WORKSHOP
MAINTENANCE MANUAL
FOR THE
ROYAL ENFIELD

350 cc OHV G, 1945 - 1954
G deluxe and 350 Clipper
1955 - 57
and 500 cc OHV J and J2
1945 – 1954
MOTOR CYCLES

HITCHCOCK'S MOTORCYCLES
ROSEMARY COURT
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CHADWICK END
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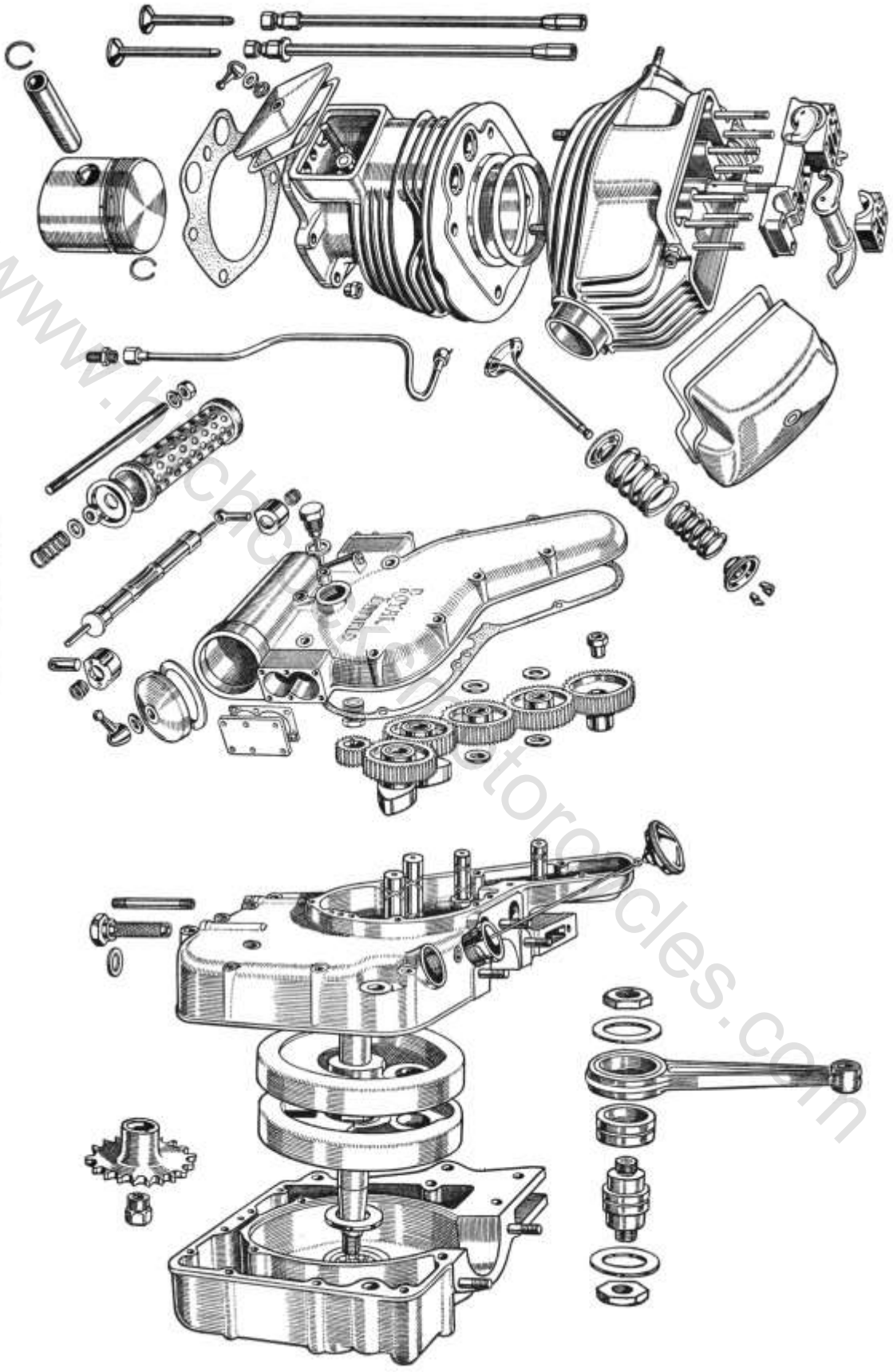

EXPLODED VIEW OF ENGINE

CONTENTS

DATA
ROYAL ENFIELD 500 c.c. O.H.V. MOTOR CYCLE

ENGINE.

Cubic Capacity ... ... 499 c.c.
Stroke ... ... 90 m.m.
Bore ... ... 84 m.m.
(3.30725in. - 3.30675 in.)
(Rebore to •015 in. when wear exceeds .008 in. and again to .030 in. after further .008 in. wear.)

Compression Ratio ....6.75 to 1
Piston Diameter:
Bottom of Skirt
Fore and Aft ... 3.3047 in./3.3042 in.
Top Lands. ..... 3.284 in./3.281 in.
Piston Ring Dimensions-
Width-Plain Rings ....1/16 in.
Scraper Ring ....5/32 in.
Radial Thickness .... .115 in./.108 in.
Gap when in unworn cyl. .012 in. to .016 in.
Clearance in grooves ..... .0035 in./.0015 in.
(Renew Piston Rings when gap exceeds 1/16 in.)

Oversize Pistons and Rings available.
Piston Boss Internal Diameter .... .7500 in. - .7495 in.
Gudgeon Pin Diameter .... .7500 in. - .7495 in.
Small End Bush Internal Diameter
(fine bored or reamered after fitting) .7507 in. - .7505 in.

Big End Bush Internal diameter
(ground after fitting) ....1.625 in. ± .00025 in.
Crank Pin Diameter .... 1.249 in. – 1.24875 in.
Main Bearing Outer Race inside diameter
(before fitting) .... 1.3752 in. – 1.3750 in.
Timing Side Bush inside diameter
(reamered after fitting) ... . .877 in. - .875 in.
Driving Side Shaft Diameter ... . .8750 in. - .8745 in.
Timing Side Shaft Diameter ... . .8750 in. - .8745 in.
Roller Diameter .... .2500 in. - .2490 in.
(Graded to nearest .0001 in. and selective assembly used.)

Rocker Bearing inside diameter .6255 in. - .6250 in
Rocker Diameter .... .6240 in. - .6235 in.
Valve Guide inside diameter (before fitting) .3447 in. - .3437 in.
Valve Stem Diameter-Inlet ..... .3435 in. - .3425 in.
Exhaust..... .3415 in. - .3405 in.
Valve Tappet Clearance (with cold engine) Inlet .002 in.
Exhaust .004 in.
Valve Timing at .005 in. tappet clearance
Exhaust opens 75° before b.d.c.
Exhaust closes 35° after t.d.c.
Inlet opens 40° before t.d.c.
Inlet closes 70° after b.d.c.

Valve Spring Free Length (outer and inner) 1.3/4 in.
(Renew valve spring when free length is reduced by 1/8 in.)
Cam Bush inside diameter (reamered
after fitting) .... .6255 in. - .6250 in.
Idler Pinion Bush inside diameter (reamered
after fitting) .... .502 in. - .501 in.
Cam Spindle .... .6245 in. - .6235 in.
Idler Pinion Spindle .... .49925 in. - .49825 in.

TRANSMISSION.

Sprockets-Engine .... 21 T. 1/2 in. P. X .305 in. W,
Clutch .... 42 T. 1/2 in. P. X .305 in. W.
Countershaft ... ... 18 T. 5/8 in. P. X .380 in. W.
Rear Wheel .... 46 T. 5/8 in. P. X .380 in. W.
Chains-Front ... ... 75 pitches 1/2 in. P. X .305 in. W.
Rear ... ... 89 pitches 5/8 in. P. X .380 in. W.
Chain Adjustment-Front ... . 1/4 in. slack.
Rear ... . 1/2 in. slack.

Clutch Thrust Rod Length ... . long part 9 7/16 in.
short part 1 7/8 in.
Clearance in Clutch Control ... . 1/16 in.

Gear Box Ball Bearings-
Large Internal Dia. 30 m.m.
External Dia. 62 m.m.
Width 16 m.m.
Small Internal Dia. 5/8 in.
External Dia. 1 13/16 in.
Width 5/8 in.
Gear Box Layshaft Bearings (reamered after fitting)
Left side Internal Dia. 1.001 in. – 1.000 in.
Right side Internal Dia. .7195 in. – .7185 in.
Kickstarter Shaft Bearing Internal Dia. 1.1255 in. – 1.1250 in.

FRAME AND WHEELS.

Wheel Hub Ball Races
Front-Internal Diameter 5/8 in.
External Diameter 1 9/16 in.
Width... ... ... 7/16 in.
Rear-Internal Diameter 5/8 in.
External Diameter 1 13/16 in.
Width... ... ... 5/8 in.
Wheel Rim Size ... W.M.2-19in. for 3.25-19 in. Tyre.

Front and rear rims interchangeable.

Wheel Spokes
Front, near side ... ... 6 5/8 in. long 8-10g butted.
Front, off side .... 8 3/4 in. long 8-10g butted.
Rear, near side .... 7 3/4 in. long 8-10g butted.
Rear, off side .... 8 1/2 in. long 8-10g butted.
Spoke lengths measured under head.
Nipples are .140 in. dia. x 40 T.P.I.

Cush Drive, allowable free movement at wheel rim when rear brake is on ... ... 1/2 in. to 1 in.
Steering Head Balls ..... 1/4 in. dia. 38 to set (19 each race).

IGNITION.

Contact breaker gap ..... 0.012 – 0.015 in.
Ignition Timing (Advanced)..... 3/8 in. before t.d.c.
..... (34° Advanced)
Spark plug type ..... 14 m.m. 1/2 in. reach Lodge C.14 or
..... Champion L.10S.

CARBURETTER

Carburetter type ..... Amal. 276
Main jet Size ..... Between 140 and 170
Throttle Valve 4

DATA
ROYAL ENFIELD 350 c.c. O.H.V. MOTOR CYCLE

ENGINE.

Cubic Capacity ... ... 346 c.c.
Stroke ... ... 90 m.m.
Bore ... ... 70 m.m.
(2.751 in. ± .00025 in.)
(Rebore to •015 in. when wear exceeds .008 in. and again to .030 in. after further .008 in. wear.)
Compression Ratio ....5.3/4 to 1
Piston Diameter:
Bottom of Skirt
Fore and Aft .....2.748in. ± .00025 in.
Sides ....2.740in. ± .00025 in.
Top of Skirt
Fore and Aft .....2.745 in. ± .00025 in.
Sides ....2.737in. ± .00025 in.
Top Lands ....2.7285 in. ± .0005 in.
Piston Ring Dimensions-
Width-Plain Rings ....1/16 in.
Scraper Ring ....5/32 in.
Radial Thickness .... .119 in. ± .004 in.
Gap when in unworn cyl. .011 in. to .015 in.
Clearance in grooves ..... .003 in.
Oversize Pistons and Rings available.
Piston Boss Internal Diameter .... .7500 in. - .7495 in.
Gudgeon Pin Diameter .... .7500 in. - .7495 in.
Small End Bush Internal Diameter
(fine bored or reamered after fitting) .7507 in. - .7505 in.
Big End Bush Internal diameter
(ground after fitting) ....1.625 in. ± .00025 in.
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Roller Diameter .... .2500 in. - .2490 in.
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Rocker Bearing inside diameter .6255 in. - .6250 in
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Valve Timing at .005 in. tappet clearance
Exhaust opens 75° before b.d.c.
Exhaust closes 35° after t.d.c.
Inlet opens 30° before t.d.c.
Inlet closes 60° after b.d.c.
Valve Spring Free Length (outer and inner) 1.3/4 in.
(Renew valve spring when free length is reduced by 1/8 in.)
Cam Bush inside diameter (reamered
after fitting) .... .6255 in. - .6250 in.
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after fitting) .... .502 in. - .501 in.
Cam Spindle .... .6245 in. - .6235 in.
Idler Pinion Spindle... .49925 in. - .49825 in.

TRANSMISSION.

Sprockets-Engine .... 19 T. 1/2 in. P. X .305 in. W,
Clutch .... 42 T. 1/2 in. P. X .305 in. W.
Countershaft ... ... 15 T. 5/8 in. P. X .380 in. W.
Rear Wheel .... 38 T. 5/8 in. P. X .380 in. W.
Chains-Front ... ... 74 pitches 1/2 in. P. X .305 in. W.
Rear ... ... 84 pitches 5/8 in. P. X .380 in. W.
Chain Adjustment-Front ... . 1/4 in. slack.
Rear ... . 1/2 in. slack.

Clutch Thrust Rod Length ... . long part $9^{7}/_{16}$ in.
short part $1^{7}/_{8}$ in.
Clearance in Clutch Control ... . $^{1}/_{16}$ in.

Gear Box Ball Bearings-
Large Internal Dia. 30 m.m.
External Dia. 62 m.m.
Width 16 m.m.
Small Internal Dia. 5/8 in.
External Dia. $1^{13}/_{16}$ in.
Width 5/8 in.
Gear Box Layshaft Bearings (reamered after fitting)
Left side Internal Dia. 1.001 in. – 1.000 in.
Right side Internal Dia. .7195 in. – .7185 in.
Kickstarter Shaft Bearing Internal Dia. 1.1255 in. – 1.1250 in.

FRAME AND WHEELS.

Wheel Hub Ball Races
Front-Internal Diameter 5/8 in.
External Diameter $1^{11}/_{16}$ in.
Width... ... $^{7}/_{16}$ in.
Rear-Internal Diameter 5/8 in.
External Diameter $1^{13}/_{16}$ in.
Width... ... 5/8 in.

Wheel Rim Size ... W.M.2-19in. for 3.25-19 in. Tyre.

Front and rear rims interchangeable.

Wheel Spokes
Front, near side ... ... $6^{1}/_{2}$ in. long 8-10g butted.
Front, off side .... $8^{3}/_{4}$ in. long 8-10g butted.
Rear, near side .... $7^{3}/_{4}$ in. long 8-10g butted.
Rear, off side .... $8^{1}/_{2}$ in. long 8-10g butted.
Spoke lengths measured under head.
Nipples are .140 in. dia. x 40 T.P.I.

Cush Drive, allowable free movement at wheel rim when rear brake is on ... ... 1/2 in. to 1 in.
Steering Head Balls ..... 1/4 in. dia. 38 to set (19 each race).

DATA-continued

CARBURETTER.

Carburetter Type ..... Amal. 276
Main Jet Size 130
Throttle Valve 6/4

Sparking Plug-Size ....14 m.m. 1/2 in. reach.
Type ..... Lodge C.14 Sintox.
..... or Champion L.10S.
Gap Setting ..... .018 in. to .020 in.

IGNITION.

Contact Breaker Maximum opening ... ... .012 in.
Ignition Setting ... ... 3/8 in. before t.d.c.
= 34° advance.

GENERAL.

Petrol Tank Capacity 2 3/4 gallons (including 1/4 gallon reserve).
Oil Tank Capacity ... ... 4 pints.
Gear Box Capacity ... 3/4 pint.

TOOLS SUPPLIED WITH MACHINE

TOOL ROLL AND CONTENTS

No. per Set	Part No.	Description.
1	29044	Double-ended Spanner-Engineers' Patt. (1/4" x 5/16" Whit.)
1	2976	(3/8" x 7/16" Whit.)
1	24092	.380" x .343" hex. -also .380" sq.)
2	24096	(3/16" x 1/4" Whit.)
1	28976	Tubular Spanner (1/4" Whit.) (For Cylinder base nuts)
1	16594	(9/16" Whit.)
1	21166	(7/16" Whit.)
1	24094	(11/16" Whit.)
1	29043	(3/16" Whit.)
1	24097	(5/16" x 3/8" Whit.)
1	29042	Tommy Bar (Bent)
1	28996	Swivel Pin and Chain Adjuster Spanner (to fit 5/16" square).
1	16008	Magneto Spanner (.255" x .283" hex. with .012" feeler).
1	29101	Pump Cover Pin Spanner (.255" hex. with .018" feeler).
1	4272	Tyre Lever (cranked type).
2	4272A	Tyre Levers (spoon type).
1	3482	Screwdriver, 6", wire.
1	14835	Extractor Nut (Dynamo Pinion).
1	16014	Grease Gun.
1	16007	Tool Roll (with strap-less tools).
4	25861	Hallite Washers for Push Rod Tubes.

SUPPLEMENTARY KIT

1	27528	Oil Can.
1	27389	Oil Funnel.
1	27575	Pliers, 7".
1	27574	Adjustable Spanner, 7".
1	27576	Screwdriver, 6".
1	27388	Chain Rivet Extractor.
1	27387	Tyre Repair Outfit.
1	29382	Box of Spare Links (5/8" pitch chain).
1	27383	Packet of insulating Tape.
2	27386	Leather Straps.

ENGINE

DECARBONISING.

1. Removal of Cylinder Head.

Decarbonising will normally be necessary approximately every 2,000 miles and can be carried out without removal of the engine from the frame.

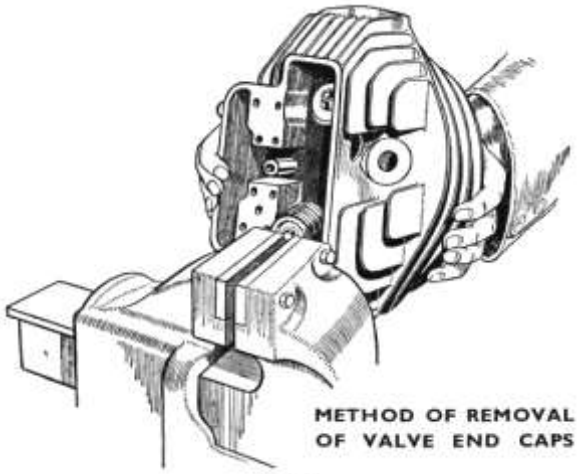
First remove the petrol pipe and the four bolts underneath the tank which secure it to the brackets and remove the tank. (If necessary the front saddle attachment bolt must be removed.) Next remove the cover over the valve gear, the carburetter, exhaust pipe and silencer. Remove the rocker bearing caps and rockers and lift the push rods out of their tubes (if the collar on the exhaust push rod will not clear the joint between the cylinder head and the barrel, leave this rod in position until after the head has been lifted off). The cylinder head can then be lifted off after unscrewing the four nuts which secure it to the cylinder.

2. Removal of Cylinder and Piston.

While it is not strictly necessary to remove the cylinder barrel and piston, this should preferably be done so that the condition of the piston, rings and big-end bearing can be examined. To remove the cylinder barrel after removal of the head, unscrew the four cylinder base nuts, **(On the 350 there is a fifth nut inside the tappet chest between the two tappets).** Disconnect the exhaust lifter cable from the handlebar lever, place the piston at the bottom of its stroke and lift the barrel off. To remove the piston, push out the gudgeon pin, after removal of the wire retaining clips with a suitable tool (such as the tang end of a small file) and lift the piston off the rod. Mark the piston so as to ensure reassembling the same way round.

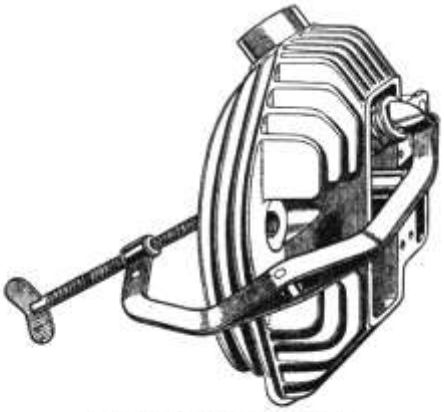
3. Removal of Valves.

To remove the valves from the cylinder head, first lift off the hardened end caps from the valve stems. If these have stuck, they can be removed by compressing the spring slightly and gripping the end cap in a vice (see Fig. 1). Then compress the valve springs with a suitable compressor, lift out the split conical collars and release the springs, when the valve can be withdrawn. Fig. 2 shows a Terry compressor in use, Fig. 3 a special type suitable for a large workshop. Keep the split conical collars and the top spring collars paired up with their respective valves and replace in the same positions when reassembling.



METHOD OF REMOVAL OF VALVE END CAPS

Fig. 1

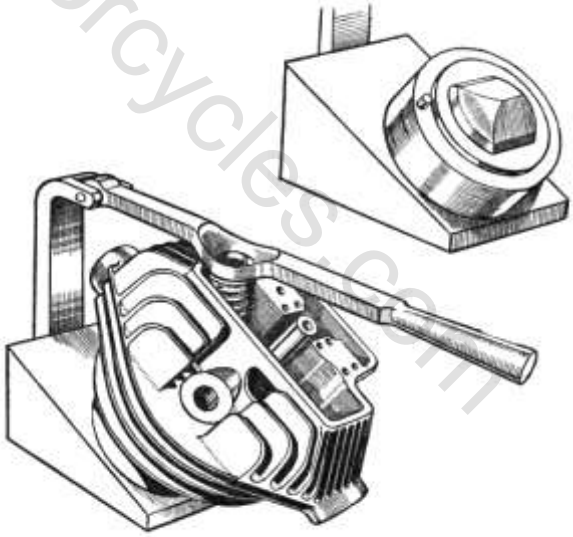


USE OF TERRY TYPE VALVE SPRING COMPRESSOR

Fig. 2

4. Removal of Carbon.

Remove carbon from the valves, ports and combustion chamber by scraping or by immersion in a solution of 4 ozs. of commercial potash to a gallon of water. Carefully remove the piston rings. Remove carbon from the ring grooves and the top of the piston by carefully scraping, taking care not to dig into the aluminium. **On no account allow potash solution to come into contact with an aluminium piston.**



BENCH TYPE VALVE SPRING COMPRESSOR

Fig. 3

5. Piston and Rings.

If the piston rings are in good condition they can be replaced, taking care to fit them in their original grooves and the same way up. If the rings show brown or black patches on their working faces or if their gaps when in position in the barrel are more than 1/16 in. new rings should be fitted. The correct gap for new rings is as listed on page 4 and 5. The gap should be measured in the least worn part of the cylinder which will be found to be at the extreme top or bottom of the bore.

The original size of the cylinder bore is 2.751 in. for the 350 c.c. and 3.30725 in. for the 500 c.c.. If the wear at any point in the bore exceeds .008 - .010 in., measured at the bottom of the skirt, fore and aft, the cylinder should be rebored and an oversize piston fitted. Pistons are available in various oversizes. The original side clearance between the piston rings and the grooves is .003 in. If the piston skirt or the grooves show .005 in. wear the piston should be replaced.

6. Big End Bearing.

While the piston is removed examine the condition of the bigend. This should have about .010 - .020 in. side play and it will be possible to rock the connecting rod slightly. The big-end is a plain bearing and has an original clearance of approximately .003 in. which is rather more than is usual with a roller bearing. If, however, **definite** up and down play can be felt the engine should be stripped further to have the big-end renewed.

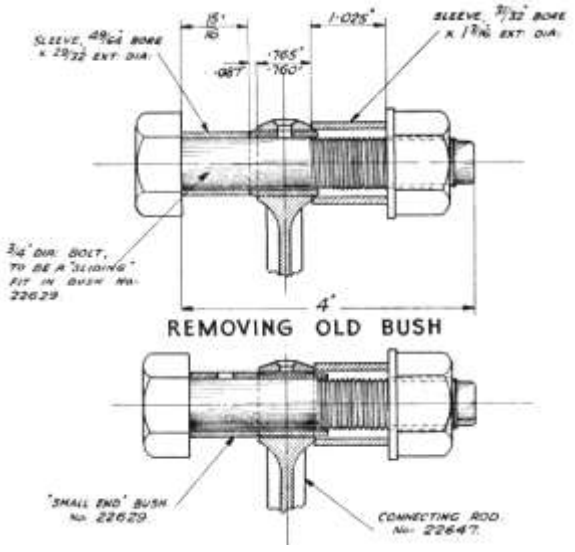
7. Small End Bearing.

The gudgeon pin should be a push fit in the piston (when cold) and a free working fit (.001 in. clearance) in the small end bush. The small end bush can be renewed if worn, using a draw bolt as shown in Fig. 4, both for withdrawing the old bush and fitting the new one. After fitting, the bush must be reamered, the size to suit a new gudgeon pin being .7507 - .7505 in.

8. Valves, Springs and Guides.

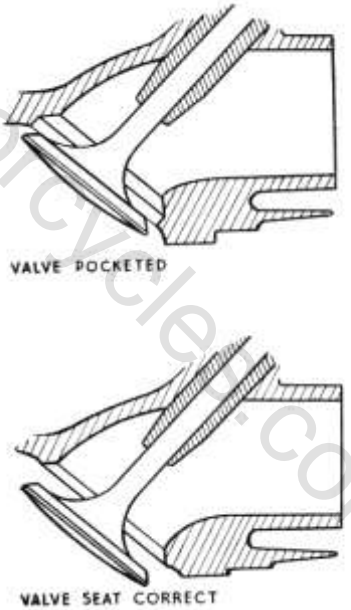
Wear on the valve stems can be seen on examination and if a definite step has formed the valves should be renewed. Test the valve guides for wear by trying the fit of a new valve in them. Both valves should be quite free, but the exhaust valve has .002 in. more clearance than the inlet valve. The guides are removed by knocking or pressing them out from inside the head using a drift 9/16 in. maximum diameter with one end reduced to 21/64 in. diameter, supporting the head on a tube 13/16 in. inside diameter 2 ins. long slipped over the collar on the guide. The same drift can be used for fitting the new guide. Check the length of the valve springs which are originally 1.3/4 ins. for both outer and inner springs. If these have closed more than 1/8 in. they should be renewed.

Before replacing the valves they must be ground on to their seats. If good faces are not formed with a reasonable amount of grinding the seats must be cut with a cutter (included angle 90°) and the valve refaced in a Universal Grinder, or if this is not available by spinning in a chuck and holding a strip of emery cloth on the back of a file at 45° to the valve stem. Do not attempt to form good seats by an excessive amount of grinding. This will cause pocketing which restricts the flow of the gases (see Fig. 5). If a pocket has already been formed this must be removed by cutting with a valve seat cutter larger in diameter than the valve head. Do not interchange



INSERTING NEW BUSH

TOOL FOR REMOVING OLD AND INSERTING NEW BUSH IN SMALL END OF CONNECTING ROD
Fig. 4

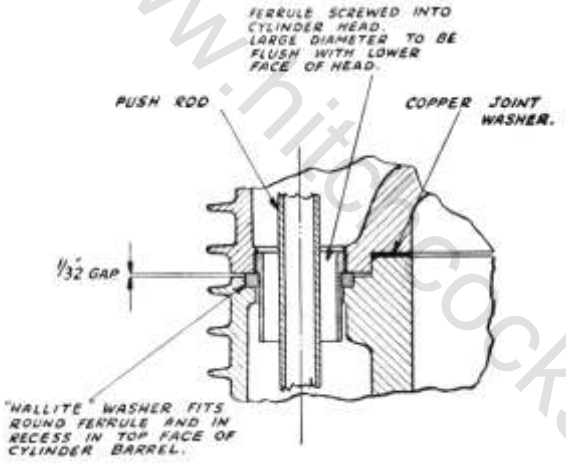


CORRECT AND INCORRECT CUTTING OF VALVE SEATS
Fig. 5

the inlet and exhaust valves, as there is a difference of .002 in. in the stem diameter.

9. Reassembly of Engine after Decarbonising.

When reassembling the engine, take great care to have all parts perfectly clean and put clean oil on the piston, particularly round the rings. The cylinder base joint must be made with a paper washer which must have a small hole in it registering with the oil feed to the back of the cylinder. The cylinder head joint may be made with the old copper washer which, however, should preferably be annealed by heating to red heat



DETAIL OF JOINTS IN PUSH ROD ENCLOSURE TUBES

Fig. 6

then quenching. New Hallite washers painted with gold size or shellac should be fitted to make the joints in the push rod enclosure tubes (see Fig. 6). When tightening down the cylinder base nuts, work diagonally from one to another to ensure pulling the base down dead level. When tightening down the cylinder head nuts put pressure first of all on the two at the push rod side of the engine so as to ensure compressing the push rod enclosure tube washers thoroughly and bringing even pressure on the copper head gasket. When replacing the valve rockers and caps put a little oil on each rocker and make sure that the rocker is free after the cap has been tightened down. If necessary, a sharp tap on the end of the rocker will usually free it. Excessive play in the rocker bearings can be taken up by grinding a little metal from the lower face of the hardened cap. Very little grinding is required and not more than .001 in. should be taken off at a time. When replacing the rocker box cover, a new joint washer should be used.

The cylinder head and base nuts should be checked again for tightness, after the engine has been run long enough to get it thoroughly warm.

TIMING GEAR.

10. Valve Timing.

Access to the timing gear is obtained by removal of the timing cover after unscrewing the nine nuts securing it. About half a pint of oil will run out of the timing case. The cam wheels and magdyno drive idler pinions can now be pulled off their spindles, having first turned the engine so that both valves are closed. Correct timing is obtained when the tooth on the exhaust cam wheel having two dots on it meshes with the space having two dots on the small timing pinion, while at the same time the tooth having one dot on the inlet timing wheel meshes with the space having one dot on the exhaust timing wheel (see Fig. 7). In case

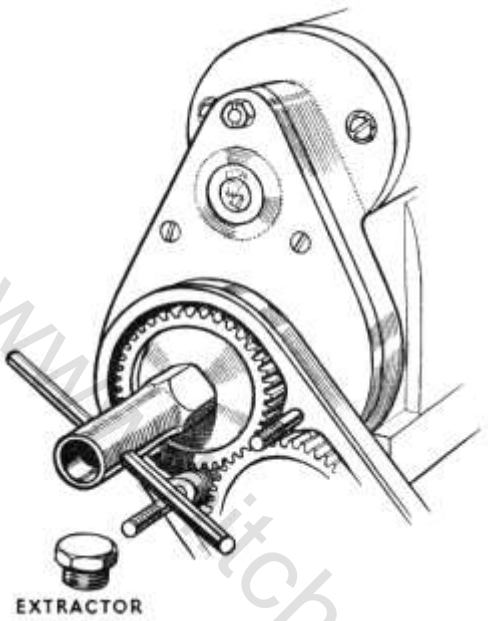
VALVE TIMING MARKS

Fig. 7

the two dots on the small timing pinion are covered by one corner of the hexagon on the oil pump driving worm, note that when the piston is at the top of the compression stroke, the single dots on the timing wheels lie on the line joining the centres of the two cam spindles. When replacing the magdyno drive idler pinions note that there is a hardened steel washer on either side of each pinion and that the deeper boss on the pinion is outwards. If the cam wheels have thin shims on either side take care to replace these on the same spindles.

11. Magneto Timing.

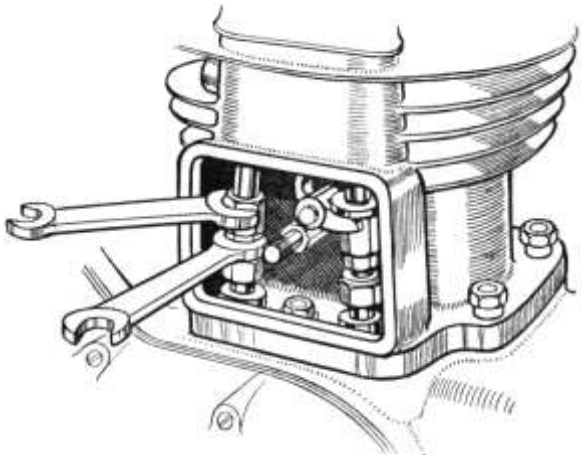
The magneto timing is not marked and must be set as follows:- Unscrew the nut which holds the timing pinion on to the magdyno shaft. Then screw the pinion extractor (supplied in the tool kit) into the centre of the timing pinion, thus loosening it from its taper (see Fig. 8). Remove the extractor, set the engine so that the piston is at the top of its compression stroke (seen by removal of the cylinder head or gauged by means of a narrow rule or timing stick passed through the sparking plug hole), see that the contact points open to the correct figure of .012 in.



LOOSENING MAGNETO PINION
Fig. 8

set the magneto control to full advance turn the engine backwards until the piston has descended 3/8 in. and turn the contact breaker forwards (clockwise viewed from contact breaker end) until the points are just about to open. With the engine and contact breaker in these positions, tap the timing pinion lightly on to its taper and lock by means of the timing pinion nut. Check the timing after tightening the nut to make sure that it has not moved.

When replacing the timing cover rotate the engine so as to ensure easy engagement of the worm gears which drive the oil pumps. It is important to use a timing cover joint washer of the correct material and thickness. Make sure also that the cork oil seal which fits inside the pump driving worm is in good condition.



ADJUSTING TAPPETS
Fig. 9

12. Tappet Adjustment.

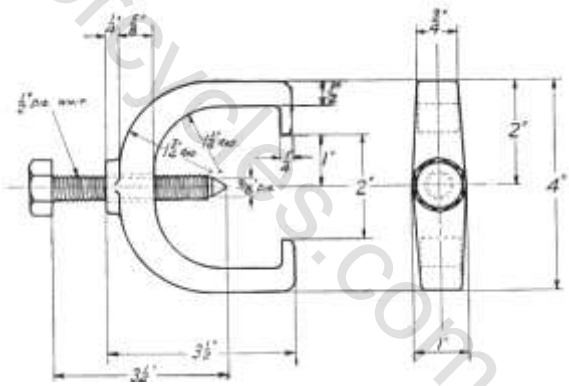
Access to the tappet adjustment is obtained by removing the inspection cover from the side of the cylinder. The exhaust tappet should have .004 in. clearance; the inlet .002 in., when the engine is cold. Owing to the ball and socket joint at the bottom of the push rods it is not possible to use feelers at these points. To check the clearance accurately the rocker box cover must be removed and the feelers applied between the ends of the valve stems and the rockers. With a little experience, however, the correct tappet clearance can be obtained by feel, the inlet push rod being just free while the exhaust has perceptible up and down clearance.

To make the adjustment (see Fig. 9) hold the push rod bottom end (top hexagon) and the locknut (middle hexagon). Unlock by turning the locknut to the left and make the adjustment by screwing the push rod cup (bottom hexagon) to the left to take up clearance or to the right to give more clearance, at the same time holding the push rod bottom end. Finally, lock up the locknut against the push rod end and check the clearance after finally tightening the locknut.

COMPLETE OVERHAUL.

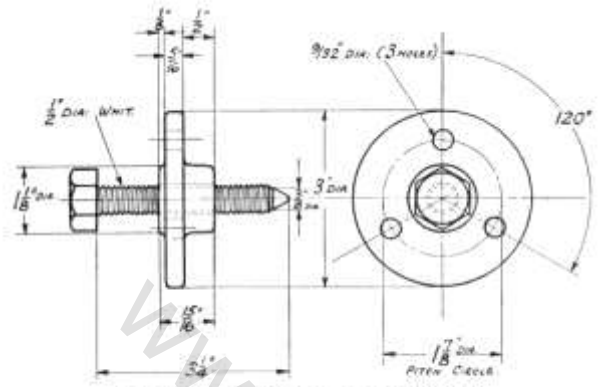
13. Removal of Engine from Frame.

To remove the engine from the frame, first take off the petrol tank, carburettor, exhaust pipe and silencer. Next remove the left footrest and the outer half of the primary chain case, taking care to allow as little oil as possible to come in contact with the rubber sealing band. Unscrew the nut securing the engine sprocket ; disconnect the front chain and withdraw the engine sprocket from its taper, using an extractor similar to that shown in Fig. 10. Dismantle



ENGINE SPROCKET EXTRACTOR
Fig. 10

the clutch (see Para. 32) and unscrew the main clutch securing nut (placing the machine in top gear and putting on the brake to prevent the mainshaft turning). Withdraw the clutch centre from its splines by means of an extractor as shown in Fig. 11. Remove the rear chain,



CLUTCH CENTRE EXTRACTOR

Fig. 11

footrest rod, inner half of the primary chain case and the leads to the dynamo ; also the clutch, exhaust lifter and magneto control wires from the handlebars. Remove the top gearbox attachment stud (by unscrewing the nut at the chain case end and knocking out towards the opposite end) and the bottom stud; also the studs securing the crankcase to the engine plates and the studs and distance pieces securing the engine plates to the bottom of the seat tube of the frame, and to the chainstays and cradle tubes. Remove both the engine plates and the gearbox. Take the weight off the engine and remove the stud securing the front of the crankcase to the bottom of the down tube of the frame and lift the engine out in a backwards direction. Fig. 12 shows the machine with the engine ready to lift out after removal of the front attachment stud.

14. Dismantling the Crankcase.

To dismantle the engine, remove the cylinder head, cylinder and timing gear as described in Paras. 1, 2 and 10. Now unscrew the oil pump driving worm, which has a left-hand thread. This can be unscrewed by means of a thin spanner, a small lathe carrier or preferably by using the special tool shown in Fig. 13. The small timing pinion has not sufficient clearance behind it to allow an extractor to be used and must be knocked off its taper by driving a blunt chisel between the back of the pinion and the bronze oil seal bush

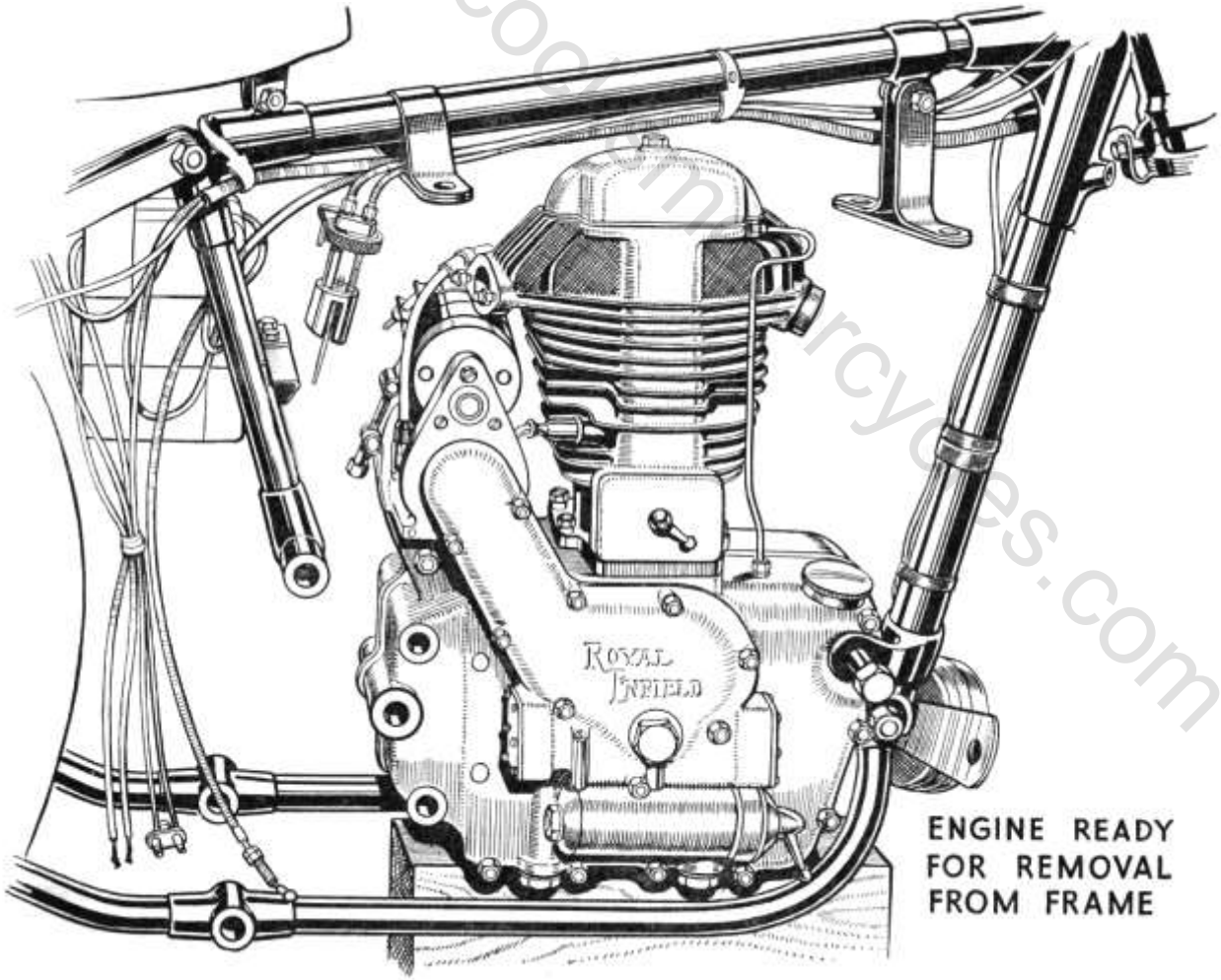
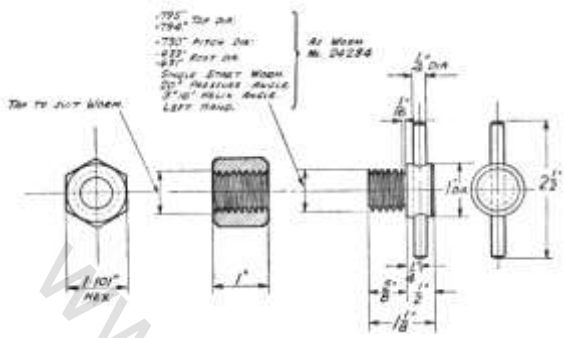


Fig. 12



PUMP WORM EXTRACTOR
Fig. 13

behind it, taking care not to damage the bush. Remove the paper cylinder base joint washer and the magdyno pinion (see Para. 11), loosen the strap securing the magdyno and remove this; also the timing pinion key and engine sprocket key. Next unscrew the two 5/16 in. nuts just below the magdyno (one each side of the case), the 5/16 in. nut below the front of the cylinder on the left side and the nuts from one end of the two 5/16 in. studs passing through the case near the bottom. Then remove the nuts from one end of the seven 1/4 in. studs which hold the two halves of the crankcase together. Before parting the two halves of the case, as much oil as possible should be drained out by removal of the two oil filter plugs. Even so, a small amount of oil will probably be left in the case. To prevent this running over the work bench, rest the case on the timing side in a clean tray and lift off the driving side. The joint will require breaking by a sharp tap with a soft mallet, after which the driving side can be lifted off quite easily. Lift the driving side rollers, cages and thrust washer off the shaft and the flywheel assembly out of the timing side of the case.

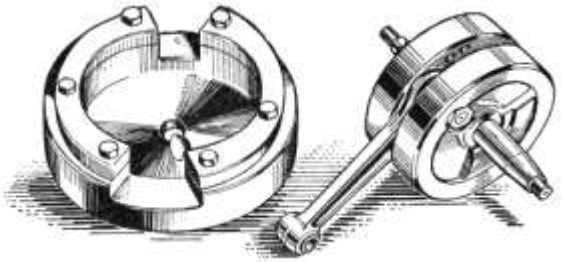
15. Removal of Tappets and Guides.

If the tappet stems, feet or guides are badly worn they must be renewed. The guides are a press fit in the crankcase and can be removed by knocking them upwards with a hammer and drift. The first part of this operation can be done by placing the drift against the tappet foot but for the last part a slightly bent and flattened drift must be used against the lower end of the guide itself. After removal of the guides the inlet tappet can be lifted out but to remove the exhaust tappet it is necessary to knock out the cam spindle. The only satisfactory way of doing this is by dividing the crankcase and knocking out the spindle from inside.

16. Dismantling Flywheels.

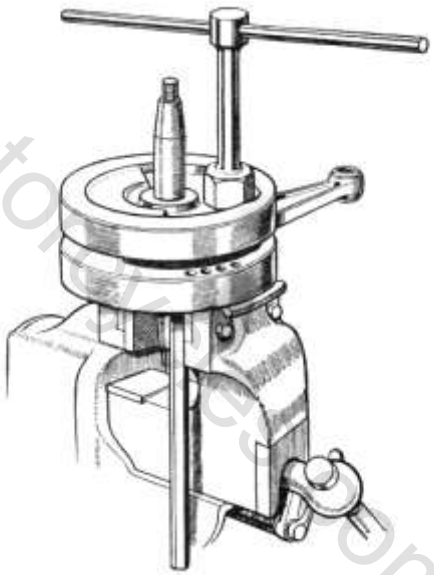
If the big-end bearing requires renewal the flywheels must be separated. To do this use the flywheel assembling jig (Fig. 14) if available, otherwise grip one of the mainshafts in a vice fitted with lead jaws and prevent the wheels from turning by inserting a stout rod between the vice and the edge of the balance weight on the lower wheel (see fig 15).

From the upper wheel remove the set screw which prevents the crankpin nut from turning and unscrew this nut, using a well-fitting tubular spanner for this purpose. The crankpin is a press fit in the flywheel



FLYWHEEL ASSEMBLY JIG
Fig. 14

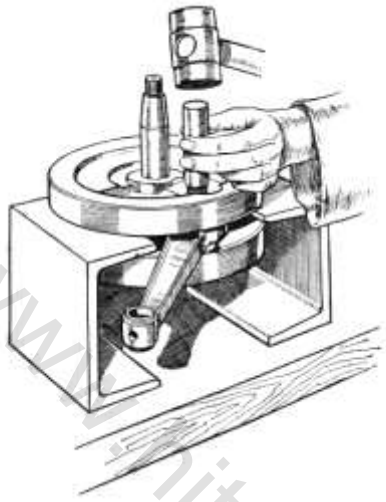
and to drive it out the upper wheel must be supported. For this purpose two pieces of channel iron may be used (see Fig. 16). The pin can then either be pressed out or knocked out using a heavy hammer and a stout brass or aluminium drift. Lift the connecting rod floating bush and thrust washers off the crankpin. If the crankpin requires renewal, grip the remaining flywheel in a vice, remove the other crankpin nut and drive the pin out of the wheel.



DISMANTLING FLYWHEELS IN VICE
Fig. 15

17. Connecting Rod.

Wear in the hardened steel big-end bush will be shown by the formation of a ridge round the centre of the bearing surface corresponding with the oil groove in the white metal bush. If this wear is excessive the rod should be replaced and returned to the Works for



SEPARATING FLYWHEELS
Fig. 16

reconditioning unless facilities are available for grinding the bush in position in the rod, in which case the old bush should be pressed out and an unground one fitted, this being subsequently ground out to 1.625 in. ±.00025 in. The practice of fitting new ready-ground big-end bushes is not recommended as it is difficult to ensure roundness of the bore if this is done.

Worn small-end bushes can be pressed or drawn out using the drawer shown in Fig. 4. The new bush should be reamered to .7507-.7505 in.

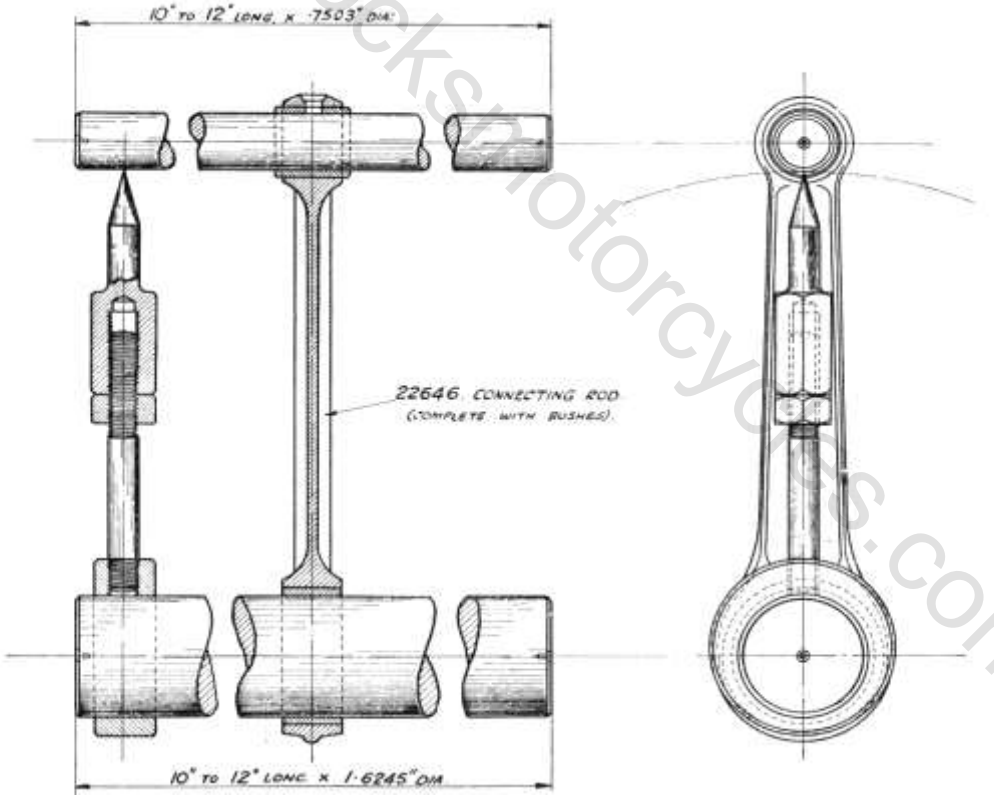
Before refitting the connecting rod it should be checked for freedom from bend or twist using the fixtures shown in Figs. 17 and 18.

18. Removal of and Replacing Mainshafts.

The driving and timing side shafts are held in to their respective flywheels by means of tapers and keys and are easily removed after unscrewing the nuts which secure them. Note the oil release valve in the end of the timing side shaft (see Para. 23). The hollow grub screw securing this must be screwed up tight and the end of the shaft centre punched to prevent the screw coming undone.

19. Reassembly of Flywheels.

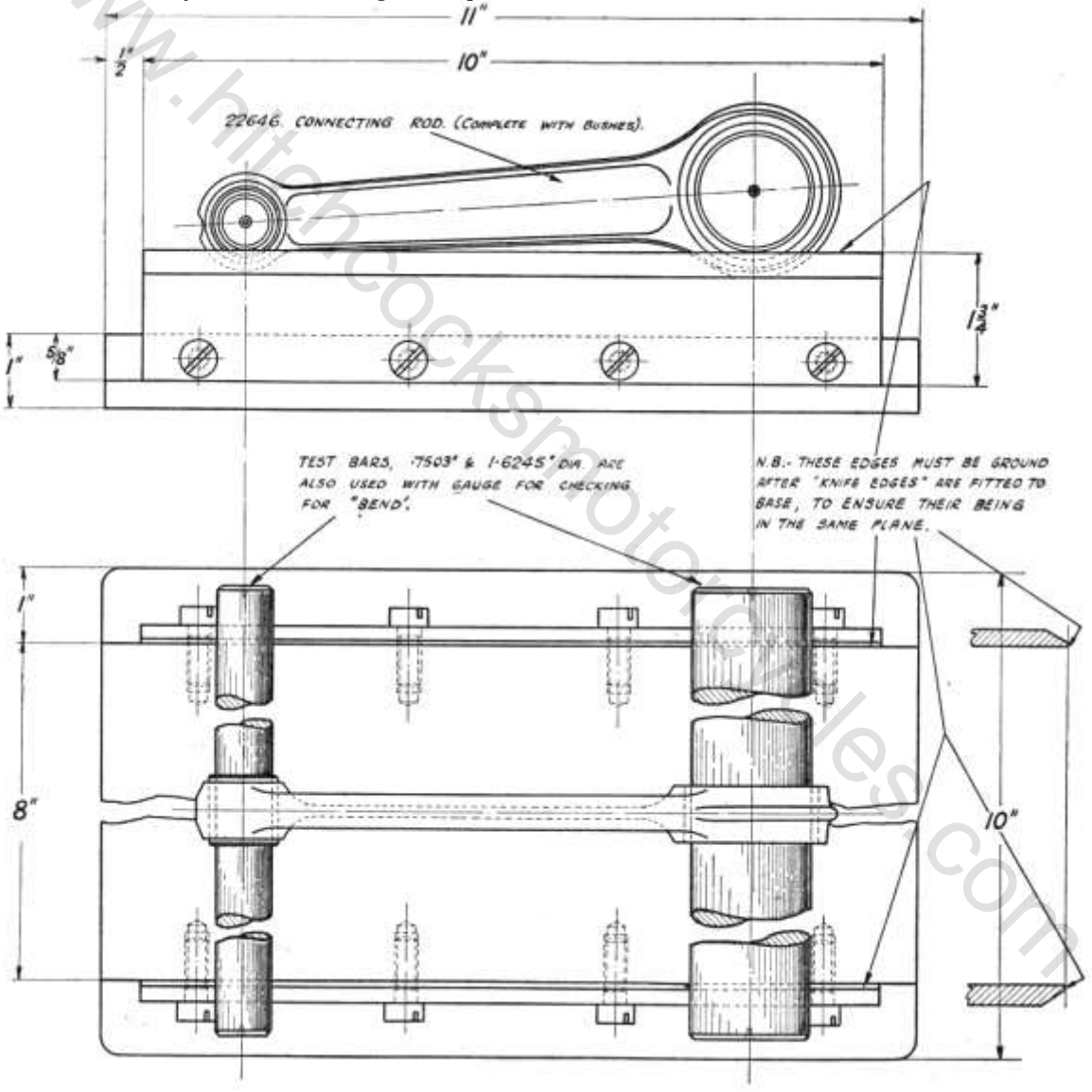
Always fit the crankpin into the timing side flywheel first and make sure that the oil hole in the pin registers with the oil passage drilled in the web of the flywheel. The best check on this is to pour oil down the timing side shaft and see that it runs out at the centre of the pin. The small grub screw in the



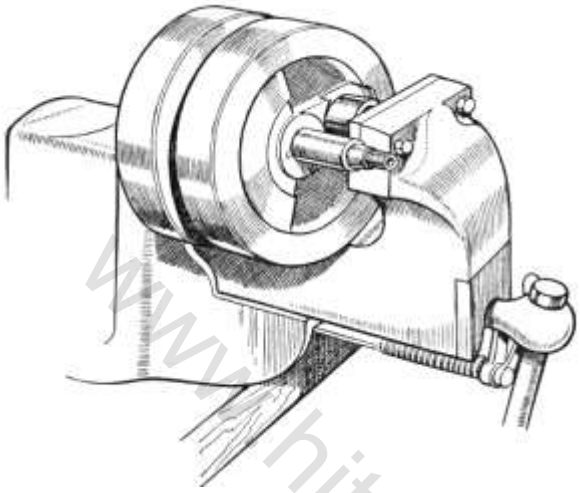
TEST BARS AND GAUGE FOR CHECKING CONNECTING ROD FOR "BEND"
Fig. 17

centre of the pin must be screwed tight and centre-punched to make sure that it does not come out. Note the hardened steel thrust washers either side of the centre portion of the crankpin. The white metal lined big-end bearing bushes must be handled with great care when fitting. The white metal is soft and easily damaged and the bush is a close fit both on the pin and in the rod so that it must be kept absolutely square otherwise it will jam and the white-metal faces will be damaged. Once this bush is correctly fitted it will outlast a roller bearing provided it is always adequately lubricated.

The driving side flywheel can be assembled on to the timing side wheel and crankpin either under a press or between the jaws of a vice, using a short piece of tube between the faces of each flywheel and the vice jaws (see Fig. 19). When assembling the flywheels, line them up as closely as possible by means of a straight edge placed against the rim of the wheels at 90° either side of the crankpin. To tighten the crankpin nuts, use either the assembly jig shown in Fig. 14 or grip one of the mainshafts in a vice, using lead jaws, and place a stout metal bar against the edge of the balance weight of the lower wheel so as to prevent the wheels from turning (see Fig. 15). After the wheels have been assembled and the crankpin nuts tightened they must be trued up by placing the whole assembly between centres and checking the truth of the shafts with a dial micrometer (clock gauge). The shafts must run true to within .001 in. Note that it is



"KNIFE EDGES" FOR TESTING CONNECTING ROD FOR "TWIST"
Fig. 18

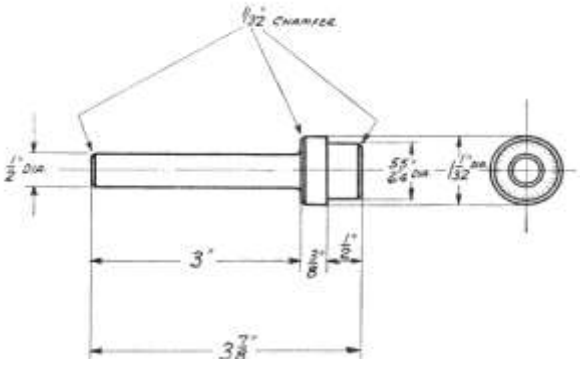


ASSEMBLING FLYWHEELS IN VICE
Fig. 19

the truth of the shafts which is important, the rims and sides of the wheel do not really matter and may run out .005 or .010 in. When finally tightened up and trued, make sure that the big-end bearing has .010 - .020 in. side play.

20. Removal of Crankcase Main Bearings.

The bearing race can be removed from the timing side of the case by pressing it out by means of the bronze oil sealing bush. To do this, support the half case on a tubular block having an inside diameter of 1 in., then press the oil sealing bush right through, using a drift as shown in Fig. 20. This will bring out the



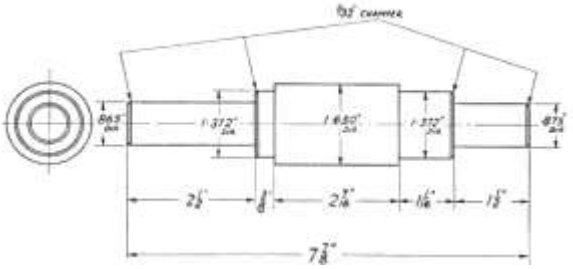
DRIFT FOR REMOVING TIMING SIDE BUSH & ROLLER RACE
Fig. 20

main bearing race and the thrust washer between the bush and the race. The thrust washer will probably be damaged in the process so that a new one will be necessary.

To remove the main bearing race from the driving side of the case, the half case should be inverted over a lighted gas ring until the heat loosens the race so that it falls out on tapping the case.

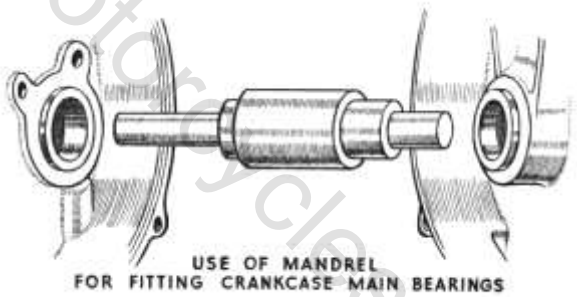
21. Replacing Crankcase Main Bearings.

In order to ensure that the timing and driving side main bearing races are in line a mandrel such as is shown in Fig. 21 should be used. The races are



MANDREL FOR FITTING CRANKCASE MAIN BEARINGS
Fig. 21

inserted about half way into their housings and the case assembled with the mandrel in position in the bearings (see Fig. 22). Application of pressure to each end of the mandrel in turn will then force the races home and at the same time ensure that the two races are in line.

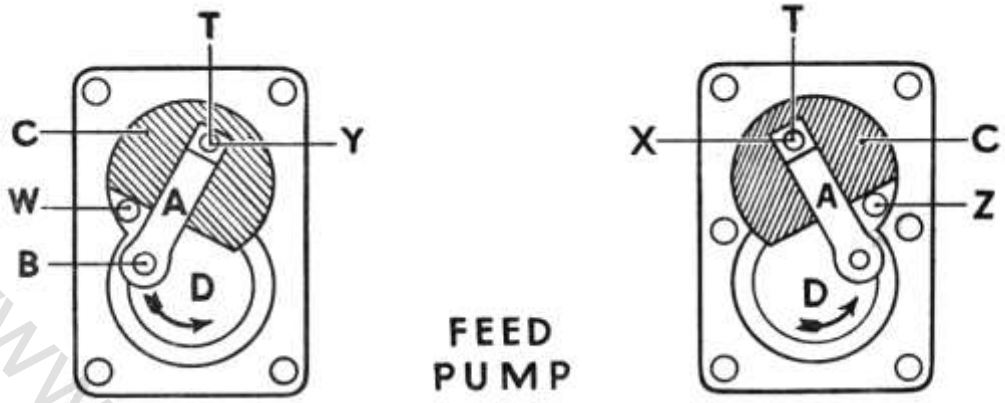


USE OF MANDREL
FOR FITTING CRANKCASE MAIN BEARINGS

Fig. 22

22. Reassembly of Crankcase.

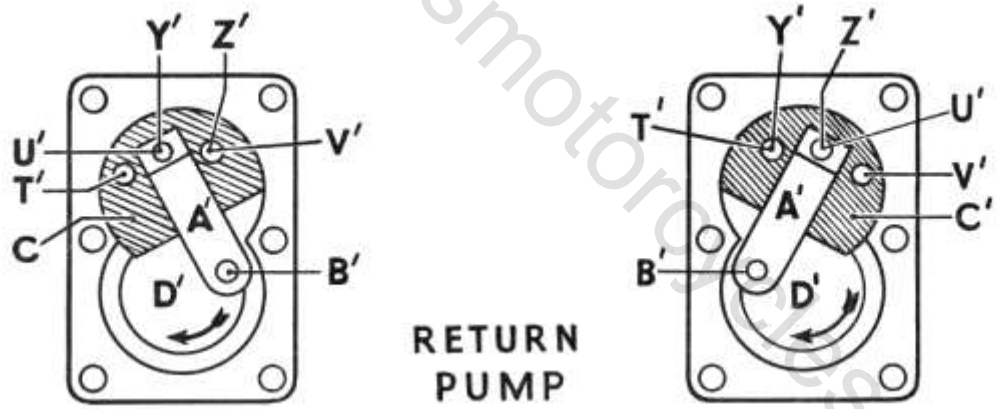
Proceed in the opposite order to that employed in dismantling the case. Make sure that all parts are perfectly clean before reassembling. Put clean oil on the shafts and roller bearings. The joint face between the two halves of the case must be made with gold size, shellac or a similar jointing compound. Before fitting the driving side of the case make sure that the magdyno strap is in position over its studs. When assembled, check for end float in the mainshaft, which should be from .005 - .015 in. If necessary the amount of end float must be adjusted by using main bearing thrust washers of different thicknesses.



Position 1.
Plunger A is being drawn out of cylindrical hole in disc C by action of peg B on shaft D. Port T in disc C registers with suction passage Y in housing. Delivery passage W in housing is uncovered. Oil flows through Y and T to fill pump cylinder and at same time oil in housing is forced through W to cylinder wall.

Position 2.
Plunger A is being pushed into cylindrical hole in disc C. Port T in disc registers with delivery passage X. Suction passage Z is uncovered. Oil is pushed through T and X to big-end bearing and at same time oil flows into housing through Port Z.

Fig. 23



Position 1.
Plunger A is being drawn out of cylindrical hole in disc C. Ports U and V in disc register respectively with suction passage Y and delivery passage Z in housing. Oil flows through Y and U to fill pump cylinder and at same time oil in housing is forced through V and Z to delivery passage.

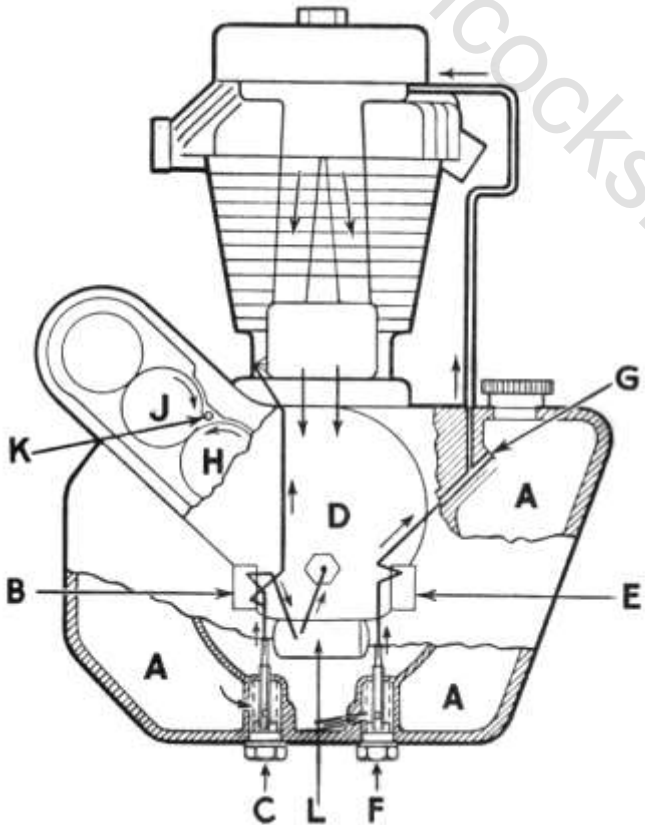
Position 2.
Plunger A is being pushed into cylindrical hole in disc C. Ports T and U in disc register respectively with suction passage Y and delivery passage Z in housing. Oil flows through Y and T to fill pump housing and at same time oil in pump cylinder is forced through U and Z to delivery passage.

Fig. 24

LUBRICATION SYSTEM.

23. Principle of Operation.

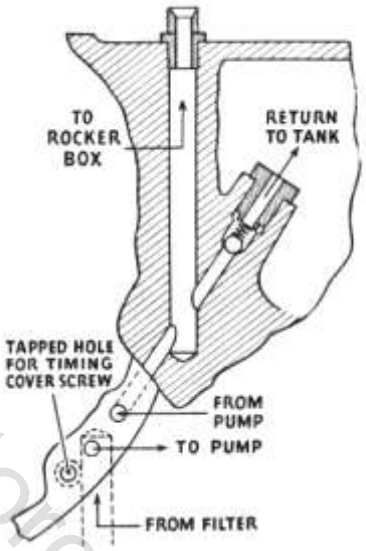
The lubrication system is of the true dry sump circulating type. The fact that the oil tank is formed in the crankcase casting does not affect the principle of operation, which is identical with that on machines employing a separate oil tank with connecting pipes. **The oil tank should, therefore, be kept full to within two inches of the top, as opposed to a car or lorry engine, in which the level of oil must be kept well below the crankshaft.** The circulation of the oil is controlled by the feed and return pumps which are mounted in the timing cover and driven by a cross shaft and worm gearing from the timing side shaft. The feed pump is at the rear of the cover and the return pump at the front. Both pumps are of the oscillating cylinder type and are double acting, the space in the pump housing being used to form a secondary cylinder which gives a delivery stroke when the main cylinder is on the suction stroke and vice versa. The operation of these pumps will be clearly understood on reference to Figs. 23 and 24. The paths through which the oil circulates are shown



OIL CIRCULATION DIAGRAM
Fig. 25

diagrammatically in Fig. 25. The primary side of the feed pump B draws oil from the tank A through the gauze filter C and delivers it through the felt oil cleaner L to the oil feed nozzle D, pointing down the timing side shaft, from which it is forced to the big-end bearing, leakage back into the timing gear being prevented by a cork oil seal. A release valve at the inner end of the timing shaft prevents excessive pressure developing when the oil is cold. This valve is designed to lift at 30-40 lbs. per sq. in. pressure.

At the same time the secondary side of the feed pumps draws oil from the tank A through the gauze filter C and delivers it to the back of the cylinder. The oil from both the cylinder and the big-end is splashed round the engine by the flywheels and lubricates the piston, main bearings and small end, finally collecting in the two small wells or sumps at the bottom of the flywheel chamber. From these sumps, both primary and secondary sides of the return pump F draw oil through the second gauze filter F and return it to the tank A through the oil return passage G. The ball valve in this passage (see Fig. 26) bypasses part of the



BALL VALVE IN OIL RETURN PASSAGE
Fig. 26

return oil up the external pipe to the overhead rocker casing, from which it runs down the push-rod enclosure tubes and through grooves in the tappet guides to the timing case which is sealed off from the flywheel chamber. When the oil reaches a sufficient level in the timing case the two gear wheels H and J, which are partially shrouded so as to form a gear pump, pick it up and return it through the hole K to the rear portion of the oil tank. Thus, positive lubrication is provided for the big-end bearing, cylinder, overhead rockers and timing gear and the whole of the oil, apart from losses, is collected and returned to the oil tank.

24. Reasons for Excessive Consumption.

The rate of circulation is approximately 1 gallon of oil every 20 miles so that to obtain a consumption figure of 2,000 m.p.g., the amount of oil lost must not exceed 1% of that circulated through the engine. The only loss of oil from an engine in good condition occurs past the piston rings. As cylinder wear occurs

the rate of loss past the rings will increase, so that the oil consumption in a well worn engine may increase to 800-1,000 m.p.g. If the oil consumption is heavier than this (or is heavier than 1,500-2,000 m.p.g. in an engine having a cylinder and piston in good condition) the cause of the excessive loss of oil should be examined. The following are the most likely causes :

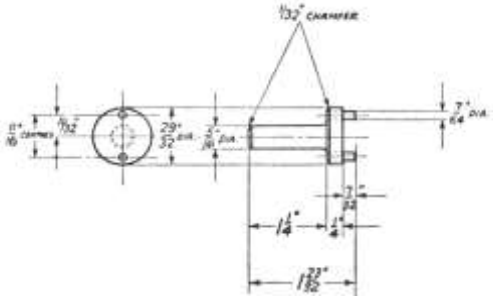
1. External oil leaks which may occur at any of the joint faces and are cured by remaking the joint.*
2. A partial obstruction in either suction or delivery passages leading to and from the return pump.
3. An air leak on the suction side of the return pump. Such a leak can occur at the washer beneath the front gauze filter, at the timing cover joint face where the suction passage crosses it, at the seating of the return pump disc in its housing or between the return pump plunger and its cylinder.

The effect of any defect in the return pump system is to allow oil to accumulate in the flywheel chamber and to escape past the driving side main bearing and through the crankcase breather which is situated behind the primary chain case. Any excessive amount of oil leaking at this point should therefore immediately suggest a defect in the return system. (Note that a certain amount of oily vapour will normally be blown out of the crankcase breather.)

To test the fit of the return pump plunger in its cylinder, remove the pump cover plate and lift out the pump disc and plunger. The fit of the plunger can be tested by placing a finger over the middle hole in the lower face of the disc and pulling the plunger out quickly. The plunger should be a good enough fit in the cylinder to spring back when released.

25. Replacing Pump Discs.

If the underside of the pump disc or the face against which it works shows signs of dirt or scoring, the disc should be relapped on to its seating, using fine pumice powder and oil or metal polish. Fig. 27 shows suitable tool for lapping the disc. This can be held in the chuck of a brace. If a new disc is fitted it will be found that the top surface is completely circular. After lapping the disc, the flat face up the side must be continued right to the top, otherwise the driving pin on the end of the cross shaft will foul the disc. Examine the lower face of the return pump disc for signs of it having been lifted off its seating by endways movement of the driving shaft and, if necessary, file a little extra clearance at the corner of the disc where the shaft may foul it.



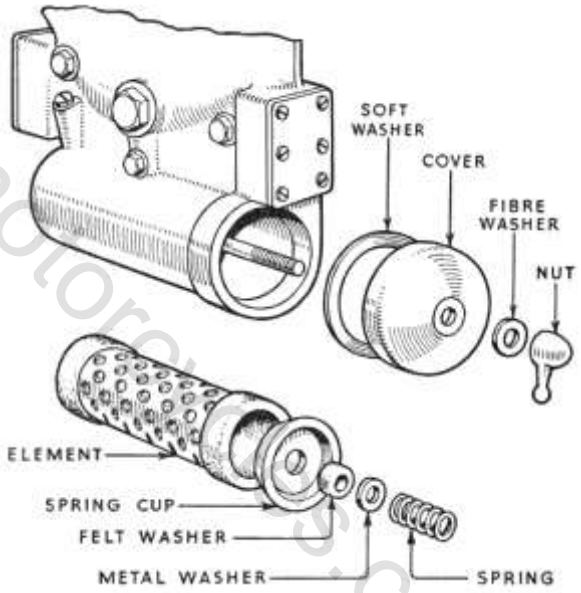
TOOL FOR LAPPING PUMP DISCS
Fig. 27

When fitting a new feed pump disc, make sure that it never simultaneously covers both the ports N and Z (see Fig. 23). If necessary, file a little more off the flat up the side of the disc to ensure this.

When replacing either pump disc make quite sure that there is no dirt between the lower face and the housing and see that the small coil spring is in position between the top of the disc and the pump cover plate. The joint beneath the cover plate must be air and oiltight.

26. Draining the System.

To drain all oil out of the engine remove the filter plugs C and F (Fig. 25) and the feed plug D (Fig. 25) leaning the machine to the right to empty the timing case. Remove also the felt element from the oil filter L (see Fig. 28 for details).



DETAIL OF FELT OIL CLEANER
Fig. 28

The oil should be changed after the first 500 miles and subsequently every 2,000 miles. All filters must be cleaned whenever the oil is changed and the felt filter element replaced every 5,000 miles.

Note.-After replacing the felt filter element allow the engine to tick over gently for five minutes to replace the oil in the filter housing. The big-end does not receive any oil until this has been done.

After draining the timing case the oil level in the tank will sink rapidly until the oil level in the timing case has been made up to normal.

***NOTE**.-Excessive oil leaks from the push rod enclosure tube joints, tappet chest, exhaust valve lifter adjusting bush or the back of the timing cover, may be due to too much oil being pumped to the rocker gear. This can be checked by replacing the external pipe leading to the rocker gear by a pipe connected to a sensitive pressure gauge, which should record a pressure of about 2 lbs. per sq. in. when the engine is running. To reduce the head of oil, fit a washer beneath the head of brass plug securing the ball valve spring (see Fig. 26). To increase the head of oil, remove any washers already fitted or remove the plug and spring, stretch the latter and replace.

TRANSMISSION

GEAR BOX.

27. Removal of Gearbox from Frame.

The method of removal of the gearbox from the frame is described in Para. 13.

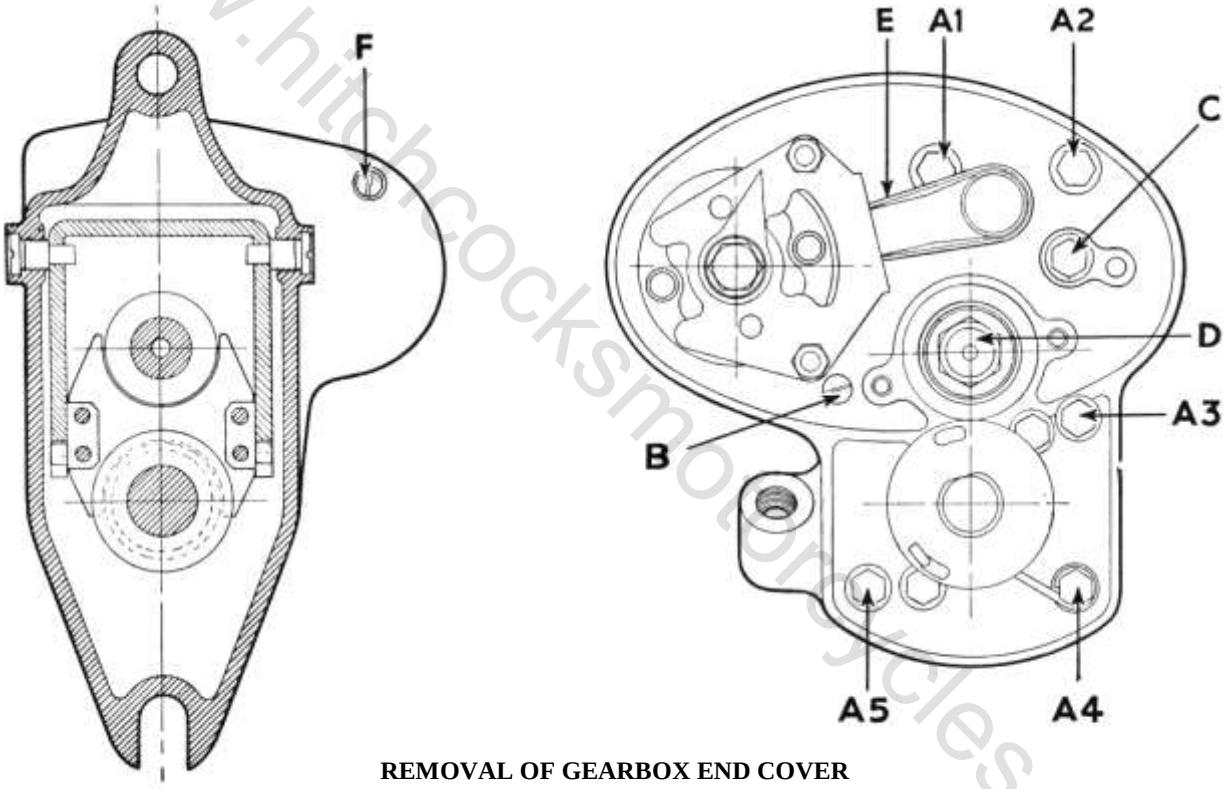
All operations on the gearbox can, however, be performed with the box in the frame except the removal of the inside operator fork and the bearings in gearbox shell. To remove the mainshaft, however, it is necessary to take off the outer half of the primary chain case, dismantle the clutch and withdraw the clutch centre. To remove the final drive sleeve and layshaft it is necessary to remove both halves of the primary chain case and the countershaft sprocket. Having done this, it may be thought preferable to remove the gearbox from the frame.

28. Removal of Gears and Shafts.

To dismantle the box, first remove the kickstarter crank, the nut securing the gear indicator pointer and the gear operating lever. Then remove the four screws which secure the cover over the gear operating mechanism and lift this cover away. Disconnect the clutch control (if in machine) hinge the lever back, and lift out the clutch adjusting screw and sleeve.

The end cover can then be removed from the gearbox after undoing the five hexagon headed bolts A (see Fig. 29), the screws B and F, the operator locating plunger spring box C, and the mainshaft bearing nut D. (This nut has a left-hand thread). There is no need to disturb the foot change ratchet mechanism when removing this cover as access to the bolt A1 can be obtained by removal of the return spring E. The kickstarter mechanism will come away with the cover, leaving the mainshaft, layshaft and final drive sleeve located in the gearbox.

If it is required to remove the mainshaft, this can now be drawn straight out after removal of the clutch (see Paras. 13 and 32) which, however, should be done before taking off the gearbox end cover. The mainshaft high gear pinion and dog will come away with the shaft (see Fig. 30).



REMOVAL OF GEARBOX END COVER

Fig. 29

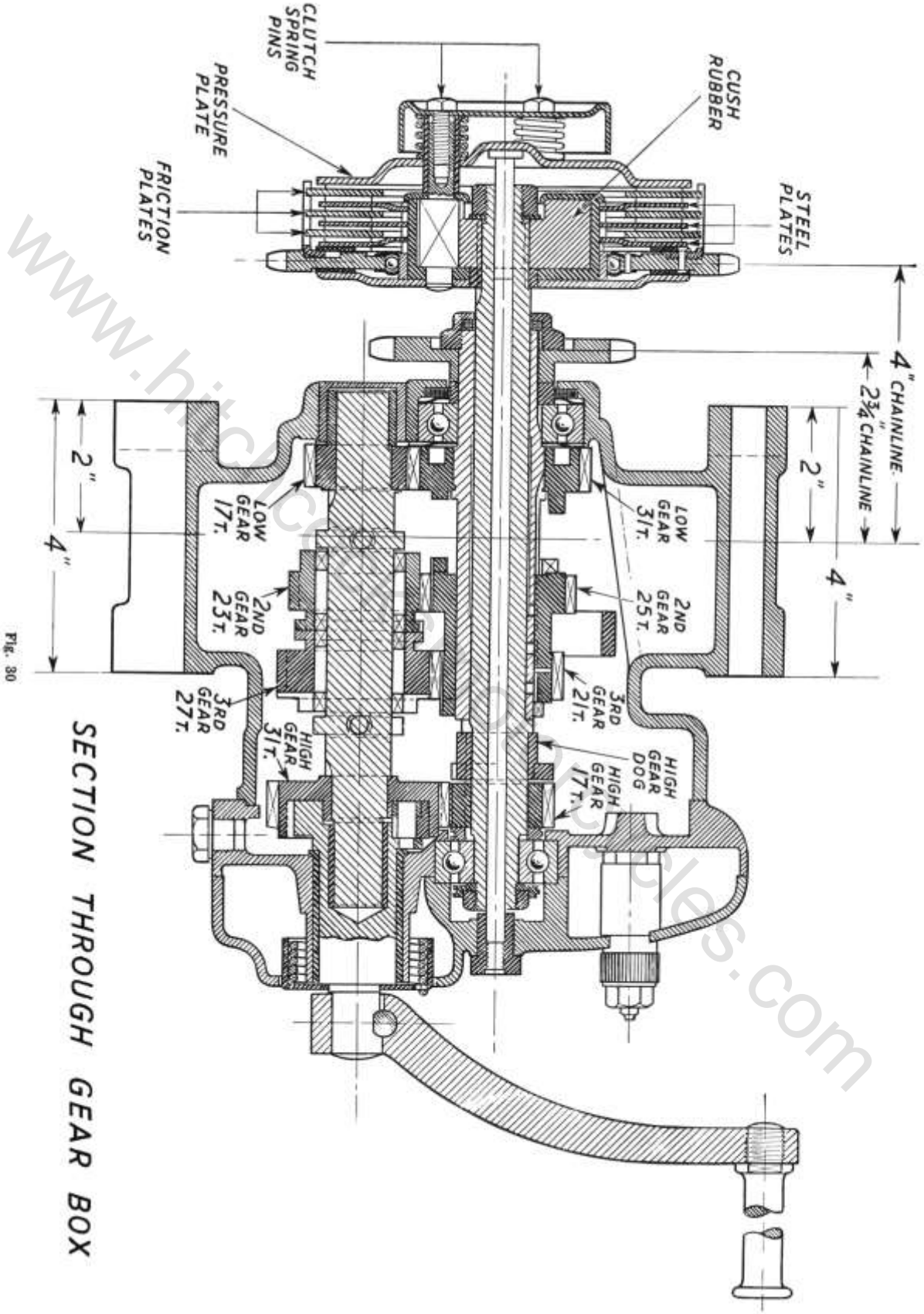


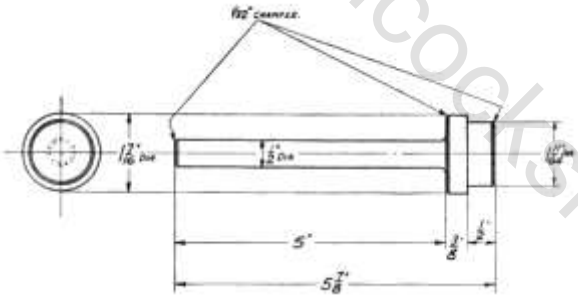
Fig. 30

SECTION THROUGH GEAR BOX

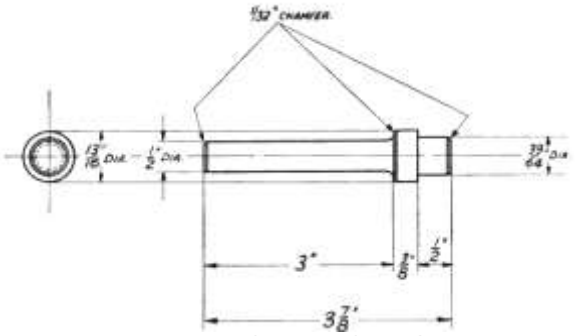
To remove the layshaft and final drive sleeve, the countershaft sprocket must first be removed. This, of course, necessitates removal of the inner half of the chain case if the box is still in the frame. The countershaft sprocket nut should be undone before removal of the gearbox end cover. Having removed the clutch, countershaft sprocket, end cover and mainshaft, the final drive sleeve and layshaft can be drawn out of the box.

29. Removal of Ball Races.

The mainshaft ball bearings can be removed from the box and the cover by means of the drifts shown in Figs. 31 and 32, while the drifts shown in Figs. 33 and 34 are suitable for refitting these bearings. Note the felt washer in the recess behind the larger mainshaft bearing and the dished pen steel washer between the bearing and the felt washer. The second dished pen steel washer (having the smaller central hole) fits on the other side of the mainshaft bearing and is nipped between the inner face of the bearing and the shoulder on the final drive sleeve. Note that both pen steel washers have their raised centre portions facing towards the clutch and countershaft sprocket.



DRIFT FOR REMOVING GEARBOX BALL RACE
Fig. 31

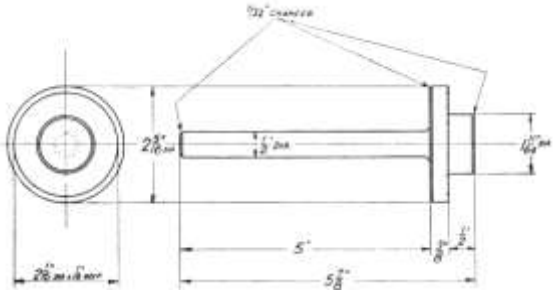


DRIFT FOR REMOVING GEARBOX COVER BALL RACE
Fig. 32

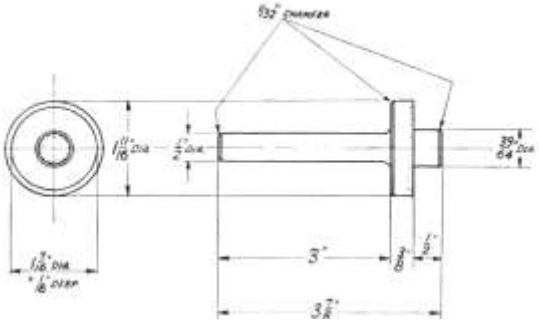
30. Foot Change Ratchet Mechanism.

Fig. 35 shows this mechanism dismantled. Note the slots in the adjuster plate which allow this to pivot after loosening the pins which secure it. If the plate is incorrectly adjusted, it may be found that, after moving from top to third or bottom to second gear, the outer ratchets do not engage the teeth on the inner ratchets correctly. When the adjuster plate is correctly adjusted, the movement of the gear lever necessary to engage the ratchet teeth will be approximately the same in either direction.

If the gears do not engage properly, ascertain whether they require a little more movement or whether too much movement is given so that a hard kick goes right through second or third gear into neutral. If more movement is required, this can be obtained by filing the stop plate very slightly at the points indicated. If too much movement is already present a new stop plate must be fitted to give less movement.



DRIFT FOR REFITTING GEARBOX BALL RACE
Fig. 33



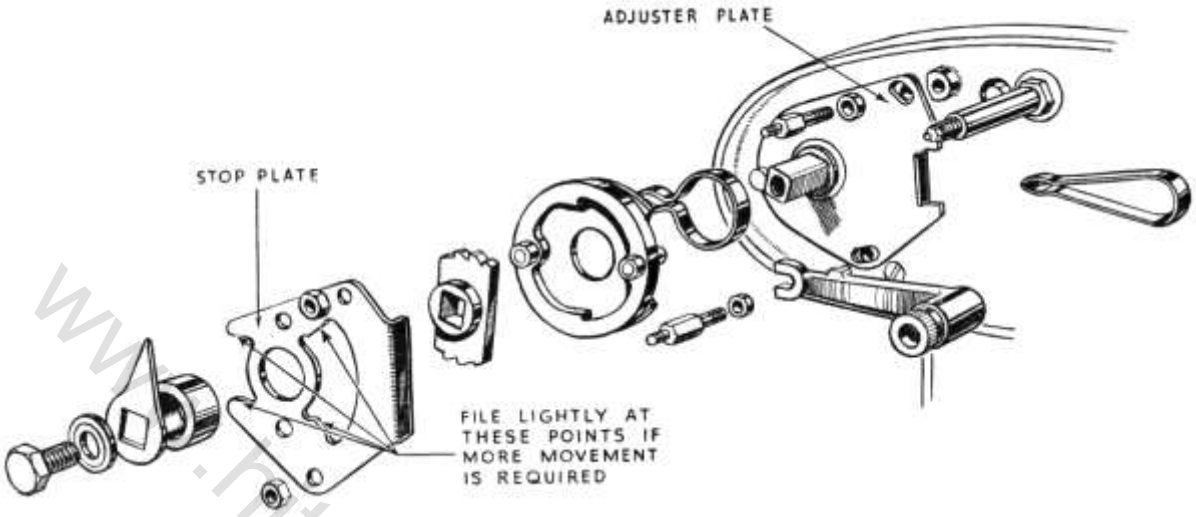
DRIFT FOR REFITTING GEARBOX COVER BALL RACE

Fig. 34

31. Reassembling the Gearbox.

No difficulty should be experienced with this but the following points should be noted :

1. If the mainshaft high gear pinion and dog have been removed, make sure that the dog is replaced the right way round (see Fig. 30). If this dog is reversed, third and top gear can be engaged simultaneously-with disastrous results.
2. When reassembling make sure that the trunnions on the operator fork engage with the slots in the inside operator.
3. See that the mainshaft is pushed right home. (It may tighten in the felt washer inside the countershaft nut.)



DETAIL OF FOOT GEAR CHANGE
Fig. 35

4. The layshaft high gear and kickstarter pinion should be assembled on the layshaft and the kickstarter shaft and ratchet assembled into it before fitting the end cover. Do not forget the washer between the layshaft high gear and kickstarter pinion and the kickstarter shaft.
5. See that the kickstarter shaft is in the working position (cotter flat to left when facing end cover) otherwise the cover will not go home.
6. The joint between the gearbox case and the end cover should be made with gold size, shellac or a similar jointing compound.
7. Note the oil retaining "scrolls" either side of the ball bearing in the cover.

Make sure that all parts are clean on assembly. For use in normal climates it is preferable to pack the recesses in the gearbox housing with soft grease and then top up to the level of the filler plug with gear oil. The oil will be found to run into the box more easily if the engine is started up and allowed to tick over, so as to rotate the gears and shafts. **On no account must heavy yellow grease be used in these boxes.**

CLUTCH.

32. Dismantling and Reassembly of Clutch.

The construction of the clutch is shown in Fig. 30. To dismantle the clutch plates unscrew the three spring pins and lift away the springs, pressure plate, cover over cush rubbers, friction plates and steel plates. To remove the clutch sprocket from the centre, spring off the large circlip which secures it. To remove the clutch centre, unscrew the attachment nut and withdraw the centre from the mainshaft using the extractor shown in Fig. 11.

When reassembling the clutch note that two of the steel plates are dished and the third one is flat. The correct order of assembly is clearly shown in Fig. 30. Do not forget to replace the cush rubber retaining cover before fitting the pressure plate. Make sure that the three 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 the probable reason is that one of the springs has taken a set, in which case a new set of springs should be fitted.

33. Adjustment of Clutch Control.

It is essential that the clutch control has about 1/16 in. free movement. To adjust, disconnect the control wire from the lever M, on the gearbox (see Fig. 36).

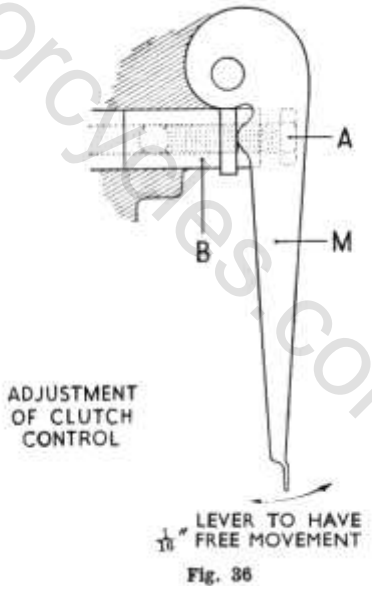


Fig. 36

Hinge the lever back and adjust by means of the screw A, holding the sleeve B to prevent it turning. Turn the screw A to the left to give more clearance to the control wire ; to the right to take up clearance.

CHAINS.

34. Lubrication.

The front chain is lubricated by filling the oilbath case with engine oil up to the level of the overflow plug.

The rear chain should be lubricated regularly by the driver, but if it is dry or dirty must be removed, thoroughly washed in paraffin and soaked in engine oil or preferably in melted grease to which a little graphite has been added.

35. Tensioning.

The front chain should have approximately ¼ in. free movement up and down ; the rear chain about ½ in. If the tension varies in different parts of the chain, adjust to the above figures at the tightest point.

To adjust the front chain, loosen the nuts on the studs which hold the gearbox to the engine plates, unscrew the central push bolt between the plates and lever the gearbox backwards until the tension is correct. This can be gauged through the inspection hole in the chaincase. After the chain has been correctly tensioned, securely tighten up the nuts on the gearbox attachment studs and screw up the central push bolt, until it bears hard against the upper lug on the gearbox, and tighten the locknut. The purpose of this push bolt is to prevent the gearbox moving backwards owing to the pull of the rear chain, which is greater than that of the front one.

To tension the rear chain, loosen the wheel spindle nuts and adjust by means of the adjuster screws in each fork end. Take care to turn each adjuster equally, otherwise the wheel will be thrown out of alignment.

36. Limits of Wear.

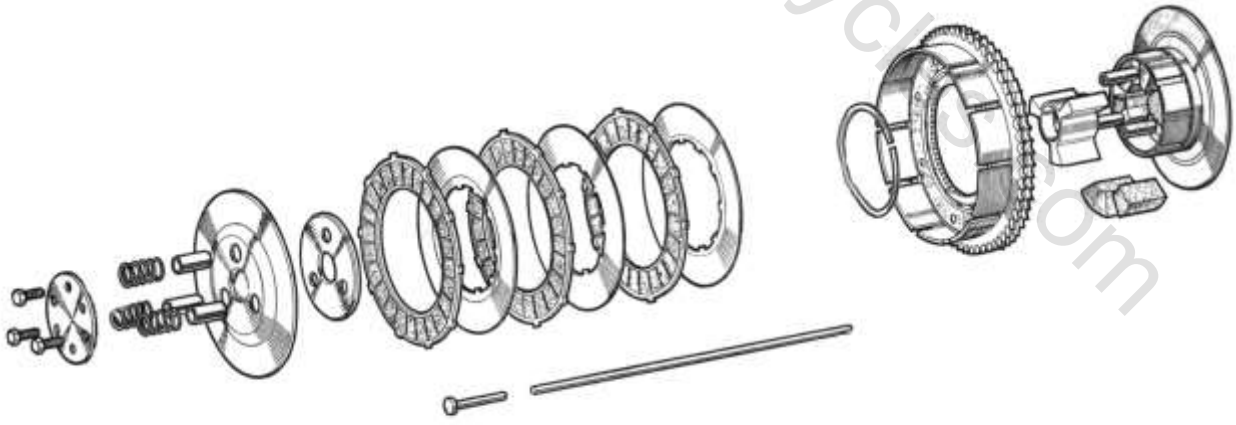
A chain is considered to be worn out when its length under load is 2 per cent. longer than the length of a new chain of the same type and same number of links. For the primary chain this means an increase in length of 3/4 in. and for the final drive chain of 1.1/8 in. When measuring chains for wear, the load applied should be 28 lbs. for the ½ in. pitch primary chain and 42-44 lbs. for the 5/8 in. pitch final drive chain.

37. Removal, Repair and Replacement.

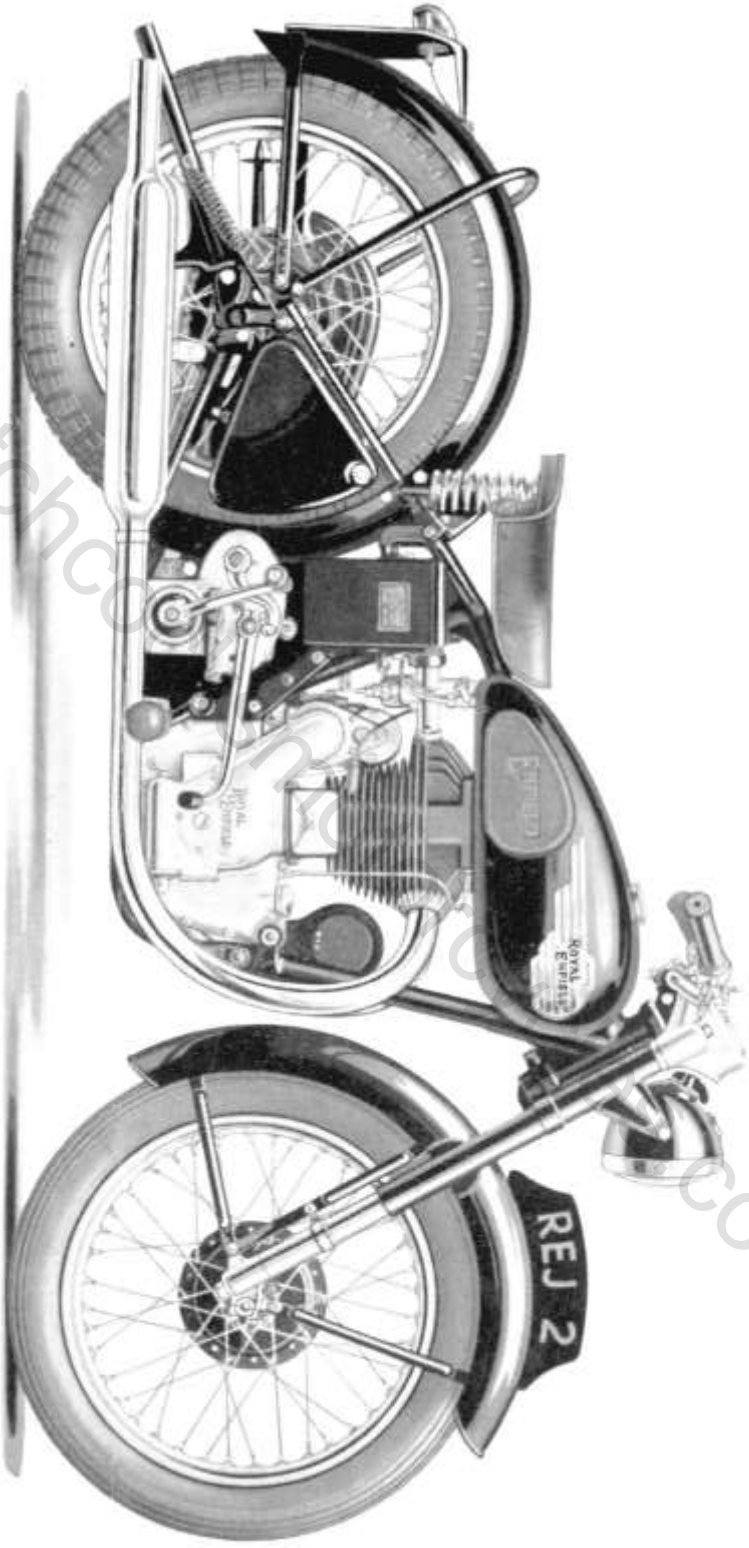
Both chains are fitted with spring links to facilitate removal. The springs can be removed with the fingers or with the aid of a pair of pliers.

If it is required to replace any of the links in a chain (as, for example, in the unlikely event of a roller or rollers having broken), two adjacent rivets passing through the same outer plate must be removed. To do this, use a rivet extractor or support the chain on two small nuts (1/4 in. or 3/16 in. diameter) and drive the rivets out with a small punch. When replacing rivetted links, support the under side of the chain on a flat piece of steel and drive the outer plate over the rivets by means of a hollow punch (or small nut) applied over each rivet in turn. Hammer the ends of the rivets over lightly, taking care not to distort the outer plate so as to cause a tight joint. **Never join together new and badly worn lengths of chain.**

When replacing the chains make sure that the open ends of the spring connecting links point away from the direction of travel. The back half of the connecting link is easily inserted in the rear chain if the ends of the chain are brought together on the rear sprocket. In the case of the front chain, however, the connecting link must be inserted in the straight run of the chain as there is insufficient clearance behind the sprockets to allow the link to be inserted. It will be found that the link can be inserted much more readily if the ends of the chain are pulled together by a pair of round-nosed pliers or similar tool, or by a loop of fine string.



EXPLODED VIEW OF CLUTCH

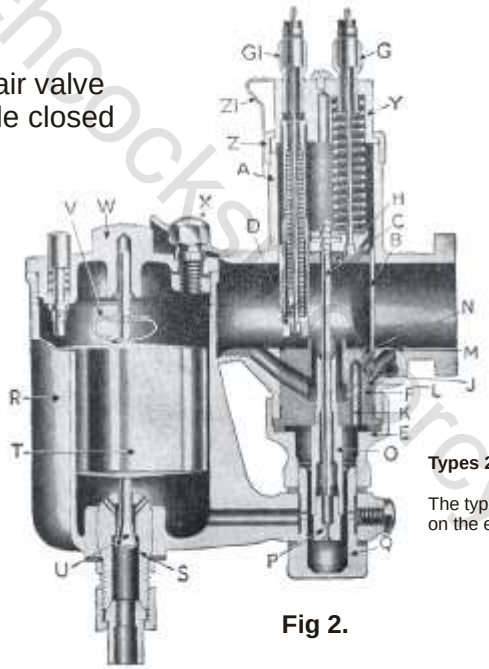


1954 MODEL J2

VARIOUS CARBURETTER SETTINGS POSSIBLE FOR 350 AND 500 OHV								
MODEL	YEAR	CARB NUMBER	CHOKE DIAMETER	MAIN JET	NEEDLE JET	NEEDLE POSITION	THROTTLE VALVE	PILOT
350 G Stub fitting	1945-46	276AC/1A	15/16"	130	106	3	4	0.037
350 G Flange fitting	1946-54	276BL/1A	15/16"	130	106	3	4	0.037
G deluxe/350 Clipper	1955-57	276AC/1A	15/16"	130	106	3	4	0.037
500 J Stub fitting	1946-50	276BM/1A	15/16"	140	106	3	4	0.031
500 J Stub fitting	1946-48	276CB/1A	1"	150	106	3	4	0.031
500 J Flange fitting	1946-54	276CT/1A	1"	150	106	3	4	0.031
500 J2 Flange fitting	1949-55	276CZ/1A	$1^1/_{16}$"	170	106	2	4	0.031
500 J2 Flange fitting	1947-55	276DB/1A	$1^1/_{16}$"	170	106	2	4	0.031

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 carburetter 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 carburetter 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 carburetters are 74, 75, 76, and 89.

These tuning instructions apply to both the above designs.

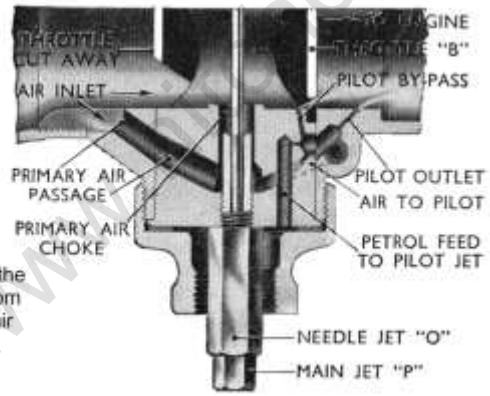
HOW IT WORKS AND PART NAMES

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

The carburetter 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 carburetters 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 carburetter offers perfectly simple and effective tuning facilities.

Fig 3.
This section view does NOT apply if your carburetter has FOUR EXTERNALprimary air holes at the base of the mixing chamber. It is for carburetters with the primary air inlet in the main air intake.

Diagrammatic section of carburetter 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 carburetter 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 carburetter body.

HINTS AND TIPS

STARTING *from cold*. Flood the carburetter 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 carburetter, 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 carburetter 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 carburetters 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 carburetter. 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 carburetter, 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 carburetter through a hole at the base of the mixing chamber.

FIXING CARBURETTER 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 carburetter the main jet may have to be smaller. If a carburetter 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 carburetter 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 Z1. 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

PARTS TO TUNE UP WITH

(A), This fig. 4 is two diagrammatic sections of the carburetter 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.

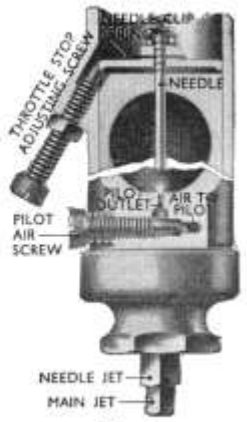


Fig. 4

(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. Verify there is no flooding.
2. **Looking for air leaks.** 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.*

Sparking plug sooty.

WEAKNESS
Spitting in carburetter.
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 carburetter, certainly cause weakness of mixture and possible damage from overheating.

HOW TO TUNE UP

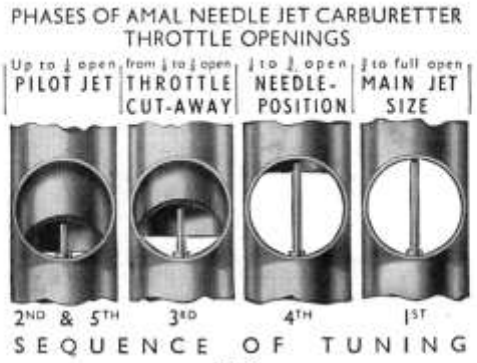


FIG. 5.

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 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 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. f 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 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.

Lucas Magdyno

Model MOIL for Single Cylinder Engines

1. General.

The Magdyno is a base-fixed magneto and dynamo unit, the body of the magneto portion being arranged to carry a standard strap-fixed dynamo. A shock absorbing drive is arranged between the magneto and dynamo portions. The magneto portion has a wound rotating armature and a high energy magnet case integral with the body.

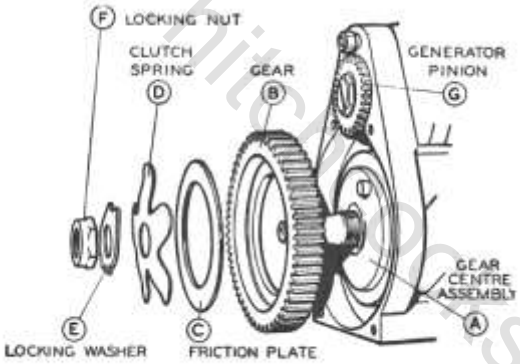


Fig. 1

The shock absorbing drive is incorporated in the larger of the two gears which transmit the drive from the magneto shaft to the dynamo and is shown exploded in Fig. 1. This drive, whilst permitting maximum dynamo output to be obtained, reduces peak shock loadings on the teeth of a bakelised fabric gear to a minimum value. The drive is taken from metal gear centre A, keyed to the magneto shaft, to fabric gear B by means of friction plate C and clutch spring D. A peg projecting from gear centre A prevents relative movement of the gear centre and tension spring D. In the event of a back-fire or an electrical short-circuit, slip will occur between the contacting surfaces of fabric gear B and gear centre A.

2. Routine Maintenance

2(a). Lubrication

To be carried out every 3,000 miles.

The cam is lubricated by a wick located in the contact breaker casting (see Fig. 2). To reach the wick, remove the backing spring and spring arm by withdrawing the single securing screw. The wick is carried in a hollow hexagon headed screw which can now be withdrawn. Take care not to lose the insulating washer or tube. Moisten the wick with a few drops of thin machine oil and refit the hollow screw.

At this stage, bend back the brass locking tag from the hexagon head of the contact breaker securing screw and withdraw the screw. The contact breaker can now be removed. Take out the tappet which actuates the spring arm and lightly smear it with thin machine oil. Extract the wire ring and remove the face cam. Lightly smear both sides of the cam with Mobilgrease No. 2.

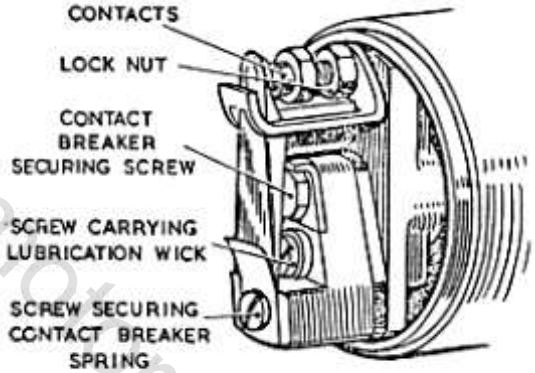


Fig. 2

Refit the cam, taking care that the stop peg in the housing and the plunger of the timing control engage with their respective slots. Note that a recess is provided for the "eye" of the wire ring.

Check that the tappet moves freely in the contact breaker casting.

Thread the special tag washer on the contact breaker securing screw and place the flat edge of the washer against the location provided for it in the contact breaker casting. Tighten the screw and lock it by bending the tag washer against one of the hexagon flats.

Wipe away any dirt or grease from the contacts with a petrol-moistened cloth. If necessary, use a very fine carborundurn stone to polish the contacts, re-cleaning

afterwards with a petrol moistened cloth.

Refit the spring arm and backing spring. The bent portion of the spring arm must curve outwards. Place a lock washer over the fixing screw and tighten.

The main bearings of the Magdynos are packed with grease during manufacture and need no attention until a general overhaul is undertaken.

2 (b). Adjustments

Check every 3,000 miles.

(i) Setting contact breaker gap. The contact breaker gap must be set to 0.012 in. - 0.015 in, when the contacts are fully separated. To adjust the gap, turn the engine until the contacts are fully opened. Slacken the locking nut of the adjustable contact and turn the contact by its hexagon head until a feeler gauge of appropriate thickness is a sliding fit in the gap. Tighten the lock nut and recheck the gap.

(ii) Adjusting the timing control cable. Any slackness in the cable can be taken up by sliding the waterproofing rubber shroud up the cable and turning the hexagon headed cable adjuster. After adjusting, return shroud to its original position over the adjuster and central barrel.

2 (c). Cleaning

To be carried out every 6,000 miles.

Check the contact breaker contacts and, if necessary, clean them as described in Subsection 2(a). Wipe the outside of the magneto to remove dirt or grease. Check the cable adjuster and control barrel for signs of water ingress.

Remove the high tension pick-up and polish with a soft dry cloth. The carbon brush must move freely in its holder. If necessary, clean it with a petrol-moistened cloth. Should the brush be worn to within 1/8 in. of the shoulder it must be renewed.

Whilst the pick-up moulding is removed, clean the slip ring track and flanges by holding a soft dry cloth against them with a suitably shaped piece of wood while the engine is slowly turned.

The high tension cable must be kept clean and dry.

2 (d). Renewing High Tension Cable

If, on inspection, the high tension cable shows signs of deterioration, it must be replaced, using neoprene covered rubber cable. To fit a new high tension cable, bare the end for about 3/8 in., thread the knurled moulded nut over the cable and thread the bared cable through tile washer removed from the old cable (see Fig. 3).

Bend back the strands radially and screw the nut into the pick-up moulding.

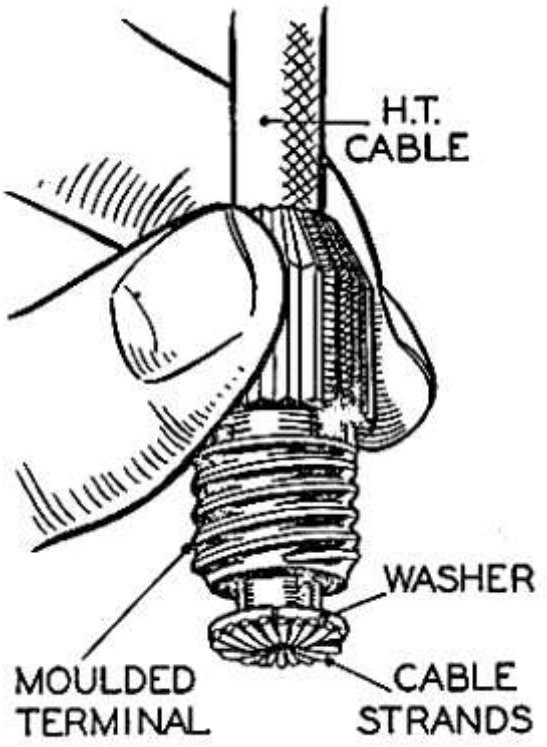


Fig. 3

2 (e). Renewing Timing Control Cable

The Bowden timing control cable should be renewed if it becomes frayed, otherwise moisture may enter the contact breaker housing.

To do this, slip back the rubber shroud and, by means of the hexagon at the base, unscrew the control barrel. If the cable and the plunger to which it is attached are now pulled upwards, the cable nipple can be disengaged from the plunger slot.

Soften the solder and remove the nipple.

Thread the new length of cable through the rubber shroud, cable adjuster, control barrel, scaling washer and restoring spring. Solder the nipple to the end of the cable. Engage the nipple with the slot in the plunger and screw the control barrel into the body, ensuring that the sealing washer is correctly fitted between the barrel and the body.

Take up any slackness in the cable by means of the adjuster before refitting the rubber shroud in position.

2 (f). Contact Breaker Spring

The correct contact breaker spring pressure, measured at the contacts, is 28-36 oz.

3. Testing Magdyno in Position on Engine

To locate cause of misfiring or failure of ignition, check as follows:

(i) Remove the sparking plug from the engine. Hold the end of the H.T. cable about 1/8 in. from the cylinder block and crank the engine. If strong and regular sparking is produced the fault lies with the sparking plug, which must be cleaned and adjusted or renewed.

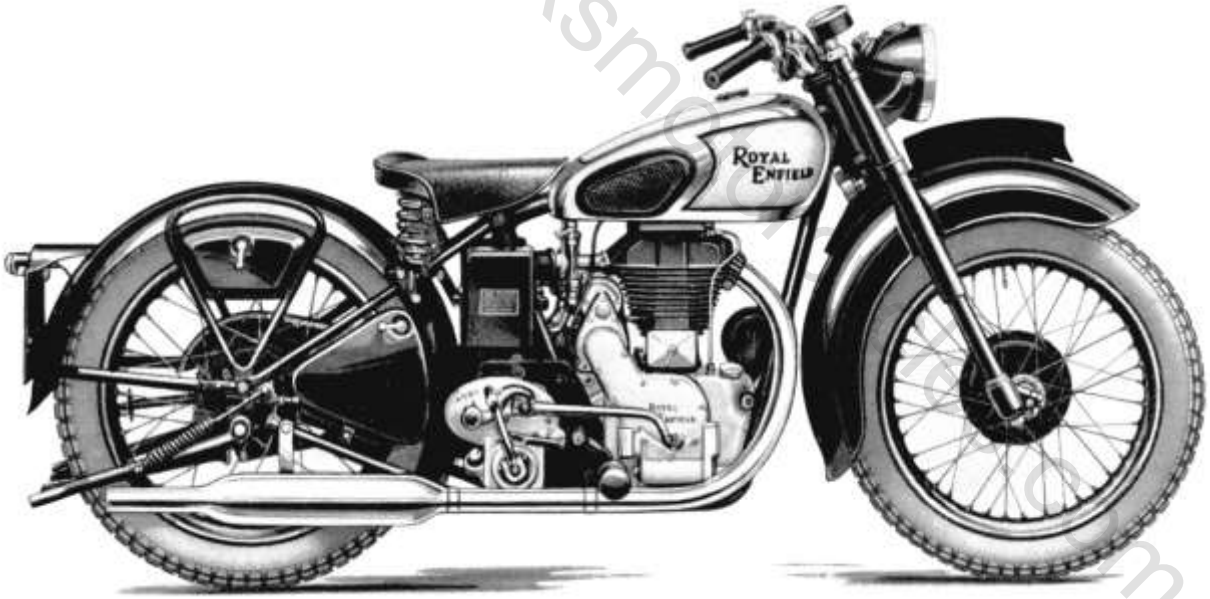
(ii) If no sparking is produced, examine the H.T. cable and, if necessary, renew it as described above in Subsection 2 (d).

(iii) Very occasionally the fault may be due to a cracked or punctured pick-up moulding. This type of fault is not easily detected by inspection and a check should be made by substitution.

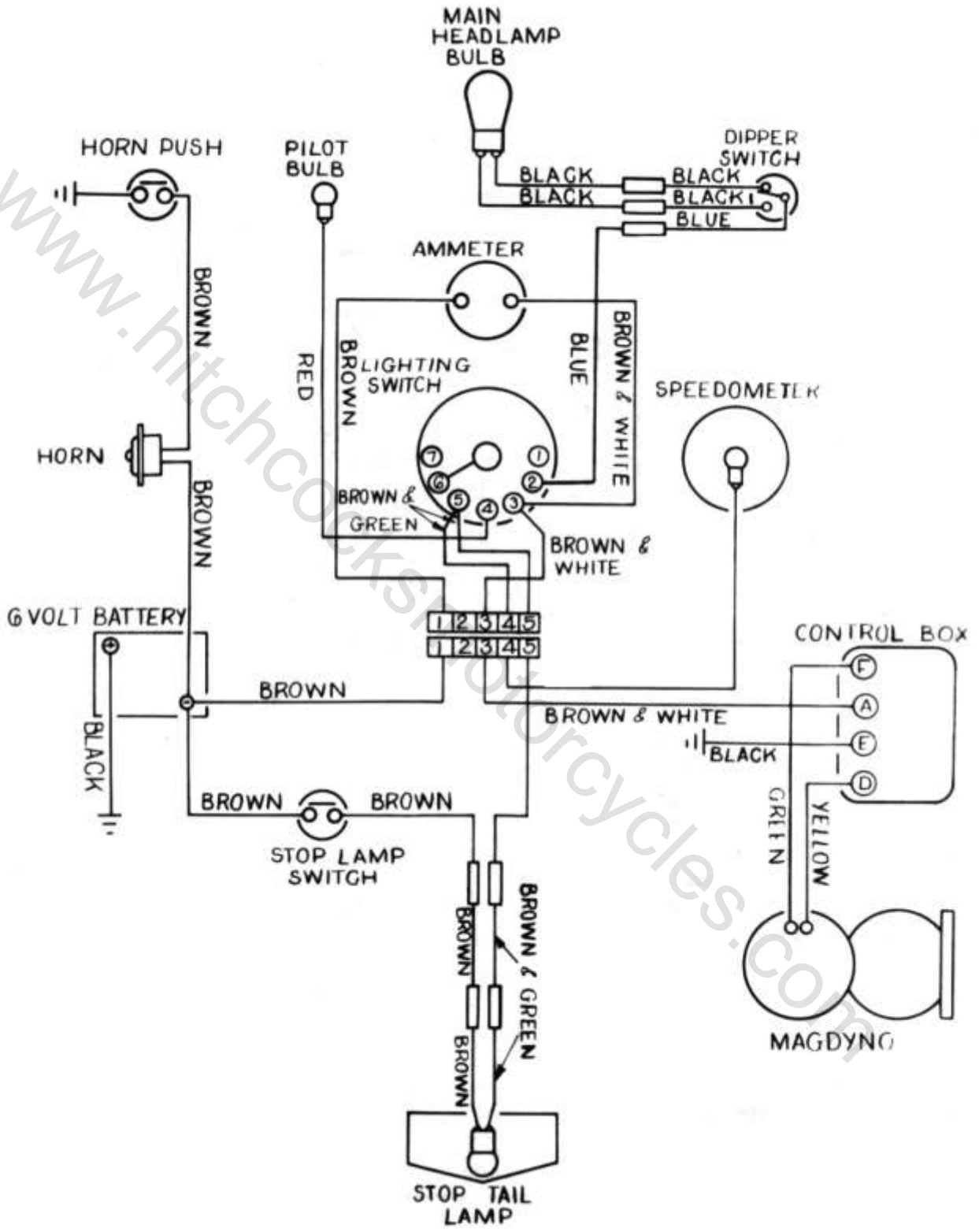
(iv) If the Magdyno has recently been replaced or removed it may be incorrectly timed (see Section C2, Subsection 4.)

(v) Check the contact breaker for cleanliness and correct contact setting as described in Subsection 2 (a).

If the cause of faulty operation cannot be traced from the foregoing checks, the cause may be an internal defect in the Magdyno. The Magdyno should therefore be removed from the engine for attention by a Lucas Agent.



1946 MODEL G



Lucas Dynamo Model E3LM

Used on all Models fitted with Magdyno

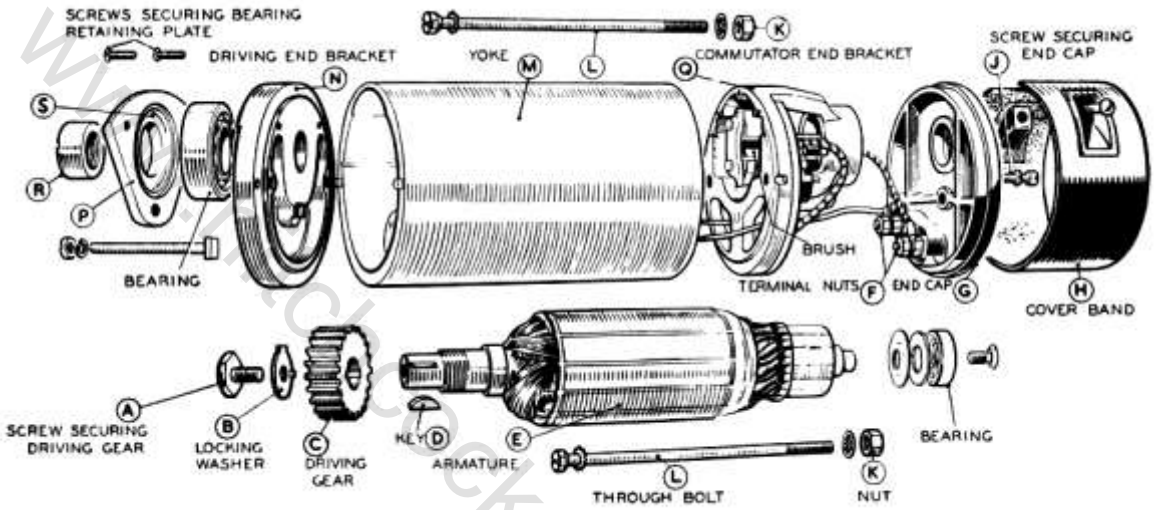


Fig. 1

1. General

The dynamo is a shunt-wound two-pole machine, arranged to work in conjunction with a regulator unit to give an output which is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the dynamo gives a high output, whereas, if the battery is fully charged, the dynamo gives only a trickle charge to keep the battery in a good condition without overcharging. In addition, an increase of output is given to balance the current taken by the lamps when in use. Model E3LM (see Fig. 1) is designed to be the upper portion of the "Magdyno" and has an output of 60 watts.

2 (a). Lubrication

No lubrication is necessary, as the ball bearings are packed with H.M.P. grease, which will last until the machine is taken down for a general overhaul, when the bearings should be repacked.

2 (b). Inspection of Commutator and Brush Gear

About once every six months remove the cover band for inspection of commutator and brushes, see Subsection 4(a) (vi).

3. Test Data

Cutting-in speed (Dynamo Cold)
1,050 – 1,200 r.p.m. at 7 volts

Output test
8.5 amps at 1,850 – 2,000 r.p.m. at 7 volts*

Field resistance
2.8 ohms

Brush spring tension
16 – 20 oz.

*On resistance load of 0.82 ohm.

4 (a). Testing in Position to Locate Fault in Charging Circuit

In the event of a fault in the charging circuit, adopt the following procedure to locate the cause of trouble.

(i) Check that the dynamo and regulator units are connected correctly. The dynamo terminal "D" should be connected to the regulator unit terminal "D" and dynamo terminal "F" to regulator terminal "F."

(ii) Remove the cables from the dynamo terminals " D " and " F " and connect the two terminals with a short length of wire.

(iii) Start the engine and set to run at normal idling speed.

(iv) Connect the negative lead of a moving coil voltmeter, calibrated 0-10 volts, to one of the dynamo terminals and connect the positive lead to a good earthing point on the dynamo yoke or engine. Reverse voltmeter connections on negative earth machines.

(v) Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to rise above 10 volts and do not race the engine in an attempt to increase the voltage. It is sufficient to run the dynamo up to a speed of 1,000 r.p.m. If there is no reading, check the brush gear, as described in (vi) below. If there is a low reading of approximately 1/2 volt, the field winding may be at fault, see Subsection 4(d). If there is a reading of approximately 1.1/2 to 2 volts, the armature winding may be at fault, see Subsection 4 (e).

(vi) Remove the cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they do not bear on the commutator or if the brush flexible is exposed on the running face, new brushes must be fitted.

Test the brush spring tension with a spring scale (see Fig. 2). The correct tension is 16 - 20 oz. and new springs must be fitted if the tension is low.

If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the engine is turned slowly by means of the kick start, with sparking plug(s) removed.

Re-test the dynamo as in (v) above. If there is still no reading on the voltmeter there is an internal fault and the complete unit should be replaced if a spare is available. Otherwise the unit must be dismantled, see Subsection 4 (b) for internal examination.

(vii) If the dynamo is in good order, restore the original connections. Connect regulator unit terminal "D" to dynamo terminal "D" and regulator terminal "F" to dynamo terminal "F" and check the regulator.

4 (b). To Dismantle

Remove the dynamo from the motor cycle. To detach the dynamo from the Magdyno, unscrew the hexagon headed nut from the driving end cover and slacken the screws securing the band clip.

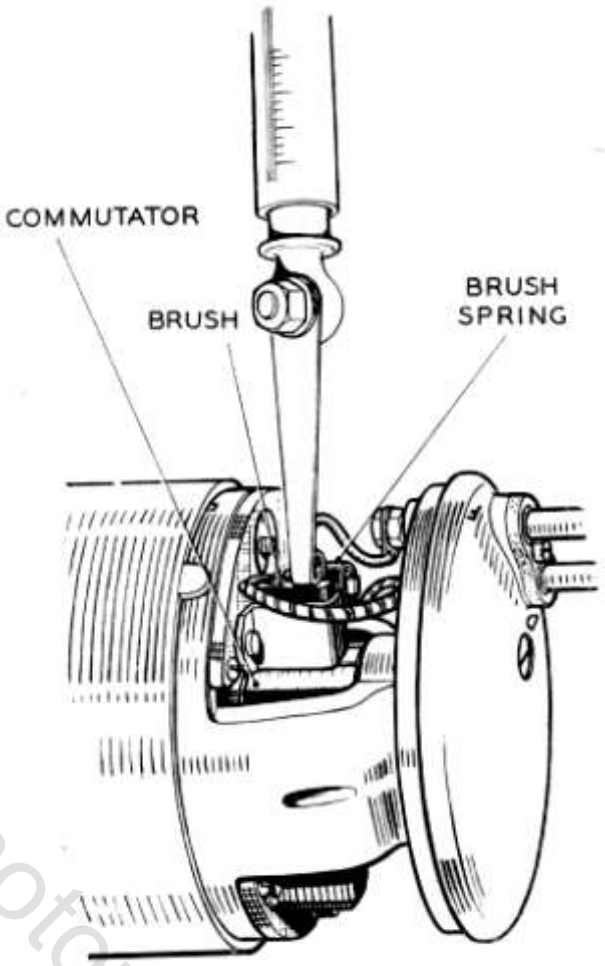


Fig. 2

To dismantle the dynamo proceed as follows: Bend back the tag on the washer "B" locking the screw "A" (see Fig. 1). Remove this screw, withdraw the gear "C" from the shaft with the aid of an extractor and remove the key(s) "D" from the shaft.

(ii) Remove the cover band "H," hold back the brush springs and lift the brushes from their holders.

(iii) Take out the screw "J" with spring washer from the centre of the black moulded end cap "G." Draw the cap away from the end bracket, take off terminal nut "F" and spring washer, and lift the connections off the terminals.

(iv) Unscrew and remove from the drive end bracket the two through bolts "L"securing the drive end bracket "N" and commutator end bracket "Q" to the yoke "M." Hold the nuts “K”

at the commutator end while unscrewing the bolts and take care not to lose the nuts.

(v) Draw the drive end bracket complete with armature "E" out of the yoke.

(vi) Remove the nut "R" and press the armature out of the drive end bracket by means of a hand press.

(vii) Remove the bearing retaining plate "P" from the end bracket. This is secured by two screws and a long threaded bolt.

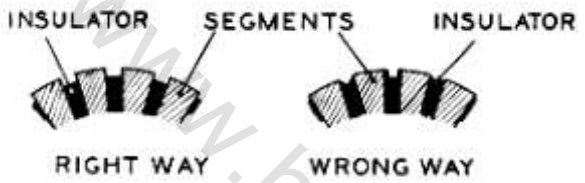


Fig. 3

(viii) Take out the screw securing the green field coil lead with the yellow sleeve to commutator end bracket and remove the end bracket "Q" withdrawing the connectors through the slot in the insulating plate.

(ix) Unscrew the three screws securing the insulating plate to the commutator end bracket and remove the plate with brush gear.

4 (c). Commutator

Examine the commutator. If it is in good condition it will be smooth and free from pits or burnt spots. Clean with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of very fine glass paper while rotating the armature.

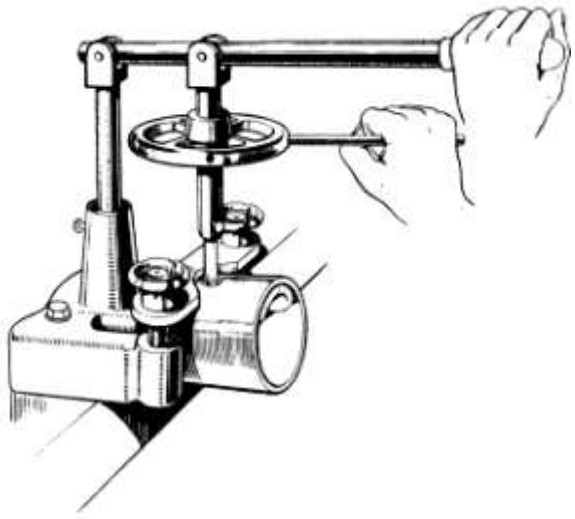


Fig. 4

To remedy a badly worn commutator, mount the armature with or without the drive end bracket in a lathe, rotate at high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary. Polish the commutator with very fine glass paper.

Undercut the insulation between the segment, to a depth of 1/32 in. with a hacksaw blade ground down until it is only, lightly thicker than the insulation (see Fig. 3.)

4 (d) Field Coil

Measure the resistance of the held winding by means of an ohm-meter. It this is not available connect a 6-volt D.C. supply with an ammeter in series with the coil. The ammeter reading should be approximately 2 amps. No reading on the ammeter indicates an open circuit in the field winding.

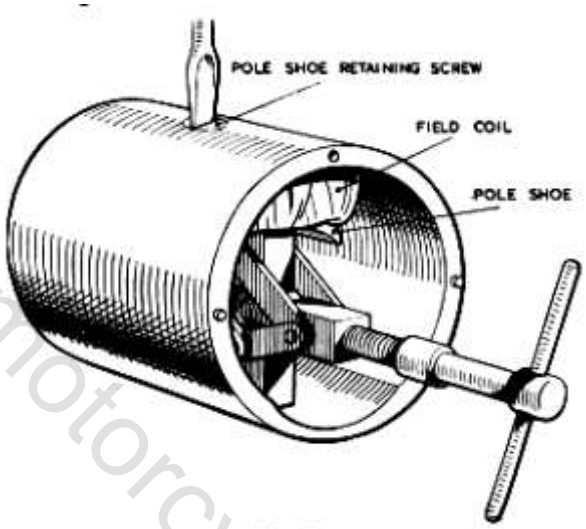


Fig. 5

To check for an earthed coil, connect a main, test lamp between one end of the coil and the yoke. If the bulb lights, there is an earth between coil and yoke.

In either case, unless a replacement dynamo is available, the field coil must be replaced but this should only be attempted if a wheel-operated screwdriver and pole shoe expander are at hand, the latter being especially necessary to ensure that there will be no air gap between the pole shoe and the inner face of the yoke.

To replace the field coil, proceed as follows

(i) Unscrew the pole shoe retaining screw by means of the wheel-operated screwdriver (see Fig. 4).

(ii) Draw the pole shoe and field coil out of the yoke and lift off the coil.

(iii) Fit the new field coil over the pole shoe and place it in position inside the yoke. Take care to ensure that the taping of the field coil is not trapped between the pole shoe and the yoke.

(iv) Locate the pole shoe and field coil by lightly tightening the fixing screw, insert the pole shoe expander (see Fig. 5), open to its fullest extent and tighten the screw. Remove the expander and give the screw a final tightening with the wheel-operated screwdriver. Lock the screw in position by caulking, that is, by tapping some of the metal of the yoke into the slot in the head of the screw.

4. (e). Armature

The testing of the armature winding requires the use of a voltdrop test or a growler. If these are not available, the armature should be checked by substitution. No attempt should be made to machine the armature core or to true a distorted armature shaft.

4 (f). Bearings

Ball bearings are fitted to both the commutator and drive end brackets. When the bearings become worn to such an extent that they allow side movement of the armature shaft, they must be replaced. To replace the ball bearing at the commutator end proceed as follows :

(i) Remove the screw from the end of the armature shaft and, using a caliper type extractor, draw the bearing off the shaft.

(ii) Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

(iii) Position the bearing on the end of the shaft and press it squarely home, applying pressure on the inner journal of the bearing.

To replace the ball bearing at the drive end proceed as follows :

(i) Remove the bearing retaining plate from the drive end bracket as previously described.

(ii) Press the bearing out of the end bracket, using a metal drift locating on the inner journal of the bearing. Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

(iii) Position the bearing in its housing and press it squarely home, applying pressure on the outer journal of the bearing.

4 (g). Reassembly

In the main, the reassembly of the dynamo is a reversal of the operation described in Subsection 4(b), bearing in mind the following points :

(i) The field coil lead fitted with the short length of yellow tubing must be connected, together with the eyelet of the earthed brush, to the commutator end bracket by means of the screw provided.

(ii) The second field coil lead must be

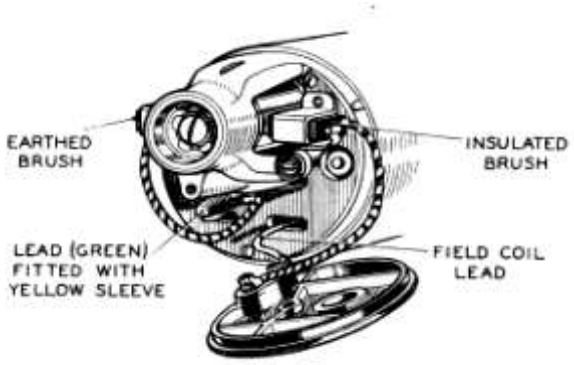


Fig. 6

connected to terminal "F" on the moulded cap (see Fig. 6).

(iii) The unearthed brush flexible lead must be connected direct to terminal "D" on the moulded end cap.

(iv) Take care to refit the cover band in its original position and make sure that the securing screw, when of flush-fitting pattern, does not "short" on the brush gear.

5. Dynamo Polarity

All replacement motor cycle dynamos are despatched from the Works suitable for immediate use on positive earth systems. If the negative terminal of the battery is earthed on the machine for which the replacement dynamo is intended, it will be necessary to re-polarize the dynamo before use to make it suitable for negative earth.

Similarly, if a dynamo has been incorrectly connected on the motor cycle and its polarity has become reversed, then it must be re-polarized.

To do this, fit the dynamo to the motor cycle but do not at this stage connect the cable to the "D" and "F" terminals. Temporarily connect a length of wire to the unearthed terminal of the battery and hold the other end of this wire in contact with dynamo terminal "F" for a few seconds only. This serves to re-polarize the dynamo. The temporary connection can now be removed and the original cables connected to "D" and "F" terminals.

The practice of closing the cut-out points to reverse the dynamo polarity is not recommended, as this method allows a high initial surge of current from the battery to pass through the armature, which can damage the windings, insulation, etc. and result in a decreased service life of the machine.

Generally speaking, Enfield motorcycles manufactured up to and including 1951 had the negative terminal of the battery connected to the frame. With a few exceptions, i.e. Miller coil ignition sets and rectifier sets on two-stroke machines, all Royal Enfield machines in current production have the positive terminal earthed.

Control Box

Used on Models G, J and J2, 1950 onwards

MODEL RB107

1. General

In Model RB107 control box, the regulator and cut-out contacts are positioned, for ease of access, above their respective armatures. It will be noticed that some of the internal electrical joints are resistance brazed.

2. Setting Data

(a) Cut-out

Cut-in voltage ..... 6.3-6.7 volts
Drop-off voltage .... 4.8-5.3 volts

(b) Regulator

Setting on open circuit relative to ambient temperature :

10° C. (50° F.) .... 7.7-8.1 volts
20° C. (68° F.) .... 7.6-8.0 volts
30° C. (86° F.) .... 7.5-7.9 volts
40° C (104° F.) .... 7.4-7.8 volts

3. Servicing

Before making any adjustment to the regulator, ensure that the dynamo and battery are in order. When a sound battery does not keep in a charged condition, or if the dynamo output does not fall when the battery is fully charged, the following procedure should be adopted :

(a) Checking the wiring between battery and regulator

Remove the control box from its mountings and withdraw the cable from terminal "A" (see Fig. 1) and connect it to the negative terminal of a voltmeter.

Connect the positive terminal of the voltmeter to an earthing point on the machine. If a voltmeter reading is given, the circuit from the battery to terminal "A" is in order.

If there is no voltmeter reading, examine the wiring between the battery and the control box for defective cables or loose connections. Re-connect the cable to terminal "A."

Check that the dynamo terminal "D" is connected to control box terminal "D"and that

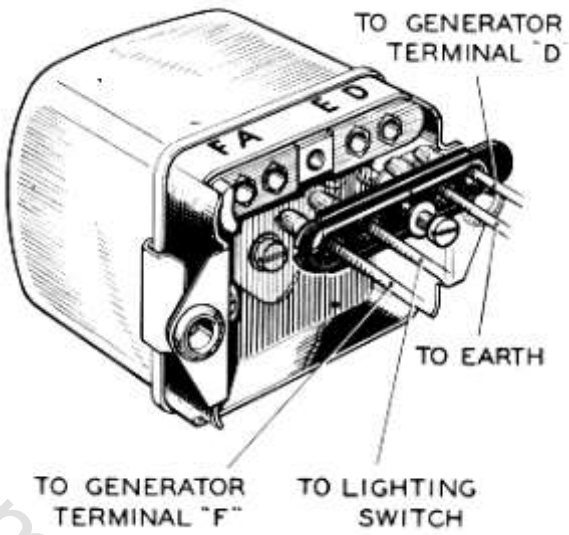


Fig. 1

the cable is in good condition. Similarly, check the cable between terminals "F" at the dynamo and control box.

(b) Checking the electrical setting of the regulator

The regulator is carefully set during manufacture and, in general, it should not be necessary to make further adjustment. If, however, the charging system is suspected it is important that only a good quality moving coil voltmeter (0-20 volts) is used to check the system. The electrical setting of the regulator can be checked without removing the cover from the control box.

Withdraw the plug-in connectors a small distance, so that a voltmeter connection can be made to terminals "D" and "E."

Connect the negative lead of the voltmeter to control box terminal "D" and the positive lead to terminal "E."

Remove the negative terminal from the battery. If coil ignition is fitted, run a temporary connection from the negative terminal of the battery to the "SW" terminal of the coil.

With the ignition switch in the "OFF" position, start the engine.

Slowly increase the speed of the engine until the voltmeter needle "flicks" and then steadies. Note this value and stop the engine.

If this value lies outside the limits given in paragraph 2(b), the regulator setting must be adjusted.

If the value is within the limits, examine the cut-out as described in paragraph 3(c).

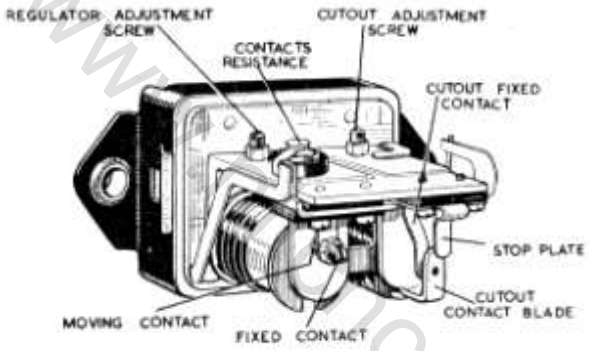


Fig. 2

(e) Adjusting the electrical setting of the regulator

Adjustment of the regulator requires removal of the control box cover. This is facilitated by removing the control box from the machine and providing temporary connections. Loosen the control box cover securing clips by slackening the securing screws set in the base of the control box, and lift off the cover.

It is important that regulator adjustments are carried out with the control box supported in a similar position to that on the machine.

Restart the engine.

Slacken the locknut of the regulator adjusting screw (see Fig. 2) and turn the screw in a clockwise direction to raise the setting or an anti-clockwise direction to lower the setting. Turn the screw only a fraction of a turn at a time and then tighten the locknut. Repeat as above until the correct setting is obtained.

Adjustment of regulator open-circuit voltage should be completed within 30 seconds; otherwise heating of the shunt winding will cause false settings to be made.

Stop the engine.

Remake the original connections and replace the cover. Ensure that the cover seats correctly on the sealing washer.

N.B.-A dynamo run at high speed on open circuit will build up a high voltage. Therefore, when adjusting the regulator, do not run the engine up to more than half throttle or a false setting will be made.

(d) Checking the electrical setting of the cutout

If the regulator is correctly set but the battery is still not being charged, the cut-out may be out of adjustment.

Replace the control box in the testing position, remake the temporary connections and remove the control box cover. Connect a voltmeter between terminals "D" and "E."

Start the engine and slowly increase the speed until the cut-out contacts close. Note the voltage at which this occurs and stop the engine. This should be 6.3-6.7 volts. If operation of the cut-out takes place outside these limits, it will be necessary to adjust.

(e) Adjusting the electrical setting of the cutout

Restart the engine.

Slacken the locknut securing the cut-out adjusting screw and turn the adjusting screw in a clockwise direction to raise the voltage setting or in an anti-clockwise direction to reduce the setting.

Turn the screw only a fraction of a turn at a time and then tighten the locknut. Test after each adjustment by increasing the engine speed and noting the voltmeter reading at the instant of contact closure.

Stop the engine.

Electrical setting of the cut-out, like the regulator, must be made as quickly as possible because of temperature-rise effects. Tighten the locknut after making the adjustment.

N.B.-if the cut-out does not operate, there may be an open-circuit in the wiring of the cut-out and regulator unit, in which case the unit should be removed for examination or replacement.

Battery Model PUZ7E

1. General

The model PUZ7E (see Fig. 1) is a "drycharged" 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, but the battery must be left to stand at least one hour after filling before putting the machine into service and then adjusting the acid level if necessary.

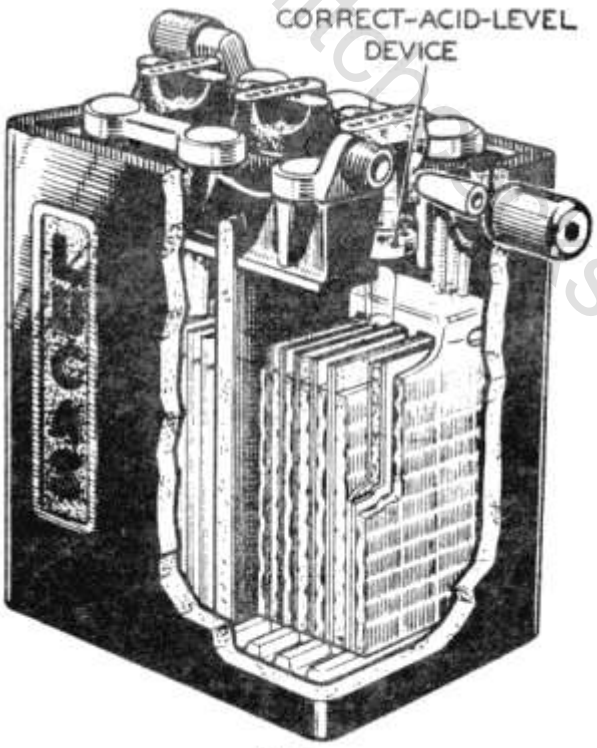


Fig. 1

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.) 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).

Occasionally check the terminals, clean and coat them with petroleum jelly. Wipe away all

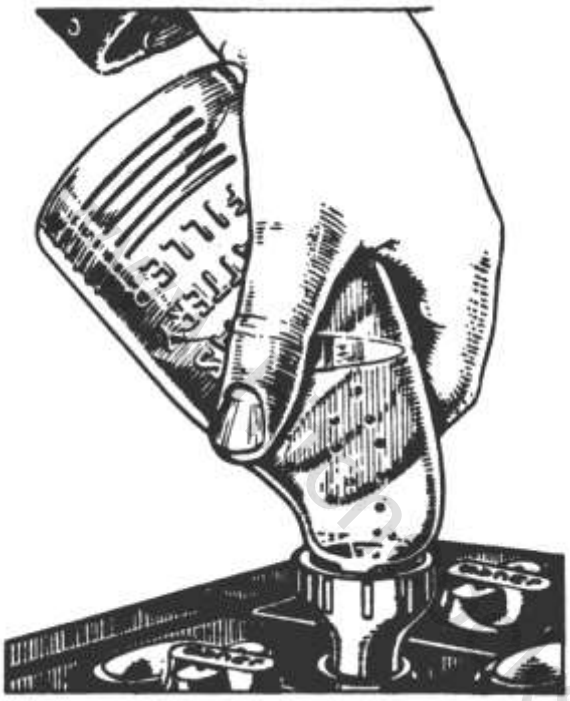


Fig. 2

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	1·050—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.

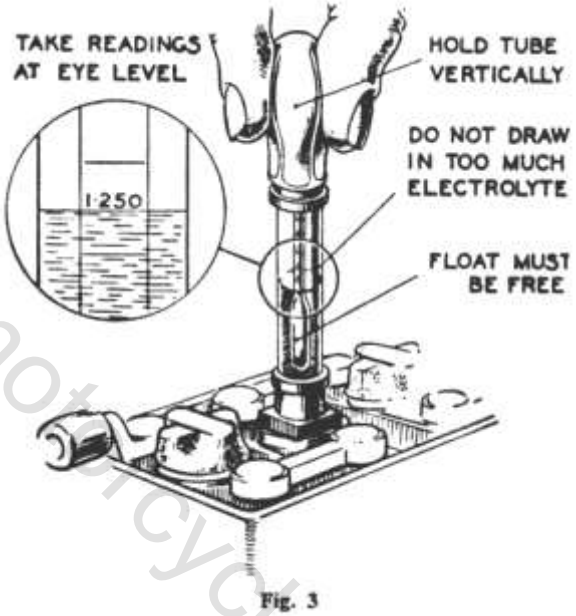


Fig. 3

Head and Tail Lamps

Used on Models G, J and J2,

1. Headlamp

In all the above Models the headlamp incorporates the Lucas Light Unit MCF700. This is either fitted into a lamp shell (see Figs. 1 and 2) carried on brackets in front of the facia panel type of fork head and housing a switch, ammeter and parking lamp, or, on later models, is built into the Casquette fork head which contains twin parking lamps as well as the ammeter and switch. On machines fitted with coil ignition the ammeter has a red central window with the ignition warning light beneath.

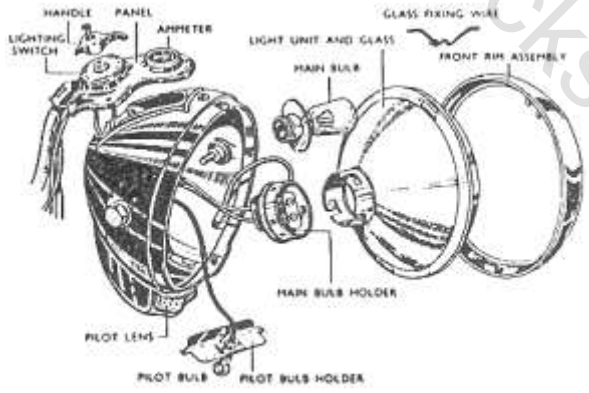


Fig. 1

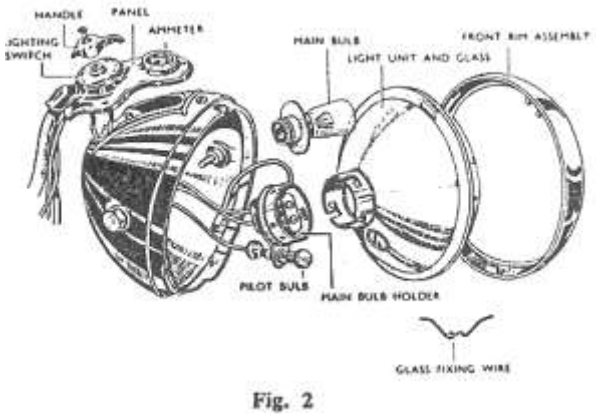


Fig. 2

2. Lucas Light Unit

The unit incorporates a combined reflector and front lens assembly (see Fig. 3). This construction ensures that the reflector and lenses are permanently protected, thus the unit keeps its high efficiency over a long period. A "prefocus" bulb is used, the filaments of which are accurately positioned with respect to the reflector, thus no focusing device is necessary.

The bulb has a large cap and a flange, which has been accurately positioned with 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.

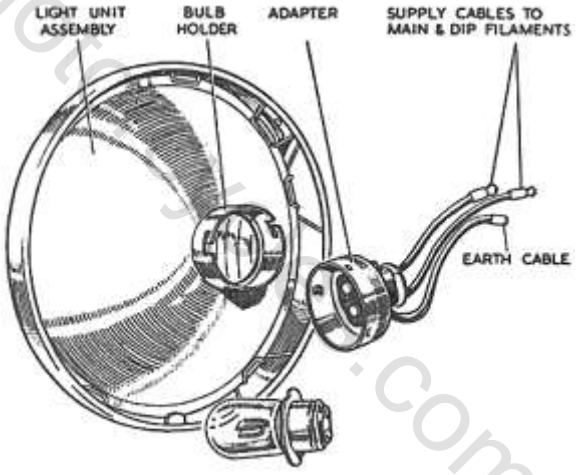


Fig. 3

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.

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

3. Replacing the Light Unit and Bulb

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

Withdraw the adaptor from the Light Unit 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.

Disengage the Light Unit securing springs from the rim and lift out the Light Unit.

Position the new unit in the rim so that the word "TOP" on the lens is correctly located when the assembly is mounted on the headlamp. Refit the securing springs ensuring that they are equally spaced around the rim.

Replace the bulb and adaptor. The bulb must be the Lucas "prefocus" type, 6v. 30/24 watt Lucas No. 312.

Locate the bottom of the Light Unit and front rim assembly in the headlamp shell or in the fixing rim attached to the Casquette fork head. Press the front on and tighten the securing screw at the top of the headlamp.

4. Parking Lights

In the case of lamps having separate shells the parking bulb may be mounted either to show through a hole in the back of the main reflector (Fig. 1) or may be mounted in a separate housing beneath the lamp shell (Fig. 2). In the case of lamps fitted into a Casquette fork head twin parking lights are provided. In all cases the bulb is the same, i.e. 6v. 3 watt M.B.C. Lucas Part No. 988.

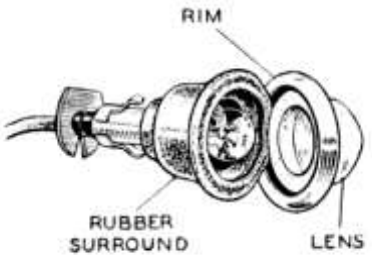


Fig. 4

Access to the parking bulb in the case of lamps with separate shells is obtained by removing the light unit as described in Subsection 2. In the case of lamps in which the parking bulb shows through a hole in the main reflector the bulb holder assembly should be removed. This will come away bringing with it the parking bulb which will then be readily accessible.

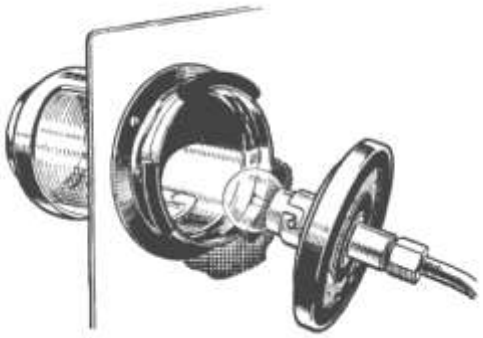


Fig. 5

In the case of lamps having the underslung parking light the parking bulb holder can be lifted out of the lamp shell after removal of the light unit.

In the case of lamps fitted into Casquette fork heads access to the parking bulbs is obtained by removing the parking lamp rim (see Fig. 4). This may merely be forced over the edge of the rubber lamp body or in the case of later machines is additionally secured by means of a small fixing screw. After removal of the lamp rim, the parking lamp lens can be pulled out of the rubber body, after which the bulb will be accessible.

5. Tail Light

Earlier machines used a circular metal-bodied tail light, either Lucas No. MT110 (Fig. 5) or No. 480 (Fig. 6). In the former case, access to the bulb is obtained by removing the back of the lamp, which will come away bringing the bulb with it. In the latter case, the front of the lamp is removed, leaving the bulb carrier in position. In either case the bulb is the same, that originally fitted being 6 volt 3 watt S.B.C., Lucas Part No. 200, which, however, on machines of over 250 c.c. should now be replaced by 6 volt 6 watt S.B.C. Lucas No. 205.

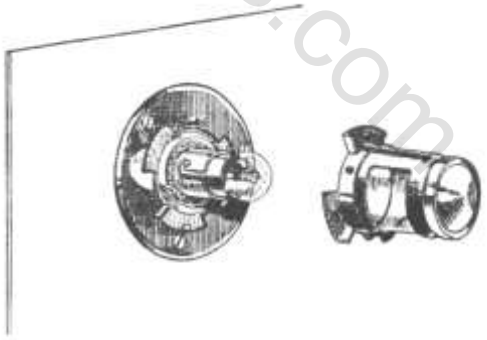


Fig. 6

Recent machines use lamps with red plastic covers, either Type 529 (Fig. 7), which is a tail lamp only; 525 (Fig. 8), which is a combined stop and tail lamp; or 564 (Fig. 9), which is a combined stop and tail lamp and reflector.

Access to the bulb is obtained by removing the two screws which secure the plastic cover.

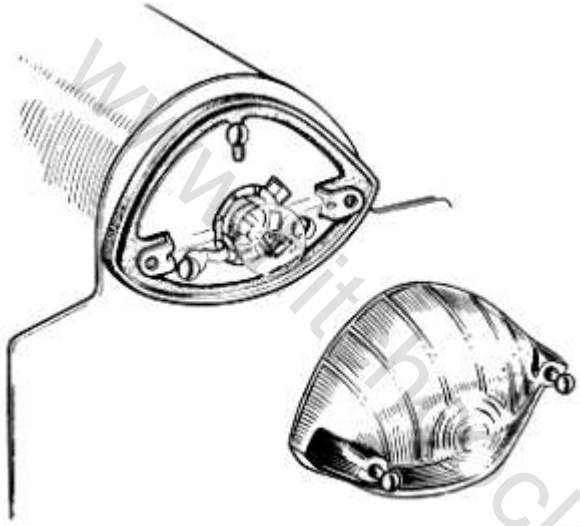


Fig. 7

The correct bulb for the 529 lamp is either Lucas No. 988 6volt 3 watt M.B.C. or No. 951 6volt 6 watt M.B.C.

The correct bulb for the stop tail lights 525 and 564 is either Lucas No. 352 6volt 3/18 watt or Lucas No. 384 6volt 6/18 watt. The 3 watt or 6 watt filament provides the normal tail light, while the 18 watt filament is illuminated on movement of the brake pedal.

6 watt bulbs are now required by law in Great Britain on machines of more than 250 c.c.

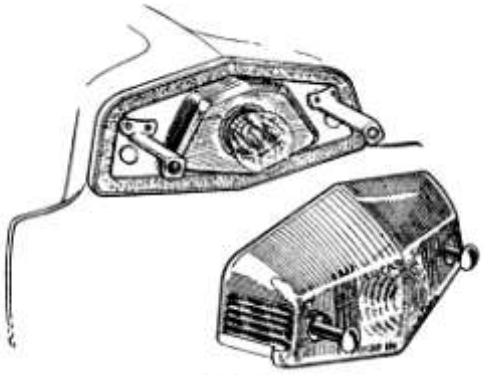


Fig. 8

Care must be taken that the leads to the stop tail lamp are correctly connected, as the use of the 18 watt filament on the normal tail light will not only discharge the battery but could cause trouble from excessive heat affecting the plastic cover. At the same time, the 3 or 6 watt filament, if used as a stop-tail light will be ineffective in bright sunlight.

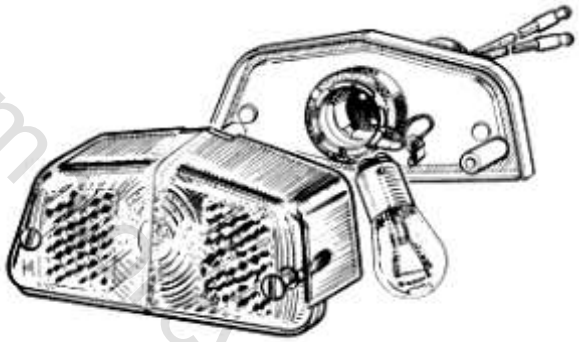
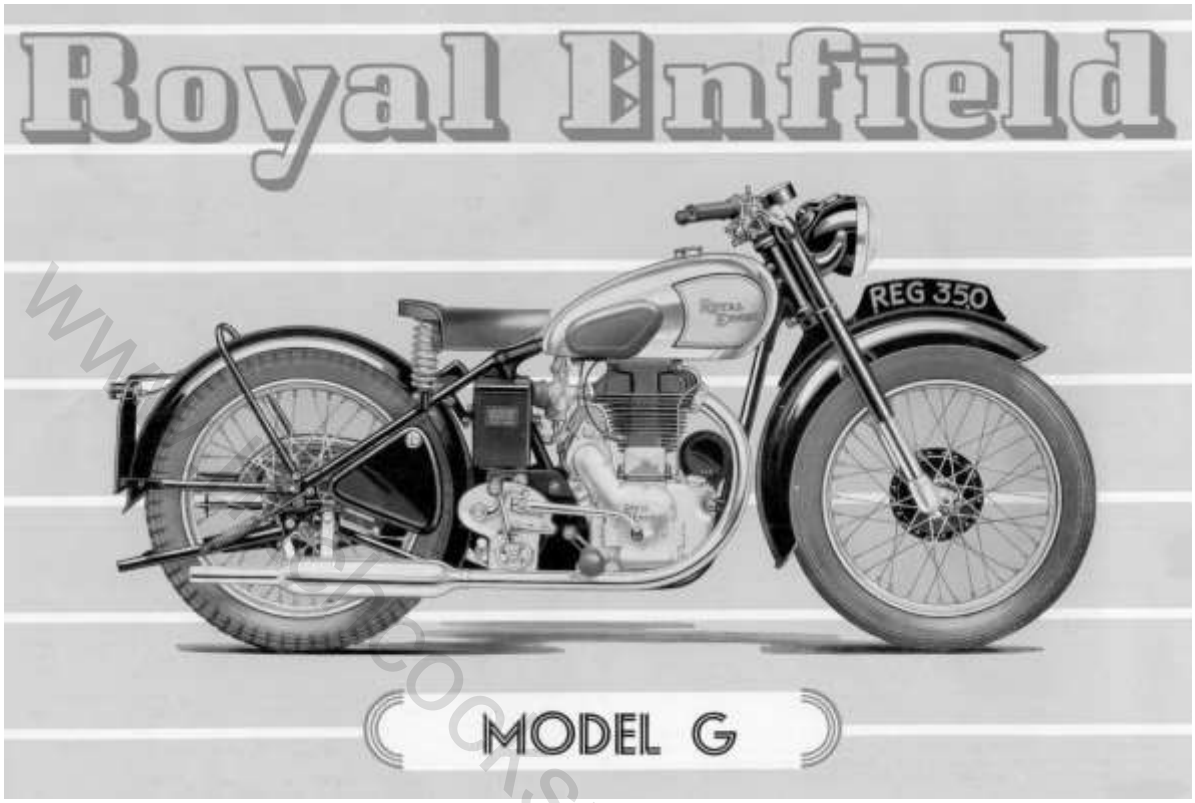
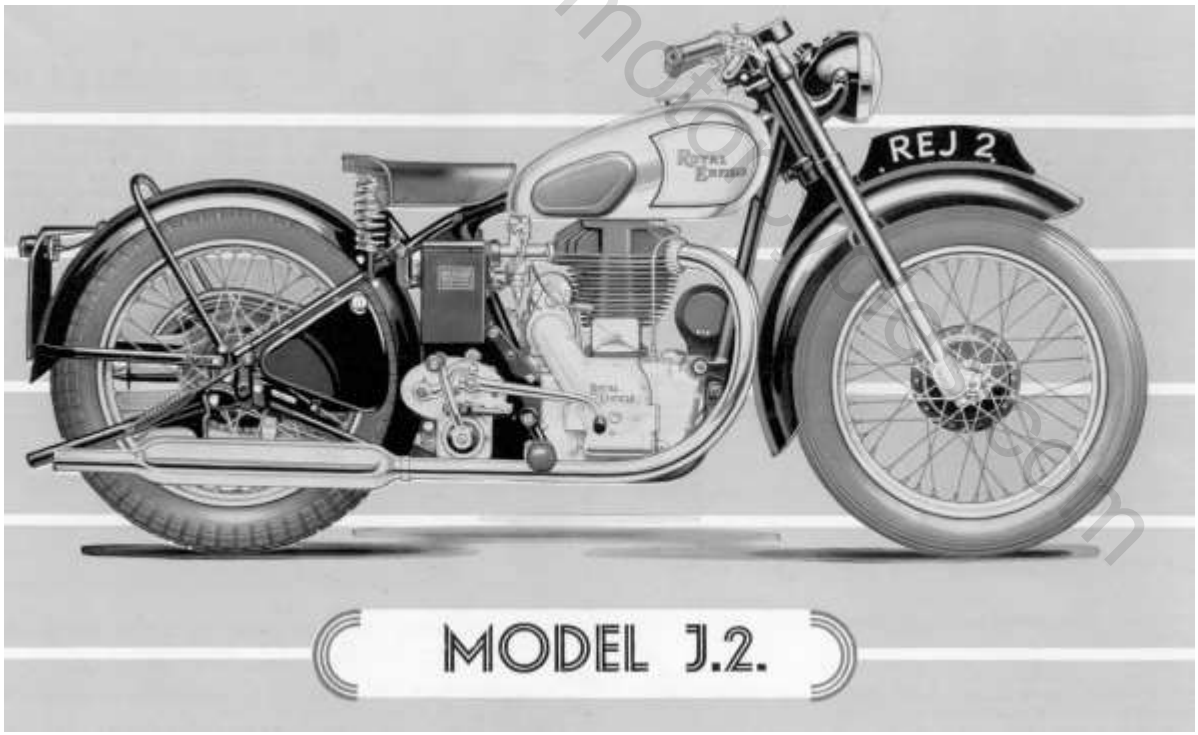


Fig. 9





1950 MODELS

Front Fork

With Facia Panel and Steel Bottom Tubes
Used on "350 Model G," "500 Model J2," 1951 onward:

1. Description

The telescopic fork consists of two legs each of which comprises a main tube of chrome molybdenum alloy steel tubing which is securely clamped to the facia panel fork head at the upper end and to the fork crown. Filled over the lower end of the main tube is the bottom tube made of steel tubing with a forged steel fork end flash-welded 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 and is secured by scrolls so that it is in tension on the rebound. 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 upper end of the main tube is covered by a tube with a pressed steel lamp bracket welded to it.

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.

A special version of the fork is available for sidecar use. This has a modified fork head and fork crown setting the main tubes 1.1/2 in. further forward, thus giving less trail and providing lighter steering when used with a sidecar. These sidecar forks also are fitted with a steering damper and have stronger springs.

**On early models the fork end was made of aluminium alloy screwed on to the bottom tube.*

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

Place the machine on the stand and in the case of Model "G" or "J2" place a box beneath the crankcase to raise the front wheel from the ground. 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 a soft mallet, thus allowing the remainder of the oil to escape.

Unscrew the outer cover tube using the hand grips E4912 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.

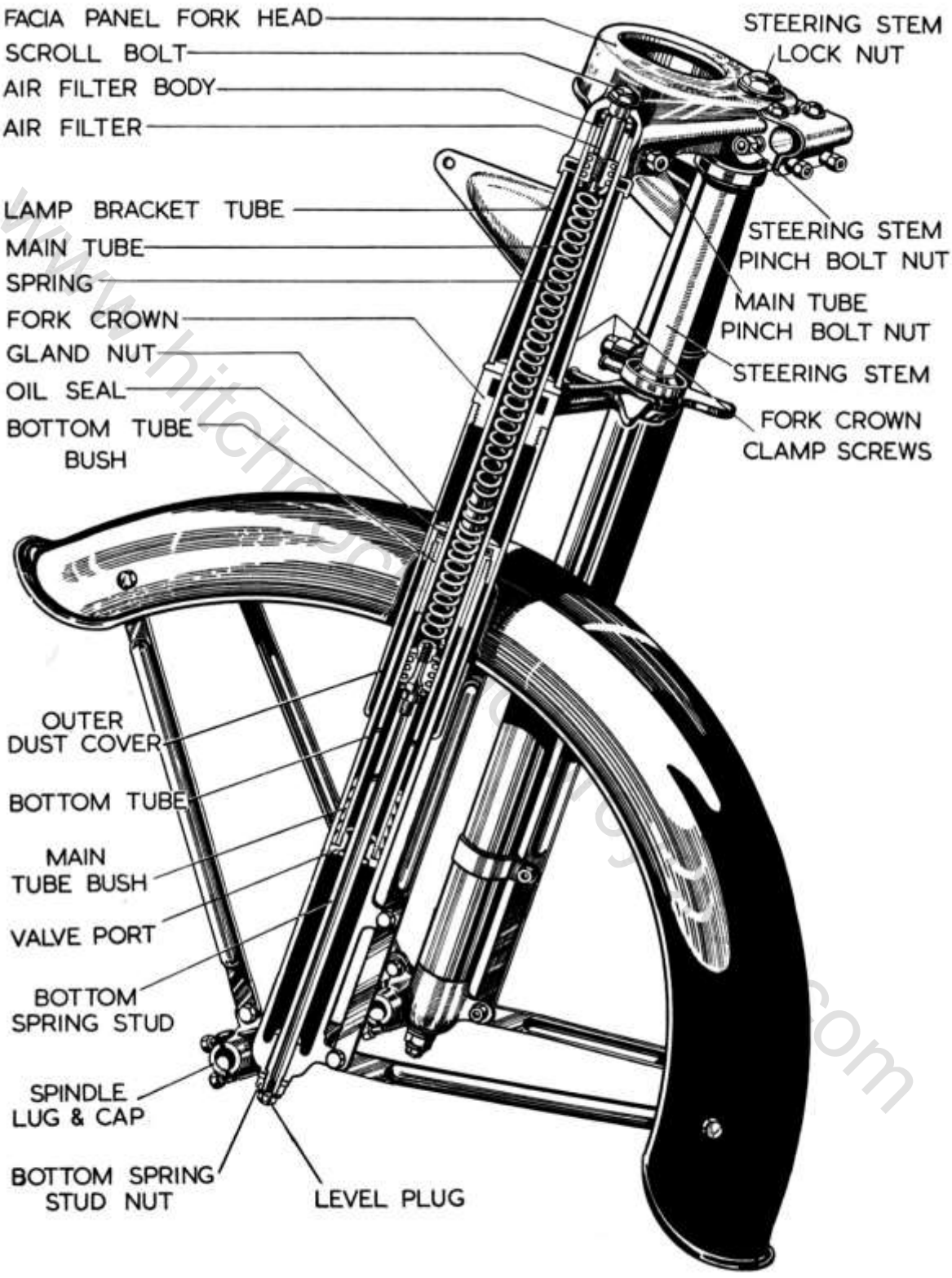
The bronze main tube bush can be now tapped off the lower end of the tube using the bottom tube bush for this purpose. The bottom tube bush, oil seal and gland nut can then be withdrawn.

3. Spring

The original length of the spring is 19 in. overall. A new spring should be fitted if the old one has set by more than 1 inch.

4. Steering Head Races

The steering head bearing consists of two deep groove thrust races each containing 19 x 1/4" diameter steel balls. The steering head bearing is adjusted by



SECTIONED VIEW OF TELESCOPIC FORK
Fig. 1

tightening the steering stem locknut after loosening the nuts on the three pinch bolts which secure the fork head to the steering stem and to the two main tubes. 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. When testing for freedom of movement the steering damper, if fitted, should be disconnected by unscrewing the anchor plate pin.

Adjustment of the steering head depends on the ability of the fork head to slide on the steering stem and on the fork main tubes. A rubber washer is interposed between the fork head and the top of the lamp bracket tube to permit the necessary movement. If this rubber washer is fully compressed while there is still some play in the steering head, it will be necessary to remove the fork head (see paragraph 5) and shorten the lamp bracket tube by, say, 1/32 in. Alternatively, if the lamp bracket tube is loose when the steering head is correctly adjusted, it can be tightened by fitting an additional steel washer (Part No. 35974) beneath the rubber washer.

It is also possible that the steering head cannot be adjusted because the main tube is bottoming in the recess in the fork head in which it fits. In this case the fork crown clamp screws must be loosened, thus permitting the main tubes to slide through the fork crown. Do no forget to tighten the fork head pinch bolts and the fork crown clamp screws after adjusting the steering head.

5. Removal of Facia Panel Fork Head, Spring, etc.

To remove the Facia Panel Fork Head for access to the lamp bracket tubes (or to change the fork spring without disturbing the bearings) proceed as follows:disconnect all control cables at the handlebar end and remove the headlamp from the lamp brackets. The switch panel can conveniently be removed from the back of the lamp so that the body of the lamp can be removed completely.

Now unscrew the two Fork Spring Scroll Bolts from the fork head, unscrew the nuts on the fork head clip bolt and the two main tube clip bolts, remove the three clip bolt sleeves and knock out the three clip bolts. The facia panel fork head can now be tapped gently upwards with a hide mallet or a hammer and a wooden drift but care must be taken to hit only the more solid parts of the fork head, i.e. beneath the handlebar clip and at the back of the main tubes, avoiding the underside of the comparatively thin portion in front of the speedometer.

After removal of the fork head the lamp bracket tubes can be lifted straight off and the springs can be withdrawn from the upper end of the main tubes after unscrewing the oil level plug and the nut which secures the spring stud to the fork end and knocking the spring stud upwards.

6. Removal of Main Tubes

To remove the main tubes first dismantle the fork as described in paragraph 2, then remove the facia panel fork head and lamp bracket tubes as described in paragraph 5. Now loosen the fork crown clamp screws and knock the main tubes out of the fork crown either upwards or downwards as may be most convenient. If the machine has been in an accident and the tube is badly bent both above and below the fork crown, it may be necessary to cut through the tube with a hacksaw before it can be withdrawn.

7. Reassembly of Parts

No difficulty should be experienced with this. When refitting the main tube, use the lamp bracket tube as a guide to its correct position in the fork crown. The small shoulder some 1.1/2 in. from the upper end of the tube should be flush with the top of the lamp bracket tube when the latter is in position on the fork crown. With the main tube in this position, tighten the fork crown clamp screws before fitting the facia panel fork head.

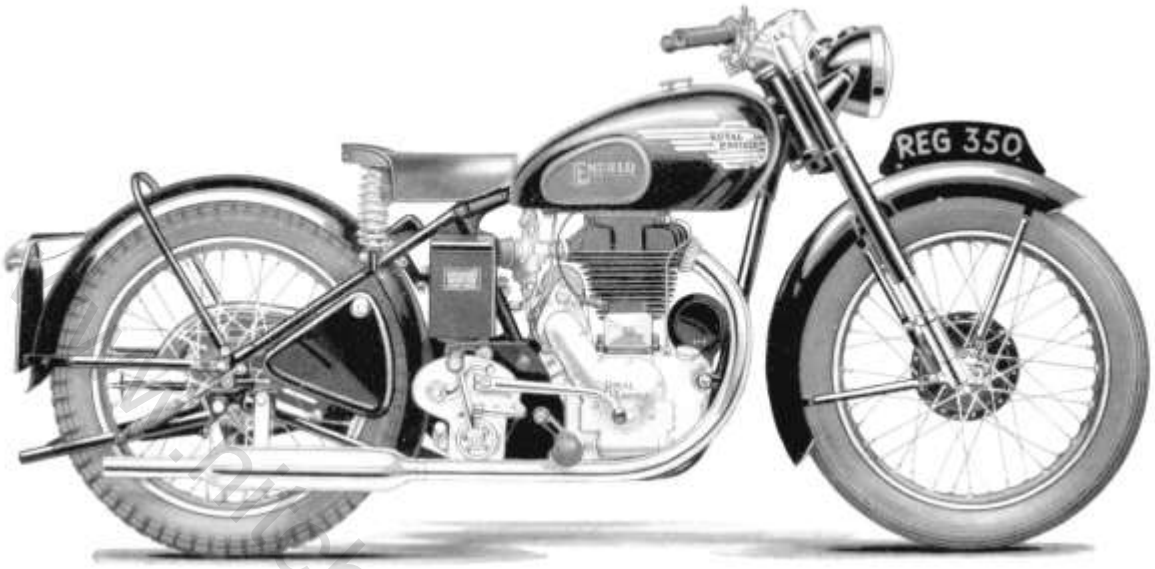
If new oil seals have been fitted it may be found that the action of the fork is very stiff when the gland nuts are tightened down fully. In this case the nuts may be left half a turn or so slack until the seals have freed off, after which they should be tightened down. Note that the seal, must be fitted with the larger bore uppermost, i.e. with the scraping edges facing downwards.

When refitting the three clip bolts, which secure the fork head to the main tubes and steering stem, make sure that the clip bolts and their sleeve, are correctly fitted so that the cut-away portions of them bear against the tubes. Any attempt to tighten the nuts with the bolts or sleeves incorrectly fitted may result in cracking the facia panel fork head.

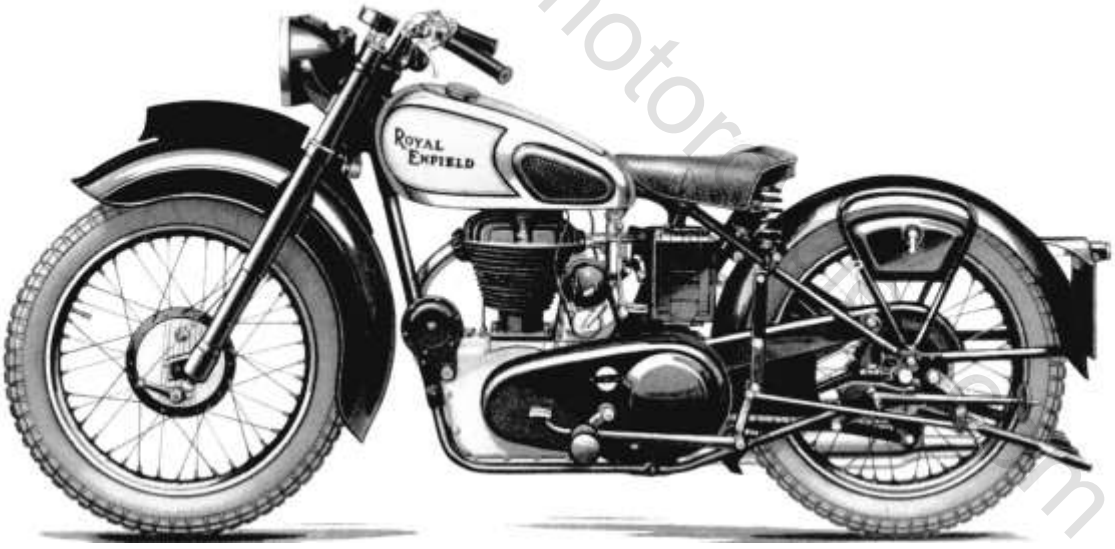
8. Lubrication

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 end. 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.



1954 MODEL G



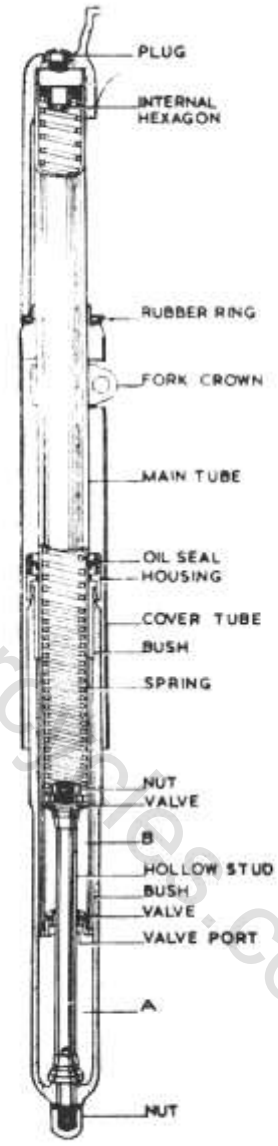
1947 MODEL J

Front Fork
With Casquette and Aluminium Alloy Bottom Tubes
Used on Model G deluxe and 350 Clipper

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 high strength aluminium alloy with an integral lug which carries the wheel spindle. Fitted on the lower end of the main tube is a steel 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 threaded housing which contains an oil seal. 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 between the spring stud and the bore of the valve port forming a hydraulic damping system. A compression spring is fitted inside the main tube between the upper end of the spring stud and the upper end of the main tube. The lower end of the main tube and upper end of the bottom tube are protected by a cover secured to the fork crown.

A special fork is available for sidecar machines. This has bottom tubes with extended wheel lugs giving less trail and is fitted with stronger springs and a steering damper.



SECTION OF FORK LEG
Fig. 1

2. Operation of the Fork

The fork provides a range of movement of 6 in. from the fully extended to the fully compressed position. The movement is controlled by the compression spring and by the hydraulic damping system. The hydraulic damping is light on the bump stroke and heavier on the rebound stroke, thus damping out any tendency to pitching or oscillation without interfering unduly with the free movement of the fork when the wheel encounters an obstacle.

The fork is filled with S.A.E. 20 to a point above the lower end of the fork spring so that the damper chamber "B" is always kept

full of oil. Upward movement of the wheel spindle forces oil from the lower chamber "A" through the annular space between the spring stud (38067) and the bore of the main tube valve port (38138) into the damper chamber "B." During this stroke the pressure on the underside of the valve plate (38073) causes this to lift so that oil can also pass from "A" to "B" through the eight holes in the valve body. Since, however, the diameter of chamber "B" is less than that of chamber "A" there is not room in "B" to receive all the oil which must be displaced from "A" as the fork operates. The surplus oil passes through the cross hole in the spring stud and up the centre hole in the stud, spilling out through the nut (38076) which secures the upper end of the spring stud to the bronze guide at the lower end of the fork spring.

On the rebound stroke the oil in the damper chamber "B" is forced through the annular space between the spring stud and the bore of the main tube valve port. During this stroke pressure in chamber "B" closes the two disc valves at the upper and lower ends of the chamber so that the only path through which the oil can escape is the annular space between the spring stud and the port. Damping on the rebound stroke is therefore heavier than on the bump stroke. At the extreme end of either bump or rebound stroke a small taper portion on the spring stud enters the bore

MAIN TUBE SPANNER

Fig. 2

of the valve port, thus restricting the annular space and increasing the amount of damping. At the extreme end of the bump stroke the larger diameter taper on the oil control collar (38075) enters the main counterbore of the valve port thus forming a hydraulic cushion to prevent metal to metal contact.

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

Place the machine on the centre stand, disconnect the front brake control and remove the front wheel and mudguard complete with stays. Unscrew the bottom spring stud nut (38080) which will allow oil to run out of the fork down

MAIN TUBE SEAL GUIDE

Fig. 3

to the level of the cross-hole in the spring stud. Now knock the spring stud upward into the fork with a soft mallet, thus allowing the remainder of the oil to escape. Pull the fork bottom tube down as far as possible, thus exposing the oil seal housing (38157). Unscrew this housing either by means of a spanner on the flats with which it is provided or by using the gland nut handgrips (E.5417). The bottom tube can now be withdrawn completely from the main tube, leaving the bottom tube bush, oil seal housing and oil seal in position 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 steel main tube bush (38156) can now be tapped off the lower end of the tube, if necessary using the bottom tube bush for this purpose. Before doing this, however, it is advisable to mark the position of the bush with a pencil line so as to ensure reassembling it in the same position on the main tube. The reason for this is that these steel bushes are finish ground to size after fitting on to the tubes so as to ensure concentricity to the main tube. After

removal of the main tube bush the bottom tube bush, oil seal housing and oil seal can be removed.In case of difficulty in removing the main tube bush it is possible to withdraw the oil seal housingafter loosening the crown clip bolt 39038, removing the plug screw 38968 and unscrewing the main tube 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. 2.

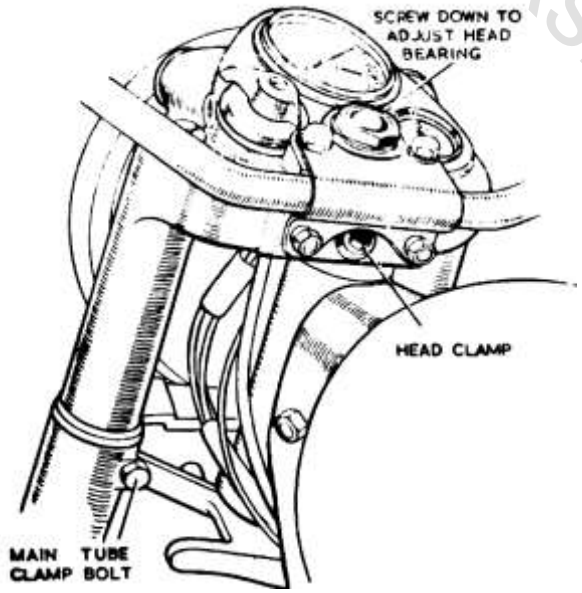
4. Spring

Solo and Sidecar springs are available. The free length of each is 20.1/2 ins. The spring should be replaced if it has closed by more than 1 inch.

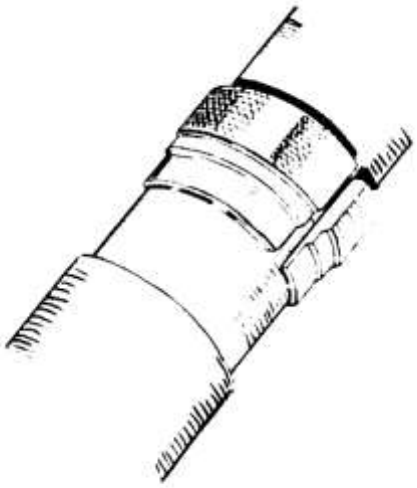
5. Reassembly of Parts

When refitting the oil seal, or fitting a new one, great care must be exercised not to damage the synthetic rubber lip which forms the actual seal. If the seal has been removed from the upper end of the main tube and is refitted from this end a special nose piece (Fig. 3) must be fitted over the end of the tube to prevent the thread from damaging the oil seal.

The spring stud is a tight fit in the hole at the lower end of the bottom tube. Once the stud has been entered in the hole push the bottom tube up sharply against the spring until two or three threads on the stud project beneath the end of the bottom tube. Now fit the nut and washer and pull the stud into position by tightening the nut. If necessary fit the nut first without the washer until sufficient thread is projecting to enable the washer to be fitted.



SHOWING THE POSITIONS OF THE CLAMP BOLTS SECURING THE STEERING STEM AND FORK TUBES
Fig. 4



OUTER COVER CENTRALISING BUSHES

Fig. 5

6. 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 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. When testing for freedom of movement the steering damper, if fitted, should be disconnected by unscrewing the anchor plate pin. 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. 5) is useful to ensure centralisation of the cover tubes.

7. 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, regulator, tail lamp, etc. at their lower ends or by means of the plug and socket connectors when these are provided. The switch and ammeter are push fits into the rubber bushes (LU/365408) in the fork head.

Disconnect the speedometer drive from the speedometer head and unscrew the steering damper knob and rod (if fitted) after removal of the split pin through the lower end of the rod. Undo the steering damper anchor plate pin so as to disconnect the damper from the frame of the machine.

Remove the two plug screws (38968) and loosen the steering head clip bolt and the two fork crown clamp bolts.

Now unscrew the fork main tubes from the fork head and 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 steering stem can be lifted out of the head lug of the frame.

8. Lubrication

The lubrication of the fork bearings is effected by the oil which forms the hydraulic damping medium. All that is necessary is to keep sufficient oil in the fork to ensure that the top end of the bottom spring stud is never uncovered even in the full rebound position. The level of oil in the fork can be gauged by removing the top plug screw and inserting a long rod about 3/8 in. diameter. If slightly tilted this will ledge against the nut at the upper end of the bottom spring stud and indicate the level of oil above the stud. If the fork is empty to start with the quantity required is approximately 7.1/2 fluid ounces in each leg. Recommended grades of oil are Castrolite, Mobiloil Arctic, Essolube 20, B.P. Energol S.A.E. 20 and Shell X-100 20/20W.

9. Air Vents

The earlier forks of this type were provided with holes at the upper end of each main tube communicating with small vent holes in the Casquette head. Experience has shown that on rough roads oil may escape through these air vents which in consequence are now omitted. Escape of oil from the earlier forks can be largely eliminated by fitting specially long plug screws, which are available. The Part Number is 40118. If these are fitted and the final vent hole is stopped up with a wooden plug leakage at this point is impossible. Fitting the special plug screws alone is sufficient in most instances.

Front Wheel

With Single 6 in. Brake
Fitted to All Models

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

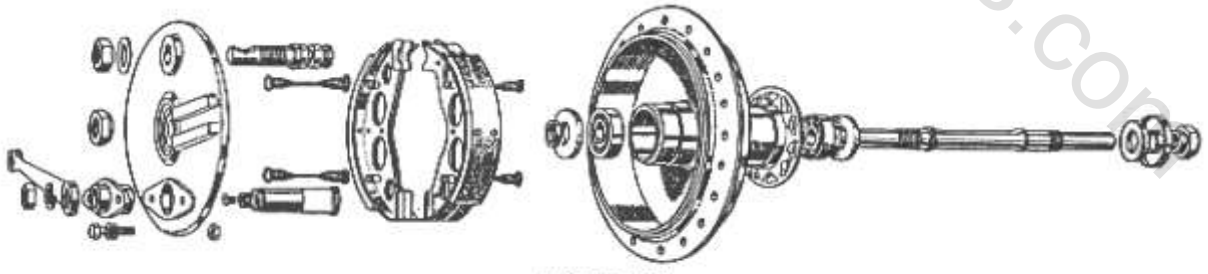
This is best done by unscrewing the pivot pin locknuts and the operating lever nuts after which the assembly of brake shoes, return springs, pivot pin and operating cam can be removed from the cover plate by light blows with a hammer and drift on the ends of the pivot pin and the operating cam. The return 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

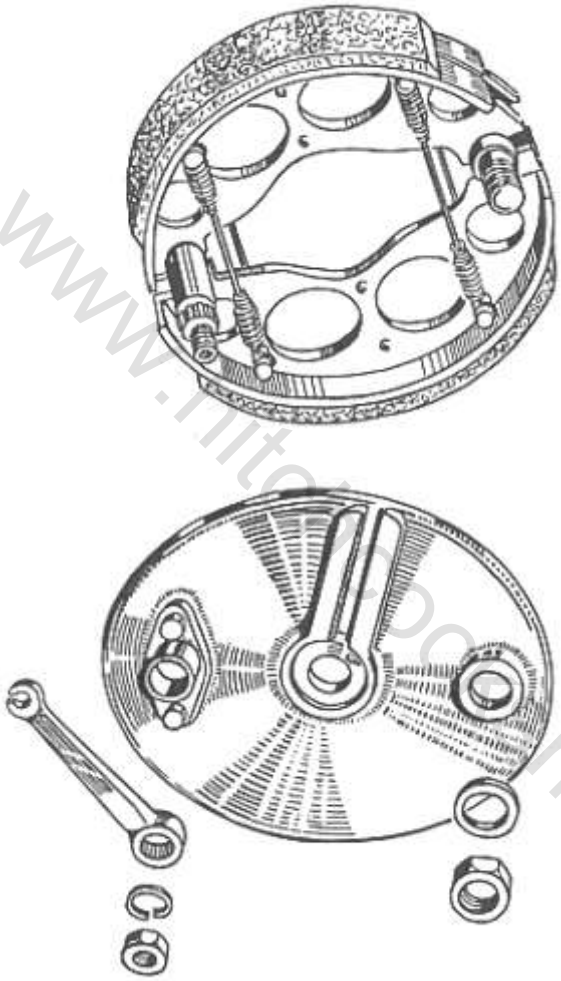
Brake linings are supplied either in pairs ready drilled complete with rivets (Part No. 37786BX) or ready fitted to service replacement brake shoes (Part No. 38042). When riveting linings to shoes secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard 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 bearing off the spindle and insert



FRONT HUB
Fig. 1



REMOVAL OF BRAKE SHOE ASSEMBLY
Fig. 2

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, 5/8 in. i/d by 1.9/16 in. o/d by 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.

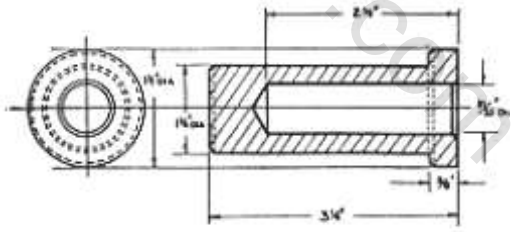
7. Fitting Limits for Bearings

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	1.5620/1.5616in.
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 the



DRIFT FOR REFITTING BEARINGS
Fig. 3

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 Castrolease (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 1.580in.

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

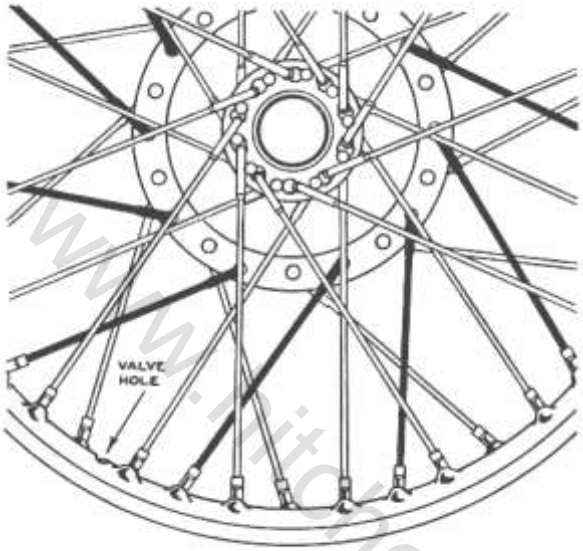


Fig. 4A Dunlop Rim

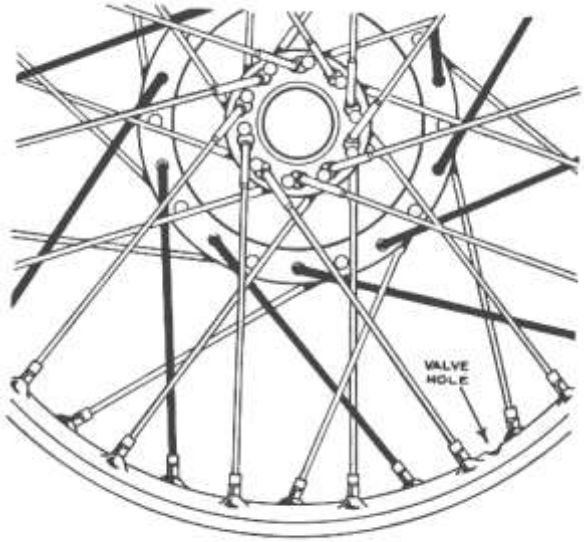


Fig. 4B Palmer Rim

WHEEL LACING

taken that they are built the right way round into the wheel.

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.

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

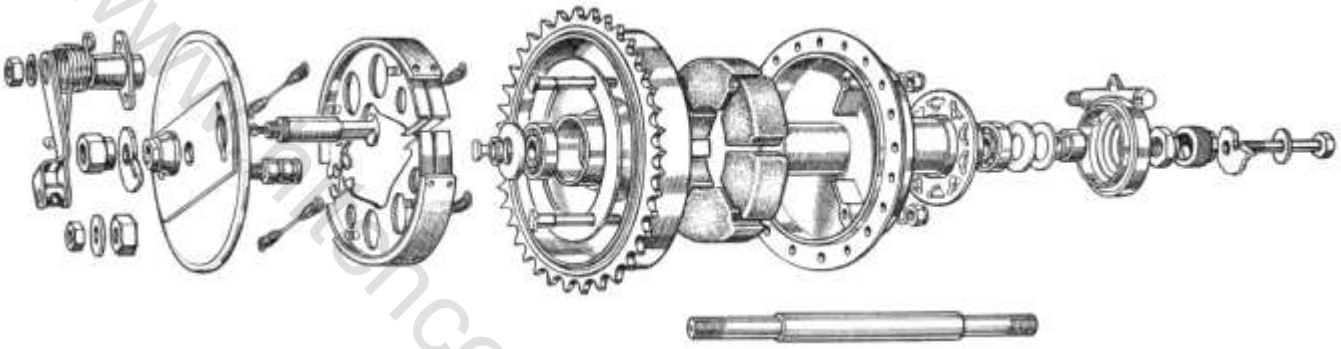
A greasing point is provided in the centre of the hub barrel. Unless the barrel is packed full with grease on assembly (which is apt to lead to trouble through grease finding its way past the felt seals on to the brake linings) this greasing point is of little value and the best way to grease the bearings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

350 CLIPPER OTHERWISE KNOW AS MODEL G DELUXE
1956

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 7.11/16 in. for the wheel for the "250 Clipper," and 7.3/16 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

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.

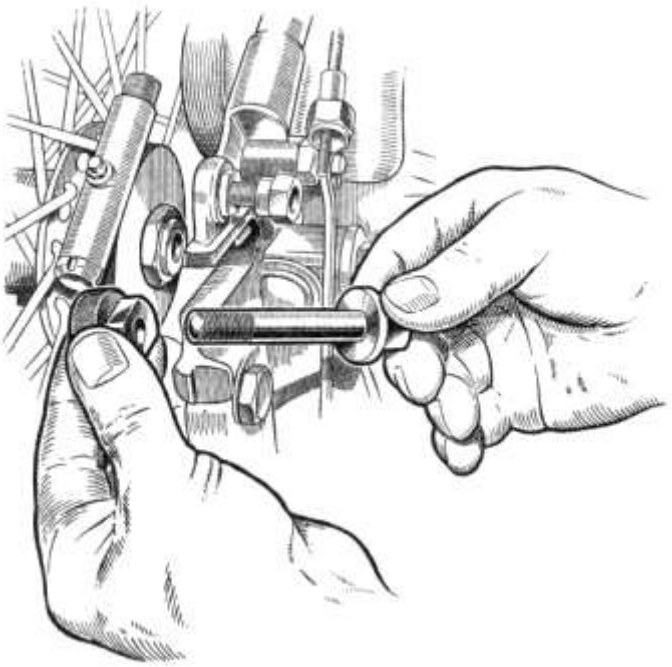
4. Removal of Brake Shoes for Replacement, Fitting New Linings, etc.

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.

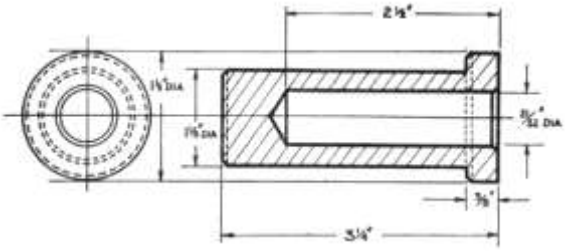
8. Fitting Limits for Bearings

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/.06247 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.

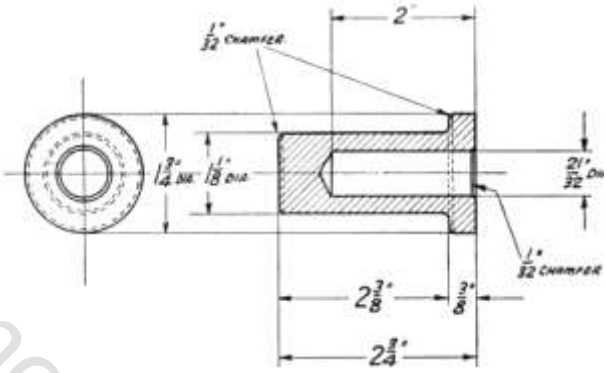


DRIFT FOR REFITTING BEARINGS "250 CLIPPER." MODELS "S" AND "G." Fig. 3

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

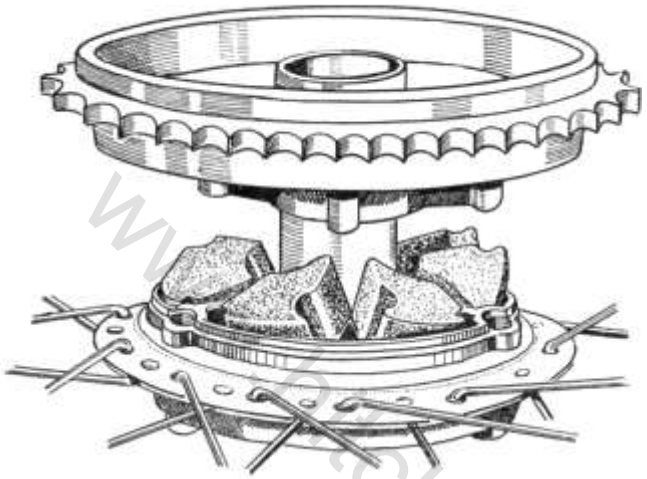
The sprocket/brake drum is free to rotate on the hub barrel. Three radial vanes are formed on the back of the brake drum and three similar



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.



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 Castrolease (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 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

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.

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

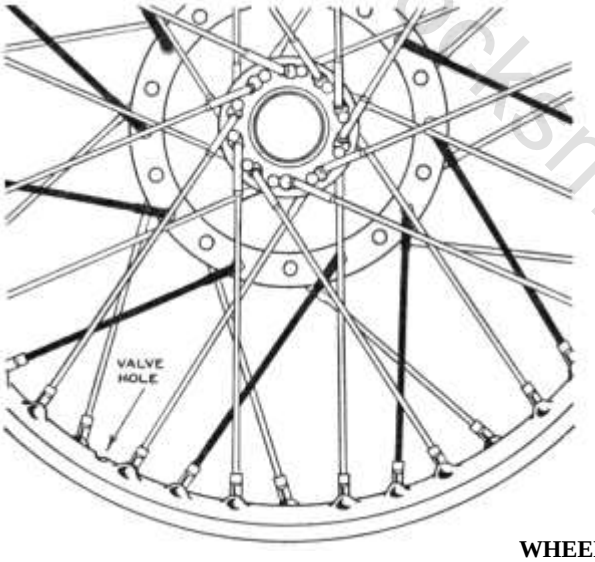


Fig. 6A Dunlop Rim

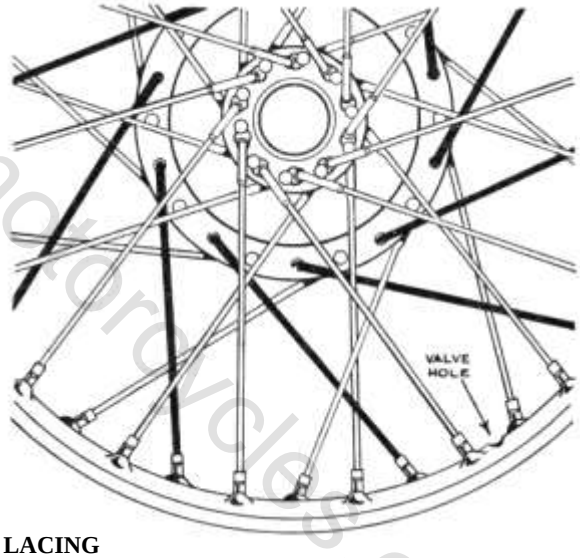


Fig. 6B Palmer Rim

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

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 :-

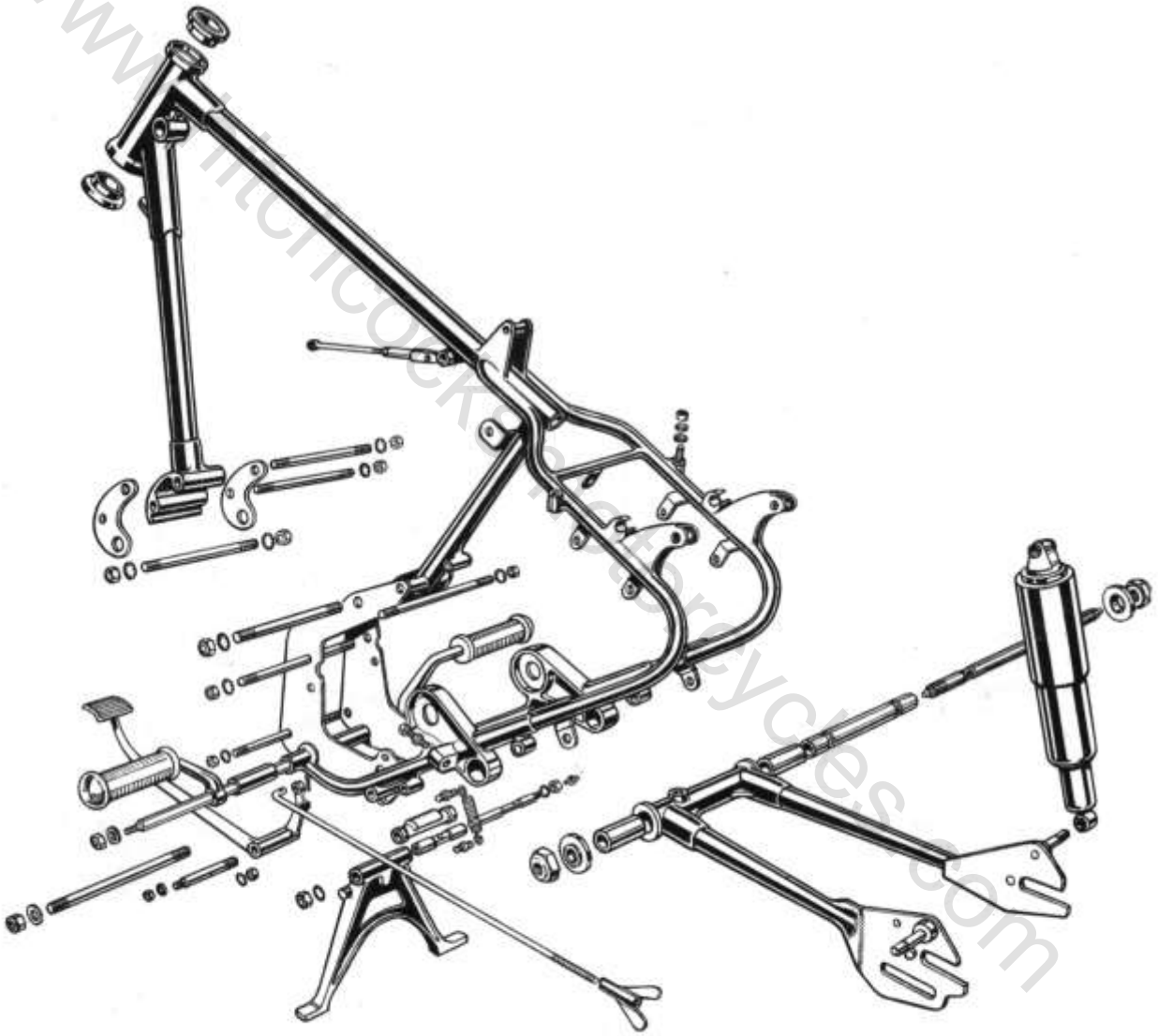
	Inflation Pressures-lb. per sq. in.					
Tyre Section Inches	16	18	20	24	28	32
	Load per tyre-lb.					
3.00	-	-	-	240	300	350
3.25	-	240	280	350	400	440
3.50	280	320	350	400	450	500

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.

SPRING FRAME
Model G deluxe and 350 Clipper



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.

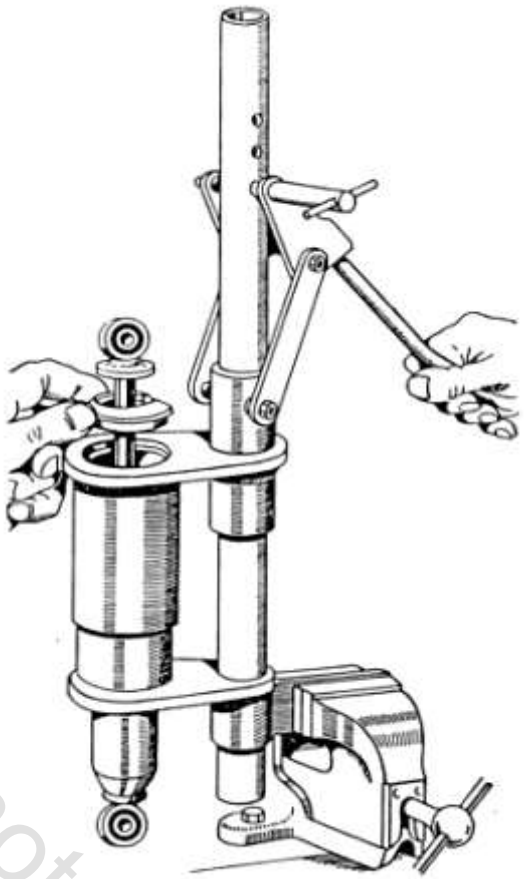
3. Removal of Rear Suspension Unit

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.

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.



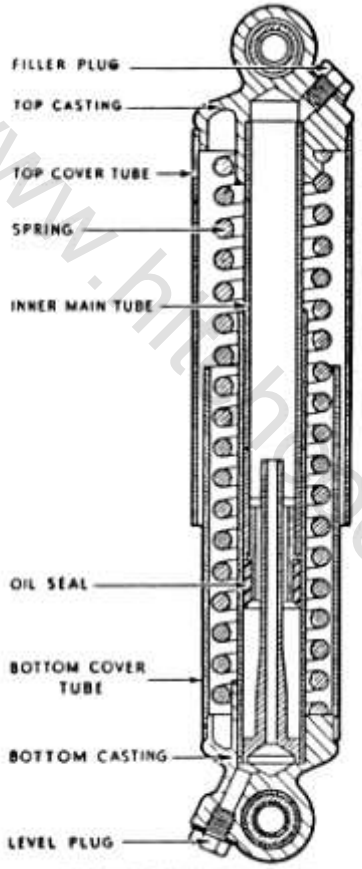
REAR SPRING COMPRESSOR
Fig. 2

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 100105lb. 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 200lb per inch (when fitted on 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.



ROYAL ENFIELD UNIT
MARK I
Fig. 3

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.

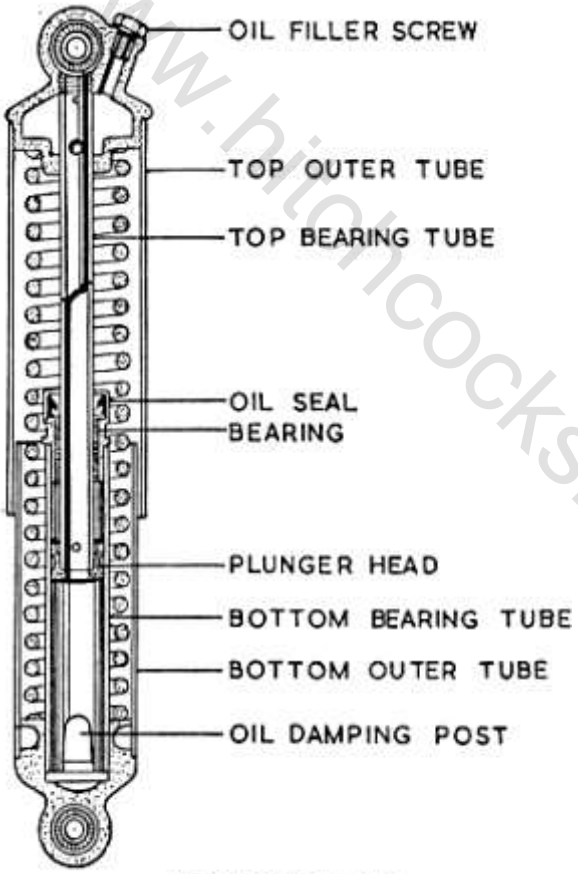
(c) Royal Enfield Units. Mark II. Enfield rear suspension units, Part No. 38109, are shown in Fig. 4. This type provides positive damping on the rebound stroke and in consequence does not need the spring to be anchored on scrolls. The range of movement is greater than the Mark I dampers and on account 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.

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-I00 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

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.

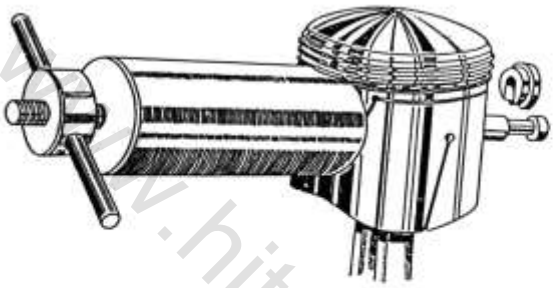
It is usual to check the alignment of the wheels at a point about six inches above the ground but, if the alignment is checked Also towards the top of the wheels, it will be possible to ascertain whether or not the frame is twisted so as to cause one wheel to be leaning while the other is vertical. To 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

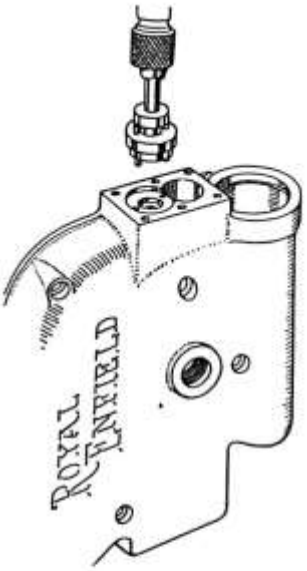
The steering head races, swinging arm pivot bearing and stand pivot bearing should be well greased on assembly. The swinging arm pivot and stand pivot are provided with grease nipples but no nipples are provided for the steering head as experience has shown that the provision of nipples at this point 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 Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C.3 or Shell Retinax A.

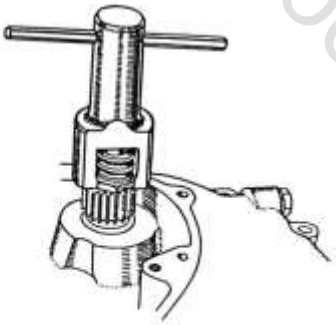
SPECIAL TOOLS



E.5477
GUDGEON PIN EXTRACTOR

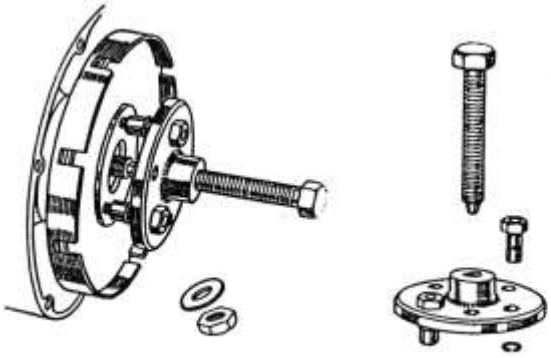


E.5425
PUMP DISC LAPPING TOOL



E.5451
PUMP WORM SPANNER

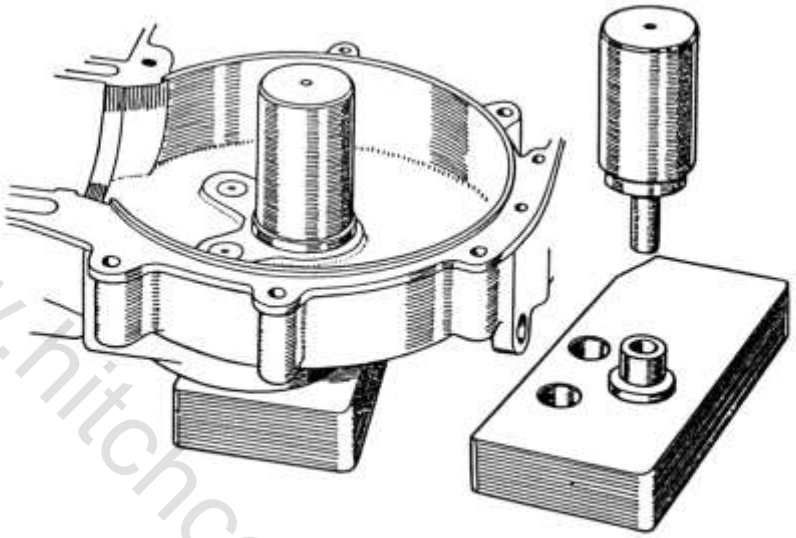
14835
MAGDYNO SPROCKET
EXTRACTOR



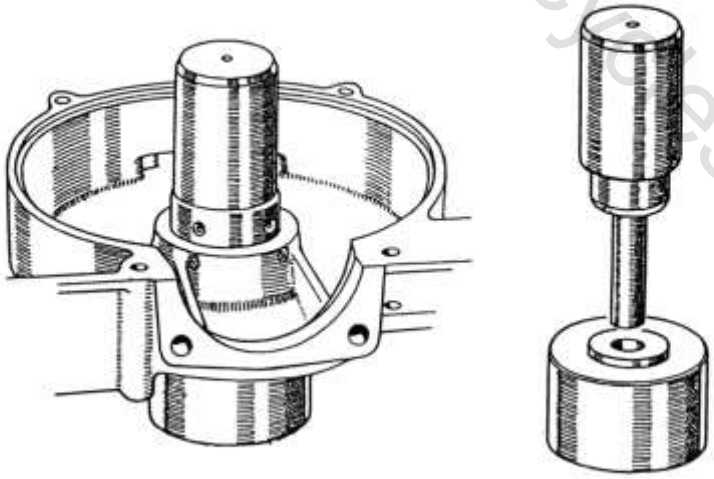
E.5414
EXTRACTOR FOR CLUTCH CENTRE

E.4871
BRAKE BAR FOR CLUTCH CENTRE

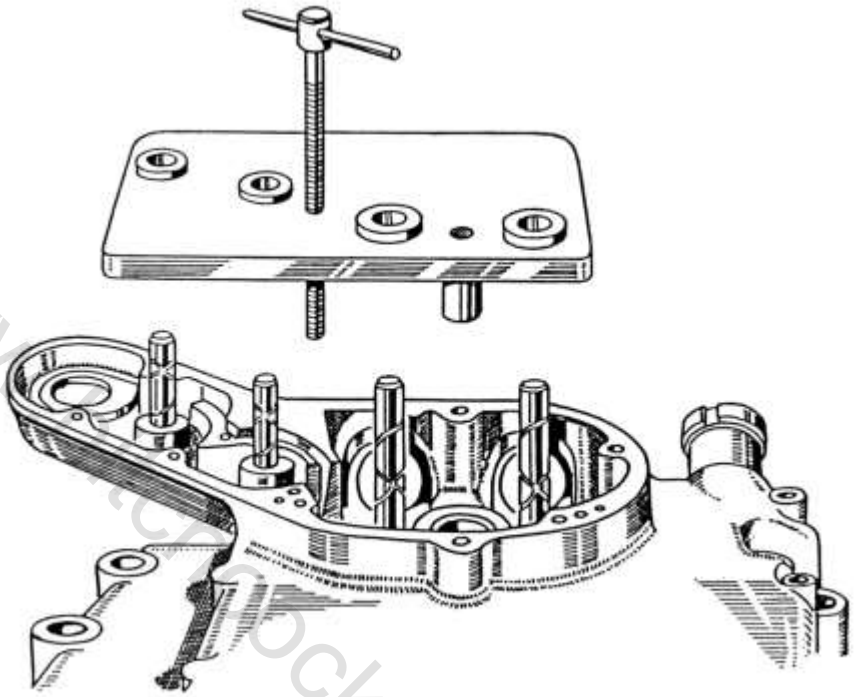
TOOLS FOR FITTING BUSHES



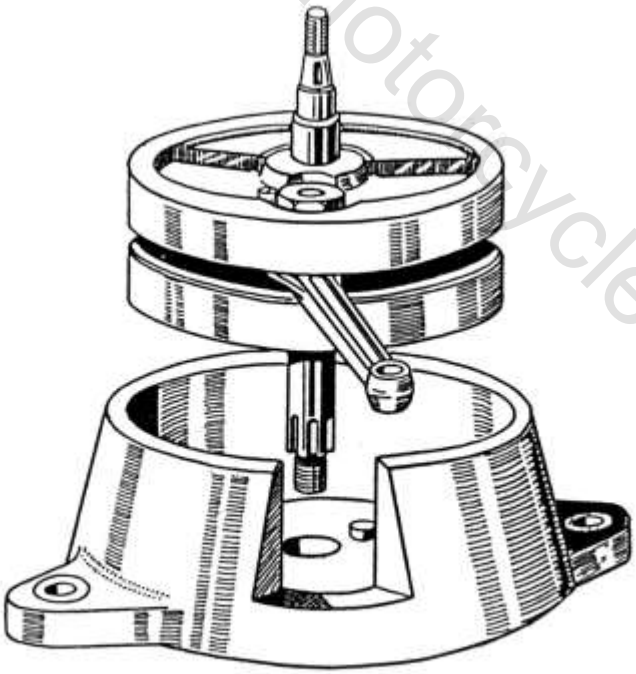
E.4816
ROLLER RACE, TIMING SIDE



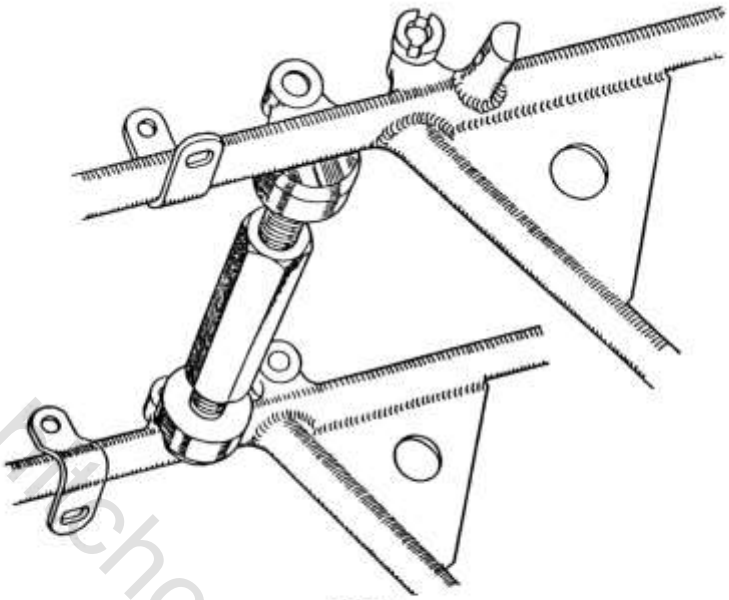
E.5119
ROLLER RACE TO CRANKCASE, DRIVING SIDE



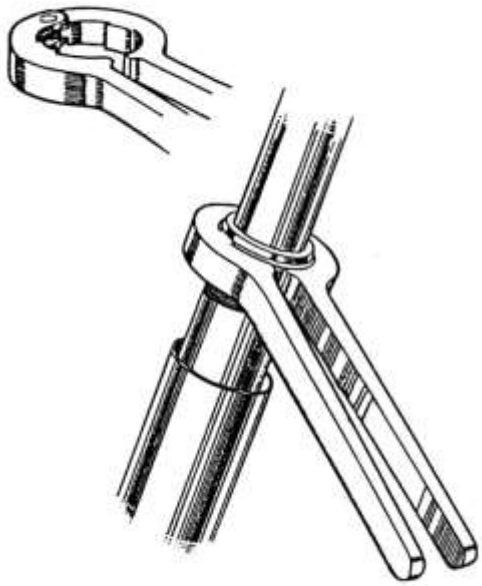
E.6462
LOCATING PLATE FOR ASSEMBLY OF CAM SPINDLES



E.2775
FLYWHEEL ASSEMBLY POT OR JIG



E.5431
FRAME EXPANDER



E.5417
GLAND NUT HAND GRIPS

E.5418
LOCKRING SPANNER