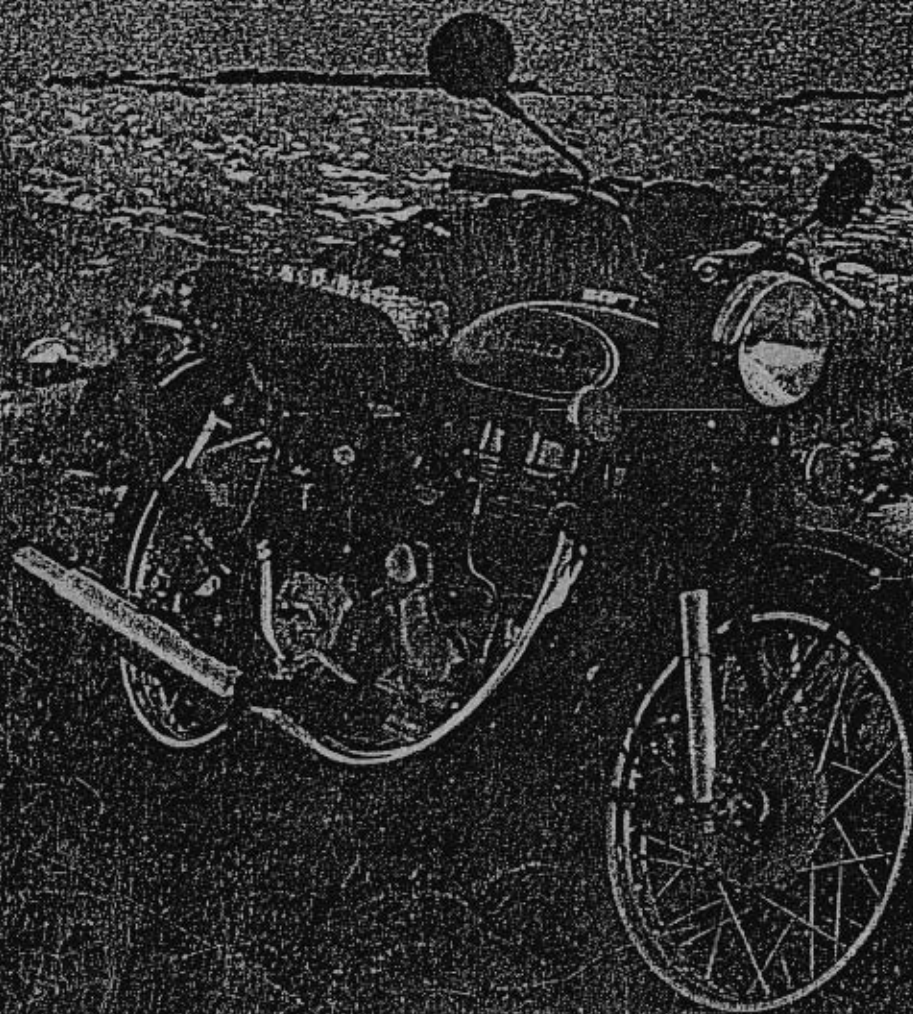


A2

# WORK SHOP MANUAL

## BULLET



## ENFIELD

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**PREFACE**

We take pleasure in releasing this Maintenance Manual as a guide to good service. Most of the servicing can well be done by the average owner. Numerous diagrammatic Sketches and photo illustrations have been introduced for better understanding. However for an owner who feels uncertain of his ability to, undertake any stripping and re-building for a major overhaul, we strongly recommend that the work be done by an authorised 'ENFIELD DEALER/DISTRIBUTOR. Needless to mention that the use of proper service maintenance tools and genuine Enfield spares will ensure best results.

Whilst every care is taken to ensure that the information in this manual is correct, no liability can be accepted by Royal Enfield or the publisher for loss, damage or injury caused due to errors or omissions in the informations given.

**PRECAUTIONS AND GENERAL INSTRUCTIONS**

- Observe the following points without fail, when dismantling and reassembling Motor-cycle parts.
- Be sure to replace packings, gaskets, circlips, 'O' rings and cotter pins with new ones, for 'safe riding'.
- Tighten bolts & nuts starting from the larger diameter ones to the smaller diameter and from inside to outside diagonally, with specified tightening torque.
- Use always genuine spares and recommended grade of oils only.
- When using a torque wrench for checking, always loosen the bolt or nut by half turn and then tighten to the specified torque. Never use torque wrench for loosening a bolt or nut.

**BUYING SPARE PARTS**

When ordering spare parts for your Motorcycle it is advisable to deal direct with the Enfield official dealer/distributor, who should be able to supply most of the parts ex-stock.

Always quote the Engine Number and Frame Number and description of part required. It is advisable to indicate the colour scheme especially while ordering parts for frame, side panels, tank, mudguards, etc.,

**USE ALWAYS GENUINE 'ENFIELD' SPARES**

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## **ROUTINE MAINTENANCE**

### **Introduction**

Periodic routine maintenance is a continuous process that commences immediately after the machine is used. It must be carried out at specified mileage recordings, or on a calendar basis if the machine is not used frequently.

Maintenance should be regarded as an insurance policy, to keep the machine in peak condition and to ensure long, trouble free service.

The various maintenance tasks are described under their respective mileage and period. The intervals between the various maintenance tasks serve only as a guide. As the machine gets older or is used under particularly adverse conditions, it would be advisable to reduce the period between each check.

For ease of reference each service operation is described in detail under the relevant heading. In order to carry out the routine maintenance tasks, a good selection of general workshop tools is absolutely essential.

Included in the kit must be a range of metric ring or combination spanners, a selection of Phillips head screw drivers and pair of circlip pliers.

No special tools are required for the normal routine maintenance tasks. The tools contained in the tool kit supplied with every new machine will prove adequate for each task, or if they are not available, the tools found in the average household will usually suffice.

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## **Daily**

A daily check of the Motorcycle is essential both from mechanical and safety aspects. It is a good idea to develop this checking procedure in a specific sequence so that it will ultimately become as instinctive as actually riding the machine. Done properly, this simple checking sequence will give advanced warning of impending mechanical failures and conditions which may jeopardize the safety of the rider.

- Clean the motorcycle with a clean cloth.
- Check engine oil level, using the dipstick provided in the oil tank cap. Maintain oil level upto 'H' mark. If necessary top up oil to the required level.
- Check proper operations of all controls viz. clutch, accelerator, brakes, all lights and horns.
- Check tyre pressure, with a pressure gauge. Check tyre pressure when the tyres are cold. It is worth purchasing a small pocket pressure gauge which can be relied upon, to give consistent readings than garage forecourt gauges which tend to be less dependable.
- Tyre Pressure Front: 32 PSI - Rear: 36 PSI.
- Check tyres for foreign materials and remove them to prevent possible punctures.
- Check for adequate fuel in the petrol tank, for the journey planned.
- Check for proper charging of the battery after starting the machine.

## **Monthly - 300 Miles/500 Kms**

- Check oil levels - engine & clutch
- Check contact breaker gap and adjust if necessary
- Check and adjust tappet clearance if necessary
- Check clutch, throttle and front brake cables and adjust if excessive play noticed
- Lubricate rear chain
- Adjust front & rear brakes
- Check wheel rims, for excessive runout, breakage of spokes and tyres for cracks or cuts.
- Check condition of battery and electrolyte level, and top up with distilled water upto the level provided.

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### **Tri monthly - 3000 miles/5000 kms**

- Clean, and adjust plug gap or replace spark plug.
- Check and service contact breaker points.
- Check and adjust Ignition timing.
- Check and adjust valve tappet clearance.
- Clean airfilter.
- Clean, tune up carburettor.
- Clean fuel tap gauze.
- Clean fuel tank and fuel lines.
- Check and adjust clutch.
- Adjust front & rear brakes
- Check front fork oil level.
- Check all electrical connections and functions of head light, trafficator, horn, speedometer, etc.

### **Six monthly - 6000 Miles/10,000 kms**

**Carry out all the operations mentioned for Tri monthly service and check the following:**

- Change oil-engine & clutch.
- Clean or replace oil filter
- Change front fork oil
- Check front & rear brake linings and replace if necessary
- Check for play in steering head bearings and adjust
- Check operation of steering lock and lubricate if necessary
- Check operation of side stand and condition of spring.

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## TECHNICAL SPECIFICATIONS - BULLET - 350 CC

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### Engine

#### Single Cylinder 4 Stroke with Overhead Valve

Cubic Capacity	: 346 c c
Stroke	: 90 mm.
Bore-Nominal	: 70 mm
Actual	: 69.875 mm/2.751 in.
Compression Ratio	: 7.25 : 1
Compression Pressure	: 110 ± 5 PSI (recommended)
Engine output	: 18 BHP / 5625 RPM
Torque	: 2.74 kgm/2875 RPM

#### Piston and piston rings:

Ring clearance in grooves	: [Dimensions for new components]
Plain (2)	: .001/.003"
Scraper	: .002/.004"
Ring end gap in bore	: .015/.020"
Maximum ring gap permissible	: 0.030"
Gudgeon pin diameter	: .7498/.7500"
Crank pin diameter	: 1.24875/1.249"
Connecting rod small end diameter	: .7505/.7507"

#### Crankshaft:

Driving side Ball bearing	: 25 x 62 x 17 mm (6305)
Roller bearing	: 25 x 62 x 17 mm (NU 305 or N 305)
Timing side Roller bearing	: 25 x 52 x 15 mm (NU205 or N 205R)
Cam lift	: .3125 in.
Valve lift	: .3125 in.

#### Valve timing with .012" clearance

Exhaust opens	: 75° BTDC
Exhaust closes	: 35° ATDC
Inlet opens	: 30° BTDC
Inlet closes	: 60° ATDC
Rocker bearing inside diameter	: .625/.626" (Dimensions for new Components)
Rocker spindle diameter	: .6235/.624"
Inlet valve stem diameter	: .3425/.3430"
Exhaust valve stem diameter	: .3405/.3410"
Valve guide internal diameter	: .3437/.3447"
Valve guide external diameter	: .6270/.6275"
Tappet guide internal diameter	: .3752/.3760"
Tappet guide external diameter	: .7505/.7510"

**Lubrication** : Dry sump, Oil tank integral with crank case

**Clutch** : Wet multiplate, Oil immersed

Engine sprocket : 25 teeth

Clutch Sprocket : 56 teeth

Primary drive chain : 3/8" pitch Duplex chain.

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**Gear Box:**

Overall gear ratios	: 5.32, 7.26, 9.80, & 14.80
Mainshaft ball bearings	: Small - 6303
	: Large - 6206
Final drive sprocket	: 16 teeth
Rear drive chain	: 5/8" pitch chain
Brake drum sprocket	: 38 teeth
<b>Carburettor</b>	: Mikcarb-VM-24
Main jet	: 90
Pilot jet	: 25

**Contact Breaker (Coil ignition):**

Points gap	: 0.14/0.16" (0.35 to 0.4 mm)
Timing before T.D.C.	: 1/32" (0.8 mm)
Spark plug	: 14 mm. diameter B7HS (NGK) or equivalent
Spark plug gap	: 0.46 to 0.50 mm
Condenser (Capacitor)	: 0.18 to 0.25 M.F.D.

**Suspension:**

Front	: Telescopic, hydraulic damping
Stroke	: 155 mm
Rear	: Pivoted fork with shock absorbers

**Wheel Rim Type**

Tyre Size	: WM 2- 19
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**Wheel Bearings :**

(Front & Rear)	: 3.50 x 19 (Front)
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**Brakes**

	: 3.50 x 19 (Rear)
	: 17 x 40 x 12 mm (6203) or 6203 ZZ
Front	: Mechanical, internally expanding shoe type
Rear	: 178 mm x 38 mm Twin Leading shoes

**Fuel tank:**

Full Tank Capacity	: 153 mm x 25 mm Single Leading Shoe
Reserve Capacity	: 14.5 litres

**Oil Capacity & Grade:**

Oil Tank	: 2.25 litres, SAE 20 W 50
Fork	: 200 ml. on each leg. Hydraulic oil or SAE-10 W 30
Clutch	: 420 ml. approximately SAE20 W 40
Gear box	: 700 grams of veedol '00' grease (for topping up use SAE-20 W 50)

**Dimensions:**

Weight (Dry)	: 163Kg.
Pay load (Max)	: 172Kg.
Ground clearance	: 14 cm. (140 mm)
Overall length	: 212 cm (2120 mm)
Overall width	: 75 cm (750 mm)
Saddle Height	: 85 cm. (850 mm)
Wheel base	: 137 cm (1370 mm)

**Electricals:**

System	: 12 V DC
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## TECHNICAL SPECIFICATIONS - BULLET - 500 CC

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### Engine

#### Single Cylinder 4 Stroke with overhead Valve

Cubic Capacity	: 499 CC
Stroke	: 90 mm
Bore-Nominal	: 84 mm
Actual	: 83.96/83.97 mm
Compression Ratio	: 6.5:1
Compression Pressure	: 110 ± 5 PSI (Recommended)
Engine output	: 22 BHP/5400 RPM
Torque	: 3.5 Kgm/3000 RPM

#### Piston and piston rings :

Ring clearance in grooves	: (Dimensions for new components)
Plain(2)	: .001/.003"
Scraper	: .002/.004"
Ring end gap in bore	: .015/.020"
Maximum ring gap permissible	: 0.039"
Gudgeon pin diameter	: .7498/.7500"
Crank pin diameter	: 1.24875/1.249"
Connecting rod small end diameter	: .7505/.7507"

#### Crankshaft :

Driving side Ball bearing	: 25 x 62 x 17 mm (6305)
Roller bearing	: 25 x 62 x 17 mm (NU 305 or N 305)
Timing side Roller bearing	: 25 x 52 x 15 mm (NU 205 or N 205R)
Cam lift	: .3125 in
Valve lift	: .3125 in.

#### Valve timing with .012" clearance

Exhaust opens	: 75° BTDC
Exhaust closes	: 35° ATDC
Inlet opens	: 30° BTDC
Inlet closes	: 60° ATDC
Rocker bearing inside diameter	: .625/.626" (Dimensions for new Components)
Rocker spindle diameter	: .6235/.6240"
Inlet valve stem diameter	: .3425/.3430"
Exhaust valve stem diameter	: .3405/.3410"
Valve guide internal diameter	: .3437/.3447"
Valve guide external diameter	: .6270/.6275"
Tappet guide internal diameter	: .3752/.3760"
Tappet guide external diameter	: .7505/.7510"

**Lubrication** : Dry sump, Oil tank integral with crank case

**Clutch** : Wet multiplate, Oil immersed

Engine sprocket : 25 teeth

Clutch : 56 teeth

Primary drive chain : 3/8" pitch Duplex chain.

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**Gear box :**

Overall gear ratios	: 5.01, 6.83, 9.22 & 13.93
Overall gear ratios	: Small - 6303
	: Large - 6206
Final drive chain	: 17 teeth
Rear drive chain	: 5/8" pitch chain
Carburettor	: Mikcarb-VM-28
Mainjet	: 110
Pilot jet	: 25

**Contact Breaker (Coll ignition) :**

Points gap	: 0.14/0.16" (0.35 to 0.4 mm)
Timing before T.D.C	: 1/32" (0.8 mm)
Spark plug	: NGK BR 8 ES or equivalent
Spark plug gap	: 0.46 to 0.50 mm
Condenser (Capacitor)	: 0.18 to 0.25 M.F.D

**Suspension :**

Front	: Telescopic, Hydraulic damping
Stroke	: 155 mm
Rear	: Pivoted fork with shock absorbers

**Wheel Rim Type**

Tyre size	: WM 2- 19
	: 3.25 x 19 (Front)
	: 3.50 x 19 (Rear)

**Wheel Bearings :**

(Front & Rear)	: 17 x 40 x 12 mm (6203) or 6203 ZZ
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**Brakes**

	: Mechanical, internally expanding shoe type
Front	: 178 mm x 38 mm Twin leading shoes
Rear	: 153 mm x 25 mm Single leading shoe

**Fuel tank :**

Full Tank Capacity	: 14.5 litres
Reserve capacity	: 1.25 litres

**Oil Capacity & grade :**

Oil tank	: 2.25 litres, SAE-20W50
Fork	: 200 ml. on each leg. Hydraulic Oil or SAE 10W30
Clutch	: 420 ml. approximately SAE-20W40
Gear Box	: 700 grams of veedol '00' grease (for topping up use SAE 20W50)

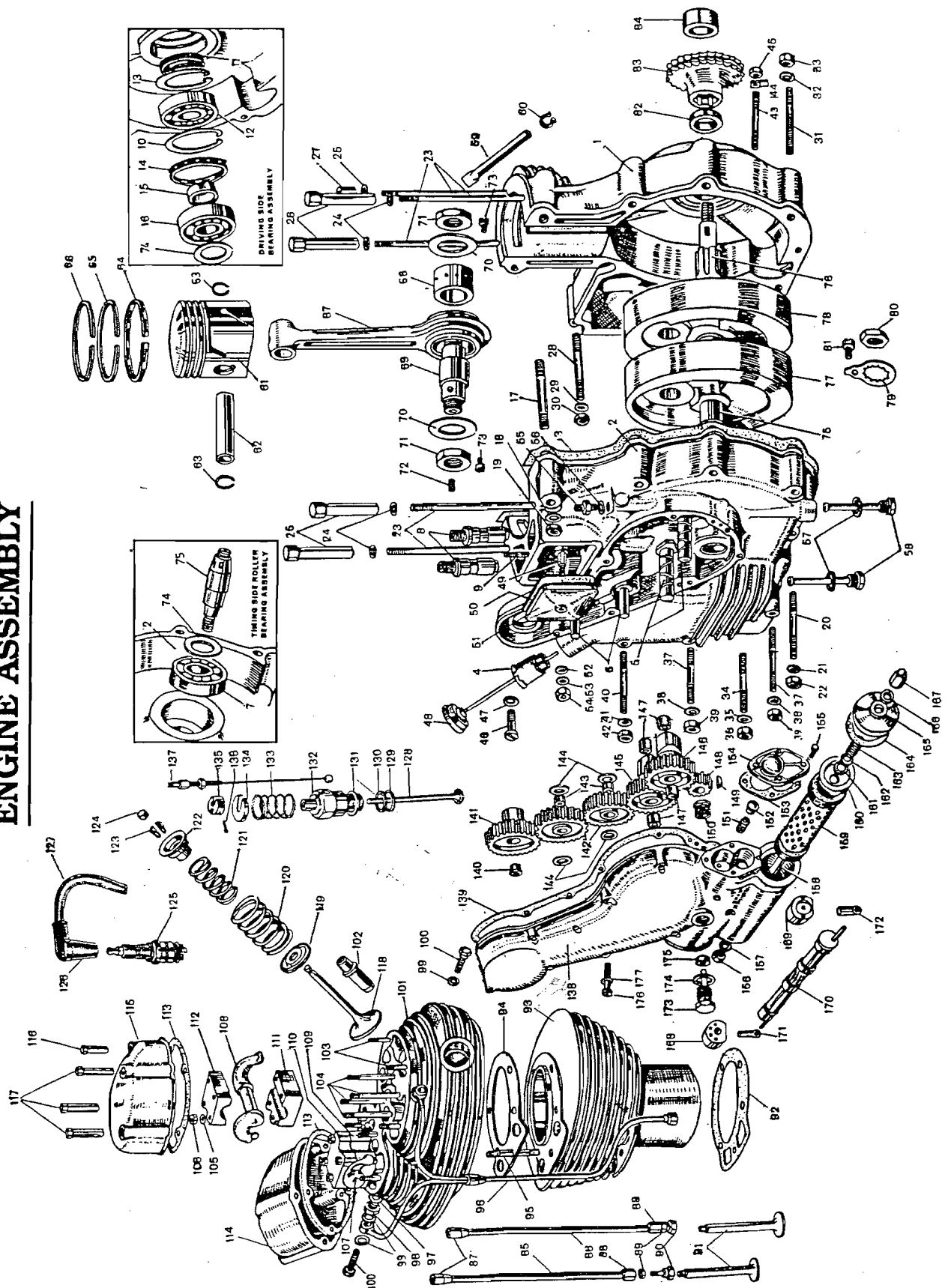
**Dimensions :**

Weight (Dry)	: 168 Kg.
Pay load (Max)	: 172 Kg.
Ground clearance	: 14 cm (140 mm)
Overall length	: 212 cm (2120 mm)
Overall width	: 75 cm (750 mm)
Saddle Height	: 85 cm (850 mm)
Wheel base	: 137 cm (1370 mm)

**Electricals :**

System	: 12V DC
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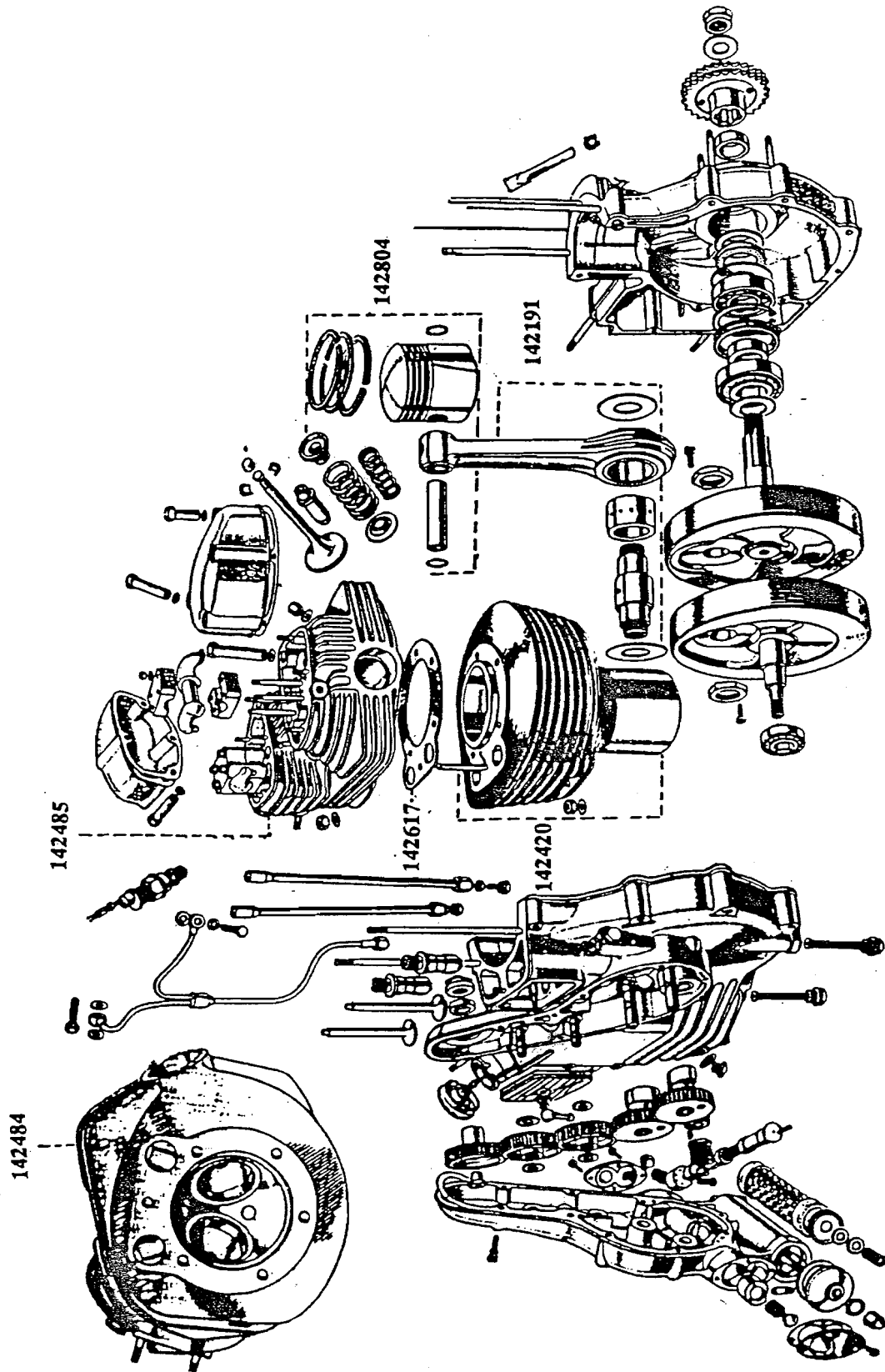
# ENGINE ASSEMBLY



## ENGINE PARTS

1. Crankcase D/S	28. Crank Case Stud, below Distributor	56. Washer, Oil Pipe Union
2. Crankcase T/S	29. Washer, below Distributor	57. Washer Oil filter Gause
3. Joint washer	30. Nut, below distributor	58. Oil feed & return filters
4. Oil filler cap collar	31. Stud-Front engine plates	59. Breather pipe
5. Cam spindle	32. Washer, Front Engine plate	60. Breather pipe clip
6. Idler pinton spindle	33. Nut, Front Engine Plate	61. Piston
7. Timing shaft roller bearing	34. Read engine plates	62. Gudgeon lpin
8. Tappet gulde	35. Washer, Rear Engine Plate	63. Circlip
9. Cylinder base stud	36. Nut, Rear Engine Plate	64. Piston ring (scraper)
10. Circlip (Seegar)	37. Stud, Crank Case Rear Joint	65. Piston ring (compression) lower taper
11. Oil seal	38. Washer, Crank Case Rear Joint	66. Piston ring (compression) top, chrome
12. Ball bearing	39. Nut, Crank Case Rear Joint	67. Connecting rod
13. Circlip (Seegar)	40. Stud, Crank Case Rear Joint	68. Connecting rod floating bush
14. Distance tube (outer)	41. Washer, Crank Case Rear Joint	69. Crank pin
15. Distance tube (inner)	42. Nut, Crank Case Rear Joint	70. Thrust washer
16. Roller bearing	43. Stud-Chaincase attachment	71. Crank pin nut
17. Stud, Crank Case Neck	44. Oil Seal Retainer	72. Crank pin oil hole grub screw
18. Washer, Crank Case Neck Stud	45. Nut, Oil Seal Retainer	73. Crank pin nut keeper screw
19. Nut, Crank Case Neck Stud	46. Distributor flange pin	74. Thrust washer
20. Stud, Crank Case Bottom Joint	47. Distributor flange pin Washer	75. Timing shaft
21. Washer, Crank Case Bottom Joint	48. Oil filler cap	76. Driving shaft
22. Nut, Crank Case Bottom Joint	49. Tappet cover stud	77. Fly wheel T/S
23. Head & Cylinder stud	50. Washer, Tappet Cover Stud	78. Fly wheel D/S
24. Washer, Head and Cylinder Stud	51. Tappet Cover	79. Lock ring
25. Washer, Head and Cylinder Stud	52. Washer (Fibre), Tappet Cover Stud	80. T/S shaft nut
26. Nut, Head and Cylinder Stud	53. Washer (Steel), Tappet Cover Stud	81. Lock ring screw
27. Nut, Head and Cylinder Stud	54. Tappet cover nut	82. Engne sprocket distance tube
	55. Oil pipe union	83. Engine sprocket 25T
		84. Alternator distance tube

# **BELLET 500 CC ENGINE ASSEMBLY**



FOR THE PART NOS. SHOWN IN THE FIG. PLEASE REFER PARTS LIST.

85. Push rod inlet	117. Nut (long) Rocker Box	148. Timing pinion 20T
86. Push rod, exhaust	118. Valve	149. Key
87. Push rod end, top	119. Valve spring collar, bottom	150. Oil pump worm
88. Push rod end, bottom	120. Valve spring, outer	151. Oil pump disc spring
89. Push rod cup lock nut	121. Valve spring, inner	152. Spring end pad
90. Push rod cup	122. Valve spring collar, top	153. Gasket Oil Pump Cover
91. Tappet	123. Valve split collar	154. Oil pump cover
92. Cylinder barrel joint washer	124. Valve stem cap	155. Oil pump cover screw
93. Cylinder barrel	125. Spark plug	156. Nut, Oil Cleaner Stud
94. Cylinder head joint washer	126. Spark plug cap	157. Washer, Oil Cleaner Stud
95. Stud, Cylinder Base	127. H.T. Lead	158. Stud, Oil Cleaner
96. Rocker oil pipe complete	128. Decompressor valve	159. Oil cleaner element
97. Rocker Oil Union Bush Washer	129. Washer, Decompressor body	160. Oil cleaner spring cap
98. Oil union bush	130. Washer, Decompressor body	161. Felt washer
99. Washer Oil Pipe banjo Union	131. Washer (Plain), Decompressor body	162. Thrust washer
100. Oil pipe banjo	132. Decompressor body	163. Oil cleaner spring
101. Cylinder head	133. Spring, Decompressor	164. Washer, Oil Cleaner Cap
102. Valve guide	134. Spring Cap, Decompressor	165. Oil cleaner cap
103. Stud, Rocker Box	135. Cable block	166. Washer, Oil Cleaner Cap Nut
104. Stud, Rocker Bearing	136. Cable block split pin	167. Nut, Oil Cleaner Cap
105. Washer, Rocker Bearing	137. Decompressor cable assembly	168. Oil pump disc (feed)
106. Nut, Rocker Bearing	138. Timing cover	169. Oil pump disc (return)
107. Rocker, inlet	139. Timing cover joint washer	170. Oil pump spindle
108. Rocker, exhaust	140. Distributor pinion nut	171. Plunger (feed)
109. Rocker bearing inlet	141. Distributor pinion 40T	172. Plunger (return)
110. Rocker bearing cap, inlet	142. Idler pinion 40T	173. Oil feed plug
111. Rocker bearing, exhaust	143. Idler pinion bush	174. Washer
112. Rocker bearing cap, exhaust	144. Idler pinion thrust washer	175. Cork oil retainer
113. Gasket	145. Cam, inlet	176. Timing cover screw
114. Rocker box, inlet	146. Cam, exhaust	177. Spring Washer, Timing Cover Screw
115. Rocker box, exhaust	147. Cam bush	
116. Nut (short) Rocker Box		

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# ENGINE

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## Decarbonising:

After a few thousands of Kms. of run the carbon build up in the engine will cause general falling off in power, accompanied by increased fuel consumption and starting trouble. Decarbonising will normally be necessary approximately every 8,000 Kms. and this can be carried out without removing the engine from the frame. The mileage between decarbonising will vary from machine to machine depending upon the type of usage. A machine used for frequent short journeys will need more attention than one which is used for fast long distance touring.

### 1. Removal of the petrol tank

Close the petrol tap. Disconnect the fuel hose from petrol tap end.

Remove the two studs which holds the petrol tank to the frame and pull the tank upwards.

### 2. Removal of the Cylinder head

Remove the engine steady eye bolt.

Disconnect the high tension lead from the spark plug. Remove rocker oil pipe.

Remove the exhaust pipe and silencer.

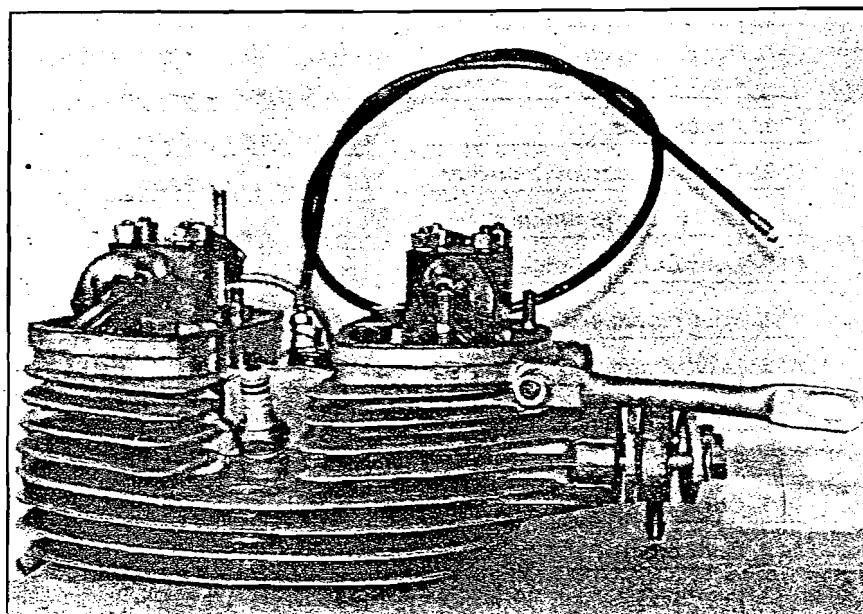
Remove the air filter by undoing the bolts on the sides of the air filter body.

Push the carburettor back clear of the studs after removing the fixing nuts.

Remove the rocker box covers.

Remove the decompressor cable from the lever end of the handle bar (LH side)

Crank the engine until both valves are closed. (Keep in Compression stroke).



CYLINDER HEAD

Remove the rocker arms and bearings completely after removing the four 3/16" nuts on each.

Lift out the push rods both inlet & exhaust.

Remove the six cylinder head nuts & washers.

Lift the cylinder head off the barrel, tapping it gently beneath the exhaust and inlet ports with a wooden mallet. Do Not tap the fins.

### 3. Removal of Cylinder and Piston

Slacken the two clamp nuts on top of the crank-case neck.

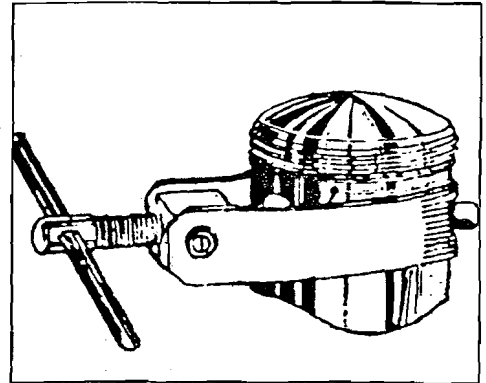
Remove the 1/4" nut above the tappet chest and lift the barrel

Remove the circlip retaining the gudgeon pin on the timing side of piston taking care not to drop the circlip into the crank case.

Extract the gudgeon pin using special Tool PED 2015 (with adaptor if necessary), so that the pin and the piston may be replaced the same way round, i.e., split skirt to the front.

During this operation put a piece of clean rag in the top of the crankcase to prevent foreign matter getting in. Finally cover the crankcase with a clean cloth to prevent ingress of dust and dirt.

REMOVAL OF PISTON



### 4. Removal of Valves

VALVE SPRING COMPRESSOR



To remove the valves from the cylinder head, first lift off the end caps from the valve stems. If this has stuck, it can be removed by a screw driver. Using compressing tool PED 2018 ST compress the valve springs and remove the split collars from the valve tip. Slacken back the compressing tools and release the springs.

Withdraw the valve and place its springs, top spring collar, bottom collar, the end cap and split conical collars together in order that they may be reassembled with the valve from which they were removed.

If the valve will not slide easily through the valve guide, remove any slight burrs on the end of the valve stem with a carborundum stone or by using a fine Jeweller's file to remove any sharp edge or burr. If the burrs are not removed and the valve is forced out, the valve guide may be damaged.

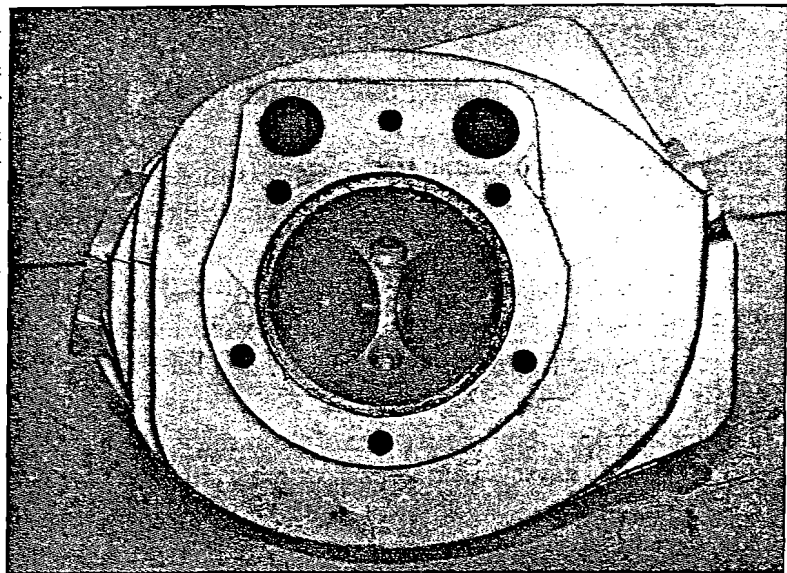


## 5. Decarbonising the Cylinder head - Combustion Chamber

Remove carbon from the valves, ports and combustion chamber by scrapping. Take care not to cause any damage to the valve faces or valve seat inserts. Scrape gently to avoid scoring the cylinder head.

DO NOT, under any circumstance, use caustic soda or potash for the removal of carbon from aluminium alloy.

Remove the piston rings carefully. For cleaning the grooves in the piston, a piece of broken piston ring thrust into a wooden handle and filed to a chisel point can be used.



CYLINDER HEAD

## 6. Piston and Rings

If the piston rings are in good condition they can be put back, taking care to fit them in their original grooves and the same way up. If the rings show brown or black patches or if their gaps, are more than specified service limits (Page 79), when in position in the barrel, new rings should be fitted. The correct gap for new rings is given in the technical specifications (pages 6 & 8 ) for 350 and 500cc. The gap should be measured in the least worn part of the cylinder which will be found at the top or bottom of the bore.

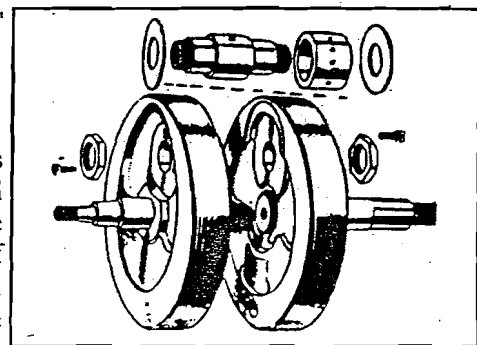
### Only For 350cc:

The original size of the cylinder bore is 2.751" (69.875mm). If the wear at any point in the bore exceeds .008" the cylinder should be rebored to .020" and an oversize piston fitted. (It should be rebored to .040" after a further .008" wear). Piston sizes available are .020" and .040" oversize.

The original side clearance between the piston rings and grooves is .003". If the grooves show a wear of .005" the piston should be replaced.

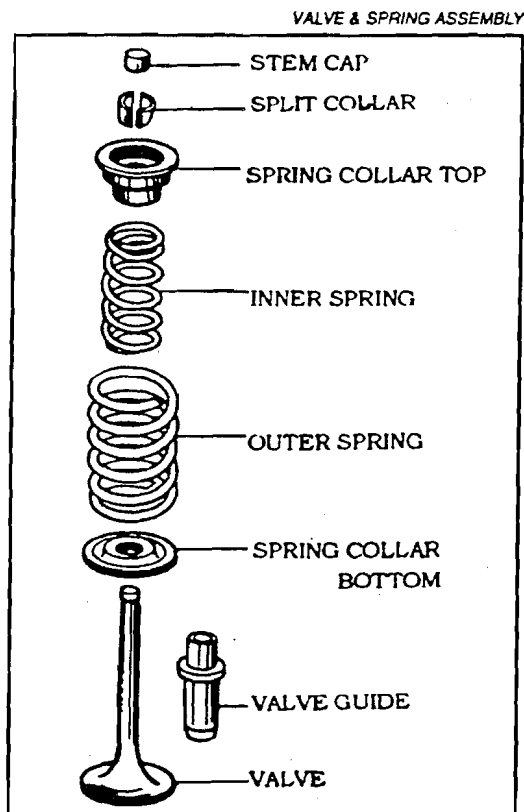
## 7. Big end bearing inspection

Examine the condition of the big end while the piston is removed. About .010" - .020" end float is permissible and it will be possible to rock the connecting rod slightly. The big end has a floating bush with an original clearance of approximately .003" However, if a DEFINITE up and down play can be felt, engine should be stripped further to have the big end renewed.



CRANKSHAFT BIG END BEARING

## 8. Valves, Valve Guides and springs



Wear on the valve stems can be seen on examination and if a definite step has formed, the valves should be renewed. Before replacing the valves, they must be ground on to their seats, if good faces are not formed with a reasonable amount of grinding, the seats must be cut with a cutter (included angle 90°) and the valve refaced in a universal grinder. Do not attempt to form good seats by an excessive amount of grinding. This will cause pocketing and restrict the flow of gases. If a pocket has already been formed this must be removed by cutting with a valve seat cutter larger in diameter than the valve head.

Test the valve guides for wear by trying the fit of a new valve in them. Both valves should be quite free, but the exhaust valve has more clearance (.002") than inlet valve.

To remove the valve guides from the head, two special tools are required which can be easily made. The first is a piece of tube with an internal bore of not less than 7/8". The second is a mandrel about 4" long made from 9/16" diameter bar with the end turned down to 1/3" diameter for a length of 1/2".

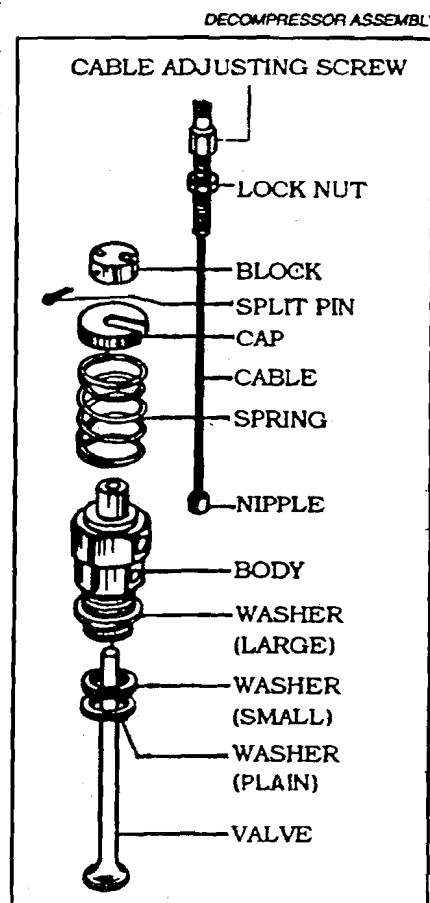
Support the cylinder head on the tube which fits over the collar of the valve guide. Using the mandrel, force the guide out of the head with a hand press or by using a hammer.

To fit a new guide, support the head at the correct angle and use a hand press and the same mandrel. If a hand press is not available, the guide can be replaced using a hammer and a mandrel, to prevent damage to the guide.

Check the length of the valve springs which are originally 2.020" and 2.095" for the inner and outer springs respectively. If these have reached the specified service limits, they should be renewed.

## 9. Decompressor

If the decompressor holds compression and operates freely, there is no need to interfere with it except to remove the carbon from the head of the valve. If the valve is leaking, it will be necessary to regrind it on its seat. This can be done without completely dismantling it. Having disconnected the control cable from the handle bar, unscrew the decompressor from the cylinder head. Compress the spring and remove the spring cap. Unscrew the adjusting screw and locknut from the cable block and pull the cable sideways out of the block. Push the spring.



upwards and pull the cable nipple out of the body. It will now be possible to remove the cable and nipple through the spring, leaving the decompressor body and spring detached from the control cable.

The spring and the cap should now be replaced. The valve may be ground in by applying a thin coating of grinding paste on the seat of the valve and twisting it to and fro by means of the cable block at its upper end and occasionally lifting the valve from its seat. Do not rotate the valve through a complete revolution before lifting, as this will groove the seat. After grinding, wash the whole assembly thoroughly in petrol, opening and shutting the valve while doing so. Make sure that all traces of grinding paste have been removed. If the paste should get into the cylinder serious damage would be caused.

If the valve shows a tendency to stick-up in the body but otherwise is satisfactory, this can be cured by washing in petrol, though in this case it will not be necessary to disconnect the control cable.

If the decompressor valve is badly burnt or bent it must be replaced.

## 10. Re-assembly after Decarbonising

Before building up the engine, see that all parts are scrupulously clean and place them on a clean tray, work bench or over a clean sheet of paper. While re-assembling it is advisable to fit a new gasket between the cylinder barrel and the crankcase.

Smear clean oil over the piston and space the ring gaps. The second ring is a taper ring and is marked TOP on the upper surface.

**WARNING:** This mark should be on top when fitted. Reversing the ring will result in pumping of oil into the cylinder and consequent smoking.

Place the piston over the connecting rod small end ensuring the split skirt is facing the front and insert the gudgeon pin. Secure the gudgeon pin with the circlips. Oil the cylinder bore and gently push barrel over the piston while keeping the rings compressed in their grooves and seat it gently on the barrel gasket. Refit the 1/4" nut above the timing chest.

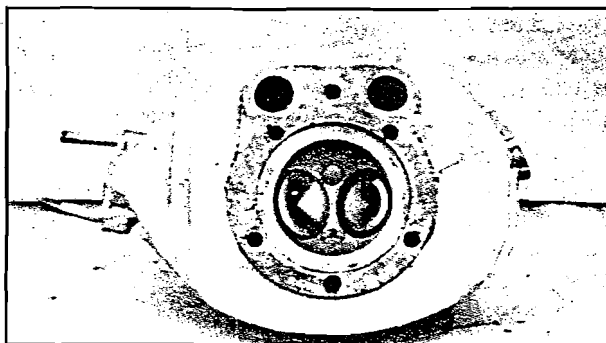
When fitting the head again, apply jointing compound sparingly on both sides of the gasket. Replace the six nuts and tighten them progressively and diagonally from one side to the other to prevent distortion.

**WARNING:** Excess compound may block oilways.

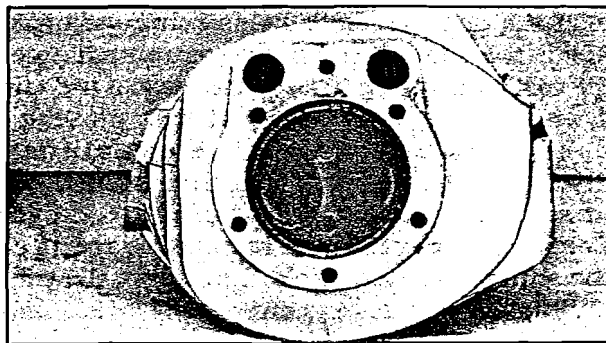
Place the push rods with the adjustable parts downwards. The shorter pushrod is the Inlet. Ensure valve stem caps are fixed on the valve stems. Position the rockers and bearings, making sure that the oil feed holes are at the bottom and that the caps and bases are in line when tightened down. Adjust the push rods after ensuring piston is in 'TDC' on compression stroke. The silencer could be cleaned of carbon using a hot caustic soda solution, if necessary.

**NOTE:** The cylinder head and base nuts should be checked again for tightness, after the engine has been run long enough to get it thoroughly warm. Tighten the clamp nuts on crankcase finally. For torque tightening or cy. head nuts please refer torque chart on PageNo. 100

CYLINDER HEAD 350CC



CYLINDER HEAD 500 CC



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## SERVICE OPERATION -

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### WITH ENGINE ON FRAME

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#### 1. Removal of the Timing cover

First place a <sup>Naure</sup> tray under the engine to hold the oil which will escape when the cover is removed.

Remove the exhaust pipe and silencer. Remove ten screws from the timing cover, taking care not to lose the sealing washers, one for each screw.

**NOTE:** When removing or refitting the timing cover it is important that the engine is gently cranked. This will prevent damage of the pump worm or the pump spindle.

Draw off the timing cover, <sup>Werkzeug</sup> tapping it lightly if necessary with a wooden <sup>Holzhammer</sup> mallet.

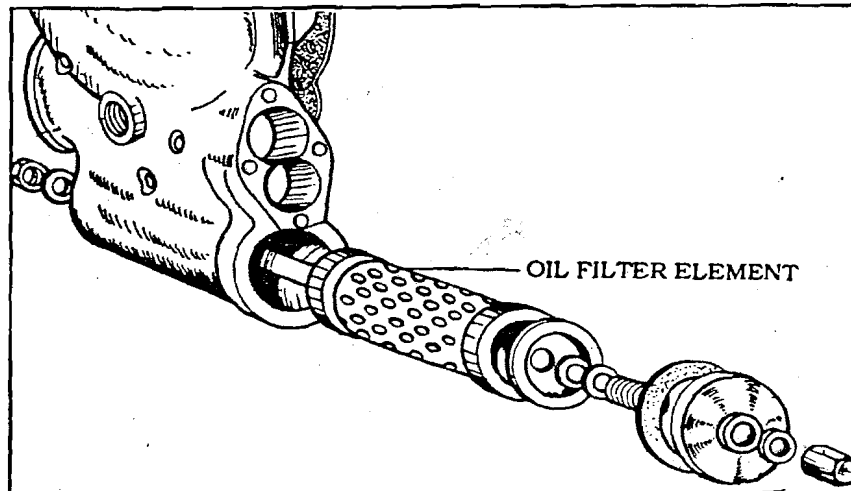
While refitting the timing cover ensure that the joint washer <sup>Dichtungsring</sup> is correctly located over the oil holes, using a little grease (not compound) to hold it in position.

Ensure that the cork plug <sup>Korkstopfen</sup> is in position in the hole in the pump worm. If the plug is damaged it should be renewed to ensure oil flow to the big end bearing.

**NOTE:** The filter chamber should be filled with clean oil before the timing cover is refitted.

Ensure proper functioning of oil pump by checking oil flow at rocker <sup>ventil</sup> union when the engine is running at slow speed. Slacken the oil pipe banjo union to see the oil-flow and clamp it again properly. Wipe the oil that has oozed out.

OIL FILTER ELEMENT IN TIMING COVER

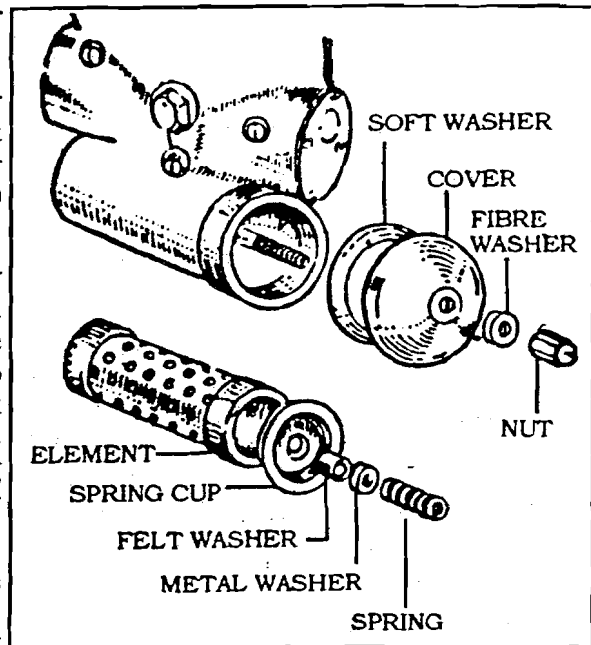


## 2. Cleaning/Replacement of Oil Filter Element - Oil Feed and Return Filters

The oil filter is located in the timing cover immediately below the oil pumps. The felt element should be taken out and washed in petrol after the first 800 Kms. and subsequently, every 4,000 Kms. Fit a new element every 8,000 Kms.

The filter element can be removed by unscrewing the nut holding the end cap in position. When re-assembling the filter take care that no grit or other foreign matter is sticking to it. After replacing the filter element it is essential to run the engine at idling for about five minutes to ensure that oil reaches the big end. If the timing cover has been removed, fill the filter chamber with clean oil before replacing the cover.

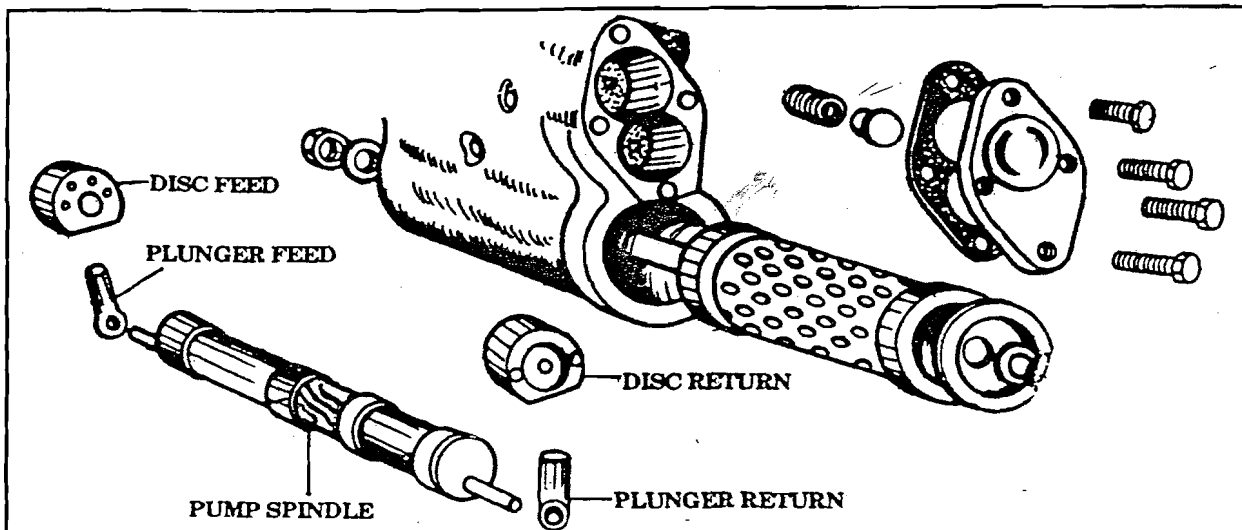
The feed and return filters are fixed on the drain plugs in oil sump and crank case. These can be cleaned by rinsing in a solvent and during reassembly ensure the filters are not twisted.



## 3. Overhauling of Oil feed and return Pumps

- Remove the timing cover.
- Remove the end covers from both pumps.
- Remove the pump discs and plungers.
- Remove the pump spindle which can be pulled out only from the front or return pump end.
- Check the fit of the plungers in the pump discs which should be sliding fit and should be able to be moved in and out by hand.

OIL FEED &amp; RETURN PUMPS ASSY.



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When matching a plunger in the pump disc, if it is found to be too tight a fit, carefully lap the plunger in the pump disc. Using metal polish until it is just free.

If the pump disc is not seating properly in the timing cover or if a new pump disc is fitted, it should be ensured that the pump disc matches properly and has a perfect seating in the timing cover.

Lap the discs in the timing cover with fine metal lapping paste or liquid metal polish using special tools PED 2034 ST for feed pump disc and PED 2035 ST for return pump disc, until a fine, grey surface is obtained on the pump disc face.

**NOTE:** Replacement pump discs have a lip left at the opposite side of the lapped face. The purpose of this is to hold the disc, central in the housing during lapping-in. It should be filed off before the pump is finally assembled. Care should be taken not to damage the lapped face.

Wash all components and passages, thoroughly with petrol, after lapping, to remove all traces of grinding paste. Check the pump disc springs for fatigue by assembling in the timing cover and placing the pump covers in position. The latter should be held 1/8" off the timing cover if the springs are correct. The pump spindle should be renewed if excessive wear has taken place on the teeth.

Reassemble the oil pumps, replacing the cover gaskets. Before fitting each cover fill the pump chamber with clean oil. Having assembled the pumps, lay the timing cover flat and fill the oil ports using an oil can. Turn the pump spindle with a screwdriver in a clockwise direction and it can then be checked whether the pumps are operating correctly. Before replacing the timing cover on the engine, fill the filter chamber with clean oil and fit the filter element.

**NOTE:** With the engine running, the oil feed to the big end can be checked by partially unscrewing the feed plug in the timing cover between the oil pumps and the oil return can be checked by slackening the rocker pipe banjo bolt on the cylinder head and observing the oil flow.

#### **4. Removal of Pump Worm and Timing Pinion**

Unscrew the pump worm using the hexagon head behind the worm, with special tool PED 2006. Withdraw the timing pinion using special tool PED 2013.

**CAUTION:** The worm nut has a left hand thread. When turned clock wise the worm nut can be loosened and when turned anticlockwise the worm nut gets tightened.

**NOTE:** When refitting the timing cover ensure that the cork is in position in the worm nut and is undamaged. This forms a seal between the oil feed plug and the oil passage in the crank shaft, timing side. If necessary this should be replaced and care should be taken to have it fitted correctly.

**CAUTION:** If this cork is not fitted or damaged, the oil feed to the big end bearing through the timing shaft will tend to escape past this point causing starvation of lubrication to the big end bearing leading to premature failure of the big end floating bush, engine bearings and other parts.

## 5. Removal of Contact breaker housing.

Loosen the distributor pinion nut and pull out the distributor pinion off the distributor shaft after removing the idler pinions.

Loosen and remove the three screws which secure the spigotted contact breaker housing and separate from crankcase. Remove the contact breaker cover. Remove the base plate after removing the two hex bolts securing it.

Pull out the contact breaker shaft from the housing. The two sintered bushes provided in the housing would have to be replaced only if excessive radial play is noticed on the distributor shaft.

Reassembly is just the reverse process of dismantling but take care to replace the washer between the contact breaker housing and the crank case.

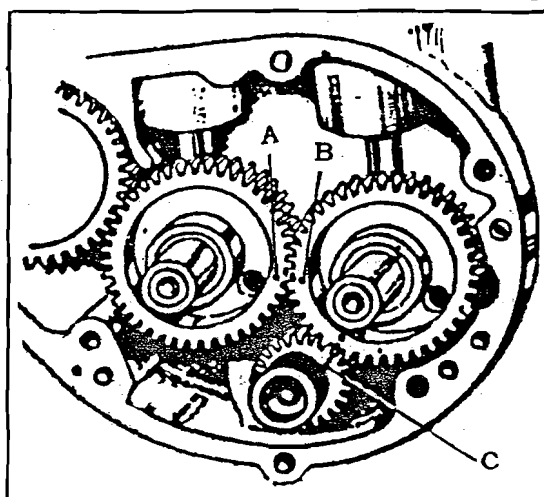
DETAIL OF FELT OIL CLEANER

## 6. Valve Timing

The cams are integral with the cam pinions. They have internal sintered iron bushes running on fixed spindles in the timing chest.

The cams and the timing pinion are provided with timing marks to set proper valve timing. The procedure is detailed below.

Bring the piston to TDC position. Match the exhaust cam (provided with two sets of punch marks) with the timing pinion so that the two punch marks coincide on both. Match the inlet cam to the exhaust cam so that the single punch mark coincide on both. Push the cams home towards the crankcase.

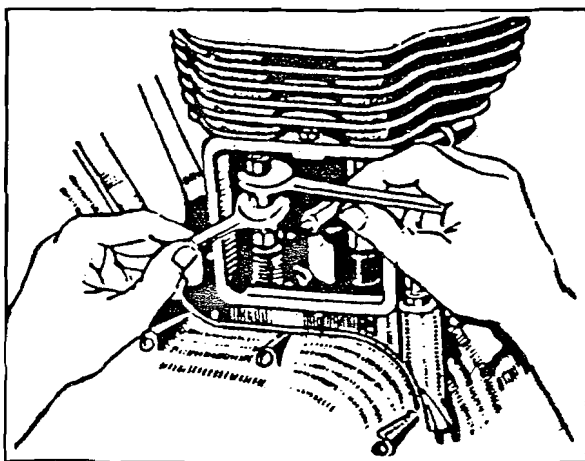


A: MARK ON INLET CAM  
B: MARK ON EXHAUST CAM  
C: MARK ON TIMING PINION

## 7. Tappet Adjustment - Cold

It is very essential to ensure that the valves are closed fully during the closing period of the cam. The tappet clearance should be adjusted properly to achieve this and to cater to certain

ADJUSTING TAPPETS



amount of thermal expansion of the working components. We recommend 'NIL' clearance for the tappets to be set at cold. Provision for adjustment is given at the bottom end of the push rod which sits over the tappet. Access to this is by removing the tappet cover.

Proceed as follows for adjustments. Bring the piston to TDC at the end of compression stroke, so that both the valves are at the closed position. This may be ensured by seeing the valve timing marks, if the timing cover is open or through ammeter needle in its centre position, when ignition is switched on.

Check the push rods. They must rotate thumb free without any up and down play.

In case the push rods do not rotate freely or if up and down play is noticed, the push rods need to be adjusted.

Loosen the lock nut in the adjuster, by holding the top nut. Thread in or out, the bottom adjuster, till the correct push rod freeness is achieved. Retighten the lock nut after adjustments are complete.

**CAUTION:** If the cylinder head has been disturbed for any attention, ensure proper fitment of valve stem caps and rocker bearings before proceeding to tappet adjustment.

**NOTE:** Owing to the initial bedding down of the wearing surfaces, the tappets on new engines may require adjustment after the first few hundred kilometres of run.

### **8. The Clutch - 350cc and 500 cc**

The 350cc clutch has five driven plates and four driving plates, including the friction disc on the sprocket.

The 500cc clutch is similar to that of 350cc. except that there are six driven plates and five driving plates.

Also the lugs on the clutch sprocket and the splines on clutch centre are longer.

### **9. Removal of the Clutch**

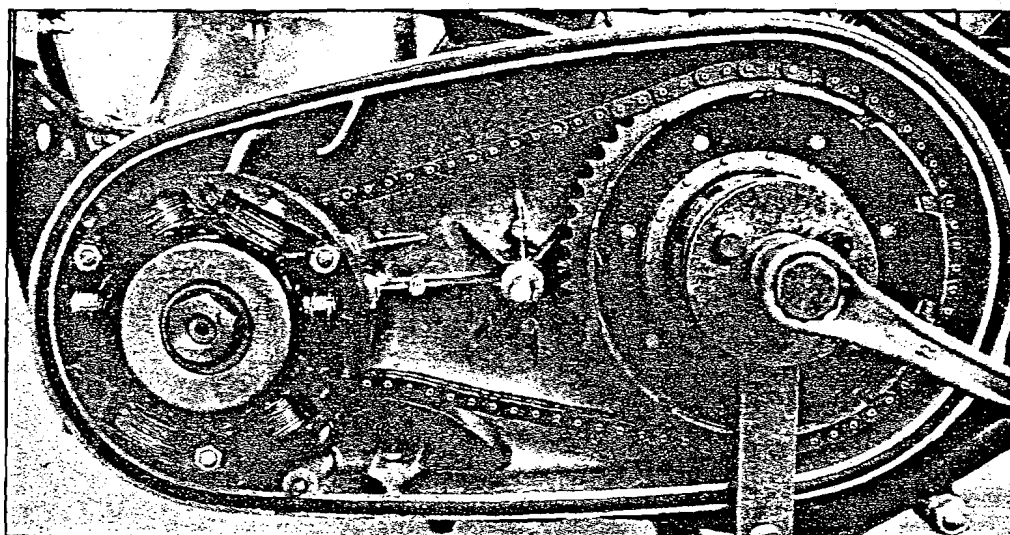
Remove the L.H. front foot rest. Place a tray beneath the primary chain case to collect the oil in the chain case. Remove the centre nut in the chain case outer and remove the cover.

To remove the clutch unscrew the clutch spring pins. Lift away the spring cap, springs, clutch front plate, clutch pad in main shaft. The assembly of driving and driven clutch plates and the clutch retaining spring. The clutch sprocket can then be withdrawn along with the chain and engine sprockets (see point 10).

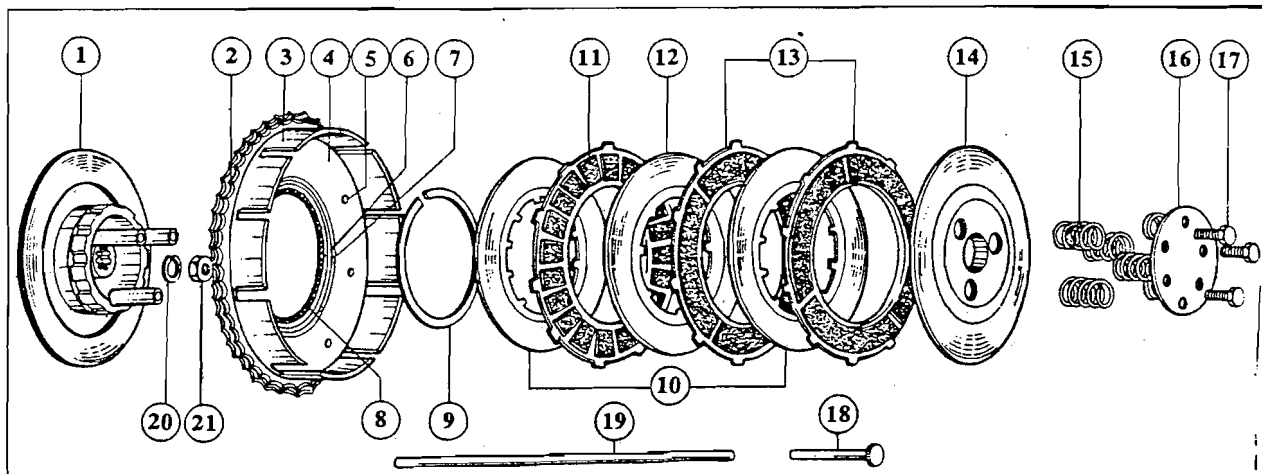
The clutch centre can be removed only after the engine sprocket, primary chain and the clutch sprocket has been removed.

To remove the clutch centre hold the clutch with a brake bar (Special Tool No. PED 2025) and remove the centre retaining nut and washer with a box spanner. The clutch centre can then be withdrawn from the shaft using extractor (Special Tool No. PED 2005).

REMOVAL OF CLUTCH ASSEMBLY

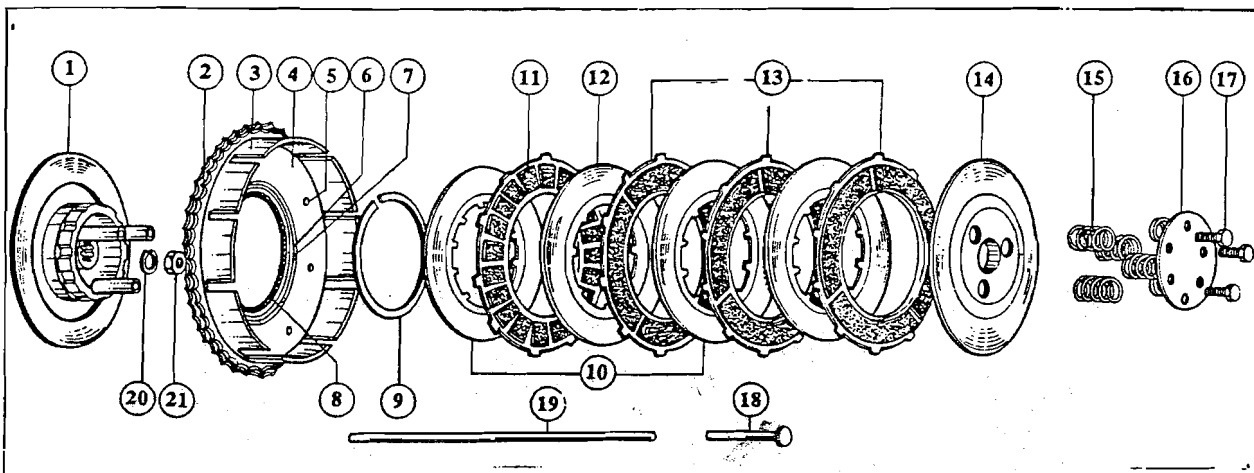






1. Clutch centre and back plate assembly
2. Clutch sprocket 56 T & drum assembly
3. Clutch sprocket drum (N/S)
4. Clutch sprocket friction disc
5. Clutch sprocket friction disc rivet
6. Clutch sprocket ball cage (N/S)
7. Clutch sprocket ball cage rivets (N/S)
8. Clutch sprocket balls (3/16" dia) (N/S)
9. Clutch retaining spring
10. Clutch intermediate plate (dished)
11. Clutch plate (insert type)

12. Clutch intermediate plate (flat)
13. Clutch bonded plate assembly
14. Clutch front plate
15. Clutch spring
16. Clutch cap
17. Clutch spring screw
18. Clutch pad
19. Clutch rod
20. Washer main shaft (spring)
21. Nut main shaft (Nyloc)



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18. Clutch pad
19. Clutch rod
20. Washer main shaft (spring)
21. Nut main shaft (Nyloc)

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## 10. Removal of Engine and Clutch sprockets

Remove the alternator stator by undoing three nuts. The primary chain is endless hence it is necessary to remove both the engine and clutch sprockets simultaneously. Remove the central hexagon nut securing the alternator rotor, which can then be drawn off, taking care not to lose the key. The engine sprocket is mounted on splines and can be removed along with the clutch sprocket using extractor PED 2004 ST

## 11. Removal of Final Drive Sprocket

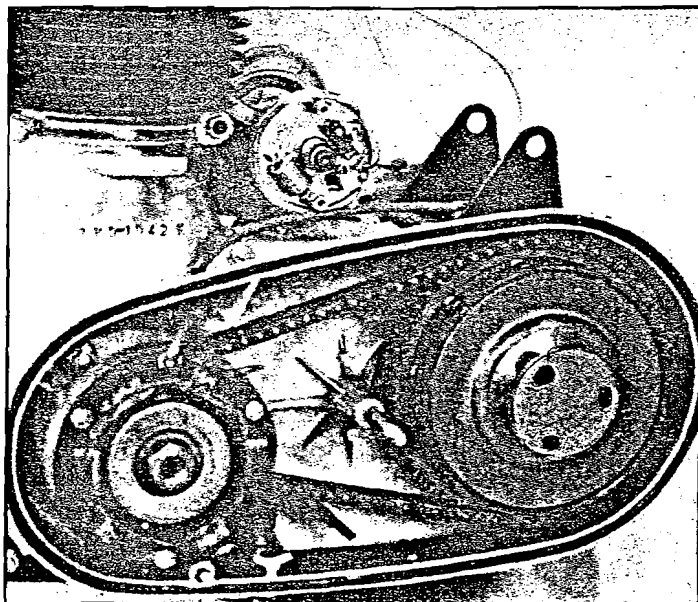
Remove the clutch as described above. Remove the primary chain tensioner. Remove the primary chaincase inner by removing three nuts. Remove the folding of the tab washer which is provided for locking the final drive sprocket nut. Hold the sprocket and remove the nut (right hand thread). The sprocket can then be withdrawn.

## 12. Re-assembly of the Clutch Plates

When re-assembling the clutch plates the following order must be observed. The clutch pad must be fitted into the main drive shaft, plain dished plate (dish projecting out wards).

Friction plate with inserts, plain flat plate, friction plate bonded, plain dished plate (dish projecting inwards), friction plate bonded, clutch front plate 3 springs on the clutch centre lugs.

CLUTCH ASSEMBLY



In the case of 500cc one more plain flat plate and one friction plate will also have to be fixed after the plate with inserts has been assembled.

The other three springs are located by means of bosses on the clutch cap. Tighten the spring pins as far as they will go. If the clutch lifts unevenly, it is probable that one of the springs has taken a set, in which case new spring should be fitted.

The friction plate with inserts should be renewed if badly worn or when the inserts have become loose in their plate. The bonded friction plates require renewal when worn or charred. (A light change to a blackish colour should not be mistaken as charred). Excessive or premature wear

of the plates is due to either running the vehicle at half clutch application or depriving the clutch plates of oil, with insufficient or no oil in the clutch chain case.

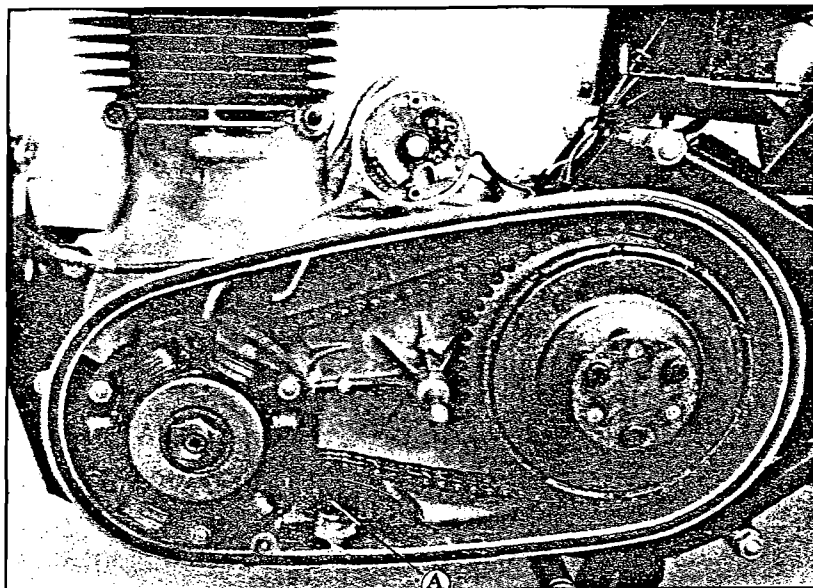
## 13. Primary Chain Adjustment

Access to the primary chain adjuster is gained by removing the primary chain cover which is held in position by a single nut. Before removing the nut, place a tray under the engine to collect the oil from the chaincase.

Beneath the bottom run of the chain is a curved slipper chain tensioner pad on which the chain rests. This can be raised or lowered by turning the adjusting screw below the chain tensioner pad after having first slackened the locknut.

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#### PRIMARY CHAIN ADJUSTMENT



A. ADJUSTER

The chain should be adjusted so that there is 1/4" up and down movement at the centre of the top run of the chain. Remember to check the chain tension at 3 or 4 places and then adjust accordingly. Ensure that the chain tensioner pad moves freely and the lock nut of the adjuster is retightened after carrying out the adjustment. The chain is to be renewed if its length has increased by 3/4" than the length of a new chain.

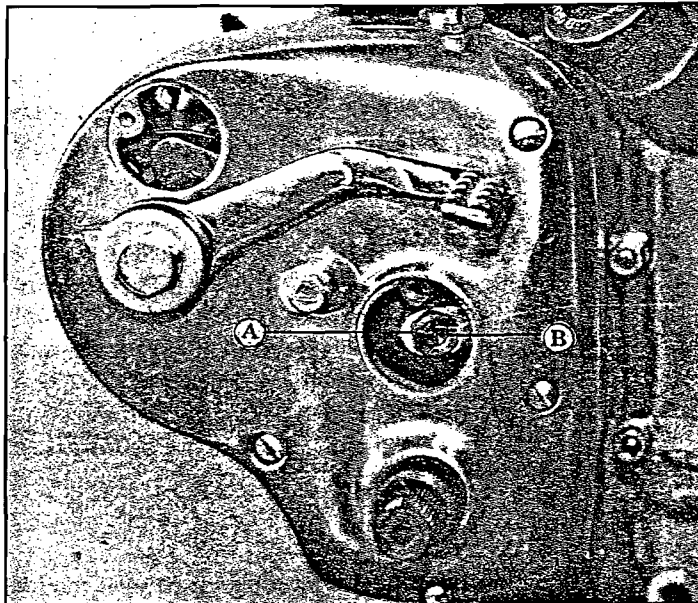
After replacing the chain cover, remember to replenish the chaincase with oil (SAE 20) up to the level plug in outer chain case (approx - Qty.. - 430 to 450 ml.)

#### 14. Adjustment of the Clutch control

It is essential that there should be about 3 to 4mm free movement in the clutch cable, to ensure that all the spring pressure is exerted on the plates.

There are two points of adjustment on the clutch cable. The first is the midway adjuster at the middle of the cable just above the chain case. The adjustment is made by

#### CLUTCH ADJUSTMENT ON GEAR BOX



screwing the adjuster screw in or out of the adjuster body. Tighten the locknut on the screwed collar after adjustment has been made.

The other point is at the handle bar end. Loosen the lock nut and thread in the adjuster to increase play and vice versa to reduce play. Tighten lock nut after carrying out adjustment. However if the adjusters have reached their maximum position then the adjustment can be carried out in the gear box outer cover. Before proceeding on the adjustment, turn in both cable adjusters to their fully closed position (fully in position).

To make the adjustment, remove the inspection cover, slacken the locknut and turn the central screw in, to get the desired free play on the clutch lever at the handle bar end. Tighten the locknut after adjustment has been made.

Owing to initial bedding down of the clutch plate inserts, the clutch control may require adjustment after the first few hundred Kms with a new machine. This point should therefore be examined soon after delivery and adjustment made if necessary. Initially, excessive play in the cable can be taken up through midway adjuster and the adjuster at the handle bar end.

**NOTE:** The clutch adjuster ball and clutch rod may require cleaning and greasing around 6000 miles/10000Kms of run. To do this, loosen and carefully remove the clutch adjuster from its position, taking care not to drop it into the gear box outer cover.

Start the engine and tilt the motorcycle towards the gear box side, so that the clutch rod can be removed. Wash thoroughly, the clutch rod and adjuster and look for chipped or worn clutch rod ends and free rotation of the clutch adjuster ball.

Smear multipurpose grease on the clutch rod and reassemble into the mainshaft. Smear grease on the clutch adjuster ball and carefully reassemble in its location. Adjust the adjuster to ensure free play is maintained on handle bar end and tighten lock nut.

### 15. Fitting the Alternator

The alternator consists of two parts, the stator and the rotor. The stator is mounted on to the primary chaincase inner by three studs and nuts.

The rotor, which contains the permanent magnet, is mounted on the end of the drive shaft and is located by a key and secured by a special nut and spring washer. The designed radial air gap between the rotor and the poles of the stator is 0.25mm (0.010") and care must be taken when refitting to see that it is not less than 0.15mm (0.006") at any point.

SINGLE PHASE ALTERNATOR

