

**MAINTENANCE
MANUAL
AND
INSTRUCTION
BOOK**

for

1952

350 c.c. and 500 c.c.

MATCHLESS
SPRING FRAME AND RIGID
SINGLE CYLINDER MODELS

PRICE 2/6 NETT



MATCHLESS
MOTOR CYCLES

ROBINSON ASSOCIATED MOTOR CYCLES LIMITED
PLIMSTED · LONDON · S.E.18

Printed in England

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EDITION CM-11

WHEN CORRESPONDING REGARDING
SERVICE OR SPARES

ALWAYS QUOTE
THE COMPLETE ENGINE NUMBER

(Including all letters in it)

THIS ENABLES US TO IDENTIFY THE MACHINE

EACH SERIES OF FRAMES IS NUMBERED FROM ZERO
UPWARDS. THEREFORE THE QUOTATION OF A
FRAME NUMBER ONLY DOES NOT PERMIT A MACHINE
TO BE IDENTIFIED.

MAINTENANCE MANUAL AND INSTRUCTION BOOK

for
MATCHLESS
1952

SINGLE CYLINDER MOTOR CYCLES



Compiled and Issued by the Manufacturers:

MATCHLESS MOTOR CYCLES

(Proprietors): ASSOCIATED MOTOR CYCLES LIMITED

Registered Offices:

PLUMSTEAD ROAD, PLUMSTEAD
LONDON, S.E.18 .. ENGLAND

Nearest Station:
WOOLWICH ARSENAL
(Southern Region Railway)

Factories:
BURRAGE GROVE and MAXEY ROAD
PLUMSTEAD, S.E.18

Telegrams and Cables: "MATCHLESS, WOL-LONDON"

Telephone: WOOLWICH 1223 (5 Lines)

Codes: A.B.C. 1st and 2nd Edition; Bentley's; and Private Codes

All correspondence to:—

MATCHLESS MOTOR CYCLES, PLUMSTEAD ROAD, LONDON, S.E.18

Price: TWO SHILLINGS and SIXPENCE

EDITION CM-18

1952 MATCHLESS MODELS

350 MODEL G3L RIGID FRAME (TOURING)
350 MODEL G3LS SPRING FRAME (TOURING)
350 MODEL G3LC RIGID FRAME (COMPETITION)
350 MODEL G3LCS SPRING FRAME (COMPETITION)

500 MODEL G80 RIGID FRAME (TOURING)
500 MODEL G80S SPRING FRAME (TOURING)
500 MODEL G80C RIGID FRAME (COMPETITION)
500 MODEL G80CS SPRING FRAME (COMPETITION)

350	Bore 49 mm.	Stroke 93 mm.	Capacity 347 c.c.
500	Bore 82.5 mm.	Stroke 93 mm.	Capacity 496 c.c.

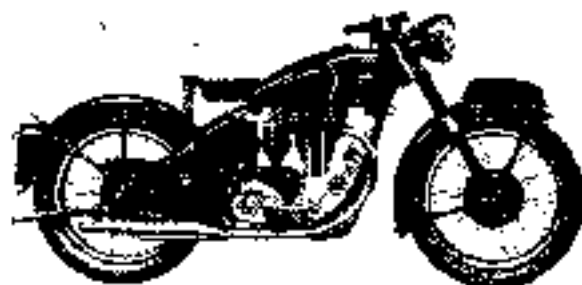
INTRODUCTION

Motorcycling is one of the most economical and pleasurable modes of transport. It is our sincere wish that every "MATCHLESS" owner should obtain, from his mount, the service, comfort and innumerable miles of low-cost travel that we have earnestly endeavored to build into it. However, it must be remembered that, although a motor cycle is of simple design and construction, it is, nevertheless, a highly specialized piece of engineering. In consequence, it must be intelligently and efficiently maintained in order to provide unfailing reliability.

In this book are non-technical instructions for carrying out all the maintenance operations likely to be called for in strenuous service and illustrations are provided to assist. Neglect or careless adjustment, or a casual attention to lubrication and the lack of periodical maintenance attention will soon neutralise the best efforts of the designers and may bring needless expense to the owner.

We are always pleased to give "MATCHLESS" owners the full benefit of our wide experience in matters relating to motor cycles of our manufacture and elsewhere will be found details of the particulars that should be given us when making such an enquiry.

MATCHLESS MOTOR CYCLES



1952
RIGID
G3L and G80



1952
SPRING
G3LS and G80S



1952
RIGID
COMPETITION
G3LC and G80C



1952
SPRING
COMPETITION
G3LCS and G80CS

Ignition (magneto)

Model	Make	Type	Location	Spark gap	Ignition point, before top dead center, with contact fully advanced position
Touring	Lucas	M14	Ahead-mast	0.13 in.	1.5° (1975)
Competition	Lucas	M11	Ahead-mast	0.12 in.	1.5° (1975)

Lighting (bulbs)

Location	Type	Voltage	Wattage	Code	Part number
Head lamp (Pro-class)	Double filament	6	30/40 W	Special	312
Head ..	Single filament	6	5	M.B.C.	425
Rear lamp ..	Single filament	6	5	M.B.C.	518
Speedometer	Single filament	6	5 W	M.B.C.	5345

Over-size parts

The following are the only over-size parts provided for the 350 and 500 cc single cylinder machines.

Ignition rollers:
001 in. and 0.015 in.
Cylinder bores:
0.003 in. and 0.004 in. oversize
Piston and rings:
0.003 in. and 0.004 in. oversize

Pistons (standard size)

Model	Top of crown to crest	Bottom of first diameter	Part number
350	3.2156 in.	3.2180 in.	01350A
500	3.2493 in.	3.2494 in.	01350B

All above measurements are subject to a tolerance limit of ±0.002 in.

Piston rings

Piston ring groove—Normal	0.014 in.
—Competition motor only	0.010 in.
Piston ring clearance—Standard	0.002 in.

Sparking Plug

Model	Make	Type	Thread	Length	Spark gap
All	K.L.C.	REC	14 mm	1.5 in.	0.15 to 0.16 in.

Spokes (350 and 500 rigid and spring frame Touring models)

Location	Type	Gauge	Length under head	Quantity	Part number
Front, left side	Butted	8x10	34 in.	20	011010
Front, right side	Butted	9x11	34 in.	20	011011
Rear, left side	Butted	7x9	31 in.	20	011012
Rear, right side	Butted	7x9	31 in.	20	011012

Spokes (350 and 500 rigid and spring frame Competition models)

Location	Type	Gauge	Length under head	Quantity	Part number
Front, left side	Butted	8x10	45 in.	20	012066
Front, right side	Butted	9x11	44 in.	20	012111
Rear, left side	Butted	6	31 in.	20	012067
Rear, right side	Butted	6	31 in.	20	012067

Valve timing (with 0.16 inch rocker clearance)

INLET VALVE		EXHAUST VALVE	
Closes before top dead center	32°	Closes before top dead center	340°
Clears after bottom dead center	63°	Closes after top dead center	300°

Valve timing pinion

Retained by nut, threaded 6 in. on 24 in. x 0.50 in. Left hand thread. Part number 003331

Weight

Weight of machine with empty tanks

Model	Standard rigid frame	Competition rigid frame
350	244 lbs.	200 lbs.
500	353 lbs.	324 lbs.

Wheels (bearing and play)

Bearing end play ... 0.01 in. (0.012 in. permissible rim rock).

CONTROLS

- (1) **Throttle twist grip.** On right handlebar. Twist inwards to open. When fully closed engine should just idle when hot.
- (2) **Air lever.** Small lever on right handlebar. Pull inwards to increase air supply to carburettor. Once set, when engine has warmed up, requires no alteration for different road speeds. Should be fully closed when starting engine from cold.
- (3) **Ignition lever.** Small lever on left handlebar. Advances and retards ignition point. Pull inwards to advance on touring mode's (retard on competition mode's). Retard two-fifths of total movement for starting.
- (4) **Valve lifter lever.** Small lever close to clutch lever. Lifts exhaust valve from seat, releasing compression in combustion chamber, enabling engine to be easily rotated for starting. Also used for stopping engine if throttle stop is set as advised above.
- (5) **Clutch lever.** Large lever on left handlebar. Grip to release clutch so that drive to rear wheel is disconnected.
- (6) **Front brake lever.** Large lever on right handlebar. Grip to operate front wheel brake and, for normal braking, use in conjunction with rear brake application.
- (7) **Rear brake lever.** Pedal close to left side foot rest. Depress with left foot to apply rear brake. Apply gently and use increasing pressure as the road speed decreases.
- (8) **Gear change lever.** Pedal in horizontal position close to right foot rest. Controls selection of the four speeds, or ratios, between engine and rear wheel revolutions, with a "free," or neutral, position. See illustration 3.
- (9) **Kick-starter lever.** Vertical pedal on right hand side of gear box.
- (10) **Lighting switch.** In top of head lamp. Controls lamps by a rotating lever which has three positions:
 - (1) "OFF" Lamps not on.
 - (2) "L" Pilot bulb in head lamp and rear lamp and speedometer lamp on.
 - (3) "H" Head and rear lamp and speedometer lamp on.
- (11) **Ammeter.** In top of head lamp. Indicates flow of electric current, in, or out, of battery ("Charge" or "Discharge.")
- (12) **Horn switch.** Press switch on right handlebar.
- (13) **Gear box filler cap.** Located on top edge of kick-starter case cover. Allows insertion of lubricant and access to clutch inner wire.
- (14) **Footrest for rider.**
- (15) **Petrol tank filler cap.** Located in top of fuel tank. To release, slightly depress, turn fully to the left, and then lift away. There are two locking positions. The middle position, between the fully tightened down and "lift away" positions, is in the nature of a "safety" device to prevent loss that might be occasioned by unauthorised meddling.
- (16) **Oil tank filler cap.** Located on top edge of oil tank. The construction and operation is exactly as the petrol tank filler cap.
- (17) **Dipping switch.** Trigger switch on left handlebar. Used to select normal or "dipped" beam of head lamp when main lighting switch lever is in the "H" position. (The head lamp bulb has two filaments.)

If any adjustment is made to the rear brake pedal make certain the brake does not bind and also see there is not excessive free pedal movement before the brake comes "on."

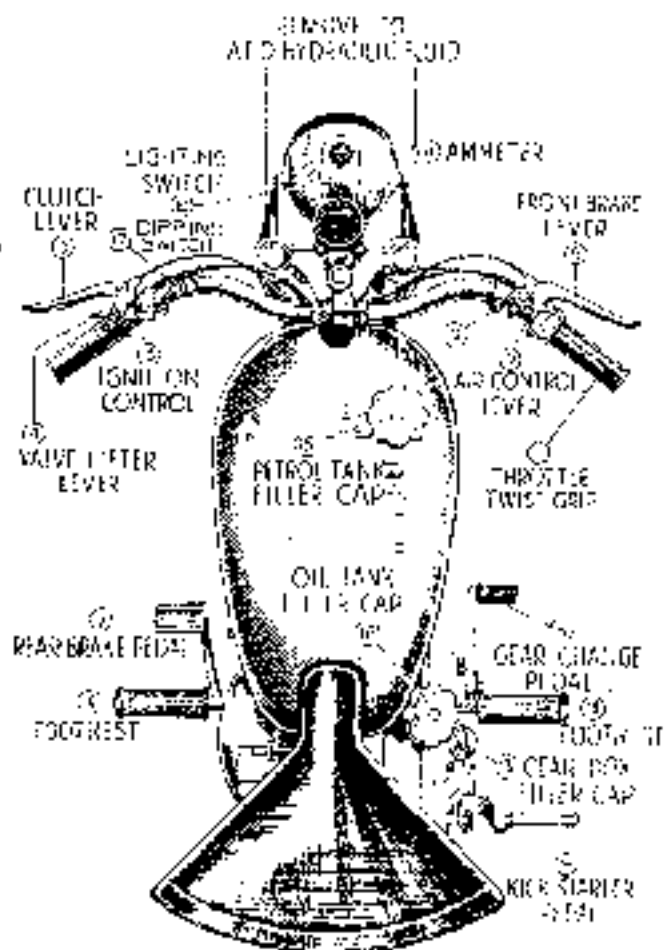


Illustration 1

Showing Controls

Before using the machine, sit on the saddle and become familiar with the position and operation of the various controls. Pay particular attention to the gear positions.

DRIVING

FUEL

At the time of publishing this instruction book only one grade of motor fuel (Prestige Spirit) is on sale, but it may be that soon the various grades of pre-war petrol will again be available when the use of best quality fuel is recommended because the small amount of economy that might be considered to accrue by using the cheaper grades is more than offset by the advantages obtained by using only Number One grades.

FUEL SUPPLY

Two fuel feed taps are situated underneath the rear end of the petrol tank. (One on each side.) Both must be shut off when the machine is left standing for more than a few minutes.

The two plungers work horizontally. To open, the hexagon knob (marked "push on") is pushed towards the body of the tap. To close, press the round milled knob (marked "push off").

Normally, only use the tap on the right hand side of the machine and then the other side will act as a reserve supply. Always refuel as soon as possible after being forced to call upon the reserve (approx. 1 gallon), and then, at once, close the "reserve" tap.

It will be noted that, by fitting two petrol feed taps, it is possible to remove the petrol tank from the machine without the necessity of first draining it of fuel.

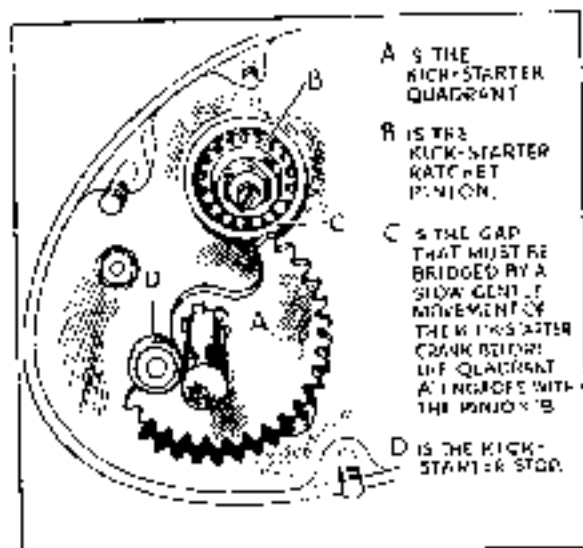


Illustration 1

Kick-starter quadrant and ratchet pinion

STARTING THE ENGINE

- See that there is sufficient fuel in the petrol tank.
- See that there is sufficient oil in the oil tank.
- See that the gear pedal is in the neutral position.
- Push inward the hexagonal end of off-side petrol tap slide.
- See that the air control lever is in the fully closed position.
- Fully advance the ignition and then slack back the control lever two-fifths of its total movement.
- Open the throttle not more than one-sixth of the total movement of the twist grip.
- Depress the plunger on the top of the carburettor float chamber until it can be felt the chamber is full of petrol.
- Raise the valve lifter lever and, while keeping it raised, turn over the engine several times by depressing the kick-starter pedal three times, the object being to free the engine. (This step applies if the engine is cold.)
- Depress the kick starter until compression is felt, then raise the valve lifter lever and when the engine just over compression. Then, after allowing the kick starter pedal to return nearly to its normal position, give it a long swinging kick with the valve closed. Flywheel momentum will carry over compression and the engine should fire immediately. If it fails to do so repeat exactly the same process.

Do not allow kick starter to return violently against its stop.

The kick-starter mechanism must be allowed to engage properly before putting heavy pressure on the kick-starter crank pedal pin. That means there are two definite and separate movements when operating the mechanism by depressing the crank.

The first is a slow and gentle movement which ends when it is felt the quadrant has engaged with the teeth on the ratchet pinion. (See illustration 2.)

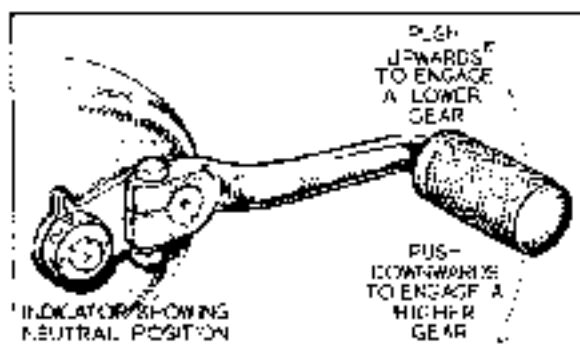


Illustration 2

Showing the gear indicator lever which upon assembly is set in regard the various gears and neutral position, as the respective figure or letter M registers with index mark on the gearbox shell.

Upon assembly, after dismantling for any purposes, index mark should be correctly reset for future reference.

The first slow and gentle movement is essential to avoid damage to the teeth of the kick-starter quadrant.

After the engine has started, slowly open the air lever until it runs evenly. Then set the throttle so that the engine is running at a moderate speed (without racing and ticking over) and allow to warm up. While doing this, check the oil circulation as detailed in page 14. The machine can then be taken on the road.

NOTE—Do not race up the engine from cold and do not flood the carburettor so much an excess of petrol is dripping, because then, in the event of a backfire, there is a danger of such loose petrol igniting. This cannot possibly happen if the starting instructions are carefully followed, but, in the event of a fire, there is no cause for panic. Merely turn off the petrol tap to isolate the main supply, open wide the throttle and turn over the engine by operating the kick-starter pedal when action will extinguish the fire.

STOPPING THE ENGINE

To stop the engine, close the throttle, raise the valve lifter lever and keep it raised until the engine has ceased to revolve.

ON THE ROAD

Having started and warmed up the engine, take the machine off the stand, sit astride it, free the clutch by pulling up the large lever or the left bar and engage the lowest gear. Next, slowly release the clutch lever and the machine will commence to move forward. As it does this, the engine speed will tend to drop as it picks up the load so it will be necessary to increase slightly the throttle opening, bit by bit, to keep the engine speed gently rising.

When well under way, disengage the clutch, slightly close the throttle, engage second gear and release the clutch lever, then open up the throttle to increase the speed of the machine. Repeat these operations in order to engage third and top gears.

To engage a higher gear the pedal is pressed downward with the toe and a lower gear is obtained by raising the pedal with the instep. To engage first gear from the neutral position, the pedal is therefore raised. After each pedal movement, internal springs return the pedal to its normal horizontal position.

The pedal must be moved to the full extent of its travel when selecting a gear, either up or down. It must not be "stamped down" or pushed, but firmly and decisively moved till it stops. A half-hearted movement may not give full engagement. Keep the foot off the pedal when driving and between each gear change because, unless the lever can freely return to its normal central position, the next gear cannot be engaged. Finally, fully advance the ignition and leave it in that position unless it is necessary to retard in order to ease the engine and so prevent "plinking" when pulling hard on a gradient.

STOPPING THE MACHINE

To stop the machine, close the throttle, disengage the clutch by lifting the large lever or the left handlebar, and gently apply both brakes, increasing the pressure on them as the road speed of the machine decreases. Raise the gear change foot pedal in the neutral position and stop the engine.

Before leaving the machine, turn off the fuel supply.

IMPORTANT NOTICE

NEVER DRIVE AWAY AT HIGH SPEED WHEN STARTING A RUN WITH A COLD ENGINE. GIVE THE OIL A CHANCE TO WARM UP AND THIN OUT, PARTICULARLY WHEN THE MACHINE IS COLD, UNTIL THE OIL REACHES ITS NORMAL RUNNING TEMPERATURE THE CIRCULATION IS RESTRICTED. SEIZURES CAN BE AVOIDED BY TAKING THIS SIMPLE ESSENTIAL PRECAUTION.

RUNNING IN

Although it is customary to quote permitted maximum speeds on the various gears during the period of running in, these are really no guide to overdriving. The main potential thing to avoid being the use of large throttle opening.

If the precaution is taken of limiting the use of the throttle to about one-third of its opening during the first 1,000 miles, irrespective of the road speed, and whether on the level or climbing, the necessary conditions for running in will have been observed.

Special attention must be given, during the running in period, to such details as valve rocker adjustment, chains, brakes, contact breaker points, and steering head bearings, all of which tend to bed down in the first hundred miles or so. Particular note must be made of the adjustment of steering head bearings, which, if run in a slack condition, will be quickly ruined. After this bedding down process has taken place, adjustments to such details will probably only be necessary at lengthy intervals.

After about 1,000 miles have been covered larger throttle openings may be gradually indulged in for short bursts only.

Until at least 2,000 miles have been covered the owner of a new machine is strongly advised to curb his natural desire to learn the mount's maximum capabilities. Restraint in this direction will be amply repaid later.

NOTES ON DRIVING

If, at first, the lowest gear will not engage, release the clutch lever and after a second or two, make another attempt. This condition may exist in a new machine, but it tends to disappear after a little use.

Always endeavour to make the movements of hand (on the clutch) and foot (on the gear pedal) as simultaneous as possible, and remember, in all gear changes, a steady pressure of the foot is desirable. This pressure should be maintained until the clutch is fully released. It is not sufficient just to jab the foot pedal and then release the clutch lever. When actually in motion, it will be found sufficient to merely free the clutch a trifle to ease the drive when changing gear and, with reasonable care, changes of gear then can be made without a sound.

Do not unnecessarily race the engine or let in the clutch sufficiently suddenly to cause the rear wheel to spin. Take a pride in making a smooth get-away.

When changing up to a higher gear, as the clutch is freed, the throttle should be slightly closed so that the engine speed may be reduced to keep in step with the higher gear ratio. Conversely, when changing down to a lower gear, the throttle should be regulated so that the engine speed is increased to keep in step with the lower gear ratio.

Do not slip the clutch to control the road speed.

The clutch must only be used when starting from a standstill and when changing gear. It must NOT be operated to ease the engine, instead of changing gear, or be held out, in order to "free-wheel."

The exhaust valve lifter is NOT used in normal driving on main and secondary roads.

When travelling slowly, such as may occur in traffic or on a hill, and the engine commences to labour, it is often necessary to change to a lower gear. Engine "snocking" or "pinging" and a harshness in the transmission are symptoms of such labour and although relief can sometimes be found by retarding the ignition, it is generally much better to change down. A good driver is able to sense such conditions and will make the change before the engine has reached the stage of distress. The gear box is provided to be used and consequently full use should be made of the intermediate gears to obtain effortless running and smooth hill climbing.

Keep the feet clear of the brake and gear pedals when not actually using them and keep the hand off the clutch lever when not in use.

Drive as much as possible on the throttle, making the minimum use of the brakes.

When using the machine on wet or greasy roads, it is generally better to apply BOTH brakes together, because sudden or harsh application of either brake only, under such conditions, may result in a skid.

In all conditions, it is advisable to make a habit of always using both brakes together, rather than habitually using the rear brake and reserving the front brake for emergency.

CHECKING OIL CIRCULATION

Provision is made to observe the oil in circulation and it is advisable to do this before each run.

If the filler cap on the oil tank is removed the bent over end of the oil return pipe will be noticed some two inches below the level of the filler cap orifice and the returning oil can be seen running from it. This check should be made immediately after starting the engine from cold. This is because while the engine is stationary, oil from all parts of the interior of the engine drains back into the crankcase sump, so that, until this surplus is cleared, the return flow is very positive and continuous. Therefore, if the oil circulation is deranged, the fact is apparent at once by the lack of a steady return flow.

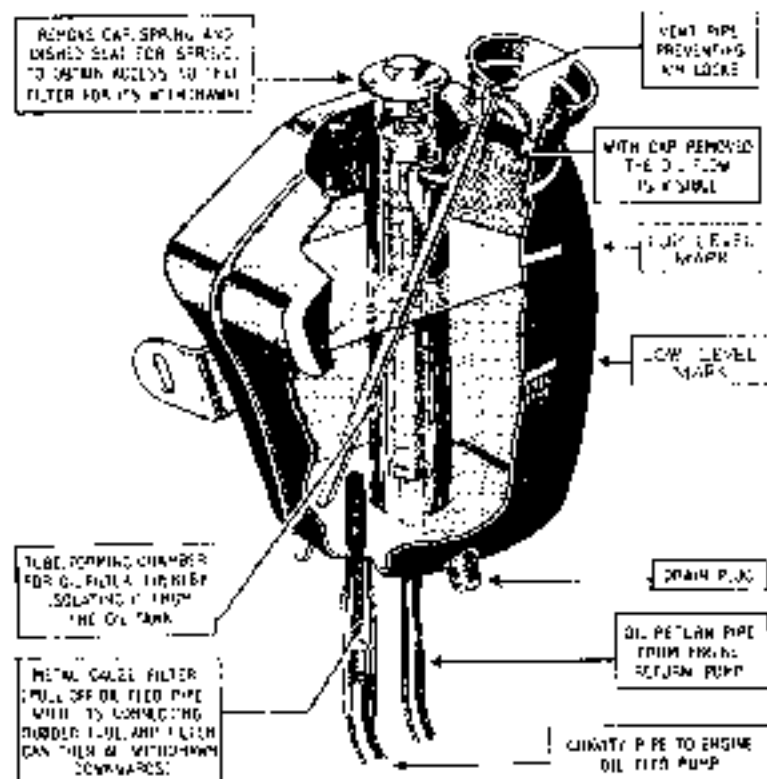


Illustration 4

Showing the oil tank with the felt filter in its cylindrical housing and the metal strainer mounted on the entry end of the lead pipe union. Also shows the direction of flow of oil from tank to engine and return flow from engine to tank via the small spout, located so that it can be inspected by removing the tank filler cap. An air vent pipe is provided to ensure freedom from air-locks.

LUBRICATION

LUBRICANTS TO USE

Efficient lubrication is of vital importance and it is false economy to use cheap oils and greases.

We recommend the following lubricants to use in machines of our make:

FOR ENGINE LUBRICATION

SUMMER		WINTER	
Mobilil BB	(SAE-30)	Mobilil A	(SAE-70)
Castrol "Grand Prix"	(SAE-60)	Castrol XCL	(SAE-30)
Price's Energol 60	(SAE-60)	Price's Energol 20	(SAE-30)
Esso-lube "Racer"	(SAE-60)	Esso-lube 30	(SAE-30)
Shell Motor Oil X-100	(SAE-60)	Shell Motor Oil X-100	(SAE-40)

FOR GEAR BOX LUBRICATION

Mobilil D	(SAE-50)
Castrol Grand Prix	(SAE-60)
Price's Energol 60	(SAE-60)
Esso-lube 50	(SAE-50)
Shell Motor Oil X-100	(SAE-60)

FOR HUB LUBRICATION AND ALL FRAME PARTS USING GREASE

Mobilgrease No. 2
 Castrolase Medium
 Price's Belmolime C
 Esso Grease
 Shell Retinax Grease C.D.

FOR TELEDRAGLIC FRONT FORKS AND TELEDRAGLIC REAR LEGS

Mobilil Arctic	(SAE-20)
Castrolite	(SAE-20)
Price's Energol 20	(SAE-20)
Esso-lube 20	(SAE-20)
Shell Motor Oil X-100	(SAE-20)

FOR REAR CHAINS

Tallow

When buying oils and greases it is advisable to specify the Brand as well as the grade and, as an additional precaution, to buy only in sealed containers or from branded cabinets.

FILLING THE GREASE GUN

The standard grease gun consists of a barrel having a spring loaded end cap, to which is fixed a central steel piston in the shape of a long rod. This piston fits into a small cylinder made in one with the screwed top cap, on the end of which is the tapered nozzle that fits over the grease nipple. In the barrel of the gun, and sliding on the central piston rod, is a cork piston.

The grease must be filled on the TOP of the cork piston. The gun may be filled by inserting the grease in the barrel of the gun by means of a lath or similar "spoon."

However, it is better to obtain the grease packed in the special containers that are supplied having loose collars in which are holes so that, by placing the barrel of the gun over the hole of the central floating plate and pressing downwards, the gun is instantly charged with grease. Twisting the gun, and, at the same time, taking it away from the floating plate, leaves the top of the gun barrel flush with grease, and then all that remains to be done is to replace the screwed top cap.

ENGINE LUBRICATION SYSTEM

This is by dry sump system. Oil feeds, by gravity, from the oil tank to the pump in the crankcase. The pump forces oil to various parts, which then drains to the bottom of crankcase sump. The pump then returns oil to the tank. This process is continuous while the engine is revolving. The pump is so designed that it has a greater capacity on the return side so that on the delivery side to ensure that all oil is extracted from the crankcase. A felt cartridge filter, in the oil tank, removes foreign matter collected by the oil in its passage through the engine. A metal gauze strainer is fitted to the oil feed pipe in the oil tank to prevent pieces of fluff, etc., which may find their way into the tank when replenishing, from entering the oil pump. (See Illustration 4.)

Felt filter and metal strainer should be cleaned in petrol each time the oil tank is drained.

ENGINE OIL PUMP

The pump has only one moving part. This is the plunger which revolves and reciprocates. Rotation is caused by the worm gear on the timing side flywheel axle. Reciprocation is caused by the guide pin which engages in the profiled groove cut on the plunger. Oil is fed to the pump through the lower of the two oil pipes between tank and crankcase and is returned through the upper pipe.

If, for any reason, the crankcase halves are separated, the oil pump plunger must be removed from its housing before attempting to separate the crankcase halves.

ENGINE OIL CIRCULATION

The oil pump forces oil through:—

- (a) A passage out through the timing side flywheel axle, timing side flywheel and crank pin to lubricate the big-end bearing. The splash passes to interior of cylinder, to lubricate the cylinder and piston, and then falls into the crankcase sump.
- (b) A passage in crankcase, controlled by ball valve, direct to the cylinder, to assist in cylinder and piston lubrication and then falls into the crankcase sump.
- (c) A passage in timing gear case where it "builds up" to a predetermined level to lubricate the timing gears and then overflows into the crankcase sump.
- (d) Through a pipe from the front of oil pump housing to the rocker box by which all rocker gear and valve stems are lubricated and then falls through the push rod cover tubes and tappet guides to the timing gear case and, from there, drains into the crankcase sump, as detailed in Para. (c).

The oil pump extracts oil in the crankcase sump and returns it to oil tank. On its way it passes through the felt cartridge filter placed in the oil tank.

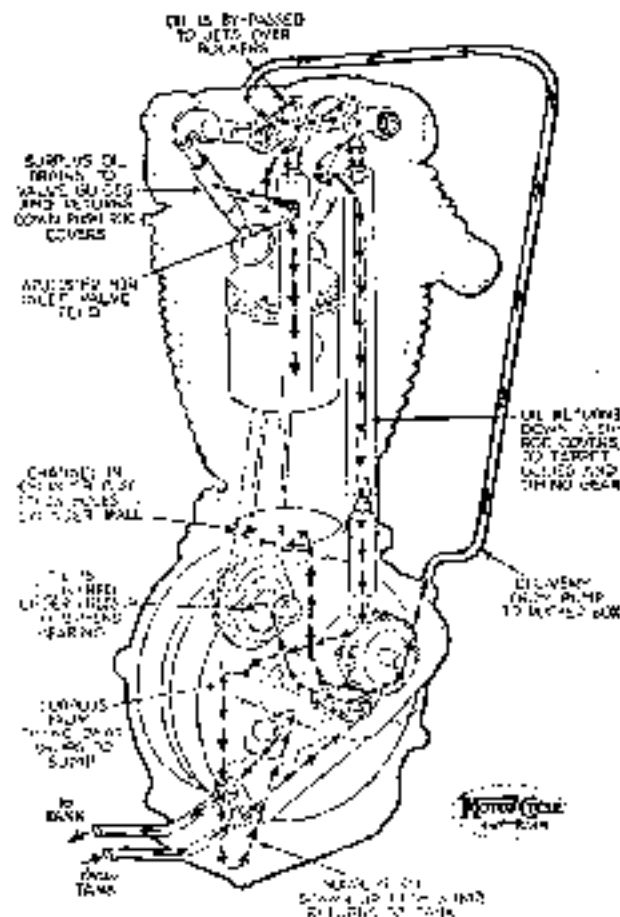


Illustration 5

Engine Oil Circulation

THE OIL TANK AND FILTERS

The level of oil in the supply tank should never be allowed to fall below the low level mark and, upon replenishment, should not be higher than the top level mark, otherwise, when starting the engine, the sink of oil in the crankcase sump may be greater than the space available in the tank.

The oil filter is made in a cylindrical form of chick felt and is supported by a tubular wire cage. The felt is not detachable from the cage.

A metal gauze strainer is secured in the tank end of the feed pipe union.

After the first 500 miles, again at 1,000 miles, and subsequently at 5,000 mile intervals, it is recommended that the oil tank is drained, the oil filter is cleaned in petrol and the tank replenished with new oil.

For access to felt oil filter —

Unscrew the hexagonal headed tap on top of oil tank and withdraw the dished washer and spring. Then insert a finger in the felt filter and gently move same until the tap end touches the underneath of saddle. Then by enclosing the filter with the hand it will be found possible to exert sufficient upward pressure on the flexible saddle cap to permit the filter to be completely withdrawn without distortion. Care is needed to avoid sinking the filter.

To re-fit filter —

Reverse above instructions.

NOTE—If, after the filter has been removed from the tank, it is damaged, so that the felt is perforated, or the ends distorted, it is essential to discard it and to fit a new filter.

Be careful to avoid damaging the filter or the cork washer under the hexagonal cap.

To remove and clean the feed pipe metal filter :

Release the oil feed pipe from the rubber connecting sleeve on the metal feed pipe protruding from the bottom of the oil tank.

The metal filter may come away with the rubber sleeve, in which case there is no need to disturb it. On the other hand it may remain in the oil tank bottom pipe, in which case it may be withdrawn by grasping the flanged open end and pulling away.

After removal the filter should be cleaned in petrol and allowed to dry before re-fitting.

Reverse the above procedure to re-fit the filter and pipes.

ADJUSTMENT OF OIL FEED

The internal flow of oil is regulated by fixed restrictions. No adjustment is provided except for the oil feed to the inlet valve stem. This adjustment is made by a needle pointed screw located in the right side of cylinder head. (See Illustration 6.) It is locked in position by a nut. The approximate correct setting is one-sixth of a complete turn from the fully closed position. Once set it requires little, or no, adjustment.

Inlet valve squeak indicates the oil feed adjustment is not open enough. Excessive oil consumption, a smoky exhaust or an oiled sparking plug, generally indicates the oil feed adjustment is open too much.

EXHAUST VALVE STEM LUBRICATION

The exhaust valve stem is lubricated by oil fed through a passage drilled in the cylinder head. No adjustment is provided. All excess oil is by-passed back to the timing gear case.

LUBRICATION POINTS TO REMEMBER

A dirty, or choked, felt oil filter causes heavy oil consumption. This is because the return flow of oil to the oil tank is reduced, or even a most completely stopped, thereby allowing an excess of oil to "build up" in the crankcase sump, much of which passes to the piston.

A clogged metal strainer in the gravity feed pipe, will also cause improper, or no, oil circulation. This can only occur as the result of adding dirty oil when replenishing the tank.

Both end caps on pump plunger housing must be airtight.

Check oil circulation before starting each run.

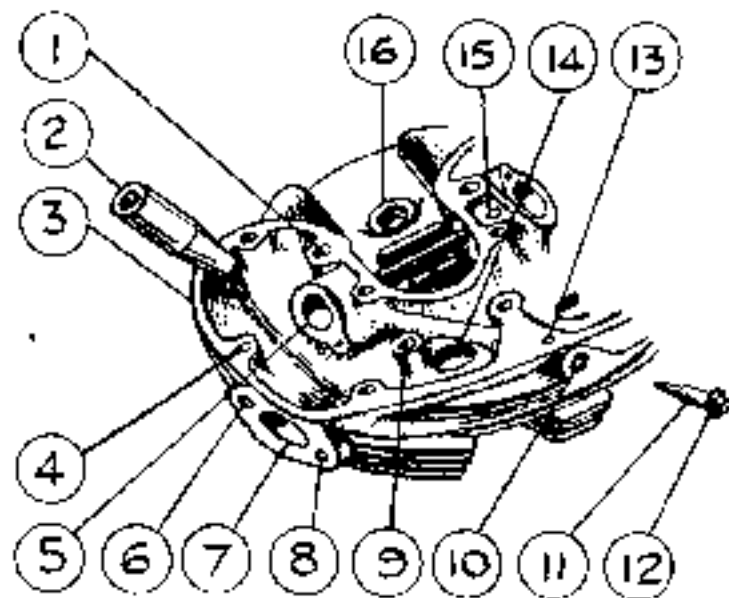


Illustration 6

The inlet valve guide is shown withdrawn as also is the inlet valve stem adjusting screw (with lock nut)

- | | |
|--|---|
| 1 PLAIN HOLE TO ACCOMMODATE CYLINDER HEAD RETAINING BOLT. | 9 TAPPED HOLE TO ACCOMMODATE NEEDLE SCREW. |
| 2 GUIDE FOR VALVE. | 10 NEEDLE SCREW, ADJUSTING OIL FEED TO INLET VALVE. |
| 3 CYLINDER HEAD. | 11 LOCK NUT, FOR NEEDLE ADJUSTING SCREW. |
| 4 TAPPED HOLE, TO ACCOMMODATE ROCKER BOX RETAINING BOLT. | 12 PLAIN HOLE, FOR OIL FEED TO INLET VALVE. |
| 5 PLAIN HOLE TO ACCOMMODATE VALVE GUIDE. | 13 PLAIN HOLE, FOR OIL FEED TO EXHAUST VALVE. |
| 6 TAPPED HOLE TO ACCOMMODATE CARBURETTER RETAINING STUD. | 14 PLAIN HOLE, TO ACCOMMODATE PUSH ROD COVER (BUSH) WASHER. |
| 7 INLET PORT. | 15 PLAIN HOLE, FOR OIL FEED TO EXHAUST VALVE. |
| 8 TAPPED HOLE, TO ACCOMMODATE CARBURETTER RETAINING STUD. | 16 TAPPED HOLE, FOR SPARKING PLUG. |
| 9 PLAIN HOLE, TO ACCOMMODATE CYLINDER HEAD RETAINING BOLT. | |

GEAR BOX LUBRICATION

Use one of the grades of Oils already specified. In no circumstances must heavy grease be used.

Lubricant is inserted through the filter cap orifice mounted on top edge of kick-starter case cover.

The gear box must not be entirely filled with oil, and, under normal conditions, the addition of two fluid ounces of oil every 1,000 miles will be sufficient.

Excessive oil will cause leakage.

A screwed drain plug in gear box shell, low down at rear, facilitates gear box flushing and change of lubricant. An oil level plug adjacent to K-S spindle, indicates maximum permissible oil level (content 1 pint).

HUB LUBRICATION

Keep hubs packed with grease. This prevents entry of water and dirt. Grease nipples in centre of hubs. Inject small quantity of grease. Excessive grease may impair efficiency of brakes.

CHAIN LUBRICATION

Front driving chain and dynamo chain run on oil bath. (Front chain case.) Use engine oil. Maintain level to height of the inspection cap opening.

Oil in front chaincase also lubricates the engine shock absorber. Transmission harness generally indicates level of oil in chaincase is too low.

Remove chaincase inspection cap each week, inspect level of oil, top-up as necessary.

To remove inspection cap —

Unscrew knurled screw about four turns.

Slide cap sideways, till the back plate can be slipped through the opening, and take away the complete cap assembly.

When replacing inspection cap, centreise cork washer and then fully tighten knurled screw. Essential that it is kept tight otherwise cap assembly will be lost.

Rear driving chain should be removed for lubrication. Clean chain in paraffin, drain and wipe. Immerse in bath of mutton tallow, leave for several minutes, remove and allow excess lubricant to drain off and then replace on machine. Engine oil is a poor substitute for tallow and, if used, chain should be allowed to soak for several hours.

Lubricate rear chain every three thousand miles in Summer and every thousand miles in Winter.

Magneto chain runs in case packed with grease.

BRAKE EXPANDER LUBRICATION

Grease nipple on each brake expander bush. (One on each brake cover plate.) Use grease sparingly. Excessive grease may impair efficiency of brakes.

BRAKE ROD JOINT LUBRICATION

A few drops of engine oil on each brake rod yoke and pin and on clear threaded portion of brake rod. (One pin on yoke each end of brake rod and on bottom of foot brake cable.)

BRAKE PEDAL LUBRICATION

Grease nipple in heel of foot brake pedal.

SPEEDOMETER LUBRICATION

One grease nipple on top of speedometer gear box attached to right side of rear wheel spindle. (No other part of the speedometer requires lubrication.)

STAND FIXING BOLT LUBRICATION

Several of the parts of a motor cycle that have a very small amount of movement, such as the hinge bolts of the stands, should be lubricated.

STEERING HEAD BEARING LUBRICATION

One grease nipple on front frame Head Lug and another on right hand side of Handbar Lug.

CONTROL LEVER LUBRICATION

Occasionally a drop of engine oil on all moving parts of the handlebar control levers.

If twist grip is too stiff - remove two screws binding the two halves of the grip. This releases the grip which may be pulled off the handlebar. Smear handlebar, the drum on which the inner wire is wound and the friction spring on the half clip with grease and replace.

REAR FORK HINGE (spring frame models)

Heavy Gear Oil (see page 56)

WHEN ORDERING SPARES
ALWAYS QUOTE
THE COMPLETE ENGINE NUMBER
(including all the letters in it).

THIS ENABLES US TO IDENTIFY THE MACHINE.

EACH SERIES OF FRAMES IS NUMBERED FROM ZERO
UPWARDS. THEREFORE THE QUOTATION OF A FRAME
NUMBER ONLY DOES NOT PERMIT A MACHINE TO
BE IDENTIFIED.

LUBRICATION CHART

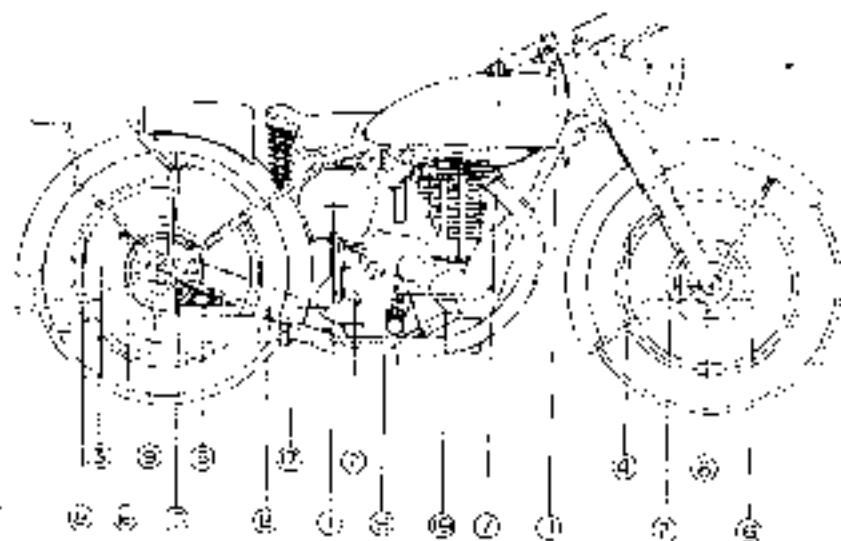


Illustration 7

Lubrication Chart

Engine Oil Locations	Motor Oil Location
1 MAIN OIL TANK.	11 GEAR BOX.
2 CONTROL LEVER TUNING PARTS	
3 BRAKE ROD JOINTS.	
4 FRONT FORK AND REAR STEM HINGE PINS.	
5 FRONT CHAIN CASE.	
Hydraulic Fluid Location	Grease Locations
6 FRONT FORK (Fill at Top).	2 FRONT HUB.
	3 REAR HUB.
	8 STEERING HEAD BEARINGS.
	9 SPEEDOMETER GEAR BOX.
Tallow Location	10 FRONT AND REAR BRAKE EXPANDERS.
7 REAR CHAIN.	15 REAR BRAKE SPINDLE.

When buying oils and greases it is advisable to specify the Brand as well as the grade and, as an additional precaution, to buy only in sealed containers or from branded canteens.

MAINTENANCE

SADDLE ADJUSTMENT

Saddle adjustment is provided at both front and rear ends. Importance is attached to the desirability of owners selecting the adjustment most to their liking. At the front end, the adjustment consists of three evenly spaced positions for the hinge bolt, accessible only upon removal of the petrol tank. At the rear end, adjustment is obtained by altering the position of the lower spring fixing nuts upon the screwed studs to which the springs are attached.

PERIODICAL MAINTENANCE

Regular maintenance, attention to lubrication, and certain adjustments must be made to ensure unfailing reliability and satisfactory service. This necessary attention is detailed below, and owners are strongly recommended to follow carefully these suggestions, and to make a regular practice of doing so from the first.

The reference numbers, in brackets, refer to the locations specified on the Lubrication Chart, Illustration 7.

DAILY

Oil tank Inspect oil level (11) and top-up if necessary. Check oil circulation.

Petrol tank Check level and re-fill if necessary.

WEEKLY

Oil tank Check level (1) and re-fill if necessary.

Tyres Check pressures and inflate if necessary.

EVERY 500 MILES

Oil tank Drain at first 500 miles and re-fill with new oil, and clean pet filter (1).

Chaincase Check level of oil when machine is standing vertically on level ground, when level of oil should not be less than $\frac{1}{8}$ " below bottom edge inspection orifice. (19.)

Rear chain If dry, apply engine oil with a brush. (5.)

Battery Inspect each cell for level of electrolyte and top-up with distilled water if necessary. (See pages 81 and 82.) Level of electrolyte should just be over top of plates.

EVERY 1,000 MILES

Oil tank	Drain at first 1,000 miles and re-fill with new oil. (1.)
Rear chain	Remove and soak in molten tallow in dry weather. (5.)
Gear box	Add 2 fluid ounces of specified oil. (12.)
Hubs	Inject small amount of grease. (12.3.)
Expanders	Inject small amount of grease. (16.)
Steering head	Inject small amount of grease. (11.)
Small parts	Smear sliding parts with engine oil and wipe off surplus.
Air Filter	(If fitted) clean and renew filter element.

EVERY 3,000 MILES

Rear chain	Remove and soak in molten tallow in dry weather. (5.)
Brake pedal	Inject small amount of grease. (17.)
Speedometer	Inject small amount of grease into speedometer gear box. (13.)
Magneto	Oil wiper on contact breaker. Smear capot with thin oil. Clean contact breaker points and re-set if necessary.
Plug	Clean sparking plug and re-set points if necessary.
Steering head	Test steering head for up and down movement and adjust (if necessary).
Bolts and nuts	Check all nuts and bolts for tightness and tighten if necessary, but beware of over-tightening.
Rockers	Check O.H.V. rocker adjustments and correct if necessary.

EVERY 5,000 MILES

Oil tank	Drain and re-fill with new oil. (1.) If machine is only used for short runs renew oil every three months instead of mileage interval.
Filters	Clean metal mesh filter in oil tank. (Illustration 4.) Clean felt fabric filter in oil tank.
Magneto	Clean as detailed in Electrical section.
Dynamo	Clean as detailed in Electrical section.
Front fork	Check each side of front fork for hydraulic fluid content and, if necessary, top up. (4.) Insufficient oil content is indicated by abnormally lively action.
Rear legs	(If fitted) Check each leg for hydraulic fluid content and, if necessary, top-up. (11-13.) Insufficient oil content is indicated by abnormally lively action. (Dealers' Service only.)
Carburettor	Remove carburettor float chamber and clean its interior.

EVERY 10,000 MILES

Magneto and Dynamo	Get a Lucas Service Station to dismantle, clean, lubricate and generally service.
Air Filter	(If fitted) renew filter element.

FREE SERVICE SCHEME

FREE SERVICE SCHEME

All owners of **NEW MODELS** are entitled to one **FREE SERVICE AND INSPECTION** at 500 miles, or, at least, three months after taking delivery.

This service is arranged by the supplying dealer to whom the Free Service Voucher must be handed. This voucher, together with the Instruction Manual, are supplied by us upon receipt of the signed application card to be found in the tool box upon taking delivery of a new motor cycle.

The **INSPECTION AND SERVICE** consists of :

- (a) Check, and, if necessary, adjust :
 - (1) Rocker clearances.
 - (2) Contact breaker points.
 - (3) Sparking plug.
 - (4) Clutch.
 - (5) Chains.
 - (6) Wheel bearings.
 - (7) Brakes.
 - (8) Forks, legs, and steering head.
 - (9) Alignment of wheels.
 - (10) Tyre pressures.
- (b) Tighten all external nuts and bolts, including cylinder bolts.
- (c) Top-up battery and check all lighting equipment.
- (d) Clean out carburettor and adjust mixture.
- (e) Adjust and lubricate cables.
- (f) Grease all nipples.
- (g) Drain oil systems. Clean filter and replenish.
- (h) Check oil level in front chaincase.
- (i) Top-up gear box.
- (j) Test machine on the road.

NOTE Oils, greases and materials used are chargeable to the customer.

FOR THE CONVENIENCE OF OWNERS, SPARES STOCKISTS

ARE APPOINTED FOR MOST DISTRICTS. TO
SAVE DELAY, AND THE DELIVERY SURCHARGE,
CUSTOMERS ARE RECOMMENDED TO ALWAYS
APPLY TO THEIR NEAREST SPARES STOCKIST.

ENGINE SERVICE

ACCESS

For almost all service work to the upper parts of the engine, it is necessary, in order to obtain accessibility, first, to remove the petrol tank. The two petrol taps facilitate this operation by removing the need to first drain the tank of petrol.

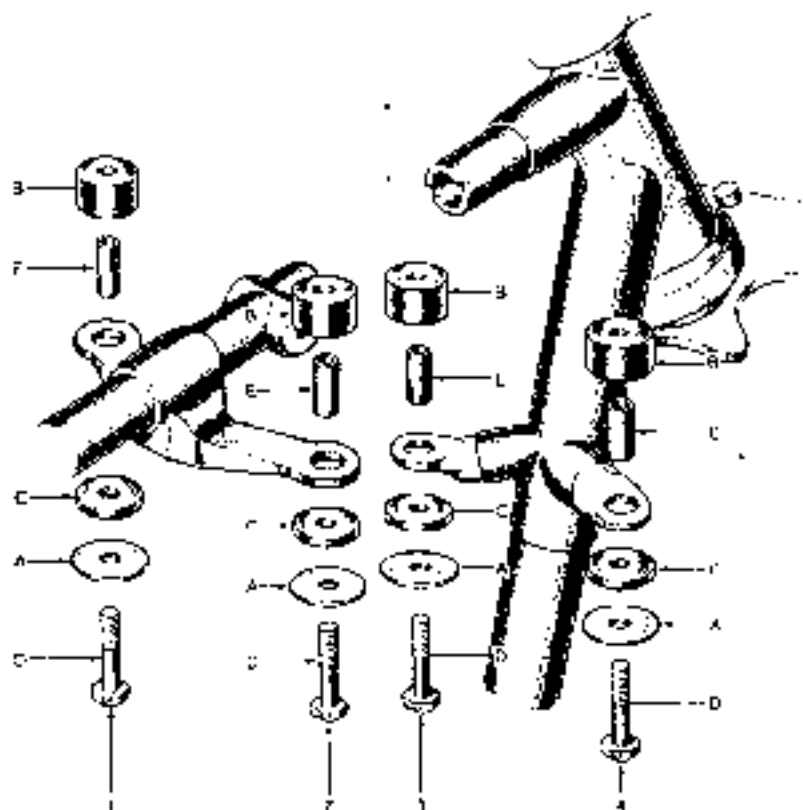


Illustration B

Showing details and order of assembly, of the fuel tank fixing bolts and components

		Part Number	
A	METAL WASHER	01499	12" diameter
B	THICK RUBBER PAD	01495	2" high
C	THIN RUBBER PAD	01496	4" high
D	TANK FIXING BOLT	04497	12" x 5/8" x 24
E	SLEEVE FOR FIXING BOLT	01498	8" long

TO REMOVE THE PETROL TANK

Close both petrol taps and disconnect the petrol feed pipe from each tap. (Use two spanners, one to hold the tap and the other to unscrew the union nut on the petrol pipe.)

Cut the wires interlacing the four fixing bolts.

Unscrew the tank fixing bolts and the tank is then free to be taken away.

NOTE—The disposition of the various rubber and metal washers and tubular spacers should be carefully observed so that they may be correctly replaced.

TO REPLACE THE PETROL TANK

Proceed in reverse order to removal. Screw firmly home the four fixing bolts and interlace them in pairs, with 22 gauge copper wire.

TO REMOVE THE ROCKER BOX

Remove the petrol tank.

Remove the three nuts and fibre washers retaining the rocker box side cover and take away the cover.

Disconnect the oil pipe leading on to the rocker box.

Turn over engine until both valves are completely closed.

On 500 c.c. model, remove engine steady bracket by removing bolts from frame clip and nuts and washers from the rocker box bolt extensions.

Remove the nine bolts retaining rocker box to cylinder head.

Disconnect valve filter pipe.

Tilt upward the right hand side of rocker box and extract the two long push rods. Lay these aside so they may be identified and replaced in their original position.

The rocker box may then be lifted off.

TO REPLACE THE ROCKER BOX

Carefully clean the top of cylinder head and lower face of rocker box.

Revolve engine until both tappets are down, i.e., the top dead centre of firing stroke. Lay the compression joining washer on cylinder head. This must be faultless if necessary, renew.

Lay the rocker box in position then slightly raise the right hand side to allow the long push rods to be inserted into the original respective positions.

Insert all nine rocker box fixing bolts and note that the bolt with three head is in the centre right hand position and on 500 c.c. models the bolts with threaded extensions are fitted on each side of the central slotted head bolt.

Tighten each bolt in turn by bit until all are fully home.

On 500 c.c. model replace the engine steady stay.

Turn engine over several times to ensure parts have bedded home.

Re-fix valve filter pipe.

Re-fix rocker box oil pipe union nut using two spanners to ensure that the union screwed into rocker box does not turn while the nut is being tightened.

Check tappet clearances and reset if necessary.

Inspect rubber filter on rocker box side cover and renew if not perfect.

Replace the side cover ensuring that a fibre washer is fitted under each of the three retaining nuts.

Beware of over tightening these nuts, the joint being made by the rubber & at excessive pressure is not necessary.

Repair the petrol tank.

DECARBONISATION

Instead of the usual stipulated mileage interval between periods of decarbonisation, it is recommended that this is undertaken only when the need for same becomes apparent because of excessive pinking, loss of power or generally reduced performance. When undertaken, unless it is thought necessary to inspect the piston and rings, the cylinder barrel is not left undisturbed. The various stages in decarbonisation are described below.

TO REMOVE THE CYLINDER HEAD

Remove

The petrol tank.

The sparking plug.

The rocker box.

Remove the exhaust system by :

Remove nut, and washers, retaining exhaust pipe to its stay.

Remove nut, and washers, retaining silencer to its stay.

Remove complete exhaust system, by pulling away from stays and then downwards, from the exhaust port in cylinder head.

Remove carburettor by :

Unscrew two carburettor retaining nuts.

Take away carburettor and rest on saddle.

Remove

The four bolts retaining cylinder head to barrel, and head is free to be taken away. Whilst doing this the push rod cover tubes will come away with the head.

If the sparking plug or cylinder head bolts resist removal, do not use force but brush paraffin round their heads and leave for a time to soak before making further effort.

TO REMOVE AND REPLACE THE VALVES

Remove the cylinder head.

Remove the valve springs by inserting a finger in the spring coil and sharply pull upward.

The top spring collar and split collet can then be removed leaving the valve free to be withdrawn.

A sharp light tap on the valve collar may be necessary to free the split collet. It will be observed that the valve spring seat has a raised impression on its under side which registers with a hole drilled on the valve guide bolts to ensure accurate positioning.

TO REPLACE A VALVE

After cleaning valve guide bores, smear each valve stem with clean oil. Insert, and apply top collar and split collet.

Then apply the valve springs which although possible to fit by hand are more easily manipulated with a special compressor tool Part No. D1E7/6 illustration 9. To operate this tool apply the top end of the valve spring to its groove in the top cap, then insert a short rod (one of the rocker box fixing bolts suits admirably) through the hole in this tool and the valve spring coils, and pull outward and upward until the ends of the prong of the spring can be rested on the seat, then press down with the fingers. Withdraw the line and when the compressor is against the cylinder head, retaining pressure with the fingers until the bolt has been withdrawn and the tool removed, when the spring can be readily pushed down in its proper location with the prongs lying flat upon the seat.



Illustration 9

Showing application of valve spring compressor

- | | |
|--|--|
| 1 COLLET FOR VALVE | 5 VALVE SPRING COMPRESSOR TOOL |
| 2 COLLAR FOR VALVE SPRING | 6 OIL PASSAGE FROM ROCKER BOX TO INLET VALVE GUIDE |
| 3 COLLAR FOR VALVE SPRING | 7 SCREW WITH LOCK NUT ADJUSTING OIL FEED TO INLET VALVE. |
| 4 BOLT THROUGH TOOL AND COILS OF VALVE SPRING. | |

NOTE—The special valve spring compressor tool is not part of the standard tool kit but is obtained from any of our dealers (Part No. D1E7/6.)

It is essential that the collets are correctly located on the valve stem. It will be observed that the collet has two grooves machined in the bore and those two grooves must register with the two rings on the valve stem. If fitted so that only one of the grooves engages the ringed valve stem, damage will almost certainly result.

On 350 c.c. the inlet valve head is larger in diameter than the exhaust. Therefore inlet and exhaust valves are not interchangeable and no mistake can be made when replacing same in the cylinder head.

On 500 c.c. both valve heads are identical in dimensions but are made of different materials. Therefore, upon removal, valves should be laid aside so that they may be identified for re-fitting. In case of doubt, see marking "Inlet" or "Ex" on stem adjacent to collet grooves.

SPARES LIST EDITION CL-21 PRICE 2/6
IS THE APPROPRIATE LIST FOR THIS SERVICE MANUAL

REMOVING CARBON DEPOSIT

Do not use a sharp implement for removing carbon deposit from the interior of the cylinder head and the piston crown. A blunt piece of soft brass will be found quite suitable and the use of such will obviate the risk of making deep scratches. Care is necessary to avoid damaging the valve seatings and in no circumstances should any abrasive material, such as emery, or emery cloth, be used for cleaning and polishing.

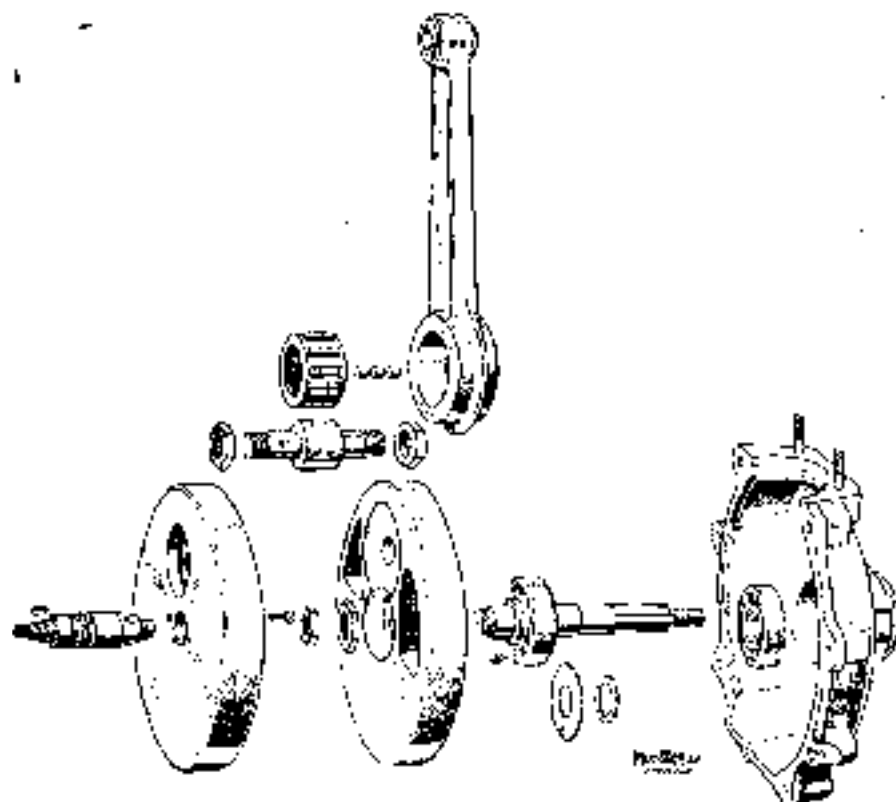


Illustration 10

Showing flywheel in exploded form

VALVE GRINDING

Before commencing valve grinding, carefully examine the tips of each valve and, if any are found to be deeply pitted, have them refaced. (Most garages have suitable equipment for that purpose.) Any attempt to remove deep pit marks by grinding will inevitably cause undue and undesirable widening of the seats.

As a rule, inlet valves require very little attention and one light application of fine grinding paste should be sufficient to restore an even matt finish to both valve face and seat. The exhaust valves may require two, or even three, applications but, as already mentioned, excessive grinding is both unnecessary and harmful.

The grinding is accomplished by smearing a thin layer of fine grinding paste (obtainable ready for use at any garage) on the valve face and then, after inserting the valve in the head, partially revolve, forwards and backwards, while applying light finger pressure to the head, raising the valve off its seat and turning to another position after every few movements. (Never revolve the valve completely in one direction.)

When the abrasive ceases to bite, remove the valve and examine its face.

The grinding may be considered to be satisfactorily completed when a continuous mating ring is observed on both valve face and seat.

After grinding, all traces of abrasive must be carefully washed off with petrol and a piece of rag, moistened in petrol, should be pulled through the bore of each valve guide to remove any abrasive that may have entered.

A holder for the valve, when grinding in the valve, can be supplied. The part number is D17485.

TO REPLACE THE CYLINDER HEAD

A gasket is fitted between cylinder head and barrel. (Touring models only).

The top ends of the piston rod cover tubes have rubber gaskets between tubes and head, they are a push fit and metal washers are inserted between the top edges of the gaskets and the cylinder head recesses. If the cover tubes are pulled away from the head, the gaskets will probably remain in position in the head.

A rubber gland is fitted at the bottom of each cover tube.

Replace the cylinder head by:

Carefully clean the top edge of the cylinder barrel and the under face of the cylinder head.

Fit the cover tubes, with their rubber gaskets and metal washers, into the cylinder head.

Place the cylinder head gasket in position on the top edge of the cylinder barrel.

Place a rubber gland round each taper guide.

Place the cylinder head in position.

Ensure each cylinder head securing bolt has a plain steel washer on it and then replace the bolts and engage each a few turns.

Finally, screw down the cylinder head securing bolts, in turn, bit by bit, till they are fully home.

Replace

The sparking plug, but before doing so it is desirable to coat thread with "Oil Dag" or graphite paste to prevent seizure upon next removal.

The rocker box, carburettor, exhaust system, and the petrol tank.

NOTE—If old gaskets are re-fitted they must be in an undamaged state otherwise new must be used.

TO REMOVE THE CYLINDER BARREL AND PISTON

Remove

The cylinder head.

The four nuts retaining cylinder barrel to crankcase.

Take away

Cylinder barrel. (Ensure piston is not damaged in doing this. Steady piston with hand as barrel is withdrawn.)

Fill throat of crankcase with clean rag to prevent entry of foreign matter.

Remove

One gudgeon pin circlip. It is immaterial which circlip is removed. Use special pliers included in tool kit.

Gudgeon pin by pushing it out of piston.

Take away piston.

NOTE—The gudgeon is an easy sliding fit in both piston and connecting rod small-end bush.

Rings may be removed from a piston by "peeling off" with a knife, or by introducing behind the rings three pieces of thin steel spaced at 120° from each other and then sliding off the rings. (Do not scratch the piston.)

TO REPLACE THE PISTON AND CYLINDER BARREL

All parts must be clean.

Place rings on piston. (Scrape first then the two compression.) (On 500 c.c. models the top compression ring is chromium plated and is marked on one edge "top" for refitting.)

Smear gudgeon pin with engine oil.

Re-fit piston by :

Introduce piston over connecting rod, so that slit in piston faces to the front of the machine.

Introduce gudgeon pin in piston and pass it through connecting rod small-end bush and centralise it.

Re-fit circlips. (Use special pliers). Use rotary action when bedding circlips in their grooves and make sure each circlip lies snugly in its groove. This is essential otherwise considerable damage will result.

Re-fit cylinder barrel by :

Take new cylinder base washer. Coat one side with liquid jointing compound and apply it to cylinder base. Ensure jointing does not choke any of the cylinder base oil holes.

Smear cylinder bore and piston with engine oil.

Space piston rings so that the gaps are evenly spaced at 120° to each other.

Gently fit barrel over piston and carefully compress each ring in turn, with the fingers, as it enters the chamfered mouth of the barrel.

Remove rag from crankcase throat.

Re-attach cylinder barrel holding down nuts, screwing each down, in turn, bit by bit, till all are fully home.

CAM CONTOUR

On the flanks of the cams are quietening curves which are very slight inclines from the base circles to the feet of the humps.

Therefore, it is necessary to ensure the tappet ends are on the base circles when checking valve clearances and valve timing.

It is for this reason valve clearances must be checked when the piston is at the top of its compression stroke, at which position both tappets are well clear of the quietening curves.

VALVE TIMING

Inlet valve timing

Inlet valve opens 32° before top dead centre.

Inlet valve closes 63° after bottom dead centre.

Exhaust valve timing

Exhaust valve opens 65° before bottom dead centre.

Exhaust valve closes 30° after top dead centre.

(See page 77 for particulars of special timing dia. produced in degrees.)

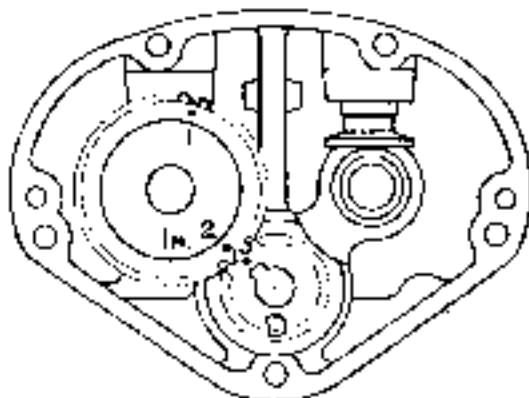


Illustration 11
Inlet Camshaft timing marks
(Use mark "2")

When checking the valve timing the tappet clearances must be set to .016 inch so that the tappets may be well clear of the quietening curves of the camshafts.

The timing gears are marked to facilitate their replacement.

To reset the valve timing, by using the marks on the gears, proceed as follows :

Turn over the engine till the mark on the small timing pinion (D in Illustration 11) is in line with the centre of the inlet (rear) camshaft bush. Insert the inlet camshaft so that the No. 2 mark on it is in mesh with the mark on the small timing pinion (D).

Rotate the engine in a forward direction till the mark on the small timing pinion (D in Illustration 12) is in line with the centre of the exhaust (front) camshaft bush. Insert the exhaust camshaft so that the No. 2 mark on it is in mesh with the mark on the small timing pinion (D).

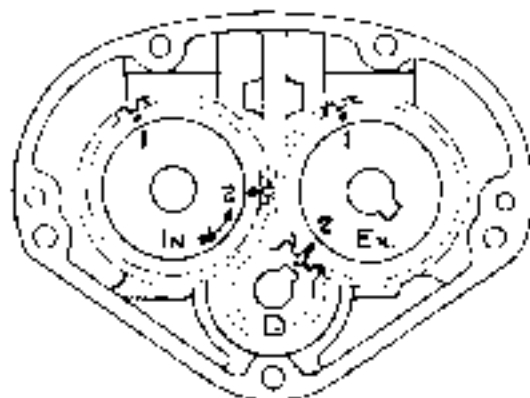


Illustration 12
Exhaust Camshaft timing marks
(Use mark "2")

TAPPET ADJUSTMENT

The top ends of the two long push rods have screwed extensions. These are locked in position by lock washers, thereby providing tappet adjustment.

The correct tappet clearance, on touring models, with valves closed and engine cold, is NIL (warm engine or competition models). This means the push rods should be free enough to revolve and, at the same time, there should be no appreciable up and down play.

Preparation to adjust tappets by:

See piston to T.O.C. (Both valves closed).

Remove the three nuts, and fibre washers under them, retaining tappet cover of rocker box.

Take away cover.

Adjust tappets on all 350 and 500 models by:

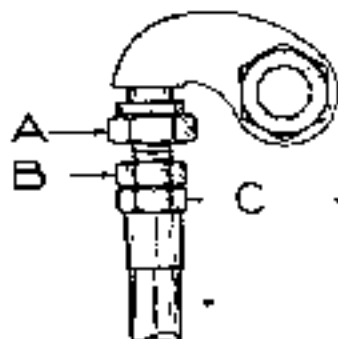
With spanners, lock the sleeve C, either valve (Illustration 13) and slacken lock nut B. Turn screw, in or out, the head A until the clearance is nil.

Tighten lock nut B and recheck the clearance.

Treat other valve in like manner.

Illustration 13

Tappet adjustment



Finally

Check adjustments so that, with no up and down movement, the long push rods are free to revolve when the valves are closed.

Complete adjustment by:

Replace rocker tappet cover taking care to replace the fibre washer that is under each retaining nut.

Do not over-tighten the nuts because the joint is made with a rubber fillet and undue pressure is not necessary.

NOTE—In normal conditions tappet adjustment should not be necessary more frequently than about every five thousand miles or after decarbonising and grinding valves. If adjustment is found necessary more frequently the cause should be investigated at once.

The tappet rods are made of Light Alloy, and in manufacture the sleeve marked C in Illustration 13 is fitted to the bare rod and then the push sleeve and the rod are threaded to take the adjusting screw marked A.

It will consequently be seen that, contrary to the practice when steel rods are used, it is not possible to slip and fit sleeve C to an existing Light Alloy rod.

Consequently the "Push Rod, bare" will only be supplied for spares purposes complete with sleeve C already fitted and threaded.

TO RE-TIME THE IGNITION

The maximum advance is $1\frac{1}{2}^{\circ}$ (39°).

Have available a stout screwdriver, or an old type tyre lever with curved up end, and a piece of stout wire $1\frac{1}{2}^{\circ}$ long.

Before setting the ignition firing point it is essential the magneto contact breaker points are correctly adjusted. Therefore always check these first.

Check contact breaker points by:

Remove contact breaker cover.

Check setting of contact breaker points, and, if necessary, re-set same.

Set ignition firing point by:

Remove:—

The sparking plug high tension cable from plug.

The sparking plug.

The magneto chain case cover.

The rocker box side cover.

U-screw, several turns, that retaining magneto sprocket to camshaft. (No need to remove nut).

Lever off sprocket until it is loose on the taper of the shaft. (Use stout screw-driver or old type tyre lever.)

Turn over engine till both valves are closed.

Insert rod through sparking plug hole, feel piston, by racking engine forwards or backwards till it is felt the piston is at the top of its stroke with both valves closed.

Mark rod flush with top face of sparking plug hole. Remove rod and measure $\frac{1}{2}^{\circ}$ above the flush mark and record position on rod.

Place handlebar ignition control lever in fully advanced position.

Replace rod in sparking plug hole.

Slightly rotate engine **BACKWARDS** until upper mark on rod is flush with top face of sparking plug hole. (To rotate engine, engage top gear and turn back wheel by hand.) Rotate sprocket on magneto armature shaft, in anti-clockwise direction (as seen from sprocket end of magneto), till the contact breaker points are just about to separate. (To find the exact moment for the commencement of the point separation, place a piece of green paper between the points and turn the armature shaft (by the sprocket on it) until the paper is just released, and no more, upon a gentle pull.)

Tighten nut on camshaft and ensure engine, and/or magneto shaft, does not move in doing so.

Re-check the setting which must be $\frac{1}{2}^{\circ}$ before top dead centre. (With the ignition handlebar control lever in the fully advanced position.)

See page 90 for particulars of special timing disc graduated in degrees.

Replace

Rocker box side cover, Contact breaker cover, Magneto chain case cover, Sparking plug (see note on page 17 re graphics on sparking plug thread), and Sparking plug wire.

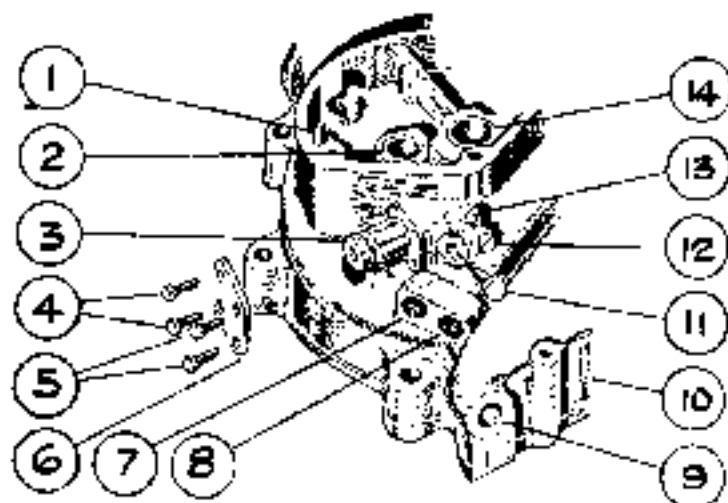


Illustration 14

The rotating oil pump plunger is here shown partially withdrawn, together with the guide screw which registers in the plunger profiled groove, thereby providing the reciprocating movement.

(See also "Main Drive")

- | | |
|---|--|
| 1 DIESEL PUMP LOCATING TIMING GEAR COVER. | 9 TAPPED HOLE TO ACCOMMODATE FRANKFURT DRAIN PLUG. |
| 2 BUSH FOR INLET CAPSLEAT. | 10 CRANKCASE TIMING SIDE. |
| 3 PLUNGER FOR OIL PUMP. | 11 GUIDE SCREW AND PIN FOR OIL PUMP PLUNGER. |
| 4 BOLT FIXING REAR END CAP. | 12 PLUG SCREW FOR OIL PASSAGE. |
| 5 BOLT FIXING REAR END CAP. | 13 PIN SCREW FOR OIL PASSAGE. |
| 6 REAR END CAP FOR OIL PUMP. | 14 BUSH FOR TIMING SIDE FLYWHEEL AXLE. |
| 7 TAPPED HOLE FOR PIPE RETURNING OIL TO OIL TANK. | |
| 8 TAPPED HOLE FOR PIPE FEEDING OIL TO OIL PUMP. | |

TO REMOVE AND REPLACE THE OIL PUMP PLUNGER

Remove

Lower end of rocker link oil feed pipe by unscrewing union nut.

Both oil pump and caps.

Oil pump plunger guide screw with pin. (See illustration 14, No. 11.)

Oil pump plunger, by pushing at front and extracting from rear end of its housing.

Replace by

Reversing above procedure.

NOTE—Remember there is a paper washer under each oil pump and cap and, when fitting a new paper washer to the front cap, ensure the oil passage in the front cap is not obstructed by the paper washer.

Make certain that the guide screw pin is correctly located in its groove (cut in the plunger) before tightening down. **NOTE**—The guide screw pin is inserted in the screw tail end first. Do not revolve the engine until quite certain that the guide screw pin is properly located, otherwise damage is inevitable.

OVERSIZE PARTS AND RE-BORING CYLINDER BARREL

Pistons and rings, .020" and .040" larger than standard, are available. These degrees of oversize make it essential for the cylinder barrel to be re-bored to accommodate them. We can provide that service at prices quoted in the Spares List.

On the 550 c.c. the cylinder standard bore is 2.7187 ± .0005". The 500 c.c. cylinder standard bore is 3.250 ± .0005".

When the wear at the top of the barrel reaches .008" the barrel should be bored out .010" oversize and a new oversize piston and rings fitted.

Crankpin millers .001" larger than standard can be supplied. We recommend only skilled machinists should fit these because it is almost general that the big-end journals and sleeves require "lapping" to ensure a correct fit.

REMOVING SPARKING PLUG

Always exercise the greatest care to avoid thread seizure when removing a sparking plug. If any resistance is felt, apply paraffin. Before replacing plug, it is desirable to coat the thread with "Oil Dug" or Graphite paste. This will guard against seizure upon subsequent removal.

WHEN IN DOUBT REGARDING THE NAMES AND PART NUMBERS OF THE PARTS YOU REQUIRE, PLEASE SEND THE OLD PARTS TO SERVE AS PATTERNS.

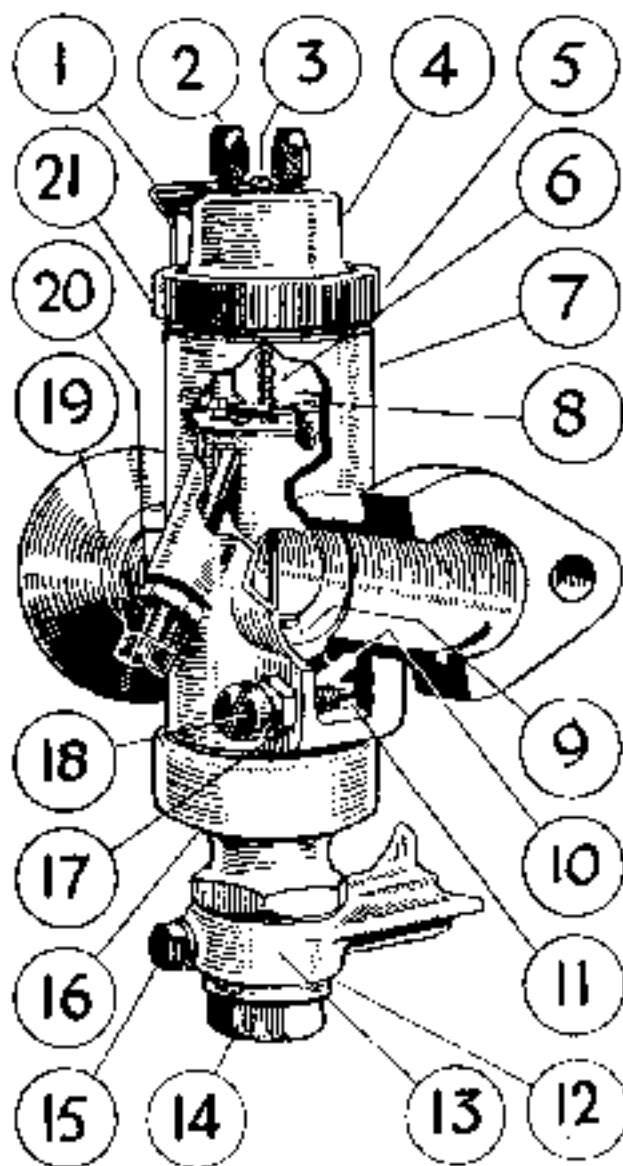


Illustration 15

Showing the mixing chamber with details of the pilot jet with its air adjusting screw and the throttle stop screw

CARBURETTER SERVICE

The information given in this section includes all that will normally be required by the average rider. For further details, particularly those connected with racing and the use of special fuels, we refer the enquirer to the manufacturer of the carburettor, Messrs. Amal Ltd., Holford Works, Perry Barr, Birmingham.

Our Spare Parts Department does not stock every part of the carburettor but confines its stock to those parts that from time to time, may need replacement as the result of wear. These parts include floats and float needles, jet taper needles, needle jets and washers.

CARBURETTER FUNCTION

The petrol level is maintained by a float and needle valve and, in no circumstances, should any alteration be made to this. In the event of a leaky float, or a worn needle valve, the part should be replaced with new. (Do not attempt to grind a needle to its seat.)

The petrol supply to the engine is controlled, firstly, by the main jet and, secondly, by means of a taper needle (see 6, Illustration 15) which is attached to the throttle valve and operates in a tubular extension of the main jet.

The main jet controls the mixture from three-quarters to full throttle, the adjustable taper needle from three-quarters down to one-quarter throttle, the cut-away portion of the brake side of the throttle valve from one-quarter down to about one-eighth throttle, and a pilot jet, having an independently adjusted air supply, takes care of the idling from one-eighth throttle down to the almost closed position. These various stages of control must be kept in mind when any adjustment is contemplated. (See 18, Illustration 15, for location of the pilot jet air adjustment screw.) The pilot jet consists of a small hole drilled in the choke, or jet block.

The size of the main jet should not be altered save for some very good reason. See "DATA" for details of standard sizes of jet, throttle valve, and jet taper needle. With the standard setting it is possible to use nearly full air in all conditions, except, perhaps, when the engine is pulling hard up hill or is on full throttle, when some benefit may be obtained by slightly closing the air control.

Weak mixture is always indicated by popping, or spitting, at the air intake.

A rich mixture usually causes lumpy, or jerky, running and, in cases of extreme richness, is accompanied by the emission of black smoke from the exhaust.

See Illustration 15

- | | |
|--|---|
| 1 SPRING CLIP, LOCKING THE FIXING RING | 11 THREADED HOLE, TO ACCOMMODATE PILOT JET AIR ADJUSTING SCREW (18) |
| 2 CABLE ADJUSTER, FOR BUSH TOP | 12 FIBRE WASHER, FOR HOLDING BOLT |
| 3 SCREW, SECURING LOCKING CLIP TO BODY TOP | 13 PART OF FLOAT CHAMBER |
| 4 TOP RING, FIXING BODY | 14 BOLT, HOLDING FLOAT CHAMBER TO MIXING BODY |
| 5 RING, FIXING TOP TO MIXING BODY | 15 BUSH SCREW, FOR PETROL PASSAGE IN FLOAT CHAMBER |
| 6 TAPER NEEDLE, FOR NEEDLE JET STOP NOTCHED END SHOWN | 16 UNION NUT, FOR FIXING BODY BASE |
| 7 MIXING BODY | 17 LOCK NUT, FOR PILOT JET AIR SCREW |
| 8 CLIP, LOCATING JET TAPER NEEDLE | 18 SCREW, FOR PILOT JET AIR ADJUSTMENT |
| 9 AIR BALANCE PASSAGE | 19 SHIM SCREW, FOR THROTTLE |
| 10 PASSAGE TO ALLOW MIXTURE FROM THE PILOT JET MIXING CHAMBER, TO PASS TO THE CARBURETTER MAIN BORE AND THENCE TO THE INLET PORT OF THE ENGINE | 20 LOCK NUT, FOR THROTTLE STOP SCREW |
| | 21 RING, FIXING TOP TO MIXING BODY |

CARBURETTER ADJUSTMENT

To ascertain if the setting is correct, a rough test is to warm up the engine and, with the ignition fully retarded and the air about three-quarters open, gradually open the throttle to full open, during which the engine should respond without a misfire, but, upon a sudden opening of the throttle, it should sputter and stop. (The engine should not be run for more than a few seconds with the ignition fully retarded.)

To check the setting of the pilot jet and its air control, warm up the engine, then, with the ignition about two-thirds advanced and the air about three-quarters open, the engine should die positively and evenly when the throttle is almost closed. If it is to do so, adjust the pilot jet air screw (18, Illustration 15) towards, or outwards, until even firing is obtained. (The pilot jet air screw is at the base of the mixing chamber and its position is locked by a nut. See 17 and 18, Illustration 15.) This adjustment is not unduly sensitive, and it should be possible to obtain the correct adjustment in a few seconds. In the event of the adjustment of the air screw failing to provide the required result it is possible the pilot jet is obstructed with dirt. The pilot jet is actually a passage drilled in the spray bar, or choke, and is very small, so there is always latent danger of this becoming choked.

Upon removing the float chamber and the large nut at the bottom of the mixing chamber, the spray bar can be pushed out of the mixing chamber and the jet can be cleared by using a strand of fine wire.

Before concluding that incorrect carburation is responsible for heavy petrol consumption, and before carrying out any of the tests and adjustments described above, it is most important to make sure the ignition is set correctly. Late ignition usually causes a great increase in petrol consumption.

TWIST GRIP ADJUSTMENT

A screw is provided in one of the halves of the twist grip body to regulate the spring tension on the grip rotating sleeve. This screw, which is locked by a nut, must be screwed into the body to increase the tension.

The most desirable state of adjustment is that when the grip is quite free and easy to operate first, at the same time, will stay in the position in which it is placed.

The complete twist grip can be moved on the handlebar by slackening the two screws that clamp together the two halves of the body. The most desirable position is that in which the throttle cable makes the cleanest and most straight path to the underside of the petrol tank.

During assembly, all control inner cables are coated with a graphite lubricant. This lasts practically indefinitely, but should a new inner wire be fitted this must be similarly treated during assembly.

AIR FILTER

In locations, such as the United Kingdom, where the roads and atmosphere are particularly free from dust, it is not considered necessary to have an air filter fitted to the carburetter, but in countries where the atmosphere contains a very heavy dust content, an air filter is essential in order to prevent abnormal wear.

The filter available (optional extra) for the conditions mentioned above is of the "Oil Waxed" type, and this requires periodical servicing.

When servicing the air filter, withdraw the filter element. Thoroughly wash this in petrol, paraffin or other suitable solvent and allow to dry. Then re-oil, using one of the light oils (SAE-20), enumerated in the first table on page 15, and allow to drain before replacing in the filter case. Clean regularly at intervals of 1,000 miles and renew the element every 10,000 miles.

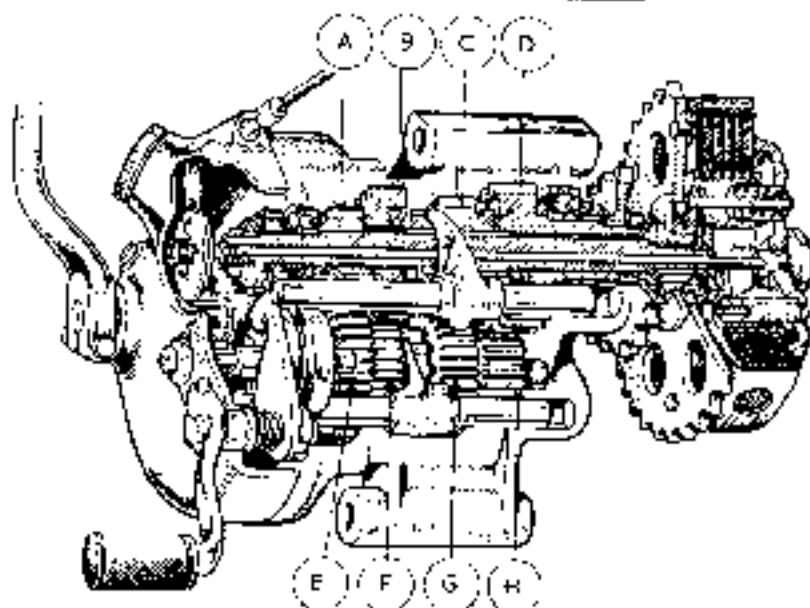
CARBURETTER TUNING INFORMATION

Poor idling may be due to:

- Pilot jet not operating correctly.
- Air leaks. Either at junction of carburetter and inlet port, or by reason of badly worn inlet valve stem or guide.
- Faulty engine valve seating.
- Spark plug faulty, or its points set too closely.
- Ignition advanced too much.
- Contact breaker points dirty, pitted, loose, or set too closely.
- High-tension wire defective.
- Rocker arms adjusted too closely.

Heavy petrol consumption may be due to:

- Late ignition setting.
- Bad air leaks. Probably at carburetter joint.
- Weakened valve springs.
- Leaky float. (Causing flooding.)
- Taper needle extension insufficient.
- Poor compression, due to worn piston rings or defective valve seating. (Test compression with throttle wide open.)



- A LOW GEAR ON MAIN SHAFT
- B THIRD GEAR ON MAIN SHAFT
- C SECOND GEAR ON MAIN SHAFT
- D MAIN DRIVING GEAR
- E LOW GEAR ON LAYSHAFT
- F THIRD GEAR ON LAYSHAFT
- G SECOND GEAR ON LAYSHAFT
- H SMALL PINION ON LAYSHAFT

Section through gearbox showing gears and clutch with actuating mechanism

Illustration 15

TRANSMISSION SERVICE

THE GEAR BOX

The gear box provides four speeds and has a positive foot change, operated by the right foot and a kick-starter.

It is retained to the frame by being clamped between the two engine rear plates by two bolts. The bottom fixing bolt acts as a pivot. The top fixing bolt passes through the gear box top lug and the rear plates, which are slotted, thereby allowing a swinging fore and aft movement of the gear box to enable the front driving chain to be adjusted. That movement is controlled by a horn which has an eye encircling the gear box top fixing hole and which passes through an eye block secured to the right-hand side engine rear plate. Two nuts threaded on the eye bolt, one on each side of the eye block, provide means of accurately tensioning the front chain and, after that adjustment, locking the eye bolt in its required position.

Illustration 16 clearly shows the general internal gearbox layout. The triple gear selection and kickstarter mechanism. It will be seen that movement of the foot change lever causes movement of the cam barrel through the medium of an ingenious trip lock to which the lever is attached.

This cam movement actuates the sliding gear striker forks causing movement of the sliding gears which engage the stationary gears by dogs. As each gear is selected it is held in engagement by means of a ball spring plunger operating in a depression on the end of the cam barrel.

The trip mechanism referred to allows the foot change lever to return to its normal position, upon foot pressure being released, in readiness for the next change of gear. Downward direction of movement causes engagement of higher gears and upward movement with the foot causes a lower gear to become engaged.

As mentioned elsewhere an external marked disc shows at a glance what gear (or neutral) is engaged.

It should be noted that although the basic design of the clutch fitted to 1951 models is identical to that used on earlier models, the method of operation differs entirely, the necessary thrust rod movement to free being now obtained through the medium of three balls operating on inclined planes. (See illustration 17.)

Operation of the clutch handlebar lever moves clutch operating lever B causing inward movement of the thrust rod by reason of the three balls mounting the inclined planes in which they are located. The resulting inward movement of the clutch thrust rod forces out the pressure plate, normally maintained in contact with the friction plates by the springs F, thereby allowing the engine to drive the clutch sprocket D without imparting drive to the mainshaft C.

Consequently no power is transmitted to the rear wheel, the clutch is said to be "out" or "free". Upon releasing the clutch handlebar lever the clutch operating lever returns to its normal position by the pressure of the spring forcing the balls down these inclined planes thereby allowing the spring pressure through the medium of the pressure plate to be transferred to the friction plates which causes the gear box mainshaft to revolve and impart driving power to the rear wheel.

TO REMOVE KICK-STARTER CASE COVER FOR EXPOSURE OF K.S., GEAR CHANGE, AND INTERNAL CLUTCH ACTUATING MECHANISM

Remove oil drain plug and drain off all contents of the gear box.

Remove the large oil filler plug and slack off the clutch cable adjuster sufficiently to permit the cable end to be pushed from the slotted end of the internal clutch operating lever which is exposed by the removal of filler cap.

Unscrew the clutch cable adjuster and it is free from the K.S. case cover and withdraw the cap nipple through the adjuster hole.

Remove the nut and small spiral spring securing small gear indicator disc from the cam barrel spindle.

Next remove the five cheese head screws by which the K.S. case cover is secured to the gear box end plate.

Withdraw the cover about $\frac{1}{2}$ inch, holding the K.S. pedal firmly while doing so.

Now swing the K.S. crank round until it can be tied to the foot change lever. This prevents the K.S. return spring re-winding and facilitates re-assembly.

The entire component may now be removed.

Re-assemble in exact reverse order, taking care to avoid damage to the paper joint gasket.

NOTE The position of the various cheese head screws securing the K.S. case cover are as follows:—

In the top position, screw measuring $2\frac{1}{2}$ inches under head.

In the bottom position, screw measuring 3 $\frac{1}{2}$ inches under head.

In the rear position, screw measuring 1 $\frac{1}{2}$ inches under head.

In the front position, two screws measuring $\frac{3}{4}$ inch under head.

TO REMOVE GEAR BOX END PLATE FOR EXAMINATION OF GEARS

Remove K.S. case cover as already described.

Remove split pin securing both gear striker shaft pins and withdraw the pins and also the cam barrel in which they operate together, with the spring ball ended plunger which engages depressions on the underside of the cam barrel.

Remove the mainshaft end nut and draw off the K.S. ratchet driver, pinion, spring and base upon which the pinion is mounted.

Remove the three cheese head screws by which the end plate is secured to the gear box shell and the end plate is then free to be withdrawn, leaving the gears and gear striker shafts in situ.

Take care to avoid losing the steel ball fitted in the end of the mainshaft and interposed between the clutch operating lever and the clutch thrust rod.

To Re-assemble

If gears have been disturbed insert them in their proper order with spider shafts in correct position and apply end cone with paper joint gasket in position.

Re-fit the three cheese head screws and firmly tighten down with a stout screwdriver.

Then insert ball ended plunger and spring and apply the gear selection cam barrel with any one of the depressions on its underside engaging with the ball end of the spring loaded plunger.

Next insert the selector shaft pins and secure each in position with its split pin.

Complete the assembly in reverse order of dismantling, before applying the K.S. case cover, that the ball is inserted in the end of the mainshaft.

Fill to correct level with one of the recommended oils and finally re-fit the gear indicator disc and adjust its position to give correct indication of gears.

TO REMOVE FRONT CHAINCASE AND CLUTCH ASSEMBLY

To remove outer half of front chaincase

Place tray under chaincase to catch oil.

Remove exhaust pipe and silencer, as one unit.

Remove nut on the end of footrest rod, push rod towards the right hand side of machine sufficiently to allow footrest to set foot to be disengaged.

Slide footrest arm to one side or completely take away.

Remove screw binding chaincase metal band at its rear.

Remove metal band.

Remove rubber band.

Remove nut and washer, in centre of chaincase front.

Take away outer half of chaincase.

To remove front driving chain and clutch assembly complete

Engage top gear, apply rear brake, and unscrew engine sprocket nut.

Unscrew the nuts retaining the clutch springs, using end of spanner Part No. 017254.

Take away the clutch spring pressure plate with the clutch springs and clutch spring cups, and fasten the turned up part of the lock plate that is under the large central nut.

Remove front chain connecting link and take away chain.

Engage top gear, apply rear brake, and unscrew nut retaining the clutch centre to the gear box mainshaft sleeve.

Remove the lockplate and plain washer from gear box mainshaft.

Remove complete clutch assembly by pulling it away, as one unit from gear box mainshaft.

Take care not to lose any of the twenty-four clutch sprocket bearing rollers which may be displaced when the clutch centre and sprocket assembly is withdrawn from the mainshaft. The clutch centre is a sliding fit on the mainshaft sleeve and an extractor should not be required.

To remove dynamo chain and back half of chaincase

Remove the spring lock ring on dynamo sprocket retaining nut.

Take away lock washer surrounding dynamo sprocket nut.

Apply spanner (017254, included in toolkit) to the two flats on the back of the dynamo sprocket and, holding same, unscrew the nut retaining the dynamo sprocket. Holding sprocket this relieves the dynamo shaft of bending strains.

Release dynamo sprocket with suitable extractor.

Take away, as one assembly, the dynamo sprocket, dynamo chain and engine shock absorber assembly. (The dynamo chain is "endless.")

Straighten tabs on lock washers under the three bolts retaining the back half of chaincase to the boss on the crankcase and remove the three bolts.

Remove the long headed bolt (under battery carrier) fixing rear chain guard to front chaincase.

Remove nut on centre fixing bolt, and spacer behind it, and back half of chaincase can be taken away.

TO RE-FIT THE FRONT CHAINCASE AND CLUTCH

Fit back half of front chaincase by 4

Place on face of crankcase boss and back face of chaincase some liquid jointing compound. "Wol seal" recommended.

Ensure the spacer is in position on the centre fixing bolt. This is located between the engine plate and the chaincase. (It is 1-13/32" long.)

Place in position rear half of front chaincase.

Fit long headed bolt, holding rear chain guard to front chaincase, but do not fully tighten.

Fit to crankcase boss the three lock washers and bolts retaining case to boss.

Fully tighten the three bolts and turn up the tabs of the three lock washers.

Fit spacer (inside chaincase, 2" long) to the centre fixing bolt.

Fit nut to centre fixing bolt and fully tighten.

Fully tighten long headed bolt holding rear chain guard to front chaincase.

Fit dynamo sprocket and chain and engine shock absorber by 1

Ensure dynamo sprocket key is in position (in dynamo armature shaft.)

Insert the spring collar, which fits between crankcase ball bearing and the back of the engine sprocket, in position on the driving side flywheel axle.

Take dynamo driving chain and place it round the small sprocket of the engine sprocket assembly and the sprocket that fits on the dynamo shaft and fit these three parts, in one movement, to the driving side flywheel axle and the dynamo shaft.

Fit the dynamo shaft plain washer and sprocket retaining nut, screwing nut with fingers only.

Hold the dynamo sprocket by applying spanner 017254 to the flats on the back of the sprocket and fully tighten the sprocket retaining nut. (This holding relieves the dynamo shaft of all bending and twisting strains while the sprocket retaining nut is being tightened.)

Fit the dynamo sprocket retaining nut, lock washer and lock ring. Ensure the lock ring lies snugly in the groove cut in the nut.

Fit engine shock absorber cam, spring, cap washer and retaining nut but do not fully tighten nut.

Fit the clutch centre and sprocket by 1

Place on the gear box main shaft splined sleeve the thrust of the two clutch sprocket roller bearing retaining washers.

Place on the gear box main shaft splined sleeve the clutch sprocket roller bearing ring.

With grease, stick in place on the bearing ring the twenty-four clutch sprocket bearing rollers.

Introduce clutch sprocket over the rollers.

Place on the gear box main shaft splined sleeve the thin clutch bearing retaining washer.

Push on the splined sleeve the clutch centre link.

Fit the plain washer, lock plate and nut that retains the clutch centre but do not fully tighten the nut.

Fit the front chain and lock the clutch centre nut by

Replace the front driving chain. Ensure the spring connecting link is fixed so that the closed end of the spring clip faces the direction of rotation.

Engage top gear, apply the rear brake and then fully tighten the nut that retains the clutch centre to the gear box mainshaft.

Turn up the angle of the lock plate so that it tightly abuts against a flat of the nut.

Fit the clutch plates and springs by

Slide into position in the clutch case attached to the clutch sprocket, a steel plain clutch plate.

Slide into place a clutch friction plate (plate with fabric inserts) and follow with a steel plain plate, then another friction plate and so on, alternately, until all plates are fitted. (Five plain plates and four friction plates on 350 c.c.; six plain, and five friction on 500 c.c. and all competition models.)

Drop into the spring pressure plate the clutch spring cups.

Show up the spring pressure plate and insert over the studs the clutch springs, retaining each one a few turns, as fitted, with a clutch spring adjusting nut.

Fully tighten the clutch spring adjusting nuts, using end of spanner Part No. D1725F.

Backen back, four complete turns, each clutch spring adjusting nut.

Engage top gear, apply rear brake and then fully tighten the engine shock absorber retaining nut.

Check front driving chain for adjustment.

Check dynamo driving chain for adjustment.

Check clutch operating lever for correct free movement as detailed elsewhere.

Fit outer half of front chaincase by

Ensure faces of both halves of chaincase are clean.

Take off, from the rear brake rod, the adjusting knurled nut.

Ensure the rubber and metal bands are clean and undamaged.

A new type of rubber band is now used and this has a "T" section. It is not symmetrical and the wider top flange or edge should be outwards.

Apply the rubber band by placing the narrow edge on the rear portion of the chaincase, arranging it so that the joint in the band occurs just to the rear of the battery carrier, and applying the band first of all to the extreme forward edge of the chaincase. It is important that ends of band abut.

Fully depress the brake pedal and then place in position the front half of the chaincase, moving it as may be necessary to ensure its outer edges snap under the exposed part of the rubber band, and then fit to the centre fixing bolt the plain washer and nut, tightening the nut fully home.

Fit the metal band, starting at the front end of the chaincase and crawling together the two free ends of the band with one hand while, with the other hand, replacing its binding screw.

Fully tighten the metal band binding screw.

Remove the inspection cap from the chaincase and pour in engine oil to the level of the bottom edge of the inspection cap orifice and then replace the cap.

NOTE—If, after replacing a front chaincase, it is found not to be oil tight, the general reason is distortion of the two joint faces or incorrect position of rubber band. These faces must be undamaged and, on first, should closely fit to a carbon plate. They must also be absolutely clean before replacement and the edges must be in exact register, one with the other. Any distortion caused by accidental impact must be remedied before refitting.

If any doubt exists, **CHECK** for **DISTORTION BEFORE ASSEMBLY**.

CLUTCH SPRING ADJUSTMENT

If clutch slip occurs the most probable cause is either incorrect cable adjustment or absence of free movement of the internal clutch lever. If both are found to be correct the clutch spring adjusting nuts may require adjustment.

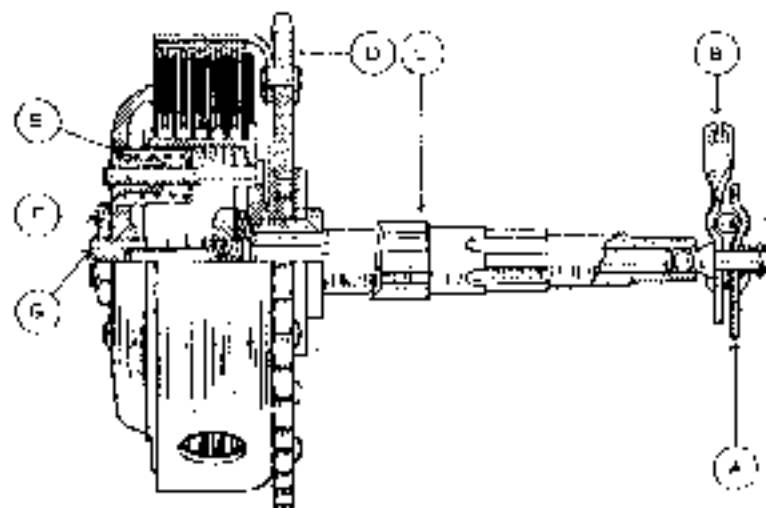
To obtain access to clutch spring adjusting nuts, remove front half of chaincase as already detailed.

With the slotted driver provided on one of the thin spanners in the tool kit, screw each nut, in turn, fully home, then unscrew exactly four complete turns.

Before replacing outer half of chain cover, test for slip by starting up the engine, engaging top gear, and applying the rear brake when it should be possible to pull up the engine a full throttle without a slip occurring.

If to cure slip it is found necessary to further tighten the adjusting nuts this is a clear indication that either the clutch springs have lost one dimension, the inserts are so worn that they require renewal or that they have become impregnated with oil.

In the two former instances renewals are necessary, but if oil is the cause of slip it may be rectified by soaking the plates in petrol and allowing to dry off. If inserts are glazed roughen with sand paper.



- | | |
|--|---|
| A. FIXED CLUTCH INTERNAL ACTUATING PLATE | E. CLUTCH SPRING |
| B. CLUTCH INTERNAL OPERATING LEVER | F. LOCK NUT FOR CLUTCH ROD THRUST CUP |
| C. GEAR BOX MAINSHAFT | G. THRUST CUP (to clutch pressure plate) FOR CLUTCH ROD |
| D. CLUTCH SPROCKET | |

Showing clutch, gear box main shaft and clutch operating mechanism

Illustration 17

Correct adjustment of the clutch operating mechanism is of the utmost importance and the following instructions must be carefully observed:

Clutch cable stretch, which may develop at long intervals, is taken up by means of the adjuster provided at the gear box end of the cable, but when making this adjustment it is important that the normal movement of the internal lever is not encroached upon. The correct procedure is to remove the gear box oil filler plug which exposes the internal lever. The end of this lever to which the cable is attached must then be prepared backward with the finger or end of a screw driver and while thus held, all slack in the cable should be taken up by means of the adjuster.

Having done this, the amount of free movement of the internal lever at the end where the cable is attached must be carefully checked. This is best done by applying light backward pressure to the lever end, as already described, at the same time operating the hand bar lever. The correct free movement is $\frac{1}{8}$ to $\frac{1}{4}$ inch. It should be explained that the free movement is readily lost on the hand bar lever by reason of the greatly increased effort required as the clutch commences to disengage.

As the rivet end of the clutch plate fabric inserts, the plates tend to close up towards each other. This closing up has the effect of reducing the free movement referred to. Clutch slip resulting from lack of free movement will rapidly run the engine and may generate sufficient heat to soften the clutch springs. Therefore should clutch slip occur immediately examine for free movement of the internal operating lever.

To adjust this free movement it is necessary to remove the cap on the centre of the front chaincase clutch extension (secured by three screws) when the screwed adjusting plug fitted to the centre of the clutch pressure plate will be exposed. The lock nut securing this screwed adjusting plug is of sparking plug size and can therefore be loosened for adjustment, and subsequently securely tightened by means of the sparking plug hex key provided in the toolkit.

Then to check the free movement of the internal lever, apply backward pressure as described and observe the movement at the extreme end of the lever before resistance is felt. The correct amount of movement is stated as $\frac{1}{8}$ to $\frac{1}{4}$ inch.

A careful study of Illustrations 16 and 17 will help considerably in making the foregoing instructions readily understandable.

To remove a clutch control cable

Remove the oil filler cap from the kick-starter case cover.

Screw right home the clutch cable adjuster that is located in the back of the kick-starter case.

Disengage, from the operating lever, the clutch cable inner wire by operating through the oil filler cap opening.

Completely unscrew the clutch cable adjuster.

Disengage, from the handlebar operating control lever, the clutch inner wire.

Pull cable, by its lower end, till removed from the machine, easing it through the frame cable clips while doing so.

To replace a clutch control cable

Reverse the above instructions and, finally, adjust as detailed earlier.

FRONT CHAIN ADJUSTMENT

Tighten the front chain by:

Slacken: Nut on right-hand side of gear box top fixing bolt.

Forward nut on the adjusting eye-bolt. (Two or three turns.)

Remove inspection cap from front chaincase.

Screw up the rear nut on adjusting eye-bolt until, with the finger through the inspection cap or filler, it can be felt that the chain is dead tight. Then slack off the rear nut and carefully tighten the forward nut until the correct chain tension is obtained, after which securely tighten the rear nut to lock the assembly. (The correct chain whip is $\frac{1}{2}$ inch.) Check the adjustment in more than one position and adjust, as above, as required. It is important that these instructions are over-tighten and then slack back and carefully followed.

Tighten nuts on gear box top fixing bolt.

Replace chaincase inspection cap.

REAR CHAIN ADJUSTMENT (Spring Frame Models)

To provide rear chain adjustment the rear wheel is bodily moved in the rear frame fork ends which are open ended and slotted.

The rear wheel centre spindle has two cams attached to it. These cams abut against projections in each of the rear fork tube slotted ends. The projection on the right-hand fork end is adjusted at the factory and its position is locked by a nut. This adjustment is provided to ensure the rear wheel is positioned in line with the front wheel and, once it has been determined during assembly, there should be no necessity ever to alter it again.

The chaincase cam has a hexagonal body to accommodate a spanner and is turned, forwards or backwards, to position the rear wheel, so that the rear driving chain is correctly tensioned. (Both cams turn together.)

The correct chain tension is such that, when the machine is on the centre stand, finger pressure applied to the chain, midway between gear box sprocket and rear wheel sprocket, in an upward and downward direction, allows a total movement up and down of $1\frac{1}{2}$ ". The rear wheel should be rotated to several positions and tests made at each, because chains never wear evenly and there is usually one position where the chain is tighter than in any other. The adjustment of $1\frac{1}{2}$ " total whip should be set for the tightest position found.

(When off the stand, and with the rider on the saddle, this measurement is reduced to about $\frac{1}{2}$ " total whip, which is the correct adjustment when on the road.)

To adjust the rear chain

Park the machine on the centre stand.

Slacken nut to right of speedometer gear box.

Slacken exterior nut on left-hand end of rear wheel spindle.

Push forward the wheel so that both cams are in contact with the projections on the rear fork ends.

Apply adjustable wrench 017249 to hexagonal body of chaincase cam, and, while maintaining a forward pressure on the wheel, to ensure contact of the two cams, turn, with the wrench, until the chain whip of $1\frac{1}{2}$ ", detailed above, is obtained. Then holding the wheel in that position, fully re-tighten the spindle exterior nut.

Finally, fully tighten the nut to the right of the speedometer gear box after being satisfied that the gear box is in such a position that no strain is being placed on the driving cable.

REAR CHAIN ADJUSTMENT (Rigid Frame Models)

To provide rear chain adjustment the rear wheel is bodily moved in the frame fork ends, which are upon wedges and slotted.

Tighten rear chain by :

Place machine on rear stand

Slightly slacken nuts on rear wheel solid spindle (left side first).

Slacken nut on each chain adjusting bolt, two or three turns. (These bolts screw into forward end of each frame fork end.)

Screw, in turn, each chain adjusting bolt, further into the fork ends until the chain tension is correct. Each bolt must be turned the same amount. The chain whip should be $\frac{1}{2}$ " to $\frac{3}{4}$ ".

Check adjustment, in more than one position, by partly revolving the rear wheel.

Tighten wheel spindle nuts.

Re-check chain tension.

Tighten nuts on chain adjusting bolts.

NOTES ON REAR CHAIN ADJUSTMENT

Before tightening the rear chain, check the front chain adjustment, and, if attention is necessary, adjust the front chain first.

Altering the adjustment of the front chain upsets the adjustment of the rear chain. Therefore, after making a front chain adjustment, always check the rear chain adjustment and re-set if necessary.

Altering the adjustment of the rear chain may upset the adjustment of the rear brake. Therefore, after making a rear chain adjustment, always check the brake adjustment and re-set if necessary.

The whip of chains should always be tested mid-way between the two sprockets, and the sprockets should be turned and tests made in several positions. This is because chains never wear evenly, and there is usually one position where the chain is tighter than in any other. The adjustment should be set for the tightest position found.

Always re-check the chain tension after making it and tightening all bolts and nuts.

DYNAMO CHAIN ADJUSTMENT

The dynamo pressure shaft is eccentric to the body of the dynamo. Therefore, by partially revolving the dynamo in its housing the distance between the two dynamo driving sprockets can be varied, thereby allowing latitude for chain adjustment.

Tighten dynamo chain by :

Remove inspection cap from front chaincase

Slacken dynamo clamping strap bolt.

With the fingers turn dynamo loosely in an anti-clockwise direction till, by passing a finger through the inspection cap opening, it can be felt the chain tension is correct.

The chain whip should be about $\frac{1}{2}$ ". Ensure, when taking tension, the front driving chain is not confused with the dynamo chain which lies behind the front driving chain.

Tighten dynamo clamping strap bolt.

Re-check chain tension.

Replace chaincase inspection cap.

MAGNETO CHAIN ADJUSTMENT

The magneto platform hinges on one of its fixing bolts. This provides sufficient movement for adjustment to the magneto driving chain.

Tighten magneto chain by :

Remove magneto chain case cover

Slacken nuts on bolts supporting magneto platform.

Insert a screwdriver under that end of the magneto platform which is slotted and lever upwards until the chain tension is correct.

The chain whip should be about $\frac{1}{2}$ ".

Tighten nuts on platform supporting bolts.

Re-check chain tension.

Place supply of grease on magneto driving chain.

Replace magneto chain cover

ENGINE SHOCK ABSORBER

The engine shock absorber is a spring device for smoothing out the impulses transmitted by the engine.

The engine sprocket is a free fit on the driving side flywheel axle. It has, integral with it, a face cam that engages with a similar face cam ("Shock absorber cam") which is keyed to the driving side flywheel axle by splines. A spring keeps the shock absorber cam in close engagement with the cam on the sprocket, and, the shock absorber cam being driven by the engine, overrides the sprocket cam under the influence of the engine impulses. The shock absorber spring is compressed by the over-riding of the cams, thereby absorbing the shocks.

It is essential the faces of the cams are adequately lubricated otherwise the shock absorbing action will be nullified and this is automatically taken care of, providing the level of the oil in the front chaincase is maintained according to the instructions given in the "Lubrication Section."

The shock absorber spring is retained by a cap washer and a retaining nut which must be fully tightened.

The dynamo sprocket is integral with the engine sprocket.

Behind the engine sprocket (between the sprocket and the crankshaft roller bearing) is a spacing collar which is a sliding fit on the driving side flywheel axle and in no circumstances must this be omitted.

NOTE—At the first sign of transmission harshness examine front chaincase for correct oil level, and dismantle and lubricate the shock absorber parts if the harshness continues. For access to the shock absorber parts it is necessary to remove the outer half of the front chaincase.

The order of assembly of the engine shock absorber is

1. The spacing collar between the crankshaft roller bearing and the engine sprocket.
2. The angle sprocket.
3. The shock absorber cam.
4. The shock absorber spring.
5. The cap washer.
6. The retaining nut.

FORK & FRAME SERVICE

STEERING HEAD ADJUSTMENT

The steering head frame races are of the floating self-aligning type and have spherical seats. Therefore they do not fit tightly in the head lug.

Occasionally test the steering head for correct adjustment by exerting pressure upwards from the extreme ends of the handlebars.

It is particularly important that the adjustment is tested after the first one hundred miles because of the initial settling down that always occurs in that period.

Should any shake be apparent, adjust the steering head bearings.

Adjust steering head bearings by:

Jack up the front of the machine so that all weight is taken off the front wheel. (A box under each footrest serves that purpose.)

Slacken the nuts on the two fork crown pinch studs.

Slacken the domed nut at top of the steering column.

Screw down the nut underneath the domed nut a little at a time (using spanner 012255) and, while doing so, test the head assembly for slackness by placing the fingers over the gap between handlebar lug and frame top lug, at the same time exerting upward pressure by lifting from the front edge of the front mudguard.

Continue to tighten the lower adjusting nut until no perceptible movements can be felt and yet the steering head is perfectly free to turn, then tighten down the domed nut in order to lock the adjustment.

Tighten the two fork crown pinch stud nuts.

Remove packing from under footrest.

FRONT FORKS (TELEDRHAULIC)

Owing to the unusual construction of the "TELEDRHAULIC" fork it is desirable to understand what happens in use and, in order to follow clearly the descriptions and subsequent assembly and adjustment instructions, reference to Illustrations 18 and 19 will be necessary.

As will be seen from the general arrangement drawing, Illustration 19, the main members of the forks are two long tubes. These are of heavy gauge and are externally ground to very fine limits. These fork main, inner, tubes are firmly fixed to the handlebar slip lug by the top bolts 016718 and are clamped to the fork crown by the clamping studs 016320 and nuts 011615. Upon the external of these tubes are mounted the springs and sliding members, so when enter the front wheel, mudguards and front stand are fixed.

The telescopic action of the sliders, combined with the hydraulic dampers, described later, explain the word "Teledraulic," coined for the description of the fork.

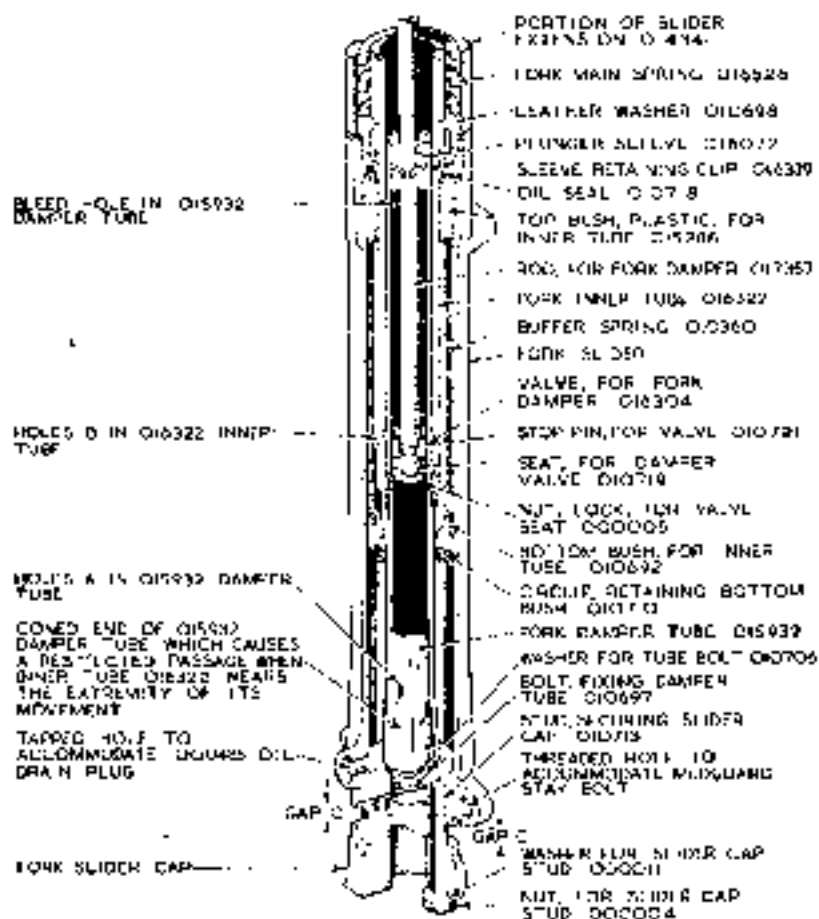


Illustration 18

Introduced in early 1941 for use under strenuous war conditions by a few allied armies, it remains unaltered, except in detail, to this day and copied practically universally. The hydraulic dampers operate in tubular members located inside the main tubes. As will be seen the aluminium sliding members operate upon steel bushes secured to the bottom ends of the main tubes and also upon bakelite bushes, secured to the top end of the sliders themselves. Above these bushes, an internal valve is fitted, the object of which is to prevent leakage of oil from below into the main spring chamber. The normal level of oil is well above the bottom extremity of the main inner tubes and having this in mind, it is at once clear that upward movement of the sliders resulting from impact with road bumps in addition to meeting resistance from the main springs also causes oil to be ejected by the cone fitting steel bushes. This oil is forced upward through the bottom ends of the main inner tubes and also through the holes A (Illustration 18) in the bottom of the damper tubes, then past the damper disc valve which the passing oil forces off its seat. As the oil level rises inside the main inner tubes, air trapped is compressed, thereby forming an air buffer acting as auxiliary to the main springs. This displacement of oil upon impact imparts a certain amount of damper effect, the extent of which increases with the violence of the shock, or in other words, the bigger the bump the greater the damping effect. Upon the recoil movement, the damper disc valve returns to its seat and the oil trapped between this valve and the plunger sleeve above

has no other source of escape but past this sleeve and the adjacent small metered bleed hole. This instantaneously restricted passage causes a considerable damper effect to the rear action. It will thus be gathered that on the slack movement of the fork, slight damper action occurs, with a greatly increased damper action on the reverse movement, both actions automatically increasing in effect the more violent the movement. Before concluding this description, it should be mentioned that upon a very violent impact, as a result of which the main springs are almost fully compressed, the damping of the upward movement of the sliders is temporarily increased by the automatically greatly restricted passage for the displaced oil, brought about by the lower ends of the outer tubes entering the tapered enlarged ends of the inner tubes as the sliders near the limit of their upward movement. Thus bottoming is prevented, no matter how violent the impact. For ordinary purposes the recommended oil content is 6 ozs. (170.6 c.c.) each leg of one of the S.A.E. 20 oil is specified. To deal with heavier loads than normal, the oil content may be increased to a permissible maximum of 10 fluid ozs. (284 c.c.) per leg. To increase damping oil of heavier grade may be used. It will be found, however, that for normal purposes the recommended grade and quantity of oil will give the most comfortable ride.

FRONT FORK "TOPPING UP"

No part of the **TELEHYDRAULIC** Front Fork requires individual lubrication, but it is advisable to check the oil content, once every five thousand miles. The normal content as already stated, is 6 fluid ounces (170.6 c.c.) each side.

Support motor cycle vertically with weight on both wheels. A steady under each footrest is the best method.

Unscrew the hexagonal plugs at top of fork inner tubes. These are on level with handlebars and attached to them are the damper rods. Have a graduated measure of not less than 10 fluid ozs. capacity available in which to catch and measure the oil. Remove the drain plug from the bottom of a slide and catch the oil which drains out. Then reinsert drain plug and work the top plugs to which damper rods are attached up and down (pumping action), making upward strokes as violent as possible but using only fingers to do so. This pumping action is to free any oil trapped in the damper tubes above the damper disc valve. Wait two minutes and again remove drain plug. Repeat the action until no further oil can be drained off when, if the fork had the correct oil content, about 6 fluid ozs. (170.6 c.c.) will have been drained off. If less, add to make this quantity, or reduce if an excess quantity has been drained off. Next refit drain plug and carefully pour into the top of the tube being checked exactly 6 fluid ozs. (170.6 c.c.), after which the top plug may be replaced.

NOTE—Although the normal oil content of each side is specified as 6 fluid ozs., it is not possible to drain all the oil via the drain plug. The excess is the lesser quantity of 6 fluid ozs. (170.6 c.c.) referred to above. However, if the fork is at any time completely dismantled and then reassembled in a dry state, it should be noted that in that event the correct quantity of oil to add to each leg is 6 fluid ozs. (170.6 c.c.).

TO REMOVE THE COMPLETE FRONT FORK ASSEMBLY

Support the machine with the front wheel clear of the ground. (A box, of suitable height, under each footrest is the best method.)

Remove front wheel by method described in Wheel Section.

Remove front stand and front mudguard.

Detach the switch panel that is held to the top of the head lamp by three screws.

Disconnect speedometer driving cable from the speedometer head.

Detach the speedometer light bulb with its holder.

Remove the two bolts retaining the head lamp and take same away.

Remove the two bolts retaining the speedometer head and take same away.

Remove the handlebar hat disc and lay the handlebars, complete with controls, upon a pad on top of the petrol tank.

Detach the front brake cable from the forks. (First remove the slotted yoke end and then completely unscrew the cable adjuster.)

Unscrew the hexagon plug on top of each inner tube and slacken the lock nuts securing the damper rods attached. Then, before removing the hexagon plugs, attach a piece of wire about 1/8 inches long underneath each damper rod lock nut, to enable the damper rods to be raised for assembly.

Remove domed lock nut at top of steering column.

Remove fork nut on steering column.

Use a soft mallet to tap upward the handlebar lug until it disengages with the fork stem (steering column) and the fork assembly can then be withdrawn. (Take care to avoid lugs of the 56 steering head steel balls.)

To re-fit a complete front fork assembly

Stick, with grease, 20 balls in fork crown ball race.

Stick, with grease, 13 balls in main frame top ball race.

Proceed to fit fork assembly by reversing the instructions given above so disassemble, carefully re-securing the damper rod adjusters before inserting the hexagonal headed plugs to which they are attached.

TO REMOVE A FORK SLIDER (either side) (Dealers service only)

Support the motor cycle with the front wheel clear of the ground, and remove the tubular slide extension from the slider which it is intended to remove. Special articulated clamp tool required. (Available in workshop toolkit.)

Next remove the front wheel, front stand and mudguard as detailed above. Then with a thin tubular box, remove the bolt securing the damper tube. The hexagonal head of the bolt is sunk in the upper half of the wheel spindle clamp. Place a receptacle underneath to catch the oil which will drain out upon removing the bolt, and take care of the fibre washer located under the head. A sharp jerk downward should now enable the slider to be withdrawn, but should difficulty be experienced, apply a little heat to the enlarged top end of the slider. This will cause sufficient expansion to release the oil seal which is normally a snug push-in fit in the top of the slider. The re-assembly is carried out in exactly the reverse order, again if necessary applying a little heat to enable the oil seal to be pushed down into the slider top before screwing in the slider extension. After completion, the oil which has escaped **MUST** be returned via the top. (See Front Fork "Topping up".)

TO REMOVE A FORK INNER TUBE ASSEMBLY (either side) (Dealers service only)

First unscrew the hexagonal plug at the top of the inner tube if it is intended to remove, and after slackening the lock nut by which the damper rod is secured to this plug, unscrew the plug, allowing the rod to fall. Next proceed to remove the slider as already detailed, except do not disturb the bolt securing the damper tube. The damper tube and protruding rod can be removed later with the slider. Now loosen the fork crown clamping stud nut when it should be possible to draw the entire inner tube assembly down through the crown lug. Upon re-assembly, the inner tube is first pushed home as far as possible by hand and then pulled right home by screwing down the top hexagonal plug. With this plug tightened down, then proceed to tighten the crown clamping stud nut, after which the hexagonal plug may be removed and a piece of wire passed down through the inner tube. Loop the bottom end of this wire underneath the damper rod lock nut. The slider is then carefully pushed upward while at the same time pulling on the wire until the top end of the damper rod projects sufficiently to permit the unscrewed plug to be attached and secured with the lock nut, after which the wire may be removed. It may be found necessary to apply a little heat to enable the oil seal to be pressed home with the fingers before screwing on the tubular extension.

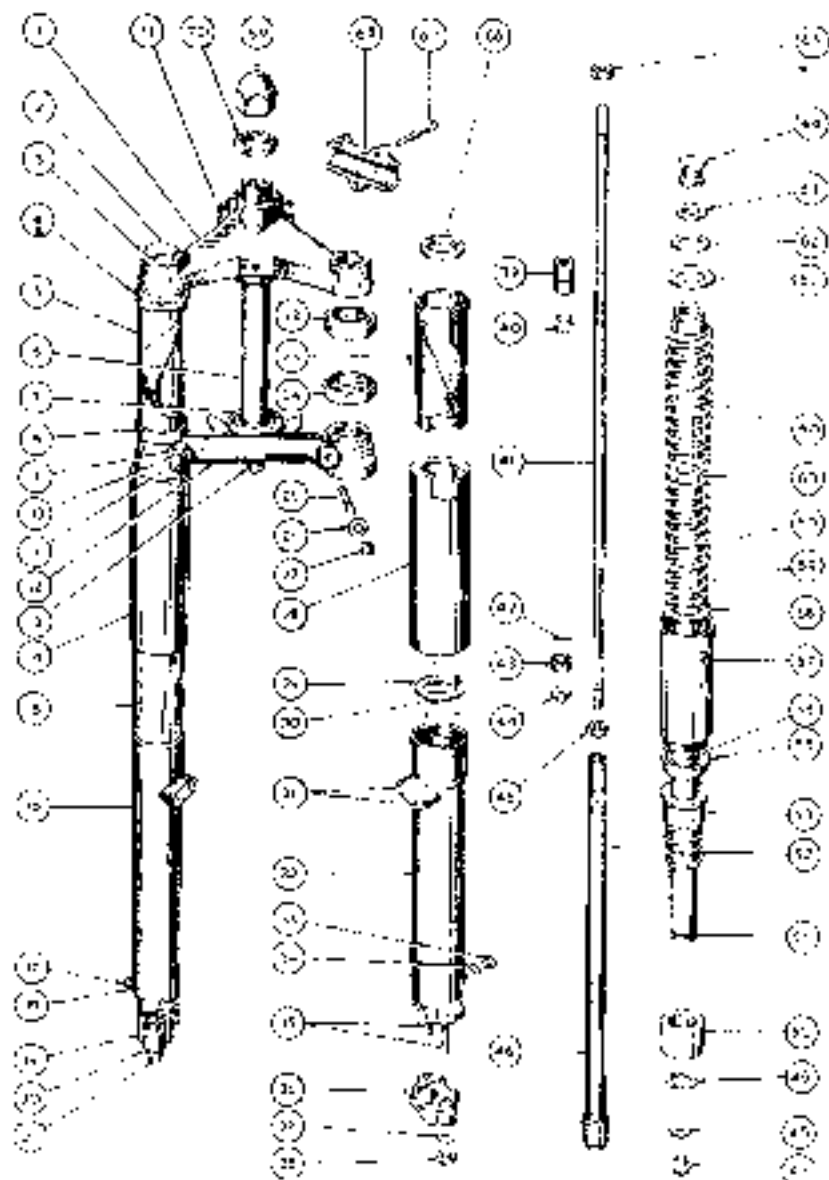


Illustration 19

REF. PART NO.	PART NUMBER	DESCRIPTION
1	01690	LUG FOR HANDLEBAR AND STEERING HEAD
2	01678	BOLT TOP FOR FORK INNER TUBE
3	010029	WASHER PLAIN FOR FORK INNER TUBE TOP BOLT
4	010003	CAP FOR FORK TOP COVER THIRF TOP LOCATION
5	016681	TUBE TOP COVER TOP RIGHT WITH LAMP LUG
6	—	STEM FOR FORK CROWN (NOT SOLD SEPARATELY)
7	000025	BALL RACE FOR FORK CROWN
8	016680	CAP FOR FORK TOP COVER TUBE BOTTOM LOCATION
9	000011	WASHER PLAIN FOR FORK CROWN FINCH THRD
10	016635	NUT FOR FORK CROWN FINCH STUD
11	—	FORK CROWN (NOT SOLD SEPARATELY)
12	016194	FORK CROWN ASSEMBLY (CROWN, STEM AND CIRCLIP)
13	—	BOSS ON FORK CROWN, THREADED TO ACCOMMODATE STEERING DAMPER PLATE FIXING BOLT
14	017024	TUBE FORK COVER BOTTOM
15	010041	EXTENSION FOR FORK SLIDER
16	016522	SLIDER FOR FORK WITH CAP STUDS AND NUTS
17	000085	SCREW PLUS FOR FORK SLIDER OIL DRAIN HOLE
18	000004	WASHER HERE FOR FORK SLIDER DRAIN HOLE SCREW
19	016604	CAP FOR FORK SLIDER
20	000001	WASHER PLAIN FOR FORK SLIDER CAP SECURING STUD
21	000004	NUT FOR FORK SLIDER CAP SECURING STUD
22	010003	CAP FOR FORK TOP COVER TUBE TOP LOCATION
23	016680	TUBE FORK COVER TOP LEFT WITH LAMP LUG
24	016680	CAP FOR FORK TOP COVER TUBE BOTTOM LOCATION
25	016635	STUD FINCH FOR FORK CROWN
26	000001	WASHER PLAIN FOR FORK CROWN FINCH STUD
27	016635	NUT FOR FORK CROWN FINCH STUD
28	017001	TUBE FORK COVER BOTTOM
29	010003	PLATE PLAIN LOCATING HOLE FOR COVER THIRF SCREW, REMAINING BOTH LOCATING PLATES
30	017001	BOLTS THREADED TO ACCOMMODATE BRAKE ANCHOR SPRAY
31	017001	SLIDER FOR FORK WITH CAP STUDS AND NUTS
32	017001	SCREW PLUS FOR FORK SLIDER OIL DRAIN HOLE
33	010003	WASHER HERE FOR FORK SLIDER DRAIN HOLE SCREW
34	010003	STUD SECURING CAP TO FORK SLIDER
35	010003	CAP FOR FORK SLIDER
36	010003	WASHER PLAIN FOR FORK SLIDER CAP SECURING STUD
37	000004	NUT FOR FORK SLIDER CAP SECURING STUD
38	010003	SLIDER PLUNGER FORK DAMPER ROD
39	016635	PLATE RETAINING DAMPER ROD SLIDE
40	016635	ROD FOR DAMPER FORK
41	010003	PIN STOP FOR FORK DAMPER VALVE
42	010003	VALVE FOR FORK DAMPER
43	010003	SEAL FOR FORK DAMPER VALVE
44	000001	NUT LOCK FOR DAMPER VALVE SEAL
45	016635	TUBE FOR FORK DAMPER
46	016635	BUSH FIXING DAMPER TUBE TO SLIDER
47	016635	WASHER HERE FOR DAMPER TUBE BOLT
48	016635	CIRCLIP FOR INNER TUBE BOTTOM BUSH
49	016635	BUSH BOTTOM FOR INNER TUBE
50	016635	GROOVE FOR CIRCLIP 0 0710
51	016635	SPRINGS UPPER FOR FRONT FORK
52	016635	BUSH TOP PLASTIC FOR INNER TUBE
53	016635	OIL SEAL FOR INNER TUBE
54	016635	TUBE FORK INNER
55	016635	EXTENSION FOR FORK SLIDER
56	016635	WASHER LEATHER FORK SPECIFIC SEATING
57	016635	SHIM PLAIN FOR FRONT FORK
58	016635	BUSH RUBBER FORK INNER TUBE
59	016635	WASHER LEATHER FORK SPRING SEATING
60	016635	WASHER PLAIN FOR INNER TUBE TOP BOLT
61	016635	NUT SEALING FOR INNER TUBE TOP BOLT
62	016635	FLUG FOR TOP OF INNER TUBE
63	000001	NUT LOCK TOP END OF DAMPER ROD
64	016635	PLATE THREADED LOCATING TOP COVER TUBE
65	016635	SCREW FOR HANDLEBAR CLIP
66	016635	CLIP (HALF ONLY) FOR HANDLEBAR LUG
67	016635	NUT LOCK (LOCKED) FOR FORK STEM
68	000001	NUT ADJUSTING FOR FORK STEM
69	000001	NIPPLE GREASE FOR HEAD BALL RACES
70	016635	OIL SEAL LEATHER (ALTERNATE TO DUGLY RUBBER OIL SEAL FOR FRONT FORK ONLY)
71	016635	WASHER PAPER (USED ONLY UNDER LEATHER OIL SEAL)

REAR SUSPENSION

The rear wheel is mounted in a fork that is hinged just behind the gear box. The hinge has robust plain bearings lubricated from a reservoir of 1 1/2 fluid ounces (42.6 c.c.) of heavy gear oil which is sufficient to last almost indefinitely. Provision is, however, made for replenishment should same be required. A small screw will be observed in the right hand end cap of the hinge bearing; upon removal of this screw, oil can be injected into the reservoir, the screw orifice operating as a level control.

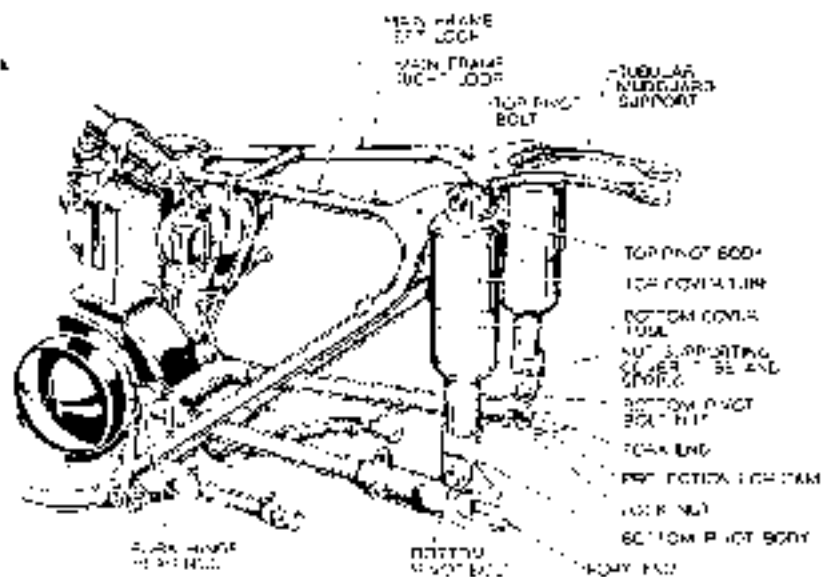


Illustration 20

Showing rear spring frame and "TELEDRAULIC" legs

The rear wheel fork is suspended on springs located in the two "TELEDRAULIC" legs joining the rear of the fork to the main frame rear loops, and the spring action is damped by hydraulic dampers identical in design to those used in the "TELEDRAULIC" Front Fork Assembly.

The hydraulic fluid used is one of the grades of oil specified in the Lubrication Section for use in the "TELEDRAULIC" Front Forks.

The recommended quantity for each leg is 85 c.c. or a trifle under 3 fluid ozs. of S.A.E. 20 grade of one of the brands specified. For exceptional loads, the next heavier S.A.E. grade may be used, but unless the front fork, overall damping as well as maximum load capacity is increased by this alteration of grade alone, and under no circumstances should the oil content of each leg exceed 90 c.c. or roughly 3 1/2 fluid ozs. Unless serious doubt exists as to the correct functioning of the rear legs, owners are advised to leave well alone. Should the need arise, however, the oil content of each leg should be separately checked as follows:

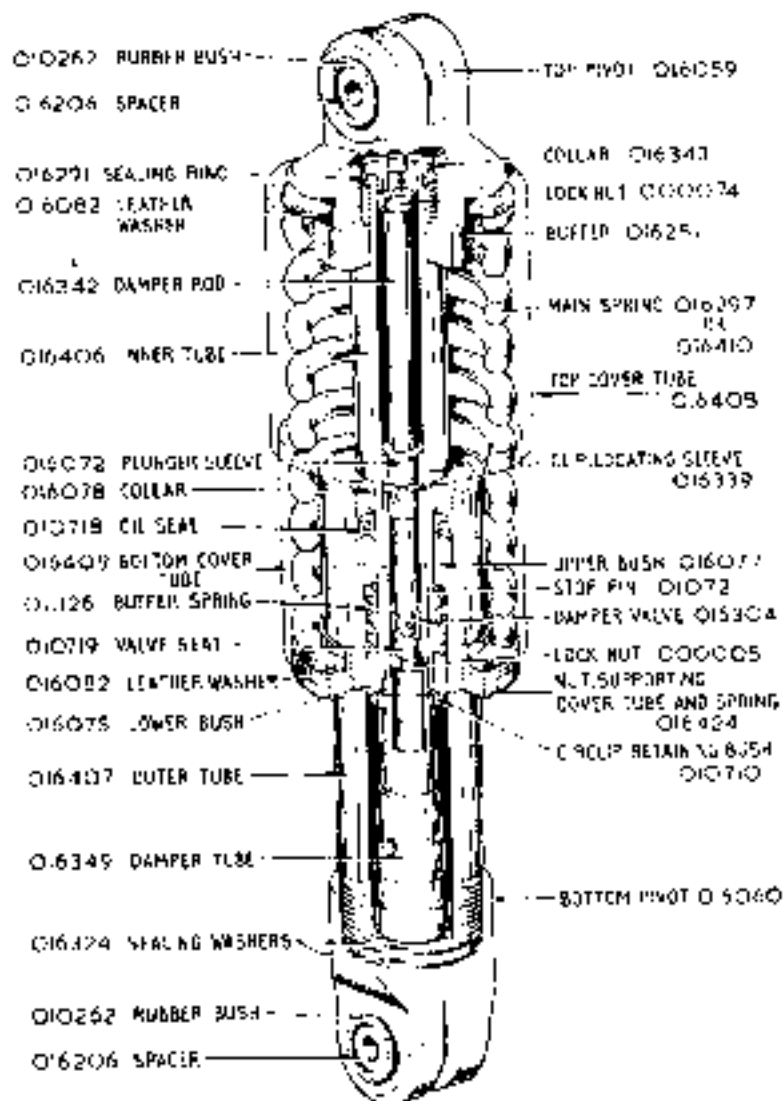


Illustration 21

Showing "Ghost" view of "TELEDRAULIC" leg

To check oil content of "TELEHYDRAULIC" leg and top-up: (DEALERS' SERVICE ONLY)

Dealing with one leg at a time, remove top securing bolt, taking care to observe the location of the spring washers on it. Remove bottom securing bolt and take away the leg.

Using a suitable clamp encircling the outer tube adjacent to the bottom pivot lug, grip in a vice and loosen the pivot lug.

Then holding leg vertically, bottom end uppermost, carefully remove the loosened pivot lug, and gripping the exposed end of the damper tube with the fingers, raise and lower several times (pumping action) after which pour the oil contents into a graduated measure.

It may be necessary to repeat the pumping action to eject oil from under-vent the damper valve, and finally the open end of tube should be supported above the measure and left to drain for several minutes.

If the leg contained the correct amount of oil, 75 c.c. (2½ ozs.) should have been drained out into the graduated measure, leaving 10 c.c. (½ oz.) which cannot be withdrawn.

All that now remains is to pour carefully back in to the leg exactly 75 c.c. (2½ ozs.) of oil, after which the pivot lug may again be screwed on and securely tightened down to prevent oil leakage when the leg is re-fitted, after which the other leg may be dealt with in a similar manner.

NOTE—Shortage of oil is evidenced by very lively action.

PROP STAND

The prop stand hinges on a bolt which passes through a lug brazed to the frame and screws into the jaw of the stand leg. It is then locked by a nut and split pin. Care in tightening this bolt is necessary to avoid pinching, and it is essential to observe after securely tightening the lock nut that the stand is perfectly free. Remove the large bolt with engine oil before replacing it.

CENTRE STAND (Spring Frame Models)

The centre stand is mounted on a bolt set across the bottom rear of the main frame and is removed by taking off a nut of the centre bolt and pushing bolt through the frame. During removal and replacement the stand should be in a horizontal position in order to take off as much of the tension of the return spring as is possible.

FRONT STAND

The front stand is intended to operate only as a support and care is necessary, when using, to avoid pinching the vertical piston. No stools are provided and dragging the machine backward with the stands down, is likely to fracture the lugs on the aluminium sliders of the forks to which the stand is attached.

Do not attempt to use the FRONT STAND unless the machine is already supported by the main stand.

REAR STAND (Rigid Frame Models)

A plain steel washer is fitted under the HEAD of each of the two bolts that retain the rear stand to the fork ends. The washers should **NOT** be fitted UNDER the nuts of these bolts.

TO REMOVE OIL TANK AND BATTERY CARRIER

Two studs on the seat tube, one facing to the front, the other facing to the rear, engage with two right-angle stays on the oil tank and two similar stays on the battery carrier, and two washers and two nuts, fitted to the studs, retain the oil tank and battery carrier in position.

Remove oil tank and battery carrier by:

1. Drain oil tank
2. Disconnect wire from the battery where it is attached to the seat lug bolt by a screw.
3. Disconnect wire from the battery at the point where it goes to the battery, where there is a double screwed connection. (Pull back the rubber sleeve to reveal the two main components of the connection. Hold one component in a wrench, or pliers while the second component is unscrewed from it.)
4. Remove battery from carrier.
5. Disconnect oil feed pipe from bottom of oil tank.
6. Disconnect oil return pipe from bottom of oil tank.
7. Disconnect vent pipe from back of oil tank.
8. Disconnect voltage control unit from carrier side. Only two bolts to remove. No need to disconnect any of the electric cables.
9. Remove bolt retaining rear stay from oil tank to rear in-plate.
10. Remove screw, in base of carrier, retaining carrier to stay that it is supported by the front chaincase.
11. Remove the two nuts and washers retaining the oil tank and battery carrier to the two studs.
12. Oil tank and battery carrier are now free to be taken away and, when doing so it is necessary to give each a slight rotary movement in order to disengage from the frame studs.

NOTE—The frame studs are brazed to the frame.

To re-fit

Locate tank and battery carrier on their two fixing studs and, before doing anything else, fit both oil pipes. Then reverse the instructions given above.

TO REMOVE THE REAR CHAIN GUARD (Spring Frame Models)

1. Remove the rear wheel. (See Wheel Section.)
2. Remove the bolt retaining the front end of the chain guard to the rear fork.
3. Remove the bolt retaining the rear end of the chain guard to the rear fork. (There are two spacers on this bolt, one is between the two sides of the guard and the other is between the head of the fixing bolt and the guard.)

TO REMOVE THE REAR CHAIN GUARD (Rigid Frame Models)

- Remove**
1. The rear portion of rear mudguard.
 2. The bolt retaining the frame, top, end of the chain guard to the front chaincase.
 3. The bolt retaining the front, bottom, end of the chain guard to the rear frame.
 4. The bolt retaining the rear, top, end of the chain guard to the rear frame.
 5. The chain guard is then free to be taken away.

BY USING GENUINE SPARES YOU ARE ASSURED THEY
WILL FIT ACCURATELY AND GIVE SATISFACTORY SERVICE

WHEELS AND BRAKES

TO REMOVE FRONT WHEEL

Place machine on beer stand.

Remove the split pin, and pin, retaining yoke end of front brake cable to the brake expander lever.

Remove bolt retaining brake anchor stay to brake cover plate.

Slacken the nut on the left-hand end of front wheel spindle.

Remove the four nuts retaining the lugs to the fork sliders, which will permit the removal of the two caps and, putting pressure on the front wheel (in order to decrease the effective height of the wheel spindle) the wheel can be withdrawn towards the front.

NOTE The two caps **MUST** be refitted in same order and position as originally. Therefore, lay them aside so that the order and position of assembly will be correctly made.

When replacing the front wheel, observe the instructions already given in the Fork and Frame Section. (And remember to press downwards on the wheel when putting in position in order to get the wheel spindle between the two sets of studs.)

Do not attempt to use the FRONT STAND unless the machine is supported by the centre stand (on SPRING FRAME MODELS) or by the REAR STAND (on RIGID FRAME MODELS).

TO REMOVE REAR WHEEL (Spring Frame Models)

Place the machine on the centre stand. Remove the bolt, washer and nut, in rear-most position on each tubular member fixing the hinged portion of the rear mudguard.

Disconnect the strap connector in the wire of the rear lamp.

Remove adjusting nut from rear brake rod.

Revolve rear wheel till the chain connecting link is in its most possible rear-most position.

Remove connecting link and allow chain to come right away from the rear wheel sprocket but ensure it hangs so it cannot come away from the gear box sprocket.

Disconnect speedometer cable from speedometer gear box by unscrewing the cable gland nut.

Slacken the nuts on the rear wheel spindle that positions the speedometer gear box.

Slacken both outer nuts on the rear wheel spindle three complete turns.

Using adjustable wrench 017149, apply it to the hexagonal body of the adjusting cam on the left-hand end of the wheel axle and turn the cam till, by pushing the wheel forwards, the wheel is in its most forward possible position.

Hold left-hand side of wheel tightly inward against the cam stop and pull backwards the right-hand side of the wheel so that the brake cover plate engages with the square headed anchor bolt. Then, raise the hinged portion of the rear mudguard and pull wheel away from the fork ends.

TO REMOVE REAR WHEEL (Rigid frame Models)

Place machine on rear stand.

Disconnect rear lamp wire at connection near rear wheel spindle.

Disconnect speedometer driving cable. (Unscrew gland nut or cable.)

Disconnect rear chain connecting link. (Allow chain to hang clear of the rear wheel sprocket without becoming disengaged from the gear box small sprocket.)

Remove the two nuts securing rear portion of rear mudguard to its front portion.

Loosen nut and washer from bolt securing mudguard side bridge and tool box stay to tubular stay.

Remove adjusting nut from rear brake rod.

Slacken the two nuts (unscrew about four turns) retaining the rear mudguard side stays to their studs.

Slacken the two nuts on the rear wheel spindle.

Remove the rear portions of the rear mudguard, with its trays, leaving tool box and stay in position.

Remove the rear wheel from the fork ends by twisting it sideways to release and clear the rear brake cover plate anchor bolt and then withdrawing it to the rear.

Refit in the reverse order but, before finally tightening the rear wheel spindle nuts, ensure the speedometer gear box is so positioned that the speedometer driving cable can be correctly replaced.

When the wheel alignment is correct a piece of thin string stretched taut across both wheels, about four inches from and parallel to, the ground, should just touch both tyre at both sides of the wheel centres.

Alternatively, a straight wooden batten, about five feet long, is handy to use for checking wheel alignment. This should be applied, as in the case of string, parallel to and about four inches from the ground.

NOTE Always check the rear chain tension and the rear brake adjustment after making an alteration to the rear wheel position.

TO RE-FIT REAR WHEEL (Spring Frame Model)

Reverse the above procedure, see that the speedometer drive cage and engaged, but leave the tightening of the nut that secures the speedometer gear box for the final operation, i.e., after the speedometer cable has been re-connected and the exterior axle nuts have been tightened. (This also applies to Rigid Frame Models.)

It will be found easier to refit the wheel to the fork ends with the brake cover plate hanging free and then, holding the wheel on its left-hand side, as far forward as the fork end as is possible, to swing the right-hand side backwards, lifting up the free cover plate so that the slot in it is positioned to engage with the square headed anchor bolt and then swinging the right-hand end of the axle forwards till engaging has been completed.

After refitting the rear wheel, check the rear chain adjustment, and, if necessary, re-set it. Then check the rear brake adjustment and, if necessary, re-set it.

WHEEL BEARINGS AND ADJUSTMENT

The wheel bearings are of taper roller type. The inner bearings for the rollers are integral with the wheel spindle in the case of the front wheel, and are separate tracks that are a push fit on the centre spindle in the case of the rear wheel. (Reference to illustration 13 will make this clear.) The outer cups for the rollers are pressed into the hub shell. They have a fixed location one side and an adjustable location on the other. The fixed location is provided by a circular groove cut in one end of the hub shell, while the adjustable location is regulated by a screwed ring that is threaded into the opposite end of the hub and the position of which can be locked by an encircling nut.

On the rear wheel the adjusting ring is located on the left-hand side of the hub while on the front wheel, the adjustment is on the right-hand side.

It is rarely necessary to make adjustment to wheel bearings. It is most important they are not adjusted too tightly as this would quickly ruin them. There must always be a slight amount of end play. This should be about .002", which represents a just perceptible rim rock. (Not more than $\frac{1}{32}$ " rock.)

To adjust the rear wheel bearings the wheel must first be removed from the machine, but those of the front wheel can be dealt with in situ.

A service method of ensuring correct adjustment is:

Slacken the lock nut.

Tighten the adjusting ring until all slackness has been taken up.

Slacken back the adjusting ring exactly one-half turn.

Tighten the lock nut, making sure that, when doing so, the adjusting ring does not creep round.

TO DISMANTLE A FRONT WHEEL BEARING

These instructions need reference to the upper part of Illustration 23.

Remove wheel from machine.

Remove nuts, and brake cover plate with shoes, etc., from left-hand side of wheel.

Turn to right-hand side and slacken lock nut. (11.)

Completely unscrew the adjusting ring (10) and take it away with the lock nut (11) still on it.

Carefully apply steady pressure on the threaded end of the wheel spindle which will, in turn, eject from the opposite end of the hub the hub housing for the oil seal (9), the oil seal (8), the metal washer (7) that is behind the oil seal, and the outer cup (6). These may be lifted away as they emerge.

The front wheel spindle (6), with its two sets of rollers in cages, may now be lifted out of the hub.

Turn to the left-hand end of the hub, carefully apply steady pressure on the visible washer (avoiding fouling the circlip that can be seen in the hub end), so that the complete left-hand assembly of oil seal and outer cup is pushed a little further into the hub shell. This will take off pressure on the circlip, thereby making its extraction an easy matter.

Extract circlip (1), and then, reversing the hub, apply pressure on the inside edge of the outer cup (6), so that it is forced out of the hub. As it emerges it will push in front of it, the oil seal external plain washer (2), the oil seal (3), with its encircling spacer collar (4) and the oil seal inner plain washer (5), all of which can be lifted away as they appear, to be finally followed by the cup (6).

The dismantling is then completed.

To re-fit, reverse the above procedure, remembering that, after cup (6), washer (5), spacer (4), oil seal (3) and washer (2) have been inserted in the plain end of the hub, to re-fit the circlip (1) and then carefully to apply steady pressure on the inner edge of the cup (6) to force the above entire assembly tightly back against the circlip (1).

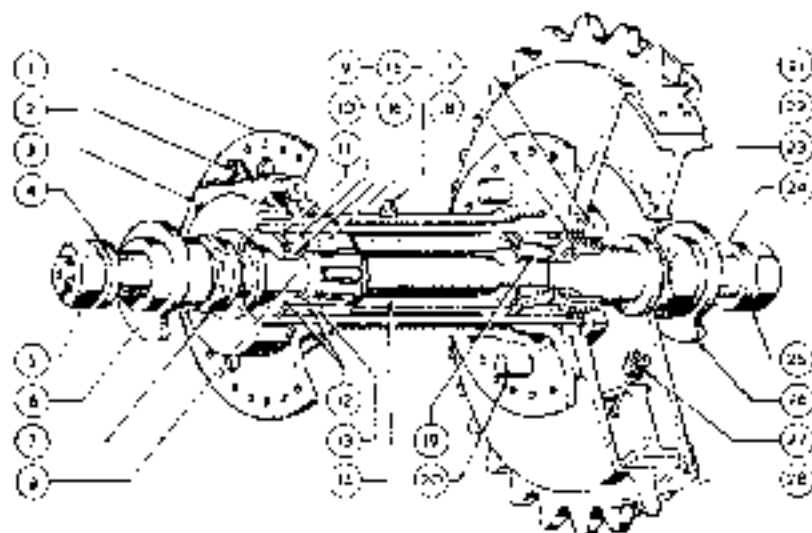


Illustration 27

Showing rear hub, rear chain sprocket, brake and speedometer gear box (Spring Frame Model)

(Rigid Frame Models identical except for items 4-6 and 26)

- | | |
|--|---|
| 1 RIGHT-HAND SIDE HUB FLANGE. | 14 SPACER, BETWEEN THE TWO TAPER ROLLER BEARINGS. |
| 2 GREASE NIPPLE ON SPEEDOMETER GEAR BOX. | 15 BRAKE NIPPLE IN HUB SHELL. |
| 3 SPEEDOMETER GEAR BOX. | 16 OUTER HALF OF RIGHT SIDE TAPER ROLLER BEARING. |
| 4 SHOOT BUSH, FITS IN RIGHT-HAND FORK END. | 17 NUT, LOCKING BEARING ADJUSTING RING. |
| 5 NUT, ON CENTRE SOLID SPINDLE. | 18 WING, FOR ADJUSTING BEARING. |
| 6 MULTIFUNCTION STOP CAM. | 19 OUTER PART OF LEFT SIDE TAPER ROLLER BEARING. |
| 7 NUT, LOCKING SPEEDOMETER GEAR BOX IN POSITION. | 20 BOLT, SECURING BRAKE DRUM AND SPROCKET TO HUB. |
| 8 SPACER, BETWEEN SPEEDOMETER GEAR BOX AND RIGHT-HAND SIDE TAPER ROLLER BEARING. | 21 BRAKE BRAKE COVER PLATE. |
| 9 OIL SEAL. | 22 BRAKE LIVING. |
| 10 COLLAR, ENCIRCLING RIGHT-HAND OIL SEAL. | 23 BRAKE SHOE. |
| 11 CIRCLIP, LOCATING RIGHT-HAND SIDE TAPER ROLLER BEARING. | 24 SHOOT BUSH, FITS IN LEFT HAND FORK END. |
| 12 WASHER, RETAINING OIL SEAL TONGUE HALF SIDE OF SEAL. | 25 NUT, ON CENTRE SOLID SPINDLE. |
| 13 SPACER, BETWEEN OIL SEAL INNER WASHER AND TAPER BEARING. | 26 LEFT HAND SIDE CAM. |
| | 27 SPRING, FOR BRAKE SHOE. |
| | 28 BRAKE DRUM AND SPROCKET. |

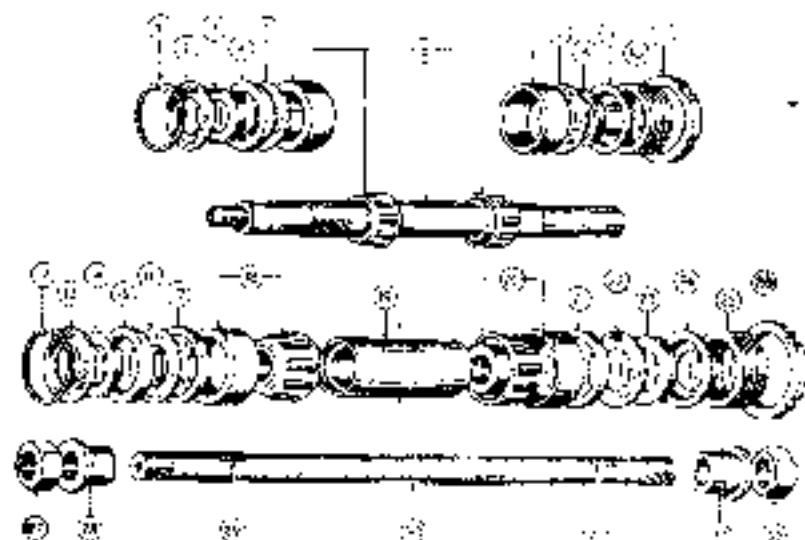


Illustration 23

Showing exploded view of hub bearing components in the order of assembly. Upper part is that of front bearings. (Rigid and Spring Frame Models). Lower part is that of rear bearings (Spring Frame Model only)

(Rigid Frame Models identical except for items 26 to 29)

- | | |
|---|--|
| 1 CIRCLIP | 14 SPACER, BETWEEN HUB AND |
| 2 WASHER, METAL, OUTSIDE OIL SEAL | 25 TAPER BEARING (OUTER CUP, CAGE FOR ROLLERS AND ROLLERS). THESE ARE NOT SUPPLIED SEPARATELY. ALSO ROLLERS ARE NOT SUPPLIED SEPARATELY. |
| 3 OIL SEAL | 26 SPACER BETWEEN OIL SEAL WASHER AND TAPER BEARING |
| 4 SPACING COLLAR ENCODING OIL SEAL | 27 WASHER, METAL BETWEEN OIL SEAL AND SPACER |
| 5 WASHER, METAL BETWEEN OIL SEAL AND TAPER BEARING | 28 OIL SEAL |
| 6 OUTER RACE (3 SETS), CENTRE SPINDLE ROLLERS IN CAGES (2 SETS). THESE ARE NOT SUPPLIED SEPARATELY. ALSO ROLLERS ARE NOT SUPPLIED SEPARATELY. | 29 CUP HOUSING FOR OIL SEAL |
| 7 WASHER, METAL, BETWEEN OIL SEAL AND TAPER BEARING | 30 ADJUSTING RING |
| 8 OIL SEAL | 31 LOCK NUT FOR ADJUSTING RING |
| 9 CUP, HOUSING, FOR OIL SEAL | 32 CIRCLIP |
| 10 ADJUSTING RING | 33 WASHER, METAL, OUTSIDE OIL SEAL |
| 11 LOCK NUT, FOR ADJUSTING RING | 34 OIL SEAL |
| 12 CIRCLIP | 35 SPACING COLLAR ENCODING OIL SEAL |
| 13 WASHER, METAL, OUTSIDE OIL SEAL | 36 WASHER, METAL, BETWEEN OIL SEAL AND SPACER |
| 14 OIL SEAL | 37 SPACER BETWEEN OIL SEAL WASHER AND TAPER BEARING |
| 15 SPACING COLLAR ENCODING OIL SEAL | 38 TAPER BEARING (OUTER CUP, CAGE FOR ROLLERS AND ROLLERS). THESE ARE NOT SUPPLIED SEPARATELY. ALSO ROLLERS ARE NOT SUPPLIED SEPARATELY. |
| 16 WASHER, METAL, BETWEEN OIL SEAL AND SPACER | 39 KEYWAY TO ACCOMMODATE KEY LOCKING CAP TO REAR WHEEL SPINDLE |
| 17 SPACER BETWEEN OIL SEAL, WASHER AND TAPER BEARING | 40 KEYWAY TO ACCOMMODATE KEY LOCKING CAP TO REAR WHEEL SPINDLE |
| 18 TAPER BEARING (OUTER CUP, CAGE FOR ROLLERS AND ROLLERS). THESE ARE NOT SUPPLIED SEPARATELY. ALSO ROLLERS ARE NOT SUPPLIED SEPARATELY. | 41 RISEL FOR REAR WHEEL SPINDLE FITS IN LOCK NUT |
| | 42 NUT, EXTERNAL, FOR REAR WHEEL SPINDLE |

TO DISMANTLE A REAR WHEEL BEARING

These instructions have reference to the lower part of illustration 23.

1. Remove wheel from machine.

2. Remove brake cover plate, with brake shoes, centre solid spindle with cone, spacers, bushes, nut and speedometer gear box.

3. Turn to left-hand side and slacken lock nut (26).

4. Carefully unscrew the adjusting ring (25) and take it away with the lock nut (26) still on it.

5. Turn to the right-hand end of the hub and carefully apply steady pressure on the visible steel washer (avoiding loading the circlip that can be seen in the hub end), so that, in turn, the cup housing (24) for the oil seal, the oil seal (23), the metal washer (22) that is behind the oil seal, the spacing ring (21) that is between the metal washer and the taper bearing, and outer cup (18) are ejected. These may be lifted away as they emerge.

6. The rollers in cage (20), the centre spacer (19) and the rollers in cage (18) may now be lifted out of the hub.

7. Turn to the right-hand end of the hub, carefully apply steady pressure to the visible washer (avoiding loading the circlip that can be seen in the hub end), so that the complete right-hand assembly of oil seal and outer cup is pushed a trifle further into the hub shell. This will take off pressure on the circlip, thereby making its extraction an easy matter.

8. Extract circlip (12).

9. Through the open end of the hub carefully apply steady pressure to the inner edge of the outer cup (18) so that it is forced out of the hub.

10. As it emerges, it will push, in front of it, the oil seal plain washer (13), the oil seal (14) with its encircling spacer collar (15), the oil seal internal plain washer (16) and the spacing ring (17) between the metal washer and the taper bearing, to be finally followed by the cup (18).

11. The dismantling is then completed.

12. To re-fit, reverse the above procedure, remembering that, after cup (18) has been fitted, washer (16), oil seal (14), spacer (15) and washer (13) have been inserted in the rear end of the hub, to re-fit the circlip (12) and then carefully re-apply steady pressure on the inner edge of the cup (18) to force the above outline assembly tightly back against the circlip (12).

FRONT BRAKE COVER PLATE

It is most important the front brake cover plate is correctly positioned.

It is retained to the front wheel spindle by an inside nut (part number 017003) and an outside nut (part number 013483). Between the inside nut and the brake cover plate is a locking washer (part number 017222).

The inside nut should be positioned so that, when the locking washer is placed next to it, the outside face of the washer is $\frac{1}{16}$ " proud of the outer edge of the brake drum. (Tested by placing a straight edge across the edge of the brake drum.)

The outside nut is fitted so that its hexagonal side is against the brake cover plate.

BRAKE DRUMS

The front wheel brake drum is retained to the wheel by ten countersunk screws.

The rear wheel brake drum is integral with the rear wheel sprocket and is retained to the wheel hub by five bolts and nuts. Under each nut is a lock washer of the "tab" type and it is essential these are always in position.

Harshness in transmission can be caused by the drums retaining bolts and nuts being loose. Rear wheel spokes will break for the same reason.

BRAKE SHOES

The front and rear brake shoes, springs and expanders are interchangeable. The two shoes in each brake are **NOT** identical, they are "handed."

One end of each shoe bears on a fulcrum fixed in the brake cover plate. The other end accommodates a detachable thrust pin. By inserting washers under a thrust pin its effective height can be increased, thereby compensating for wear on the brake linings.

BRAKE SHOE ADJUSTMENT

Brake adjustment, to compensate for lining wear, is normally made by means of a finger adjuster on the rear brake rod and a cable adjuster for the front brake cable.

After a very considerable mileage this continual adjustment causes the brake cam to occupy a position whereby the available leverage is considerably reduced and, as a result, the brake loses efficiency.

To overcome this a hardened headed thrust pin is fitted to each shoe to enable a packing washer to be fitted under the head as, and when, required. Light of these washers (JCG174) are provided in the tool kit. When wear of the brake linings is taken up in this manner it is then necessary to unscrew considerably the adjusting nut on the rear brake rod, or screw in the cable adjuster of the front brake cable, and afterwards adjust the brake, as described afterwards.

When a brake cover plate has been disturbed, it is advisable, upon re-assembly, to centralise the shoes in the brake drum to ensure equal pressure to each. In the case of the front wheel this is best done before re-fitting the wheel to the machine, but in the case of the rear wheel it is best done after re-fitting. If brake shoes tend to squeak, when the brake is applied it is generally an indication the brake shoes are not centralised in the drum.

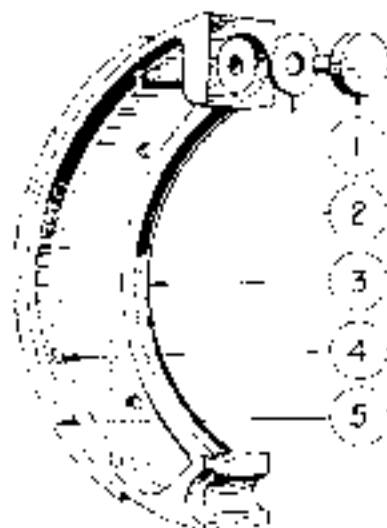


Illustration 24

- (1) Brake shoe thrust pin.
- (2) Thrust pin packing washer.
- (3) Brake shoe.
- (4) Rivet, securing brake shoe lining.
- (5) Brake shoe lining.

Centralise brake shoes, Front or Rear, by:

Ensure the nut binding the cover plate to the wheel spindle is slightly slack.

Place on the brake expander lever a tubular spanner (to increase the leverage), and, while maintaining pressure on the tubular spanner (to expand fully the brake shoes), fully tighten the spindle nut binding the cover plate to the spindle.

FRONT BRAKE ADJUSTMENT

Major adjustment of the front brake shoes is made on the brake thrust pins, by fitting packing washers under the pins, as already described.

Minor adjustment of the front brake shoes is made by altering the position of the brake cable adjuster on the fork assembly. Unscrew the adjuster to "take up" the front brake.

The adjuster is locked in position by a nut.

Adjust front brake by:

Place machine on both stands.

Slightly lock nut on cable adjuster.

Unscrew the cable adjuster till, by rotating the front wheel, it can be felt the brake shoes are just touching the brake drum.

Then screw back the adjuster two complete turns and tighten the lock nut.

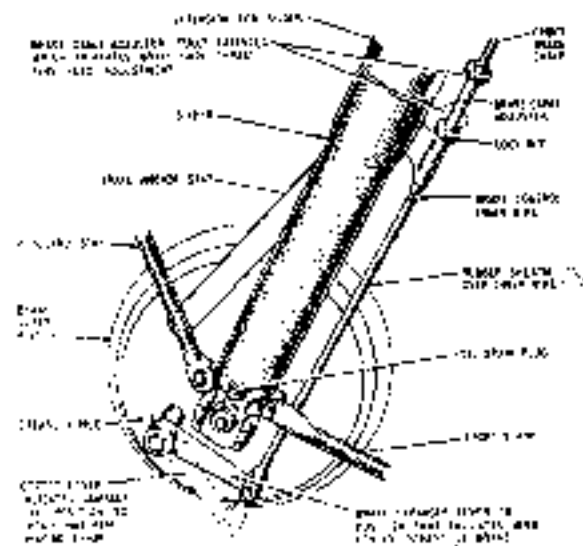


Illustration 25

Showing front brake cable adjuster thread exhausted, indicating brake shoe thrust pin adjustment is necessary.

REAR BRAKE ADJUSTMENT

Major adjustment of the rear brake shoes is made on the brake thrust pins, by fitting packing washers under the pins, as already described.

Minor adjustment of the rear brake shoes is made by altering the position, on the brake rod, of the knurled adjusting nut. Screw the nut further on the rod to "take up" the rear brake.

Adjust rear brake by :

Place machine on centre stand if spring frame, otherwise on rear stand.

Screw further on the brake rod the knurled adjusting nut till, by rotating the wheel, it can be felt the brake shoes are just touching the brake drum.

Then unscrew the adjusting nut two complete turns. (The adjusting nut is automatically locked in position in virtue of the two projecting noses on it engaging in corresponding slots cut in the slip which connects the brake rod and brake expansion lever and being retained in that position by the spring which encircles the rear end of the brake rod.)

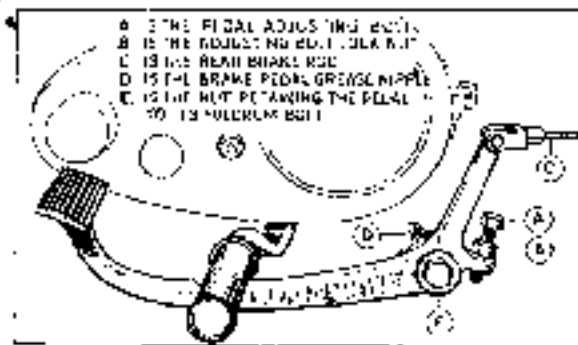


Illustration 26

Showing the rear brake pedal with its adjusting bolt and lock nut. To permanently raise the toe end of the pedal, slacken lock nut B and unscrew the adjusting bolt (A). (Check back brake adjustment after.)
RIGID FRAME MODELS

BRAKE PEDAL ADJUSTMENT

The position of the rear brake pedal can be adjusted with in narrow limits. This is done by means of a link screwed into the heel of the pedal. The adjusting bolt is locked by a nut.

The best position, for normal use, is to position the pedal so that, when the brake is "off," it is just clear of the underside of the front-end arm.

After altering the adjustment of the brake pedal, rear brake adjustment should be checked.

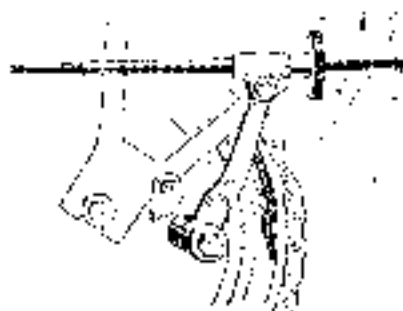


Illustration 27

Showing brake rod adjustment exhausted, adjusting brake shoe through pin adjustment is essential.
RIGID FRAME MODELS

RIMS AND SPOKES

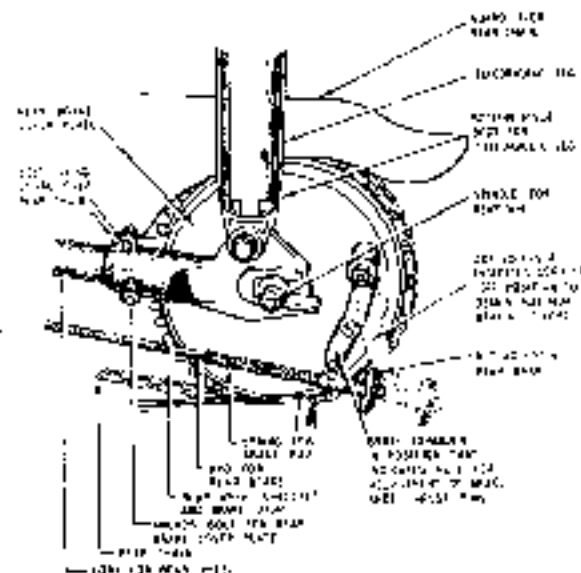
The front and rear rims are each drilled for forty spokes, but they are not interchangeable because the nipple holes in the front rim are smaller than those in the rear rim. See "DATA."

The dimensions of spokes will be found in "DATA."

Illustration 28

Showing brake rod adjustment exhausted, in directing the need for brake shoe pin adjustment.

RIGID FRAME MODELS



TYRES AND SERVICE

Obtaining satisfactory life and service from the tyres is largely a matter within the user's control because the first essential is correct inflation. Check tyre pressure with a low pressure gauge at least once a week. Inflate as may be necessary.

Avoid unnecessary, or "stunt," acceleration and fierce braking, which wear out tyres by causing wheel spin and skid.

Do not drive in tram lines. It is dangerous, especially when wet, and the uprising edges of worn rails will damage the tyres.

Remove lints, etc., that become embedded in the tread and if any oil gets on the tyres or spokes, clean it off with petrol.

Make sure the front and rear wheels are in track. When the wheel alignment is correct, a piece of thin string stretched taut across both wheels, about four inches from, and parallel to, the ground, should just touch each tyre at both sides of the wheel centres.

Alternatively, a straight wooden batten, about five feet long, is handy to use for checking wheel alignment. This should be applied, as in the case of string, parallel to and about four inches from the ground.

Always check the rear chain adjustment, and the rear brake adjustments, when making an alteration to the rear wheel position.

TYRE REMOVAL

It is not essential to remove a wheel from the machine to repair a puncture, but it will usually be found desirable and more convenient to do so.

Take off outer cover and remove inner tube by :

Remove cap from tyre valve.

Remove nut from tyre valve.

Remove the "inside" from tyre valve. This allows inner tube to deflate. Most valve caps have a reduced and slotted top to engage with the valve "inside" in order to unscrew it.

Push edge of cover, that is diametrically opposite to the valve, **RIGHT INTO WELL OF RIM** and, using tyre lever 017007, pick up edge of cover **NEAR VALVE** so that it comes off over the edge of the rim.

Work off the remaining edge of the cover till it is clear of the rim. This is quite easy and there is no reason to use force.

Push upwards valve stems through its hole in the rim, and the inner tube is then free to be taken away.

Remove cover from rim by pushing it right into well of rim and, diametrically opposite, picking it up with the tyre lever and then working it off all the way round.

TYRE FITTING

Re-fit inner tube and outer cover by :

Place one edge of cover right into well of rim, with the three white dots on the cover side adjacent to the valve hole, and, diametrically opposite, and using the levers only, work the cover over the edge of the rim.

Replace the valve "inside" and slightly inflate the inner tube. (Do not distend the tube.) Fit the valve into its hole in the rim and replace its nut, or by screwing it on the valve stem about half an inch.

Push in the inner tube so that it lies snugly in the cover. Ensure it is not twisted. Smear some soapy water round the free edge of the cover. This is a great help in fitting and in ensuring the cover centralises itself on the rim and should always be employed if at all possible.

Introduce the free edge of the cover into the rim at the spot diametrically opposite to the valve. Get this edge right into the well of the rim and then, by working round the cover, equally on either side of the valve position, the cover will slip into place without excessive exertion. Fitting the part nearest to the valve last of all.

Slightly inflate the inner tube and inspect for the inner tube being trapped between the outside edge of the cover and the rim at the spot where the valve is located.

Half inflate tyre, spin wheel and test for trueness because it is essential the pattern of the tread runs evenly and the cover must be manipulated till that occurs. This centralisation of the cover is most important.

Inflate to required pressure.

Screw fully home the nut on the valve.

Replace the valve cap.

TYRE PRESSURES

The following are correct minimum inflation pressures for specified loads per tyre :

Load per tyre, 200 lb.	Pressure 15 lb. per square inch		
do.	240 lb.	do.	18 lb.
do.	280 lb.	do.	20 lb.
do.	350 lb.	do.	24 lb.
do.	400 lb.	do.	26 lb.
do.	440 lb.	do.	32 lb.

The best method of ascertaining the correct pressure is to actually weigh the loads on the front and rear tyres. This should be done on a weighbridge and is a service that can usually be provided by British Railways at a Goods Depot or by a Corporation at its Depot.

When the weights are known the table above can then be used.

As a rough guide it may be stated that, with a rider of average weight and with normal equipment, solo, the pressure should be 18 lb. for the front tyre and 22 lb. for the rear.

USEFUL INFORMATION

In the following five paragraphs are particular failures and troubles that can occur, together with the probable reasons. These troubles are arranged in the order of their probability.

TRACING TROUBLES

Engine fails to start, or is difficult to start, may be due to :

- Throttle opening too large.
- Air lever in open position, or carburettor inlet or carburettor flange.
- Ignition not set, just off fully advanced position.
- Lack of fuel because of insufficient flooding.
- Lack of fuel because of pipe, or tap, obstruction.
- Excessive flooding of carburettor (with hot engine only).
- Pilot jet choked.
- Choked, or fouled, sparking plug.
- Stuck up engine valve.
- Worn, or broken, valve spring.
- Valve not seating properly.
- Contact points dirty.
- Incorrect contact point gap.
- Water on high-tension pickup.
- Moisture on sparking plug.

Engine misses fire may be due to :

- Defective, or blind, sparking plug.
- Incorrect contact point gap.
- Contact breaker points loose.
- Rocker adjustment incorrect.
- Oil on contact breaker points.
- Weak valve springs.
- Defective sparking plug wire.
- Partially obstructed petrol supply.

Loss of power may be due to :

- Faulty sparking plug.
- Lack of oil in tank.
- Weak, or broken, valve spring.
- Sticky valve stem.
- Valve not seating properly.
- Brakes adjusted too closely.
- Badly fitting, or broken, piston rings.
- Punctured carburettor float.
- Engine carburettor.
- Choked silencer.

Engine overheats may be due to :

- Lack of proper lubrication. (Quantity or quality of oil.)
- Faulty sparking plug.
- Air control to carburettor out of order.
- Punctured carburettor float.
- Engine carbonised.
- Weak valve springs.
- Pitted valve seats.
- Worn piston rings.
- Ignition setting incorrect.
- Choked silencer.

Engine stops suddenly may be due to :

- No petrol in tank, or choked petrol supply.
- High-tension wire detached from sparking plug.
- Choked main jet.
- Choked up, or fouled, sparking plug.
- Water on high-tension pick-up, or sparking plug.
- Water in float chamber.
- Vent hole in petrol tank filler cap blocked.

EXCESSIVE OIL CONSUMPTION

Excessive oil consumption may be due to :

- (a) Clogged, or partly clogged, oil filter.
- (b) Stoppage, or partial stoppage, in the pipe returning oil from the engine to the oil tank.
- (c) Badly worn, or stuck up, piston rings. (Causing high pressure in the crankcase.)
- (d) Air leak in dry sump oiling system.
- (e) Worn inlet valve stem or guide.

EXCESSIVE PETROL CONSUMPTION

Excessive petrol consumption may be due to :

- (a) Leaks in the petrol feed system. (Damaged fibre washers, loose union nuts on piping, defective float needle action.)
- (b) Incorrect ignition setting. (Ignition not advanced sufficiently.)
- (c) Defective engine valve action.
- (d) Incorrect use of air control lever.
- (e) Moving parts of carburettor badly worn. (Only possible after very considerable mileage.)
- (f) Bad air leak at carburettor junction.

STEERING UNSATISFACTORY

- Incorrect steering head adjustment. (Too tight or excessively slack.)
- Pitted steering head ball races resulting from loose adjustment.
- Wheels out of alignment.
- Front and/or rear tyre tread not correctly manipulated to run true with wheel (i.e. see handlebar oscillation at low road speed.)
- Damaged fork main tubes resulting from impact.

ABNORMAL TYRE WEAR

Abnormal tyre wear may be due to :

- (a) Incorrect tyre pressure.
- (b) Wheels not in alignment.
- (c) Harsh driving methods. (Miscellaneous acceleration and braking.)

CLEANING THE MACHINE

Do not attempt to rub, or brush, mud off the enamelled surfaces because this will soon destroy the sheen of the enamel. Mud, and other road dirt, should be soaked off with water.

The best method is to use a small hose, taking care not to direct water on to the engine, carburettor, magnets and other such parts. As a coarse substitute, a pail of water and a sponge may be used.

After washing down with water, the surplus moisture should be removed with a chamois leather, and, when the enamelled surfaces are thoroughly dry, they may be polished with a good wax polish and soft dusters.

Such parts as the engine crankcase and the gear box can be cleaned by applying paraffin with a stiff brush, and, with a final application of petrol, will come up like new.

CHROMIUM PLATING

Under some climatic conditions, a rusty looking deposit may be observed on ferrous parts that are chromium plated. This is not ordinary rust (ferric oxide) but is a salt deposit that, in most cases and in its early stages, can be quickly and easily removed with a damp chamois leather. In stubborn cases it may be necessary to use a special chromium cleaning compound.

Lack of attention will lead to more serious damage.

The safest protection during Winter is to wipe over all chromium plated parts with a soft rag or "TEKALL," which is a lanoline base rust preventative marketed in small tins and available at most garages. This material, so applied, leaves an almost invisible film that is impervious to moisture and its use cannot be too highly recommended to owners who value the appearance of their mounts.

In Summer, when these conditions do not prevail, chromium parts should be frequently cleaned with a damp chamois leather and afterwards polished with a soft duster, or better still, with a polisher of the "Solex" type.

If a polish is used it must be one of the special compounds for chromium plating only. Ordinary metal polishing liquids, in particular, must not, on any account, be used because these, almost without exception, contain acids which attack chromium.

NOTE—"Tekall" is a product of 20th Century Finishes Ltd., 175-177, Kirkgate, Wakefield, and is available in ½ pint and 1 pint tins. It can be obtained from our Spare Parts Department, as follows :

½ pint tin "Tekall," Part number 011957, price 2/6, plus 6d. postage.

1 pint tin "Tekall," Part number 011958, price 2/6, plus 6d. postage.

ELECTRICAL SERVICE

ELECTRICAL EQUIPMENT

LUCAS electrical equipment is fitted and this comprises three independent electrical circuits, as follows:

- (1) **IGNITION**—Magneto, High-tension wire and Sparking plug.
- (2) **CHARGING**—Dynamo, Automatic Voltage Control Unit and Battery.
- (3) **LIGHTING AND ACCESSORIES**—Lamps, Horn, Switches and Wiring.

IGNITION CIRCUIT

A LUCAS type NR14 magneto is fitted (Type NR1 to competition models) and the only service attention this requires is occasional lubrication of the contact breaker cam and tappet, infrequent adjustment of the contact breaker points and complete servicing at intervals of about ten thousand miles. To lubricate the contact breaker cam and tappet it is necessary to remove the complete contact breaker from the magneto.

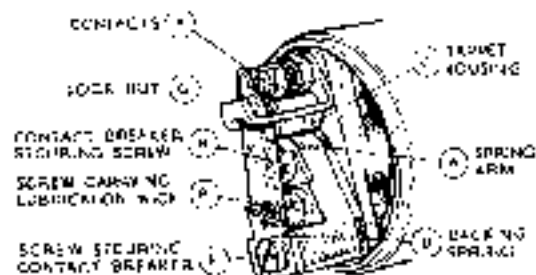


Illustration 29

Showing Contact Breaker

Remove contact breaker by:

Swing away the flat blade retaining the contact breaker cover.

Pull away the contact breaker cover.

Remove the screw E, Illustration 29, retaining the contact breaker spring arm A, Illustration 29, to the contact breaker body and take away the backing spring F, Illustration 30, and the spring arm E, Illustration 29. There is a spring washer under the screw.

Unscrew the screw B, Illustration 29, carrying the lubrication wick and take away the fibre insulating bush enclosing the screw.

Straighten the tab on the lock washer D, Illustration 30, under the central screw H, Illustration 29, retaining the contact breaker body A, Illustration 30, to the armature shaft and, with spanner 017351, remove the central screw.

Finally, lever off the contact breaker.

The above instructions do not apply to competition models fitted with Racing Magneto Type NR1.

Lubricate contact breaker cam and tappet by:

Remove contact breaker as described on page 76.

Saturate, with a few drops of thin machine oil, the wick mounted in the core of its carrying screw B, Illustration 29.

Push out of the contact breaker body the tappet B, Illustration 30, wipe it with a soft cloth, smear it with thin machine oil and then replace it.

NOTE—When replacing the contact breaker parts, ensure the backing spring F, Illustration 30, is fitted so that its bent over end faces outwards.

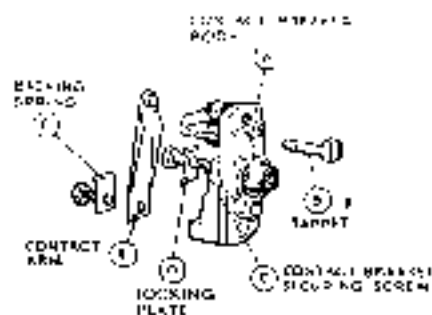


Illustration 30

Showing component details of Contact Breaker

Contact breaker points.

The contact breaker point separation should be from .010" to .012".

Clean contact breaker points by:

Remove the contact breaker cover.

Examine contacts. (1, Illustration 29.)

If they are dirty, oily, or burnt, they must be cleaned with a fine carborundum stone, or very fine emery cloth, and afterwards wiped with a cloth that has been moistened with petrol.

Cleaning is made easier if the contact breaker spring arm A, Illustration 29, is removed.

Examine the contact breaker spring arm and wipe away any rust.

Check and adjust contact breaker point setting by:

Remove contact breaker cover.

Turn over engine till the contact breaker points F, Illustration 29, are fully open.

Insert the gauge (part of spanner 017251) between the two contact points. If the setting is correct the gauge should be a sliding fit.

If there is an appreciable variation from the gauge slacken the lock out G, Illustration 29, on the adjusting point and turn the contact point (apply spanner 017251 in its hexagon head) into the gap as set to the gauge. (Screw the point into the contact breaker body to increase the gap, or outwards, to decrease it.)

Finally, tighten the lock out and re-check the setting.

The foregoing instructions do not apply to competition models fitted with Racing Magnetas Type NRE.

SPECIAL NOTE—Check the contact breaker point gap after the first one hundred miles and five hundred miles. Owing to the initial seating down, there is a tendency for the gap to alter in the first few hundred miles of use. This may seriously affect the ignition setting. Subsequent adjustment will only be required at long intervals but it is as well to check the gap every two thousand miles. (When the engine is decommissioned, always decommission it at an opportune time.)

Complete service (dismantling, cleaning, lubrication of the armature shaft bearings, etc.) should be entrusted to a Lucas Service Station every ten thousand miles.

SPARKING PLUG

The K.L.C.L. Type FFRD "Corundite" Plug is fitted to all models.

It has a thread of 14 mm. and the reach is 1". The point gap is 0.5". Check the point gap every time the engine is decommissioned and, if necessary, re-set the points.

See the plug is fitted with its external seating washer.

Coat the threads with "O'Dog" or Graphite paste. (See page 17.)

Firmly tighten the plug by using the standard box spanner and conical bar (Part No. 017252.) All that is required is a GAS-TIGHT joint. Therefore do not over-tighten, which will not make a gas-tight joint more gas-tight, but can, and possibly will, distort and damage the body of the plug.

Set the gap to .015 inch. NEVER TRY TO MOVE THE CENTRAL ELECTRODE. To widen, or narrow, the gap between the electrodes, only move the earth (or bent over) electrode. Check the gap first with a gap gauge.

If it is too wide, tap the earth electrode (the bent-over one) towards the central electrode. Use any sturdy metal tool to do this, provided it is light enough in weight to be controllable.

Check the gap between each top and step when the gauge is a rain sliding fit between the two electrodes.

If the gap is too narrow to start with, gently lever the earth electrode away from the central electrode by using a small screwdriver, and then tap back to the correct position.

Do not move the electrodes apart by forcing anything between them.

For maximum efficiency, plugs should be cleaned at every 3,000 miles. To take the plug to pieces for cleaning, unscrew the gland nut by holding the smaller hexagon on the gland nut upside down in a vice and then using the box spanner to unscrew the larger hexagon on the body.

Then slide away the central electrode assembly which should be washed in petrol or paraffin. Then, using fairly coarse glass paper, remove the carbon deposit and wash again.

The central firing point should be cleaned with fine emery cloth. The insides of the body should be scraped clean with a knife and finally rinsed in petrol.

There is an internal washer, between the insulator and its seating in the body. On re-assembly lightly smear this with thin oil and then screw up the gland nut sufficiently tight to give a gas-tight joint.

Finally adjust the gap to .015"-.018".



Illustration 31

CHARGING

A LUCAS type EJ N dynamo is fitted. It is anti-clockwise in rotation. The cutting speed is 1250-1500 r.p.m. at 7 volts and at 1,850 to 2,200 revolutions per minute it gives an output of 5 ampere at 7 volts. The replacement part number is 20028A. The positive brush is insulated and the negative brush is earthed. The two exciter terminals are marked "D" and "F," indicating the respective terminals for the Positive and Field wires that lead to similar marked terminals on the Regulator Unit.

Inspect commutator and brush gear every 5,000 to 6,000 miles. (Maker's Recommendation.)

Remove the cover band to inspect commutator and brush gear.

The brushes are held in contact with the commutator by means of springs. Move each brush, see they are free to slide in their holders. If dirty, or sticking, remove and clean with a cloth moistened with petrol. Take care to replace brushes in their original positions, otherwise they will not "bed" properly on the commutator.

If, after long service, the brushes have become worn to such an extent that the brush flexible wire is exposed on the running face, or if the brushes do not make good contact with the commutator, they must be replaced by genuine LUCAS brushes.

The commutator must be free from any traces of oil or dirt and should have a highly polished appearance. Clean a dirty, or blackened, commutator by pressing a fine dry cloth against it while the engine is slowly turned over by means of the kick-starter. It is an advantage to remove the sparking plug before doing this. If the commutator is very dirty, moisten the cloth with petrol.

At every 10,000 miles, the complete dynamo should be handed to a Lucas Service Station for dismantling, replacement of worn parts, cleaning and lubrication.

Electrical breakdown of the dynamo is most unusual and therefore before assuming this unit is defective, it should be tested as follows:

Check that the dynamo, regulator and battery are correctly connected.

To remove the dynamo (see page 86)

Test Dynamo in position by:

- Remove the two wires from the dynamo terminals and connect the two terminals with a short length of wire.
- Start the engine and set to run at normal idling speed.
- Connect the positive lead of a moving coil voltmeter (calibrated not less than 0 to 10 volts) to either of the two dynamo terminals and connect the negative lead to a good earth point on the dynamo or engine.
- Gradually increase the engine speed, when the voltmeter reading should rapidly rise and without fluctuation.

Do not allow the voltmeter reading to rise above 10 volts.

Do not start the engine in an attempt to increase the voltage. It is sufficient to run up the engine to a speed of 1,000 r.p.m.

If the above reading is obtained the dynamo is in order.

If there is no reading, check the brush gear.

If there is a low reading of approximately $\frac{1}{2}$ volt, the field winding may be at fault.

If there is a low reading of approximately $\frac{1}{2}$ to 2 volts, the armature winding may be at fault.

If the tests, mentioned above, clearly indicate the dynamo is not charging, it is then desirable to remove the dynamo from the machine in order to make further tests and repairs or replacements.

TO REMOVE THE DYNAMO

Remove the fast rest rod and nut on the transmitter side and push rod through until footrest arm on drive side is free to be removed. Remove exhaust pipe and silencer as one unit. (This is desirable but not absolutely necessary.)

Place a tray under primary chaincase to catch the oil.

Remove chaincase band binding screw and remove metal band.

Remove nut and washer in centre of chaincase when outer half can be taken away.

Remove spring circlip, locking plate and nut securing dynamo sprocket and attach dynamo sprocket with suitable tool. (Use spanner 017254 to hold sprocket while nut is being slackened, this relieves the dynamo shaft of all bending strain.)

Detach dynamo cables and loosen dynamo clamping bolt to full extent.

Twist dynamo by hand until the locating strip on its body is in line with the keyway cutaway in the rear engine plate housing the dynamo, in which provision some can be withdrawn lifting upwards to clear gear box while doing so.

To re-fit the dynamo, reverse the foregoing taking care to accurately locate the dynamo sprocket key when applying the sprocket. See separate instructions for correct dynamo chain adjustment and re-fitting outer half of chaincase. Ensure that dynamo sprocket retaining nut is well tightened before refitting locking plate and retaining circlip.

The cut-out and regulator unit (A.V.C.), is type HCR-2, and the replacement part number is 17144-A.

Although the voltage regulator and the cut-out are combined structurally, they are electrically separate.

The regulator is set to maintain a pre-determined generator voltage at all speeds and regulates the output of the dynamo to the battery according to the state of charge of the battery. The charge rate is at its maximum when the battery is discharged, automatically tapering off to a minimum as the battery becomes charged and its voltage rises.

Normally, during daytime running, when the battery is in good condition, the dynamo generates a trickle charge so that the ammeter reading will seldom exceed 1 to 2 amperes, i.e. half to one division on scale. The cut-out is an automatic switch which is connected between the dynamo and the battery. When the engine is running fast enough to cause the voltage of the dynamo to exceed that of the battery the cut-out allows the battery to be charged by the dynamo. On the other hand, when the engine speed is low, or the engine is stationary, the cut-out disconnects the battery from the dynamo, thereby preventing current flowing back from the battery to the dynamo, a proceeding that would soon cause the battery to become completely discharged.

The regulator and cut-out are accurately set during manufacture. If, under normal running conditions, it is found that the battery is continually in a low state of charge, or is being constantly over-charged, then the regulator setting should be checked by a qualified electrician and, if necessary, reset. Whenever possible, this should be carried out by a Lucas Service Depot or Agent.

The A.V.C. Unit is secured to the battery carrier by two bolts with self locking nuts. Upon assembly these nuts are adjusted to permit flexion of the rubber grommets through which the bolts pass. The self locking nature of the nuts prevents subsequent slackening off. The four terminals of the A.V.C. Unit are plainly marked by the letters F.A.D.E. Wires from F and D go to similarly marked terminals on the dynamo. The A terminal is connected to one of the ammeter terminals and the E terminal is "earthed."

We specially warn against unskilled meddling with the settings of the regulator and the cut-out contacts.

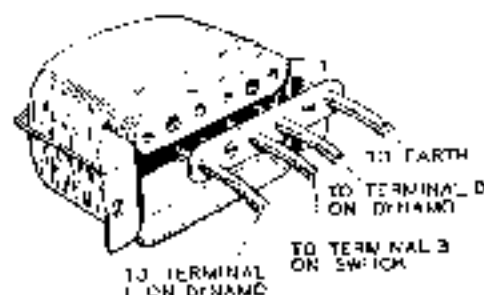


Illustration 32

Showing connections to regulator and cut-out unit Type HCR-2

Later machines may be fitted with a new A.V.C. Unit type RB-107, but the foregoing notes will still apply with the exception of certain grouping which will be F.A.F.D.

Battery

The battery fitted is Lucas type PUW-7E-4. This is a lead acid battery in which the electrolyte is in free liquid form. The voltage is 6 and the capacity is 12 ampere hours.

Maintenance once every 14 days

Remove battery cover, brush dirt from top of battery and remove vent plugs. (There are three vent plugs.)

NOTE—NEVER bring a naked light near a battery when the vent plugs have been removed, or when the battery is being charged, as the gas given off by the electrolyte is highly explosive.

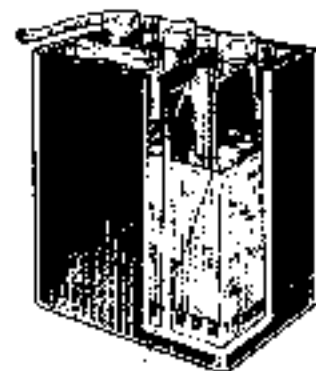
The specific gravity of the electrolyte indicates the state of charge of the battery. With a fully charged battery the specific gravity of the electrolyte should be 1.250 to 1.300. Check the gravity by means of a hydrometer, and if it is below 1.150 the battery should be charged as soon as possible by the normal running of the motor cycle. If this cannot be arranged, the battery should be charged from an external source.

If the level of the electrolyte is so low that a hydrometer reading cannot be taken, no attempt should be made to take a reading after adding distilled water until the battery has been uncharged for at least 30 minutes.

NEVER transfer the electrolyte from one cell to another.

NEVER leave a battery in a discharged condition. It must be put on charge as soon as possible.

Check if the electrolyte in each cell is level with the top of the separators. Top-up, if necessary, with distilled water. Do not allow the distilled water to come into contact with metals - always only use a glass or earthenware container and funnel.



ELECTROLYTE LEVEL

Illustration 33

Lucas PUW-7E-4
Battery

If a battery is found to need an excessive amount of topping-up, steps should be taken to find out the reason. For example, the battery may be receiving an excessive charge, in which case the regulator setting may need adjustment. If one cell in particular needs topping-up more than another, it is likely the case, for instance, is cracked, in which event the battery must be replaced and arrangements made to clean up the battery carrier.

Metal parts should be well cleaned and, if possible, washed, with a solution of ammonia, or bicarbonate of soda, in water.

Vent plugs should be kept clean and air passages in them kept free. Re-fix vent plugs tightly.

- Keep the battery, and surrounding parts, particularly the tops of the cells, clean and dry. Brush away any sand or dirt or road slush.

Battery electrolyte, which contains sulphuric acid in a diluted form, is destructive to practically everything except rubber, lead, glass or earthenware. Therefore, rags used to clean battery tops, etc., should be thrown away afterwards. If put back in the tool box they will cause the tools to rust.

Assuming the temperature of the electrolyte is about 60° F, a test with a hydrometer quickly shows the state of charge, as under:

- Reading 1.280 to 1.300 indicates fully charged.
- Reading about 1.210 indicates half discharged.
- Reading below 1.150 indicates fully discharged.

If the electrolyte exceeds this, 0.02 must be added to the hydrometer reading for each 5° F. rise to give the specific gravity at 60° F. Similarly, 0.02 must be subtracted from the hydrometer reading for every 5° F. below 60° F.

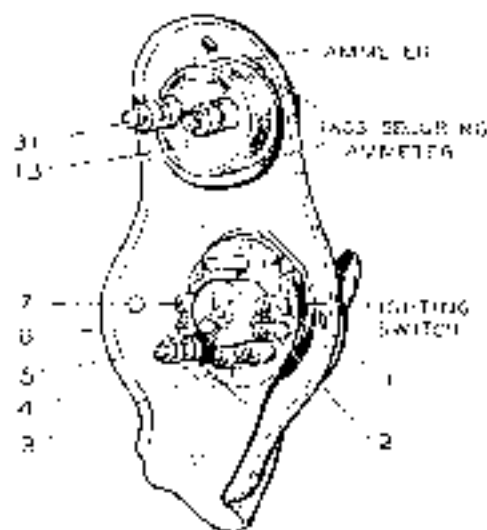


Illustration 14

Showing lamp panel containing ammeter (at top) switch and cable harness.

The ammeter fitted is type C2U 37.
[See page 63 for numbered references.]

LIGHTING AND ACCESSORIES

Headlamp

A LUCAS headlamp is fitted. It has a panel mounted on its top, retained by three screws, in which is the main switch and ammeter and it also supports the cable harness. See Illustration 14. The main bulb has a double filament. One filament provides the main driving beam and the other a dipped beam, brought into operation by the dipping switch on the left handlebar as may be required. The pilot bulb is the same as used in the rear lamp and is mounted outside the reflector. It is carried on a sliding plate which may, after removal of the headlamp rim and light unit, be slid out for bulb replacement.

The reflector and front glass are made up as one assembly and the two components are not sold as separate spares.

The lamp is fitted with a pre-focus main bulb. The design of the bulb, and of its holder, is such that the bulb is correctly positioned in relation to the reflector and no focusing is required when a replacement bulb is fitted.

To remove the headlamp rim and light unit

Loosen the screw on the top of the lamp body at the front, pull the rim outward from the top and, as the front comes away, lower slightly to disengage the bottom tag from the lamp shell. Twist the back shell in an anti-clockwise direction and pull it off, the bulb can then be removed. The light unit is secured to the rim by means of spring clips. These can be disengaged from the turned up inner edge of the rim by prising with a screwdriver blade and, at the same time, working away from the edge.

To replace the headlamp rim and light unit

Lay the light unit in the rim so that the locator block on the unit back engages with the forked bracket on the rim.

Replace, by springing in, the spring clips so that they are evenly spaced around the rim.

To replace the bulb shell engage the projections on the inside of the body shell with the slots in the holder, press on and secure by twisting it to the right.

Engage bottom tag on lamp rim with the small slit in the shell and gently force the top of the rim back into the shell, after which retighten the locking screw on the top of the lamp body.

Rear lamp

A LUCAS rear lamp is fitted. The body, with bulb holder, is secured to the rear number plate.

Details of lamp bulbs are given in "DATA"

Horn

The horn push switch, situated on the right handlebar,

Fuses

There are no detachable fuses in LUCAS motor cycle electrical equipment.

Snap wire connector

The LUCAS snap connector, as shown in Illustration 35, is made up of four components. Two are tubular sleeves, having pointed extremities, and which are soldered to the ends of the two wires to be connected. The third part is the centre spig ferrule, into which the two sleeves snap and the fourth component is a rubber sleeve which covers the whole connector. This rubber sleeve serves the dual purpose of insulating the various metal parts and also preventing same from separation as the result of vibration.

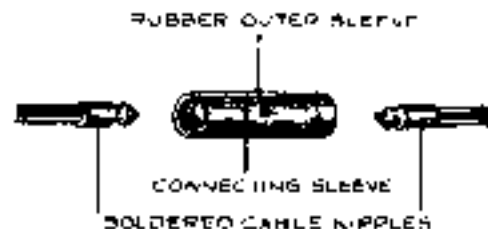


Illustration 35

Lucas snap connector
Part number 900269

One snap connector is used in the rear lamp wire and another is used in the wire connecting the regulator unit to the output side of the ammeter in the head lamp.

Screwed wire connector

A LUCAS screwed connector of the type shown in Illustration 36 is used in the wire connecting the terminal of the battery to the input side of the ammeter in the head lamp. It is made up of four parts. One part, a metal sleeve, is threaded internally and accommodates a collet which is placed on the end of one of the wires to be connected in such a manner that the wire ends protrude through the centre of the collet. The third metal part screws into the first and has passing through it the second of the wires to be connected. The wire ends are splayed out and the act of screwing the two threaded parts together binds the ends of the two wires, thereby making a good electrical contact that can be immediately broken as, and when, it is wished to remove the battery from the machine. A rubber sleeve encloses the whole assembly, serving the dual purpose of insulation and prevention of loss through vibration.

Illustration 36

Lucas screwed wire connector
Part number 571395



Terminals

All 1932 models will have the POSITIVE battery terminal connected to "EARTH".

The earth wires (two—one from regulator, the other from terminal of battery) and the high-tension wires (two—one on sparking plug end of each wire from magnets to sparking plug) have terminals of the solid sleeve type having an eye at the extreme end. To make such a connection, it is necessary to bare the end of the wire for $\frac{1}{8}$ " and pass the terminal over the wire so that the bared end fully enters the reduced cone of the terminal and then flatten that part by either pinching it in a vice or by hammering.

The two earth wires, mentioned above, are connected to the "cars" by securing them to the left side of the seat lag bolt (which is situated just under the saddle) by means of a washer and a screw. It is essential that the connections are kept clean and the screw must be kept fully tight.

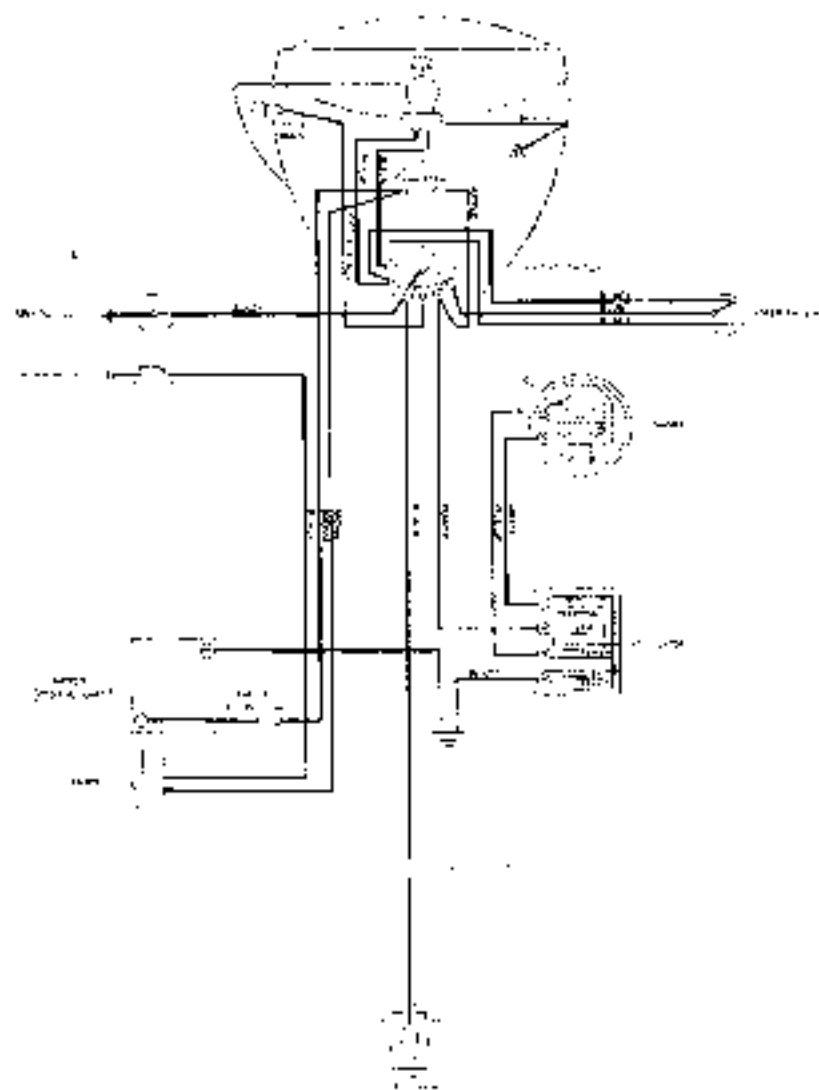


Illustration 37

Wiring diagram

REPAIRS AND SERVICE

REPAIRS

The instructions regarding repairs should be clear and definite, otherwise the cost may be greater than that expected. We shall be pleased to give estimates for repairs if parts are sent to us for repair purposes. If the estimate is accepted, no charge is made for the preliminary examination, but should it be decided not to have the work carried out, it **MAY** be necessary to make a charge to cover the cost of whatever dismantling and re-assembly may have been done to prepare the estimate.

Customers desiring that old parts which are replaced with new during the course of overhaul or repair be retained must make the fact known prior to the work being put in hand because, normally, such parts, having no further useful life, are scrapped upon removal.

Parts sent to us as patterns, or for repair, should have attached to them a label bearing the sender's full name and address. The instructions regarding such parts should be sent under separate cover.

If it is necessary to bring a machine, or parts, to the Works for an urgent repair, **IT IS ESSENTIAL** you **MAKE AN APPOINTMENT** beforehand to **AVOID DISAPPOINTMENT**. This can be done by letter or telephone.

CORRESPONDENCE AND ORDERS

Our routine is organized into different departments, therefore delay cannot be avoided if matters relating to more than one department are contained in one letter.

Consequently, it is desirable when communicating with more than one department, to do so on **SEPARATE SHEETS**, each of which should bear your name and address. When writing on a technical matter, or when ordering spares, it is essential to quote the **COMPLETE ENGINE NUMBER**. Some numbers have one, or more, letters incorporated in them and these letters **MUST BE QUOTED**, otherwise model identification is not possible.

Orders should always be sent in list form and not as part of a letter.

Owners are strongly advised to purchase a Spare Parts List so that correct part numbers can be quoted. Most parts are clearly illustrated in this list which makes it very easy to recognize the part or parts required.

PROPRIETARY FITTINGS

No expense is spared to secure and fit the most suitable, and highest quality, instruments and accessories for the standard equipment of our machines.

Nevertheless, our Guarantee does not cover such parts and, in the event of trouble being experienced, the parts in question should be returned to, and claims made, direct on the actual manufacturers who will deal with them on the terms of their respective guarantees.

Those manufacturers are:

Carburetors	Messrs. Anglo-American Carburetors Ltd., Hatfield Works, Hemm Barn, Birmingham
Chains	The Royal Land Coventry Chain Co. Ltd., Onebon, Manchester
Electrical Equipment	Messrs. Joseph Lucas Ltd., Great King Street, Birmingham, 19
Gear Boxes	Messrs. Rayman & Sons Ltd., Wychnol Lane, King's Norton, Birmingham, 15
Sparking Plugs	K.L.G. Sparking Plug Ltd., Putney Vale, London, S.W. 15
Speedometers	Messrs. S. Smith & Sons (M.A.) Ltd., Cusickwood, London
Tyres	Messrs. Dunlop Rubber Co. Ltd., Park Drive, Bury, Lancashire

All the above manufacturers except S. Smith & Sons (M.A.) Ltd., issue instructive literature regarding their products which is obtainable by writing to them.

SERVICE

The Service and Repair Department is situated in Burrage Grove, Plumstead, London, S.E.18, and is open on Mondays to Fridays from 8.30 a.m. to 2.55 p.m.—2.0 p.m. to 3.30 p.m. It is closed on Saturdays, Sundays and National Holidays.

It exists for the purposes of:

- Giving technical assistance verbally or through the post.
- Supplying spare parts over the counter or through the post.
- Repairing and re-conditioning machines, or parts of machines, of our make.

Burrage Grove is the first turning on the left from Burrage Road when entering Burrage Road from the Plumstead Road. (See final paragraph below.)

The nearest Railway Station is WOOLWICH ARSENAL SOUTHERN REGION RAILWAY. This Station is five minutes walk from our Service Depot in Burrage Grove. There is an excellent service of electric trains from Charing Cross, Waterloo, Cannon Street and London Bridge Stations, Southern Region Railway.

Bus routes 53, 53a, 54, 89 and 172. Trolleybus routes 496 and 696, and Tram routes 16, 38 and 40, pass the end of Burrage Road (one minute from the Service Depot).

Bus routes 21a, 75 and 161 and Tram routes 44, 46 and 72 serve Beresford Square which is three minutes walk from the Service and Repair Department.

Visitors from the North can pass into Woolwich via the Free Ferry between North Woolwich and Woolwich. North Woolwich is a British Railways terminus and is also served by Bus and Trolleybus routes 101, 599, 689 and 635. There is also a tunnel under the River Thames at this point for foot passengers. The Free Ferry accommodates all types of motor vehicles and there is a very frequent service. The Southern landing stage is less than a mile from the Service Depot.

Visitors arriving by road, if they are strangers to the locality, should enquire for Beresford Square, Woolwich. Upon arrival there, the road skirting the Royal Arsenal should be followed in an Eastern direction for about four hundred yards, and Burrage Road is the second turning on the right after leaving the Square. Burrage Grove is then the first turning on the left.

THE DRIVER AND THE LAW

The driver of a motor cycle **MUST** be **INSURED** against Third Party Claims and **MUST** be able to produce an **INSURANCE CERTIFICATE** showing that such an insurance is in force.

If your Insurance Certificate specifies you can only drive one particular machine you **MUST NOT DRIVE** any other machine unless its owner has a correct Certificate covering "**ANY DRIVER**" and it is advisable to remember that, in the absence of such a provision the penalties for doing so are very heavy.

The driver of a motor cycle **MUST** hold a current **DRIVING LICENCE**. If you are a learner and hold a Provisional Driving Licence, your machine must show, front and back, the standard "L" plates in red and white and you must not take a **PILLION PASSENGER** unless that passenger is the holder of a current **UNRESTRICTED** driving licence.

As soon as you receive your driving licence, sign it in the appropriate place and do so each time it is renewed. It is an offence not to.

Make sure you are well acquainted with the recommendations set down in the "Highway Code," a copy of which can be obtained from any main Post Office.

THE MACHINE AND THE LAW

Every motor cycle used on the public roads must be registered and carry the registration numbers and licence disc allotted to it. The dealer, from whom the machine is bought, will, generally, attend to all matters equally essential before it is used on the public roads.

To register a new machine

Send to the Local Registration Authority the following :

- Form "RF1/2," duly completed.
- The certificate of insurance.
- The invoice you received from your dealer when you purchased the machine.
- The appropriate registration fee.

In due course you will receive :

- A Registration Book. (Commonly called the "log" book.)
- A Licence Disc.
- Your Insurance Certificate.
- Your Invoice.

The Registration Book and the Licence Disc will bear the registration numbers that have been allotted to your machine and will also show the date the Road Licence expires.

Your number plates must then be painted, in white upon a black background, with the registration numbers in characters of even thickness as follows :

The numbers on the front plate must be $1\frac{1}{2}$ " high, $1\frac{1}{2}$ " wide and $\frac{1}{16}$ " thick with spaces of $\frac{1}{8}$ " between each two characters.

The numbers on the rear plate must be $2\frac{1}{2}$ " high, $1\frac{1}{2}$ " wide and $\frac{1}{16}$ " thick with spaces $\frac{1}{8}$ " between each two characters.

The Licence Disc must be enclosed in a water-tight container, having a transparent front, and this must be fixed to the machine in a conspicuous position, near the front and on the left hand side.

It is then legally necessary to carry your Driving Licence, Insurance Certificate and Registration Book while driving your machine.

Speedometer

A speedometer **MUST** be fitted and **MUST BE** so ILLUMINATED that it is possible to read the dial after lighting up time.

Lamps

During the official "LIGHTING UP" hours the machine must exhibit a white light facing forwards and a red light facing backwards. The rear number plate must be adequately illuminated by a white light.

Each electric light bulb **MUST** be marked with its "Wattage." (Beware of cheap, imported, bulbs that do not have this marking.)

All motor cycles made by us have electric equipment that complies with the law regarding position, size of bulbs, marking on bulbs and the correct illumination of the rear number plate.

GUARANTEE

We give the following guarantee with our motorcycles, motorcycle combinations and sidecars, which is given in place of any implied conditions, warranties or conditions whatsoever, statutory or otherwise, all such implied conditions, warranties and liabilities being in all cases excluded. Any statement, description, condition or representation contained in any catalogue, advertisement, leaflet or other publication shall not be construed as enlarging, varying or restricting the guarantee. In the case of machines (of which have been used for "time-out" purposes or (b) any motorcycle and/or sidecar used for any dirt track, cross track or grass track racing or competition for any longer time of any kind within an enclosure for which a charge is made for admission to take part in or view the competition) or for machines from which the trade mark, name or manufacturing number has been removed, no guarantee, condition or warranty of any kind is given or to be implied.

We guarantee, subject to the conditions mentioned below, that all precautions which are usual and reasonable have been taken by us to secure excellence of materials and workmanship, but this guarantee is in effect and in no sense to be taken as a warranty from date of purchase, and damages for which we make ourselves responsible under this guarantee are limited to the free supply of a new part or carriage for the part of the motorcycle, motorcycle combination or sidecar which may have proved defective. We do not undertake to replace or repair or bear the cost of replacing or repairing such new parts in the motorcycle, motorcycle combination or sidecar. We undertake, subject to the conditions mentioned below, to make good at any time within six months any defects in these respects. As motorcycles, motorcycle combinations and sidecars are rarely liable to derangement by engine, or unless the guarantee does not apply to defects caused by wear and tear, a loss or defect.

The term "defect" shall include amongst others the following acts—

- The attaching of a sidecar to a motorcycle in such a manner as to cause damage or calculated to render the latter unsafe when ridden.
- The use of a motorcycle or of a motorcycle and sidecar combined, when carrying more persons or a greater weight than that for which the machine was designed by the manufacturer.
- The attaching of a sidecar to a motorcycle or any form of attachment not provided, supplied or approved by us or our manufacturers which is not designed for such use.

Any motorcycle, motorcycle combination or sidecar sent to us to be plated, cranked or repaired will be repaired upon the following conditions, i.e. We guarantee that all precautions which are usual and reasonable have been taken by us to secure excellence of materials and workmanship, such guarantee is in effect and in no sense to be taken as a warranty from date of purchase, and damages for which we make ourselves responsible under this guarantee are limited to the free supply of a new part or carriage for the part of the motorcycle, motorcycle combination or sidecar which may have proved defective. We do not undertake to replace or repair or bear the cost of replacing or repairing such new parts in the motorcycle, motorcycle combination or sidecar. We undertake, subject to the conditions mentioned below, to make good at any time within six months any defects in these respects. As motorcycles, motorcycle combinations and sidecars are rarely liable to derangement by engine, or unless the guarantee does not apply to defects caused by wear and tear, a loss or defect.

CONDITIONS OF GUARANTEE

If a defective part should be found in our motorcycles, motorcycle combinations or sidecars, or in any part supplied by way of exchange before referred to, it may be sent to us CASHLESS PAID and accompanied by an indication from the owner that he desires to have it repaired or exchanged free of charge under our guarantee and he must also furnish us at the same time with the number of the machine, the date of the purchase or the date when the alleged defect or part was exchanged as the case may be.

Having complied with the above, such articles will be sent **AT THE RISK OF THE OWNER**, and the guarantee and any implied guarantee, warranty or condition shall not be reinstated.

We do not guarantee special built up cycles, add on, the so-called equipment, lamp, etc., or any component parts supplied to the order of the Purchaser differing from standard specifications supplied with our motorcycles, motorcycle combinations, sidecars or otherwise.

TOOLS AND SPECIAL EQUIPMENT

TOOLS

The standard tool kit, issued with each new machine, contains:

1	017253	Tool bag.
1	017114	Tyre inflator.
1	017007	Tyre lever.
1	017248	Pliers.
1	011188	Gudgeon pin circlip pliers.
1	017256	Screwdriver.
1	017246	Grease gun.
1	017249	Adjustable wrench.
1	017252	Sparking plug hex spanner and timing bar.
1	017254	Dynamo spanner and clutch spring nut key.
1	010178	Double end spanner, 1-010 in. by 1-200 in.
2	017052	Double end spanner, Small.
1	0 7053	Double end spanner, Large.
1	0 7251	Contact point spanner and gauge (Touring).
1	015071	Contact point spanner and gauge (Competition).
1	0 7257	Double end spanner.
1	018055	Handbar tip screw key.
1	018151	Single spanner for petrol tap.

OPTIONAL EQUIPMENT

The following items of optional equipment are available. They are described and priced in the Spares List.

- (a) Air cleaner.
- (b) Mudguard type pillion seat.
- (c) Pillion footrests, bolted on, to fold up when not in use and specially designed for these machines. (Not on competition).
- (d) Detachable luggage carrier. (Not on competition).
- (e) Timing disc 015955. A circular timing disc, graduated in degrees and made of Ivorine. A very useful device.
- (f) Valve holder, for valve grinding. Part number 017451.
- (g) Valve spring compressor. Part number 018276. (See page 29).
- (h) Fender frames and bags for spring frame and rigid models.

SPARES LIST

An illustrated and priced spares list is available at a cost of 2/6 post free. (See page 29).

GASKET SETS

For convenience in ordering, standard sets of engine washers and gaskets as well as the washers used in the petrol and oil feed systems are stocked. Full details of contents and prices are included in the Spares List.

BADGES

Flat monogram badges are now available at a cost of 1/6, plus 6d. postage. They can be supplied as a tie pin, as a brooch or for fitting in a button hole. When ordering state type required.

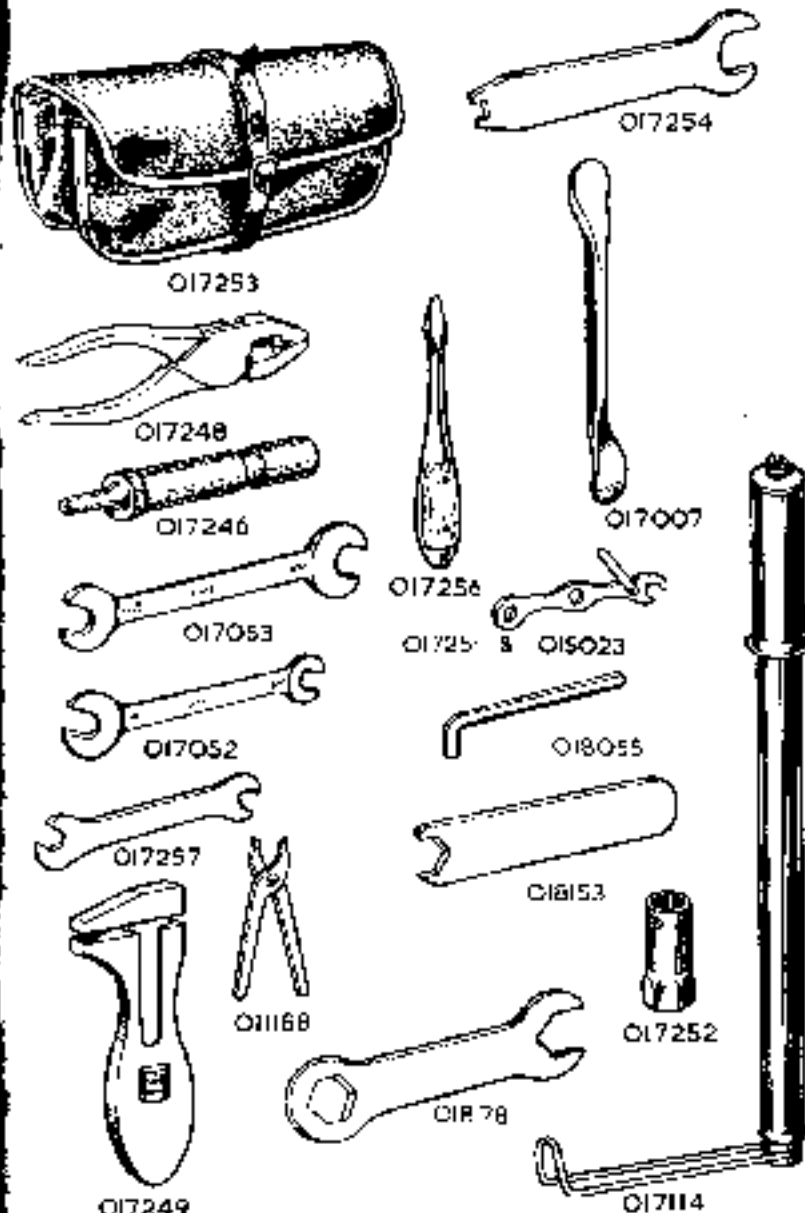


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SPARES AND SERVICE DEPARTMENTS

HOURS OF BUSINESS FOR CALLERS

MONDAYS	8.30 a.m. to 12.55 p.m. 2.0 p.m. to 5.30 p.m.
TUESDAYS	Ditto
WEDNESDAYS	Ditto
THURSDAYS	Ditto
FRIDAYS	Ditto

NOT OPEN ON NATIONAL HOLIDAYS

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