

TRIUMPH

Instruction Book

for

4.94 h.p. Motor Cycle

Model "N de Luxe"

Barnstormers.co.nz

OPERATION AND CARE OF THE TRIUMPH MOTOR CYCLE

4.94 H.P.

MODEL "N de LUXE"



TRIUMPH CYCLE CO. LTD., COVENTRY.

Telephone—4191 Coventry.

LONDON - - - - 218, Great Portland Street, W.1.

Telephone—Museum 3951.

LONDON REPAIR DEPOT Bloemfontein Avenue, Uxbridge
Road, Shepherd's Bush, W.12.

Telephone—Riverside 3161-2.

LEEDS - - - - 53, Vicar Lane.

Telephone—26538 Leeds.

MANCHESTER - - - 160-162, Deansgate.

Telephone—Central 1911.

GLASGOW - - - - 164A, Buchanan Street, C.1.

Telephone—Douglas 3900.

DUBLIN - - - - 1-4, Lower Erne Street.

Telephone—62744 Dublin.

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TRIUMPH "SERVICE" STOCKISTS.

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| WINCHESTER | ... | WINCHESTER CYCLE & MOTOR Co., Jewry Street (opposite Corn Exchange). |
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| WORCESTER | ... | F. LEWIS & Co., 40-41, New Street. |
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| YEOVIL | ... | J. MOFFAT, Town Hall Garage. |
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OPERATION AND CARE OF THE 4.94 H.P. TRIUMPH MOTOR CYCLE, MODEL "N de LUXE."

CHAPTER 1.

Dimensions and Particulars.

| | | | |
|-----------------------|-----|-----|----------------------------------|
| No. of Cylinders | ... | ... | 1. |
| Bore | ... | ... | 84 mm. |
| Stroke | ... | ... | 89 mm. |
| Capacity | ... | ... | 494 cc. |
| Type | ... | ... | Side-valve, four-stroke. |
| Wheelbase | ... | ... | 55 ins. |
| Overall Length | ... | ... | 86 ins. |
| Height | ... | ... | 38½ ins. |
| Width | ... | ... | 31½ ins. |
| Ground Clearance | ... | ... | 4½ ins. |
| Petrol Tank Capacity | ... | ... | 2½ galls. |
| Oil | ... | ... | 3¼ pints. |
| Weight | ... | ... | 260 lbs. |
| Manufacturer's Rating | ... | ... | 4.94 h.p. |
| Tax, Solo | ... | ... | £3. |
| Gear Ratios, Solo | ... | ... | 14.12 to 1; 8.2 to 1; 5.06 to 1. |
| " " Sidecar | ... | ... | 15.9 to 1; 9.3 to 1; 5.73 to 1. |

RUNNING INSTRUCTIONS.

Preliminary. Starting. Running. Stopping.

PRELIMINARY. Fill up with petrol and oil. The petrol filler cap is on the right hand side of the tank, and the oil filler cap is on the right hand side of the separate oil tank.

A small amount of oil may remain in the engine and gear box when the machine leaves the works. Before starting the engine or using the machine, and before purchasing any oil, carefully read Chapter 2, which deals with lubrication. When these instructions have been read and carried out, and the tyre air pressures verified (see Chapter 3, paragraph headed "Tyres") the machine is ready to be ridden.

STARTING. *Turn on petrol, depress "tickler" of carburettor until petrol pressure is just felt—do not flood.

Place gear lever in neutral, fully advance ignition lever, open air lever half way, throttle lever slightly, raise exhaust lever and smartly depress kick-starter to the full extent of its travel, at the same time releasing the exhaust lever just before the kick-starter reaches the end of its stroke to allow the exhaust valve to close just before the moment of firing. The kick-starter should be released as soon as the engine fires; any delay causes undue stress on the ratchet teeth.

*Note:—As two petrol taps are provided, about 1½ pints of fuel can be kept in reserve if one tap only is turned on. The reserve supply can then be brought into use by turning on the other tap.

In very cold weather, when the engine is stiff to turn owing to the oil being cold, the engine may be freed as follows:

Close air lever, open throttle lever about half way, raise exhaust lever and *slowly* depress kick-starter until inlet valve commences to open. Now release exhaust lever and continue stroke of kick-starter until resistance (due to compression) is felt. The engine will now have sucked in some very rich mixture, which will thin the oil slightly and make the engine easier to rotate by means of the kick-starter.

Repeat the above once or twice, if necessary, then return levers to normal position for starting and start the engine as per instructions already given.

The above need only be carried out when the engine is cold and, consequently, stiff to turn.

After starting the engine as above, regulate its speed by the throttle.

RUNNING. To start away with the engine running, hold up the clutch lever, which is placed on the left side of handlebar, place gear lever in low gear position (right back), very gradually release clutch lever, at the same time opening the throttle slightly as the engine takes up the load, when the machine will glide smoothly away. If the machine starts with a sudden jerk, the clutch lever has been released too quickly. If the machine jerks forward slightly and the engine stops, the throttle has not been opened sufficiently to enable the engine to take up the load.

When the machine has attained reasonable momentum, raise the clutch lever and at the same time move the gear lever forward into second gear position, gently releasing the clutch lever as soon as the gear lever is in second gear position.

Top gear, which is right forward, is engaged in a similar manner as soon as sufficient road speed has been attained.

If, after changing up from low to second or second to top, the machine goes forward jerkily, it is a sure sign that the change of gear has been made too early, i.e., before sufficient road speed has been attained.

The present day motor cycle is controlled more easily than a car, so riders should realise that it is a simple matter to get under way quietly and smoothly.

The gear lever positions are—low or first gear, lever right back; neutral; second or middle gear; top or third gear. In the last-named position the lever will be right forward, the two intermediate positions being found on the way forward from low gear.

The road speed should be controlled by the throttle control; the air lever should be fully opened. If the engine labours on a hill, or if the motion of the machine becomes jerky, it is time to change down to a lower gear.

To change down to a lower gear use the clutch as when changing up, moving the gear lever back from top to second or second to low as the case may be.

Never allow the engine's speed to become so low that the motion of the machine becomes jerky, as this puts a severe strain on the transmission, and is also bad for the engine.

When approaching a hill, the best climb will be made if the throttle opening is increased sufficiently early to allow the machine to start the climb at a good speed. Similarly, if the hill is not surmountable in top gear, the change down to second gear should be made before the engine speed gets too low in top gear.

Use the clutch for starting, stopping and gear changing only. Do not slip the clutch on hills instead of changing gear.

STOPPING. To stop the machine at the conclusion of a run, declutch and close the throttle, using the footbrake to make the machine come to rest at the desired stopping place.

To stop in traffic, or on other occasions when the halt is only of a few moments' duration, declutch, close throttle sufficiently to allow the engine to "tick over" quietly and bring the gear lever back to low gear position, just as the machine comes to rest, so as to have low gear engaged ready to move away with the other traffic.

N.B.—A new machine should not be driven at more than 30 m.p.h. for the first 500 miles in top gear, with a corresponding engine speed in lower gears.

The best way to ensure that a machine will be well "run in" at the end of this period is by never opening the throttle more than one-third while the first 500 miles are being covered, and, most important of all, never allowing the engine to "slog" or labour, always changing to a lower gear instead of increasing the throttle opening.

A machine carefully run in is always superior to one with which no pains have been taken

CHAPTER 2.

LUBRICATION.

Lubrication of the Engine. Lubrication of the Transmission. Steering and Controls. Road Wheels.

LUBRICATION OF THE ENGINE.

Correct lubrication is of the utmost importance in the successful running of a motor cycle, and we recommend the grades of Gargoyle Mobiloil mentioned below. Refuse any oil that may be offered from an open tin or drum—insist on being supplied with sealed tins of

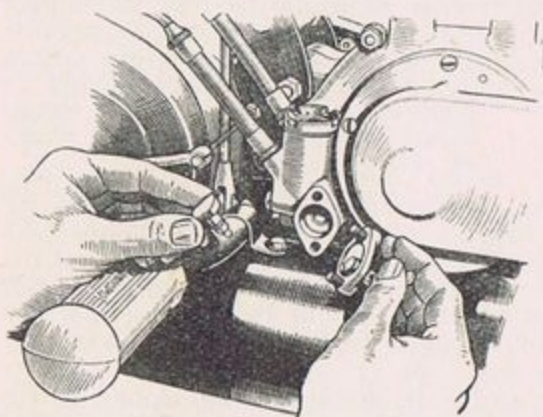
Gargoyle Mobiloil "BB" in Summer.
Gargoyle Mobiloil "TT" in Winter.

The winter recommendation should be followed during the period when freezing temperatures may be expected. These grades are of the highest quality and uniformity, and are obtainable everywhere.

TRIUMPH MECHANICAL OIL PUMP.

This is located on the right hand side of the crankcase, in a projection at the rear of the timing gear case, and is of the variable stroke plunger type.

The stroke of the plunger and therefore the quantity of oil fed to the engine is regulated by the small lever which will be found on the pump body. Maximum feed is given when the lever is pointing to "ON" and the amount of oil reaching the engine is lessened as the lever is turned towards "OFF."



Inspection of Mechanical Oil Pump.

The tap in the oil pipe should be turned on (downwards) when the machine is in use.

If the engine appears to be getting more oil than the pump is supplying, it is probable that the machine has been left standing with the

oil tap turned on, or dirt may be preventing the ball valve at the base of the auxiliary pump from seating properly.

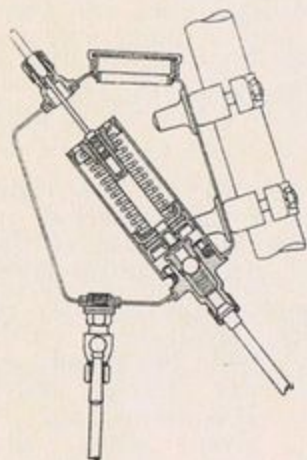
The oil reaches the crankcase *via* a sight feed.

If, at any time, oil is not visible in the sight feed when the engine is running, make sure that the oil tank is not empty and that the oil pipe from the tank to the mechanical

pump allows oil to reach the latter. This may be ascertained by detaching the outer oil pipe (i.e., the pipe connected to the tap) from the mechanical pump, when oil should drip from the pipe. If oil does not drip with tap turned on and if the oil tank is not empty, it is probable that there is some obstruction in the pipe or tap, which should be cleared.

If no obstruction is found and still no oil flows through the sight feed when the engine is running, take out the two screws securing oil pump cover and regulator, remove cover and inspect plunger and barrel.

FOOT OIL PUMP. The foot oil pump is fitted purely as an auxiliary for use when refilling the crankcase after draining, giving the engine an extra supply of oil at any time, or for use in the unlikely event of the mechanical oil pump failing to work.



*Section of
Foot Oil Pump.*

The auxiliary oil pump contains, at its base, the usual ball-valve. When the auxiliary pump is used, this ball-valve opens, and if at any time this valve should stick open, the engine will get too much oil.

Should this happen, it is only necessary to undo the oil pipe union, when the base of the auxiliary pump can be unscrewed, and the valve, which will come away with the base of the pump, can be washed in petrol or paraffin to remove any obstruction. When doing this, the oil tank should be emptied or the end of the pump barrel plugged up to prevent waste of oil.

CARE IN ENGINE LUBRICATION. Before starting a new machine take out the drain plug at the bottom of the crankcase and drain out any oil that may have been left in; the plug should be replaced and the crankcase replenished by giving it four full charges by means of the foot pump.

The regulator lever of the mechanical pump should be set at full feed. If, with the regulator in this position, the exhaust is very smoky, the regulator should be closed, a little at a time, until a position is found where the oil feed is just sufficiently small for the engine not to smoke.

It should be remembered that closing the regulator lever will not immediately stop the exhaust smoke, owing to the fact that, before the smoke abates, the excess of oil in the crankcase will have to be used up. Do not, therefore, adjust the regulator hastily, but allow each alteration of setting time to take effect.

When travelling at high speeds or in hilly districts, put the oil regulator to a more liberal setting.

If in doubt at any time as to whether the engine requires more oil, give the engine the benefit of the doubt by using the foot pump. The worst that can happen is a smoky exhaust or oiled-up sparking plug, whereas the consequences of insufficient oiling are far more serious.

Equally serious is the effect of using cheap, dirty, and unsuitable oil, which is responsible for loss of power, overheating, stiffness in starting and mechanical damage.

A fairly safe test as to whether the engine has sufficient oil is to throttle down, close the throttle for a few moments, and then open the throttle fairly wide, when the exhaust should show a trail of thin blue smoke.

The used oil should be drained from the crankcase every 1,000 miles, and four fresh charges injected with the foot pump. Crankcase draining is preferably carried out when the engine is warm, after a run, as the oil will then be thinned by heat and will flow easily through the drain plug hole, carrying out any carbon deposits in the oil.

Do not use undue force in replacing the drain plug.

N.B.—The tap at the bottom of the oil tank should be turned off when the machine is not in use—i.e., when garaging for the night or making a stop of considerable duration. Failure to turn the tap on when using the machine will prevent oil reaching the engine.

OIL TANK. Always avoid, if possible, allowing the oil tank to drain completely. This will also empty the oil pipe to the mechanical pump, and when the tank is refilled an air-lock may form which will prevent oil feeding to the engine. In such a case, therefore, the sight feed should be watched carefully to verify that oil is passing.

The air-lock can be removed by detaching the outer oil pipe from the mechanical pump, turning on the oil tap, till oil drips from the disconnected end of the pipe and then replacing the latter.

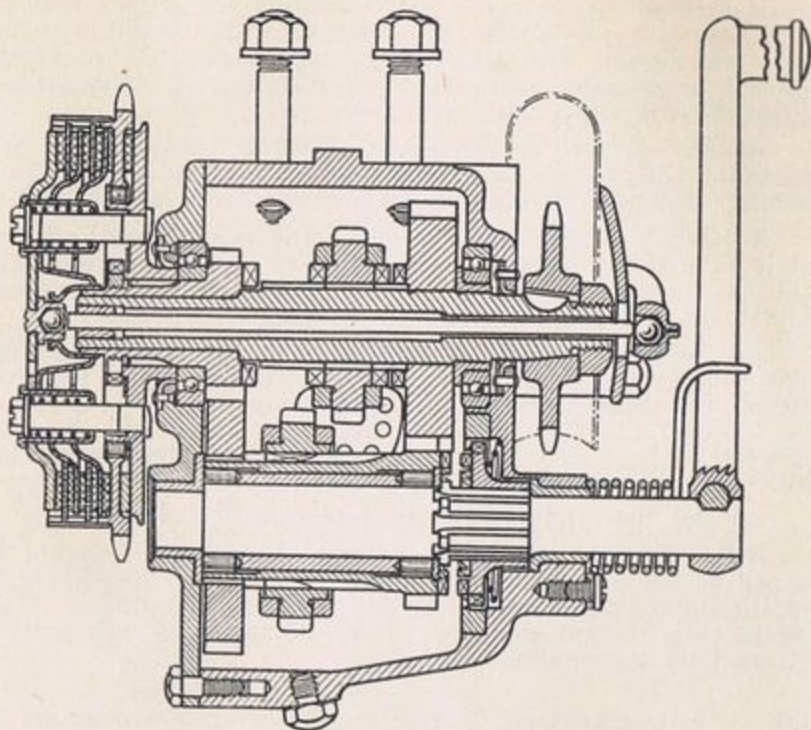
LUBRICATION OF THE TRANSMISSION. **Primary Chain** (Engine to Clutch Sprocket). This is lubricated from the engine, but this supply should be supplemented from time to time by a few drops of engine oil, especially when the machine is ridden in wet weather.

Gear Box. When the machine is first received from the works any oil remaining in the gear box should be drained out by unscrewing the drain plug which will be found in the bottom of the gear box. The drain plug should then be carefully replaced, and the large oil filler plug, which will be found in the back of the gear box on the right hand side, unscrewed.

Pour in gear oil until, having allowed it to settle down, the oil level reaches the top of the filler orifice when the machine is standing vertical: the gear box will then be filled to the correct level. The oil filler plug can now be replaced.

Use Gargyle Mobiloil "C."

It is important that the oil in the gear box should be kept up to the correct level, and the gear box should therefore be replenished to the correct level every 1,000 miles, if necessary.



Section of Gear Box.

The gear box should be drained out every 5,000 miles when warm, flushed out with paraffin and replenished with fresh oil to the correct level. It is important that all the paraffin should be drained out after flushing, and it should be given plenty of time to run out before replacing the drain plug prior to refilling.

Clutch.—A nipple is provided on the clutch operating lever (the clutch operating lever will be found at the right hand side of the gear box), through which the thrust ball, felt washer and the end of the clutch push rod should be lubricated from time to time.

The other end of the clutch push rod, together with its thrust ball, is lubricated automatically from the gear box.

Rear Chain.—This should be given a dressing of Gargoyle Graphite Grease Medium every 1,000 miles. This should be applied in a molten condition, after first cleaning the chain with paraffin.

In wet weather, periodically remove the chain, wash thoroughly in paraffin, and place it in a bath of molten graphite grease (as above), allowing the lubricant to get into all the joints. Rock the bath to keep the graphite from settling to the bottom. Allow the chain to remain in the bath and cool down. Then remove chain, clean off surplus lubricant, and replace.

Note.—Do not overheat the chain in the bath. The lubricant should be just molten.

LUBRICATION OF STEERING, CONTROLS & WHEEL HUBS. **Spring Forks.**—Use the grease gun frequently on the nipples provided.

Regular attention to the lubrication of the shackle spindles through the nipples provided will prevent wear and greatly lengthen the life of the spring forks.

Steering Head.—This also should be kept well lubricated and two nipples are provided to which the grease gun should be applied. One of these will be found in the lug above the top head race, while the other is at the back of the bottom shackle lug and lubricates both the bottom rear shackle spindle and the lower head race.

Controls.—All controls should be kept well lubricated, as this will keep the machine easy to ride and control.

Any small pieces of Bowden cable that are exposed, such as the gear box end of the clutch cable, should be well smeared with grease. All control levers should be lubricated from time to time, but *excessive* use of oil on the levers should be avoided as it will run down them, making them unpleasant to hold.

When the machine is being overhauled it is worth while to take off all Bowden cables, hang them up by one end and work some thin oil through them. This can conveniently be done by boring the required number of holes in a cork, inserting the top ends of the Bowden cable outer casings in the holes, placing the cork in a bottle or can of oil which it fits and then inverting the bottle and leaving the whole hanging up until oil gets right through the Bowden cables and drips from the lower ends. Keeping the cables well lubricated will make all controls easy to manipulate.

Road Wheels.—The hubs are provided with nipples, and the grease gun should be used to lubricate the hub bearings through them from time to time.

The wetter the weather the more frequently should the grease gun be used.

Use Gargoyle Mobilubricant Soft in the grease gun.

CHAPTER 3,

MAINTENANCE.

General Notes. Engine. Transmission. Adjustments. Steering and Controls. Road Wheels. Carburetter. Magneto. Plugs. Tyres.

GENERAL NOTES. It is well worth while to keep a motor cycle in correct adjustment throughout.

Any time and trouble expended by the rider in carrying out adjustments will be well repaid by the power maintenance, smooth running and ease of control of his machine. It never pays to postpone making adjustments, as it invariably increases the wear on the parts concerned, thus shortening their life.

ENGINE. **Tappets.**—The tappet clearances should be checked from time to time.

The valve stems should just clear the tappet heads when the valves are closed. If there is an appreciable distance

between them, or the stems and tappets are in actual contact, slacken the lock nut on the adjustable tappet and screw the tappet head to the left or right to lengthen or shorten the tappet as required. The clearance of the exhaust valve should be slightly greater than that of the inlet valve.

The correct clearance for the exhaust valve is eight thousandths of an inch, and for the inlet valve four thousandths when the engine is cold.

If the exhaust valve has no clear-

ance, a burnt valve and seating will rapidly result, while if the clearance is excessive, the engine will lose power and run hot.

Compression Leaks.—Watch for any stains on the cylinder, round the timing plug, sparking plug and valve caps, as these are caused by oil blown out from the cylinder and indicate compression leakage. The valve cap or plug, as the case may be, round which such stains appear, should be screwed down tightly with a spanner.

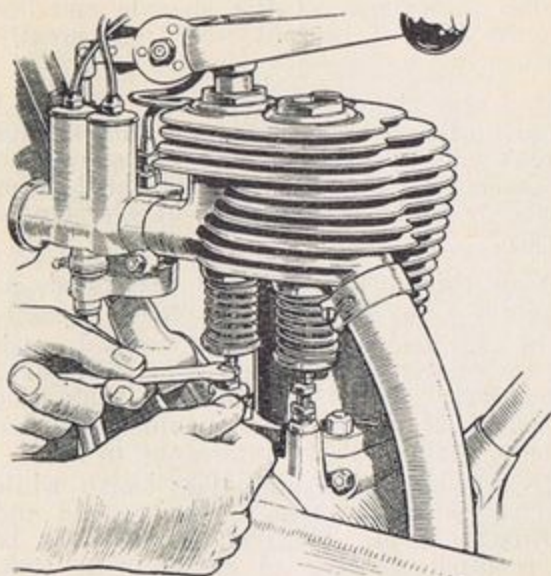
If these compression leakages are allowed to continue, they will cause overheating and loss of power.

TRANSMISSION. Primary Chain.—The front chain should not be allowed to get too slack or it will make an objectionable rattle on the chain case. It is adjusted by slackening the four nuts which hold the gear box to the frame and then sliding the gear box towards the rear or front of the machine to tighten or slacken the chain respectively. The chain should not be run tight, but should have about half an inch up-and-down play in the run between the sprockets.

Gear Box.—Adjusting the front chain may slightly affect the adjustment of the gear control.

To adjust gears, place gear lever in neutral position, disconnect the vertical rod from the change speed lever, slacken the nut on the rod, and turn the connection either up or down as required, so that the pin which connects lever to rod slides freely in and out with lever in neutral position.

Clutch.—There should always be a little play between the clutch push rod and the hardened steel ball in the clutch operating lever on the right hand side of the gear box. A cable abutment is provided on the rear right hand engine



Adjustment of Tappets.

plate, and this should be adjusted in or out until the end of the clutch operating lever (where the cable is anchored) has about three-sixteenths of an inch of play. If no play is allowed here, the clutch will slip when the throttle is opened, causing wear and heating of the clutch plates, while, if the play is excessive, the clutch will not free properly when the handlebar clutch lever is raised.

Rear Chain.—The rear chain, like the front, should not be allowed to get too slack, or it will rattle against the chain guard.

To adjust the rear chain, slacken the nuts at the ends of the rear spindle, tighten or loosen, as required, the nuts on the rear spindle drawbolts, which will be found at the rear of the frame lugs which carry the rear wheel spindle, and finally tighten up the nuts on the rear spindle.

The rear chain should not be run tight, a little up-and-down movement being allowed in the run between the sprockets. Chains sometimes stretch unevenly, and a chain should always be adjusted correctly at its *tightest* position.

It should not be forgotten that moving the gear box to adjust the front chain will necessitate adjustment of the rear chain.

After adjusting the rear chain it may be found that the rear brake requires adjustment. Turn to paragraph on rear brake adjustment.

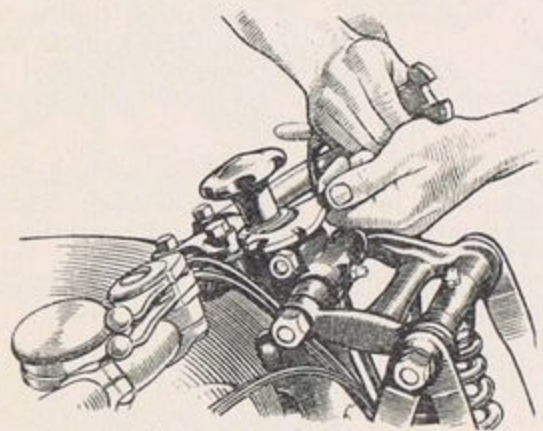
After adjusting the rear chain, make sure that the road wheels are in correct alignment.

STEERING AND CONTROLS.

Spring Forks.—It is unlikely that any side play will develop in the spring forks for a long time if proper attention is given to their lubrication.

When side play is apparent, slacken nuts on right hand side of fork shackles, take up the play in the forks by tightening up nuts on left hand side, and finally tighten up nuts on the right hand side, which lock the adjustment.

Steering Head.—The steering head should be kept adjusted so that there is neither play nor tightness. The adjustment is



Adjustment of Steering Head.

best tested by lifting the front of the machine and placing a block of wood or other suitable support under the crankcase, so that the front wheel is held off the ground. Any play in the head can then be felt by attempting to pull the forks backwards and forwards. If play exists, slacken the nut on the pinch bolt, tighten down the cap nut

with a "C" spanner till correctly adjusted and finally tighten up the pinch bolt nut again.

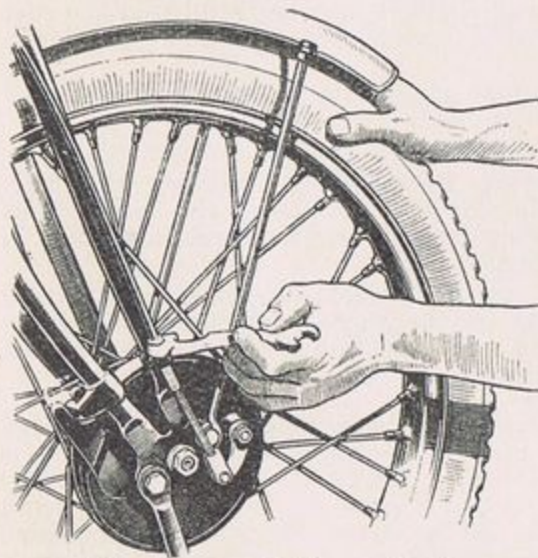
Handlebar.—To alter the position of the handlebar it is only necessary to slacken the nuts holding the handlebar clamps a little, move handlebar to position desired and tighten up nuts.

Carburetter Controls.—The throttle or air lever may be made stiff or easy in operation, to suit the rider's taste, by tightening or loosening the adjusting nuts provided with the special "C" spanner in the tool kit.

Clutch Control.—See "Clutch."

Magneto Control Lever.—Adjustable in the same manner as carburetter controls.

Front Brake.—This is adjusted by means of the adjustable cable casing abutment on the spring fork girder.



Adjustment of Front Brake.

To adjust, place machine on stand, slacken off lock nut on abutment, and unscrew the latter until the front wheel just runs freely, a slight pressure on the inverted lever on the handlebar causing the wheel to stop.

With the brake lever released, the wheel should spin freely, and there should be no drag caused by the brake.

When adjusted correctly, tighten up abutment lock nut, taking care not to alter the adjustment.

Rear Brake.—Adjust the brake—by giving the butterfly nut either half turns or complete turns (so that, at each adjustment, the locking projections will be in the slots)—until the rear wheel just spins free (allowing for chain drag) but stops immediately pressure is applied to the brake pedal. Finally, make sure that the locking projections are in their slots.

Exhaust Valve Lifter.—This seldom requires adjustment and should never be adjusted so that there is no play, as this would prevent the exhaust valve from seating properly, causing burning of the exhaust valve and its seating with consequent loss of power and damage. For making this adjustment, when necessary, an adjustable cable abutment is provided inside the magneto chain-case.

ROAD WHEELS.

The wheel bearings should be examined occasionally for side play caused by wear. The machine should be placed on the stands, if adjustment is required, the spindle nut on the left hand end of the spindle slackened off, and the adjusting collar gradually tightened up. The wheel should be kept spinning while making the adjustment, and the collar should only be tightened till the play disappears.

Do not screw the collar up tight as this will damage the rollers and their races.

After adjusting, tighten up spindle nuts and test again for freeness, readjusting if any tightness exists.

When adjusting the rear wheel bearings, it is advantageous to remove the rear chain, thus eliminating chain drag when spinning the wheel to test adjustment.

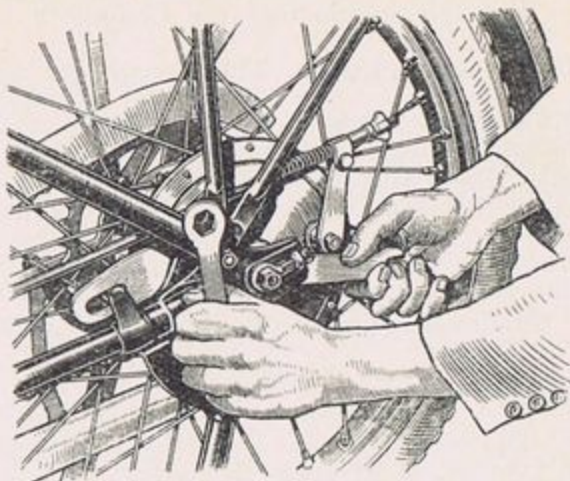
Instructions for removing the rear chain will be found in Chapter 5.

CARBURETTER.

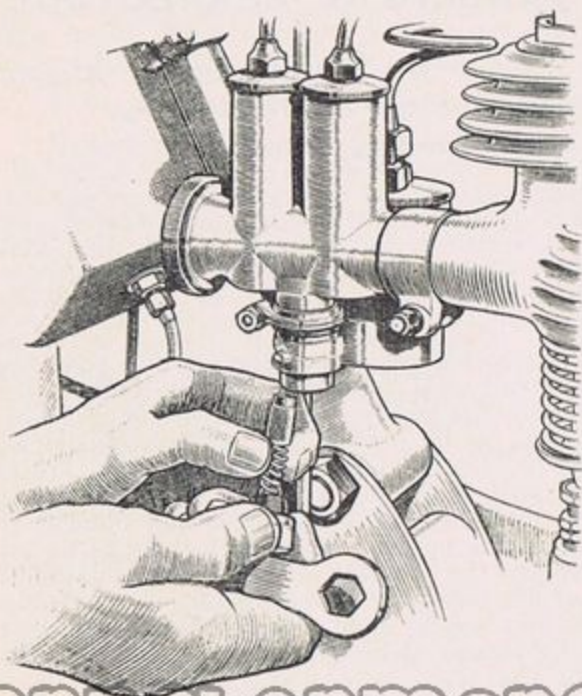
It is worth while to remove the drain plug from the bottom of the jet chamber

occasionally, take out the filter, which the drain plug holds in position, and clean away all dirt that may have collected.

The float chamber may also be detached by unscrewing the lower petrol pipe union and the clamping screw holding the float chamber to the carburetter body, and any dirt or water removed from it. Do not forget to turn off the petrol tap before removing the drain plug or unscrewing petrol pipe union.



Wheel Bearing Adjustment.



Inspection of Carburettor Filter.

MAGNETO. Occasionally see that contact breaker points separate correctly, that rocker arm moves freely and that carbon brushes are clean.

For full instructions see Chapter 9.

SPARKING PLUG. This should be taken out from time to time for cleaning and adjustment of gap between points.

The insulator, and, with it, the central electrode, may be removed from the plug body by unscrewing the nut at the top of the plug body. When this is removed it can be cleaned carefully with a penknife, cloth and petrol, and the inside of the plug body may be scraped till it is free of carbon. The plug may now be reassembled and put back.

The gap should be from .025 in. to .030 in.

TYRES. These should be kept at the correct pressures to ensure their having the maximum possible life.

The correct pressures for the Dunlop 26in. x 3.25in. wired on tyres fitted to Model N de Luxe are as follows:—

Solo:— Front, 25 lbs.

Rear, 27 lbs.

Sidecar:—Front, 25 lbs.

Rear, 27 lbs.

Sidecar, 25 lbs.

CHAPTER 4.

TROUBLES—TRACING & CORRECTING.

General Hints. Engine Misfires or Stops. Engine Knocks. Loss of Power. Overheating. Trouble-Finding Chart.

GENERAL HINTS. Troubles should always be traced and rectified methodically, and the first thing to do in cases of engine stoppage is to make sure that there is petrol in the tank and that it is reaching the carburetter.

Next, it is advisable to ascertain that the jet and passages in the carburetter are clear, and, therefore, that the carburetter is alright and can supply the engine with the correct mixture. If these points are found to be correct, the ignition should be examined. Commence by taking out the sparking plug, lay it on the cylinder head with high tension wire attached, move engine smartly round by means of kick-starter and observe if there is a spark between the points. Make sure there is no oil or other matter between the points, as this would cause a "short" and prevent the spark from occurring. If the plug seems O.K. but does not spark, hold the terminal of it and slowly rotate engine by means of kick-starter. Should a slight electric shock be felt, the plug only is at fault, but if there is no shock a fault or "short" between the high tension wire

and the frame is indicated, or the magneto itself requires attention. Troubles can be traced as above in a few seconds.

Those troubles which are the most likely to be met with are given below.

ENGINE MISFIRES OR STOPS.

(1.) **Stuck Exhaust Valve.**—After proceeding as instructed in "General Hints," and finding that the carburetter and ignition are in order, rotate the engine by means of the kick-starter, raising the exhaust lifter at first and then releasing it.

If no resistance is felt after dropping exhaust lever, it is probable, especially if the engine has been lubricated generously or is new, that the exhaust valve is stuck up with burnt oil. This is cured by squirting petrol up the valve stem where it enters the guide, or if badly stuck, the valve may have to be taken out and cleaned. (See Chapter 5).

(2.) **Sooted Plug.**—The trouble is traced to the ignition and the sparking plug, when taken out, is found to be "shorted" by soot or oil, either at the points or inside the body. The plug should be cleaned (see Chapter 3: "Sparking Plug") and put back, when the engine should respond to the kick-starter unless it is so over-lubricated that the plug points are immediately fouled again.

(3.) **Choked Petrol Supply or Jet.**—If petrol is not reaching carburetter, first remove filler cap to see that there is petrol in the tank. If, when filler cap is taken off, petrol reaches carburetter, the stoppage was due to air lock, and the air way at the side of the petrol filler orifice should be cleared.

If petrol does not reach carburetter, turn off tap and remove petrol pipe by unscrewing union at each end. Turn on petrol tap for a moment to see that tap is clear—if petrol does not flow freely, push piece of wire or something similar up hole in tap while turned on. This will clear obstruction.

If tap is clear, blow through petrol pipe from bottom end.

If pipe is clear, examine needle valve hole in carburetter lid, remove drain plug below jet, take out and clean filter, and, if cause of stoppage is still not apparent, remove float chamber and take out jet. (See Chapter 3: "Carburetter.")

(4.) **Fault in Magneto.**—When the method of fault tracing outlined in "General Hints" indicates that the stoppage is due to lack of current from the magneto, the carbon brush on the high tension wire should first be taken off the magneto and cleaned. The collector ring of the magneto, on which this carbon brush presses, should also be cleaned by inserting through the brush hole a piece of soft rag by means of a pencil and rotating magneto and the carbon brush put back. Next examine the contact breaker and make sure that the points are clean and are breaking properly. (See Chapter 9).

ENGINE KNOCKING.

This is almost always caused by trying to accelerate on too high a gear at low engine speeds, the remedy being obvious. If, however, the engine knocks when climbing a hill, and the engine speed is not sufficiently low to warrant changing to a lower gear, close the air lever a little at a time and gradually

retard the ignition lever, and the knocking will stop, unless the engine speed is too low. Too weak a mixture, due to partially choked jet or pipe, will cause knocking.

Continued and persistent knocking usually indicates that the engine requires decarbonising.

LOSS OF POWER.

Loss of power may be due to any one or any number of the following causes:

Partially choked jet causing weak mixture; magneto control too far retarded; loss of correct exhaust tappet adjustment (due to expansion of exhaust valve under excessive heat); insufficient oil in engine; excessive carbon deposit in cylinder, ports, exhaust pipe or silencer.

OVERHEATING.

This usually is experienced in conjunction with loss of power. Bad overheating can cause the engine to "konk" to a standstill, the overheating having, in such cases, caused pre-ignition.

In addition to the causes already given under "Loss of Power," overheating may be due to any of the following causes:

Wrong kind of oil; wrong kind of plug (electrodes too thin); incorrect valve timing; magneto timing slipped; or driving the engine hard for long distances on too low a gear.

TROUBLE CHART.

| <i>Trouble.</i> | <i>Cause.</i> | <i>Reason.</i> |
|--|---------------------|---|
| Engine Stops. | Faulty Carburation. | No petrol (or only reserve). |
| | | Choked tap. |
| | | Air hole in filler cap stopped up. |
| | | Choked pipe. |
| | | Choked filter in carburetter. |
| | | Choked jet. |
| Engine Stops. | Faulty Ignition. | Sooted plug. |
| | | Plug shorted by water on outside of insulation. |
| | | Worn H.T. wire shorting to frame. |
| | | Cracked H.T. brush holder. |
| | | Dirty H.T. brush. |
| | | Dirty H.T. brush collector ring. |
| | | Dirty contact breaker points. |
| | | Contact breaker rocker stuck. |
| Contact breaker points not separating. | | |
| Contact breaker points worn. | | |

| <i>Trouble.</i> | <i>Cause.</i> | <i>Reason.</i> |
|--------------------|---------------------|---|
| Engine Stops. | No Compression. | <ul style="list-style-type: none"> Exhaust valve stuck up with oil. Tappet adjustment undone. Broken valve cotter. " " spring. Broken or burnt valve. |
| Engine Misfires. | Faulty Carburation. | <ul style="list-style-type: none"> Partially choked tap. pipe. Air "hole in" filler cap stopped up. Partially choked jet. filter. " " " " filter. Needle valve stuck Dirt on needle valve seating } Causing Flooding Punctured float Water in carburetter. Air leaks (carburetter loose or carburetter caps loose). |
| Engine Misfires. | Faulty Ignition. | <ul style="list-style-type: none"> Dirty plug. Faulty H.T. wire. Dirty carbon brush. Dirty carbon brush collector ring. Cracked H.T. brush holder. Dirty contact breaker points. Contact breaker rocker stiff. Contact breaker rocker spring damaged. Insufficient break at points. Water in magneto. Worn contact breaker points. |
| Engine Power Poor. | Poor Compression. | <ul style="list-style-type: none"> Dirt or carbon on valve seat. Insufficient tappet clearance. Weakened valve springs Valve cap leaking. Plug leaking. Piston rings worn, burnt or stuck. Cylinder walls scored. Valves pitted or burnt. |

| <i>Trouble.</i> | <i>Cause.</i> | <i>Reason.</i> |
|--------------------|---------------|---|
| Engine Power Poor. | Overheating. | Wrong oil. Insufficient oil. Weak mixture. (Jet too small or partially choked). Excessive tappet clearance. Excessive carbon deposit in cylinder. Excessive carbon deposit in ports. Excessive carbon deposit in silencer. Excessive carbon deposit in exhaust pipe. Running with retarded ignition. Unsuitable sparking plug. Piston rings worn, burnt or stuck. Cylinder cooling fins blocked with mud. Valve timing wrong. Brakes binding. Wheel bearings tight. Chains tight. |

CHAPTER 5.

DISMANTLING THE MACHINE.

Removal of Carburetter—of Exhaust Pipe—of Cylinder—of Piston—of Piston Rings—of Valves. Decarbonising. Removal of Timing Case Cover. To Remove Crankcase from Frame. Dismantling Crankcase and Flywheels. Removal of Primary Chain—of Rear Chain—of Rear Chain Guard—of Gear Box. Dismantling Gear Box. Taking out Road Wheels. Dismantling Hubs. Dismantling Spring Fork and Head.

REMOVAL OF CARBURETTER. The petrol pipe must first be taken off by undoing the union nut at each end, after which the float chamber should be detached by slackening off its retaining bolt.

The clamping screw which holds the carburetter to the inlet stub should next be slackened off, when the carburetter can be pulled off.

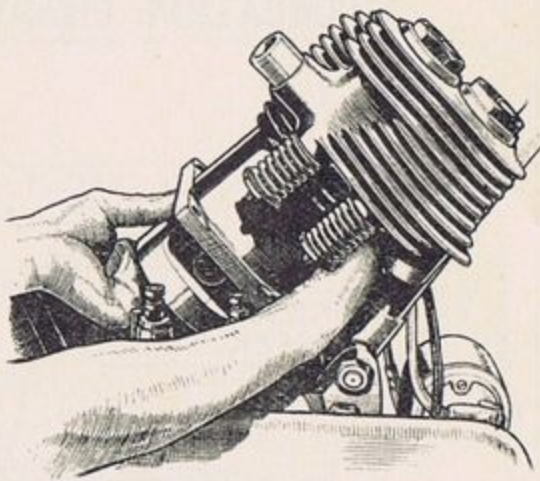
REMOVAL OF EXHAUST PIPE. Unscrew bolt holding rear exhaust box to rear stand pin and withdraw box together with its curved pipe from the main expansion chamber. Remove the two clip screws which fix the expansion chamber to the footrest, also unscrew the primary pipe clamping screw at exhaust port and detach primary pipe, together with expansion chamber.

REMOVAL OF CYLINDER.

of the holding down front down tube of frame), taking care that connecting rod touches rear of crankcase cylinder orifice. If the cylinder is now lifted forward and upward till checked by frame tubes, the piston can be manipulated downwards till clear of the cylinder bore, when the cylinder can be removed.

Be careful not to pull or push cylinder towards either side of machine, as this may bend the connecting rod.

Remove sparking plug, timing plug or compression tap and unscrew the four cylinder base nuts. Lift the cylinder clear studs and tilt it forward (i.e., towards



Removal of Cylinder.

Note.—It is a good practice to slacken the valve caps before removing cylinder from crankcase, as they will probably be tight, and, consequently, more easily removed while cylinder is firmly held on crankcase. They will be found easier to remove if the engine is warm.

REMOVAL OF PISTON.

out one circlip with the pliers and push out gudgeon pin with the fingers. The piston is now free.

The gudgeon pin is held in the piston by a circlip at each end. To remove gudgeon pin, place rag over crankcase orifice, take

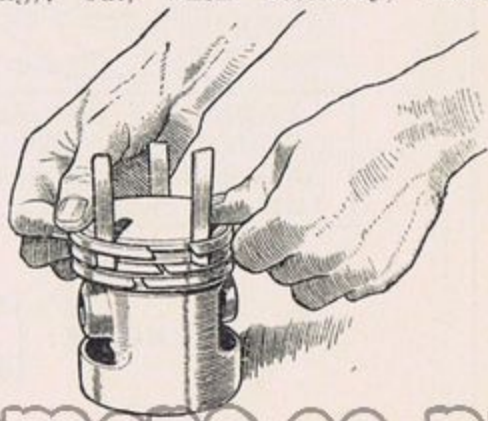
place rag over crankcase orifice, take

REMOVAL OF PISTON RINGS.

three thin strips of metal between the ring and the wall of the piston—working them round till fairly equi-distant apart. The strips will hold the ring clear of the groove and it can be slid off.

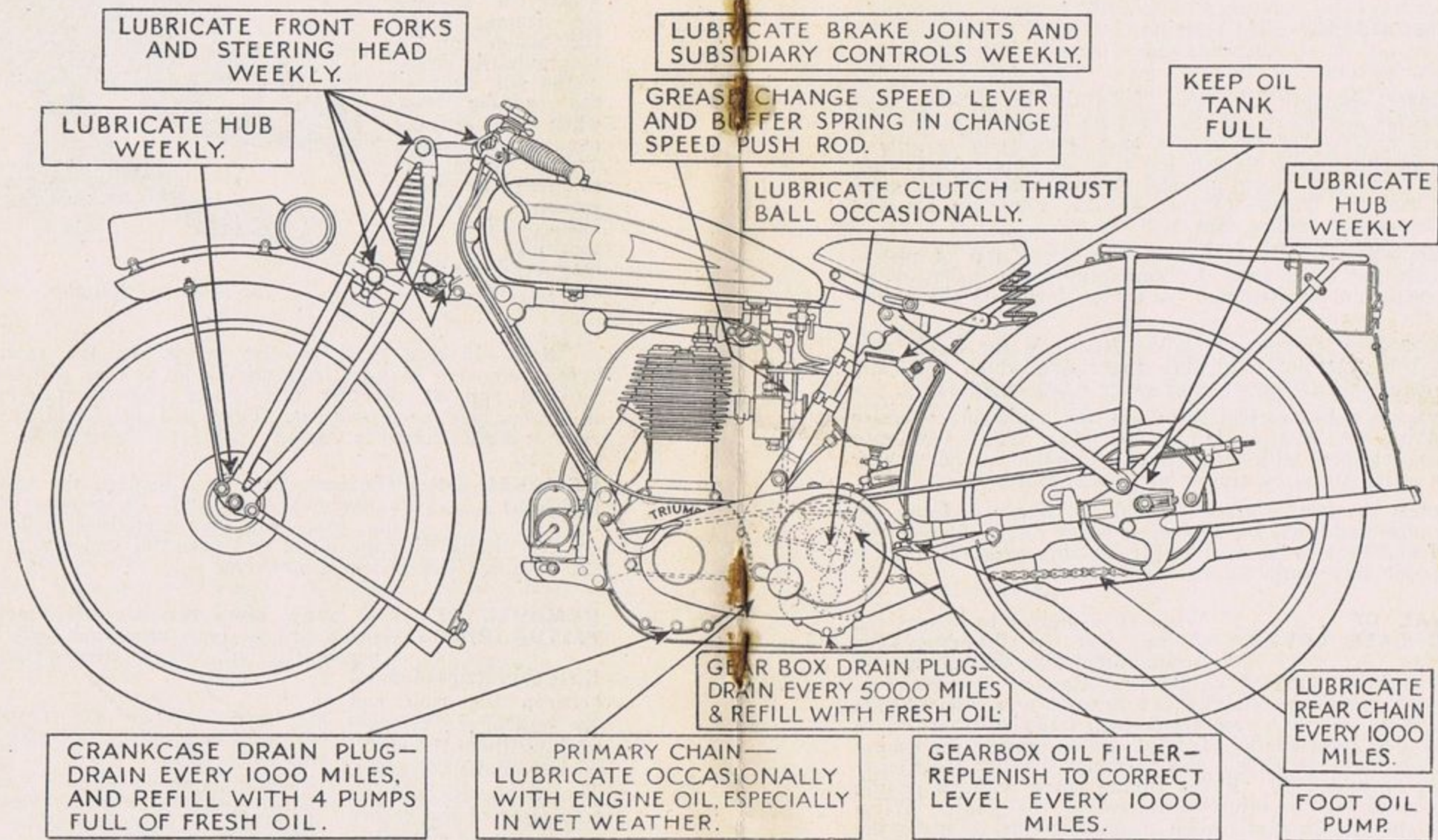
Piston rings are made of cast iron, and cannot be sprung open any wider than will just allow them to slide off as above.

It is not often necessary to remove the piston rings (see paragraph on Decarbonising), but, when necessary, insert



Removal of Piston Rings.

LUBRICATION CHART OF THE 4.94 H.P. TRIUMPH MOTOR CYCLE, MODEL "N de LUXE."



ENGINE: { Use Mobiloil "BB" in Summer.
Use Mobiloil "TT" in Winter.

GEARBOX: Use Mobiloil "C."

OILCAN: Use Engine Oil.

REMOVAL OF VALVES. Take out valve cap and turn cylinder upside down on bench with small tin or anything suitable, in valve cap hole, so that valve head rests on the tin. The valve collar can now be pressed clear of the cotter and the latter pulled out. The valve spring and collar can now be removed and the valve taken out. If the end of the valve stem is slightly burred it should be filed a little to facilitate its passing through the valve guide. A valve, if necessary, can be removed without removing the cylinder, it only being necessary to hold the valve on its seating while pressing the collar clear of the cotter and extracting the latter.

DECARBONISING. The engine is now sufficiently dismantled for thorough decarbonisation to be carried out.

Cylinder.—Remove all carbon from the head, valve caps, valve pockets and ports. When scraping carbon from cylinder head, which is best done with a long screwdriver or similar tool, be careful not to scratch the cylinder bore. Also, when cleaning ports and valve pockets, do not scratch the valve seats. Clean the outside of the cylinder, removing all mud from between the cooling fins.

Piston.—Scrape all carbon carefully from top of piston, taking care not to damage the aluminium; the inside of the piston should not be forgotten, as carbon forms on the underside of the crown.

Unless there is excessive carbon deposit in the piston ring grooves it is best not to disturb the rings, which will only require decarbonising about once every 6,000—8,000 miles.

Valves.—Remove carbon from top and underside of valve head, taking care not to damage the seat. The valve stem should be cleaned with petrol and rag—the use of emery cloth on valve stems is not to be recommended.

Exhaust System.—Carbon should be removed from the exhaust pipe and silencer—a piece of steel rod, with one end flattened and bent to form a scraper, making a useful tool for carrying out this work.

REMOVAL OF TIMING CASE COVER. When it is desired to inspect the timing gear or dismantle the engine completely, the timing case cover should be removed as follows: Remove the magneto chain cover, which is held by two screws, and take off the magneto chain and both sprockets, which latter will have to be forced off their taper shafts. The five screws holding the timing cover to the crankcase should now be removed, when the timing cover can be pulled off. If the timing cover requires prising off, be careful not to injure the faces of the joint. When replacing, use jointing oil, goldsize or seccotine to make the joint.

TO REMOVE CRANKCASE FROM FRAME. First remove primary chain case and chain (see paragraph "Removal of Primary Chain.") The footrests should now be removed, the footbrake lever and ignition and exhaust lifter cables disconnected, and the oil pipes taken off.

Remove nut from bolt holding front engine plates to front down tube of frame, also nuts from bolts holding crankcase to rear engine plates. Place wood block or other suitable support under crankcase to prevent it from falling, and withdraw above-mentioned bolts. The crankcase can now be removed complete with front engine plates and magneto.

DISMANTLING CRANKCASE AND FLYWHEELS.

Remove front engine plates and unscrew nut holding shock absorber and sprocket on engine shaft. All shock absorber parts can now be removed from shaft. Unscrew the nut securing the small timing pinion (this nut has a *left hand thread* and will therefore unscrew in the opposite direction to ordinary nuts), mark the keyslot in the small pinion which is meshed with the key and remove the small timing pinion. Marking the keyslot as above will ensure that the pinion can be replaced in its correct position, thus ensuring that the valve timing will not be altered. The four remaining bolts holding the halves of the crankcase together can now be removed and the halves of the crankcase prised apart, care being taken not to injure the faces of the joint.

The locking screw and nut may now be removed from the crankpin and the timing gear side flywheel detached. This allows the roller retaining washer to be removed and the big end bearing dismantled.

REMOVAL OF PRIMARY CHAIN.

Pull the left hand footrest rubber off its tube, take out the screw holding front of chain case to crankcase, screw holding rear of chain case and the two smaller screws securing the centre of the case. The chain case can now be removed and the gear box slid forward to allow the chain, which has no spring link, to be taken off. If the chain is tight it may be necessary to dismantle the clutch or drop gear box from frame.

REMOVAL OF REAR CHAIN.

To remove the rear chain it is only necessary to slide off the spring clip of the connecting link, when the latter can be detached and the chain removed.

REMOVAL OF REAR CHAIN GUARD.

Uncouple clutch cable from clutch operating lever on right hand side of gearbox, unscrew the two nuts holding the end plate to which the clutch lever is attached and the plate can be pulled off.

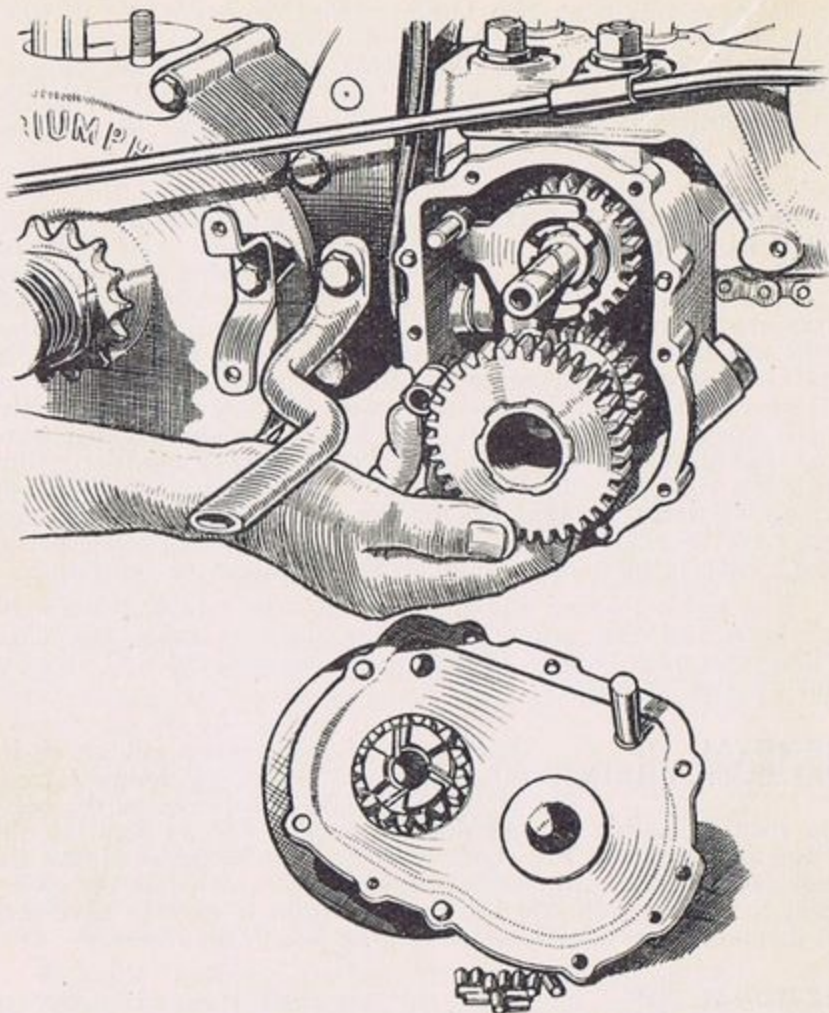
The bolt securing the rear end of chain guard should now be taken out, when the chain guard can be removed.

REMOVAL OF GEARBOX.

Remove split pin and take out pin holding gear operating rod to gear lever. It is now only necessary to take off the four nuts securing the gearbox, which latter can then be removed.

DISMANTLING GEARBOX.

First unscrew the nut holding the gearbox rear chain sprocket and remove the sprocket from its tapered shaft. This is best done with a wheel puller. Next dismantle the clutch by unscrewing



Dismantling Gearbox.

the six nuts holding the clutch springs, the removal of which will allow all the clutch plates to be taken out.

To facilitate reassembly, take careful note of how and in what order the plates were arranged.

Remove nut holding clutch body and slide the latter off the splined shaft. Take out the seven screws securing the gearbox end plate, when the end plate can be prised off, care being taken not to damage the faces of the joint.

The two fork guide rods and all gears can now be pulled out of the box, the layshaft spindle remaining in position

The layshaft spindle can be removed, if necessary, by taking out the kick-starter cotter pin and removing the kick-starter crank, which will allow the layshaft spindle to be pulled out at the opened end of the gearbox.

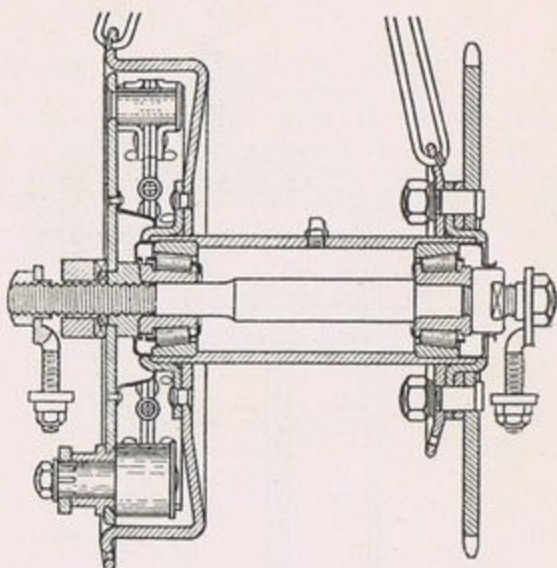
TAKING OUT THE ROAD WHEELS.

on the brake and unscrew the spindle nuts, when the wheel can be pulled out after placing the machine on the stand.

DISMANTLING HUBS.

Unscrew the nut at the brake end of spindle and take the brake out of the brake-drum. Next, unscrew the dust cap at the opposite end of hub and the adjusting cone nut.

The spindle can now be knocked out towards the brake end of hub.



Section of Hub.

DISMANTLING SPRING FORK AND HEAD.

Take off the lock nuts from the right hand ends of the front shackle bolts and take out the two front shackle bolts—unscrewing them at the left side of fork.

The fork girders can now be detached.

Now take out the remaining top shackle bolt in the same manner as the others.

Slacken nut on head pinch bolt and take off stem lock nut. The handlebar and lug can now be pulled off complete and the stem removed complete with spring and shackles, the top shackle being left on the spring.

When dismantling the head as above, care should be taken not to lose any of the balls.

CHAPTER 6.

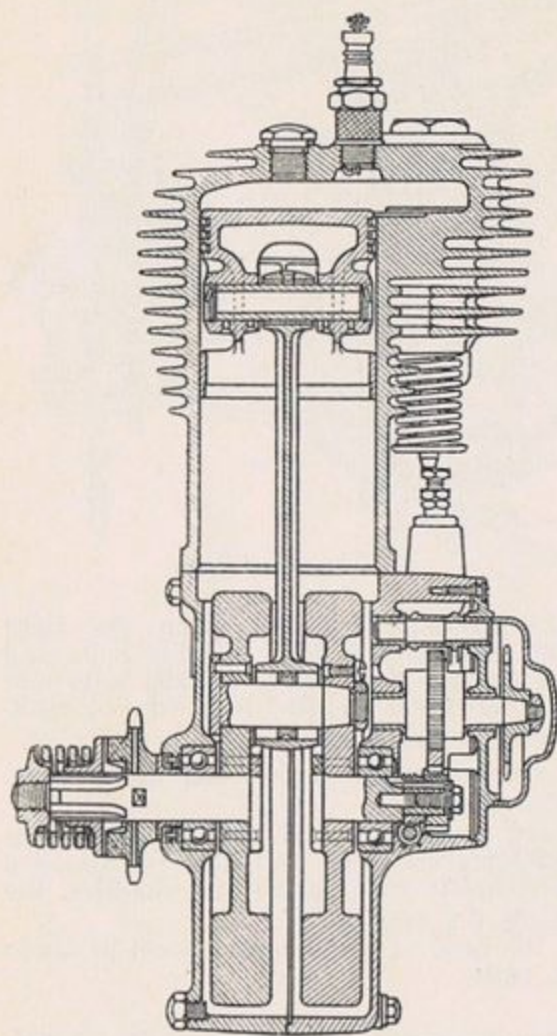
REASSEMBLING THE MACHINE.

Reassembly of Flywheels—of Crankcase. Replacing Crankcase in Frame. Reassembly of Piston—of Valves—of Cylinder, Carburetter and Exhaust Pipe—of Shock Absorber—of Gear Box—of Head and Fork—of Road Wheels—of Rear Chain and Guard.

REASSEMBLY OF FLYWHEELS.

The connecting rod complete with roller bearing and roller retaining washers, should first be assembled on the crankpin, after which the timing side flywheel should be

replaced as nearly true as possible, and the crankpin nut screwed on but not very tightly. The flywheels should now be placed between the centres of a lathe and rotated by means of the connecting rod.



Section of Engine.

Any eccentricity should be corrected by light taps with a wooden mallet or lead hammer, on the periphery of the flywheels, and when the position is found in which both shafts and flywheels run absolutely true, the crankpin nut should be screwed up *dead tight* and the assembly re-tested to make sure that tightening the crankpin nut has not interfered with the truth of the assembly.

Note.—Although instructions are given for completely dismantling the engine, it should be clearly understood that assembling the flywheels should be carried out by a skilled mechanic, as the smallest malalignment will seriously affect the running of the machine.

The Triumph Cycle Co., Ltd., prefer to carry out complete engine overhauls themselves, thus ensur-

ing correct reassembly; failing this, it is advisable to send the flywheels and connecting rod complete.

REASSEMBLY OF CRANKCASE.

Place the driving (left hand) side half of the crankcase on a box, so that when the flywheel assembly is put in, the mainshaft can project through the main bearing. The two halves of the crankcase should be perfectly clean, especially the joint faces. Next paint the joint faces of the crankcase half now holding the flywheel assembly with jointing oil, gold-size, or seccotine, place the other crankcase half in position, put in the four bolts, which were removed last when dismantling, and tighten up their nuts.

Note.—When handling the flywheel assembly, do not carry or move it by the connecting rod, and, when placing flywheel

assembly in left hand half of crankcase, make sure that connecting rod projects through cylinder orifice at top of crankcase.

The crankcase assembly can now be completed by the addition of the front engine plates, etc.

REPLACING CRANKCASE IN FRAME. Lift crankcase assembly until a suitable steel rod can be passed through the upper hole

in the rear engine plates and the corresponding hole in crankcase. This steel rod will now hold crankcase in position while the two remaining bolts are put in, when it can be taken out and replaced by the correct bolt. The engine bolt nuts should now be put on and screwed home dead tight.

REASSEMBLY OF PISTON. The piston rings should first be replaced and the piston should then be held in position while the gudgeon pin is pushed in.

Be careful to replace the piston the same way round as it was before dismantling—the side on which the circlip was not removed will be a convenient guide.

Replace the circlip carefully, making sure that it is properly fitted in its groove.

REASSEMBLY OF VALVES. Before replacing the valves the seatings should be examined, and, if the valve seatings do not show a clean ring all round, grinding is necessary. For this purpose use a prepared valve grinding compound or fine emery powder mixed with oil or paraffin.

Smear a small quantity of this evenly round the lip of the valve, lower the valve on to its seating and rotate it backwards and forwards with a screwdriver, frequently raising it off the seating and turning it to a fresh position. Do not press the valve down heavily. This should be continued until a clean ring is obtained both on the valve itself and also on the seating in the cylinder.

Further grinding after this has been attained will merely wear away metal to no purpose.

If the valve face is badly pitted it is advisable to have it refaced, as the grinding necessary will wear away the metal from the seating in the cylinder.

The Triumph Cycle Co. undertake to re-face valves at a nominal cost. Re-faced valves should be lightly ground in before assembly.

After grinding, all traces of grinding compound must be removed with the greatest care and the valves replaced by the method used for removing them.

REASSEMBLY OF CYLINDER. Replace the paper cylinder base washer in position on the crankcase—if it got damaged during dismantling it will be

necessary to make a new one. Smear the washer and also the piston with oil and then manoeuvre the cylinder into position. Great care must be taken to help the piston rings to enter the cylinder bore, as they are easily broken. The gaps in the piston rings should be on opposite sides of the piston—preferably at front and back.

If one tappet is up, preventing the cylinder from seating properly, rotate engine, holding cylinder, until both tappets are down.

The cylinder holding-down nuts can now be put on and tightened down, great care being taken to tighten each nut in turn a little at a time, thus keeping even pressure all round the cylinder base and avoiding risk of fracture. The valve caps can now be put in and screwed tightly home, also the compression tap or timing plug and the sparking plug. Subsequent removal will be facilitated if the threads are lightly smeared with Gargoyle Graphite Grease Medium. The carburetter, float-chamber, petrol pipe and exhaust system can now be added, care being taken that the carburetter is pushed right home on the inlet stub.

ASSEMBLY OF SHOCK ABSORBER. The shock absorber should be assembled on the engine shaft by first sliding on the loose bush, then the sprocket—cams outwards—followed by the splined sleeve, the cams of the latter meshing with those on the sprocket. Now put on the spring and screw on the retaining nut, pressing the latter inwards to compress the spring while starting the nut on its thread.

ASSEMBLY OF GEAR BOX. Proceed in the reverse order to that given for dismantling.

When replacing the gear wheels, make sure that the gear operating lever in the gear box is correctly engaged with the sliding fork.

When replacing the end plate make sure that the faces forming the joint are clean and paint with a little jointing oil, goldsize, or seccotine.

The clutch and rear chain sprocket need not be assembled until the gear box is placed in the frame, and the primary chain should be put on before the nuts securing the gear box are tightened down.

REASSEMBLY OF HEAD & FORK. To facilitate assembly, smear the head ball races with Gargoyle Mobilubricant Soft before attempting to place the balls in position. This grease will hold the balls in position while the stem is placed through the frame head lug.

Proceed in the reverse order to that given for dismantling, smearing grease on the shackle bolts before putting them in position.

REASSEMBLY OF ROAD WHEELS. First reassemble the hubs in the reverse order to that given for dismantling, carefully greasing all roller bearings.

After the hubs have been reassembled the wheels should be put back in the frame, care being taken that the brake anchor plates are correctly fitted to the frame lugs and that the hub bearings are correctly adjusted (see Chapter 3—"Road Wheels.")

REASSEMBLY OF REAR CHAIN & GUARD. The rear chain can now be placed on its sprockets—if the two ends are on the rear sprocket the teeth of the latter will hold them together, facilitating the replacement of the connecting link. The spring

clip should be put on so that the *split* end points downwards when the connecting link is on the rear wheel sprocket. The rear chain guard can now be put in position, the end plate holding the clutch operating lever replaced, and the clutch cable connected up.

CHAPTER 7.

TIMING AND TUNING.

General Notes. Timing of Valves. Timing of Magneto. Carburetter Jet Size. Tuning Hints.

GENERAL NOTES. When reassembling the timing gear, the small timing pinion should be put on so that the key in the main shaft engages in the same pinion keyway as it did before dismantling.

To ensure the correct replacing of the camshaft, a tooth on the small timing pinion is marked, and this tooth should coincide with the marked space between two teeth on the cam wheel.

In the event of the marking of the small pinion keyway being forgotten or subsequently obliterated, it should be borne in mind that each keyway in the small pinion gives a slightly different relative position of the pinion teeth to the mainshaft. The timing may thus be varied by a fraction of a tooth in either direction.

When timing an engine in which the pinion key slot is not marked, *all* marks on the timing gear wheels should be disregarded and the timing given in the next paragraph obtained by experiment.

When timing, do not forget to rotate the engine in the correct direction.

TIMING OF VALVES. The valve timing is given in relation to the piston position in the cylinder.

Top dead centre refers to the topmost position of the piston in the cylinder.

Bottom dead centre refers to the lowest position of the piston in the cylinder.

(**Twelve millimetres past bottom dead centre** means that the engine should be rotated in the correct direction until the piston reaches the bottom of its stroke (bottom dead centre), and the correct rotation continued until the piston has risen twelve millimetres from its lowest position, etc.)

Valve Timing, Model N de Luxe.—The inlet valve commences to open when piston is on top dead centre, and closes when piston is $11\frac{1}{2}$ mm. past bottom dead centre.

The exhaust valve commences to open when piston is 14 mm. before bottom dead centre, and closes when piston is $\frac{1}{2}$ mm. past top dead centre.

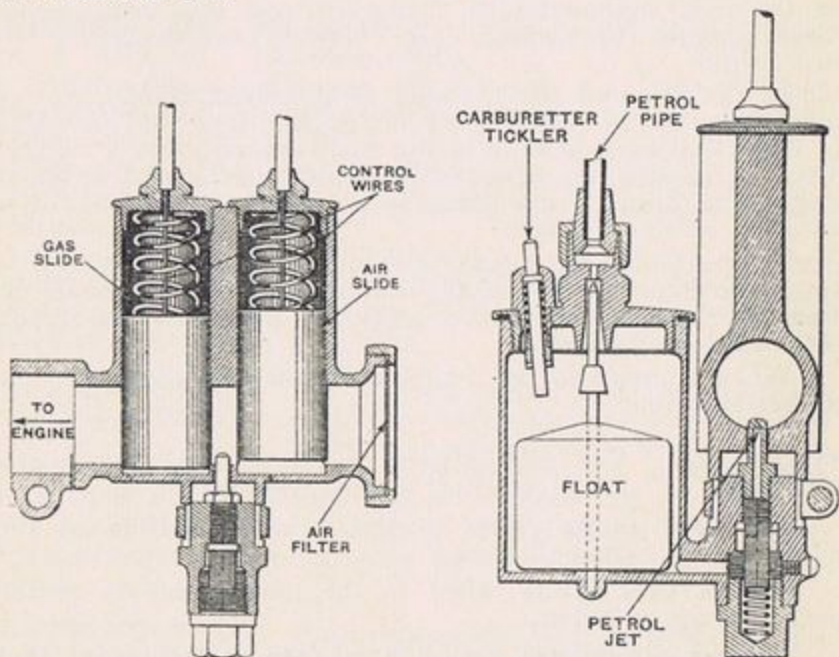
The above figures are correct for tappet clearances as given in Chapter 3.

TIMING OF MAGNETO. Remove cover of magneto driving chain and unscrew magneto sprocket nut, loosening sprocket on shaft. Bring piston to within 7 mm. of top of compression stroke (*i.e.*, piston should be 7 mm. before top dead centre *with both valves closed*). Fully advance ignition lever and turn magneto armature in the correct direction until the platinum points of the contact breaker are in the act of separating. Hold in this position and tighten up nut securing magneto sprocket.

The magneto timing should be verified, after tightening up nut holding magneto sprocket, by rotating engine till the above-mentioned piston position is reached and making sure that the platinum points are then just separating.

CARBURETTER JET SIZE. The size fitted as standard gives the best results under average riding conditions.

The Triumph Cycle Co., Ltd., supply jets of various sizes and if the machine is used in hilly districts, a large jet may be found advantageous, while, if the prevailing conditions are easy, the petrol consumption can be improved by the fitting of a smaller jet.



Section of Carburettor showing air and gas valve slides.

Section of Carburettor illustrating float chamber, jet, "tickler" and filter.

When a small size jet is fitted, it will probably be found that the air lever should not be opened fully, but its correct setting will soon be found.

TUNING HINTS. Perfect accuracy and freedom of all moving parts are the first essentials of sweet running and the development of maximum power, while the quality next in importance is ease of flow for the gases entering and leaving the cylinder.

The fastidious rider, with this latter end in view, will find it worth his while to smooth out the inlet and exhaust ports with files and emery cloth, taking the greatest care not to touch the valve seatings.

The condition of the piston is another important factor in getting the best out of an engine. Pistons invariably develop high spots, and these can easily be seen by examining the piston carefully when decarbonising.

The high spots thus found can be removed very carefully with a fine file, placing the piston on a piece of blanket or other soft material and carrying out the filing process by a rolling motion of the piston.

It should be remembered that even a fine file can reduce aluminium rapidly.

Any sign of binding in any moving part should be investigated and corrected, and, by this care, the rider will become the possessor of a machine better than sister machines whose owners are less painstaking.

CHAPTER 8.

SIDECAR.

*General Notes. Supplementary Running Instructions.
Lubrication. Maintenance.*

GENERAL NOTES. Machines sent out from the works fitted with sidecars, are equipped with a rear wheel sprocket giving the correct gear ratios for sidecar work.

When a sidecar is to be fitted to a machine previously bought and used as a solo machine, it is important that the rear wheel sprocket should be changed when the sidecar is fitted, as pulling a sidecar on solo gear ratios is an unfair strain on the engine and will cause wear, also making the engine prone to overheating and knocking.

Alignment.—When fitting a sidecar or replacing a sidecar that has been removed from the machine for any purpose, it is most important that the sidecar wheel should be in correct alignment with the motor cycle wheels. To test the alignment, the combination should be on a floor or level ground and two straight edges, each six feet long, should be placed on the floor against the rims of the wheels. This will probably be done most easily by raising the straight edges a few inches from ground level—supporting them on bricks being satisfactory. The distance between the straight edges measured immediately behind the rear wheel should exceed, by $\frac{3}{4}$ in., the distance between the straight edges measured immediately in front of the front wheel.

With this $\frac{3}{4}$ in. difference the alignment is correct.

The motor cycle should lean outwards, *i.e.*, slightly away from the sidecar—so that the top of the seat lug is $\frac{1}{4}$ in. out of the vertical.

SUPPLEMENTARY RUNNING INSTRUCTIONS.

It should not be forgotten that the sidecar is on the left hand side of the machine.

Corners to the left should be taken with caution, especially when the sidecar is empty, but experience will quickly indicate the maximum safe speed.

The best way to take corners to the *left* is to approach the corner slowly and accelerate while rounding the bend.

The best way to take corners to the *right* is to approach the corner at reasonable speed, closing the throttle, and, if necessary, applying the brake while rounding the bend.

The above methods will be found both the easiest and safest.

On right hand corners, the machine has to pull the sidecar round, and, on hills, an early change down will consequently be advantageous when a right hand corner is approached.

LUBRICATION.

Road Wheel.—The hub is provided with a nipple and should be lubricated with the grease gun as per instructions given for the motor cycle road wheels.

Care should be taken to keep the wheel bearings in correct adjustment.

Springs and Spring Shackles.—These should be lubricated from time to time with engine oil—if they are allowed to get dry, squeaks will result.

MAINTENANCE. Mud on the bodywork is more easily removed while still wet than when allowed to dry on.

If, however, mud has been allowed to dry, it must be thoroughly soaked before any attempt is made to remove it.

Mud or dust should always be removed with a sponge and plenty of cold water—the removal of dust with a dry cloth will scratch the varnish and greatly impair the glossy finish.

The upholstery should not be forgotten, and periodical dressings with any of the creams sold for the purpose will maintain its appearance and prolong its life.

LUCAS "Magdyno" Lighting System.

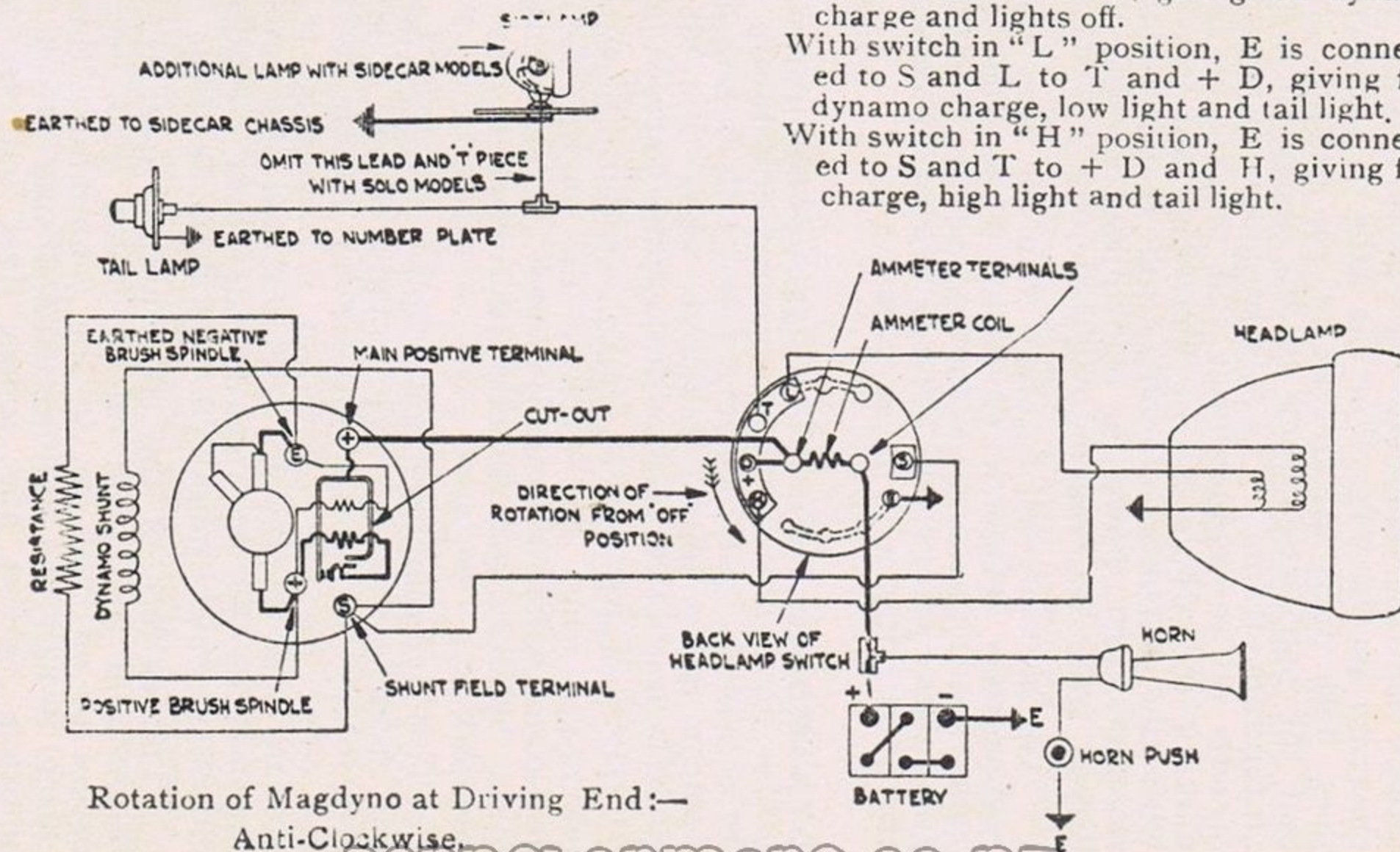
Diagram of Wiring for TRIUMPH Model "N de Luxe."

Diagram shows switch in "OFF" position, which provides half dynamo charge with lights off.

With switch in "C" position, E is connected to S and L to T, giving full dynamo charge and lights off.

With switch in "L" position, E is connected to S and L to T and + D, giving full dynamo charge, low light and tail light.

With switch in "H" position, E is connected to S and T to + D and H, giving full charge, high light and tail light.



RUNNING INSTRUCTIONS FOR THE LUCAS "MAGDYNO."

The "Magdyno," as the name suggests, consists of two units, *i.e.*, the magneto for ignition, and the dynamo for charging the battery. For the sake of simplicity and compactness, both units are housed in one casting, the dynamo yoke and the pole laminations of the magneto being cast into an aluminium frame. The electro-magnetic cut-out is mounted directly on the commutator end bracket of the dynamo, thus making the whole of the charging and the ignition system, with the exception of controlling switches, one complete and compact unit. Power is transmitted to the dynamo by gears driven from the magneto spindle.

All the bearings, together with the gear wheels, are packed with grease before leaving our works, but after the motor cycle has run, say, 10,000 miles, the "Magdyno" should preferably be sent back to the works for cleaning, adjustment and re-packing with fresh grease.

DYNAMO (6 volt). The dynamo commences to charge the battery at about 10—12 miles per hour, its maximum output being from 4 to 5 amperes. These particulars relate to the machine when cold, the output being slightly less after it has thoroughly warmed up.

To prevent the charging current increasing above this maximum when the speed of the engine becomes very high, an extra brush is added, which is placed between the two main brushes and directly connected to the negative brush *via* earth.

The dynamo does not require a great deal of attention, but there are a few components which should be inspected occasionally to ensure satisfactory running. Before removing the cover for any reason, it is necessary to disconnect the positive lead of the battery to avoid the danger of reversing the polarity of the dynamo, or short circuiting the battery, either of which might cause serious damage.

The surface of the commutator must be kept clean and bright and free from oil or brush dust, etc. Should any grease or oil work on to the commutator through over-lubrication it will not only cause sparking at the brushes, but in addition, carbon and copper dust will be collected in the grooves between the commutator segments. The best way to clean the commutator is, without disconnecting any leads, to remove from its box one of the main brushes, and, inserting a fine duster in the box, hold it, by means of a suitably shaped piece of wood, against the commutator surface, causing the armature to be rotated at the same time. If the commutator has been neglected for long periods, and has become blackened or rough, it may need cleaning with fine glass paper, but this is more difficult to do, and should not be necessary if it has received regular attention.

BRUSHES. That the brushes work freely in their holders is also a very important point. This can easily be ascertained by gently pulling the brush flexible; the brush should move without the slightest suggestion of sluggishness. The brush should also return to its original position directly the brush flexible is released. Do not, however, let the brush down violently on the commutator, as there is a possibility of its being fractured or chipped, causing burning of the commutator.

The brushes should "bed" over the whole surface in contact with the commutator, and this brush surface should appear polished.

If any of the brushes become so badly worn that it is necessary to replace them, this can easily be accomplished by carrying out the following instructions:

Having first removed the sheet metal cover from the commutator end bracket of the dynamo, it is only necessary to release the eyelet on brush flexible by unscrewing hexagonal nut off brush terminal, then, holding the brush tension spring out of the way, the brush may be withdrawn from its holder.

The brush springs should also be inspected occasionally to see that they have sufficient tension to keep the brushes firmly pressed against the commutator when the machine is running.

TERMINALS. For connecting up, special terminals are provided. There are only two outgoing cables from the dynamo: one of these is taken from the terminal by the side of the automatic cut-out to the positive dynamo terminal on the switch situated in the back of the headlamp, while the other is the shunt field terminal, and is taken to the terminal marked "S" on the switch.

To connect the cable to these terminals on the dynamo it is only necessary to remove the insulation from the cable, no special socket or attachment being required. Care should be taken when connecting up the terminals that no loose ends or strands of wire are left straying, which may touch any other metal part of the machine and cause a short circuit.

BATTERY. We would impress upon the owner the importance of the battery in the electrical equipment, and the absolute necessity of it receiving the care and regular attention necessary to keep it in good condition. Otherwise, the length of service for which it was designed will not be attained.

90 per cent. of battery troubles result from neglect of the following three rules:

1. Keep the acid level well above the top of plates.
2. Use only distilled water with the acid.
3. Keep the specific gravity at 1.225 when fully charged.

The battery should be inspected fortnightly for the purpose of checking the level of the electrolyte (diluted sulphuric acid), the correct height of the latter being approximately $\frac{3}{8}$ in. above the top of the plates.

Only distilled water should be added to replace the loss of electrolyte caused by evaporation and the action of the charging current. If the loss of electrolyte is due to spilling it should be replaced by a dilute acid solution of 1.225 specific gravity at 60°F.

The acid can be seen in each cell by unscrewing the vent screws, which will be found between the lead bridges in the top of the battery. In making this inspection, do not place a naked light near the vents, as, by the action of charging, a mixture of gases is released, which may cause an explosion if ignited.

When inspecting the battery for this purpose it is as well to check the specific gravity of the acid in each cell, as this gives a very good indication of the internal condition of the battery. An instrument known as the hydrometer, should be used for this purpose. This should be of the bulb type. To use this instrument it is only necessary to unscrew the vent screw from the cell, insert the rubber tube, and on pressing and releasing the bulb a quantity of acid will be drawn into the glass tube in which the hydrometer floats, thus allowing a reading to be taken.

A reading of 1.250 indicates the cell to be in a fully charged condition; at 1.200 it is more than half discharged; and at 1.150 that it is practically discharged and the battery should be recharged at once. These readings are with the temperature of the acid at 60°F.

Another means sometimes used for ascertaining the condition of the battery is by taking a voltmeter reading of each cell. We do not recommend this test, for the following reasons:

The normal voltage of a fully charged cell is between 2 and 2.1, and drops to 1.8 when practically discharged. As will be seen by this, there is only a very small variation of voltage between a fully charged and a discharged cell, and therefore the voltmeter must be extremely accurate to be of any use as an indicator of the condition of the battery. Also, a battery that is practically run down may show an appreciable voltage on open circuit, but it will be incapable of supplying any current; so it is best to rely on the hydrometer test.

For further particulars regarding batteries, including mixing of acid, charging rates, and temperature corrections, refer to separate "First Charge" instructions.

If the equipment is laid by for several months, in order to keep the battery in good condition it should be charged up for an hour or so monthly from a separate source of electrical supply.

Under no circumstances should the electrolyte be removed from the battery and the plates allowed to dry, as they will rapidly deteriorate and perhaps become totally ruined.

Battery terminals are another important point in conjunction with the battery. These should be periodically examined to ensure that the nuts are quite tight. Both the battery terminals and lugs are made of a lead alloy to withstand the corrosive effects of sulphuric acid. This alloy being of a comparatively soft nature gives somewhat under pressure

and although the terminals are quite tight when the battery leaves the works, it may be found some time afterwards that they have become slightly loose. The nuts should always be kept (small) spanner tight.

The battery cable should be securely soldered to the lead eyelet, *i.e.*, pass the bared end of the cable right through the hole to the recess, spray out the ends of the cable, and then solder. The eyelet has a rectangular recess which fits the correspondingly shaped boss on the battery lug, ensuring that it must be replaced in a definite position relative to the battery lug. This also prevents the eyelet turning when tightening the hexagon lead covered brass nut.

The lead lug and eyelet should be covered with vaseline before tightening. This obviates the possibility of creeping acid setting up corrosion in the terminal.

PERIOD FOR WHICH BATTERY SHOULD BE CHARGED UNDER RUNNING CONDITIONS.

It is impossible to lay down rigid instructions on this subject, as the conditions under which motor cycles are used vary considerably, and obviously the amount of charging the battery will require is directly dependent on the extent to which the lamps are used. The battery being the reservoir of the system, any draining of its power has to be replenished by charging up from the dynamo:

- 1.—Under normal conditions, providing the lamps are used a fair amount, the battery should be charged in the daytime for a period equal to that which the lamps are used at night time.
- 2.—If the motor cycle is used very little for night work, but for long runs in the daytime, it is advisable to charge for about one hour only after commencement of each journey, and then turn the switch to the "Off" position.

ELECTRIC-MAGNETIC CUT-OUT.

This is provided for closing automatically the generator to battery circuit as soon as the dynamo is driven at sufficient speed to cause its voltage to rise above that of the battery, and vice-versa, the reverse action breaks the circuit on the dynamo voltage falling below that of the battery, thereby preventing the battery discharging through the dynamo windings.

The cut-out is accurately set before leaving the works, and should not be tampered with or adjusted. Should the cut-out fail to close the circuit on accelerating the engine, the cause of the damage is likely to be found elsewhere in the system, and the table of possible faults should be referred to.

The cut-out in no way switches off the dynamo when the battery is fully charged, and no such automatic device is provided.

In order to simplify the system as far as possible, no fuse is provided. If all the connections are kept clean and tight there is no possibility of any excess current causing damage to the apparatus.

LAMPS—Important Points.

FOCUSSING BULB. There are three alternative positions in the headlamp and sidelamp bulb holders. Try the bulb in each position to obtain best result.

CARE OF REFLECTOR. Do not touch unless tarnished. Then clean carefully with a fine chamois leather and rouge wet with petrol.

CARE OF OUTER BODY. If the ebony black becomes dull in service the original polished finish can be restored, no matter how long neglected, by rubbing up with a good furniture or car polish.

HEAD LAMP AND SWITCH CONNECTIONS. The switch for controlling the whole of the charging and lighting circuits is mounted at the back of the lamp. The switch, in addition, is the junction box for the cables. Another special feature is that an ammeter is incorporated in the switch. This centre-zero instrument indicates to the rider the amount of current in amperes by which the battery is being charged or discharged under the various conditions governed by the position of the switch. To operate the switch it is only necessary to rotate the cover (on which the positions are clearly marked), by gripping it on the outer edge with the fingers and turning it until the desired letter, giving the wanted position, is opposite the white spot marked on the body of lamp. A good click action indicates each position.

With regard to connecting up of cables to the switch and lamp, the front of the lamp, which is secured by means of a bayonet fixing, must be first removed. To do this, hold the sides of the lamp with the fingers, press the front rim evenly with the thumb and palm of the hand, and then rotate to the left as far as it will go, when the front may be easily withdrawn. This method prevents strain on the lamp mounting. Having removed the front of the lamp, the reflector must next be withdrawn when it is desired to connect or disconnect the cables from the switch terminals. To remove it, press evenly on the rim, and turn to the left, when the studs will disengage themselves from the slots in the body. It is now best to withdraw the lamp cables until the switch is wired up. To do this, compress the contact pieces at the back of the reflector, when the cables can be withdrawn from the terminal holes. Having removed the front of the lamp and reflector, the terminals of the switch are exposed. From the inside of the lamp these terminals, each of which takes the form of a hole in the moulding, are clearly marked. The cable should be pulled through the stem of the lamp and under the cable clip which is provided inside the lamp. These cables should consist of a twin cable from the dynamo and two 5 mm. cables, one of which goes to the tail and the other to the battery. The ends of the cables should be bared for $\frac{3}{4}$ in., and pushed well into the correct terminal hole (as per wiring diagram), and held there until the grub screw of that particular terminal is screwed down tightly. Before the grub screws of the terminals are visible, the spring top which regulates the movement of the switch must be swung over outwards. This cover is then rotated until the hole is over the grub screw of terminal into which the cable is to be pushed.

When rotating this cover for the purpose of connecting up cables, a slight pressure should be put on it, to enable the stop to work under the fixed portion of the switch, otherwise it will not be possible to get at all the terminals. The cable from the positive dynamo terminal is secured to the left hand ammeter terminal (looking at the back of the switch) by means of a nut and the cable from the positive battery terminal is similarly secured to the right hand ammeter terminal.

After connecting up the cables the cover should be rotated to the correct position, and the stop pushed into the hole in the cover again. Care should be taken not to unscrew the grub screws of terminals completely out of the terminals, as difficulty may be experienced in getting them back again without removing the switch from the lamp. When replacing, see that the studs pass through their respective slots in the body of the lamp, then turn to the right until the stop is reached. The word "TOP," which is stamped on the reflector, should be at the top of the lamp and opposite to the indication mark or medallion. The switch has four positions and the stop which is provided prevents shooting past the extreme positions. The positions are:

"OFF."—Lamps off, but dynamo charging at half its maximum output.

"C."—Lamps off, dynamo giving maximum output.

"L."—Low filament of head lamp, tail (and side lamp where fitted), switch on. Also dynamo giving maximum output.

"H."—With the exception that high filament is in place of the low filament the conditions are exactly the same as in position "L."

These lamps are fitted with a universally adjustable mounting, which enables the beam of light to be set to the best advantage on the road by the adjustment of a single nut.

This lamp is fitted with a double filament bulb, the illumination of the filaments being controlled by the switch. It will be understood, however, that it will depend upon the way the bulb happens to be put into the lamp whether the switch will control the filament it is intended to, therefore care should be taken to see that in replacing the bulb it is inserted in the holder so that on turning the switch to "H" the full light is obtained.

FOCUSSING HEAD LAMPS. The very accurate formation and particularly high polish on the surface of the reflector is the result of many years of research work, manufacturing experience, and prolonged night driving observations on the road. If, however, the bulb is not correctly focussed, the advantages of this scientific design are lost; it is, therefore, essential that the filament should be approximately at the focus of the reflector. In order to arrange this, the lampholder is provided with three notches, so that by trying the bulb in the alternative positions it can be placed as near as possible to the correct focus

The best way of carrying out focussing and setting is to take the motor cycle on to a straight level road, try the bulb in each of the three notches, and then move the lamp on its adjustable mounting until the best road illumination is obtained. The full light should be switched on when focussing is carried out.

At this point it may also be mentioned that the efficiency of the head lamp depends not only on the shape of the reflector but on its surface. When the lamp is used under normal conditions, it is not advisable to polish the reflector: should it, however, become tarnished in any way, use a good quality chamois leather and rouge for re-polishing. On no account should any metal polishes be used on reflectors.

WIRING HEAD LAMPS. Remove reflector, then see that the black insulator piece which divides the two terminal posts is passed over the one terminal before wiring the lamp. Depress the contact pieces, and pass the bared end of the cables through the terminal holes, care being taken that the cable ends do not project more than $\frac{1}{16}$ in. On releasing the pressure on the contact pieces the cables will be securely held, and good contact made.

SIDECAR LAMP. Except in size, and also that there is no switch in the back of this lamp, the instructions already given for the headlamp apply to this sidecar lamp as well. As an "earth" return system is used, the lampholder is arranged for a single contact bulb.

TAIL LAMP. This lamp is a great improvement on all other types of electrical tail lamps for motor cycle use, as the bulb holder and bulb are mounted on a rubber diaphragm, which prevents road and engine vibration being transmitted to the bulb filament, thus greatly prolonging its life. The lamp is fixed to a base plate, which is readily removable by giving one-third of a turn to the left, which enables it to be detached from the bayonet fixing.

The lamp is mounted directly to the number plate, and besides showing the usual red light, it is provided with a side window to illuminate the number plate.

WIRING. All the wiring, with the exception of the twin dynamo cable, is carried out by means of standard 5 mm. single ignition cable, obtainable at any garage. The connections are so arranged that no soldering or special eyelets are required, spring clips or screws being provided, which form a secure and efficient means of coupling up the various electrical circuits.

An "earth return" system is used, and, therefore, care should be taken to see that the various cables are not chafed or cut in any way through being jammed in the frame, as any injury to the insulation is liable to cause a "short" and damage the battery through the heavy discharge which will take place. Also see that the headlamp, tail lamp, switchbox, and negative connections are in good electrical contact with the machine frame.

LOCATING LIGHTING EQUIPMENT FAULTS.

1.—Lights of insufficient brilliance—Cause:—Dirty connections, bulbs discoloured with use or out of focus, or dirty reflector or bulb.

2.—Bulbs light when switched on, but gradually go out—Cause:—Battery exhausted. If on running the engine the bulbs do not light up, the dynamo is not charging. Examine the dynamo and the charging circuit to find out the cause of the trouble.

3.—No lights—Cause:—Bulb filament broken, bad adaptor contact, battery exhausted, or broken connection between battery and switch, or lamps and switch, or battery and frame.

4.—Lights flicker—Cause:—Broken or loose connections, defective earth connections. If the engine is running, an additional cause may be dynamo charging intermittently.

5.—Lights vary in brilliance with speed of engine—Cause:—Battery disconnected through bad earth connection, or loose or broken connections.

If the battery is found to be discharged, have it removed and examined and charged up from an independent electrical supply.

Occasionally go over the electrical equipment in order to see that all nuts and connections are quite tight.

The set must be used in conjunction with a battery. If the battery is removed or disconnected for any reason, the electrical equipment must not be used, the switch must be kept in the "OFF" position, and the two main brushes must be withdrawn from their boxes.

The same remarks also apply when the battery is supplied dry. In this case the battery should be charged up in accordance with the "First Charge Instructions" issued by the makers, and until it is charged and connected up to the lighting set the switch must be kept in the "OFF" position, and the two main brushes must be lifted out of their boxes.

Failure to comply with these remarks may cause serious damage to the switchbox, and also to the dynamo windings.

MAGNETO ADJUSTMENT. The proper setting for
CONTACT BREAKER POINTS. the distance between the points is .012—.015 in.,

but a reasonable tolerance can be allowed without alteration being made. Should it be necessary to remove the contact breaker for the purpose of examination or cleaning, the contact breaker cover should first be taken off, when the centre securing screw can be extracted. If the rocker arm is working sluggishly, it must be removed from its steel pin, and should there be signs that it has been binding, due to rust, this should be carefully removed until the whole surface of the pin appears polished, care being taken to avoid reducing the diameter of the latter to any appreciable extent. The fibre on the rocker arm of all magnetos is liable to swell slightly, especially if the machine is working in a moist atmosphere. This point should always be remembered and looked for in the event of any trouble being experienced, due to failure of the ignition, particularly during the winter months.

See that the contact breaker points are kept clean, as dirt or grease will cause sparking and rapid burning away of the points.

If when the points are examined it is found that they have been burned or blackened they may be cleaned with very fine emery cloth and afterwards with a cloth moistened with petrol. Care must be taken that all particles of dirt and metal dust are wiped away, and that all surplus petrol should be allowed to evaporate before the contact breaker is replaced or the engine started.

Should the points be badly pitted they should be dressed down by means of a dead smooth file, only the smallest amount of metal being removed. The gap should then be adjusted as follows:—Turn the engine round slowly until the points are seen to be fully opened, then using the magneto spanner, slacken the locking nut, and rotate the fixed contact screw by its hexagon head until the gap is set to the thickness of the gauge (on magneto spanner). Finally, tighten the locking nut.

Remove the pickup occasionally. This is accomplished by swinging aside the flat holding-on spring. The pickup is then easily removed by gently pulling it forward; it should be wiped clean and polished with a fine dry cloth. See that the brush works freely in its holder, and clean the brush, if necessary, with a cloth moistened with a few drops of petrol. With the pickup still removed, carefully clean the slip ring track and flanges by holding a soft cloth on the ring, by means of a pencil while the engine is slowly turned round.

IGNITION FAULTS. Before interfering with the "Magdyno" make sure there is a good spark occurring at the plug points. If not, examine the high tension cable carefully to see that it is free from any cracks or punctures through which the current is leaking. This applies particularly in wet weather. If the cable appears in good condition, examine the contact breaker and make sure that the rocker arm is working freely on its lever.

To test the "Magdyno" for sparking, remove the high tension cable from its plug and hold the cable so that the end is about $\frac{1}{8}$ in. from the engine casting. On sharply turning the engine, a spark should be obtained across the gap.

RETARDED IGNITION. A driver is commonly advised to keep his timing lever advanced, retarding it only when necessary, *e.g.*, for starting and for hill climbing. This is sound advice, for it not only enables more power to be developed and petrol economised, but the magneto is greatly helped, since prolonged and unnecessary running in the retard position causes burning and rapid wear at the contact breaker points.

LUBRICATION. The bearings are packed with grease before leaving the works, and do not require oiling.

FIRST CHARGE INSTRUCTIONS.

ACID SOLUTION. The best brimstone sulphuric acid must be used with distilled water to specific gravity 1.225 at 60°F. The proportion is roughly one part acid to four parts of water by volume.

It is important in mixing to pour the water into the vessel first, adding the acid slowly, and stirring thoroughly to assist diffusion. A mixing vessel, made of glass, glazed earthenware, or lead, should be employed, and a glass rod for stirring the solution.

ACID DENSITY AND TEMPERATURE. The specific gravity is affected by the rise or fall in the temperature of the solution, and in checking the temperature must be noted and the appropriate correction made before the acid solution is put aside for use.

density with hydrometer

It is always advisable to cool the solution to atmospheric temperature before filling up the cells.

The following table gives the corrections for various temperatures:—

Acid at 50°F. deduct .004 from readings to obtain S.G. at 60°F.

| | | |
|--------|-----|-------|
| 55°F. | .. | .002 |
| 60°F. | .. | — |
| 65°F. | add | .002 |
| 70°F. | .. | .004 |
| 75°F. | .. | .006 |
| 80°F. | .. | .008 |
| 85°F. | .. | .010 |
| 90°F. | .. | .012 |
| 95°F. | .. | .014 |
| 100°F. | .. | .015. |

ELECTROLYTE. The acid solution used in batteries is commonly known as electrolyte, since it is the body which carries the current, and which, at the same time, is decomposed by it.

The specific gravity of the electrolyte which should be used in LUCAS dry accumulators is 1.225 at 60°F. and this density should not be exceeded, as there is a loss in conductivity, and local action may also become a factor of some importance.

The maximum density of electrolyte at completion of charge should not exceed 1.290 at 60°F.

An important point to which attention must be given is the level of the electrolyte in the cells; it must not be too low or the acid concentration will fall too quickly, thus limiting the capacity of the cells. The correct height is about $\frac{3}{8}$ in. above the top edge of the plates.

FIRST CHARGE. After being filled with acid of the correct density, the battery may, with advantage, be allowed to stand for a period not exceeding 12 hours before charging current is passed into the plates. It is not essential, however, to soak the plates in this way, and no harm will result if the battery is put on charge immediately after being filled with acid, provided that the rise in temperature is not excessive.

No dry uncharged accumulator should be filled with acid solution unless the charge can be commenced within the period of time indicated above.

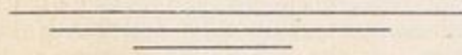
For the LO5E type, the maximum rate of charge is 1.5 amp. for 14 hours.

At the end of this period it will be found that gas is being produced at the surface of all the plates, and the density of the electrolyte is at maximum.

SUBSEQUENT CHARGE. On completion of the first cycle (i.e., charge and discharge), the battery will be put into regular working condition by charging at 2 amps. for 6 hours for the LO5E battery.

DISCHARGE. The discharge of the battery should not be carried beyond the lower limit of the voltage, which is fixed for electro-chemical reasons at 1.8 volts per cell.

BATTERIES FOR SHIPMENT ABROAD. In such cases the only safe procedure is to send out new accumulators in a dry and uncharged condition. The practice of clearing out the electrolyte and filling up the cells with distilled water is not considered desirable, and should only be used in exceptional circumstances. It is ruinous to either charged or discharged plates to stand any length of time without acid, on account of certain more stable modifications in the crystalline structure of the lead sulphate which forms.



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