.

- OP. 1 Remove the nuts and washers which secure the H.T. cable tube to the cooling baffle.

- OP. 2 Lift the sub-assembly of H.T. cables clear of the engine.

#### Removing cooling baffle

26. The cooling baffle which is on the star-board side of the engine is removed as follows:—

- OP. 1 Remove the three nuts, spring washers, and plain washers from the studs which secure the upper edge of the cooling baffle to the crankcase.
- 2 Remove the three nuts and washers which secure the cooling baffle to the three brackets on the cylinder heads.
- 3 Remove the cooling baffle.

#### Removing push rods and push rod covers

27. Although the cylinder heads may be removed without prior removal of the push rods and the push rod covers, it is preferable to remove these components first. If this is not done care must be taken, when lifting off the cylinder heads, that the push rods and their covers do not fall and become damaged. Each of the eight push rods and push rod covers is removed in the same manner, which is as follows:—

- OP. 1 Using the crankshaft turning tool T1900-355, turn the crankshaft until the relevant piston is at T.D.C. with both valves closed, so that there is no spring load on the valve operating mechanism.
- 2 Using the valve spring compressor T1300-78A with its hook engaged under the valve rocker, as illustrated in fig. 3, force down the valve until the tappet adjusting ball-end can be disengaged from the push rod and the latter can be withdrawn from the push rod cover. Alternatively, having slackened off the tappet adjustment, it is possible to displace the valve rocker sideways against its bearing spring and so disengage the push rod without the use of the valve spring compressor.

#### Note . . .

*If the plain nuts on the two rocker bracket clamping bolts are slackened off, the rocker can be displaced sideways further as both bearing springs can then be compressed.*

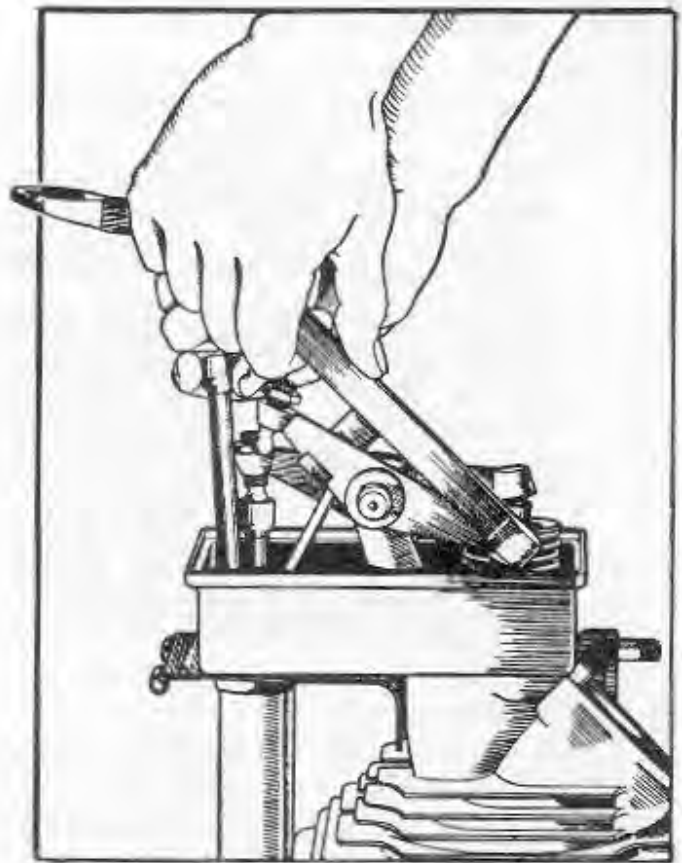


Fig. 3. Removal of push rods

- OP. 3 Remove the thimble from the tip of the valve stem.
- 4 Telescope the push rod cover and remove it from between the crankcase and the cylinder head.

#### Completing removal of port screened ignition harness (Mk. 7)

28. The port screened ignition harness cannot be removed completely until the eight push rods and their covers have been removed, as described in para. 27. When this has been done, complete the removal of the port ignition harness as follows:—

- OP. 1 Remove the two nuts and bolts securing the ignition harness to the brackets on the port side of the cylinder heads.
- 2 Remove the port ignition harness.

#### Removing cylinder heads

29. The method of removing each of the four cylinder heads is identical, except as detailed in OP. 3, therefore, instructions for removing one only are detailed in this paragraph. If the push rods have not been removed, set the relevant piston at T.D.C.

with both valves closed, then proceed as follows:—

- OP. 1 Using the jaw spanners T800-80, T1400-10 and T1400-11 as necessary, remove the four cylinder holding-down nuts and the four washers from the cylinder holding-down studs.
- 2 Remove the nut and washer from the adjacent cylinder holding-down stud, which secures the other end of the ignition harness support on the port side of the engine, and remove the ignition harness support.
- 3 *When removing cylinder head No. 2, 3 and 4.* Remove the baffle bracket from the cylinder holding-down stud on the starboard side of the engine.
- 4 Ease the cylinder head off the cylinder barrel, and remove the cylinder head joint washer.

30. If it is not possible to break the joint between the cylinder head and the cylinder barrel, remove the cylinder head and barrel together, as described in the next paragraph.

#### Removing cylinders

31. Remove each of the four cylinder barrels in the following manner:—

- OP. 1 Using crankshaft turning tool T1900-355, turn the crankshaft until all four pistons are clear of the underside of the crankcase. This obviates the risk of the scraper rings being trapped in the crankcase when the cylinder barrels are removed.
- 2 Carefully withdraw the cylinder barrel from the crankcase and off the piston. If difficulty is experienced in freeing the cylinder barrel, it may be eased by lightly striking alternate sides with a rubber mallet. As the piston emerges from the cylinder barrel, it must be supported to avoid the risk of damage to the piston or the piston rings through their knocking against the cylinder holding-down studs.

#### Removing pistons

32. Having removed the cylinder heads and the cylinder barrels, each piston is removed as follows:—

- OP. 1 Insert the end of the circlip extractor T2200-156 in one of the slots provided in the gudgeon pin and prise off the circlip. Care must be taken

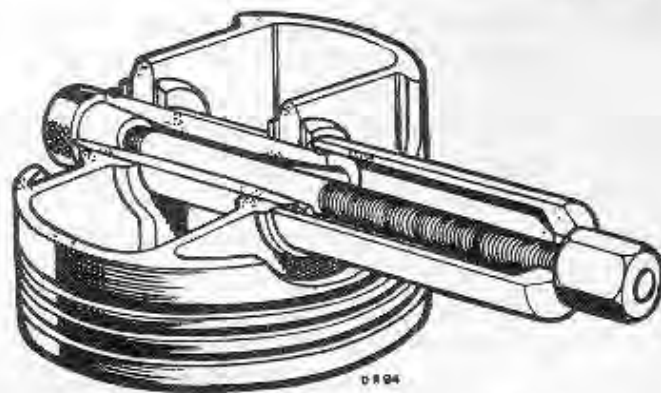


Fig. 4. Extracting a gudgeon-pin

to avoid burring the slot or circlip groove at the end of the gudgeon pin. If a burr is raised accidentally, it must be stoned off to avoid scoring the piston or small-end bore in the connecting rod, before proceeding with the next operation.

- OP. 2 Remove the thrust washer and any carbon that may be deposited on the gudgeon pin.
- 3 Support the piston so that no bending load is imposed on the connecting rod, and push out the gudgeon pin.
- 4 *If the gudgeon pin is too tight to be withdrawn by hand.* Remove the second circlip and thrust washer by repeating OP. 1. Using the gudgeon pin extractor T2200-157, thread extractor draw-bolt through the gudgeon pin until the knurled nut abuts one end of the gudgeon pin. Place the extractor body over the opposite end of the gudgeon pin and screw the hexagon extractor nut on to the draw-bolt (*fig. 4*). Support the piston, and tighten the hexagon nut until the gudgeon pin is withdrawn fully.

#### Removing settling tank (Mk. 7 only)

33. The settling tank (or sump) is situated at the bottom of the timing gear cover. The removal procedure is as follows:—

- OP. 1 Release the locking tabs and remove the two bolts, nuts and lock washers securing the oil pipe elbow to the settling tank.
- 2 Release the locking tabs and remove the two nuts and lock washers securing the flanged end of this oil pipe to the foremost inlet on the oil pump, and remove the settling tank to pumps oil pipe assembly.



- OP. 3 Remove the plain nut and spring washer from the settling tank securing stud which also accommodates the suction oil pipe clip.
- 4 Unscrew the union nut which connects the suction oil pipe to the front scavenge filter on the starboard side of the crankcase.
- 5 Release the locking tabs and remove the two nuts and lock washers securing the flanged end of this pipe to the centre inlet on the oil pump, and remove the crankcase to suction pump oil pipe assembly.
- 6 Remove the remaining three plain nuts and spring washers which secure the settling tank to the timing gear cover.
- 7 Remove the timing gear cover nut and spring washer from the stud, which also supports the carburettor flooder control, and remove the flooder operating cable assembly complete.
- 8 Remove the settling tank.

#### Removing rear oil drain (Mk. 1 variants)

34. The rear oil drain fitted at the bottom of the timing gear cover of Mk. 1 variants is removed as follows:—

- OP. 1 Remove the four plain nuts and spring washers which secure the rear oil drain to the timing gear cover.
- 2 *When engine-driven fuel pumps are fitted.* Remove the timing gear cover nut and spring washer from the stud which also supports the carburettor flooder control, and remove the flooder operating cable assembly complete.
- 3 Remove the rear oil drain.

#### Removing tappet guide nuts

35. Remove the sixteen plain nuts and spring washers which secure the eight tappet guides to the crankcase.

#### Removing oil pipes

36. The front oil drain pipe (*Mk. 1 variants*), the settling tank to pumps oil pipe (*Mk. 7*), and the crankcase to suction pump oil pipe (*Mk. 7*) have been removed already. Before proceeding to remove the remaining oil pipes, turn the engine through 180 degrees so that the cylinder apertures are downwards, and

ensure that the stand is properly locked in this position. Whilst turning the engine through 180 degrees, steady the four connecting rods so that they do not fall against the sides of the cylinder apertures.

37. Proceed to remove the remaining oil pipes from the rear of the engine in the following manner:—

- OP. 1 Cut the locking wire, unscrew the union nuts at each end of the oil pipe from the pressure filter to the gallery in the top cover, and remove the pressure filter to gallery oil pipe assembly.
- 2 Cut the locking wire, unscrew the union nut connecting the timing gear oil jet pipe assembly to the timing gear oil jet union, which is adjacent to the tachometer drive. Release the locking tabs and unscrew the nut securing the other end of this pipe to the pressure filter. Remove the pipe, joint washers and the small gauze filter which surrounds the union on the pressure filter.
- 3 *Mk. 1 variants.* Cut the locking wire and unscrew the union nut which secures the main oil pump to filter pipe assembly to the oil pumps. Remove the two plain nuts and spring washers which secure the flanged end of this pipe to the oil pressure filter, and remove the pipe. *Mk. 7.* Release the locking tabs and remove the four nuts securing the flanged ends of the pressure filter to pressure pump oil pipe assembly. Remove the two lock washers, two spring washers and remove the pipe.
- 4 *Mk. 1 variants.* Cut the locking wire, unscrew the union nuts, at each end of the suction pump oil pipe assembly, securing the oil pipe to the suction filter and the oil pump, and remove the pipe.
- Mk. 7.* Cut the locking wire and unscrew the union nut securing the suction filter to pressure pump oil pipe assembly, to the suction filter. Release the locking tabs and remove the two nuts securing the flanged end of this pipe to the oil pump. Remove the pipe.

#### Removing suction filter

**38.** Before removing the suction filter, it is advisable to loosen the large plug at the top of the filter casing, as this is effected more easily whilst the filter is still attached to the engine. Then proceed as follows:—

- OP. 1 Remove the three plain nuts and spring washers which secure the suction filter to the timing gear cover.
- 2 Remove the suction filter complete.

#### Removing main control bracket

**39.** The main control bracket assembly, which includes the oil pressure filter, is removed as a sub-assembly. The procedure is as follows:—

- OP. 1 Using spanner T2200-51, loosen the oil pressure filter cover.

#### Note . . .

*This operation cannot be done without the aid of a jig or fixture to hold the sub-assembly once it is off the engine.*

- 2 Unscrew the three plain nuts and remove the spring washers from the studs in the timing gear cover which secure the oil pressure filter casing to the timing gear cover.
- 3 Remove the oil pressure filter casing and control bracket assembly.

#### Removing front scavenge filter (Mk. 7)

**40.** The front scavenge filter is secured to the starboard side of the crankcase by three studs, spring washers and nuts. Where Mod. G.1483 has been embodied, one of these nuts and spring washers will have been removed, as described in para. 24, when removing the carburettor, air-intake and induction pipe. The removal procedure is as follows:—

- OP. 1 Unscrew the three nuts and remove the spring washers, filter cover, joint washer, and gauze filter.
- 2 Remove the filter casing off the studs in the crankcase.

#### Removing front oil drain (Mk. 1 variants)

**41.** The front oil drain is secured to the starboard side of the crankcase by three studs, spring washers, and nuts. The removal procedure is as follows:—

- OP. 1 Remove the three plain nuts and spring washers which secure the front oil drain.
- 2 Remove the oil drain.

#### Removing tachometer drive

**42.** Although the tachometer drive is different according to whether a dual, quarter engine-speed, or a dual, engine-speed, or a single, quarter engine-speed drive is fitted, the procedure for its removal is the same in each instance, and is as follows:—

- OP. 1 Remove the three plain nuts and spring washers from the studs which secure the tachometer drive assembly to the port side of the timing gear cover.
- 2 Withdraw the tachometer drive assembly from the timing gear cover.

#### Removing timing gear cover

**43.** The timing gear cover, complete with the oil pump, magneto drive, and crankcase breather connection, is removed as a sub-assembly. No attempt must be made to remove the timing gear cover until the tachometer drive has been removed, as described in para. 42, as otherwise the tachometer drive will foul the magneto driving gear on the idler gear assembly which is mounted on the rear wall of the crankcase. The procedure is as follows:—

- OP. 1 Remove the eight bolts and spring washers which secure the upper part of the timing gear cover to the rear of the top cover.
- 2 Remove the thirteen plain nuts and spring washers from the studs which secure the lower part of the timing gear cover to the crankcase.

#### Note . . .

*Where engine-driven fuel pumps are fitted, one of these nuts and spring washers has been removed already to release the flooder control cable assembly.*

- OP. 3 Draw the timing gear cover off the studs in the crankcase.

#### Removing front cover

**44.** The outer race of the thrust bearing is nipped between the front cover and the rear of its housing in the crankcase and top cover. This thrust bearing nip is controlled by the number of packing shims fitted under the front cover flange and, therefore, these shims should be retained intact so that, upon reassembly, time is not wasted unnecessarily when checking to obtain the correct shim thickness. To remove the front cover, proceed as follows:—

- OP. 1 Extract the split pins, and remove

the five slotted nuts which secure the front cover to the top cover and the crankcase.

- OP. 2 Remove the washers, front cover, the steel shim, Part No. 1306-26, and the packing shims.

#### Removing top cover

45. Four of the bolts which fasten the top cover to the crankcase are fitting bolts, and are slightly larger in diameter than the other twenty-three. A note should be made of the location of these four fitting bolts, as they must be refitted in their original locations. Two of these fitting bolts belong to the starboard side of the crankcase, as they also secure the air-intake steady bracket. On engines Pre-mod. G.1635, the other two fitting bolts are located on the port side opposite those which secure the air-intake steady bracket, but when Mod. G.1635 has been embodied, these two fitting bolts are located at the front and rear of the port and starboard sides respectively.

- OP. 1 Having noted the location of the four fitting bolts, remove the twenty-seven bolts, nuts and spring washers which fasten the top cover to the crankcase.
- 2 Remove the eight nuts and spring washers from the studs in the crankcase, which also secure the top cover.
- 3 Keeping the top cover square to the crankcase, lift it off.

#### Removing crankshaft

46. The main bearing caps are secured by castellated nuts which are locked by both split pins and lock washers. Both forms of locking must be released before attempting to unscrew the nuts. The removal procedure is as follows:—

- OP. 1 Extract the split pins, release the locking tabs, and, using box spanner T2200-91 and tommy bar T2200-92, unscrew the castellated nuts securing the main bearing caps.
- 2 Remove the main bearing caps. If difficulty is experienced when attempting to remove any of the five main bearing caps, a gentle tap with a rubber mallet will usually free them.
- 3 *If the cap halves of the main bearings do not come away with the bearing caps.* Remove the cap halves of the main bearings and place each with its individual bearing cap.

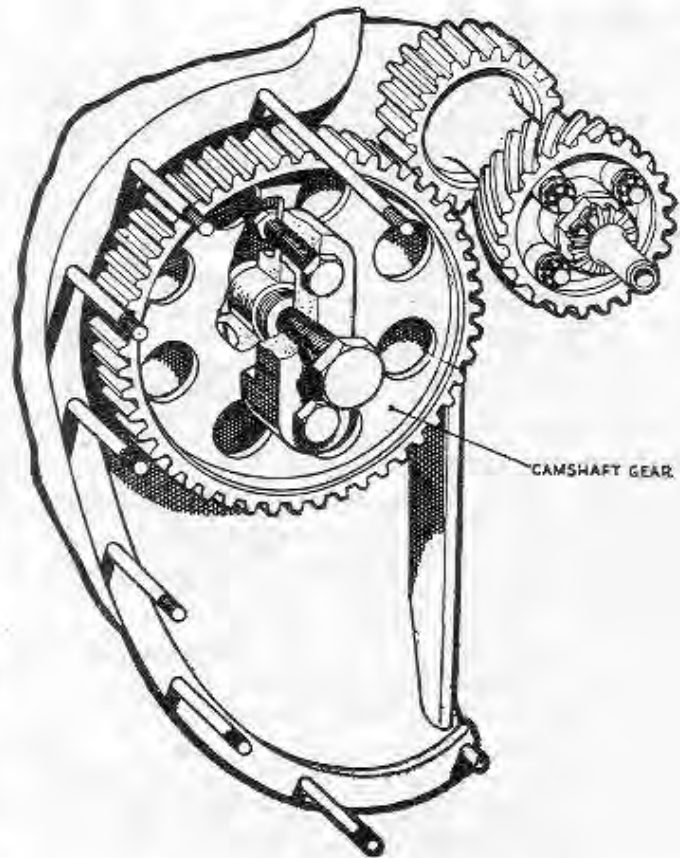


Fig. 5. Extracting camshaft gear

- OP. 4 Lift the crankshaft, complete with the connecting rods, out of the crankcase.

#### Note . . .

*The crankshaft should be placed on a suitable stand.*

- OP. 5 Remove the crankcase halves of the main bearings and place each with its individual cap half and bearing cap. If a bearing is stuck in the crankcase, a gentle tap with a rubber mallet will usually free it.

#### Removing camshaft

47. The camshaft is removed from the rear of the crankcase, the procedure being as follows:—

- OP. 1 Release the locking tab and, holding the camshaft stationary, use spanner T800-53 and tommy bar T2300-193 to unscrew the ring nut which retains the camshaft gear.
- 2 Screw the two bolts of extractor T800-61 into the two tapped holes in the camshaft gear (*fig. 5*), and

tighten the set screw until the camshaft gear has been drawn off the camshaft.

- OP. 3 Unless the key is really tight in the camshaft, remove the key from the rear end of the camshaft.
- 4 Extract the split pins and unscrew the two slotted nuts which secure the rear camshaft bearing in the crankcase.
  - 5 Remove the plain washers, the rear camshaft bearing, and the camshaft from the rear of the crankcase.
  - 6 Remove the three plain nuts and spring washers which secure the front camshaft bearing at the front of the crankcase.
  - 7 Lightly tap the bearing with a rubber mallet to break the joint and, using a suitable drift passed through the camshaft bearings from the rear of the crankcase, gently drive out the front camshaft bearing.

**Note . . .**

*The drift, which could be made of hard wood, should have a spigotted end to fit in the front camshaft bearing, but the spigot must not bottom within the bearing. On no account may the camshaft itself be used to remove this bearing.*

**Removing tappets and tappet guides**

48. The sixteen plain nuts and spring washers which secure the eight tappet guides to the crankcase were removed whilst the engine was inverted. Proceed with the removal as follows:—

- OP. 1 Lift the eight tappets out of the tappet guides.
- 2 Using a suitable, soft metal drift, gently drive out the eight tappet guides.

**Removing idler gear**

49. The idler gear assembly which remains attached to the rear wall of the crankcase should be dismantled as follows:—

- OP. 1 Extract the split pin, and unscrew the lock nut at the rear end of the idler spindle.
- 2 Remove the washer, idler gear, shim(s), and thrust bearing.
  - 3 Release the locking tab, and remove the plug and lock washer from the front end of the idler spindle.
  - 4 Using camshaft idler spindle extractor T1300-97, place the body of the extractor over the idler spindle, screw the extractor screw on to the spindle, and tighten the small nut until the spindle has been drawn out of the crankcase rear wall.

**LIST OF TOOLS**

50. The following tools are available in the Dismantling and Assembling Tool Kit.

<i>Part No.</i>	<i>Description</i>
T1400-129	Spanner, propeller hub bolt nut
T2300-232	Bar, tommy
T1900-383	Spanner box, for crankshaft front nut, Mod. Gipsy 903
T1900-245	Bar, tommy, $\frac{3}{4}$ in. by 30 in. long for use with crankshaft front nut spanner
T1900-252	Extractor, propeller hub, for Mod. Gipsy 903 type hubs
T1900-4	Extractor, propeller hub, for Pre-mod. Gipsy 903 type hubs
T2200-180	Bar, tommy, for use with propeller hub extractor
T1900-355	Tool, crankshaft turning
T1300-78A	Tool, valve spring compressing
T800-80	Spanner, jaw, for cylinder head retaining nuts
T1400-10	Spanner, jaw, for cylinder head retaining nuts
T1400-11	Spanner, jaw, for cylinder head retaining nuts
T2200-156	Extractor, gudgeon pin circlip
T2200-157	Extractor, gudgeon pin
T2200-51	Spanner, pressure oil filter cover
T2200-91	Spanner, box, for main bearing nuts
T2200-92	Bar, tommy $\frac{1}{2}$ in. by $7\frac{1}{2}$ in. for main bearing nut spanner
T800-53	Spanner, box, for camshaft gear-wheel nut
T2300-193	Bar, tommy, $\frac{3}{8}$ in. by 9 in. for camshaft gear-wheel nut spanner
T800-61	Extractor, camshaft gear-wheel
T1300-97	Extractor, camshaft idler spindle
T800-5A	Spanner box, for crankshaft front nut, Pre-mod. Gipsy 903

## Chapter 14

# DISMANTLING THE SUB-ASSEMBLIES

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#### GENERAL

1. This chapter contains instructions for dismantling the sub-assemblies after they have been removed from the engine in accordance with the instructions given in Chapter 13.

2. Certain components, such as the airscoop, fuel pipe, cooling baffle, front cover, and camshaft, will require no further dismantling than has been necessary in removing them from the engine. The dismantling and reconditioning of components such as the ignition harness, magnetos, and fuel pumps is not described in this chapter. For fuel pump information refer to Chapter 17.

3. All consumable parts such as split pins, tabwashers, circlips, etc., must be disposed of without delay so that there is no risk of their becoming mixed with new items and used again.

#### Propeller boss

4. The nose cap, or spinner, the two locking plates, and the propeller boss plate have been separated from the propeller hub whilst removing the propeller boss from the engine. The remaining parts are removed as follows:—

- OP. 1 Release the locking tabs, unscrew the eight set-bolts and remove the hub bolt lock plate.
- 2 Take out the eight hub bolts.

5. The timing pointer, and the four studs which are in the propeller boss plate, are locked by peening. Therefore, these detail parts should not be disturbed unless they are loose or damaged.

#### Carburettor, air-intake and induction pipe

6. The carburettor, air-intake, and induction pipe, which were removed from the engine as a single sub-assembly, should be dismantled into component assemblies as follows:—

OP. 1 Remove the four bolts and spring washers which secure the flange on the induction pipe to the bottom flange on the carburettor.

*Mk. 7 only.* Remove the oil pipe clip link which was secured by the bolt at the front inboard corner of the flange.

2 Separate the carburettor from the induction pipe and remove the carburettor joint washer.

3 Extract the split pins, and unscrew the plugs at each end of the throttle control rod, which connects the bell-crank on the air-intake to the lever on the carburettor. Remove the control rod.

4 *Mk. 1 variants, and Mk. 7 when Mod. G.1483 has not been embodied.* Extract the split pin and detach the upper end of the flap valve operating cable by removing the nut on the link pin.

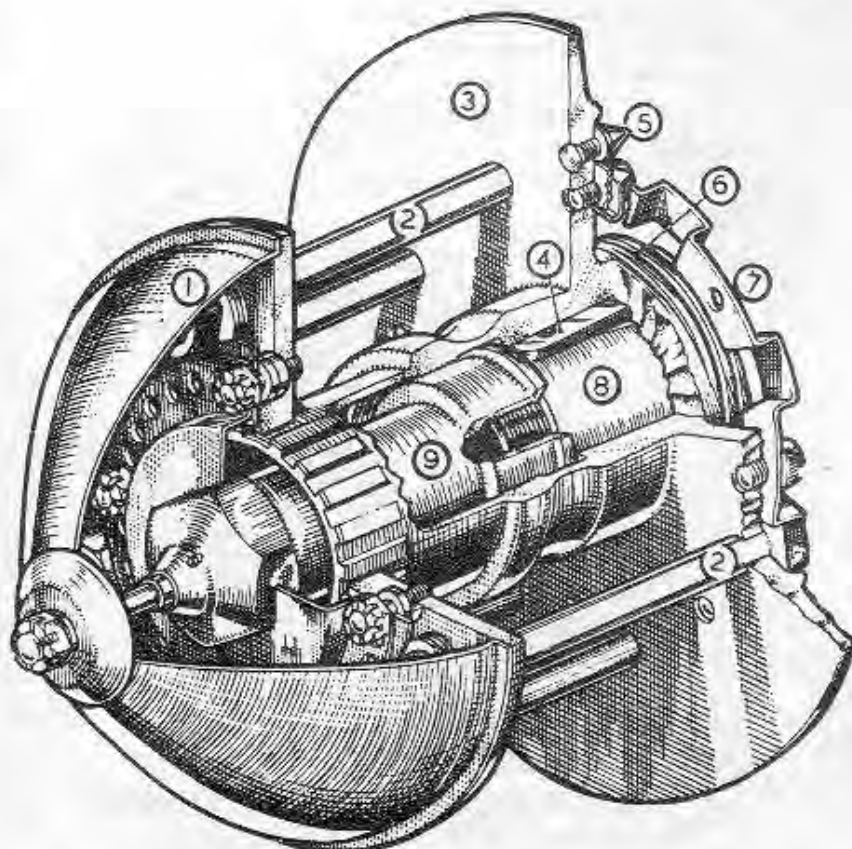
#### Note . . .

*Do not disturb the bolt in the lower end of the link pin as this is a cable clamping screw.*

OP. 5 Remove the four plain nuts and spring washers which secure the air-intake flange to the carburettor, separate the carburettor from the air-intake, and remove the fibre joint washer.

#### Carburettor

7. Before the carburettor is transferred to



1 NOSE CAP OR SPINNER  
2 HUB BOLT  
3 HUB  
4 CRANKSHAFT KEY  
5 TIMING POINTER

6 OIL RETURN GROOVE  
7 HUB BOLT LOCK PLATE  
8 TAPERED END OF CRANKSHAFT  
9 HUB RETAINING NUT

Fig. 1. Propeller boss assembly (*Mod. 2085 introduces two fibre friction discs on Mk. 7 engines*)

the appropriate section, the following engine parts should be removed:—

OP. 1 Remove the cap nut from the base of the carburettor float chamber, and take off the joint washers and the fuel inlet union. Refit the joint washers, fit a distance piece in the form of a cardboard tube to prevent the entry of foreign matter into the float chamber, and secure it with the cap nut.

2 Extract the split pins, unscrew the plugs at each end of the altitude control link, and remove the control link.

3 File off the riveted-over end of the taper pin, which secures the altitude control bell-crank to its fulcrum, and gently drive out the taper pin from this end using a suitable pin punch.

4 Remove the fulcrum, bell-crank, and washer.

- OP. 5 *Mk. 1 variants when fitted with engine-driven fuel pumps and Mk. 7.* Unscrew the two nuts which secure the carburettor flooder bracket, remove the spring washers and the bracket. Refit the spring washers and nuts.
- 6 *Mk. 1 variants when fitted with engine-driven fuel pumps and Mk. 7.* File off the riveted-over end of the taper pin, which secures the flooder lever to the fulcrum pin, and gently drive out the taper pin from this end using a suitable pin punch.
- 7 *Mk. 1 variants when fitted with engine-driven fuel pumps and Mk. 7.* Remove the flooder lever, the operating lever complete with fulcrum pin, and spring from the carburettor. File off the riveted-over end of the taper pin which secures the operating lever to the fulcrum pin, gently drive out the taper pin, and separate the pin from the lever.
- 8 *Mk. 1 variants and Mk. 7 when Mod. G.1483 has not been embodied.* Extract the split pin, unscrew the slotted nut, remove the washer and detach the trunnion and cable from the lever on the throttle spindle.

**Note . . .**

*Do not disturb the locking screw in the trunnion as this is a cable clamping screw.*

- OP. 9 *Mk. 1 variants and Mk. 7 when Mod. G.1483 has not been embodied.* Unscrew the two nuts which secure the bottom bracket for the flame trap control, remove the spring washers and the flame trap control assembly, and re-fit the spring washers and nuts. File off the riveted-over end of the taper pin which secures the dog to throttle spindle, gently drive out the taper pin, and remove the dog and the lever.
- 10 File off the peened end of the ball-joint balls in the throttle and altitude levers and remove these balls.

**Flame trap control tube**

8. Having separated the flame trap control tube assembly from the carburettor and air-intake, it should be dismantled as follows:—

- OP. 1 Release the locking tab and unscrew the locking screw from the trunnion.
- 2 Pull the trunnion off the end of the operating cable, and draw the cable out of the control tube.
- 3 Separate the second trunnion from the control cable in a similar manner.
- 4 Remove the nuts, spring washers and bolts, and separate the clip and the brackets from the control tube.

**Air-intake and flame trap housing**

9. The air-intake and flame trap housing should be dismantled as follows:—

- OP. 1 Remove the plain nut and spring washer from the upper end of the steady bracket stud and take off the Silent-bloc bush.
- 2 *Pre-mod. 1498.* File off the riveted-over end of the taper pin securing the collar which retains the throttle control bell-crank, gently drive out the taper pin, and remove the collar and the bell-crank.
- Mod. 1498.* Prise off the circlip which retains the throttle control bell-crank, and remove the bell-crank and the washer.
- 3 File off the riveted-over end of the taper pin, which retains the bell-crank fulcrum, drive out the taper pin, and remove the fulcrum.
- 4 Remove the eight plain nuts and spring washers which secure the flame trap, and gently ease the flame trap off the studs.

**Note . . .**

*The individual parts of the flame trap are not supplied as separate spares, therefore it is unnecessary to dismantle this sub-assembly.*

- OP. 5 Disengage the flame trap valve return spring cable; the detail parts of this sub-assembly are not supplied separately.
- 6 File off the riveted-over end of the two taper pins which secure the flame trap valve to the spindle, gently drive out the taper pins, and withdraw the spindle complete with lever; or pulley in the case of Mk. 7 embodying Mod. G.1483.

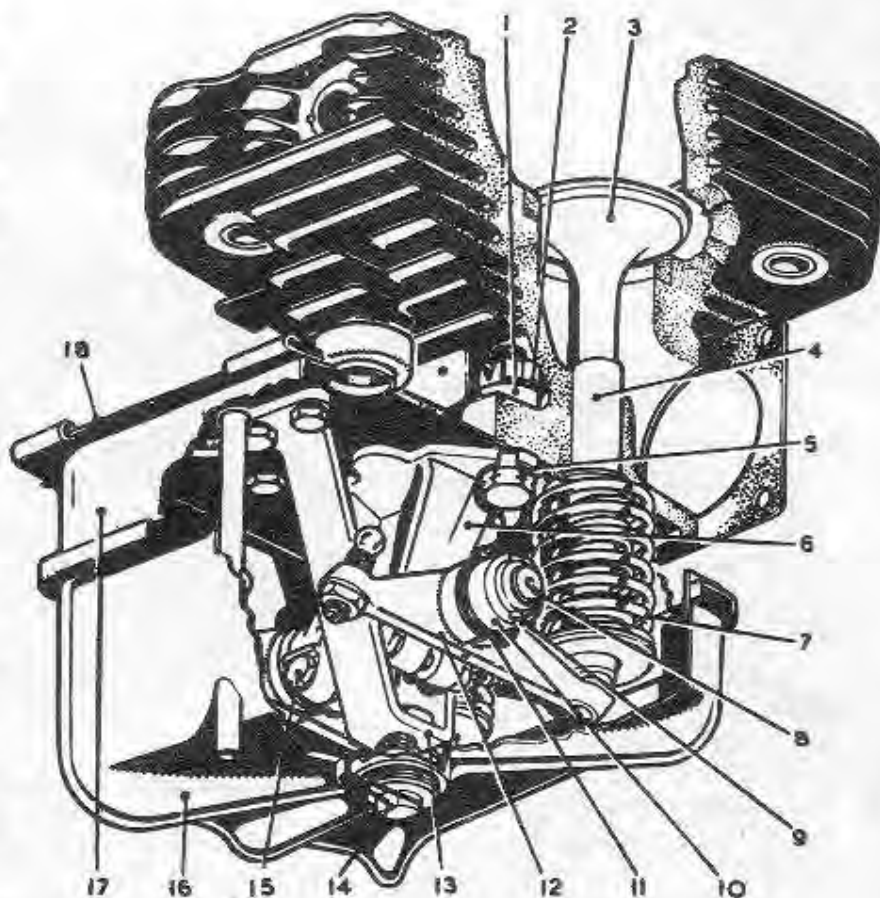
OP. 7 File off the riveted-over end of the third taper pin which secures the lever (or pulley) to the spindle, gently drive out the taper pin, and separate the lever (or pulley) from the spindle.

#### Cylinder heads

10. All four cylinder heads (fig. 2) are identical and, therefore, the dismantling of one only is detailed here. The valve gear cover has been removed already, and does not require dismantling further, unless the retaining screw or its washer are faulty. The valve spring compressing tool T1300-78A and the valve supporting tool T800-6 are intended for valve spring removal without removing the cylinder head from the engine and are unsuitable for workshop use. A valve spring compressor T85011 and wooden block T85010 illustrated in fig. 3 should be employed. The procedure is as follows:—

OP. 1 If valve gear cover retaining screw or its washer are faulty. Extract the split pin which is inside the valve gear cover and separate the detail parts.

- 2 Press back the cap at the end of the rocker spindle against the spring, push out the retaining pin, and remove the cap, spring, thrust collar, rocker and thrust washer.
- 3 Repeat OP. 2 to remove the second valve rocker.
- 4 Position the cylinder head on a suitable wooden block so that the valves are held firmly against their seats. Then using a valve spring compressor of the type illustrated in fig. 3, depress each valve collar in turn, and remove the split collets, valve collar and springs.
- 5 Clean off any carbon deposit from the valve stems, and examine them for burrs and nicks which might



- |                       |                                     |
|-----------------------|-------------------------------------|
| 1 DISTANCE PIECE      | 11 SPRING                           |
| 2 LOCK PLATE          | 12 ROCKER                           |
| 3 INLET VALVE         | 13 STIRRUP BRACKET                  |
| 4 VALVE GUIDE         | 14 VALVE GEAR COVER RETAINING SCREW |
| 5 ROCKER BRACKET BOLT | 15 ROCKER BRACKET CLAMPING BOLT     |
| 6 ROCKER BRACKET      | 16 VALVE GEAR COVER                 |
| 7 VALVE SPRINGS       | 17 VALVE GEAR CASING                |
| 8 ROCKER SPINDLE      | 18 CYLINDER BAFFLE                  |
| 9 RETAINING PIN       |                                     |
| 10 ROCKER SPINDLE CAP |                                     |

Fig. 2. Cylinder head assembly

damage the valve guides; any marks should be carefully removed before attempting to withdraw the valves. Remove the cylinder head from the wooden block and withdraw the valves.

- OP. 6 Remove the two plain nuts, spring and plain washers, and bolts which fasten the baffle to the valve gear casing.
- 7 Remove the two plain nuts, spring washers, and rocker bracket clamping bolts. Slide the rocker spindle out of the rocker bracket.
- 8 Remove the two plain nuts, spring washers, and short bolts which secure the two-hole end of the stirrup bracket.

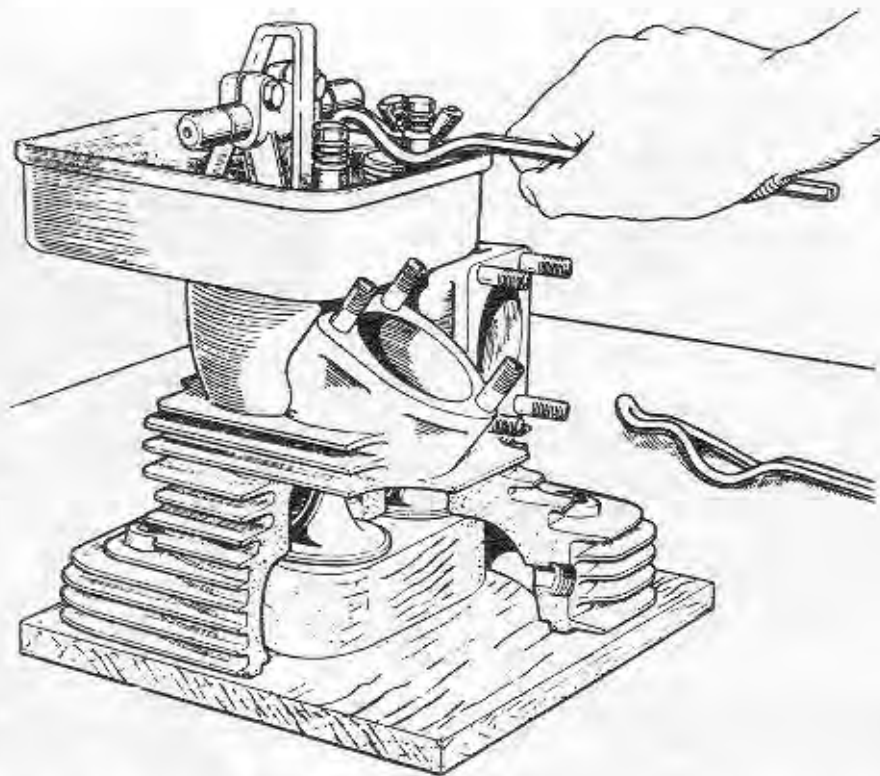


OP. 9 Using a jaw-spanner T2500-37/2 to hold the nut, and the special spanner T1900-490 to turn the bolt head, unscrew the three rocker bracket bolts and remove the three nuts, distance pieces and lock plate.

10 Separate the stirrup bracket, rocker bracket, valve guide collars, valve gear casing, and baffle from the cylinder head.

**Note . . .**

*In early type engines, each valve guide, when driven into the cylinder head imprisons the base of the valve gear casing and an aluminium joint washer between its flange and the cylinder head, there being no separate valve guide collars. Therefore, in this instance, the valve gear casing can be separated from the cylinder head only after extraction of the valve guides.*



**Fig. 3. Bench type valve spring compressor and wooden block**

**Pistons**

11. It is usual to renew all piston rings during overhaul, the compression rings should be removed over the crown of the piston, and the scraper rings over the skirt.

**Main control bracket**

12. The main control bracket assembly and the oil pressure filter were removed as a single sub-assembly. The oil pressure filter has been loosened while the main control bracket assembly was still attached to the engine, and therefore the filter assembly can be unscrewed by hand. The dismantling procedure is as follows:—

OP. 1 Extract the split pins, unscrew the plugs at the end of the altitude and throttle control tubes, and disconnect the control tubes from the balls on the operating levers.

**Note . . .**

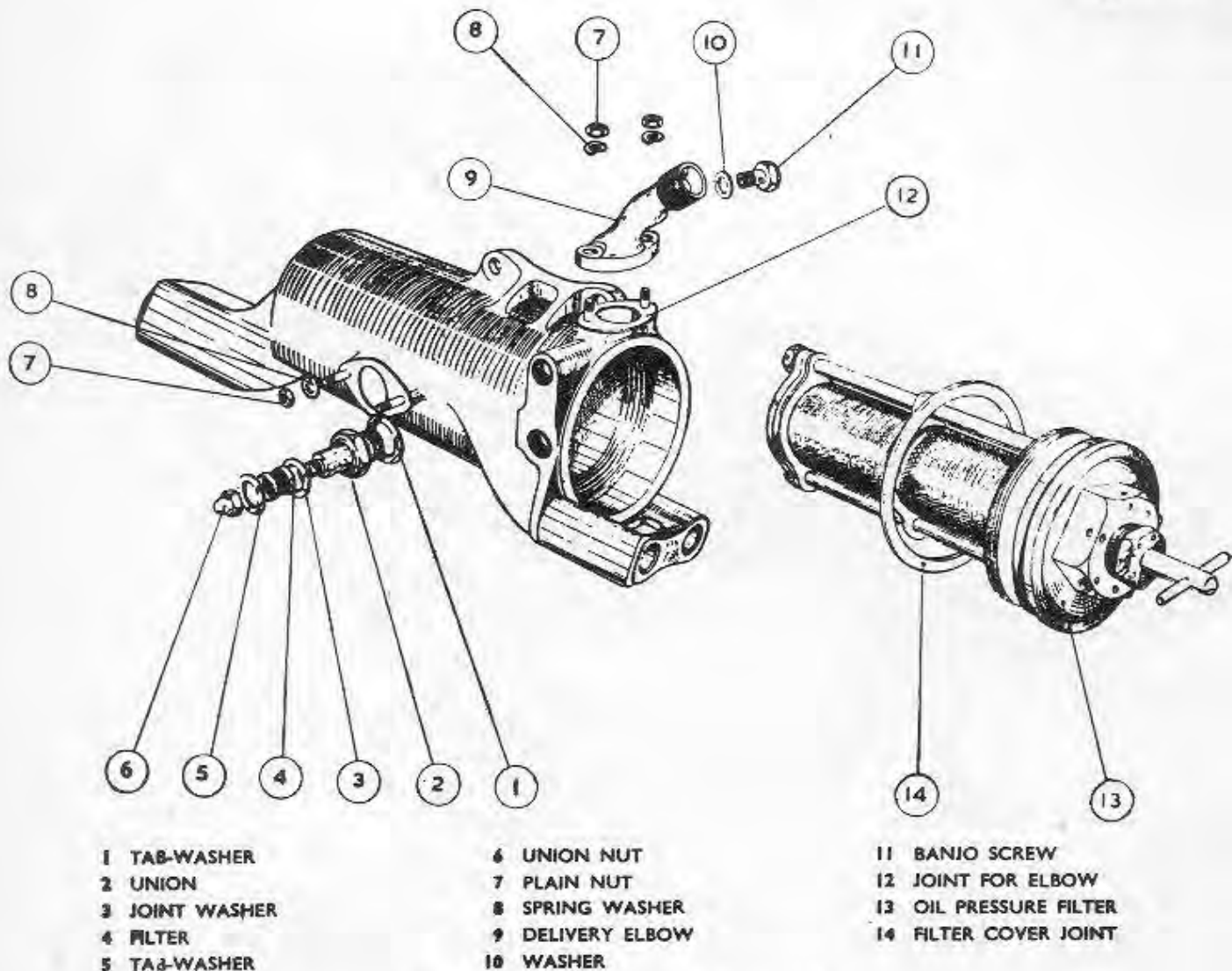
*The control bracket assembly should not be dismantled further than is necessary*

*to renew any damaged parts, or to check for wear in the bushes or on the shafts, or to rectify excessive end-float.*

OP. 2 File off the riveted-over end of the taper pin which secures the fitting to one end of the altitude control cross-shaft, gently drive out the taper pin, remove the fitting, and withdraw the cross-shaft complete with the remaining fitting. If required, the remaining fitting can be removed from the altitude control cross-shaft in a similar manner.

3 Remove the two plain nuts, spring washers, and bolts which fasten each pair of magneto control links together, and remove the link plates and distance pieces.

4 File off the riveted-over ends of the three taper pins securing the star-board magneto control cam, the magneto control spindle collar, and the throttle operating lever, gently drive out the taper pins, and withdraw the throttle control cross-shaft complete with the throttle control



**Fig. 4. Oil pressure filter assembly**

- 1 TAB-WASHER
- 2 UNION
- 3 JOINT WASHER
- 4 FILTER
- 5 TAB-WASHER

- 6 UNION NUT
- 7 PLAIN NUT
- 8 SPRING WASHER
- 9 DELIVERY ELBOW
- 10 WASHER

- 11 BANJO SCREW
- 12 JOINT FOR ELBOW
- 13 OIL PRESSURE FILTER
- 14 FILTER COVER JOINT

pick-up lever and the port magneto control cam, which can be removed, if required, in a similar manner.

- OP. 5 Unscrew the oil pressure filter assembly (fig. 4), by hand, and remove it from the casing. Remove the filter cover joint washer.

**Note . . .**

*The Auto-Klean filter assembly MUST NOT be dismantled.*

- OP. 6 Unscrew the two plain nuts which secure the oil filter delivery elbow, and remove the spring washers, elbow, and joint washer.
- 7 Release the locking tab and unscrew the timing gear oil jet union.

#### **Suction filter**

13. The drain plug and washer have been removed from the base of the oil suction filter (fig. 5) and the large plug at the top of

the filter loosened already. Proceed then as follows:—

- OP. 1 Unscrew the large plug at the top of the suction filter and remove the washer and the gauze filter.
- 2 Unscrew the two plain nuts and remove the spring washers and the inlet elbow.
- 3 If required, unscrew the outlet union and remove the washer.

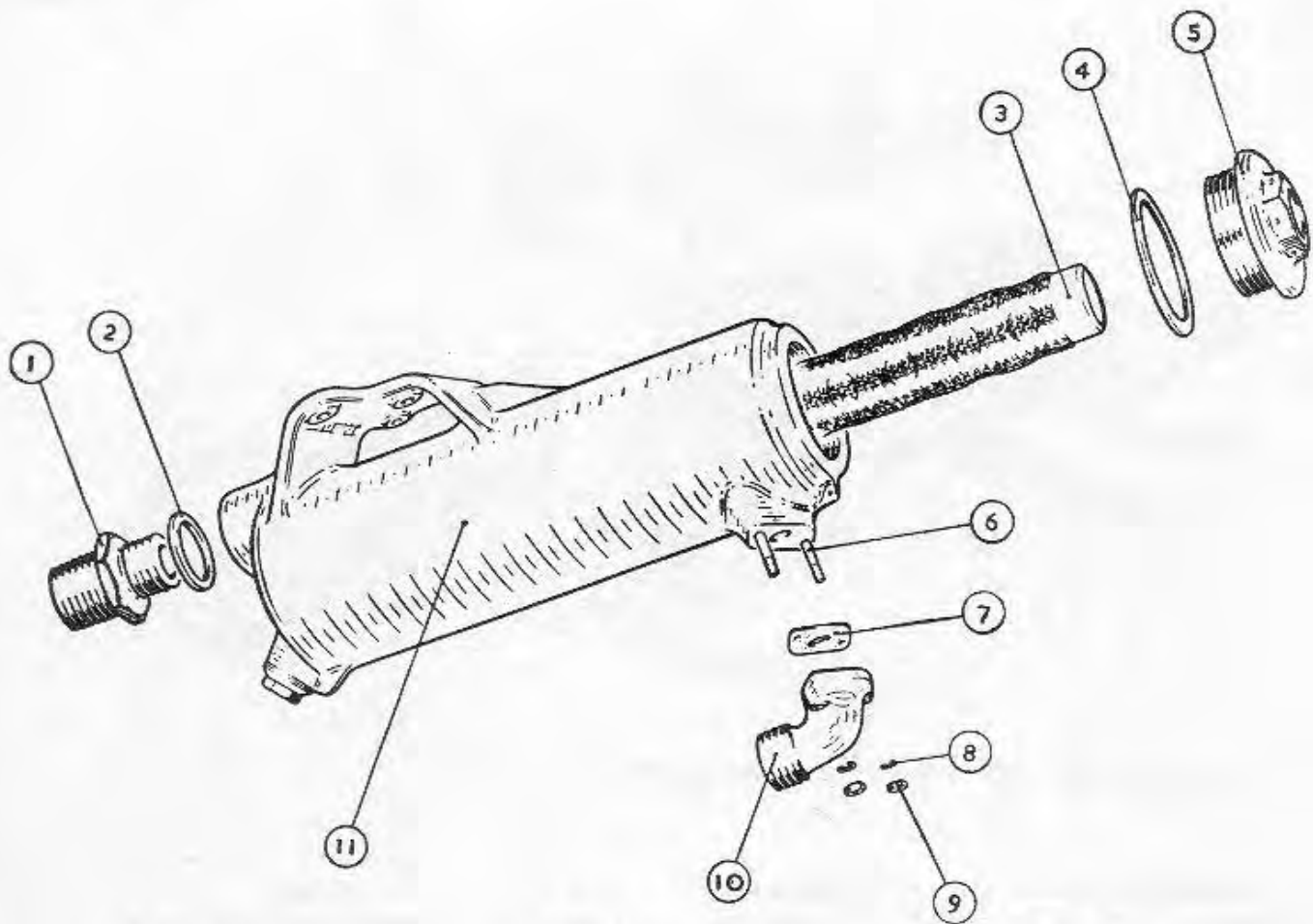
#### **Front scavenge filter (Mk. 7 only)**

14. If required, unscrew the union adapter from the front scavenge filter casing (fig. 6) and remove the joint washer.

#### **Dual quarter engine-speed tachometer drive**

15. The quarter engine-speed tachometer drive fitted to certain Mk. 1 variants and to Mk. 7, illustrated in fig. 12, Chapter 1, is dismantled as follows:—

- OP. 1 *Mk. 7 only.* Remove the blanking

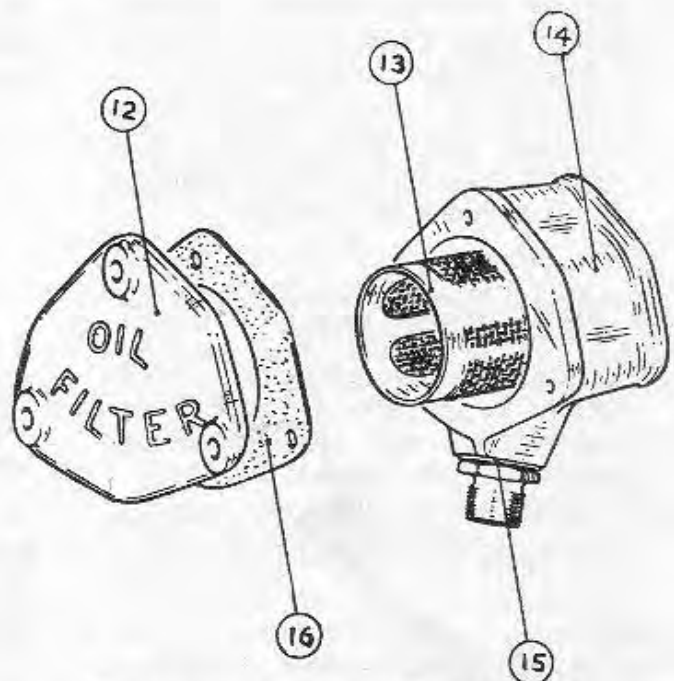


- |          |                 |                |
|----------|-----------------|----------------|
| 1 UNION  | 5 PLUG          | 9 PLAIN NUT    |
| 2 WASHER | 6 STUD          | 10 INLET ELBOW |
| 3 FILTER | 7 JOINT         | 11 FILTER BODY |
| 4 WASHER | 8 SPRING WASHER |                |

Fig. 5. Suction filter assembly

cap and washer from the unused drive outlet.

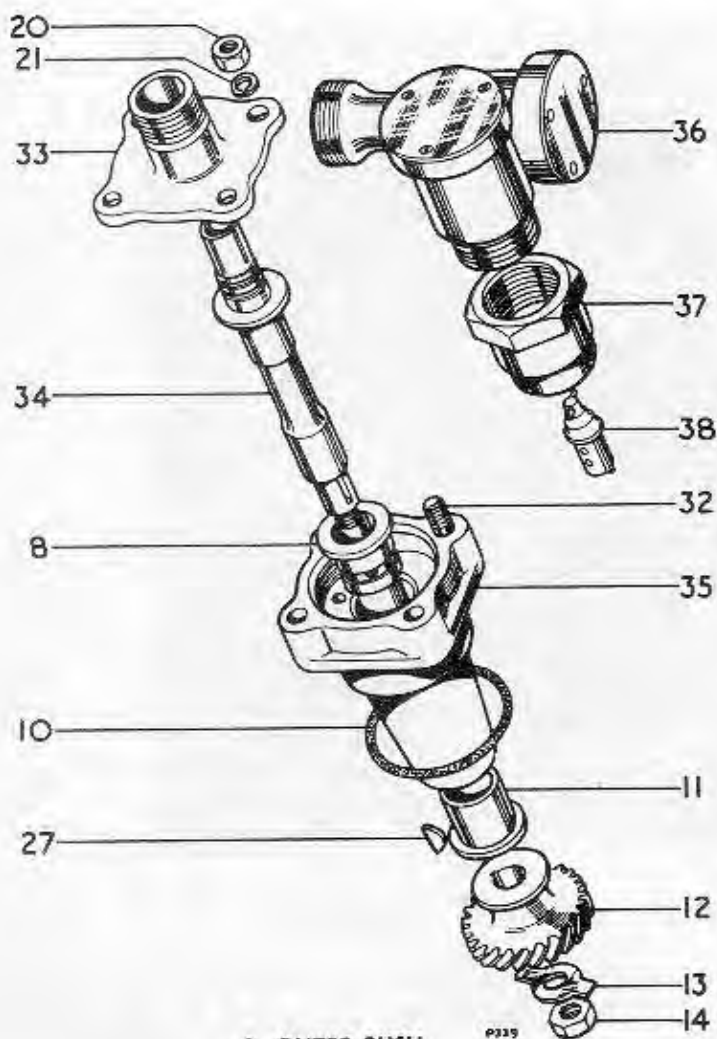
- OP. 2 Cut the locking wire, unscrew the two bearings from the casing and remove the two driven gears and adjusting washers.
- 3 Release the locking tab, unscrew the plain nut which retains the driving gear, and draw the driving gear off the driving shaft. Remove the key from the shaft.
- 4 Unscrew the housing cap from the top of this casing, remove the washer and withdraw the driving shaft and adjusting washer.
- 5 Release the locking tab and remove the casing plug.



KEY TO FIG. 6

- |           |                |
|-----------|----------------|
| 12 COVER  | 15 WASHER      |
| 13 FILTER | 16 COVER JOINT |
| 14 CASING |                |

Fig. 6. Front scavenge filter assembly



- 8 OUTER BUSH
- 10 JOINT WASHER
- 11 INNER BUSH
- 12 DRIVING GEAR
- 13 LOCK WASHER
- 14 PLAIN NUT
- 20 PLAIN NUT
- 21 SPRING WASHER
- 27 KEY
- 32 STUD
- 33 COVER
- 34 DRIVING SHAFT
- 35 HOUSING

Additional parts required to convert to quarter engine-speed:

- 36 ELLIOT-TYPE GEARBOX
- 37 ADAPTER
- 38 DRIVING LINK ASSEMBLY

**Fig. 7. Single engine-speed tachometer drive fitted to certain civil engines. The Elliot-type gearbox converts the drive to quarter engine-speed**

#### Dual engine-speed tachometer drive

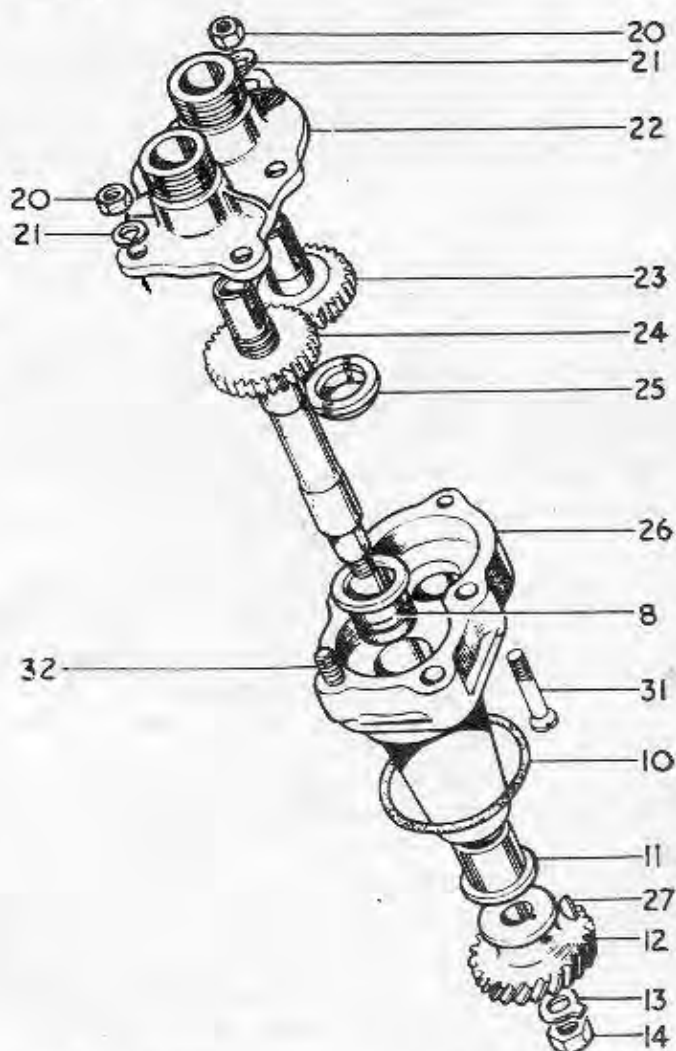
**16.** The engine-speed tachometer drive fitted to certain Mk. 1 variants, which is illustrated in fig. 8, is dismantled as follows:—

**OP. 1** Remove the two plain nuts and spring washers from the countersunk screw, and the stud which fasten the cover to the housing.

- OP. 2** Remove the cover and the countersunk screw.
- 3** Lift out the auxiliary gear.
- 4** Release the locking tab, unscrew the plain nut which retains the driving gear, and draw the gear off the driving shaft. Remove the key from the shaft.
- 5** Withdraw the driving shaft.

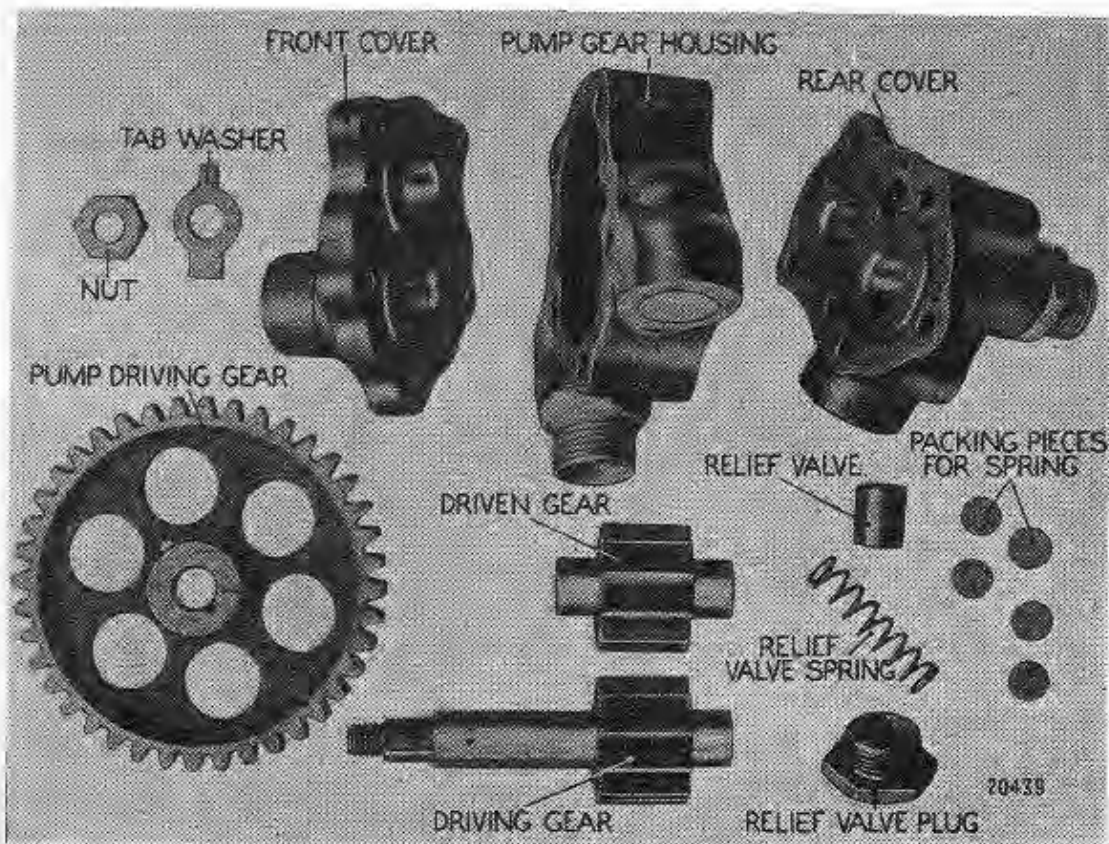
#### Timing gear cover

**17.** The timing gear cover complete with the oil pump, magneto drive, and crankcase breather connection was removed as a sub-assembly, which should be mounted on a suitable stand, or carefully held in a vice using soft clams to protect the cover from injury.



- 8 OUTER BUSH
- 10 JOINT WASHER
- 11 INNER BUSH
- 12 DRIVING GEAR
- 13 LOCK WASHER
- 14 PLAIN NUT
- 20 PLAIN NUT
- 21 SPRING WASHER
- 22 COVER
- 23 AUXILIARY GEAR
- 24 DRIVING SHAFT
- 25 SHORT BUSH
- 26 HOUSING
- 27 KEY
- 31 COUNTERSUNK SCREW
- 32 STUD

**Fig. 8. Engine-speed tachometer drive**



**Fig. 9. Single pressure oil pump**

*Oil pump (Mk. 1 variants)*

**18.** It will probably be found most convenient to commence dismantling the single pressure-pump (fig. 9) whilst it is still attached to the timing gear cover. The procedure is as follows:—

**OP. 1** Release the locking tab, then using spanner T2300-198 unscrew the relief valve plug from the oil pump rear cover, and remove the lock washer, relief valve spring, packing discs and the relief valve.

**Note . . .**

*Retain the packing discs to assist in obtaining the original setting of the relief valve when the engine is re-assembled.*

**OP. 2** Release the locking tab unscrew the driving gear nut, remove the lock washer, and draw off the gear with a standard three-claw extractor. Lift the key out of the keyway in the spindle.

**Note . . .**

*The oil pump cannot be removed from the timing gear cover until the oil pump driving gear has been taken off.*

**OP. 3** Unscrew the five plain nuts, which secure the oil pump to the timing gear cover.

**4** Remove the spring washers and the lockwire tab, and gently tap the end of the oil pump spindle with a hide mallet until the oil pump is free to slide off the studs in the timing gear cover.

**5** Separate the oil pump rear cover, pressure pump housing, oil pump gears, and front cover.

*Oil pump (Mk. 7 only)*

**19.** It will probably be found most convenient to commence dismantling the pressure and dual scavenge pump (fig. 10) while it is still attached to the timing gear cover. The procedure is as follows:—

**OP. 1** Release the locking tab, then using spanner T2300-198 unscrew the relief valve plug from the oil pump rear cover, and remove the lock washer relief valve spring packing discs and the relief valve.

**Note . . .**

*Retain the packing discs to assist in*

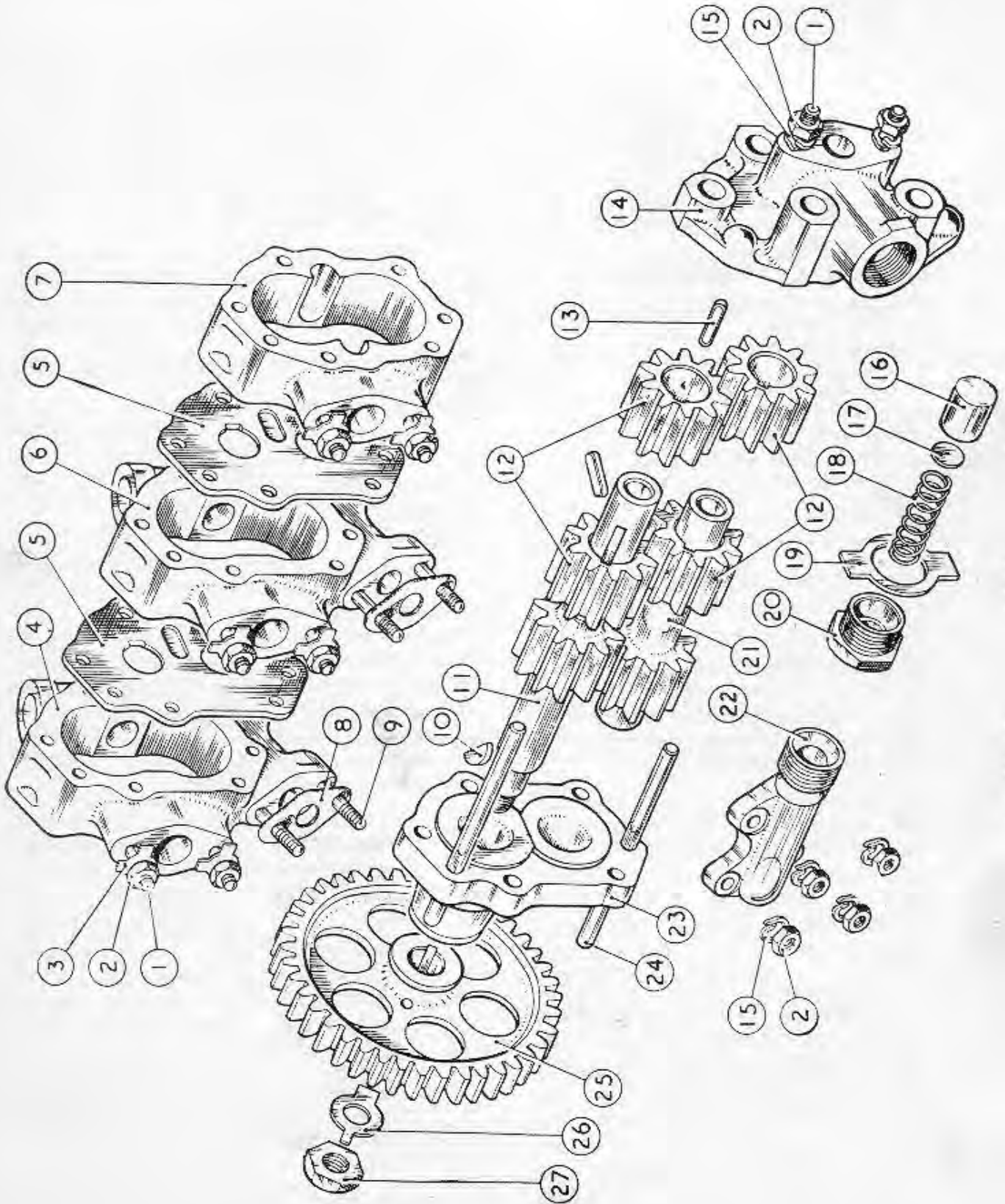


Fig. 10. Pressure and dual scavenge oil pump

## KEY TO FIG. 10

- 1 STUD
- 2 PLAIN NUT
- 3 LOCK WASHER
- 4 FRONT SUCTION PUMP HOUSING
- 5 DIVIDING PLATE
- 6 REAR SUCTION PUMP HOUSING
- 7 PRESSURE PUMP HOUSING
- 8 OUTLET JOINT
- 9 STUD
- 10 DRIVING GEAR KEY
- 11 DRIVER GEAR
- 12 AUXILIARY GEAR
- 13 AUXILIARY GEAR KEY
- 14 REAR COVER
- 15 SPRING WASHER
- 16 RELIEF VALVE
- 17 PACKING DISC FOR RELIEF VALVE ADJUSTMENT
- 18 RELIEF VALVE SPRING
- 19 LOCK WASHER
- 20 RELIEF VALVE PLUG
- 21 DRIVEN GEAR
- 22 OUTLET CONNECTION
- 23 FRONT COVER
- 24 DOWEL
- 25 DRIVING GEAR
- 26 LOCK WASHER
- 27 NUT

*obtaining the original setting of the relief valve when the engine is re-assembled.*

- OP. 2 Unscrew the four plain nuts which fasten the outlet connection to the side of the pump housing, and remove the spring washers, outlet connection and the two joint washers.
- 3 Release the locking tab, unscrew the driving gear nut, remove the lock washer, and draw off the gear with a standard three-claw extractor. Lift the key out of the keyway in the spindle.

**Note . . .**

*The oil pump cannot be removed from the timing gear cover until the oil pump driving gear has been taken off.*

- OP. 4 Release the locking tabs, and unscrew the five special cap nuts from the ends of the studs which secure the oil pump to the timing gear cover.
- 5 Remove the five lock washers, and gently tap the end of the oil pump gear spindle with a hide mallet until the oil pump is free to slide off the studs in the timing gear cover.

- OP. 6 Carefully tap the oil pump rear cover with a hide mallet to break the joint, and pull this cover off the two dowels which run right through the oil pump assembly.
- 7 Using lead or fibre clamps, gently grip the oil pump in a vice and using a suitable drift (a length of  $\frac{3}{8}$  in. silver-steel rod is quite suitable) carefully drive out the two dowels.
- 8 Remove the pressure pump housing, and then remove the first pair of auxiliary gears.
- 9 Align the key in the driver spindle with the keyway in the first dividing plate, and slide off the dividing plate and the rear suction pump housing.
- 10 Remove the second pair of auxiliary gears.
- 11 Ensure that the keys in the driver spindle are aligned with the keyway in the second dividing plate and remove the dividing plate, and the front suction pump housing.
- 12 Take the driver and the driven gear out of the front cover.

**Magneto drive**

**20.** The magneto drive, with the exception of the idler gear assembly which remained attached to the rear wall of the crankcase, was removed as part of the timing gear cover, and is dismantled as follows:—

- OP. 1 Extract the split pin, then remove the slotted nut and the distance piece from the centre of the star-board magneto coupling flange.
- 2 Remove the bolt from the centre of the port magneto coupling flange, and, using the extractor T86245 (Mk. 7), pull both coupling flanges out of the magneto driving shaft.
- 3 Remove the eight nuts and spring washers which secure the bearing housings and the oil retainers to the timing gear cover, and ease the two oil retainers off the studs.
- 4 Use a suitable drift, from either side of the timing gear cover, to drive out the magneto driving shaft complete with key, one of the ball

bearings, and oil baffle. One of the ball bearing housings will usually come out with the driving shaft.

- OP. 5 Using a suitable drift from the opposite side, drive out the second ball bearing and its housing.
- 6 Separate the ball bearing housing from the driving shaft and remove the key.
- 7 Lift the driven gear out of the timing gear cover.
- 8 Use a suitable extractor to remove the ball bearings from their housings.

#### *Crankcase breather connection*

21. The crankcase breather connection is removed as follows:—

- OP. 1 Remove the four plain nuts and spring washers which secure the breather connection to the timing gear cover.
- 2 Ease the connection off the studs and remove the joint washer, shield assembly, and the remaining joint washer.

#### *Blanking cover (Mk. 1 variants)*

22. The blanking cover, which is permanently fitted to the timing gear cover of Mk. 1 variants, is removed as follows:—

- OP. 1 Remove the four plain nuts and spring washers which secure the blanking cover to the starter facing on the timing gear cover.
- 2 Remove the blanking cover.

#### *Starter adapter (Mk. 7 only)*

23. The starter adapter, which is fitted to the timing gear cover of the Mk. 7, is removed as follows:—

- OP. 1 Remove the four plain nuts and spring washers which secure the starter adapter to the timing gear cover.
- 2 Remove the starter adapter.

#### *Crankshaft and connecting rods*

24. The connecting rods were removed from the engine attached to the crankshaft. It will be found most convenient to remove the connecting rods from the crankshaft if the latter is mounted in a suitable stand. Taking each connecting rod in turn, proceed as follows:—

- OP. 1 Extract the split pins and using spanner T1900-1A, remove the four

nuts and washers which secure the cap to the rod.

#### *Note . . .*

*During the next operation, it is important to support the connecting rod efficiently whilst the bolts are driven out. When assistance is available, one operator should press the rod firmly towards the crankpin whilst the second operator carefully drives out the bolts with a light hammer and suitable drift. When single-handed, swing the connecting rod round so that the small end can be supported against the body while the bolts are driven out towards the operator.*

- OP. 2 Using a light hammer and a suitable drift, drive the four bolts down as far as the joint between the cap and the rod.
- 3 Remove the cap, and if necessary, drive the bolts clear of the rod; do not lose the shim which is adjacent to each bolt head.
- 4 Remove the connecting rod.

#### *Note . . .*

*It is impossible to remove the connecting rod from the crankshaft while the oil seals are in position, unless it is held at a wide angle to the crank webs.*

- OP. 5 Loosely assemble the connecting rod, bearing, cap, bolts, shims, washers, and nuts, in their original positions to ensure that the detail parts are not interchanged between connecting rods or positions in their individual connecting rod.

25. Having removed the four connecting rods, the four crankpin oil seals, and the oil seals in No. 2 and 4 journals should each be removed as follows:—

- OP. 1 Extract the split pins, and unscrew the slotted nut.
- 2 Remove the bolt, two oil seals, the oil seal washers, the oil seal bolt washers, and the steel washer.

26. Complete dismantling of the crankshaft as follows:—

- OP. 1 Screw the extractor T2200-B6 into the tapped hole in the key, which locates the propeller boss, until the key has been forced out of the keyway in the tapered front end of the crankshaft.



- OP. 2 Release the locking tab, hold the crankshaft stationary and unscrew the thrust bearing lock nut with the spanner T1300-51, or T86381 where Mod. 2094 is embodied. Slide the lock nut and the tab washer off the front end of the crankshaft.
- 3 Assemble the split ring of the extractor T1300-93 (fig. 11) behind the thrust bearing and push the counter-bored portion forward over the thrust bearing.
- 4 Draw the thrust bearing off the crankshaft by screwing in the extractor screw.
- 5 *Mk. 7 only.* Extract the split pins, unscrew the six slotted nuts and remove the bolts which secure the starter dog, or extension shaft, to the flange at the rear of the crankshaft gear. Pull off the starter dog.
- 6 Extract the split pin, unscrew the slotted nut which secures the clamp washer to No. 5 journal, and remove the clamp washer and the bolt.
- 7 Manoeuvre the gear extractor T1300-94 into position and clamp it to the rearmost crankweb, as indicated in fig. 12.
- 8 Screw in the extractor bolt until the gear is forced out of the crankshaft.

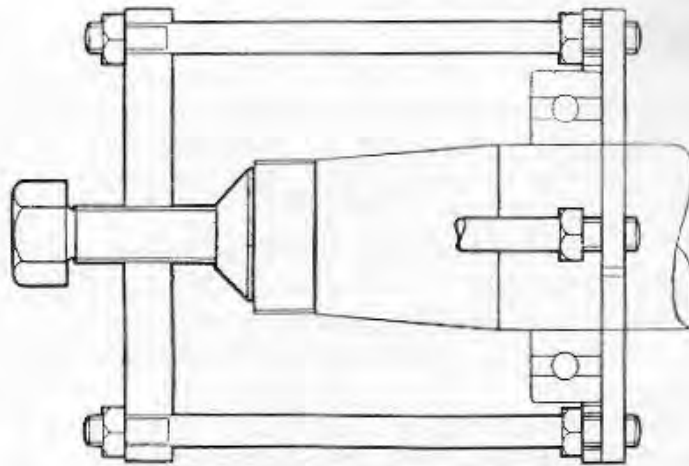


Fig. 11. Withdrawing thrust bearings from crankshaft using extractor T1300-93

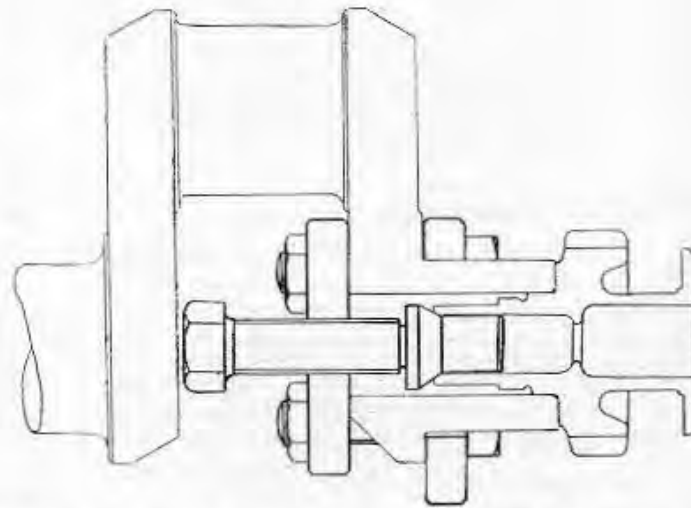


Fig. 12. Withdrawing gear from crankshaft using extractor T1300-94

#### Idler gear

27. If it is required to separate the magneto driving gear from the idler gear, extract the split pins, remove the four slotted nuts, distance pieces and bolts.

#### LIST OF TOOLS

28. The following tools are available in the Dismantling and Assembling Tool Kit:—

<i>Tool No.</i>	<i>Description</i>
T2500-37/2	Spanner, jaw
T1900-490	Spanner, box for valve rocker bracket bolts
T2300-198	Spanner, oil pressure relief valve plug
T1900-1A	Spanner, connecting rod bolt nuts
T2200-B6	Extractor for crankshaft key
T1300-51	Spanner, slotted ring, for crankshaft lock nut (Pre-mod. 2094)
T1300-93	Extractor, thrust bearing
T1300-94	Extractor, crankshaft gear-wheel
T85011	Valve spring compressor
T85010	Wooden block
T86245	Extractor, magneto coupling flange (Mk. 7)
T86381	Spanner, crankshaft front nut (Mod. 2094)