

WORKSHOP
MAINTENANCE MANUAL
FOR THE

Royal Enfield

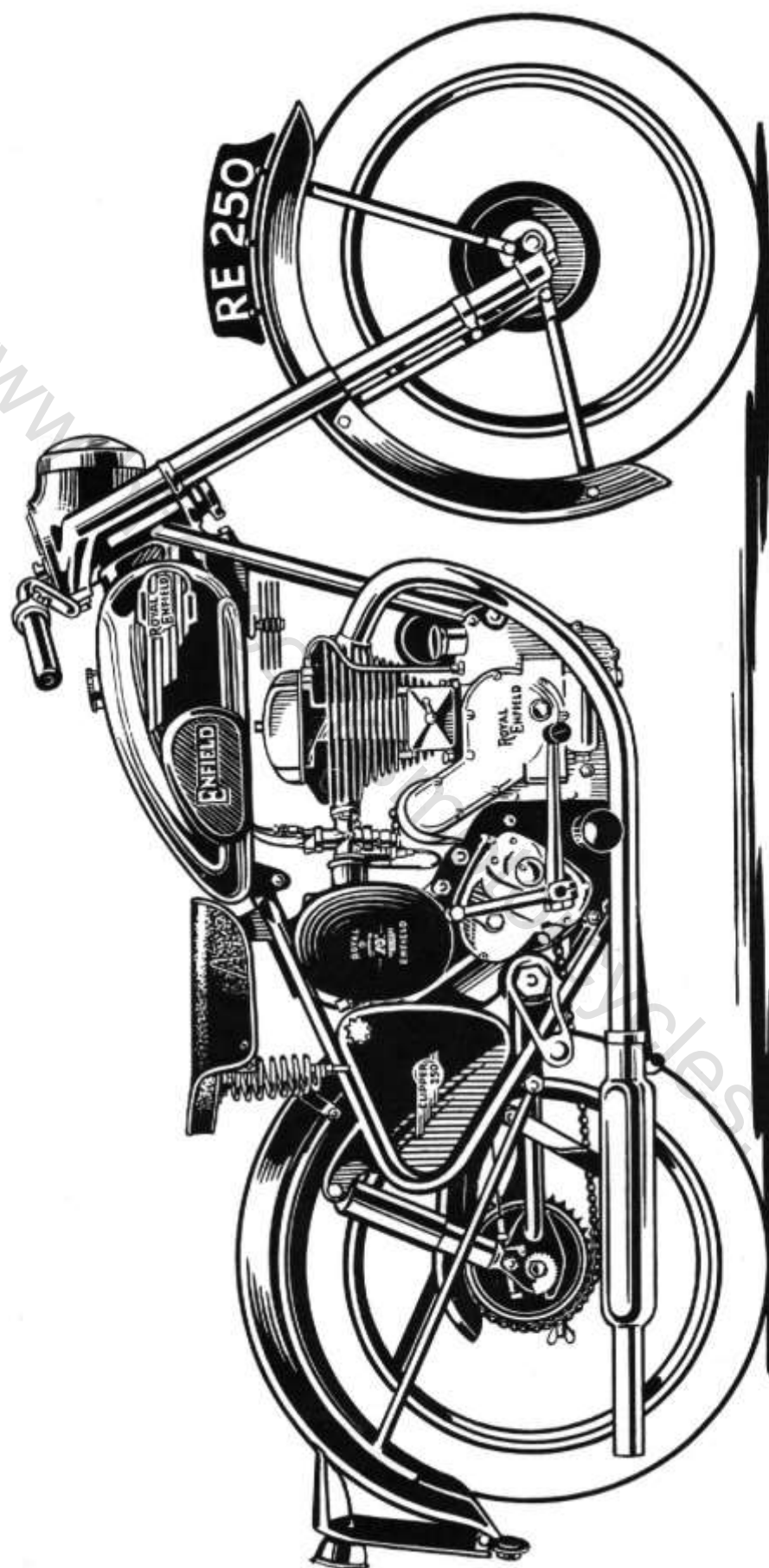
1954—1957
SPRING FRAME O.H.V.
250cc CLIPPER



ROYAL ENFIELD WORKSHOP MANUAL

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248 c.c. O.H.V. SPRING FRAME "250 CLIPPER"
(Frontispiece)

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SECTION A3

Technical Data

"250 Clipper" Engine

Cubic Capacity	248 c.c.	Tappet Guide External Diameter	.875/.874 in.
Stroke	77 mm	Guide Hole in Crankcase	.875/.874 in.
Bore	Nominal 64 mm		
	Actual 63.970 mm/2.5185 in.	Tappet Clearance with cold engine-	
(Rebore to .020 in. when wear exceeds .005 in. and again to .040 in. after a further .005 in. wear.)		Inlet	.002 in.
Compression Ratio	6.5 to 1	Exhaust.	.004 in.
Piston Diameter-		Valve Spring Free Length	
Bottom of Skirt Fore and Aft.	63.926/63.901mm	Inner	1 ¹³ / ₁₆ in.
Top Lands	63.50/63.45 mm	Outer	1 ²⁷ / ₃₂ in.
Piston Rings-		(Renew when reduced by ³ / ₁₆ in.).	
Width-Plain Rings (Two)	.0625/.0615 in.	Valve Timing with .012 in. clearance-	
Scraper Ring (One)	.15625/.15525 in.	Exhaust Opens	75° before B.D.C.
Radial Thickness	2.612/2.460 mm	Exhaust Closes	35° after T.D.C.
Clearance in Grooves	.0035/.0015 in.	Inlet Opens	30° before T.D.C.
Renew Piston Rings when gap exceeds ¹ / ₁₆ in.		Inlet Closes	60° after B.D.C.
Oversize Pistons and Rings available .020 and .040 in.			
Piston Boss Internal Diameter	.7500/.7498 in.	Cam Spindle External Diameter	.6245/.6235 in.
Gudgeon Pin Diameter	.7498/.7495 in.	Cam Bush Internal Diameter	.6255/.6250 in.
Con. Rod Small End Diameter	.7510/.75025 in.	Cam Lift	.3125 in.
Con. Rod Big End Diameter	1.6257/1.6252 in.	Valve Lift (approximately)	.3125 in.
Floating Bush Ext. Diameter	1.6235/1.6230 in.		
Floating Bush Int. Diameter	1.2502/1.2498 in.	Contact Breaker-	
Floating Bush Width	.739/.736 in.	Speed	Half Engine Speed
Crank Pin Diameter	1.24900/1.24875 in.	Points	.015/.018 in.
Engine Shaft Diameter	1.0000/.9997 in.	Timing	³ / ₈ in. before T.D.C. advanced
Driving Side Main Roller Bearing			¹ / ₆₄ in. before T.D.C. retarded
Outside Diameter	1.876/1.875 in.	Engine Sprocket	17 Teeth.
Inside Diameter	1.5002/1.4998 in.	Clutch Sprocket	42 Teeth.
Width	1.437/1.432 in.	Final Drive Sprocket	15 Teeth.
No. of Rollers	24 (2 rows)		
Timing Side Main Roller Bearings-		Primary Chain	
Outside Diameter	1.8772/1.8770 in.	Type	110046 Renold
Inside Diameter	1.5004/1.5002 in.	Length	66 Pitches.
Width	.4425/.4405 in.	Width	.305 in.
No. of Rollers	12 (1 row)	Pitch	.500 in.
Size of Rollers		Feed Oil Pump	
Diameter	.2500/.2490 in.	Speed	¹ / ₁₂ Engine Speed.
Length	.328/.327 in.	Piston Diameter	.25 in. (nominal)
Graded Rollers are available in steps of .0001 in. from .2490 in.-.2500 in.		Stroke	.375 in.
Rocker Bearing Inside Diameter	.626/.625 in.	Return Oil Pump-	
Rocker Spindle Diameter	.624/.6235 in.	Speed	¹ / ₁₂ Engine Speed.
Inlet Valve Stem Diameter	.34275/.34175 in.	Piston Diameter	.375 in. (nominal)
Exhaust Valve Stem Diameter	.34175/.34075 in.	Stroke	.375 in.
Valve Guide Internal Diameter	.3452/.3437 in.	Spark Plug	
Valve Guide External Diameter	.624/.623 in.	Type	Lodge H 14.
Guide Hole in Cylinder Head	.623/.622 in.		K.L.G.F70.
Tappet Stem Diameter	.375/.374 in.		Champion L10S.
Tappet Guide Internal Diameter	.3765/.3750 in.	Diameter	14 mm

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SECTION B3

Engine Specification 250 Clipper

1. Engine

The engine is a 248c.c. vertical single four stroke, with separate cylinder head and fully enclosed pressure-fed overhead valve gear. It has dry sump lubrication with the oil tank integral with the crankcase and a built-up steel crankshaft.

2. Cylinder Head

The cylinder head is of cast iron and is generously finned to ensure adequate cooling. It has a large bore induction port, stream-lined and blended to the valve seating.

3. Cylinder

The cylinder barrel is of cast iron, with internal tunnels enclosing the push rods. The bore is nominally 64m.m. and the stroke 77m.m., giving a cubic capacity of 248 c.c.

4. Piston

The piston is cast from low expansion aluminium alloy, heat treated and form-turned oval and having a split skirt. The compression ratio is 6½ to 1. There are three piston rings, the top two of which are compression rings. Both are taper ground and the top, one is chromium plated. The third ring is for oil control and is slotted.

5. Connecting Rod

The connecting rod is machined from a manganese-molybdenum steel stamping and has a carobronze bush in the little end. The big end has a hardened chrome steel bush pressed in and a floating bush made from mild steel and white metalled.

6. Crankcase

The combined crankcase and oil tank are die-cast from light alloy in two halves, being split vertically.

7. Crankshaft and Flywheel

The crankshaft is built up from two steel flywheels bolted to the crankpin and bolted and keyed to the engine shafts the whole being carefully balanced.

8. Main Bearings

Heavy duty roller bearings are provided for the engine shafts, the outer races being shrunk into the crankcase while internally the rollers run direct on the shafts.

9. Cams

The cams are integral with the cam pinions being machined from carbon steel and case hardened. They have internal bronze bushes running on fixed spindles in the timing chest. The cam profiles are produced with silencing ramps to ensure quiet running.

10. Valves

The inlet valve is machined from a stamping of silicon-chrome valve steel and the exhaust valve is of austenitic steel.

11. Valve Gear

The valves are operated from the cams by, means of large flat based guided tappets, high quality tubular steel push rods, with steel caps. and overhead rockers. Two compression springs are fitted to each valve.

12. Timing Drive

The cams are located in the timing chest and are driven at half engine speed from the crankshaft by a positive geared drive.

The contact breaker is driven from the inlet cam pinion through two idler pinions which also act as a gear pump to return the oil from the timing chest to the oil tank.

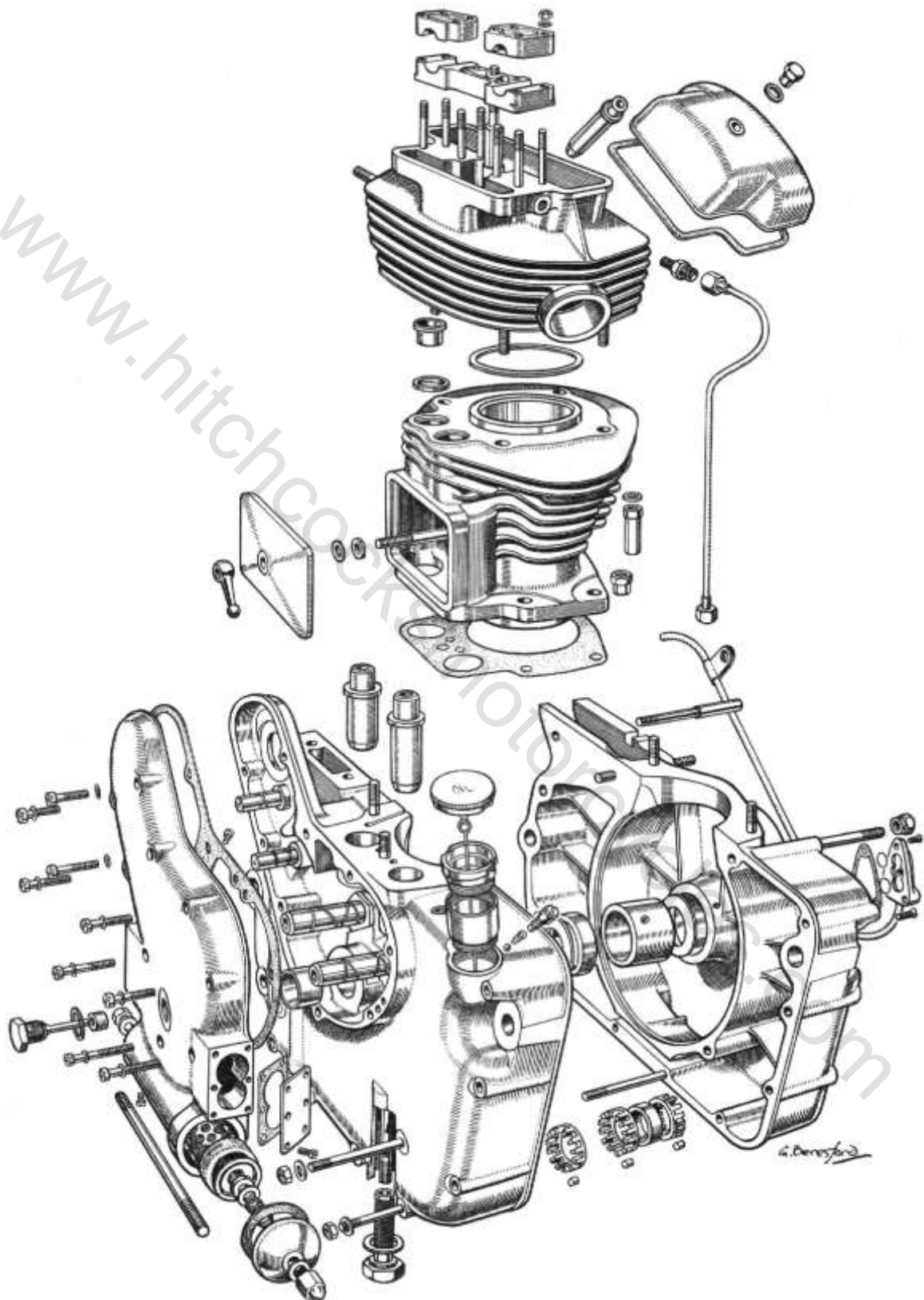
13. Ignition and Lighting System

Coil ignition and lighting are supplied from a 6volt battery which is charged through a rectifier from an A.C. alternator mounted on the engine shaft inside the primary chain case.

The alternator has a permanent magnet rotor revolving within a six pole wound laminated stator.

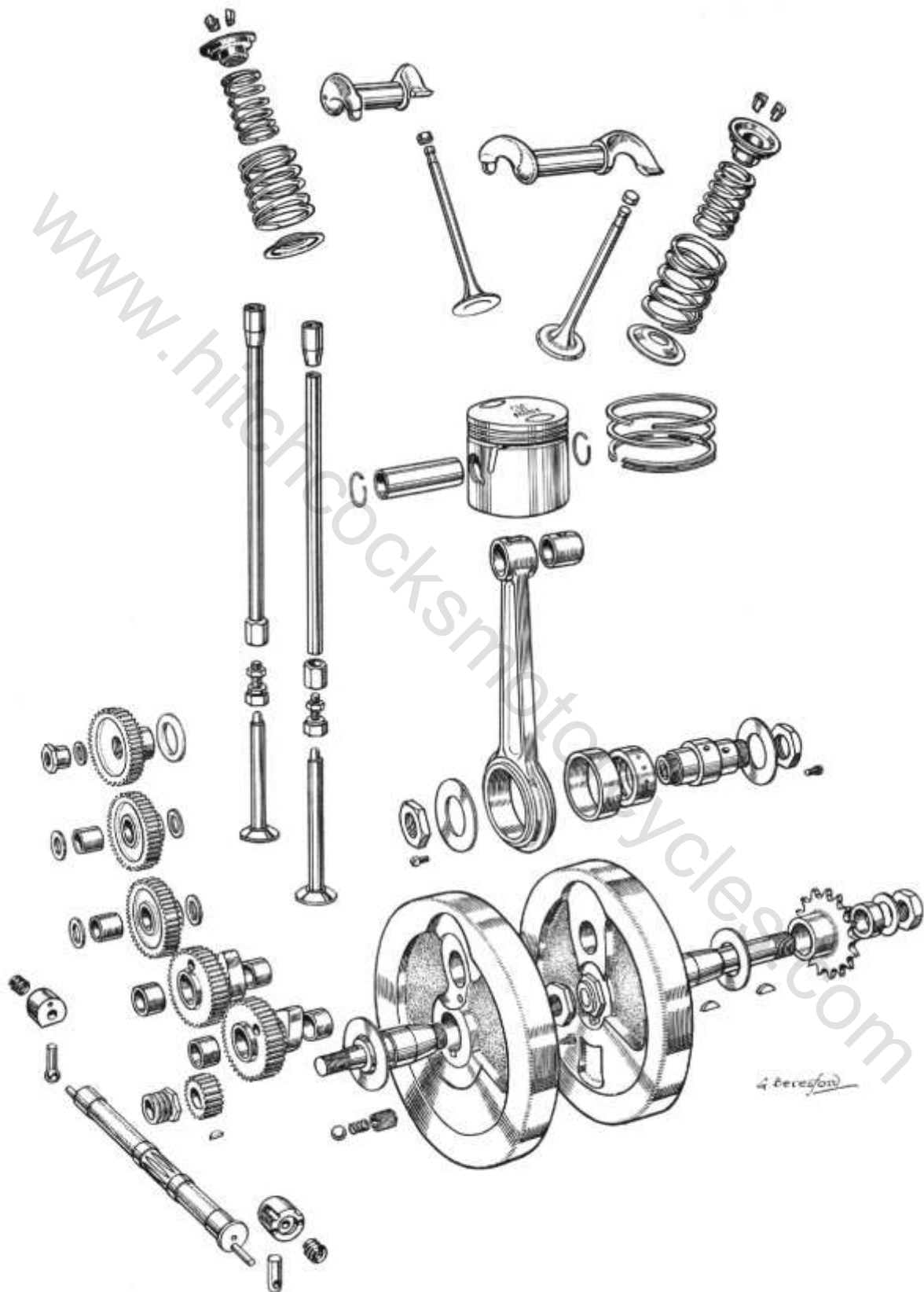
The arrangement is such that in case of battery failure, the ignition can be supplied direct from the alternator.

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EXPLODED VIEW OF "250 CLIPPER" ENGINE
Fig. 1A

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EXPLODED VIEW OF "250 CLIPPER" ENGINE
Fig. 1B

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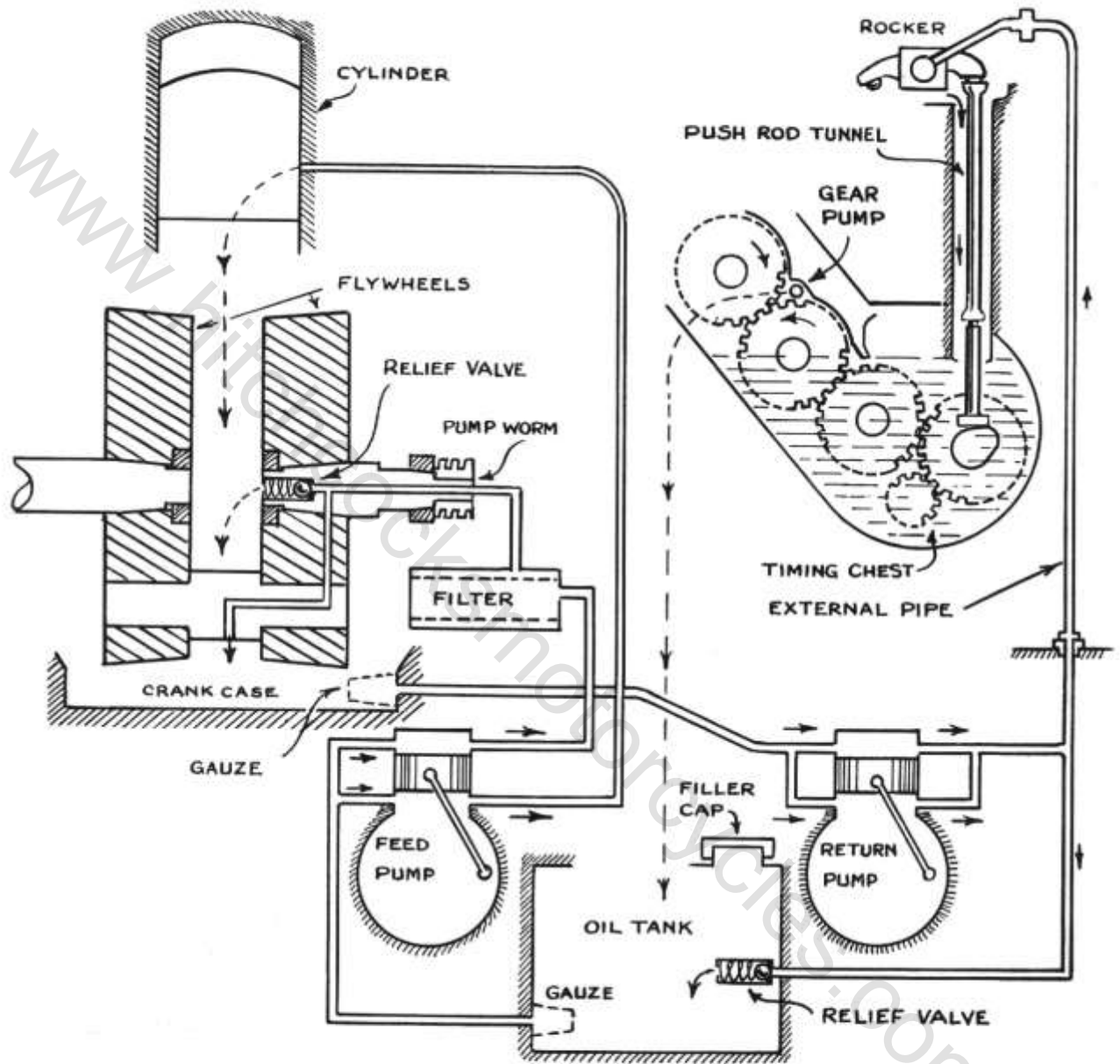


DIAGRAM OF LUBRICATION SYSTEM

"250 CLIPPER"

Fig. 2

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Earlier engines have Miller equipment and more recent ones Lucas.

14. Carburettor

Amal Type 274/BS/3A. See Section F.1. or Amal Type 375/10. See Section F.2.

15. Air Filter

The air supply to the carburettor is cleaned by a Vokes Micro-Vee felt and gauze dry filter, housed in a box bolted to the frame behind the carburettor.

16. Lubrication System

Lubrication is by the Royal Enfield dry-sump system which is entirely automatic and positive in action. The oil tank is integral with the crankcase, ensuring the full rate of circulation immediately the engine is started and rapid heating of the oil in cold weather.

There are two piston type oil pumps running at 1/12 engine speed, positively driven from the timing side engine shaft through a worm gear.

The feed pump, at the rear of the timing cover, is for pumping oil from the tank to the big end bearing and to the cylinder wall. This oil drains to the bottom of the crankcase and is pumped by the return pump back to the tank.

Some of the return oil is by-passed to the cylinder head for lubricating the rocker gear, whence it flows down the push rod tunnels to the timing chest. From there it is returned to the tank by the two idler pinions in the timing drive which act as a gear pump.

The return pump has a capacity of approximately double that of the feed pump, which ensures that oil does not accumulate in the crankcase.

Both pumps are double-acting, one side of the feed pump supplying the big end only, while the other side pumps oil to the cylinder wall to lubricate the back of the piston. Both sides of the return pump are inter-connected for draining the crankcase.

Separate spring loaded relief valves control the pressure to the big end and to the valve gear. The oil supplies to the big end and to the

cylinder wall are through internally drilled passages and that to the valve gear is through an external pipe.

Gauze strainers are provided for the feed oil leaving the tank and for the return oil from the crankcase. In addition, the feed oil to the big end is pumped under pressure through a large capacity felt filter. An important feature of the design of this filter is that the internal arrangement is such that, should it be neglected and become clogged, the oil pressure will lift the spring end cap off its seating thereby automatically by-passing the filter so that the big end will not be deprived of lubrication, even though the oil may be dirty.

17. Breather

The efficient operation of the breather is of paramount importance to the performance of the engine because it acts as a non-return valve between the crankcase and the outside atmosphere, causing a partial vacuum in the crankcase and rocker box which prevents the passage of oil into the cylinder and consequent smoking and oiling of the plug.

The breather is located on the driving side of the crankcase and consists of a small housing containing two pen-steel discs covering two holes drilled in the crankcase.

Accurate seating of the discs is ensured by a pen-steel plate held between the breather body and the crankcase.

18. Gearbox

The gear box is bolted on to the rear engine plates and has four speeds, which are foot controlled. All the gears are in constant mesh, changes being effected by robust dog clutches.

The standard gear ratios are 6.25, 8.45, 13.1, 18.5 to 1.

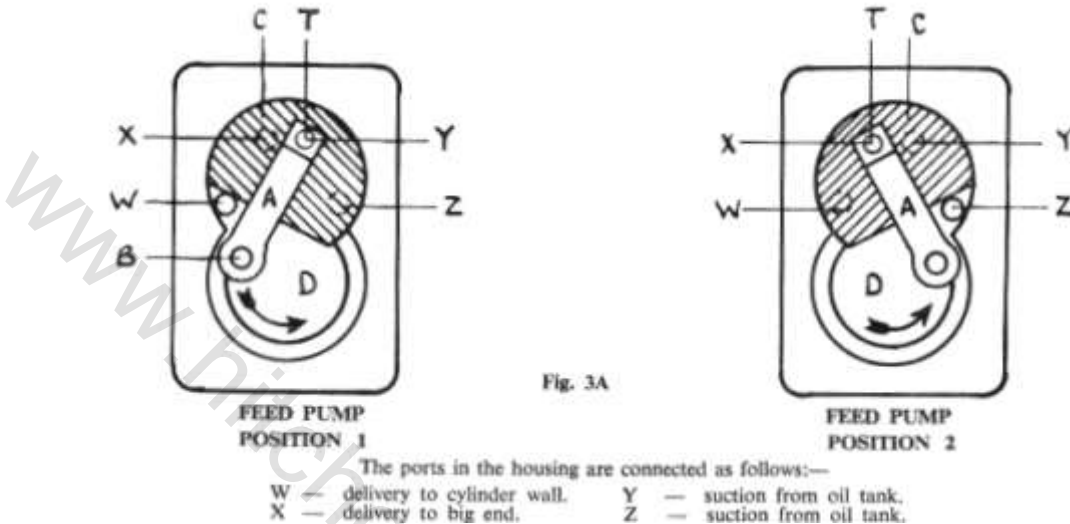
19. Clutch

The clutch has three pressure plates and two friction plates, one of which is the inner portion of the clutch sprocket.

Both friction plates have cork inserts which give smooth operation and freedom from slipping in the presence of oil.

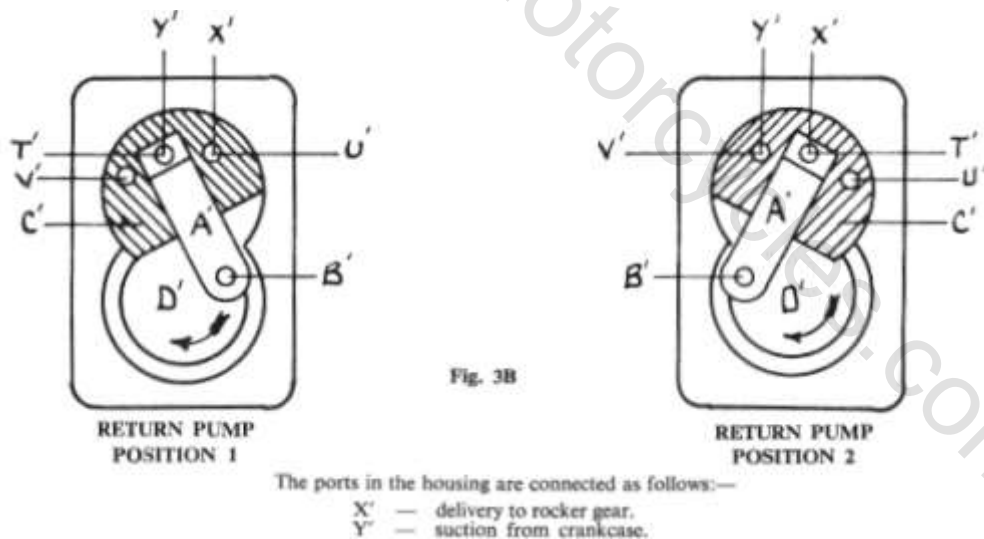
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"250 CLIPPER" OIL PUMP DIAGRAMS



Position 1. The plunger A is being drawn out of the cylinder hole in the disc C by the action of the peg B on the shaft D. The port T in the disc C registers with suction port Y in the housing, so that oil is drawn into the cylinder from the oil tank. At the same time the delivery port W in the housing is uncovered and oil below the disc in the housing is forced through W to the back of the engine cylinder wall.

Position 2. The plunger A is being pushed into the cylinder hole in the disc C. The port T in the disc now registers with the delivery port X in the housing so that oil is forced out of the cylinder to the big end. At the same time the suction port Z in the housing is uncovered and oil is drawn into the housing below the disc from the oil tank.



Position 1. The plunger A' is being drawn out of the cylinder hole in the disc C'. The port T' in the disc registers with the suction port Y' in the housing, so that oil is drawn into the cylinder from the crankcase sump. At the same time the port U' in the disc registers with the delivery port X' in the housing, so that oil below the disc in the housing is forced through U' and X' to the rocker gear.

Position 2. The plunger A' is being pushed into the cylinder hole in the disc C'. The port T' in the disc now registers with the delivery port X' in the housing, so that oil is forced out of the cylinder to the rocker gear. At the same time the port V' in the disc registers with the suction port Y' in the housing, so that oil is drawn into the housing below the disc from the crankcase sump through V and Y'.

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SECTION C3

Service Operations with Engine in Frame 250 Clipper

1. Removal of Timing Cover

First place a tray under the engine to catch the oil which will escape when the cover is removed.

Remove the exhaust pipe and silencer.

Remove nine screws from the cover, taking care not to lose the sealing washers, one for each screw.

Draw off the timing cover, tapping it lightly if necessary.

In refitting the timing cover see that the joint washer is correctly located over the oil holes, using a little grease (not compound) to hold it in position.

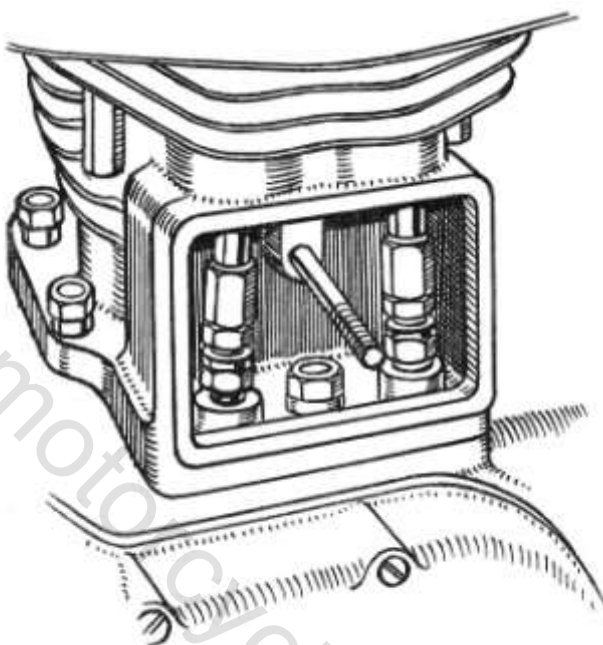
See that the cork or rubber plug is in position in the hole in the pump worm. If the plug is damaged it should be renewed to ensure oil pressure to the big end bearing.

When refitting the timing cover it is important that the engine is turned gently forwards while the cover is being put in place. This will help the engagement of the pump worm with the pump spindle and prevent damage to the gears.

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

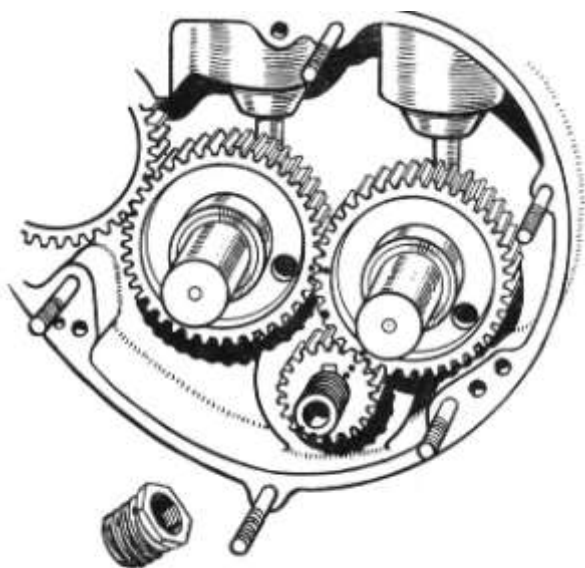
To verify that the oil pumps are working after replacing the timing cover, start the engine up and

remove the oil filler cap so that the oil return through the relief valve can be seen. It may take several minutes before there is sufficient oil in the engine for the return flow through the relief valve to commence.



TAPPET ADJUSTMENT

Fig. 2



VALVE TIMING MARKS

Fig. 1

2. Valve Timing

The cams are integral with the cam pinions and the position for correct timing is marked on the pinions by small dots.

Rotate the engine to top dead centre and put the exhaust (or right hand) cam pinion in position so that the pair of dots on it are opposite the pair of dots on the timing pinion on the crankshaft.

Put the inlet (or left hand) cam pinion in position so that the single dot on it is opposite the single dot on the exhaust cam pinion.

The correct timing at .012 in. clearance is as follows:-

Exhaust opens 75° before bottom dead centre.

Exhaust closes 35° after top dead centre.

Inlet opens 30° before top dead centre.

Inlet closes 60° after bottom dead centre.

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3. Tappet Adjustment

The tappets are adjusted by the ball and socket joints which are located in a compartment at the side of the cylinder and access to which is obtained by removing the inspection cover.

Before checking the clearance or making any adjustment, rotate the engine until the piston is at the top of the firing stroke. This will ensure that both valves are closed and that the tappets are well clear of the silencing ramps on the cams. If the cylinder head has been dismantled, make sure that the end caps have been put back on the valve stems.

Owing to the ball and socket joints at the bottom of the push rods, the tappet clearance cannot be measured there, but between the valve stems and rockers, with the rocker box cover removed.

The correct clearance is .002 in. for the inlet and .004 in. for the exhaust with the engine **COLD**.

As a rough guide, the clearance is .002 in. when the push rod is just free to spin and .004 in. when the up and down play is just perceptible.

To make the adjustment, hold the push rod bottom end (top hexagon) and turn the locknut (middle hexagon) to the left. Screw the push rod cup (bottom hexagon) to the left to take up clearance or to the right to increase the clearance, at the same time holding the push rod bottom end (top hexagon). Lock the adjustment by tightening the locknut against the push rod end and then re-check the clearance.

Owing to the initial bedding down of the wearing surfaces, the tappets on new engines may require adjustment after the first few hundred miles.

4. Ignition Timing

An automatic centrifugal advance mechanism is provided at the back of the contact breaker, having a range of approximately 121 degrees which corresponds to 25 degrees of the crankshaft because the contact breaker runs at half engine speed.

The optimum ignition timing is 30 degrees advance so that in the fully retarded position the contact points must open when the piston is five degrees or 1/64 in. **before** top dead centre.

Miller Equipment. If the timing drive has been dismantled, the ignition must be set as nearly as possible by positioning the cam on the contact breaker shaft and the fine adjustment made by rotating the plate on which the contact breaker is mounted. This plate is held by two screws in slots in the plate and provides a range of adjustment of approximately 12 degrees. If the timing drive has not been dismantled, this movement will be ample for any small adjustment required.

To set the ignition timing, remove the contact breaker cam by taking out the centre fixing screw using a 5/16 in. bolt as an extractor, having first checked that the maximum opening of the points is .015 - .018 in.

Move the contact breaker baseplate until the screws are in the middle of the slots and tighten up; then turn the engine until the piston is 1/64 in. before top dead centre on the compression stroke, i.e., with both valves closed.

Rotate the cam on the contact breaker shaft in a clockwise direction (looking on the left side of the engine) until the contact points are just opening. (See below.)

Give the cam a sharp tap endways to secure it on the shaft and then lock it tightly with the centre fixing screw.

Check the timing again and make the final adjustment by easing the two screws securing the contact breaker baseplate and rotating it slightly.

Lucas Equipment. The contact breaker housing is clamped on to the contact breaker bracket which is bolted to the top of the crankcase. The timing is adjusted by slackening the clamping bolt and rotating the housing relative to the bracket.

If the timing drive has been dismantled, clamp the contact breaker housing so that the name on the cover is roughly horizontal.

Check the maximum opening of the contact points, which should be .015-.018 in., and adjust if necessary.

Turn the engine until the piston is 1 in. before top dead centre on the compression stroke, i.e., with both valves closed. (It may be found convenient to apply the brake to hold the engine in this position.)

Turn the contact breaker shaft and cam until the contact points are just opening. (See below.)

Replace the contact breaker pinion and tighten the fixing bolt.

Having set the timing approximately and bolted the contact breaker pinion on to the shaft, check the maximum opening of the contact points again.

Check the timing again and make the final adjustment by loosening the clamping bolt securing the contact breaker housing and rotate the housing slightly until the correct setting is obtained.

Contact Opening Point. There are several methods of determining the point at which the contacts open:

(1). Switch on the ignition. Looking on the left side of the engine, rotate the cam in a clockwise direction (or the housing in a counterclockwise direction) until the warning light in the ammeter lights up or until the ammeter needle indicates a discharge. Continue to rotate the cam (or housing) slowly until the warning light goes out or until the

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ammeter needle returns to zero, indicating that the points have opened.

(2). Remove the sparking plug cap from the lead and tuck the lead between the fins of the cylinder. Rotate the cam (or housing) and a spark will be seen at the instant the points open.

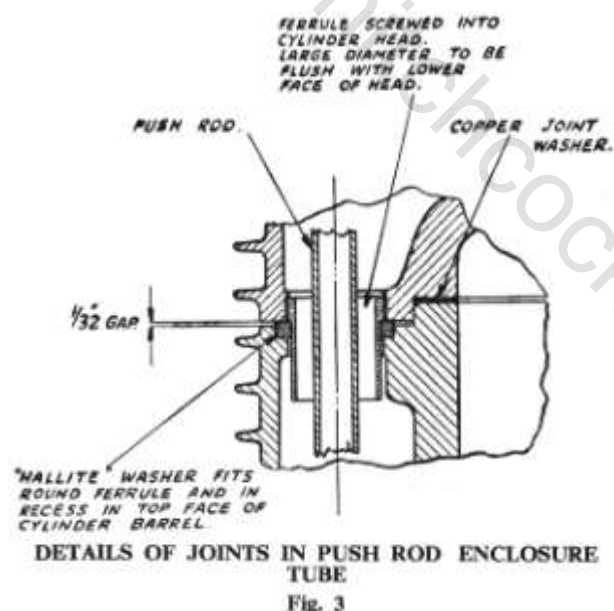
(3). Insert a piece of thin tissue paper between the points of the contact breaker and turn the cam (or housing) until the paper can just be pulled out.

5. Removal of Petrol Tank

Turn off the petrol tap.

Disconnect the petrol pipe.

Remove the two bolts which secure the tank to the frame at front and rear and it can then be lifted clear.



6. Removal of Cylinder Head

Remove the Petrol Tank (Subsection 5).

Remove the Engine Steady and Exhaust Pipe.

Disconnect the Oil Pipe and Sparking Plug Lead.

Push the Carburettor back clear of the studs after having removed the fixing nuts.

Remove the Rocker Box Cover.

Turn the engine until both valves are closed.

Remove the Rockers and Bearings complete by undoing four 1/4 in. nuts on each.

Lift out the Push Rods, having marked them so that they can go back in the same positions.

Remove four nuts, taking care not to lose the washers, and lift off the cylinder head. To break the seal, tap the head gently with a hide hammer beneath the exhaust and inlet ports, not beneath the fins.

Before replacing the head see that the two Hallite washers are in position in the push rod holes in the barrel.

Apply a thin coat of compound to both sides of the gasket and place in position. It is preferable to fit a new gasket each time the head is removed.

Place the head on the cylinder barrel and replace the four nuts which should be tightened progressively and diagonally from one side to the other to prevent distortion. If new Hallite washers have been fitted, screw down the two nuts on the timing side first, sufficiently to compress the washers.

Replace the push rods in their correct position, with the adjustable ends downwards.

Refit the Rockers and Bearings, making sure that the oil feed hole is on the underside and that the cap and base of each bearing are in line when tightened down. A sharp tap with a hammer on the end of the rocker will help to ensure this. See that the valve stem caps are in place.

See that the Rocker Box Gasket is intact and replace the Rocker Box Cover.

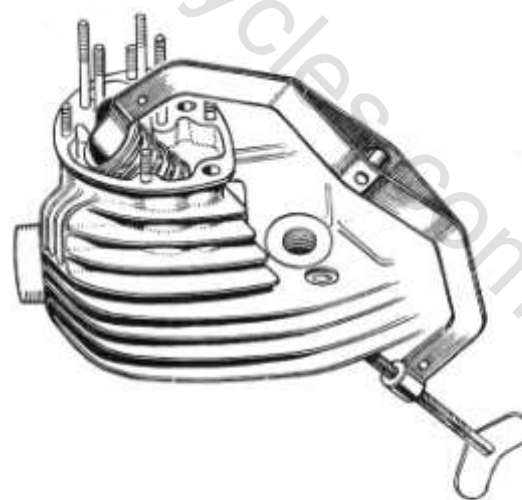
After the engine has been run long enough to get thoroughly hot, the tightness of the nuts should be re-checked.

7. Removal of Valves

Remove the Cylinder Head and Rockers (Subsection 6).

Pry away the hardened steel thimble or end cap. If this has stuck it can be removed by means of a screwdriver.

Using a suitable compressing tool compress the valve springs and remove the split conical collets from the end of the valve stem.



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Slacken back the compressing tool and release the springs.

Withdraw the valve and place its springs, top spring collar (and bottom collar if it is loose) and split conical collets together in order that they may be re-assembled with the valve from which they were removed.

Deal similarly with the other valve in the head. 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. If the burrs are not removed and the valve is forced out, the guide may be damaged.

8. Removal of Rockers

See Subsection 6.

9. Removal of Valve Guides

To remove the valve guides from the head two Special Tools are required which can easily be made.

The first is a piece of tube with an internal bore of not less than 7/8 in.

The second is a mandrel about 4 in. long, made from 9/16 in. dia. bar with the end turned down to 11/32 in. dia. for 1/2 in.

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 and the guide is replaced by a hammer, use the mandrel to prevent damage to the guide which is of cast iron and must be treated with great care.

It is necessary to re-cut the valve seat and grind in the valve after a guide has been replaced.

10. Removal of Cylinder Barrel.

Remove the Cylinder Head (Subsection 6).

Put the Piston at bottom dead centre.

Undo five nuts and lift the barrel off.

When replacing the cylinder, clean off the joint faces and fit a new paper joint washer. See that the oil hole in the paper joint is opposite the oil passage through the crankcase and cylinder.

11. Removal of Piston

Remove the cylinder head and cylinder barrel. (Subsections 6 and 10.)

With the tang of a file remove one of the wire circlips retaining the gudgeon pin.

Extract the gudgeon pin using Special Tool No. E.5477, having first marked the pin so that it, and the piston, may be replaced the same way round.

During this operation put a piece of clean rag in the top of the crank case to prevent foreign matter getting in. In particular, take care not to drop the circlip in the crankcase.

12. Decarbonising

Having removed the cylinder head, as described in Subsection 6, scrape away all carbon gently and avoid scoring the combustion chamber or the valve seats. Be careful too not to injure the joint face which beds down on to the head gasket.

Scrape away all carbon from the valve heads and beneath the heads, being careful not to damage the valve faces. In cleaning the top of the piston remember that it is made of aluminium alloy and easily damaged.

If the piston rings are removed, the grooves can be cleaned out and new ones fitted. For cleaning the grooves a suitable tool is a piece of broken ring thrust into a wooden handle and filed to a chisel point.

While the cylinder and piston are not in position, cover the crankcase with a clean cloth to prevent the ingress of dust and dirt of all kinds. Do not, of course, attempt to scrape the carbon from the piston when the mouth of the crankcase is open.

13. Grinding-In Valves

Wipe the valve faces clean and examine them carefully. If they are at all pitted, have the faces re-cut. Pay similar attention to the valve seats in the head; excessive grinding will form a pocket and the gas flow will be restricted. The angle of the valve face should be 45 degrees to the axis of the valve stem.

To grind a valve, smear the seating with a little grinding-in compound, place a light, short coil spring over the valve stem and beneath the head, insert the valve into its appropriate guide, press it on to the seat using a tool with a suction cup or one which grips the valve stem and with a backwards and forwards rotary motion, grind it on to its seat. Frequently lift the valve and move it round so that an even and true seating is obtained. Continue grinding until a bright ring is visible on both valve and seating.

14. Reassembly after Decarbonising.

Before building up the engine, see that all parts are scrupulously clean and place them conveniently to hand on a clean sheet of brown paper.

It is advisable to fit a new gasket to the cylinder head and a new paper washer at the cylinder base. Make sure that there is a hole in the latter registering with the oil feed to the back of the cylinder.

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If the old copper gasket is used for the cylinder head joint, it should be annealed by heating to red heat and plunging in water.

New Hallite washers, painted with gold size or compound should be fitted to make the joints in the push rod enclosure tubes.

Smear clean oil over the piston and space the ring gaps, having replaced the rings if these have been removed, lower the piston over the connecting rod and insert the gudgeon pin. Fit the circlip securing the gudgeon pin.

If the piston ring gaps exceed $1/16$ in. when the rings are in position in the barrel, new rings should be fitted. The correct gap for new rings is $.011 - .015$ in. The gap should be measured in the least worn part of the cylinder, which will be found to be the extreme top or bottom of the bore.

Oil the cylinder bore and lower the barrel over the piston and seat it gently on the paper washer. Tighten down the cylinder base nuts, working diagonally from one to another to ensure pulling the barrel down dead level.

Replace the cylinder head and rockers as described in Subsection 6.

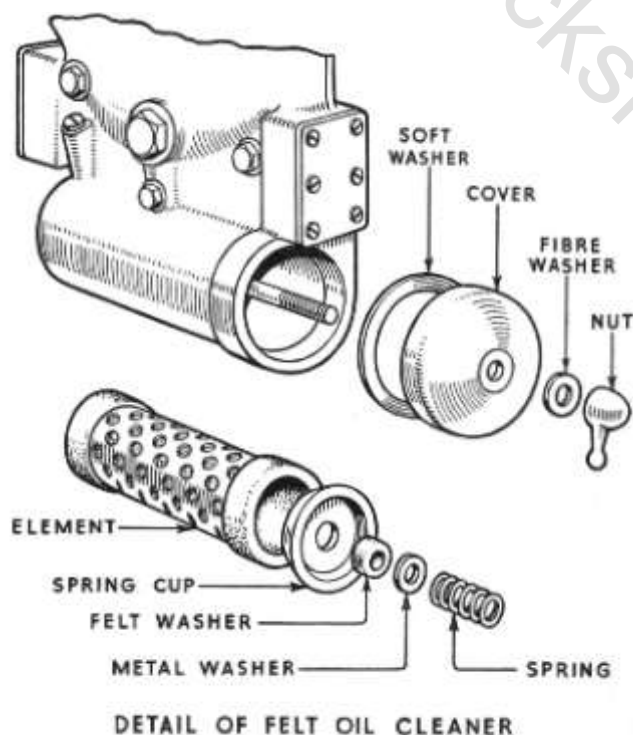


Fig. 5

15. Cleaning the Oil Filter

The oil filter is located in the timing cover immediately below the oil pump. The felt

element should be taken out and washed in petrol after the first 500 miles and every subsequent 2,000 miles. Fit a new element every 5,000 miles.

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

16. Overhaul of Oil Pumps

Remove the timing cover as described in Sub-section 1.

Remove the end plates from both pumps.

Remove the pump discs and plungers.

Remove the pump spindle which can be pulled out from the front or return pump end.

Check the fit of the plungers in the pump discs which should have a minimum of clearance but should be able to be moved in and out by hand.

If, when fitting a new disc or plunger, the plunger is found to be too tight a fit, carefully lap with metal polish until it is just free. If the pump disc is not seating properly or if a new pump disc is being fitted, it should be lapped to the seating with Special Tool No. E.5425, using Carborundum 360 Fine Paste or liquid metal polish until an even surface is obtained.

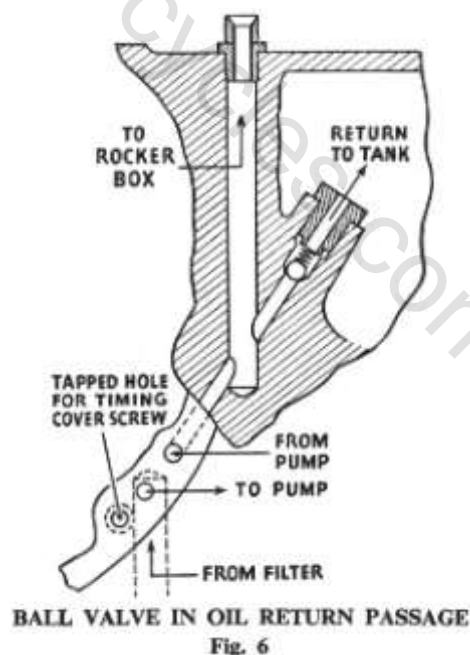


Fig. 6

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Wash all passages, etc., 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 before placing the pump covers in position. The latter should be held 1/8 in. off the timing cover if the springs are correct.

The pump spindle should be renewed if excessive wear has taken place on the teeth.

Re-assemble the oil pumps, replacing the paper cover gaskets if necessary. Before fitting each cover fill the pump chamber with clean oil.

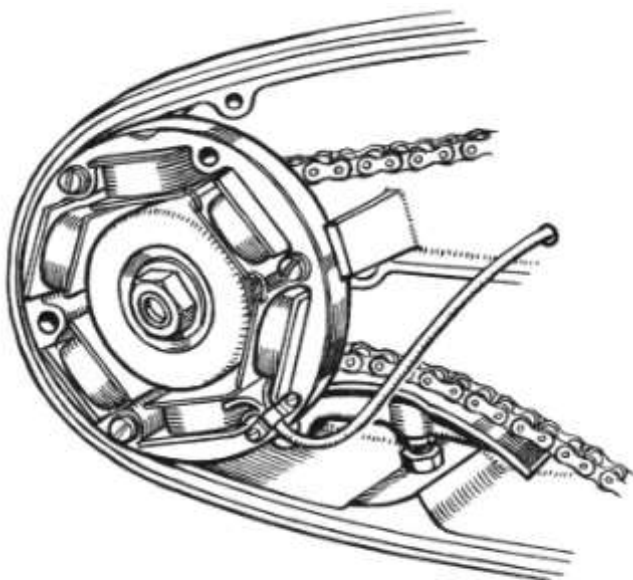
Having assembled the pumps, lay the timing cover flat and fill the oil ports by means of an oilcan. Turn the pump spindle with a screw driver in a clockwise direction looking on the front and it can then be seen whether the pumps are operating correctly.

Before replacing the timing cover on the engine, fill the filter chamber with clean oil.

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 to the tanks can be checked by removing the oil filter cap.

17. Removal of Pump Worm and Timing Pinion

Unscrew the worm shaft by the hexagon head behind the worm, using Special Tool No. E.5451. This is a **Left Hand Thread**.



A SLIPPER IS USED FOR PRIMARY CHAIN ADJUSTMENTS

Fig. 7

Withdraw the timing pinion by means of a flat chisel placed behind the pinion and tapped gently.

18. Removal of Contact Breaker Pinion

Remove the timing cover and take off the hexagon nut holding the pinion.

Extract the pinion with the Special Tool No. 14835.

19. 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 catch the oil from the chain case.

Beneath the bottom run of the chain is a curved slipper on which the chain rests and which may be raised or lowered by turning the adjusting screw after having first slackened the locknut.

The chain should be adjusted so that there is 1/4 in. up and down movement at the centre of the top run of the chain.

After replacing the chain case cover, remember to replenish the chain case with oil.

On early models the alternator stator was attached to the chain case cover. When replacing the cover it is important to do up the securing nut finger-tight and rotate the engine several times to centralise the stator on the rotor through the medium of the spigot bearing before tightening the nut fully.

20. Removal of Engine and Clutch Sprockets

Remove the primary chain case cover, having first placed a tray underneath to catch the oil.

Remove the alternator stator by unscrewing three 1/4 in. screws, taking care that the lock washers do not adhere to the rotor.

Unscrew the engine sprocket nut.

Remove the alternator rotor and distance piece.

Remove the chain by opening the spring link.

Withdraw the engine sprocket with a suitable extractor.

To remove the clutch sprocket, unscrew the three clutch spring pins and the springs, plates and sprocket can then be lifted away.

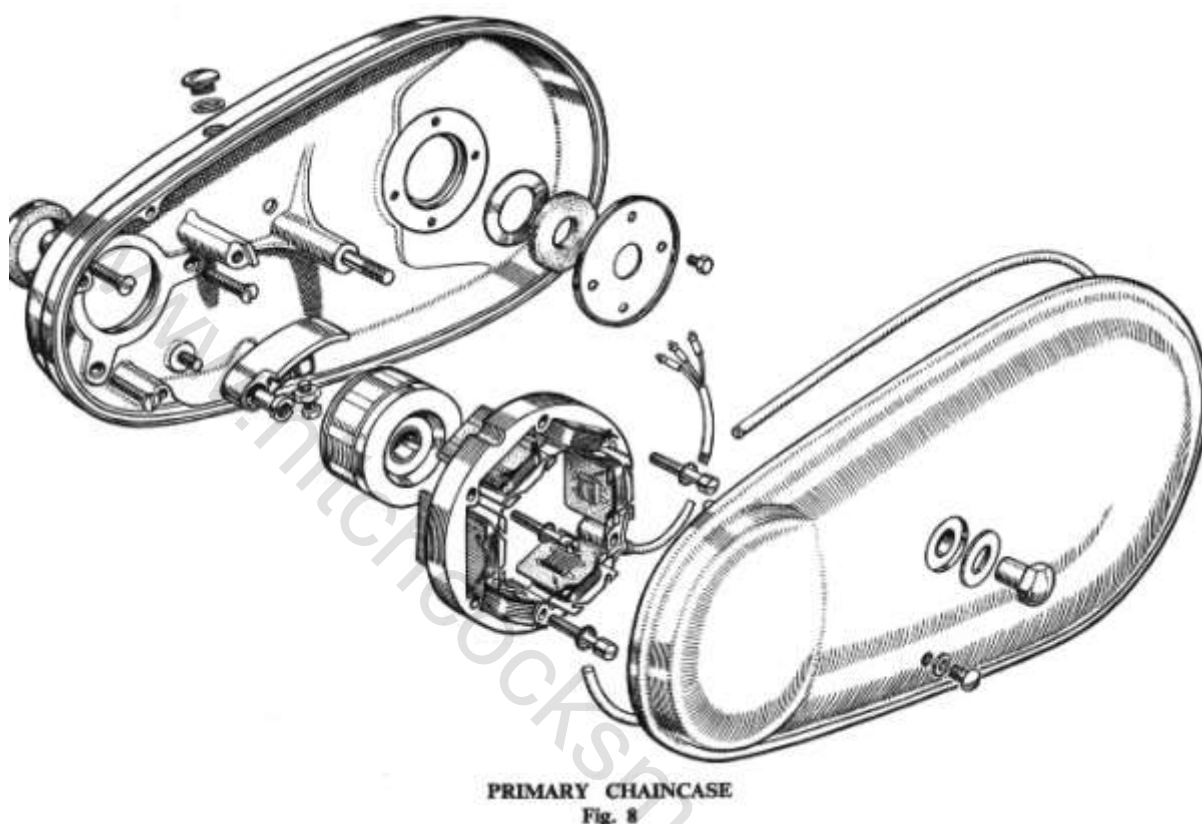
On earlier engines it is not necessary to remove the alternator stator as this is attached to the chain case cover.

21. Removal of Tappets and Guides

It is only necessary to remove the tappets and guides if they have become worn.

To remove the guides heat the crankcase locally with a blow lamp and the guide can then be withdrawn with a pair of pliers. Otherwise it may be

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necessary to dismantle the crankcase and drive the tappet and guide out from underneath.

The guide should have an interference fit of .0015 to .0025 in. in the crankcase and can be driven in with a bronze drift, care being taken when the guide is nearly home to avoid breaking the collar.

22. Dismantling the Breather.

If the breather is not operating efficiently, it may cause pressure in the crankcase, instead of a partial vacuum, giving rise to smoking or over oiling.

See that the discs and backplate are clean and undamaged and that the discs are seating properly.

When re-assembling the breather, apply jointing compound very sparingly to the back of the steel plate, taking great care to keep it away from the discs or their seatings.

23. Removal of the Clutch.

Remove the primary chain cover and take off the primary chain by opening the spring link.

Remove the clutch sprocket as described in Subsection 20.

To remove the clutch hub, hold the clutch with Special Tool No. E.4871 and remove the centre retaining nut and washer with a box spanner.

The hub can then be withdrawn from the shaft with Special Tool No. E.5414.

24. Removal of Final Drive Sprocket.

Remove the engine sprocket and alternator rotor as described in Subsection 20 and the clutch as described in Subsection 23.

Remove the primary chain tensioner.

Remove the alternator stator. (Later models only.)

Remove the rear half of the primary chain case by taking out three socket screws.

Remove the set screw locking the final drive sprocket nut.

Hold the sprocket and remove the nut (**Right Hand Thread**). The sprocket can then be withdrawn.

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On some early engines with Miller equipment the rotor may have two keyways. In this case care should be taken when reassembling to fit the key in the keyway previously and to reassemble the rotor the same way round. If this is not done the efficiency of the Emergency Starting may be affected.

25. Pressure Relief Valves.

There are two pressure relief valves in the oil feeds to the big end and to the rocker gear respectively. Their function is to prevent excessive pressure and their setting is not critical. The feed to the rocker gear comes from the return oil from the crankcase to the tank.

The pressure relief valves are set before leaving the Works and should not normally require to be disturbed. If, however, it is found necessary to dismantle either of them, they can be reset as follows:-

Rocker Feed Relief Valve. This is located in the oil tank immediately below the oil filler cap socket and consists of a 3/16 in. steel ball held in position by a spring and brass plug (see Fig. 6).

To gain access to it, take out the securing peg of the oil filler cap socket and remove the socket.

The valve should be set so that oil just reaches the rockers when the engine is running slowly.

Great care must be taken not to drop the plug, the spring or the ball into the oil tank. A small magnet is useful for extracting the springs and ball or a rod with stiff grease on the end.

Big End Relief Valve. This is located in the timing-side crankshaft and can only be adjusted when the crankshaft has been dismantled. It consists of a 5/16 in. dia. steel ball and spring held in position by a screwed plug.

The valve is set to open when the oil pressure exceeds about 35 lbs. per square inch and when set correctly there is a movement of about 3/32 in. of the ball off the seat. This can be measured without dismantling the crankshaft by pushing a thin rod through the hole in the pump worm with the oil feed plug in the timing cover removed.

If the crankshaft is dismantled for any reason, it is always advisable to fit a new spring to the relief valve in case the original one has become weak.

If the valve is set to give too high a pressure, the pump disc will be forced off its seating.

26. Removal of Contact Breaker Housing and Bracket.

Disconnect the lead to the switch.

Remove the contact breaker pinion (Sub-section 18).

Lucas Equipment. The contact breaker housing is attached to the housing bracket by one round headed screw and if this is removed the housing can be withdrawn.

The bracket can be detached from the crankcase by removing two hexagon headed fixing bolts.

Miller Equipment. Slacken the nut on the securing strap and withdraw the contact breaker and housing complete.

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SECTION D3

Service Operations with Engine out of Frame 250 Clipper

1. Removal of the Engine from the Frame

Disconnect the battery leads and remove the battery.

Turn off the petrol and disconnect the petrol pipe.

Take the slides out of the carburettor.

Remove the air cleaner.

Remove the exhaust pipe.

Disconnect the electric horn leads.

Disconnect the alternator lead connectors behind the battery carrier.

Disconnect the lead to the contact breaker.

Disconnect the engine steady.

Remove the rear chain.

Remove the footrest bar.

Support the engine on a suitable box or wood block.

Remove the centre stand and the stand stop.

Remove the front engine plates.

Remove the bolt securing the rear engine plate to the frame.

Lift the engine and gearbox out.

2. Removal of Gearbox

Remove the primary chain case, engine sprocket, alternator stator and rotor and clutch. (See Section C3, Subsection 24.)

Remove two 5/16 in. engine bolts and the top gearbox bolt.

Slacken the bottom gearbox bolt and the gearbox can then be lifted out.

3. Dismantling the Crankcase

Drain the oil tank by removing the drainplug.

Having removed the engine from the frame as described in Subsection 1, dismantle the cylinder head, barrel, piston, timing gear, contact breaker housing, etc., as described in Section C.

Remove the nuts on the driving side of the engine from two fixed studs at the top of the crankcase.

Remove the stepped bolt securing the contact breaker housing strap.

Remove nine studs passing through the crankcase.

The two halves of the crankcase can then be separated, the outer races of the main bearings remaining in the crankcase.

4. Main Bearings.

To remove the outer races from the crankcase, heat the crankcase to 100°C. or more and drop the halve case sharply on a flat block of wood or bench, when the race will drop out.

To replace the outer races, heat the case and press the races in, using Special Tool No. E. 4816 on the timing side and E.5119 on the driving side.

Care must be taken on the driving side to see that the oil holes in the bearings come opposite the two holes in the crankcase.

If it is necessary to replace the rollers, new ones are available, graded in steps of .0001 in. from .2490 in. to .2500 in.

5. Replacement of the Cam and Idler Spindles

To remove the cam spindles heat the crankcase and tap the spindles out from inside.

To remove the idler spindles heat the crankcase as before, hold the spindles in a vice and tap the crankcase lightly with a hide hammer.

To replace the spindles use special tool No. E.6462, which is a locating plate for all the spindles.

Start the spindles in the holes in the crankcase by tapping them lightly.

Offer the locating plate to the spindles, making sure that they are all upright. Tap the plate over the spindles until it touches the timing chest face, having first made sure that the latter is quite clean.

Drive the spindles home with a small hammer (not heavier than 1/2 lb.) and a drift.

Remove the locating plate.

6. Flywheel Assembly

The flywheel assembly consists of crankshaft and connecting rod.

To dismantle the crankshaft remove the set screws securing the crank pin nuts.

Holding the crankshaft in a special jig, No. E.2775, remove the crank pin nuts.

Using E.2775, with a pair of steel bars (about 1 in. x 3/8 in. x 9 in. long) placed across, press out the crank pin with a hand press.

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The connecting rod can then be removed.
Turn the crankshaft over in the jig and repeat with the other side if necessary.

To remove the main shafts, remove the set screws from the shaft nuts and unscrew nuts. Tap the shafts out with a hammer and bronze drift.

To replace the main shafts reverse the above process, making sure that the keys are a good fit. The nuts should be screwed up very tightly, using a well-fitting box spanner and a 12 in. tommy bar.

To re-assemble the crankshaft, press the crank pin into the timing side flywheel, making sure that the oil hole is in the correct position and that the thrust washer is facing the right way, i.e., with the chamfer **away** from the flywheel. (See below).

Test the oil passages with an air line or oil gun to make sure that they are clear.

Smear oil over crankpin and floating bush.

Put the floating bush over the crank pin.

Put the connecting rod over the floating bush.

Place the other thrust washer over the crankpin. (Chamfer away from flywheel).

Press the driving side flywheel on.

Put the flywheel in the assembly jig E.2775 to ensure the flywheels and shafts are in line, tighten the nuts as much as possible and replace the set screws.

Test the oil passages again to ensure that they are clear.

If the same crank pin has been put back, it will be necessary to drill out the grub screw, in order to clean the oil passages after which a new grub screw must be fitted.

Mount the crankshaft between centres and true up to .0005 in. on either side of the shafts.

If the readings for the two shafts are high on opposite sides, the error can be corrected by gently tapping either or both of the flywheels.

If the readings are high on the same side of the two shafts, it is probably due to dirt or foreign matter in the joints and the crankshaft should be dismantled again, carefully examined and cleaned and re-assembled.

Thrust washers are available in the following thicknesses, .065 in., .075 in., .085 in. and .100 in. for adjusting the end float on the crankshaft. The end float should be adjusted to centralise the connecting rod in the mouth of the crankcase and should not exceed .015in. when newly assembled.

7. Reassembly of the Crankcase

Replace the outer roller races in the crankcase halves as described in Subsection 4.

Fit the distance piece and the rollers and cages in the driving side crankcase and pour a little clean oil on to them.

Lay the thrust washer on the bearing.

Assemble the flywheel into the bearing.

Make sure that the crankcase face is clean and apply jointing compound to it.

Put the thrust washer on the timing side shaft and then the rollers and cage.

Place the timing side crankcase in position over the flywheel. Where Miller electrical equipment is fitted, it is an advantage to put the contact breaker housing straps in position before bolting up the case.

Bolt the two halves of the crankcase together, making sure that the joint matches correctly so that the cylinder base is flat.

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SECTION E2

Gearbox and Clutch

250 Clipper

1. Removal of Gearbox

This is described in Section D. Subsection 2.

The gearbox can, however, be completely dismantled with the engine in the frame except for the removal of the inside operator and the bearings in the gearbox shell.

2. To Dismantle the Gearbox.

Remove the kickstart crank, the change-gear lever and the indicator pointer.

Disconnect the clutch cable from the lever on the top of the box.

Remove six screws. These are different lengths and care must be taken on re-assembling that they are put back in their correct positions.

The gearbox outer cover can then be removed.

Remove the change-gear mechanism by taking off the two nuts securing it.

Remove the main shaft bearing cover which is attached by two hexagon-headed bolts. Note that the bottom bolt is slightly longer than the other to provide an anchorage for the kick-start crank return spring.

Remove three cheese-headed screws. Do not remove the countersunk screw which secures the pawl trip and stop inside the box.

Remove the spring box locating plunger nut and washer.

Remove the main shaft nut. **(Left Hand Thread).**

The gearbox inner cover can then be removed.

The mainshaft can be drawn straight out if the clutch has been removed, which, however, should be done before taking off the gearbox inner cover. (See Section C, Subsection 23.) The top gear pinion will come away with the mainshaft.

The layshaft can then be removed and the 2nd and 3rd gears drawn off the final drive sleeve together with the operator fork.

To take out the final drive sleeve, the final drive sprocket must be removed and this is preferably done before removing the inner cover. (See Section C, Subsection 29.)

3. Removal of the Ball Races

The mainshaft ball bearings can be removed by using a stepped drift $1\frac{5}{16}$ inch- $\frac{63}{64}$ inch diameter for the bearing in the box and $1\frac{1}{8}$ inch- $\frac{37}{64}$ inch diameter for the bearing in the cover.

When refitting the bearings stepped drifts of $2\frac{3}{16}$ inches; inch diameter and $1\frac{3}{8}$ inch- $\frac{37}{64}$ inch diameter must be used for the bearings in the box and cover respectively.

Note the felt washer in the recess behind the larger main shaft bearing and the dished pen-steel washer between the bearing and the felt washer. The second dished pen-steel washer (having a smaller central hole) fits on the other side of the main shaft bearing and is nipped between the inner face of the bearing and the shoulder on the final drive sleeve. See that both of the dished pen-steel washers have their portions facing towards the clutch and final drive sprocket.

4. Change-Gear Mechanism

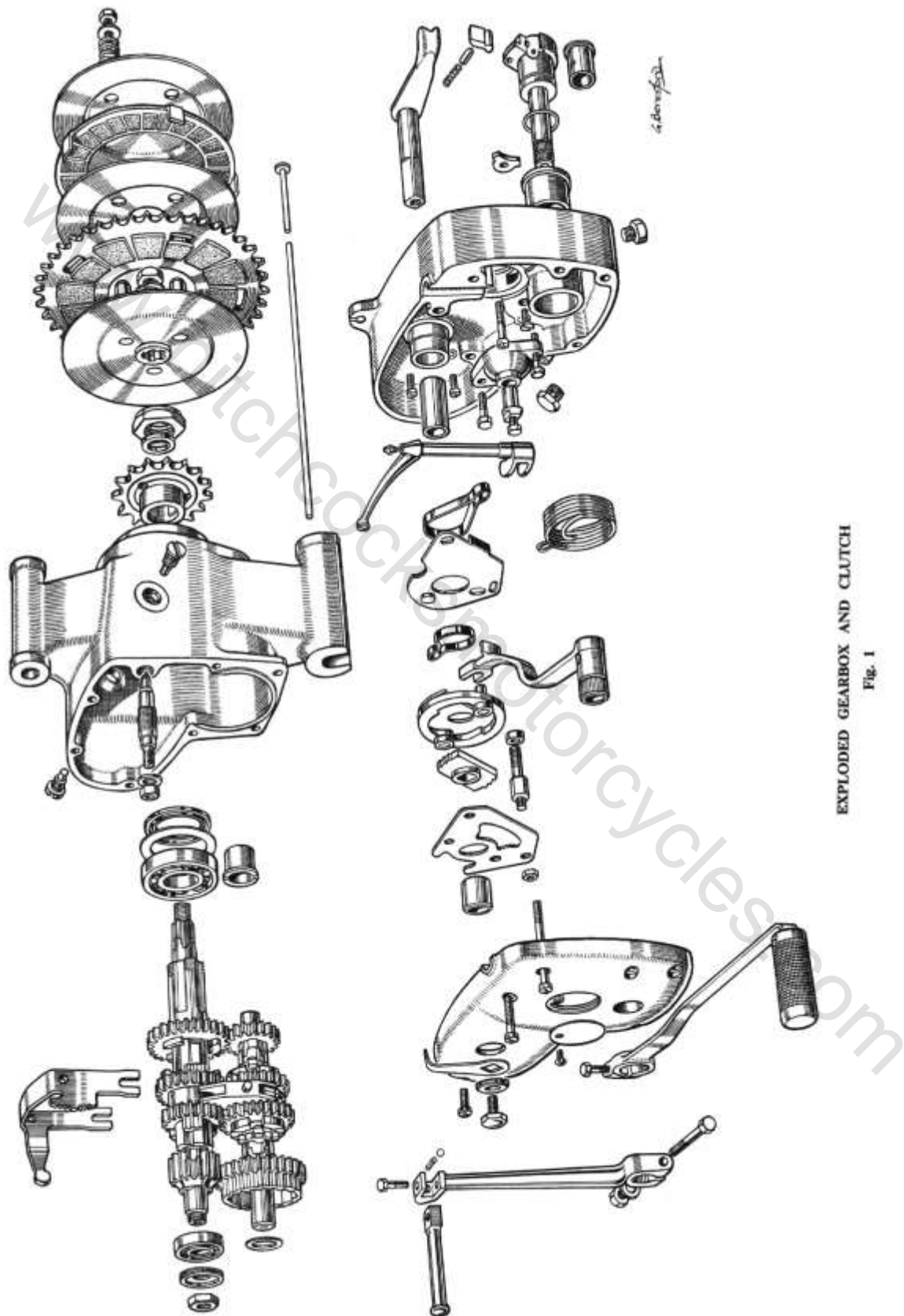
If the two nuts securing the change-gear ratchet mechanism are slackened, the adjuster plate can be set in the correct position. In this position the movement of the gear lever necessary to engage the ratchet teeth will be approximately the same in each direction.

If the plate is incorrectly adjusted, it may be found that, after moving from top to third or from bottom to second gear, the outer ratchets do not engage the teeth on the inner ratchets correctly.

If, when fitting new parts, it is found that the gears do not engage properly, ascertain whether a little more movement is required or whether there is too much movement so that the gear slips right through second or third gear into neutral. If more movement is required, this can be obtained by filing the adjuster plate very slightly at the points of contact with the pegs on the ratchet ring.

If too much movement is already present, a new adjuster plate giving less movement must be fitted.

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5. Reassembling the Gearbox

The procedure is the reverse of that given in Subsection 2, but the following points should be noted:-

If the main shaft top gear pinion has been removed, make sure that it is replaced the right way round, or third and top gears can be engaged simultaneously.

Make sure that the trunnions on the operator fork engage with the slots in the inside operator.

See that the main shaft is pushed right home. (It may tighten in the felt washer inside the final drive shaft nut.)

The layshaft top gear and kickstarter pinion should be assembled on the layshaft and the kickstarter shaft and ratchet assembled on to it before fitting the end cover.

Do not forget the washer on the layshaft between the kickstarter pinion and the kickstarter shaft.

The joint between the gearbox and the inner cover should be made with gold size, shellac or a similar jointing compound.

Make sure that all parts are clean before commencing assembly. In normal climates the

recesses in the gearbox should be packed with soft grease and the box should be filled up to the correct level with gear oil. On no account must heavy yellow grease be used.

6. Dismantling and Reassembly of the Clutch

The method of removing the clutch is described in Section C, Subsection 23.

When reassembling, note that two of the steel plates are dished and that the other(s) are flat. The correct order of assembly is shown on the exploded drawing.

Do not forget to replace the cush rubber or plate retaining cover before fitting the pressure plate.

Make sure that the distance tubes inside the springs pass through the holes in the pressure plate.

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 springs should be fitted.

7. Adjustment of the Clutch Control

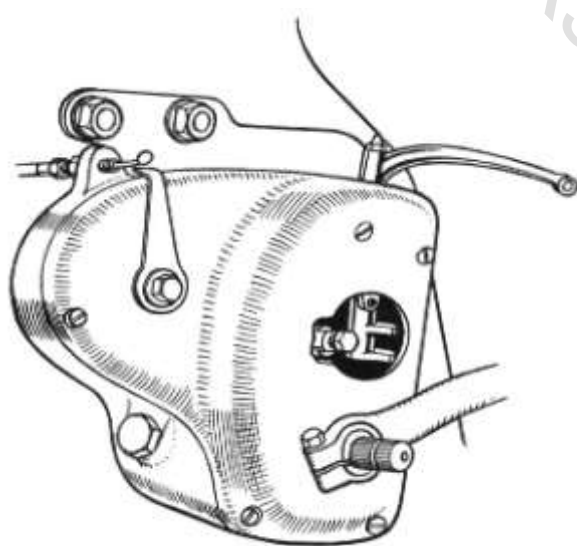
It is essential that there should be about $\frac{1}{16}$ in. free movement in the clutch cable, to ensure that all the spring pressure is exerted on the plates.

There are two points of adjustment for the clutch cable. The first is on the top of the gearbox at the end of the horizontal lever and is provided for taking up any stretch in the cable. The adjustment is made by screwing the collar in or out of the lug on the top of the gearbox. Tighten the locknut after the adjustment has been made.

The other point of adjustment is behind the small cover on the front of the gearbox and is for compensating for wear on the clutch plate inserts. To make the adjustment, remove the small over, slacken the locknut and turn the central screw. Tighten the locknut after the adjustment has been made.

The reason for the two points of adjustment is to enable the lever and fork to be kept in their proper positions whether the need for adjustment is caused by plate wear or cable stretch.

Owing to initial bedding down of the clutch plate inserts, the clutch control may require adjustment after the first few hundred miles with a new machine. This point should therefore be examined soon after delivery and adjustment made if necessary.



CLUTCH ADJUSTMENT

Fig. 2

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**AMAL
NEEDLE TYPE
CARBURETTER**



**AMAL
MONOBLOC
CARBURETTER**

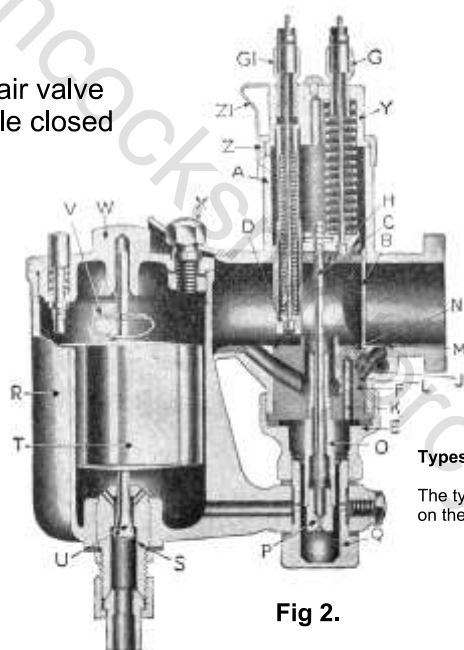
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SECTION F1 AMAL NEEDLE TYPE CARBURETTER

MODEL	YEAR	CARB NUMBER	CHOKE DIAMETER	MAIN JET	NEEDLE JET	NEEDLE POSITION	THROTTLE VALVE	
250 MODEL S	1951-53	274BH/3A	25/32	75	106	2	4	STUB FITTING
250 MODEL S	1951-53	274BS/3A	25/32	75	106	2	4	FLANGE FITTING
250 CLIPPER	1954-55	274BS/3A	25/32	75	106	2	4	FLANGE FITTING
250 CLIPPER	1955-57	375/10	25/32	120	105	3	4	PILOT JET 25

CARBURETTER WITH PILOT JET SYSTEM

Showing air valve
and throttle closed



Types 274, 275, 276 and 289

The type numbers are found
on the engine connection

Fig 2.

Your carburettor may be vertical, inclined or horizontal, but diagrammatically this view applies to all models, the variation being in the attachment to the engine and of the float chamber.

TWO DESIGNS

Fig. 2 above is the sectioned view of the standard Amal carburettor as shown on sheet 1, figure 1. This is the standard design where the primary air to the main jet and the pilot jet system comes in jointly through the main air intake, see figure 3, sheet 3. The type numbers are 274, 275, 276 and 289.

An alternative design is made where the primary air to the main jet comes in through four visible ports around the base of the mixing chamber, and where also the air supply to the pilot jet system is separate. The type numbers of these carburettors are 74, 75, 76, and 89.

These tuning instructions apply to both the above designs.

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HOW IT WORKS AND PART NAMES

- | | | | |
|----|------------------------------|-----|----------------------------|
| A. | Mixing Chamber | O. | Needle Jet |
| B. | Throttle Valve (see sheet 6) | P. | Main Jet (see sheet 6) |
| C. | Jet Needle and Clip above | Q. | Float Chamber Holding Bolt |
| D. | Air Valve | R. | Float Chamber |
| E. | Mixing Chamber Union Nut | S. | Needle Valve Sealing |
| F. | Jet Block | T. | Float |
| G. | Cable Adjuster (Throttle) | U. | Float Needle Valve |
| H. | Cable Adjuster (Air) | V. | Float Needle Clip |
| I. | Jet Block Barrel | W. | Float Chamber Cover |
| J. | Pilot hole (see sheet 6) | X. | Float Chamber Lock Screw |
| K. | Passage to Pilot | Y. | Tickler (to left of W.) |
| L. | Pilot Air Passage | Z. | Mixing Chamber Top Cap |
| M. | Pilot Mixture Outlet | Z. | Mixing Chamber Lock Ring |
| N. | Pilot By-pass | ZI. | Security Spring for above |

The carburettor proportions and atomises the right amount of petrol with the air that is sucked in by the engine because of the correct proportions of jet sizes and the main choke bore. The float chamber maintains a constant level of fuel at the jets and cuts off the supply when the engine stops.

The throttle control from the handlebar controls the volume of mixture and therefore the power, and at all positions of the throttle the mixture is automatically correct. The opening of the throttle brings first into action the mixture supply from the pilot jet system for idling, then as it progressively opens, via the pilot by-pass, the mixture is augmented from the main jet, the earlier stages of which action is controlled by the needle in the needle jet. The main jet does not spray directly into the mixing chamber, but discharges through the needle jet into the primary air chamber, and goes from there as a rich petrol-air mixture through the primary air choke into the main air choke. This primary air choke has a compensating action. The carburettors usually have a separately-operated mixture control called an air valve, for use when starting from cold, and until the engine is warm, this control partially blocks the passage of air through the main choke. This design of carburettor offers perfectly simple and effective tuning facilities.

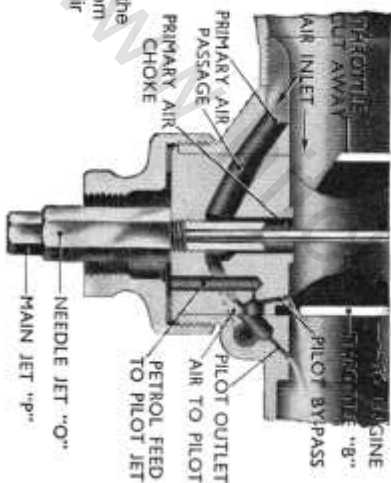
Fig 3.

This section view does NOT apply if your carburettor has FOUR EXTERNAL primary air inlets at the base of the mixing chamber. It is for carburettors with the primary air inlet in the main air intake.

Diagrammatic section

of carburettor showing only the lower half of the throttle chamber with the throttle a little open and the internal primary air passages to the main jet and pilot system

If the carburettor should flood whilst the engine is not running, the overflow from the main jet will run into the primary air passages and trickle out from there through a small hole seen at the side of the carburettor body.



HINTS AND TIPS

STARTING from cold. Flood the carburettor by depressing the tickler sharply three or four times, and close the air valve; set the ignition, approximately half retarded. Then shut the throttle and open it a little, eg. about one eighth open, see diagram on sheet 7 position 2, then kick-start. If it is too much open starting will be difficult.

STARTING, engine hot. Do not flood the carburettor, but close off the air lever. Set the ignition and close the throttle, then open the throttle about one eighth of its travel and kick-start. If the carburettor has been flooded and won't start because the mixture is too rich - open the throttle wide and give the engine several turns to clear the richness, then start again with the throttle one eighth open, and air lever wide open. Generally speaking it is not advisable to flood at all when an engine is hot.

STARTING, general. By experiment, find out if and when it is necessary to flood, also note the best position for the air lever and the throttle for the easiest starting (some carburettors have the throttle stop fitted with a starting position on to which the throttle must be shut down).

CABLE CONTROLS. See that there is a minimum of backlash when the controls are set back and that any movement of the handlebar does not cause the throttle to open; this is done by the adjusters on the top of the carburettor. See that the throttle shuts down freely.

PETROL FEED, verification. Detach petrol pipe union at the float chamber end; turn on petrol tap momentarily and see that fuel gushes out. Avoid petrol pipes with vertical loops as they cause air locks. Flooding may be due to a worn or bent needle or a leaky float, but nearly all flooding with new machines is due to impurities (grit, fluff, etc.) in the tank, so clean out the float chamber periodically until the trouble ceases. If the trouble persists, the tank might be drained, swilled out, etc. Note that if a carburettor, either vertical or horizontal, is flooding with the engine stopped, the overflow from the main jet will not run into the engine, but out of the carburettor through a hole at the base of the mixing chamber.

FIXING CARBURETTOR AND AIR LEAKS. Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the cylinder or inlet pipe, check by means of an oil can and eliminate by new washers and the equal tightening up of the flange nuts. Also in old machines look out for air leaks caused by a worn throttle or worn inlet valve guides.

BANGING IN EXHAUST may be caused by too weak a pilot mixture when the throttle is closed. It may also be caused by too rich a pilot mixture and an air leak in the exhaust system, the reason in either case is that the mixture has not fired in the cylinder and has fired in the hot silencer. If the banging happens when the throttle is fairly wide open, the trouble will be ignition not carburation

BAD PETROL CONSUMPTION of a new machine may be due to flooding, caused by impurities from the petrol tank lodging on the float needle seat and so prevent its valve from closing. If the machine has had several years use, flooding may be caused by a worn float needle valve. Also bad petrol consumption will be apparent if the throttle needle jet "O" (see fig. 2) has worn; it may be remedied or improved by lowering the needle in the throttle, but if it cannot be then the only remedy is to get a new needle jet.

AIR FILTERS. These may affect the jet setting, so if one is fitted afterwards to the carburettor the main jet may have to be snarled. If a carburettor is set with an air filter and the engine is to run without it, take care not to overheat the engine due to too weak a mixture, testing with the air valve (sheet 5, -4) will indicate if a larger main jet and higher needle position are required.

FAULTS. read sheet 5. The trouble may not be carburation; if the trouble cannot be remedied by making the mixture richer or weaker with the air valve, and you know the petrol feed is good and the carburettor is not flooding, the trouble is elsewhere.

RE-ASSEMBLING after dismantling. Note particularly that the mixing chamber nut E (fig. 2, sheet 2) is tightened up tight onto the washer that holds the jet block F (fig. 2 sheet 2), otherwise petrol will leak up. When replacing the throttle see that the throttle needle goes into the centre hole in the choke block and once in, note the throttle works freely when the mixing chamber top ring Z is screwed down firmly and held by spring ZI. Float chamber lid, to remove, first loosen screw X (FIG. 2). To remove float, pinch the bow V (fig. 2), and pull, when replacing, slip overneedle and slide down till bow jumps into the needle groove. Care required to avoid bending needle

ROYAL ENFIELD WORKSHOP MANUAL

PARTS TO TUNE UP WITH

(A). This fig. 4 is two diagrammatic sections of the carburettor to show :-

1. The throttle stop screw
2. The pilot screw

(b). **THROTTLE STOP SCREW.**

Set this screw to prop the throttle open sufficiently to keep the engine running when the twist grip is shut off.

(c). **PILOT AIR SCREW.**

This screw regulates the strength of the mixture for idling and for the initial opening of the throttle. The screw controls the suction on the pilot petrol jet by metering the amount of air that mixes with the petrol.

NOTE.— The air for the pilot jet may be admitted internally or externally according to one or other of the designs, but there is no difference in tuning.

(d). **MAIN JET.** The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle openings although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet.

Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike. NEVER REAMER A JET OUT, GET ANOTHER OF THE RIGHT SIZE. The bigger the number the bigger the jet.

To get at the main jet, undo the float chamber holding bolt Q (sheet 2). The jet is screwed into the needle jet so if the jet is tight, hold the needle jet carefully with a spanner, whilst unscrewing the main jet.

(e). **NEEDLE AND NEEDLE JET.** The needle is attached to the throttle and being a taper, either allows more or less petrol to pass through the needle jet as the throttle is opened or closed throughout the range, except when idling or nearly full throttle. The needle jet is of a defined size and is only altered from standard when using alcohol fuels. The taper needle position in relation to the throttle opening, can be set according to the mixture required, by fixing it to the throttle with the needle clip spring in a certain groove (see above illustration), thus either raising or lowering it. Raising the needle richens the mixture and lowering it weakens the mixture at throttles openings from quarter to three-quarters open (see illustration sheet 7).

(f). **THROTTLE VALVE CUTAWAY.** The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cutaway is recorded by a number marked on the throttle, eg. 6/3 means throttle type 6 with number 3 cutaway. Larger cutaways, say 4 and 5, give weaker mixtures, and 2 would give a richer mixture.

(g). **AIR VALVE.** is only used for starting and running when cold, and for experimenting with, otherwise run with it wide open.

(h). **TICKLER,** a small plunger spring loaded in the float chamber lid. When pressed down on the float the needle valve is pushed off its seat and so "flooding" is achieved. Flooding temporarily enrichens the mixture until the level of the petrol subsides to normal.

HOW TO TRACE FAULTS

There are only **TWO** possible faults in carburation; either **RICHNESS** of mixture or **WEAKNESS** of mixture, so in case of trouble, decide which is the cause, by:

1. **Examining the petrol feed.** Verify jets and passages are clear. Verify ample flow.

2. **Looking for air leaks.** Verify there is no flooding. At the connection to the engine. Or due to leaky inlet valve stems.

3. **Defective or worn parts.** Slack throttle or worn needle jet. The mixing chamber union nut not tightened up, or loose jets.

4. **TEST WITH THE AIR VALVE.** to see if by richening the mixture, the results are better or worse.

INDICATIONS OF:

RICHNESS.

Black smoke in exhaust.
Petrol spraying out of the carb.
Four strokes, eight stroking.
Heavy, lumpy running.
Heavy petrol consumption.
- If the jet block F is not tightened up by washer and nut E, richness will be caused through leakage of petrol.
- Air cleaner choked up.
- Needle jet worn large.
Sparkling plug sooty.

WEAKNESS

Spitting in carburettor.
Erratic slow running.
Overheating.
Acceleration poor.
Engine goes better if:
- throttle not wide open
or air valve is partially closed
- Has air cleaner been removed
- Jets partially choked up
REMOVING the silencer or running with a racing silencer requires a richer setting and a larger main jet.

NOTE:

Verify correctness of fuel feed, stop air leaks, check over ignition and valve operation and timing. **DECIDE BY TEST WHETHER RICHNESS OR WEAKNESS IS THE TROUBLE AND AT WHAT THROTTLE POSITION.** See throttle opening diagrams, sheet 7.

PROCEDURE:

If at a particular throttle opening you partially close the air valve and the engine goes better, weakness is indicated. If the running is worse, richness is indicated. **THEN YOU PROCEED TO ADJUST THE APPROPRIATE PART AS INDICATED AT THE BOTTOM OF SHEET 7 FOR THAT THROTTLE POSITION.**

FAULT AT THROTTLE POSITIONS (Indicated on sheet 7)

TO CURE RICHNESS

1. Fit smaller main jet.
2. Screw out pilot air screw.
3. Fit a throttle with larger cut-away
4. Lower needle one or two grooves

TO CURE WEAKNESS

1. Fit larger main jet
2. Screw pilot air screw in.
3. Fit a throttle with smaller cut-away.
4. Raise needle one or two grooves.

NOTE: It is not correct to cure a rich mixture at half throttle by fitting a smaller main jet because the main jet may be correct for power at full throttle, the correct way is to lower the needle.

CHANGING FROM STANDARD PETROLS TO SPECIAL FUELS, such as alcohol mixtures will, with the same setting in the carburettor, certainly cause weakness of mixture and possible damage from overheating.

ROYAL ENFIELD WORKSHOP MANUAL

HOW TO TUNE UP

PHASES OF AMAL NEEDLE JET CARBURETTER THROTTLE OPENINGS

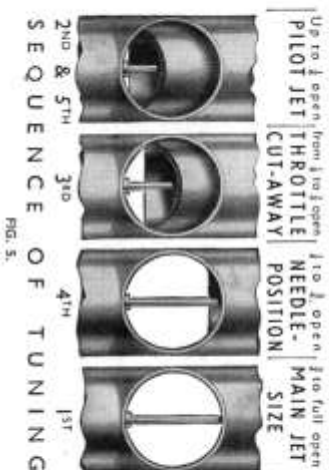


FIG. 5.

TUNE UP IN THE FOLLOWING ORDER ONLY, by so doing you will not upset good results obtained.

READ REMARKS ON SHEET 5 AND 6 for each tuning device and get the motor going perfectly on a quiet road with a slight up gradient so that on test the engine is pulling.

1st. MAIN JET with throttle in position 1 (sheet 7). If at full throttle the engine runs 'heavily', the main jet is too large. If at full throttle by slightly closing the throttle or air valve, the engine seems to have better power, the main jet is too small. With a correct sized main jet, the engine at full throttle should run evenly and regularly with maximum power. If you are testing for speed work, ensure that the main jet size is sufficient for the mixture to be rich enough to keep the engine cool, and to verify this, examine the sparking plug after taking a fast run, de-clutching and stopping the engine quickly. If the plug body air its end has a cool appearance, the mixture is correct. If sooty the mixture is rich, if however there are signs of intense heat, the mixture is too weak, and a larger main jet is required.

2nd. PILOT JET WITH THROTTLE IN POSITIONS 2 AND 5.

With the engine idling too fast with the twist grip shut off and the throttle shut down on to the throttle stop screw, and ignition set for best slow running: a) loosen the stop screw nut and screw down until engine runs slower and begins to falter. Then screw the pilot air screw in or out to make the engine run regularly and faster. b) Now gently lower the throttle stop screw until the engine runs slower and just begins to falter, then lock the nut lightly and begin again to adjust the pilot air screw to get the best slow running. If this second adjustment makes the engine run too fast, go over the job again a third time. Finally, lock up tight the throttle stop screw nut without disturbing the screws position.

3rd. THROTTLE CUT AWAY with throttle in position 3 (sheet 7). If, as you take off from the idling position, there is objectional spitting from the carburetter, slightly richen the mixture by screwing in the air screw sufficiently, but if this is not effective, screw it back again, and fit a throttle with a smaller cut away. If the engine jerks under load at this throttle position and there is no spitting, either the throttle needle is too high or a larger throttle cut away is required to cure the richness.

4th. NEEDLE with throttle in position 4 (sheet 7). The needle controls a wide range of throttle opening and also the acceleration. Try the needle in as low a position as possible, eg. with the clip in a groove as near the top as possible. If acceleration is poor and with the air valve partially closed the results are better, raise the needle by two grooves, if much better, try lowering the needle by one groove and leave it where it is best. **NOTE**, if the mixture is still too rich with the clip in groove number one (nearest the top), the needle and needle jet probably needs replacing due to wear.

5th FINALLY go over the idling again for final touches.

TUNING TWIN ENGINES WITH TWIN CARBURETTERS (where each cylinder has it's own carburetter)

To start with, slacken the throttle stop screws and put the twist grip into the shut off position, to allow the throttle to shut off. There should be a slight back-lash in the cables where back-lash can be obtained, if necessary, by screwing in the cable adjusting screws on the top of the carburetter.

Then, with the handlebars in the normal position, and with the throttles closed, adjust the cable adjusting screws so that on the slightest opening of the twist grip, both throttles begin to open simultaneously.

To set the carburetters, follow the procedure as given on sheet 7 overleaf, and bear in mind these "hints" which may be useful. Main jet sizes are selected by checking the effect of the mixture on the sparking plugs, after taking a run at full throttle over a straight piece of road. The smallest pair of jets that give the best maximum speed is usually correct provided that the plugs do not show any signs of excessive heat. It might be that for really critical tuning, one carburetter might require a slightly different jet size from the other.

For slow running, set the twist grip to make the engine run slowly but just faster than a "tick over". Then gently screw in the throttle stops to just hold the throttles in that position, and return the twist grip into the shut position, leaving the engine running on the throttle stops.

The next thing to do is to set each carburetter according to paragraph 2, on sheet 7, to obtain the idling by screwing down the throttle stop screws and adjusting the pilot air screws accordingly.

Regarding the setting of the pilot jets, a fairly satisfactory method is to detach one sparking plug lead, and set the pilot air adjusting screw on the other cylinder as a single unit, and then reversing the process to the other cylinder. It may be found that when both leads are connected to the sparking plugs, the engine runs slightly quicker than desirable. If this happens, a slight readjustment of the throttle stop screws will put this right. It is essential that the speed of idling on both cylinders is approximately the same, as this will either make or mar the smoothness of the get-away on the initial opening of the throttle.

It is essential with twin carburetters that the throttle slides are a good fit in the boodies, and also that there is no suspicion of air leaks at either of the flange attachments to the cylinder.

With regards to the lower end of the throttle range, which is always the more difficult to set, one can only take excessive pains to make quite sure that the control cables are perfectly adjusted, without any excessive back-lash or difference in the amount of back-lash between one carburetter and another, otherwise one throttle slide will be out of phase with the other, and so resulting in uneven running.

To check the opening of the throttles simultaneously, shut the twist grip back so that the throttles are resting on the throttle stop screws in their final position of adjustment. Then, insert the fingers into the air intakes and press them on the throttles. With the other hand, gently open with the twist grip and feel the throttles lift off their stops at the same time.

ROYAL ENFIELD WORKSHOP MANUAL

SECTION F1 AMAL MONOBLOC CARBURETTER

SECTIONAL ILLUSTRATIONS OF CARBURETTERS.
TYPES 375, 376, 389 and 689

HINTS AND TIPS
FOR AMAL MONOBLOC CARBURETTER
TYPES 375, 376, 389 and 689

(For key to diagram
numbers see page 3)

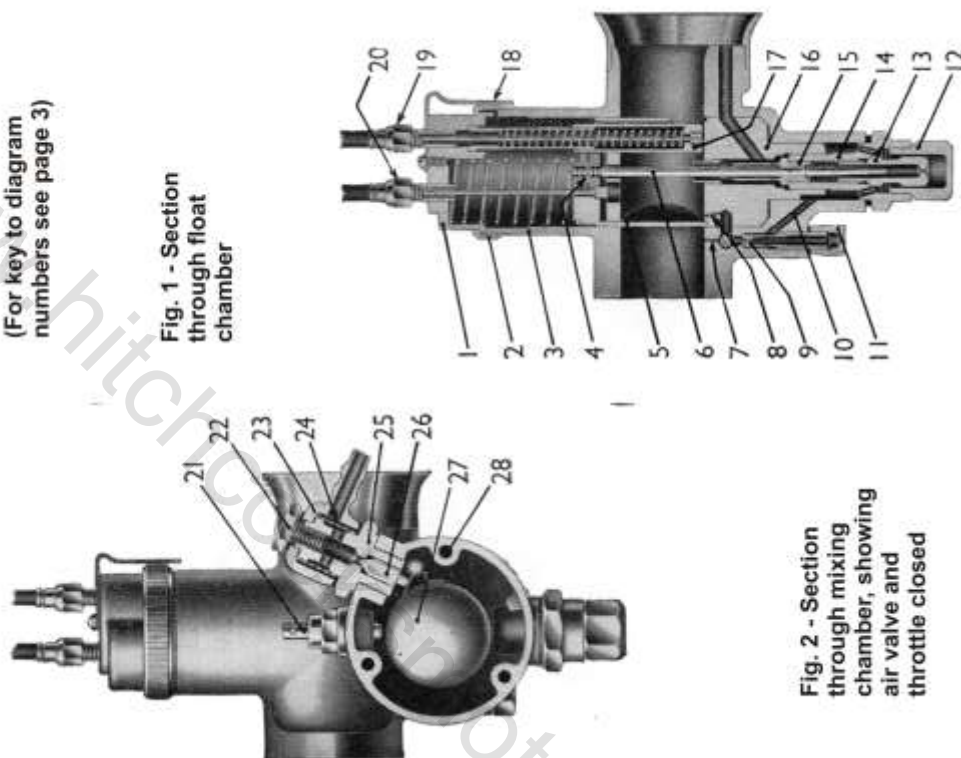
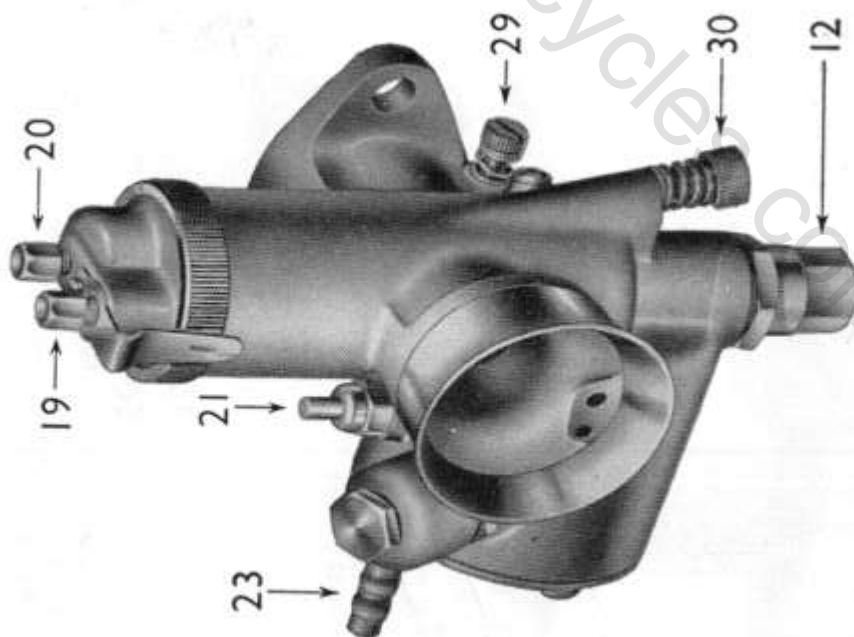


Fig. 1 - Section
through float
chamber

Fig. 2 - Section
through mixing
chamber, showing
air valve and
throttle closed



(For key to diagram numbers see page 3)

ROYAL ENFIELD WORKSHOP MANUAL

HOW IT WORKS AND PART NAMES

- | | |
|-------------------------------|-------------------------------|
| 1. Mixing Chamber | 19. Cable Adjuster (Air) |
| 2. Mixing Chamber cap | 20. Cable Adjuster (Throttle) |
| 3. Carburettor Body | 21. Tickler |
| 4. Jet Needle Clip | 22. Banjo Bolt |
| 5. Throttle Valve | 23. Banjo |
| 6. Jet Needle | 24. Filter Gauze |
| 7. Pilot Outlet | 25. Needle Sealing |
| 8. Pilot by-pass | 26. Needle |
| 9. Pilot Jet | 27. Fical |
| 10. Petrol feed to pilot jet | 28. Side Cover screws |
| 11. Pilot Jet Cover Nut | 29. Pilot Air Adjusting Screw |
| 12. Main Jet cover | 30. Throttle Adjusting Screw |
| 13. Main Jet | 31. Air To Pilot Jet |
| 14. Jet Holder | 32. Feed Holes in Pilot Jet |
| 15. Needle Jet | 33. Bleed Holes in Needle Jet |
| 16. Jet Block | 34. Primary Air Choke |
| 17. Air Valve | 35. Primary Air Passage |
| 18. Mixing Chamber Cap Spring | 36. Throttle valve Cutaway |

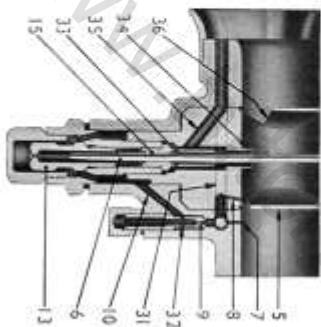
The carburettor proportions and atomises the right amount of petrol with the air that is drawn in by the engine because of the correct proportions of jet sizes and the main choke bore. The float chamber maintains a constant level of fuel at the jets and cuts off the supply when the engine stops.

The throttle control from the handlebar controls the volume of mixture and therefore the power, and at all positions of the throttle the mixture is automatically correct. The opening of the throttle brings first into action the mixture supply from the pilot jet system for idling, then as it progressively opens, via the pilot by-pass, the mixture is augmented from the main jet, the earlier stages of which action is controlled by the needle in the needle jet. The main jet does not spray directly into the mixing chamber, but discharges through the needle jet into the primary air chamber, and goes from there as a rich petrol-air mixture through the primary air choke into the main air choke. This primary air choke has a compensating action in conjunction with bleed holes in the needle jet, which serves the double purpose of air compensating the mixture from the needle jet and allowing the fuel to provide a well outside and around the needle jet, which is available for snap acceleration.

The carburetors usually have a separately-operated mixture control called an air valve, for use when starting from cold, and until the engine is warm, this control partially blocks the passage of air through the main choke.

Fig. 3

Diagrammatic section of carburettor showing only the lower half of the throttle chamber with the throttle a little open and the internal primary air passages to the main jet and pilot system



FOR KEY TO DIAGRAM NUMBERS SEE ABOVE.

HINTS AND TIPS

STARTING from cold. Flood the carburettor by depressing the tickler, and close the air valve. Then open the throttle a little, eg. about one eighth open, see diagram on sheet 7 position 2, then kick-start. If it is too much open starting will be difficult. When engine starts open air valve and close the throttle. If the engine begins to falter, partially close the air valve until the engine is warm, then set in the fully open position.

STARTING, engine hot. Do not flood the carburettor. Then open the throttle about one eighth of its travel and kick-start. If the carburettor has been flooded and won't start because the mixture is too rich - open the throttle wide and give the engine several turns to clear the richness, then start again with the throttle one eighth open, and air lever wide open. Generally speaking it is not advisable to flood at all when an engine is hot.

STARTING, general. By experiment, find out if and when it is necessary to flood, also note the best position for the air lever and the throttle for the easiest starting.

CABLE CONTROLS. See that there is a minimum of backlash when the controls are set back and that any movement of the handlebar does not cause the throttle to open, this is done by the adjusters on the top of the carburettor. See that the throttle shuts down freely.

PETROL FEED, verification. Later models are fitted with a filter gauze at the inlet to the float chamber. To remove the filter gauze, unscrew the banjo bolt (22), the banjo can then be removed and the filter gauze removed from the needle seating. Ensure that the filter gauze is not damaged and free from dirt. Before replacing the banjo, turn on the petrol tap momentarily and see that fuel gushes out. Avoid petrol pipes with vertical loops as they cause air locks. Flooding may be due to a worn or bent needle or a leaky float, but nearly all flooding with new machine is due to impurities (grit, fluff, etc.) in the tank, so clean out the float chamber periodically until the trouble ceases. If the trouble persists, the tank might be drained, swilled out, etc.

FIXING CARBURETTOR AND AIR LEAKS. Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the cylinder or inlet pipe, check by means of an oil can and eliminate by new washers and the equal tightening up of the flange nuts. Most models have an "O" ring provision machined into the flange, make sure that this is undamaged and replace if necessary. Also in old machines look out for air leaks caused by a worn throttle or worn inlet valve guides.

BANGING IN EXHAUST may be caused by too weak a pilot mixture when the throttle is closed, it may also be caused by too rich a pilot mixture and an air leak in the exhaust system, the reason in either case is that the mixture has not fired in the cylinder and has fired in the hot silencer. If the banging happens when the throttle is fairly wide open, the trouble will be ignition not carburation

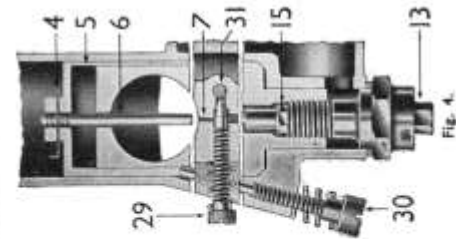
BAD PETROL CONSUMPTION of a new machine may be due to flooding, caused by impurities from the petrol tank, clogging on the float needle seat and so prevent its valve from closing. If the machine has had several years use, flooding may be caused by a worn float needle valve. Also bad petrol consumption will be apparent if the throttle needle jet "15" (see fig. 2) has worn, it may be remedied or improved by lowering the needle in the throttle, but if it cannot be then the only remedy is to get a new needle jet.

AIR FILTERS. These may affect the jet setting, so if one is fitted afterwards to the carburettor the main jet may have to be smaller. If a carburettor is set with an air filter and the engine is to run without it, take care not to overheat the engine due to too weak a mixture, testing with the air valve (sheet 5) will indicate if a larger main jet and higher needle position are required.

EFFECT OF ALTITUDE ON CARBURETTOR. Increased altitude tends to produce a rich mixture. The greater the altitude, the smaller the main jet required. Carburetors ex-works are suitable for altitudes up to 3,000 feet approximately. Carburetors used constantly at altitudes 3,000 to 6,000 feet should have a reduction in the main jet size of 5%, and thereafter for every 3,000 feet in excess of 6,000 feet altitude, further reductions of 4% should be made.

ROYAL ENFIELD WORKSHOP MANUAL

PARTS TO TUNE UP WITH



(a). This fig. 4 is two diagrammatic sections of the carburettor to show:-

1. The throttle adjusting screw
2. The pilot air adjusting screw

(b). **THROTTLE ADJUSTING SCREW.**
Set this screw to hold the throttle open sufficiently to keep the engine running when the twist grip is shut off.

(c). **PILOT AIR ADJUSTING SCREW.**
This screw regulates the strength of the mixture for idling and for the initial opening of the throttle. The screw controls the depression on the pilot petrol jet by metering the amount of air that mixes with the petrol.

(d). **MAIN JET.** The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle openings although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet.

Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike. NEVER REAMER A JET OUT, GET ANOTHER OF THE RIGHT SIZE. The bigger the number the bigger the jet. To remove the main jet unscrew the main jet cover, the exposed main jet can then be unscrewed from the jet holder.

(e). **NEEDLE AND NEEDLE JET.** The needle is attached to the throttle and being a taper, either allows more or less petrol to pass through the needle jet as the throttle is opened or closed throughout the range, except when idling or nearly full throttle. The taper needle position in relation to the throttle opening, can be set according to the mixture required, by fixing it to the throttle with the needle clip in a certain groove (see above illustration), thus either raising or lowering it. Raising the needle enriches the mixture and lowering it weakens the mixture at throttle openings from quarter to three-quarters open (see illustration sheet 7). The needles are marked with the letters: B type are fitted in the 375 carburettor C type are fitted in the 376 carburettor D type are fitted in the 389 carburettor

(f). **THROTTLE VALVE CUTAWAY.** The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cutaway is recorded by a number marked on the throttle, eg: 376/3 means throttle type 376 with number 3 cutaway. Larger cutaways, say 4 and 5, give weaker mixtures, and 2 would give a richer mixture.

(g). **AIR VALVE,** is only used for starting and running when cold, and for experimenting with, otherwise run with it wide open.

(h). **TICKLER,** a small plunger spring loaded in the float chamber wall. When pressed down on the float the needle valve is pushed off its seat and so "flooding" is achieved. Flooding temporarily enrichens the mixture until the level of the petrol subsides to normal.

RE-ASSEMBLING

RE-ASSEMBLING after dismantling. See that the washer on the bottom of the jet block is in good condition, otherwise fuel will leak across its face causing rich erratic running, if the washer is faulty it should be replaced by a new one. When replacing the throttle see that the jet needle goes into the centre hole in the jet block and once in, check the throttle works freely when the mixing chamber cap (2) is screwed down firmly by spring clip (18).

When re-assembling the float see that the narrow leg portion of its hinge is uppermost, as this operates the float needle. Care should be taken to see that the joint faces of the side cover and body are not damaged or warped and that the joint washer is in good condition, otherwise difficulty will be experienced in making a petrol tight joint.

HOW TO TRACE FAULTS

There are only **TWO** possible faults in carburation; either **RICHNESS** of mixture or **WEAKNESS** of mixture, so in case of trouble, decide which is the cause, by:

1. **Examining the petrol feed.**
Verify jets and passages are clear.
Verify the banjo gauze is clear and allows ample flow.
Verify there is no flooding.
At the connection to the engine.
Or due to leaky inlet valve stems.
Slack throttle or worn needle jet.
Loose jets.
2. **Looking for air leaks.**
3. **Defective or worn parts.**
4. **Test with the air valve,** to see if by enriching the mixture, the results are better or worse.

INDICATIONS OF:

RICHNESS.

Black smoke in exhaust.
Petrol spraying out of the carb.
Four strokes, eight stroking.
Heavy, lumpy running.
Heavy petrol consumption.
- If the jet block 15 is not tightened up by washer and nut 14, richness will be caused through leakage of petrol.
- Air cleaner choked up.
- Needle jet worn large.
Sparkling plug sooty.

NOTE:

Verify correctness of fuel feed, stop air leaks, check over ignition and valve operation and timing. Now at throttle position shown on sheet 7, fig.5, test to see if the mixture is rich or weak. This is done by partially closing the air valve, and if the engine runs better weakness is indicated, but if the engine runs worse richness is indicated.

TO CURE RICHNESS

1. Fit smaller main jet.
2. Screw out pilot air screw.
3. Fit a throttle with larger cut-away
4. Lower needle one or two grooves

NOTE: It is not correct to cure a rich mixture at half throttle by fitting a smaller main jet because the main jet may be correct for power at full throttle, the correct way is to lower the needle.

CHANGING FROM STANDARD PETROLS TO SPECIAL FUELS, such as alcohol mixtures will, with the same setting in the carburettor, certainly cause weakness of mixture and possible damage from overheating.

WEAKNESS

Spitting in carburettor.
Erratic slow running.
Overheating.
Acceleration poor.
Engine goes better if:
- throttle not wide open
- or air valve is partially closed
- Has air cleaner been removed
- Jets partially choked up
REMOVING the silencer or running with a racing silencer requires a richer setting and a larger main jet.

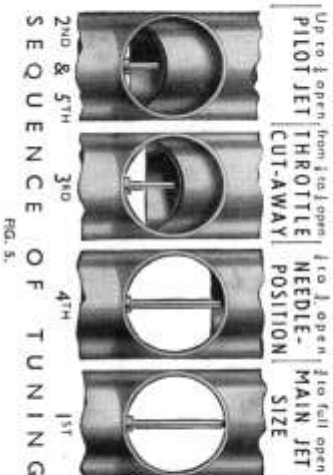
TO CURE WEAKNESS

1. Fit larger main jet
2. Screw pilot air screw in.
3. Fit a throttle with smaller cut-away.
4. Raise needle one or two grooves.

ROYAL ENFIELD WORKSHOP MANUAL

HOW TO TUNE UP

PHASES OF AMAL NEEDLE JET CARBURETTER THROTTLE OPENINGS



TUNE UP IN THE FOLLOWING ORDER ONLY, by so doing you will not upset good results obtained.

READ REMARKS ON SHEET 5 AND 6 for each tuning device and get the motor going perfectly on a quiet road with a slight up gradient so that on test the engine is pulling.

1st. MAIN JET with throttle in position 1 (sheet 7). If at full throttle the engine runs 'heavily', the main jet is too large. If at full throttle by slightly closing the throttle or air valve, the engine seems to have better power, the main jet is too small. With a correct sized main jet, the engine at full throttle should run evenly and regularly with maximum power. If you are testing for speed work, ensure that the main jet size is sufficient for the mixture to be rich enough to keep the engine cool, and to verify this, examine the sparking plug after taking a fast run, de-clutching and stopping the engine quickly. If the plug body at its end has a cool appearance, the mixture is correct. If sooty the mixture is rich, if however there are signs of intense heat, the mixture is too weak, and a larger main jet is required.

2nd. PILOT JET WITH THROTTLE IN POSITIONS 2 AND 5.

With the engine idling too fast with the twist grip shut off and the throttle shut down on to the throttle adjusting screw, and ignition set for best slow running: a) screw out the throttle adjusting screw until the engine runs slower and begins to falter. Then screw the pilot air adjusting screw in or out to make the engine run regularly and faster; b) Now gently lower the throttle adjusting screw until the engine runs slower and just begins to falter, and begin again to adjust the pilot air adjusting screw to get the best slow running. If this second adjustment makes the engine run too fast, go over the job again a third time.

3rd. THROTTLE CUT AWAY with throttle in position 3 (sheet 7). If, as you take off from the idling position, there is objectional spitting from the carburetter, slightly richen the mixture by screwing in the air screw sufficiently, but if this is not effective, screw it back again, and fit a throttle with a smaller cut away. If the engine jerks under load at this throttle position and there is no spitting, either the throttle needle is too high or a larger throttle cut away is required to cure the richness.

4th. NEEDLE with throttle in position 4 (sheet 7). The needle controls a wide range of throttle opening and also the acceleration. Try the needle in as low a position as possible, eg: with the clip in a groove as near the top as possible. If acceleration is poor and with the air valve partially closed the results are better, raise the needle by two grooves, if much better, by lowering the needle by one groove and leave it where it is best. *NOTE, if the mixture is still too rich with the clip in groove number one (nearest the top), the needle and needle jet probably needs replacing due to wear.*

5th FINALLY go over the idling again for final touches.

TUNING TWIN ENGINES WITH TWIN CARBURETTERS

(where each cylinder has it's own carburetter)

To start with, slacken the throttle stop screws and put the twist grip into the shut off position, to allow the throttle to shut off. There should be a slight back-lash in the cables where back-lash can be obtained, if necessary, by screwing in the cable adjusting screws on the top of the carburetter.

Then, with the handlebars in the normal position, and with the throttles closed, adjust the cable adjusting screws so that on the slightest opening of the twist grip, both throttles begin to open simultaneously.

To set the carburetters, follow the procedure as given on sheet 7 overleaf, and bear in mind these "hints" which may be useful. Main jet sizes are selected by checking the effect of the mixture on the sparking plugs, after taking a run at full throttle over a straight piece of road. The smallest pair of jets that give the best maximum speed is usually correct provided that the plugs do not show any signs of excessive heat. It might be that for really critical tuning, one carburetter might require a slightly different jet size from the other.

For slow running, set the twist grip to make the engine run slowly but just faster than a "tick over". Then gently screw in the throttle stops to just hold the throttles in that position, and return the twist grip into the shut position, leaving the engine running on the throttle stops.

The next thing to do is to set each carburetter according to paragraph 2, on sheet 7, to obtain the idling by screwing down the throttle stop screws and adjusting the pilot air screws accordingly.

Regarding the setting of the pilot jets, a fairly satisfactory method is to detach one sparking plug lead, and set the pilot air adjusting screw on the other cylinder as a single unit, and then reversing the process to the other cylinder. It may be found that when both leads are connected to the sparking plugs, the engine runs slightly quicker than desirable. If this happens, a slight readjustment of the throttle stop screws will put this right. It is essential that the speed of idling on both cylinders is approximately the same, as this will either make or mar the smoothness of the get-away on the initial opening of the throttle.

It is essential with twin carburetters that the throttle slides are a good fit in the bodies, and also that there is no suspicion of air leaks at either of the flange attachments to the cylinder.

With regards to the lower end of the throttle range, which is always the more difficult to set, one can only take excessive pains to make quite sure that the control cables are perfectly adjusted, without any excessive back-lash or difference in the amount of back-lash between one carburetter and another, otherwise one throttle slide will be out of phase with the other, and so resulting in uneven running.

To check the opening of the throttles simultaneously, shut the twist grip back so that the throttles are resting on the throttle stop screws in their final position of adjustment. Then, insert the fingers into the air intakes and press them on the throttles. With the other hand, gently open with the twist grip and feel the throttles lift off their stops at the same time.

ROYAL ENFIELD WORKSHOP MANUAL

SECTION G2c

Miller A.C. Generator and Rectifier Lighting and Ignition Set

Used on "250 Clipper," 1954 and early 1955

containing six powerful permanent magnets of "Alcomax" arranged to produce six poles, alternatively north and south.



MILLER A.C. GENERATOR, REAR VIEW

Fig. 1

1. General Description

The lighting and ignition set consists of a battery and coil ignition system plus a means of charging the battery from a permanent magnet A.C. generator (Fig. 1) through a full wave selenium rectifier (Fig. 2) which acts in effect like a pair of non-return valves converting the A.C. current into uni-directional current which is used to charge the battery. Current is drawn from the battery to light the lamps and energise the ignition coil but an "emergency start" position is provided on the switch (Fig. 3) to enable the engine to be started with a flat battery, or even with no battery at all.

The generator consists of a rotor mounted on the end of the driving shaft of the engine and



FULL WAVE RECTIFIER

Fig. 2

Surrounding the rotor is the stator consisting of six coils carried on a laminated core plate. On earlier models the stator was mounted in the outer half of the chaincase which was accurately located relative to the rotor by means of a centre bearing. On later models the stator is mounted on the inner half of the chaincase which itself is accurately located on the engine crankcase. This method of mounting has the advantage that the clearance between rotor and stator poles can readily be checked with feelers after removal of the chaincase outer half. The nominal air gap is .015 in. If the gap is less than .008 in. at any point there is a risk of fouling when the engine is running under load.

The headlamp (see Section G5b) is mounted in a specially designed "Casquette" fork head which contains an ammeter with warning light and a six position lighting and ignition switch.

2. Switch Positions

2 (a). Parking

Pilot light, speedometer light and tail light are connected to the battery. There is no connection to the ignition coil and the engine can NOT be started nor run with the switch in this position.

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LIGHTING AND IGNITION SWITCH

Fig. 3

2 (b). Emergency Start

This position enables the engine to be started on the kickstarter with a completely discharged battery or even with no battery at all. The engine should not be run for any length of time with the switch in this position as it causes exceptionally heavy currents to pass through the contact breaker points and ignition coil and is also liable to cause pre-ignition.

2 (c). Off

Battery and generator are both disconnected.

2 (d). Ignition and Charge

Two of the generator coils are connected to the rectifier which produces direct current to

charge the battery. Current passes through the coil and contact breaker to provide ignition. Rate of charge at normal speeds is about 2 amps., increasing slightly if the battery is in a low state of charge. Speed in top gear to balance ignition load is 17 to 28 m.p.h., depending on the state of charge of the battery.

2 (e). Head

All six generator coils are connected to the rectifier which charges the battery and supplies current for the head, tail and speedometer lights and for the ignition. Charge rate is about the same as in switch position (d).

2 (f). Pilot

Four of the generator coils are connected to the rectifier which charges the battery and supplies current for the pilot, tail and speedometer lights and for the ignition. Charge rate is rather higher than in switch position (d), being normally about 3 amps.

3. Circuits

See Wiring Diagram. Fig. 4.

Emergency Start. The "outer" ends of four of the generator coils are connected to the ignition coil through switch terminals 2 and 1. The inner ends are, as always, connected to No. 1 terminal of the rectifier. During the closed period of the contact breaker current flows through the primary winding of the ignition coil by one of two paths depending on the direction of the A.C. voltage produced in the generator coils, which is, of course, changing from instant to instant.

(i) If the "outer" ends of the coils are positive current flows from them to terminals 2 and 1 of the switch, then through the primary winding of the ignition coil and the contact points to earth. The return circuit is through the battery from the earthed positive to the negative terminal (charging the battery on its way) then through the ammeter to switch terminal 6 and thence to rectifier terminal 2 and through one rectifier plate to terminal 1 and so back to the generator coil.

(ii) If the "inner" ends of the "generator" coils are positive current flows from them to rectifier terminal 1, through one rectifier plate to the rectifier positive terminal (or centre screw), which is earthed and thence through the contact breaker and ignition coil to terminals 1 and 2 of the switch, and finally to outer ends of the generator coils.

The second of these circuits is clearly the easier one since it does include passage through the battery against battery voltage. The alternator

ROYAL ENFIELD WORKSHOP MANUAL

rotor is therefore keyed on the shaft with its pole pieces in such a position that the "inner" ends of the coils are positive and current is flowing as described through circuit (ii), immediately before the contact points open with the automatic advance fully retarded. When the engine has started, the automatic advance mechanism comes into operation so that the contact points open before the rotor has reached its optimum position. This weakens the spark and produces misfiring which prevents the engine running at high speeds unless the switch is moved to the "IG and CH" position. At higher speeds further advance brings the previous pole of the rotor into operation and a good spark is again obtained with the current at the point of opening of the points flowing through circuit (i) (see above).

Note. The position of the keyway in the rotor depends on the method of mounting the stator (see Subsection 1). Some rotors have two keyways in them, in this case note which was in use and replace the same way. Some early rotors had the keyway not in the centre of a pole piece, in this case the rotor must be replaced the same way round. Incorrect positioning of the rotor can affect only the emergency start, it can have no effect on the charge rates.

Ignition and Charge. The current is taken from two of the generator coils on either of the two following circuits, depending on the instantaneous direction of the A.C. voltage. If the inner ends of the generator coils are positive, current flows from them to terminal 1 of the rectifier, through the rectifier plate to the positive terminal (or centre screw) which is earthed and thence through the battery from positive to negative, thus charging the battery. The return circuit is through the ammeter to terminal 6 of the switch and thence to terminal 2 of the rectifier through the rectifier plate to terminal 3, then to terminals 3 and 4 of the switch and so back to the outer ends of the generator coils.

If the outer ends of the generator coils are positive current flows from them to terminals 3 and 4 of the switch, then to terminal 3 of the rectifier, through the rectifier plate to the positive rectifier terminal (or centre screw) which is earthed, and thence through the battery from positive to negative thus charging the battery. The return circuit is through the ammeter to terminal 6 of the switch and thence to terminal 2 of the rectifier, through the rectifier plate to terminal 1 and so back to the inner ends of the coils. Switch terminal 6, being connected through the ammeter to the battery negative terminal, is always at negative voltage relative to earth or the frame of the machine. When the

engine is running at a moderate or high speed the negative voltage is increased on account of the connection to the negative (No. 2) terminal of the rectifier. When the contact breaker points are closed, therefore, current flows from earth through them and the primary winding of the ignition coil to terminal 1 of the switch, thence through the warning light (and its resistance in parallel) to terminal 9 of the switch and so to terminal 6. The return circuit if the engine is not running is through the ammeter to the battery negative terminal. When the engine is running the current will return to earth through the four plates of the rectifier.

Headlight. With the switch in the "H" position the charging circuit is the same as described above, with the exception that the remaining four coils of the generator are brought into operation owing to the fact that the switch then makes contact between the terminals 2 and 3 as well as 3 and 4. Current from earth flows through one of the headlamp filaments to the dip-switch and then to terminal 8 of the battery, also through the tail and speedometer lights to terminal 7. Both terminals 8 and 7 are connected to 6 and the return circuit is either through the ammeter to the battery negative terminal or through the rectifier, depending on whether or not the engine is running. Since the output from the rectifier is limited by the capacity of the generator the current taken by the lamps naturally reduces the rate of charge through the battery, which would otherwise be excessive with six generator coils in use.

Pilot Light. With the switch in the pilot light position the contact between terminals 4 and 3 of the switch is broken so that only four of the generator coils remain in use. Terminal 6 of the switch is connected to 5, 7 and 9 but not to 8 so that current flows through the pilot bulb but not through the main headlamp bulb.

It will be noted from the above that the battery (even if completely discharged) should be included in the circuit if the "emergency start" position of the switch is to operate satisfactorily. (Alternatively the lead normally connected to the battery negative terminal can be earthed.) The battery is also necessary in switch positions (d), (e) and (f) in order to prevent excessive voltage rise which might burn out the lamp bulbs and/or ignition coil. The battery also smoothes out the "peaks" of the uni-directional current from the rectifier and thus prevents the possibility of a spark occurring at the crest of the first "peak" after the contact points are closed. The points must be closed for about 100° in order to ensure a good spark at high speeds when running on the smooth current obtained when the battery is in the circuit.

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This period of 100° embraces **TWO** peaks of current from the rectifier, the **SECOND** of which corresponds approximately with the firing point. Without the battery there is, therefore, a danger of a spark occurring at the first peak, i.e. about 60° too soon, which will, of course, cause pre-ignition.

4. Warning Light

This, with a resistance in parallel, is placed in series with the ignition coil and contact breaker. It lights when the ignition is switched on and the engine is stationary with contact points closed. When running it glows very dimly since it passes current momentarily every time the points close. Failure of the bulb does not prevent the ignition working since the resistance in parallel provides an alternative path.

5. Timing

An automatic advance mechanism is provided at the back of the contact breaker. This has a range of approximately 12 1/2° on the half speed shaft corresponding to 25° on the engine shaft.

The optimum ignition timing is 30° advance so that in the fully retarded position the contact points must open when the piston is 5° or about 1/64 in. before T.D.C.

To time the ignition proceed as follows :-

Switch off and check the maximum opening of the points which must be .015-.018 in.

Unscrew and remove the centre screw securing the contact breaker cam centre to the shaft.

Loosen the centre from the shaft by screwing a 5/16 in. B.S.F. bolt into the thread provided.

Loosen the two small screws which secure the contact breaker base plate and set the plate central in its slots. Tighten the screws.

Place the machine on the stand (packed if necessary to lift the rear wheel clear of the ground). Engage top gear and turn the engine by rotating the back wheel until the piston is 1/64 in. before the top of the compression stroke, as measured by a rod or wire inserted through the plug hole, both valves being closed.

Switch on the ignition and rotate the cam centre in a clockwise direction (viewed from the left side of the machine) until the warning lamp lights up (or the ammeter indicates a discharge). Continue rotating slowly until the lamp just goes out (and the ammeter needle returns to zero) indicating that the points have opened.

Give the cam centre a sharp tap endways to secure it on the shaft and lock up tightly with the centre screw.

Check timing by turning engine with back wheel until warning light just goes out and see that piston is 1/64 in. before the top of the compression stroke.

If timing is slightly incorrect adjust by loosening two screws which secure the contact breaker base plate to its housing and turn the plate clockwise to retard the timing, anti-clockwise to advance it. The slots in the plate provide a range of adjustment of approximately $\pm 6^\circ$.

6. Checking for Faults

If the ammeter does not show approximately the rates of charge quoted in Subsection 2 (d) first make sure that the ammeter itself is working correctly. To do this switch on the lights which should show about 5 amps. discharge for the headlights and 1 amp. for the pilot lights, plus a further 3-4 amps. if the engine has stopped with the contact breaker closed, which should be indicated by the warning light.

Assuming that the ammeter is reading correctly, failure to charge may be due to a loose connection or a "short" in the wiring system which should be carefully examined. In particular make sure that the connections between the stator coils are not contacting either the inside of the chaincase or cover or the pivot pin for the slipper chain tensioner.

If no short or open circuit can be located test the generator in the following way :-

(a) First disconnect leads from generator at the plug and socket connections. Start the engine and connect an A.C. voltmeter across the leads from the generator. Reading when meter is connected across yellow and brown, or green and brown, should be 20 volts minimum at 3,000 r.p.m. and up to 45 volts at top revs.

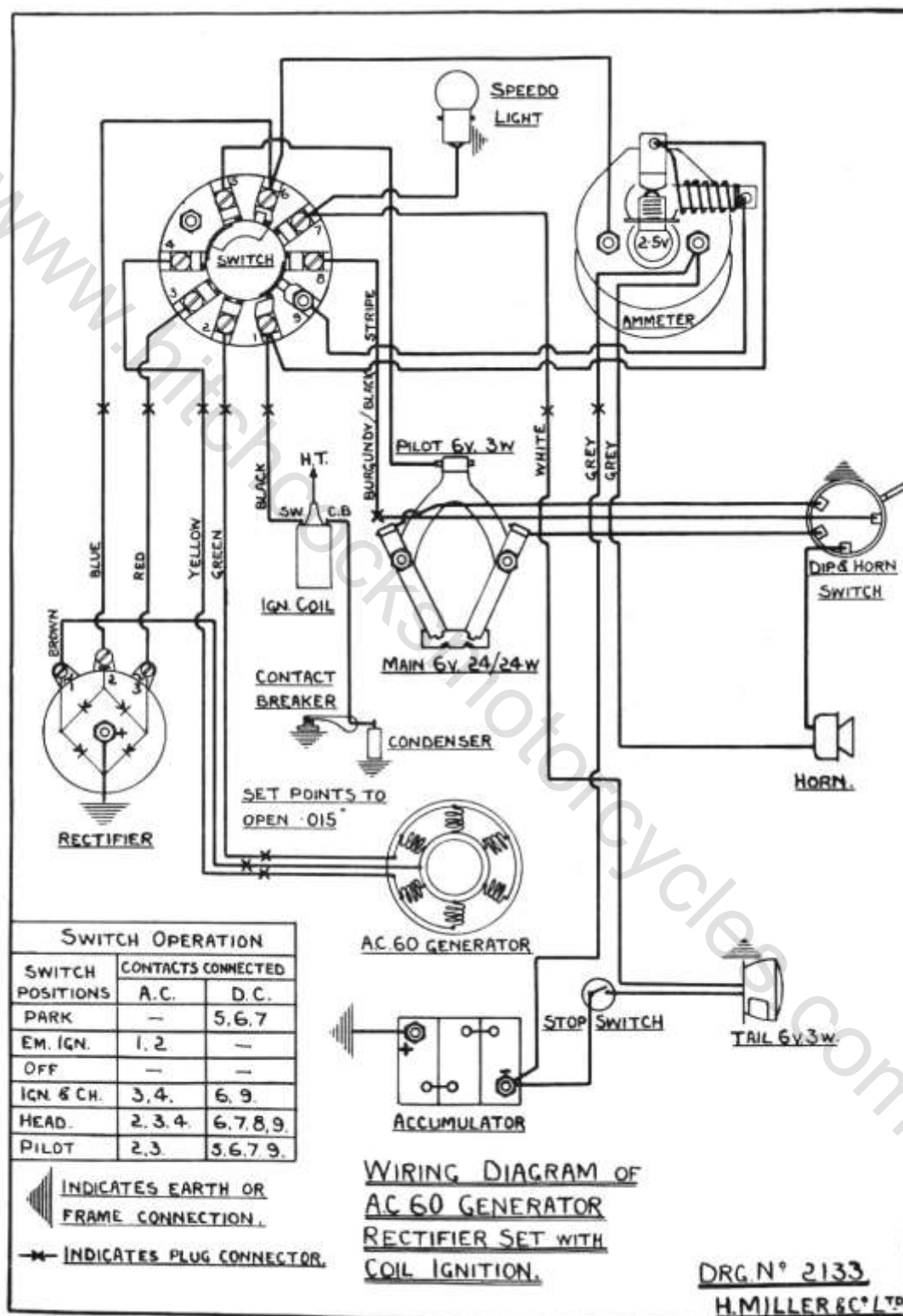
Resistance between yellow and brown should be .65 ohms and between green and brown .35 ohms.

500 volts meger test to earth should be infinity (minimum 1 meg ohm) test on any of these three leads.

(b) Rectifier-if voltage reading from generator is correct but similar readings are not obtained between rectifier terminal 2 and earth when switch is in positions (d), (e) or (f), substitute a new rectifier. Do not loosen rectifier centre screw as this will damage rectifier as will the drilling of holes through the plates.

(c) Electrical circuit-check to diagram No. 2133. (Fig. 4).

ROYAL ENFIELD WORKSHOP MANUAL



WIRING DIAGRAM
 Fig. 4

ROYAL ENFIELD WORKSHOP MANUAL



1954 250 CLIPPER

ROYAL ENFIELD WORKSHOP MANUAL

SECTION G2d

Lucas A.C. Lighting-Ignition System

Fitted to "250 Clipper," 1955

I. General

The Lucas A.C. Lighting-Ignition System comprises seven main components:

- (1) Alternator with magnet rotor.
- (2) Bridge-connected rectifier.
- (3) Ignition coil.
- (4) Contact breaker unit with automatic timing control.
- (5) Lighting switch.
- (6) Ignition switch.
- (7) 6-volt battery.

Under normal running conditions electrical energy in the form of rectified A.C. passes through the battery from the alternator, the rate of charge depending on the position of the lighting switch. When no lights, or only the pilot lights, are in use the alternator output is sufficient only to supply the ignition coil and to trickle charge the battery. When the lighting switch is turned to the "HEAD" position the current increases proportionately.

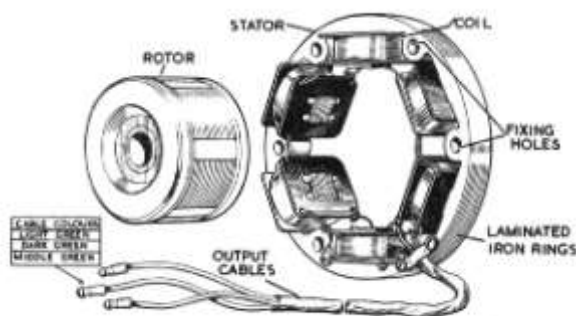


Fig. 1

1 (a). Alternator Model RM13.

Model RM13 alternator (see Fig. 1) has an outside diameter of 5 in. and is suitable for motor cycles up to 250 c.c. having headlamp bulbs not exceeding 30 watts. The alternator comprises two main components, a stator and a rotor. The stator is built up from iron laminations and carries three pairs of series-connected coils insulated from the laminations. The rotor has a hexagonal steel core, each face of which carries a permanent magnet keyed to a laminated pole tip. The pole tips are riveted circumferentially to brass side plates,

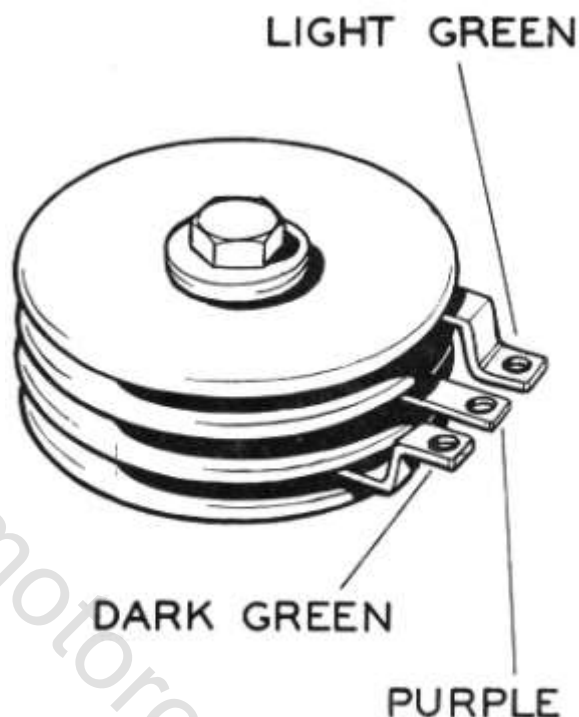


Fig. 2

the assembly being cast in aluminium and machined to give a smooth external finish. The stator and rotor can be separated without the need to fit magnetic keepers to the rotor poles. As the rotor turns rapid and repeated reversals of flux take place in the coil cores. These lines cut through the turns of the coil and induce alternating voltages in that coil. External connections are taken to these coils from a bridge-connected rectifier (see Fig. 2).

1 (b). Circuit Details

The alternator stator carries three pairs of series connected coils, one pair being permanently connected across the rectifier bridge network. The purpose of this latter pair is to provide some degree of charging current for the battery whenever the engine is running.

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Connections to the remaining coils vary according to the position of the lighting and ignition switch controls, as shown schematically in Fig. 3.

In the " OFF " and " PILOT " positions two pairs of coils are disconnected and only the third pair is in use. Current flows from these through the rectifier and battery, taking one of two

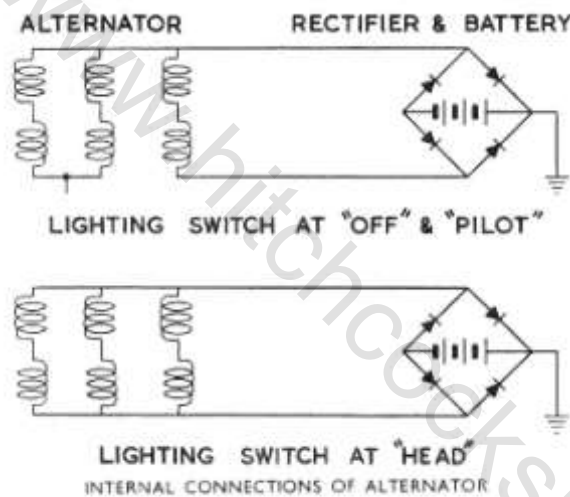


Fig. 3

alternative paths (indicated by the arrows on the rectifier diagram) according to the instantaneous polarity at the alternator coils. Thus the rectifier acts as an electrical non-return valve converting the A.C. current from the alternator into unidirectional current, which trickle charges the battery as well as energising the ignition coil. In the " HEAD " position the alternator output is increased by connecting all three pairs of coils in parallel, thus providing current for the headlight, tail and speedometer lights in addition to the ignition and a trickle charge to the battery.

1 (c). Emergency Starting

An emergency starting position is provided on the ignition switch. This switch is for use if the battery has become discharged and a normal start cannot be made. In the switch position "EMG" the alternator is connected directly to the ignition coil and this allows the engine to be started independently of the battery (see Fig. 4). During the closed period of the contact points, pulses of unidirectional current pass from the upper end of the two left alternator coils (Fig. 4) through the top right hand plate of the rectifier and the contact points back into the left hand alternator coils.

If the opening of the contact points is timed to coincide with one of these pulses there will be sufficient energy present in the system to overcome the impedance of the primary winding of the ignition coil and the voltage of the battery, thus causing a pulse of current to pass through the primary of the ignition coil and so create sufficient voltage in the secondary winding to provide a good spark at the plug. The advantage of this system is that the primary of the ignition coil is short circuited during the closed period of the contact breaker so that no unwanted sparks can occur on the compression stroke of the engine. Note that, if the battery is removed, the emergency start will not function unless the lead normally connected to the battery negative terminal is earthed. The emergency start system functions better with a discharged battery than with a fully charged one.

Proper functioning of the emergency starting feature is dependent on accurate ignition timing being observed and correct contact breaker gap being maintained. After starting has been effected the ignition switch should be turned to the normal running " IGN " position.

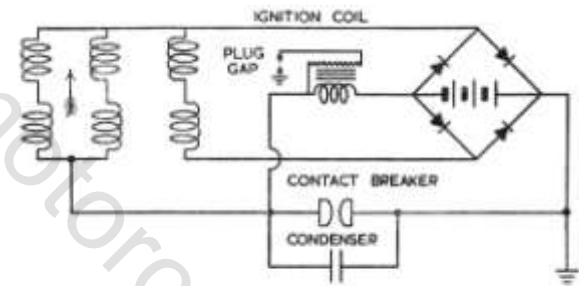


Fig. 4

1 (d). Direct Operation

Short journeys without the battery can be made with the switch in the " EMG " position. To do this, the cable normally connected to the battery negative terminal must be connected to an earthed point on the machine. If lights are required when the battery is disconnected, use only the headlights and keep the engine speed low to prevent excessive voltage rise.

2. Routine Maintenance

The alternator and rectifier require no maintenance apart from ensuring that all connections are clean and tight.

If the rotor, stator, engine crankshaft or rear half of the chaincase have been disturbed, the air gap between the rotor and stator should be checked.

ROYAL ENFIELD WORKSHOP MANUAL

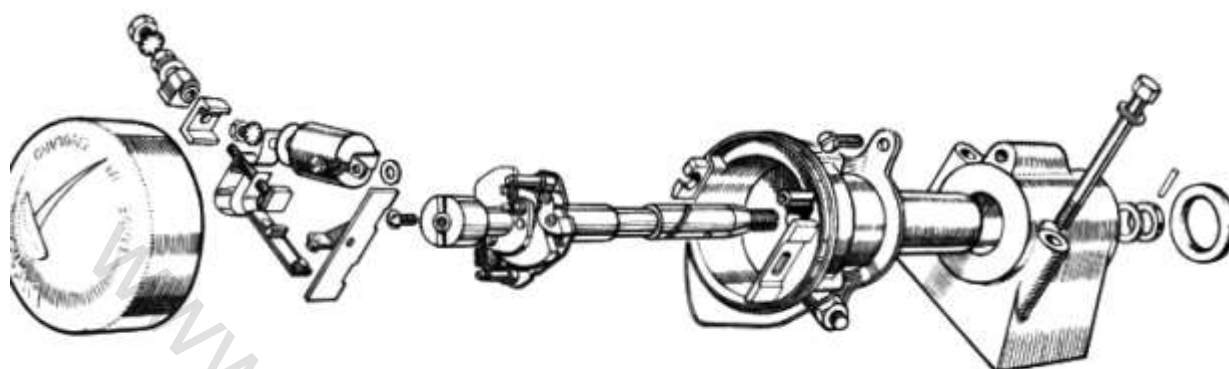


Fig. 5

If a feeler gauge at least .008 in. thick cannot be passed between the rotor and each of the stator poles the alignment should be checked.

The nuts which clamp together the rectifier plate assembly must not under any circumstances be slackened. They have been carefully set during manufacture to give correct rectifier performance. A separate nut is used to secure the rectifier to the frame of the motor cycle.

2 (a). Ignition Coil

The ignition coil should be kept clean and the terminals kept tight.

2 (b). Contact Breaker Unit Model 15D1

(See Fig. 5). Lubrication every 3,000 miles.

(i) Remove the metal cover and lightly smear the surface of the cam with Mobilgrease No. 2 or, if this is not available, clean engine oil may be used. On no account must oil or grease be allowed to get on or near the contacts.

(ii) Lubricate the automatic timing control mechanism using thin machine oil.

Cleaning every 6,000 miles.

Remove the metal cover and wipe it inside and outside with a clean dry fluffless cloth.

Examine the contact breaker. The contacts must be free from grease and oil. If they are

burnt or blackened, clean with a fine carborundum stone or a very fine emery cloth. Wipe away any dirt or metal dust with a clean petrol-moistened cloth.

Cleaning of contacts should be carried out with the moving contact removed. To remove this, withdraw the condenser securing screw, remove the terminal nut and withdraw the nylon washer. The assembly comprising condenser, terminal and contact breaker spring arm can now be lifted out of the unit body.

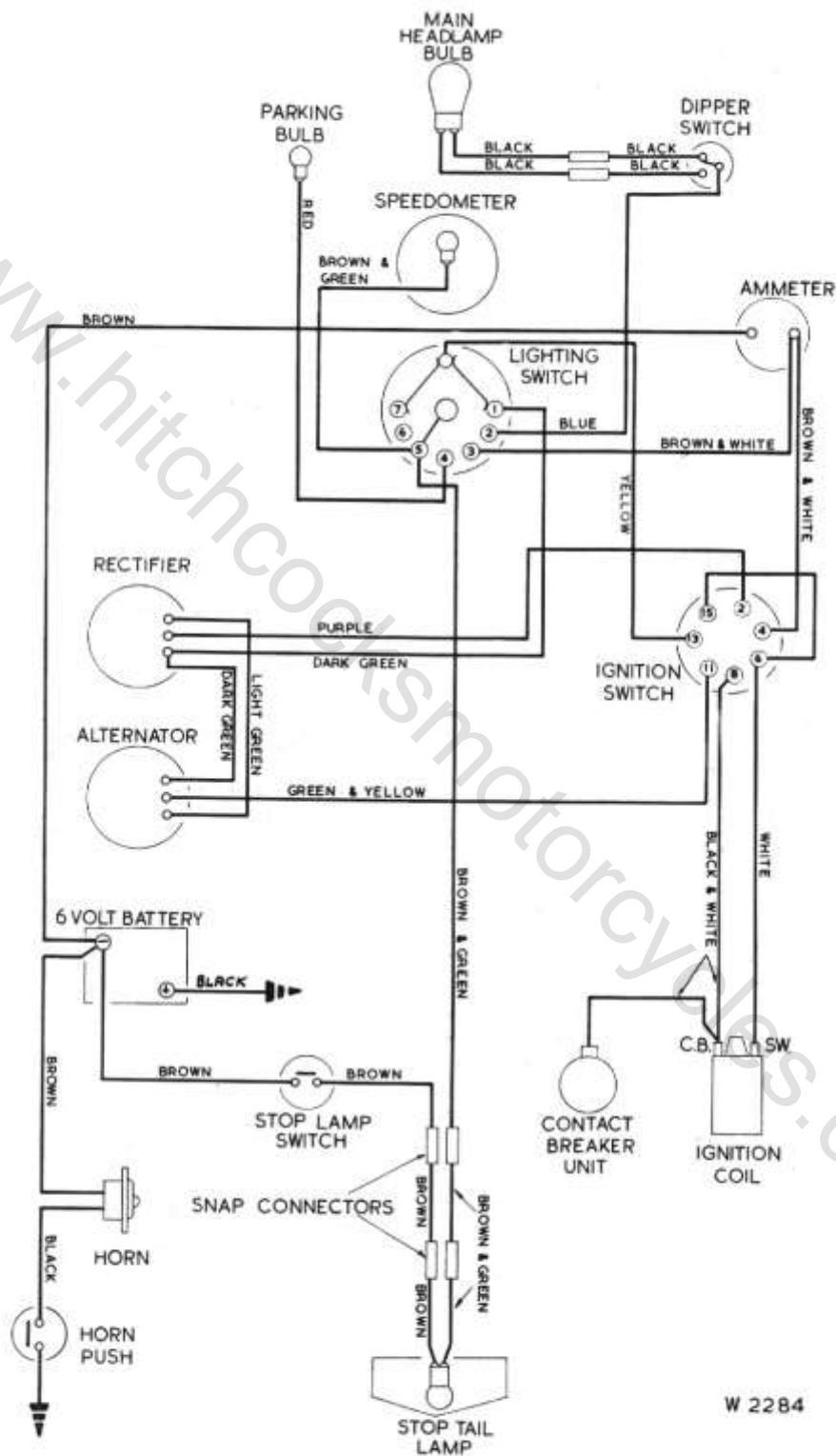
When refitting this assembly see that the widest edge of the nylon block is at the top.

2 (c). Contact Breaker Setting

The contact breaker setting should be checked after the first 500 miles running and subsequently every 6,000 miles. To check the gap, turn the engine over slowly until the contacts are seen to be fully open and insert a .0014-.0016 in. feeler gauge between the contacts.

If the gap width is correct the gauge will be a sliding fit. To adjust the setting, set the engine in the position giving maximum contact opening. Slacken the screw at the side of the unit body. Slide the fixed contact carrier in its slotted hole until the correct gap is obtained. Retighten the screw and recheck the gap.

ROYAL ENFIELD WORKSHOP MANUAL



W 2284

WIRING DIAGRAM
Fig. 6

ROYAL ENFIELD WORKSHOP MANUAL

SECTION G4a

Battery Model PUZ7E

1. General

The model PUZ7E (see Fig. 1) is a "dry charged" battery and is supplied without electrolyte but with its plates in a charged condition. When the battery is required for service it is only necessary to fill each cell with sulphuric acid of the correct specific gravity. No initial charging is required.

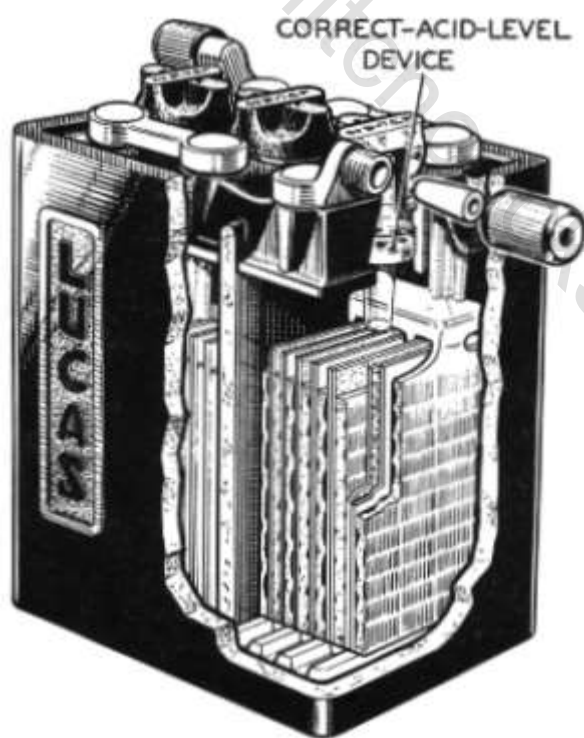


Fig. 1

2. Preparation for Service

The electrolyte is prepared by mixing together distilled water and concentrated sulphuric acid, using lead-lined tanks or suitable glass or earthenware vessels. Slowly add the acid to the water, stirring with a glass rod. Never add water to the acid, as this causes dangerous spurting of the concentrated acid. The specific gravity of the filling electrolyte depends on the climate in which the battery is to be used.

Specific gravity of electrolyte for filling "dry charged" batteries

Climates below 90°F (32°C.)	Climates above 90°F. (32°C.)
Filling, 1.270	Filling, 1.210

The approximate proportions of acid and water to obtain these specific gravities

To obtain specific gravity (corrected to 60°F.) of:	Add 1 vol. of 1835 S.G. acid (corrected to 60°F.) to
1.270	2.9 vols. of water.
1.210	4.0 vols. of water.

Heat is produced by the mixture of acid and water, the electrolyte should be allowed to cool before pouring it into the battery.

The specific gravity of the electrolyte varies with the temperature. For convenience in comparing specific gravities, they are always corrected to 60°F, which is adopted as a reference temperature.

The method of correction is as follows:-

For every 5°F. below 60°F., deduct 002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F. above 60°F. add .002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be that indicated by a thermometer having its bulb actually immersed in the electrolyte and not the ambient temperature.

Fill the cells to the tops of the separators, in one operation. The battery filled in this way is 90% charged. When time permits, a short freshening charge for no more than four hours at the normal recharge rate of 1.5 amp. should be made.

3. Routine Maintenance

Fortnightly (or more frequently in hot climates) examine the level of electrolyte in the cells and if necessary add distilled water to bring the level up to the tops of the separators. The use of a Lucas Battery Filler will be found helpful, as it ensures that the correct electrolyte level is automatically maintained and also prevents distilled water from being spilled on the top of the battery (see Fig. 2).

ROYAL ENFIELD WORKSHOP MANUAL

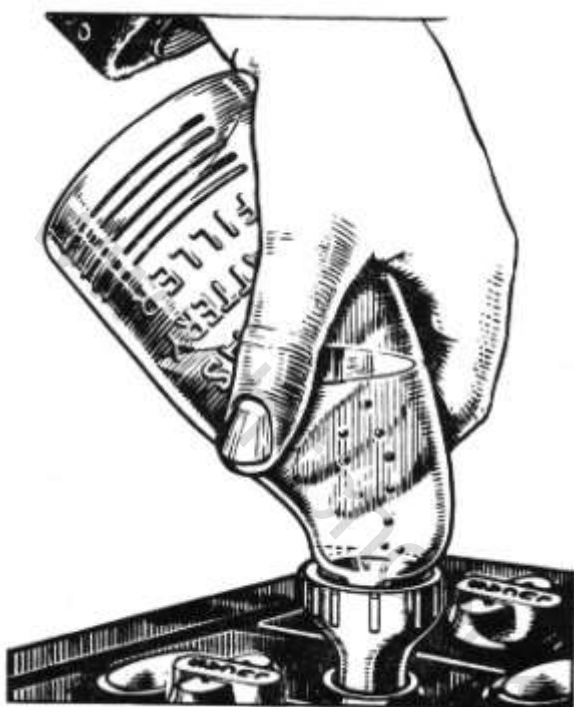


Fig. 2

Occasionally examine the terminals, clean and coat them with petroleum jelly. Wipe away all dirt and moisture from the top of the battery and ensure that the connections are clean and tight.

4. Servicing

If the battery is subjected to long periods of night parking with the lights on, without suitable opportunities for recharging, a low state of charge is to be expected.

Measure the specific gravity of the acid of each cell in turn with a hydrometer (see Fig. 3).

The following table shows the state of charge at different values of specific gravities:

State of Charge	Temperature under 90°F.	Temperature over 90°F.
Battery fully charged	1.270 - 1.290	1.210 - 1.230
Battery about half charged	1.190 - 1.210	1.130 - 1.150
Battery fully discharged	1.110 - 1.130	1.1050 - 1.070

If the battery is discharged, it must be recharged, either on the motor cycle by a period of daytime running or from an external D.C. supply at the normal recharge rate of 1.5 amp.

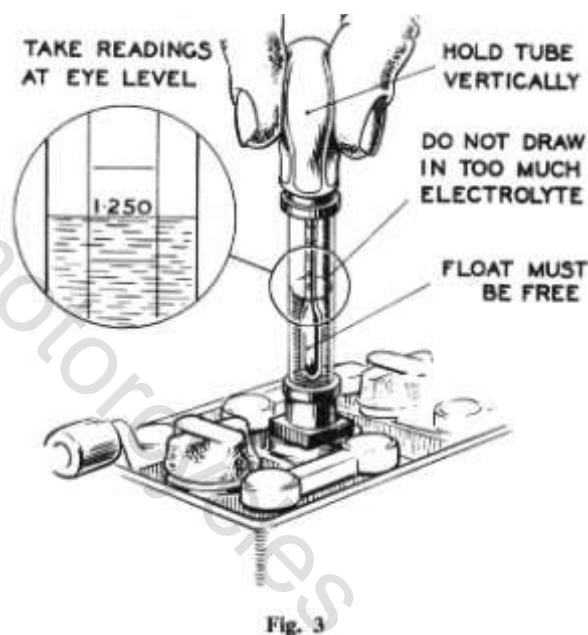


Fig. 3

ROYAL ENFIELD WORKSHOP MANUAL

SECTION G4b

Battery Model PUZ5E

"250 Clipper," 1955 (with Lucas Ignition and Lighting)

1. General

The model PUZ5E (see Fig. 1) is a "dry charged" battery and is supplied without electrolyte but with its plates in a charged condition. When the battery is required for service it is only necessary to fill each cell with sulphuric acid of the correct specific gravity. No initial charging is required.



Fig. 1

2. Preparation for Service

The electrolyte is prepared by mixing together distilled water and concentrated sulphuric acid, using lead-lined tanks or suitable glass or earthenware vessels. Slowly add the acid to the water, stirring with a glass rod. Never add water to the acid, as this causes dangerous spurting of the concentrated acid. The specific gravity of the filling electrolyte depends on the climate in which the battery is to be used.

Specific gravity of electrolyte for filling "dry charged" batteries

Climates below 90°F. (32°C.)	Climates above 90°F. (32°C.)
Filling, 1.270	Filling, 1.210

The approximate proportions of acid and water to obtain these specific gravities

To obtain specific gravity (corrected to 60°F.) of :	Add 1 vol. of 1.835 S.G. acid (corrected to 60°F.)
1.270	29 vols. of water.
1.210	4.0 vols. of water.

Heat is produced by the mixture of acid and water, the electrolyte should be allowed to cool before pouring it into the battery.

The specific gravity of the electrolyte varies with the temperature. For convenience in comparing specific gravities, they are always corrected to 60°F, which is adopted as a reference temperature.

The method of correction is as follows :-

For every 5°F. below 60°F., deduct .002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F. above 60°F. add .002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be that indicated by a thermometer having its bulb actually immersed in the electrolyte and not the ambient temperature.

Fill the cells to the tops of the separators, in one operation. The battery filled in this way is 90% charged. When time permits, a short freshening charge for no more than four hours at the normal recharge rate of 1.0 amp. should be made.

3. Routine Maintenance

Fortnightly (or more frequently in hot climates) examine the level of electrolyte in the cells and if necessary add distilled water to bring the level up to the tops of the separators. The use of a Lucas Battery Filler will be found helpful, as it ensures that the correct electrolyte level is automatically maintained and also prevents distilled water from being spilled on the top of the battery (see Fig. 2).

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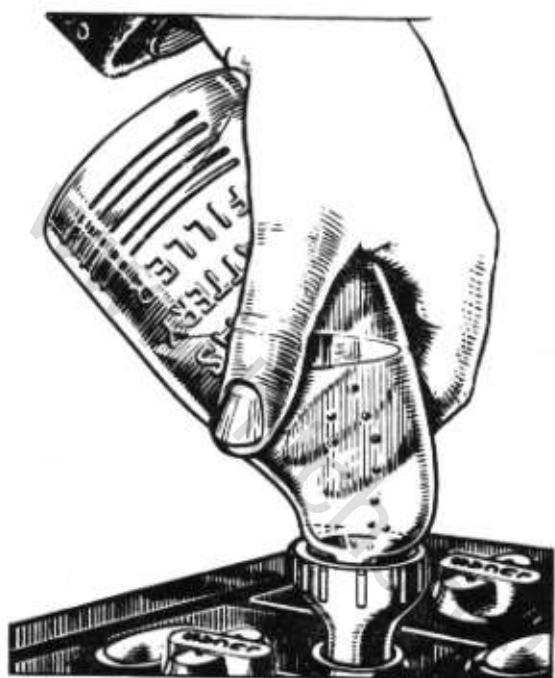


Fig. 2

Occasionally examine the terminals, clean and coat them with petroleum jelly. Wipe away all dirt and moisture from the top of the battery and ensure that the connections are clean and tight.

4. Servicing

If the battery is subjected to long periods of night parking with the lights on, without suitable opportunities for recharging, a low state of charge is to be expected.

Measure the specific gravity of the acid of each cell in turn with a hydrometer (see Fig. 3).

The following table shows the state of charge at different values of specific gravities:

State of Charge	Temperature under 90°F.	Temperature over 90°F.
Battery fully charged	1.270 - 1.290	1.210 - 1.230
Battery about half charged	1.190 - 1.210	1.130 - 1.150
Battery fully discharged	1.110 - 1.130	1.1050 - 1.070

If the battery is discharged, it must be recharged, either on the motor cycle by a period of daytime running or from an external D.C. supply at the normal recharge rate of 1.0 amp.

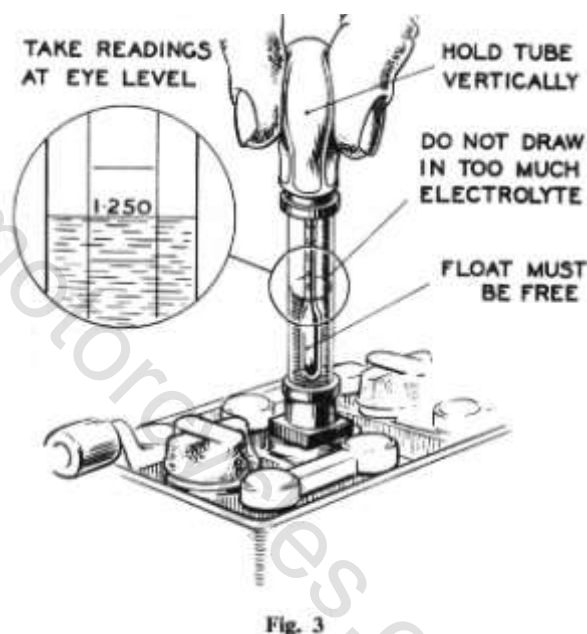


Fig. 3

ROYAL ENFIELD WORKSHOP MANUAL

SECTION G5b Miller Lamps

For "250 Clipper" 1954 and early 1955



1. Headlamp

The headlamp (see Fig. 1) is built into the Casquette fork head which also houses the ammeter (with ignition warning light) and the six-position combined lighting and ignition switch. For details of the functions of the six positions of the switch see Section G2c, sub-section 2.

The headlamp consists of a rim secured to the fork head by a screw at the bottom and attached to which are the lens and reflector with a sealing washer between. These components are secured to the rim by means of four spring clips and need not be separated from it except in the event of damage to either the rim, lens or reflector.

A bulb holder is held at the back of the reflector by a hinged wire clip and carries both the main and pilot bulbs as well as the leads carrying the supply to the bulb contacts.

2. Replacing Bulbs

Unscrew the screw at the bottom of the lamp rim and remove the rim complete with lens,

reflector and bulb holder. Release the wire clip securing the bulb holder, hinge this back and remove the bulb holder.

The correct bulbs are :

Main bulb ... 6v - 24x24 watt S.B.C.

Part No. MI/62/13

Pilot bulb ... 6v - 3 watt S.B.C.

Part No. MI/36/6

Note a 6v:-30 x 30 watt S.B.C. bulb can be used if desired. This will give more light but will increase the speed at which the lamp and ignition load is balanced by the output from the alternator and rectifier. For this reason the 30 watt bulb is not recommended if circumstances call for much low speed riding with the headlight on.

Note. Bulbs will not light when the bulb holder is removed from the machine unless the reflector portion of the bulb holder is "earthed" to the frame of the machine.

3. Replacing Lens or Reflector

Remove the lamp rim as described in Subsection 2, remove the bulb holder thus

ROYAL ENFIELD WORKSHOP MANUAL

disconnecting the reflector completely from the wires connecting it to the switch. Remove the four spring clips which secure the reflector and lens to the lamp rim and lift away the lens and reflector.

When replacing see that the hole for the pilot light and the word "Miller" on the lens are both at the top of the rim, i.e. 180° from the tag for the screw which secures the rim to the fork head. If the washer between lens and reflector is damaged a new one should be fitted otherwise the reflector will become dull. Refit the securing springs so that they are equally spaced round the rim.



AMMETER AND WARNING LIGHT

Fig. 2

4. Warning Light

Access to the ignition warning light is obtained by removing the ammeter (Fig. 2) which is simply a push fit into the top of the Casquette with a rubber sealing ring. If the rubber sticks moisten with petrol.



TAIL LAMP, TYPE 36E

Fig. 3

The replacement bulb is 2.5v.-0.3 amp. M.E.S.

Note. The warning lamp lights only when the ignition is "on" and the contact breaker points are closed.

5. Tail Lamp

The tail lamp on early machines is Miller Type 36E (Fig. 3) or later models Miller Type 37ET (Fig. 4). The bulb for both lamps is the same, i.e. 6v. 3 watt S.B.C. Part No. MI36/6.



TAIL LAMP, TYPE 37ET

Fig. 4

To replace the bulb in the 36E lamp first remove the retaining wire then the lens mount and ruby lens thus giving access to the bulb. Make sure that the lens, lens mount and retaining wire are replaced securely. Note that this lamp is mounted on rubber bushes so that an "earth" wire to one of the attachment studs is necessary.

To replace the bulb in the 37ET lamp remove the two screws which secure the plastic cover.

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SECTION G5c

Lucas Lamps

For "250 Clipper" late 1955 onwards

1. Headlamp

The headlamp incorporates Lucas Light Unit MCF.575 (see Fig. 1) which is built into the Casquette fork head which contains also the ammeter and the lighting switch.

2. Lucas Light Unit

The unit incorporates a combined reflector and front lens assembly and includes a parking light in the main reflector. The main bulb is the Lucas "prefocus" type the filaments of which are accurately positioned with respect to the reflector, thus no focussing device is necessary.

The bulb has a large cap and a flange which has been accurately positioned in relation to the bulb filaments during manufacture. A slot in the flange engages with a projection on the inside of the bulb holder positioned at the back of the reflector.

A bayonet fitting adaptor with spring loaded contacts secures the bulb firmly in position and carries the supply to the bulb contacts.

The outer surface of the lens is smooth to facilitate cleaning. The inner surface is formed of a series of lenses which determine the spread and pattern of the light beams.

The construction ensures that the reflector and lenses are permanently protected, thus the unit keeps its efficiency over a long period.

In the event of damage to either the lens or reflector a replacement light unit must be fitted.

3. Replacing the Light Unit and Bulbs

Slacken the securing screw at the bottom of the headlamp rim. Remove the front rim and Light Unit assembly.

To change the main bulb withdraw the adaptor by twisting it in an anti-clockwise direction and pulling it off. Remove the bulb from its locating sleeve at the rear of the reflector.

To change the parking bulb pull the bulb holder out of the reflector into which it is held by spring claws formed on it.

To change the entire Light Unit disengage the springs which secure it to the rim.

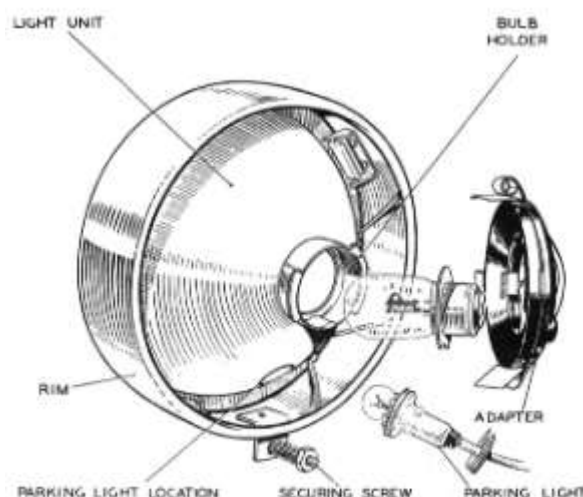


Fig. 1

Replacement bulbs are :-

Main bulb ...	Lucas "Prefocus" type 6v.-30/24 watt Lucas No. 312.
Parking bulb...	6v.-3 watt M.B.C. Lucas No. 988.



Fig. 2

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When fitting a new Light Unit make sure that it is correctly positioned in the rim, i.e. with the word "TOP" on the lens opposite the tag in the rim through which the securing screw passes. Refit the securing springs so that they are equally spaced around the rim.

When replacing the parking bulb holder make sure that the rubber washer is correctly fitted between it and the back of the reflector.

When replacing the main bulb adaptor make sure that it is correctly fitted with the word

"TOP" moulded on the back corresponding to the top of the lens.

4. Tail Light

The tail lamp is Lucas Type 529 (see Fig. 2). Access to the bulb is obtained by removing the two screws which secure the plastic cover.

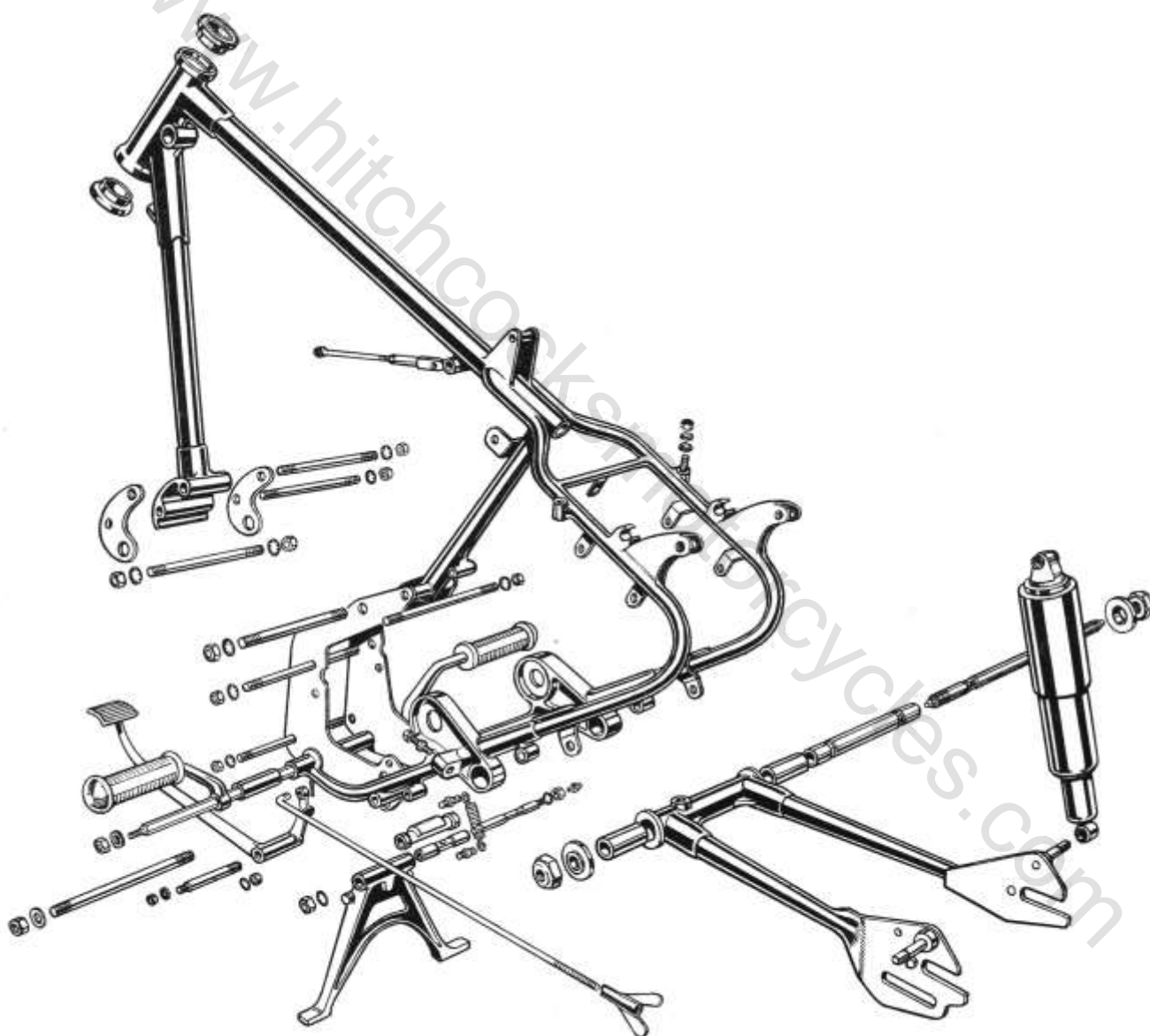
The standard bulb is 6v.-3 watt M.B.C. (Lucas No. 988). Alternatively a 6v.-6 watt M.B.C. bulb can be fitted (Lucas No. 951).

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SECTION H1

Frame

"Meteor 700"; "500 Twin"; "500 Bullet"; "350 Bullet"; "250 Clipper"



EXPLODED VIEW OF "250 CLIPPER" FRAME

Fig. 1

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1. Description of Frame

The frames used on the above models are basically identical, with swinging arm rear suspension, but there are some small differences in the lugs for engine attachment, the method of attachment of the pivot point for the swinging arm and in the width between the brackets supporting the upper ends of the rear suspension units. For part numbers of frames see appropriate spares lists.

The frame is built throughout of cold drawn weldless steel tubing with brazed or welded joints, liners being fitted where necessary for extra strength. All the main frame members are made of chromemolybdenum alloy steel tubing which retains its strength and resistance to fatigue after brazing or welding.

The swinging arm unit which forms the chain stays is provided with large diameter phosphor bronze bushes and pivots on a stout steel tube which is secured to the main frame by a long bolt passing through the pivot lugs. Hardened steel thrust washers are provided to deal with side thrust. The torsional rigidity of the swinging arm unit helps to maintain the rear wheel upright in the frame and thus relieves the wheel spindle of bending stresses to which it is subject with other types of rear suspension.

2. Steering Head Races

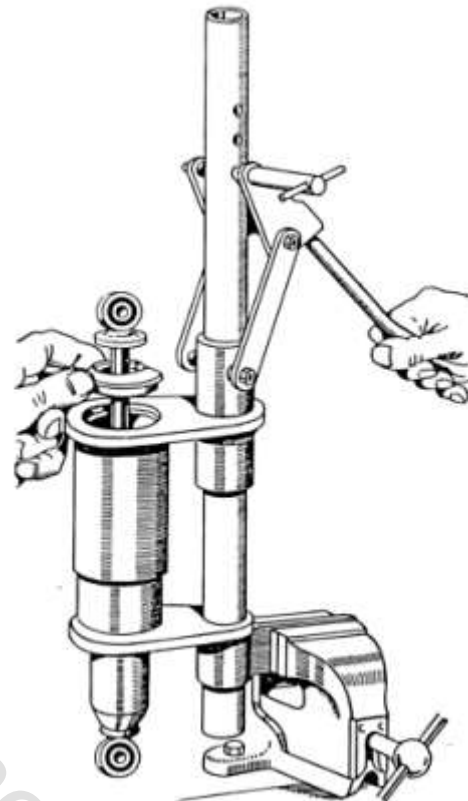
The steering head races, 34085, are the same at the top and bottom of the head lug and are the same for all models. They are easily removed by knocking them out with a hammer and drift and new races can be fitted either under a press or by means of a hammer and a wooden drift.

3. Removal of Rear Suspension Unit

The rear suspension units are readily removed by undoing the top pivot pin nut, driving out the pivot pin, then hinging the suspension unit back on the lower pivot pin, removing the lower nut and pushing the suspension unit off the pivot pin welded to the fork end.

4. Servicing Rear Suspension Units

(a) **Proprietary Units.** The proprietary units fitted to most 1954 and all 1955 models are sealed and servicing of the internal mechanism can be carried out only by the manufacturers.



REAR SPRING COMPRESSOR

Fig. 2

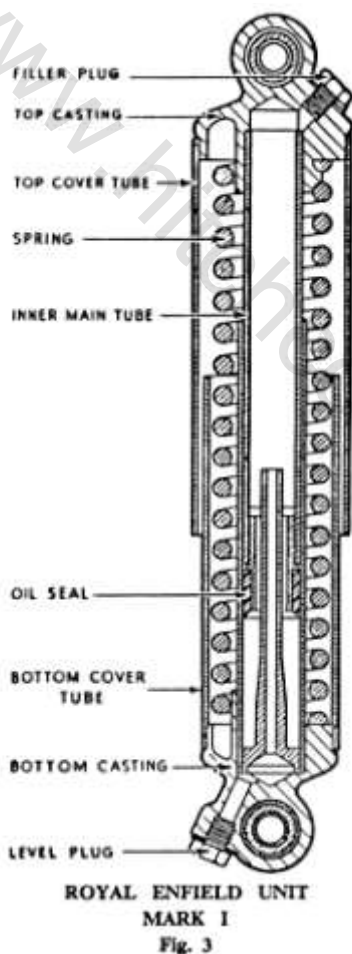
The rubber bushes in the top and bottom eyes can easily be renewed and the spring can be removed by pushing down on the top spring cover so as to release the split collar above it. After removal of the split collar the top cover and spring can be lifted off. When reassembling, the spring should be greased to prevent rust and squeaking if it should come into contact with either of the covers.

The standard solo springs have a rate of 100-105lb. per inch and it is not difficult to compress these by hand. Heavier springs having a rate of 130lb. per inch are available which may require the use of a spring compressor, as shown in Fig. 2.

(b) **Royal Enfield Units. Mark 1.** Enfield rear suspension units, Part Number 34276 or 36451, are shown in Fig. 3. Units having Part No. 34276 are fitted with springs of .252 in. diameter wire (Part No. 34284) having a rating of approximately

ROYAL ENFIELD WORKSHOP MANUAL

200 lb. per inch (when fitting the scrolls). Units having Part No. 36451 have a spring of .264in. diameter wire (Part No. 35494) having a rating of approximately 250lb. per inch. The free overall length of both types of spring is 7.3/4 in. New springs should be fitted if they have set more than 1/8 in.



This type of suspension unit was fitted on "350 Bullet" and "500 Twin" Models up to the early part of the 1954 season, and on the "250 Clipper" Model up to the later part of the 1954 season.

To dismantle the unit, remove it from the machine, grip the lower end of the bottom casting in a vice, unscrew the top cover tube, place a suitable bar through the Silentbloc bush in the top casting and turn so as to unscrew the spring from the scroll on either the top or bottom casting.

The top casting with the inner main tube (which is brazed into it) and the oil seal can now be withdrawn from the outer main tube and bottom casting. If the spring has remained attached to the bottom casting, unscrew the bottom cover tube and unscrew the spring from the scroll on the bottom casting, if necessary tapping it with a hammer and a blunt chisel. The outer main tube is brazed into the bottom casting and the hollow damper post is brazed into the main tube.

Oil tightness of these units depends on the condition of the edge of the oil seal which must be handled with great care. The synthetic rubber seal is bonded to a hollow metal plug which forms the valve port in the hydraulic damping system. If the oil seal needs renewing the easiest way to remove it from the inner main tube is to pass a 13/32 in. diameter bar through the hollow plug to prevent it closing in, then grip the oil seal in a vice, pass a bar through the eye in the top casting and pull and twist to withdraw the hollow metal plug from the end of the main tube. Take care not to damage the new seal when fitting it.

After reassembling, remove the oil filler and level plugs and fill with one of the following oil, until it runs out through the level plug orifice:

Castrolite; Vacuum Arctic ;
Shell X-100. 20/20w; Essolube 20;
B.P. Energol S.A.E. 20.

Wait till the oil has ceased running, then replace the oil filler and level plugs.

(c) **Royal Enfield Units. Mark II.** Enfield rear suspension units, Part No. 38109, are shown in Fig. 4. This type provides positive damping on the rebound stroke and in consequence does not need the spring to be anchored on scrolls. The range of movement is greater than the Mark I dampers and on account of this and the improved damping the ride is better, particularly on extended rough sections. The spring rate is 150 lb. per inch.

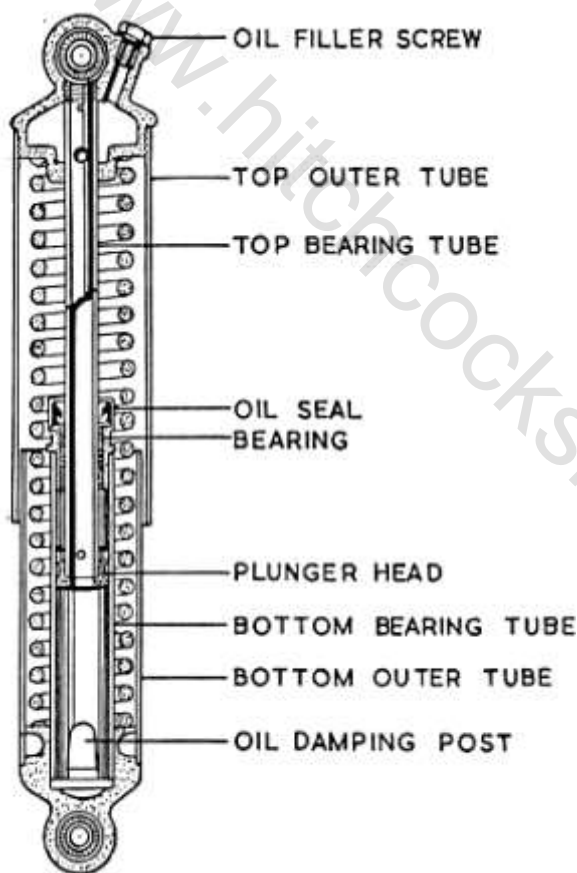
This type of unit was fitted on the "Meteor 700" model up to the early part of the 1954 season and on the "500 Bullet" model up to the later part of the 1954 season.

The Plunger Head contains a disc valve which on the bump stroke provides only a slight restriction to passage of oil between the inside of the bottom bearing tube and the damper chamber which is bounded by the inside wall of the upper end of the bottom bearing tube, the outer wall of the lower end of the top bearing tube, the upper surface of the plunger head and the lower end of the bearing bush. Since there is not room in the damper chamber for all the oil displaced on the bump stroke, provision is made for the surplus to pass up the inside of the top bearing tube and into the hollow top end casting.

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On the rebound stroke the disc valve in the plunger head closes under pressure in the damper chamber, so that the oil is forced past the clearance between the plunger head and the inside wall of the bottom bearing tube, thus providing positive damping on the rebound stroke.

At the end of the bump stroke the Oil Damping Post enters the open end of the top bearing tube thus providing a hydraulic cushion to prevent bottoming.



ROYAL ENFIELD UNIT
MARK II
Fig. 4.

To dismantle the unit, remove it from the machine, grip the lower end of the bottom casting in a vice and unscrew the top outer tube. Now insert a thin spanner .820 in. across flats between the coils of the spring to engage the flats on the top bearing and oil seal assembly, unscrew this and withdraw the top casting, top bearing tube and plunger head from

the bottom bearing tube, bottom casting and outer tube assembly.

The spring can now be lifted away. Its original free length is 8.3/4 in. If it has closed more than 1/8 - 3/16 in. a new spring should be fitted.

If it is required to renew the bearing bush or oil seal, the plunger head must be dismantled by unscrewing it from the top bearing tube and then lifting away the Oil Control Valve and circlip, the top bearing assembly comprising the oil seal and bearing bush in a housing can now be withdrawn from the lower end of the top bearing tube. The oil seal and bearing bush are secured in the housing by spinning over the end of the latter. A new assembly must therefore be fitted if either oil seal or bearing require renewing.

After reassembly of the plunger head, fill the bottom bearing tube with oil of one of the grades given below. Remove the oil filler screw from the top casting, replace the spring, and carefully insert the plunger head into the bottom bearing tube, pushing it down slowly so as to spill as little oil as possible and allow time for oil to enter the damper chamber and pass up the inside of the top bearing tube. Tighten down the top bearing and oil seal assembly with a thin spanner inserted between the coils of the spring.

Now use a mandrel press or a vertical drilling machine to compress the damper unit fully and carefully insert oil through the filling orifice until the unit is completely full. Slightly release the pressure and then compress again fully several times to remove air bubbles. Release the pressure to allow the spring to expand about 1 in. before replacing the oil filler plug.

Use one of the following grades of oil:

Castrolite; Vacuum Arctic;
Shell X-100 20/20w; Essolube 20;
B.P. Energol S.A.E. 20.

5. Removal of Swinging Arm Chain Stays

First remove one of the pivot pin nuts and pull the pivot pin out from the other end. To release the pivot bearing it is necessary to spread the rear portion of the frame, using the frame expander E.5431, which will spread the frame sufficiently to enable the spigots on the thrust washers to clear the recesses in the pivot lugs forming part of the frame.

If it is necessary to remove the bronze bushes these can be driven out by means of a hammer and a suitable drift and new bushes can be fitted under a press without difficulty. After fitting the bushes they must be reamed to .844/.843 in.

6. Centre Stand

To remove the centre stand unscrew the nut from one end of the stand spindle, knock out the

ROYAL ENFIELD WORKSHOP MANUAL

latter and withdraw the stand complete with its bearing sleeve after disconnecting one end of the stand spring. Note that the position of the stand when raised is controlled by the stop on the rear engine plate spacer, Part No. 35060. This should be adjusted so that the stand is as high as possible without actually hitting the exhaust pipe.

7. Wheel Alignment

Note that it is not possible to guarantee that the wheels are correctly aligned when the same notch position is used on both adjuster cams. It is therefore not sufficient to count the notches and use the same position on both sides of the machine. The only way to guarantee that the wheels are in line is to check the alignment from front wheel to back using either a straight edge or a piece of taut string. The alignment should be checked on both sides of the machine and if the front and rear tyres are of different section allowance must be made for this.

It is usual to check the alignment of the wheels at a point about six inches above the ground but, if the alignment is checked also

towards the top of the wheels, it will be possible to ascertain whether or not the frame is twisted so as to cause one wheel to be leaning while the other is vertical. To do this it is always necessary to remove the mudguards and, unless a straight edge cut away in its centre portion is available, it will be necessary also to remove the cylinder, toolboxes, battery, etc., in order to allow an unbroken straight edge or a piece of taut string to contact the front and rear tyres.

8. Lubrication

The steering head races, swinging arm pivot bearing and stand pivot bearing should be well greased on assembly. The swinging arm pivot and stand pivot are provided with grease nipples but no nipples are provided for the steering head as experience has shown that the provision of nipples at this point causes trouble through chafing and cutting of control and lighting cables. If the steering head bearings are well packed they will last for several years or many thousands of miles.

Recommended greases are Castrolase (Heavy), Mobilgrease (No. 4), Esso Grease, Energase C.3 or Shell Retinax A.

ROYAL ENFIELD WORKSHOP MANUAL



1955 250 CLIPPER

ROYAL ENFIELD WORKSHOP MANUAL

SECTION J2 Front Fork

With Casquette and Steel Bottom Tubes
Used on " 250 Clipper " 1954 onwards

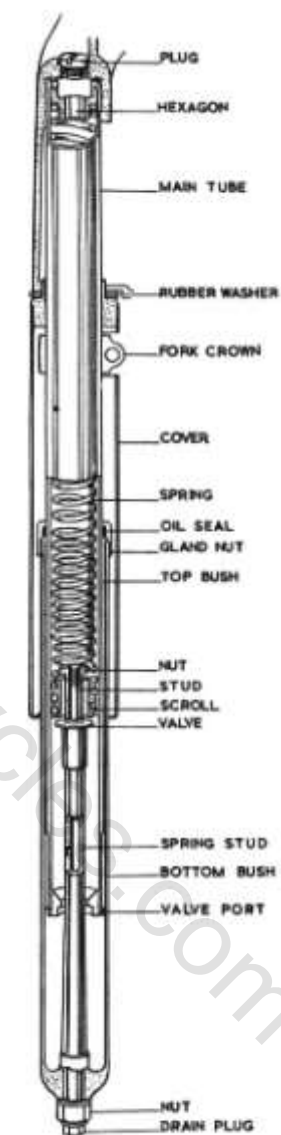
1. Description

The telescopic fork consists of two legs each of which comprises a main tube of chrome molybdenum alloy steel tubing which is screwed into the Casquette fork head at the upper end and securely clamped to the fork crown. Fitted over the lower end of the main tube is the bottom tube made of steel tubing with a forged steel fork end flashwelded to it. Fitted on the lower end of the main tube is a bronze bush which is a close fit in the bore of the bottom tube. The upper end of the bottom tube carries a bronze bush which is a close fit over the outside diameter of the main tube. The bush is secured to the bottom tube by means of a gland nut with an oil seal fitted inside it. A stud, known as the "spring stud," is fitted in the lower end of the bottom tube and a valve port is secured to the lower end of the main tube. As the fork operates oil is forced through the annular space between the bore of the valve port and the outside diameter of the spring stud which is formed with a double taper. Thus hydraulic damping is provided which is light at the normal position of the fork and becomes increasingly effective towards each end of the fork's travel. A compression spring is fitted inside the main tube between the upper end of the tube and a scroll secured to the upper end of the spring stud. The lower end of the main tube and upper end of the bottom tube are protected by a cover tube screwed to the fork crown.

The fork is filled with a light oil (S.A.E. 20) up to a level above the valve port, this oil providing both the damping medium and the lubricant for the bearings.

2. Dismantling Fork to Replace Spring, Oil Seal or Bearing Bushes

Place the machine on the stand, disconnect the front brake control and remove the front wheel and mudguard complete with stays. Unscrew the oil level plug after placing a tray to catch any oil which may run out. Undo the nut which secures the spring stud to the fork end and knock the spring stud upwards into the fork with



SECTION OF FORK LEG

Fig. 1

ROYAL ENFIELD WORKSHOP MANUAL

a soft mallet, thus allowing the remainder of the oil to escape.

Pull the bottom tube down as far as it will go, thus exposing the gland nut which can be unscrewed with the hand grips E5417, *using a bar through the bracket for the wheel spindle to prevent the bottom tube from turning. The bottom tube can now be withdrawn completely from the main tube leaving the bottom tube bush, oil seal and gland nut on the main tube.

Now unscrew the main tube valve port using "C" spanner E5418. * The spring stud and spring can now be withdrawn from the lower end of the main tube.

The bronze main tube bush can now be tapped off the lower end of the tube using the bottom tube bush for this purpose. The bottom tube bush, oil seal and gland nut can then be withdrawn.

3. Spring

The original overall length of the spring is 18.3/16 in. A new spring should be fitted if the old one has set by more than 1 inch.

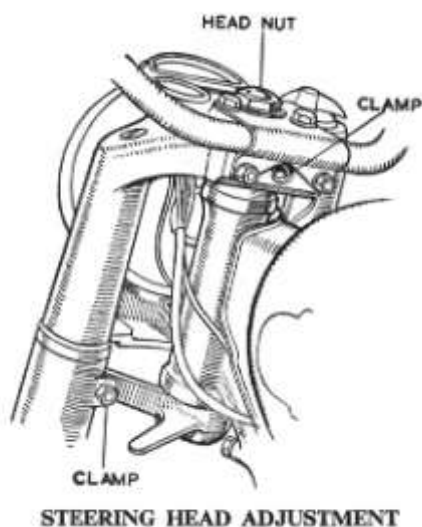


Fig. 2

4. Reassembly of Parts

No difficulty should be experienced with this. If new oil seals have been fitted it may be found that the action of the fork is very stiff when the gland nuts are tightened down fully. In this case the nuts may be left half a turn or so slack until the seals have freed off, after which they should be tightened down.

* See Manual of Workshop Tools.

5. Steering Head Races

The steering head bearing consists of two deep groove thrust races each containing nineteen 1/4 in. diameter balls. The bearing is adjusted by tightening the steering stem locknut after loosening the ball head clip screw and both

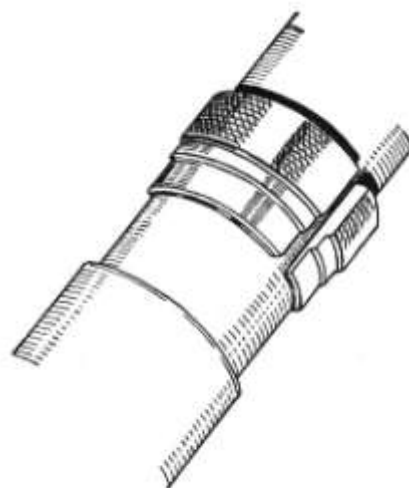


Fig. 3

the fork crown clamp bolts. The head should be adjusted so that, when the front wheel is lifted clear of the ground, a light tap on the handlebars will cause the steering to swing to full lock in either direction, while at the same time there should be only the slightest trace of play in the bearings. Do not forget to tighten the ball head clip screw and fork crown clamp bolts. Before tightening the latter make sure that the cover tubes are located centrally round the main tubes so that the bottom tube does not rub inside the cover tube. A pair of split bushes (Fig. 3) is useful to ensure centralisation of the cover tubes.

6. Removal of Complete Fork

The fork complete with front wheel and mudguard can be removed from the machine, if necessary, by adopting the following procedure.

The leads to the lighting switch and ammeter should be disconnected from the battery, rectifier, tail lamp, alternator and earth points at their lower ends, or at the plug and socket connectors when these are provided. If it is required to remove the lighting switch and ammeter these are push fits in the rubber bushes in the fork head. Disconnect the speedometer

ROYAL ENFIELD WORKSHOP MANUAL



MAIN TUBE SPANNER

Fig. 4

drive from the speedometer head and remove the two plug screws and loosen the steering head clip bolt and the two fork crown bolts.

Now unscrew the fork main tubes from the fork head by means of a hexagon bar .500 in. across flats (Unbrako wrench W.11) or the special tool shown in Fig. 4. At the same time unscrew the steering stem locknut from the top of the steering stem, turning each tube and the nut a turn or two at a time. When the nut has been removed from the steering stem and the main tubes have been completely unscrewed from the fork head the complete fork and wheel with the steering stem can be lifted out of the head lug of the frame.

7. Lubrication

The lubrication of the fork bearings is effected by the oil which forms the hydraulic damping medium. The oil level is fixed by a cross hole in the spring stud leading to a drilled passage terminating in the oil level plug. To fill each fork leg to the correct level remove the plug screws from the fork head and the oil level plugs from the fork ends. Pour oil in at the top until it runs out at the bottom of the fork. Wait till oil has stopped running and replace level plugs and plug screws.

Recommended grades of oil are Castrolite, Mobiloil Arctic, Essolube 20, B.P. Energol S.A.E. 20, Shell X-100 20/20W.



MAIN TUBE SEAL GUIDE

Fig. 5

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SECTION K2

Front Wheel With Single 6 in. Brake

**Fitted to 250 Clipper, Model S, G, J and J2.
Also 350 + 500 Bullet, and 500 Twin up to the end of 1954**

1. Removal from Fork

To remove the front wheel from the fork, place the machine on the centre stand (in the case of the spring frame models) with sufficient packing (about 2 in.) beneath each side of the stand to lift the wheel clear of the ground when tilted back on to the rear wheel. In the case of Models S, G and J place the machine on the rear stand and place a suitable box or block beneath the crankcase to lift the front wheel clear of the ground. Slacken the brake cable adjustment and disconnect the cable from the handlebar lever and from the operating cam lever on the hub. Unscrew the four nuts securing the fork bottom tube lug caps (Part No. 38593) and allow the wheel to drop forwards out of the front fork. Make sure that the machine stands securely on the rear wheel and centre stand-if necessary place a weight on the saddle or a strut beneath the fork to ensure this.

2. Removal of Brake Cover Plate Assy.

Lock the brake "on" by pressure on the operating lever and unscrew the cover plate nut. The cover plate assembly can then be withdrawn from the brake drum.

3. Removal of Brake Shoes and Springs

This is best done by unscrewing the pivot pin locknuts and the operating lever

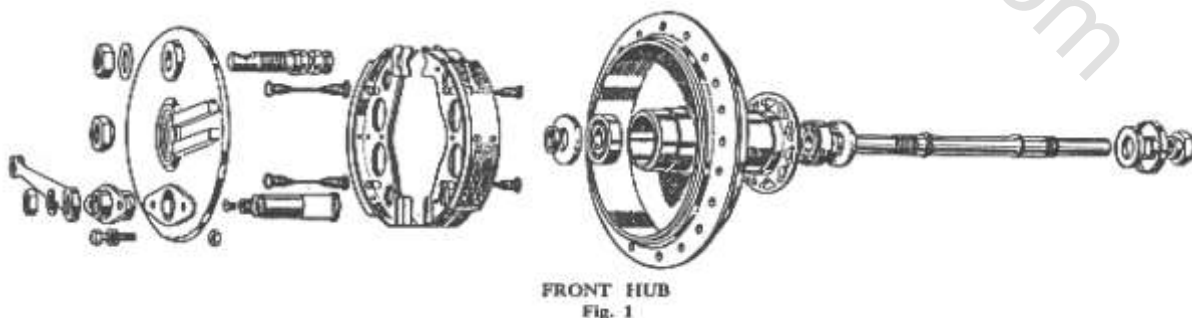
nuts after which the assembly of brake shoes, return springs, pivot pin and operating cam can be removed from the cover plate by light blows with a hammer and drift on the ends of the pivot pin and the operating cam. The return springs can then be unhooked from the spring posts in the brake shoes thus allowing the whole assembly to fall apart.

4. Replacing Brake Linings

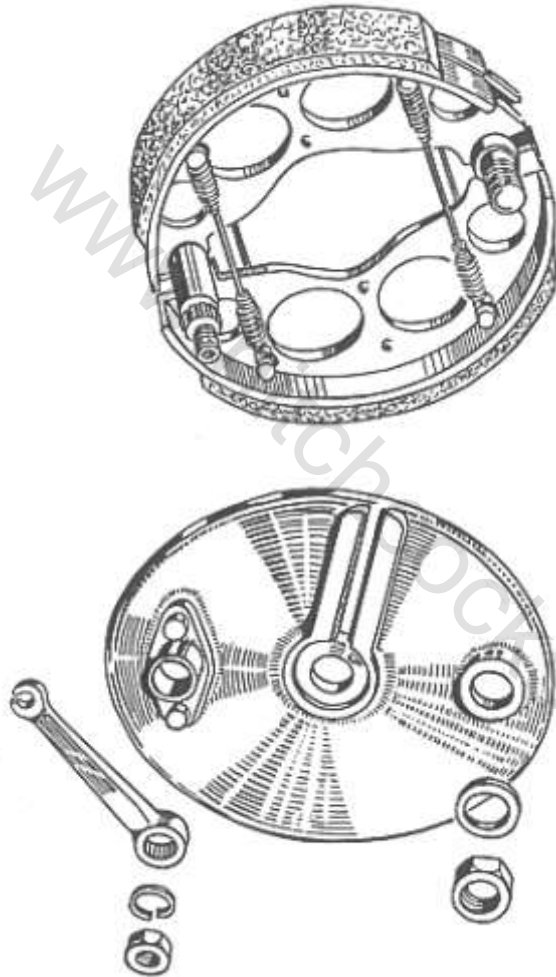
Brake linings are supplied either in pairs ready drilled complete with rivets (Part No. 37786BX) or ready fitted to service replacement brake shoes (Part No. 38042). When riveting linings to shoes secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo MR41, which are drilled to receive cheese headed rivets.

5. Removal of Hub Spindle and Bearings

To remove the hub spindle and bearings having first removed the brake cover plate, unscrew the retaining nut and remove the dust excluder from the non-brake side of the hub. Now remove the felt washers and the distance washer from the brake side and hit one end of the spindle with a copper hammer or mallet, thus driving it out of the hub bringing one bearing with it and leaving the other in position in the hub. Drive the



ROYAL ENFIELD WORKSHOP MANUAL



REMOVAL OF BRAKE SHOE ASSEMBLY

Fig. 2

bearing off the spindle and insert the latter once more in the hub at the end from which it was removed. Now drive the spindle through the hub the other way, when it will bring out the remaining bearing.

6. Hub Bearings

These are deep groove single row journal ball bearings, $\frac{5}{8}$ in. i/d by $\frac{1.9}{16}$ in. o/d by $\frac{7}{16}$ in. wide. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Marles LJ5/8 in., Fischer LS7.

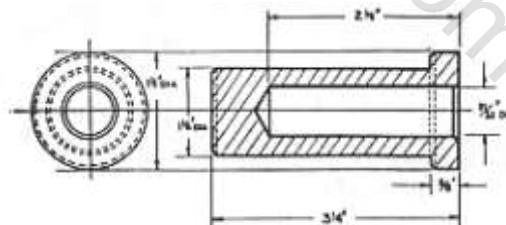
7. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulders and the distance pieces, 30538, which in turn are held up by the nuts on the spindle. In order to prevent endways pre-loading of the bearings it is essential that there is a small clearance between the inner edge of the outer race of the bearing and the back of the recess in either end of the hub barrel. To prevent any possibility of sideways movement of the hub barrel on the bearings it is, therefore, necessary for the bearings to be a tight fit in the barrel but this fit must not be so tight as to close down the outer race of the bearing and thus overload the balls. The following are the manufacturing tolerances which control the fit of the bearings. The figures for the bearings themselves are for SKF bearings but other manufacturers' tolerances are similar.

Bearing o/d	1.5622/1.5617 in.
Housing bore	1.5620/1.5616 in.
Bearing bore	.6252/.6247 in.
Shaft diameter	.6252/.6248 in.

8. Refitting Ball Bearings

Note that the two ends of the spindle are not identical. The end with the longer plain portion between the thread and the shoulder is fitted to the brake side of the wheel. To refit the bearings in the hub two hollow drifts are required, as shown in Fig. 3. One bearing is first fitted to one end of the spindle by means of the hollow drift; the spindle and bearing are then entered into one end of the hub barrel which is then supported on one of the hollow drifts. The other bearing is then threaded over the upper end of the spindle and driven home by means of the second hollow drift either under a press, or by means of a hammer, which will thus drive both bearings into position simultaneously. In order to make quite sure that there is clearance between the inner faces of the outer bearing races and the bottom of the recesses, fit the distance washer, cover plate, dust excluder and



DRIFT FOR REFITTING BEARINGS

Fig. 3

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the nuts on the spindle. Tightening the nuts should not have any effect on the ease with which the spindle can be turned. If tightening the nuts makes the spindle hard to turn this may be taken as proof that the bearings are bottoming in the recesses in the hub barrel before they are solid against the shoulders on the spindle. In this case the bearing should be removed and a thin packing shim fitted between the inner race and the shoulder on the spindle.

9. Reassembly of Brake Shoes to Cover Plate

Assemble the shoes with their return springs on to the pivot pin and operating cam, putting a smear of grease in the grooves of the pivot pin and on the operating faces of the cam. Now fit the assembly into the cover plate, putting a smear of grease on to the cylindrical bearing surface of the operating cam and secure with the pivot pin locknut and washer. Fit the operating lever on its spline in a position to suit the extent of wear on the linings and secure with the nut and washer. Note that the position of the operating lever may have to be corrected when adjusting the brake after refitting the wheel. The range of adjustment can be extended by moving this lever on to a different spline. Limit of wear is reached when the cam is turned through nearly 90° with the brake hard on so that there is a danger that the operating springs cannot return the brake to the off position.

10. Floating Cam Housing

Note that the cam housing is intended to be left free to float. The bolt holes in the cam housing are slotted and the securing pins are provided with double coil spring washers beneath their heads to enable them to be tightened sufficiently to prevent the cam housing moving under the influence of road shocks, while at the same time it can be, and should be, left free enough to be capable of being moved by hand in the direction of the slots. The pins are secured by locknuts which are centre punched as an additional precaution.

The leading shoe (i.e. the one towards the rear of the machine) has a servo action which renders it more effective than the trailing shoe. This servo action causes the lining on the leading shoe to wear more quickly than that on the trailing shoe and at the same time tends to lift the leading shoe off the cam and press the trailing shoe harder on to the cam. With a fixed cam housing the result is that the majority of the cam pressure is applied to the less efficient trailing shoe. By leaving the housing free to float the cam can follow up the leading shoe thus maintaining equal pressure between the

cam and the two shoes and so making full use of the more efficient leading shoe. Owing to the servo action the wear on the leading shoe with a floating cam housing is greater than that of the trailing shoe and in time the limit of float of the cam housing will be reached, after which the brake will continue to function as a fixed cam brake with some loss of efficiency. This can be restored by removing the shoes and fitting them in the opposite positions. Floating cam brakes are self-centering and there is no need to take any special precautions to see that the two linings are of equal thickness, or that the brake shoe assembly is centered in the drum.

11. Refitting Brake Cover Plate

After assembling the brake shoe pivot pin and operating cam into the cover plate repack the hub bearings with grease. The recommended greases are Castrolase (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C3 or Shell Retinax A. These are all medium heavy lime soap or aluminium soap greases. The use of H.M.P. greases which have a soda soap base is not recommended as these tend to be slightly corrosive if any damp finds its way in to the hubs.

Before fitting the distance washer and felt washer make sure that the inside of the brake drum is quite clean and free from oil or grease, damp, etc. and replace the brake cover plate assembly. Securely tighten the cover plate nut.

12. Wheel Rims

The rim used on the 250 Clipper and Model "S" is type WM1-19 in., internal width 1.60 in. The rim used on the other models is type WM2-19 in., internal width 1.580 in.

The rim diameter after building is the same in each case, i.e. 19.062 in., the tolerances on the circumference of the rim shoulders where the tyre fits being 59.930/59.870 in. The standard steel measuring tape for checking rims is 5/16 in. wide, .011 in. thick and its length is 59.964/59.904 in. All rims are pierced with forty holes for spoke nipples.

Note that two makes of rim are used "Dunlop" and "Palmer Jointless." These differ in the positions of the pierced spoke holes. The Dunlop rims have a group of three holes on one side of the centre line, then a single hole on the other side, a further group of three and a single hole and so on. Palmer rims have the holes alternately spaced either side of the centre line. Both rims are interchangeable and both use the same length spokes but the method of lacing the wheel is different (see Subsection 14). Neither types of the wheel rim are symmetrical and care must be taken they are built the right way round into the wheel.

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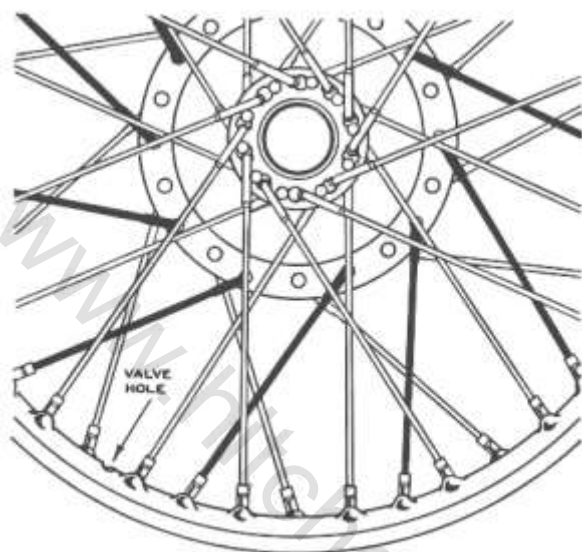


Fig. 4A Dunlop Rim

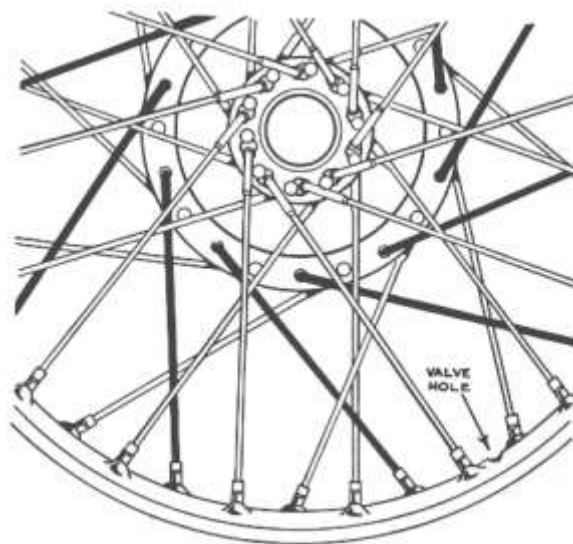


Fig. 4B Palmer Rim

WHEEL LACING

13. Spokes

The spokes are of the single butted type 8-10 gauge with 90° countersunk heads, angle of bend 95°-100°, length 6.5/8 in. brake drum side, 8.1/2 in. spoke flange side, thread diameter .144 in., 40 threads per inch, thread form British Standard Cycle.

14. Wheel Building and Truing

The spokes are laced one over two on the brake side and one over three on the spoke flange side of the wheel. The wheel must be built central in relation to the faces of the nuts on the spindle. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus 1/32 in.

Figs. 4A and 4B show the difference between the lacing when using Dunlop and Palmer rims. The key to correct lacing is the inside spokes to the large flange on the brake drum side which must slope in the direction shown in Fig. 4. With the Dunlop rim this spoke goes to the middle hole of one of the groups of three (see Subsection 12) and the rim must be built into the wheel so that these groups of three holes are on the right of the centre line when the brake drum is on the left, i.e. the inside spokes to the large flange cross from the left to the right of the centre line.

With the Palmer rim the spokes from the large flange on the brake drum side go to the more steeply angled holes in the rim which must be on the left of the centre line when the brake drum is on the left, i.e. none of the spokes crosses from left to right of the centre line.

15. Tyres

Standard tyres on the "250 Clipper" and "Model S" are Dunlop 3.00-19 in. Lightweight Reinforced and on the other models Dunlop 3.25-19 in. Ribbed.

When removing the tyre always start close to the valve and see that the edge of the cover at the other side of the wheel is pushed down into the well in the rim.

When replacing the tyre fit the part by the valve last, also with the edge of the cover at the other side of the wheel pushed down into the well.

If the correct method of fitting and removal of the tyre is adopted it will be found that the tyres can be manipulated quite easily with the small levers supplied in the toolkit. The use of long levers and/or excessive force is liable to damage the walls of the tyre. After inflation make sure that the tyre is fitting evenly all the way round the rim. A line moulded on the wall of the tyre indicates whether or not the tyre is correctly fitted. If the tyre has a white mark, indicating a balance point, this should be fitted near the valve.

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16. Tyre Pressures

The load which the tyre will carry at different inflation pressures is shown below:

Tyre Section Inches	Inflation Pressure—lb. per sq. in.		
	18	20	24
	Load per tyre—lb.		
3.00	180	200	240
3.25	240	280	300

17. Lubrication

A greasing point is provided in the centre of the hub barrel. Unless the barrel is packed full

with grease on assembly (which is apt to lead to trouble through grease finding its way past the felt seals on to the brake linings) this greasing point is of little value and the best way to grease the bearings is by packing them with grease after dismantling the hub as described above.

Note that the brake cam is drilled for a grease passage but the end of this is stopped up with a countersunk screw instead of being fitted with a grease nipple. This is done to prevent excessive greasing by over-enthusiastic owners. If the cam is smeared with grease on assembly it should require no further attention but in case of necessity it is possible to remove the screw, fit a grease nipple in its place and grease the cam by this means.

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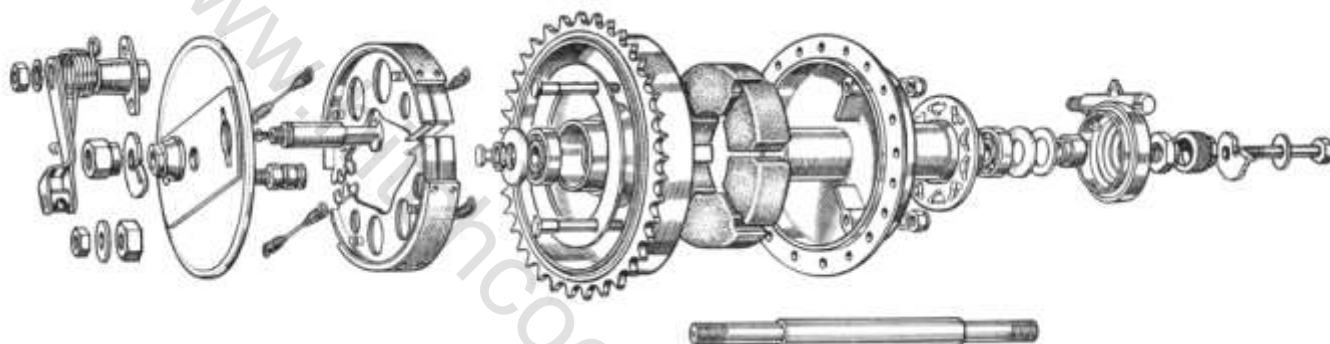
1957 250 CLIPPER

ROYAL ENFIELD WORKSHOP MANUAL

SECTION L3

Rear Wheel (Non-Detachable Type)

Part No. 38920-250 Clipper; Part No. 36998-250 Model S; Part No. 32832 350 Model G; Part No. 33595-500 Model J2.



REAR HUB

Fig. 1

1. Description

These instructions cover the servicing of four types of rear wheel which differ only in tyre and rim size, the diameter of the brake drum, size of bearings and in the overall width of the hub. The width over the distance collars is $7 \frac{11}{16}$ in. for the wheel for the "250 Clipper," and $7 \frac{3}{16}$ in. for the "250 Model S," "350 Model G" and the "500 Model J2."

The wheels for the "250 Clipper," "250 Model S" and "350 Model G" have a 6 in. diameter brake, the wheel for the "500 Model J2" has a 7 in. diameter brake.

All the wheels incorporate a rubber cush drive and the chain line in each case is 23 in. A special feature is the provision of a two-piece spindle with a detachable distance piece, the removal of which enables the inner tube to be changed with the wheel in position in the machine.

2. Removal of Inner Tube with Wheel in Position in Frame

Place the machine on the stand. Remove the dual seat, if fitted, and the detachable portion of the rear mudguard. Deflate the tyre and remove the right hand side of the tyre from the rim, using tyre levers in the ordinary way. Unscrew the centre bolt and withdraw this completely. Spring the fork ends slightly apart so as to

release the slip collar, 38917 (spacing collar 31993 or 32455 for Models "S" or "G" and "J2" respectively) from the spigot which locates it and slide the collar out of the fork end. Disconnect the speedometer driving flex from the speedometer gearbox, remove the inner tube from the tyre and withdraw it through the gap left between the inside of the fork end and the speedometer gearbox.

3. Removal and Replacement of Wheel

Place machine on the stand, if necessary putting packing pieces beneath the legs of the stand to lift the wheel clear of the ground. Remove the dual seat, if fitted, and the detachable portion of the rear mudguard. Disconnect the rear driving chain at the spring link and remove the chain from the rear wheel sprocket, leaving it in position on the gearbox countershaft sprocket. Unscrew the rear brake rod adjusting nut completely and depress the brake pedal so as to disengage the rod from the trunnion in the brake operating lever. Unscrew the brake cover plate anchor nut (anchor link nut in the case of Models "S," "G" and "J2") and remove this together with the washer behind it. Disconnect the speedometer driving cable, loosen the spindle nut and the centre bolt and, in the case of the "250 Clipper," mark the chain adjuster cams to ensure replacing in the same position. Slide the wheel out of the fork ends

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tilting it so as to disengage the end of the brake shoe pivot pin from the slot in the fork end in the case of the 250 Clipper.

When replacing the wheel make sure that the dogs on the speedometer drive gearbox are engaged with the slots in the end of the hub barrel. Make sure also that the speedometer drive gearbox is correctly positioned so that there is no sudden bend in the driving cable. Make sure that the closed end of the spring link points in the direction of travel of the chain. In the case of the "250 Clipper" replace the chain adjuster cams in their original positions or, if necessary, turn each of them the same number of notches to tension the chain and maintain correct wheel alignment. (In the case of Models "S," "G" and "J2" turn each adjusting screw the same number of turns). Do not forget to refit the brake rod and adjust the brake so that the wheel turns freely while the brake is off, while at the same time only a small travel of the brake pedal is necessary to put the brake on.

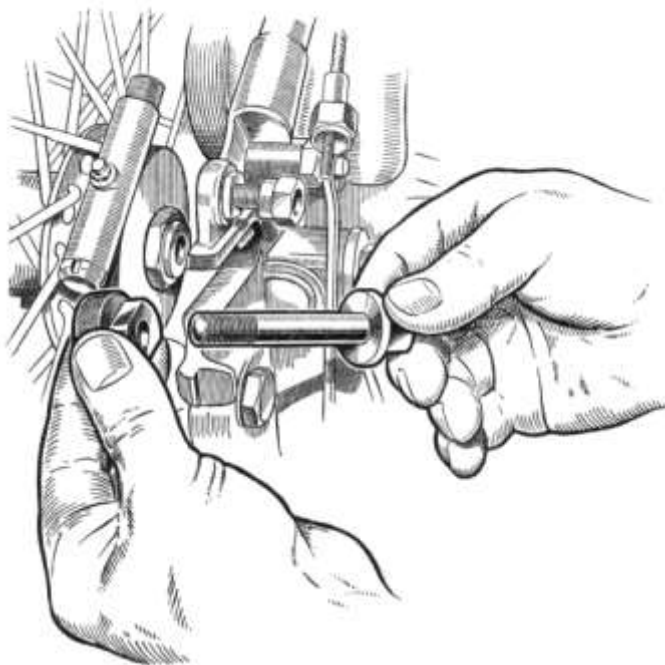
4. Removal of Brake Shoes for Replacement, Fitting New Linings, etc.

Remove the complete wheel as described above, then remove the left hand spindle nut and washer (chain adjuster in the case of "250 Clipper") and distance collar, thus permitting the complete brake cover plate with operating cam, pivot pin, shoes and return springs to be lifted off the hub spindle. In the case of the "250 Clipper" and Models "S" and "G" unscrew the pivot pin locknut and the operating lever nut, after which the assembly of the brake shoes, return spring, pivot pin and operating cam can be removed from the cover plate by unscrewing the pivot pin and applying light blows with a hammer and drift on the end of the operating cam. The return springs can then be unhooked from the spring posts in the brake shoes, thus allowing the whole assembly to fall apart.

In the case of Model "J2" the springs can be unhooked without removing the operating cam or the pivot pin which is riveted to the cover plate.

5. Replacing Brake Linings

Brake linings are supplied either in pairs ready drilled complete with rivets, Part No. 37786BX (6 in. shoes) or 37787BX (7 in. shoes), or ready fitted to service replacement brake shoes, Part No. 38042 (6 in. shoes) or 38043 (7 in. shoes). When riveting linings to shoes secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo MR41 which are drilled to receive cheese headed rivets.



REMOVAL OF CENTRE BOLT AND SLIP COLLAR
TO PERMIT REMOVAL OF INNER TUBE

Fig. 2

6. Removal of Hub Spindle and Bearings

To remove the hub spindle and bearings, having already removed the brake cover plate assembly and speedometer drive gearbox, lift out the felt washers and distance pieces then hit one end of the spindle with a copper hammer or mallet thus driving it out of the hub, bringing one bearing with it and leaving the other in position in the hub. Drive the bearing off the spindle and insert the latter once more in the hub at the end from which it was removed. Now drive the spindle through the hub in the opposite direction, when it will bring out the remaining bearing.

7. Hub Bearings

These are deep groove single row journal ball bearings. The lighter bearings used in the "250 Clipper" and Models "S" and "G" are 5/8 in. i/d x 1.9/16 in. o/d x 7/16 in. wide. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Marles LJ5/8 in., Fischer LST

The heavier bearings used in the Model J2 are 5/8 in. i/d x 1.13/16 in. o/d x 5/8 in. wide. The Skefko Part No. is RMS5. Equivalent bearings of other makes are Hoffmann MS7, Ransome and Males MJ5/8 in., Fischer MS7.

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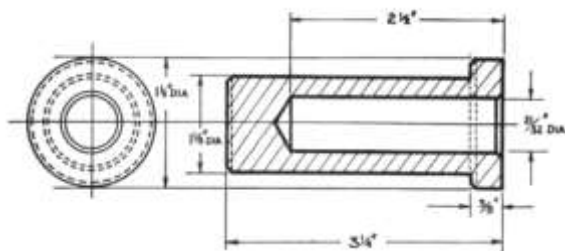
8. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulders and the distance pieces, which in turn are held up by the cover plate nuts. In order to prevent endways pre-loading of the bearings it is essential that there is a small clearance between the inner edge of the outer race of the bearing and the back of the recess in either end of the hub barrel. To prevent any possibility of sideways movement of the hub barrel on the bearings it is, therefore, necessary for the bearings to be a tight fit in the barrel but this fit must not be so tight as to close down the outer race of the bearing and thus overload the balls. The following are the manufacturing tolerances which control the fit of the bearings. The figures for the bearings themselves are for SKF bearings but other manufacturers' tolerances are similar.

	250 Clipper S and G	500 Model J2
Bearing o/d	1.5622/1.5617 in.	1.8122/1.8117 in.
Housing bore	1.5620/1.5615 in.	1.8115/1.8110 in.
Bearing bore	.6252/.6247 in.	.6252/.6247 in.
Shaft diameter	.6252/.6248 in.	.6252/.6248 in.

9. Refitting Ball Bearings

To refit the bearings in the hub two hollow drifts are required, as shown in Figs. 3 and 4. One bearing is first fitted to one end of the spindle by means of the hollow drift; the spindle and bearing are then entered into one end of the hub barrel which is then supported on one of the hollow drifts. The other bearing is then threaded over the upper end of the spindle and driven home by means of the second hollow drift either under a press or by means of a hammer which will thus drive both bearings into position simultaneously.



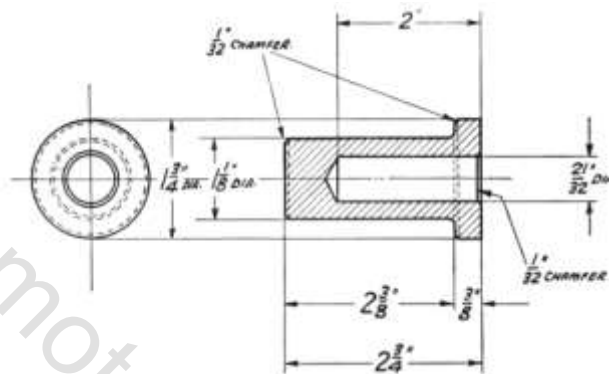
DRIFT FOR REFITTING BEARINGS
"250 CLIPPER." MODELS "S" AND "G."
Fig. 3

In order to make quite sure that there is clearance between the inner faces of the outer bearings and the bottom of the recesses fit the distance washers against the inner races of the

bearings and either fit the assembly of brake cover plate, speedometer gearbox, etc. or make up this distance with tubular distance pieces. Fit and tighten the spindle nuts. Tightening the nuts should not have any effect on the ease with which the spindle can be turned. If tightening the nuts makes the spindle hard to turn this may be taken as proof that the bearings are bottoming in the recesses in the hub barrel before they are solid against the shoulders on the spindle. In this case the bearing should be removed and a thin packing shim fitted between the inner race and the shoulder on the spindle.

10. Cush Drive

The sprocket/brake drum is free to rotate on the hub barrel. Three radial vanes are formed on the back of the brake drum and three similar

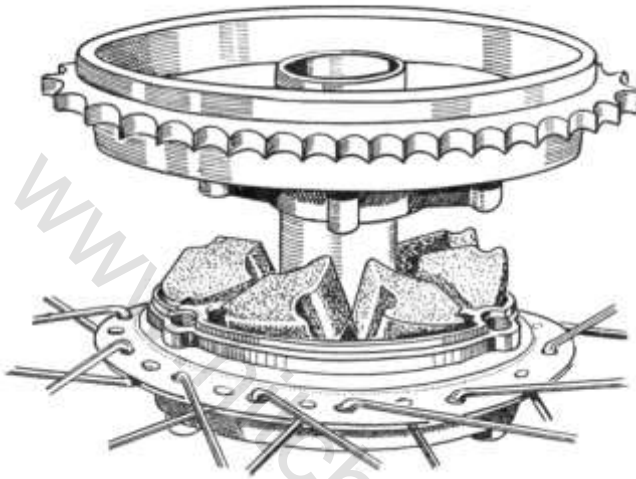


DRIFT FOR REFITTING BEARINGS
"500 MODEL J2"
Fig. 4

vanes are formed on the cush drive shell. Six rubber blocks are fitted between the vanes on the brake drum and those on the cush drive shell, thus permitting only a small amount of angular movement of the sprocket/brake drum relative to the hub barrel and transmitting both driving and braking torques and smoothing out harshness and irregularity in the former.

If the cush drive rubbers become worn so that the amount of free movement measured at the tyre exceeds 1/2 in. to 1 in. the rubbers should be replaced. To obtain access to them remove the complete wheel as described above, remove the brake cover plate complete with the brake shoe assembly, unscrew the three Simmonds nuts at the back of the cush drive shell-if necessary holding the studs by means of the flats on the heads inside the brake drum. Drive out the three studs into the brake drum after which the sprocket/ brake drum can be separated from the cush drive shell and the six cush drive rubbers can be lifted out.

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REASSEMBLY OF CUSH DRIVE

Fig. 5

When reassembling the cush drive the entry of the vanes between the rubbers will be facilitated if the latter are fitted into the driving shell first and then tilted. The rubbers should be liberally painted with soapsuds to facilitate entry of the vanes.

When reassembling the cush drive coat the inside of the bore of the sprocket/brake drum liberally with grease where it fits over the hub barrel and also put grease on the inner face of the lockring. The three Simmonds nuts should be tightened down solid as there is a shoulder on the stud which prevents tightening of the nuts from locking the operation of the cush drive.

11. Reassembly of Brake Shoes, Pivot Pin and Operating Cam into Cover Plate

No difficulty should be experienced in carrying out these operations. Make sure that the pivot pin is really tight in the cover plate and put a smear of grease in the grooves of the pivot pin and on the operating face of the cam ; also on the cylindrical bearing surface of the operating cam if this has been removed. Fit the operating lever and trunnion on its splines in a position to suit the extent of wear on the linings and secure with the nut. The range of adjustment can be extended by moving the lever on to a different spline.

12. Centering Cam Housing

Note that the bolt holes in the cam housing are slotted, thus enabling the brake shoe assembly to be centered in the drum. It is not intended that on rear brakes the cam housing should be left free to float but the shoes should

be centered by leaving the screws just short of dead tight. The brake cover plate assembly with the shoes should then be fitted over the spindle into the brake drum and the brake applied as hard as possible by means of the operating lever. This will centre the shoes in the drum. The screws should then be tightened dead tight and secured with the locknuts. If the shoes are not correctly centered the brake will be either ineffective or too fierce, depending on whether the trailing or leading shoe first makes contact with the drum. With the brake assembly correctly centered and the screws securing the cam housing correctly tightened wear on both linings should be approximately equal.

13. Final Reassembly of Hub before Replacing Wheel

Before replacing the felt washers which form the grease seals, pack both bearings with grease. Recommended greases are Castrolase (Heavy), Mobilgrease (No. 4), Esso Grease, Energrelase C3 or Shell Retinax A. These are all medium heavy lime soap or aluminium soap greases. The use of H.M.P. greases which have a soda soap base is not recommended as these tend to be slightly corrosive if any damp finds its way into the hubs.

Make sure that the inside of the brake drum is quite free from oil or grease, damp, etc. Replace the felt washers, distance collars, the brake cover plate assembly, speedometer drive gearbox, distance collars, chain adjuster cams, the loose section of the spindle and the spindle nut. The wheel is then ready for reassembly into the machine.

14. Wheel Rims

The rim used on the "250 Clipper" and Model "S" is Type WM 1-19 in., internal width 1.60 in. The rim for the Model "G" and Model "J2" is WM2-19 in., internal width 1.580 in.

The rim diameter after building is the same in each case, i.e., 19.062 in. the tolerances on the circumference of the rim shoulders where the tyre fits being 59.930/59.870 in. The standard steel measuring tape for checking rims is 5/16 in. wide, .011 in. thick and its length is 59.964/59.904 in. All rims are pierced with forty holes for spoke nipples.

Note that two makes of rim are used "Dunlop" and "Palmer Jointless." These differ in the positions of the pierced spoke holes. The Dunlop rims have a group of three holes on one side of the centre line, then a single hole on the other side, a further group of three and a single hole and so on. Palmer rims have the holes alternately spaced either side of the centre line. Both rims are interchangeable and

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both use the same length spokes but the method of lacing the wheel is different (see Subsection 16). Neither type of rim is symmetrical and care must be taken that they are built the right way round into the wheel.

15. Spokes

The spokes are of the single butted type 8-10 gauge with 90° countersunk heads, angle of bend 95°-100°, length 7.3/4 in. cush drive side, 8.1/2 in. spoke flange side, thread diameter .144 in., 40 threads per inch, thread form British Standard Cycle.

16. Wheel Building and Truing

The spokes are laced one over three and the wheel must be built central in relation to the faces of the distance collars which fit between the fork ends. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus 1/32 in.

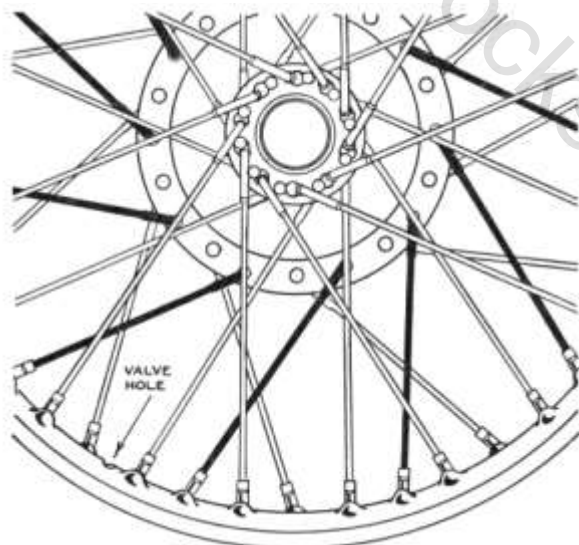


Fig. 6A Dunlop Rim

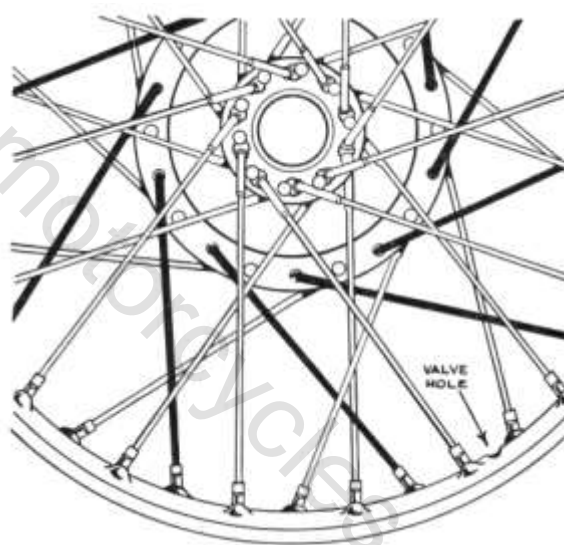


Fig. 6B Palmer Rim

WHEEL LACING

Figs. 6A and 6B show the difference between the lacing when using Dunlop and Palmer rims. The key to correct lacing is the inside spokes to the large flange on the cush drive shell which must slope in the direction shown in Fig. 6. With the Dunlop rim this spoke goes to the middle hole of one of the groups of three (see Subsection 14) and the rim must be built into the wheel so that these groups of three holes are on the right of the centre line when the cush drive is

on the left, i.e. the inside spokes to the large flange cross from the left to the right of the centre line.

With the Palmer rim the spokes from the large flange on the cush drive shell go to the more steeply angled holes in the rim which must be on the left of the centre line when the cush drive is on the left, i.e. none of the spokes crosses from left to right of the centre line.

17. Tyres

Standard tyres on the "250 Clipper" and Model "S" are Dunlop 3.00-19 in. Lightweight Reinforced. On the Model "G" the standard tyre is Dunlop 3.25-19 in. Universal tread and on the Model "J2," Dunlop 3.50-19 in. Universal tread.

When removing the tyre always start close to the valve and see that the edge of the cover at the other side of the wheel is pushed down into the well in the rim.

When replacing the tyre fit the part by the valve last, also with the edge of the cover at the

other side of the wheel pushed down into the well.

If the correct method of fitting and removal of the tyre is adopted it will be found that the covers can be manipulated quite easily with the small levers supplied in the toolkit. The use of long levers and/or excessive force is liable to damage the walls of the tyre. After inflation make sure that the tyre is fitting evenly all the way round the rim. A line moulded on the wall

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of the tyre indicates whether or not the tyre is correctly fitted. If the tyre has a white mark, indicating a balance point, this should be fitted near the valve.

18. Tyre Pressures

The load which the tyre will carry at different inflation pressures is shown below :-

Tyre Section Inches	Inflation Pressures-lb. per sq. in.					
	16	18	20	24	28	32
	Load per tyre-lb.					
3.00	-	-	-	240	300	350
3.25	-	240	280	350	400	440
3.50	280	320	350	400	450	500

19. Lubrication

A greasing point is provided in the centre of the hub barrel. Unless the barrel is packed full with grease on assembly (which is apt to lead to trouble through grease finding its way past the felt seals on to the brake linings) this greasing point is of little value and the best way to grease the bearings is by packing them with grease after dismantling the hub as described above.

Note that the brake cam is drilled for a grease passage but the end of this is stopped up with a countersunk screw instead of being fitted with a grease nipple. This is done to prevent excessive greasing by over-enthusiastic owners. If the cam is smeared with grease on assembly it should require no further attention but in case of necessity it is possible to remove the screw, fit a grease nipple in its place and grease the cam by this means.

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SECTION M3 Special Tools For "250 Clipper"

SECTION C3

<i>Sub- Section</i>	<i>No.</i>	<i>Use</i>	<i>Page</i>
11	E.5477	Gudgeon Pin Extractor	1
16	E.5425	Pump Disc Lapping Tool	1
17	E.5451	Pump Worm Spanner	1
18	14835	Magneto Sprocket Extractor	1
23	E.4871	Brake Bar for Clutch Centre	1
23	E.5414	Extractor for Clutch Centre	1

SECTION D3

4	E.4816	Tool for fitting Timing Side Roller Race	2
4	E.5119	Tools for fitting Roller Race to Driving Side Crankcase	2
5	E.6462	Locating Plate for Assembly of Cam Spindles	3
6	E.2775	Flywheel Assembly Pot or Jig	3

SECTION HI

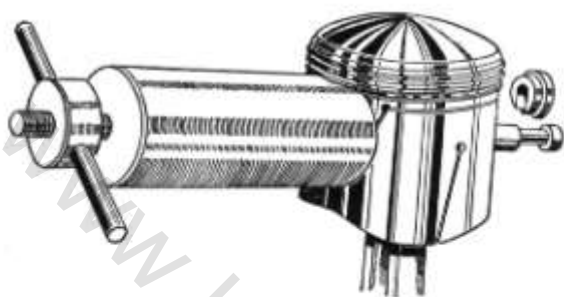
5	E.5431	Frame Expander	4
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SECTION J2

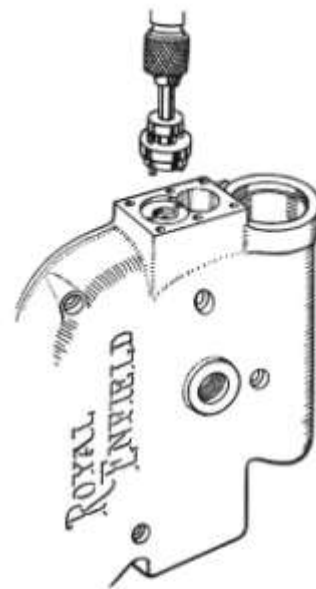
2	E.5417	Gland Nut Hand Grips	4
2	E.5418	Lockring Spanner	4

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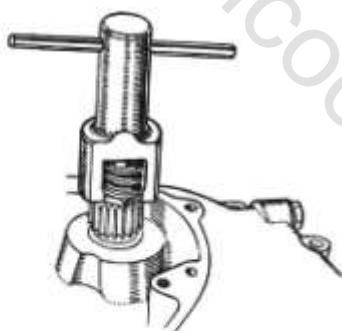
Special Tools for the "250 Clipper"



E.5477
GUDGEON PIN EXTRACTOR



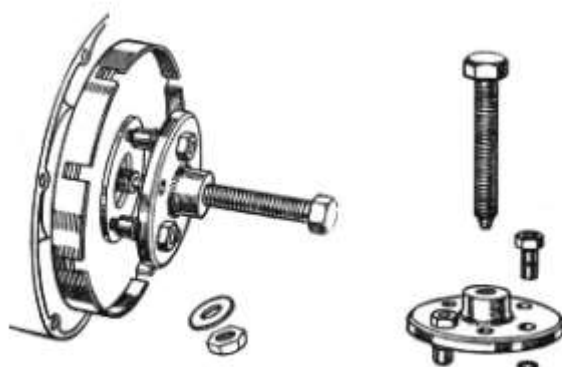
E.5425
PUMP DISC LAPPING TOOL



E.5451
PUMP WORM SPANNER



14835
MAGDYNO SPROCKET
EXTRACTOR



E.5414
EXTRACTOR FOR CLUTCH CENTRE

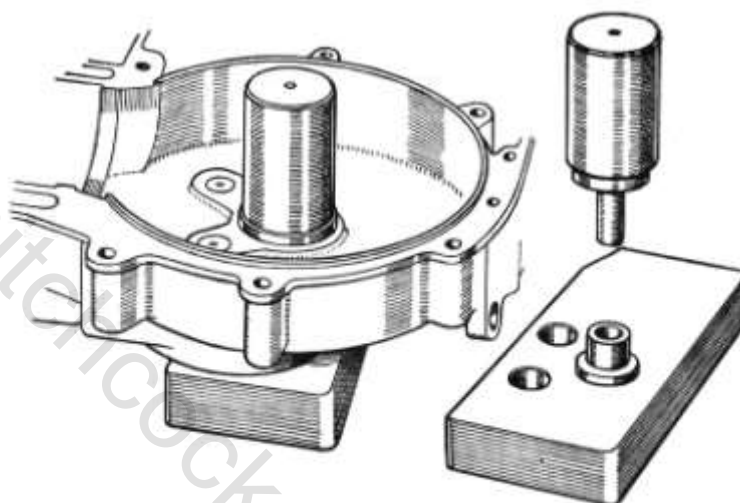


E.4871
BRAKE BAR FOR CLUTCH CENTRE

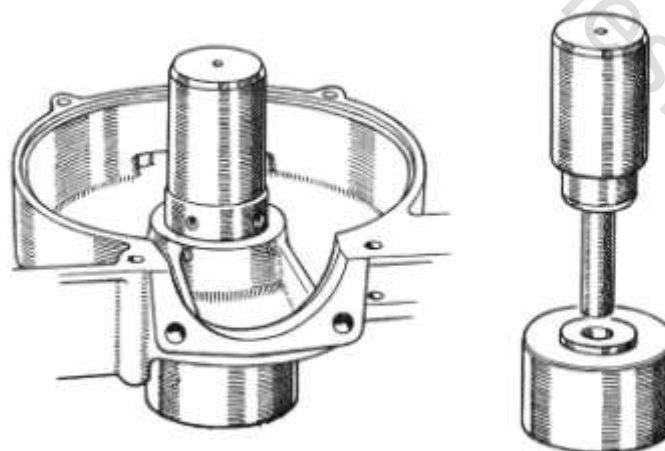
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Special Tools for the " 250 Clipper"

TOOLS FOR FITTING BUSHES



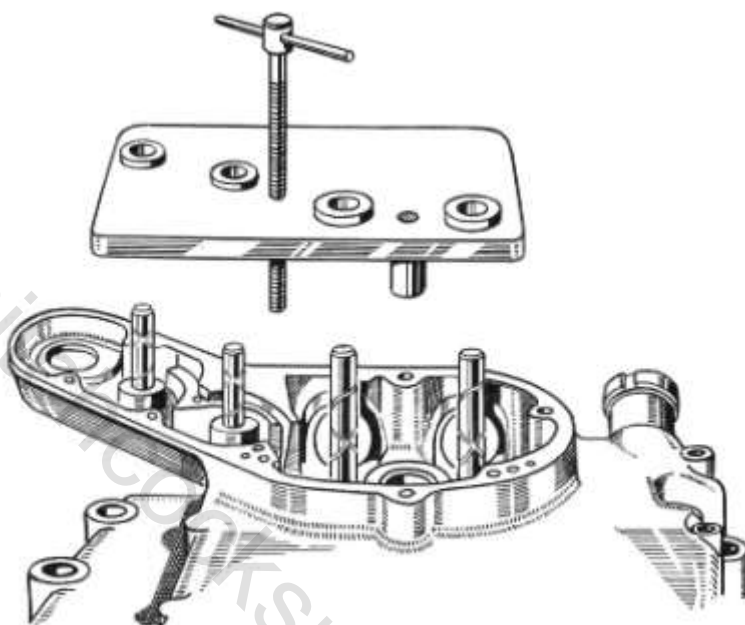
E.4816
ROLLER RACE, TIMING SIDE



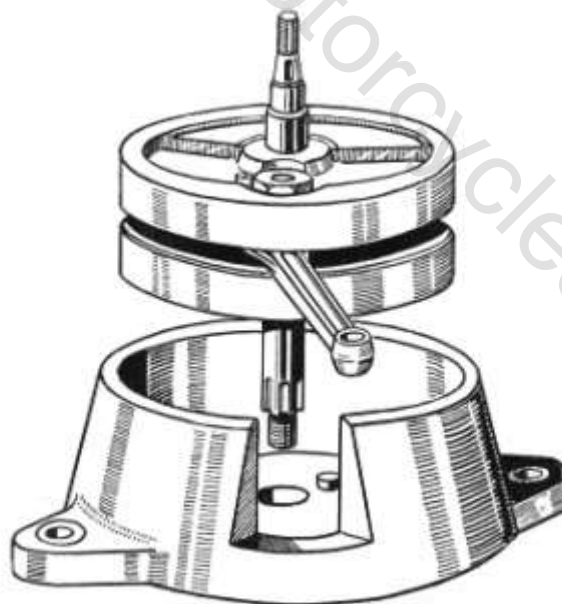
E.5119
ROLLER RACE TO CRANKCASE, DRIVING SIDE

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Special Tools for the " 250 Clipper "



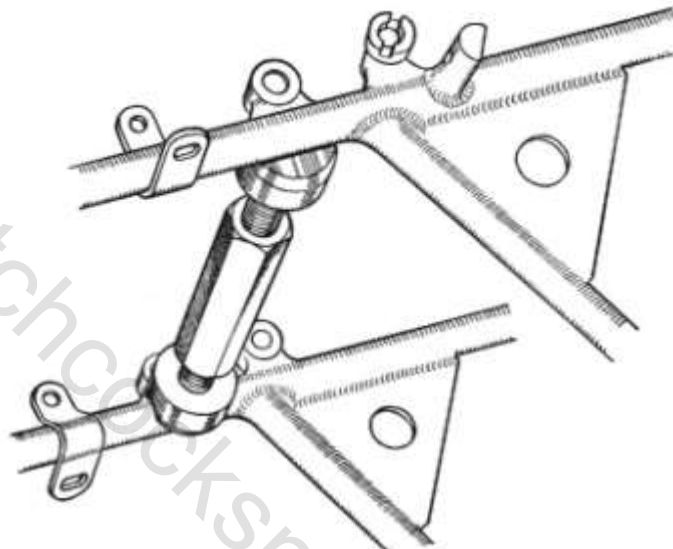
E.6462
LOCATING PLATE FOR ASSEMBLY OF CAM SPINDLES



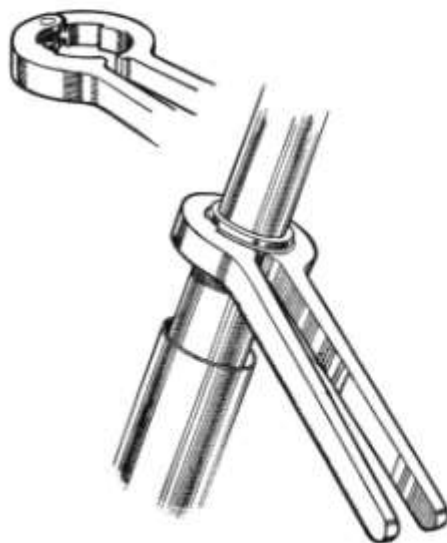
E.2775
FLYWHEEL ASSEMBLY POT OR JIG

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Special Tools for the "250 Clipper"



E.5431
FRAME EXPANDER



E.5417
GLAND NUT HAND GRIPS



E.5418
LOCKRING SPANNER



SPARES for ROYAL ENFIELD & AMAL

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