DRIVING & ADJUSTMENT INSTRUCTIONS

FOR

1939/G3 MATCHLESS MOTOR CYCLES

(WITH WAR OFFICE MODIFICATIONS)

FRAME NUMBERS 3257 to 3520

ENGINE NUMBERS 39/G3-2715 to 39/G3-2978

(INCLUSIVE)

CONRACT C/2073 (D.C. 2A) DATED 14-9-38

ISSUED BY THE MANUFACTURERS

MATCHLESS MOTOR CYCLES

(Proprietors: ASSOCIATED MOTOR CYCLES LIMITED)

Registered Offices:

Plumstead Road, London, S.E.18 - - England

Nearest Station:
WOOLWICH ARSENAL,
SOUTHERN RAILWAY.

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

Telegrams and Cables: "Matchless, Wol-London."

Telephone: Woolwich 1223 (5 lines). *Code* {*A.B.C. 5th and 6th Edition, Bentley's and Private Code*

All correspondence to:—

Offices: Plumstead Road, LONDON, S.E.18.

DRIVING.

A SUGGESTION.

Before attempting to start the engine or to use the machine on the road, a new owner is advised to first of all place the machine on the rear stand, sit on the saddle, and become familiar with the position and operation of the various controls. Particular attention should be devoted to the various gear positions as detailed on Page 4.

CONTROLS.

The following controls are provided :—

CARBURETTER.	Throttle ...	Quick action twist grip on the right handlebar. Twist inwards to open throttle.
	Air	Small lever on right handlebar. Pull inwards to open air valve.
IGNITION.	Advance and Retard	Small lever on left handlebar. Pull inwards to advance ignition.
EXHAUST VALVE LIFTER ...		Short lower lever on left handlebar. Pull upwards to raise exhaust valve.
CLUTCH		Large upper lever on left handlebar. Pull towards driver to free the clutch.
FRONT BRAKE		Large lever on right handlebar. Pull towards driver to apply the front brake.
REAR BRAKE		Foot pedal on left-hand side of machine. Press downwards to apply the rear brake.
GEARS		The forward pedal on the right side of the gear box. Press pedal downwards to obtain next higher gear. Pull pedal upwards to obtain next lower gear. The neutral position is indicated by the two pointers being in line with each other. One pointer is bolted to the kickstarter case cover, the other moves with the foot pedal. Neutral position is between the first (lowest) and second gears.
HORN		Switch on right handlebar. Press switch button to operate horn.

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LIGHTS	... ...	The MAIN SWITCH is located in the bottom centre of the panel mounted in the top of the petrol tank. This has three positions marked "OFF," "L," and "H." When in the off position no lights are on. In the "L" position the pilot bulb in the head lamp, the rear lamp and the speedometer internal lamp are alight. In the "H" position the main bulb in the head lamp, the rear lamp and the speedometer internal lamp are alight.
HEAD LAMP DIP SWITCH	...	Two way switch on the left handlebar. This controls the normal and dipped beams.
STEERING DAMPER	... ...	Knurled knob on top of steering column. Turn in clockwise direction to increase the damping action.
FORK DAMPER	... ...	Knurled knob on left side of front fork lower front spindle. Turn in clockwise direction to increase the damping action.

FUEL.

All makes of No. 1 quality petrol are recommended. The tap that controls the main petrol feed is of the "push" type. The tap push slide has two knobs. One of these is hexagon in shape and this should be pushed in order to allow petrol to pass from the tank to the carburetter. The other knob is round in shape and has a knurled edge. Push this end in order to turn "off" the petrol. This variety in the two ends enables the tap to be used, with certainty, in the dark. The two knobs are marked "ON" and "OFF."

GEAR POSITIONS.

Before attempting to start the engine make sure the gear is in the neutral, or free, position. Make a habit of always placing the gear in neutral after a run on the machine. Neutral is indicated by the pointer on the foot change pedal being in line with the pointer that is bolted to the kickstarter case cover.

Every time the foot gear change pedal is fully depressed the next higher gear is engaged and every time the pedal is raised to the limit of its movement the next lower gear is engaged. The downward movement is best made with the toe and the upward by the instep. The neutral position is between the first (lowest) and second gears. There are four gear ratios and the fourth is called "top."

The foot pedal is raised upward, from the neutral position, to engage the first, or lowest gear. Then, to engage all the higher gears, the pedal must be pressed downwards, step by step, till, after three movements the top gear is engaged.

STARTING THE ENGINE.

(a) Make sure there is enough fuel in the petrol tank.

(b) Inspect the level of the oil in the oil tank. (See Page 12.)

(c) Make sure the gear is in the neutral position.

(d) Turn "ON" the fuel supply tap.

(e) Place the air control lever in the closed position.

(f) Fully advance the ignition lever and then slightly slack it back so that the ignition is slightly retarded from the fully advanced position.

(g) Slightly open the throttle by twisting the twist grip inwards not more than one-sixth of its total movement.

(h) Flood the carburetter by depressing the spring plunger in the top, or cap, of the float chamber and holding it down till petrol is seen emerging from the small holes bored in the knurled edge of the cap.

(i) Raise the exhaust valve by lifting the small lower lever on the left handlebar and, while this is kept raised, turn over the engine by depressing the kickstarter crank two or three times.

(k) Then give the kickstarter crank a vigorous downward kick and, when it is almost at the bottom of its movement, release the handlebar exhaust lifter lever, when the engine should commence to fire.

After the engine has started, let it run for a second or two and then open the air lever, a trifle at a time, till it runs quite evenly. Then, by flicking open the twist grip two or three times, allow the engine speed to increase and decrease in order to clear the combustion chamber and the silencing system of all condensed moisture, which otherwise has a heavy corrosive action on the silencer interior.

Do not let the engine race, neither let it just tick over, but set the twist grip so that it is running at a moderate speed in order to get "warmed up." While it is doing this take the opportunity of checking the oil circulation as detailed on Page 11.

One or two minutes is ample time for starting, warming up and checking the oil circulation. The machine can then be taken on the road.

STOPPING THE ENGINE.

To stop the engine, close the throttle, raise the small lower lever on the left handlebar (exhaust lifter lever) and keep it raised till the engine has ceased to revolve.

ON THE ROAD.

With the engine running, sit astride the machine, free the clutch by pulling up the large lever on the left handlebar, gently move the machine forward till the rear stand is released, and then, with the right instep, raise the foot gear change pedal to engage the lowest gear.

Next slowly release the clutch handlebar lever when the machine will commence to move forward. Guard against having the engine speed too high when first engaging the clutch and regulate the speed, as required, by moving the twist grip.

When well under way, disengage the clutch, slightly close the throttle, engage second gear by fully depressing the foot gear change pedal, release the clutch and open up the throttle to increase the speed. Repeat these operations in order to engage third and top gears, respectively.

The ignition should be advanced fully immediately the machine is well under way, and it should be left in this position unless it is necessary to retard the ignition to ease the engine. Never run for any considerable period with the ignition retarded.

Always endeavour to make the movements of hand (on the clutch) and foot (on the gear pedal) as simultaneous as possible, but remember, in all gear changes a steady pressure of the foot is desirable, and this pressure should be maintained until the clutch lever is fully released. It is not sufficient to jab the foot pedal and then realease the clutch lever.

When actually in motion, it will be found sufficient to merely free the clutch a trifle to ease the drive when changing gear, and, with reasonable care, changes of gear can be made without a sound.

Avoid letting the engine race when changing gear. Normally the movements of the clutch lever and the foot pedal are too quick to permit of any appreciable rise in engine revolutions, but, until this stage of efficiency is reached, the beginner is advised to slightly close the throttle when making a change, because by suddenly engaging the clutch while the engine is racing an enormous load is imposed on both gears and chains.

When, by reason of travelling slowly in top gear, such as may be caused by traffic conditions, or by reason of travelling up a hill, the engine commences to labour, it is necessary to change to a lower gear in order to lessen the strain on the engine and transmission. A good driver is able to sense such conditions and will make the change before the engine has reached the stage of stress. Remember the gear box is provided to be used, and full use should be made of the lower gears in order to obtain effortless running and hill climbing.

Avoid slipping the clutch to an undue amount.

STOPPING.

To stop the machine, close the throttle, declutch by lifting the large lever on the left handlebar, and gently apply both brakes, increasing the pressure on them as the speed of the machine decreases.

Place the foot gear change pedal in the neutral position before releasing the clutch lever.

Stop the engine (see Page 5) and before leaving the machine turn off the fuel supply, because, should the carburetter flood while the machine is stationary, there is a possibility of neat petrol entering the cylinder via the inlet port. When this occurs there is a risk of fire and a real danger of the oil thinning with the conseqent risk of engine seizure.

RUNNING IN.

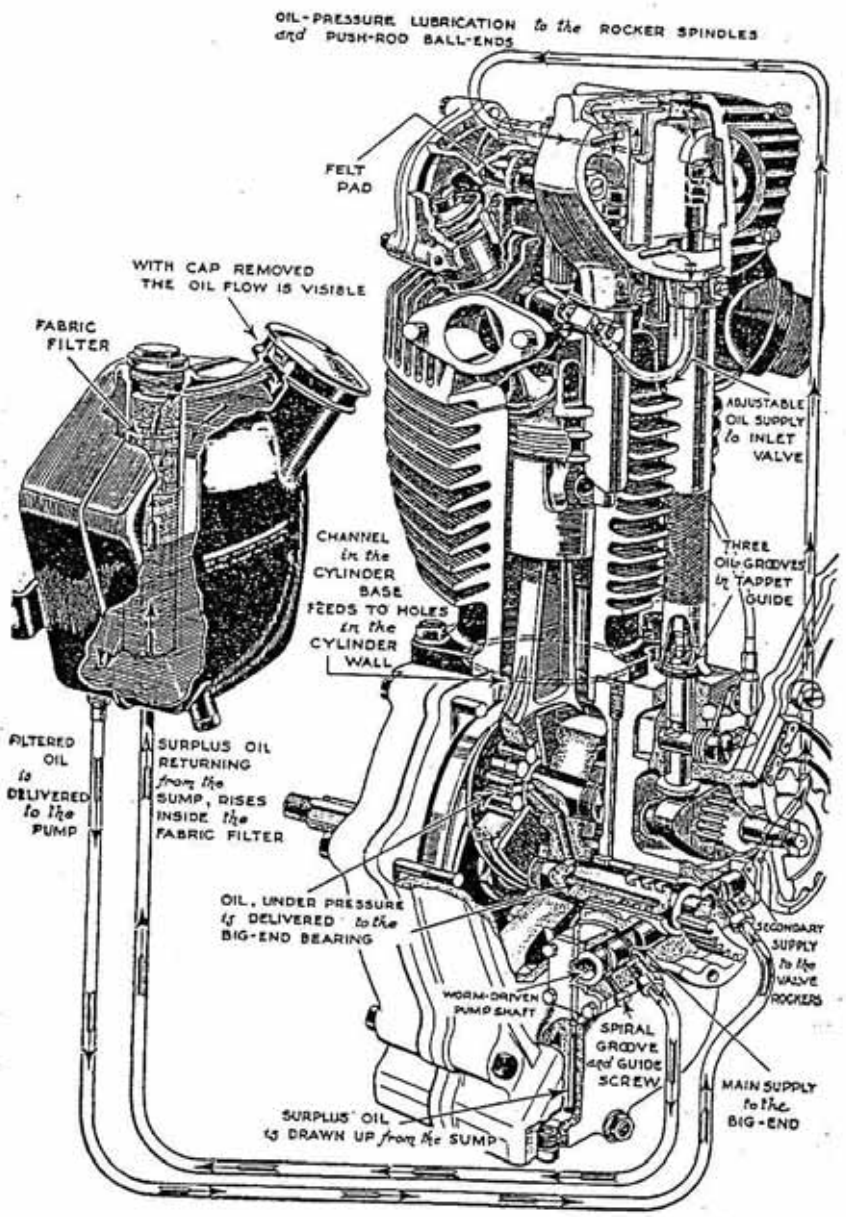
For at least the first five hundred miles full throttle driving should be avoided. A speed of thirty miles per hour should not be exceeded during this period, the engine should not be allowed to labour (so use the gear box) and it should not be allowed to attain a high rate of revolutions on the lower gears or in neutral. After this initial running in short speed bursts are permissible, but it is recommended not to indulge in extended high speeds until at least a thousand miles have been covered.

At the conclusion of the first one hundred and five hundred miles the adjustment of tappets, chains, brakes, contact breaker, wheel bearings, fork spindles, and steering head bearings should be checked, and corrected if necessary. After the initial settling-down process, attention to such details will only be necessary at very infrequent intervals.

ENGINE LUBRICATION SYSTEM.

The engine is lubricated by the DRY SUMP system. In this the main bulk of oil is carried in a tank from which it feeds by gravity to the oil pump. The pump forces the oil through a series of channels to the various parts requiring lubrication, and is then allowed to drain into the crankcase sump, from which it is extracted and returned to the oil tank by the pump. This process is continuous while the engine is running, and, because the oil pump is designed so that it is capable of exhausting a greater amount of oil than it is capable of injecting into the engine, it will be obvious that the crankcase sump is kept free of excess oil.

Therefore never allow the oil tank to become empty, or nearly so, because owing to there being no reserve of oil in the engine, an empty tank means an immediate shortage of oil to the working parts.



Oiling System.

ENGINE OIL CIRCULATION.

As already mentioned, oil is fed to the oil pump by gravity. The oil pump has only one moving part. This is the plunger, which rotates and also has a reciprocating motion. The plunger is rotated by the timing side flywheel axle, and, while rotating, moves forwards and backwards because of the influence of the small guide screw which engages in the profiled groove cut in the rear end of the plunger.

As the plunger moves in its housing in one direction the large end draws oil from the crankcase sump, while, at the same time, the smaller end is delivering oil to the various channels provided. Upon the reverse movement of the plunger, the large end returns to the tank the oil it has already drawn from the sump, while the smaller end takes in a fresh charge of oil from the tank in readiness for delivery to the engine on the following movement of the plunger. This action goes on all the time the engine is revolving.

In the oil tank is an efficient filter in the form of a felt cartridge, through which the returning oil is compelled to pass before emerging through the spout immediately underneath the oil tank filler cap, from which it rejoins the main supply of oil in the tank. The felt filter effectively removes all dirt and other foreign matter that the oil may have collected during its passage through the engine.

Reference to the illustration of the oiling system shows that the oil pump forces oil through :—

(1) A channel to the timing side flywheel axle bearing, and then through a drilled passage in the flywheel to the big-end bearing, the splash from which passes into the interior of the cylinder.

(2) A channel controlled by a ball valve direct to the cylinder so that this, the most vital part of the engine, receives an adequate supply of oil, particularly at high engine speeds.

(3) A channel to the timing gear case, in which the oil is allowed to "build up" to a pre-determined level, after which all surplus oil drains back into the crankcase sump via a hole cut between the timing gear case and the flywheel chamber.

(4) A pipe fixed to the oil pump housing front cap and leading to the rocker box, by which all the overhead rocker mechanism and valves are positively lubricated, by an ingenious arrangement of oil jets that pass a pre-determined quantity of oil, which eventually passes down the push rod cover tubes and through grooves machined in the tappet guides into the timing gear case, and from there it drains back into the crankcase sump as detailed in paragraph three.

THE OIL TANK.

Oil for engine lubrication is carried in the tank situated immediately under the saddle. In use, the level of the oil in the tank should never be allowed to fall below the half-way mark that is indicated on the outside of the tank.

At periods, of not more than every five thousand miles, the oil tank should be drained, thoroughly washed out with petrol, and then re-filled with fresh, clean oil. A drain plug is provided in the bottom of the tank to facilitate this process.

The felt cartridge oil filter is located in the oil tank and on each occasion the engine is decarbonised, or not less frequently than every fifteen hundred miles, this filter should be removed and thoroughly washed in petrol. The filter is situated under the hexagon headed cap in the top of the tank. By unscrewing this cap and lifting away the spring and dished washer, which will be found under it, access to the filter is possible in order to withdraw it from the tube in which it fits. This is facilitated by removing the two nuts retaining the saddle springs to the saddle frame, which will enable the saddle to be raised so that the filter can be withdrawn in the direction of the rear wheel.

OILING ADJUSTMENT.

The correct delivery of oil to each part of the engine is arranged internally by suitably dimensioned passages, and no provision is made for external adjustment of the oil supply except for the oil feed to the inlet valve stem.

The adjuster for the inlet valve stem oil feed consists of a needle pointed screw that can be locked in position by a thin lock nut. This screw is located in the cylinder head, and is a part of the oil union that takes oil from the rocker box to a channel cut in the head and inlet valve guide. Once the adjuster is set it requires little, or no, adjustment. The approximate correct setting is half a complete turn from the fully closed position and, unless troubled with valve squeak or excess oil we advise the adjustment to be left as set by our testers on the road tests.

Valve squeak generally indicates this valve is not passing enough oil, in which case the needle valve should be unscrewed a trifle. Excessive oil consumption, an oily exhaust, or an oiled plug, in the case of a new machine, usually indicates this needle valve is passing too much oil, in which case it should be screwed home, a trifle at a time, till the symptoms disappear.

CHECKING OIL CIRCULATION.

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

If the filler cap is removed, the returning oil can be seen running from the small spout just inside the filler cap orifice. This check should be made immediately after starting the engine from cold. This is because, while the engine is stationary, oil from all parts of the interior of the engine drains back into the crankcase sump, so that until this surplus is cleared, the return flow is very positive and continuous. Therefore, if the oil circulation is deranged, the fact is apparent at once, by the lack of a steady return flow.

It should be remembered that normally the return flow is somewhat spasmodic and mixed with air bubbles. This is partly due to the fact the return portion of the oil pump plunger has greater pumping capacity than that delivering fresh oil, and partly due to the variations in the amount of oil in suspense in the crankcase according to the engine speed. For example, upon a sudden acceleration, the return flow may completely cease for a time, only, of course, to resume at a greater rate than normal upon deceleration.

REMOVING THE OIL PUMP PLUNGER.

To remove the oil pump plunger, it is necessary to proceed as follows :—

Drain the oil tank.

Remove the four bolts holding the oil pump housing rear cap to the crankcase and take away the cap.

Unscrew the guide screw for the oil pump plunger. (This is a screw, having a hexagon head, that screws into the oil pump housing portion of the crankcase. It is located in the under side of the housing, just in front of the rear cap. This screw is at right angles to the plunger and its reduced end engages in the profiled groove cut in the rear end of the pump plunger).

Then the pump plunger can be extracted from its housing.

WARNING.

If, for any reason, the engine is dismantled, the oil pump plunger MUST be removed before the two halves of the crankcase are separated.

REPLACING THE OIL PUMP PLUNGER.

To replace the oil pump plunger, it is necessary to proceed as follows :—

See that the interior and exterior of the oil pump plunger and its housing are free from dirt. Then smear the plunger with clean engine oil.

Insert the narrow end of the plunger in the rear end of the plunger housing and gently push it into place.

Next, introduce the guide screw into its hole and while gently screwing this, slightly move the plunger in a to and fro motion until the narrow end of the guide screw is felt to engage in the profiled groove cut in the end of the plunger. Once the guide screw has engaged in the groove it should be screwed right home.

If the screw does not engage in the groove, and it is tightly screwed against the body of the plunger, the plunger will be prevented from rotating, so that, when the engine is turned for starting, the teeth on the plunger and on the timing side flywheel axle will be stripped. Therefore great care must be taken in order to prevent this occurring.

There now only remains to replace the end cap. It will be noticed there is a paper washer under each end cap and if either, or both, are damaged, it is necessary to replace with new. (Paper washer, for oil pump end cap. Part number STD 582).

It is most essential that both of the end caps are an air tight fit on the pump housing, and consequently it is advisable to smear one side of each washer with a small quantity of liquid jointing compound, and to place that side in contact with the end cap.

Note that the cap on the front end of the housing is retained by four screws having countersunk heads, and the cap on the rear end is retained by four small bolts having hexagon heads.

POINTS TO REMEMBER.

Clean the oil filter felt cartridge, as already detailed, and if necessary replace with new. (Oil filter cartridge, for oil tank. Part number STD 796). A dirty, or choked filter will inevitably cause heavy oil consumption.

Make sure the oil tank has an ample supply of oil. The level should not be less than the half-way mark indicated on the outside of the oil tank, nor more than within one inch from the top of the filling orifice.

Make sure both end caps on the oil pump plunger housing are air tight.

Before each run check the operation of the oil in circulation, by inspection through the oil tank filling orifice.

GEAR BOX LUBRICATION.

All mechanism inside the gear box is lubricated with grease. A grease nipple is provided on the top edge of the kickstarter case cover and this is the only point requiring grease gun application.

The gear box must not be entirely filled with grease and, under normal conditions, the addition of about two ounces of grease every thousand miles will be sufficient.

If desired, instead of using the grease nipple, grease may be inserted through the round screwed plug mounted in the top edge of the kickstarter case cover.

In no circumstances must heavy grease be used for gear box lubrication.

CHAIN LUBRICATION.

Both the primary and dynamo chains run in an oil bath case. The inspection cap orifice in the chain case determines the correct oil level, and it is imperative that the level is not allowed to fall lower than about 3/16in. below the height of the bottom edge of this orifice. Add engine oil to maintain this level. It is advisable to check the oil level each week because failure to maintain it will result in rapid chain wear with the possibility of total destruction.

The inspection cap has a screw passing through its centre, and this screw engages in a plate (situated inside the chain case) that bridges the orifice. Between the back of the inspection cap and the outside of the chain case is a cork washer. It is advisable to secure the cork washer to the inspection cap by liquid jointing compound.

To remove the inspection cap, the central screw must be undone about four complete turns. This will enable the cap to be slid sideways out of position and then, by tilting the cap assembly, the back plate can be slipped through the orifice and the complete assembly removed. It can be replaced in the reverse manner, taking care to centralise the cork washer before screwing home the central screw. (Securing the cork washer with jointing compound ensures it being centralised).

The rear chain should be removed every fifteen hundred to two thousand miles in Summer, and every thousand miles in Winter, and thoroughly washed in paraffin. After removing the paraffin by draining and wiping with a rag, it should be immersed for several minutes in a bath of molten tallow, or, as a poorer substitute, ordinary engine oil. If the latter is used, the chain should be laid in soak overnight in order to ensure penetration to all joints. If treated in this manner the maximum miles of satisfactory service will be obtained.

The case covering the magneto driving chain is packed with grease during assembly, and a grease nipple is provided in the case cover. A small quantity of grease should be added every thousand miles.

HUB LUBRICATION.

The hubs are packed with grease when first asembled. This prevents the entry of mud and water as well as lubricating the bearings. A small quantity of grease should be injected through the angular grease nipple in the centre of the hub shell every five hundred miles.

It should be remembered that if too great a quantity of grease is injected there will be a tendancy for some of the surplus to work into the brake drum, and the brake efficiency will be considerably reduced.

FORK SPINDLE LUBRICATION.

To maintain an efficient front fork action, it is essential the spindles receive adequate lubrication. Two grease nipples are fitted in the fork girders, two are fitted in the fork crown and one is fitted in the top lug, in front, on the steering stem. Grease should be injected through these nipples every five hundred miles, until it is seen to exude from both ends of each spindle bearing. This surplus should then be wiped off.

STEERING HEAD BEARING LUBRICATION.

In the head lug of the main frame is fitted a grease nipple to lubricate the bottom steering head bearing, and another nipple is fitted to the head clip at the top of the steering stem to lubricate the top bearing. These bearings require very little grease, and only a small quantity should be injected every thousand miles.

BRAKE CAM LUBRICATION.

A grease nipple is fitted to each brake cam expander bush, and a very small quantity of grease should be injected every thousand miles. Excessive quantities of grease may get on the brake linings. (See paragraph, above, re Hub Lubrication).

BRAKE ROD JOINT LUBRICATION.

About every thousand miles, and more frequently in bad weather, place a drop or two of engine oil on each brake rod joint and the threaded end of the brake rod.

SPEEDOMETER LUBRICATION.

The speedometer driving gear box screws into the front brake cover plate, and on its end is a sunk grease nipple. A small quantity of grease should be injected every five hundred miles. No other part of the speedometer requires lubrication.

DYNAMO LUBRICATION.

The dynamo bearings are packed with grease during asembly, and at least once every ten thousand miles the dynamo should be dismantled for cleaning, adjustment and re-packing the bearings with grease.

MAGNETO LUBRICATION.

The magneto bearings are packed with grease during assembly, and at least once every ten thousand miles the magneto should be dismantled for cleaning, adjustment and re-packing the bearings with grease.

CONTROL CABLE LUBRICATION.

Control cables are very susceptible to the influence of dryness and rust, and they should be kept flooded out with lubricant. The effect of efficiently lubricating a dry control cable has to be tried to believe the immense difference it causes. In order to do this we fit a small metal clip, in a convenient position, to each control cable. These clips cover small bared patches on the outer casings through which lubricant can be injected by means of a specially constructed oil gun.

This gun (special oil gun for control cables. Part number BGG) is not supplied with the standard tool kit.

The operation of flooding a control cable only takes a few minutes. It is necessary to slide the clip along the casing to enable the gun to be clamped to the casing so that the bared patch occupies a central position on the rubber pad that is on the nozzle of the gun. The clamping pressure is provided by the large, milled edge disc just under the rubber pad. The screwed plunger of the gun is then given a few turns which action forces oil through the metal spiral of the outer casing, and floods the entire length of the cable with lubricant.

Avoid oiling the ignition control cable to excess, because, if this is done there is a danger of oil collecting inside the contact breaker cover.

To fill the oil gun, unscrew the barrel from the end cap nearest to the nozzle. Unscrew the operating handle as far as it will go and then pour the lubricant into the barrel. (Engine oil or a very light grease may be used). Then replace the end cap and nozzle assembly and the gun is ready for use.

CONTROL LEVER LUBRICATION.

A drop or two of engine oil should be placed on all the moving parts of the various control levers every thousand miles.

BRAKE PEDAL LUBRICATION.

A grease nipple is provided to lubricate the bolt and bush on which the brake pedal is hinged. A small quantity of grease should be injected every thousand miles.

FILLING THE GREASE GUN.

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

The grease must be filled on the TOP of this cork piston. The gun may be filled with grease by inserting it in the gun barrel by means of a lath or similar "spoon." However, it is better to obtain the grease packed in the special containers that are supplied, having loose collars in which are holes, so that by placing the gun barrel over the hole in the central floating plate and by pressing downwards, the gun is instantly charged with grease. Twisting the gun, and, at the same time, taking it away from the floating plate, leaves the top of the gun barrel flush with grease, and then all that remains to be done is to replace the screwed top cap.

SPECIAL.

In addition to the parts mentioned in the preceeding paragraphs, there are several parts of a motor cycle that have a very small moving motion which can, with benefit, be lubricated. Among these are the bolts on which the front and rear stands hinge. It is advised to occasionally remove these bolts and lightly smear them with grease before re-fitting them.

Because grease prevents the entry of water, it is advisable, during the wet season, to smear round the contact breaker cover and the high tension pick up.

TO REMOVE AND REPLACE THE PETROL TANK.

The petrol tank, and its fittings, is designed so that it may be easily removed in order to provide ready access to the engine.

To remove the petrol tank, proceed as follows:—

Remove the positive wire from the battery.

Remove the petrol pipe, drain the petrol from the tank, remove the tank connection pipe and the four tank fixing bolts with their rubber pads and metal washers.

Remove the three screws that fix the instrument panel to the top of the tank, and also remove the inspection lamp from the panel.

Then lift away the tank, and, while doing so, pass the instrument panel through the slot between the two halves of the tank.

The instrument panel can then be hung over the front forks, out of the way, and it will be noted there is no need to disconnect any of the electric cables.

To replace the petrol tank, reverse the procedure described above.

TO REMOVE AND REPLACE THE ROCKER BOX.

To remove the rocker box, first remove the tank and then proceed as follows:—

Slack off the bolt securing the engine steady stay to the clip on the frame tube, remove the nut and washer fixing the steady stay to the front, right, rocker box bolt and gently spring the stay clear of the rocker box.

Disconnect the main oil pipe that leads oil to the centre of the rocker box, and the oil pipe that feeds oil from the rocker box to the inlet valve guide.

Remove the two detachable caps enclosing the valve springs by taking away the screws that retain them to the rocker box.

Next, turn over the engine until both push rods are free, this is when the piston is at the top of its stroke and both of the valves are closed. Should the rocker box bolts be removed with either, or both, of the valves raised, damage may occur to the rocker box.

Then remove the four bolts that secure the rocker box to the four bolts that retain the cylinder head to the barrel, and the complete rocker box with rockers assembled and push rod cover tubes can be lifted away. While doing this, remove the two long tappet push rods from the cover tubes and be careful to lay them aside so that they may be identified, because these should not be interchanged.

Finally remove the two steel caps that are on the valve stems.

To refit the rocker box, reverse the procedure described above, taking care, first of all, that the tappets are both "down." This is when the piston is at the top of its compression stroke.

Remember to replace the steel caps on the valve stems, and it is also necessary to take care that the valve spring cups are located correctly. The assembly is best done by first of all sliding the rocker box approximately in position, make certain that the lower ball ends of the long push rods are located in the tappet tops, after which, see the valve spring cups fit snugly in their respective positions, whereupon the four fixing bolts can be screwed down. Remember each fixing bolt has a metal washer on it and the bolt with the threaded extension is fitted in the forward position on the right-hand side of the box. Screw down each bolt, bit by bit, in turn until all are fully home.

Tappet clearances must always be checked after re-fitting the rocker box and adjusted if necessary.

TO REMOVE AND REPLACE THE CYLINDER HEAD.

To remove the cylinder head, first remove the tank and rocker box and then proceed as follows :—

Remove the entire exhaust system by loosening the screw that tightens the clamp on the exhaust pipe, where it is fixed to the cylinder head and removing all the bolts retaining the exhaust pipe and silencer to the main frame, and taking away the pipe and silencer as one unit.

Unscrew the top cap of the carburetter mixing chamber, and withdraw the throttle and air slides and remove the sparking plug.

Remove the four bolts retaining the cylinder head to the cylinder barrel and the head is then free to be taken away.

A copper gasket is fitted between the head and the barrel, and if in any way this is damaged, a new gasket should be used when refitting the head (Gasket, for cylinder head. Part number 12268).

To replace the cylinder head, reverse the procedure described above, taking care to refit the cylinder head gasket when doing so. When replacing the cylinder head bolts, screw each down, bit by bit, in turn until all are fully home.

TO REMOVE AND REPLACE THE VALVES.

After the cylinder head has been removed in the manner already described, to remove the valves it will be found convenient to rest the head of each, in turn, on a small wood block while the springs are compressed to allow of the valve cap divided collets being removed from the grooves cut in the valve stems. These collets are a taper fit and it may be necessary to give the valve spring cap a sharp tap in order to release them. Upon the removal of the split collets the pressure on the valve spring cap should be released, which will permit the removal of the valve spring cap and the springs, so that the valve will be free to be withdrawn from the head.

To replace the valves, smear each stem with engine oil and then reverse the procedure described above.

TO REMOVE THE CYLINDER BARREL.

To remove the cylinder barrel, first remove the tank, rocker box and cylinder head, and then proceed as follows :—

Remove the four nuts that retain the barrel to the crankcase, and this will leave the barrel free to be taken away. While doing this, take care to ensure that the piston assembly does not receive damage.

(For instruction for refitting the barrel, see Page 19.)

TO REMOVE THE PISTON.

To remove the piston, first remove the tank, rocker box, cylinder head and cylinder barrel and then proceed as follows :—

Fill the throat of the crankcase with rag. Then, using the special pliers included in the tool kit, compress the two ends of one of the gudgeon pin circlips and extract the circlip from the piston. It is immaterial which clip is extracted, because the gudgeon pin is parallel.

Next, push the gudgeon pin out of the piston, and this action frees the piston from the connecting rod so that it may be taken away. The gudgeon pin is an easy sliding fit in the piston and the gudgeon pin bush, so that no difficulty should be met in removing it. To refit the piston, see the following paragraph.

To Re-fit the Piston and Cylinder Barrel.

All part should be clean. Place the rings on the piston (see Page 20). Smear the gudgeon pin with clean engine oil, and, placing the piston over the connecting rod so that the slit in the piston faces to the front of the machine, and so that the holes for the gudgeon pin are in line with the bush in the rod, introduce the gudgeon pin and centralise it in the piston.

Then fit the gudgeon pin circlip (or circlips, if both have been removed). To do this, the rounded ends of the special pliers should be inserted in the holes in the circlip and the pliers gently compressed. The circlip should then be introduced into the piston, with a rotary movement, until the whole of the circlip lies snugly in the groove which is machined in the gudgeon pin boss in the piston.

This is most essential, because, if the circlips are not fitted properly, there is a possibility of the gudgeon pin working out of position and scoring the wall of the cylinder.

A paper washer is fitted between the base of the cylinder and the crankcase, and it is best to stick this to the barrel base with liquid jointing compound. (Paper washer, for cylinder base. Part Number 37-8-E3.) Make sure that none of the jointing compound closes the holes for lubricating the cylinder.

Next, smear the cylinder wall and the piston with clean engine oil, space the three piston rings so that the gaps are evenly spaced at approximately 120 degrees to each other and proceed to refit the cylinder barrel, taking care that the piston rings are fully compressed into their grooves, in turn, as the barrel passes over them.

When the barrel is down on to the crankcase, replace the four holding down nuts, screwing down each, bit by bit, in turn, until all are fully home.

DECARBONISATION.

The period for which an engine will run satisfactorily without being decarbonised depends, to a great extent, upon the driving conditions. Generally, this process should be carried out every fifteen hundred to two thousand miles.

The need for decarbonising will be indicated by a tendency to "pink," or knock, when ascending hills, or upon accelerating after rounding a corner, and particularly so when the engine is hot.

Although it is only necessary to take off the cylinder head to remove carbon deposit, it is advisable to also remove the cylinder barrel every five thousand miles to inspect the piston rings and to remove any carbon there may be in the piston ring grooves.

All piston rings should have a uniform matt appearance on their exterior, and any having black portions on their exterior (a sign leakage has occurred) should be replaced with new.

When all parts are cold, the two top piston rings should have a gap of .006in., and the bottom ring should have a gap of .004in.

All carbon should be scraped off the top of the piston and the inside of the cylinder head, and do not overlook any deposit there may be in the inlet and exhaust ports.

Do not use emery cloth or any other abrasive to remove carbon from the piston crown. A blunt screwdriver having a wide blade makes an excellent scraper for both piston and head.

VALVE GRINDING.

It is advisable to grind in the valves upon each occasion the engine is decarbonised.

First, scrape off all carbon deposit that is on the valve heads and clean the stems with very fine emery cloth by holding it between the thumb and forefinger and moving up and down the stem.

Then smear the face of each valve, in turn, with valve grinding paste and revolve the valve on its seat in a slight forward and backward direction, at the same time, maintaining slight pressure on the valve head.

During this operation, occasionally raise the valve off its seat and turn it slightly, afterwards repeating the forward and backward movement.

Generally, one application of grinding paste will be ample for the inlet valve, but two or three applications may be necessary for the exhaust valve before the seating is restored. The grinding may be considered satisfactory and completed when a continuous matt ring is observed on both valve and valve seat.

Finally, remove all traces of grinding paste from the valves and seatings by washing off with petrol and pass a piece of clean rag through each valve guide to remove any abrasive that may have collected.

TAPPET ADJUSTMENT.

The top ends of the tappet long push rods have screwed extensions. These are locked in position by nuts, and this movement provides tappet adjustment.

The correct tappet clearance between the rocker ends and the valve ends, when the valves are completely closed and the engine is cold, is the nearest possible approach to nil. This means the push rods should be free enough to be able to revolve them without any binding, and, at the same time, there should be no appreciable up and down movement possible.

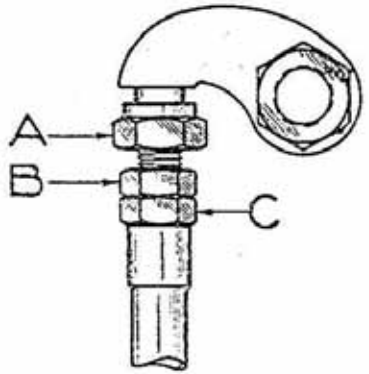
To adjust the tappet clearance, proceed as follows :—

Remove the four knurled nuts that retain the rocker box cap. This frees the cap for removal, and this reveals the adjustable ends mentioned in the first paragraph, above.

Revolve the engine until the piston is at the top of the compression stroke, in which position both of the valves are closed.

With spanners, hold the body C and slacken the lock nut B. Then screw, in or out, the head A until the clearance is nil. Next, tighten the lock nut B and re-check the clearance.

Finally, replace the rocker cap, taking care to replace the fibre washer that is under each knurled nut. Do not over-tighten these nuts because the joint is made with a rubber fillet, and undue pressure is not necessary. Excessive pressure may crack the cap.



MAGNETO CHAIN ADJUSTMENT.

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

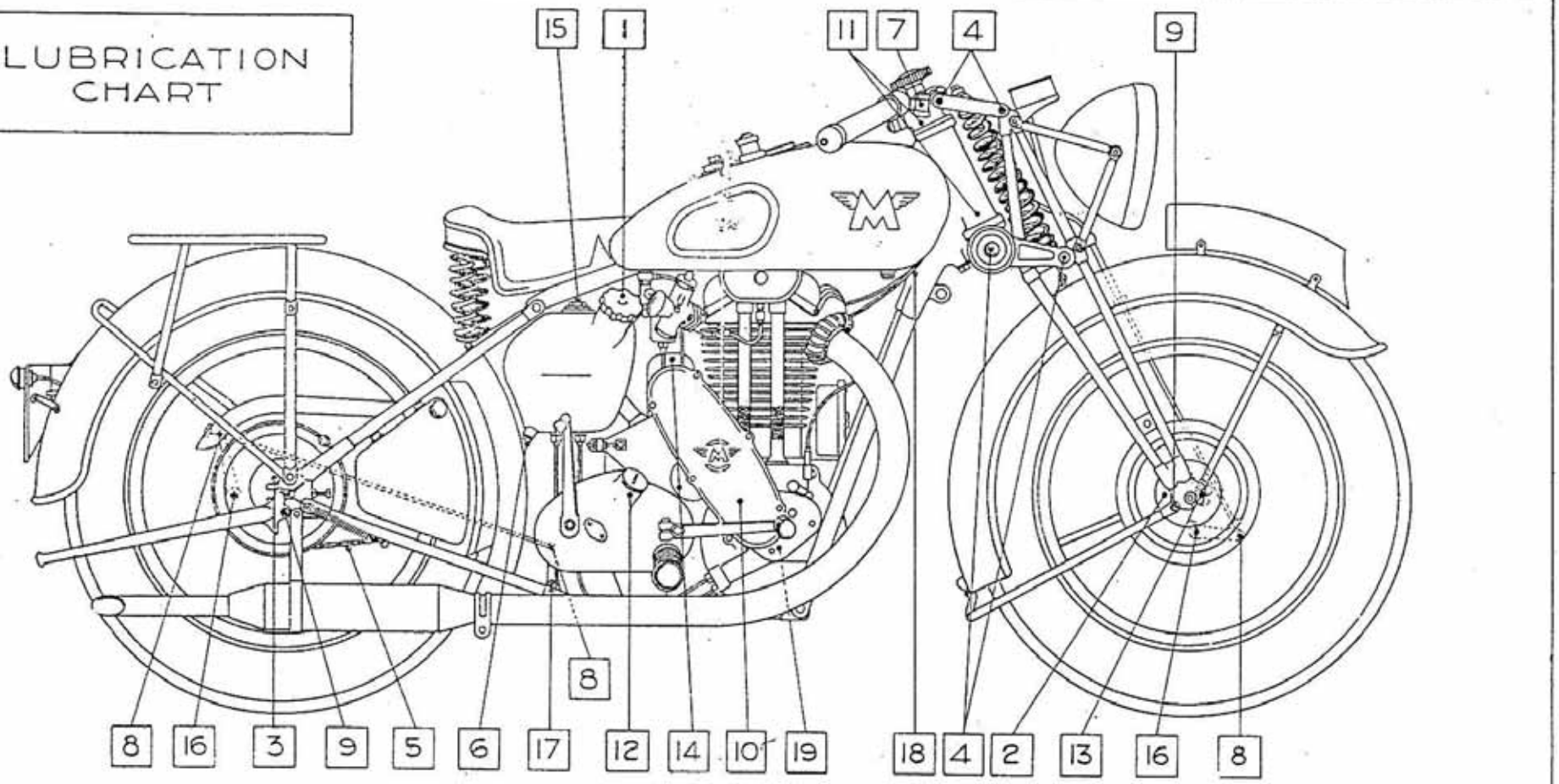
To adjust the magneto driving chain, proceed as follows :—

Slacken off the nuts on the right-hand side of the two bolts that retain the magneto platform to the engine plates, and remove the cover of the magneto driving chain case.

Insert a lever, or screwdriver, underneath the front edge of the magneto platform and lever it upwards until the whip of the driving chain is ¼in.

Finally, tighten the nuts on the platform fixing bolts, re-check the chain whip, and replace the chain case cover.

LUBRICATION CHART



— MATCHLESS MOTORCYCLE. TYPE-39/G3. MILITARY MODEL. —

DAILY.

Nº	PART.	LUBRICANT.
1	OIL TANK-TOP UP AND INSPECT CIRCULATION	M. 220.

GENERAL.

GEAR BOX - CLEAN OUT AND REFILL WITH C.600 AFTER FIRST 500 MILES.

EVERY 500 MILES.

Nº	PART	LUBRICANT.
2 & 3.	FRONT & REAR HUBS	GREASE
4	FORK SPINDLES.	GREASE
13.	SPEEDO. GEARBOX	GREASE
19.	FRONT CHAINCASE.	M. 220

EVERY 5000 MILES.

DRAIN OIL TANK - Nº6. SWILL OUT, AND REFILL WITH M. 220.

EVERY 1000 MILES.

Nº	PART	LUBRICANT
18	BOWDEN CABLES	C.600
12	GEAR BOX	C.600
10	MAGNETO CHAIN	GREASE
11	STEERING HEAD.	GREASE
16	BRAKE CAMS.	GREASE
8	BRAKE ROD JOINTS	M. 220
7	CONTROL LEVERS.	M. 220.
17	BRAKE PEDAL.	GREASE

EVERY 1500 MILES.

Nº	PART	LUBRICANT.
15.	REMOVE THE OIL FILTER & CLEAN IT	
5.	REAR CHAIN	TALLOW
9.	FRONT & REAR STANDS,	GREASE.

EVERY 10000 MILES.

DISMANTLE - CLEAN - ADJUST & REPACK BEARINGS WITH GREASE DYNAMO AND MAGNETO. Nº 14.

FRONT CHAIN ADJUSTMENTS.

To provide front chain adjustment the gear box hinges on its lower fixing bolt, while the top fixing bolt can slide in slots cut in the engine plates to allow the hinging movement. This movement is controlled by an eyebolt which encircles the top fixing bolt, and is anchored to a block secured to the right engine plate.

By altering the position of the eye bolt in the block, the gear box top fixing bolt can be moved in its slots. This action swings the gear box and, according to the direction of the swing, the front chain can be tightened or loosened. The gear box must be moved backwards to tighten the chain.

The movement of the eye bolt is controlled by two nuts, threaded on it, and located on either side of the block or crosshead.

To tighten the front chain, proceed as follows :—

Slacken the two nuts on the right hand ends of the gear box top and bottom fixing bolts. Remove the inspection cap on the front chain case (see Page 31). Unscrew the forward nut on the eye bolt two or three turns.

Then screw up the rear nut on the eye bolt until, by testing through the front chain case inspection cap orifice, it is felt the front chain adjustment is correct.

If the chain can whip, or move, about ¾in. as it is pressed up and down, midway between the sprockets, the adjustment is correct.

Finally, tighten down the forward nut on the eye bolt, tighten the nuts on the gear box top and bottom fixing bolts, recheck the amount of chain whip (see Page 23) and replace the inspection cap.

Check the chain whip in more than one position, by rotating the engine. (See notes on chain adjustment—Page 23.)

REAR CHAIN ADJUSTMENT.

To provide rear chain adjustment, the rear wheel is bodily moved in a backwards direction. To provide this movement the rear wheel spindle is anchored in open ended slots, and the adjustment is controlled by a bolt in each slot. Each bolt impinges on the rear axle and is locked in position by a nut. (A collar is placed on each bolt between the nut and the fork end to facilitate easy access to the nut).

To tighten the rear chain adjustment, proceed as follows :—

Slacken the nut on the centre solid spindle and the nut that locks the brake drum sleeve to the fork end. Both of these nuts are on the left hand side of the rear wheel and are concentric to each other.

Slacken the nut on each chain adjuster bolt and screw it two or three turns towards the hexagon end of the bolt.

Then screw each hexagon headed bolt further into the fork end, until the chain adjustment is correct, taking care to move each bolt an equal distance.

The correct chain adjustment should allow a chain whip of from ⅜in. to ½in. as the chain is pressed up and down at a position about mid-way between its two sprockets.

Then tighten the centre spindle and brake drum sleeve nuts, and finally the two lock nuts on the hexagon headed adjusting bolts.

NOTES ON CHAIN ADJUSTMENT.

Before tightening the rear chain, the adjustment of the front chain should be inspected, and, if attention is required, this should be adjusted first.

It should be remembered that altering the adjustment of the front chain affects the adjustment of the rear chain, while altering the adjustment of the rear chain will probably upset the adjustment of the rear brake. Therefore, after adjusting the rear chain, always check the adjustment of the rear brake, and, if necessary, re-adjust the brake as detailed on Page 28.

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

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 engine plates), the distance between the sprockets driving the dynamo can be varied.

Provision is made to permit the dynamo to be revolved in order to allow the dynamo driving chain to be adjusted.

To adjust the dynamo chain proceed as follows :—

First, slacken the dynamo clamp bolt and remove the inspection cap on the front chain case. Then rotate the dynamo in a forward direction until, by passing the finger through the inspection cap orifice it can be felt the dynamo chain has a whip of about ¼in. This adjustment is important.

The dynamo may be rotated by applying the thin spanner, supplied in the tool kit, to the boss cast on the chain (left) side of the dynamo. This boss is located just below the word "LUCAS" that is cast on the dynamo end plate.

Finally, tighten the dynamo clamping bolt, recheck the chain whip, and replace the inspection cap.

Should it ever be necessary to remove the chain sprocket on the dynamo armature shaft, it is absolutely essential to hold the sprocket with a spanner while lossening the sprocket retaining nut. There are two flats on the boss of the sprocket to accommodate a spanner. This action is necessary to relieve the armature shaft of any bending stress, and should also be taken when refitting the sprocket.

WARNING.

Before removing the dynamo sprocket fixing nut it is essential, first of all, to take away the spring ring that encircles the nut and the locking washer that is next to it.

VALVE TIMING.

The timing gears are marked to facilitate their replacement. The correct valve timing is given on Page 41, and when checking it, the tappet clearances must be set to .016in. (See Page 25.)

To reset 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, is in line with the centre of the inlet (rear) camshaft bush.

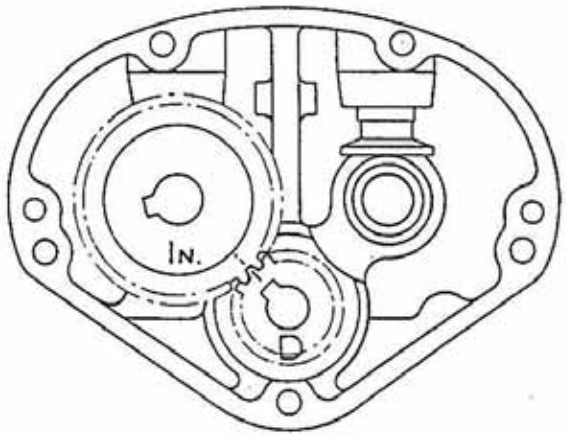
Insert the inlet camshaft " In " so that the mark on it is in mesh with the mark on the small pinion D.

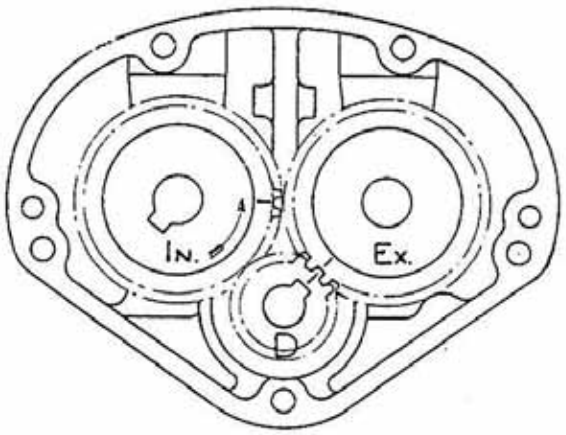
Then rotate the engine in a FORWARD direction till the mark on the small timing pinion D, is in line with the centre of the exhaust (front) camshaft bush.

Then insert the exhaust camshaft " Ex," so that the mark on it is in mesh with the mark on the small pinion D.

If the mark on the small pinion is not visable, it may be obscured by the fixing nut. This has a LEFT HAND thread and should be unscrewed in a clockwise direction, two or three complete turns which will expose the mark.

Finally retighten the nut.





CAM CONTOUR.

Owing to the presence on the cam flanks of what are technically known as quietening curves, which actually are a very slight incline from the base circle of the cam to the foot of the hump, it is necessary, when checking valve clearances, to make certain that the tappet ends are on the base circle, and it is for this reason that clearances should be checked with the piston at the top of the compression stroke, at which position both tappets are well clear of the quietening curves.

For the same reason it is necessary to check the valve timing with a rocker clearance (.016in.) sufficient to skip the slight inclines.

STEERING HEAD ADJUSTMENT.

The steering head races are of the floating, self-aligning type, and have spherical seats. The races in the head lug and head clip are all identical.

The steering head should be occasionally tested for correct adjustment by exerting pressure, upwards, from the extreme ends of the handlebars. (The steering damper should be completely slack).

Should any shake be apparent, the top nut on the steering column must be slackened and the lower nut screwed down until all trace of slackness has disappeared. Then tighten the upper nut, holding the lower nut while doing so. It is of the utmost importance the lock nut is most securely tightened.

It is advisable to jack up the front of the machine so that all weight is taken off the front forks while making this adjustment.

FORK SPINDLE ADJUSTMENT.

Never attempt to adjust more than one spindle at a time. Slack off both spindle nuts, and, by means of the hexagonal offside end of the spindle, turn it in a clockwise direction to take up slack. Do not turn more than half a revolution before tightening the two spindle nuts and testing the adjustment. Guard against having the adjustment too tight, because then the fork will be very stiff in action or most probably refuse to function.

The washers, which are fitted on the spindle ends, are not provided for frictional purposes, but to prevent actual seizure in the event of the fork spindle adjustment being too tight.

FORK DAMPER ADJUSTMENT.

The fork damper is best adjusted when the machine is actually in motion. A road with a badly corrugated surface provides the best conditions for this purpose.

The ebonite hand nut should be screwed home sufficiently to make the fork action sluggish under the circumstances described above, and subsequently should require very little attention for other conditions.

STEERING DAMPER ADJUSTMENT.

The steering damper is controlled by the ebonite hand nut mounted on the top of the steering column. This nut should be turned in a clockwise direction to increase the damper action. Normally, very little damper action is required or is desirable.

CLUTCH CABLE ADJUSTMENT.

As the result of wear on the clutch plate inserts the plates tend to close up. This action increases the effective length of the clutch thrust rod, while, additionally, the clutch operating cable tends to stretch in use.

Two adjustments are provided to cope with these conditions. One is so arranged that the fulcrum for the clutch operating lever in the gear box can be moved, and the other is on the clutch cable, and takes the form of an adjustable clutch cable stop.

The clutch cable adjustment should be such that the clutch operating lever in the gear box does not bear against the clutch thrust rod. It should be possible to move the handlebar clutch lever about half an inch (measured at the tip of the lever) before the clutch thrust rod commences to move. This movement is felt by virtue of the greatly increased resistance of the handlebar lever as the declutching action commences.

Major adjustment may be made by altering the position of the clutch lever fulcrum. To do this, remove the projecting cap that is secured to the kickstarter case cover by two screws. Under this cap is a sleeve having a hexagon head. Turn this head in an anti-clockwise direction to take up wear between the clutch thrust rod and the operating lever, and in a clockwise direction if the lever is bearing on the clutch thrust rod (thereby causing clutch slip). Then replace the cap, which, it will be noted, has a hexagon recess on its underside to fit over the hexagon sleeve, thereby locking it in position.

Minor adjustment may be made by the adjustable clutch cable stop. This has a knurled body, and is locked in position by a knurled lock nut. The clutch cable passes through it and it is located in the back of the kickstarter case.

To decrease the clearance between the clutch lever in the gear box and the clutch thrust rod this stop should be unscrewed from the kickstarter case (to take up slack in cable). To increase the clearance the stop should be screwed further into the case.

CLUTCH ADJUSTMENT.

In the event of clutch slip being experienced, the most likely cause is incorrect cable adjustment. (See preceding paragraph.)

However, if the cable adjustment is satisfactory, the clutch spring retaining nuts should be adjusted. To do this, remove the outer half of the front chain case (see Page 31). This will reveal the four clutch spring adjuster nuts, each should be screwed in exactly half a turn, when a re-trial of the clutch should be made. If necessary, repeat—but be careful to adjust each of the nuts a similar amount.

Normally, the correct adjustment of these nuts is five complete turns from right home, and, after dismantling the clutch, the correct setting is obtained by screwing all four nuts right home and then slackening off five complete revolutions. Uneven or excessive tightening of these nuts will prevent the clutch from releasing properly.

TO REMOVE THE FRONT WHEEL.

To remove the front wheel, proceed as follows:—

Place the machine on the rear and front stands. Remove the split pin and pin retaining the front brake cable yoke end to the front brake expander lever. Unscrew the speedomter driving cable from the speedometer gear box. Remove the nuts and bolt that secures the front brake anchor plate to the fork girder. Slacken both nuts on the front wheel centre solid spindle, unscrewing them several turns, and then, if the two washers on the centre spindle are slid outwards along the spindle till they are clear of the recesses in the fork end lugs, the wheel is free to drop out.

To refit the front wheel, reverse the procedure described above.

It is essential the brake cover plate anchor bolt nuts are securely tightened.

TO REMOVE THE REAR WHEEL.

The rear wheel is of the quick detachable type and, in order to remove it there is no need to disturb any part of the rear brake and final drive.

To remove the rear wheel, proceed as follows:—

Place the machine on the rear stand, disconnect the tail lamp cable connector that is inserted in the cable at a point just above the rear wheel centre solid spindle, take away the two nuts and washers that retain the back half of the mudguard to the fixed front half, and slacken the two nuts that retain the rear tubular arch to the rear fork ends. This will enable the rear half of the rear mudguard with the tubular arch to be taken away from the machine.

Remove the three square headed sleeve nuts that secure the hub flange to the brake drum, by using the tubular spanner provided in the tool kit.

Remove the nut on the wheel centre solid spindle and withdraw the spindle, this action will free the distance piece fitted on the solid spindle between the inside side of the right fork end and the hub, and then, by moving the wheel to the right in order to disengage it from the driving studs in the brake drum, it is free to be taken away from the machine.

To refit the rear wheel, reverse the procedure described above.

IN NO CIRCUMSTANCES MUST THE CENTRE SOLID SPINDLE BE REMOVED UNTIL THE MACHINE IS PLACED ON THE REAR STAND, AND THE SPINDLE MUST ALWAYS BE IN POSITION BEFORE THE MACHINE IS TAKEN OFF THE STAND.

TO REMOVE REAR INNER TUBE.

If it is desired merely to remove the inner tube of the rear tyre this can be done without removing the wheel from the machine.

To do this, proceed as follows :—

Place the machine on the rear stand, remove the tube from the wheel (see Page 34). Remove the nut on the wheel centre solid spindle, withdraw the spindle and spring the right fork asembly to the right, sufficient to allow the solid spindle distance piece to drop out. This action will leave sufficient space between the fork end and the hub to enable the inner tube to be taken away.

To refit the inner tube, reverse the procedure described above.

PERIODICALLY TEST, WITH A SPANNER, THE CENTRE SOLID SPINDLE NUT AND THE THREE SLEEVE NUTS AND KEEP THEM TIGHT. If the sleeve nuts are loose, a dull hammering will be felt, and heard, when driving at slow speeds. If this is noticed, tighten the three sleeve hub nuts without delay.

BRAKE ROD ADJUSTMENT.

A finger operated thumb nut on the rear end of the rear brake rod provides a means of making minor adjustment to the rear brake. This nut is locked in position by a spring that encircles the brake rod.

The thumb nut should be screwed on the rod so far that the brake shoes are just clear of the brake drum when in the " OFF " position. When making this adjustment it is advisable to have the machine on the rear stand so that it may be observed the wheel is free to revolve when the brake is " OFF."

BRAKE SHOE ADJUSTMENT.

As the brake linings wear, this can be taken up by suitably adjusting the thumb nut on the rear brake rod, but, after some considerable mileage, this continual adjustment causes the brake expander lever to lie in such a position that the leverage that is available is considerably reduced and consequently the brake loses in efficiency.

To overcome this difficulty, the brake shoes are fitted with detachable heel pads. These fit in the heel of each brake shoe and take the thrust of the brake cam, or expander. When it becomes desirable no longer to take up the wear of the brake linings by adjustment of the thumb nut adjustment, and to reset that adjustment to suit the new then, if the steel heel pads are taken away from the shoes, one or more steel shim washers can be placed on the stem of each pad. This will have the effect of centralising the cam expander, thereby restoring the brake efficiency to an "as new condition." When the wear is taken up in this manner it is, of course, necessary to slack out the brake rod thumb nut on the brake rod, the brake shoes should be removed, and position of the brake shoes.

BRAKE PEDAL ADJUSTMENT.

The position of the rear brake foot pedal can be adjusted within narrow limits. This is done by means of a small bolt screwed into the heel of the pedal. The adjusting bolt is locked with a thin nut. After altering this adjustment always check the rear brake adjustment. (See Page 28.)

FRONT BRAKE ADJUSTMENT.

Minor adjustment of the front brake may be made by the front brake cable adjuster. This cable adjuster is located at the top of the left side fork girder, and is locked in position by a nut. The brake cable passes through the adjuster and both adjuster and lock nut have large knurled bodies so that they may be finger operated. To " Take up " the front brake adjustment, the adjuster should be unscrewed from the fork girder. It is advisable to have the machine on both rear and front stands when adjusting the front brake so that the adjustment may be made so that when the brake is " OFF " the brake shoes are just clear of the brake drum, and the wheel consequently free to revolve.

The front brake shoes have the same type of heel pads as described in the preceding paragraph, and can be adjusted in the same manner.

WHEEL BEARINGS.

The wheel bearings are of the taper roller type. A complete bearing for one wheel consists of a hollow spindle, two sets of rollers (retained in two cages) and two outer bearing rings.

The outer bearing rings are pressed into the hub shell, that on the left-hand side has a positive location, while that on the right-hand side can be adjusted in its position. The adjustment is obtained by a ring that is screwed into the right-hand side of the hub shell, and this is locked in position by a large circular locking ring.

It is of the utmost importance that the bearings are not adjusted too tightly, as this would ruin them in a very short distance. There must always be a slight degree of end play. This should be .001in.

To adjust a wheel bearing, proceed as follows :—

Slacken the large locking ring B that is on the right-hand side of the hub and then screw inwards, or outwards, the adjusting ring A (on which the lock ring is threaded) until the correct adjustment is obtained.

Finally, tighten the locking ring B, taking care that the adjusting ring A does not creep forward and make the bearings too tight. So always check the adjustment after tightening the locking ring.

Special spanners are provided to facilitate this operation.

TO DISMANTLE A WHEEL BEARING.

To dismantle the bearings in a wheel, proceed as follows :—

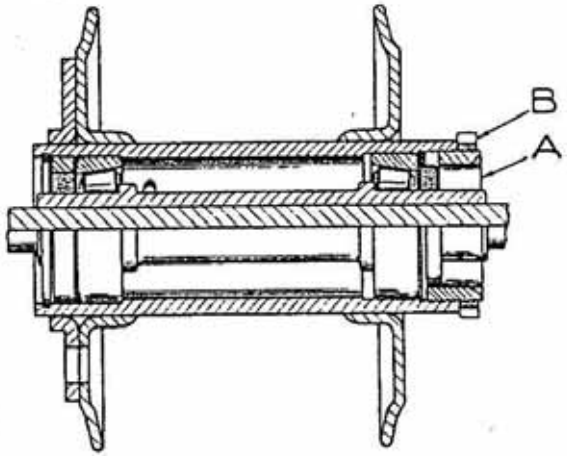
First, remove the wheel (see Page 27).

Then, slacken the locking ring B that is on the right-hand side of the hub and remove the adjusting ring A on which the locking ring is threaded.

A dished plate, felt washer and a plain plate is then free to be removed.

Next, turn to the opposite side of the hub and remove the spring ring that will be observed just under the hub shell. This will permit the removal of another felt washer and plate assembly.

The hollow spindle, complete with rollers and cages and one outer bearing, can now be pressed, or driven, out from either end, leaving one outer bearing ring in position. If desired, this can also be driven out.



TO ASSEMBLE A WHEEL BEARING.

It will be noticed that the tracks for the rollers on the hollow spindle are not evenly spaced. It is essential that the longer end of the spindle is assembled in the hub so that it is on the adjusting side.

To assemble the bearings, proceed as follows :—

Press one of the outer bearing rings into the plain (unthreaded) end of the hub so that the thicker end of the ring is outward, and its position is a little nearer the centre of the hub than it normally occupies. Take care when pressing this ring into the hub that it is quite square to the hub body.

Next, replace the felt washer and plate assembly that was removed from this end of the hub and finally replace the spring ring. (The appended illlustration clearly shows the order of assembly of these parts).

Then, from the threaded end of the hub, force back the outer bearing ring until the felt washer assembly plates are tight against the spring ring.

Next, from the threaded end of the hub, introduce the hollow spindle, entering the shorter end first, and push it, without undue force, as closely to the outer bearing ring as possible.

Then press the second outer bearing ring into the hub shell, until there is about 1/16in. play in the bearings, and replace the right hand side felt washer and plate assembly, followed by the adjusting ring with its locking ring and proceed to adjust the bearing as described on Page 29.

TO REMOVE THE OUTER HALF OF THE FRONT CHAIN CASE.

The outer half of the front chain case is retained to the back half by a centre nut and an exterior metal band. Between the metal band and the chain case is a rubber packing strip, or fillet.

To remove the outer half of the front chain case, proceed as follows :—

Place a tray under the chain case in which to collect the oil that will be released when the outer half of the case is free.

Remove the thumb adjusting nut from the rear end of the rear brake rod.

Remove the screw that binds the two ends of the metal band that encircles the case, this will free the band for removal, after which remove the rubber fillet.

Next, remove the centre nut and washer, and then, if the rear brake foot pedal is fully depressed, the outer half of the case can be taken away.

To replace the outer half of the front chain case, proceed as follows :—

Clean both sides of the outer half of the case and also the outer face of the rear half of the case. Place a line of liquid jointing compound on the faces of both halves of the case, and, by depressing the foot brake lever, place the outer half of the case in position.

Replace the centre nut and washer and, when tightening this move the outer half of the case, as necessary, to make it register with the back half. Smear some more liquid jointing compound round the edges of the case and press the rubber fillet in position. Then refit the metal band, starting at the narrow, front end of the case and, drawing the two free ends together with one hand, replace the binding screw with the other.

Replace the rear brake rod thumb adjusting nut, and adjust the rear brake as detailed on Page 28.

Finally, after the jointing compound has set, remove the inspection cap in the outer half of the case, and fill with engine oil to the level detailed on Page 13.

CARBURATION.

The carburetter is tuned during the road tests of the machine, and it should not be necessary to interfere with the standard setting. However, we give below an outline of how the carburetter functions and how adjustment may be made.

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.

The petrol supply to the engine is controlled firstly, by the main jet and secondly, by means of a taper needle 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.

The correct size of jet (150) and throttle cut away (6x4) should not be altered save for some very good reason.

With the standard setting it is possible to use full, or 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 emisson of black smoke from the exhaust.

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, slowly 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). 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 a latent danger of this becoming choked. Upon removing the float chamber and the large nut at the bottom of the mixing chamber, the sprayer base can be pushed out of the mixing chamber and the jet can then be cleared by using a strand of fine wire.

Before concluding that incorrect carburation is responsible for heavy petrol consumption, and before carrying out any of the tests and adjustments described above, it is most important to make sure the ignition is set correctly (see Page 39). Late ignition usually causes a great increase in petrol consumption.

Poor idling may be due to:—

Air leaks, either at the junction of the carburetter and engine, or by reason of a badly worn inlet valve stem or guide.
Faulty valve seatings. (Engine valves).
Sparking plug faulty, or the points set too closely.
Ignition advanced too much.
Contact breaker points dirty or set too closely.
Defective high tension cable.
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).

TYRES AND SERVICE.

Obtaining satisfactory life and service from the tyres is largely a matter within the user's control.

Maintain in the tyres the correct inflation pressures. Do not guess at the pressure but use a pressure gauge and use it frequently

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

Avoid driving in tramlines. Apart from its danger, the upstanding edge often deeply cuts the loaded tyre.

Do not allow flints, etc., to remain embedded in the tread. They will work through, puncturing the tube and destroying the casing.

Keep oil away from the tyres and from the spokes. If any finds its way on to the tyres, clean it off by using petrol sparingly.

INFLATION PRESSURES.

Too much emphasis cannot be given to the importance of correct inflation pressure. Too little pressure is a very costly matter from the tyre point of view, but, on the other hand, a very high pressure is neither asked for nor required.

The pressure should simply be correct for the load, and very little trouble in maintaining this will be repaid over and over again in comfort, durability and freedom from tyre trouble.

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

Load per tyre, 200 lbs. ... pressure, 16 lbs. per square inch.
Load per tyre, 240 lbs. ... pressure, 18 lbs. per square inch
Load per tyre, 280 lbs ... pressure, 20 lbs. per square inch.
Load per tyre, 350 lbs. ... pressure, 24 lbs. per square inch.
Load per tyre, 400 lbs. ... pressure, 28 lbs. per square inch.
Load per tyre, 440 lbs. ... pressure, 32 lbs. per square inch.

With a driver of average weight, the load on the front tyre of the Military Model 1939 G3 is 215 lbs., and that on the rear tyre, 310 lbs. The minimum inflation pressures, for these loads, are 17 and 21 lbs. per square inch, respectively.

TYRE REMOVAL.

First completely deflate by removing all valve parts, including the inside check mechanism. At a point diametrically opposite the valve, push the cover edges into the rim base. To remove the first portion, insert two small levers (one about three inches each side of the valve position) and gently ease the cover edge over the rim. No force is required to do this, but the edges of the cover opposite the valve must be in the base of the rim. The remainder of the cover will then come off quite easily.

TYRE FITTING.

Push one edge of the cover over the side of the rim. It will go quite easily if that part of the edge first put on is pushed right down into the rim base. Very slightly inflate the inner tube, do not distend it, place it in the cover, and put the valve through the hole in the rim.

Commence to fit the second edge of the cover at a point diametrically opposite the valve, by placing it over the rim and pushing down into the rim base. Proceed to push on the remainder of the cover, working round each side so that the portion at the valve position is fitted last. Two small levers may be used for the last few inches. Do not use large levers. Force is unnecessary, and may damage the cover edges. Whilst inflating, see that the edges of the cover become seated evenly round the rim; the moulded line on the cover will serve as a guide.

ELECRICAL EQUIPMENT.

The dynamo charge rate is automatically controlled by a constant voltage unit. This unit functions when the voltage generated by the dynamo rises above 7.3 to 7.5 volts, and then, with a fully charged battery and under "No Load" conditions, only a small current flows through the system.

As the load is switched on, the dynamo output is automatically increased to meet the demand. Therefore, it is only when the battery is in a run down condition, and during daylight running, that the ammeter will show a high charging rate, when a charge rate as high as from 5 to 6 amps may be recorded. Under normal conditions the charge rate is between 2 and 4 amps, according to the state of the battery.

This constant voltage system is designed to maintain a fully charged battery without the risk of overcharging.

All the wiring is of the single pole type, the frame of the machine being used for the negative (or earth) return.

BATTERY MAINTENANCE.

A Lucas NIFE Type C105 steel plate battery is fitted. This is a nickel-cadmium alkaline battery.

Under working conditions, the electrolyte loses water by evaporation. At least once a month, the vent plugs should be removed, and, if necessary, distilled water should be added to bring the level half an inch above the tops of the plates. Do not overfill, as this will cause slopping when the machine is running over rough roads. Care must be taken when "topping up" cells, taking specific gravity readings, etc., that no liquid is spilled on the tops of the cells. When examining cells, naked lights must not be held near the vents, because the gases evolved from the Nife cell are inflammable.

Before measuring the density of the electrolyte by means of the hydrometer, see that the level in each cell is correct. Readings should be taken after a run on the machine so that the electrolyte is thoroughly mixed.

Draw in sufficient electrolyte to float the hydrometer, and note the scale reading at the surface of the liquid; this gives the density or specific gravity. Care must be taken that the instrument is held vertically and that the stem of the float does not touch any part of the container while the reading is being taken. Having taken the reading, return the electrolyte to the cell and take readings for the other four cells. The five readings should be approximately the same. If one cell gives a reading much lower than the rest, it is probable that electrolyte has been spilled.

The density of the electrolyte in the Nife cell does not vary with the state of charge or discharge, and therefore the hydrometer does not give readings by which the state of charge of the cell is known.

The density of the electrolyte should be 1.170 under normal working conditions. In regular use, the solution will become gradually diluted until when the reading is 1.160 the battery will begin to lose its efficiency and become sluggish. Consequently the electrolyte must be completely renewed when this condition is reached, which, with a battery in regular service, is about every twelve months.

If the density of the electrolyte is found to be less than 1.160 after only a short period of service, it is probable that this is due to spillage, and fresh soluton must be added to bring the density between the limits of 1.160 to 1.190. If the density of the electrolyte is found to be more than 1.200, some solution must be extracted and replaced be distilled water, repeating this procedure until the density is within the limits of 1.160 to 1.190.

Keep the tops of the cells clean and see that the terminals are kept tight. It is advisable to keep the terminals smeared with vaseline to prevent corrosion. Care must be taken not to allow any grease to come into contact with the electrolyte, as this will cause frothing.

In normal use it will be necessary to renew the electroylte about every 12 to 18 months, and only Nife alkaline solution must be used.

When refilling, the battery must first be completely discharged, the cells shaken in order to loosen dirt, and the solution poured out. Rinse out with clean water until the cells are thoroughly cleansed of sediment, and then invert the cells for half an hour, so as to drain away the water completely. It is important not to leave the cells standing with the plates exposed to the atmosphere, unless they have been thoroughly washed out with clean water, and even then not for more than half an hour. Fill up with the new solution, and give the battery a charge of 2.5 amperes for a period of 12 hours, when it will be fully charged and ready for use.

The battery may be stored indefinitely, provided care is taken to keep the electrolyte above the tops of the plates. Before storing, the battery must be fully charged and then half discharged. When required for service after a long period of idleness, it should be given a charge of 2.5 amperes for a period of 12 hours.

It must be remembered that the electrolyte used in a Nife Battery is alkaline and is highly corrosive, and iron or porcelain vessels must be used for mixing and filling. On no account use galvanised vessels or vessels with soldered joints.

To sum up, the important points are :—

(1) Maintain the electrolyte above the plates by adding distilled water.

(2) Every precaution must be taken that no trace of any form of acid gets into the battery.

(3) The specific gravity of the electrolyte must be within the safe limits. 1.160 to 1.190. Check this by taking regular hydrometer readings.

(4) The electrolyte must be completely changed about every twelve months.

DYNAMO.

The dynamo is fitted with two main brushes, the positive is insulated and the negative is earthed.

Before removing the dynamo cover, disconnect the positive lead of the battery, otherwise there is a danger of reversing the polarity of the dynamo or short circuiting the battery, either of which might cause serious damage.

Occasionally examine the dynamo brushes. They can be removed from their holders when the spring lever is held aside. They should slide freely in their holders and make good contact with the commutator. If the brushes are dirty or greasy, clean them with a cloth moistened with petrol. Replace the brushes in their original position.

After long service, when the brushes have become so worn that they will not bear properly on the commutator, they should be replaced with new.

Keep the commutator clean and free from oil. The best method of cleaning is, without disconnecting any leads (wires), to remove one of the brushes from its holder and, inserting in its place a soft duster, hold the duster, by means of a suitably shaped piece of wood, against the surface of the commutator, at the same time turning the engine so as to rotate the armature.

THE VOLTAGE CONTROL UNIT.

The voltage control unit consists of a regulator unit which is mounted together with the cut-out.

The regulator causes the dynamo to give an output which varies acording to the load on the battery and its state of charge.

When the battery is discharged the dynamo gives high output, so that the battery receives a quick recharge which brings it back to its normal state in the minimum possible time. On the other hand, if the battery is fully charged, the dynamo is arranged to give only a trickle charge which is sufficient to keep it in good condition without the possibility of causing damage to the battery by overcharging.

In addition to controlling output of the dynamo according to the condition of the battery, the regulator provides for an increase of output to balance current taken by lamps or other accessories whenever they are switched on.

The compensated voltage control system, ensures that the battery is charged even during winter and it eliminates danger of a discharged battery.

If the battery becomes disconnected, or is removed, the machine may still be used without damage to the electrical equipment.

The cut out is an automatic switch which prevents the discharge of the battery when the dynamo is stationary. Its contacts close when the dynamo voltage rises above that of the battery, as the engine speed rises, and open when the speed drops and the voltage falls below that of the battery. The cut out is incorporated with the voltage control regulator, and the complete assembly is located on the seat stays under the saddle.

HEAD LAMP.

The head lamp is fitted with a double filament bulb, 6 Volts, and 24 Watts. One filament is arranged to be at the focus of the reflector and gives a normal driving light, while the other, mounted slightly above the first, gives a dipped, anti-dazzle beam for use when meeting other traffic or driving in fog. This anti-dazzle device is controlled by the two way switch on the left handlebar.

A small pilot bulb, 6 Volts, 3 Watts, is provided for use when the machine is stationary or for town riding.

To remove the front of the head lamp, it is necessary to release the clip at the bottom of the rim. Then pull the bottom of the rim outwards and the rim, complete with the reflector and bulb assembly, will come away from the body.

The main bulb can be focussed by altering its position in the holder. The bulb holder is a sliding fit in the reflector and is locked in position by a small clamp and screw. If this screw is loosened, the holder can be slid inwards or outwards to the required position, after which the screw should be tightened.

To fit a new main or pilot bulb, it is necessary to detach the bulb holder assembly from the reflector. This is retained by two long springs, these can be pushed sideways from the centre of the reflector and by doing so the bulb holder assembly is released and can be lifted away. It is not necessary to detach any of the wiring when a new bulb is fitted.

The tilt of the headlamp can be adjusted by slightly releasing the two bolts fixing the lamp to the brackets, placing the lamp in the desired position and tightening the bolts.

TAIL LAMP.

The tail lamp is in two pieces. That portion which carries the ruby glass is fixed to the rear number plate, the other portion, which carries the bulb, is attached to the main body by a bayonet clip. To remove the portion carrying the bulb, it is necessary to rotate it in an anti-clockwise direction about a third of a turn. The bulb is identical with that used as a pilot light in the head lamp (6 Volts, 3 Watts).

LIGHTING SWITCH.

The main lighting switch is mounted in the bottom end of the panel, mounted in the top of the petrol tank. The switch has three positions, marked "OFF," " L" and " H." When in the " OFF " position, no lamps are alight but the dynamo can charge the battery. In the " L" position the pilot bulb in the head lamp and the tail lamp are alight. In the " H " position the main bulb in the head lamp and the tail lamp are alight.

The switch must be in either the " L" or the " H " position before the speedometer light will light up, and before it is possible to use the inspection lamp.

INSPECTION LAMP.

An inspection lamp is provided. This is located in the centre of the panel mounted in the top of the petrol tank, and serves the dual purpose of illuminating the ammeter and inspection lamp. To illuminate the ammeter, it is only necessary to turn the top of the lamp to the " ON " position indicated by an arrow.

For service as an inspection lamp it is necessary to remove it from the panel. To do this the small spring pin on the right hand side of the base of the lamp should be competely depressed, and the whole lamp tilted so that the depressed pin can clear the flange in which it fits. The lamp can then be lifted away from the panel. Attached to the lamp is a length of wire sufficient to allow the lamp to be of service when working on any part of the machine. The bulb is identical with that used as a pilot light in the head lamp (6 Volts, 3 Watts), and can only be lit when the other lamps on the machine are alight.

In an emergency, the inspection lamp bulb can be used in the tail lamp or as a pilot bulb for the head lamp.

THE MAGNETO.

Occasionally remove the high tension pick-up, remove the carbon brush and spring that slide in the brass-lined sleeve of the pick-up, and, with petrol and rag, clean away all traces of oil and carbon dust. Then clean the slip ring, which is on the end of the armature of the magneto and on which the carbon brush presses.

The best way of doing this is to take an ordinary lead pencil, and, on the unsharpened end, wrap one or two folds of a soft duster. Insert this in the opening disclosed by the removal of the high tension pick-up, and push gently against the bottom of the slip ring, at the same time revolving the engine.

Then replace the carbon brush and spring in the pick-up, and, finally, fix the pick-up assembly to the magneto.

Take the opportunity of examining the high tension cable, and, if it appears perished, denoted by the surface being covered by a multiplicity of small cracks, it is advisable to replace with new.

About every three months remove the contact breaker cover and examine the contact points. One contact point is mounted in the narrow end of the spring blade. The other point is adjustable, and screws into the face of the magneto, and is locked in position by a nut. If the points are burned or blackened, clean them with the finest grade of emery cloth, and afterwards clean with a rag that is moistened with petrol.

Check the gap between the two points by turning the engine till both points are separated. The gap should be .012in., and a gauge of this thickness is a part of the magneto spanner. The gauge should just pass between the points without any binding or slackness. If necessary, adjust the gap by slackening the lock nut on the adjustable point, and screwing the point inwards to increase the gap or outwards to decrease it. Then tighten the lock nut and finally recheck the gap.

A gap that is too small, or too large, may produce engine symptoms that might be mistaken as being due to carburation trouble, and will also affect the ignition setting.

TO RETIME THE IGNITION.

Have available a stout screwdriver, or an old-type tyre lever having a short turned-up end, and a bar of metal not less than 3/16ths of an inch in diameter and about 5½ inches long. (The tommy bar in the tool kit is suitable.)

Remove the sparking plug, the contact breaker cover and the outer cover of the aluminium magneto chain case. Check the contact breaker points and set to .012in.

Then proceed as follows:—

Unscrew the nut that retains the lower magneto drive sprocket, and, with the screwdriver or tyre lever, gently lever the sprocket loose from the taper on the camshaft to which it is attached.

Turn the engine over until both valves are closed, and, with the rod inserted through the plug hole, feel the piston till, by partially rotating the engine, forwards and backwards, it is felt the piston is at the extreme top of its stroke.

Place a mark on the bar level with the top of the plug hole. remove the bar, measure above the mark a distance of 7/16ths of an inch and record that position on the bar.

Place the handlebar ignition control lever in the fully advanced position, re-insert the bar in the plug hole and slightly rotate the engine backwards until the upper mark on the bar is level with the top of the plug hole.

Rotate the magneto armature in a clockwise direction (as viewed from the contact breaker side) by turning the sprocket on the magneto shaft until the contact breaker points are just about to separate.

Tighten the nut on the camshaft, taking care not to move the engine or the magneto shaft when doing so, and finally recheck the setting before replacing the sparking plug, contact breaker cover and the magneto chaincase cover.

To find the exact moment for the commencement of the point separation, place a piece of cigarette, or tissue paper between the points and turn the armature shaft until the paper is just released, and no more, upon a gentle pull.

CHROMIUM PLATING.

To preserve the condition of the parts that are plated dull chromium, they should be cleaned with a chamois leather moistened with water.

CLEANING THE MACHINE.

Do not attempt to rub, or brush mud off the enamelled surfaces, because this will soon destroy the enamel. Mud, and other road dirt, should be soaked off with water. The best method is to use a small hose, taking care not to direct water on to the engine, carburetter and magneto. As a poorer substitute a pail of water and a sponge can be used.

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

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

USEFUL INFORMATION.

Bore	69 mm.
Stroke	93 mm.
Cubic capacity	347 c.c.
Horse power	3.47
Inlet valve opens	7/64in. B.T.D.C. or 20°
Inlet valve closes	25/32in. A.B.D.C. or 67°
Exhaust valve opens	31/32in. B.B.D.C. or 75°
Exhaust valve closes	7/32in. A.T.D.C. or 28°
Tappet clearance (cold engine) ...	Nil
Maximum ignition advance ...	7/16in.
Sparking plug gap	.018in.
Contact breaker point gap ...	.012in.
Piston ring gap	.006in. (top rings)
Type of sparking plug	14 mm.
Size of main jet	150
Size of jet choke	6-053
Size of throttle slide	6x4
Compression ratio	6.5 to 1
Capacity of petrol tank	3 gallons.
Capacity of oil tank	4 pints

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 adjustments should be made, nor should any part be tampered with, until the cause of the trouble has been located. Otherwise, adjustments which are correct may be deranged.

We give, on Page 42, particulars of failures and troubles that can occur, together with probable reasons.

The Engine fails to start or is difficult to start :—

Throttle opening too large.
Petrol tap closed.
Air lever in open position.
Ignition lever not advanced sufficiently.
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 filler cap choked.

Engine misses fire :—

Defective or oiled sparking plug.
Incorrect contact point gap.
Contact breaker blade sticking.
Tappet adjustment incorrect.
Oil on contact breaker points.
Weak valve springs.
Defective sparking plug cable.
Partially obstructed petrol supply.

Loss of Power :—

Faulty sparking plug.
Lack of oil in oil tank.
No tappet clearance, or excessive 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 :—

Lack of proper lubrication.
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.

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.
Choked vent hole in petrol tank filler cap.

Excessive Oil Consumption.

Clogged or partly clogged felt filter in oil tank.
High crankcase pressure caused by inoperative release valve action. (The disc in the valve may be damaged or jammed with dirt.)
Stoppage or partial stoppage in pipe returning oil from engine to oil tank.
Badly worn or stuck up piston rings, causing high pressure in crankcase.
Air leak in dry sump oiling system.

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