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**MAINTENANCE
MANUAL
AND
INSTRUCTION
BOOK**

for

1954

A·J·S

“SPRINGTWIN”

VERTICAL TWIN
(MODEL 20)

PRICE 2/6 NETT



A·J·S

MOTOR CYCLES

PROPRIETORS: ASSOCIATED MOTOR CYCLES LIMITED

PLUMSTEAD · LONDON · S.E.18

EDITION CM-29

MAINTENANCE MANUAL AND INSTRUCTION BOOK

for

A·J·S "SPRINGTWIN"

1954

500 c.c. VERTICAL TWIN
(MODEL 20)



Compiled and Issued by the Manufacturers :

A·J·S MOTOR CYCLES

(Proprietors : ASSOCIATED MOTOR CYCLES LIMITED)

Registered Offices :

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

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A·J·S MOTOR CYCLES, PLUMSTEAD ROAD, LONDON, S.E.18

Price: TWO SHILLINGS and SIXPENCE

EDITION CM-29

A-A.T.

WHEN CORRESPONDING REGARDING
SERVICE OR SPARES

ALWAYS QUOTE
THE COMPLETE ENGINE NUMBER
(Including all letters in it)

THIS ENABLES THE MACHINE TO BE IDENTIFIED

EACH SERIES OF FRAMES IS NUMBERED FROM ZERO
UPWARDS. THEREFORE THE QUOTATION OF A
FRAME NUMBER ONLY DOES NOT FACILITATE
IDENTIFICATION.

A·J·S "SPRINGTWIN"

VERTICAL TWIN

Model 20

Bore 66 m.m.

Stroke 72·8 m.m.

Capacity 498 c.c.

INTRODUCTION

Motorcycling is one of the most economical and pleasurable modes of transport. It is our sincere wish that every "A·J·S" owner should obtain, from his mount, the service, comfort and innumerable miles of low-cost travel that we have earnestly endeavoured 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 specialised 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 to make essential adjustments, only casual attention to lubrication and the lack of periodical maintenance attention will soon neutralise the best efforts of the designers and may bring needless trouble to the owner.

We are always pleased to give "A·J·S" 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.

A·J·S MOTOR CYCLES

DATA

Identity

Engine number	...	...	...	...	...	...	...	...	...	On crankcase in front of left cylinder
Frame number	...	...	...	...	...	...	...	...	...	On seat lug of main frame, right side (below saddle)
Number of cylinders	...	...	...	...	...	...	...	...	...	Two
Bore (nominal)	...	...	...	...	...	...	...	...	...	66 mm. (2.6 ins.)
Stroke	...	...	...	...	...	...	...	...	...	72.8 mm. (2.868 ins.)
Engine capacity	...	...	...	...	...	...	...	...	...	498 c.c. (30.459 cu. ins.)

Capacities

Location	British	Metric
Engine	30.459 cub. in.	498 c.c.
Gear box	1 pint	568.2 c.c.
Front fork (each side)	6½ fl. ozs.	184.6 c.c.
Rear leg (each leg)	3 fl. ozs.	85 c.c.
Rear wheel fork hinge bearing	1½ fl. ozs.	42.6 c.c.
Fuel tank	3¾ gallons	17.04 litres
Oil tank	4½ pints	2.557 litres

Carburettor

Type	76AG/1AU
Main jet size (no air filter fitted)	180
Main jet size (air filter fitted)	160
Throttle valve size	6/4
Jet taper needle position	Centre notch

Connecting rod

Internal diameter small end	Internal diameter big end (liner situ)	Centres	Part number
$\frac{3}{4} + .0005$ in. (H)	1.7715 in. (H)	5.75 in.	014221
$\frac{3}{4} - .0000$ in. (L)	1.7710 in. (L)		

Gudgeon Pin $\frac{3}{8}$ in. — .0001 to $\frac{1}{4}$.0003.

Crankshaft external diameters

Crankpin	Centre bearing
H—1.62525	H—1.62625
L—1.62475	L—1.62575

Cylinders

Nominal bore	Actual bore	Part number
66 mm.	2.598 + .0005 (H) — .0005 (L)	011713

Gear box ratios

First gear	Second gear	Third gear	Fourth gear (top)
2.65 to 1	1.70 to 1	1.308 to 1	1 to 1

Gear ratios

Engine sprocket	First gear	Second gear	Third gear	Fourth gear (top)
19	14.55 to 1	9.33 to 1	7.18 to 1	5.49 to 1
20	13.91 to 1	8.91 to 1	6.86 to 1	5.25 to 1
21	13.25 to 1	8.50 to 1	6.54 to 1	5.0 to 1

The standard size of engine sprocket is the 20 tooth

Shock absorber spring

Free length	1 $\frac{1}{8}$ in. \pm $\frac{1}{32}$ in.
-------------	----------------------------------------------

Lighting (bulbs)

Location	Type	Voltage	Wattage	Part number
Head lamp (Pre-focus)	Double filament	6	30 x 24	312
Pilot	Single contact	6	3	988
Rear lamp	Double filament	6	18 and 3	352
Speedometer	Single contact	6	1.8	53205

Over-size or under-size parts

The following are the only "over-size" variations provided for the 500 c.c. Vertical Twin machine.

Big-end and crankshaft centre main bearings:

Under-size010 below normal (Journals to be reground to suit).

Cylinder re-bore:

.020 inch and .040 inch over-size.

Pistons and rings:

.020 inch and .040 inch over-size.

Pistons

Top of skirt diameter Bottom of skirt diameter

2.5976 inches (H) 2.5984 inches (H)

2.5969 inches (L) 2.5969 inches (L)

Bore of gudgeon pin boss $\frac{3}{4}$ in. + .0005
— .0000

Piston rings

Piston ring gap—Normal006 inch

Permissible maximum030 inch

Piston ring clearance in groove002 inch

Sparking plug

Make	Type	Thread	Reach	Point gap
K.L.G.	FE80	14 mm.	$\frac{3}{8}$ in.	.015 in.

Sprockets

Location	Number of teeth	Chain pitch	Chain width	Part number
Engine	19	$\frac{1}{2}$ inch	*305 inch	015203
Engine	20	$\frac{1}{2}$ inch	*305 inch	015204
Engine	21	$\frac{1}{2}$ inch	*305 inch	014294
Clutch	40	$\frac{1}{2}$ inch	*305 inch	G-34-2
Gear box	16	$\frac{3}{8}$ inch	*380 inch	G-31-1
Rear wheel	42	$\frac{3}{8}$ inch	*380 inch	010293

Valve springs

Outer valve spring		Inner valve spring	
Free length	Part number	Free length	Part number
1 $\frac{1}{8}$ inches	011769	1 $\frac{1}{16}$ inches	011770

Renew valve springs when $\frac{1}{16}$ to $\frac{1}{8}$ inch less than normal free length

Valve timing (with .012 inch rocker clearance)

INLET VALVE		EXHAUST VALVE	
Opens before top dead centre	35°	Opens before bottom dead centre	65°
Closes after bottom dead centre	65°	Closes after top dead centre	35°

Valve timing pinion

Retained by bolt threaded $\frac{1}{2}$ inch by 20 threads per inch. Right hand thread.

Camshaft gears

Retained by nut. Left hand thread.

Weight

Weight of machine with empty tanks 400 lbs.

Wheels (bearing end play)

Bearing end play002 inch (just perceptible 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 carburetter. 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 retard. Retard two-fifths of total movement for starting.
- (4) **Magneto cut-out switch.** Push switch on magneto contact breaker cover. A press action switch which, when operated, short circuits the magneto, thereby stopping the engine from firing. Place gear foot lever in neutral position before using cut-out switch to stop engine.
- (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 lamps, rear lamp and speedometer lamp on.
 - (3) "H" Main headlamp, 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.") 1 division = approx. 2 amps.
- (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 and internal clutch operating lever.
- (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 main head lamp bulb has two filaments).
- (18) **Dummy grip.** The fixed grip on the left handlebar.
- (19) **Speedometer hand.** The rotating hand in speedometer head. Indicates speed in miles per hour to a maximum of 120 miles per hour. (Certain machines for export have the head calibrated in kilometres per hour to a maximum of 180 k.p.h.)
- (20) **Total mileage recorder.** The top set of figures located in the speedometer dial. Indicates the number of miles (or kilometres) travelled to a total of 100,000 and then automatically re-sets to zero.
- (21) **Trip mileage recorder.** The bottom set of figures located in the speedometer dial. Indicates the number of miles (or kilometres) travelled since the recorder was set to zero. Can be re-set at any time. Used to measure the length of individual trips. The red figures indicate tenths of a mile. Unless re-set, indicates a total of 1,000 miles and then automatically re-sets to zero.
- (22) **Re-set knob.** Protrudes from lower part of speedometer head. Pull and turn to right till "000.0" appears to re-set the trip mileage recorder.
- (23) **Gear indicator.** Disc on gear box with periphery marked 1,N,2,3,4. Moves under the control of the gear change lever and the number registering with a line on gear box indicates gear in engagement (or neutral).
- (24) **Pillion foot rest.** Fold upwards to a vertical position when not in use.
- (25) **Fork top bolt.** One at top of each fork main inner tube. Must be raised to allow insertion of hydraulic fluid.

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.

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."

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.

DRIVING

FUEL

Now that pre-war quality fuels are again available, owners are advised to use only the best. The small 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 each side). Both must be shut off when the machine is left standing for more than a few minutes.

The tap 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 re-fuel as soon as possible after being forced to call upon the reserve (approx. ½ 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.

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 the off side petrol tap slide.
- See that the air control lever is in the fully closed position.
- Fully advance the ignition and then pull inwards 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 carburetter float chamber until it can be felt the chamber is full of petrol.
- Operate the kick-starter by giving it a long swinging kick and the engine should immediately fire.

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.

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

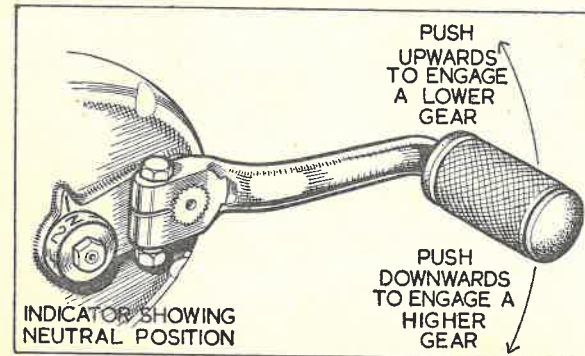


Illustration 2

Showing the gear indicator drum which upon assembly is set to record the various gears and neutral position, as the respective figure or letter N registers with index mark on the gearbox shell.

Upon re-assembly, after dismantling for any purpose, the index disc should be correctly re-set for future reference.

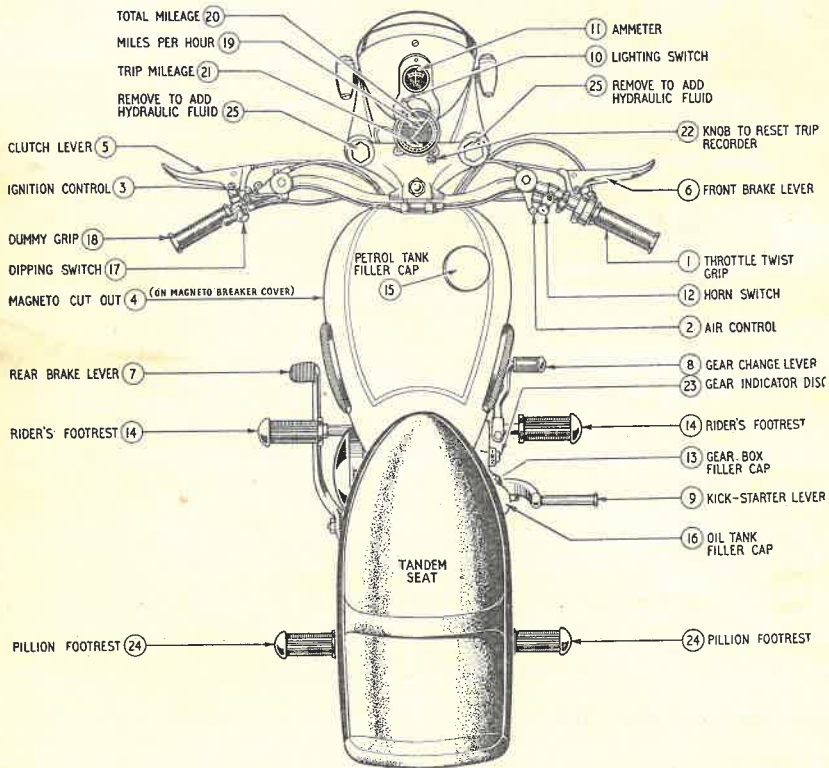


Illustration 1

Showing Controls

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 (neither racing nor ticking over) and allow to warm up. While doing this, check the oil circulation as detailed in page 12. The machine can then be taken on the road.

NOTE—Do not race up the engine from cold and do not flood the carburettor to such an extent that 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 suction will extinguish the fire.

STOPPING THE ENGINE

To stop the engine, close the throttle, depress the magneto cut-out press switch on the contact breaker cover and keep it depressed 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 on the left bar and engage 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 the throttle opening, gradually, 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 jabbed, 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 "pinking" when pulling hard on a gradient.

STOPPING THE MACHINE

To stop the machine, close the throttle, declutch by lifting the large lever on the left handlebar, and gently apply both brakes, increasing the pressure on them as the road speed of the machine decreases. Place 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 ENGINE 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 only essential 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 only be necessary at lengthy intervals.

After about 1,000 miles has 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 silent 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 is 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."

When travelling slowly, such as may occur in traffic or on a hill, and the engine commences to labour, it is then necessary to change to a lower gear. Engine "knocking" or "pinking" 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.

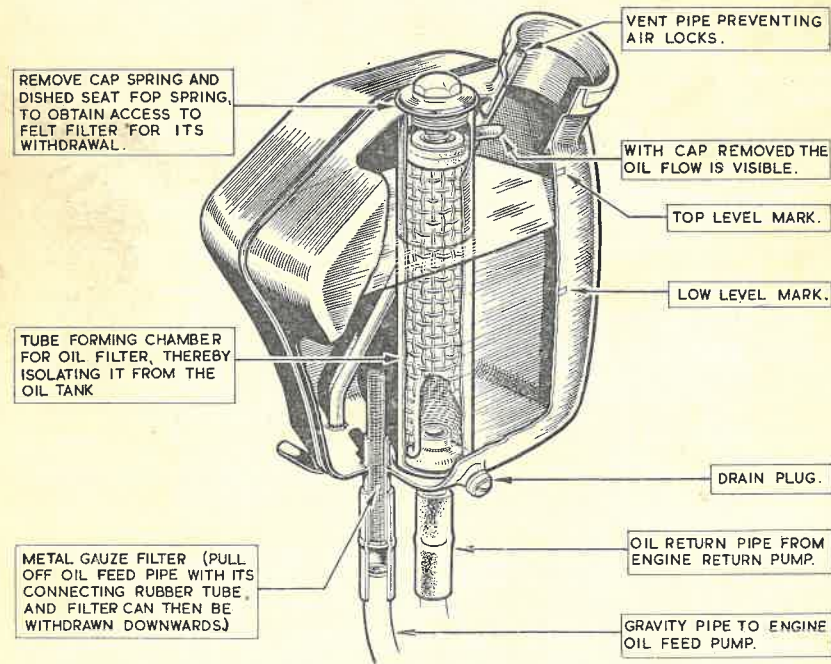


Illustration 3

Showing the oil tank with the felt filter in its cylindrical housing and the metal strainer mounted on the entry end of the feed 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	
Mobiloil D	(SAE-50)	Mobiloil A	(SAE-30)
Castrol Grand Prix	(SAE-50)	Castrol XL	(SAE-30)
Energol 50	(SAE-50)	Energol 30	(SAE-30)
Essolube 50	(SAE-50)	Essolube 30	(SAE-30)
Shell Motor Oil X-100	(SAE-50)	Shell Motor Oil X-100	(SAE-40)

FOR GEAR BOX LUBRICATION

Mobiloil D	(SAE-50)
Castrol Grand Prix	(SAE-50)
Energol 50	(SAE-50)
Essolube 50	(SAE-50)
Shell Motor Oil X-100	(SAE-50)

FOR HUB LUBRICATION AND ALL FRAME PARTS USING GREASE

Mobilgrease No. 4
Castrolase Heavy
Energrease C3
Esso Pressure Gun Grease
Shell Retinax Grease C.D. or A

FOR TELEDRUALIC FRONT FORKS AND TELEDRUALIC REAR LEGS

Mobiloil Arctic	(SAE-20)
Castrolite	(SAE-20)
Energol 20	(SAE-20)
Essolube 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.

ENGINE LUBRICATION SYSTEM

This is of the **dry sump** type. Two separate gear type oil pumps are used, one for delivery and the other for returning oil to the tank. Oil feeds by gravity to the delivery pump, by which it is forced, under pressure, to various parts of the engine, from whence it drains back to the crankcase sump to be collected by the return pump and returned to the tank. The return pump has a much larger capacity than the delivery pump to ensure that the crankcase is kept clear of excess oil.

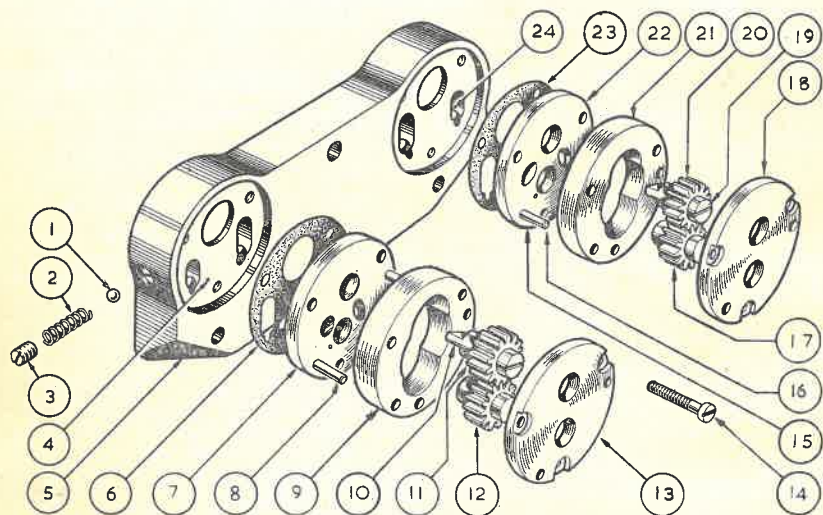


Illustration 4

Showing Delivery Oil Pump (on the right) and the Return Oil Pump (on the left)

- | | |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1 BALL, FOR NON-RETURN VALVE. | 13 FRONT PLATE OF OIL RETURN PUMP. |
| 2 SPRING, FOR NON-RETURN VALVE. | 14 SCREW (1 OF 6) USED TO RETAIN PLATES AND BODIES OF OIL PUMPS TO THE CARRYING PLATE. |
| 3 PLUG, RETAINING NON-RETURN VALVE SPRING AND BALL. | 15 BACK PLATE OF OIL FEED PUMP. |
| 4 BLEED HOLE. | 16 DOWEL PIN, LOCATING PUMP PLATES AND BODY. |
| 5 PLATE, CARRYING OIL FEED AND RETURN PUMPS. | 17 DRIVEN GEAR, FOR OIL FEED PUMP. |
| 6 PAPER WASHER FOR OIL RETURN PUMP. | 18 FRONT PLATE OF OIL FEED PUMP. |
| 7 BACK PLATE OF OIL RETURN PUMP. | 19 SCREWDRIVER SLOT, TO ENABLE DRIVING GEAR TO BE CORRECTLY POSITIONED DURING ASSEMBLY. |
| 8 DOWEL PIN, LOCATING PUMP PLATES AND BODY. | 20 DRIVING GEAR, FOR OIL FEED PUMP. |
| 9 BODY OF OIL RETURN PUMP. | 21 BODY OF OIL FEED PUMP. |
| 10 DOG END OF PUMP GEAR TO ENGAGE IN END OF CAMSHAFT. | 22 BACK PLATE OF OIL FEED PUMP. |
| 11 DRIVING GEAR, FOR OIL RETURN PUMP. | 23 PAPER WASHER FOR OIL FEED PUMP. |
| 12 DRIVEN GEAR, FOR OIL RETURN PUMP. | 24 BLEED HOLE. |

ENGINE OIL PUMPS

Each pump is independently driven, at half engine speed, from the ends of the two camshafts. They each consist of a pair of close fitting gear wheels in a cast iron body. The gears of the delivery pump are considerably narrower than those of the return pump, giving the latter the necessary extra capacity to ensure efficient scavenging.

ENGINE OIL CIRCULATION

Oil, from the oil tank, is fed by gravity, through a coarse mesh metal filter, via an external pipe, to the suction side of the delivery pump, from whence it is discharged, under pressure, to a large and easily detachable felt filter that is housed in the crankcase.

A pressure relief valve (see illustration 10) is incorporated purely as a safeguard when the oil is thick and cold, the blow off pressure of the valve being well above the normal oil pressure.

After passing through the felt filter the main supply is directed to the crankshaft centre bearing and thence, through passages in the crankshaft, to each big-end, the splash from which provides adequate cylinder lubrication.

A by-pass carries an ingeniously divided supply direct to the camshaft bearings and also to each of the four overhead rocker bearings, the rocker pillars being drilled to allow a small discharge into the cupped ends in which the ball ended valve push rods operate. These oilways are intentionally metered.

A predetermined level of oil is allowed to build up in the timing case to ensure adequate lubrication of the gears, and also in the camshaft tunnels, to ensure adequate lubrication of the cams and cam levers. Upon reaching these determined levels, the surplus overflows into the crankcase, and so to the sump.

The return pump collects all surplus oil from the crankcase sump and passes it, via another external pipe, through the large felt filter located in the oil tank. (See illustration 3.)

The stream of oil flowing into the tank is instantly visible upon removal of the tank filler cap.

THE OIL TANK

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 upper mark line, at which level the oil content is $4\frac{1}{2}$ pints.

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 filters cleaned in petrol and the tank replenished with new oil.

THE OIL FILTERS

There are three filters for the oil.

(A) The metal filter located in the feed pipe in the bottom of the oil tank.

This is a thimble shaped filter of coarse metal mesh inserted, from the exterior, in the short metal feed pipe located in the bottom of the oil tank. It has an open end finished with a turned over metal ring, which, upon the fitting of the tubular rubber sleeve connecting the oil feed pipe to the end of the rigid feed pipe to the engine, is gripped by the rubber sleeve, thereby preventing it from moving from its correct location.

(B) The felt fabric filter located in a chamber in the front part of the crankcase and parallel to the exhaust camshaft.

This is a cylindrical filter made of close grain felt that is supported by a tubular wire cage.

On the inner end is fitted a steel cup which effectively seals that end of the cylindrical filter. This cup is a push on fit.

In the outer end is inserted an aluminium plug, or valve, which acts as a relief valve, allowing the oil to escape if, for any reason, it cannot percolate through the felt fabric. In normal conditions this valve does not operate but, if for example, the cleaning of the filter had been neglected to such an extent that it was so clogged the oil could not pass through it in the volume supplied by the pump, then the valve would lift to give immediate temporary, or permanent, relief, as may be necessary.

(C) The large close grain felt cartridge, located in the oil tank through which all oil returning from the crankcase sump is compelled to pass.

CLEANING OIL FILTERS

To remove and clean the feed pipe metal filter :

Release the engine end of the oil feed pipe. (This leads from the rear outlet in the base of the oil tank to the forward banjo connection on the timing side of the crankcase.) Then remove the oil feed pipe by withdrawing the rubber connecting sleeve from 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 ringed 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.

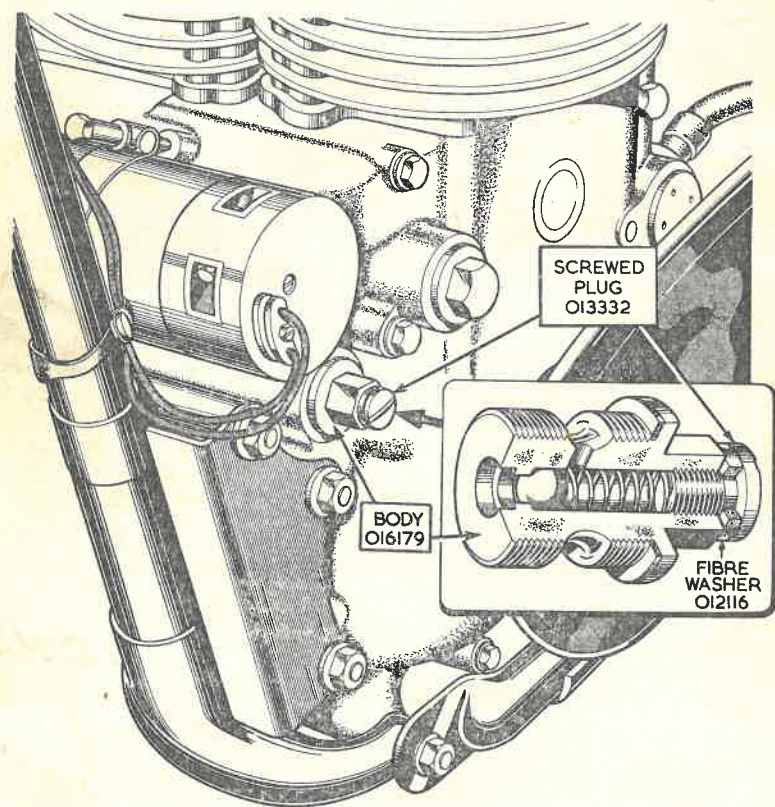


Illustration 5

Showing oil non-return valve

Body 016179 screws into the housing for the oil felt filter. This body contains the oil non-return ball valve, and the complete assembly, as shown in the small inset picture, must be removed to obtain access to the oil felt filter. The screwed plug 013332 must be removed in order to apply the oil pressure gauge mentioned on page 17.

To remove and clean the felt crankcase fabric filter :

Unscrew the hexagonal headed plug just beneath the dynamo on the drive side of the crankcase, and gently withdraw the spring and aluminium blow-off plug in which the spring operates. (See illustration 5.)

This will expose the felt fabric filter which can be withdrawn by inserting a finger in the open end. In the other end of the filter is a steel cup which should be pulled away from the filter.

The filter should be cleaned in petrol and allowed to dry before re-insertion.

The housing tunnel for the filter should also be thoroughly cleaned out with a fluff-free rag moistened in petrol.

Reverse the above procedure to re-fit the felt filter and, when doing so, do not forget to replace the steel cup on the open end of the filter before inserting it in its housing tunnel.

To remove the felt filter located in the oil tank :

Unscrew the hexagonal headed cap on the top of oil tank and withdraw the dished washer and spring. Then insert a finger in the exposed open end of the filter and gently raise same. As it emerges from the tank gently strain outward and forward to clear the twin seat. Care is necessary in this operation to avoid kinking the filter.

OIL PRESSURE GAUGE (Workshop service only)

Upon the removal of screwed plug 013332 (see illustration 5) a suitable oil pressure gauge can be applied to enable a check to be made of oil pump efficiency and operation, subsequent to an overhaul or dismantling.

The pressure gauge should be graduated to at least 150 lbs. and must have a shank threaded .518 inch by 19 T.P.I. ($\frac{1}{2}$ B.S.P.). We can supply a suitable gauge, graduated to 250 lbs. The Part Number is B4108.

The gauge should be screwed into the valve body 016179, and with a cold engine running at idling speed, the recorded pressure should be approximately 140 lbs., which is the blow off pressure of the PRESSURE RELIEF VALVE. (See illustration 10).

When the oil is warm and thin, the recorded pressure at idling speed should be between 20 to 40 lbs., rising somewhat when the engine revolutions are increased.

As indicated, the important check is at idling speed, and, if the mentioned pressures are obtained, the oil delivery pump is operating as intended.

GEAR BOX LUBRICATION

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

Lubricant is inserted through the filler 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).

CHAIN LUBRICATION

Front driving chain runs in an oil bath. (Front chaincase). Use engine oil. Maintain level to height of the inspection cap opening.

Oil in front chaincase also lubricates the engine shock absorber. Transmission harshness 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, centralise cork washer and then fully tighten knurled screw. Essential this 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 molten tallow for preference, 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 to ensure penetration to all joints.

Treat rear chain every 3,000 miles in dry weather and every 1,000 in wet weather.

HUB LUBRICATION

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

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 end pin and on the 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 Handlebar Lug.

CONTROL CABLE LUBRICATION

To ensure free smooth action the clutch and throttle cables are fitted with a conveniently situated grease nipple. Use engine oil and hold the grease gun as near vertical as possible (spout downward) to obtain efficient ejection of oil, the gun being primarily intended for grease. Lubricate at the first sign of stiff or jerky action.

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 clip. 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

Heavy Gear Oil. (See pages 19 and 51.)

LUBRICATION CHART

The figures in diamond frames refer to parts located on the left hand side of the machine and those in circles refer to parts located on the right hand side.

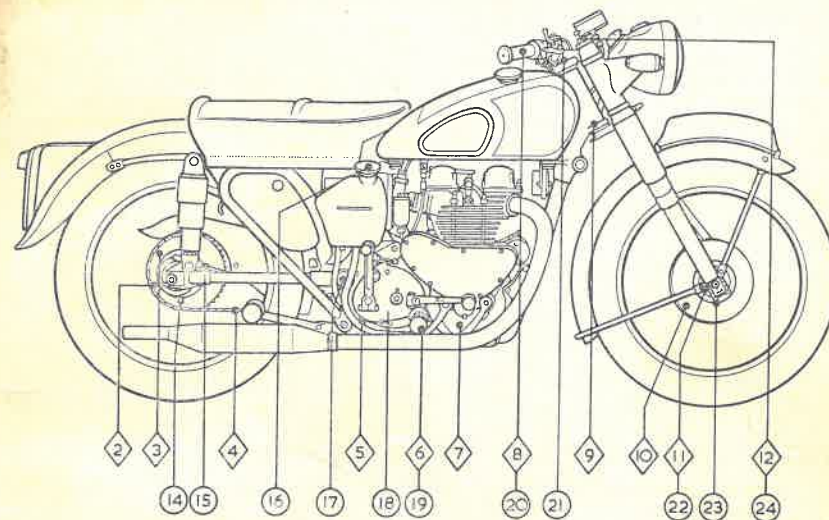


Illustration 6

Lubrication Chart

Engine Oil Locations	Grease Locations
16 MAIN OIL TANK.	23 FRONT HUB.
7 FRONT CHAINCASE.	14 REAR HUB.
8 } CONTROL LEVER MOVING PARTS.	21 STEERING HEAD TOP BEARING.
20 }	9 STEERING HEAD BOTTOM BEARING.
2 BRAKE ROD JOINTS.	15 SPEEDOMETER GEAR BOX.
6 }	10 FRONT BRAKE EXPANDER.
11 } FRONT, CENTRE AND PROP STAND	3 REAR BRAKE EXPANDER.
19 }	5 BRAKE PEDAL SPINDLE.
22 }	
Hydraulic Fluid Locations	Heavy Gear Oil Location
12 } FRONT TELEDRAGALIC FORKS.	17 REAR FORK HINGE.
24 }	
Heavy Engine Oil Location	Tallow Location
18 GEAR BOX.	4 REAR CHAIN.

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

WHEN ORDERING SPARES
ALWAYS QUOTE
THE COMPLETE ENGINE NUMBER
(Including all the Letters in it).
THIS ENABLES THE MACHINE TO BE IDENTIFIED

EACH SERIES OF FRAMES IS NUMBERED FROM ZERO UPWARDS. THEREFORE THE QUOTATION OF A FRAME NUMBER ONLY DOES NOT FACILITATE IDENTIFICATION.

MAINTENANCE

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 carefully follow 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 6.

DAILY

- Oil tank** Inspect oil level (16) and top-up to top line level if necessary. Check oil circulation.
- Petrol tank** Check level and re-fill if necessary.

WEEKLY

- Oil tank** Check level and re-fill to top line level if necessary. (16).
- Tyres** Check pressures and inflate if necessary.

EVERY 500 MILES

- Oil tank** Drain at first 500 miles and re-fill to top line level with new oil, and clean felt filter. (16).
- Gear Box** Drain at first 500 miles and refill (18) 1 pint.
- Chaincase** Check level of oil when machine is standing vertically on level ground when level of oil should not be less than $\frac{3}{16}$ " below bottom edge of inspection orifice. (7).
- Rear chain** If dry, apply engine oil with a brush. (4).
- Battery** Inspect each cell for level of electrolyte and top up with distilled water if necessary. (See pages 75 and 76). 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. (16).
- Rear chain** In wet weather remove and soak in molten tallow for preference. (4).
- Gear box** Add 2 fluid ounces of specified oil. (18).
- Hubs** Inject small amount of grease. (14-23).
- Expanders** Inject small amount of grease. (3-10).
- Steering head** Inject small amount of grease. (9-21).
- Small parts** Smear all moving parts with engine oil and wipe off surplus. (2-6-8-11-19-20-22).

EVERY 2,000 to 5,000 MILES (according to road conditions.)

- Air Filter** (If fitted) clean and re-oil filter element.

EVERY 3,000 MILES

- Rear chain** In dry weather remove and soak in molten tallow for preference. (4).
- Brake pedal** Inject small amount of grease. (5).
- Speedometer** Inject small amount of grease into speedometer gear box. (15).
- Magneto** Clean contact breaker points and re-set if necessary.
- Plugs** Clean sparking plugs and re-set points as necessary. When refitting reverse respective positions.
- 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.V.H. rocker adjustment and correct if necessary.

EVERY 5,000 MILES

- Oil tank** Drain and re-fill with new oil. (16). 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 3.)
Clean felt fabric filters in oil tank and crankcase.
- Magneto** Clean and adjust 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. (12-24).
Insufficient oil content is indicated by abnormally lively action.
- Rear legs** Check each leg for hydraulic fluid content and, if necessary, top up. Insufficient oil content is indicated by abnormally lively action. (Dealers' Service only).
- Carburetter** Remove carburetter 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 latest, 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. | (6) Wheel bearings. |
| (2) Contact breaker points. | (7) Brakes. |
| (3) Sparking plugs. | (8) Forks, legs, and steering head. |
| (4) Clutch. | (9) Alignment of wheels. |
| (5) Chains. | (10) Tyre pressures. |
- (b) Tighten all external nuts and bolts, including cylinder head nuts and fork crown pinch screws.
- (c) Top-up battery and check all lighting equipment.
- (d) Clean out carburetter and check for correct idling.
- (e) Adjust and lubricate all cables.
- (f) Grease all nipples.
- (g) Drain oil system. 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

TO ADJUST OVERHEAD ROCKERS (Tappet clearance)

Using key bar 018055 remove screws securing a rocker cover. (It is desirable to deal only with one cover at a time).

Lift off the cover, exposing the rocker.

Using single ended spanner 015264, slightly slack off the nut of the bolt clamping the disc headed end of the rocker spindle. (See note below).

Then slowly revolve the engine, by means of the kick-starter pedal, till well past the position at which the valve closes and then proceed to revolve the rocker spindle until the correct clearance is obtained, whereupon, re-tighten the locking nut and replace the cover. (Inspect gasket under rocker cover and, if damaged, replace with new.)

The correct rocker clearance, with cold engine, is .006" for both inlet and exhaust.

It is best to ensure that each piston, in turn, is at the top of its firing stroke when adjusting rocker clearances. The method of obtaining that position is explained in the paragraph dealing with **Timing the Ignition**. This piston position is essential to ensure the cam levers are well clear of the cam quietening curves when adjusting rocker clearance.

It should, perhaps, be explained here that these quietening curves, as they are called, are actually slight inclines from the base circles of the cams to the foot of each hump and their object is to slowly take up the clearance between the cam levers and valve push rods as the valves open and close thus reducing noise.

NOTE—If the rocker spindle clamping bolt nut is unscrewed to an unnecessary extent the rocker spindle will then move sideways, under the influence of the spring washer, and then the thrust washer at the end of the rocker spindle may drop out of exact location and, unless noticed and re-positioned, damage to the flanged end of the rocker spindle may result upon re-tightening the clamping bolt nut. Care to avoid this is necessary. (See illustration 7.)

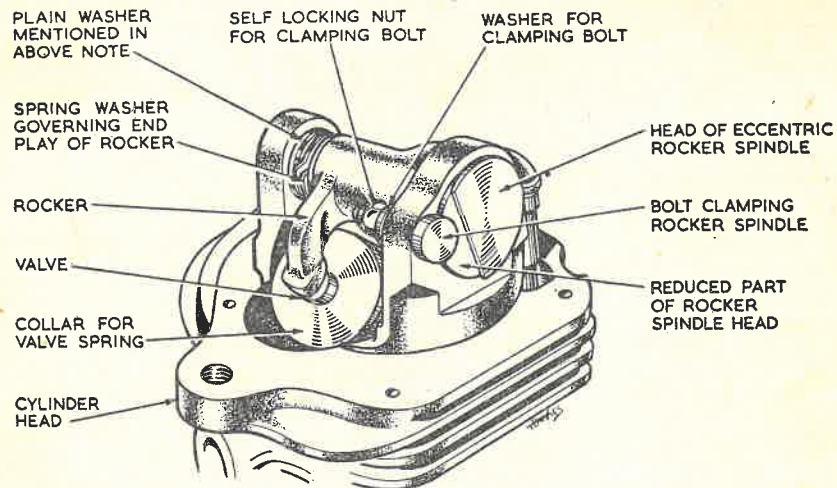


Illustration 7

Rocker Adjustment

ACCESS

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

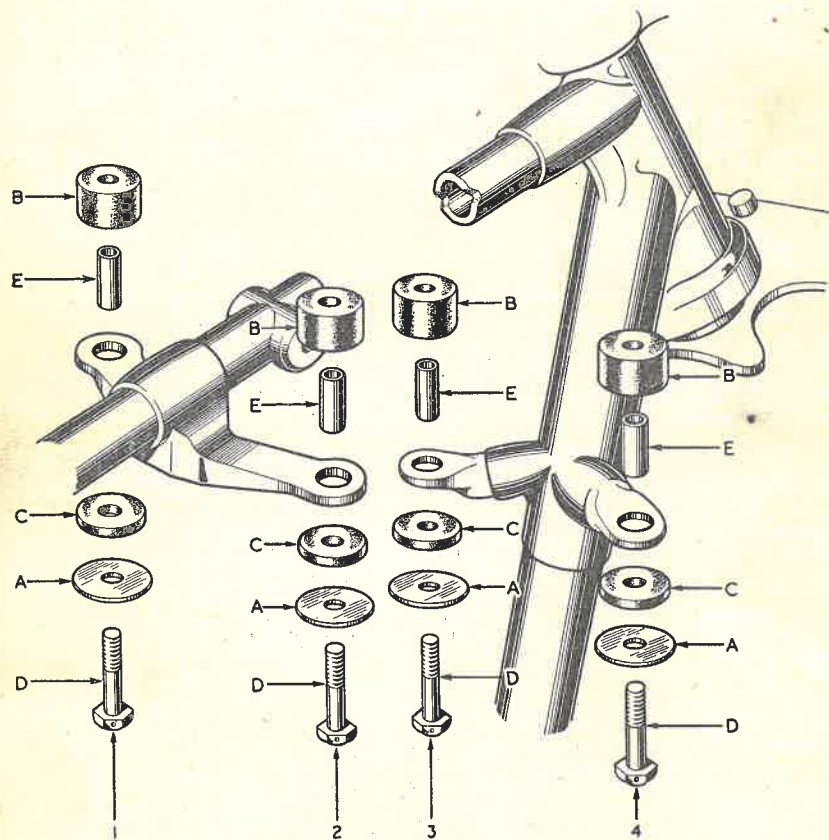


Illustration 8

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

			Part Number		
A	...	METAL WASHER	...	014999	1½" diameter.
B	...	THICK RUBBER PAD	...	014995	⅜" high.
C	...	THIN RUBBER PAD	...	014996	⅜" high.
D	...	TANK FIXING BOLT	...	014997	1½" × ⅜" × 26.
E	...	SLEEVE FOR FIXING BOLT	...	014998	1½" long.

TO REMOVE THE PETROL TANK

Remove the twin seat.

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 should be specially observed so that they may be correctly replaced.

TO REPLACE THE PETROL TANK

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

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 pistons and rings, the cylinder barrels are best left undisturbed. The various stages in decarbonisation are described below.

TO REMOVE CYLINDER HEADS FOR DECARBONISATION

To ensure the various parts of each head are not intermixed it is recommended that only one head is removed at a time.

Remove the petrol tank, as already described.

Remove the rocker box covers, as already described.

Remove the sparking plugs.

Remove the exhaust pipes and silencers (no need to separate pipes and silencers) by taking away nuts and washers holding pipes to stays and silencers to rear frame, pulling silencer end of each assembly outwards far enough to allow fixing studs to disengage and then pulling each assembly forwards till disengaged from the cylinder head.

Remove air filter (if fitted).

Remove carburetter by taking away the two fixing bolts and withdrawing to the rear. Lay carburetter on saddle.

Remove inlet manifold by taking away the four fixing nuts and washers and withdrawing to the rear. Take care not to damage the gaskets between manifold and heads or rubber ring insert.

Remove cylinder head steady plate (secured by 3 bolts and nuts).

Remove heads by using box spanner 015213 to remove the four domed nuts that retain each head.

After removal invert each head to dislodge the spacers under the domed nuts and lay aside to await re-assembly.

The cylinder head gaskets will generally adhere to the tops of the barrels but care must be taken not to damage them.

TO REMOVE THE VALVES

Remove rockers.

Assuming that a valve spring compressor is not available :

Prepare a block of wood about 2" cube, lay same on a bench, place cylinder head over it so that the heads of both valves are supported on the block.

Apply pressure to each valve spring cap, in turn, to sufficiently compress the springs to permit the extraction of the split collet. The collets are a taper fit in the valve spring collar and it may be necessary to give the collar a sharp tap to release them. (A stout screwdriver is a handy tool with which to apply the pressure).

Lift away valve spring collar, springs and spring seat from each valve.

Lift head off the wood block and valves will drop out.

TO REMOVE VALVE GUIDES

Apply gentle heat to cylinder head and press upward guide to be removed just sufficiently to permit removal of external circlip. Then thoroughly clean protruding top end of guide re-heat and press downward to extract.

Re-heat when replacing.

REMOVING CARBON DEPOSIT

Do not use a sharp implement for removing carbon deposit from the interior of the aluminium 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 inserted valve seatings and in no circumstances should any abrasive material, such as emery cloth, be used for cleaning and polishing.

VALVE GRINDING

Before commencing valve grinding, carefully examine the face 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 continuously in one direction).

The grinding may be considered to be satisfactorily completed when a continuous matt 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 collected.

NOTE—A piece of oil resisting rubber tube having a bore of $\frac{1}{4}$ " slipped over the valve end will be found a suitable device for revolving the valves during grinding in. This is not included in the standard tool kit. The Part number is 011381.

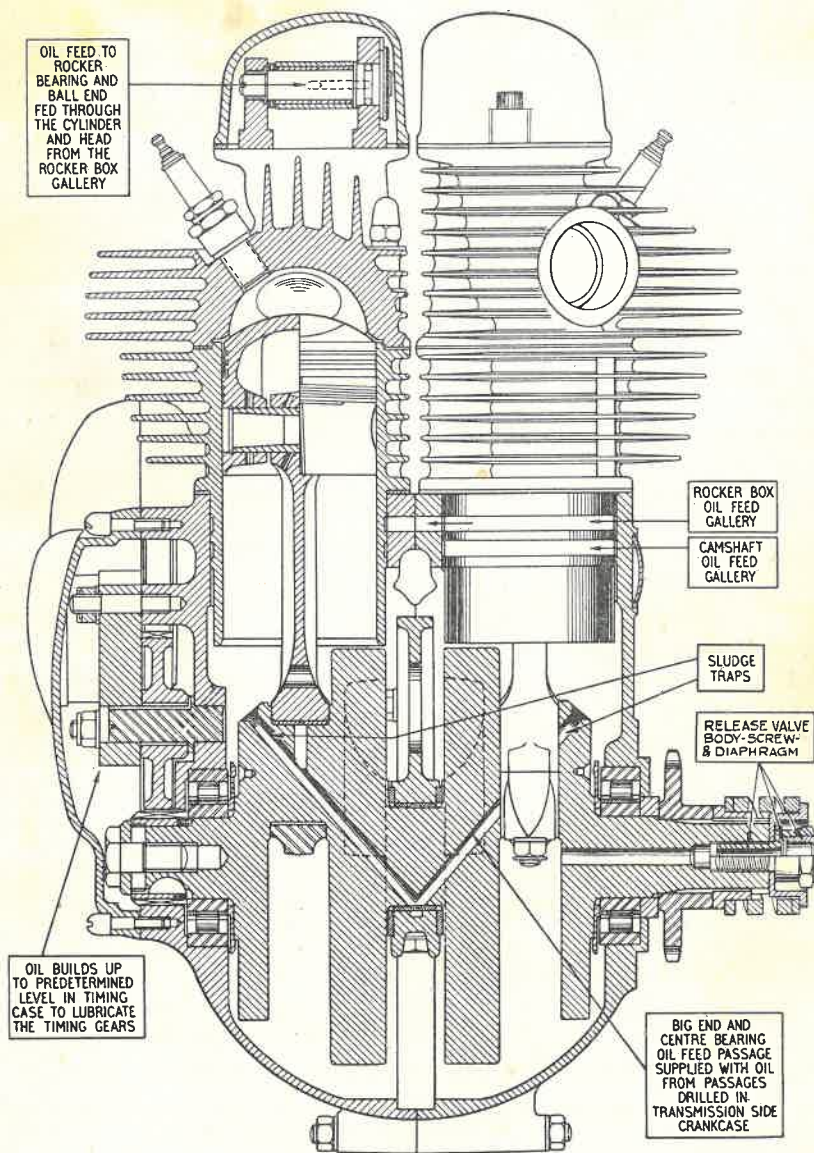


Illustration 9

Cross section of engine showing oil galleries, oil passages, and release valve.

REMOVING CYLINDER BARRELS AND PISTONS

Unless it is desired to inspect the pistons and rings, during decarbonisation, they are, as already advised, best left undisturbed.

Having removed the cylinder heads withdraw the cylinder barrels by :
Lift away the four push rods, identify them for re-fitting and lay aside.

Dealing with one barrel at a time, exert upward pressure on a barrel, slightly rocking to and fro while doing so, and steady the piston with one hand as it emerges from the barrel.

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

To remove a piston

Using 011188 circlip pliers, contract one of the gudgeon pin circlips and, with a rotary motion, gently withdraw the circlip from its housing. The gudgeon pin may then be pushed out of the piston which action frees the piston from the connecting rod. (Being a parallel, floating fit in the piston and connecting rod small end it is immaterial from which side the gudgeon pin is withdrawn.)

NOTE—It may be necessary to apply a little heat to the piston to permit free gudgeon pin removal and replacement.

Rings may be removed from a piston by peeling off or by introducing behind them three thin and narrow metal strips, equally spaced round the piston, and then sliding them off, taking care not to scratch the piston.

Carefully examine the contact edge of each piston ring and replace any which do not show a bright surface over the whole circumference.

FITTING PISTONS AND CYLINDER BARRELS

Pistons to be free of carbon on their crowns and all piston ring grooves to be clean. Piston rings to be clean and on pistons.

Fit a piston to its connecting rod by : Smear gudgeon pin with clean engine oil.

Place piston over connecting rod so that the slotted side faces to the front of the machine, introduce gudgeon pin to piston and pass through connecting rod, press right home against the circlip still in situ. Then again, using pliers 011188, contract the other circlip, introduce same into its groove in the piston, using a rotary movement. Make quite certain that the circlip lies snugly in its groove because failure to do so will inevitably lead to serious damage.

(See "NOTE" above).

Before fitting the cylinders, make sure they are clean and examine the base washers and renew same if not perfect.

To fit a new cylinder base washer : first clean off the old washer and all traces of jointing compound. Then smear one side of the new washer with jointing compound and, when that is nearly dry ("tacky") apply to the cylinder.

Place rings on piston, scraper first, then the two compression rings. On all models the top compression ring is chromium plated. These chrome plated rings have a slightly tapered exterior and when new are clearly marked with the word TOP on one side to indicate assembly position. After use this word tends to become indiscernable, but over a large mileage the assembly position can be determined by brightness of the edge contacting cylinder wall. This bright edge is the lower one. When as the result of wear, contact with the cylinder wall appears uniform over the whole width of the ring, it is then immaterial which way round it is refitted.

Space the piston rings so that the gaps are 120° to each other, smear piston and rings and bore of barrel with clean engine oil and, supporting the piston with one hand, gently pass over the barrel, compressing each piston ring with the fingers, as it enters the barrel.

Press the cylinder barrel right down into the throat of the crankcase.

Fit the second piston, gudgeon pin, rings and barrel in a like manner.

Revolve the engine till the pistons are at the top of their strokes and then, with a clean rag, wipe off all surplus oil. All is now ready to re-fit the cylinder heads.

TO RE-FIT THE CYLINDER HEADS

Clean the valve stems and the bores of the valve guides with rag moistened with petrol, make sure all other parts are clean, then smear each valve stem with clean engine oil and proceed to re-fit the valve stems by reversing the procedure taken to dismantle them.

Insert the four valve push rods into their original positions and, after making sure that the cylinder head gaskets are undamaged and in position, proceed to fit the two heads and leave the two sets of four cylinder head retaining nuts finger tight.

Now re-fit the inlet manifold, making sure the two paper gaskets are undamaged, and leave the four retaining nuts only just tight enough to ensure correct alignment.

Next, fully tighten down the four retaining nuts on each head, treating each, diagonally, bit by bit, till all are fully down.

Then, fully tighten the inlet manifold retaining nuts and re-fit the carburetter.

Next, carefully check each rocker clearance, as previously described, and re-set if necessary. (The correct rocker clearance with cold engine is .006" for inlet and exhaust).

The gaskets under each rocker cover should be inspected and, if not sound, should be replaced after which the rocker covers can be refitted.

Next re-fit the cylinder head steady plate and securely tighten the three fixing bolts.

NOTE—Before re-fitting carburetter make sure the rubber ring in manifold joint face is in position and undamaged.

VALVE TIMING

Inlet valve opens 35° before top dead centre

Inlet valve closes 65° after bottom dead centre

Exhaust valve opens 65° before bottom dead centre

Exhaust valve closes 35° after top dead centre

(Check valve timing with .012" rocker clearance)

Upon removing the timing gear cover (secured by 10 screws and 1 nut) and the pump plate assembly it will be observed the valve timing gears are marked to facilitate correct assembly.

One tooth of the mainshaft small pinion is marked with one centre punch dot and a tooth gap of the idle pinion, into which it meshes, is similarly marked. With these two marks coinciding it will be seen that a tooth gap on each side of the intermediate pinion is marked with two centre punch dots which also coincide with a similarly marked tooth on each of the camshaft driving gear wheels.

During assembly it is only necessary to mesh the gears with these various marks coinciding to ensure correct valve timing.

The dynamo and magneto drive pinions are not marked. The dynamo does not need "timing" and if, for any reason, the magneto timing has been disturbed, it is re-set as described later.

Removal of gears

When completely dismantling the engine there is no necessity to remove the small timing pinion from the crankshaft before splitting the crankcase because the complete crankshaft can be taken away with the pinion still in position.

If, however, it is desired to remove the pinion without completely dismantling the engine a special extractor is required (part number 015273). This consists of a nut, threaded externally and internally. The external threads enable it to be screwed into the threaded centre of the pinion and the internal threads accommodate a specially designed and hardened bolt which, upon screwing down, pulls off the pinion. This same tool is used for the removal of the magneto gear.

The intermediate gear needs no extractor.

The gears on the two camshafts (secured by nuts having left-hand threads) have to be mechanically withdrawn and each has two holes drilled and threaded to accommodate the two bolts of a bridge type extractor (part number 015374) which has a central bolt threaded in the bridge. The two outside bolts are screwed into the holes in the gears whereupon application of the centre bolt being screwed into the bridge bears on the end of the shaft thereby causing the gear to be withdrawn.

The gear on the dynamo needs no extractor because the dynamo, complete with gear assembled, is easily and quickly removed from the engine and the subsequent removal of the gear from the dynamo shaft is a simple workshop operation.

NOTE—Under excessive oil pressure the relief valve plunger (11) is forced outward against the influence of spring (12) to an extent sufficient to uncover the drilled cross hole in plunger through which part of the oil delivery escapes into the timing case.

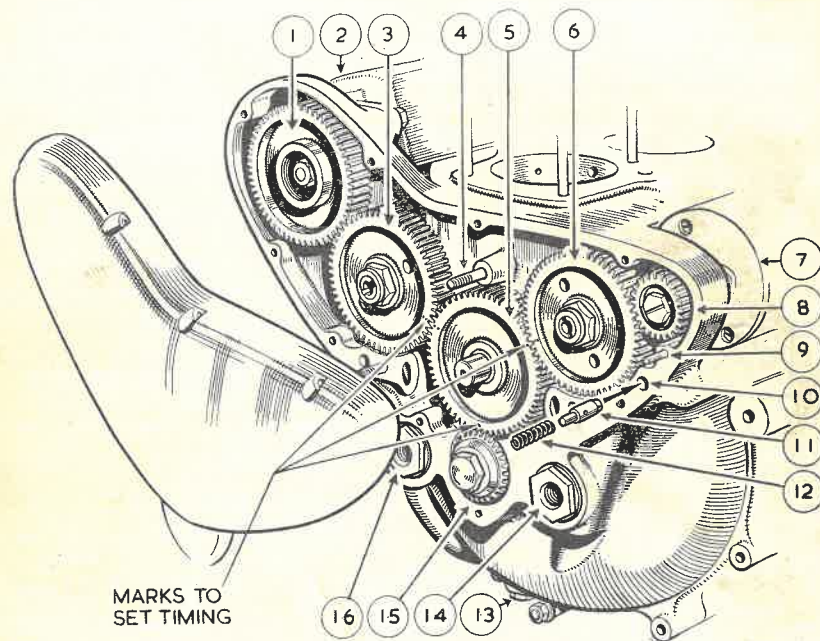


Illustration 10

Showing valve timing gear

- | | |
|------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1 GEAR WHEEL ON MAGNETO ARMATURE SHAFT. | 9 STUD, IN DYNAMO BODY AND PASSING THROUGH CRANKCASE AND TIMING GEAR COVER. |
| 2 MAGNETO. | 10 ORIFICE TO ACCOMMODATE RELIEF VALVE. |
| 3 GEAR WHEEL ON INLET CAMSHAFT. | 11 OIL RELIEF VALVE. |
| 4 ONE OF THE THREE STUDS RETAINING THE OIL PUMPS ASSEMBLY. | 12 SPRING, CONTROLLING OIL RELIEF VALVE. |
| 5 INTERMEDIATE (OR IDLE) GEAR. | 13 CRANKCASE DRAIN PLUG. |
| 6 GEAR WHEEL ON EXHAUST CAMSHAFT. | 14 ADAPTOR TO ACCOMMODATE OIL FEED PIPE BANJO PIN. |
| 7 DYNAMO. | 15 TIMING PINION ON CRANKSHAFT. |
| 8 GEAR WHEEL ON DYNAMO ARMATURE SHAFT. | 16 ADAPTOR TO ACCOMMODATE OIL RETURN PIPE BANJO PIN. |

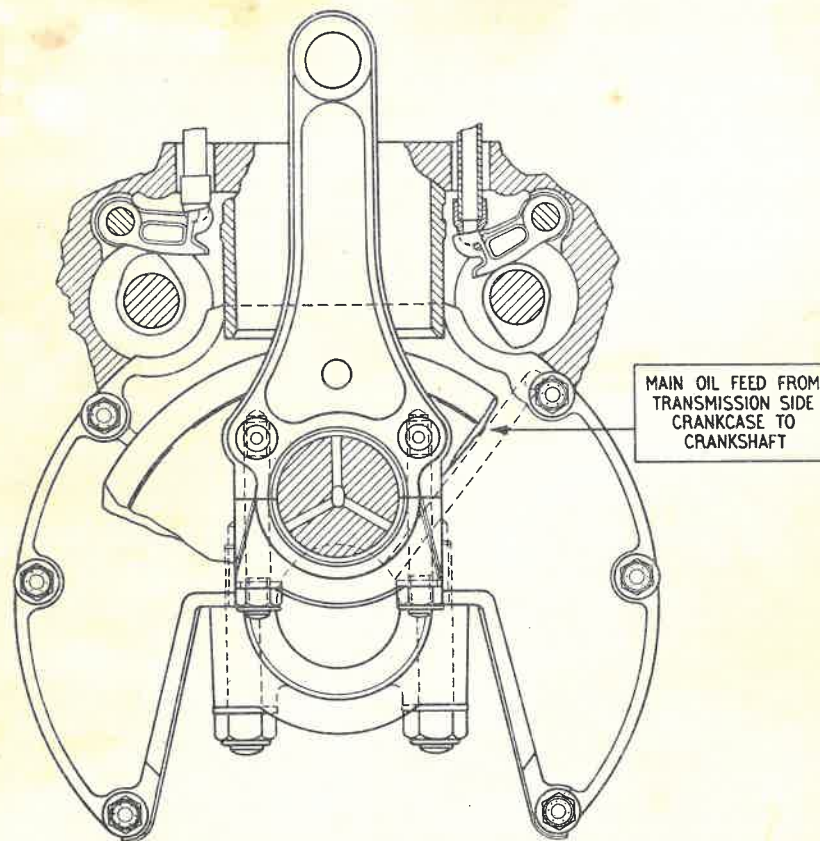


Illustration 11

Showing mounting for centre bearing for crankshaft, and a connecting rod with big-end bearing

TO RE-TIME THE IGNITION

Before proceeding to time the ignition it is advisable first to check the contact breaker point gap, which should be from .010" to .012", and correct it if necessary.

Having loosened the nut securing the magneto driving pinion, release same from the tapered end of the magneto shaft by means of a special extractor, as described on page 29. Remove the inlet rocker cover from the off-side cylinder head.

Remove the sparking plug from the off-side cylinder.

Insert a small rod into the sparking plug hole and, feeling the piston with the end of this rod, carefully turn the engine in its normal direction of rotation until the piston is exactly at the top of the stroke after the inlet valve has closed.

Hold the rod as vertical as the angular sparking plug hole will permit, make a mark on same exactly coinciding with the top edge of the sparking plug hole boss. Then withdraw the rod and make another mark exactly $\frac{3}{8}$ " higher up. Re-insert the rod and turn the engine backward until the higher mark coincides with the top edge of the sparking plug hole boss.

Place the ignition control lever in the fully advanced position.

Next, taking care not to disturb the piston position, turn the magneto in a clockwise direction (looking at the contact breaker end of the magneto) until the contact breaker points are just about to separate by reason of the fibre block on the bell crank lever commencing to mount the lower cam hump.

The exact point of separation is best found by inserting between the contact points a strip of thin tissue paper when the separation point can be determined by the paper just being released with a light pull.

Having obtained this position, press the magneto driving gear on to its taper with the fingers and lightly tighten the securing nut.

It is next advisable to re-check the setting by again turning the engine to the position at which the piston is $\frac{3}{8}$ " before the top of the firing stroke, re-inserting tissue paper between the contact points and confirming that same can be released with a light pull.

Upon being satisfied that the setting is correct securely tighten down the nut fixing the magneto driving gear.

Thoroughly clean off all traces of jointing compound from face edges of the timing cover and crankcase and then smear both faces with new jointing compound, which leave till tacky and then re-fit the cover to the crankcase. ("Wellseal" recommended.)

The whole operation of timing the ignition will be found quite simple if the foregoing instructions are carefully followed.

NOTE—The sparking plug High Tension cable for the off-side cylinder is that connected to the rear pick-up on the magneto.

TO DISMANTLE AND REFIT CRANKCASE RELEASE VALVE IN CRANKSHAFT (see Illustration 9)

Upon removal of the outer portion of front chaincase as described elsewhere, the release valve will be observed on the end of the engine shaft.

The larger hexagon, is the release valve body, which also secures the shock absorber spring cap.

The smaller hexagon is the release valve screw, which retains the spring and diaphragm.

To inspect release valve and ensure correct re-assembly it is essential to remove the valve body from the engine shaft, then the valve screw can be removed.

When re-fitting diaphragm, hold the valve body vertical with large hole uppermost, and correctly locate spring when the valve screw is assembled.

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 Dag" or Graphite paste. This will guard against seizure upon subsequent removal.

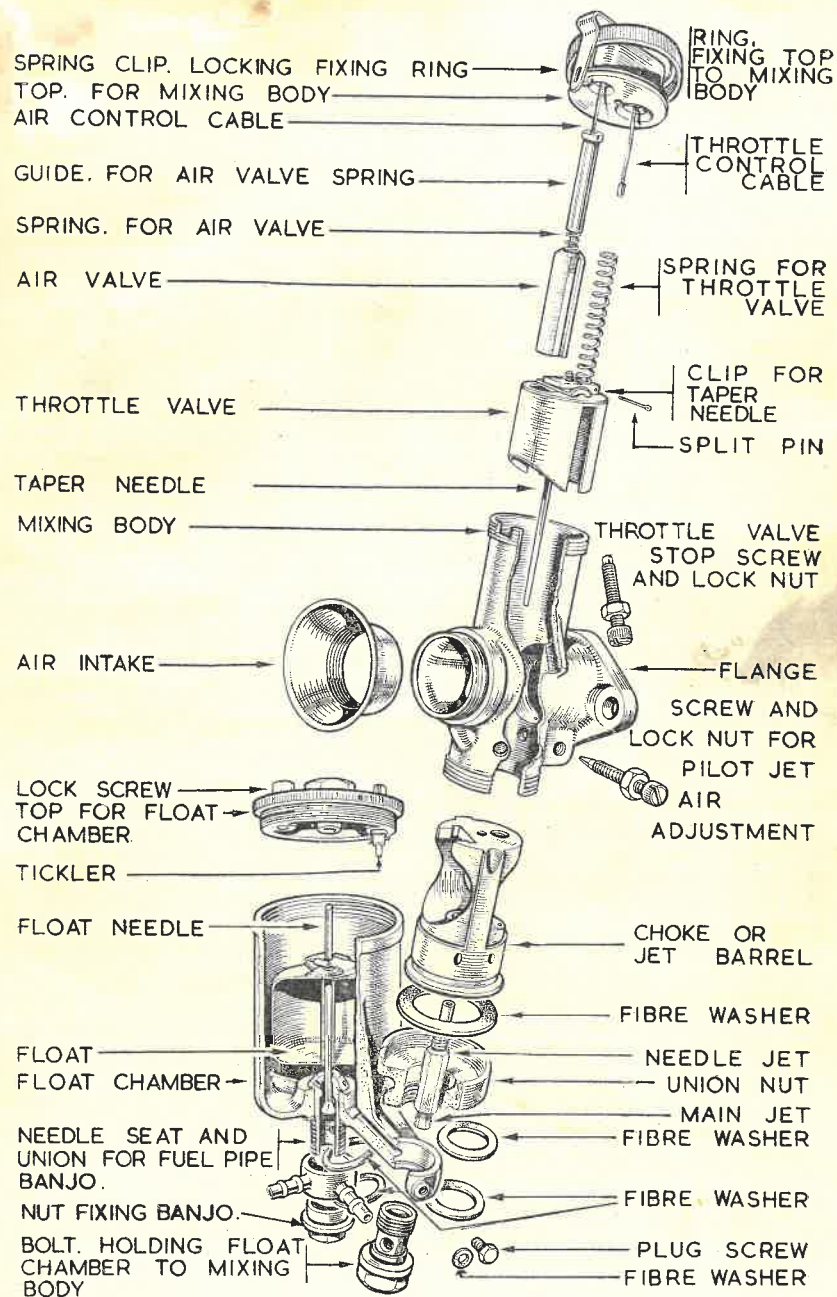


Illustration 12

Carburettor details in assembly order

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 manufacturers of the carburetter, **Amal Ltd., Holford Road, Witton, Birmingham, 6.**

Our **Spare Parts Department** does not stock every part of the carburetter but confines its stock to those parts that, from time to time, may need replacement as the result of wear. Those 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 illustration 12) 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 intake 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 illustration 12, 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 bumpy, or jerky, running and, in cases of extreme richness, is accompanied by the emission of black smoke from the exhaust.

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 splutter 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 idle positively and evenly when the throttle is almost closed. If it fails to do so, adjust the pilot jet air screw (illustration 12) inwards, 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 illustration 12). This adjustment is not unduly sensitive, and it be should 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 sprayer base, 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 sprayer base 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 but, 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 under-side of the petrol tank.

Smooth throttle operation is assured by the provision of a cable oil nipple. At the first signs of jerky action a little engine oil should be injected applying the gun as near vertical as possible (nozzle downward).

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 abrasive wear.

The filter available (optional extra) for the conditions mentioned above is of the "Oil Wetted" 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 final table on page 13, and allow to drain before replacing in the filter case. Clean at intervals of 2,500 to 5,000 miles according to road conditions, and renew the element every 10,000 miles.

TO OBTAIN ACCESS TO THE AIR FILTER ELEMENT

Remove battery and battery carrier.

Remove bolts holding Rear Chain Guard in front and at rear, (when free move guard towards the rear as far as possible).

Remove the two bolts retaining the lid of the filter chamber.

Take away the lid and the felt end washer.

Remove the two sleeve nuts in the centre of the air filter body.

Withdraw the filter element, (this also releases the other felt end washer which can be taken away).

After servicing the filter element by the method indicated above, replacement is made by reversing the above operations. Assembly will be facilitated by retaining the two felt end washers to their respective metal backings by sticking them in position with grease or jointing compound.

CARBURETTER TUNING INFORMATION

Poor idling may be due to :

Air leaks. Either at junction of carburetter and inlet manifold, or by reason of badly worn inlet valve stems or guides.

Faulty engine valve seatings.

Sparking 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.

Pilot jet not operating correctly.

Rockers adjusted too closely.

Heavy petrol consumption may be due to :

Late ignition setting.

Bad air leaks. Probably at carburetter or manifold joints.

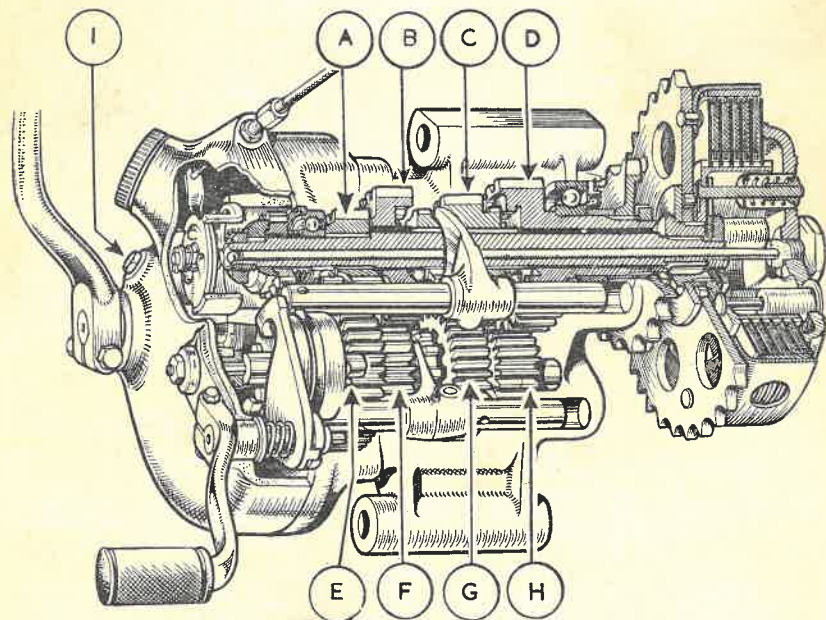
Weakened valve springs.

Leaky float. (Causing flooding).

Taper needle extension insufficient.

Poor compression, due to worn piston rings or defective valve seatings. (Test compression with throttle wide open).

GEAR BOX



A LOW GEAR ON MAINSHAFT.
B THIRD GEAR ON MAINSHAFT.
C SECOND GEAR ON MAINSHAFT
D MAIN DRIVING GEAR.
E LOW GEAR ON LAYSHAFT.

F THIRD GEAR ON LAYSHAFT.
G SECOND GEAR ON LAYSHAFT.
H SMALL PINION ON LAYSHAFT.
I OIL LEVEL PLUG.

Section through gearbox showing gears and clutch with actuating mechanism

Illustration 13

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 bolt that has an eye encircling the gear box top fixing bolt 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 13 clearly shows the general internal gearbox layout, the simple 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 fork 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 spring loaded conical ended plunger operating in depressions 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 toes causes a lower gear to become engaged.

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

The unusual method of clutch operation should be noted, the necessary thrust rod movement to free being obtained through the medium of three balls operating on inclined planes. (See illustration 14.)

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 E, 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 oil 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 detached from the slotted end of the internal clutch operating lever which is exposed by the removal of filler cap.

Unscrew the clutch cable adjuster until it is free from the K.S. case cover and withdraw the cable 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 unwinding and facilitates re-assembly.

The entire cover can now be removed.

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

Fill to correct level with one of the recommended oils and lastly refit the gear indicator disc and adjust its position to give correct indication of gears.

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

In the top position, screw measuring $3\frac{1}{8}$ inches under head.

In the bottom position, screw measuring $2\frac{7}{8}$ inches under head.

In the rear position, screw measuring $\frac{7}{8}$ inch under head.

In the front position, top screw measuring $1\frac{1}{8}$ inches under head.

In the front position, bottom screw measuring $1\frac{3}{8}$ inches 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 bush 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 actuating lever and the clutch thrust rod.

To Re-assemble

If gears have been disturbed insert them in their proper order with slider shafts in correct location and apply end plate 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 ascertaining, 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 lastly 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

Remove left side exhaust pipe and silencer (the pipe with its silencer is taken away as a unit).

Remove the left side footrest arm.

Place tray under chaincase to catch oil.

Remove screw binding chaincase metal band at its rear.

Remove metal band and endless rubber band.

Remove nut and washer, in centre of chaincase front.

Take away outer half of chaincase.

To remove front driving chain, shock absorber and clutch

Engage top gear, apply the rear brake and unscrew engine shock absorber retaining bolt.

Unscrew the five nuts retaining the five clutch springs.

Take away the clutch spring pressure plate with the clutch springs and clutch spring cups.

Remove front chain connecting link and take away chain.

Withdraw shock absorber assembly consisting of cap, spring, cam and sprocket.

Flatten the turned up edge of the lock plate under the clutch centre retaining nut.

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

Lift away the plain and lock washers under the retaining nut.

Remove the remainder of the clutch assembly by pulling it away, as one unit, from the gear box main shaft. Take care not to lose any of the twenty-four clutch sprocket bearing rollers which will be displaced during withdrawal. (The clutch centre is a sliding fit on the splined main shaft sleeve and an extractor should not be required).

To remove back half of chaincase

Flatten turned up ends of tab lock washers under the three bolts retaining the back half of the chaincase to the boss of the crankcase and remove the three bolts and the lock washers.

Remove the wide nut on the centre fixing bolt and also the washer under it.

Remove bolt, having long head, that retains the battery carrier stay to the lug on inner side of chaincase half.

Back half of front chaincase is now free to be lifted away.

TO RE-FIT THE FRONT CHAINCASE AND CLUTCH

Check truth of faces of both chaincase halves. (See note at end of these instructions.)

Fit back half of front chaincase by :

Place on face of crankcase boss and back of chaincase some liquid jointing compound, and leave till tacky. ("Wellseal" recommended.)

Ensure the spacer is in position on the centre bolt. This is located between the engine plate and the chaincase.

Place in position rear half of front chaincase.

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 nut (inside chaincase, $\frac{7}{8}$ " long) and washer to the centre fixing bolt and fully tighten.

Re-fit long headed bolt binding battery carrier stay to back of the chaincase rear half.

Fit engine shock absorber by :

Ensure the spacing collar, which fits between crankcase roller bearing and the back of the engine sprocket, is in position on the driving side flywheel axle.

Then place in position, on the flywheel axle, in the order specified, the engine sprocket, the shock absorber cam, the spring and cap washer and, finally, the shock absorber retaining bolt. Do not attempt to fully tighten the bolt.

Fit the clutch centre and sprocket by :

Place on the gear box main shaft splined sleeve the thicker 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 end of the gear box main shaft splined sleeve the clutch centre.

Fit the lock plate plain washer and nut that retain the clutch centre but do not attempt to fully tighten the nut.

Fit the front chain and lock centre nut by :

Replace the front driving chain. (Connecting link adjacent to engine sprocket on bottom run is most convenient position). Ensure the spring connecting link is fitted 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 main shaft.

Finally, turn up one edge of the lock plate so that it is firmly against one of the faces of the nut.

Fit the clutch plates and springs by :

Slide into position, in the clutch case attached to the clutch sprocket, one of the steel plain clutch plates.

Slide into position a clutch friction plate (plate with fabric inserts) and follow with a steel plain plate, then another friction plate and so on, alternatively, till all plates are fitted. (Six plain and five friction plates).

Drop into the spring pressure plate the five cups for the clutch springs.

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

Fully tighten the five clutch spring adjusting nuts using end of spanner part number 017254.

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

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

Check front 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.

Ensure the rubber and metal bands are clean and undamaged.

After carefully positioning the outer half so that its exterior edge exactly coincides with that of the inner half, apply the endless rubber band.

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

Whilst slowly tightening the binding screw apply at the same time light taps all round the band exterior using a small rubber mallet.

These light taps will cause the metal band to creep on the rubber to ensure an even all-round pressure, and make an astounding difference in the extent to which the binding screw can be tightened down.

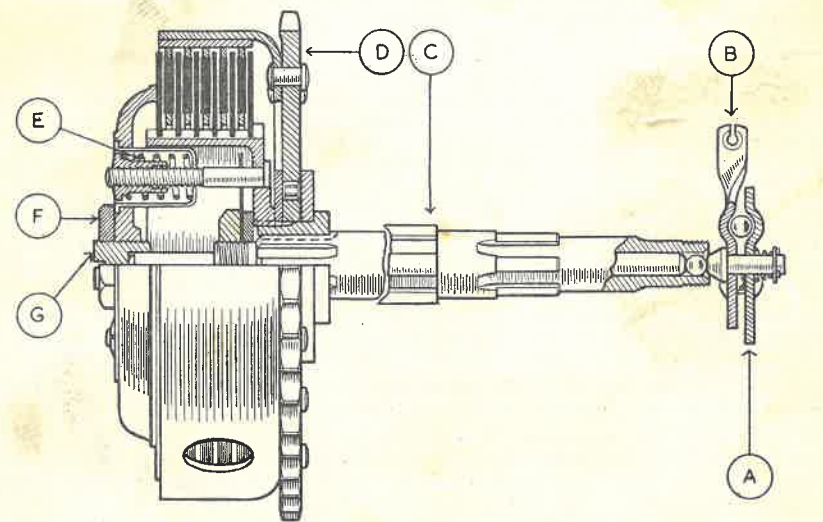
Remove the inspection cap from the chaincase and pour in engine oil to the level of the bottom edge of the inspection cap orifice and then replace the cap.

Replace the left side footrest arm.

Replace and fully tighten the nut on the left side of the footrest rod.

Replace the exhaust pipe and silencer unit.

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 the rubber band. These faces must be undamaged and, on test, should closely fit to a surface 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.**



- | | | | |
|---|----------------------------------------|---|-------------------------------------------------------|
| 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 (in clutch pressure plate) FOR CLUTCH ROD. |
| D | CLUTCH SPROCKET. | | |

Showing clutch, gear box main shaft and clutch operating mechanism

Illustration 14

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 the domed clutch cover (secured by eight screws).

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 the domed clutch cover, test for slip by starting the engine, engaging top gear, and applying the rear brake when it should be possible to pull the engine on full throttle without 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 their tension, 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 this may be rectified by soaking the plates in petrol and allowing to dry off. If inserts are glazed roughen with sand paper.

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 pressed 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 handlebar lever. The correct free movement is $\frac{1}{8}$ to $\frac{3}{16}$ inch. It should be explained that the free movement is readily felt on the handlebar lever by reason of the greatly increased effort required as the clutch commences to disengage.

As the result of wear 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 ruin the inserts 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 domed clutch cover (secured by eight 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 box key provided in the tool kit.

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, as stated is $\frac{1}{8}$ to $\frac{3}{16}$ inch measured at the end of the operating lever.

A careful study of illustrations 13 and 14 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 top of the kick-starter case cover.

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 orifice, 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 $\frac{3}{8}$ inch.) Check the adjustment in more than one position and adjust, as above, at tightest place. **It is important that these instructions to over-tighten and then slack back are carefully followed.**

Tighten nut on gear box top fixing bolt.

Replace chaincase inspection cap.

REAR CHAIN ADJUSTMENT

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 slotted ends. The projection on the right-hand fork end is adjusted at the Factory and its position is locked by a nut. That 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 chainside 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 $1\frac{1}{8}$ " . 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 $1\frac{1}{8}$ " 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

Place the machine on the centre stand.

Slacken nut to right of speedometer gear box.

Slacken exterior nut on both ends 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 chainside 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 $1\frac{1}{8}$ " , detailed above, is obtained. Then holding the wheel in that position, fully re-tighten the spindle exterior nuts.

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.

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.

ENGINE SHOCK ABSORBER

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

The engine sprocket is a free fit on the driving side 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, over-rides 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." This bolt also houses the crankcase breather valve.

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

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 engine sprocket.
- 3 The shock absorber cam.
- 4 The shock absorber spring.
- 5 The cap washer.
- 6 The retaining bolt incorporating crankcase breather.

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 two fork crown pinch screws.

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 018178) 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. Tested in this manner the slightest slackness is discernable.

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

Securely tighten the two fork crown pinch screws (this is very important).

Remove packing from under footrest.

To check oil content
in the leg

FRONT FORKS (TELEDRAULIC)

Owing to the unusual construction of the "TELEDRAULIC" fork it is desirable to understand what happens in use and, in order to clearly follow the descriptions and subsequent assembly and adjustment instructions, reference to Illustrations 15 and 16 will be necessary.

As will be seen from the general arrangement drawing, Illustration 16, 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 clip lug by the top bolts 016718 and are clamped to the fork crown by the clamping screws. Upon the external of these tubes are mounted the springs and sliding members, to which latter 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.

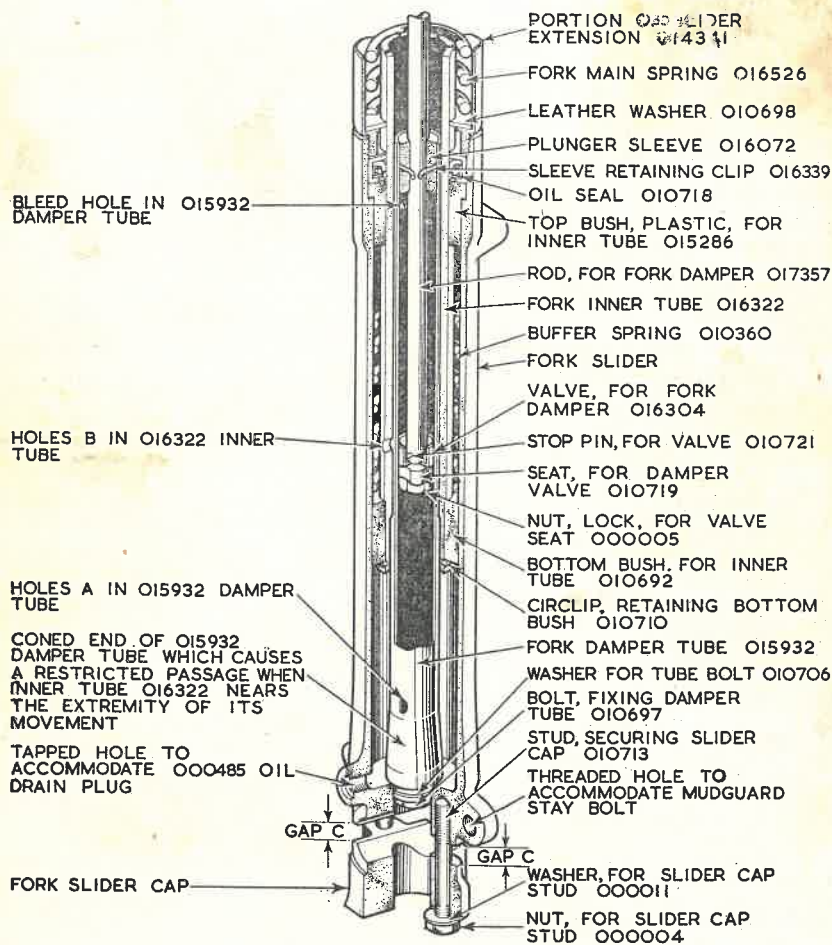


Illustration 15

Introduced in early 1941 for use under strenuous war conditions by all the 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 attached 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 oil seal 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 bearing 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 close fitting steel bushes. This oil is forced upward through the open ends of the main inner tubes and also through the holes A (Illustration 15) in the bottom of the damper tubes, then past the damper disc valve which the passing oil raises 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 imposes 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 intentional, restricted passage causes a considerable damper effect to the recoil action. It will thus be gathered that on the shock 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 intentionally increased by the automatically greatly restricted passage for the displaced oil, brought about by the lower ends of the main tubes encircling the tapered enlarged ends of the damper 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 6½ ozs. (184.6 c.c.) each leg of one of the S.A.E. 20 oils 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 **TELEDRAULIC** 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 6½ fluid ounces (184.6 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 slider 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 eject 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. (170.4 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. (170.4 c.c.) after which the top plug may be replaced.

NOTE—Although the normal oil content of each side is specified as 6½ fluid ozs., it is not possible to drain all the oil via the drain plug. This explains the lesser quantity of 6 fluid ozs. (170.4 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 6½ fluid ozs. (184.6 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 the front wheel as described in Wheel Section.

Remove the front stand and front mudguard.

Slacken the screw on head lamp top, gently prise out the rim and reflector assembly, detach with a slight rotary and lifting movement the cap to which head lamp wires are attached and take away rim and reflector assembly.

Gently ease back the rubber sleeves covering the pilot lamp wire snap connectors and pull latter apart.

Remove the three screws securing switch panel and lift same off with all wires attached.

Remove the nuts on the tubular bolts through which the pilot lamp wires pass, which enables the pilot lamps and head lamp shell to be taken away.

Disconnect the driving cable from the speedometer head and detach the speedometer lamp bulb with its holder.

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

Remove the handlebar half clip 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 18 inches long underneath each damper rod lock nut, to enable the damper rods to be raised for reassembly.

Remove domed lock nut at top of steering column.

Remove lock 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 loss of any of the 56 steering head steel balls.)

To re-fit a complete front fork assembly

Secure, with grease, 28 balls in fork crown ball race.

Secure, with grease, 28 balls in main frame top ball race.

Proceed to fit fork assembly by reversing the instructions given above to dismantle, carefully retightening the damper rod locknuts 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 unscrew the tubular slider extension from the slider which it is intended to remove. Special articulated clamp tool required. (Available in workshop tools.)

Next remove the front wheel, front stand and mudguard as detailed above. Then with a thin tubular box key, 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 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. This damper tube and protruding rod can be removed intact with the slider. Now loosen the fork crown clamping screw 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 screw, 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 screwed 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.

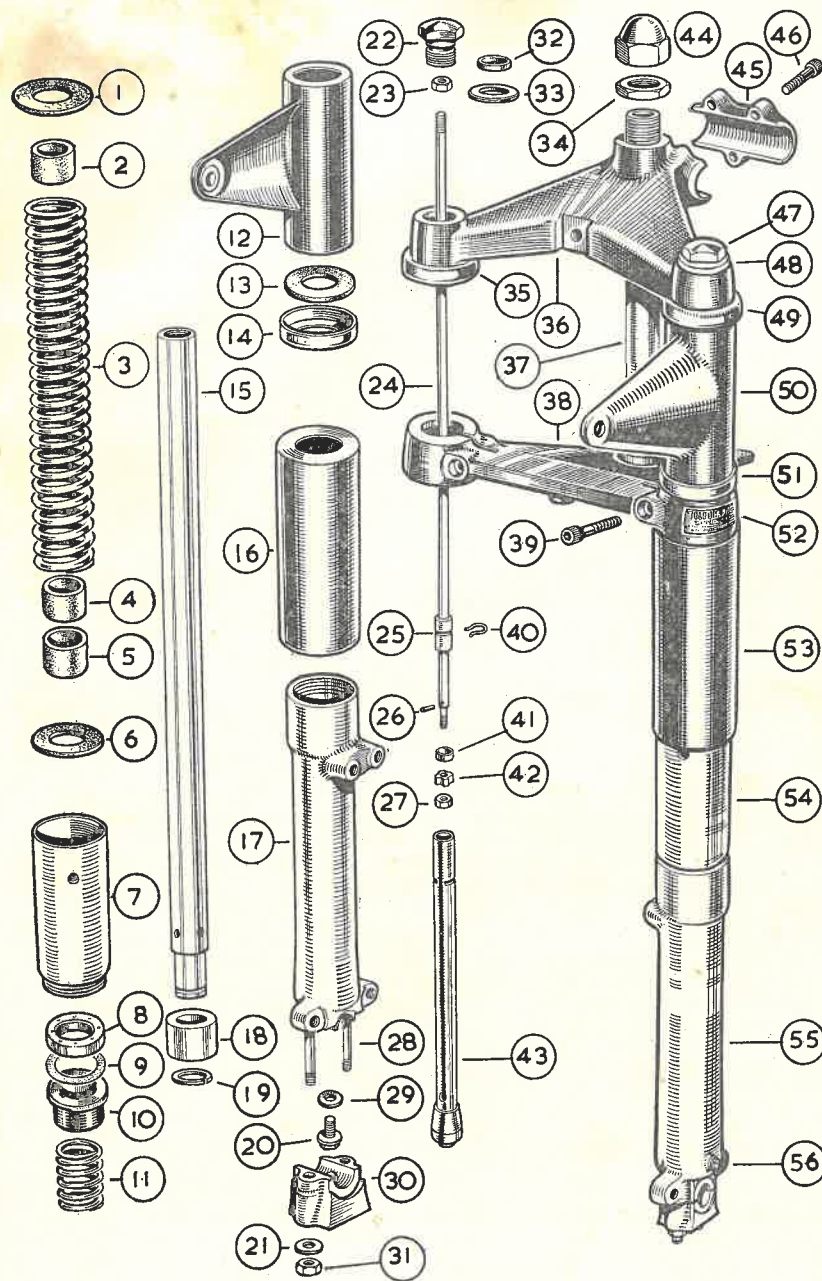


Illustration 16

REF. NO.	DESCRIPTION
1	WASHER, LEATHER, FOR FORK SPRING TOP SEATING.
2	BUFFER, RUBBER, FOR FORK INNER TUBE (ONE OF THREE).
3	SPRING, MAIN, FOR FRONT FORK.
4	BUFFER, RUBBER, FOR FORK INNER TUBE (ONE OF THREE).
5	BUFFER, RUBBER, FOR FORK INNER TUBE (ONE OF THREE).
6	WASHER, LEATHER, FOR FORK SPRING BOTTOM SEATING.
7	EXTENSION, FOR FORK SLIDER.
8	OIL SEAL, RUBBER, FOR FORK INNER TUBE (AN ALTERNATIVE OIL SEAL IS MADE OF LEATHER).
9	WASHER, PAPER, FOR USE ONLY WITH LEATHER OIL SEAL.
10	BUSH, TOP, PLASTIC, FOR FORK INNER TUBE.
11	SPRING, BUFFER, FOR FRONT FORK.
12	TUBE, FORK COVER, TOP, RIGHT, WITH LAMP LUG.
13	WASHER, RUBBER, FOR TOP COVER TUBE BOTTOM CAP.
14	CAP, FOR FORK TOP COVER TUBE, BOTTOM LOCATION.
15	TUBE, FORK, INNER.
16	TUBE, FORK COVER, BOTTOM.
17	SLIDER, FOR FORK, WITH STUDS.
18	BUSH, BOTTOM, STEEL, FOR FORK INNER TUBE.
19	CIRCLIP, LOCATING FORK INNER TUBE BOTTOM BUSH.
20	BOLT, FIXING DAMPER TUBE TO SLIDER.
21	WASHER, PLAIN, FOR FORK SLIDER CAP SECURING STUD.
22	BOLT, TOP, FOR FORK INNER TUBE.
23	NUT, LOCK, FOR TOP END OF DAMPER ROD.
24	ROD, FOR FORK DAMPER.
25	SLEEVE, PLUNGER, ON FORK DAMPER ROD.
26	PIN, STOP, FOR FORK DAMPER VALVE.
27	NUT, LOCK, FOR DAMPER VALVE SEAT.
28	STUD, SECURING CAP TO FORK SLIDER.
29	WASHER, FIBRE, FOR DAMPER TUBE BOLT.
30	CAP, FOR FORK SLIDER.
31	NUT, FOR FORK SLIDER CAP SECURING STUD.
32	RING, RUBBER, SEALING, FOR INNER TUBE TOP BOLT.
33	WASHER, PLAIN, FOR INNER TUBE TOP BOLT.
34	NUT, ADJUSTING, FOR FORK STEM.
35	CAP, FOR FORK TOP COVER TUBE, TOP LOCATION.
36	LUG, FOR HANDLEBAR AND STEERING HEAD.
37	STEM, FOR FORK CROWN (NOT SOLD SEPARATELY).
38	FORK CROWN (SOLD ONLY AS AN ASSEMBLY OF CROWN, STEM AND STEM CIRCLIP).
39	SCREW, PINCH, FOR FORK CROWN.
40	CLIP, RETAINING DAMPER ROD SLEEVE.
41	VALVE, FOR FORK DAMPER.
42	SEAT, FOR FORK DAMPER VALVE.
43	TUBE, FOR FORK DAMPER.
44	NUT, LOCK, (DOMED) FOR FORK STEM.
45	CLIP (HALF ONLY), FOR HANDLEBAR LUG.
46	SCREW, PINCH, FOR HANDLEBAR LUG CLIP.
47	BOLT, TOP, FOR FORK INNER TUBE.
48	WASHER, PLAIN, FOR INNER TUBE TOP BOLT.
49	CAP, FOR FORK TOP COVER TUBE, TOP LOCATION.
50	TUBE, FORK COVER, TOP, LEFT, WITH LAMP LUG.
51	CAP, FOR FORK TOP COVER TUBE, BOTTOM LOCATION.
52	FORK CROWN.
53	TUBE, FORK COVER, BOTTOM.
54	EXTENSION, FOR FORK SLIDER.
55	SLIDER, FOR FORK, WITH CAP, STUDS AND NUTS.
56	SCREW, PLUG, WITH FIBRE WASHER, FOR FORK SLIDER OIL DRAIN HOLE.

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 $1\frac{1}{2}$ 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.

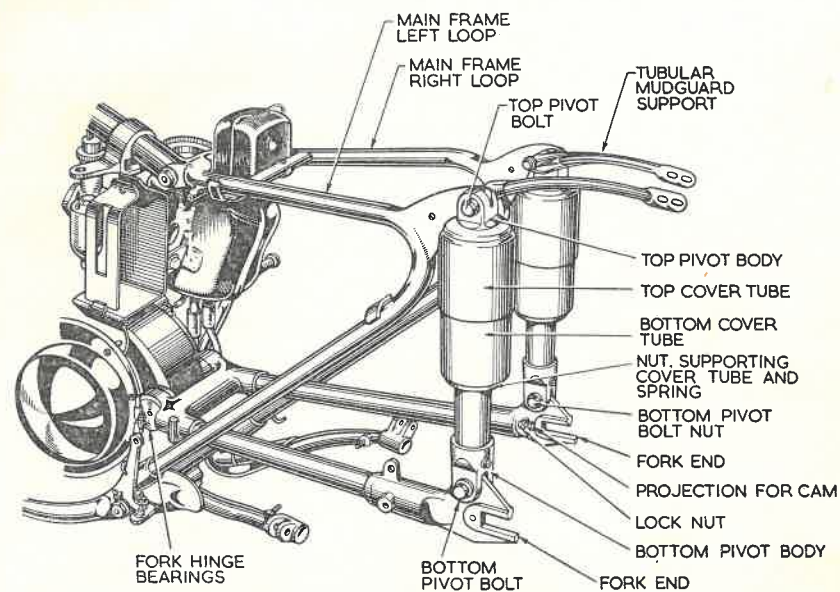


Illustration 17

Showing rear sprung 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 abnormal loads, the next heavier S.A.E. grade may be used, but unlike the front fork, recoil 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 $3\frac{1}{8}$ fluid ozs. Unless serious doubt exists as to 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 :

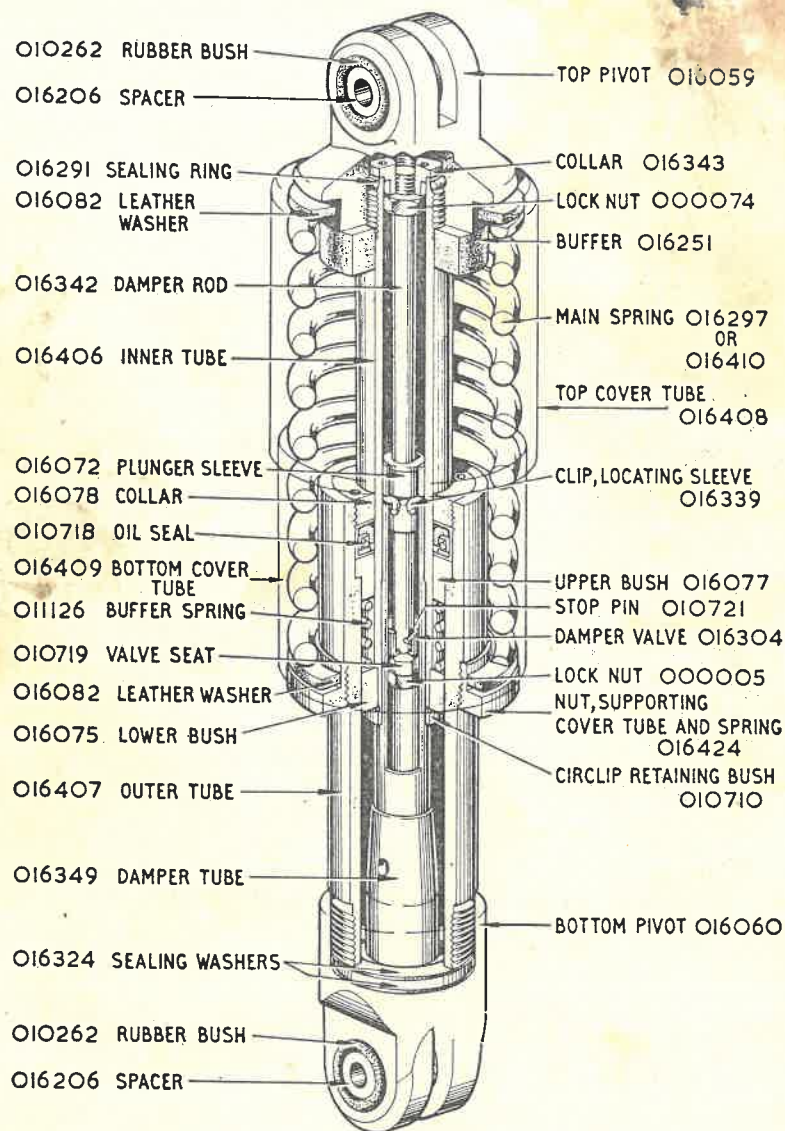


Illustration 18

Showing "Ghost" view of "TELEDRAULIC" leg

TELEDRAULIC " leg and top-up :
the heart of the TELEDRAULIC SYSTEM (FOR MECHANICS' SERVICE ONLY)

Dealing with the top-up at a time, remove top securing bolt, taking care to observe the location of the top-up. Remove top 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 underneath 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. (2 5/8 ozs.) should have been drained out into the graduated measure, leaving 10 c.c. (1/2 oz.) which cannot be withdrawn.

All that now remains is to pour carefully back into the leg exactly 75 c.c. (2 5/8 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. Smear the hinge bolt with engine oil before replacing it.

CENTRE STAND

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 off 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 passing the vertical position. No stops 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 centre stand.

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 (note split pin to secure upper stud nut).

Remove oil tank and battery carrier by :

Drain oil tank.

Disconnect wire from the battery where it is attached to the seat lug bolt by a screw.

Disconnect wire from the battery at the point, close to the battery, where there is a double screwed connector. (Pull back the rubber sleeve to reveal the two main components of the connector. Hold one component in a wrench, or pliers, while the second component is unscrewed from it.)

Remove battery from carrier.

Disconnect oil feed pipe from bottom of oil tank.

Disconnect oil return pipe from bottom of oil tank.

Disconnect vent pipe from back of oil tank.

Remove bolt retaining rear stay from oil tank to rear mudguard.

Remove screw, in base of carrier, retaining carrier to stay that chaincase.

Remove the two nuts and washers retaining the oil tank and battery carrier to the two studs (note split pin securing upper nut).

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 fixed 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

Remove the rear wheel. (See Wheel Section).

Remove the bolt retaining the front end of the chain guard to the rear fork.

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).

ALWAYS QUOTE THE COMPLETE ENGINE NUMBER

(Including all the Letters in it).

THIS ENABLES THE MACHINE TO BE IDENTIFIED

EACH SERIES OF FRAMES IS NUMBERED FROM ZERO UPWARDS. THEREFORE THE QUOTATION OF A FRAME NUMBER ONLY DOES NOT FACILITATE IDENTIFICATION.

WHEELS AND BRAKES

TO REMOVE FRONT WHEEL

Place machine on both stands.

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 caps 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 re-fitted in same order and position as originally. Therefore, lay them aside so that the order and position of assembly will be correctly made.

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

TO RE-FIT FRONT WHEEL

Holding the left side cap on the wheel spindle, offer wheel up so as to engage the cap with its securing studs. Then apply fixing nuts and washers but only loosely tighten.

NOTE—To pass the wheel spindle into position it may be necessary to apply pressure to flatten the tyre so as to enable the spindle to pass the forward fixing studs.

Next fit the right side cap and again only loosely tighten the securing nuts. Now attach the brake anchor arm and refit the yoke end pin.

Next fully tighten the nuts securing the left side cap, taking care to keep the gap fore and aft approximately equal. Then tighten the left side spindle nut and lastly the nuts securing the right side cap.

Should any fork stiffness be apparent after refixing the front wheel, loosen the nuts securing the right side cap and after working the fork up and down violently, retighten. This action will ensure that the wheel clamp occupies its natural position on the spindle end on which it is intentionally not positioned.

TO REMOVE REAR WHEEL

Place the machine on the centre stand. Loosen the bolt in rearmost position on each tubular member to which the detachable rear portion of the mudguard is fixed. Also slacken the two bolts securing the two portions of mudguard together. The rear portion can then be removed.

Disconnect the snap connector in the wire of the rear lamp (2 if stop light fitted).

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. Engage a gear to prevent sprocket revolving.

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

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

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

Using adjustable wrench 017249, 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 forward against the cam stop and pull backwards the right-hand side of the wheel so that the brake cover plate disengages with the square headed anchor bolt. Then, pull wheel away from the fork ends.

TO RE-FIT REAR WHEEL

Reverse the above procedure, see that the speedometer drive dogs are engaged, the tightening of the nut that locates the speedometer gear box for the rear wheel, i.e., after the speedometer cable has been re-connected and the exterior axle nuts have been tightened.

It will be found easier to re-fit 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 in 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 engagement has been completed.

After re-fitting 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. Also check that brake cover plate anchorage is correct (see illustration 19).

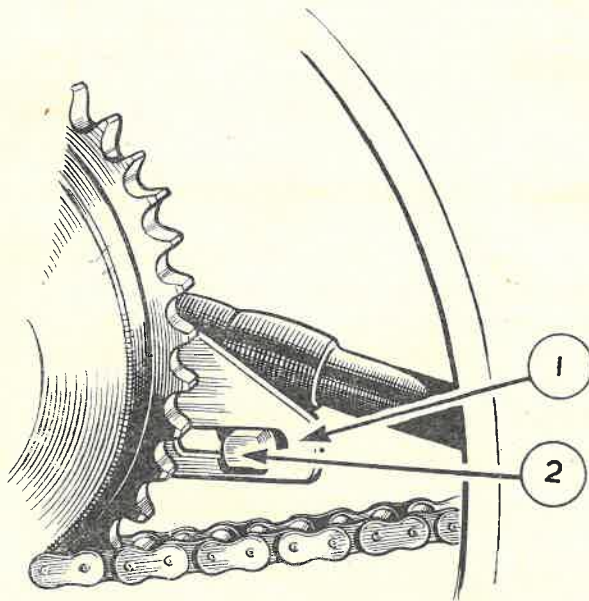


Illustration 19

REAR BRAKE COVER PLATE.

2 BOLT, ANCHORING COVER PLATE TO REAR FRAME.

WHEEL BEARINGS AND ADJUSTMENT

The bearings are of taper roller type. The inner bearings for the rollers are inserted on the wheel spindle in the case of the front wheel, and are separate tracks that will fit on the centre spindle in the case of the rear wheel. (Reference to illustration 20 will make that 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 circlip in a 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.

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 21.

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, together with cover disc.

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 cup 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 trifle 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).

Position disc to permit access to grease nipple.

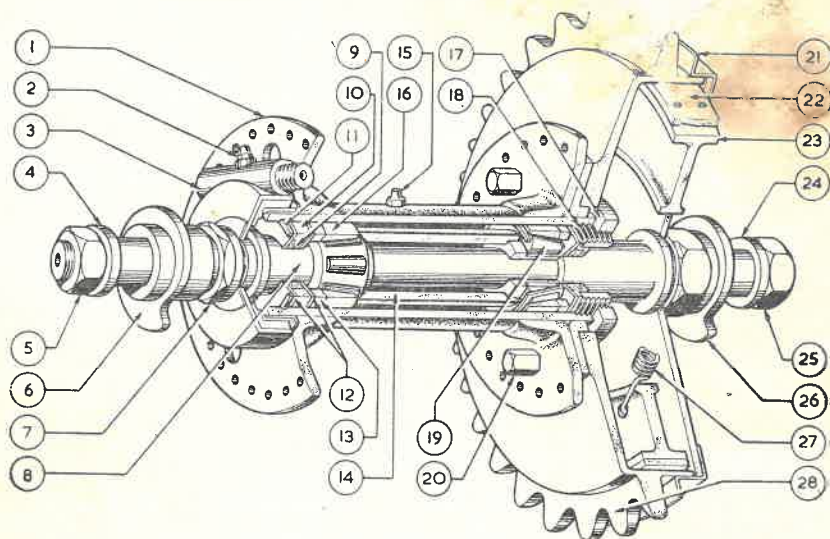


Illustration 20

Showing rear hub, rear chain sprocket, brake and speedometer gear box

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| <ul style="list-style-type: none"> 1 RIGHT-HAND SIDE HUB FLANGE. 2 GREASE NIPPLE ON SPEEDOMETER GEAR BOX. 3 SPEEDOMETER GEAR BOX. 4 SPIGOT BUSH, FITS IN RIGHTHAND FORK END. 5 NUT, ON CENTRE SOLID SPINDLE. 6 RIGHT-HAND SIDE CAM. 7 NUT, LOCKING SPEEDOMETER GEAR BOX IN POSITION. 8 SPACER, BETWEEN SPEEDOMETER GEAR BOX AND RIGHT-HAND SIDE TAPER ROLLER BEARING. 9 OIL SEAL. 10 COLLAR, ENCIRCLING RIGHT-HAND OIL SEAL. 11 CIRCLIP, LOCATING RIGHT-HAND SIDE TAPER ROLLER BEARING. 12 WASHER, RETAINING OIL SEAL (ONE EACH SIDE OF SEAL). 13 SPACER, BETWEEN OIL SEAL INNER WASHER AND TAPER BEARING. | <ul style="list-style-type: none"> 14 SPACER, BETWEEN THE TWO TAPER ROLLER BEARINGS. 15 GREASE NIPPLE, IN HUB SHELL. 16 OUTER RACE OF RIGHT SIDE TAPER ROLLER BEARING. 17 NUT, LOCKING BEARING ADJUSTING RING. 18 RING, FOR ADJUSTING BEARING. 19 ROLLER (PART OF LEFT SIDE TAPER ROLLER BEARING). 20 BOLT, SECURING BRAKE DRUM AND SPROCKET TO HUB. 21 REAR BRAKE COVER PLATE 22 BRAKE LINING. 23 BRAKE SHOE. 24 SPIGOT BUSH, FITS IN LEFT-HAND FORK END. 25 NUT, ON CENTRE SOLID SPINDLE. 26 LEFT-HAND SIDE CAM. 27 SPRING, FOR BRAKE SHOE. 28 BRAKE DRUM AND SPROCKET. |
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TO DISMANTLE REAR WHEEL BEARING

These instructions need reference to the lower part of illustration 22.

Remove wheel from machine.

Remove brake cover plate, with brake shoes, centre solid spindle with cams, spacers, bushes, nuts and speedometer gear box.

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

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

Turn to the right-hand end of the hub and carefully apply steady pressure on the visible steel washer (avoiding fouling 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 (20) are ejected. These may be lifted away as they emerge.

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

Turn to the right hand end of the hub, carefully apply steady pressure to the visible washer (avoiding fouling 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.

Extract circlip (12).

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.

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).

The dismantling is then completed.

To re-fit, reverse the above procedure, remembering that, after cup (18), spacer (17), washer (16), oil seal (14), spacer (15) and washer (13) have been inserted in the plain end of the hub, to re-fit the circlip (12) and then carefully to apply steady pressure on the inner edge of the cup (18) to force the above entire 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 018171). Between the inside nut and the brake cover plate is a locating washer (part number 017222).

The inside nut must be positioned so that, when the locating washer is placed next to it, and the cover plate applied, the outer face of the latter lies flush with the hub shell edge.

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

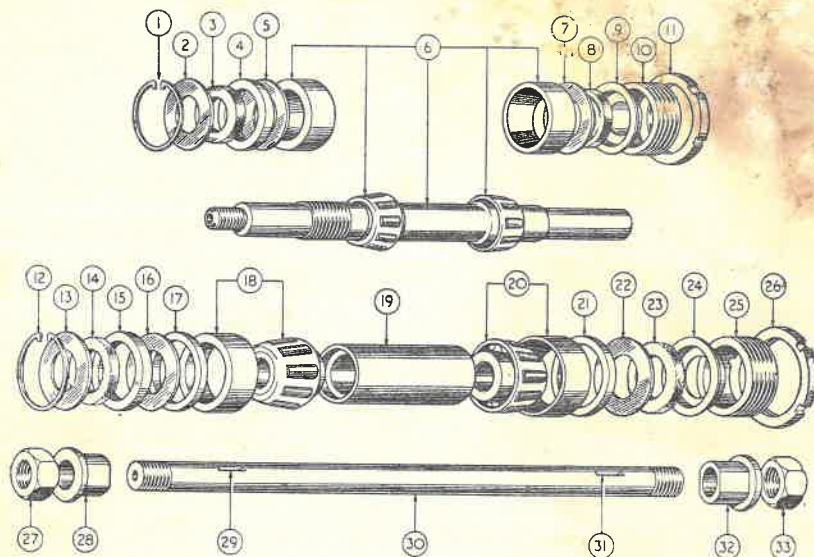


Illustration 21

Showing exploded view of hub bearing components in the order of assembly. Upper part is that of front bearings. Lower part is that of rear bearings.

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| <ol style="list-style-type: none"> 1 CIRCLIP. 2 WASHER, METAL, OUTSIDE OIL SEAL. 3 OIL SEAL. 4 SPACING COLLAR, ENCIRCLING OIL SEAL. 5 WASHER, METAL, BETWEEN OIL SEAL AND TAPER BEARING. 6 OUTER RACES (2 OFF). CENTRE SPINDLE. ROLLERS IN CAGES (2 SETS). THESE ARE NOT SUPPLIED SEPARATELY. ALSO, ROLLERS ARE NOT SUPPLIED SEPARATELY. 7 WASHER, METAL, BETWEEN OIL SEAL AND TAPER BEARING. 8 OIL SEAL. 9 CUP, HOUSING, FOR OIL SEAL. 10 ADJUSTING RING. 11 LOCK NUT, FOR ADJUSTING RING. 12 CIRCLIP. 13 WASHER, METAL, OUTSIDE OIL SEAL. 14 OIL SEAL. 15 SPACING COLLAR, ENCIRCLING OIL SEAL. 16 WASHER, METAL, BETWEEN OIL SEAL AND SPACER. 17 SPACER, BETWEEN OIL SEAL WASHER AND TAPER BEARING. 18 TAPER BEARING (OUTER CUP, CAGE FOR ROLLERS AND ROLLERS. THESE ARE NOT SUPPLIED SEPARATELY. ALSO ROLLERS ARE NOT SUPPLIED SEPARATELY.) | <ol style="list-style-type: none"> 19 SPACER, BETWEEN BEARINGS. 20 TAPER BEARING (OUTER CUP, CAGE FOR ROLLERS AND ROLLERS). THESE ARE NOT SUPPLIED SEPARATELY. ALSO ROLLERS ARE NOT SUPPLIED SEPARATELY. 21 SPACER, BETWEEN OIL SEAL WASHER AND TAPER BEARING. 22 WASHER, METAL, BETWEEN OIL SEAL AND SPACER. 23 OIL SEAL. 24 CUP, HOUSING, FOR OIL SEAL. 25 ADJUSTING RING. 26 LOCK NUT, FOR ADJUSTING RING. 27 NUT, EXTERNAL, FOR REAR WHEEL SPINDLE. 28 BUSH, FOR REAR WHEEL SPINDLE (FITS IN FORK END). 29 KEYWAY, TO ACCOMMODATE KEY LOCKING CAM TO REAR WHEEL SPINDLE. 30 REAR WHEEL SOLID CENTRE SPINDLE. 31 KEYWAY, TO ACCOMMODATE KEY LOCKING CAM TO REAR WHEEL SPINDLE. 32 BUSH, FOR REAR WHEEL SPINDLE (FITS IN FORK END). 33 NUT, EXTERNAL, FOR REAR WHEEL SPINDLE. |
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BRAKE DRUMS

The front wheel brake drum is shrunk in fit in the hub shell (assembled under heat) and retained additionally by five 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 drum 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. Eight of these washers (000174) 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.

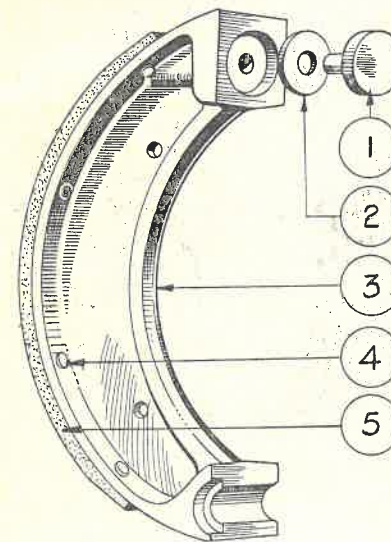


Illustration 22

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.

- (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 by:

Ensure the nut securing the cover plate to the wheel spindle and also the fulcrum stud nut (front only) are slightly slacked off.

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 and also the nut on fulcrum stud.

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.

Slacken 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.

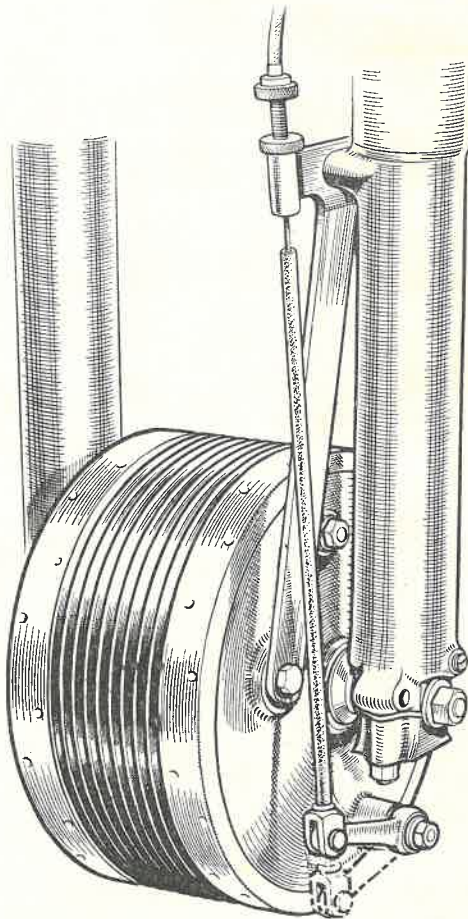


Illustration 23

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.

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 accommodating slots cut in the clip which connects the brake rod and brake expander lever and being retained in that position by the spring which encircles the rear end of the brake rod).

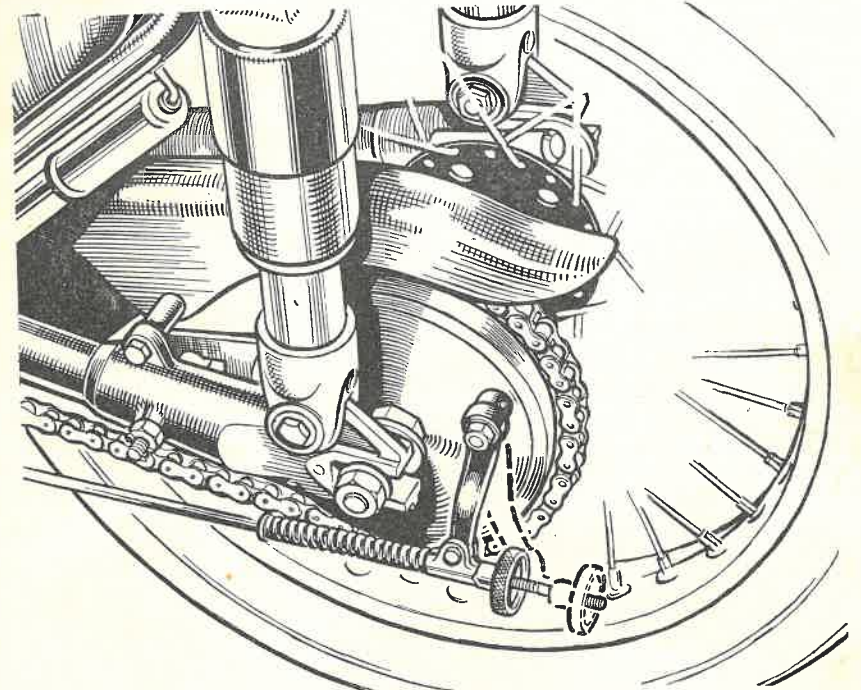


Illustration 24

Showing brake rod adjustment exhausted, indicating the need for brake thrust pin adjustment.

BRAKE PEDAL ADJUSTMENT

The position of the rear pedal brake can be adjusted within narrow limits. This is done by means of a bolt 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 under-side of the footrest rubber pad.

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

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 pressures 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 uprisng edges of worn rails will damage the tyres.

Remove flints, 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 adjustment, after 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 levers 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 stem** 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, commencing diametrically opposite, and using the hands 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, only screwing it on the valve stem about half an inch.

Tuck 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 spots 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 16 lb. per square inch
do. 240 lb.	do. 18 lb. do.
do. 280 lb.	do. 20 lb. do.
do. 350 lb.	do. 24 lb. do.
do. 400 lb.	do. 28 lb. do.
do. 440 lb.	do. 32 lb. do.

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 pressures should be 18 lb. for the front tyre and 22 lb. for the rear.

SPARES LIST EDITION CL-32 PRICE 2/6
IS THE APPROPRIATE LIST FOR THIS SERVICE MANUAL

USEFUL INFORMATIC

In the following five paragraphs are particulars of 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 :

- Water on high-tension pick-ups.
- Moisture on sparking plugs.
- Oiled up, or fouled, sparking plugs.
- Throttle opening too large.
- Pilot jet choked.
- Air lever in open position or bad air leak at carburetter joints.
- Lack of fuel because of insufficient flooding.
- Lack of fuel because of pipe, or tap, obstruction.
- Excessive flooding of carburetter (with hot engine only).
- Stuck up engine valve.
- Weak, or broken, valve spring.
- Valve not seating properly.
- Contact points dirty.
- Incorrect contact point gap.

Engine misses fire may be due to :

- Defective, or oiled, sparking plugs.
- Incorrect contact point gap.
- Contact breaker rocker arm sticking.
- 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 plugs.
- Lack of oil in tank.
- No rocker clearance, or too much clearance.
- Weak, or broken, valve spring.
- Sticky valve stem.
- Valve not seating properly.
- Brakes adjusted too closely.
- Badly fitting, or broken, piston rings.
- Punctured carburetter float.
- Engine carbonised.
- Choked silencer.
- Bad air leak between carburetter and manifold.

overheats may be due to :

- Proper lubrication. (Quality or quantity of oil).
- Faulty sparking plugs.
- Air control to carburetter out of order.
- Punctured carburetter float.
- Engine carbonised.
- Weak valve springs.
- Pitted valve seats.
- Worn piston rings.
- Ignition setting incorrect.
- Choked silencer.

Engine stops suddenly may be due to :

- Stuck up valve.
- No petrol in tank, or choked petrol supply.
- Choked main jet.
- Oiled up, or fouled, sparking plugs.
- Water on high-tension pick-up, or sparking plugs.
- Water in float chamber.
- Vent hole in petrol tank filler cap choked.

EXCESSIVE OIL CONSUMPTION

Excessive oil consumption may be due to :

- Clogged, or partly clogged, oil filter.
- Stoppage, or partial stoppage, in the pipe returning oil from the engine to the oil tank.
- Badly worn, or stuck up, piston rings. (Causing high pressure in the crankcase.)
- Air leak in dry sump oiling system.
- Worn inlet valve stems.
- Improper non-return valve action.

EXCESSIVE PETROL CONSUMPTION

Excessive petrol consumption may be due to :

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

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 (causes handlebar oscillation at low road speed.)
- Damaged front fork main tubes resulting from impact.

ABNORMAL TYRE WEAR

Abnormal tyre wear may be due to :

- Incorrect tyre pressure.
- Wheels not in alignment.
- Harsh driving methods. (Misuse of 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, carburetter, magneto and other such parts. As a poorer 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.

The safest precaution during Winter is to wipe over all chromium plated parts with a soft rag soaked in "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 those 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 polishing cloth of the "Selvyt" 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 retailed in $\frac{1}{2}$ pint and 1 pint tins. It can be obtained from our Spare Parts Department, as follows:

$\frac{1}{2}$ pint tin "Tekall," Part number 011957, price 2/—, plus 6d. postage.

1 pint tin "Tekall," Part number 011958, price 3/—, plus 6d. postage.

GENUINE SPARES

PURCHASED FROM AN AUTHORISED DEALER OR FROM THE FACTORY, ARE IDENTICAL WITH THE PARTS ORIGINALLY BUILT INTO YOUR MOTOR CYCLE

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

ELECTRICAL SERVICE

ELECTRICAL EQUIPMENT

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

- (1) **IGNITION**—Magneto, High-tension wires, Sparking plugs and Cut-out switch.
- (2) **CHARGING**—Dynamo Automatic Voltage Control Unit and Battery.
- (3) **LIGHTING AND ACCESSORIES**—Lamps, Horn, Switches and wiring.

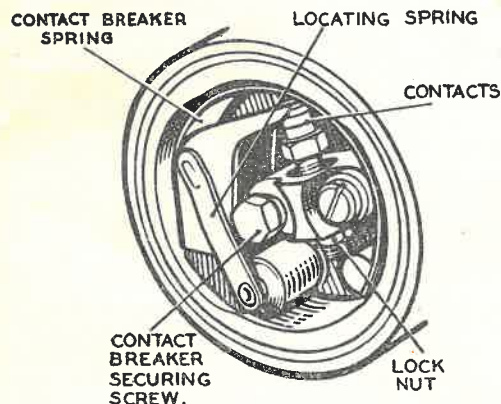


Illustration 25

Showing Contact Breaker

IGNITION

A LUCAS type K2F magneto is fitted. The replacement part number is 42230-A and the part number of the complete contact breaker is 470534.

Lubrication and adjustment is required every 3,000 miles, cleaning is required every 5,000 miles and every 10,000 miles the complete unit should be handed to a Lucas Service Station for dismantling, replacement of worn parts, cleaning and lubrication.

Lubrication every 3,000 miles

(a) The cam is supplied with lubricant from a felt pad contained in a pocket in the contact breaker housing. A small hole in the cam fitted with a wick, enables the oil to find its way on to the surface of the cam. Remove the contact breaker cover and turn over the engine until the hole in the cam can be clearly seen and then carefully add a few drops of thin machine oil. (The hole is located in the lowermost part of the cam ring). Do not allow any oil to get on the contact points.

(b) The contact breaker rocker arm also requires lubrication and the complete contact breaker must be removed for this purpose. Take out the hexagon headed screw from the centre of the contact breaker and pull the contact breaker off the tapered shaft on which it fits. Then push aside the rocker arm retaining spring, prise the rocker arm off its bearing and lightly smear the bearing with clean engine oil. When replacing the contact breaker, take care to ensure that the projecting key, on the tapered portion of the contact breaker base, engages with the keyway cut in the magneto spindle, otherwise the timing of the magneto will be upset. Tighten the hexagon-headed screw with care; it must not be too slack, nor must undue force be used.

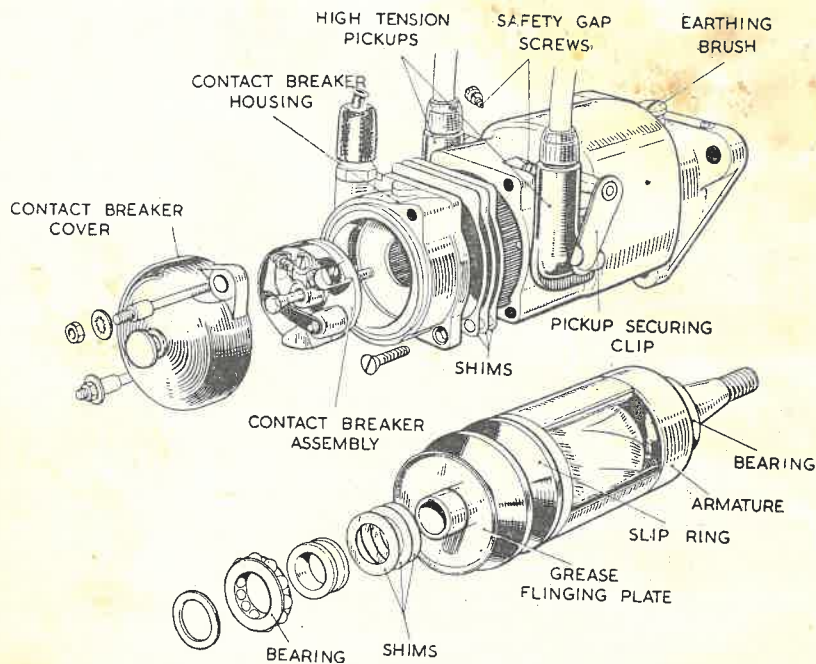


Illustration 26

Showing dismantled components of magneto

Adjustment every 3,000 miles

Remove the contact breaker cover and turn the engine until the contact points are fully opened. Check the gap with a gauge having a thickness of .012" (Spanner 015023 has a gauge of this thickness as an integral part of it). If the setting is correct the gauge should be a sliding fit, but if the gap varies appreciably from the gauge it should be adjusted.

Keep the engine in the position to give maximum opening of the contact points, slacken the lock nut on the fixed contact point and turn the contact screw, by its hexagon head (use spanner 015023) until the gap is set to the gauge. Finally, tighten the lock nut and re-check the setting.

Cleaning every 5,000 to 6,000 miles

Take off the contact breaker cover and remove the contact breaker. If the contact points are burned or blackened, clean them with a fine carborundum stone or with very fine emery cloth, and afterwards wipe away any dust or dirt with a petrol moistened cloth. After replacing the contact breaker check the point gap and, if necessary, re-set it.

Remove the high tension pick-ups (held by swinging spring clips), wipe clean and polish with a fine dry cloth. The high tension pick-up brush must move freely in its holder.

If it is dirty, clean with a cloth moistened with petrol. If the brush is worn to within $\frac{1}{8}$ " of the shoulder it must be renewed. Treat both pick-ups and their brushes.

While the pick-ups are removed, clean the slip ring track and flanges by holding a soft cloth on the ring by means of a suitably shaped piece of wood, while the engine is slowly turned.

If, on inspection, the high tension cable shows signs of perishing or cracking, it must be replaced by a suitable length of 7 mm. rubber covered ignition wire.

SPARKING PLUG

The K.L.G. Type FE80 "Corundite" Plug is fitted to all models.

It has a thread of 14 mm. and the reach is $\frac{3}{4}$ ". The point gap is .015". Check the point gaps every time the engine is decarbonised and, if necessary, re-set the points.

See the plug is fitted with its external seating washer.

Coat the thread with "Oil Dag" or Graphite paste. (See page 32.)

Firmly tighten the plug by using the standard box spanner and tommy 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 gaps to .015 inch. NEVER TRY TO MOVE THE CENTRAL ELECTRODE. To widen, or narrow, the gap between the electrodes, only move the earth (side electrodes). Check the gaps first with a gap gauge. If they are too wide, tap the earth (side electrodes) towards the central electrodes using preferably a small copper drift and light hammer. Check the gaps between each tap and stop when the gauge is a nice sliding fit between the central electrode and the three earth side electrodes.

If the gaps are too small to start with, gently lever the earth electrodes away from the centre electrode, using a small screwdriver, and then tap them back as described above. Avoid damaging the centre electrode and do not attempt to 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 lift 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 inside 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 27

Magneto removal and fitting

The magneto is "spigot fitting" and is retained to the crankcase by two studs and one bolt.

To remove the magneto it is necessary to :

Take away the timing gear cover.

Withdraw the driving gear from the magneto shaft. (Already described in the Engine Section).

Disconnect the high tension wires from the sparking plugs.

Disconnect the ignition control cable.

Remove the nuts from the two studs and one bolt that secure the magneto body to the crankcase and the unit is free to be taken away.

The re-fitting is done by the above procedure reversed and the method of timing has already been described in the Engine Maintenance Section.

CHARGING

A LUCAS type E3L-L1-0 dynamo is fitted. It is anti-clockwise in rotation. The cutting in speed is 1,050—1,200 r.p.m. at 6.5 volts and at 1,850 to 2,000 revolutions per minute it gives an output of 8.5 amps at 7 volts. The positive brush is earthed. The two exterior terminals are marked "D" and "F," indicating the respective terminals for the Positive and Field wires that lead to similarly marked terminals on the Regulator Unit.

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

Remove the dynamo (see page 73 for instructions.)

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 if 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 trace 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 plugs 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.

Test Dynamo in position by :

- (a) Remove the two wires from the dynamo terminals and connect the two terminals with a single length of wire.
- (b) Start the engine and set to run at normal idling speed.
- (c) Connect the negative lead of a moving coil voltmeter (calibrated not less than 0 to 10 volts) to either of the two dynamo terminals and connect the positive lead to a good earth point on the dynamo or engine.
- (d) 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 race 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 $1\frac{1}{2}$ 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 and re-fit dynamo

The dynamo rests on a cradle forming part of the crankcase and is retained by a band having an adjustable clamping action and one stud passing through timing gear case. It is rotated by a gear meshing with the timing gear wheel on the exhaust cam shaft.

Upon merely slackening the clamping strap and removing the sleeve nut on the outside of timing cover, the dynamo, complete with its driving gear, can be withdrawn from the crankcase. The two wires from dynamo to regulator unit are retained by an insulated bridge secured by one screw and, upon removing that screw, the bridge, with the two cables, can be taken away from the dynamo.

The cut-out and regulator unit (A.V.C.), is type **MCR-2**, and the replacement part number is 37097-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 day-time running, when the battery is in good condition, the dynamo gives only a trickle charge, so that the ammeter reading will seldom exceed 1 to 2 amperes, i.e. :- Half to one division of 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 and the cover protecting them is therefore sealed. If, under normal running conditions, it is found that the battery is continually in a low state of charge, or is being constantly overcharged, then the regulator setting should be checked by a qualified electrician and, if necessary, re-set. Whenever possible, this should be carried out by a Lucas Service Depot or Agent.

The A.V.C. Unit is retained by two bolts with self-locking nuts. The self-locking nature of the nuts prevents subsequent slacking 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.

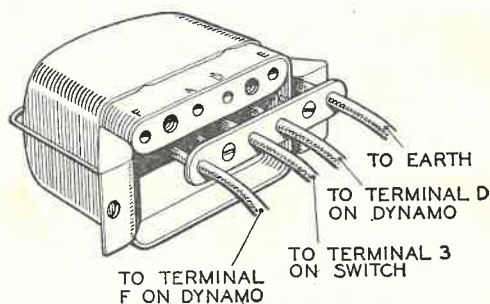


Illustration 28

Showing connections to regulator
and cut-out unit Type MCR-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 terminal grouping which will be F.A.E.D.

Battery

The battery fitted is LUCAS type **PU7E/9**. 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 1.280 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.

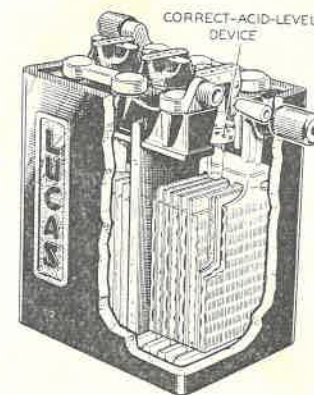


Illustration 29

Lucas **PU7E/9**
Battery

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 on charge 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. See filling instructions on underside of battery lid.

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, or container, 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, dust 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, .002 must be added to the hydrometer reading for each 5° F. rise to give the specific gravity at 60° F. Similarly, .002 must be subtracted from the hydrometer reading for every 5° F. below 60° F.

LIGHTING AND ACCESSORIES

Headlamp

A LUCAS headlamp is fitted and snugly mounted, on each side is a neat torpedo shaped pilot lamp. These pilot lamps and also the head lamp are secured to the front fork arms by means of tubular bolts through which a wire passes to each pilot lamp. The headlamp has a panel mounted on its top retained by three screws (see Illustration 30). This panel carries the main switch and ammeter. The headlamp bulb has two filaments one of which provides the main driving beam and the other a dipped beam brought into operation as required by the dipping switch on the left handlebar. The headlamp reflector and glass are made up as one assembly and are in consequence not sold separately as spares. The main bulb is of the pre-focus type and the design of its holder is such that the bulb is correctly positioned in the reflector. No focussing is therefore necessary when a replacement bulb is fitted. See Controls page 7 for switch functions.

To remove headlamp rim and light unit

Slacken 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 cap 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 pressing with a screwdriver blade and, at the same time, working away from the edge.

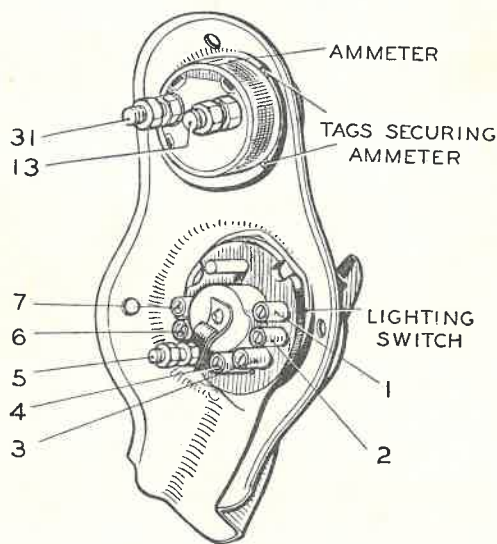


Illustration 30

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

The ammeter fitted is type CZU-27.

(See page 80 for numbered references.)

To replace headlamp rim and light unit

Lay the light unit in the rim so that the location 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 back cap engage the projections on the inside of the back cap 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 re-tighten the locking screw on the top of the lamp body.

Access to the pilot lamps interior for bulb removal is obtained by removing the screw at the rear end and gently pulling forward on the glass rim.

Rear lamp

A LUCAS rear lamp is fitted. The body, with bulb holder, is secured to the rear number plate. (Convertible to stop light at option.)

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 31, 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 split ferrule, into which the two sleeves snap and the fourth component is a rubber sleeve which covers the whole connector. That rubber sleeve serves the dual purpose of insulating the various metal parts and also preventing same from separation as the result of vibration.

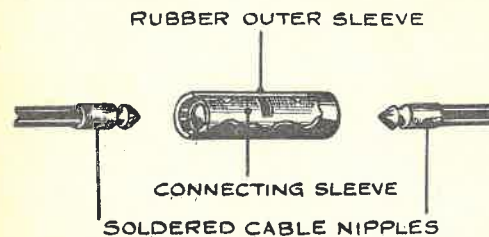


Illustration 31
Lucas snap connector
Part number 900269

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.

Two more are used in the headlamp interior (pilot lamp wires).

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 that purpose. 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 organised 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 :

Carburettors	Messrs. Amalgamated Carburettors Ltd., Holford Road, Witton, Birmingham, 6
Chains	The Renold and Coventry Chain Co. Ltd., Didsbury, Manchester
Electrical Equipment	Messrs. Joseph Lucas Ltd., Great King Street, Birmingham, 19
Gear Boxes	Messrs. Burman & Sons Ltd., Wychall Lane, King's Norton, Birmingham, 30
Sparking Plugs	K.L.G. Sparking Plugs Ltd., Putney Vale, London, S.W.15
Speedometers	Messrs. S. Smith & Sons (M.A.) Ltd., Cricklewood, London
Tyres	Messrs. Dunlop Rubber Co. Ltd., Fort Dunlop, Birmingham
Air Filter	Messrs. Vokes Ltd., Henley Park, Nr. Guildford, Surrey

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 12.55 p.m.—2.0 p.m. to 5.30 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, 99 and 122. Trolleybus routes, 696 and 698 pass the end of Burrage Road (one minute from the Service Depot).

Bus routes 21a, 75 and 161 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, 569, 669 and 685. 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 Easterly 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 current 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 legally 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 $1\frac{3}{4}$ " high, $1\frac{1}{4}$ " wide and $\frac{5}{16}$ " thick with spaces of $\frac{1}{2}$ " between each two characters.

The numbers on the rear plate must be $2\frac{1}{2}$ " high, $1\frac{3}{4}$ " wide and $\frac{3}{8}$ " thick with spaces $\frac{1}{2}$ " 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 not legally necessary to carry your Driving Licence, Insurance Certificate and Registration Book while driving your machine.

Ignition Suppressors

As required by law all 1954 Home models are issued with an approved type of radio interference suppressor already installed.

Speedometer

A speedometer **MUST** be fitted and it **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 rearwards. The rear number plate must be adequately illuminated by a white light.

Each front 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.

TOOLS AND SPECIAL EQUIPMENT

TOOLS

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

1	017253	Tool bag.
1	017114	Tyre inflator.
2	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 box spanner and tommy bar.
1	018178	Spanner 1.010 in. and 1.200 in.
1	017052	Double end spanner. $\frac{3}{16}$ " x $\frac{1}{4}$ " in.
1	017053	Double end spanner. $\frac{5}{16}$ " x $\frac{3}{8}$ " in.
1	015023	Contact point spanner and gauge.
1	018153	Spanner, for petrol tap.
1	018055	Key, for handlebar clip screw and rocker cover bolts.
1	017257	Double end spanner. $\frac{3}{16}$ " x .375" in.
1	015264	S.E. spanner. (Rocker clamping bolt nut).
1	015213	Box spanner. (Cylinder head nut).
1	017254	Clutch spring stud nut adjuster.
1	018667	Key for fork crown pinch screw.

OPTIONAL EQUIPMENT

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

Stop rear light fittings (see page 77.)

Air cleaner.

Gear extractor 015374. A bridge type extractor, consisting of bridge, central screw and two side bolts, for removing the gears on the camshafts.

Detachable luggage carrier.

Timing disc 015955. A circular timing disc, graduated in degrees and made of ivory. A very useful device.

Pinion extractor 015273. A two piece extractor for removing the timing gear small pinion and the gear on the magneto shaft.

Pannier frames and bags.

Holder for valve grinding. Part number 011381.

Pillion footrests, specially designed fold up type.

SPARES LIST

An illustrated and priced spares list is available at a cost of 2/6 post free (see page 65).

GASKET SETS

For convenience in ordering, standard sets of engine washers and gaskets are stocked. Full details of contents and prices are included in the Spares List.

BADGES

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

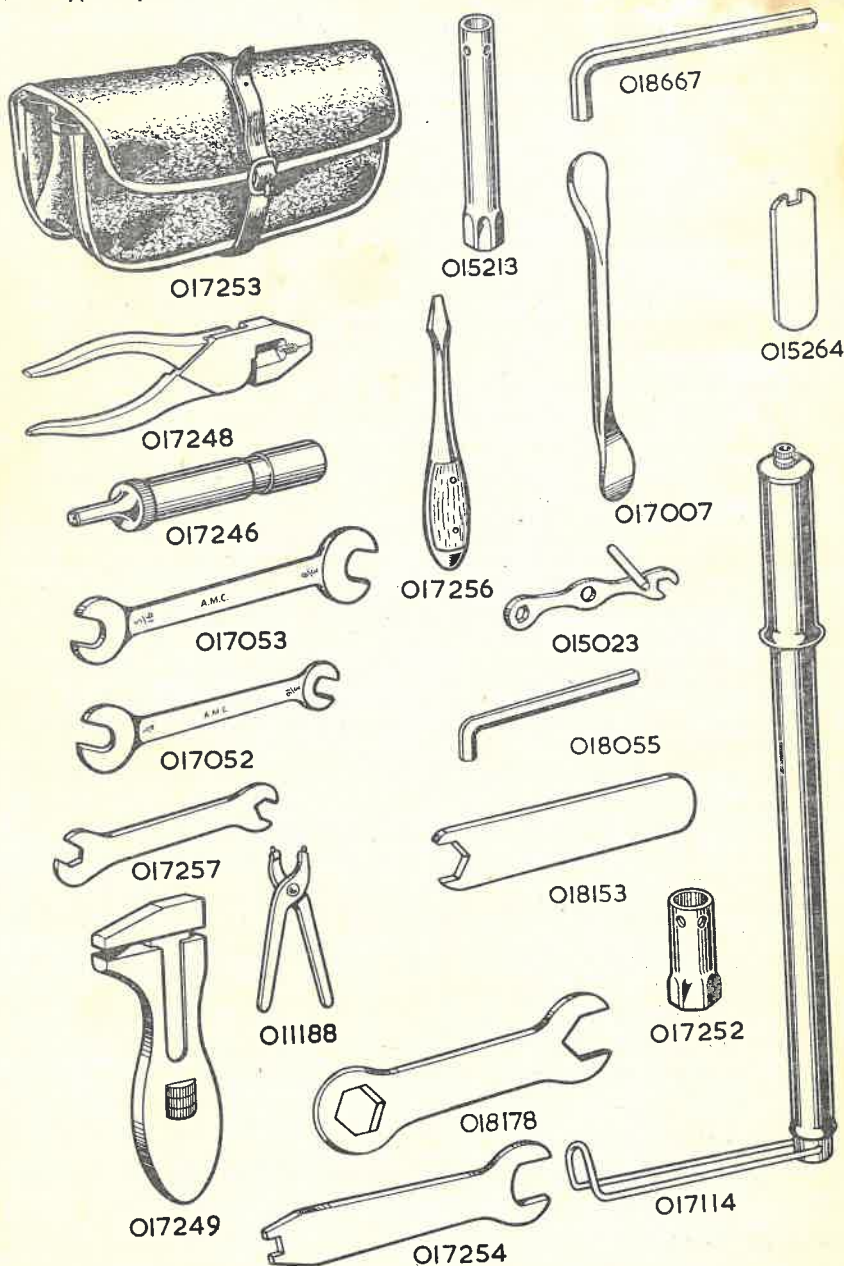


Illustration 34

GUARANTEE

We give the guarantee with our motorcycles, motorcycle combinations and sidecars, which is given in place of any implied conditions, warranties or liabilities 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 overriding this guarantee. In the case of machines (a) which have been used for "hiring-out" purposes or (b) any motorcycle and/or sidecar used for any dirt track, cinder track or grass track racing or competitions (or any competition of any kind within an enclosure for which a charge is made for admission to take part in or view the competition) or (c) machines from which the trade mark, name or manufacturing number has been removed, no guarantee, condition or warranty of any kind is given or is 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 to extend and be in force for six months only 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 in exchange for the part of the motorcycle, motorcycle combination or sidecar which may have proved defective. We do not undertake to replace or refix, or bear the cost of replacing or refixing, such new part 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 easily liable to derangement by neglect, or misuse, this guarantee does not apply to defects caused by wear and tear, misuse or neglect.

The term "misuse" shall include amongst others the following acts:—

1. 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.
2. 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 manufacturers.
3. The attaching of a sidecar to a motorcycle by any form of attachment not provided supplied or approved by us or to a motorcycle which is not designed for such use.

Any motorcycle, motorcycle combination or sidecar sent to us to be plated, enamelled 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 to extend and be in force for three months only from the time such work shall have been executed or until the expiration of the six months above referred to, and this guarantee is in lieu and in exclusion of any common law or statute warranty or condition, and the damages recoverable are limited to the cost of any further work which may be necessary to amend and make good the work found to be defective.

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 must be sent to us CARRIAGE PAID, and accompanied by an intimation 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 defective part was exchanged as the case may be.

Failing compliance with the above, such articles will lie here AT THE RISK OF THE OWNER, and this guarantee and any implied guarantee, warranty or condition shall not be enforceable.

We do not guarantee specialities such as tyres, saddles, chains, electrical equipment, lamps, 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.

NOTICE

We do not appoint agents for the sale on our behalf of our motor cycles or other goods, but we assign to motor cycle dealers areas in which we supply to such dealers exclusively for re-sale in such areas. No such Dealer is authorised to transact any business, give any warranty, make any representation or incur any liability on our behalf.

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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

**GENUINE
A·J·S SPARES**

PURCHASED FROM
AN AUTHORISED "A·J·S" DEALER
OR FROM THE FACTORY, ARE IDENTICAL
WITH THE PARTS ORIGINALLY BUILT
INTO YOUR MOTOR CYCLE.

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