BOOK No. 101-MC1

MAINTENANCE MANUAL AND INSTRUCTION BOOK

for

MOTOR CYCLE, SOLO, 350 c.c.

O.H.V., MATCHLESS

MODEL 41-G3L

MATCHLESS MOTOR CYCLES

PROPRIETORS: ASSOCIATED MOTOR CYCLES LIMITED

EDITION M.M.I

BOOK No. 101-MC1

MAINTENANCE MANUAL AND INSTRUCTION BOOK

50 c.c.

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OR CYCLES LIMITED

EDITION M.M.1

(Attach this slip inside the front cover of all "B" Vehicle Instruction Books, Maintenance Manuals, Drivers' Handbooks, etc., and amend references to lubricants to conform).

LUBRICANT EQUIVALENTS.

Consequent on the change in W.D. lubricants, the table below gives the equivalents in the old and new nomenclatures.

Old Nomenclature.	*New Nomenclature.*
Oil M.120X }	Oil 10 H.D.
" M.120 }	
" M.160	30 H.D.
" M.220	50 H.D.
" C.600	C.600
" Hypoid 90	HY. 90
" C.155	HY. 80
Grease A	Grease No. 0. (Extreme cold).
—	Grease No. 1 (Softer than Grease No. 2).
Grease G.S.	Grease No. 2.
Grease H.M.P.	Grease No. 3. (High Melting Point grease)
—	Grease No. 4. (Water pump grease).

Chilwell.
1/4/43.

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DATA

CUBIC CAPACITY	**347 c.c.**
STROKE	**93 mm.=3·6614 inches.**
CYLINDER BORE	**$2\frac{23}{32}$ inches=2·7187 ± ·0005 inch.**
(Re-bore to + ·020 inch when wear exceeds ·008 inch).	
COMPRESSION RATIO (WITH PLATE)	**5·88 to 1.**
(WITHOUT PLATE)	**6·3 to 1.**
PISTON RING DIMENSIONS (PLAIN RING)	**$2\frac{23}{32}$ inches by $\frac{1}{16}$ inch.**
(SCRAPER RING)	**$2\frac{23}{32}$ inches by $\frac{1}{8}$ inch.**
PISTON RING GAP (NORMAL)	**·006 to ·008 inch.**
PISTON RING CLEARANCE IN GROOVE	**·003 inch.**
GUDGEON PIN BUSH REAMERED TO	**$\frac{7}{8}$ inch ± ·0005 inch.**
(Gudgeon pin should be easy sliding fit in piston bosses and gudgeon pin bush).	

ROCKER BOX BUSHES REAMERED TO	**$\frac{5}{8}$ inch ± ·0005 inch.**
CAMSHAFT BUSHES REAMERED TO	**$\frac{1}{2}$ inch ± ·0005 inch.**

VALVE HEAD DIAMETER (INLET)	**$1\frac{19}{32}$ inch ± ·005 inch.**
(EXHAUST)	**$1\frac{1}{2}$ inch ± ·005 inch.**
VALVE SEAT ANGLE (INLET AND EXHAUST)	**45°.**
VALVE STEM DIAMETER (INLET AND EXHAUST)	**·371 inch ± ·0005 inch.**
VALVE TAPPET CLEARANCE (WITH COLD ENGINE)	**NIL.**

VALVE TIMING (WITH ·016 inch TAPPET CLEARANCE).

INLET OPENS 20° BEFORE TOP DEAD CENTRE.

INLET CLOSES 67° AFTER BOTTOM DEAD CENTRE.

EXHAUST OPENS 78° BEFORE BOTTOM DEAD CENTRE.

EXHAUST CLOSES 28° AFTER TOP DEAD CENTRE.

VALVE GUIDES PROJECT FROM CYLINDER HEAD (INLET)	**$\frac{1}{2}$ inch.**
(EXHAUST)	**$\frac{5}{8}$ inch.**
OUTER VALVE SPRING FREE LENGTH	**$2\frac{1}{16}$ inch.**
INNER VALVE SPRING FREE LENGTH	**$1\frac{13}{16}$ inch.**

(Renew valve springs when free length is more than $\frac{3}{16}$ to $\frac{1}{4}$ inch below above measurements).

CONTACT BREAKER POINT SEPARATION ... ... .012 inch.

IGNITION SETTING ... ... $\frac{3}{8}$ inch BEFORE TOP DEAD CENTRE.
(With the ignition control fully advanced).

SPARKING PLUG (14 mm.) ... ... $\frac{1}{2}$ inch REACH.
(CHAMPION L-10-S OR LODGE H-53 OR LODGE H-14).

TIMING PINION NUT (LEFT—HAND THREAD) ... ... $\frac{7}{16}$ inch by 26 TPI.

TAPPET GUIDES PROJECT FROM CRANKCASE FACE ... ... $\frac{9}{32}$ inch.

FLYWHEEL AXLES SHOULD RUN TO WITHIN .001 inch FROM DEAD TRUE.

DRIVING SIDE FLYWHEEL AXLE BALL BEARINGS ... ... (2 OFF).

INTERNAL DIAMETER ... ... 1 inch.

EXTERNAL DIAMETER ... ... $2\frac{1}{4}$ inch.

WIDTH ... ... $\frac{5}{8}$ inch.

CARBURETTER MAKE AND TYPE NUMBER ... ... AMAL, TYPE 275F/1J.

CARBURETTER MAIN JET SIZE ... ... 120.

CARBURETTER THROTTLE VALVE ... ... 5×5.

CARBURETTER JET TAPER NEEDLE IS LOCATED IN THIRD NOTCH FROM TOP.

SPROCKETS ...	ENGINE	18 TEETH	$\frac{1}{2}$ by .305 inch.
	CLUTCH	40 TEETH	$\frac{1}{2}$ by .305 inch.
	GEAR BOX SMALL	16 TEETH	$\frac{5}{8}$ by .380 inch.
	REAR WHEEL	42 TEETH	$\frac{5}{8}$ by .380 inch.
CHAINS	FRONT DRIVING	66 LINKS	$\frac{1}{2}$ by .305 inch.
	REAR DRIVING	91 LINKS	$\frac{5}{8}$ by .380 inch.
	MAGNETO	58 LINKS	$\frac{3}{8}$ by .225 inch.
	DYNAMO	47 LINKS	$\frac{3}{8}$ by .225 inch.

CHAIN WHIP ...	FRONT DRIVING CHAIN	$\frac{3}{8}$ inch.
	REAR DRIVING CHAIN	$\frac{3}{8}$ to $\frac{1}{2}$ inch.
	MAGNETO CHAIN	$\frac{1}{4}$ inch.
	DYNAMO CHAIN	$\frac{1}{4}$ inch.

GEAR RATIOS	TOP	5.8 to 1.
	THIRD ...	7.5 to 1.
	SECOND ...	12.2 to 1.
	FIRST ...	18.5 to 1.

CLUTCH THRUST ROD—OVERALL LENGTH ... ... 9⅞ inches.

CLUTCH OPERATING FORK TO NOSE OF OPERATING LEVER CLEARANCE $\frac{1}{32}$ inch.

GEAR BOX MAINSHAFT—OVERALL LENGTH ... ... 10¼ inches.

BALL BEARING ... ... FOR GEAR BOX MAIN GEAR :—

INTERNAL DIAMETER ... ... 1 $\frac{9}{32}$ inch.

EXTERNAL DIAMETER ... ... 62 mm.

WIDTH ... ... 16 mm.

BALL BEARING ... ... FOR GEAR BOX MAINSHAFT (RIGHT-HAND END) :

INTERNAL DIAMETER ... ... 12 mm.

EXTERNAL DIAMETER ... ... 40 mm.

WIDTH ... ... 17 mm.

STEERING HEAD BALLS $\frac{3}{16}$ inch DIAMETER. 56 TO SET (28 EACH RACE).

WHEEL BEARING END PLAY ... ... .002 inch.

WHEEL RIM SIZE ... ... 19 inch by 2½ inch. (For 26 by 3·25 inch tyre).

(Front and rear rims not interchangeable.)

WHEEL SPOKES :—

FRONT, LEFT SIDE ... ... 5⅝ inch 8g. by 10g. Butted.

FRONT, RIGHT SIDE ... ... 8 $\frac{3}{16}$ inch 9g. by 11 g. Butted.

REAR, LEFT SIDE ... ... 8 $\frac{3}{16}$ inch 6g. by 9g. Butted.

REAR, RIGHT SIDE ... ... 8 $\frac{3}{16}$ inch 6g. by 9g. Butted.

SPOKE LENGTHS ... ... MEASURED UNDER HEAD

PETROL TANK CAPACITY ... ... 3 gallons

OIL TANK CAPACITY (USE M-220) ... ... 3 Pints.

GEAR BOX CAPACITY (USE C-600) ... ... 1¾ PINTS.

FRONT FORK CAPACITY (USE M-120-×) ... ... 6½ OUNCES (EACH SIDE)

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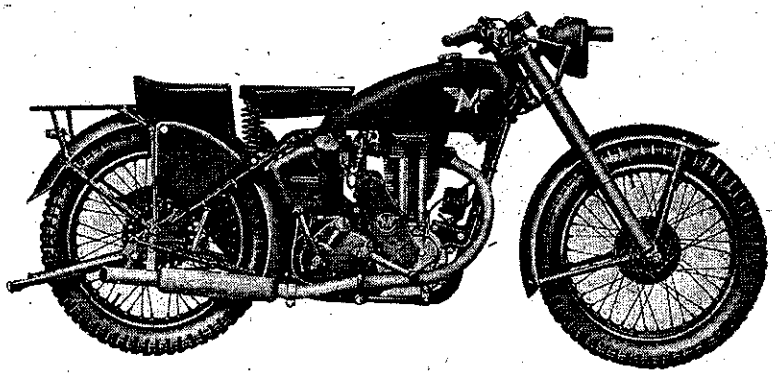
MODEL G3L



Matchless Model G3L

Introduction

THE MATCHLESS Model G3L Motor Cycle, dealt with in this Manual, although of simple design and construction, is, nevertheless, a highly specialised piece of engineering. In consequence, it must be intelligently and efficiently maintained to provide unfailing reliability in service.

In the following pages are non-technical instructions for carrying out most of the maintenance operations likely to be called for under strenuous service and, where necessary assembly illustrations are provided as a guide.

In the instructions references are made to some special tools and extractors and all of them can be made by a good mechanic from the illustrations of same. (Blue prints are available.)

It should be borne in mind that every fault has a definite cause and the methodical repairer will locate the cause before attempting the cure. By this means repetition is avoided and knowledge is acquired which cannot possibly be imparted efficiently by a manual of this description. Such knowledge grades the repairer and, for this reason, every single maintenance job should be given individual thought and attention.

Compiled and Issued by the Manufacturers

MATCHLESS MOTOR CYCLES

(PROPRIETORS: ASSOCIATED MOTOR CYCLES LIMITED)

EDITION M-M-I

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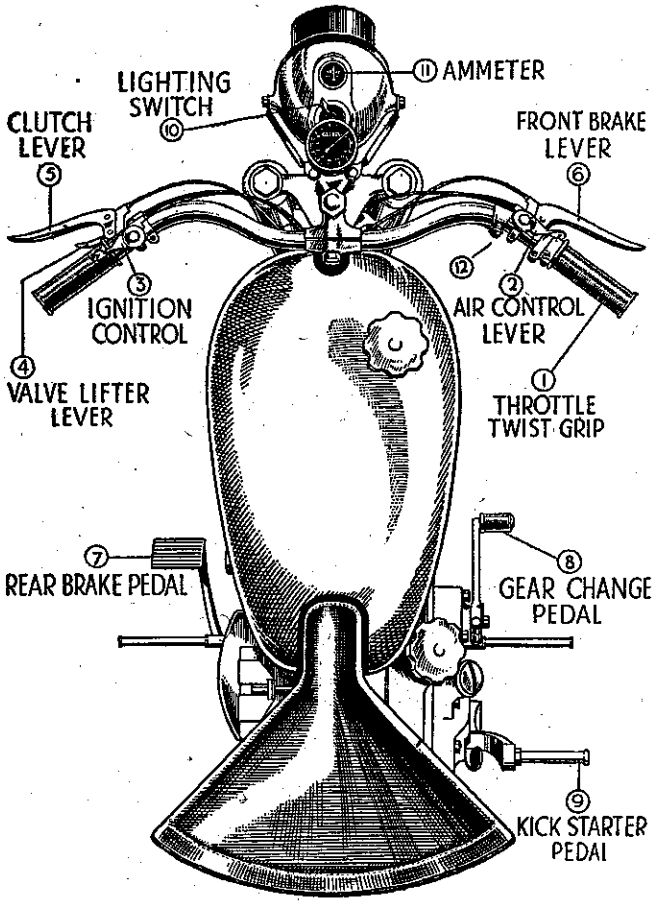


Illustration 1

1 CONTROLS.

1. Throttle twist grip.

   Twist inwards to open. When fully closed, engine should just idle when hot.

2. Air control lever.

   Pull inwards to increase air supply. Once set, when engine has warmed up requires no alteration for different road speeds. Should be fully closed to start engine from cold.

3. Ignition control.

   Advances and retards ignition point. Pull inwards to advance. Retard slightly for starting.

4. Valve lifter lever.
5. Clutch lever.
6. Front brake lever.
7. Rear brake pedal.
8. Gear change pedal.
9. Kick-starter pedal.
10. Lighting switch.
11. Ammeter.
12. Electric horn button.

LUBRICATION

2 ENGINE LUBRICATION.

This is by dry sump system. Oil feeds, by gravity, from oil tank under saddle to pump in crankcase. Pump forces oil to various parts. Oil then drains to bottom of crankcase sump. Pump then returns oil to tank. Process is continuous while engine is revolving. Pump is designed to return more oil to tank than it can force into engine. Therefore crankcase sump is kept clear of excess oil.

A felt cartridge filter, in the oil tank, removes foreign matter collected by the oil in its passage through the engine. Filter must be cleaned every two thousand miles.

3 ENGINE OIL PUMP.

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

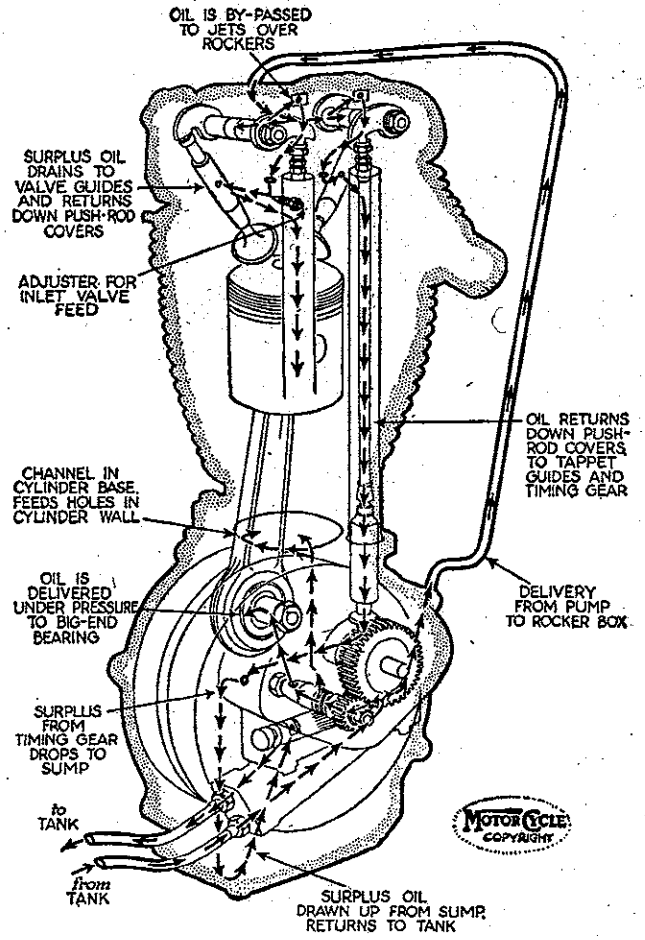


Illustration 2

Engine Oil Circulation

4 ENGINE OIL CIRCULATION.

Engine oil pump forces oil through :—

(*a*) Passage cut through timing side axle, timing side flywheel and crank pin to lubricate big-end bearing. The splash passes to interior of cylinder, to lubricate cylinder and piston, and then falls into crankcase sump.

(*b*) Passage in crankcase, controlled by ball valve, direct to cylinder, to assist in cylinder and piston lubrication and then falls into crankcase sump.

(*c*) Passage in timing gear case where it "builds up" to a predetermined level to lubricate the timing gears and then falls into crankcase sump.

(*d*) Through pipe from front of oil pump housing to rocker box by which all rocker gear and valve stems are lubricated and then falls through push rod cover tubes and tappet guides to the timing gear case and, from there, it drains into crankcase sump, as detailed in Para. (*c*).

Engine oil pump extracts oil in crankcase sump and returns it to oil tank. On its way it passes through the cartridge filter located in the oil tank. (See Para. 2.)

5 THE OIL TANK AND FILTER.

The level of oil in tank should never be less than the half-full mark (otherwise the small amount of oil becomes excessively hot and dirty thereby impairing lubrication and cooling) or more than within one inch of filler cap opening (otherwise, upon starting the engine, the bulk of oil then in the crankcase sump may be greater than the space left in the oil tank, see Para. 6).

Remove oil filter and clean in petrol every two thousand miles. (The oil filter is made in cylindrical form of thick felt and is supported by a tubular wire cage. The felt is not detachable from the cage.)

For access to filter :—

Remove the two bolts fixing lower ends of saddle springs to frame.

Raise rear of saddle.

Unscrew hexagon cap on top of tank.

Withdraw spring and dished washer.

Insert finger in filter and withdraw to the rear of machine. (Great care needed towards end of this operation otherwise filter will be kinked.)

To re-fit filter :—

Reverse above instructions.

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

6 CHECKING OIL CIRCULATION.

Check oil circulation immediately after starting engine from cold.

Remove oil tank filler cap and return flow of oil will be seen emerging from the spout just inside the filler cap opening. The flow of oil should be positive. This is because when engine is stationary oil from all parts of interior drains into the crankcase sump. Therefore, till that surplus has been cleared, the flow of oil is continuous.

Normally, the return flow is spasmodic and mixed with air bubbles. This is because the pump can return more oil than it can force into the engine.

7 ADJUSTMENT OF OIL FEED.

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

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

8 EXHAUST VALVE STEM LUBRICATION.

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

9 LUBRICATION POINTS TO REMEMBER.

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

Both end caps on pump plunger housing must be air-tight.

Check oil circulation (Para. 6) before starting each run.

10 GEAR BOX LUBRICATION.

Use C–600 oil. Gearbox capacity 1¾ pints. Correct level is about 2½ inches from the bottom of the kick-starter case. Level may be ascertained by thin dip stick. Unscrew the large screwed plug in top edge of kick-starter case cover and pass dip stick through its opening.

Lubricant may be inserted through the grease nipple on the kick-starter case or through the opening mentioned above. About two ounces every two thousand miles.

When operating in temperatures between 16° and zero replace the C–600 oil with M–120 oil.

M–120 oil must not be used in temperate and tropical climates.

Heavy General Service grease (G.S.) not to be used.

A screwed drain plug in gearbox shell (low down at rear) facilitates gearbox flushing and change of lubricant.

11 CHAIN LUBRICATION.

Front driving chain and dynamo chain run in oil bath. (Front chaincase.) Use engine oil (M–220). Maintain level to height of the inspection cap opening.

Oil in front chaincase also lubricates the engine shock absorber and transmission harshness generally indicates level of oil in chaincase is too low.

Remove chaincase inspection cap each week, inspect level of oil, and 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 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, leave for several minutes, remove and allow excess lubricant to drain off and then replace on machine.,

C–600 gear oil or M–220 engine oil is a poor substitute for tallow and, if used, chain should be allowed to soak for several hours.

Lubricate rear chain every two thousand miles in summer and every thousand in winter.

Magneto chain runs in case packed with grease. A grease nipple is fitted to the case cover. Inject small quantity of grease monthly.

12 HUB LUBRICATION.

Keep hubs packed with grease. This prevents entry of water and dirt. Inject small quantity of grease. Nipples in centres of hubs.

Excessive grease will penetrate to brakes and impair their efficiency.

13 BRAKE CAM LUBRICATION.

Nipple on each brake expander bush. (One on front brake cover plate, one on rear brake cover plate.) Use grease very sparingly. Excessive grease will impair efficiency of brake.

14 BRAKE ROD JOINT LUBRICATION.

A few drops of engine oil on each brake rod yoke end pin and on the threaded rear portion of brake rod. (One yoke end at each end of brake rod.)

15 BRAKE PEDAL LUBRICATION.

One grease nipple in heel of brake foot pedal. Use grease sparingly.

16 SPEEDOMETER LUBRICATION.

One nipple on top of speedometer gearbox attached to rear wheel spindle. Use grease sparingly.

No other part of the speedometer (including the driving cable) requires lubrication.

17 FRONT FORK LUBRICATION.

No part of the TELEDRAULIC Front Fork requires lubrication, but it is necessary to test the level of the hydraulic fluid, and top-up, if necessary, every three thousand miles.

Test level and top-up by :—

(1) Support motor-cycle, vertically, with the weight on both wheels. (A steady under each footrest is best method.)

(2) Unscrew the two hexagonal plugs at top of fork inner tubes. (These are on level with handlebars.)

(3) Pull upwards each plug as far as possible. (Attached to undersides of plugs are the fork damper rods. Rods will therefore be exposed.)

(4) Work plugs and rods up and down, several times (pumping action), making upward strokes as violent as possible but only use fingers to do so. (This action is to eject any hydraulic fluid that may be trapped in the tubes above the damper valves.)

(5) Wait two minutes. (To allow any ejected oil to drain down to main supply.)

(6) Remove oil level screws. These are located on each slider, just under the mudguard bridge fixing bolts. (Each screw has a fibre washer.)

(7) Oil should just ooze from oil level holes if the oil level is correct.

(8) If no trickle, top-up, by pouring down each fork inner tube about two table-spoonsfull (one fluid ounce) of M–120X oil.

(9) Repeat pumping action. (Para. 4.)

(10) Wait two minutes. (To allow oil time to trickle out of holes.)

(11) Let all excess oil leak away.

(12) If no trickle, repeat as Paras. 8 and 9.

(13) If still no trickle it is evident leakage has occurred. Investigate and correct same.

(14) Replace oil level screws. (Ensure a fibre washer on each screw.)

(15) Replace plug in top of each fork inner tube.

18 STEERING HEAD BEARING LUBRICATION.

Nipples on Main frame head lug (one nipple) and Handlebar lug (one nipple). Use grease sparingly.

19 CONTROL LEVER LUBRICATION.

A drop of engine M-220 oil on all moving parts of the handlebar control levers.

20 MAGNETO AND DYNAMO LUBRICATION.

Every ten thousand miles dismantle bearings, clean and re-pack with a high melting-point grease. (See Paras. 112, 122, 123, 139 and 140.)

Grease prevents the entry of water. Therefore, during the wet season, smear grease round the contact breaker cover and the high-tension pick-up.

21 STAND FIXING BOLT LUBRICATION, ETC.

Several of the parts of a motor-cycle that have a very small movement, such as the hinge bolts for the stands, should be lubricated. Occasionally remove those bolts and smear with engine oil.

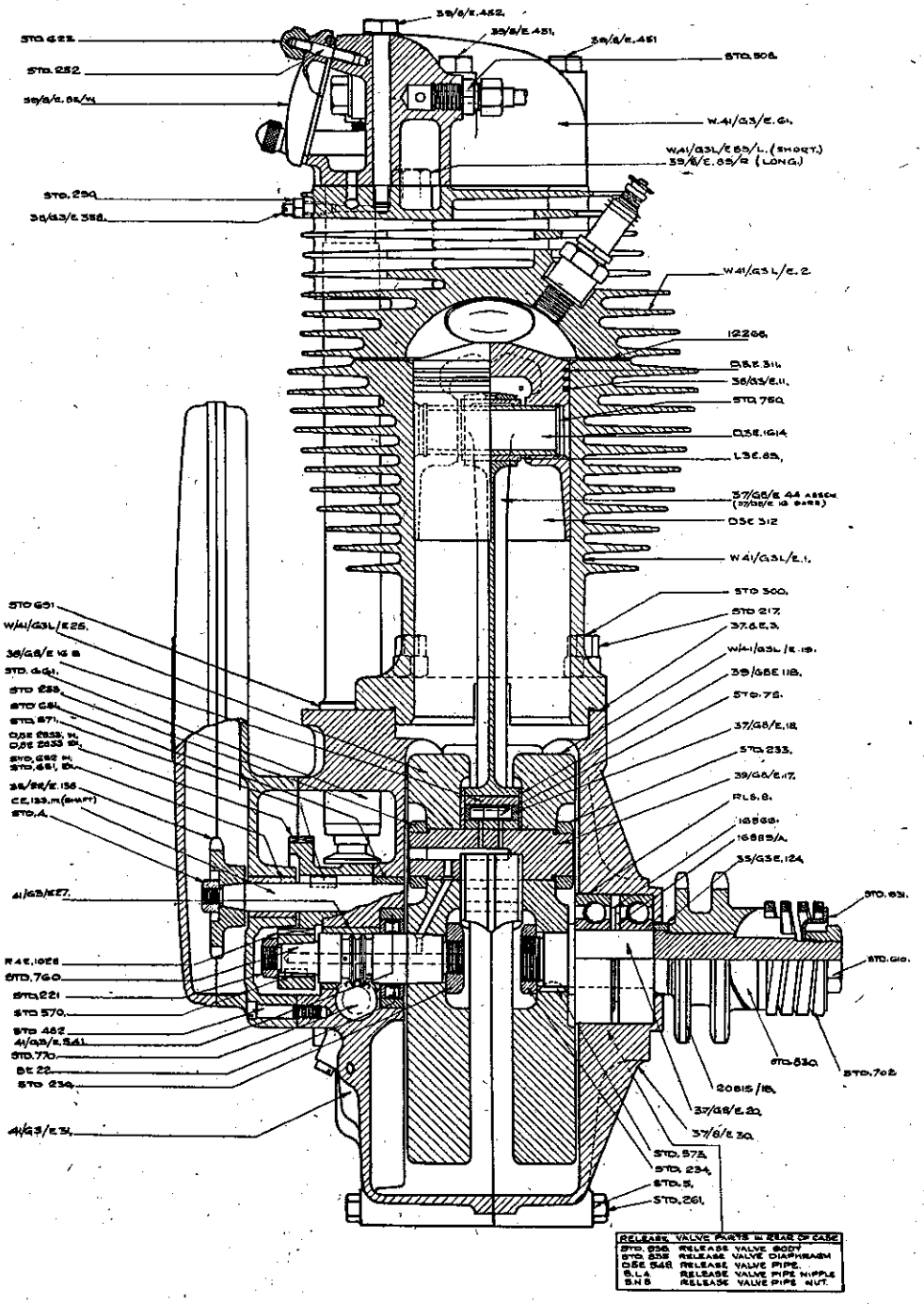


Illustration 3

Cross Sectional Drawing of 41-G3L Matchless Engine

ENGINE SERVICE INFORMATION

For almost all service work to the upper part of the engine it is necessary, in order to obtain accessability, first to remove the petrol tank.

NOTE :—Every part, no matter how small, has a definite function. When dismantling, do not lose any pins, washers, packings, gaskets, or rubber glands. Carefully observe the position of every small part before removing the component.

22 TO REMOVE THE PETROL TANK.

Remove the petrol feed pipe.

Drain off petrol into suitable container.

Remove petrol tap and banjo pin and take away tank connection pipe.

Cut wires locking the four tank fixing bolts.

Unscrew tank fixing bolts and tank may be removed from the frame. (Unscrew the rear bolt on the left-hand side last.)

23 TO REPLACE THE PETROL TANK.

Place a metal washer on each tank support bracket.

Place a thick rubber pad on each metal washer.

Place the tank in position.

Place a metal washer on the hexagon-headed tank fixing bolt and screw it into the rear left-hand location.

Place thin rubber pads on each of the remaining three tank fixing bolts and replace them.

Screw home all four fixing bolts sufficiently to just slightly compress the rubber pads and, in that position, interlace them, in pairs, with 22 gauge copper wire. (It is not intended the tank fixing bolts should be screwed home as far as they will go.)

Replace the tank connection pipe by inserting through its banjo unions the petrol tap and banjo pin and screwing tap and pin into the tank. There is a small fibre washer on the top side of each banjo union and a large one on the under side. Do not tighten the tap and pin sufficiently to crush the fibre washers.

Replace the petrol feed pipe. (Hold the tap with the adjustable wrench when tightening the top end union nut on the petrol feed pipe.)

24 TO REMOVE THE ROCKER BOX.

Remove the petrol tank. (See Para. 22.)

Remove the three nuts, and washers under them, retaining the rocker box side cover and take away the cover.

Take the opportunity to determine if excessive wear has taken place on the valve operating mechanism by :—

Set tappet clearance to NIL. (See Para. 52.)

Turn engine till inlet valve is open.

Observe if cupped end, at top of push rod, is at least $\frac{1}{32}$ inch below the projecting oil lug of rocker box.

Turn engine till exhaust valve is open and observe clearance, as before.

If the clearance is less than $\frac{1}{32}$ inch it is evident that abnormal wear has taken place and the opportunity should be taken to replace the part, or parts, so worn. The parts concerned could be :—

The rocker arms.

The cupped adjusting screws at top of push rods.

The valve stem caps or even the absence of the valve stem caps.

Proceed to remove the rocker box by :—

Disconnect oil pipe feeding oil to rocker box.

Turn over engine till both valves are closed.

Remove the seven bolts retaining rocker box to cylinder head.

Tilt upwards the right-hand side of rocker box and extract the two long push rods. Lay these aside so they may be identified because, although identical in design, they should not be interchanged.

Raise forward end of rocker box (to clear the exhaust valve assembly), swing it round in an anti-clockwise direction (to clear the frame tube), and then lift it clear of the inlet valve assembly.

Do not lose the hardened steel caps on the ends of the valve stems.

25 TO REPLACE THE ROCKER BOX.

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

Ensure steel caps are in position on valve stem ends. Revolve engine till both valves are closed.

Lay composition washer on cylinder head. This must be faultless. If necessary, fit new. (Gasket, for rocker box, Part Number 39–8–E440.) Ensure small lip of gasket surrounds the small hole in cylinder head through which oil to inlet valve stem passes.

Place rear end of rocker box over inlet valve assembly, swing it in a clockwise direction over exhaust valve assembly till it is in position.

Slightly raise right-hand side of rocker box which will allow the two long push rods to be dropped in position. (Ensure inlet rod is placed in inlet position. See Para. 24.)

Ensure each rocker box fixing bolt has a plain steel washer on it and then insert the bolts and screw down each a few turns. (Note that the rocker box fixing bolt having the short head fits in the centre, right-hand position.) Finally, tighten each bolt, in turn, bit by bit, till all are fully home.

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

Test rocker box fixing bolts for tightness.

Check tappet clearances and re-set, if necessary. (See Para. 52.)

Replace rocker box oil feed pipe. Do not allow union, screwed into rocker box, to turn when tightening union nut. (Use two spanners.)

Replace rocker box side cover, the three fibre washers and three retaining nuts.

Replace petrol tank. (See Para. 23.)

26 TO REMOVE THE CYLINDER HEAD.

Remove :—

The petrol tank. (See Para. 22.)

The rocker box. (See Para. 24.)

Remove the right-hand side footrest by :—

Remove nut, and washer, on right-hand side of footrest rod.

Partially withdraw rod from left-hand side.

Prise away the right-hand side footrest arm.

Remove the exhaust system by :—

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

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

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

Remove carburetter by :—

Unscrew venturi air intake.

Unscrew two carburetter retaining nuts.

Take away carburetter and rest on saddle.

Remove :—

The four bolts retaining cylinder head to barrel and head is free to be taken away.

While doing this the cover tubes will come away with the head.

If the cylinder head bolts resist removal, brush paraffin round their heads and leave for a time to soak before making further effort.

27 TO REPLACE THE CYLINDER HEAD.

A gasket is fitted between cylinder head and barrel. This must be perfect. (Gasket, for cylinder head, Part Number 12268.)

The top ends of cover tubes have rubber gaskets between tubes and head, they are a push fit and metal washers are located between the top edges of the gaskets and the cylinder head recesses. If the cover tubes are pulled away from the head, the gaskets will probably remain in position in the head. They must be perfect. (Gasket, for top of cover tube, two used per machine, Part Number 38–G4–E368.) (Metal washer, for top of gasket, two used per machine, Part Number 38–G4–E379.)

A rubber gland is fitted at the bottom of each cover tube. They must be perfect. (Rubber gland, for cover tube, two used per machine, Part Number STD–691.)

Under each rubber gland, and surrounding the exposed portion of each tappet guide, is a fibre washer. There is only need to disturb this fibre washer when a tappet and its guide are extracted. (See Para. 36.) (Fibre washer, for tappet guide, two used per machine, Part Number 35–12–E73.)

Replace the cylinder head by :—

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

Ensure the fibre washers are in position surrounding the tappet guides.

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

Place the cylinder head gasket in position on the top edge of the cylinder barrel. This must be perfect. (Gasket, for cylinder head, Part Number 12268.)

Place a rubber gland on top of each fibre washer surrounding each tappet guide.

Place the cylinder head in position.

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

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

Replace :—

The rocker box. (See Para. 25.)

The carburetter.

The exhaust system.

The footrests.

The petrol tank. (See Para. 23.)

28 TO REMOVE THE CYLINDER BARREL.

Remove :—

The cylinder head. (See Para. 26.)

The four nuts retaining cylinder barrel to crankcase.

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

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

Do not disturb the compression plate or the fibre washers surrounding the tappet guides.

29 TO REMOVE THE PISTON.

Remove :—

The cylinder barrel. (See Para. 28.)

One gudgeon pin circlip. (It is immaterial which circlip is removed. Use special pliers, 11024, included in tool kit.)

Gudgeon pin by pushing it out of piston.

Take away piston.

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

All pistons accommodate three rings. The two at the top are plain compression rings, each $\frac{1}{16}$ inch wide. The bottom ring is a slotted oil scraper ring, $\frac{1}{8}$ inch wide.

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

30 TO REMOVE AND REPLACE THE VALVES.

Remove the cylinder head. (See Para. 26.)

Rest, in turn, head of each valve on small wood block and compress springs to allow removal of valve split collets. The collets are a taper fit in the valve spring collars and it may be necessary to give the collar a sharp tap to release them.

Replace valves by :—

Clean valve guide bores with rag.

Smear each valve stem with engine oil.

Reverse procedure described above.

NOTE :—The inlet valve head is larger in diameter than the exhaust. Therefore inlet and exhaust valves are not interchangeable.

31 TO RE-FIT A PISTON AND CYLINDER BARREL.

All parts must be clean.

Place rings on piston.

Smear gudgeon pin with engine oil.

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

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

Refit circlips. Use special pliers, 11024, included in tool kit. Use rotary action when bedding circlips in their grooves and make sure each circlip lies snugly in its groove.

This is **essential** otherwise considerable damage will result.

Take new cylinder base washer. (Washer, for cylinder base, Part Number 37–8–E3.)

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

Smear cylinder bore and piston with engine oil.

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

Remove rag from crankcase throat.

Fit barrel over piston. Ensure each piston ring is fully compressed into its groove, in turn, as the barrel passes over it.

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

If, for any reason, the compression plate is removed and discarded it is then essential to also discard the fibre washer that surrounds each tappet guide.

32 DECARBONISATION.

Need for decarbonisation depends on fuel, oil and driving conditions. It will be indicated by a tendency to knock on hills or accelerating after rounding a corner.

Every two thousand miles is a fair average.

Generally only necessary to take off cylinder head, clean head and piston top and grind in valves.

Every other time also remove cylinder barrel and inspect piston rings and clean out piston ring grooves. If rings show any black portions on their bearing faces (indicating leakage) replace same.

Do not use any abrasive, such as emery cloth, to remove deposit from the crown of a piston. It is preferable to use a scraper made of soft metal.

It is usually not necessary to clean the inside of a piston and no attempt should be made to polish the skirt.

33 VALVE GRINDING.

It is advisable to grind in the valves at every decarbonisation.

Clean stems with very fine emery cloth, using up and down motion with cloth held between thumb and forefinger.

Clean both valve guide bores with rag.

Ensure both valve ports are free from carbon.

Inner valve spring should have a free length of $1\frac{13}{16}$ inch.

Outer valve spring should have a free length of $2\frac{1}{16}$ inch.

If free length of spring is more than $\frac{3}{16}$ to $\frac{1}{4}$ inch less than above measurements replace with new. (Inner valve spring, two used per machine, Part Number CE–211.) (Outer valve spring, two used per machine, Part Number CE–212.)

If a valve seat is re-cut the cutting tool should have an angle of 45°. The inlet valve head is larger in diameter than the exhaust valve head. (See "DATA," Page 7.)

Grind in valves in usual manner. A suitable valve holding tool is necessary.

The following valve grinding tools can be supplied. The first is suitable for casual use and the second is recommended as a workshop tool. Neither is included in the standard tool kit.

(*a*) Valve grinding tommy. Part Number 11520.

(*b*) Valve holder, for grinding. Part Number 38–G4–TK9–A.

34 TO REMOVE AND REPLACE VALVE GUIDES.

Valve guides are a tight press fit in the cylinder head and should be removed, and fitted, in an arbor press. Should this not be available proceed as follows :—

Carefully clean the projecting end of the old guide and then, using a pilot drift, as shown in Illustration 4, tap the old guide through the cylinder head bore.

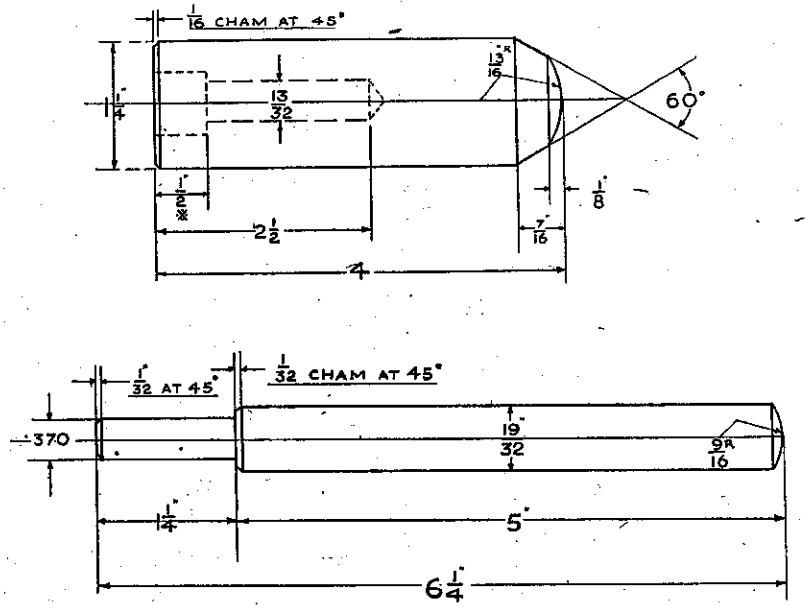


Illustration 4

Valve Guide Drift

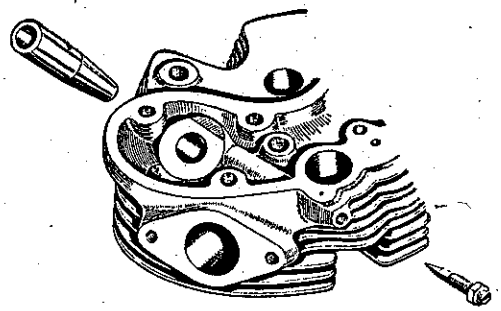


Illustration 5

The inlet valve guide is shown withdrawn and the inlet valve stem oil adjusting screw is also withdrawn. (See para. 7.)

(*By courtesy of "Motor Cycling"*)

To fit a new guide :—

Place an engine valve in the head and, holding same firmly in contact with the valve seat, slide the new guide on the stem, taking care to correctly align the oil hole in the guide with the oil way drilled in the head.

When the guide has been introduced as far as possible with finger pressure, gently tap the guide home, using a drilled drift as illustration 4.

The inlet valve guide must project $\frac{1}{2}$ inch from the cylinder head and the exhaust guide $\frac{5}{8}$ inch. A washer $\frac{1}{8}$ inch thick is used under drift when fitting exhaust guide.

These measurements must be accurate and should be carefully checked.

35 TAPPETS AND GUIDES.

The tappet guides are a tight fit in the crankcase. The lower ends are chamfered to facilitate fitting. The two tappets are dissimilar. That for the exhaust is fitted with a split collar which is used for raising the exhaust valve when the valve lifting mechanism is operated. The tappets cannot be removed from their guides when fitted to a crankcase, therefore tappets and guides must be removed " en bloc."

36 TO REMOVE A TAPPET GUIDE.

Remove :—

Petrol tank. (See Para. 22.)
Rocker box. (See Para. 24.)
Cylinder head. (See Para. 26.)
Fibre washer surrounding tappet guide.
Valve lifter cable from operating lever. (Engine end.)
Magneto chain case cover.
Magneto sprocket nut on magneto armature shaft.
Magneto sprocket nut on camshaft, and washer under it.
Sprocket on camshaft, by method described in Para. 54.
Sprocket on magneto armature shaft by using claw type extractor.
Both sprockets with chain.
Timing gear cover.
Timing gear cover paper washer.
Both cam wheels.

A fixture, as illustration 6, should be used to force the tappet and guide out of position.

Alternatively, the guide can be driven out by means of a soft drift, but, if this method is adopted, considerable care to avoid damage is necessary and, in obstinate cases, some heat may be required to expand the metal surrounding the guide. If heat is applied to facilitate removal the utmost care must be taken.

In the refitting process care must be taken to have each guide projecting $\frac{8}{32}$ inch above the crankcase face, and the exhaust guide must be positioned, when fitting, so that the gap for exhaust lifter application faces the rear.

The exhaust valve lifter collar lies in a shallow groove cut in the exhaust tappet and is slit to facilitate removal and refitting.

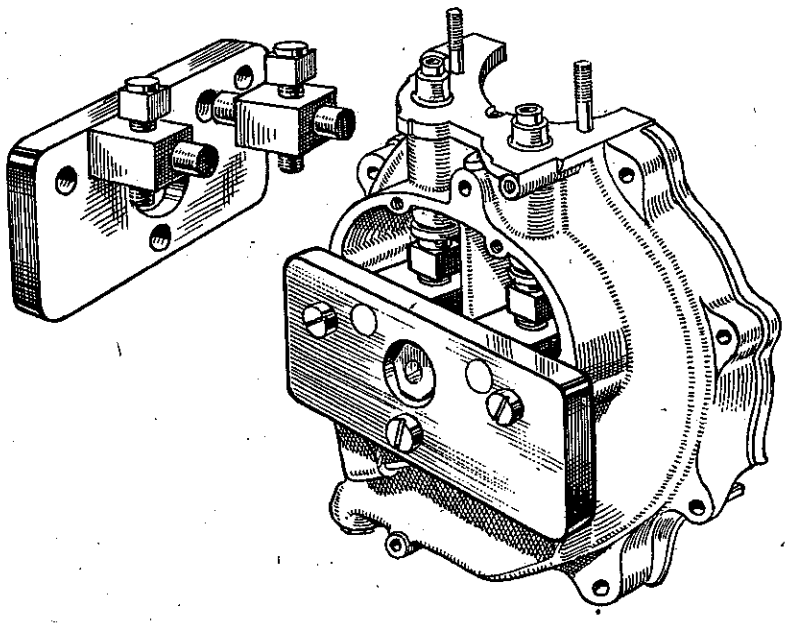


Illustration 6

Tappet Guide Removing Fixture

37 TO REMOVE COMPLETE POWER UNIT. (ENGINE AND GEAR-BOX.)

Remove the petrol tank. (See Para. 22.) (There is no need to remove the oil tank.)

Disconnect :—

The battery positive wire.
The rocker box oil feed pipe. (At both ends.)
The valve lifter cable. (At engine end.)
The two horn wires.
The two earth wires from the saddle lug bolt.
The speedometer cable at rear wheel end. (Unscrew gland nut.)
The ignition control cable from the handlebar lever.
The throttle control cable from the twist grip.
The air control cable from the handlebar lever.
The rear lamp wire at coupling near rear wheel spindle.

Remove :—

Nut, and washer, on right-hand side of saddle lug bolt.

Carburetter, by unscrewing venturi air tube, the two fixing nuts and withdrawing the control cables through their rubber clips.

Footrests, by removing nut, and washer, on left-hand side of footrest rod, pulling away rod from right-hand side and prising the two arms from position.

Silencer and exhaust pipe, by removing nut, and washers, holding silencer to its stay, removing domed nut, and washer, holding exhaust pipe stay to frame, pulling silencer and pipe from stay and frame bolt and then, pulling in downwards direction, from cylinder head exhaust port.

Clutch cable, by removing slotted head cap on top edge of kick-starter case cover, pushing inwards clutch operating lever and slipping cable nipple out of slot in its end, detaching cable from handlebar control lever, unscrewing cable adjuster from kick-starter case and drawing complete cable through engine plates.

Draw forward :—

The speedometer cable till it can be looped round the handlebar.

The rear lamp wire till it is clear of the rear frame.

Remove :—

The two bolts, with washers and nuts, retaining the Voltage Control Regulator to rear frame and sling regulator, with string, to the oil tank filler neck.

Disconnect dynamo wires, on machines fitted with LUCAS electrical equipment (see Para. 110) by :—

Slacken double-headed dynamo clamping bolt.

Apply flat spanner (RTK–1, included in tool kit) to flats cast on left-hand side of dynamo and rotate, in clockwise direction, till a screwdriver can be applied (through hole in rear half of magneto chain case) to the screw retaining the dynamo wire insulating block (on right-hand side of dynamo), remove block and disconnect wires, noting the terminal to which the coloured wire is fixed, and drawing wires through the engine plates.

Disconnect dynamo wires, on machines fitted with MILLER electrical equipment (see Para. 110) by :—

Remove the timing gear cover. (See Para. 36.)

Slacken screw securing commutator band cover.

Remove the one screw retaining dynamo cap and take away cap.

This will expose the three terminals.

Disconnect the wires. The coloured wire is attached to the top terminal and the joined wires are attached to the centre terminal.

Drain the oil tank.

Remove :—

The two oil pipes between oil tank and crankcase. (Hold unions, to prevent turning, when slackening off the union nuts. Use two spanners, W41–G3L–TK2 and LTK–12.)

The rear chain.

The long headed bolt (under battery) that retains rear chain guard to front chaincase.

The bolt, washer, spacers and nut, fixing oil tank stay to rear mudguard.

The saddle nose bolt.

Place under engine a stout box of a height suitable just to make contact with the engine and, from now onwards, the help of a second person is required.

Remove the rear frame assembly by :—

Remove the frame front fixing bolt.

Remove the seat lug bolt.

Take away rear frame assembly.

Remove the engine front plate (horn platform) by :—

Taking away the three bolts, with washers and nuts, that pass through it and lifting away.

Remove the remainder of the motor cycle (main frame and forks, etc.), from the engine unit by :—

Slacken the two nuts on the dynamo fixing square crossbar. (This supports the forward end of the magneto platform.)

Remove the seat tube bottom lug bolt. (This supports the rear end of the magneto platform and also passes through the rear of the engine rear plates.)

Tilt forward the magneto platform and the complete power unit so that the main frame of the machine is free and then lift it clear of the complete power unit (engine and gearbox).

This will leave the complete power unit supported on the box that had been placed underneath it for that purpose.

Refitting.

Refitting is carried out in exactly the reverse order.

When replacing the two oil pipes between oil tank and crankcase extreme care must be taken to ensure the threads of the oil pipe union gland nuts are correctly (squarely) engaged in the crankcase, otherwise the tapped holes in the soft aluminium crankcase will be damaged.

38 TO REMOVE THE ENGINE ONLY.

Remove the petrol tank. (See Para. 22.) (There is no need to remove the oil tank.)
Drain the oil tank.

Disconnect :—

The battery positive wires.

The two horn wires.

The high tension wire from the sparking plug.

The exhaust lifter cable at engine end.

The wires from the dynamo. (See Para. 37.)

Remove :—

The footrest assembly. (See Para. 37.)

The exhaust pipe and silencer. (See Para. 37.)

The carburetter. (See Para. 37.)

The gear change foot pedal.

The timing gear cover. (See Para. 36.)

The two oil pipes between oil tank and crankcase.

Remove the front chaincase and clutch by :—

Place tray under engine to catch oil.

Remove battery from its carrier.

Remove screw binding chaincase metal band.

Remove metal band. (Prise up battery carrier if necessary.)

Remove rubber band.

Remove nut, and washer, in centre of chaincase front.

Take away outer half of chaincase.

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

Unscrew the four nuts retaining the four 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.

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

Withdraw, by pulling away, the clutch centre with clutch sprocket and plates.

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

Remove spring lock ring on dynamo sprocket retaining nut.

Take away lock washer surrounding dynamo sprocket nut.

Apply spanner (RTK–1, included in tool kit) to the two flats on the back of the dynamo sprocket and, holding same, unscrew the nut retaining the dynamo sprocket.

Release dynamo sprocket with suitable extractor. (See illustration 7.)

Take away, as one assembly, the dynamo sprocket, dynamo chain and engine shock absorber assembly.

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

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

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

Remove :—

The engine front plate. (See Para. 37.)

The bottom and centre bolts passing through the crankcase and engine rear plates.

Steady engine with one hand and remove the crankcase top, rear bolt which will completely free the engine for removal.

Refitting :—

Refitting is carried out in exactly the reverse order.

When refitting the magneto sprocket ensure the sprocket having the deeper recess is fitted to the magneto armature shaft.

When refitting the front chaincase and clutch follow the instructions given in Para. 76.

When refitting the main oil pipes observe the instructions given in the final part of Para. 37.

After refitting the engine check, and reset, if necessary, the adjustments of the front and rear driving chains, the dynamo and magneto driving chains and the rear brake.

39 TO DISMANTLE THE ENGINE.

Remove the engine from the frame. (See Para. 38.)

Remove :—

Rocker box. (See Para. 24.)

Camshafts. (By withdrawing.)

Cylinder head. (See Para. 26.)

Cylinder barrel. (See Para. 28.)

Compression plate and paper washer.

The two fibre washers surrounding the tappet guides.

Small timing pinion nut. (This has a left-hand thread, turn clockwise to unscrew.)

Small timing pinion, using claw type extractor. (See illustration 7.)

Both oil pump end caps.

Oil pump plunger guide screw.

Oil pump plunger. By pushing at front and extracting from rear end of its housing. (See illustration 8.)

Crankcase bottom bolt.

Crankcase is then free to be separated. (The timing gear side will easily pull away from the flywheel assembly and the driving side case can then be taken away, leaving the driving side ball bearings, with spacing collar and washer, remaining in the crankcase.)

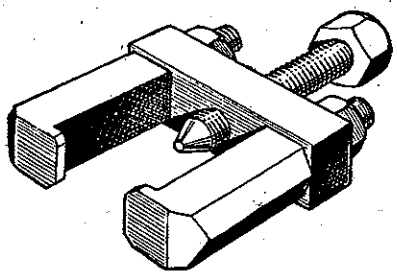


Illustration 7

Claw type Sprocket Extractor

(By courtesy of "Motor Cycling")

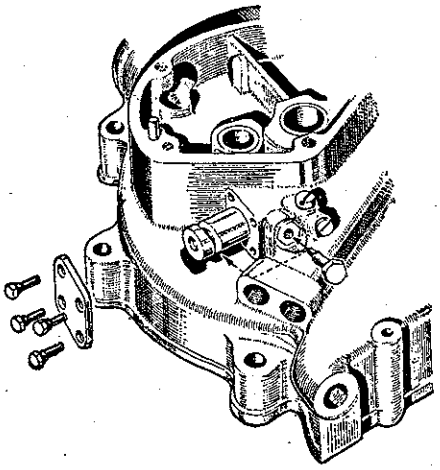


Illustration 8

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

(By courtesy of "Motor Cycling")

Refitting :—

Refitting is carried out in exactly the reverse order.

When refitting the small timing gear pinion, ensure it does not ride its key. To tighten, gently tap home the pinion and then tighten down the left-hand threaded nut, taking care not to use excessive pressure and so burst the pinion.

NOTE :—Halves of crankcases must be matched in the factory. Therefore it is necessary to send the sound half of a crankcase when ordering a new half.

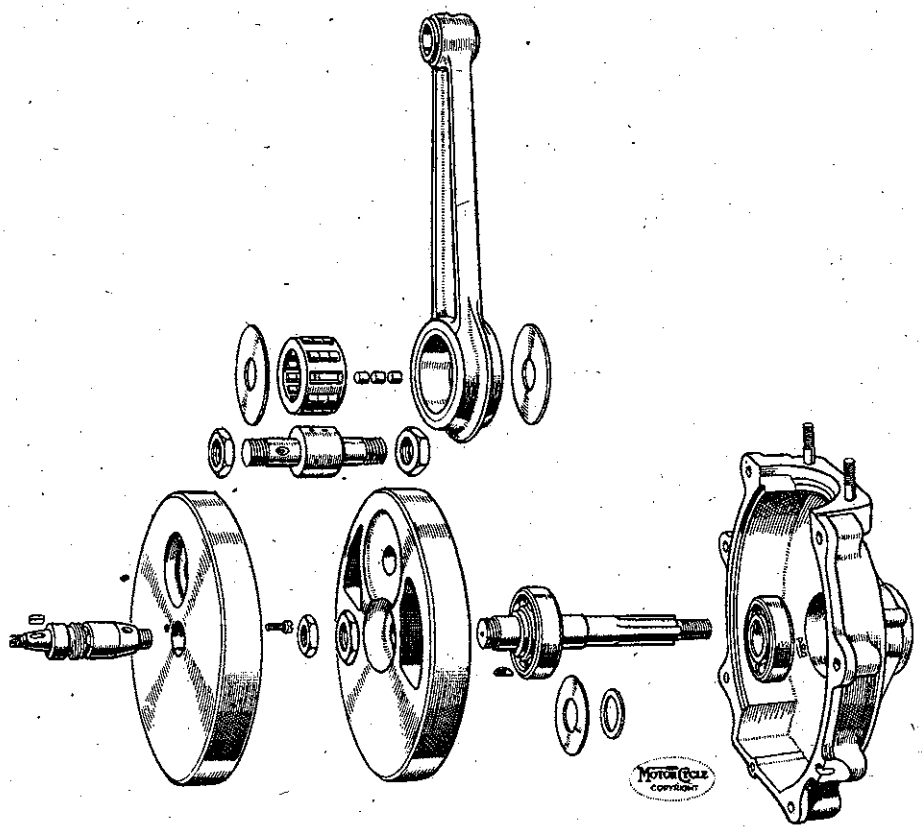


Illustration 9

An exploded drawing of the Connecting Rod and Flywheel Assemblies.

40 TO DISMANTLE THE FLYWHEELS.

A puller, as illustration 10, should be used.

The crankpin has parallel shanks which are a tight fit in the flywheels.

Remove both crankpin nuts and then extract crankpin, in turn, from each flywheel.

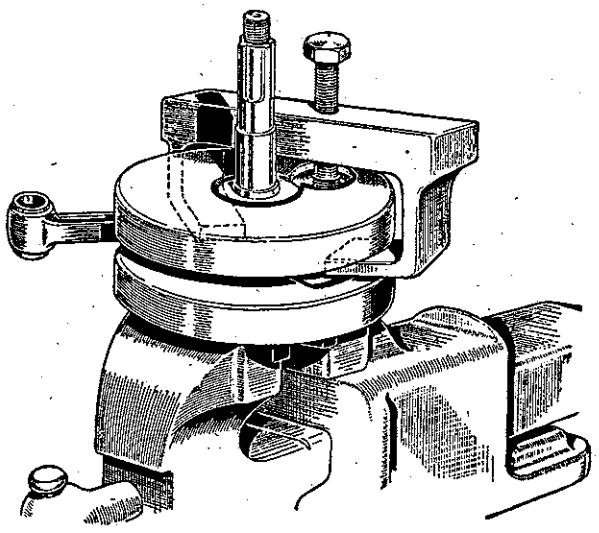


Illustration 10

(By courtesy of "Motor Cycling")

41 TO ASSEMBLE FLYWHEELS.

Fit crankpin into timing side flywheel by:—

Place a thrust washer on the crankpin shank.

Introduce crankpin in flywheel so that the oil hole in the crankpin will register with the oil hole in the flywheel. (It is through those holes that all the oil pumped to the big-end bearing passes.)

Press the crankpin fully home and proceed to assemble the connecting rod and big-end bearing. (The connecting rod is symmetrical and not "handed.")

Fit the driving side flywheel by:—

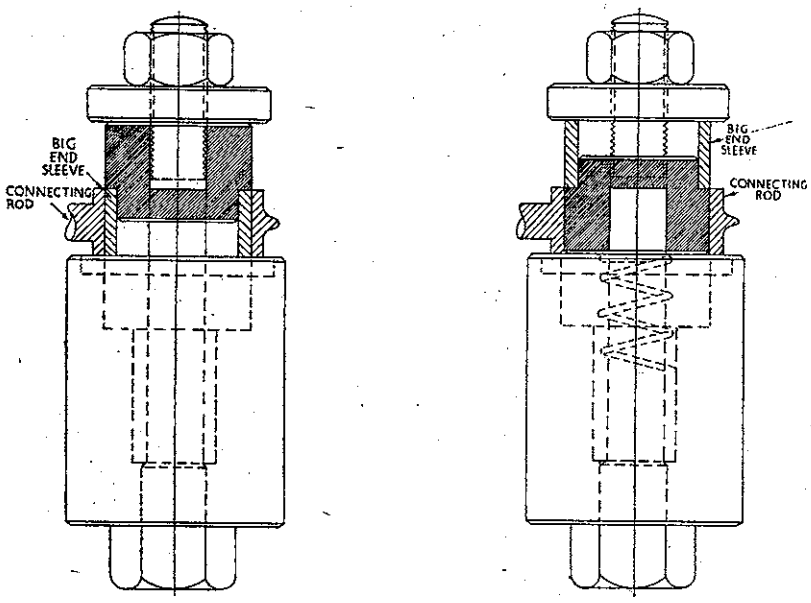
Place the second thrust washer on the crankpin shank.

Introduce the flywheel on the crankpin and line up both flywheels as accurately as possible when using a straight edge laid across the edges of the flywheels and then lightly tighten both crankpin nuts.

True the flywheels to within ·001 inch and, finally, evenly and firmly, tighten down each crankpin nut.

The final truing (to within ·001 inch) can best be done between lathe centres or suitable "V" blocks, with the aid of a pointer gauge or clock.

When both crankpin nuts are fully tightened the connecting rod should move freely. If it does not the cause must be investigated.



Removing Liner **Fitting Liner**

Illustration 11

Big-end Liner Tool

42 FITTING NEW LINER TO CONNECTING ROD BIG-END.

To remove the old liner, and to fit the new, a tool as illustration 11 is desirable, the application of which will be obvious.

Fitting the hardened steel liner, which is a press-in fit in the connecting rod, usually causes a slight contraction of the bore and, as this contraction varies slightly on different rods, it is not possible to provide liners which can be guaranteed to assume the exact correct bore upon fitting.

Therefore, before attempting to reassemble a newly lined connecting rod, the crankpin assembly should first be offered up. If, when doing so, it is found impossible to introduce the rollers, or if, when fitted, the assembly is stiff to rotate, it is then necessary to correct the bore diameter by a hand lapping process.

This is quite easily done by using an expanding lap, as shown in illustration 12. A mixture of fine emery and paraffin is used as an abrasive, all traces of which must be carefully washed off in petrol before final assembly.

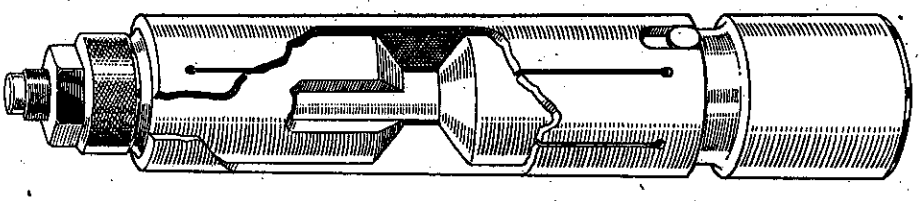


Illustration 12

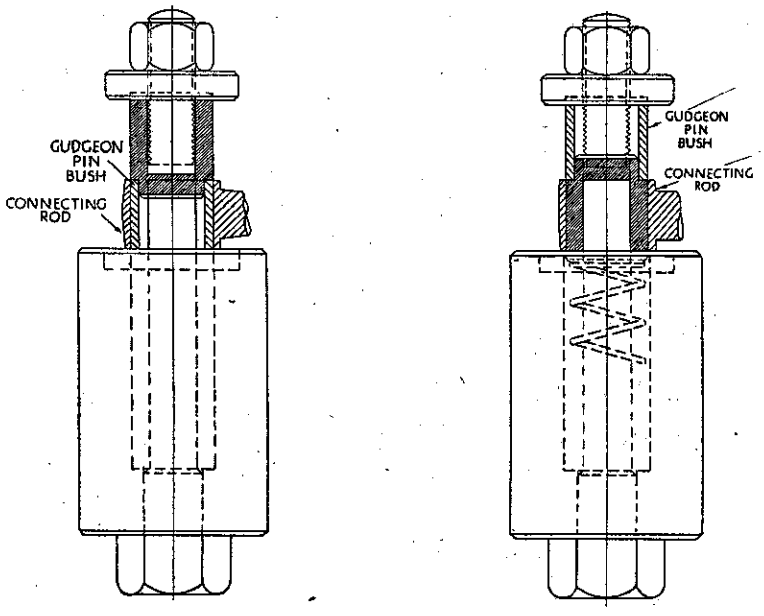
Lapping Tool

43 FITTING NEW SMALL-END BUSH (GUDGEON PIN BUSH).

To remove the old bush, and to fit the new, a tool as illustration 13 is desirable.

The new bush will contract in the bore, a trifle, in the fitting process and, although allowance is made for this, it is not possible to guarantee accuracy. Therefore, always check the fit of the gudgeon pin after inserting a new bush and, if too tight, ream the bore with a straight flute reamer $\frac{7}{8}$ inch diameter, which, if in good condition, will provide the correct fit.

See " DATA," page 7.



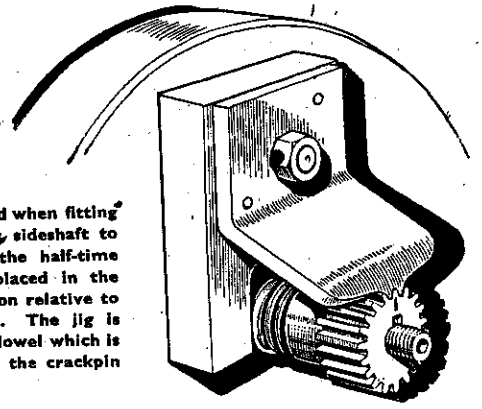
Removing Bush **Fitting Bush**

Illustration 13

Gudgeon Pin Bush Fitting Tool

44 FITTING NEW TIMING SIDE FLYWHEEL AXLE.

The timing side flywheel axle is not keyed to the flywheel and, in order to ensure correct valve timing and oil passage register, it is necessary to fit the shaft in the flywheel in such a position that the mark on the small timing pinion is exactly in line with the centre of the crankpin. To ensure this, a special jig, as illustration 14, should be used. (The nut, retaining the axle in the flywheel, is locked by a screw.)



This jig is used when fitting a new timing sideshaft to ensure that the half-time pinion is replaced in the correct position relative to the crankpin. The jig is located by a dowel which is a close fit in the crackpin hole.

Illustration 14

(By courtesy of "Motor Cycling")

45 FITTING NEW TIMING SIDE FLYWHEEL AXLE PLAIN BUSH.

The timing side main bearing consists of a plain bearing plus a roller bearing. See Illustration 3.

The old timing side flywheel axle plain bush should be removed from the crankcase in an arbor press and the new bush should be fitted with the same tool.

If a press is not available the old bush may be driven out of position by using a double diameter drift. The drift pilot should be ·870 inch diameter and the main part $\frac{15}{16}$ inch diameter and the crankcase should be supported on a tube $1\frac{1}{2}$ inches outside diameter, $1\frac{1}{4}$ inches internal diameter and 1 inch long, placed inside the timing chest around the main bearing bore.

The same drift may be used to press the new bush into position and it should be positioned so that the inside edge of the bush is flush with the inside face of the crankcase.

The internal diameter of the new bush, when fitted, should be $\frac{7}{8}$ inch ± ·0005 inch.

46 TIMING SIDE ROLLER BEARING.

The rollers of the timing side roller bearing are spaced in a cage and bear on the timing side flywheel axle and the inside of a hardened steel ring which is pressed into the timing side crankcase.

To remove the hardened steel ring, the crankcase should be heated (when heat is applied to facilitate removal the utmost care must be taken) and an expanding extractor used to withdraw the ring, although, if the crankcase is correctly, and sufficiently, heated, the ring will generally release itself upon inverting the crankcase on the bench and tapping it with a soft-faced mallet.

A new ring, chamfered end first, should be pressed into the crankcase by an arbor press.

47 DRIVING SIDE BALL BEARINGS.

The driving side main bearings are two ball bearings (identical) spaced by a distance washer and collar. They may be removed with a plain drift $1\frac{1}{4}$ inches diameter and the inside of the crankcase should be supported on a tube $2\frac{7}{16}$ inches outside diameter, not less than $2\frac{5}{16}$ inches inside diameter and $1\frac{3}{4}$ inches long.

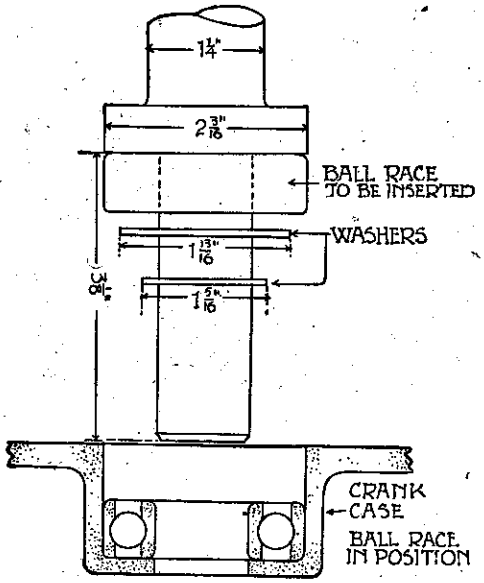


Illustration 15

The approved system of mounting the inner drive side main bearing on a pilot drift prior to pressing the bearing into the case. It is essential that the washers shown be assembled in the positions illustrated.

(By courtesy of "Motor Cycling")

New bearings may be fitted by a pilot drift, as illustration 15. The pilot must be 1 inch in diameter by $3\frac{1}{8}$ inches long, and the shoulder, for pressing the bearings home, should be $2\frac{1}{4}$ inches minus ·01 inch. The spacing collar and washer should be positioned, as illustration 15, and, if the bearings are a very tight fit, the crankcase may be heated.

If heat is applied to facilitate fitting the utmost care must be taken.

48 CAMSHAFT BUSHES.

All four camshaft bushes can be removed in an arbor press, or knocked out, with a double diameter drift. The pilot should be ·495 inch diameter by $\frac{1}{2}$ inch long, and the handle, or main drift, $\frac{9}{16}$ inch diameter by 4 inches long.

The bush in the timing gear cover, for the exhaust camshaft, has a steel cap, or disc, on the outside. This is pressed into the timing gear cover and can be removed, from the inside, by a $\frac{7}{16}$ inch diameter drift. When this is replaced, after the bushes have been reamered, use some liquid jointing compound round its edge.

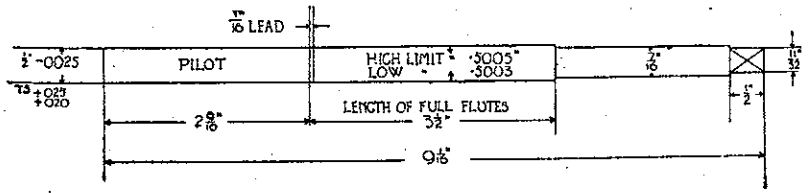


Illustration 16

(By courtesy of "Motor Cycling")

For reamering the bushes a pilot reamer, as illustration 16, should be used, in order to ensure correct alignment. When reamering the bushes the timing gear cover should be firmly screwed to the timing side crankcase.

Note which way the bush, in the timing gear cover, for the inlet camshaft, is fitted because it has an internal worm thread designed to sling oil back into the timing gear chest.

The actual internal diameter of the camshaft bushes is ½ inch ± ·0005 inch.

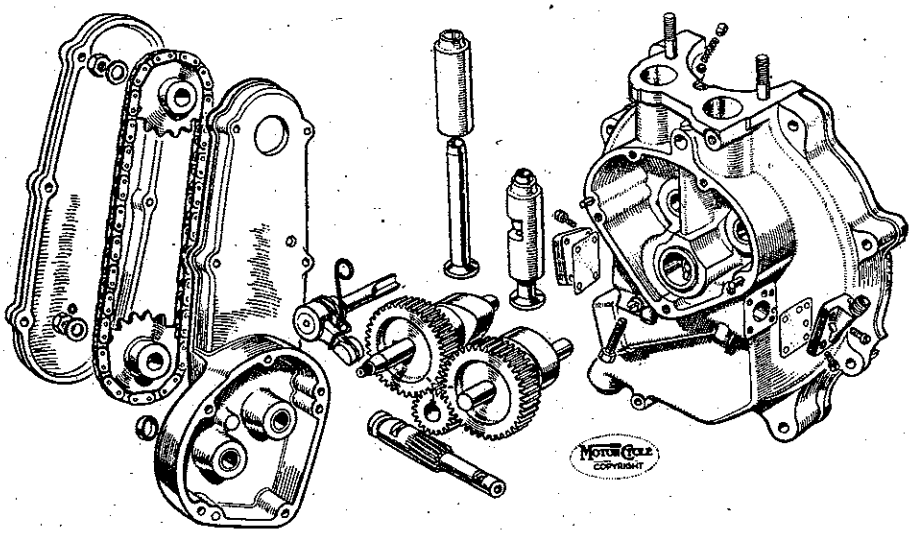


Illustration 17

Exploded drawing of timing gear, valve actuating mechanism, and magneto drive. It also shows the oil pump parts, valve lifter parts and timing side crankcase.

49 TIMING GEAR CAMSHAFTS.

The Inlet camshaft is assembled from three parts, the cam wheel, the shaft and a key. The key locates the cam wheel on the shaft.

The Exhaust camshaft is assembled from two parts, the cam wheel and the shaft.

On both Inlet and Exhaust camshafts the cam is integral with the toothed cam wheel, and the part described in this Manual, and in the Spares List, as a "camshaft" means the entire cam wheel, cam and shaft, assembled.

Assembly is done in an arbor press and the cam wheel is a very tight fit on its shaft.

The component parts are not listed as separate spares. When any replacement is needed it is invariably better to fit a new assembly. These are listed in the Spares List. (Inlet camshaft, Part Number D8–E2932 and Exhaust camshaft, Part Number D8–E2931.) (See third para. above.)

If only a new cam wheel, or shaft, is required it is better to send the complete camshaft to the factory for the new component to be fitted there.

If the fitting is done " In the Field," the cam wheel should be placed on the shaft so that the distance from the inside end of the shaft to the inside face of the cam wheel is $\frac{9}{16}$ inch.

50 CAM CONTOUR.

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

Therefore, it is necessary to ensure the tappet ends are on the base circles when checking valve clearances and valve timing. It is for this reason valve clearances must be checked when the piston is at the top of its compression stroke, at which position both tappets are well clear of the quietening curves.

51 VALVE TIMING.

The Inlet valve opens 20° before top dead centre.
The Inlet valve closes 67° after bottom dead centre.
The Exhaust valve opens 78° before bottom dead centre.
The Exhaust valve closes 28° after top dead centre.

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

The timing gears are marked to facilitate their replacement.

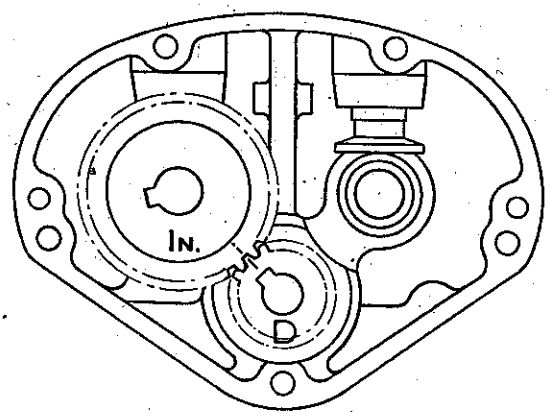


Illustration 18

To re-set the timing gears, by using the marks on the gears, proceed as follows :—

Turn over the engine till the mark on the small timing pinion (D in illustration 18) is in line with the centre of the inlet (rear) camshaft bush. Insert the inlet camshaft so that the mark on it is in mesh with the mark on the small timing pinion (D).

Rotate the engine in a **forward** direction till the mark on the small timing pinion (D) is in line with the centre of the exhaust (front) camshaft bush. Illustration 19. Insert the exhaust camshaft so that the mark on it is in mesh with the mark on the small timing pinion (D).

NOTE :—The exhaust camshaft is that fitted with the shorter centre shaft. The inlet camshaft has the longer centre shaft, with a tapered end, to carry the magneto chain sprocket.

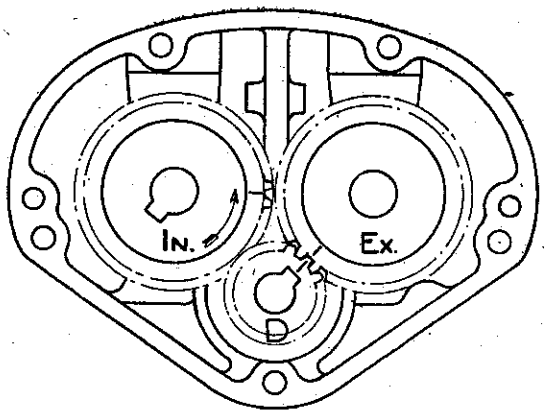


Illustration 19

52 TAPPET ADJUSTMENT.

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

The correct tappet clearances, with valves closed and engine cold, is NIL. This means the push rods should be free enough to revolve and, at the same time, there should be no appreciable up and down play.

To adjust tappet clearances :—

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

Take away cover.

Turn over engine till exhaust valve is lifted.

Slacken nut on exhaust push rod.
(" B " in illustration 20.)

Turn over engine till inlet valve is lifted.

Slacken nut on inlet push rod.
(" B " in illustration 20.)

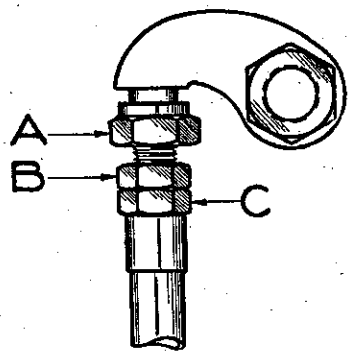


Illustration 20

Screw out, or in, the exhaust tappet adjusting screw till tappet clearance is nil. (" A " in illustration 20.)

Turn over engine till exhaust valve is lifted.

Tighten lock nut on exhaust push rod. (" B " in illustration 20.)

Screw out, or in, the inlet tappet adjusting screw till tappet clearance is nil. (" A " in illustration 20.)

Turn over engine till inlet valve is lifted.

Tighten lock nut on inlet push rod. (" B " in illustration 20.)

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

NOTE :—The part marked " C " in illustration 20 is the top end of the long push rod. It is threaded and the adjusting screw " A " screws into it.

Replace tappet cover, fibre washers and retaining nuts.

In normal conditions tappet adjustment should not be necessary more frequently than about every five thousand miles or after decarbonising and grinding valves.

If adjustment is found necesssary more frequently the cause should be investigated at once.

In no circumstances should the valve end hardened thimbles be omitted. These thimbles, or caps, are provided to prevent wear of the valve stem ends and, although it is possible to lengthen the push rods sufficiently to take up the clearance resulting from the omission of the caps, the effect of this would be to bring the edge of the adjusting cup " A," at the top of its travel, dangerously close to the oil lug on the rocker box. (See Para. 24.)

53 OVERHEAD VALVE ROCKERS.

Each overhead rocker assembly is built up with an axle, sleeve, two arms, two washers and two nuts.

The axle fits inside the sleeve.

The sleeve acts as a spacer for the two arms and also as the journal for the assembly.

The rocker axle does not oscillate inside the sleeve which is tightly gripped between the two arms because of the tightening of the end nuts on the axle.

The bearing for each overhead rocker assembly is two bushes which are a tight fit in the rocker box. Between each pair of bushes is a space filled with a felt ring which acts as an oil distributor.

Each right-hand bush should be fitted so that there is no appreciable end play on the rocker assembly and, when end play develops as the result of wear, it may be taken up by driving the left-hand bush further from the right-hand bush.

Rocker bushes should be removed and refitted in an arbor press.

An old bush can be removed with a double diameter drift. The pilot end ·490 inch diameter by $\frac{3}{4}$ inch long, and the driving end $\frac{9}{16}$ inch diameter by 4 inches long.

New bushes can be fitted with the same drift. Fit the left-hand bush first, then introduce the felt ring and, finally, fit the right-hand bush.

After fitting, the bushes should be reamered to $\frac{5}{8}$ inch $\pm$ ·0005 inch.

Upon assembly, it is occasionally difficult to push the rocker sleeve through the felt ring that is between the two bushes. In such a contingency, a taper mandril will expand the ring outwards, into place, and, if the mandril is followed through with the sleeve, no trouble should be experienced.

The push rod end rocker arms are interchangeable with each other but not with the valve stem rocker arms, and vice versa.

Assemble an overhead rocker assembly by :—

Take the axle and place on it the tappet end rocker arm.

Against the arm place a plain steel washer and then a nut.

Screw on the nut several turns.

Pass the sleeve into the two bushes.

Pass the rocker axle into the sleeve and, as the threaded end commences to emerge from the left-hand rocker bush, place on it the valve end rocker arm, taking care to engage it so that the two arms are spaced at 180° to each other.

Place a plain steel washer next to the arm and follow with a nut which should be fully tightened.

Finally, fully tighten the nut retaining the tappet end rocker arm.

Test the assembly for end play. It should just rock in the bushes without binding and without appreciable end play. If necessary, move left-hand bush, as required. (See sixth para. above.)

To dissemble an overhead rocker assembly :—

Reverse above procedure.

NOTE: It is essential to remove the rocker box from the engine before removing an overhead rocker assembly. (See Para. 24.)

54 TO RE-TIME THE IGNITION.

The maximum advance is $\frac{3}{8}$ inch.

Have available a stout screwdriver, or an old type tyre lever with turned up end, and a bar of metal about $\frac{1}{4}$ inch diameter and $5\frac{1}{2}$ inches long.

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

Check contact breaker points by :—

Remove contact breaker cover.

Check setting of contact breaker points, and, if necessary, adjust same. (See Para. 114.)

Set ignition firing point by :—

Remove :—The sparking plug high tension cable from plug.
The sparking plug
The magneto chain case cover.
The rocker box tappet side cover.

Unscrew, several turns, nut retaining magneto sprocket to inlet camshaft. (No need to remove nut.)

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

Turn over engine till both valves are closed.

Insert rod through sparking plug hole, feel piston till, by partially rotating engine, forwards or backwards, it is felt the piston is at the top of its stroke.

Mark rod flush with top face of sparking plug hole.

Remove rod and measure $\frac{3}{8}$ inch above the flush mark and record position on rod.

Place handlebar ignition control lever in fully advanced position.

Replace rod in sparking plug hole.

Slightly rotate engine BACKWARDS until upper mark on rod is flush with top face of sparking plug hole.

Rotate sprocket on magneto armature shaft, in anti-clockwise direction (as seen from sprocket end of magneto), till the contact breaker points are just about to separate.

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

Re-check the setting.

Replace :—Rocker box tappet cover.
Contact breaker cover.
Magneto chain case cover.
Sparking plug.
Sparking plug wire.

NOTE :—To find the exact moment for the commencement of the point separation, place a piece of tissue paper between the points and turn the magneto armature shaft (by the sprocket on it) until the paper is just released, and no more, upon a gentle pull.

55 OVERSIZE PARTS AND RE-BORING CYLINDER BARREL.

Pistons and rings, ·020 inch larger than standard, are available. This degree of oversize is such that it is essential for the cylinder barrel to be re-bored to accommodate it. (See " Data," page 7.)

The cylinder barrel standard bore is 2·7187 ± ·0005 inches. When the wear at the top of the barrel reaches ·008 inch the barrel should be bored out ·020 inch oversize and a new oversize piston and rings fitted.

NOTES

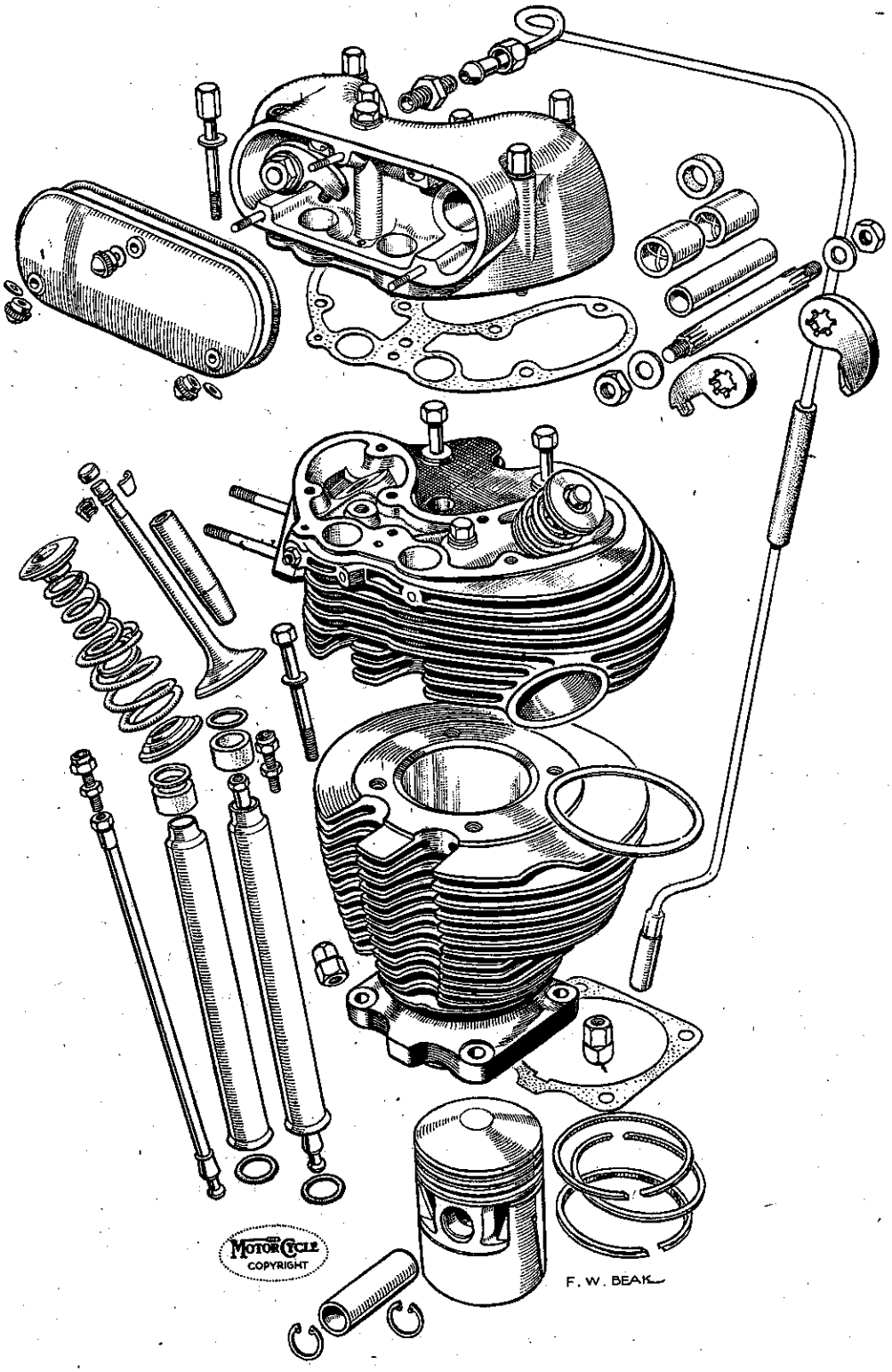


Illustration 21

Exploded Drawing of Cylinder, Piston, Cylinder Head, Valves, Rocker Box and Rocker Gear.

TRANSMISSION SERVICE INFORMATION

56 THE GEARBOX.

The gearbox fitted to the G3L Matchless is a type C.P. Burman. This provides four forward gears and has a positive foot gear change, operated by the right foot, and a kick-starter.

It is retained to the main 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 gearbox top lug and the rear plates, which are slotted, thereby allowing a swinging fore and aft movement of the gearbox to enable the front driving chain to be adjusted. That movement is controlled by a bolt that has an eye encircling the gearbox top fixing bolt and which passes through an eye block secured to the right-hand side engine rear plate.

57 TRANSMISSION OF POWER THROUGH GEARS.

A is the Clutch Assembly.
B is the Main Gear Wheel.
C is the Mainshaft Sliding Gear. (It has a pinion each end.)
D is the Mainshaft Third Gear.
E is the Layshaft Small Gear.
F is the Layshaft Second Gear.
G is the Layshaft First Gear
H is the Layshaft Third Gear.
J is the Final Drive Sprocket.
K is the Kick-starter Crank.
L is the Kick-starter Axle.
M is the Kick-starter Quadrant.
N is the Kick-starter Ratchet Pinion.
O is the Kick-starter Ratchet Driver.
P is the Kick-starter Return Spring.
Q is the Kick-starter Stop.
R is the Clutch Operating Lever.
S is the Clutch Thrust Rod.
T is the Gearbox Mainshaft.
V is the Layshaft.
W is the Layshaft Sliding Clutch.

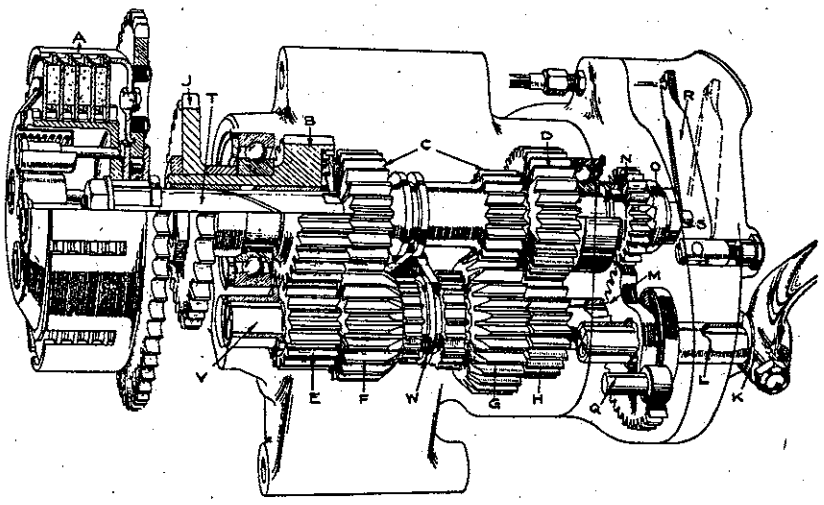


Illustration 22

The transmission of power, or drive, through the gears may easily be traced on illustration 22, as follows :—

First, or lowest, gear.

Sliding gear (C) on mainshaft is in mid-way position, i.e. disengaged from gears B and D.

Layshaft sliding clutch (W) moves to right and engages with gear G.

Power passes through clutch A, to mainshaft T, to mainshaft sliding gear C, to layshaft gear G, to layshaft clutch W, to layshaft V, to layshaft gear E, to main gear B, to chain sprocket J.

Second gear.

Sliding gear (C) on mainshaft is in mid-way position, i.e. disengaged from gears B and D.

Layshaft sliding clutch (W) moves to left and engages with gear F.

Power passes through clutch A, to mainshaft T, to mainshaft sliding gear C, to layshaft gear F, to layshaft clutch W, to layshaft V, to layshaft gear E, to main gear B, to chain sprocket J.

Third gear.

Sliding clutch (W) on layshaft is in mid-way position, i.e. disengaged from gears F and G.

Mainshaft sliding gear (C) moves to right and engages with gear D.

Power passes through clutch A, to mainshaft T, to mainshaft sliding gear C, to mainshaft gear D, to layshaft gear H, to layshaft V, to layshaft gear E, to main gear B, to chain sprocket J.

Fourth gear, or "top."

Sliding clutch (W) on layshaft is in mid-way position, i.e. disengaged from gears F and G.

Mainshaft sliding gear (C) moves to left and engages with main gear B.

Power passes through clutch A, to mainshaft T, to mainshaft sliding gear C, to main gear B, to chain sprocket J.

58 TO REMOVE THE GEARBOX.

Remove :—

The exhaust pipe and silencer. (See Para. 26.)
The clutch control cable. (See Para. 37.)
The front chaincase. (See Para. 38.)
The rear chain.
The top bolt fixing gearbox.
The bottom bolt fixing gearbox.

Gearbox is now free to be taken away.

NOTE :—It may be necessary to slacken the nuts on the bolt retaining the rear of the engine rear plates to the seat tube bottom lug and the nuts on the bolts passing through the rear of the crankcase and the engine plates to enable the gearbox to be extracted from between the engine plates.

Refitting is carried out in exactly the reverse order.

When refitting the front chaincase follow the instructions given in Para. 76.

59 TO REMOVE CLUTCH ONLY.

Follow instructions given in Para. 38.

60 TO OBTAIN ACCESS TO CLUTCH PLATES AND SPRINGS.

To obtain access to the clutch plates and springs, for inspection, adjustment or replacement, follow the instructions given in Para. 38.

61 THE CLUTCH.

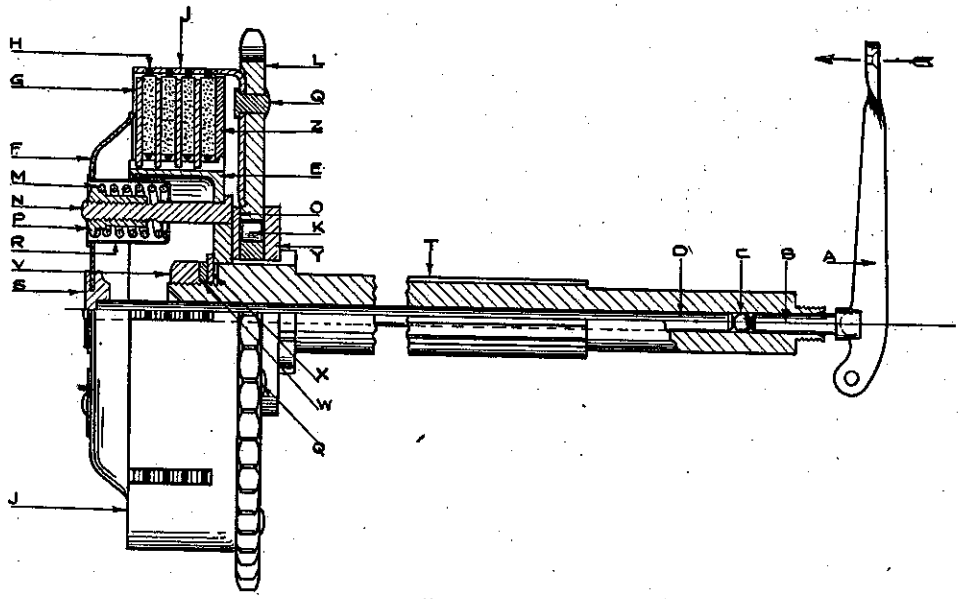


Illustration 23

Showing Clutch, Gear Box Mainshaft and Clutch Operating Mechanism.

Clutch operating lever A is moved in direction of arrow to disengage the clutch.

Operation of clutch handlebar lever moves lever A in direction of arrow and causes it to press against operating plunger B, which, in turn, presses against steel ball C, against the clutch thrust rod D which pushes against the clutch spring pressure plate F.

This action compresses the clutch springs M so that their pressure is released from compressing the clutch plain plates G and the clutch friction plates H, thereby allowing the engine to drive the clutch sprocket L without imparting power, and motion, to the mainshaft T.

Consequently no power is transmitted to the rear wheel and the clutch is said to be " out " or free.

On allowing the clutch handlebar lever to return to its normal position the clutch operating lever becomes " free " and the clutch spring pressure causes the clutch thrust rod D, the steel ball C and the operating plunger B to move to the right.

The whole of the clutch spring pressure is thereby transferred to the clutch spring pressure plate F and this forces the steel plates G tightly against the clutch friction plates H so that power, transmitted by the engine to clutch sprocket L, is transferred through clutch case J, to friction plates H, to steel plates G, to clutch centre E which causes the gearbox mainshaft T to revolve.

62 CLUTCH SPRING ADJUSTMENT.

If clutch slip is experienced the most probable cause is incorrect cable adjustment. (See Para. 64.)

If the clutch cable adjustment is found to be correct, i.e. there is the clearance mentioned in Para. 63, the clutch spring adjusting nuts should be adjusted. (Obtain access to these by following the instructions given in Para. 38.)

Adjust clutch spring adjusting nuts by :—

Obtain access, as detailed in Para. 38.

Screw home one-half of a complete turn each clutch spring adjusting nut.

Test machine for clutch slip.

If necessary, repeat, by screwing home a further half-turn but be careful to adjust each of the nuts a similar amount.

The standard setting of the clutch spring adjusting nuts is obtained by fully tightening all four nuts and then unscrewing each exactly four complete turns.

If, to remedy clutch slip, it is necessary to screw nearly home the four nuts this is a clear indication that, either the clutch springs have lost their strength, and/or, the fabric inserts in the clutch friction plates have worn so that they are past further useful service. Replace with new.

63 CLUTCH ADJUSTMENT.

Minor adjustment of the clutch operating mechanism is obtained by screwing, in or out, the clutch cable adjuster located in the back of the kick-starter case.

Major adjustment of the clutch operating mechanism is obtained by altering the position of the fulcrum pin of the operating lever in the kick-starter case. (Lever A in illustration 23 and 175–X–4 in illustration 24.)

This adjustment is explained below.
175–X–4 is the gearbox clutch operating lever, and 66–X–7 is the pin on which it hinges.

329–X is the operating lever fork and this slides in the kick-starter case cover, its position being determined by the sleeve nut 331–X.

Cap 328–X is secured to the outside of the kick-starter case cover, being fixed by the two screws 333–X and acts as a locking device for the sleeve nut 331–X.

The external stop spring clip, 347–X (not shown in illustration 24), fits under the sleeve nut 331–X, between the outside of the kick-starter case cover and the cap 328–X.

Operating fork 330–X is marked B in illustration 23, and the steel ball 67–X is marked C in the same illustration.

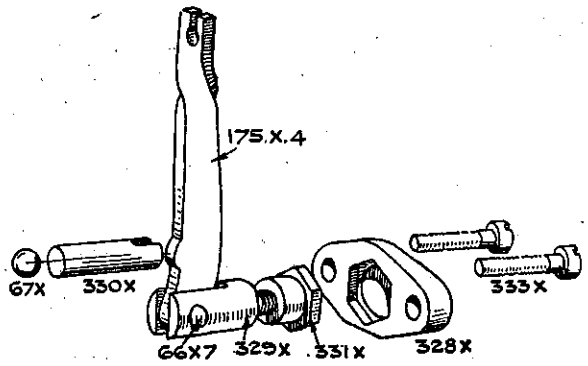


Illustration 24

It is essential that there is about $\frac{1}{32}$ inch clearance between the operating fork 330–X and the nose on operating lever 175–X–4 when the clutch is in the engaged, or driving position.

It will be appreciated that, as the result of wear on the fabric inserts in the clutch friction plates, the plates will tend to close up towards each other. This increases the effective length of the clutch thrust rod. On the other hand, the clutch control inner wire tends to stretch in use. These two actions will neutralise each other but the fact remains that, from time to time, it is necessary to adjust the rod clearance and also take up cable stretch.

Clutch slip caused by the clutch thrust rod permanently bearing on the spring pressure plate will rapidly ruin the fabric inserts and thrust rod. In addition, the heat generated by this may be so intense that the hardening of the clutch springs and the two ends of the thrust rod may be adversely affected.

Therefore, the importance of correct adjustment, and inspection of same to see the adjustment is maintained, must be stressed.

Major adjustment of the clutch operating mechanism is obtained by :—

Remove the two screws (333–X). (See illustration 24.)

Take away the cap (328–X).

Adjust the sleeve nut (331–X) as may be required, as follows :—

To increase clearance between clutch operating lever 175–X–4 and operating plunger 329–X, turn sleeve nut in a right-hand, or clockwise, direction.

To decrease clearance between clutch operating lever 175–X–4 and operating plunger 329–X, turn sleeve nut in a left-hand, or anti-clockwise, direction.

One or two turns should be ample.

Replace cap and screws.

64 CLUTCH CABLE ADJUSTMENT.

Minor adjustment of the clutch operating mechanism is obtained by :—

Slacken nut on the cable adjuster screwed into the back of the kick-starter case.

To decrease the effective length of the clutch control cable, i.e. to take up play between the control and the clutch thrust rod, unscrew the cable adjuster from the kick-starter case. A few turns should be ample.

To provide for a greater amount of play, screw the cable adjuster into the kick-starter case

Tighten lock nut on cable adjuster.

NOTE :—The amount of play, or free movement, can easily be discovered by virtue of the greatly increased resistance of the handlebar clutch control lever as the de-clutching action commences.

65 ACCESS TO CLUTCH CABLE (GEARBOX END).

Access to the gearbox end of the clutch control inner wire is obtained by removing the slotted head screwed cap mounted in the top edge of the kick-starter case cover.

66 GEARBOX CAMSHAFT AND FORKS.

Two forks slide on the camshaft. The smaller (C) engages with the sliding gear on the gearbox mainshaft. The larger (D) engages with the sliding clutch on the gearbox layshaft. (Illustration 25.)

A peg (B) passes through each fork and engages in a profiled groove cut in the camshaft. A split pin, passing through each peg and the fork, retains each peg in position.

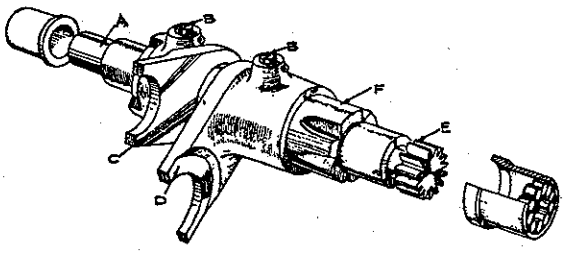


Illustration 25

The forks cannot move in an up and down direction (in virtue of their fork-like construction) but are free to slide endways on the camshaft. The sliding movements are controlled by the pegs operating in the grooves and the partial rotation of the camshaft, thereby providing the various gears described in Para. 57.

The rotation of the camshaft is made by the small pinion (E) (which is an integral part of the camshaft) and this engages with the toothed sector forming a part of the foot controlled gear change mechanism.

Notches (F) are cut in the camshaft to accommodate a spring loaded pawl, the function of which is positively to lock the shaft in any of the desired gear positions and thereby prevent the shaft from moving, on its own account, under the influence of vibration or other outside causes.

A tooth of the small pinion (E) is marked for correct assembly. One of the tooth gaps in the engaging sector is similarly marked. (See Para. 68.)

NOTE :—On gearboxes numbered 70975, upwards, the rollers on the right-hand bearing of the camshaft are discarded, a plain bush being used in lieu.

Provided the roller bearing is retained, the later type camshaft 45-C-3 can be used in place of the earlier type 45-C-2. The bushes are not interchangeable.

67 KICK-STARTER OPERATION.

(See illustration 22.)

When the kick-starter crank K is depressed the toothed quadrant M engages with the ratchet pinion N. This is clutched, by ratchet teeth, to the ratchet driver O, which, in turn, is fixed to the gearbox mainshaft T.

When the kick-starter crank is released, it returns to its normal upright position under the influence of the return spring. (This spring is shown, in illustration 22, coiled round the kick-starter axle and adjacent to the toothed quadrant.)

When the kick-starter crank is in its normal upright position the back edge of the toothed quadrant is in contact with the rubber cushioned stop pin Q, and the engaging side of the toothed quadrant is quite clear of the ratchet pinion so that, when the gearbox mainshaft is revolving, the ratchet pinion revolves with it.

Therefore, if the kick-starter crank is depressed while the engine is running, the ratchet pinion will be held stationary by reason of its engagement with the toothed quadrant. In no circumstances should this be allowed for any length of time because the design of the ratchet pinion bearing, and its lubrication, will not permit constant engagement but will cause seizure of the pinion, and/or, its bush, so causing extensive damage.

Consequently, if the kick-starter crank permanently drops downwards (denoting a broken return spring), or swings to the rear when the motor cycle is in motion (denoting a weak return spring, or a spring that has not been wound up enough, see Para. 68), early action should be taken to remedy the fault. In the meantime, care should be taken to ensure the kick-starter crank is pushed back, by hand, to its normal upright position and is held in that position by the external spring clip that is secured to the kick-starter case cover.

68 TO DISMANTLE AND RE-ASSEMBLE THE GEARBOX (WHEN IN POSITION IN THE FRAME).

Remove :—

The footrests. (See Para. 37.)

The exhaust pipe and silencer. (See Para. 37.)

The front chaincase and clutch. (See Para. 38.)

The nut locking the gearbox small sprocket, by engaging top gear, applying the rear brake and unscrewing the nut. (The lock washer tabs should be turned down before moving nut.)

The rear chain.

The clutch cable inner wire from the operating lever. (See Para. 37.)

The kick-starter crank and pedal pin.

The gear indicating moving finger.

The gear change foot pedal.

The nuts retaining the kick-starter case cover to the kick-starter case.

Pull away the kick-starter case cover which will come away with the gear change mechanism and the kick-starter quadrant, axle and spring. (If it is desired to dissemble those mechanisms the methods will be obvious.)

Remove :—

The clutch operating lever.

The steel ball between the operating plunger and the clutch thrust rod with the clutch thrust rod by pushing it from left to right. (The rod lies inside the gearbox mainshaft.) (Do not lose the steel ball.)

The clutch cable, with adjuster, by unscrewing the adjuster from the kick-starter case.

The four nuts retaining the kick-starter case to the gearbox shell.

The kick-starter case is then free for withdrawal from the gearbox shell and, while doing so, the twelve rollers on the right-hand side of the camshaft will fall away. (On gearboxes numbered 70975 upwards, the rollers have been discarded and a plain bearing is used in lieu. See Para. 66.)

Remove screwed plug (the one with screwdriver slit head) from bottom of gearbox shell and take away the spring from behind it. (This spring operates on the pawl that engages with the grooves cut on the camshaft and it is essential it is removed before attempting to remove any of the gearbox gears and shafts.)

The whole of the gearbox gears (except the main gear), the layshaft and the camshaft, may now be withdrawn.

The gear box mainshaft may be withdrawn from the clutch end of the gearbox.

Pull away the gearbox small sprocket. (It is a splined fit on the main gear.)

Remove the washer and spacing collar under the sprocket and then push the main gear into the interior of the gearbox shell, from which it can be taken away.

The main gear ball bearing is retained in the gearbox shell by a washer and a spring circlip and, upon removing the circlip, the bearing may be pushed out of position.

The mainshaft ball bearing, in the kick-starter case, is retained by a washer and spring circlip and, upon removing the circlip, the bearing may be pushed out of position.

The dismantling is now complete.

To re-assemble the gearbox :—

Replace in the gearbox shell the main gear ball bearing with its oil retaining washers and circlip.

Replace the main gear by passing it, from the interior of the gear box shell, through its ball bearing.

Replace on the main gear the spacing washer, spacing collar, gear box small sprocket, spacing washer, spacing collar, lock washer and nut. (Do not attempt to fully tighten nut.)

Push mainshaft through main gear.

Assemble gears on layshaft :—

Place sliding clutch on middle of layshaft.
Place a free pinion on each side of sliding clutch.
Place the small fixed pinion next to the small free pinion.
Place the large fixed pinion next to the large free pinion.

Hold layshaft assembly (above) in hand so that the small fixed pinion is to the left.

Take camshaft, so that its small pinion is to the right, engage the larger of the two sliding forks with the centre of the layshaft sliding clutch.

Hold mainshaft sliding gear, so that the larger end is to the left, lay alongside the layshaft assembly so that the smaller camshaft fork engages with its central groove.

Insert into gearbox shell the entire assembly of layshaft and gears and, while doing so, slide the mainshaft gear over the mainshaft. Push this assembly right home until the inner ends of the layshaft and the camshaft can be introduced in their respective bushes at the end of the shell.

Slide over the mainshaft the remaining large free pinion.

Replace pawl spring and its retaining screwed plug.

Place some thick grease round the exposed end of the camshaft and press into position the twelve camshaft bearing rollers. (On gearboxes numbered 70975 upwards, the rollers are discarded, a plain bearing being used in lieu.)

Fit the mainshaft ball bearing to the kick-starter case, with its washer and circlip.

Fit the kick-starter case to the gearbox shell, ensuring the camshaft bearing rollers enter the bush without displacing any and, when pushed fully home, replace the four retaining nuts and fully tighten them.

Fit the ratchet pinion bush (over the mainshaft), the ratchet pinion spring, the ratchet pinion (with ratchet teeth outwards), the ratchet pinion driver and the retaining nut, which must be fully tightened down against the ratchet driver.

Particular care must be exercised during the remaining operations, otherwise the gear change mechanism will not function correctly.

Turn the camshaft till the tooth marked " o " is in a 9 o'clock position.

Insert the gear change toothed sector so that the centre tooth gap marked " o " is in mesh with the marked tooth of the camshaft pinion.

From the left-hand side, push into the gearbox mainshaft the clutch rod leaving about two inches of it exposed.

From the right-hand side, push into the gearbox mainshaft the steel ball and follow this with the operating plunger so that its forked slot is almost vertical.

Take the spring box and ensure the four springs, with their end plates, are in position.

Lay the cover over the spring box and then place it on the operating quadrant. (This is the part on which the gear foot pedal fits.) Ensure the pin on the quadrant engages between the two smaller springs in the spring box.

Place the rocking pawl on its peg, so that it is the same way " round " as it was originally.

Take the spring box and quadrant assembly and fit it in the kick-starter case cover, ensuring the steel pin, on the cover, engages between the two larger springs in the spring box. Then, to make sure the assembly cannot move, fit the gear change foot pedal right home on its shaft. (The exact position of the pedal is immaterial because it can be re-set later.)

Place the return spring on the kick-starter crank spindle (make sure it is the right way " round "), insert the spindle in the kick-starter case cover, ensure the inner end of the return spring engages with one of the slots cut in the spindle boss, place the outer end of the return spring on its peg that is located inside the kick-starter case cover and fit the kick-starter crank to its spindle. (The exact position is immaterial because it can be re-set later.)

Using the kick-starter crank as a handle, wind up the kick-starter return spring two complete turns. **This is most important.** Then, holding the kick-starter crank, so that the spring cannot unwind, introduce the kick-starter case cover over its retaining studs, push the cover right home, replace the stud nuts and fully tighten them.

NOTE :—If the kick-starter case cover will not go completely home this may be due to one of two things.

Firstly :—The rocking pawl may not be engaged properly on its ratchet, in which case, work the gear change foot pedal up and down to locate the pawl.

Secondly :—The slot of the clutch operating plunger (330–X in illustration 24) has not engaged with the clutch operating lever (175–X–4), in which case, partly withdraw the kick-starter case cover and move the operating lever plunger as may be required.

Replace the clutch control cable.

Remove the gear change foot pedal and re-fix in the most suitable position.

Remove the kick-starter crank and re-fix it in its correct upright position.

Replace the gear indicating moving finger.

Place a full charge of lubricant in the gearbox (1¾ pints of C–600 oil). (See Para. 10.)

Replace the rear chain.

Tighten the gearbox sprocket retaining nut and turn up the tabs of its lock washer. (See Para. 69.)

Replace :—

The front chaincase and clutch. (See Para. 76.)

The exhaust pipe and silencer.

The footrests.

69 REMOVAL OF GEARBOX SPROCKET RETAINING NUT.

The nut retaining the gearbox sprocket has a right-hand thread and under it is a tab locking washer. The turned-up tabs must be straightened before the nut is moved. If the complete gearbox (including the gear shafts and pinions) is in position in the frame, the sprocket retaining nut may be removed by :—

Engage top gear.

Apply rear brake.

Unscrew nut.

If the gearbox is removed from the frame, and/or if the internal shafts and pinions are removed, and the nut has not previously been slackened by the method mentioned above, a " chain grip " is then required, as illustration 26.

A chain grip can be made from a bar of steel, about $\frac{1}{2}$ inch by $\frac{3}{4}$ inch in section. One end should be reduced to accommodate a piece of rear chain ($\frac{5}{8}$ inch by ·380 inch), and should be drilled to take a rivet of the chain.

The chain can be fitted to the bar by unrivetting one side plate, discarding the roller on the extreme end, passing the exposed chain rivet through the hole in the end of the bar, replacing the chain side plate and re-rivetting the two rivets so that the chain remains permanently on the bar.

To use the chain grip it is necessary to wrap the chain round the sprocket, prevent the bar from rotating with the sprocket and apply a suitable spanner to the nut. The same tool can be used to tighten the nut.

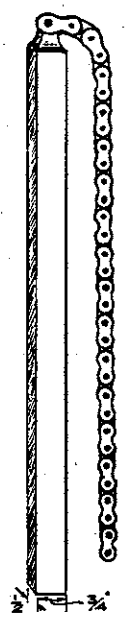


Illustration 26

70 FITTING NEW LAYSHAFT BUSHES.

Layshaft bushes are flanged and are a tight fit in the gearbox shell and the kick-starter case. The bush in the shell is blanked off by a steel cap. This must be removed before the bush is removed.

Remove steel cap with a soft drift passed through the bush from inside the shell.

Remove bushes with drift of type shown in illustration 15.

After fitting new layshaft bushes the bare layshaft should be fitted in the shell and the kick-starter case nutted down on its studs and the layshaft tested for sufficient end free movement. If this is insufficient (layshaft should be free to easily revolve) the face of the bush, or bushes, should be reduced, by machining, till the fit is correct.

71 FRONT CHAIN ADJUSTMENT.

See Para. 56 for details of gearbox attachment and movement for front chain adjustment.

Tighten the front chain by :—

Remove inspection cap from front chaincase. (See Para. 11.)

Slacken :—

Nut on right-hand of gearbox top fixing bolt.

Nut on right-hand of gearbox bottom fixing bolt.

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

Screw up rear nut on adjusting eye-bolt until, by testing through inspection cap opening in front chaincase, it is felt the front chain tension is correct. The chain whip should be about $\frac{3}{8}$ inch. (See final part of Para. 72.)

Check adjustment, in more than one position, by turning over the engine by means of the kick-starter crank.

Tighten down forward nut on adjusting eye-bolt.

Tighten nuts on gearbox top and bottom fixing bolts.

Re-check chain tension.

Replace chaincase inspection cap. (See Para. 11.)

72 REAR CHAIN ADJUSTMENT.

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

Tighten the rear chain by :—

Place machine on rear stand.

Slacken nuts on rear wheel spindle.

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

Screw, in turn, each chain adjusting bolt, further into the fork ends until the chain tension is correct. Each bolt must be turned the same amount. The chain whip should be $\frac{3}{8}$ inch to $\frac{1}{2}$ inch. (See final paragraph below.)

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

Tighten wheel spindle nuts.

Re-check chain tension.

Tighten nuts on chain adjusting bolts.

NOTE :—Before tightening the rear chain, check the front chain adjustment, and, if attention is necessary, adjust 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 it 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. (See Para. 88.)

When adjusting the rear chain care should be taken to leave the rear wheel in correct alignment. (See Para. 79.)

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.

73 DYNAMO CHAIN ADJUSTMENT.

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

Tighten dynamo chain by :—

Remove inspection cap from front chaincase. (See Para. 11.)

Slacken dynamo clamping strap bolt.

Apply spanner, RTK–1, to the flats cast on the dynamo end plate (left-hand side of dynamo) and rotate dynamo, in an anti-clockwise direction till, by passing a finger through the inspection cap opening, it can be felt the chain tension is correct.

The chain whip should be about $\frac{1}{4}$ inch. (See final part of Para. 72.) (Ensure, when feeling tension, the front driving chain is not confused with the dynamo chain.)

Tighten dynamo clamping strap bolt.

Re-check chain tension.

Replace chaincase inspection cap. (See Para. 11.)

74 MAGNETO CHAIN ADJUSTMENT.

The magneto platform hinges on its rear fixing bolt. This provides movement to enable the magneto driving chain to be adjusted.

Tighten magneto driving chain by :—

Remove magneto chain case cover.

Slacken :—Nut on right-hand of dynamo strap square crossbar.
Nut on left-hand of dynamo strap square crossbar.
Nut on right-hand of seat tube bottom lug bolt.

Insert under the front edge of the magneto platform a lever, such as a screwdriver, and lever upwards until the chain tension is correct. The chain whip should be about $\frac{1}{4}$ inch. (See final part of Para. 72.)

Tighten nuts on dynamo strap square crossbar.

Tighten nut on seat tube bottom lug bolt.

Re-check chain tension.

Place supply of grease on magneto chain.

Replace magneto chain case cover.

75 ENGINE SHOCK ABSORBER.

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

The engine sprocket is a free fit on the driving side flywheel axle. It has, integral with it, a face cam that engages with a similar face cam (shock absorber cam) which is keyed to the driving side flywheel axle by splines. A spring keeps the shock absorber cam in close engagement with the sprocket cam, 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, provided the level of the engine oil in the front chaincase is maintained according to the instructions given in Para. 11.

The shock absorber spring is retained by a cap washer and a sleeve lock nut. The sleeve nut must be fully tightened against the shoulder of the driving side flywheel axle.

The dynamo sprocket is integral with the engine sprocket.

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

76 TO RE-FIT THE FRONT CHAINCASE AND CLUTCH.

Fit the back half of the front chaincase by :—

Place on face of crankcase boss some liquid jointing compound.

Ensure the spacer (behind the chaincase and next to engine plate, $1\frac{81}{84}$ inches long) is in position on the centre fixing bolt.

Place in position rear half of front chaincase.

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

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

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

Fit spacer (inside chaincase, $\frac{7}{8}$ inch long) to the centre fixing bolt.

Fit nut to centre fixing bolt and fully tighten.

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

Ensure dynamo sprocket key is in position.

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

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

Hold the dynamo sprocket by applying spanner RTK–1 to the flats on the back of the sprocket and fully tighten the sprocket retaining nut. This holding relieves the dynamo shaft of all bending and twisting strains while the sprocket retaining nut is being tightened.

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

Fit engine shock absorber cam, spring, cap washer and retaining nut. (Do not fully tighten nut.)

WARNING:—Before fitting the engine sprocket to its axle make sure the spacing collar is on the axle. (See Para. 75.)

Fit the clutch sprocket and centre by :—

Place on the gearbox main shaft the thicker of the two clutch sprocket roller bearing retaining washers.

Place on the gearbox main shaft 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 gearbox main shaft the thin clutch bearing retaining washer.

Push on the splined end of the gearbox main shaft the clutch centre.

Fit the plain washer, spring washer and nut that retains the clutch centre. (Do not fully tighten nut.)

Fit the front driving chain and lock the clutch centre nut by : —

Replace the front driving chain. 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 gearbox main shaft.

Fit the clutch plates and springs by :—

Slide into position, in the clutch case attached to the clutch sprocket, the thickest of the five steel plain clutch plates. Ensure the recessed part of the steel plate faces to the clutch centre and thereby overhangs the flange of the clutch centre.

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

Drop into the spring pressure plate the four clutch spring retaining cups.

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

Fully tighten the four clutch spring adjusting nuts.

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 nut.

Check front driving chain for adjustment. (See Para. 71.)

Check dynamo driving chain for adjustment. (See Para. 73.)

Fit outer half of front chaincase by :—

Ensure faces of both halves of chaincase are clean.

Place a line of liquid jointing compound on the face of the front half of the chaincase.

Take off, from the rear brake rod, the adjusting knurled nut and fully depress the brake pedal and then place in position the front half of the front chaincase.

Fit to the centre fixing bolt the plain washer and nut and, when tightening the nut, move the front half of the chaincase, as may be necessary, for it to register with the back half.

Ensure the rubber band is clean.

Place round the edge of the chaincase some liquid jointing compound.

Press in position the rubber band so that its two free ends meet at the rear of the larger end of the chaincase.

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

Fully tighten the metal band binding screw.

Replace, on the brake rod, the knurled adjusting nut, and adjust the rear brake. (See Para. 88.)

Allow time for the liquid jointing to set, then :—

Remove inspection cap from the chaincase and pour in engine oil to the level mentioned in Para. 11.

Replace inspection cap.

NOTES

WHEEL, BRAKE AND TYRE SERVICE INFORMATION

77 TO REMOVE THE FRONT WHEEL.

Place machine on rear and front stands. (Some machines may not be fitted with a front stand. In those cases, place under the engine a box, of suitable height and strength, to lift the front wheel well clear of the ground.)

Remove :—

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

Release, but do not remove, the nut retaining the brake cover plate to the fork slider. (It is not necessary to remove the split pin which is provided to prevent the loss of the nut should it work loose.)

Slacken :—

The nut on the left-hand side of the wheel spindle.

Remove :—

The four nuts and washers that clamp the fork slider caps to the fork sliders.

The two caps. (These 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.)

The wheel is then free to drop out after disengaging the brake cover plate from the anchor bolt in the left-hand fork slider.

When replacing the wheel, observe the instructions in Para. 98.

78 TO REMOVE THE REAR WHEEL.

Place machine on rear stand.

Disconnect :—

Rear lamp wire at connection near rear wheel spindle.

Speedometer driving cable. (Unscrew gland nut on cable.)

Rear chain connecting link. Allow chain to hang clear of the rear wheel sprocket without becoming disengaged from the gearbox small sprocket.

Remove :—

The two nuts securing rear portion of rear mudguard to its front portion.

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

Adjusting nut from rear brake rod.

Slacken :—

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

The two nuts on the rear wheel spindle.

Remove :—

The rear portion of the rear mudguard, with its stays. (Spring outwards the tool box to disengage its top fixing bolt.)

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

Re-fit in the reverse order but, before finally tightening the rear wheel spindle nuts, ensure the speedometer gearbox is so positioned that the speedometer driving cable can be correctly replaced.

79 WHEEL ALIGNMENT.

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.

An excellent " rough and ready " test is to :—

(*a*) Put machine on rear stand. (Front wheel on the ground.)

(*b*) Take up a kneeling position in front of machine, and at right angles to it, with the left shoulder about two feet forward of the front wheel.

(*c*) With the head and eyes inclined to the left, and about six inches from the ground, look across the left-hand side walls of the front tyre and turn the steering head until the left-hand forward wall of the rear tyre can only just be seen, and no more.

(*d*) Without disturbing the machine, take up a similar kneeling position at the rear of it and, this time, look across the left-hand walls of the rear tyre, when, if the wheels are in correct alignment, the rear left-hand side wall of the front tyre will just be visible, and no more.

(*e*) If, when looking from back to front, more than one-half of an inch of the front tyre width is visible, the wheels need aligning.

Always check the rear chain tension and the rear brake adjustment after making an alteration to the rear wheel position. (See Paras. 72 and 88.)

80 WHEEL BEARINGS.

The wheel bearings are of taper roller type. The inner bearings for the rollers are integral with the wheel spindle. The outer cups for the rollers are pressed into the hub shell. They have a fixed location on one side and an adjustable location on the other.

Adjustment is obtained by a ring screwed into the hub shell and which abuts against movable bearing cup. This adjusting ring is locked in position by a large circular lock ring, or nut.

On the rear wheel the adjustment is made on the left-hand, or brake side, but, on the front wheel, it is on the right-hand side.

81 WHEEL BEARING ADJUSTMENT.

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 inch.

To adjust the rear wheel bearings the wheel must 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 to tighten the adjusting ring (A in illustration 27) until all slackness has been taken up and then to slacken it back exactly one-half of a turn.

Ensure that, when tightening the lock ring (B in illustration 27), the adjusting ring A does not creep round.

82 TO DISMANTLE A WHEEL BEARING.

Remove the wheel from the machine.

Unscrew spindle nut on brake side and take away brake cover plate with brake shoes, etc.

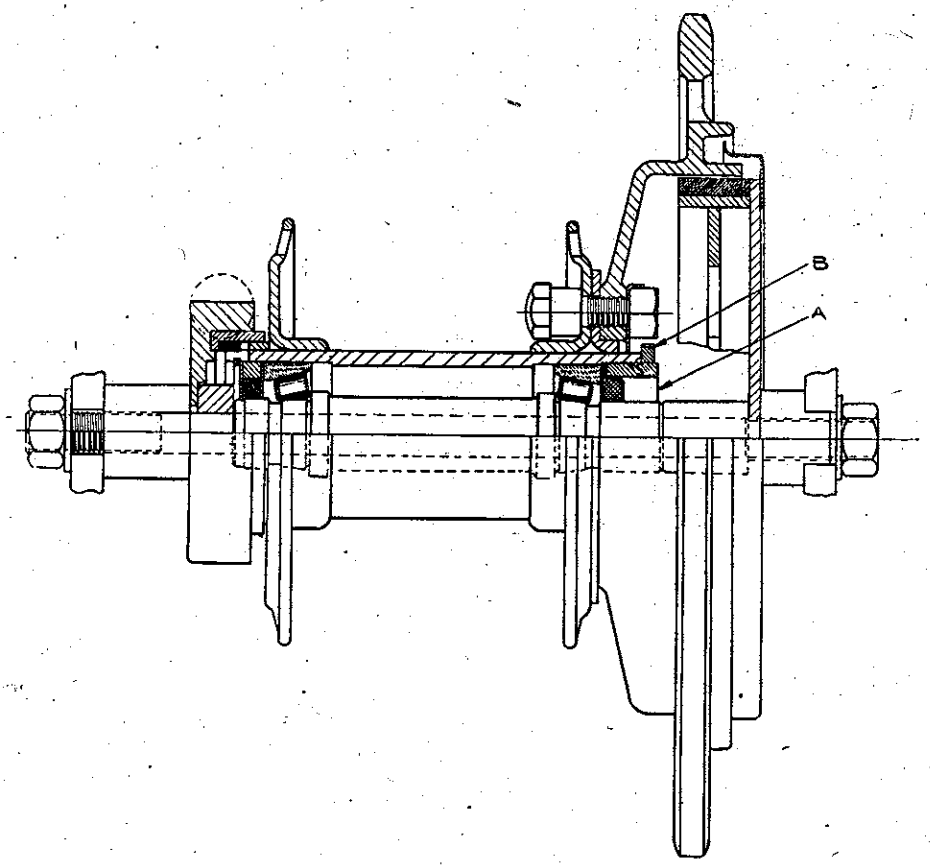


Illustration 27

In all relative details the construction of the front and rear hubs is similar

Slacken :—

Lock ring (B in illustration 27). (Use spanner 11717.)

Unscrew :—

Adjusting ring (A in illustration 27).

Remove :—

Adjusting ring. (The lock ring B will come away with it.)
Dished steel washer.
Felt washer.
Plain steel washer.

Turn to opposite end of hub.

Remove :—

Spring ring fitted just inside the hub end.
Plain steel washer.
Felt washer, with the spacing collar encircling it.
Plain steel washer.

The spindle, complete with rollers and cages, and one outer cup, by pressing them out of the hub shell, from either end, leaving one outer bearing cup in position.

If desired, the remaining cup can also be pressed out of the shell.

83 TO ASSEMBLE A WHEEL BEARING (FRONT OR REAR).

The interior of hub shell and all parts must be clean.

Fit one outer bearing cup by :—

Press into the unthreaded end of the hub shell one of the cups. Its thinner edge should face inwards and the position a trifle nearer to the centre of hub than normal. (Ensure cup is quite " square " to the hub shell before entry.)

Place next to cup :—

A plain steel washer.
A felt washer, with the spacing collar encircling it.
A plain steel washer.

Re-fit the spring split ring.

From the threaded end of the hub shell, force back the outer bearing cup until the felt washer assembly is tight against the spring split ring.

From the threaded end of hub shell introduce the spindle and rollers, entering the correct end of spindle first. (Threaded end in the case of the front wheel and longer end in the case of the rear wheel.)

Press in the other outer bearing cup, thinner edge inward, till there is about $\frac{1}{16}$ inch end play in the bearings.

Place next to cup :—

A plain steel washer.
A felt washer.
A dished metal washer. (The dished part encircles the felt washer.)

Screw into the hub shell the adjusting ring. (This will already have the lock ring on it.)

Adjust hub bearings. (See Para. 81.)

Inject two fluid ounces of grease (G.S.) into the hub shell. (Through grease nipple in hub barrel.) (More than this quantity may result in brake inefficiency.)

Re-fit brake cover plate and brake shoes and wheel is ready for fitting to machine.

NOTE :—In the case of the front brake cover plate it is most important this is correctly positioned.

It is retained to the front wheel spindle by an inside nut (Part Number 40–G12M–H47), and an outside nut (Part Number 40–G12M–H46). Between the inside nut and the brake cover plate is a locating washer (Part Number 40–G12M–B100.)

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

84 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 collar. (See Para. 85.)

85 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 expander to occupy a position whereby the available leverage is considerably reduced and consequently the brake loses efficiency.

To overcome this, the brake shoes have adjustable thrust collars. These have machined slots of three varying depths. (See illustration 28.)

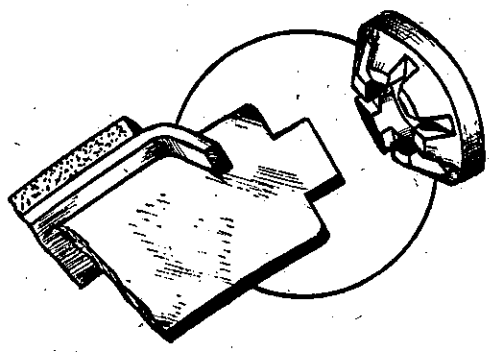


Illustration 28

Adjustment is obtained by removing the collars and turning them, so that the next shallower slots are engaged with the shoes upon replacement on the shoes.

The thrust collars on each pair of shoes must be engaged by the same depth slots, so as to match the shoes.

When wear on 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 then to adjust the brake as described in Paras. 88 and 89.

When a brake cover plate and brake shoe assembly has been disturbed it is advisable, upon re-assembly, to centralise the brake shoes in the brake drum to ensure equal shoe pressure. This is best done before re-fitting the wheel to the machine and before fully tightening the spindle nut retaining the brake cover plate to the wheel spindle.

To centralise the brake shoes :—

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

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

If brake shoes tend to squeak when the brake is applied on the road it is generally an indication the brake shoes are not centralised in the drum.

86 FRONT BRAKE COVER PLATE.

It is essential the front brake cover plate is correctly positioned on the front wheel spindle. Full information regarding this is given in Para. 83 under the heading of " NOTE."

87 BRAKE PEDAL ADJUSTMENT.

The position of the rear brake pedal 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 thin nut.

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

After altering the adjustment of the brake pedal, rear brake adjustment should be checked. (See Para. 88.)

88 REAR BRAKE ADJUSTMENT.

Major adjustment of the rear brake shoes is made on the brake thrust collars, as described in Para. 85.

Minor adjustment of the rear brake shoes is made by altering the position on the rear brake rod of the knurled adjusting nut.

Screw further on the rod to " take up " the brake.

Adjust rear brake by :—

Place machine on rear stand.

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

Then unscrew the adjusting nut two complete turns.

89 FRONT BRAKE ADJUSTMENT.

Major adjustment of the front brake shoes is made on the brake thrust collars as, described in Para. 85.

Minor adjustment of the front brake shoes is made by altering the position of the knurled cable adjuster on the fork assembly.

Unscrew the brake cable adjuster to " take up " the front brake.

The adjuster is locked in position by a nut.

Adjust front brake by :—

Place machine on rear and front stands.

Unscrew the adjuster lock nut about half a turn.

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

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

90 BRAKE DRUMS.

The front wheel brake drum is retained to the wheel by eight raised head countersunk screws.

The rear wheel brake drum is integral with the sprocket and is retained to the wheel by six bolts and nuts. Under each nut is a special lock washer 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.

91 RIMS, SPOKES AND SECURITY BOLTS.

The front and rear rims are 19 inch by 2½ inch and accommodate the same size of tyre (26 inch by 3·25 inch), but they are not interchangeable because the nipple holes in the front rim are smaller than those in the rear rim.

The dimensions of spokes will be found on page 9.

A security bolt is fitted to each tyre. These are interchangeable and it is essential their binding nuts are kept fully tightened otherwise the usefulness of the bolts will cease.

92 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 per week. Inflate as necessary.

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

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

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

With a driver of average weight, the load on the front tyre of the Military Model 1941 G3L Matchless Motor Cycle is 215 lbs. and that on the rear tyre is 310 lbs.

93 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.

To take off an outer cover and remove the inner tube :—

Remove :—

Cap from tyre valve.

Nut from tyre valve.

Nut from security bolt.

Inside from tyre valve. (This allows tyre inner tube to deflate. The valve cap has a slotted top to engage with the valve inside in order to unscrew it.)

Push edge of cover that is diametrically opposite to valve right into well of rim and, using tyre lever W40–G3–TK29, 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 the security bolt. (Push through rim and remove as tyre valve.)

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 off all the way round.

94 TYRE FITTING.

To re-fit an inner tube and outer cover :—

Place one edge of cover right into well of rim, and, commencing diametrically opposite, and using the hands only, work the cover over the edge of the rim.

Replace the security bolt and screw on its nut a few turns.

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."

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, 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 and security bolt are located.

Half inflate the 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.

Inflate to required pressure.

Screw fully home the nuts on valve and security bolt.

Replace the valve cap.

NOTE :—Never run without the valve cap in position, otherwise dirt will enter the valve and, upon application of a tyre pump, some will get on the valve seat, thereby preventing the valve making an air-tight seal and deflation will result.

NOTES

FRAME AND FORK SERVICE INFORMATION

95 STEERING HEAD ADJUSTMENT.

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

The two races in the head lug and the race in the handlebar clip lug are all identical. The lowest of the four races (fork crown ball race) is dissimilar to the others.

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 the engine serves that purpose.)

Slacken :—

The two bolts in the fork crown. (These support the lower ends of the head lamp bottom stays.)

The domed nut at top of the steering column.

Screw down, as far as it will go when using spanner RTK–3 or a spanner having no greater leverage, the lower nut on the steering column, and then slacken back the nut exactly one half of a complete turn and, holding the nut in that position, fully tighten down the domed nut by using adjustable wrench LTK–12.

Tighten the two fork crown bolts.

Remove packing from under engine.

96 FRONT FORKS. (TELEDRAULIC.)

In order to clearly understand the following description, and subsequent assembly and adjustment instructions, reference to illustrations 29, 30 and 31 will be necessary.

Owing to the unusual construction of the **Matchless Teledraulic** fork it is desirable to understand what happens in use.

Here is a brief description of the fork and the way it functions.

As will be seen from the general arrangement (illustration 29) the main members are two long, stout, externally ground, tubes which, it will be observed, are firmly fixed to the handlebar clip lug by the top bolts 40–G12M–FF189 and are clamped to the fork crown by the pinch bolts STD–369.

Upon the external of these tubes are mounted the springs and sliding members, to which latter the front wheel and mudguard are fixed.

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

The hydraulic dampers operate in tubular members located inside the main tubes.

As will be seen, the sliding members operate on steel bushes attached to the bottom ends of the main tubes and also upon bakelite bushes secured to the top ends of the sliders themselves. Above each bakelite bush will be observed an oil seal, provided to overcome any possibility of oil leakage into the spring chamber.

The normal level of oil reaches a line diagonally across the bottom edge of the oil level screw hole. It will be seen that all parts located below this level are continuously submerged in oil. Bearing this in mind, it is at once clear that the upward movement of the sliders, upon impact with a road bump, in addition to meeting resistance from the springs, also causes oil to be swept down by the close-fitting steel bushes 40–G12M–FF192.

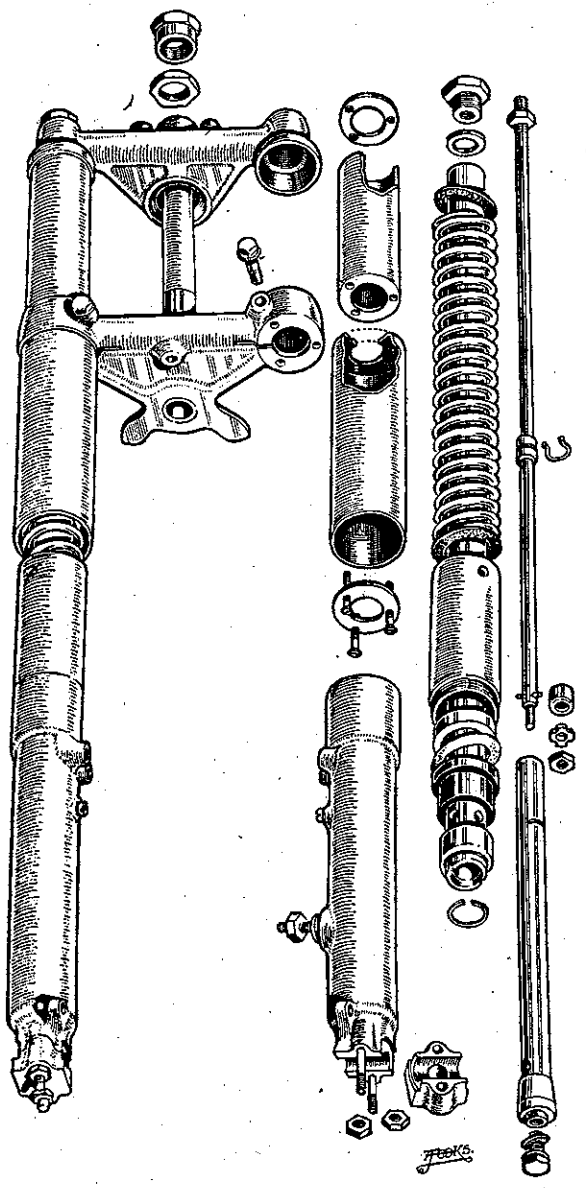
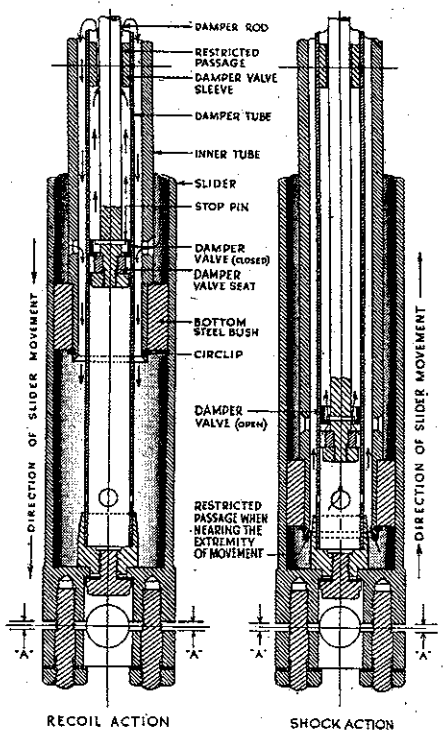


Illustration 29

(By courtesy of "Motor Cycling"

General arrangement drawing of Teledraulic front fork

This oil is forced upward through the holes A in the bottom ends of the damper tubes and also through holes B in the bottom ends of the main inner tubes. At the same time, oil pressure lifts the damper valve 40–18–FF58 and fills the tube between this valve and the plunger sleeve 40–G12M–FF56. This displacement of oil, upon impact, imposes a certain amount of damper effect, the extent of which increases with the violence of the shock caused by the road unequality, or, in other words, the bigger the bump, the more the damping effect takes place.



SECTION OF TELEDRAULIC FRONT FORKS
SHOWING FLUID MOVEMENT ON SHOCK & RECOIL.

Illustration 30

Damper Tube Detail Sectional Drawing

Upon the recoil movement the damper valve 40–18–FF59 returns to its seat 40–18–FF57 and the oil trapped between the valve and the plunger sleeve 40–G12M–FF56 has no other source of escape but past this sleeve. This very restricted passage causes a considerable damper effect to the recoil action.

It will thus be gathered that, on the shock movement of the sliders, 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 springs are almost fully compressed, the damping of the upward movement of the sliders is automatically increased by the greatly restricted passage for the displaced oil, due to the lower ends of the inner tubes encircling the tapered, enlarged, ends of the damper tubes. Thus bottoming is prevented, no matter how violent the impact.

The hydraulic dampers each contain 6½ ounces of M–120–X oil.

It is necessary to maintain the correct level of oil.

A screw level plug (with a fibre washer under it) is fitted to each slider, just below the bolts securing the mudguard bridge. These screws should be removed each three thousand miles and additional M120–X oil added, as may be necessary.

For testing and topping-up instructions see Para. 17. It is important those instructions are carefully followed.

To make the various stages of assembly quite clear it must be assumed that the fork is completely dismantled and then, for assembly instructions, follow the stages detailed in Paras. 97 and 98.

To dismantle the forks, reverse the information given in Paras. 97 and 98.

97 TO ASSEMBLE THE FRONT FORK.

Prepare, by making five sub-assemblies :—

(*a*) Fork crown and cover tube assembly.
(*b*) Inner tube right assembly.
(*c*) Inner tube left assembly.
(*d*) Right-hand damper tube and slider assembly.
(*e*) Left-hand damper tube and slider assembly.

(a) Make the fork crown and cover tube assembly by :—

Fit steering column into fork crown and secure lower end with circlip.

Place column in a vice and fit the two top and bottom cover tubes, right and left, in turn by :—

Place a plain locating plate inside a bottom (long) cover tube.

Place a screwed locating plate inside a top (short) cover tube.

Place the bottom and top cover tube, with locating plates, in position against the fork crown and bind together with three screws. (See illustration 29.)

The screws are inserted from the bottom and the holes in the locating plates and the fork crown are not evenly spaced. Therefore, before inserting the first screw, the plates must be positioned so that all holes in the two plates and the fork crown register with each other.

Fit the fork crown ball race (the odd one of the four races) to the fork crown, load it with grease and fill with twenty-eight steel balls ($\frac{3}{16}$ inch diameter).

Lay a frame ball race over the steel balls.

Fit on the handlebar clip lug the two top cover tube caps.

(b) Make the inner tube right assembly by :—

Take an inner tube and lay it down so that the internally threaded end is to the left.

Pass over the right-hand end, in the order mentioned :—

A leather washer.

A fork spring.

A leather washer.

A slider extension. (Unscrewed end first.)

An oil seal. (Leather side first.) (See Note below.)

A paper washer.

A fibre (bakelite) bush. (Flanged end first.)

A steel bush.

Then fit a circlip to the right-hand end of the inner tube.

NOTE :—Exercise great care when removing and re-fitting the oil seals.

It is advisable to use a thin, tubular sleeve, slipped over the reduced diameter of the inner tube.

The sleeve should have an external diameter similar to the enlarged part of the inner tube and a slightly chamfered end to permit the oil seal to slide off and on without coming into contact with any sharp edges.

(c) Make the inner tube left assembly by :—

Exactly the same as for the right-hand assembly (b).

(d) Make the right-hand damper tube and slider assembly by :—

Take a damper tube rod and fit, in the drilled end, a damper stop pin.

Place a damper valve on the same end of the rod, reduced end outwards, so that the valve body can slide over the stop pin. (The damper valve is made of steel.)

Place next to the damper valve a valve seat. (The damper valve seat is made of brass.)

Thread on the rod a $\frac{1}{4}$ inch nut and fully tighten.

Take a damper tube and push the above assembly into it.

Slide on to the damper rod a Plunger Sleeve. (The plunger sleeve has a groove cut round its centre.)

Manipulate the plunger sleeve till the groove round it registers with the slot cut in the body of the damper tube and locate it in that position by fitting a "U" shaped plunger sleeve clip.

Select the slider that does not have in its side the stud for anchoring the front brake cover plate.

Insert the damper rod and tube assembly into the slider and retain by fitting a bolt passing through the bottom of the slider and engaging with the enlarged and screwed end of the damper tube. There is a fibre washer under the bolt. A thin walled tubular box spanner will be required for the bolt. Such a spanner is not included in the standard tool kit.

Fit a $\frac{5}{16}$ inch nut to the free end of the damper rod and screw it down as far as it will go.

(e) Make the left-hand damper tube and slider assembly by :—

Exactly the same method as described above for the right-hand assembly.

It will be noted that the left-hand damper tube and slider assembly is the one that utilises the slider having the screwed stud for anchoring the front brake cover plate.

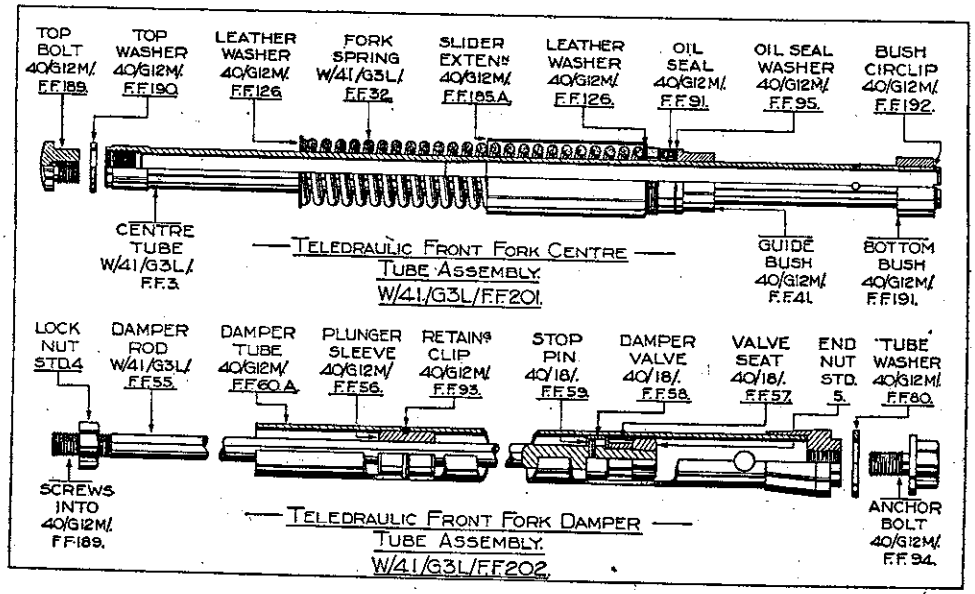


Illustration 31

98 FITTING THE FIVE FORK SUB-ASSEMBLIES TO THE MACHINE

Fit the fork crown, steering column and handlebar clip lug by :—

Place a frame ball race in the top of the main frame head lug, load it with grease and fill with twenty-eight steel balls ($\frac{3}{16}$ inch diameter).

Lay a frame ball race over the steel balls.

Pass up the main frame head lug the steering column and slide on to it the handlebar clip lug, ensuring the top cover tubes enter the caps fitted to the handlebar clip lug so that they fit snugly.

Fit a head stem adjusting nut. (Do not fully tighten.)

Fit a head stem domed lock nut. (Do not fully tighten.)

Ensure the grease nipples are screwed into the main frame head lug and the handlebar clip lug. (One in each.)

Take a fork crown binding bolt, place on it a plain steel washer and pass it through the lower hole in a head-lamp left-hand side bottom stay and fit the bolt in the left-hand position in the crown. (Do not fully tighten.)

Fit the right-hand bolt, washer and stay in a like manner. (Do not fully tighten.)

Fit the inner tube assemblies (b and c) to the front fork crown assembly by :—

Take one inner tube assembly, introduce the top end (the internally threaded end) to the fork crown (immaterial if left or right side) and push it upwards till it engages with the handlebar clip lug and then, with a soft-faced mallet, drive it right home.

Fit the second inner tube assembly in a like manner.

Fit the left-hand damper tube and slider assembly (e) by :—

Pass downwards through the left-hand inner tube assembly a piece of flexible wire and attach it to below the $\frac{5}{16}$ inch nut on the damper rod of the damper tube and slider assembly that has, in the side of the slider, the stud for the front brake cover plate anchorage.

Draw upwards the damper tube and slider assembly until the damper rod protrudes above the handlebar clip lug sufficiently for the flexible wire to be detached. Take a domed top bolt and place on it a large plain steel washer. Screw the domed bolt on to the damper rod and then lock it in position by unscrewing the $\frac{5}{16}$ inch nut on the damper rod till it abuts against the under-side of the domed bolt.

(Make sure the $\frac{5}{16}$ inch nut is tightly locked against the bolt.) (Do not screw the domed bolt into the end of the inner tube.)

Fit the right-hand damper tube assembly (d) by :—

Exactly the same method as described above. (There is no brake anchor stud in the side of the right-hand slider.)

Complete the assembly of the fork by :—

Fit the two oil level screws. (One to each slider and each has a fibre washer under its head.)

From the top, pour down each inner tube $6\frac{1}{2}$ ounces of M–120–X oil.

Apply pressure, in turn, to the inner tube top domed bolts until they can be screwed into the tubes and fully tighten.

Screw slider extensions to sliders, as far as possible, by hand.

Fit the front mudguard, front stand, front wheel and make final adjustments by :—

Fit front mudguard and stays.

Fit front stand. (See Para. 100.)

Offer up front wheel, twisting same till the slot in the front brake cover plate engages with the stud on the left-hand slider, and secure with the two clamps.

The clamps are each retained by two $\frac{5}{16}$ inch nuts, under which is a plain steel washer. These nuts should only be screwed up " finger tight."

The clamps, or caps, must not be interchanged and it is most important that the gaps, fore and aft, between the clamp and the end of the fork slider are equal. (The gaps are indicated by arrows " A " in illustration 30.)

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

Fully tighten the four spindle clamping nuts.

Fully tighten nut on left-hand end of front wheel spindle.

Fit, and tighten, nut on brake anchorage stud and fit split pin.

Fully tighten the two screwed slider extensions. These each have two holes at their top ends to accommodate a hook spanner. Use small end of hook spanner 11717. The holes are only exposed when all weight is relieved from the front wheel.

Test fork for freedom of action and, if any stiffness is felt, loosen the nuts on the right-hand side spindle clamp, and work fork up and down. Then tighten spindle clamp nuts.

Adjust steering head. (See Para. 95.)

Fully tighten the two fork crown binding bolts. (These pass through the lower ends of the head lamp bottom stays.)

NOTE :—During assembly, absolute cleanliness is essential because any dirt, or other abrasive matter, left on the various sliding parts will cause damage and rapid wear.

99 PROP STAND.

The prop stand hinges on a bolt that has a screwdriver slot in its head. The bolt screws into a lug brazed to the frame and is locked by a $\frac{7}{16}$ inch nut. It is essential all parts are quite clean when replaced and that the nut is fully tightened, otherwise it will become displaced and lost.

100 FRONT STAND.

The two bolts fixing the front stand to the fork sliders are not interchangeable. That on the left-hand side is longer than that on the opposite side. The nuts on these bolts are safeguarded by split pins passing through the bolts.

101 REAR STAND.

A plain steel washer is fitted under the **head** of each of the two bolts that retain the rear stand to the fork ends. The washers should **not** be fitted **under** the nuts of those bolts.

102 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 nuts, fitted to the studs, retain the oil tank and battery carrier in position.

Remove oil tank and battery carrier by :—

Drain oil tank

Remove battery from the carrier.

Disconnect :—

Oil feed pipe from bottom of oil tank.

Oil return pipe from bottom of oil tank.

Remove :—

Venturi air intake from carburetter.

Bolt retaining oil tank stay to rear mudguard. (This bolt has on it two spacers and one washer.)

The two nuts retaining oil tank and battery carrier to the two frame studs, and the washer under each 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.

(The frame studs are brazed to the frame.)

103 NUTS, BOLTS, ETC.

Every nut and bolt used to assemble the entire machine has a right-hand thread **except** the nut that retains the small timing pinion to the timing side flywheel axle.

That nut has a **left-hand** thread.

All nuts, bolts, studs and other threaded parts of the machine having diameters of $\frac{1}{4}$ inch, $\frac{5}{16}$ inch, $\frac{3}{8}$ inch, $\frac{7}{16}$ inch and $\frac{1}{2}$ inch are threaded 26 T.P.I. (Does not refer to units and parts of proprietary make.)

NOTES

CARBURETTER SERVICE INFORMATION

104 THE CARBURETTER.

An AMAL type 275/1J carburetter is fitted. It is tuned during the road tests of the machine and it should not be necessary to interfere with the standard setting but instructions for doing so are given in Para. 106.

105 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 (see illustration 32) and, secondly, by means of a taper needle (see illustration 32) 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 32 for location of the pilot jet air adjustment screw. The pilot jet, which is a hole in the choke, will be noticed just to the right of the reduced part of the screw.)

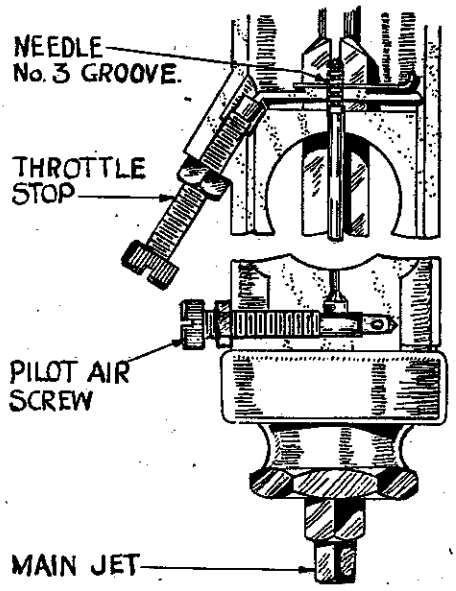


Illustration 32

The size of jet should not be altered save for some very good reason. The correct size is 120 with throttle cut-away 5 x 5. The jet taper needle is secured at the third notch from the top.

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.

106 CARBURETTER ADJUSTMENT.

A rough test, to ascertain if the setting is correct, 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 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 inwards or outwards, until even firing is obtained. (The pilot jet air screw will be observed at the base of the mixing chamber and its position is locked by a nut. See illustration 32.) This adjustment is not unduly sensitive, and it should be possible to obtain the correct adjustment in a few seconds.

In the event of 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 cut in the sprayer base or choke and is very small, so there is always latent danger of this becoming choked. (See Para. 105.)

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.

When about to remove the float chamber from the carburetter it is desirable, first, to remove the high-tension wire by unscrewing the bakelite gland nut that retains the wire to the pick-up. This is because otherwise the wrench may foul the gland nut and so damage it as well as, possibly, the pick-up.

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. (See Para. 54.) Late ignition usually causes a great increase in petrol consumption.

107 CARBURETTER TUNING USEFUL INFORMATION.

Poor idling may be due to :—

Air leaks. Either at junction of carburetter and engine, or by reason of badly worn inlet valve stem or guide.
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.
Tappets adjusted too closely.

Heavy petrol consumption may be due to :—

Late ignition setting.
Bad air leaks. Probably at carburetter and engine joint.
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.)

108 TWIST GRIP ADJUSTMENT.

A screw is provided in one-half of the twist grip body to regulate the spring tension on the twist grip rotating sleeve. This screw is locked by a nut and it 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 turn 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 it in position. 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.

109 CONTROL LEVERS AND CABLES.

AMAL and BOWDEN control levers and twist grips are fitted and the parts of same are not interchangeable.

Machines with engine numbers 41–G3L–49012 to 41–G3L–54511, frame numbers 34012 to 39511, are equipped with BOWDEN control levers and twist grips.

Machines with engine numbers 41–G3L–54512 to 41–G3L–56011, frame numbers 39512 to 41011, are equipped with AMAL control levers and twist grips.

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

NOTES

ELECTRICAL SERVICE INFORMATION

The electrical equipment comprises three independent electrical circuits, as follows :—

(a) IGNITION—Magneto, High-tension Wire and Sparking Plug.
(b) CHARGING.—Dynamo, Cut-out and Regulator, Ammeter and Battery.
(c) LIGHTING AND ACCESSORIES—Lamps, Wires, Switch and Horn.

110 MAKE OF ELECTRICAL EQUIPMENT.

Either **LUCAS** or **MILLER** electrical equipment is fitted.

Machines with engine numbers **41-G3L-49012** to **41-G3L-54511,** frame numbers 34012 to 39511, are fitted with **LUCAS** electrical equipment.

Machines with engine numbers **41-G3L-54512** to **41-G3L-56011,** frame numbers 39512 to 41011, are fitted with **MILLER** electrical equipment.

111 MAGNETO.

All machines are fitted with a **LUCAS** type **N1/O/AO** magneto.

112 LUBRICATION OF MAGNETO CONTACT BREAKER MECHANISM.

The cam is lubricated by a wick, contained in the contact breaker base, which must be given a few drops of thin machine oil. The tappet, which operates the contact breaker spring blade, should also be lightly smeared with thin machine oil.

To do this it is necessary to take away the contact breaker.

Remove the contact breaker by :—

Swing away the flat spring blade retaining the contact breaker cover.
Pull away the contact breaker cover.

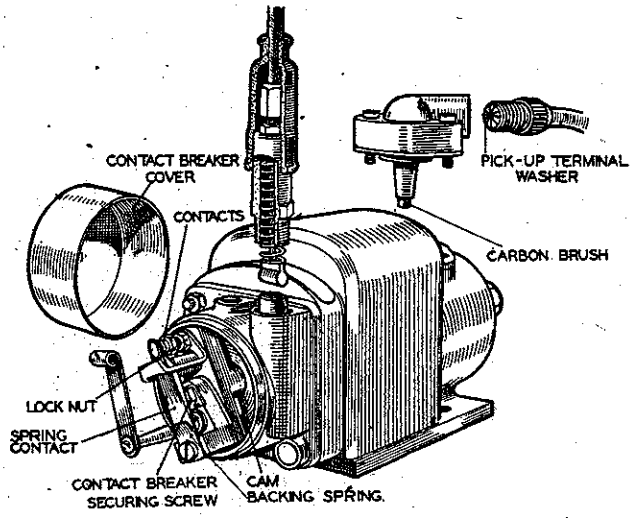


Illustration 33

Magneto—Lucas—Type N1/0/A0

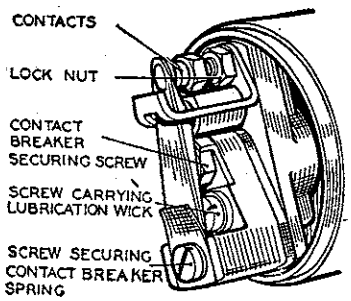


Illustration 34

Illustration of Contact Breaker, showing :—

Contacts.
Lock nut.
Contact breaker securing screw.
Screw carrying lubrication wick.
Screw securing contact breaker spring.

Remove the screw retaining the contact breaker spring blade to the contact breaker body and take away the backing spring and the spring blade. (There is a spring washer under the head of the screw.)

Unscrew the screw carrying the lubrication wick and take away the fibre insulating bush encircling the screw.

Straighten the tab, on the brass lock washer under the central screw retaining the contact breaker to the armature shaft, and, with spanner **LTK-5,** remove the central screw.

Lever off the contact breaker body.

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

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

Replace the contact breaker and its parts by exactly the reverse procedure described above. (Ensure the backing spring, for the spring blade, is replaced so that its bent over end faces outwards.)

113 CLEANING MAGNETO CONTACT BREAKER MECHANISM.

Remove the contact breaker cover. (See Para. 112.)

Examine contacts.

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

Cleaning is made easier if the contact breaker spring blade is removed. (See Para. 112.)

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

114 ADJUSTMENT OF CONTACT BREAKER POINTS.

The contact breaker point separation should be from ·012 to ·015 inch.

Check, and adjust, contact breaker point setting by :—

Remove contact breaker cover. (See Para. 112.)

Turn over engine till the contact breaker points are fully opened.

Insert the gauge (part of spanner **LTK-5**) between the two contact points. If the setting is correct the gauge should be a sliding fit.

If there is an appreciable variation from the gauge, slacken the lock nut on the adjustable point and turn the contact point (apply spanner **LTK-5** to its hexagon head) until the gap is set to the gauge. Finally, tighten the lock nut and re-check the setting. (Screw the point into the contact breaker body to increase the gap, or outwards, to decrease it.)

115 NOTE RE CONTACT BREAKER.

Check the contact breaker point gap after the first one hundred miles and five hundred miles. Owing to the initial settling down, there is a tendency for the gap to alter in the first few hundred miles of use.

This may seriously affect the ignition setting. Subsequent adjustment will only be required at long intervals but it is as well to check the gap every two thousand miles. (When the engine is decarbonised is always an opportune time.)

116 HIGH-TENSION WIRE.

The high-tension wire should be 7 mm. in diameter. Other sizes, such as 5 mm. and 9 mm., will not fit the Immobilizer and Suppressor. The wire must be replaced if the rubber insulation has perished or shows cracks and has become brittle.

117 MAGNETO HIGH-TENSION PICK-UP.

The high-tension pick-up is secured to the magneto body by two bolts, having hexagon heads which are slotted for a screwdriver, and between the pick-up and the magneto body is a cork washer. (See illustration 33.)

The high-tension wire is retained to the pick-up by a gland nut and a spring controlled carbon brush slides in the pick-up and bears against the slip ring on the magneto armature shaft.

Examine the pick-up and carbon brush by unscrewing the retaining bolts.

Ensure the carbon brush moves freely in the pick-up, being careful not to stretch unduly the brush spring.

While the pick-up is removed, clean the slip ring track and flanges by holding a soft cloth on the ring while the engine is turned by hand. (Best method of turning engine is to remove the sparking plug and slowly depress kick-starter by hand.)

To fit a new high-tension wire, bare the wire for about $\frac{1}{4}$ inch, thread the knurled gland nut over the wire, thread the bared wire through the metal washer removed from the old wire and bend back the strands. Finally, screw the gland nut into the pick-up.

118 SUPPRESSOR AND IMMOBILIZER.

Check for cracks in insulation, check for positive contacts of high-tension wire, always disconnect lead at sparking plug end before unscrewing Immobilizers.

119 MAGNETO CHAIN DRIVE.

See Para. 74 for information regarding magneto chain drive.

See Para. 11 for instruction regarding magneto chain lubrication.

120 IGNITION TIMING.

See Para. 54 for information relating to Ignition Timing.

121 DISMANTLING MAGNETO.

The magneto is mounted on a platform and is retained to it by two short bolts on the left-hand side and two long bolts on the right-hand side. There is a plain steel washer under the head of each bolt.

The magneto platform is retained to the machine by :—

At the rear by the seat tube bottom lug bolt passing through it. (This bolt also passes through the rear of the engine rear plates.)

At the front by the dynamo square crossbar, each end of which is threaded and has on the right-hand end an extended nut, and on the left-hand end an ordinary $\frac{5}{16}$ inch nut.

The turned over ears of the platform that support it on the square crossbar are slotted, so that the platform can hinge on the seat tube bottom lug bolt and tilt upwards in the front, thereby permitting lattitude for the adjustment of the magneto driving chain.

To remove magneto, on its platform, from motor cycle :—

Remove :—Magneto chain case cover.
Both magneto sprockets and driving chain. (See Para. 36.)
High-tension wire from sparking plug.
Ignition control cable at handlebar control lever end.

Slide up the magneto control cable the rubber cap. (Magneto end.)

Unscrew from magneto the metal sleeve and, holding this clear of the magneto, pull upwards the inner cable till the nipple on its lower end can be disengaged from the plunger that operates the face cam of the contact breaker.

Slacken, several turns, the two nuts on the dynamo square crossbar. (These nuts retain the front portion of the magneto platform.)

Remove nut on left-hand side of bolt passing through rear of magneto platform and push bolt out of position. (This bolt retains rear of engine rear plates to the frame and it is advisable to support engine by placing suitable packing under it.)

Magneto, on its platform, is now free to be taken away.

Magneto is retained to platform by four bolts. Each bolt has a washer under its head. The two longer bolts fit in the right-hand locations.

Completely dismantle magneto by :—

Remove high-tension pick-up. (See Para. 117.)

Remove contact breaker cover and contact breaker arm. (See Para. 112.)

Unscrew safety gap screw from bottom of magneto body. (This screw has a special spring lock washer under its head.)

Remove the two round-headed screws retaining the maker's name plate to the contact breaker end of the magneto body and take away the plate which will expose a brass housing for the earth brush.

Unscrew earth brush housing. (The carbon earth brush and its spring will come away with the housing.)

Remove magneto contact breaker face cam by extracting the spring circlip that lies in a groove encircling the face cam. (This circlip has an eye on one end and, by pulling the eye end with a suitable tool or length of bent wire, it can easily be removed from its groove.)

The face cam is then free to be taken away. (Notice position of the recessed part of the cam face in relation to the slotted end of the armature shaft.)

Remove the screw, located immediately under the control cable entry, and unscrew the nut, diagonally opposite, that retain the end plate to the magneto body. (Both screw and nut have spring lock washers under their heads.)

Pull away the magneto end plate. This has under it a sealing gasket and one or more brass shims. (See Para. 123.)

The armature shaft can now be pushed out of the magneto body. (No force or extractor needed for this operation.)

There is no need to put a " keeper " across the magnet, as it retains its magnetic properties more or less indefinitely. Although it loses a certain amount of power in the first removal of the armature, subsequent removals do not affect it.

122 MAGNETO TEST AND REPAIR.

Dismantle magneto. (See Para. 121.)

When the armature has been removed it should be examined for actual structural faults, such as cracked or bent shaft. Any flaw in the winding needs special equipment to detect. If the condenser is faulty a new one CAN be fitted, but in the event of either of these faults, it is desirable to fit a complete service armature.

It is important that the two ball bearings which support the armature shaft are in good condition. If they are packed on assembly with a suitable high-melting point grease they will stand an almost unlimited amount of normal wear, but if they start to fail because of a bent shaft or other cause they must be replaced.

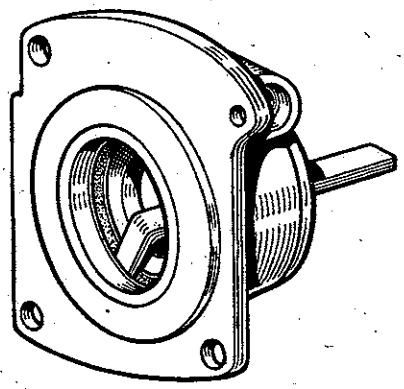


Illustration 35

Tool for removing armature bearings, showing end plate with special tool inserted behind ball bearing outer race.

The ball bearings can be removed with a tool as shown in illustration 35. They should be replaced with a pressure of 250 lbs. At the works this is done in a hydraulic press, but, in case of emergency, they can be driven in with a mandril made to the dimensions shown in illustration 36.

The serrated fibre washer fits behind the race to prevent any electrical current attacking the surface of the metal.

Illustration of mandril for replacing armature ball bearings, showing shape and essential dimensions.

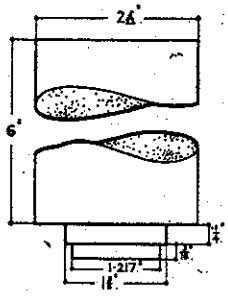


Illustration 36

123 MAGNETO ASSEMBLY.

On re-assembly the armature shaft should be set up with an end clearance of ·002 inch.

This is adjusted by means of shims which are fitted between the magneto body and the end plate carrying the shaft bearing on the contact breaker end of the magneto.

Assemble the magneto by reversing the procedure detailed in Para. 121 and, ensure the face cam is replaced in the correct relation to the slot in the end of the armature shaft.

It is most important that, upon assembly, the two ball bearings are packed with a suitable high melting-point grease.

After fitting the magneto to its platform and fitting the assembly to the machine, it is necessary to adjust the driving chain according to the instructions given in Para. 74.

124 SPARKING PLUG.

The sparking plug has a thread of 14 mm. and the reach is $\frac{1}{2}$ inch. The following plugs are used :—

LODGE	...	...	...	...	Type H–53
LODGE	...	...	...	...	Type H–14
CHAMPION	...	...	...	...	Type L–10–S

The Lodge plugs are detachable and, by unscrewing the gland nut, the central electrode may be removed for cleaning.

The point gap should be from ·018 inch to ·020 inch.

(The Champion plug does not have a detachable central electrode.)

125 THE DYNAMO.

Either a LUCAS type E3AR/A05/1 or MILLER Type WDM dynamo is fitted. Both are fitted with two brushes. The positive brush is insulated and the negative is earthed. (See Para. 110.)

126 TO REMOVE THE DYNAMO.

Remove the dynamo (either make) by :—

Remove the front chaincase and clutch. (See Para. 38.)

Unscrew, about $\frac{5}{16}$ inch, the dynamo clamping strap bolt. (Do not completely remove bolt.)

Apply spanner RTK–1 to the flats cast on the left-hand dynamo end plate and rotate dynamo in a clockwise direction until the cheese headed locating screws in the dynamo body register with the slot cut in the engine rear plates.

Detach dynamo wires and commutator band. (See Para. 37 and also make a note of the terminal to which the coloured wire is fixed.)

Withdraw dynamo from engine plates.

NOTE :—A locating plate (to ensure correct driving chain alignment) is secured to the dynamo with screws and these should not be disturbed.

127 TO REPLACE THE DYNAMO.

Replace the dynamo (either make) by :—

If a new dynamo is being fitted remove from the old dynamo the locating plate and its two retaining screws.

Fit the locating plate to the new dynamo by :—

Fit the locating plate and leave the two screws finger tight. Replace the dynamo through the engine plates and fit the dynamo chain sprocket. (No need to fully tighten its retaining nut if sprocket is pushed right home on the tapered shaft.)

Place a straight edge across the two dynamo driving sprockets and shift dynamo left to right, or vice versa, until both sprockets are in line.

Tighten the two locating plate screws sufficiently to prevent the plate from moving.

Then carefully withdraw dynamo and fully tighten the locating plate screws after which, proceed to fit the dynamo as under :—

Insert the dynamo in the engine plates and, before pushing it right home, clip on the commutator band and attach the dynamo wires.

Next fit the back half of the front chaincase, the dynamo chain and sprockets, the clutch and the outer half of the chaincase, as detailed in Para. 76.

128 NOTE RE DYNAMO REMOVAL.

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

Disconnect the two dynamo wires. (See Para. 37.) Join the two dynamo terminals with a short length of wire. Then take a good quality moving coil voltmeter and clip its negative lead to a good earthing point on the dynamo, or engine, and the positive lead to the two dynamo terminals that have been "bridged" with wire.

Start the engine and slowly increase its speed. If no reading is shown on the voltmeter the fault lies in the dynamo.

Damage to the dynamo bearings may occur as the result of consistently and excessively flooding the carburetter, by which, petrol is allowed to drip on the dynamo body and penetrate to the ball bearings and so wash out their lubricant. This may also be a cause for the dynamo armature shaft being broken or bent.

129 TO DISMANTLE A LUCAS DYNAMO.

Remove dynamo from machine. (See Para. 126.) (In this process the commutator cover band is taken away as are the two dynamo wires.)

The Lucas dynamo consists of four main components :—

(1) The body with field coil, pole piece and earth brush, and one terminal.

(2) The right-hand end plate with positive brush, the two brush holders and springs, two terminals, and a ball bearing cup.

(3) The left-hand end plate with a ball bearing cup.

(4) The armature with two sets of balls in two cages.

Dismantle LUCAS dynamo by :—

Remove brushes from their holders.

Remove nuts from the two long screws retaining the two end plates to the dynamo body. There are shockproof washers under the screw heads and the nuts.

Remove key from armature shaft.

Remove the right-hand (bakelite) end plate. This is a slightly tight fit in the end of the dynamo body and no force should be required. If force is found necessary it should most carefully be applied, otherwise the end plate may be cracked.

When the end plate is free from the body disconnect the green wire from the terminal in the end cap which will completely free the end plate. (There is a spring washer under the terminal nut.)

Remove the armature by pushing from left to right.

By using a screwdriver and hammer, and exercising but little weight and force, the left-hand end plate can then be taken away from the dynamo body.

Remove the terminal screw and nut binding the field coil wire and negative brush wire to the dynamo body. (Spring washer under nut.)

Remove the lock screw locking the large screw that retains the field coil and pole piece to the dynamo body and then remove the large screw and the field coil and pole piece will be free to be taken away.

The dismantling is now complete and it will be noticed that :—

(*a*) The two sets of balls, in their cages, are in position on the armature shaft. The balls and cages are easily removed by prising with a screwdriver. The inner races are a tight fit on the shaft and must be removed with a special extractor.

Behind the left-hand bearing is a brass disc to seal the bearing.

Behind the right-hand ball bearing is a brass washer which is backed by a fibre washer.

(*b*) The ball bearing cup is still in position in the left-hand end plate and should be removed in the manner described in Para. 122.

(*c*) The ball bearing cup is still in position in the right-hand end plate and should be removed in the manner described in Para. 122. The brush holders and springs are also attached to this end plate. The springs are easily removed but the holders are rivetted to the plate. The two terminals are also attached to the end plate and can be removed from the plate by removing the nuts on the terminals and pushing the terminals through the plate. There is a plain washer under each terminal retaining nut. The positive brush is also attached to the positive terminal and can be taken away by removing its binding nut. (There is a spring washer under the binding nut.)

WARNING :—It may be assumed that by removing :—

The left-hand end plate,

The dynamo sprocket key,

The dynamo brushes,

That the armature shaft can then be withdrawn.

THIS IS NOT THE CASE. THE ARMATURE SHAFT MUST NOT BE WITHDRAWN FROM RIGHT TO LEFT.

130 TO ASSEMBLE A LUCAS DYNAMO.

Reverse the procedure described in Para. 129, bearing in mind the following points :—

(1) The field coil green wire having the yellow marking sleeve and the negative brush wire are both attached to the terminal screw and nut in the dynamo body.

(2) The field coil green wire having no marking sleeve is attached to the unmarked terminal in the right-hand end plate.

(3) The negative brush fits in the brush holder that is nearest to the rear wheel of the machine.

(4) The positive brush wire is coupled to the insulated terminal mounted in the right-hand end plate and this is indicated by a red mark on the outside of the plate.

(5) The dynamo sprocket key is located in the armature shaft so that the squared end faces the dynamo end plate.

131 TO DISMANTLE A MILLER DYNAMO.

Remove dynamo from machine. (See Para. 126.) (In this process the commutator end cover (which is retained by one round-headed screw which has a spring washer under it) is taken away as are the three dynamo wires.)

The Miller dynamo consists of four main components :—

(1) The body with field coil and pole piece.
(2) The right-hand end plate, with brush holders, cut-out and terminals.
(3) The left-hand end plate, with ball bearing.
(4) The armature with one ball bearing.

Dismantle MILLER dynamo by :—

Remove brushes from their holders.

On the right-hand end plate are two terminal posts, binding the brush holders to the end plate and three terminals. Take off the nuts from the three terminals and the right-hand brush holder binding terminal and lift away all the insulated wires except the right-hand brush wire and the wire leading from the cut-out to the middle of the three terminals.

Remove the two screws binding the two end plates to the dynamo body.

Then, by exerting pressure against the right-hand (commutator) end of the armature shaft the shaft will be forced endways so that the ball bearing on the commutator end of the shaft is forced out of its housing and the two end plates will tend to come away from the dynamo body.

Withdraw the right-hand end plate and, while doing so, ensure the red insulated wire, the white insulated wire and the two green insulated wires pass through the two accommodation slots cut in the end plate base, so that they are not damaged and also ensure the ball bearing does not catch on the fibre insulating base of the end plate.

From the left-hand end of the dynamo body the armature shaft may be withdrawn, complete with the left-hand end plate and ball bearing. Remove the grub screw in the end plate.

Protect the jaws of a vice with lead or other soft metal and hold the armature shaft within the jaws, gripping the armature at its greatest diameter and using very little pressure to hold it. Then unscrew the circular lock ring that is screwed on the armature shaft just behind the tapered part of the shaft. This lock ring is of soft metal and has two holes to accommodate a pin spanner or similar tool.

By supporting the inside face of the end plate and exerting pressure on the threaded end of the armature shaft the shaft can be pushed out of the ball bearing, which will remain in the end plate.

The ball bearing on the right-hand end of the armature shaft can be removed from the shaft by using a suitable extractor. (It is not a very tight fit on the shaft.)

Remove the two screws securing the grease retaining cover over the ball bearing located in the left-hand end plate and the bearing can then be gently driven out of position by using a suitable drift.

Remove the large-headed screw retaining the field coil and pole piece to the dynamo body and those parts are then free to be taken away.

The dismantling is now complete and it will be noticed that :—

(*a*) The cut-out is retained by one nut and that one end of its winding is earthed to the end plate, being retained by a washer and round-headed screw.

(*b*) That the right-hand brush is the negative, or earthed, brush.

132 TO ASSEMBLE A MILLER DYNAMO.

Reverse the procedure described in Para. 131, bearing in mind the following points :—

(1) Fit the right-hand end plate to the dynamo body first.

(2) Pass the red wire and the adjacent green wire through the triangular slot in the end plate.

(3) Pass the white wire and the adjacent green wire through the long curved slot in the end plate.

(4) Fit the armature shaft ball bearing in the left-hand end plate, follow with fitting the end plate and bearing over the tapered end of the armature shaft and then insert the armature in the dynamo body and gently press the exposed ball bearing into its housing in the right-hand end plate.

(5) Replace the two long screws binding the two end plates to the body and fully tighten.

(6) Replace the bearing lock collar on the armature shaft and the grub screw in the left-hand end plate.

(7) Place the rubber bush, protecting the three 5 mm. wires and the three wires, in position in the commutator cover band.

(8) Connect wires as under :—

Green (with black band) through triangular slot to top terminal. Black 5 mm. wire, with red band to top terminal.

5 mm. black, with plug connection, to centre terminal.

Red with black band to bottom terminal.

Green with black band to bottom terminal.

5 mm. black, that goes on clip terminal of voltage regulator to bottom terminal.

White with red band to positive (right-hand) brush terminal.

(9) Replace brushes.

(10) Replace key in armature shaft.

Dynamo is now ready for fitting to machine. (The commutator cover band and end cap is not fitted till after the dynamo has been fitted to the machine.)

133 DYNAMO TEST AND REPAIR.

To obtain access to the dynamo commutator and brushes it is necessary to remove the timing gear cover. (See Para. 36.)

Therefore it is better to arrange to give attention to dynamo commutator and brush gear when, for reasons of service attention to the engine, the timing gear cover has to be removed.

134 CLEANING DYNAMO COMMUTATOR AND BRUSH GEAR. (LUCAS AND MILLER.)

Commutator and brush gear should be cleaned every 5,000 miles.

Check action and clean brush gear by :—

Remove commutator band.

Ensure brushes are clean and free in their holders.

If sticky, remove brush, clean sides with cloth moistened with petrol. Alternatively lightly polish sides of brush with fine glass paper.

Always replace brushes in their original positions.

Check commutator for cleanliness and clean by :—

Remove commutator band.

Commutator must be clean and free from trace of oil or dirt.

Clean commutator by pressing against it a fine duster while the engine is slowly turned over.

If commutator is very dirty, moisten duster with petrol.

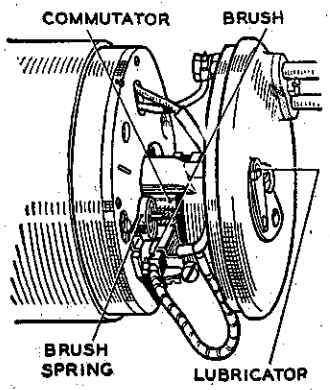


Illustration 37

Showing Lucas Dynamo Commutator and Brushes

135 FITTING NEW DYNAMO BRUSHES. (LUCAS AND MILLER.)

Brushes worn so that they do not make a good bearing contact on the commutator must be replaced with new.

Brushes worn so that the embedded end of the flexible wire is exposed must be replaced with new.

After fitting new brushes they must be correctly bedded to ensure good contact with the commutator.

Bed new brushes by :—

Pass between the commutator and brush a thin strip of fine glass paper so that its abrasive surface is towards the brush.

Pull paper backwards and forwards several times.

Wipe away any carbon dust or glass paper dust.

136 TO REMEDY BADLY WORN COMMUTATOR. (LUCAS AND MILLER.)

To remedy badly worn commutator :—

Remove armature. (See Paras. 129 and 131.)

Mount in lathe.

Rotate at high speed.

Take a light cut with a very sharp tool. Do not remove more metal than necessary.

Polish commutator with very fine glass paper.

Undercut mica insulation between commutator segments to depth of $\frac{1}{32}$ inch. (Hack-saw blade ground till only slightly thicker than the mica is a suitable tool. Use by drawing backwards and forwards along mica till required depth is attained.)

137 TEST AND REPAIR DYNAMO FIELD COIL. (LUCAS AND MILLER.)

The fitting of the field coil requires the use of a pole shoe expander. If this is not available do not attempt to replace coil.

When fitting new coil tighten pole piece fixing screw to fullest extent.

138 TEST AND REPAIR ARMATURE. (LUCAS AND MILLER.)

Remove armature. (See Paras. 129 and 131.)

Test on " growler," or by substitution.

After fitting replacement armature re-bed brushes. (See Para. 135.)

139 DYNAMO LUBRICATION. (LUCAS.)

Ball bearings must be packed with high melting-point grease.

140 DYNAMO LUBRICATION. (MILLER.)

Ball bearings must be packed with high melting-point grease.

Oil may also be introduced to the commutator end bearing by removing round-headed screw retaining the end plate and inserting oil through the screw hole.

Oil may also be introduced to the driving end bearing by removing the grub screw mounted in the driving side end plate and inserting oil through the screw hole. (High melting-point grease is preferable to oil.)

141 REGULATOR AND CUT-OUT.

The regulator provides complete automatic control, causing the dynamo to give an output which varies according to the load on the battery or its state of charge.

Normally, during daytime running, when the battery is in good condition, the dynamo gives only a trickle-charge, so that the ammeter readings will seldom exceed 1 or 2 amperes.

If, under normal running conditions, it is found that the battery is continually in a low state of charge, or is being overcharged, then the regulator setting should be checked by a qualified electrician and re-set, if necessary.

The cut-out is mounted alongside the regulator in Lucas sets.

The cut-out is mounted on the dynamo end plate (commutator end) in Miller sets.

Clean cut-out contacts by :—

Place between the contacts a strip of fine glass paper and then, closing the contacts by hand, draw the paper through. Do this several times with the abrasive side towards each contact.

The regulator is attached to the rear frame, just under the saddle. Two bolts with washers and nuts are used to secure same and, upon removing those bolts, the regulator unit can be taken away. There is ample length of cable loom to permit this removal without first disconnecting the loom.

The Lucas regulator and cut-out is type MCR. (MT4/LU/33020A.)

The Miller regulator is type CV1WD. (MT4/MI/CV1/WD.)

142 THE AMMETER.

Check ammeter for faults by substitution.

The Lucas ammeter is type 364461.

The Miller ammeter is 72M/75V. (MT3/MI/75V/WD.)

143 THE BATTERY. (LUCAS AND MILLER.)

When examining a battery, do not hold naked lights near the vents as there is a danger of igniting the gas coming from the plates.

When the vent plugs are removed ensure the ventilating holes in each are quite clear. Remove dirt with bent wire. A clogged vent plug will cause the pressure in the cell to increase, due to gases given off while charging, and this may cause damage.

Ensure a rubber washer is fitted under each vent plug, otherwise the electrolyte may leak.

Top-up battery by :—

Unscrew battery clamping screw.

Remove battery lid.

Remove the three vent plugs.

Pour distilled water in each cell to bring the acid (electrolyte) level with the tops of the plate separators.

Acid must not be added to the electrolyte unless some is accidentally spilled. Should this happen, make loss good with acid diluted to same specific gravity as acid in the cell.

Specific gravity is measured with a hydrometer.

Take a reading from each cell.

Readings should be :—

1·280 to 1·300 if battery fully charged.
About 1·210 if battery half discharged.
Below 1·150 if battery fully discharged.

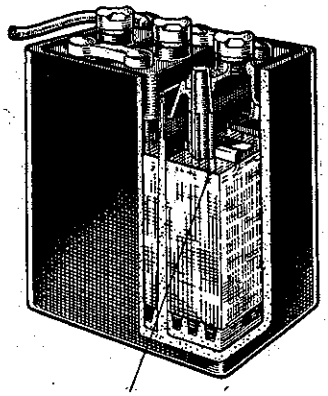


Illustration 38

Lucas Battery

Above figures are given assuming temperature of acid is about 60° F.

If one cell gives a reading very different from the rest it may be that acid has been spilled, or has leaked, from that cell, or there may be a short circuit between the plates. This will necessitate the battery being sent to a repair depot for rectification.

Wipe the top of the battery to remove all dirt or water.

NOTE :—Do not leave a battery in a discharged condition for any length of time. If it is to be stored out of use it must first be fully charged and afterwards given a refreshing charge about every two weeks.

144 BATTERY CHARGING.

If tests indicate the battery is merely discharged, and if the acid level is correct, the battery must be recharged from an external supply.

Charge the battery with a constant current of 1·2 amperes until the specific gravity of the electrolyte in the cells remains constant.

If the battery does not respond to a freshening charge, it must be put through what is known as a " cycle."

First, charge, as described above, for a period of 10 hours, and then discharge it at the rate of 1·2 amperes. The time taken to discharge should be from seven to eight hours. If the battery discharges in a shorter time, repeat the charging and discharging cycle.

If the efficiency of the battery is not improved by this process there is probably an internal fault and the battery should be replaced.

145 THE HEADLAMP. (LUCAS.)

A Lucas type DU–42 headlamp is fitted.

To remove the lamp front (including reflector and mask), release the spring clip located at the bottom of the lamp front and pull outwards the bottom of the front.

The ammeter, switch and wire loom are retained to a panel which may be detached from the lamp shell by removing the three fixing screws. There is a spring washer under the head of each screw.

The reflector and mask are retained to the lamp front by four spring clips and, upon removing the clips the reflector and mask may be taken away.

The two bulbs are held in holders fixed to a plate that fits in the rear of the reflector and the plate is retained by two spring wires. Upon springing the two wires outwards, so that they are clear of the bulb holder plate, the plate with holders and bulbs may be taken away.

The pilot bulb is a 6–7 volt bulb, 3 watts, S.B.C.

The main bulb is a 6–7 volt bulb, with double filaments, 24 watts, S.B.C.

The main bulb is adjustable in its holder. It is secured by a clamp bound with one screw and, upon slackening the screw, the bulb may be pushed, inwards and outwards, thereby providing movement to enable the light beam to be focussed.

146 THE HEADLAMP. (MILLER.)

A Miller type 72–E headlamp is fitted.

To remove the lamp front (including reflector and mask), pull forward the locking plate on the catch located on the bottom of the lamp front and then, to release the lamp front, pull it outwards.

The ammeter is retained to the lamp shell by a metal bridge and two knurled nuts. To remove the ammeter, unscrew the nuts, take away the bridge and the ammeter can then be withdrawn from the shell.

The switch is retained to the lamp shell by two nuts. To remove the switch, unscrew the screw binding the operating arm to the switch rotor. Unscrew the two nuts, disconnect the wires and the switch is free to be taken away. (There are water-excluding washers between the switch and the lamp shell.)

The wire loom is retained to the lamp shell by pliable tabs. These must be straightened before attempting to remove the loom.

The reflector and mask are retained to the lamp front by five spring clips and, upon removing the clips, the reflector and mask may be taken away.

The two bulbs are held in holders fixed to a plate that fits in the rear of the reflector and the plate is retained by two spring wires. Upon springing each wire from its catch, and swinging them clear, the plate with holders and bulbs may be taken away.

The pilot bulb is a 6–7 volt bulb, 3 watts, S.B.C.

The main bulb is a 6–7 volt bulb, with double filaments, 24 watts, S.B.C.

147 HEAD LAMP NOTES. (LUCAS AND MILLER.)

When replacing headlamp fronts, locate the top of the rim first and then press on at the bottom.

Lamps are retained to their brackets by two side fixing bolts. By slightly slackening the two bolts the lamp may be tilted, up and down, and it should be set so that the beam is projected below the horizontal.

When handling the reflector take care to prevent it becoming finger marked. It can be cleaned by polishing with a fine chamois leather. Metal polishes must not be used.

148 THE REAR LAMP. (LUCAS.)

A Lucas type L–WD–MCT1 rear lamp is fitted.

The body, with bulb holder, is secured to the rear mudguard by two bolts, with washers and nuts.

The bulb is 6–7 volts, 3 watts, S.B.C.

The cover, carrying the red glass, is secured to the body by a spring clip and a rubber sleeve encircles the body, serving the dual purpose of a water seal and locking device for the cover.

To remove the cover, twist it and then pull outwards.

To replace the cover, push the cover between the rubber sleeve and lamp body and then turn it until the spring clip is heard to clip into its position.

149 THE REAR LAMP. (MILLER.)

A Miller type 31WD rear lamp is fitted.

The body, with bulb holder, is secured to the rear mudguard by two bolts, with washers and nuts.

The bulb is 6–7 volt, 3 watts, S.B.C.

The cover, carrying the red glass, is secured to the body by a spring clip (in the form of a circlip located in a groove in the cover) and two round-headed screws.

To remove the cover, remove the two screws and then pull away the cover.

To replace the cover, push it on to the body of the lamp, rotate it till the screw holes register and then replace the screws.

150 THE WIRE LOOM. (LUCAS AND MILLER.)

Lucas and Miller electrical wire looms are similar but are not interchangeable.

All electrical wires should be strapped to the frame tubes as near as possible to the points where they enter lamps, battery, etc. A loose wire will soon break away from its terminals. Use the rubber clips or, as a substitute, insulating tape.

Electrical wires must be kept free from oil and grease.

151 ELECTRICAL TERMINALS. (LUCAS ELECTRICAL EQUIPMENT.)

Most of the terminal connections consist of a metal sleeve that is a holding fit in a metal socket. To make such a connection it is necessary to withdraw the metal sleeve from the terminal socket, bare the end of the wire for $\frac{3}{8}$ inch, pass the wire into the metal sleeve and turn back the wire strands so that they lie outside the sleeve and then push the sleeve into the socket.

Terminal connections to the switch and regulator are in the form of a metal post to which the wires are secured by a binding screw. To make such a connection it is necessary to slacken the binding screw, bare the end of the wire for $\frac{3}{16}$ inch, pass the wire through the slot cut in the metal post and secure by fully tightening the binding screw.

The earth wires and high-tension wire have terminals of the solid sleeve type having an eye at the extreme end.

To make such a connection it is necessary to bare the end of the wire for $\frac{3}{8}$ inch, pass the terminal over the wire so that the bared end fully enters the reduced core of the terminal and then flatten that part by pinching in a vice or by hammering.

The rear lamp wire has inserted in it a screwed connection. This is located just above the rear wheel spindle and is quickly detachable. It consists of four parts, a threaded sleeve, a collet, a gland nut and a rubber sleeve. To make such a connection, bare the ends of the wires for $\frac{1}{8}$ inch, pass the rubber sleeve over one wire, pass the threaded sleeve over the same wire and follow by passing the bared end of that wire

through the collet and bend back the wire strands. Pass the bared end of the second wire through the gland nut and bend back the wire strands. Then screw the gland nut into the threaded sleeve and complete the operation by sliding the rubber sleeve over the metal assembly. The sleeve serves the dual purpose of insulating the exposed metal parts and preventing same from separation which might be caused by vibration.

152 ELECTRICAL TERMINALS. (MILLER ELECTRICAL EQUIPMENT.)

The Miller system uses sleeve and socket terminals, as described in Para. 151. The earth and high-tension terminals are also the same as those described in Para. 151.

One cable loom connection and the detachable connection in the rear lamp wire consist of an insulated metal plug, attached to one wire, and an insulated metal socket, attached to the second wire. The parts are separated by gently pulling apart.

153 EARTH CONNECTION.

There are two earth wires, one from the regulator and the second from the negative terminal of the battery. The ends of those wires are secured to an extension of the seat lug bolt (just under the saddle on the left-hand side.) It is essential those connections are kept clean and the binding nut must be kept fully tight.

154 HORN.

Either a Lucas or Clearhooter horn is fitted.

These are identical in general appearance and construction and are operated by a push switch on the right-hand handlebar.

Electric horns are adjusted to give their best performance before leaving the works and will give a long period of service without any attention. No subsequent adjustment is necessary.

If the horn becomes uncertain in action, or does not vibrate, it has not necessarily broken down. The trouble may be due to a discharged battery, or a loose connection, or short circuit in the wiring of the horn.

The performance of the horn may be upset by the fixing bolt working loose, or by vibration of some part adjacent to the horn. To check this, remove the horn from its mounting, hold it firmly in the hand by its bracket and press the push. If the note is still unsatisfactory, do not attempt to dismantle the horn, but return it to a depot for examination.

The horn push must make good electrical contact with the metal part of the handlebar and, if there is reason to suspect the bar is corroded at that point, the switch should be unclipped and the bar and switch thoroughly cleaned and then replaced.

155 SWITCH. (LUCAS.)

A Lucas 351541 switch is fitted. This has four positions : Off, rear lamp only, rear lamp and pilot lamp and rear lamp and main lamp. For removal instructions see Para. 145.

156 SWITCH (MILLER.)

A Miller 72M/125 switch is fitted. This has four positions : Off, main lamp and rear lamp, rear lamp only and pilot lamp and rear lamp. For removal instructions see Para. 146.

157 FUSES.

There are no detachable fuses in either Lucas or Miller electrical equipment.

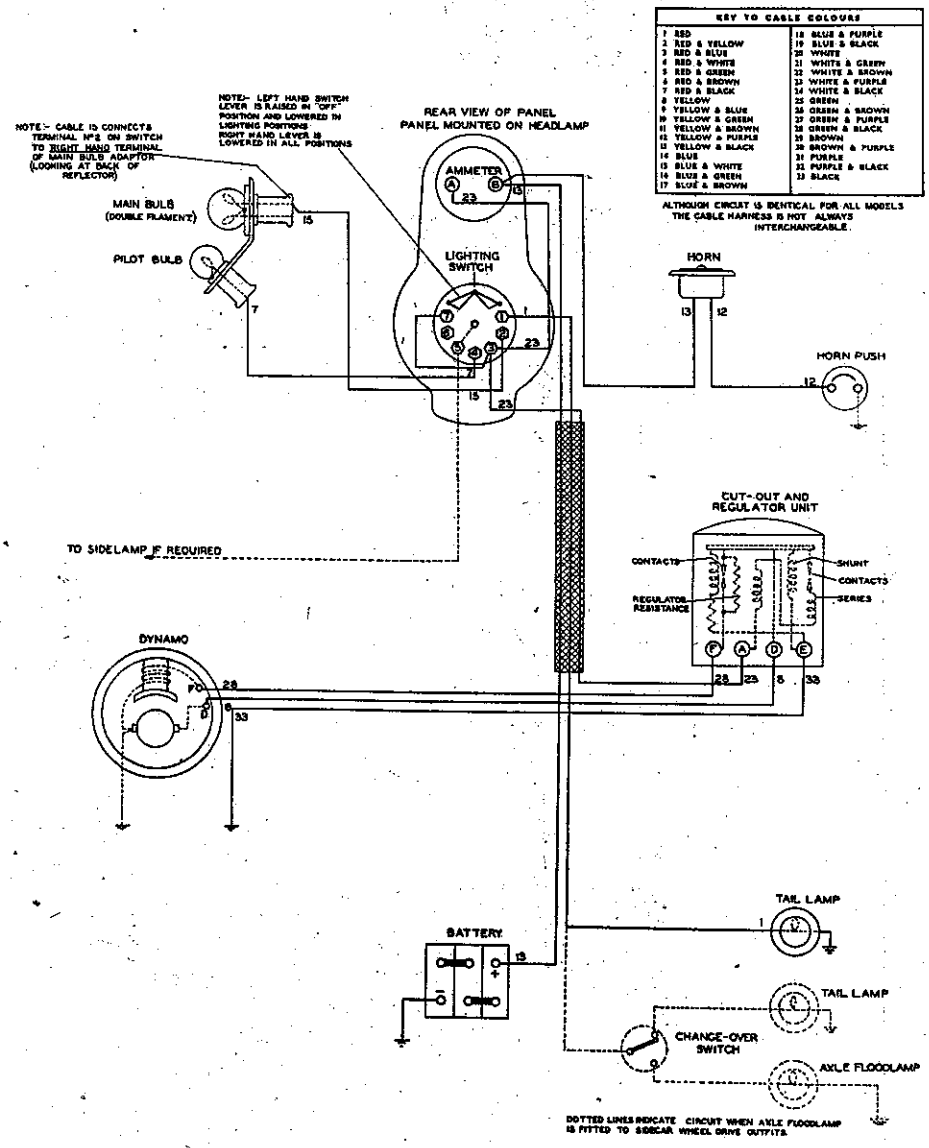


Illustration 39

Lucas Wiring Diagram

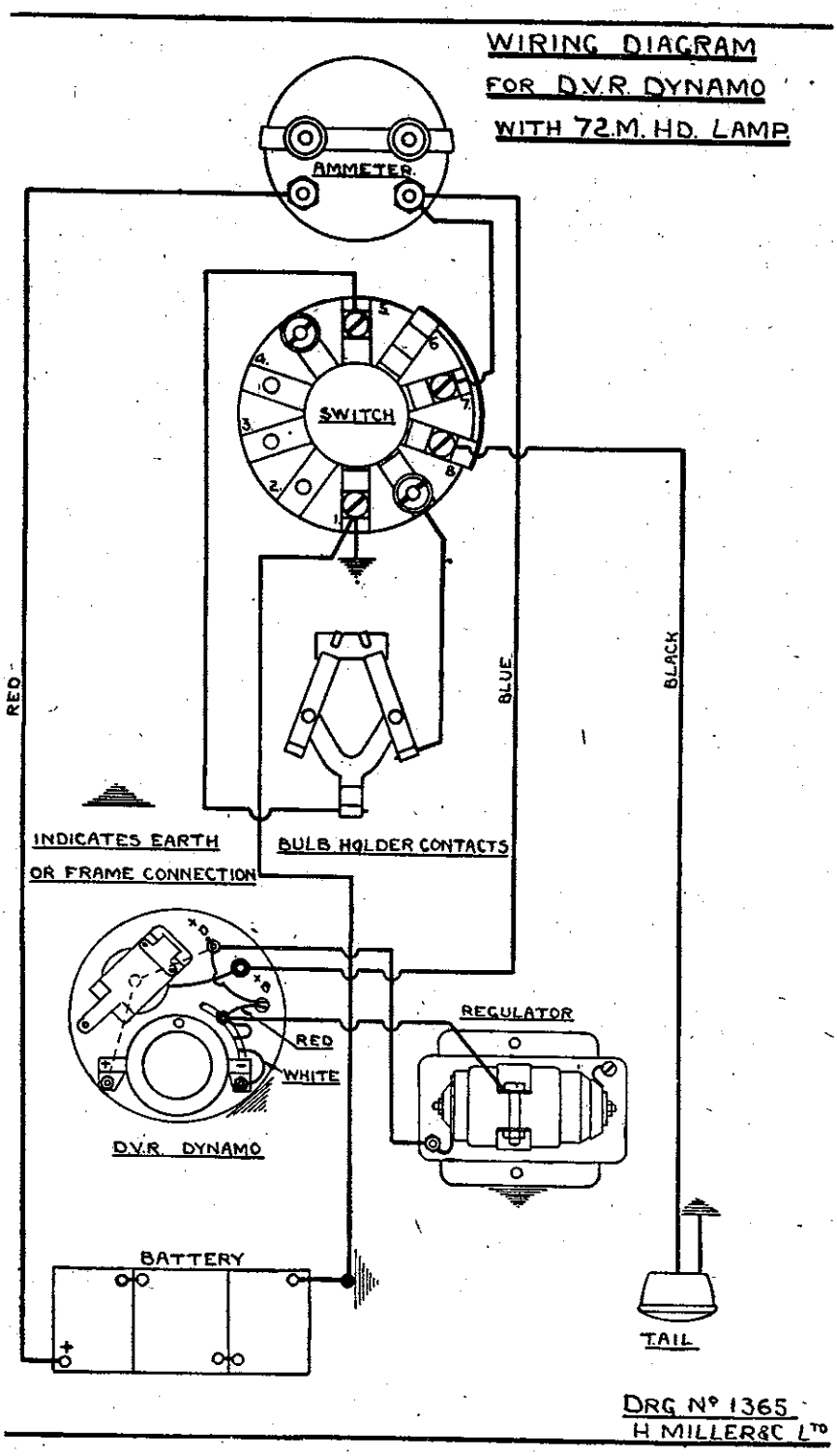


Illustration 40

Miller Wiring Diagram

USEFUL INFORMATION

158 MECHANICAL TROUBLES.

Sudden failures are generally due to one definite thing.

Gradual failure may be due to a combination of circumstances. In any case of failure in operation no adjustment should be made, nor any part tampered with, until the cause of the trouble has been located. Otherwise adjustments which are correct may be deranged.

159 TRACING TROUBLES.

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

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

Throttle opening too large.
Petrol tap closed.
Air lever in open position.
Ignition not set just off fully advanced position.
Not enough petrol in the tank.
Lack of fuel because of insufficient flooding.
Lack of fuel because of pipe, or tap, obstruction.
Excessive flooding of carburetter.
Pilot jet choked.
Oiled up, or fouled, sparking plug.
Stuck up engine valve.
Valve stem sticky with burnt oil.
Weak valve spring.
Valve not seating properly.
Contact points dirty.
Incorrect contact point gap.
Water on high-tension pick-up.
Water on sparking plug.
Vent hole in petrol tank filler cap choked.

Engine misses fire may be due to :—

Defective, or oiled, sparking plug.
Incorrect contact point gap.
Contact breaker spring blade sticking.
Contact breaker spring blade tappet sticking.
Tappet adjustment incorrect.
Oil on contact breaker points.
Weak valve springs.
Defective sparking plug wire.
Partially obstructed petrol supply.

Loss of power may be due to :—

Faulty sparking plug.
Lack of oil in tank.
No tappet clearance, or too much clearance.
Weak valve spring, or sticky valve stem.
Valve not seating properly.
Brakes adjusted too closely.
Ignition lever creeps to full retard position.
Badly fitting, or broken, piston rings.
Punctured carburetter float.
Engine carbonised.
Choked silencer.

Engine overheats may be due to :—

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

Engine stops suddenly may be due to :—

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

Excessive oil consumption may be due to :—

Clogged, or partly clogged, felt filter in oil tank.
High crankcase pressure, caused by inoperative release valve action. (The disc in valve may be damaged or jammed with dirt.)
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 leaks in dry sump oiling system.

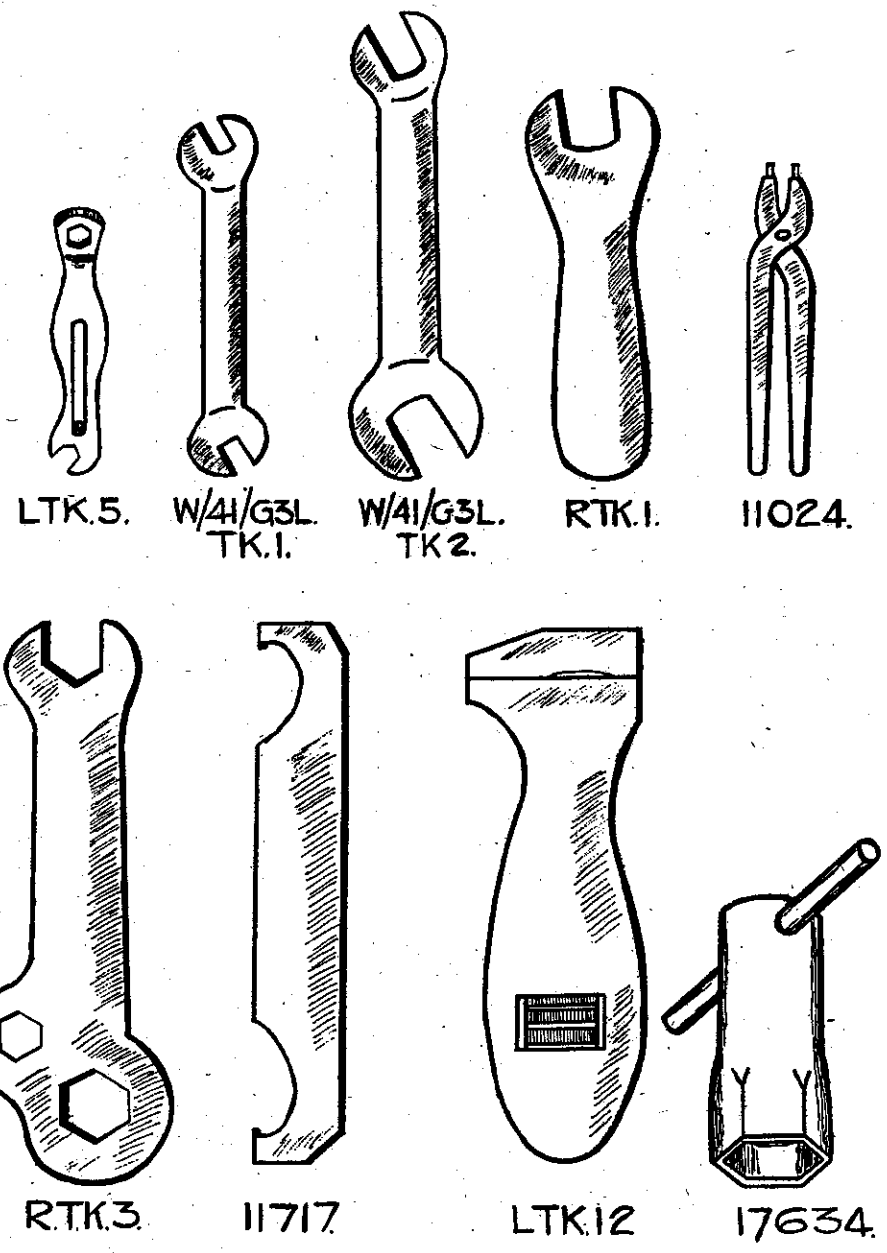


Illustration 41

Tools

160 TOOLS.

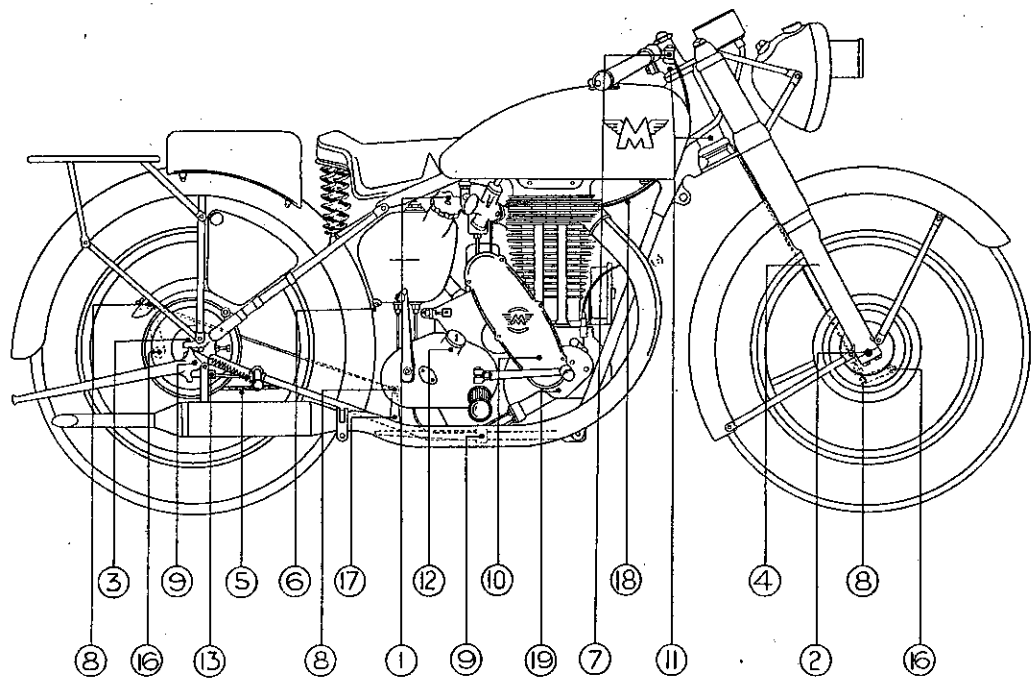
In addition to the tools illustrated in illustration 41, the following tools are included in the standard tool kit of a **41-G3L Matchless** :—

Tool bag	... ...	Part number	17520
Screwdriver	... ...	,, ,,	LTK–13
Pliers ...	... ...	,, ,,	LTK–15
Grease gun	... ...	,, ,,	LTK–20
Tyre inflator	... ...	,, ,,	38–G3–EQ2
Tyre lever	... ...	,, ,,	W40–G3–TK29

The description of the tools depicted in illustration 41 is :—

Part number 11024	...	Pliers, for gudgeon circlips.
W41–G3L–TK1		Spanner, double end, $\frac{3}{16}$ inch by $\frac{1}{4}$ inch.
W41–G3L–TK2		Spanner, double end, $\frac{5}{16}$ inch by $\frac{3}{8}$ inch.
RTK–3	...	Spanner, triple end, ·80 inch by 1·011 inch by 1·200 inch.
17634	...	Spanner, box, for sparking plug.
RTK–1	...	Spanner, for dynamo chain adjustment.
11717	...	Spanner, for hub lock nut.
LTK–5	...	Spanner, for contact breaker points.
LTK–12	...	Adjustable wrench.

NOTES



No	PART	LUBRICANT
1	OIL TANK CAPACITY 3 PINTS	M220
2	FRONT HUB	GREASE. GS
3	REAR HUB	GREASE GS
4	TELEDRAULIC FORKS. CAPACITY 6 OZS EACH SIDE.	M 120 X
7.	CONTROL LEVERS	M220
8.	BRAKE ROD JOINTS	M220
10	MAGNETO CHAIN	GREASE GS.
11.	STEERING HEAD	GREASE. GS
12.	GEAR BOX	C 600
13.	SPEEDO GEARBOX	GREASE GS
16.	BRAKE CAMS	GREASE GS
17.	BRAKE PEDAL	GREASE GS
18.	BOWDEN CABLES	M 120 X
19.	FRONT CHAINCASE	M. 220
	OIL CAN LUBRICATION	
5	REAR CHAIN	M. 220.
9	STANDS	M. 220