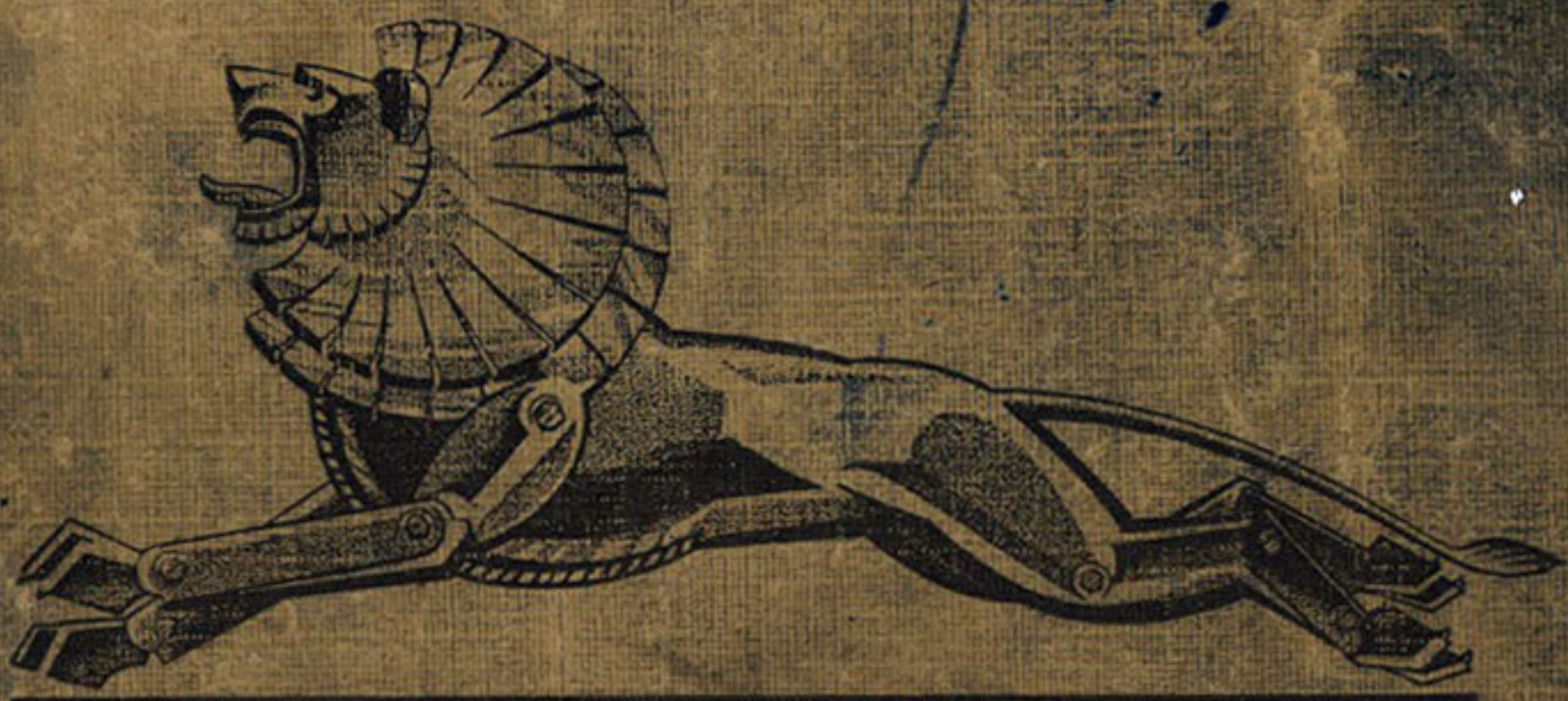
R. BIDWELL

NEW IMPERIAL

MOTOR CYCLES



HANDBOOK
for 1936

PRICE ONE SHILLING

Dear Cecil
Will you go to Rego
for ¼ bacon an egg
if any, coming
home early if I
can
Winnie

NEW IMPERIAL HANDBOOK

1936 EDITION

FOREWORD.

The purpose of this little volume is to assist you in obtaining the best—the very best—from your New Imperial Motor Cycle.

It is not pretentious; it is not a work of reference to cover the whole business of producing and marketing Motor Cycles: it is just what its name implies—Hints and Tips.

If the hints are rather broad and the tips sound, then it will have served its purpose. A long explanation does not of necessity mean a long job, but these instructions have to be followed by the uninitiated, as well as the expert amateur.

In conclusion, a warning. Don't fit, or allow any other person to fit, any new parts to your machine which are not genuine New Imperial—some "spare spares" may be suitable—some very definitely may not, and their use is too risky to appeal to the prudent rider.

At your service.

NEW IMPERIAL MOTORS LTD.

For illustrations of Special Tools mentioned in this booklet, see pages 99 and 100.

Published by
NEW IMPERIAL MOTORS, LTD.,
SPRING ROAD, HALL GREEN,
BIRMINGHAM.
Telephone: SPRingfield 1164. Telegrams: "Peerage, Birmingham."

Contents

LIST OF ILLUSTRATIONS.

For complete Index, see pages 108, 109, 110 and 111.

Part I.

UNIT-CONSTRUCTION MODELS.

(Fully Patented and Registered).

Models 23, 30, 36, 40, 46, 70, 76 and 80.

GENERAL LAYOUT. The general layout of UNIT-CONSTRUCTION is the Engine and Gearbox cast in one block. In the design of the "NEW IMPERIAL" the Oil Tank or Sump is also cast in the Unit Block immediately below the Crankcase. UNIT-CONSTRUCTION obviates the necessity of using Engine Plates, or a bracket, to connect the Gearbox to the Engine, thus avoiding the attendant possibilities of mis-alignment when the throttle is opened and heavy loads are transmitted; also obviating wear on moving parts and continual adjustment of the primary chain. It will be seen therefore with UNIT-CONSTRUCTION, where the whole assembly is cast in one block and machined as a composite part, perfect and true alignment is assured in a way it is impossible to achieve in any other design. The Primary Drive of the "NEW IMPERIAL" UNIT-CONSTRUCTION models is made through a train of helical gears all totally enclosed in an aluminium Oil Bath Case. Apart from occasional lubrication this drive will need no attention whatever, as, with Gear Drive, adjustment is unnecessary.

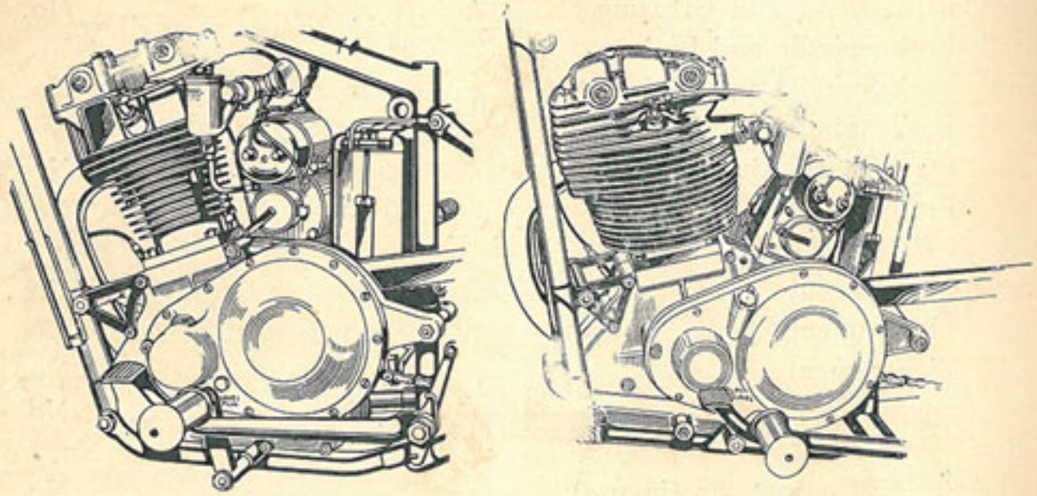


Illustration No. 1.

Illustration No. 1 shows typical "NEW IMPERIAL" UNIT-CONSTRUCTION units.

Illustration No. 2 shows a unit with certain internal parts disclosed. The Oil Tank, or Sump, can be clearly seen below the Crankcase.

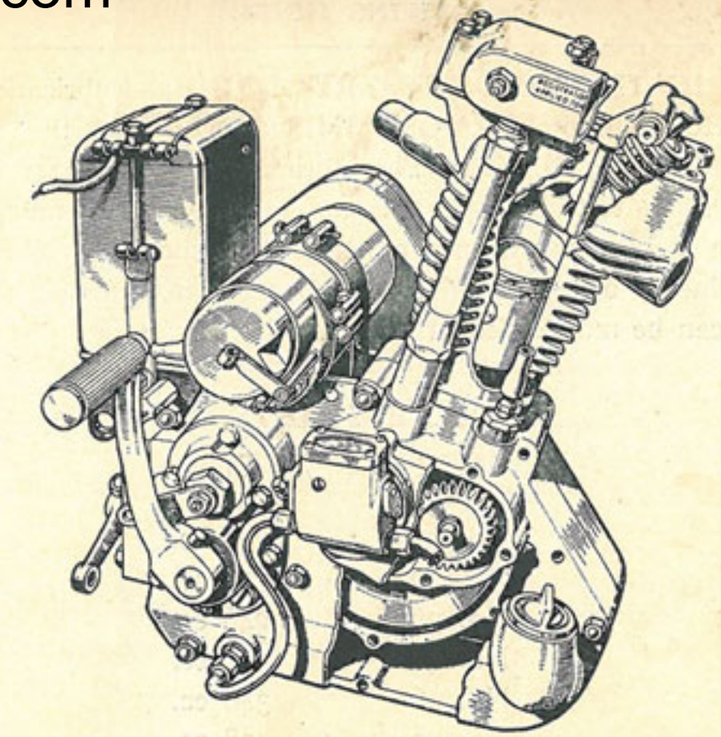


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Illustration No. 2.

PATENTED LUBRICATION OF ENGINE AND GEARBOX.

The method of lubrication is most simple and absolutely efficient. Oil is supplied through the filler shown in Illustration No. 2, into the Sump below the Crankcase. From here the oil is pumped by the mechanical pump through the sight feed direct to the Flywheels, thence to Cylinder and Piston, and forced by crankcase compression into the timing cover, automatically lubricating cams, tappets and guides. On all overhead valve units having external push rod cover tubes, the valves, valve springs, etc., are lubricated by the engine, but on the 500 cc. O.H.V. unit there is a secondary feed from the mechanical pump which supplies oil through the special oil-way cast through the fins of the cylinder head and rocker-box. The oil lubricates the push rod tops, rockers, valves and valve springs. The push rod tops and rockers on the first mentioned units are supplied with grease through the rocker spindle greaser. (See Illustration No. 11, page 15.)

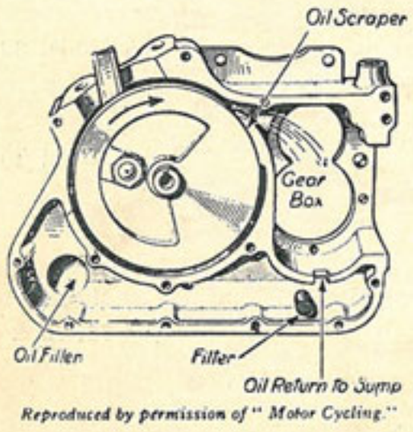

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Illustration No. 3.

Scrapers are used in the crankcase to deflect the surplus oil as it is carried round by the flywheels on to the gearbox pinions and shafts, and on to all other parts in the gearbox, giving an automatic supply for the whole Unit. After lubricating the gears, the oil passes under pressure through an aperture in the bottom of the gearbox into the Sump, and is again pumped into the crankcase after passing through a filter, for re-circulation.

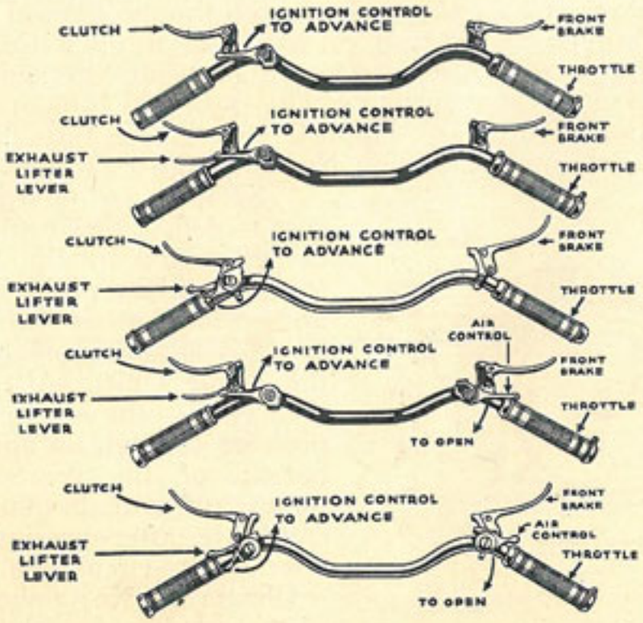
Illustration No. 3 shows a section of the crankcase, and the action of the Scrapers throwing the oil into the gearbox.

LUBRICATION OF PRIMARY DRIVE.—Lubrication of the Primary Helical Gears IS MOST IMPORTANT and the gears must never be allowed to run dry. The lubricant in the Primary Drive Case is entirely separate from the engine and gearbox oil and the case is provided with a filler placed in a convenient position and in addition an oil level line or a level plug is incorporated in the case so that the lubricant can be maintained at the correct level.

DRIVING HINTS.

Model Numbers	Cubic Capacity
No. 23	146 cc.
No. 30	246 cc.
No. 36	246 cc.
No. 40	348 cc.
No. 46	348 cc.
No. 70	498 cc.
No. 76	498 cc.
No. 80	550 cc.

HANDLEBAR CONTROLS.—Illustration No. 4 shows the position of the handlebar controls as fitted to the various models. The rider should study the illustration and refer to it when reading the hints on starting, stopping, etc., which follow.

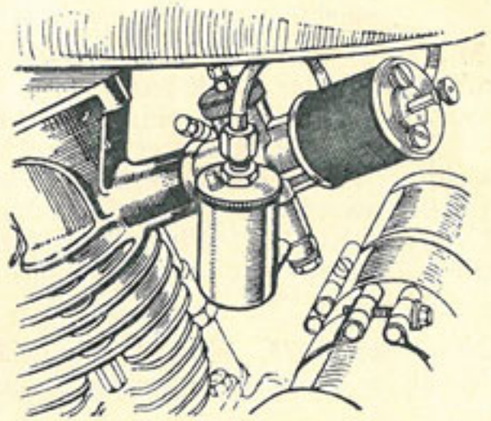


Model 23.
Model 30.
Model 36.
Model 40.
Models 46, 70, 76 & 80.

Illustration No. 4.

STARTING. Model 23 and 30 (Coil Ignition).—At the rear of the carburetter is a small shutter which it is necessary to close when starting the engine from cold (for re-starting the engine from warm this will be unnecessary). (See Illustration No. 5.) Turn on petrol tap—flood the carburetter by depressing the tickler on carburetter float top and close the air shutter. Turn the ignition switch on (at the left of the headlamp or by means of the key in the switch gear). This operates a small red warning light on the right of the headlamp or at the back of the ammeter. Set the ignition lever three quarters "Advance." **Open the carburetter control slightly** by turning twist grip towards rider. Now depress the kick starter smartly downwards. When the engine has started, open the air shutter gradually until the engine warms up, then open shutter fully. On the Model 30 it will be necessary when using the kick starter to raise the exhaust valve lifter, and to release the lever half way down the kick starter stroke.

STARTING MODELS 23 and 30 ("Maglita" Ignition).—The same remarks apply to these models as above, except that there is no ignition switch to be turned on.



Air Control.

Illustration No. 5.

STARTING MODEL 40 (Coil Ignition).—On these Models the Air Shutter is controlled by a lever on the handlebars (see Illustration No. 4). The air control should be closed for starting. Turn on the petrol tap, flood the carburetter slightly by depressing the tickler on the float chamber top. Turn the ignition switch on (at the left of the headlamp or by means of the key in the switch gear), this operates a small red warning light on the right of the headlamp or at the back of the ammeter. Set the ignition lever three quarters "Advance," **open the carburetter control slightly** by turning twist grip towards rider. Raise the exhaust valve lifter and depress the kick starter smartly, releasing the valve lifter half way down the kick starter stroke. When the engine has started the air control should be opened gradually to the fully open position.

STARTING MODEL 40 ("Maglita" Ignition).—The same remarks apply to these models as above, except that there is no ignition switch to be turned on.

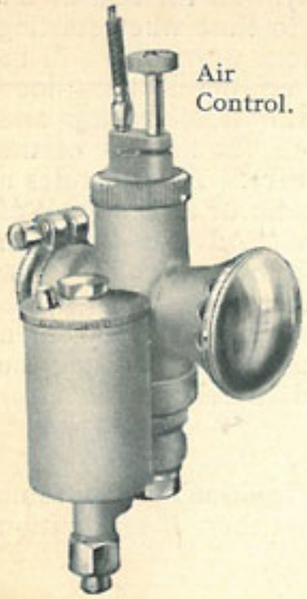


Illustration No. 6.

STARTING MODEL 36 ("Magdyno" Ignition).—On this model the air shutter is controlled by a knob on the top of the mixing chamber. (See Illustration No. 6.) This control should be closed for starting. To close the air shutter turn the knob in a clockwise direction, at the same time pushing the knob inwards. Set the ignition lever three quarters advance. **Open the carburetter control slightly** by turning twist grip towards rider. Raise the exhaust valve lifter and depress the kick starter smartly downwards, releasing the exhaust valve lifter half way down the kick starter stroke. When the engine has started, open the air shutter control gradually by pulling out the knob and turning at the same time in an anti-clockwise direction, until the spring clip can be felt to engage in a slot, the air control will then be fully open. The spring clip engages in a slot in the slide rod in order to prevent the air control shutting when the machine is running.

STARTING MODELS 46, 70, 76 and 80.—The air shutter on these machines is controlled from the handlebars. (See Illustration No. 4.) The air control should be closed for starting. Set the ignition lever three quarters advance. **Open the carburetter control slightly** by turning twist grip towards rider. Raise the exhaust valve lifter and depress the kick starter smartly downwards, releasing the exhaust valve lifter half way down the kick starter stroke. When the engine has started, open the air shutter gradually until the engine warms up and then open shutter fully.

GEAR CHANGING.—Model 23, 3-speed Hand Change.

Gear changing will be found quite simple if the following hints are observed:—

TO START AWAY.—Lift the clutch lever and engage the bottom gear (nearest the Rider), then gently release the clutch lever and at the same time open the throttle a little.

When a speed of approximately 8-10 m.p.h. has been reached, the throttle should be slightly closed, and with the clutch lifted the gear lever pushed into the second gear position and the clutch again gently released.

Now accelerate to 18-20 m.p.h. and change into top gear in the same manner.

When changing down from top gear the throttle should be left open, and with the clutch raised the gear lever pulled back into second, and the clutch released; changing from second to bottom gear is exactly the same.

The main points to remember are, that when changing from a low to a high gear, i.e., bottom to second, or second to top, the throttle should be slightly closed, and when changing down to a lower gear the throttle should be left open.

Never let the Engine snatch through running too slowly in a high gear—make use of the gears.

GEAR CHANGING—All 4-speed Hand Change Models. The method of gear changing is exactly the same as outlined for the three speed type with the exception that the bottom gear position is the one farthest away from the rider.

Remember. Slightly close the throttle when changing from low gears to higher gears and leave the throttle open when changing down.

The speeds at which to change gears are as follows:—

150 c.c. and 250 c.c. machines, solo.
350 c.c. machine with sidecar.

Bottom to Second Speed	6 to 8 m.p.h.
Second to Third Speed	12 to 14 m.p.h.
Third to Top Speed	20 to 25 m.p.h.

350 c.c. machine, solo.
500 c.c. and 550 c.c. machines, solo or with sidecar.

Bottom to Second Speed	10—12 m.p.h.
Second to Third Speed	20—22 m.p.h.
Third to Top Speed	27—30 m.p.h.

GEAR CHANGING—Foot Control.—On these models bottom gear is engaged by depressing the lever downwards as far as possible from the neutral position. To change up, i.e., from bottom to second, second to third, and third to top, raise the gear lever with the foot as far as possible. Always allow the pedal to return to the normal position before attempting to engage another gear. The foot control mechanism is of the positive stop type, so that it is impossible to engage more than one gear with one kick, so the lever must be allowed to return to the normal position between each gear change.

The speeds at which to change gear are as set out for the hand change models; and remember also to slightly close the throttle when changing from low gears to high gears and leave the throttle open when changing down.

It is also a good plan on foot change models always to engage bottom gear as the machine is brought to rest, thus neutral gear is obtained readily by simply lifting the lever slightly.

BRAKING—All Models. One of the most important points in driving a motor cycle is the method of braking. The novice and the experienced rider alike should cultivate the habit of applying both brakes together under all circumstances. In this manner the machine may be brought to a standstill in an extremely short distance, even on a wet road, without fear of skidding. There is no doubt whatever that many accidents could be avoided if every rider cultivated this habit. **NOTE.** Hurried application of the rear brake only, may lock the rear wheel and thus cause the machine to skid. Similarly, the front brake only should not be applied suddenly when negotiating a sharp bend.

STOPPING—All Models. When stopping lift the clutch, close the carburetter control and apply the brakes. When the machine is at a standstill engage neutral gear. On coil ignition models it is now necessary to switch off the ignition by means of the switch or key in the headlamp. This is **most** important as unless this is done the battery will be discharged which will prevent the machine being restarted after a few hours. **Lastly, turn off the petrol tap. This applies to all models and is most important. Under no circumstances leave the machine standing with the petrol tap turned on.**

USE OF THE IGNITION LEVER.—All Models. Always run the machine with the Ignition Lever in the fully advanced position. The ignition should only be retarded for starting purposes or when travelling up a long incline. Misuse of this control causes overheating and the consequences are burnt valves and blued exhaust pipe.

USE OF THE EXHAUST VALVE LIFTER.—All Models except Model 23—150 c.c. This control is for starting only and should not be used for any other purpose.

USE OF THE CHARGING SWITCH.—Coil Ignition Models. Under normal conditions run with the Charging Switch in the "Summer half charge" position and use "Winter full charge" position for a short time after using the lights or if the battery is in a low state of charge.

USE OF THE CHARGING SWITCH.—Maglita and Magdyno Models. The switch should be left in the "charge" position for a short period only when the machine is being used. This time should only be increased if the period of night running is considerable or if the battery is found to be in a low state of charge.

FIRST 500 MILES RUNNING IN.—All Models. The models when assembled in our works are assembled with all bearings and pistons on the tight side and so it is very necessary to run the engine at slow speeds until these bearings are correctly faced. This running in takes approximately 500 road miles at a speed not exceeding 30/35 miles per hour. Good use also should be made of the gears during this period to prevent the engine labouring. After starting the engine, and before setting out on any run see that the oil pump is functioning. When the pump is working correctly the continual supply of oil can be seen through the sight feed. When the engine has been started it will be a few seconds before this commences to operate and the engine should therefore be run slowly until it is certain that the oil is flowing through to the engine.

During the running in period certain parts will need attention and we recommend that the instructions given under the heading of "Care and Maintenance" be most carefully followed. The work is not in any way difficult or serious, but the rider will be amply repaid if the instructions are carefully followed. For the rider who wishes to get the best out of his machine with longest service these hints are most important.

Care and Maintenance.

FIRST RUNNING IN PERIOD AT CONCLUSION OF 150 MILES.

ADJUSTMENT OF STEERING.—Examine the Ball Head to see that there is no play in the bearings. To do this, place the machine on the rear stand and pull the front wheel in an upward and backward direction, at the same time put the fingers around the ball head clip—any play will immediately be felt. (See Illustration No. 7.) If play is felt, adjust in the following manner. First slacken the Ball Head Clip Pin Nut (the one just below the handlebar lugs) in an anti-clockwise direction, then turn the large hexagon nut on the top of the fork column in a clockwise direction, about a quarter of a turn—or until no play

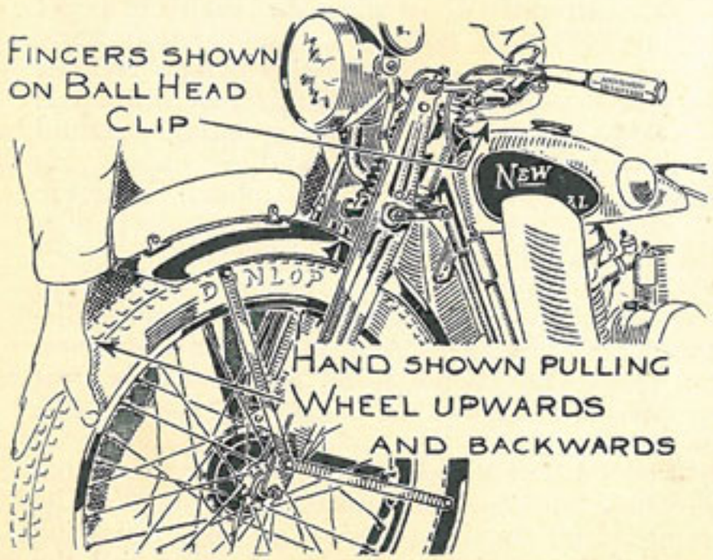


Illustration No. 7.

can be felt when tested as above—but making sure that the handlebar can be turned freely and that no binding is felt.

ADJUSTMENT OF REAR CHAIN AND ALIGNMENT OF WHEELS.—All Models.—Examine the rear chain to see that the up and down play does not exceed half an inch. If the chain is allowed to run too slack, not only will it tend to jump off the sprockets, but it will decrease the life of both the chain and the sprockets.

The adjustment of the rear chain is quite a simple operation by means of the two long $\frac{1}{4}$ inch adjusting bolts, which are situate in the fork ends. It is important that these two adjusting bolts be moved an equal amount to ensure that the rear wheel remains in a central position in the chain stays.

When the rear chain requires tightening, proceed as follows:—First, slacken the two spindle end nuts in an anti-clockwise direction; then, by means of the small $\frac{3}{16}$" box spanner provided in the tool kit, unscrew the adjuster bolt locknuts in an anti-clockwise direction; it will be found that the box spanner will slide over the head of the adjuster bolt and on to the lock nut. (See Illustration No. 8.)

Note. On Models fitted with metal tool box, it will be necessary to use the $\frac{1}{8}$ W end of the double-ended spanner supplied in the Kit.

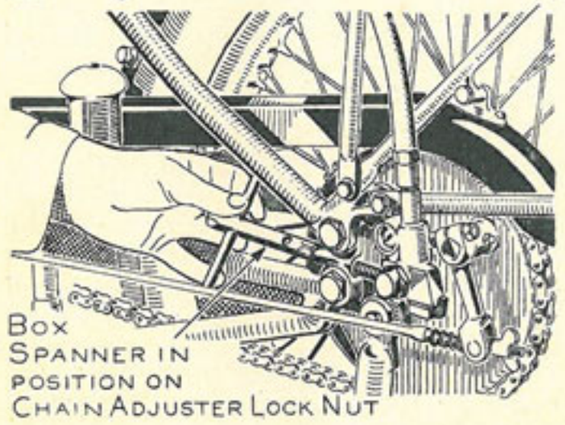


Illustration No. 8.

The adjuster bolt should be screwed in a clockwise direction—this will have the effect of pushing the wheel back in the fork ends—at the same time tightening the chain.

It is possible, after considerable mileage, that the chain becomes stretched more in one place than in another, so care should be taken, when the chain is tested for tension, to revolve the wheel to find the tightest place in the chain. This position should be used for all adjustments to chain and wheel; the correct tension in this position should be a total movement of half an inch up and down.

Should the chain for any reason require slackening, the procedure is the same, except that the adjuster bolts are turned in an anti-clockwise direction.

When the chain has been adjusted, it is always advisable to check the machine for alignment. Place the machine on the rear stand, and obtain a long straight-edge (a length of wood is suitable, provided the edge is quite straight).

The straight-edge should be placed alongside the machine, and touching both wheels at the bottom, as shown in illustration No. 9.

If the machine is in correct alignment, the straight-edge will touch the wheels in two places, i.e., at the back and front of both tyres. To correct any mis-alignment the remedy is to move the rear wheel over to the desired position by means of the adjuster bolts, bearing in mind that the chain tension must be as laid down in the preceding paragraphs when the job is completed.

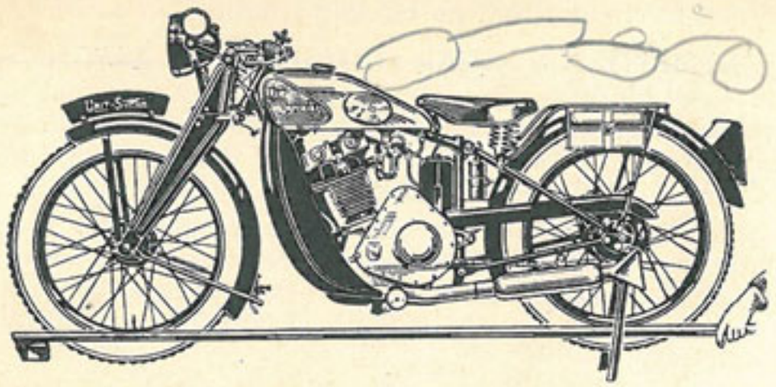


Illustration No. 9.

IMPORTANT.—It is essential that the wheel alignment is correct, otherwise bad steering and excessive tyre wear will result. Alignment of chain sprockets depends entirely upon correct wheel alignment, therefore it will be seen that if the machine be ridden with mis-aligned wheels, chain and sprocket wear will be greatly increased.

NUTS AND BOLTS.—Go systematically round the machine and give an extra turn to any nut where possible. These remarks apply to the engine bolts and nuts as well as the nuts on the frame parts.

TAPPET ADJUSTMENT—Models 23, 30, 36, 40 and 46.—First unscrew the top hexagon nuts on the cover tubes two or three turns, moving the spanner from right to left; now completely unscrew the hexagon nuts on the bottom push rod covers, moving the spanner from left to right, then telescope the bottom covers up the top push rod covers—this will expose the tappets. Turn engine over until both valves are closed. To adjust tappets, slacken tappet head locknut by moving with spanner from right to left. To prevent tappets turning during adjustment, on revolving type, place a spanner on the flats provided, just below the tappet head locknut. Raise tappet head by moving spanner from left to right until no up and down play can be felt in the tappets, but the push rod will revolve freely. The tappet head should then be locked in position by means of the locknut. (See Illustration No. 12, page 24.) Tighten the bottom halves of the push rod covers down to their full extent, then screw the top covers into position; do not lock the top covers too tightly, as this will only destroy the rubber joint between the two covers. When the nuts can be felt to tighten slightly this is sufficient, as if the nut is tightened abnormally, it is possible to distort the rocker box in such a manner that both valves are raised slightly from their seats, causing loss of compression and making engine starting impossible. Always adjust tappet with engine cold.

TAPPET ADJUSTMENT—Model 70 O.H.V.—Remove the inspection cover at the base of the Cylinder. This is held in position by means of a knurled nut which unscrews in an anti-clockwise direction. Take care not to damage the washer between the cover and the cylinder, as this has to be an oil tight joint. Turn the engine over by means of the kick starter until both valves are closed, then check the tappets for up and down play. If any play is felt adjust as follows.

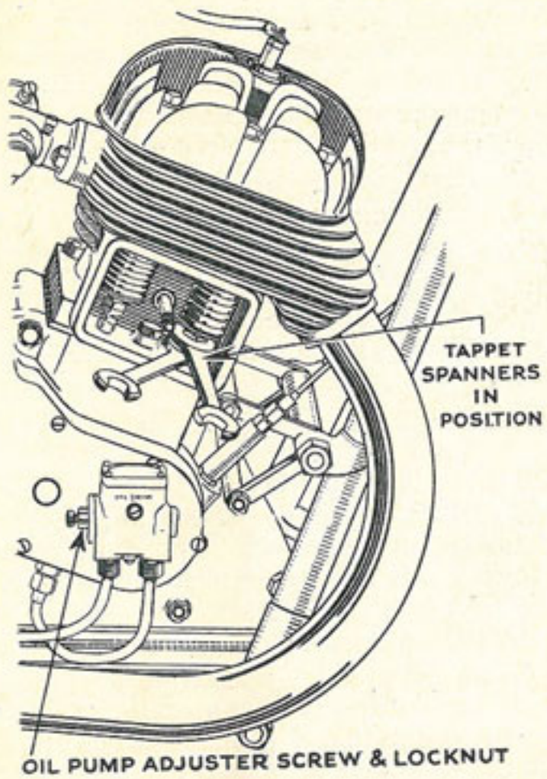


Illustration No. 10.

First hold the tappet head and loosen the lock nut by moving the spanner from right to left, then hold the tappet by means of a smaller spanner placed on the flats provided, and turn the tappet head from left to right. When the adjustment is correct lock the tappet head in position by means of the lock nut. (See Illustration No. 41.) IT IS MOST IMPORTANT that the adjustments be carried out when the engine is quite cold. (See next paragraph for note on Side Valve Engine.) The adjustment is correct when the tappets revolve freely, but have no up and down play.

TAPPET ADJUSTMENT—Model 80 Side Valve.—The procedure is identical as described above for Model 70 O.H.V. except that the adjustments must be carried out when the engine is **hot.** (See also Illustration No. 10.)

CONTACT BREAKER ADJUSTMENT.—Examine the contact points and see that they are clean and that the gap is adjusted to .010", i.e., the thickness of the gauge on the magneto spanner. The correct method of adjustment is described on page 53 for Coil Ignition models, page 55 for Maglita Ignition models, and page 59 for Magdyno Ignition models.

CABLE ADJUSTMENTS.—Examine the front brake and exhaust lifter cables taking up any play by means of the adjusters provided. Care being taken not to over adjust otherwise the front brake will bind and the exhaust lifter will raise the valve from the seat. **Next examine the clutch cable.** This cable when correctly adjusted should not have more than $\frac{1}{16}$" play at the handlebar control. Under no circumstances should the machine be used when no play in the cable is apparent. Adjust without delay as this is the primary cause of clutch slip. The adjustment is provided for by the quick screw adjuster screw situated just above the kick-starter return spring. Release lock nut in an anti-clockwise direction and to take up any play in the cable, turn the adjuster screw in a clockwise direction, then re-tighten the lock nut.

BRAKES.—All Models.—Adjustment is provided on all front and rear brakes to take up the normal wear of the shoes. To adjust front brakes it is only necessary to take up the play in the cable by means of the adjuster on the front brake outer plate. To take up the play turn the adjuster from left to right, and finally lock into position by means of the adjuster lock nut.

To take up play in the rear brake a wing nut is provided at the end of the brake rod. Turn the wing nut in a clockwise direction. Care should be taken that the adjustment is not carried too far causing the brakes to bind. This can be checked by placing the machine on the stand and spinning the wheel.

BRAKE CAMS GREASING.—WHERE A GREASER IS PROVIDED ON THE BRAKE CAM BEARING **a small supply** should be given, approximately every 1,000 miles. **Warning.—Do not overgrease.**

BRAKE SHAFT GREASING (Models 30 and 40 only).—Where the brake shaft spindle passes through the frame, a greaser is provided for lubrication, and it is essential that this point receives a regular supply of grease.

BRAKES—Cleaning. Refer to article on page 34.

SPRING FORK—GREASING. The fork spindles should be greased regularly through the grease gun nipples which are provided where necessary. Grease thoroughly at the completion of the first 150 miles and then regularly every 500 miles. Too much stress cannot be placed on the importance of regular greasing, as a seized fork spindle, due to lack of lubrication, not only makes riding uncomfortable, but is also very dangerous.

SPRING FORK ADJUSTMENT.

PRESSED STEEL TYPE—Model 23. No adjustment is provided on these Pressed Steel Forks as this is unnecessary. The only point which requires attention on these forks is the greasing which is mentioned above. (For illustration see page 68.)

SPRING FORK GIRDER TYPE—Model 23. Should any side play develop this can be taken up as follows:—On each fork spindle will be found a nut—this should be slackened in an anti-clockwise direction and then the bolt head on the opposite end of the spindle turned in a clockwise direction, until all play is taken up; finally lock up the locking nut tightly. Each spindle should be treated in this manner, care being taken to see that as each spindle is adjusted, the spring action is left free.

SPRING FORKS GIRDER TYPE—Model 30 and 40 (Double Shock Absorber Type. Should any side play develop this can be taken up as follows:—First slacken the fork spindle nuts on the left-hand side of the machine, in an anti-clockwise direction; then turn the nuts inside the links in a clockwise direction until all side play is taken up, and re-tighten the outside nuts. The instructions apply to the two top spindles and the bottom rear spindle.

The adjustment on the bottom front spindle is provided for by the tensioning of the shock absorbers and is exactly the same as described for the other spindles, except that the inside nut is held in position by two pegs on the fork link; to disengage these pegs, for adjustment of shock absorbers, both nuts on the bottom fork links on the left-hand side of the machine should be unscrewed in an anti-clockwise direction, practically to the end of the threads, and then the link gently tapped away from the inside adjusting nuts, until the pegs are quite clear. To increase tension turn in clockwise direction; to decrease, turn in an anti-clockwise direction.

Now replace fork link, making sure that the pegs register with the holes in the adjusting nut. Lastly, re-tighten the outside nuts. (For Illustration see page 69.)

SPRING FORK—Models 30, 36, 40, 46, 70 and 80 (Single Shock Absorber Type). Should any side play develop this can be taken up as follows:—First, slacken the fork spindle nuts on the left-hand side of the machine, in an anti-clockwise direction. Turn the nuts inside the links in a clockwise direction until all side play is eliminated, and then re-tighten the outside nuts. (For Illustration see page 69.)

SPRING FORK (Shock Absorber Double Type)—Models 30 and 40. The spring action of the fork is controlled by the two shock absorbers mounted on the front bottom fork spindle. The adjustment of these shock absorbers is described under the heading "Spring Fork Double Shock Absorber Type, Model 30 and 40. (See page 14.)

SHOCK ABSORBER SINGLE TYPE, Model 30, 36, 40, 46, 70, 76, 80.—The spring action of the fork is controlled by the Shock Absorber mounted on front bottom or front top fork spindle on the right hand side of the machine. To reduce the fork spring action, turn the hand adjuster wheel in a clockwise direction, to increase the action turn in the opposite direction.

Illustration No. 11.

ROCKER SPINDLES. Greasing — All Overhead Valve Models. A grease gun nipple is provided on the hexagon end of each Rocker Spindle. At the end of the first 150 miles, and afterwards every 500 miles, a supply of grease should be forced into the spindles by means of the grease gun provided in the tool kit. This operation is most important, as the overhead Rocker Bushes depend entirely on this supply of grease through the spindles for their adequate lubrication and in all of the above models, except the 150 c.c. and 500 c.c. Models there is an oilway drilled through the Rocker Arm and the Rocker Arm Ball through which the grease passes to fill the cup at the top of the push rods. (See Illustration No. 11.) On the 500 c.c. models the push rod tops receive a direct supply of oil and therefore do not rely upon the grease forced in through the rocker spindles, but as mentioned above the rocker bushes depend entirely on the supply of grease supplied through the nipples in the spindles.

LUBRICATING OIL. At the end of the first 150 miles check the oil levels in the Engine and Primary Drive Cover and refill where necessary. These adjustments should be checked subsequently each week and the oil maintained at the correct levels.

RECOMMENDED LUBRICATING OILS. We now recommend only the following lubricants for New Imperial Motor Cycles:—

Engine Oil:—

Patent Castrol "XXL" in Summer. Patent Castrol "XL" in Winter.	Mobiloil "D" in Summer and Winter.	Aeroshell in Summer and Winter.

Gear Oil (For Primary Drive Cover, Models 23, 30, 36, 40, 46, 70, 76 and 80):

Castrol "D"	Mobiloil "C"	Shell Gear Oil.

Exposed Chains and Grease Gun Nipples:—

Castrolease, Light.	Mobilgrease No. 2.	Shell Retinax

FILLING ENGINE SUMP. Fill the sump, when the machine is on the rear stand on level ground, to within ½" of the top of the filler hole. On no account overfill the sump by tilting the machine on its side.

The Primary Drive Cover Lubricant should be a mixture of half engine and half gear oil. The Primary Drive Cover should not be over-filled—up to the level plug situated on the side of the Primary Drive Cover. On Models 23, 30 and 40 no filler plug is fitted, but the filler orifice is so placed that the correct oil level is obtained by filling Cover up to the bottom thread in the filler boss.

GEAR BOX LUBRICATION—All Models. The gear box on New Imperial Unit Construction Machines is automatically lubricated by oil from the engine so that Gearbox requires no attention whatever.

FUELS—Models 23, 30, 36, 40, 46, 70 and 80.

We recommend for the above machines either Esso High Test or Shell. All the above machines however will run satisfactorily on Essolene or Shellmex Spirit. We only recommend the latter spirits where the running costs of the machine are to be kept as low as possible.

Model 76—500 c.c. Unit Clubman. We recommend Esso Ethyl or B.P. Ethyl. These machines will also run satisfactorily on Esso High Test or Shell.

TYRE PRESSURES
(ALL MODELS.)
FOR SOLO MACHINES.

Model	Tyre Size	Minimum Inflation Pressures lbs. per square inch. Front	Rear	Sidecar
23 ...	25″ × 3″	16	23	—
23 ...	26″ × 3.25″	16	18	—
30 ...	26″ × 3.25″	16	20	—
30 ...	26″ × 3.50″	16	16	—
36 ...	26″ × 3.25″	16	20	—
36 ...	26″ × 3.50″	16	16	—
40 ...	26″ × 3.25″	16	20	—
40 ...	26″ × 3.50″	16	16	—
46 ...	26″ × 3.25″	16	20	—
46 ...	26″ × 3.50″	16	16	—
70 ...	26″ × 3.25″	16	22	—
70 ...	27″ × 4″	16	16	—
76 ...	26″ × 3.25″	16	22	—
76 ...	27″ × 4″	16	16	—
80 ...	26″ × 3.25″	16	22	—
80 ...	27″ × 4″	16	16	—

FOR SIDECAR MACHINES.

40 ...	26″ × 3.25″	18	22	16
40 ...	26″ × 3.50″	16	18	16
46 ...	26″ × 3.25″	18	22	16
46 ...	26″ × 3.50″	16	18	16
70 ...	26″ × 3.25″	20	22	18
70 ...	27″ × 4″	16	16	16
76 ...	26″ × 3.25″	20	22	18
76 ...	27″ × 4″	16	16	16
80 ...	26″ × 3.25″	20	22	18
80 ...	27″ × 4″	16	16	16

FOR MODEL 23, 150 c.c.

Compression Ratio 7 to 1.

Bore and Stroke—55 m/m × 62½ m/m = 146 c.c.

Valve Timing—Inlet opens $\frac{1}{16}$″ before T.D.C.
Exhaust closes $\frac{1}{8}$″ after T.D.C.

Ignition Timing—T.D.C. with ignition lever in full retard position, points set about to break.

	Top	Third	Second	Bottom
Gear Ratios (3 speed)	8 —1	—	11½—1	21½—1
Gear Ratios (4 speed)	7½—1	9—1	12 —1	19½—1

Carburetter Jet and Slide Sizes:—
Main Jet No. 45.
Pilot Jet No. 20.
Slide No. 5.

Sparking Plugs—Refer to Table on page 45.

Fuels—Esso High Test or Shell. Essolene or Shell Mex Spirit. See page 16.

Lubricating Oils and Greases—See recommended list on pages 15 and 16.

Tyre Pressures—Refer to Table on page 16.

Tank and Sump Capacity—Petrol 2¾ gallons.
Oil 2 pints (approx.).

Rear Chain Size and Length—½″ pitch × .205 ($\frac{3}{16}$″) × 115 Rollers.

FOR MODEL 30, 250 c.c.

Compression Ratio 6.5—1.

Bore and Stroke—67 m/m × 70 m/m = 246 c.c.

Valve Timing—Inlet opens $\frac{1}{16}$″ before T.D.C.
Exhaust closes $\frac{1}{8}$″ after T.D.C.

Ignition Timing—T.D.C. with ignition lever in full retard position, points set about to break.

	Top	Third	Second	Bottom
Gear Ratios (4 speed)	6—1	7½—1	9¾—1	15¾—1

Carburetter Jet and Slide Sizes:—
Main Jet No. 55.
Pilot Jet No. 20.
Slide No. 4.

Sparking Plugs—Refer to Table on page 45.

Fuels—Esso High Test or Shell. Essolene or Shell Mex Spirit. See page 16.

Lubricating Oils and Greases—See List on pages 15 and 16.

Tyre Pressures—Refer to Table on page 16.

Tank and Sump Capacity—Petrol 2¾ gallons.
Oil 2 pints (approx.).

Rear Chain Size and Length—½″ pitch × $\frac{5}{16}$″ × 118 Rollers.

FOR MODEL 36, 250 c.c.

Compression Ratio 6.5—1.

Bore and Stroke—67 m/m × 70 m/m = 246 c.c.

Valve Timing—Inlet opens $\frac{1}{16}$" before T.D.C.
Exhaust closes $\frac{1}{8}$" after T.D.C.

Ignition Timing—T.D.C. with ignition lever in full retard position, points set about to break.

	Top	Third	Second	Bottom
Gear Ratios (4 speed)	$6\frac{1}{2}$—1	$7\frac{3}{4}$—1	$10\frac{1}{2}$—1	$16\frac{1}{2}$—1

Carburetter Jet and Slide Sizes:—
Main Jet No. 80.
Needle Position 3rd groove.
Slide No. 4/4.

Sparking Plugs—Refer to Table on page 45.

Fuels—Esso High Test or Shell. Essolene or Shell Mex Spirit. See page 16.

Lubricating Oils and Greases—See List on pages 15 and 16.

Tyre Pressures—Refer to Table on page 16.

Tank and Sump Capacity—Petrol $2\frac{3}{4}$ gallons.
Oil 2 pints (approx.).

Rear Chain Size and Length—$\frac{1}{2}$" Pitch × $\frac{5}{16}$" × 126 Rollers.

Magdyno Chain Size and Length—$\frac{3}{8}$" Pitch × $\frac{1}{8}$" × 43 Rollers.

FOR MODEL 40, 350 c.c.

Compression Ratio 6—1.

Bore and Stroke—74 m/m × 80 m/m = 346 c.c.

Valve Timing—Inlet opens $\frac{1}{16}$" before T.D.C.
Exhaust closes $\frac{1}{8}$" after T.D.C.

Ignition Timing—T.D.C. with ignition lever in full retard position, points set about to break.

	Top	Third	Second	Bottom
Gear Ratios (Solo)	$5\frac{1}{2}$—1	$6\frac{3}{4}$—1	9—1	$14\frac{1}{2}$—1
Gear Ratios (Sidecar)	6 —1	$7\frac{1}{2}$—1	$9\frac{3}{4}$—1	$15\frac{3}{4}$—1

Carburetter Jet and Slide Sizes:—
Main Jet No. 110.
Needle Position 3rd groove.
Slide No. 5/3.

Sparking Plugs—Refer to Table on page 45.

Fuels—Esso High Test or Shell. Essolene or Shell Mex Spirit. See page 16.

Lubricating Oils and Greases—See List on pages 15 and 16.

Tyre Pressures—Refer to Table on page 16.

Tank and Sump Capacity—Petrol $2\frac{3}{4}$ gallons.
Oil 2 pints (approx.).

Rear Chain Size and Length—
Solo $\frac{1}{2}$" Pitch × $\frac{5}{16}$" × 117 Rollers.
Sidecar $\frac{1}{2}$" Pitch × $\frac{5}{16}$" × 118 Rollers.

FOR MODEL 46, 350 c.c.

Compression Ratio 6—1.

Bore and Stroke—74 m/m × 80 m/m = 346 c.c.

Valve Timing—Inlet opens $\frac{1}{16}$" before T.D.C.
Exhaust closes $\frac{1}{8}$" after T.D.C.

Ignition Timing—T.D.C. with ignition lever in full retard position, points set about to break.

	Top	Third	Second	Bottom
Gear Ratios (Solo)	$5\frac{1}{2}$—1	$6\frac{3}{4}$—1	9—1	$14\frac{1}{2}$—1
Gear Ratios (Sidecar)	$6\frac{1}{2}$—1	$7\frac{3}{4}$—1	$10\frac{1}{2}$—1	$16\frac{1}{2}$—1

Carburetter Jet and Slide Sizes:—
Main Jet No. 110.
Needle Position 3rd groove.
Slide No. 5/3.

Sparking Plugs—Refer to Table on page 45.

Fuels—Esso High Test or Shell. Essolene or Shell Mex Spirit. See page 16.

Lubricating Oils and Greases—See List on pages 15 and 16.

Tyre Pressures—Refer to Table on page 16.

Tank and Sump Capacity—Petrol $2\frac{3}{4}$ gallons.
Oil 2 pints (approx.).

Rear Chain Size and Length—Solo $\frac{1}{2}$" Pitch × $\frac{5}{16}$" × 122 Rollers.
Sidecar $\frac{1}{2}$" Pitch × $\frac{5}{16}$" × 126 Rollers.

Magdyno Chain Size and Length—$\frac{3}{8}$" Pitch × $\frac{1}{8}$" × 43 Rollers.

FOR MODEL 70, 500 c.c.

Compression Ratio 5.5—1.

Bore and Stroke—82 m/m × 94 m/m = 499 c.c.

Valve Timing—Inlet opens $\frac{1}{16}$" before T.D.C.
Exhaust closes $\frac{1}{8}$" after T.D.C.

Ignition Timing—12 m/m before T.D.C. with ignition lever in fully advanced position, points set about to break.

	Top	Third	Second	Bottom
Gear Ratios (Solo)	5 —1	$6\frac{1}{2}$—1	9 —1	$13\frac{1}{2}$—1
Gear Ratios (Sidecar)	$5\frac{1}{2}$—1	$7\frac{1}{2}$—1	$10\frac{1}{4}$—1	$15\frac{1}{2}$—1

Carburetter Jet and Slide Sizes:—
Main Jet No. 160.
Needle Position 3rd groove.
Slide No. 6/4.

Sparking Plugs—Refer to Table on page 45.

Fuels—Esso High Test or Shell. Essolene or Shell Mex Spirit. See page 16.

Lubricating Oils and Greases—See List on pages 15 and 16.

Tyre Pressures—Refer to Table on page 16.

Tank and Sump Capacity—Petrol $3\frac{3}{4}$ gallons.
Oil 3 pints (approx.).

Rear Chain Size and Length—Solo $\frac{5}{8}$" Pitch × $\frac{1}{4}$" × 100 Rollers.
Sidecar $\frac{5}{8}$" Pitch × $\frac{1}{4}$" × 103 Rollers.

FOR MODEL 76, 500 c.c.

Compression Ratio 7—1.

Bore and Stroke—82 m/m × 94 m/m = 499 c.c.

Valve Timing—Inlet opens $\frac{1}{16}$" before T.D.C.
Exhaust closes $\frac{1}{8}$" after T.D.C.

Ignition Timing—12 m/m before T.D.C. with ignition lever in fully advanced position, points set about to break.

	Top	Third	Second	Bottom
Gear Ratios (Solo)	5 —1	$6\frac{1}{2}$—1	9 —1	$13\frac{1}{2}$—1
Gear Ratios (Sidecar)	$5\frac{1}{2}$—1	$7\frac{1}{2}$—1	$10\frac{1}{4}$—1	$15\frac{1}{2}$—1

Carburetter Jet and Slide Sizes:—
Main Jet No. 160.
Needle Position 3rd groove.
Slide No. 6/4.

Sparking Plugs—Refer to Table on page 45.

Fuels—Esso Ethyl or B.P. Ethyl. Esso High Test or Shell. See page 16.

Lubricating Oils and Greases—See List on pages 15 and 16.

Tyre Pressures—Refer to Table on page 16.

Tank and Sump Capacity—Petrol $3\frac{3}{4}$ gallons.
Oil 3 pints (approx.).

Rear Chain Size and Length—Solo $\frac{5}{8}$" Pitch × $\frac{1}{4}$" × 100 Rollers.
Sidecar $\frac{5}{8}$" Pitch × $\frac{1}{4}$" × 103 Rollers.

FOR MODEL 80, 550 c.c.

Compression Ratio 4.5—1.

Bore and Stroke—84 m/m × 94 m/m = 550 c.c.

Valve Timing—Inlet opens $\frac{1}{16}$" before T.D.C.
Exhaust closes $\frac{1}{8}$" after T.D.C.

Ignition Timing—10 m/m before T.D.C. with ignition lever in fully advanced position, points set about to break.

	Top	Third	Second	Bottom
Gear Ratios (Solo)	$5\frac{1}{4}$—1	$6\frac{3}{4}$—1	$9\frac{1}{2}$—1	$14\frac{1}{2}$—1
Gear Ratios (Sidecar)	$5\frac{3}{4}$—1	8 —1	11—1	16 —1

Carburetter Jet and Slide Sizes:—
Main Jet No. 130.
Needle Position 3rd groove.
Slide No. 6/4.

Sparking Plugs—Refer to Table on page 45.

Fuels—Esso High Test or Shell. Essolene or Shell Mex Spirit. See page 16.

Lubricating Oils and Greases—See List on pages 15 and 16.

Tyre Pressures—Refer to Table on page 16.

Tank and Sump Capacity—Petrol $3\frac{3}{4}$ gallons.
Oil 3 pints (approx.).

Rear Chain Size and Length—Solo $\frac{5}{8}$" Pitch × $\frac{1}{4}$" × 100 Rollers.
Sidecar $\frac{5}{8}$" Pitch × $\frac{1}{4}$" × 103 Rollers.

Care and Maintenance.

Second Running in Period from 151 to 500 miles.

At the conclusion of the first 500 miles it is advisable to go over all those adjustments mentioned on pages 10 to 16 under the heading—"First running in period at the conclusion of 150 miles." The points that need attention are:—

1. Steering Head.
2. Rear Chain.
3. All Nuts and Bolts.
4. Tappet Adjustment.
5. Contact Breaker Adjustment.
6. Cables.
7. Rear Brake Adjustment and Brake Shaft Greasing.
8. Front Brake Adjustment.
9. Spring Fork Greasing.
10. Spring Fork Adjustment.
11. Rocker Spindle Greasing.
12. Fill up Engine Sump.
13. Fill up Primary Drive Cover.

In addition to the above points the following work should be done before the machine is opened out and fast road work undertaken:—

CLEANING OIL FILTER.—Models 23, 30, 36, 40 and 46.

Every 500 miles the oil filter should be cleaned. To save wasting oil lean machine over on to its left side. The Oil Filter is attached to the Oil Pipe Union at the bottom of the Crankcase and to take out, unscrew Oil Pipe first and then the Union. Clean filter gauze thoroughly with petrol and replace.

CLEANING OIL FILTER.—Models 70, 76 and 80.

Every 500 miles the Oil Filter should be cleaned. To save wasting oil, lean machine over on its left side. The Oil Filter is attached to the Oil Pipe Union at the back of the Crank Case, and to take out unscrew Oil Pipe first and then the Filter. Clean Filter Gauze thoroughly with petrol and replace.

CARBURETTERS.—Model 23 and 30.

Dismantle and clean carburetter—first detach the petrol pipe from both the petrol tap and the float chamber top.

Then unscrew the knurled nut on the top of the carburetter in an anti-clockwise direction; this allows the slide with the cable to be withdrawn. Next unscrew the nut at the bottom of the carburetter, moving the spanner from right to left, in order to expose the two jets for removal and cleaning; the float chamber top can now be unscrewed in an anti-clockwise direction, and the float and needle removed. Now slacken the small hexagon-headed pin in the clip around the induction stub and slide off carburetter. The jets can be unscrewed with a screwdriver. Place all the components in a dish of clean petrol and wash thoroughly. Blow through the jets, and then reassemble into the carburetter, taking care to fit the larger numbered and longer jet (Main Jet) nearest the air intake. The number will be found stamped on the base of the jet. Replace the slide with the cut away portion facing the air intake, in this position the groove in the slide will readily register with the locating pin

in the side of the mixing chamber. Reassemble remaining parts and fix carburetter in an upright position on the induction stub and tighten up the clip screw. Blow through the petrol pipe to remove any foreign matter before refitting.

Note.—A further article on Carburetters, their tuning and maintenance, will be found on pages 37 to 40.

CARBURETTER.—Models 36, 40, 46, 70, 76 and 80.

Detach the petrol pipe from both the petrol tap and the float chamber, then unscrew the knurled nut at the top of the carburetter in an anti-clockwise direction. This allows the slides and the needle to be withdrawn. Next, whilst the carburetter is still in position, unscrew the small locking screw, in an anti-clockwise direction, in the top of the float chamber. This will allow the top to be unscrewed by means of the large hexagon, in the centre of the float chamber top. Loosen the float chamber top and turn in an anti-clockwise direction. Now unscrew the nut at the bottom of the carburetter mixing chamber, moving the spanner in an anti-clockwise direction. This will allow the float chamber to be completely removed. Care should be taken not to lose the two fibre washers which are used at the joint between the float chamber and the mixing chamber. The main jet will then be exposed and may be unscrewed by turning the spanner from right to left. Blow through the jet and make sure it is perfectly clear, and replace. Next clean out the float chamber, take off the float chamber top and take out the float. This is done by gripping with the thumb and forefinger the two extreme edges of the clip at the top of the float, and pressing inwards. Then lift the float clear of the needle, the needle will then drop out of the bottom of the float chamber. Next clean out any foreign matter from the bottom of the float chamber. Now place the finger over the union at the bottom of the float chamber and blow hard into the top to make sure there is no obstruction in the delivery feed to the jet. Replace the needle and then the float, grip the clip as before and slide over the needle, then hold the top of the needle and press the float down until the clip springs into the groove. Take care not to bend the needle in the process. Now replace the float chamber top making sure that the needle enters the locating hole in the float chamber top. Screw up the float chamber top and then tighten the locking screw. Replace the float chamber on to the mixing chamber taking care that the fibre washers are in position. Check that the float chamber is upright when the machine is standing on its wheels before finally tightening. When replacing the throttle and air slides take care that the needle enters the centre hole in the choke block and that all slip into place without force. When the mixing chamber cap ring is tightened up see that the throttle works up and down easily. It is essential that the cap ring be tightened up securely.

NOTE.—A further article on carburetters, their tuning, and maintenance, will be found on pages 37 to 45.

General Maintenance Hints.

Under this heading—General Maintenance Hints—we deal with the following:—

1. Draining Engine Oil Sump.
2. Decarbonising.
3. Wheel Removal.
4. Wheel Alignment.
5. Hub Adjustment.
6. Cush Drive.
7. Brake Adjustment and Cleaning.
8. Gear Adjustment.
9. Cable Renewing and Greasing.
10. Twist Grips.
11. Carburetters.
12. Sparking Plugs.
13. Oil Pumps.
14. Clutch, Single Plate.
15. Clutch, Multi Plate (250 and 350 c.c.).
16. Clutch, Multi Plate (500 and 550 c.c.).
17. Gear Controls. (Hand Change and Foot Change.)
18. Speedometer Drive and Wheels.
19. Lighting Equipment.
20. Tyres.
21. How to adjust Magneto Chain. Models 36 and 46.
22. How to time Ignition.
23. How to time Valves.
24. How to dismantle and refit Engine Shock Absorbers (Models 36, 46, 70, 76 and 80).
25. How to alter Gear Ratios.
26. How to fit a new Rear Chain.
27. How to dismantle a Spring Fork and re-assemble.
28. How to fit new Shock Absorber Friction Discs.
29. How to fit new Steering Damper Discs.
30. How to dismantle Steering Head.
31. How to fit new Push Road Cover Rubbers.
32. Electric Horns.

DRAINING ENGINE OIL SUMPS.—Models 23, 30, 36, 40 and 46.

As these engines are of the semi-dry sump type, the oil is being circulated through the engine and gearbox continually. After 1,500 miles it will be found that the oil has lost its viscosity (or body), and in this state is useless for lubricating the working parts.

To drain oil from sump—remove oil filter, the oil filter is attached to the oil pipe union at the bottom of the crank case, and unscrews in an anti-clockwise direction. Lean the machine on its side so that the oil is drained out. Now cork up the hole and pour in about a pint of paraffin. Rock machine from side to side then allow paraffin to drain out. Refill sump with clean oil to the correct level after re-fitting the oil filter and oil pipe.

DRAINING ENGINE OIL SUMP.—Models 70, 76 and 80.

The same remarks apply as described for the Models 23, 30, etc., except that it is a good plan to place front wheel of machine on a box, to ensure the oil being drained from the sump.

The oil filter on these models is situated at the back of the crank case.

Decarbonising.

MODELS 23, 30, 36, 40 and 46.

After the engine has done approximately 2,500 miles decarbonisation in all probability will be found desirable. There will be quite a large amount of carbon in the engine to be removed; the following is the procedure for the purpose of doing this job. This will not be found in any way too much for people with a fair technical knowledge, but it is nevertheless work that MUST BE MOST CAREFULLY AND ACCURATELY carried out.

First remove the footrests, then exhaust pipe and silencer; after this the sparking plug and carburetter. To remove carburetter, first slacken the carburetter clip by means of the small hexagon pin in the clip round the induction stub, remove the petrol pipe from the petrol tap in the tank only. Carburetter can then be withdrawn from the induction stub. It is a good plan to tie the carburetter out of the way until the rest of the work has been done; tie with a piece of string to any convenient part of the frame.

Next the push rod cover tubes and push rods should be removed. The top hexagon nuts on the push rod covers should be completely unscrewed, moving the spanner from right to left (i.e. in a clockwise direction); then the large hexagon nuts on the bottom push rod covers should be undone, moving the spanner from left to right (i.e. in anti-clockwise direction). Then telescope the bottom covers up the top covers—this will expose the tappets. To remove push rods, first turn over the engine until the piston is half way up the cylinder on the compression stroke (i.e. when both valves are closed). Next slacken tappets down as much as possible by screwing the tappet lock nuts and tappet heads in a clockwise direction, moving the spanner from right to left. It is then possible to remove the push rods by easing them over the tappet heads, by means of a screwdriver—or by a special tool obtainable from our Works or our Stockists, as shown in Illustration No. 12. (NOTE.—The push rod cover tubes are removed with the push rods.)

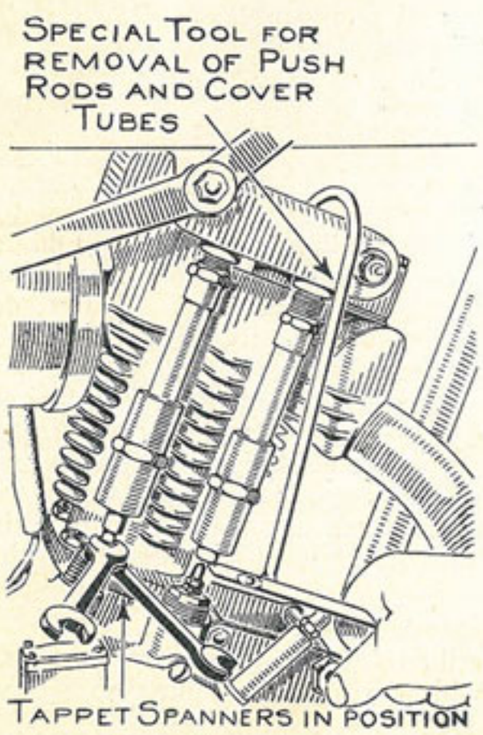


Illustration No. 12.

Next undo the four cylinder head holding down bolts—these unscrew by turning the spanner from right to left. The cylinder head complete with rocker box can then be lifted clear of the cylinder barrel and placed on one side for the time being. Now unscrew the four cylinder barrel holding down nuts, by moving the spanner from left to right, the cylinder can then be raised clear of the piston. Next mark the gudgeon pin boss INSIDE the piston on the timing cover side, with a scratch, in order that the piston can be refitted in the same position upon re-assembling. THIS IS MOST IMPORTANT.

In the case of the Gudgeon Pin being fitted with end pads, the piston is removed by pushing the Gudgeon Pin through with a finger, pushing from the Driving Side towards the Timing Cover Side. Where circlips are fitted this can be removed by placing a $\frac{1}{4}$ bar (like a scriber) behind the circlip where the piston is slotted for the purpose, the circlip will spring out when a little force is applied.

It is a wise precaution to fit new circlips each time as if the circlips lose their tension, damage to cylinder and piston may occur.

To refit circlips put a slight set in the circlip sideways and fit one end in the groove in the gudgeon pin bore, and force into position.

Now cover over the top of the crankcase with a piece of clean rag to prevent any foreign matter falling inside. The parts are now ready for decarbonising, the piston being the first job.

Remove piston rings; this is best done by inserting three thin strips of tin behind the rings at equal distances, the ring can then be removed by sliding over the strips without fear of breakage. Now carefully remove all traces of carbon from the top of the piston, and also from the ring grooves.

Clean the piston rings, removing carbon from back and ends. Before replacing rings it is advisable to check the amount of gap. To check the gap place the rings in the bottom of the cylinder barrel, and by means of the piston, push the rings to the centre of the barrel. The gap between the ends of the rings should be 5 thousandths of an inch. When the gap is found to be in excess of this amount it is advisable to fit new rings.

The new rings should be tested in the cylinder, as above, and if necessary the ends should carefully be filed with a smoot-cut file, until the correct gap of 5 thousandths of an inch is obtained.

Having checked the piston rings, these may now be re-fitted to the piston in the same manner as they were removed (i.e. with the strips of tin). Re-fit the piston to the connecting rod, taking care to smear the gudgeon pin with engine oil, and also that the piston has been refitted the correct way round, according to the scratch inside the piston boss, which, as previously described, is most important.

Replace the cylinder base paper washer with a new one if the original is damaged or broken. Now place the top piston ring with its gap to the back of the piston and the bottom ring with its gap to the front.

Smear piston and rings carefully with engine oil, also the inside of cylinder barrel. Slide the barrel into position over the piston and rings on to the four holding down studs. See that the barrel is seating correctly on the crankcase before replacing and tightening the four holding down nuts—these should be tightened evenly (THIS IS IMPORTANT), the best plan being to tighten a little at a time, first the nut on one corner, then the nut on the opposite corner and so on until all are tight.

Now cover over the top of cylinder with clean rag until cylinder head is ready for fitting.

Proceed to decarbonise the cylinder head; first unscrew the eight hexagon pins on the top of the rocker box—the rocker box can now be removed from the cylinder head leaving the rockers, etc., in position.

Under normal conditions the rocker box needs no further attention except washing down with paraffin, drying and the rockers greased. If, however. there appears to be any undue play in the rockers they should be removed, examined and re-bushed if worn. If the only play visible is a side movement. this may be taken up by fitting one or two steel shim washers (obtainable from Stockists or the Works). Four shim washers are included in decarbonising kits.

To remove rockers, withdraw the split pin from the rocker spindle, unscrew the castle nut by turning the spanner from left to right. Now turn the rocker box over and unscrew the rocker spindle in the same way, when this is done take out the spindle. Next remove large distance piece, which can be seen inside the rocker box; this will enable the rocker itself to be withdrawn. After the rocker has received the necessary attention, the job may be re-assembled in exactly the same way except that the order of replacement is exactly opposite. Care must, of course, be taken to see that the small distance piece at the back of the rocker is correctly fitted on the spindle. After assembly see that the rockers move freely.

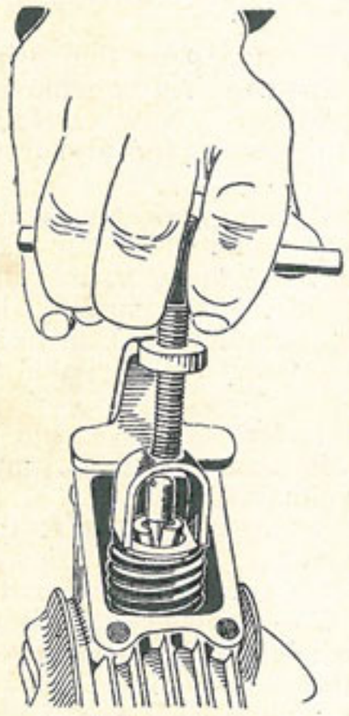


Illustration No. 13.
View showing Compressor in position on Cylinder Head.

The valves should then be removed from the cylinder head; first lift off the valve end caps and then compress the valve springs until the split cotters fall out. This operation will be found difficult unless the proper tool is used. It is considered advisable to purchase one of these before attempting the job.

Valve removal is a simple operation with the special inexpensive tool which has been designed for these particular Models. The Illustration No. 13 fully demonstrates the method and the ease with which valves are removed with the special tool. (The tool is obtainable from the Works or our Stockists, and is also illustrated on page 99.)

When the cotters have been removed the valves can be pushed out of their guides; the springs and spring collars are then free.

The cylinder head and valves should now be thoroughly cleaned, and any traces of carbon or dirt removed; this is easily done with a screwdriver or an old knife, finishing off with some emery cloth. Care should be taken not to damage the valve seats either in the cylinder head or on the valves themselves. Now grind in the valves; this is done by smearing a little grinding compound on the seats and replacing the valve in the cylinder head; a special tool is required to hold the valve in order that it may be turned backwards and forwards to grind the seats. Valve grinding tool for $\frac{5}{16}$" stem is required. (Obtainable from the Works or our Stockists and illustrated on page 99.)

While the valve is being ground in it is advisable to lift it slightly every turn or so, to enable the grinding compound to fall back on the seats—this facilitates the grinding operation.

When the valves have been thoroughly ground and the pit marks in the seats have been removed, wash the cylinder head, valves and springs in clean paraffin or petrol, until all traces of the grinding compound and carbon have been removed; dry the parts with clean rag. The head is now ready for re-assembly. First smear the valve stems with a little engine oil and replace in the guides; the springs and cotters are then replaced by means of the tool previously mentioned. Now replace the valve stem caps, care being taken not to turn the head UPSIDE down once these caps have been fitted, AS THEY ARE LIABLE TO FALL OFF AND DAMAGE THE SPRINGS, ETC.

Next pour a little oil into the wells around the valve springs and then replace the rocker box, taking care to see that the rocker box oil washers are in good condition, and that all the rocker box pins are tightened down.

Examine the cylinder head gasket—if burnt or damaged in any way, replace with a new one. To fit cylinder head, lift into position and screw in the four holding-down studs, care being taken to ensure the head being bolted down tightly and evenly, in the same manner as described for the cylinder holding-down nuts.

Next replace the push rods and cover tubes by means of a screwdriver or the special tool, first smearing a little oil on the push rod tops and tappet heads.

NOTE.—Should the push rod slip from the screwdriver when slightly raised, there is a danger that the valve stem cap will be dislodged, by the force of the valve spring, from the valve stem. The special tool referred to, and illustrated on page 99, was designed to overcome this difficulty.

Each tappet should now be adjusted; this is done by turning the tappet head with the spanner from left to right, until no up and down play can be felt in the tappets, but the push rod will revolve freely. The tappet head should then be locked in position by means of the lock-nut; now tighten down the bottom halves of the push rod covers to their full extent, and screw the top covers into position. Do not lock the top push rod covers too tightly as this will only destroy the rubber joint between the two covers. When the nut can be felt to tighten slightly this is sufficient, as if the nut is tightened abnormally it is possible to distort the rocker box in such a manner that both valves are raised slightly from their seats, causing loss of compression and making engine starting impossible.

NOW CLEAN THE SPARKING PLUG in the following manner: hold the large hexagon firmly and unscrew the smaller one in an anti-clockwise direction, the top portion of the plug may then be lifted out.

Remove all traces of carbon from the plug centre and the body; re-assemble and correctly set each gap to 18 thousandths of an inch. (See also article on pages 45 to 47.)

Finally replace the carburetter, the exhaust system, and the foot-rests, when the machine will again be ready for the road.

Decarbonising

MODELS 70 and 76.

Remove the four tank bolts, the petrol pipe and also the yoke end pin from the gear lever. The tank can then be lifted off clear of the machine. Next the exhaust pipe and silencer, after this the sparking plug and carburetter. To remove the carburetter undo the two hexagon nuts on the flange; the carburetter can then be withdrawn from the induction flange pins. It is a good plan to tie the carburetter out of the way until the rest of the work has been done.

Detach the rocker box by undoing the eight hexagon pins on the top of the box in an anti-clockwise direction. When the rocker box has been taken off, the four cylinder head holding down bolts can be unscrewed, also in an anti-clockwise direction. Lift off cylinder head and place on one side.

Now remove the two push rods, taking care to notice which is the exhaust and which is the inlet.

The cylinder barrel is held in position by five nuts at the base. Four nuts can be clearly seen, and the fifth nut is situated inside the small chest which is provided for tappet adjustment. All these nuts unscrew from left to right. When these are removed lift the cylinder barrel half way off the piston, then wrap some clean rag around the connecting rod to cover the mouth of the crankcase to prevent any foreign matter falling into the crankcase. Now completely lift the cylinder barrel clear of the piston.

In the case of the gudgeon pin being fitted with end pads the piston is removed by pushing the gudgeon pin through with a finger, pushing from the driving side towards the timing cover side. Where circlips are fitted this can be removed by placing a piece of $\frac{1}{4}$" bar (like a scriber) behind the circlip where the piston is slotted for the purpose, the circlip will spring out when a little force is applied.

It is a wise precaution to fit new circlips each time as if the circlips lose their tension, damage to cylinder and piston may occur.

To refit circlips put a slight set in the circlip sideways and fit one end in the groove in the gudgeon pin bore, and force into position.

REMEMBER THE NEXT POINT, IT IS MOST IMPORTANT.

When the piston is removed from the cylinder, care must be taken to mark the piston in such a way that it can be re-assembled the same way round. A good plan is to write the word "Front" on the forward face of the piston with an indelible pencil.

Work may now be started on the piston.

Remove piston rings; this is best done by inserting three thin strips of tin behind the ring at equal distances, the ring can then be removed by sliding over the strips without fear of breakage. Now carefully remove all traces of carbon from the top of the piston, and also from the ring grooves.

Clean the piston rings, removing carbon from the back and ends. Before replacing rings it is advisable to check the amount of gap. To check the gap place the rings in the bottom of the cylinder barrel, and by means of the piston, push the rings to the centre of the barrel. The gap between the ends of the rings should be five thousandths of an inch. When the gap is found to be in excess of this amount, it is advisable to fit new rings.

The new rings should be tested in the cylinder, as above—and if necessary the ends should carefully be filed with a smooth-cut file, until the correct gap of five thousandths of an inch is obtained.

Having checked the piston rings, these may now be re-fitted to the piston in the same manner as they were removed (i.e. with the strips of tin). Re-fit the piston to the connecting rod, taking care to smear the gudgeon pin with engine oil, and also that the piston has been re-fitted the correct way round according to the mark inside the piston which, as previously described, is most important.

Replace the cylinder base paper washer with a new one if the original is damaged or broken. Now place the top piston ring with its gap to the back of the piston and the second ring with its gap to the front, and the slotted oil control ring with its gap to the back of the piston.

Smear piston and rings carefully with engine oil, also the inside of cylinder barrel. Slide the barrel into position over the piston and rings on to the five holding down studs. See that the barrel is seating correctly on the crankcase before replacing and tightening the five holding down nuts—these should be tightened evenly (THIS IS IMPORTANT), the

best plan being to tighten a little at a time, first the nut on one corner, then the nut on the opposite corner, and so on until all are tight.

Now cover over the top of the cylinder with clean rag until cylinder head is ready for fitting.

Proceed to decarbonise the cylinder head.

Under normal conditions the rocker box needs no attention except for washing down with paraffin, drying and the rockers greased. If, however, there appears to be any undue play in the rockers they should be removed, examined and re-bushed if worn. If the only play visible is a side movement, this may be taken up by fitting one or two steel shim washers (obtainable from Stockists or the Works). Four shim washers are included in the decarbonising kits.

To remove rockers, withdraw the split pin from the rocker spindle, unscrew the castle nut by turning the spanner from right to left. Now turn the rocker box over and unscrew the rocker spindle in the same way; when this is done take out the spindle. Next remove large distance piece, which can be seen inside the rocker box; this will enable the rocker itself to be withdrawn. After the rocker has received the necessary attention, the job may be re-assembled in exactly the same way, except that the order of replacement is exactly opposite. Care must, of course, be taken to see that the small distance piece at the back of the rocker is correctly fitted on the spindle. After assembly see that the rockers move freely.

The valves should then be removed from the cylinder head; first lift off the valve end caps and then compress the valve springs until the split cotters fall out. This operation will be found difficult unless the proper tool is used. It is considered advisable to purchase one of these before attempting the job.

Valve removal is a simple operation with the special inexpensive tool which has been designed for these particular models. The illustration on page 26 fully demonstrates the method and the ease with which the valves are removed with the special tool. (The tool is obtainable from the Works or our Stockists, and is also illustrated on page 99.)

When the cotters have been removed the valves can be pushed out of their guides, the springs and spring collars are then free.

The cylinder head and valves should now be thoroughly cleaned, and any traces of carbon or dirt removed; this is easily done with a screwdriver or an old knife, finishing off with some emery cloth. Care should be taken not to damage the valve seats in the cylinder head or on the valve themselves. Now grind in the valves; this is done by smearing a little grinding compound on the seats and replacing the valve in the cylinder head; a special tool is required to hold the valve in order that it may be turned backwards and forwards to grind the seats. Valve grinding tool of $\frac{3}{8}$" stem is required. (Obtainable from the Works or our Stockists and illustrated on page 99.)

While the valve is being ground in it is advisable to lift it slightly every turn or so, to enable the grinding compound to fall back on the seats—this facilitates the grinding operation.

When the valves have been thoroughly ground and the pit marks in the seats have been removed, wash the cylinder head, valves, and

springs in clean paraffin or petrol, until all traces of the grinding compound and carbon have been removed; dry the parts with clean rag. Smear the valve stems with a little engine oil and replace in the guides; the springs and cotters are then replaced by means of the tool previously mentioned. Replace the valve stem caps, care being taken not to turn the head upside down once these caps have been fitted, as they are liable to fall off and damage the springs, etc.

Now pour a little oil into the wells around the valve springs and the parts are now ready for re-assembly.

New washers should be fitted between the cylinder head and cylinder barrel, and between the rocker box and cylinder head, to ensure that an oil tight joint is made between the faces. These washers are of a special thickness and should be obtained from the Works or Stockists, otherwise oil leaks will result, or the head will not seat properly, causing blowing at the gasket.

Examine the cylinder head gasket. If burnt or damaged in any way replace with a new one. To fit cylinder head place push rod joint face washer in position and lift cylinder head on to the spigot on the cylinder. Now screw in the four cylinder head holding down bolts, care being taken to tighten each bolt evenly, as described for the cylinder holding down nuts. Before the head is bolted down finally, make sure that the push rod joint face washer has not moved out of position, and that the oil way in the centre of the washer is quite clear. This can be tested by pushing a spoke or some similar article down the hole. Next place the other push rod joint face washer on top of the cylinder head, and re-fit the rocker box, together with its two oil retaining washers; take care during this operation not to move the push rod joint face washer in the process. Proceed to adjust the tappets as described on page 12.

NOW CLEAN THE SPARKING PLUG in the following manner: hold the large hexagon firmly and unscrew the smaller one in an anti-clockwise direction; the top portion of the plug may then be lifted out.

Remove all traces of carbon from the plug centre and the body; re-assemble and correctly set each gap to 18 thousandths of an inch.

Finally replace the tank, carburetter and exhaust pipe, when the machine will be ready for the road.

NOTE.—A good plan is to check that the overhead valve lubricating oil-way is quite clear and in working order. To test, unscrew the small hexagon headed pin in the forward side of the rocker box, turn up the supply of oil through the secondary pump by turning the regulating screw on the left hand side of the pump.

To increase the flow of oil turn the regulating screw in an anti-clockwise direction, after having loosened the lock nut in the same direction. (To decrease the supply of oil turn in the opposite direction.)

AFTER EVERY ADJUSTMENT OF THE REGULATING SCREW THE LOCK NUT MUST BE TIGHTENED SECURELY.

Now start up the machine and wait until the oil flows out of the hole in the rocker box, which will prove that the oil-way is quite clear, then replace the small hexagon headed pin and re-adjust the flow of oil to four spots per minute.

Decarbonising

MODEL 80, Side Valve.

The general procedure is exactly the same as outlined for the Model 70 with the exception that the tank need not be removed, and there are no push rods or rocker boxes to be dealt with.

The cylinder head is detachable, and is held in position by eight studs, all of which unscrew in an anti-clockwise direction. It is considered advisable to renew the cylinder head gasket when decarbonising.

The procedure for grinding in the valves is slightly different from the Model 70, and should be done as follows:—Remove all traces of carbon from the valves and then smear a little grinding compound on the seats and replace the valves in their guides for grinding. Rotate the valves backwards and forwards with a screwdriver, in the slots provided, and at every turn or two lift the valve off the seat to allow the grinding compound to fall back on the seats to assist the grinding action.

When the valves have been thoroughly ground in and all the pit marks in the seats have been taken out, wash away all traces of the grinding compound with clean paraffin and dry the parts with clean rag.

Then smear the valve stems with engine oil and replace in their guides and re-fit the valve springs and cotters.

A special valve spring compressor for this Model 80 Side Valve engine can be obtained from the Works or Stockists, and facilitates the work of removing and re-fitting the valves and springs. (Illustrated on page 99.) Adjust tappets as described on page 13.

FRONT WHEELS, REMOVAL OF.—All Models.

To remove front wheel, first raise wheel from the ground by placing a small box under the crankcase in the case of the Model 23, or by means of the front stand on all other models. Now remove the front brake cable at the handlebar end. This can be done if the front brake operating lever is held up by means of a spanner. This will allow sufficient clearance in the cable for the cable and cap to be removed. Now slacken spindle nuts both in an anti-clockwise direction—the wheel can then be withdrawn.

To replace the wheel, lift into position in the fork ends, care being taken to see that the brake anchor plate is in the correct position, finally tighten the spindle nuts, and replace and adjust the front brake cable.

REAR WHEELS, REMOVAL OF.—All Models.

Place machine on rear stand, take out spring connecting link from the rear chain, unscrew brake rod wing nut in an anti-clockwise direction. Now unscrew brake stop pin until it is clear of the slot in the brake cover plate—this pin is situated in the fork end; in the case of Model 23, on the left-hand side of the machine, and the Models 30 and 40, the right-hand side of the machine, on all the other models the brake stop is brazed to the frame. Slacken the spindle nuts in an anti-clockwise direction and pull wheel from fork ends; to take the wheel completely away, lean machine over on left side and pull wheel out sideways, as shown in illustration No. 14.

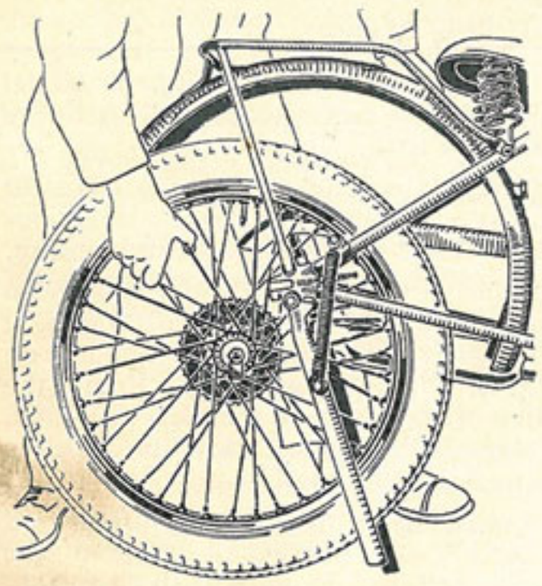


Illustration No. 14.

To replace wheel, lean machine over on left side as before, and then lift wheel into position in the fork ends, care being taken to see that the adjuster blocks are fitted correctly, i.e., that the portion of the block which fits into the fork end is to the rear.

The chain can now be refitted, and the brake stop pin should be screwed into position, making sure that the end of the pin enters the slot in the brake cover plate. The spindle nuts should now be locked up. Connect up the brake rod, this is easily done by depressing the brake pedal until the rod can be threaded into the roller in brake lever—now fit the wing nut to complete the job. If any difficulty is experienced, deflate the tyre.

For adjustment of rear chain and wheel alignment see pages 11 and 12, and Illustration No. 9.

HUBS.—ADJUSTMENT.

Whilst the brakes are being cleaned and adjusted, it is a good plan to examine the hubs for side play in the bearings, and should the play be more than 1/32nd of an inch it will be necessary to adjust as follows.

FRONT HUB.—Models 23, 30 and 40 (refer to illustration No. 15).

Slacken locknut "B" in an anti-clockwise direction, and adjust cone "A" in clockwise direction to take up play. Then tighten locknut "B." When adjustment is complete the wheel should revolve freely with no side play.

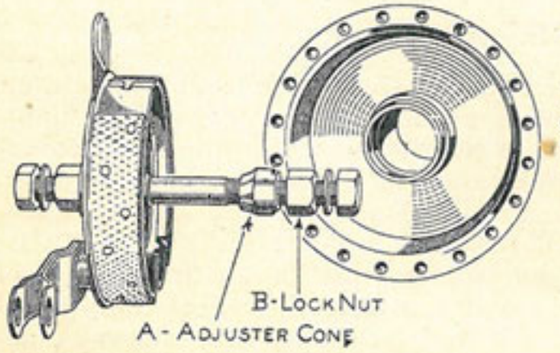


Illustration No. 15.

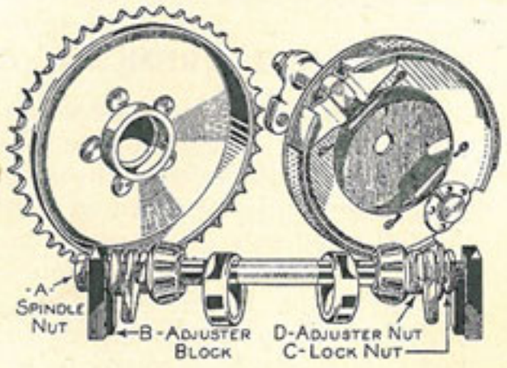


Illustration No. 16.

REAR HUB.—Model 23 (Refer to illustration No. 16).

Slacken locknut "C" and adjust taper bearings by means of the nut "D"; then lock up nut "C." When wheels are fitted with taper roller bearings, adjustment is correct when 1/32nd of an inch play can be felt at the rim.

REAR HUB.—Models 30 and 40 (Refer to illustration No. 19).

Slacken the locknut and adjust taper bearings by turning the adjuster nut, which is the hexagon portion of the dust cover. Re-tighten locknut.

FRONT HUB.—Models 36, 46, 70, 76, and 80 (also 90 and 100).

Refer to illustration No. 17.

To adjust for side play remove wheel, slacken locknut "A" in an anti-clockwise direction, turn the taper roller bearing "B" in a clockwise direction, until only 1/32nd of an inch play can be felt at the rim. Re-tighten locknut "A" and replace wheel.

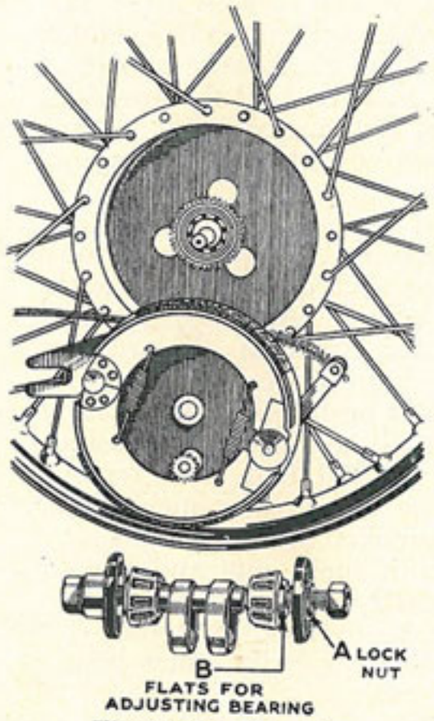


Illustration No. 17.

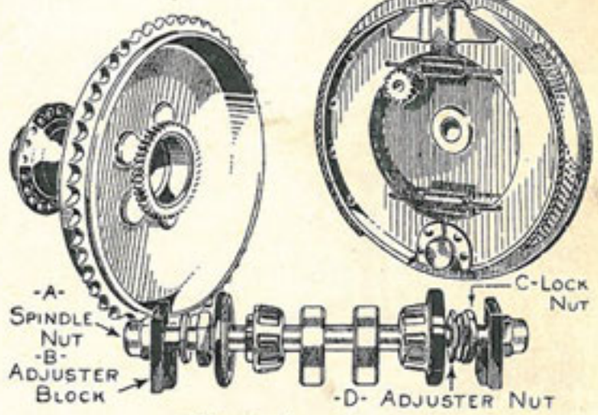


Illustration No. 18.

REAR HUB.—Models 36, 46, 70, 76 and 80 (also 90 and 100).

Refer to illustration No. 18.

To adjust, slacken locknut "C" in an anti-clockwise direction and turn adjusted nut "D" in a clockwise direction, re-tighten locknut "C" and replace wheel. Test for correct side play when job is complete, which should be only 1/32nd of an inch at the rim.

HUBS.—GREASING.

Every twelve months a good supply of grease should be forced into the hub by means of the grease gun, through the two nipples provided on each hub shell; a better plan however, is to remove the wheels completely, dismantle the hubs, thoroughly wash all parts with paraffin and repack with recommended grease, see page 15.

WHEELS.—REMOVAL. Front Wheel, Models 36, 46, 70, 76 and 80.

Refer to page 31, the procedure being exactly the same.

REAR WHEEL.—Models 70, 76 and 80.

To facilitate wheel removal the back portion of the rear mudguard has been made easily detachable. This detachable portion is held in position by two pins attaching to lugs on the rear stays of the lifter handle, and two bolts attaching to the fork ends.

To detach from main portion of mudguard remove the top pins completely and loosen the bottom bolts, the back portion complete with number plate will then readily slide out of position. The rest of the wheel removal operation is as described for the Model 23 (page 31).

CUSH DRIVE.—Models 30 and 40.

Method of fitting New Cush Rubbers. The best method is to remove the rear wheel from the machine and take off spindle nuts and adjuster blocks—then remove the large nut which holds the brake outer plate in position—pull off the brake outer plate complete, and lightly tap the spindle end with a mallet; the spindle will carry with it the dust cover and bearing, from the cush drive end, so that the three bolts which hold the sprocket in position can be removed by unscrewing both nuts on each bolt in an anti-clockwise direction; then pull off the sprocket; by using this method the bearing adjustment of the wheel is not affected.

Refer to illustration No. 19, and notice that the rubbers are shown leaning on each other, to enable the three segments on the sprocket to be inserted between the rubbers without any difficulty. As the sprocket is pushed into place these rubbers will automatically position themselves. All that then remains to be done is the replacement of the three sprocket holding bolts, together with their nuts and locking nuts. Lastly, replace the spindle, taking care to lock up tightly the nut holding the brake outer plate.

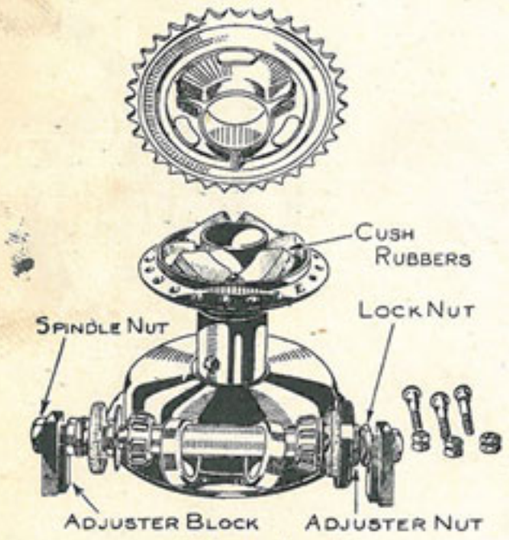


Illustration No. 19.

BRAKES.—All Models.

CLEANING.—To obtain the maximum efficiency from the brakes they should be completely dismantled, examined and cleaned, periodically. For the average rider this should be done every six months. The Ferodos should be thoroughly cleaned with petrol, and the rivets should be examined, and should any of the rivet heads be seen standing above the surface of the Ferodo, they should be knocked down with a punch. Having cleaned the surface of the Ferodos with petrol, rough it with a fairly coarse file, and also file a lead on each end of the linings. If this is not done the braking effect is very fierce, and may cause damage to the linings. The brake outer plates should be examined and cleaned. Should the brake cam show any signs of being stiff—remove from the plate, grease, and re-assemble. Should the drum be scored it may be returned to one of our Agents, or to the Works for re-facing or replacing if necessary. The scoring of the brake drum is caused by allowing the rivet heads to remain standing above the linings, and this

point should be carefully watched. When the wheel has been replaced—which is clearly described on pages 31 and 32—make sure, by spinning the wheel, that the adjustment has not been carried too far, causing the brakes to bind.

BRAKE LININGS.—Materials and Sizes.

Recommended Material—Ferodo Bonded Asbestos, Die-pressed.

Model 23.	Front	4″	long × $\frac{3}{4}$″ wide	× $\frac{1}{8}$″ thick.
,, 23.	Rear	5″	,, × $\frac{3}{4}$″ ,,	× $\frac{1}{8}$″ ,,
,, 30-40.	Front	5½″	,, × $\frac{3}{4}$″ ,,	× $\frac{1}{8}$″ ,,
,, 30-40.	Rear	6″	,, × $\frac{3}{4}$″ ,,	× $\frac{1}{4}$″ ,,
,, 36-46.	Front			
,, 70-76.	and	5½″	,, 1″ ,,	× $\frac{3}{16}$″ ,,
,, & 80.	Rear			

ADJUSTMENT OF GEARS.—All Hand Change Models.

It is important that gears are always in correct adjustment—otherwise serious damage to gearbox may result.

Check the gear adjustment if for any reason the petrol tank be removed.

Place gear lever into second gear position and remove the split pin and yoke end pin from the bottom yoke end. If the selector arm on the gear box is not in correct second gear position, a slight touch up or down will cause the spring-loaded internal selector to engage the gear properly. Next, attempt to replace the yoke end pin—this should slide into position freely if the hole in the selector arm registers with the holes in the yoke end; if, however, these holes do not register, adjust length of gear control rod by first slackening the small locknut on the bottom of the rod, and adjust the yoke end up or down till the desired position is found. Re-tighten locknut and refit yoke end pin and split pin.

CABLES.

To obtain the best results from the control cables, these should be lubricated occasionally; the owner will be well rewarded for any time expended on this job, as not only will the life of the cable be increased but the action of the various controls will be sweet and smooth.

Disconnect the cables from the handlebar controls. Tie a piece of greaseproof paper in the shape of a funnel around the top of the outer casing, fill with thin oil and allow to remain overnight. By this means the cable will be lubricated throughout its entire length.

NEW CABLES.

Made up cables of correct length are obtainable (from the Works or our Stockists) and have only to be threaded into position and attached to the controls.

TWIST GRIPS.—Models 23, 30, 36, 40, 46, 70, 76 and 80.

To dismantle the twist grip for fitting new cable, slacken the twist grip end clip by unscrewing the pin in an anti-clockwise direction, turn the grip over to the right—i.e., in a clockwise direction—until the top of the slide strip is exposed far enough to allow the new cable to be fitted.

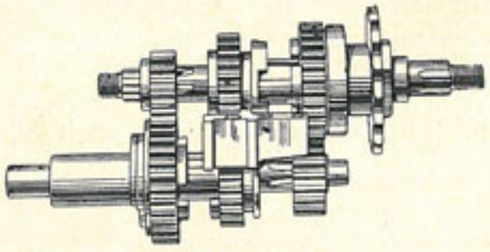
Thread the new throttle cable inside the handle bar and attach nipple to the slide strip, then re-assemble by turning the grip over to the left—i.e., in an anti-clockwise direction—and tighten the end clip to the handle bar.

EXHAUST VALVE LIFTER.

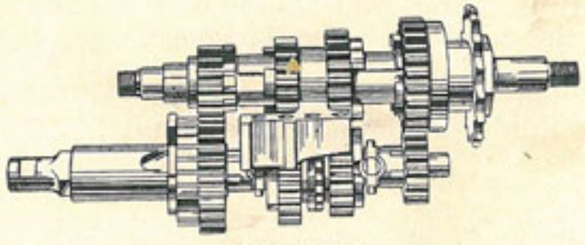
Cable Renewal.—Refer to Illustration No. 27 which shows the Exhaust Valve lifter quite clearly. To remove cable the best method is to first turn the engine over until the exhaust valve is fully lifted, this can be seen if the exhaust push rod cover is dropped, and the engine is turned over by means of the kick starter. Now grasp the cable and pull upwards, this will lift up far enough to allow the slotted sleeve on the top of the valve lifter body to be taken out, then unscrew the body completely and slide up the cable. The barrel nipple of the cable can then be withdrawn from the valve lifter spindle, the cable can be disconnected at the handlebar end, and removed from the machine. Replace in the reverse order, making sure that the exhaust valve is fully lifted.

GEARS.

3-speed and 4-speed.



THREE SPEED



FOUR SPEED

Illustration No. 20.

Illustration No. 20 shows the internal shafts and pinions as fitted to New Imperial Unit Construction Models.

Amal Carburetters—All Models.

Below we give two tables, the first is our standard settings for all carburetters, and the second table is our recommended settings should the owner wish to obtain maximum mileage per gallon:—

STANDARD SETTINGS

Model	Main Jet	Pilot Jet	Throttle Valve	Needle Position
23	45	20	5	—
30	55 { Type No. 104/006 }	20	4	—
36	80	—	4/4	3
40	110	—	5/3	3
46	110	—	5/3	3
70	160	—	6/4	3
76	160	—	6/4	3
80	130	—	6/4	3

SETTINGS FOR MAXIMUM MILEAGE PER GALLON

Model	Main Jet	Pilot Jet	Throttle Valve	Needle Position
23	40	15	5	—
30	50 { Type No. 104/006 }	20	6	—
36	75	—	4/4	2
40	100	—	5/4	2
46	100	—	5/4	2
70	150	—	6/4	2
76	160	—	6/4	2
80	130	—	6/4	2

CARBURETTERS.—Cleaning.

Refer to the articles on the cleaning of carburetters on pages 21 and 22.

AIR CLEANERS.

An air cleaner is fitted to Models 23 and 30, and is a perfectly simple device requiring very little attention. The small knob at the back operates the air shutter, so before starting engine press the knob in; then when the engine fires pull out the knob to its full extent.

To clean filter gauze unscrew both nuts on the end of the cleaner in an anti-clockwise direction, the whole cleaner being thereby detached from the carburetter. Wash the gauze thoroughly in clean petrol to remove all foreign matter, and re-assemble complete air cleaner to the carburetter.

CARBURETTERS.—Location of Trouble. Engine Stops Suddenly.

As far as the carburetter is concerned, this can only be caused by:—

(1) Shortage of fuel.
(2) Broken or obstructed petrol pipe or tap.
(3) Tank tap inadvertently closed.
(4) Obstructed jets.
(5) Broken or detached throttle valve cable.

MIS-FIRING DUE TO EXCESS OR LACK OF FUEL.

EXCESS OF FUEL.—Punctured float, foreign matter between needle valve and seating. Main jet or pilot jet unscrewed, mixing chamber union nut loose, causing a leakage of petrol.

LACK OF FUEL.—Partial obstruction of fuel supply; obstruction in carburetter passages or in jets. If the obstruction is only due to water or small foreign bodies in the jets, this can frequently be cured by placing the palm of the hand over the air intake of the carburetter when the engine is running, at the same time opening the throttle lever. The engine will cease to fire for a few seconds and then, if the obstruction is cleared, will resume firing regularly. If this is of no avail, the petrol pipe and float chamber must then be inspected. If this is unavailing, the only course is to remove the jets and clear the obstruction. Examine float chamber cover and see that the float needle is not bent and is working smoothly, and that the passage in the float chamber cover is free from water or foreign matter. **Also examine vent hole in petrol filler cap,** and if obstructed clean with a pin. This latter trouble can easily be detected if when engine suddenly stops, it can immediately be restarted if petrol filler cap is removed.

FLOODING—especially with a new machine, is most often caused by impurities in the fuel supply lodging on the float needle seating.

General Tuning Hints.

MODELS 23 and 30. CARBURETTERS.

AMAL NON-NEEDLE CARBURETTER.

HOW IT WORKS.—The petrol tap having been turned on, petrol will flow past the Needle Valve P until the quantity of petrol in the Float Chamber G is sufficient to raise the Float O, when the Needle Valve P will prevent a further supply entering the Float Chamber.

The action of the Float can readily be understood, for, as the quantity of fuel in the Float Chamber is used. the Float O will drop carrying with it the Needle P, and admitting a further supply.

Thus, automatically, the petrol level is kept constant.

In connection with the Float Chamber, it must be clearly understood that any alteration to our standard level can only have detrimental results.

When the Float Chamber is filling to its correct level, the fuel passes along the passage through the diagonal hole into the Jet Plug H, when it will be in communication with the Main Jet D and the Pilot Jet C, the level in these Jets being, obviously, the same as that maintained in the Float Chamber.

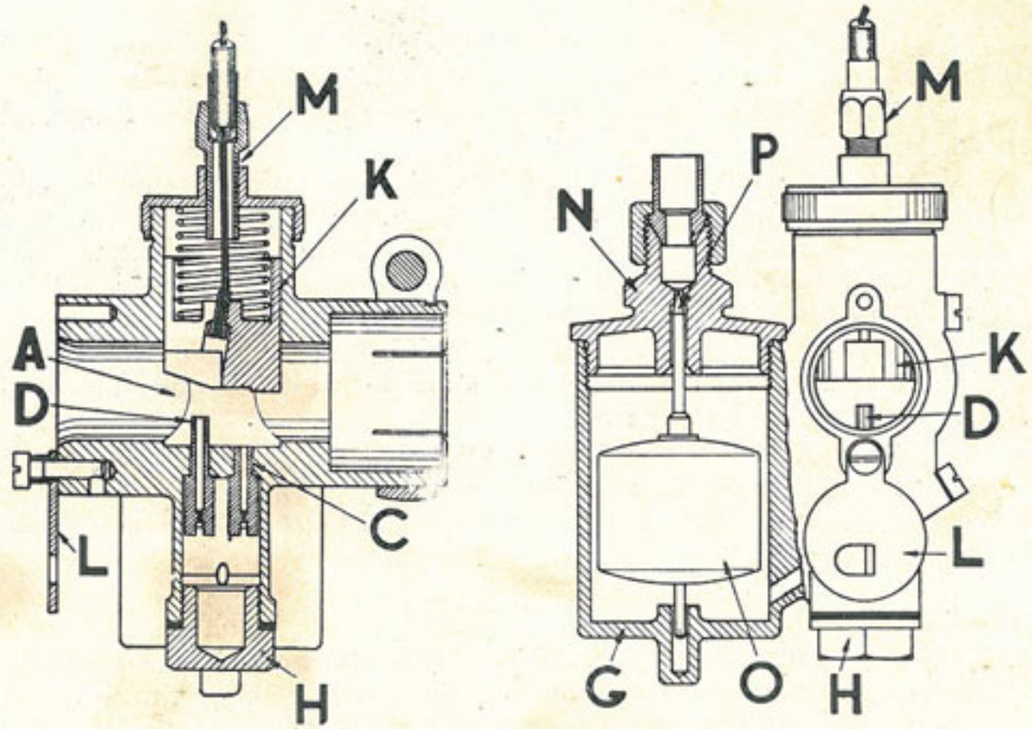
Imagine the Throttle Valve K very slightly open. As the piston descends, a partial vacuum is created in the carburetter, causing a rush

of air through the through-way A, and drawing fuel from the Pilot Jet C. The Pilot Jet, being situated immediately beneath the base of the throttle valve, is subjected to a heavy depression, so as to obtain the necessary mixture for "Idling" and small loads.

In the case of the Main Jet D, which is the longer of the two, and situated near the carburetter air intake, at the small throttle openings it is inoperative, and the mixture is governed entirely by the size of the Pilot Jet.

The Throttle K being almost closed, it will be seen that the Pilot Jet C is situated in an extremely restricted area. In consequence, the passage of the air from the main through-way will be restricted, and at the same time a high depression will exist on the Pilot C. At this position of the throttle, it will readily be seen that not only is the Main Jet D standing higher, and shrouded by the throttle valve, but also the area of the mixing chamber in which it is housed is infinitely bigger than the area of the through-way exposed to the suction of the engine, in consequence of which no fuel is drawn from the main jet.

As the Throttle K is raised, the area immediately above the Pilot Jet C is increased, and in consequence the suction or depression on this jet diminishes, and at the same time increases on the main jet, so a balance between the two jets is obtained throughout the whole range.



Section through Jet Chamber showing position of Jets.

A—Air Intake.
C—Pilot Jet.
D—Main Jet.
G—Float Chamber.
H—Jet Plug.
K—Throttle.
L—Strangler.
M—Throttle Adj. Screw.
N—Float Chamber Lid.
O—Float.
P—Float Needle.

Illustration No. 21.

TUNING THE CARBURETTER.

There are three ways in which the quality of the mixture can be varied and these are given hereunder in the order in which the adjustments should be made:—

1. Main Jet (affects the mixture from $\frac{5}{8}$ to full throttle).
2. Pilot Jet (affects the mixture from closed to $\frac{1}{4}$ throttle).
3. Throttle Valve Cutaway (affects the mixture from $\frac{1}{4}$ to $\frac{5}{8}$ throttle).

The following diagram clearly indicates the part of the throttle range over which each adjustment is effective.

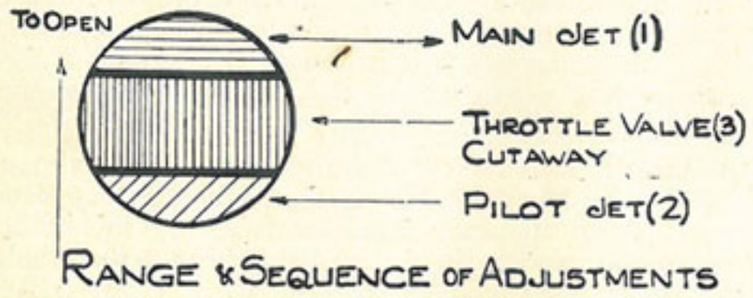


Illustration No. 22.

1. MAIN JET. Fit the smallest size main jet which gives maximum speed.

2. PILOT JET. This affects "slow running" and slow pulling only, and the smallest size should be selected which gives the best "Idling." At the same time, care must be taken not to reduce the size of the Pilot Jet unduly, otherwise difficulty will be experienced in obtaining a correct blend with the Main Jet.

BLEND OF MAIN AND PILOT. If any trouble is experienced due to a weak spot between the Pilot and Main Jet, it can usually be cured by increasing Pilot Jet one size

3. THROTTLE VALVE CUT-AWAY. Richness at $\frac{3}{8}$ to $\frac{5}{8}$ throttle can be rectified by fitting a larger "Cut-away" Throttle Valve. The standard cut-aways are from "O", with its flat bottom, to No. 5, which is cut away $\frac{5}{16}$in.

STARTING UP.

With a COLD ENGINE, depress the carburetter tickler, close air strangler, open throttle about one-eighth, ignition about three-quarter advanced, when if the ignition system is in good order no difficulty should be experienced in obtaining an "easy start."

With a WARM ENGINE it is unnecessary to flood carburetter, but the air strangler on the air filter should be closed, and opened again after starting.

If the float chamber is unduly flooded, excessive richness of mixture will prevent the engine starting. Open strangler and throttle fully and revolve engine smartly until excess of fuel is exhausted, then proceed as before, without again flooding.

CARBURETTERS.

GENERAL TUNING HINTS for Models 36, 40, 46, 70, 76 and 80.

1. Carburetter faults are either due to too RICH or too WEAK a mixture, and before they can be corrected, it must be known WHICH is the cause and at WHAT throttle position.

2. A WEAK MIXTURE is discovered when the closing of the air valve makes the engine run better. Other indications are spitting in the carburetter, overheating at speed, knocking, on hills engine goes better when throttle is closed down a little. When idling look for air leaks in the induction system and worn inlet valve guide.

3. A RICH MIXTURE causes 8 stroking, sooty plugs, smoky exhaust, lumpy running, or excessive blow back spray. Richness when idling is discovered if the petrol is turned off and the engine goes faster for a time as the level lowers.

4. TUNING PROCEDURE:—
   - 1st. Correct the idling on the pilot jet by adjusting the air screw with engine warm and air control wide open.
   - 2nd. Fit the smallest main jet that will give power at full throttle.
   - 3rd. Adjust the throttle needle a $\frac{1}{16}$th of an inch at a time into the most extended position permissable for good acceleration and correct mixture—at throttle positions from one-eighth to three-quarter open. To alter the needle position —pull out sideways the flat spring which is split to grip the needle in a groove.

5. STARVING at full throttle (weak mixture). If a bigger main jet does not improve matters, look for obstructions in petrol pipe and tap or in the passages leading to the jets; beware of air locks in petrol pipe.

6. FLOODING (causing richness and bad consumption) may be due to a bent needle, leaky float, worn needle valve head, but most often is due to impurities getting on to the needle seating. Clean out carburetter and petrol pipe, and see that the air vent hole is clear in the float chamber lid.

7. LACK OF POWER. If engine pulls better at less than full throttle, and there is no restriction of petrol feed, fit a larger main jet.

8. ACCELERATION when progressively opening the throttle. If the main jet gives good power and the acceleration is poor—raise the needle one groove.

9. SPITTING in carburetter (also "pinking" knocking) shows weakness. Find out what throttle position and enrichen the mixture in that phase. Check faults, paragraph 2.

10. BAD CONSUMPTION. Check for flooding and tune as paragraph 4 for economy. The needle-jet may have worn large and so destroyed the restriction of the needle, causing richness at small throttle openings not curable by lowering the needle. Remedy. Purchase a new needle-jet and possibly a new needle.

11. DIFFICULT STARTING. Back firing is not due to the carburetter, assuming the idling is good. Good starting from cold is effected by opening the throttle a little only, the air valve closed and the float chamber flooded. Also try closing both air and throttle first and kick over three times, then proceed as recommended. If continued "kicking"

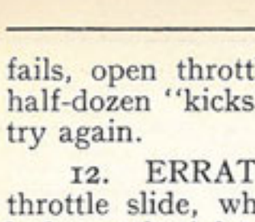
fails, open throttle wide, open air valve, don't flood again and give half-dozen "kicks" and if engine does not fire, close down as at first and try again.

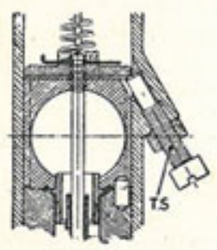
12. ERRATIC SLOW RUNNING may be due to a badly worn throttle slide, which must be replaced—to a choked pilot jet—to air leaks up the inlet valve stem where a new guide or possibly a new valve is required to remedy the defect. These remarks assume that the engine and ignition is in good order.

13. BLUEING OF EXHAUST PIPE may be due to driving with retarded ignition or to over-heating which might be caused by a weak mixture from the main jet.

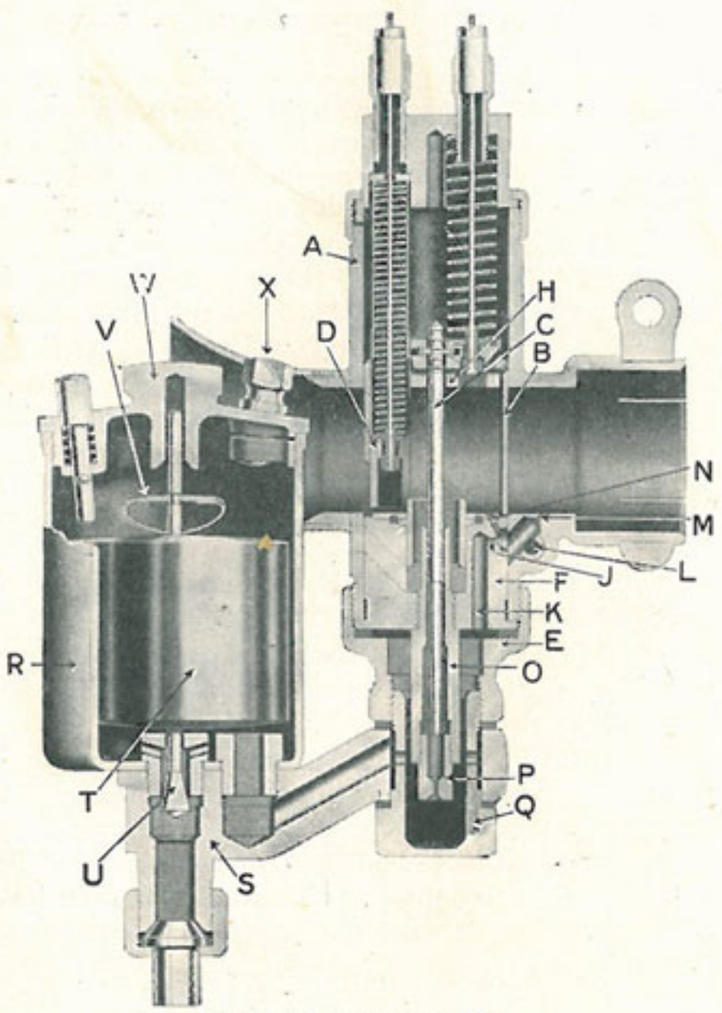
14. CARBURETTER SETTINGS, as a basis to start tuning on:- Refer to page 37.

CARBURETTERS—NEEDLE TYPE
(Fitted to Models 36, 40, 46, 70, 76 and 80).





TS—THROTTLE STOP



AMAL CABURETTER.
Needle Jet Type.
(Section View).
Illustration No. 23.

The Amal Needle-Jet Carburetter in Section.

A–Carburetter Body or Mixing Chamber.
B–Throttle Valve.
C–Taper Needle and Clip.
D–Air Valve. This passes through the Throttle Valve and is independently operated. It also serves the purpose of obstructing the main air passage for starting and mixture regulation.
E–Union Nut.
F–Jet Block–connected to Mixing Chamber by Union Nut E. Fibre washer interposed between, to ensure petrol-tight joint.
H–Adaptor Body on upper part of Jet Block.
J–Pilot Jet integral with Jet Block.
K–Passage to Pilot Jet.
L—Adjustable Pilot Air Inlet.
M–Pilot Outlet.
N–By-pass.
O–Needle-jet screwed into underside of Jet Block.
P–Main Jet.
Q–Jet Plug bolting Mixing Chamber and Float Chamber together. When this plug is removed, the main Jet "P" and the needle-jet "O" can be dismantled.
R–Float Chamber.
S–Float Chamber Platform.
T–Float.
T.S.–Throttle Stop.
U–Needle Valve.
V–Needle Valve Clip.
W–Float Chamber Cover.
X–Float Chamber Lock Screw.

THE AMAL NEEDLE JET CARBURETTER (How it Works).

The petrol tap having been turned on, petrol will flow past the Needle Valve U, until the quantity of petrol in the Chamber R is sufficient to raise the Float T, when the Needle Valve U will prevent a further supply entering the Float Chamber.

The action of the Float can readily be understood, for, as the quantity of fuel in the Float Chamber is used, the Float T will drop, carrying with it the Needle U, and admitting a further supply. Thus, automatically, the petrol level is kept constant. No alteration should be made to our standard petrol level.

The float chamber having filled to its correct level, fuel passes along the passages, through the holes in the Jet Plug Q, when it will be in communication with the Main Jet P, and the Pilot Feed Hole K; the level in these jets being, obviously, the same as that maintained in the Float Chamber.

Imagine the Throttle Valve B very slightly open. As the piston descends, a partial vacuum is created in the carburetter, causing a rush of air through the Pilot Air Hole L and drawing fuel from the Pilot Jet J. The mixture of air and fuel is admitted to the engine through the Pilot Outlet M. The quantity of mixture capable of being passed through the Pilot Outlet M is insufficient to run the engine. This mixture also carries excess of fuel. Consequently, before a combustible mixture is admitted, Throttle Valve B must be slightly raised, admitting a further supply of air from the main air intake.

The further the Throttle Valve is open the less will be the depression on the Outlet M, but in turn a higher depression will be created on the By-Pass N, and the Pilot mixture will flow from this passage as well as from Outlet M.

The mixture provided by the Pilot and By-Pass system is supplemented at approximately $\frac{1}{8}$ throttle by fuel from the main jet system, the Throttle Valve cut-away governing the mixture strength from here to $\frac{1}{4}$ throttle. Proceeding up the throttle range, mixture control by the position of the needle takes place from $\frac{1}{4}$ to $\frac{3}{4}$ throttle, and thereafter the Main Jet is the only regulation.

The four holes seen in barrel of the carburetter are primary air holes giving a permanent air supply to the main jet. The Air-Valve D which is cable-operated on the Two Cable Control Carburetter and Hand-operated on the Single Cable Control Carburetter, has the effect of obstructing the main through-way, and, in consequence, increasing the depression on the Main Jet, enriching the mixture.

TUNING THE AMAL NEEDLE JET CARBURETTER.

There are four ways in which the quality of the mixture supplied by an AMAL Carburetter can be varied, and these are given hereunder, in the order in which the adjustments would be made:—

1. Main Jet ($\frac{3}{4}$ to full throttle).
2. Pilot Air Adjustment (Closed in $\frac{1}{8}$ throttle).
3. Throttle Valve cut-away on the air intake side ($\frac{1}{8}$ to $\frac{1}{4}$ throttle).
4. Needle position ($\frac{1}{4}$ to $\frac{3}{4}$ throttle).

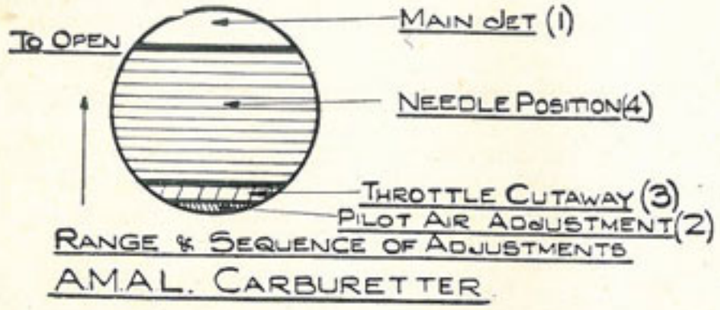


Illustration No. 24.

This diagram clearly indicates the part of the throttle range over which each adjustment is effective. The carburetter having been carefully fitted, the general tuning can be carried out. The following sequence must be observed.

1. OBTAIN MAIN JET SIZE by selecting the smallest size jet which gives the maximum speed at full throttle. If the machine is to be used for speed work a rather large main jet should be used.

2. PILOT ADJUSTMENT.
   TO WEAKEN SLOW RUNNING MIXTURE screw pilot air adjuster outwards.
   TO ENRICH SLOW RUNNING MIXTURE screw pilot air adjuster inwards.

Screw pilot air adjuster home in a clockwise direction. Place gear lever in "neutral."

Slightly flood float chamber by gently depressing the tickler until fuel can be observed overflowing from the mixing chamber.

Set magneto half advanced, throttle approximately $\frac{1}{8}$ open, close air lever, start the engine and warm up.

After warming up, reduce the engine revolutions by gently closing the throttle (note the throttle stop T.S. may require adjusting). The slow running mixture will prove too rich, unless air leaks are present.

Very gradually unscrew the pilot air adjuster.

The engine speed will increase and must be again reduced by gently closing the throttle on the throttle stop until, by combination of throttle positions, and air adjustments, the desired "idling" is secured.

It is sometime necessary to retard fully the magneto before good "idling" results.

If it is not desired to have the throttle set to the stop for "idling" the screw can be further screwed out to allow the throttle to shut off. Remember to lock the nut when setting the screw.

3. THROTTLE VALVE CUT-AWAY. This is determined at the works, but if excessive spitting should obtain just as the throttle is opened a little and it cannot be cured by enriching the pilot mixture—then a throttle valve with a smaller cut-away can be fitted.

4. NEEDLE POSITION. This has a definite effect upon the acceleration and the consumption because the "needle position" is one in which most driving is done.

Keep the needle position as low as possible.

If the consumption is heavy or the running heavy at about half throttle try lowering the needle groove by groove until the mixture is too weak to give good acceleration—then come up one groove.

Alternatively, if the acceleration is too poor and the mixture weak, and tends to spit, raise the needle by one groove at a time until the desired result is obtained.

If when a machine is several years old and the needle has had to be lowered to the extreme, viz., the spring clip in the top groove No. 1, it is an indication that the needle jet has worn large and must be replaced. Needle positions are counted from the top of the needle, and the groove nearest the top is No. 1.

List of Recommended K.L.G. Plugs.

We recommend that all replacements be of K.L.G. make and of the type as set out in the list below. The plugs recommended are the latest type which have just been passed as being the most suitable and up-to-date ones for New Imperial engines.

			18 m.m.	14 m.m.
Model 23	150 c.c.	...	K.1	831
Model 30	250 c.c.	...	K.1	831
Model 36	250 c.c.	...	K.1	831
Model 40	350 c.c.	...	K.1	831
Model 46	350 c.c.	...	K.1	831
Model 70	500 c.c.	...	—	831
Model 76	500 c.c.	...	—	831
Model 80	550 c.c.	...	K.1	—

SPARKING PLUGS.—GENERAL HINTS.

Gap-setting.—Type K.1 or Type 831. The gaps of these plugs are set at fifteen to eighteen thousandths of an inch (.015"—.018") and they should be maintained at this distance to ensure even running.

Gap-setting.—Types L.583, L.268, L.246. These plugs are set with gaps at .012"—.015". In the case of types L.583, L.268 and L.246 which are of three-piece construction with single earth points the centre electrode should be turned and held in position to the correct gap, then tightened up by the gland nut.

Cleaning. After the first thousand miles, including the "running-in" period, it may be necessary to clean the sparking plugs because when an excess of oil is used it causes a deposit of carbon on the internal insulation of the plug. After the initial cleaning and re-adjustment of the gap setting it should then only be necessary for periodic inspection and cleaning to be undertaken.

SYMPTOMS OF MINOR PLUG TROUBLES.

Misfiring, especially at high speeds and under heavy pulling at lower speeds, invariably indicates that the gap setting of the plugs is too wide, whilst erratic slow running can be accounted for by too narrow a gap setting. Excessive flooding of the carburetter or an over rich mixture will have a detrimental effect on the plug, resulting in, or ultimately leading to, trouble in the form of an excess deposit of soot on the internal insulation and a consequent "short" inside the plug. Faulty high tension cables from the distributor to the sparking plug terminal and the distributor points being out of adjustment can also account for the plugs misfiring. Sparking plug trouble frequently reflects some other fault or failure of the ignition or carburation system.

The booklet, "The Care and Maintenance of K.L.G. Plugs," issued with each new machine, should be retained for reference. Any information concerning K.L.G.'s, particularly for racing or competition work, is readily available on request of the Technical Department of K.L.G. Sparking Plugs Limited, Putney Vale, London, S.W.15.

METHOD OF CLEANING.

To clean plug first remove from the engine and then dismantle. All "K.L.G." plugs are detachable and they are either of 2 or 3 piece construction. In the two-piece types the gland nut is integral with the centre electrode and on **no account must any attempt be made to separate this gland nut from the insulation.** In the three-piece types the gland nut is a separate unit which is immediately apparent as the plug is loosened.

Illustration No. 25.
(Obtainable from the Works.)

The procedure for cleaning both the two and three-piece types is identical. The insulated centre electrode must be removed from the plug body by unscrewing the gland nut. This is best accomplished with the K.L.G. Combined Detacher and Plug Box Spanner as illustrated, which sells at 5/6, or alternatively the plug should be inverted and held in a vice by the gland nut hexagon. This will permit the box spanner of a suitable size to be used on the hexagon of the plug body.

When the gland nut is unscrewed, the centre electrode may then be withdrawn. The lower mica insulation should now be carefully wiped with a rag soaked in petrol. If any carbon deposit is caked so hard on to the insulation that the application of a rag soaked in petrol will not remove it, the centre electrode should be left steeped in petrol, when after an hour or so it will be found that the carbon deposit can be easily dispersed.

The mica insulation should then be polished with a dry rag until the mica attains a high polish, in which condition it offers the greatest resistance to an accumulation of soot, oil or carbon.

Whilst it is permissable to scrape the actual firing point with a knife or small file, **an abrasive must not be used on the mica insulation in any circumstances whatever.**

The body should now receive attention. The inside of the body should be well scraped out with either a penknife or small file and the earth points cleaned with a wire brush, finally washing out the body in petrol and then drying it.

To re-assemble, verify that the internal washer is in place before inserting the electrode. Having tightened the gland nut to secure gas tightness, the earth point or points (according to whether the plug is fitted with one or three points) should then be re-set to fifteen to eighteen thousandths of an inch (.015"—.018"). This will probably necessitate bending each earth point towards the firing point of the centre electrode, or if the gap is too narrow, prising the earth points outwards. **The centre electrode must not be levered towards the earth points.**

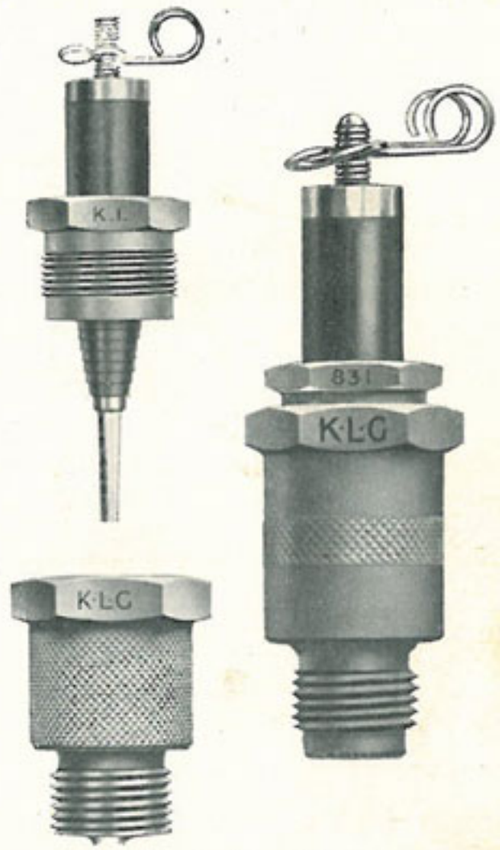


Illustration No. 26.

If the external washer has been completely flattened or is cracked or broken it is advisable to replace with a new one.

OIL PUMPS.—Models 23, 30, 36, 40, 46, and 80.

PILGRIM SIGHT FEED PUMPS.—These Pumps are set before leaving the Works, and should require no further adjustment; however, a regulating screw is provided to control the flow of oil. This screw is found on the side of the Pump nearest to the kick starter pedal (see Illustration No. 27). To decrease the supply of oil slacken the locknut in an anti-clockwise direction, and turn the regulating screw in a clockwise direction. To increase the flow of oil turn the screw in an anti-clockwise direction. When adjustment is complete the locknut **must** be tightened securely. IN THE EVENT OF A PUMP CEASING TO FUNCTION, examine the oil level in the sump and replenish if necessary. If, however, the oil level is correct, remove oil pipes and see that they are clear of any obstruction, also that the nipples are securely soldered. If this does not effect a cure the Pump should be returned to the Works for examination. ON NO ACCOUNT should the machine be ridden if the Pump ceases to work, as without oil the engine will be totally wrecked.

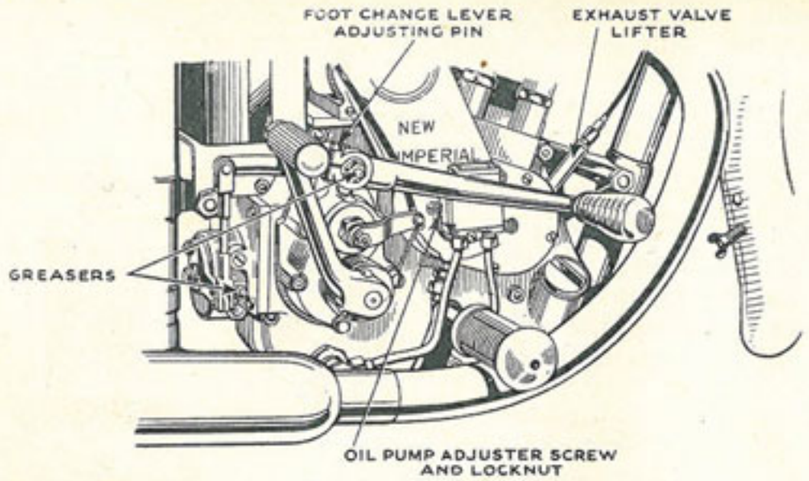


Illustration No. 27.

PILGRIM DUPLEX OIL PUMP (Models 70 and 76).

This Pump is constructed so that both supplies of oil can be seen through the windows fitted in the top. The main pump passes through the sight feed chamber on the outside of the pump, and the secondary pump for the lubrication of the rockers passes through the sight feed chamber nearest to the cylinder. The supply of oil to the main chamber should not be cut down from the setting given by the works, as although an enormous amount of oil is passed through to the engine and gearbox this is not being wasted, as it is continually returned to the sump. The secondary pump may require adjustment according to the conditions under which the engine is being used, and according to the temperature prevailing at the time. However, the rocker gear only requires a small amount of oil and the feed, therefore, should be kept as low as possible, the approximate supply being four spots of oil per minute.

CLUTCH, SINGLE PLATE TYPE. Model 23.

Renewal of Clutch Linings. As the cork linings are continually running in oil, they are practically indestructible, however, when the time comes for replacement, they may be changed in the following manner. Remove the front of the primary drive cover, then unscrew the six clutch spring cover pins and also the large hexagon clutch spring adjuster nut, in an anti-clockwise direction, withdraw clutch front plate.

To save time and trouble of retiming the ignition, great care must be taken not to move either the engine or dynamo pinions when the clutch gear wheel is removed.

The journal ball bearing which is situate in the centre of the clutch gear wheel is made a tight press fit, and should on no account be removed from the gear wheel. The centre portion of this journal bearing should slide quite freely on the splined centre of the clutch back plate, allowing it to be withdrawn complete with the gear wheel. Place new corks in position and carefully slide gear wheel back again, re-assemble remaining parts in the reverse order in which they were dismantled. To facilitate the fitting of the spring, unscrew the clutch nut, by means of the slot, in an anti-clockwise direction until it is possible to start the clutch spring adjusting nut on the threads with the fingers—the whole then being locked up solid in a clockwise direction. (See Illustration No. 28.)

The clutch back plate should not be taken off except by a skilled mechanic, as there is an oil spinner washer driven by two steel pegs at the back of this plate; these pegs must fit correctly in the oil spinner otherwise serious damage to the primary drive cover will result.

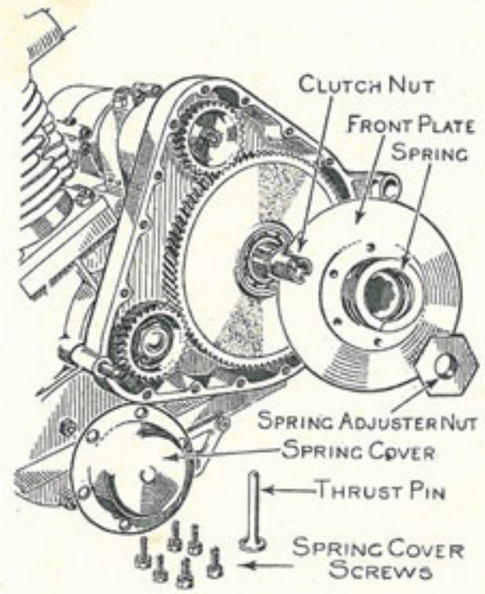


Illustration No. 28.

MULTI-PLATE CLUTCH.—Models 30, 36, 40, and 46.

These clutches consist of two Ferodo discs and two plates fitted with Ferodo inserts. (For details, see Illustration No. 29.)

The order of assembly of plates and Ferodos are as follows:—

One Ferodo disc behind the gear wheel and one in front; next a dished splined plate with the dished side outwards, then a Ferodo insert plate, now a flat splined plate, then another Ferodo insert plate, and another dished splined plate with the dished side inwards, finally the front plate which carries the six clutch spring cups, springs and pins.

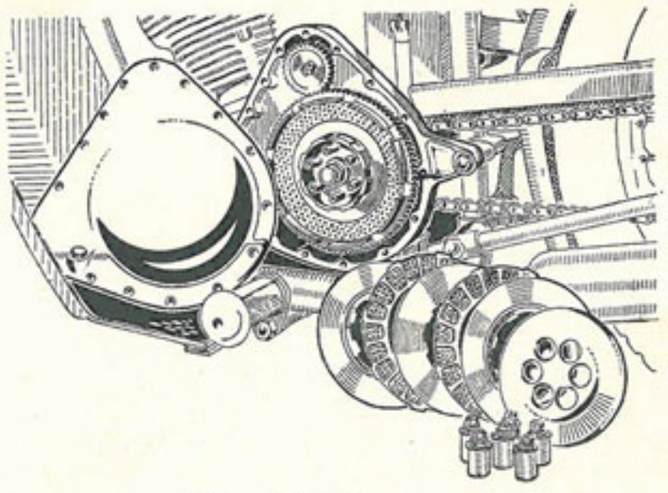


Illustration No. 29.

The clutch centre back plate with the gear wheel and rollers should not be taken off except by a skilled mechanic, as there is an oil spinner washer driven by the six back plate studs nuts at the back of this plate. These nuts must register correctly in the oil spinner wheel otherwise serious damage to the primary drive cover will result.

CLUTCH MATERIAL AND SIZES.

Recommended Material—Ferodo R.A.D.5.

Clutch Rings (2 per set) $5\frac{15}{16}$" O.D. × $4\frac{1}{4}$" I.D. × 3/32" thick.
Clutch Inserts (20 per plate) .755 to .750 × .700 to .695 × .450 to .445 × $\frac{1}{4}$" thick.

MULTI-PLATE CLUTCH.—Models 70, 76 and 80.

These clutches are of multi-plate type and run in oil and contain four plates fitted with Ferodo inserts. This type of clutch is capable of transmitting heavy loads without slipping, and is indestructible. (For details see Illustration No. 30.)

The order of assembly of plates and Ferodo insert plates is as follows:—First a Ferodo insert plate, then a dished plate with the dished side outwards, next a Ferodo insert plate followed by a dished plate with the dished side inwards, then a Ferodo insert plate, followed by a dished plate with the dished side inwards, followed by a dished plate with the dished side again inwards (see illustration No. 30)

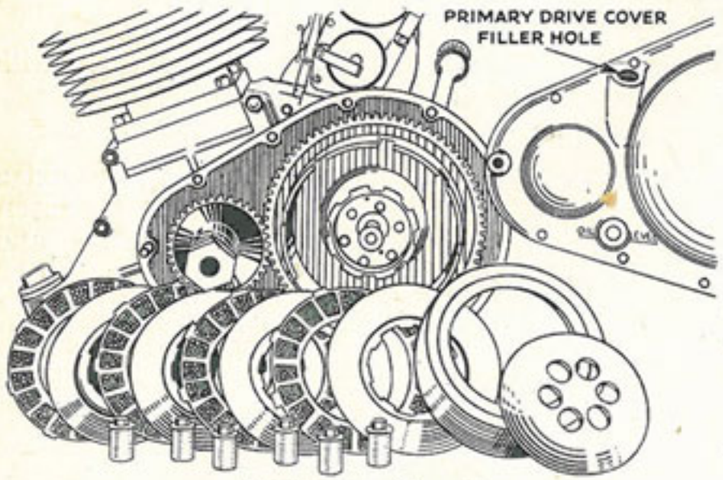


Illustration No. 30.

After the plates are re-assembled a cover is slipped completely over the clutch, lastly fit the front plate which carries the six clutch spring cups, springs and pins.

CLUTCH MATERIAL AND SIZES.

Recommended Material—Ferodo R.A.D.5.

Clutch Inserts (20 per plate) .755 to .750 × .700 to .695 × .450 to .445 × $\frac{1}{4}$" thick.

GEAR CONTROL.—Hand Change.

In order to make gear changing as easy as possible, where the gears are hand controlled, the gear lever should be removed completely from the tank and the pivot thoroughly cleaned and greased. This should be done regularly, once a month during the winter season and about twice only during the summer.

GEAR CONTROL.—Foot Change (External pattern).

Maintenance. Every three months the foot change mechanism should be thoroughly greased. To grease, remove the centre pin which holds the gear indicator in position. This has a right hand thread and should be undone in an anti-clockwise direction. This done the indicator can be removed from its position on the square shaft and by grasping the kick change lever the whole of the front can be removed. Pack the mechanism well with grease and re-assemble.

Adjustment. It is considered advisable to check the gear adjustment periodically; this is easily done when the front of the foot change is removed for greasing. Before dismantling put the machine into the third gear position. Then remove the top yoke end pin from the gear rod and the front of the foot change, as previously described. To check the adjustment refer to Illustration No. 31. This shows the kick change in third gear, and all adjustments should be carried out in this position.

If the selector arm of the gearbox is not in the correct third gear position, a slight touch up or down will cause the spring loaded internal selected to engage the gear properly. Next attempt to replace the yoke end pin, this should slide into position freely if the hole in the selector arm registers with the holes in the yoke end; if, however, these holes do not register adjust length of gear control rod by first slackening the small lock nut at the top of the rod, adjusting the yoke end up or down until the desired position is found. Re-tighten lock nut and re-fit yoke end pin and split pin.

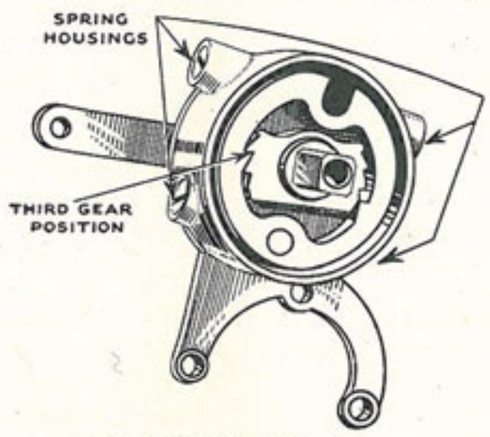


Illustration No. 31.

REPLACEMENT OF SPRINGS.

The foot change lever is returned to its normal central position by means of four coil springs. These springs should be replaced as soon as the change lever shows a tendency to be loose, and does not return to its central position readily.

The springs are held in position by four screwed caps, two at the front of the unit and two at the back; these caps can be seen clearly in Illustration No. 31 and all unscrew in an anti-clockwise direction; when the caps are removed it is possible to withdraw the springs and replace them with new ones.

Please note the two springs at the top are longer than the bottom pair... . .

FOOT CHANGE (Internal Pattern).

Maintenance. The internal foot change is shown in Illustration No. 32. The foot change unit is accurately set when assembled at the Works, and it is impossible for it to get out of adjustment. To keep the mechanism in good order, grease regularly by means of the greaser situated on the side of the foot change unit.

Adjustment of Foot Lever. To raise or lower the foot lever to suit personal requirements, loosen the hexagon headed pin in an anti-clockwise direction. The pin is situated on the lever itself, slide the lever completely off and replace on the desired spline. Then re-tighten the locking pin.

Foot change levers are lubricated by means of the greaser situated in the centre of the rocking shaft. Grease regularly every 1,000 miles.

REPLACEMENT OF SPRINGS.

The foot change lever is returned to its normal central position by means of four coil springs in the foot change unit. These springs should be replaced as soon as the change lever shows a tendency to be loose and does not return readily to its central position. To replace the springs it will be necessary to take off the gear box lid and foot change unit. This is held in position by four bolts which unscrew in an anti-clockwise direction. The springs are held in position by four screwed caps, two at the front of the unit and two at the back. These caps can be seen clearly in Illustration No. 31. The caps unscrew in an anti-clockwise direction and when removed, it is possible to withdraw the springs and replace them with new ones. Please note the two springs at the top are longer than the bottom pair.

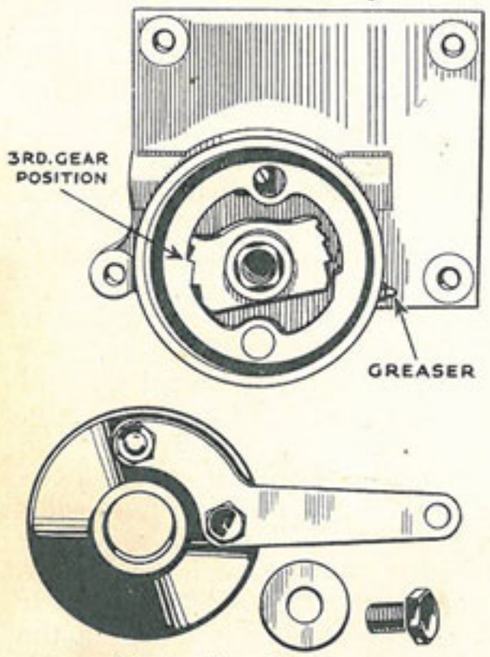


Illustration No. 32.

Care should be taken when the gear box lid and foot change unit are replaced that the internal selector arm engages in the slot at the back of the slut or gear selector.

SPEEDOMETERS (Front Wheel Drive Type).

The speedometer drive is taken from the front hub and is by a gear ring screwed on to the hub, as shown in Illustration No. 17. Should the ring require renewing at any time, it must be remembered that the thread on the hub is left hand, and would, therefore, unscrew in a clockwise direction.

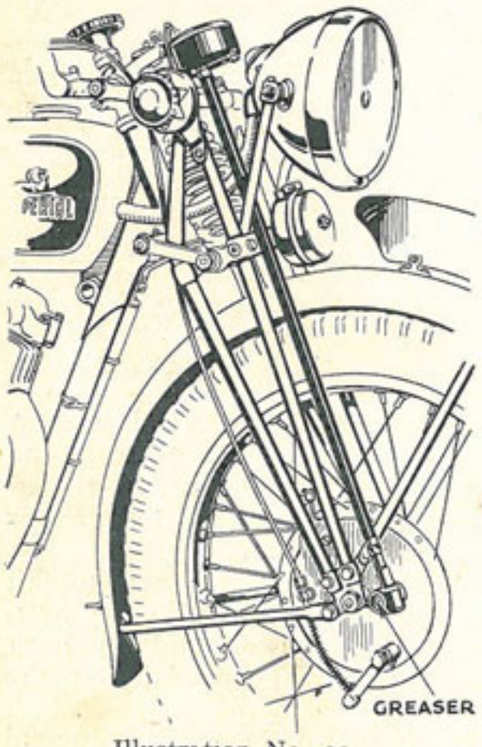


Illustration No. 33.

SPEEDOMETER GEAR BOX.

This gear box is supplied with a grease gun nipple, for greasing purposes. A supply of grease should be forced into the gear box once every three months. Care should be taken not to over-grease, as if this is done the excess will find its way on to the brake shoes, which will affect their efficiency.

SPEEDOMETER CABLE.

Every three months the spring drive should be removed from the rubber outer casing and thoroughly greased. It is most important that the spring drive in the speedometer gear box should receive a supply of grease regularly every three months.

Coil Ignition and Lighting (Models 23, 30 and 40)

MAINTENANCE OF THE LUCAS COIL IGNITION EQUIPMENT.

To ensure the best service from Lucas Dynamo Lighting and Coil Ignition Equipment the most important points are:

Battery.—Inspect the battery regularly every fortnight and keep acid level with the tops of the separators by adding distilled water. **Unless you do this your battery will quickly deteriorate.**

Wiring.—Keep all connections and terminals tight. See that the cables are clear of moving parts.

Replace high-tension (ignition) cable if it becomes worn or perished.

Dynamo.—Keep brushes and commutator clean.

Contact Breaker.—Keep contact breaker clean. If necessary polish the contacts with very fine carborundum stone or fine emery cloth and afterwards wipe with cloth moistened with petrol.

Occasionally check contact breaker gap.

Headlamp.—Focus headlamp after fitting new bulb.

BATTERY.

Topping Up.—The vent plugs in the top of the battery should be removed, and the level of the acid solution examined. If necessary, distilled water (Which can be obtained at all chemists and most garages) should be added to bring the acid level with the top of the separators. When examining the cells, do not hold a naked flame near the vents, as there is a danger of igniting the gas coming from the plates.

Storage.—If the equipment is laid by for several months, the battery must be given a small charge from a separate source of electrical energy about once a fortnight, in order to obviate any permanent sulphation of the plates. In no circumstances must the electrolyte be removed from the battery and the plates allowed to dry, as certain changes take place which result in loss of capacity.

DYNAMO.

The only parts of the Dynamo calling for occasional attention are the brushes and commutator, which are readily accessible when the end cover is removed. The brushes should slide freely in their holders. They should be clean, and the face in contact with the commutator should appear uniformly polished. Dirty brushes may be cleaned with a cloth moistened with petrol. The commutator surface must be kept clean and free from oil or brush dust.

CONTACT BREAKER. (Refer to Illustration No. 34.)

Cleaning.—Occasionally remove the moulded cover and examine the contact breaker; it is important that the contacts "A" are kept clean and free from oil or grease. If they are burned or blackened, clean with very fine carborundum stone or fine emery cloth and afterwards with a cloth moistened with petrol. If the contacts have been allowed to get into bad condition it is advisable to remove the rocker arm "B" from its housing in order to clean them properly. Remove the nut "C" and collar securing the spring, and then lift the rocker arm off its pin. After cleaning, fit the rocker arm, replace the collar and nut, and then check the contact breaker gap.

Adjustment.—The contact breaker gap is carefully set before leaving the Works, and will only need adjustment at very long intervals. To test the contact breaker gap, slowly turn the engine over by hand until the contacts are seen to be fully opened. Now insert a gauge of 8-10 thousandths of an inch thickness in the gap; if it is correct the gauge should be a sliding fit. It is not advisable to alter the setting unless the gap varies considerably from the gauge. If adjustment is necessary, proceed as follows:—

When the contacts are fully opened, slacken the locking screw "D" so that the plate carrying the stationary contact can just be moved by inserting a screwdriver in the slot "E" in the plate. Adjust its position until the gap is set to the thickness of the gauge. Tighten the locking screw and re-check the gap. When replacing the moulded cover, it is essential to see that the hinged spring blade on the contact breaker makes a good contact with the condenser case inside the cover.

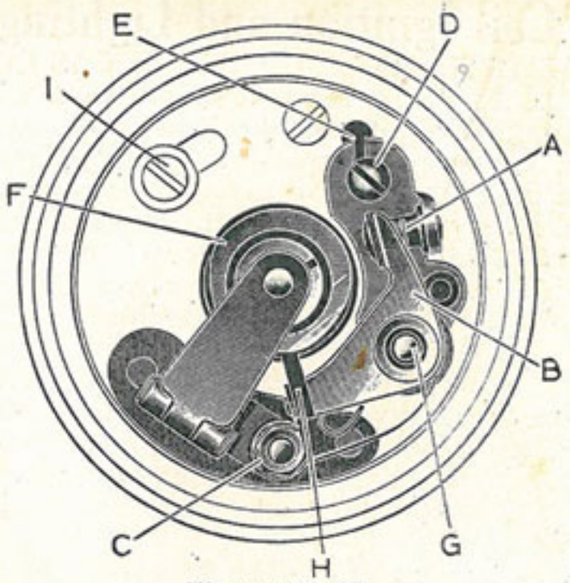


Illustration No. 34.

If the blade does not press firmly against the case, there will be excessive sparking and burning away of the contacts.

Lubrication.—About every 1,000 miles touch the surface of the steel cam "F" with a match previously dipped in oil. Do not give any excess.

Every 5,000 miles, place a single drop of oil on the pivot "G" on which the contact breaker works.

HOW TO REMEDY IGNITION TROUBLES.

If engine will not fire, or misfires, check the following points:—

(1) See that the battery is fully charged.

(2) If battery is O.K. remove contact breaker cover, see that the contacts are closed, and switch on ignition; then intermittently make contact between the condensor case and the aluminium contact breaker housing, at the sime time hold high tension cable ¼ of an inch from cylinder; if sparking occurs then this proves that the coil portion is O.K. and that the misfiring is due to one of the following points, Nos. (3) to (7). If sparking does not occur, see that the small pointed screw in the contact breaker cover makes good contact with the cable from the coil.

(3) Clean plug points and set each gap to 18 thousandths of an inch. (See page 45.)

(4) Another cause of misfiring may be found in the moulded contact breaker cover in which the condensor is housed, owing to the fact that the brass ring on inside edge of cover does not make good contact with the contact breaker housing; clean brass ring and portion of housing into which it fits with fine emery cloth.

(5) Clean contact breaker points and set gap as instructed on page 53, under heading "Contact Breaker, Cleaning and Adjustment."

(6) See that the hinged spring blade on the contact breaker makes good contact with the condensor case inside the cover.

(7) See that fibre pad marked "H" on view of contact breaker (see above) is firmly riveted to rocker arm "B."

(8) Examine high tension cable from coil to sparking plug and see that it is not damaged, perished or broken.

(9) See that terminals on coil do not touch frame.

(10) If after checking all the above points misfiring still persists, please write to the Works or visit the nearest Lucas Service Station. A booklet No. 175, issued by Messrs. Joseph Lucas Ltd., contains a wiring diagram and full instructions.

The switch should be left in the "C" position for about 1 hour daily. This time should only be increased if the period of night running is considerable, or when the battery is found to be in a low state of charge (if the specific gravity of the acid solution is 1.210 or below).

The battery must never be left in a fully discharged condition and unless some long runs are to be taken, it is advisable to have the battery removed from the machine and charged up from an independent electrical supply.

Magneto.—Keep contact breaker clean. If necessary, polish the contacts with very fine carborundum stone or fine emery cloth and afterwards wipe with cloth moistened with petrol.

Occasionally check contact breaker opening (using gauge on magneto spanner).

Adjustment of the Contact Breaker.—The contacts only need adjustment at long intervals, and unless the gap varies considerably from the gauge (12 thousandths) the owner is warned that it is not desirable to alter the setting. To adjust, turn the engine slowly by hand until the points are seen to be fully opened. Then slacken the locking nut and rotate the contacts screw by its hexagon head until the gap is set to the gauge on the magneto spanner. After the adjustment tighten the locking nut.

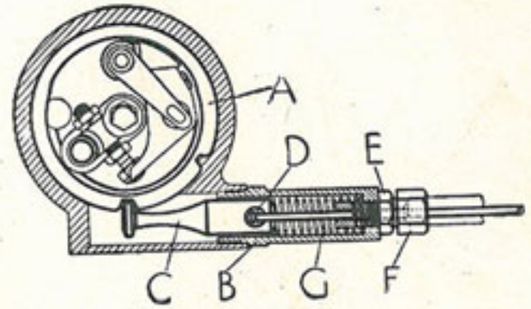


Illustration No. 36.

SECTION OF SPRING CONTROL.

A—Cam. D—Locating hole for nipple.
B—Cable casing. E—Locknut. G—Spring.
C—Plunger. F—Cable stop.

High Tension Cable.—Replace high tension cable if it becomes worn or perished.

HEADLAMPS.

Headlamp Type DU142D.

The lamp front and reflector can be withdrawn for bulb replacement when the fixing clip is pressed back. When re-fitting locate top of rim first.

To remove bulb holder, press back the two securing springs.

The main bulb can be focussed by removing the lamp front and reflector and slackening the clamping screw which secures bulb holder. Move the bulb and holder until the best results are obtained and finally tighten the clamping screw.

Replacement Bulbs.—When the replacement of any bulb is necessary, we strongly recommend that **genuine spare Lucas bulbs** are used. The filaments are arranged to be in focus and give the best results with our reflectors. Particulars of replacement bulbs are as follows:—

REPLACEMENT BULBS.

For	No.	Watts	Remarks
Headlamp (driving and dipped beam lights)	Lucas No. 70	24 & 24	Special double filament gas filled bulb.
Headlamp (Pilot Light) Sidecar Tail and Stop Lamps.	Lucas No. 200	3	Centre contact bulb.

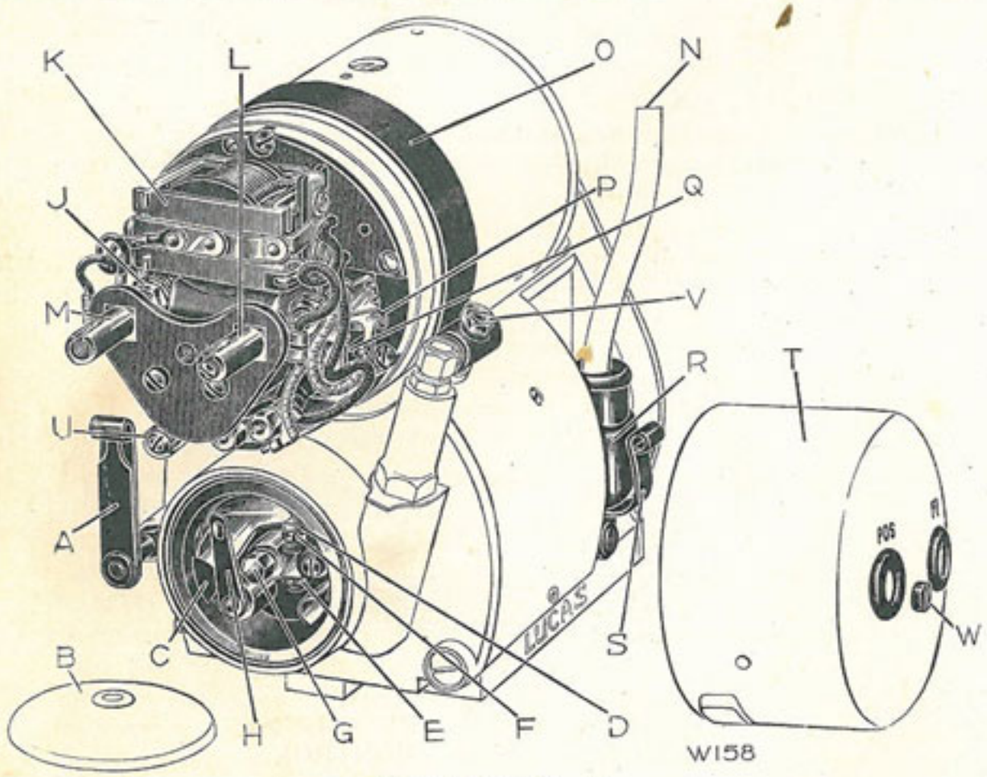


Illustration No. 37.

VIEW OF " MAGDYNO."

Illustration shows a machine arranged for driving in an anti-clockwise direction. With a clockwise machine the positions of the termnals marked + and FI are interchanged, and the control brush box is situated on the opposite side.

A—Securing spring for contact breaker cover.
B—Contact breaker cover.
C—Fibre heel.
D—Contact points.
E—Locking nut.
F—Adjustable contact point.
G—Contact breaker fiixng screw.
H—Locating spring.
J—Nut securing brush eyelet.
K—Cut-out.
L—Cable to headlamp or panel switch terminal marked FI.
M—Cable to headlamp or panel switch terminal marked +.
N—Cable to sparking plug.
O—Dynamo securing strap.
P—Spring lever holding brush in position.
Q—Carbon brush.
R—Pick-up.
S—Securing spring for pick-up.
T—Cover.
U—Earthing terminal.
V—Screw securing dynamo strap.
W—Cover fixing screw.

A Booklet, No. 171, is issued by Messrs. Joseph Lucas Ltd., giving full instructions on the care and maintenance, and contains wiring diagrams; this booklet is supplied with all new machines.

B.T.H. COMBINED IGNITION AND LIGHTING SETS.

Type P.D.M.1 (Clockwise).

MAINTENANCE IN SERVICE.

Very little attention is required to maintain this equipment in first-class condition. Attention must, however, be given to the following:—

Battery.—Examine acid level periodically and where evaporation has occurred, replenish with distilled water. If the acid has been accidentally spilt, fresh acid should be used and not distilled water.

The terminals should not be allowed to become corroded; this can be prevented by smearing them occasionally with vaseline.

Generator and Output.—Every 8,000 to 10,000 miles remove the side plate secured to the central portion of the main housing and examine the brushes and commutator. If the commutator is blackened it should be cleaned by holding against it, through the aperture provided, a piece of fine emery cloth wrapped round a blunt piece of wood and at the same time revolving the armature. The slots in the commutator should also be cleaned out with a pointed piece of wood.

If the brushes are worn down to such an extent as to prevent the controlling springs operating, new brushes should be fitted. It is essential that the correct grade of brush be used, otherwise the commutator may be permanently damaged. Replacements should therefore be obtained from the B.T.H. Co.

Remove the contact breaker cover and examine the contacts. When fully open the gap should be 0.018" and may be adjusted by screwing in, or out, the contact mounted in the centre block of the contact breaker. This contact must be carefully locked with the nut provided after making any adjustment.

If the contact surfaces are pitted they may be levelled with a very fine India stone or fine emery cloth. This operation should be very carefully performed and care taken to clean thoroughly with a dry cloth.

The wick in the contact lever bearing pin should be given one drop of oil every 2,000 or 3,000 miles. Any surplus oil must be removed from the lever in order to prevent oil reaching the contacts. A lubricating pad is provided for the cam and this should be given two drops of oil every 3,000 miles. On no account should more oil be used.

The cut-out is correctly adjusted and set, and should function indefinitely without further attention.

HEAD LAMP—Bulb Replacement and Focussing. Insert bulb in the usual manner, but when the bayonet pins have arrived home, a further twisting force to the right will enable both the bulb and holder to slide either backwards or forwards, and on removal of the extra twisting force the bulb will be securely held in that position. The range of backward and forward movement will be found to be sufficient to cover all variations likely to be met with in standard bulbs.

Cleaning Reflector.—Should reflector be merely dusty, just wipe gently with a Selvyt. Metal polish will only make the surface dull.

SIDE LAMP—Bulb Replacement. See instructions under Head Lamp."

Cleaning Reflector.—See instructions under " Head Lamp."

TAIL LAMP—Bulb Replacement. Remove front, which is fixed by ordinary right-hand threaded screw. Be careful glass does not fall, as it is fitted loose to ensure easy replacement.

Wiring.—Occasionally the wiring should be examined to see that the insulation has not been damaged. Any leads which have been subjected to chafing or have become damaged from any cause should be replaced or suitably bound with insulating tape.

Inspection.—Every possible care is taken by the manufacturers to eliminate any likely cause of trouble, but failure may occur due to lack of attention or damage to wiring and for this reason a periodical inspection of the system, at least once a month, is strongly recommended.

The points itemized below will be of assistance in this respect.

(1) Carefully examine the wiring to see that it is in no way damaged.

(2) See that all connections are tight, particularly where attached to battery, lamps, etc. It is also important that all frame connections should make bright and clean contact with the motor cycle frame.

(3) Check the condition of the battery and add distilled water if necessary.

(4) Remove the side plates of the magneto-generator and inspect the condition of the commutator and brushes. The charging switch should be in the "off" position before any cleaning is done to these parts.

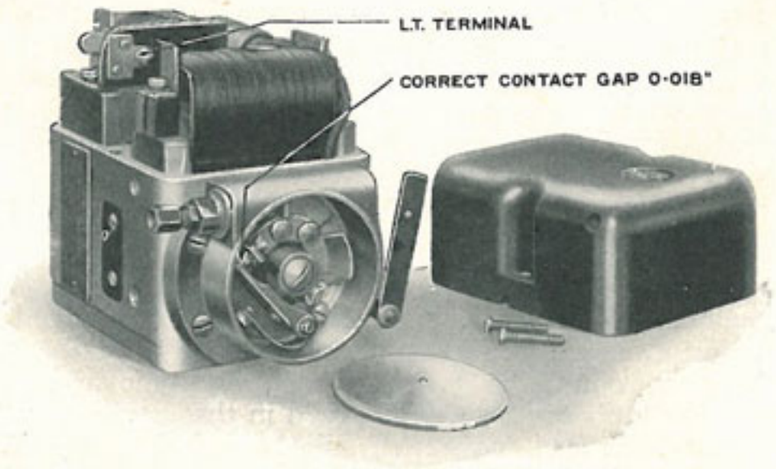


Illustration No. 38.

View of Mag-generator with main cover and contact breaker cover removed. For further information see B.T.H. Booklet No. 1,474, issued by The British Thomson-Houston Co., Ltd., Coventry, England.

Tyres.

Probably more than 90 per cent. of premature tyre failures are due to causes such as neglect or indifference, which are within the control of the user.

Tyres require some care but, in total, the requirements are quite simple.

(1) First, last and all the time, maintain in the tyres the correct inflation pressure. Buy a pressure gauge and use it frequently. (See page 16.)

(2) Do not carry a pillion passenger or heavy luggage on the carrier without increasing the pressure in the back tyre at least 5 lbs. per square inch above the normal.

(3) Avoid unnecessary or "stunt" acceleration and fierce braking—which wear out tyres rapidly by causing wheel slip and which distinguish the bad driver.

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

(5) Drive at a reasonable speed having regard to the road conditions, and do not "blind" over bad roads. The amount of concussion which the tyres can stand is limited.

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

TYRE REMOVAL.

First completely deflate by removing all valve parts, including the inside check mechanism. At a point diametrically opposite the valve, push the cover into the rim base. To remove the first portion, insert two small levers (one about 3 inches each side of the valve position) and gently ease the cover edge over the rim. No force is required to do this, but the edges of the cover opposite the valve must be in the base of the rim. The remainder of the cover will then come off quite easily.

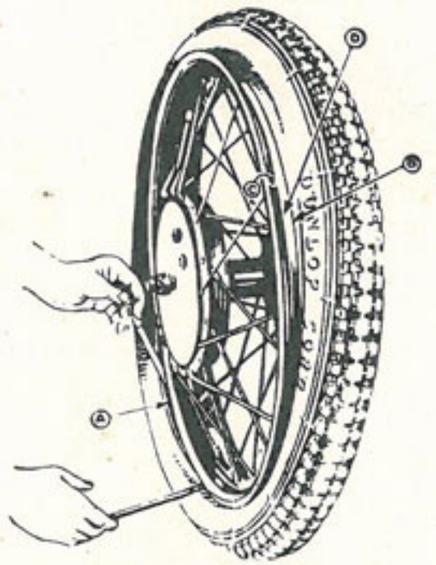


Illustration No. 39.

THE USE OF THE LEVERS.

Particular emphasis must be laid on the fact that the levers are not to be used for the purpose of attempting to stretch any portion of the tyre. As the edges are made of steel wire they will not stretch, but they may be broken.

The whole idea of the well-base is that if the tyre edge is pushed thoroughly into the rim base at one part, the portion diametrically opposite can be lifted over.

Remember that if any force is required, the operation is being performed wrongly.

MAGDYNO CHAIN ADJUSTMENT AND GREASING (Models 36 and 46).

Adjustment.—The Magdyno is held in position by means of two cross-bolts, the head of the rear bolt will be found just under the Magdyno on the right hand side of the machine, and the other bolt head on the opposite side. If these two bolts are loosened in an anti-clockwise direction, it is possible to slide the Magdyno backwards or forwards to tighten or loosen the chain.

The chain is correctly adjusted when there is an up or down movement of $\frac{1}{4}$".

Greasing.—Every thousand miles the Magdyno chain should receive a fresh supply of grease; remove the front of the Magdyno chain cover and rub some grease into the chain, and place a small quantity at the back of the cover, just above the bottom sprocket.

MAGDYNO CHAIN LENGTH AND SIZE. Models 36 and 46.

$\frac{3}{8}$" pitch × $\frac{1}{8}$" × 43 rollers.

MAGDYNOS, COILS, and MAGLITAS, which are gear driven on Models 23, 30, 40, 70, 76 and 80 are not provided with adjustment as this is not required.

IGNITION.

How to re-time Models 23, 30 30 and 40, Gear Drive, Coil, or Maglitas.—Remove the front half of the primary drive cover, next loosen the nut in the centre of the brass pinion, in an anti-clockwise direction, and withdraw the gear wheel from its taper by means of a special extractor (an extractor of suitable type is available from our Stockists or from the Works, and is illustrated on page 99). Remove the sparking plug and set the piston at top dead centre (T.D.C.), then fully retard the ignition control and rotate the armature until the points are just about to break, then lock the brass pinion tightly in position. Now check the timing, and re-assemble the front half of the primary drive cover.

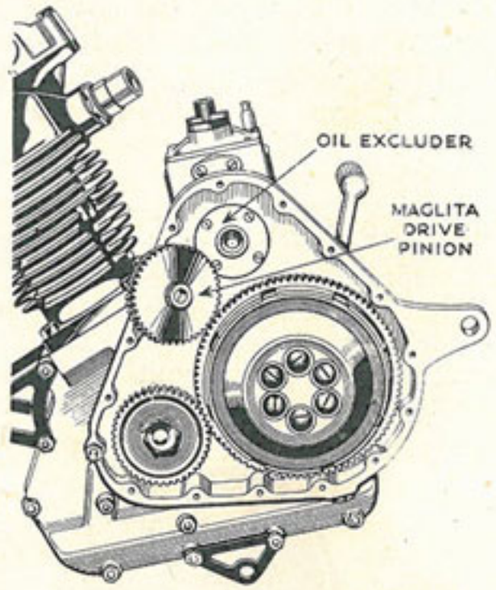


Illustration No. 40.

NOTE.—The Maglita and Coil units are both driven at engine speed so, therefore, it is immaterial which stroke of the engine is used for ignition timing so long as the piston is at T.D.C.; this is the correct position for timing.

IGNITION.—How to re-time on Models 36 and 46.

First remove the front half of the magneto chain cover, then loosen the nut in the centre of the bottom sprocket in an anti-clockwise direction and prise the sprocket off the taper spindle by means of two screwdrivers, placed behind the sprocket. Remove the sparking plug and turn engine over until the piston is at the top of the compression stroke (i.e., when both valves are closed). When the piston is in this position, insert a piece of stiff wire in the plug hole and make a mark on the wire

where it touches the top of the hole. Remove wire and make another mark 12 m/m above it.

Replace the wire and turn the engine backwards—i.e. in an anti-clockwise direction looking at the engine from the primary drive side—until the second mark is reached. Fully advance the ignition control on the handlebar and rotate the magneto until the contact breaker points are just about to break. Then lock the sprocket nut tightly. Check the timing to make sure it is correct before finally replacing the front half of the magneto chain cover.

(NOTE.—12 m/m is just under $\frac{1}{2}$".)

IGNITION.—How to re-time on Models 70, 76 and 80.

First undo oil pipes at the oil pump end, and then completely remove the oil pump. Now detach the front half of the timing cover and loosen the nut in the centre of the top pinion, i.e., the Magdyno Drive Pinion (this pinion can then be withdrawn by means of a special tool obtainable from the Works or our Stockists). Remove the sparking plug and turn the engine over until the piston is at the top of the compression stroke—i.e., the stroke when both valves are closed. When the piston is in this position insert a piece of stiff wire in the plug hole, and make a mark on the wire where it touches the top of the hole. Remove the wire and make another mark 12 m/m above it for Model 70 and 76 O.H.V. engines, or 10 m/m in the case of the Model 80 side valve. Replace the wire and turn the engine backwards—i.e., in an anti-clockwise direction looking at the engine from the primary drive side—until the second mark is reached. Fully advance the ignition control on the handlebar and rotate the Magdyno until the contact breaker points are just about to break, then lock the pinion nut tightly. Check the timing to make sure it is correct before finally replacing the front half of the timing cover and oil pump.

(NOTE.—10 m/m is just over $\frac{3}{8}$". 12 m/m is just under $\frac{1}{2}$".)

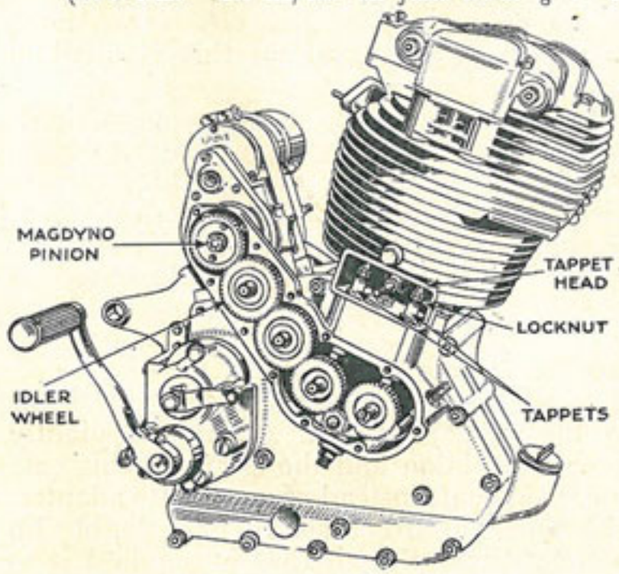


Illustration No. 41.

NOTE.—If the Magdyno drive pinion has not been moved and is tight on the taper—the timing may be set by means of the idler wheel next to the Magdyno drive pinion, this wheel should be removed whilst the timing is set as above, when the correct setting is found, slide the idler wheel into position, taking care that neither the engine nor the Magdyno move as the wheel is replaced.

(See also Illustration No. 41.)

HOW TO TIME VALVES.—Models 23, 30, 36, 40, 70, 76 and 80.

If the owner is not sufficiently skilled to time the valves from our valve timing, which is given on pages 17 to 20, under heading "Useful Information," the following hints will enable the owner to re-time the engine.

First of all remember that the engine runs backwards, i.e., in an anti-clockwise direction when looking at the timing side of the engine. Now engage a gear and with the plug removed bring the piston to within an $\frac{1}{8}$" of the top dead centre (do this by pulling the back wheel round). Now slide the inlet cam wheel into position so that the cam is just about to lift the tappet. Now check that the inlet valve is just about to open 1/32" before top dead centre. Next, with the piston at the top of the same stroke, commence to time the exhaust cam, turn the back wheel so that the piston travels $\frac{1}{8}$" down the cylinder after top dead centre, slide the exhaust cam wheel into position so that the cam is just about to leave the tappet. Finally check the exhaust timing, which should be closing 1/32" after top dead centre. The measurements as set out above have been given so that the cams will slide into position, and it will not be necessary to lift the tappets.

TRANSMISSION SHOCK ABSORBER.—Models 36 and 46.

The shock absorber is mounted on the main engine shaft, and consists of three inclined faces cut on the engine pinion, into which are meshed three inclined faces upon a sleeve, all are free to move longitudinally, but forced to rotate with the engine. A spring (adjustable for tension) keeps this sleeve in contact with the inclined faces on the engine pinion.

To dismantle the shock absorber, first remove the split cotter which locks the spring adjusting nut in position. Then remove the nut in an anti-clockwise direction. On careful examination the two lips on the shock absorber lip washer (which have been knocked down into their locking position) will be seen on top of the shock absorber sleeve nut. These lips must be knocked upright with a chisel. Replace the spring nut and insert a flat bar of steel such as a tyre lever into the slot in the sleeve nut, grip the bar with a movable spanner and lightly tap with a hammer in an anti-clockwise direction. When the sleeve nut has been removed, the pinion and the sleeve can be pulled off. The shock absorber adapter can also be pulled off by hand, as this is fitted in position on parallel splines.

When re-assembling, it is always necessary to fit a new shock absorber lip washer and a split cotter, as the old ones are badly weakened or broken on removal. Re-assemble in the reverse order, taking care to knock the lips on the locking washer well down into the slots provided. To facilitate the refitting of the shock absorber spring, a special tool can be obtained from our Stockists or from the Works, and is Illustrated on page 99.

SHOCK ABSORBER.—Models 70, 76 and 80.

The shock absorber fitted to the above Models is exactly the same in action as the one fitted to the Models 36 and 46, but is slightly different in construction. The engine pinion and the sleeve in this case are carried directly on the engine main shaft instead of a separate adapter. This construction eliminates the shock absorber sleeve nut, double lip washer and the split cotter, and to dismantle, all thas is required is to unscrew the spring nut in an anti-clockwise direction, when the spring and sleeve can be withdrawn.

Should it be necessary to remove the engine pinion, it will be necessary to completely dismantle the clutch, as the primary drive of these machines are double helical gears, and so the engine pinion and the clutch wheel must be removed together.

CLUTCH.—Models 70, 76 and 80.

To Dismantle.—Remove the six spring pins in an anti-clockwise direction and lift out the whole of the clutch plates and the clutch thrust pad, then place the gear lever in bottom gear and unscrew the large nut in the centre of the clutch in an anti-clockwise direction. This nut is held in position by means of a locking plate and pin which must be removed before unscrewing the centre nut, the large nut can usually be unscrewed quite easily by means of a box spanner and a few sharp taps on the tommy bar with a hammer. When the clutch and the shock absorber have been dismantled as described above, the engine pinion and the clutch gear and clutch centre can be pulled off together; these can be withdrawn by hand, no special tools being required.

When the clutch gear has been withdrawn, an oil spinner washer will be seen at the back of the primary drive cover which is held in place by a spring washer. When the clutch is being re-assembled, it is most important that this spinner is fitted correctly. It will be noticed that the spinner is drilled and tapped so that it may be held in position by two special pegs through the clutch centre. These pegs will be supplied from the Works on application. Note, however, that the pegs must be removed after the clutch nut has been securely tightened and locked in position.

CLUTCH PLATES.—Order of Assembly.

The order of assembly of plates and Ferodo insert plates is as follows. First a Ferodo insert plate, then a dished plate with the dished side outwards, next a Ferodo insert plate followed by a dished plate with the dished side inwards, then a Ferodo insert plate, followed by a dished plate with the dished side inwards, and finally another Ferodo insert plate followed by a dished plate with the dished side again inwards.

After the plates are assembled a cover is slipped completely over the clutch, lastly fit the front plate which carries the six clutch spring cups, springs and pins.

GEAR RATIOS.—To vary. Models 36, 46, 70, 76 and 80.

The gear ratios can be varied by the use of different sized rear wheel sprockets. This sprocket which also incorporates the rear brake drum is attached to the hub by means of five pins. It is necessary to remove the back wheel from the machine, and take off the brake outer plate with the shoes before the brake drum pins can be removed. The nuts which position the five brake drum pins are right-hand thread, and therefore unscrew in an anti-clockwise direction.

GEAR RATIOS.—To vary. Models 30 and 40, Cush Drive Hub.

The gear ratios can be varied by the use of different size rear wheel sprockets. The best method is described on page 34, under heading, "Cush Drive—Models 30 and 40."

CHAINS.

HOW TO FIT NEW REAR CHAIN.—All Models.

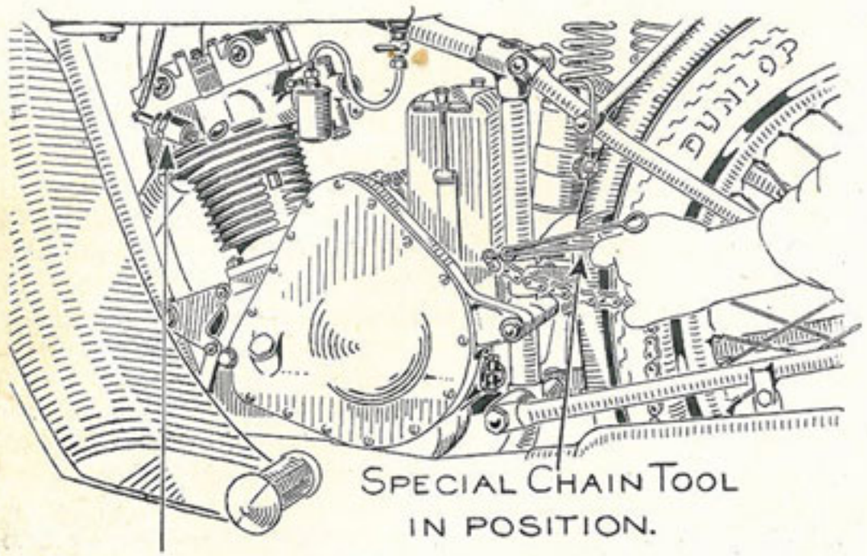
Having procured a chain of the correct length (see pages 17 to 20 for chain sizes and lengths), proceed as follows:—

DO NOT REMOVE OLD CHAIN FIRST, as the correct method of fitting new chain is to connect both together by the spring connecting link and—with the gear in neutral—pull the new chain into position by means of the old one. Should the rear chain be removed from the machine for any purpose, such as cleaning, greasing, etc., the method of replacement is to insert a screwdriver into the chain about two rollers from the end, and by this means push the chain behind the primary drive cover until it comes into contact with the rear drive sprocket, now with bottom gear engaged, turn the engine over by means of the kick starter.

If the chain is held in the correct position by this method, it will catch on the sprocket and be drawn into position.

An inexpensive and highly efficient tool (obtainable from our Stockists or from the Works) and which may be carried in the tool bag, will make the replacement of the chain a very simple matter.

(See also page 100.)



SPECIAL CHAIN TOOL IN POSITION.

NOTE SPARKING PLUG REMOVED.

Illustration No. 42.

Spring Forks.

SPRING FORKS.—Model 23 (Pressed Steel Type).

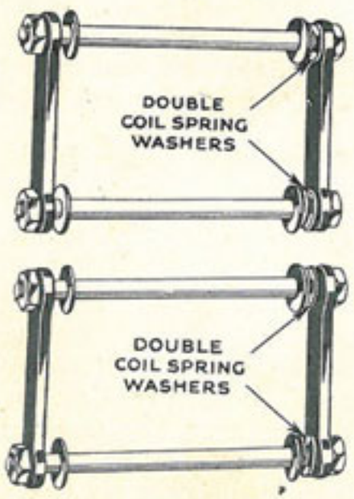


Illustration No. 43.

Providing the forks are greased regularly, they will give long and trouble free service; however, should the spindles require dismantling for cleaning or renewal purposes, proceed as follows. First remove the split cotters and unscrew the two spindle nuts on the top left-hand side of the machine in an anti-clockwise direction. Then place a box just under the front of the crankcase to remove the weight of the machine from the forks. Now the fork link can be pulled off and the spindles withdrawn complete with the right-hand link. Thoroughly clean or replace the spindles and re-assemble. Then proceed in exactly the same manner for the bottom links and spindles. Illustration No. 43 shows the position of the washers, etc., on the spindles. (See also page 14.)

SPRING FORKS.—Model 23 (Girder Type).

Adjustment.—For full description see page 14.

To Dismantle.—In order to remove spindles and links place a box under the front of the crankcase to relieve the weight of the machine for the forks. On these forks one spindle nut will be found on each side of the machine; remove these nuts in an anti-clockwise direction, then unscrew the bolt heads of the spindles in an anti-clockwise direction. The spindles can then be pulled out for cleaning or replacement. Re-assemble and readjust as described on page 14.

SPRING FORKS.—Models 30, 36, 40 and 46 (Double Shock Absorber Type).

Adjustment.—For full description see page 14.

To Dismantle.—Place a box under the front of the crankcase to relieve the weight of the machine from the forks. Then unscrew the two spindle nuts on the top left-hand link in an anti-clockwise direction. Then pull off the link. Remove the two adjusting nuts and pull out the spindles from the opposite side. The procedure for the bottom spindles is exactly the same except that after the link has been removed the shock absorber star washer and the anchor plate must be removed before pulling out the spindles. Clean or replace spindles and re-assemble and re-adjust as described on page 14.

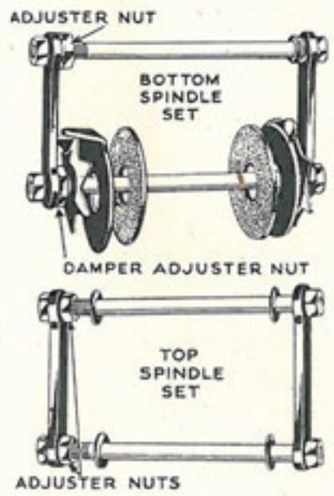


Illustration No. 44.

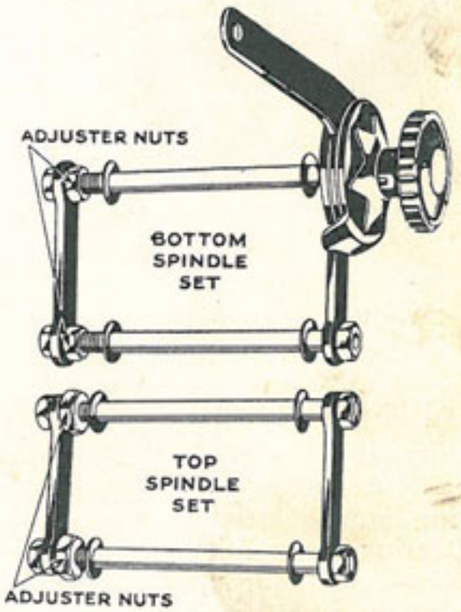


Illustration No. 45.

SPRING FORKS.—Models 30, 36, 40, 46, 70, 76 and 80 (Single Shock Absorber Type).

Adjustment.—For full description see page 14.

To Dismantle.—Place a box under the front of the crankcase to relieve the weight of the machine from the forks. Then unscrew the two spindle nuts on the top left-hand link in an anti-clockwise direction. Then pull off the link. Remove the two adjusting nuts and after having unscrewed the pin which holds the long friction plate to the fork girder tube, in an anti-clockwise direction, the link with the two spindles and the side damper can be withdrawn complete. The bottom fork spindles are removed in the same manner except that there is no friction plate pin to be unscrewed. Spindles can then be cleaned or replaced and the forks re-assembled and re-adjusted as described on page 14.

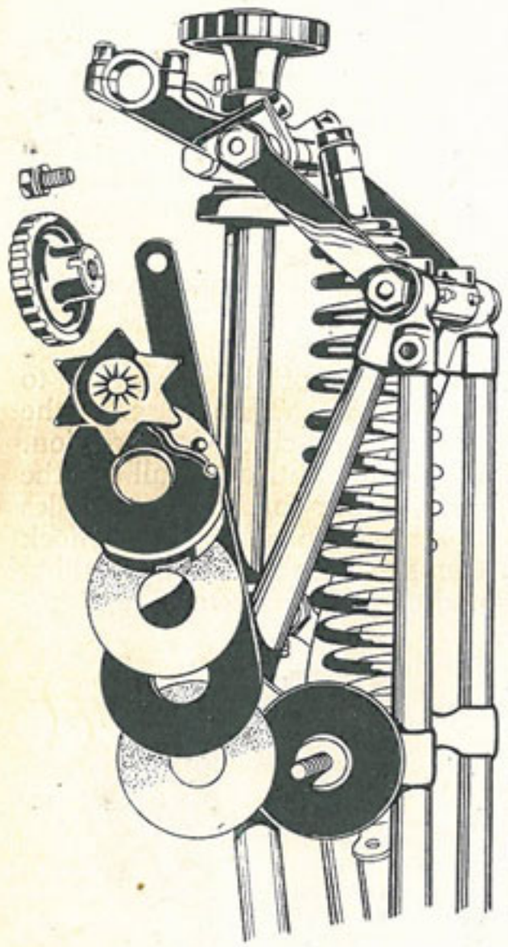


Illustration No. 46.

SHOCK ABSORBER.—Overhaul. Models 30, 36, 40, 46, 70, 76 and 80 (Single Type).

In the centre of the hand adjuster wheel is a small aluminium disc. This disc can be prized out with a screwdriver, in order to expose the two nuts which hold the damper together. These may be undone with a box spanner in an anti-clockwise direction, and the hand adjuster wheel screwed off in the same direction, allowing the damper plates and friction discs to be removed. Replace worn parts and re-assemble in the reverse order.

SPRING FORK STEERING DAMPER.—Models 30, 36, 40, 46, 70, 76 and 80.

The steering damper is controlled by a hand adjuster wheel situated on the top of the fork column. To tighten steering when travelling at high speeds, turn the wheel in a clockwise direction. At normal speeds it will be found unnecessary to damp the steering action, except where a sidecar is fitted to the machine, when a certain amount of damping is always necessary.

STEERING DAMPER.—Overhaul.

Should new friction discs or anchor plates be required the method of fitting is as follows. To dismantle the steering damper, first remove steering damper knob and rod completely, and also the nut which holds the steering damper anchor plate in position on the frame. Next place a box underneath the crankcase and remove the two bottom fork spindle nuts on the right-hand side of the machine. These nuts unscrew in an anti-clockwise direction. Take off the side link and tap both spindles about three-quarters of the way through the fork. The steering damper assembly will then fall out complete enabling the discs to be removed and replaced, or a new anchor plate to be fitted. Re-assemble in the reverse order.

STEERING HEAD.—All Models.

Illustration No. 47 clearly shows the method of dismantling the steering head for cleaning or renewal purposes. It will be seen that only the bottom fork spindles need be removed. The steering damper anchor plate and the steering head nut must be removed complete and the steering head locking bolt loosened. These nuts all unscrew in an anti-

Maintenance of Lucas "Maglita" Equipment.

Models 23, 30 and 40.

GENERAL HINTS.

(1) **Contact Breaker.**—Examine the contact points occasionally. See that they are clean and keep the gap adjusted to .010", i.e., the thickness of the gauge on the magneto spanner.

(2) **Brushes.**—Examine the generator brushes every two or three thousand miles. See that they are clean and free from oil, and that they slide freely in their guides. When replacing, be careful to put them back in their original position.

(3) **Lubrication.**—Place a spot of oil on the cam, and a drop of oil in the oil hole under the contact breaker, every 1,000 miles or so. Do not on any account remove the armature, as this would partially demagnetise the Maglita. If the machine should require re-magnetising it should be returned to a Lucas Service Depot, as an ordinary magnetiser is useless for the purpose.

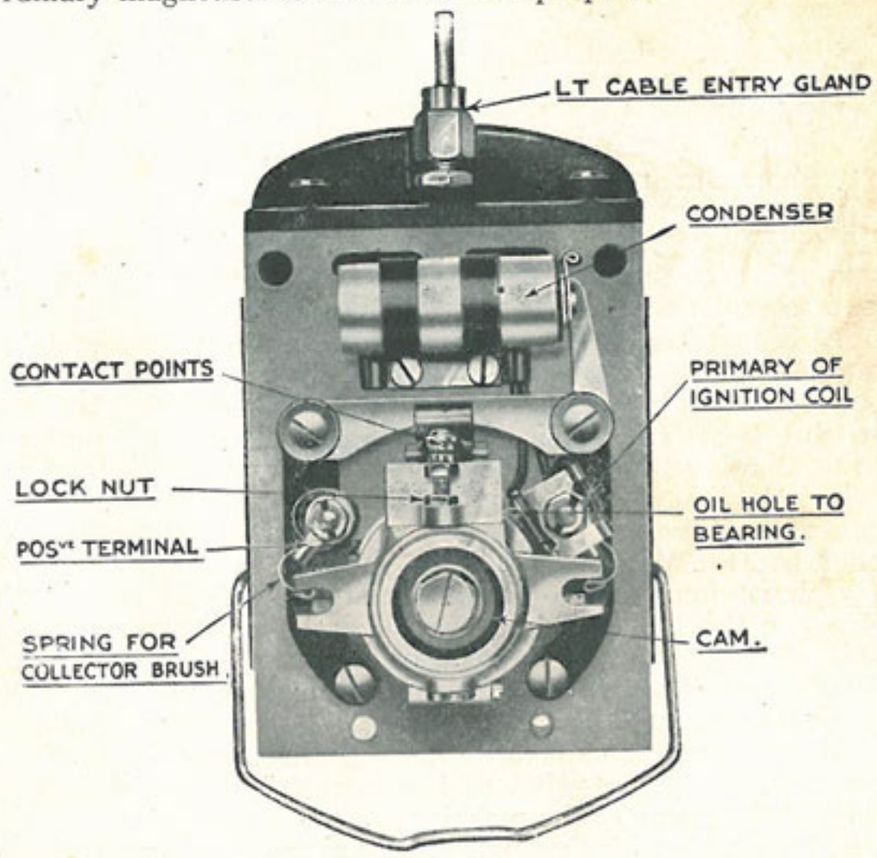


Illustration No. 35.

TROUBLES AND THEIR REMEDIES.

(a) Ignition Faults.

In the case of irregular firing, first ascertain that the trouble is not due to the carburetter or induction system. A stuck valve, partially choked jet, or an incorrect petrol level may be the cause of such trouble. Then examine the contact breaker carefully, and see that the points are set to the correct gap, that they close properly, and are free from oil.

Examine the sparking plug and, if doubtful, replace with another.

In normal running the current drawn from the Maglita for charging the battery and lighting the lamps has no effect on the ignition, but a dead short circuit in the lighting system may cause misfiring. Should

misfiring still occur after tracing through the causes already enumerated, the charging wire should be disconnected from the terminal. Do not touch the double connection from the right-hand terminal. Should this stop the misfiring, the connections between the Maglita and the control switch should be carefully examined. Further than these points there is no possibility of a breakdown in the ignition circuit, other than the insulation of either the ignition coil or the ebonite terminal. As both these are very carefully tested, and as there is an ample margin of safety, it is not likely to occur. Should, however, the ignition still be defective, the machine should not be dismantled further, but should be returned to the Works or nearest Lucas Service Depot.

(b) Lighting Circuit.

(1) Lamps will not light when stationary, but light when running.—Battery run down or broken connection between battery and control switch. If due to a broken connection there will be no reading of the ammeter at any time. This may be due to a bad earth or broken lead. If the battery is run down a charge reading will be noted on starting up the engine with the switch in the charge position.

(2) Lamps will not light either running or stationary. This may be due to:—

(A) Bulbs burnt out. If none of the lamps light this is unlikely as all the bulbs will not usually burn out simultaneously.

(B) Short circuit or open circuit in wiring.

(C) Generator not charging and battery run down.

PROCEED AS FOLLOWS:—A short circuit will be noted by a full-scale deflection of the ammeter, and its location can be traced by a process of elimination commencing with putting the switch in the "off" position. If there is a full-scale deflection (after making quite certain that the ammeter is not sticking, by giving the case of the ammeter a smart tap or two with the finger), then the short is between the ammeter and switch. If a short circuit does not occur in the "off" position, but does so in all other three positions, remove charging cable from positive terminal of Maglita. If this removes the short circuit the fault is in the Maglita itself. If the short circuit persists it must lie in the cable between the switch and the Maglita.

If a short circuit only occurs when the switch is in the "lights" position, then the fault lies between the switch and the corresponding bulbs.

If no charge is obtained, owing to an open circuit, locate the fault by first connecting a bulb direct across the generator terminal, and running the engine at a moderate speed. If the lamp lights, disconnect the generator lead at the switch and connect a bulb between the end of the wire and the frame of the machine.

Failure to light, with the engine again running at a moderate speed, indicates a broken connection between the Maglita and the switch.

If no light can be obtained directly from the Maglita, examine the brushes, check the spring tension and see that they slide freely in the holders.

(3) **Lights Flicker in Use.**

This may be due to loose contacts in the lamp holders, in the battery and battery terminals, or in the control switch. It may also be due to an intermittent short circuit in the wiring. Observe whether all the lamps flicker simultaneously. If so, examine the battery terminals, the bridge pieces between the cells, the connections of the control switch and the wiring generally. If only one lamp flickers at a time, examine the bulb holders and the spring plunger on the lamp in question.

For hints re Headlamp Focus and list of correct replacement bulbs, see pages 57 and 58.

For further instructions and wiring diagram see Booklet No. 203, issued by Messrs. Joseph Lucas Ltd.

HEADLAMPS.

Types fitted.

	Coil Ignition—	**Maglita Ignition—**
Model 23.	D.U.42 C.	D.U.42 M.
Model 30.	H.52 C.S.L. or D.U.142 C.	H.52 or D.U.142 M.
Model 40.	H.52 C.S.L. or D.U.142 C.	H.52 or D.U.142 M.

TAIL LAMPS.

Types Fitted.

M.T.110. M.T.210.

Headlamps Types DU42C and DU142C.

The lamp front and reflector can be withdrawn for bulb replacement when the fixing clip is pressed back. When re-fitting locate top of rim first.

To remove bulb holder, press back the two securing springs.

The main bulb can be focussed by removing the lamp front and reflector and slackening the clamping screw which secures bulb holder. Move the bulb and holder until the best results are obtained and finally tighten the clamping screw.

Headlamps Types H52, H52CSL.

To remove the lamp front, press the front rim evenly and then rotate to the left (looking at the front of the lamp).

When removing the main bulb for replacement, screw it out two or three turns in an anti-clockwise direction. This will enable the bulb to be withdrawn easily. Care should be taken that the bulb is fitted the correct way round, i.e., with the dipped beam filament above the centre filament.

To enable the lamp to be focussed, the bulb holder is arranged so that it can be adjusted. By turning the bulb in a clockwise direction it is moved inwards, and by turning it in an anti-clockwise direction, it is moved outwards. The best position can be readily found by trial. The normal driving light should, of course, be switched on while focussing is being carried out.

In adjusting the bulb, it is important that it is given a complete turn at a time, so that the filaments are in the correct position; a spring stop is incorporated in the holder which indicates every time the bulb has been given a complete turn by a click action.

Headlamps Type DU42M, DU142M.

To remove lamp front and reflector, press back spring clip at bottom of lamp. To remove the bulb holder, press down ends of securing springs and withdraw them from their locating holes.

To focus the lamp, remove lamp front and reflector and slacken clamping screw which secures the bulb holder. Move the bulb and holder until the best results are obtained, and finally tighten the clamping screw.

Tail Lamp MT110.

The rear portion of this lamp is removed for a bulb replacement by giving it half a turn to the left, when it becomes detached from its fixing.

Tail Lamp Type MT210.

The rear portion of the lamp is detached for bulb replacement by depressing the spring catches or by twisting the rear portion of the lamp in an anti-clockwise direction and at the same time giving a forward pull.

REPLACEMENT BULBS.

When the replacement of any bulb is necessary, we strongly recommend that **genuine spare Lucas bulbs are used.** Particulars of replacement bulbs are as follows:—

For Coil Sets.

Headlamp (Driving and Dipped Beam Lights) Lucas No. 69, 18 and 18 w. Special double filament, gas filled bulb.

For Maglita Sets.

Headlamp (Driving and Dipped Beam Lights) Lucas No. 68, 12 and 12 w. Special double filament gas filled bulb.

Headlamp (Pilot Light), Sidecar, Tail and Stop Lamps, Lucas No. 200, 3 w. Centre contact bulb.

Ignition Warning Light, 252 M.E.S. (coil only).

NOTE.—When replacing the double-filament main bulb in the head lamp, care should be taken that the bulb is fitted the correct way round, i.e., with the dipped beam filament above the centre filament.

Running Instructions for Lucas "Magdyno" Equipment.

LIGHTING AND CHARGING SWITCHING ARRANGEMENT.

The control switch which is mounted at the back of the headlamp has the following positions:—

"Off" Lamps off, and dynamo not charging.

"C" Lamps off and dynamo giving about half its normal output.

"H" Headlamp (main bulb), tail lamp and sidecar lamp (when fitted) on; dynamo giving maximum output.

"L" With the exception that the pilot bulb is in the place of the main bulb, the conditions are exactly the same as in position " H."

BATTERY.

Topping Up.—At least once a month the vent plugs in the top of the battery should be removed, and the level of the acid solution examined. If necessary, distilled water, which can be obtained at all chemists and most garages, should be added to bring the level to the top of the separators. If, however, acid solution has been spilled, it should be replaced by a diluted sulphuric acid solution of the same specific gravity as the acid solution in the cell to which it is to be added. When examining the cells do not hold naked lights near the vents, as there is a danger of igniting the gas coming from the plates.

Commutator.—Keep the commutator clean and free from oil. The best way to clean the commutator is, without disconnecting any leads, to remove from its holder one of the main brushes, and inserting a fine duster, hold it by means of a suitably shaped piece of wood against the commutator surface, at the same time turning the engine so as to rotate the armature.

Brushes.—Examine the dynamo brushes, they can be removed from their holders when the spring lever is held aside. They should slide freely in their holders and make good contact with the commutator. If the brushes are dirty or greasy, clean them with a cloth moistened with petrol. When replacing the brushes, care must be taken that they are replaced in their original position.

Use of Charging Switch.—The conditions under which motor-cycles are used vary very considerably, and obviously the amount of charging a battery will require is directly dependent on the extent to which the lamps are used. However, the following suggestions will serve as a rough guide:—

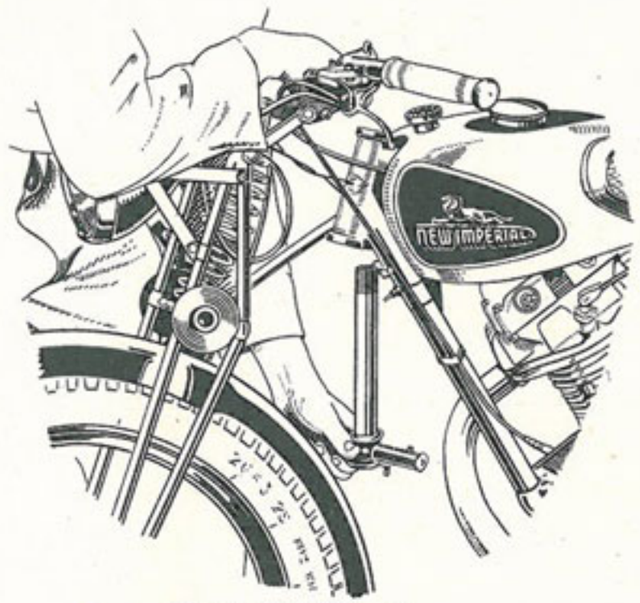


Illustration No. 47.

clockwise direction. The fork column can then be tapped out as shown on the illustration. When dismantling in this way, the steering head ball races and the bearings may be cleaned, examined and renewed if any signs of pitting are visible. When replacing bearings pack the races thoroughly with grease (as recommended on page 15). It will be seen that if this method of dismantling is used, it will be unnecessary to disconnect any control from the handlebars or the lighting set cables.

PUSH ROD COVER RUBBERS.

A rubber joint is provided between the two push rod covers to make the joint oil tight; these rubbers require renewing occasionally, otherwise an oil leakage will result. These rubbers can be removed quite easily, when the push rods complete with the covers are removed from the machine. A special tool is available, at the Works or our Stockists, which enables the push rods to be removed easily (Illustrated on page 24). If one set of covers is dealt with at a time, no trouble will result from the push rods being exchanged in the process. If the bottom cover is pushed to the top of the top cover then the rubber will be exposed, this can be removed or if broken up can be swilled out with clean paraffin, and the new rubber slipped over the cover bottom, into its correct position.

ELECTRIC HORNS.

Maintenance.—These horns, before being passed out of the Works, are adjusted to give their best performance, and will give a long period of service without any attention; no subsequent adjustment is required.

If the horn becomes uncertain in its action, giving only a choking sound, or does not vibrate, it does not follow that the horn has broken down. First ascertain that the trouble is not due to some outside source, e.g. a discharged battery, a loose connection, or short circuit in the wiring of the horn. In particular, ascertain that the horn push bracket is in good electrical contact with the handlebars.

It is also possible that the performance of a horn may be upset by its becoming loose on its mounting.

If the cause of the trouble cannot be found, do not attempt to dismantle the horn, but return it to a Lucas Service Depot for examination, or direct to the Works.

Part 2.

MODELS 90 and 100

250 c.c. and 350 c c. Clubman Models.

GENERAL LAYOUT.

The Clubman Engines are a replica of the highly successful NEW IMPERIAL Grand Prix Racing Engines.

The engine and the four speed gearbox (which is foot controlled) are housed in a patented duplex cradle frame, incorporating large ball bearing races in the steering head.

Large and powerful brakes are fitted, the front brake being operated by a large lever on the right hand side of the handlebar, and the rear brake by a pedal, conveniently mounted in a position under the ball of the left foot.

The four-speed gearbox is operated by means of a positive stop foot control, on the right hand side of the machine. Low gears are obtained by raising the lever upwards, high gears by kicking the lever down.

The special flanged-type down-draught carburetter is actuated by a short quick-action racing twist grip.

LUBRICATION.—ENGINE.

The engine is lubricated by the dry sump system, oil being force fed to the big end bearing via the timing side shaft; the oil is then distributed to the sides of the flywheels, and then to the piston and cylinder walls.

After this operation, the oil drains to the sump and is picked up by the return pump, and thence to the oil tank. A large filter is situated in the oil tank and is easily removed for cleaning.

The return oil is pumped into the tank through a pipe inside the oil compartment, and can readily be seen if the oil filler cap is raised. If the oil can be seen being pumped into the tank, this indicates that the whole system is working properly.

A separate supply of oil from the pump is forced to a union at the rear of the cylinder, and another pipe feeds oil to the valve guides; the quantity of oil to this point can be regulated by the adjusting screw provided.

FUELS.—Models 90, 100—250 and 350 c.c. Clubman.

We recommend Esso-Ethyl or B.P. Ethyl. These machines will also run satisfactorily on Esso High Test or Shell.

LUBRICATING OIL.

We now recommend only the following lubricants for NEW IMPERIAL Motor Cycles:—

Engine Oil.

Patent Castrol "XXL" in Summer. Patent Castrol "XL" in Winter.	Mobiloil "D" in Summer and Winter.	Aeroshell in Summer and Winter.

GEAR BOX GREASE AND GREASE FOR EXPOSED CHAINS AND GREASE GUN NIPPLES:—

Castrolease Light. Mobilgrease No. 2. Shell Retinax.

NOTE.—For trials work it is advisable to mix engine oil with the grease for gear box lubrication. Approximately 50 per cent. of each.

Driving Hints.

Model No. 90 Cubic Capacity 246 c.c.
Model No. 100 Cubic Capacity 346 c.c.

HANDLEBAR CONTROLS.

Illustration No. 48 shows the position of the handlebar controls as fitted on these Models. The rider should study the illustration and refer to it when reading the hints on starting, stopping, etc., which follow.

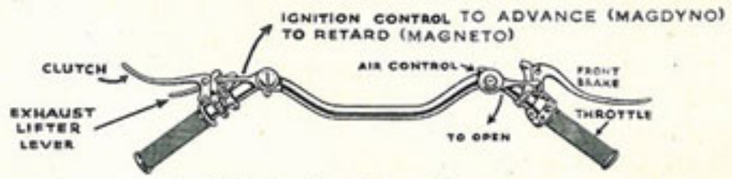


Illustration No. 48.

STARTING.

The air shutter on this machine is controlled by a lever on the handlebars. The control should be half closed when starting. The ignition lever should be set between half and three-quarters advance. **Open the carburetter control slightly** by turning twist grip towards rider. Raise the exhaust valve lifter, and depress the kick starter smartly downwards releasing the exhaust valve lifter half way down the kick starter stroke.

When the engine has started open the air shutter gradually until the engine warms up then open shutter fully.

GEAR CHANGING—FOOT CONTROL.

Attached to the control lever is a small pointer which registers with a pointer on the gearbox when the lever is in neutral gear. This is for use when starting the machine; the rider should see that the lever registers the correct neutral gear before starting up the machine (see Illustration No. 49 on page 81).

Bottom gear is engaged by raising the gear lever upwards, as far as possible from the neutral position. To change up, i.e., from bottom to second, second to third, and third to top, depress the lever downwards.

Always allow the pedal to return to the normal position between each gear change. The foot control mechanism is of the positive stop type, so that it is impossible to engage more than one gear with one kick, so the lever must be allowed to return to its normal position between each gear change.

The speeds at which to change gear are as follows:—

Bottom to second	...	8—10 m.p.h.
Second to third	...	20—22 m.p.h.
Third to top	...	27—30 m.p.h.

When changing gear remember to close the throttle slightly and raise the clutch lever. Never change gear by means of the exhaust valve lifter.

BRAKING, STOPPING, USE OF IGNITION LEVER, AND EXHAUST VALVE LIFTER, see pages 9 and 10.

Use of the Charging Switch (Magdyno Sets).

The switch should be left in the "charge" position for a short period only when the machine is being used. This time should only be increased if the period of night running is considerable, or if the battery is found to be in a low state of charge.

Care and Maintenance.

First Running-in Period at conclusion of 150 miles.

Refer to article on pages 10 to 15.

TAPPET ADJUSTMENT. Models 90 and 100.

Adjust the tappets when the engine is cold. Unscrew the top hexagon nuts on the cover tubes, two or three turns, moving the spanner from right to left. Now completely unscrew the hexagon nuts on the bottom push rod covers, moving the spanner from left to right. Then telescope the bottom covers up the top push rod covers—this will expose the tappets.

Turn engine over until both valves are closed. Hold the tappet head locknut with a spanner, and then loosen the tappet head with another spanner by moving the spanner from left to right.

The tappet can then be prevented from turning by holding the spanner on the two flats provided just below the locknut.

The tappets are correctly adjusted when no up or down play can be felt, but the tappets are free to revolve freely. The tappet head should then be locked into position by means of the locknut.

Tighten the bottom half of the push rod covers to their full extent, then screw the top covers into position; do not lock the top covers too tightly, as this will only destroy the rubber joint between the two covers, when the top cover nut can be felt to tighten slightly—this is sufficient—as if the nut is tightened abnormally it is possible to distort the rocker box in such a manner that both valves are raised slightly from their seats, causing loss of compression and making engine starting impossible.

USEFUL INFORMATION FOR MODEL 90, 250 c.c. CLUBMAN.

Compression Ratio (Standard). 6.85—1.

Bore and Stroke. 62½ mm. × 80 mm. = 246 c.c.

Ignition Timing. 12 mm. before T.D.C. with ignition in fully advanced position, points set about to break.

Valve Timing. Inlet opens ⅛″ before T.D.C.
Exhaust closes ⅛″ over T.D.C.

Gear Ratios. Refer to Table on page 80.

Carburetter Jet and Slide Sizes.
Main Jet No. 130.
Slide No. 6/4 or 6/3.
Needle Position, 3rd Groove.

Sparking Plug. K.L.G. Type 831.

Fuels. Esso-Ethyl or B.P. Ethyl or Esso High Test or Shell.

Lubricating Oils and Greases. See page 72.

Tyre Pressures. Front 16lbs. Rear 20 lbs.

Tank and Sump Capacity. Petrol 3¾ gallons.
Oil 2 pints (approx.).

Front Chain Size and Length. $\frac{5}{16}'' \times \frac{1}{2}''$ Pitch × 65 Rollers.

Rear Chain Size and Length. $\frac{5}{16}'' \times \frac{1}{2}''$ Pitch × 114 Rollers.

Magdyno or Magneto Chain Sizes. $\frac{1}{8}'' \times \frac{3}{8}''$ Pitch × 48 Rollers.

USEFUL INFORMATION FOR MODEL 100, 350 c.c. CLUBMAN.

Compression Ratio (Standard). 6.8—1.

Bore and Stroke. 70 mm. × 90 mm. = 346 c.c.

Ignition Timing. 12 mm. before T.D.C. with ignition in fully advanced position, points set about to break.

Valve Timing. Inlet opens ⅛″ before T.D.C.
Exhaust closes ⅛″ over T.D.C.

Gear Ratios. Refer to Table on page 80.

Carburetter Jet and Slide Sizes.
Main Jet No. 160.
Slide No. 6/4 or 6/3.
Needle Position, 3rd Groove.

Sparking Plug. K.L.G. Type 831.

Fuels. Esso-Ethyl or B.P. Ethyl or Esso High Test or Shell.

Lubricating Oils and Greases. See page 72.

Tyre Pressures. Front 16lbs. Rear 20 lbs.

Tank and Sump Capacity. Petrol 3¾ gallons.
Oil 2 pints (approx.).

Front Chain Size and Length. $\frac{5}{16}'' \times \frac{1}{2}''$ Pitch × 66 Rollers.

Rear Chain Size and Length. $\frac{5}{16}'' \times \frac{1}{2}''$ Pitch × 114 Rollers.

Magdyno or Magneto Chain Sizes. $\frac{1}{8}'' \times \frac{3}{8}''$ Pitch × 48 Rollers.

Care and Maintenance.

GENERAL MAINTENANCE HINTS.

Under this heading we deal with the following points:—

(1) Decarbonizing.
(2) Tyre Pressures and Removal.
(3) Sparking Plugs and Cleaning.
(4) Compression Ratios.
(5) Fuels.
(6) Gear Ratios (special table).
(7) Gear Ratios (to vary).
(8) Primary Chain Lubrication.
(9) Rear Chain Lubrication.
(10) Footchange. Greasing.
(11) Primary Chain Adjustment.
(12) Rocker Box Oil Feed Adjustment.
(13) Clutch Adjustment.
(14) Clutch Plates (order of assembly).
(15) Magneto Chain Adjustment and Greasing.
(16) Carburetters.
(17) Lucas Magdyno Equipment.
(18) B.T.H. Magnetos.
(19) How to fit New Push Rod Cover Rubbers.
(20) How to Time Magneto.
(21) Twist Grips (quick action).
(22) Oil Pump.

The following general maintenance hints were described in Part I. of the handbook:—

Care and Maintenance.

Second running-in period from 151 to 500 miles.—In addition to the points enumerated under the heading "First Running-in Period," the following work should be done before the machine is opened out and fast road work undertaken.

CLEANING OIL FILTER.

The filter inside the oil tank should be cleaned every 500 miles. Place a clean receptacle under the tank to catch the oil. Undo the flexible oil pipe union nut at the rear of the oil tank (i.e. the one nearest the rear mudguard), moving the spanner from right to left, then unscrew the union in the same direction. This union carries a long filter which should be thoroughly washed with clean petrol. Make sure before re-fitting that the oil union washer is in good condition.

DRAINING OIL TANK.

Every two thousand miles drain the oil tank as described for cleaning Oil Filter. Thoroughly wash the filter and then re-fill the tank with fresh oil.

CARBURETTERS.

Dismantle and clean as described on page 22.

BRAKE LININGS.—Materials and Sizes. Models 90 and 100.

Recommended Materials.—Ferodo Bonded Asbestos, die-pressed.
Models 90 and 100—Front and Rear Brake Linings.
$5\frac{1}{2}$" long × 1" wide × $\frac{1}{16}$" thick.

Decarbonizing.

(Models 90 and 100).

To obtain the maximum efficiency from the machine it is advisable to decarbonize the engine approximately every 2,500 miles. This entails a certain amount of skill, but providing the owner follows the ensuing instructions carefully no difficulty should be experienced.

Commence by disconnecting the exhaust pipe at the cylinder head, a special spanner is provided in the tool kit for this purpose, and the finned nut unscrews in an anti-clockwise direction. When the finned nut is completely unscrewed, the exhaust pipe can be left in position, next take off the carburetter by unscrewing the two bolts on the induction pipe flange in an anti-clockwise direction. Now remove the cylinder head steady clip pin and also the plate. The clip pin and the two rocker spindle nuts all unscrew in an anti-clockwise direction. At this stage the sparking plug and both the rocker box oil feed and the cylinder barrel feed oil pipes should be removed. All that remains to be done in order to remove the head is to unscrew the push rod covers, take out the push rods, and unscrew the four cylinder holding down bolts.

The top hexagon nuts on the push rod covers should be completely unscrewed, moving the spanner from right to left (i.e. in clockwise direction); then the large hexagon nuts on the bottom push rod covers should be undone, moving the spanner from left to right, i.e., in an anti-clockwise direction. Then telescope the bottom covers up the top covers —this will expose the tappets. To remove push rods, first turn over the engine until the piston is half-way up the cylinder on the compression stroke (i.e. when both valves are closed). Next slacken tappets down as much as possible by screwing the tappet lock nuts and tappet heads in a clockwise direction, moving the spanner from right to left. It is then possible to remove the push rods by easing them over the tappet heads, by means of a screwdriver—or by a special tool (obtainable from our Works or our Stockists), as shown in Illustration No. 12. (Note: The push rod cover tubes are removed with the push rods.)

Next undo the four cylinder head holding down bolts—these unscrew by turning the spanner from right to left. The cylinder head complete with rocker box can then be lifted clear of the cylinder barrel and placed on one side for the time being. The cylinder can then be raised clear of the piston.

Before removing the gudgeon pin and piston mark the piston inside so that it may be fitted the same way round on re-assembly. The gudgeon pin is held in position by special circlips, to remove these, place a pointed piece of $\frac{1}{4}$" bar (like a scriber), behind the circlip where the piston is slotted for the purpose, the circlip will spring out, when a little force is applied.

It is a wise precaution to fit new circlips each time, as if the circlips lose their tension, damage to cylinder and piston may occur.

To fit circlips put a slight set in the circlip, sideways, and fit one end into the groove in the gudgeon pin boss and force into position.

Examine piston carefully for seizures or bright high spots; any high spots should be removed with a superfine file (do not use emery cloth).

The piston is removed by pushing the gudgeon pin through with a finger, pushing from the timing cover side towards the driving side. Now cover over the top of the crankcase with a piece of clean rag to prevent any foreign matter falling inside. The parts are now ready for decarbonising, the piston being the first job.

Remove piston rings; this is best done by inserting three thin strips of tin behind the ring at equal distances, the ring can then be removed by sliding over the strips, without fear of breakage. Now carefully remove all traces of carbon from the top of the piston, and also from the ring grooves.

Clean the piston rings, removing carbon from the back and ends. Before replacing rings, it is advisable to check the amount of gap. To check the gap place the rings in the bottom of the cylinder barrel. The gap between the ends of the rings should be 5 thousandths of an inch. When the gap is found to be in excess of this amount, it is advisable to fit new rings.

The new rings should be tested in the cylinder, as above—and if necessary the ends should carefully be filed with a smooth-cut file, until the correct gap of 5 thousandths of an inch is obtained.

Having checked the piston rings, these may now be re-fitted to the piston in the same manner as they were removed (i.e., with the strips of tin). Re-fit the piston to the connecting rod, taking care to smear the gudgeon pin with engine oil, and also that the piston has been re-fitted the correct way round according to the scratch inside the piston boss, which, as previously described, is most important.

Smear the piston and rings with clean engine oil and set the ring gaps at equal distances around the piston, then slide the barrel into position over the piston and rings on to the four holding down studs. Cover the top of the cylinder with clean rag, and proceed to decarbonize the cylinder head. The rocker box lid can be unclipped and taken off. It is necessary to remove the rockers before attempting to take out valve and springs.

The valve springs are very strong and a special compressor must be used (a suitable tool is illustrated on page 100). Examine the valves for signs of wear or seizing and replace if necessary. The valve springs owing to the strenuous nature of their work should carefully be examined and replaced if any signs of weakness are apparent. It is a good plan to renew these springs during each decarbonize.

The cylinder head and valves should now be thoroughly cleaned, and any traces of carbon or dirt removed; this is easily done with a screwdriver or an old knife, finishing off with some emery cloth. Care should be taken not to damage the valve seats, either in the cylinder head or on the valves themselves. Now grind in the valves; this is done by smearing a little grinding compound on the seats and replacing the valve in the cylinder head; a special tool is required to hold the valve in order that it may be turned backwards and forwards to grind the seats. Valve grinding tool for $\frac{3}{8}$" stem is required. (Obtainable from the Works or our Stockists, and illustrated on page 99.)

While the valve is being ground in it is advisable to lift it slightly every turn or so, to enable the grinding compound to fall back on the seats—this facilitates the grinding operation.

When the valves have been thoroughly ground and the pit marks in the seats have been removed, wash the cylinder head, valves, and springs in clean paraffin or petrol, until all traces of grinding compound and carbon have been removed; dry the parts with clean rag. The head is now ready for re-assembly. First smear the valve stems with a little engine oil and replace in the guides; the springs and cotters are then replaced by means of the tool previously mentioned.

Re-assemble the rockers, and the head can then be re-fitted.

Great care must be taken when replacing the head to see that the joint between the two faces are perfect. Examine the faces of the head and barrel and see if any signs of discolouration is shown. The head

face should be ground to the face on the barrel. This is done by using a little very fine emery paste on the surface. The barrel should be held lightly in a vice and the head rotated backwards and forwards until the whole of the face is perfectly clean. Do the above while the head is completely dismantled, and after this grinding has been done the whole parts must be thoroughly washed again to remove all traces of emery. This is very IMPORTANT. Washers are never used between these two faces as the only perfect joint is by grinding the two cast metal surfaces together. If washers are used there is always a chance of their blowing and causing trouble.

When tightening the cylinder head bolts, care should be taken that the bolts are pulled down quite evenly, working from corner to corner.

When the head is properly tightened down, examine the push rod tops and bottoms and replace if any signs of wear are apparent. Next replace the push rods and cover tubes by means of a screwdriver or the special tool previously mentioned, smearing a little oil on the push rod tops and tappet heads—each tappet should now be adjusted.

Hold the tappet head locknut with a spanner, then loosen the tappet head with another spanner by moving the spanner from left to right. The tappet can then be prevented from turning by holding a spanner on the two flats provided just below the locknut.

Adjustment is correct when no up or down play can be felt, and the tappet is free to revolve freely.

Tappets should always be adjusted when the engine is cold. Now tighten up the bottom half of the push rod covers to their full extent, then screw the top covers into position; do not lock the top covers too tightly, as this will only destroy the rubber joint between the two covers. When the nuts can be felt to tighten slightly, this is sufficient, as if the nuts are tightened abnormally it is possible to distort the rocker box in such a manner that both valves are raised slightly from their seats, causing loss of compression and making engine starting impossible.

Replace the rocker box lid and cylinder barrel oil feeds, then the plug, carburetter and finally the exhaust pipe.

TYRE PRESSURES.

Correct inflation pressures make for comfort and increase the life of the tyres.

For tyre removal and general hints see page 63.

FOR SOLO MACHINE		Minimum Inflation Pressures, lbs. per square inch.		
Model	Tyre Size	Front	Rear	Sidecar
90 and 100	27×2.75	22	–	–
90 and 100	26×3.25	16	–	–
90 and 100	26×3.25	–	20	–
90 and 100	26×3.50	–	18	–
90 and 100	27×4	–	16	–
FOR SIDECAR MACHINES				
100	27×2.75	22	–	20
100	26×3.25	18	22	16
100	26×3.50	–	20	–
100	27×4	–	16	–

SPARKING PLUGS.

We recommend the use of K.L.G. Plugs, Type 831 or Type L246. Replacement plugs should be one of these types.

For normal road work use Type 831; for Trials and Local Speed Events, use Type L246.

CLEANING.

Refer to article on pages 45 to 47.

COMPRESSION RATIOS.

The compression ratio of these engines can be varied according to the thickness of the packing between the crankcase and cylinder, as per list:—

MODEL 90. 250 c.c.		MODEL 100. 350 c.c.	
Standard Ratio	6.85—1	Standard Ratio	6.8—1
With 1/16" packing	7.65—1	With 1/8" packing	7.1—1
Without packing	8.75—1	With 3/32" packing	7.4—1
		With 1/16" packing	7.8—1
		With 1/32" packing	8.2—1

FUELS.

If the compression ratio is raised from standard, Esso Ethyl or B.P. Ethyl fuel must be used.

If the highest ratio on the list above is used we recommend the use of:—

50% Esso High Test and 50% Benzol or
60% Esso Ethyl and 40% Benzol or
50% Shell and 50% Benzol or
60% B.P. Ethyl and 40% Benzol.

GEAR RATIOS.

The gear ratios can be varied by the use of different sized engine sprockets.

The standard sprocket for Model 90, 250 c.c., has **17 teeth.**

The standard sprocket for Model 100, 350 c.c. has **19 teeth.**

The gearboxes have various internal ratios and are known as Standard Pattern, Trials Pattern, and Special Low Pattern.

The following tables give approximate ratios in all gears with the range of sprockets available:—

STANDARD RATIOS.

Sprocket Size	Top	Third	Second	Bottom
20 T.	5.5	7	9.7	14.7
19 T.	5.8	7.4	10.2	15.5
18 T.	6.2	7.9	10.9	16.5
17 T.	6.5	8.3	11.4	17.3
16 T.	6.9	8.8	12.1	18.4

TRIALS RATIOS.

Sprocket Size	Top	Third	Second	Bottom
20 T.	5.5	7.6	10.5	15.9
19 T.	5.8	8.2	11.3	17
18 T.	6.2	8.6	11.9	18
17 T.	6.5	9	12.5	19
16 T.	6.9	9.6	13.2	20

SPECIAL LOW RATIOS.

Sprocket Size	Top	Third	Second	Bottom
20 T.	5.5	8.3	13.7	17
19 T.	5.8	8.8	14.5	18.3
18 T.	6.2	9.4	15.5	19.6
17 T.	6.5	9.9	16.2	20.5
16 T.	6.9	10.5	17.2	21.8

TO VARY GEAR RATIOS.

The gear ratios can be varied by the use of different sized engine sprockets. The sprocket is fitted to the driving shaft on splines, and is secured by a large hexagon nut, which in turn is locked by means of a small screw. To remove, turn both screw and locknut in an anti-clockwise direction.

On page 80 will be found tables giving the gear ratios with the different sized engine sprockets, from 20-teeth to 16-teeth. Standard engine sprocket on Model 90 is 17-teeth and on Model 100 19-teeth.

PRIMARY CHAIN LUBRICATION.

Refer to illustration No. 49 which shows the oil regulator to primary chain. This feed is force fed, and to increase the flow turn the regulator in anti-clockwise direction and to decrease turn in a clockwise direction. The correct rate of flow is approximately 1 to 2 spots per minute.

REAR CHAIN LUBRICATION.

The rear chain should be cleaned and thoroughly greased at regular intervals—to ensure the maximum life and the minimum of frictional losses.

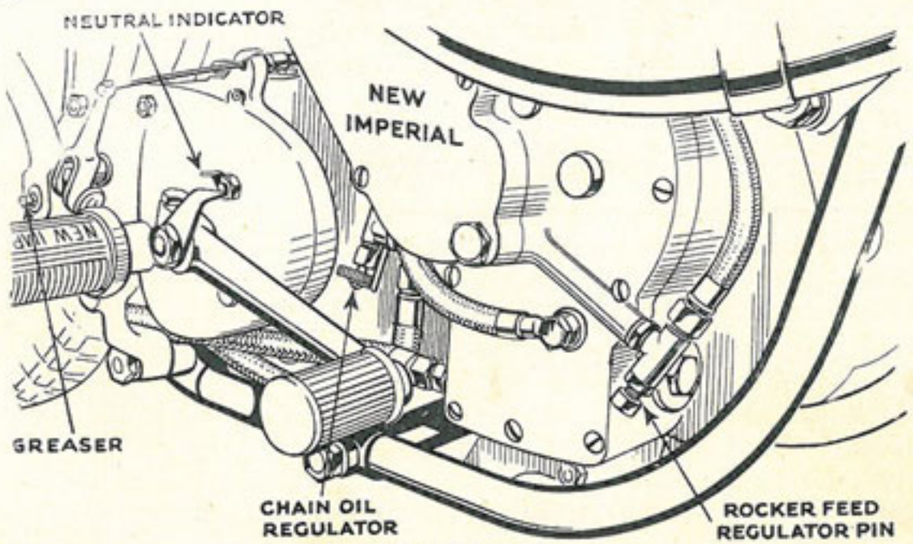


Illustration No. 49.

FOOTCHANGE (GREASING).

A good supply of grease should be forced into the footchange unit every three months. The grease nipple for this purpose is situated in the centre of the kick starter spindle. This is shown in illustration No. 49.

PRIMARY CHAIN ADJUSTMENT.

The primary chain is adjusted by swivelling the gearbox backwards or forwards. Slacken the swivel nut (Illustration No. 50), then the footrest bolt; next adjust the gearbox by means of the adjusters shown on Illustration No. 50.

In order to tighten the chain loosen the locknut and also the adjusting screw in the front of the gearbox, both the locknut and adjusting screw unscrew in an anti-clockwise direction, then loosen the rear adjusting bolt locknut in an anti-clockwise direction and turn the adjuster in a clockwise direction. It is advisable to loosen the front adjuster bolt considerably before moving the rear adjuster. When the desired chain tension has been obtained (i.e. approximately $\frac{1}{2}$" free up and down movement in the chain) lock up the swivel bolt and the footrest bolt then tighten the front adjuster bolt in a clockwise direction. To slacken the chain reverse the foregoing instructions with regard to the tightening and loosening of the adjuster bolts.

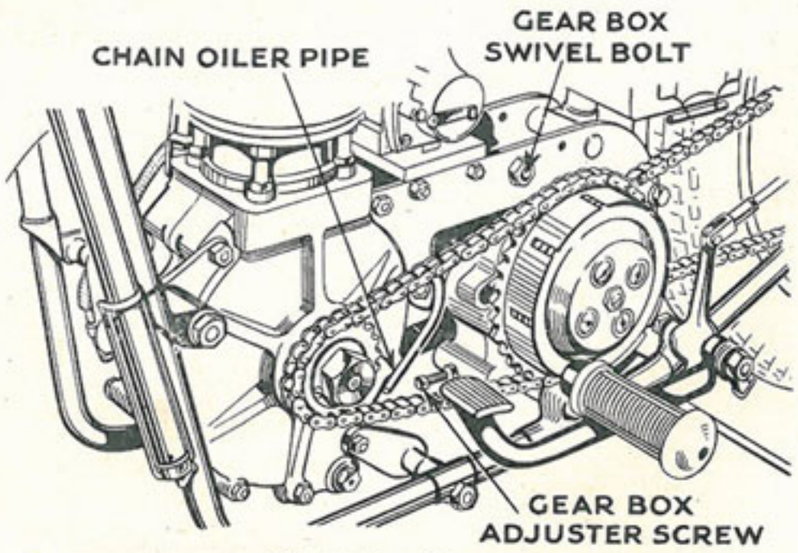


Illustration No. 50.

ROCKER BOX OIL FEED ADJUSTMENT.

The rocker box is provided with force fed lubrication and once the correct setting is found will need no further attention except occasional checking. First disconnect the oil pipe from the rocker box then start the engine.

The feed is correct when oil is pumped out at approximately 2 to 3 spots per minute. Illustration No. 49 clearly shows the adjusting screw and locknut. To increase the supply first slacken the locknut moving the spanner from right to left, then turn the adjusting nut in the same direction, or to decrease the flow turn in the opposite direction; when the correct supply is delivered tighten the locknut and re-check.

CLUTCH ADJUSTMENT.

In order to take up any slackness which may develop in the clutch cable a cable adjuster is provided and can clearly be seen screwed on to the gearbox shell on the kick starter side; to take up any play first loosen the locknut by moving the spanner from left to right, then turn the adjuster in the same direction until only $\frac{1}{16}$" play is felt in the cable, then tighten the locknut in the reverse direction.

A second clutch adjustment is provided which acts directly upon the clutch push rod. When the front chain cover is removed a large nut and screwdriver slotted pin can be seen. These are shown in illustration No. 51. The nut acts as a locknut and can be loosened by turning in an anti-clockwise direction. When this is loose the centre bolt can be screwed in or out, as the case may be, in order to tighten or loosen the clutch push rod. When adjustment is complete tighten the locknut and replace the chain cover.

Illustration No. 51.

CLUTCH PLATES. Order of Assembly.

Illustration No. 51 shows the correct order of assembly, i.e.:—

(1) Plain Plate.
(2) Cork Plate.
(3) Plain Plate.
(4) Cork Plate.
(5) Plain Plate.
(6) Cork Plate.
(7) Plain Plate.

Then the outer plate which carries the four springs, cups and screws.

CLUTCH PLATES. Re-Cork.

Inserts can be supplied for these clutch plates in either cork or Ferodo material (riders intending to use the machines in trials are advised to fit Ferodo inserts, but for normal use cork inserts are quite satisfactory).

Clutch plates should be returned to the works for fitting up when new inserts are required.

MAGNETO CHAIN ADJUSTMENT AND GREASING.

Adjustment. The magdyno or magneto chain is adjusted by sliding the magdyno or magneto backwards or forwards in the slots in the gear box and engine plates. (See Illustration No. 50.) To adjust, loosen the two magdyno or magneto platform bolt nuts on the left hand side of the machine. The magdyno or magneto would then be pushed backwards to tighten or forwards to loosen the chain. When the adjustment is correct (i.e. $\frac{1}{4}$" up or down play in the chain), the nuts should be re-tightened.

Greasing. Every thousand miles the magdyno or magneto chain should receive a fresh supply of grease. Remove the front of the magneto chain cover and rub some grease into the chain and place a small quantity at the back of the cover, just above the bottom sprocket.

MAGDYNO OR MAGNETO CHAIN SIZES.—Models 90 and 100.

$\frac{3}{8}$" pitch × $\frac{1}{8}$" × 48 rollers.

CARBURETTERS—NEEDLE TYPE. Models 90 and 100.

Jet and Slide sizes:—

Model 90. Main Jet, 130 or 140.
Slide No. 6/4 or 6/3.
Needle Position 3rd Groove—Size No. 6.
Needle Jet Size, Standard (not marked) or .1075.

Model 100. Main Jet, 160.
Slide No. 6/4 or 6/3.
Needle Position 3rd Groove—Size No. 6.
Needle Jet Size Standard (not marked).

An article on the working and tuning of a Needle Type Amal Carburetter is described on pages 41 to 45, and a section of the Carburetter is shown on page 42 (Illustration No. 23).

LUCAS MAGDYNO EQUIPMENT.

Refer to article on pages 58 to 60.

B.T.H. RACING MAGNETOS.

Refer to article on page 90.

PUSH ROD COVER RUBBERS.

A rubber joint is provided between the two push rod covers to make the joint oil tight, these rubbers require renewing occasionally, otherwise an oil leakage will result. These rubbers can be removed quite easily, when the push rods complete with the covers are removed from the machine. A special tool is available, at the Works or our Stockists, which enables the push rods to be removed easily (illustrated on page 99). If one set of covers is dealt with at a time, no trouble will result from the push rods being exchanged in the process. If the bottom cover is pushed to the top of the top cover then the rubber will be exposed; this can be removed or if broken up can be swilled out with clean paraffin, and the new rubber slipped over the cover bottom into its correct position.

IGNITION.—How to Re-time on Models 90 and 100.

First remove the front half of the magneto chain cover, then loosen the nut in the centre of the bottom sprocket in an anti-clockwise direction, and prise the sprocket off the taper spindle by means of two screwdrivers, placed behind the sprocket.

Remove the sparking plug and turn engine over until the piston is at the top of the compression stroke (i.e., when both valves are closed). When the piston is in this position, insert a piece of stiff wire in the plug hole and make a mark on the wire where it touches the top of the hole. Remove wire and make another mark 12 mm. above it.

Replace the wire and turn the engine backwards, until the second mark is reached. Fully advance the ignition control on the handlebar and rotate the magneto until the contact breaker points are just about to break. Then lock the sprocket nut tightly. Check the timing to make sure it is correct, before finally replacing the front half of the magneto chain cover.

TWIST GRIPS. Quick Action Type.

To dismantle the twist grip for greasing or for cable renewal, first pull the outer case of the control cable and withdraw the cable stop, then unscrew completely the clip pins in an anti-clockwise direction, when the clip will fall apart.

This enables the cable nipple to be lifted from its socket, refit new cable if required, and thoroughly grease the mechanism.

OIL PUMPS (Dry Sump Type).

As the engine is supplied with a pre-determined amount of oil, to the big end, etc., no adjustment is required or provided.

Part 3

MODELS 50 and 60 250 c.c. and 350 c.c. "GRAND PRIX" MODELS.

GENERAL LAY-OUT.

The "Grand Prix" Models have been constructed from the designs used on our highly successful "NEW IMPERIAL" Racing Machines.

The engine and four-speed gearbox are housed in a patented duplex cradle frame, incorporating a taper roller bearing steering head, which combined with a special racing spring fork produces a machine the road holding and steering qualities of which are unexcelled.

Large and very powerful brakes are fitted; the front brake is operated by a large lever on the right of the handlebar, and the rear brake is operated by a pedal, conveniently mounted in a position just under the ball of the left foot.

The four-speed gearbox is operated by means of a built-in positive foot control, on the right-hand side of the machine.

The special flange-type down-draught carburetter is actuated by a short quick-action racing twist grip.

LUBRICATION. ENGINE.

The engine is lubricated by the dry sump system, oil being force-fed to the big end bearing via the timing side shaft; the oil is then distributed to the sides of the flywheels, and then to the piston and cylinder walls.

After this operation, the oil drains to the sump and is picked up by the return pump and thence to the oil tank, after passing through a large filter. The filter is situated in the base of the crankcase, and is easily removed for cleaning.

The return oil is pumped into the tank through a pipe inside the oil tank, and can readily be seen if the oil filler cap is raised. If the oil can be seen being pumped into the tank, this indicates that the whole system is working correctly.

CYLINDER WALL AND VALVE GUIDES.

A separate supply of oil from the pump is forced to a union at the rear of the cylinder, and another pipe feeds oil to the valve guides; the quantity of oil to this point can be regulated by the adjusting screw provided.

GEARBOX.

The gearbox should be lubricated every 1,500 miles. A large filler orifice is provided for this purpose.

PRIMARY CHAIN.

The lubrication of the primary chain is provided for by a needle valve oiler, which is interposed in the return oil circuit, from the engine to the oil tank. This device can be controlled according to requirement by the milled nut, and ensures a supply of oil at all times when the engine is in use.

REAR CHAIN.

The rear chain should be cleaned and thoroughly greased at regular intervals—to ensure the maximum life and the minimum of frictional losses.

RECOMMENDED LUBRICANTS.

Engine.		
Patent Castrol "R"	Mobiloil Vacuum "R"	Shell Super Heavy
Gearbox.		
Patent Castrol "XL"	Mobiloil "D"	Aeroshell
Exposed Chains and Grease Gun Nipples.		
Castrolease Light	Mobilgrease No. 2	Shell Retinax

FUELS.

Grand Prix—Models 250 and 350 c.c.

For Standard Compression Ratio Engines we recommend:—
50% Esso High Test and 50% Benzol or
60% Esso-Ethyl and 40% Benzol or
50% Shell and 50% Benzol or
60% B.P. Ethyl and 40% Benzol.

For High Compression Ratio Engines we recommend Esso Racing Ethyl or B.P. Racing Ethyl with the addition of Benzol to suit various requirements. Bear in mind that Esso Racing Ethyl or B.P. Racing Ethyl used neat will stand the Highest Compression Ratio (see page 89).

USEFUL INFORMATION.

BORES AND STROKES.

Model 50	...	62½ mm. × 80 mm.	...	246 c.c.
Model 60	...	70 mm. × 90 mm.	...	346 c.c.

HANDLEBAR CONTROLS.

Illustration No. 52 shows the position of the various controls.

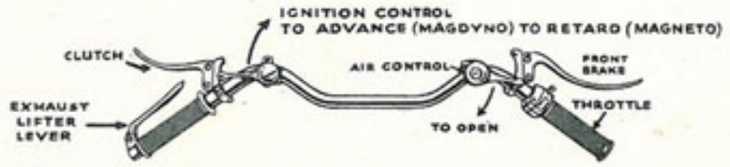


Illustration No. 52.

VALVE TIMING.

This approximately reads:—
Inlet opens 28 degrees before Top Dead Centre.
Inlet closes 62 degrees after Bottom Dead Centre.
Exhaust opens 60 degrees before Bottom Dead Centre.
Exhaust closes 30 degrees after Top Dead Centre.

MAGNETO TIMING.

12 mm. before T.D.C. with ignition in fully advanced position, points set about to break, for road work;
14 mm. before T.D.C. for racing.

COMPRESSION RATIOS.

Compression ratios may be altered by means of cylinder base washers to suit varying conditions and events.

The Model 50, 250 c.c. machine, as sent out from the Works, fitted with two 1/32" base washers, has a compressio ratio of 7.5—1; with one 1/32" washer removed, 7.8—1; and with both washers removed, 8.2—1.

The Model 60, 350 c.c. Machine, with two 1/32" base washers, has a compression ratio of 7—1; with one 1/32" washer removed 7.4—1; and with both washers removed 7.8—1.

GEAR RATIOS.

Sports Type—
Model 50, 250 c.c.—Top 6.2—1, 3rd 6¾—1, 2nd 8—1, Bottom 11¼—1.
Model 60, 350 c.c.—Top 5½—1, 3rd 6 —1, 2nd 7—1, Bottom 10 —1.

Close Ratio T.T. Type—
Model 50, 250 c.c.—Top 6.2—1, 3rd 6¾—1, 2nd 8—1, Bottom 10¼—1.
Model 60, 350 c.c.—Top 5½—1, 3rd 6 —1, 2nd 7—1, Bottom 8¾—1.

TO VARY GEAR RATIOS.

The Gear Ratios can be varied by the use of different sized engine sprockets. The sprocket is fitted to the driving shaft on splines, and is secured by a large hexagon nut, which in turn is locked by means of a small screw. To remove, turn both screw and locknut in an anti-clockwise direction.

Standard Sprocket for Model 50, 250 c.c.—18T.
Standard Sprocket for Model 60, 350 c.c.—20T.

SPARKING PLUGS.

Detachable Type for Running in.	**K.L.G. 831.**
Detachable Type for Local Speed Events.	**K.L.G. L.246.**
Non-detachable Type for Racing	**K.L.G. 646.**

NOTE.—So much depends upon compression ratios, fuels, etc., that the plug recommendations given above can only be approximate.

PETROL AND OIL TANK CAPACITIES.

Petrol Tank 4 gallons.
Oil Tank 1 gallon.

CARBURETTERS, AMAL.

Types TT/34, Track Racing, TT/35.

Carburetter Jets ..... T.T./34 Type Carburetter)	250 c.c. Model 50	350 c.c. Model 60
Main Jet No.	57 or 320	59 or 350
Slide No.	5	6
Needle Position	4th Groove	4th Groove
Needle Jet No.	.1075	.109
Carburetter Jets ..... (Track Racing Type Carburetter)	250 c.c. Model 50	350 c.c. Model 60
Main Jet No.	170 P.	220 P.
Slide No.	10	12
Carburetter Jets ..... (T.T./35 Type Carburetter)	250 c.c. Model 50 Special (Hairpin Valve Spring Type)	
Main Jet No.	260	
Slide No.	6	
Needle Position	4th Groove	
Needle Jet No.....	.1075	

CHAINS. PRIMARY CHAIN ADJUSTMENT.

The primary chain is adjusted by swivelling the gearbox backwards or forwards. Slacken top bolt which carries gearbox, and also the bolt at the bottom of the box which passes through the anchor lug; the gearbox can then be moved to the desired position by means of the two adjusting screws.

REAR CHAIN.

For adjustment and illustration, see page 11.

WHEEL ALIGNMENT.

For full description and illustration, see pages 11 and 12.

CHAIN SIZES.

Front Chain (250) ½" Pitch × .305 × 64 Rollers.
Front Chain (350) ½" Pitch × .305 × 66 Rollers.
Rear Chain (250) ½" Pitch × .305 × 120 Rollers.
Rear Chain (350) ½" Pitch × .305 × 118 Rollers.
Magneto Chain ⅜" Pitch × ⅛" × 48 Rollers.

TYRE PRESSURES.

Correct inflation pressures in lbs. per square inch.

27 × 2.75	on	Front Wheel	... 22 lbs.
26 × 3.00	on	Front Wheel	... 20 lbs.
27 × 3.00	on	Front Wheel	... 20 lbs.
26 × 3.00	on	Rear Wheel	... 24 lbs.
27 × 3.00	on	Rear Wheel	... 24 lbs.
26 × 3.25	on	Rear Wheel	... 20 lbs.

CLEANING OIL FILTERS (Engine and Oil Tank).

Whenever the engine is removed for tuning up, both oil filters should be cleaned; wash thoroughly in clean petrol. The engine filter is situate at the base of the crankcase on the drive side, and the oil tank filter is attached to the feed pipe union.

STEERING HEAD ADJUSTMENT.

Taper roller bearings are used in the steering head. The method of adjustment is the same as described on page 10.

MAGNETO CHAIN ADJUSTMENT.

The magneto chain is adjusted by moving the magneto backwards or forwards bodily in the slots in the gearbox plates.

To adjust, loosen the two magneto platform bolt nuts on the left-hand side of the machine.

The magneto can then be pushed backwards to tighten the chain or forwards to loosen it.

When the adjustment is correct (i.e., ¼ of an inch up and down play) the nuts should be re-tightened.

SPRING FORKS.

"WEBB" FORKS Models 50 and 60.

Adjustment.—Should any side play develop this can be taken up by means of the adjustment on the fork spindles. Procced as follows:—

First slacken the four nuts on top fork spindles in an anti-clockwise direction—then turn each spindle slightly by the small square end, on right-hand side of machine, in an **anti-clockwise** direction, then tighten both nuts on left-hand side and check for side play. If no play is felt and the spring action is quite free tighten nuts on right-hand side. Adjust bottom fork spindles in exactly the same way.

Shock Absorbers.—The spring action of the fork is controlled by two shock absorbers, mounted on on either end of the bottom fork spindle.

To reduce the fork spring action, turn the two hand adjusters (situated just inside the fork links) in a clockwise direction. To increase the action, turn the two hand adjusters in an anti-clockwise direction.

Steering Damper.—The steering damper is controlled by a hand adjuster wheel situated on the top of the fork column.

To tighten steering when travelling at high speeds, turn the wheel in a clockwise direction. At normal speeds it will be found unnecessary to damp the steering action.

SPRING FORK (GREASING OF).

The fork spindles should be greased regularly through the grease gun nipples which are provided where necessary. Grease thoroughly every month. Too much stress cannot be placed upon the importance of regular greasing; a seized fork spindle, due to lack of lubrication, not only makes riding uncomfortable, but is also very dangerous.

BRAKES. T.T. Type.

Front 8" diameter. Rear 7" diameter.

These brakes have been designed for T.T. use, and are made from special materials which ensure long life. Clean up carefully before each race.

Should the linings require renewing—return the shoes complete to the works for fitting and grinding to size.

BRAKE LININGS. Type and Sizes.

Recommended Material Ferodo "M.Z." quality.
8" front brake—7¾" long × 1¼" wide × 3/16" thick.
7" rear brake—5½" long × 1" wide × 7/32" thick.

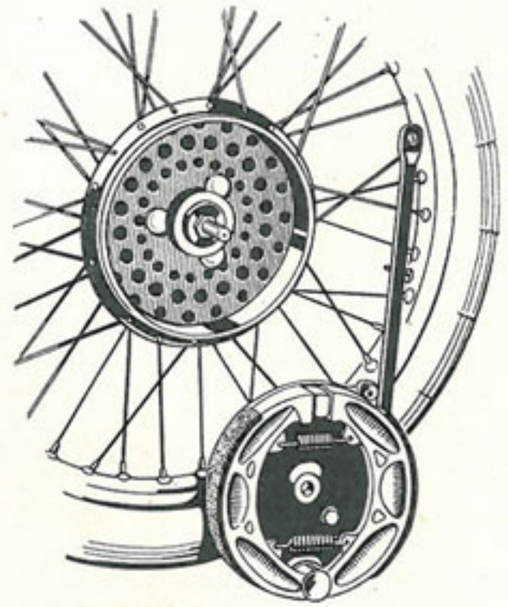


Illustration No. 53.

HUB ADJUSTMENT.

See page 33 and refer to Illustrations Nos. 17 and 18.

STEERING HEAD ADJUSTMENT.

Refer to article and Illustration on pages 70 and 71.

HIGH COMPRESSION RATIOS AND CARBURETTER JET SIZES.

The highest compression ratios for use with Esso Racing Ethyl and B.P. Racing Ethyl are as follows:—

250 c.c. Model 50 ... 11½—1.
350 c.c. Model 60 ... 10 —1.

These ratios are obtained with the use of special high compression pistons.

Using the above fuel the carburetter jets should be increased by 250 per cent. approximately. (See special article on racing carburetters on pages 92 to 95.)

Twin fuel pipes should always be used and on 350 c.c. machines it is advisable to fit double float chambers.

B.T.H. RACING MAGNETOS—TYPE M.C.1.
ATTENTION IN SERVICE.

Lubrication.—The magneto armature runs on ball bearings which are packed with a lubricant before the magneto leaves the Works, and this lubricant should not require renewal for a very considerable period. **It is of the utmost importance that the points on the contact breaker be kept absolutely free from oil, because any oil on the contacts will become oxidised and prevent good electrical contact between the points when closed. Failure to observe this may result in a considerable reduction of the current of the magneto.**

Contact Breaker.—The magneto is intended to operate with a gap of approximately 0.012 inches between the contact points. This gap should be checked occasionally by means of the feeler gauge attached to the small spanner which is provided with each machine. Do not unnecessarily readjust the contact gap. Great care should be taken to keep the contacts absolutely clean. The points may be cleaned with a very fine emery cloth, but under no circumstances should they be filed.

The contact breaker may be removed for cleaning by unscrewing the central hexagon-headed screw and withdrawing the breaker. The contact lever may then be lifted from its bearing bush by first raising and then moving to one side the check spring which is located in the end of the bearing bush. Care should be taken not to distort in any way the contact lever control spring. When replacing the contact lever, it is advisable to smear the bearing bush lightly with thin lubricating oil, taking the utmost care to wipe off any surplus oil for the reasons already stated under the heading "Lubrication."

The collector brush moulding should be periodically removed and the surface wiped clean with a cloth moistened with petrol. Before replacing this moulding insert the corner of a clean cloth in the aperture in the housing so that it bears against the slip-ring track and the flanges, at the same time turning the engine SLOWLY. This will remove any oily or carbon deposit likely to cause leakage over the slip-ring flanges; but on no account must any implement be used to exert pressure with the cloth on the slip-ring flanges, as this may cause them to be broken.

Location of Faults.—If the engine is firing irregularly due to faulty ignition, the investigator should in the first place satisfy himself that the fault does not lie in the plugs, the sparking gaps of which should be about 16 thousandths of an inch (.016").

Faulty ignition may result if the high tension cable becomes detached, loose, broken or earthed so that a very careful examination of the connections and cable should be made. If sparking persistently occurs in the safety gap, it is an indication that there is a break in the external high tension circuit.

Irregular firing may result from defective operation of the contact breaker. To determine whether this is the case, remove the cover and see if the contact breaker fixing screw is securely tightened. Attention should also be given to the screws which should be securely locked in position. The points should be carefully examined and, if necessary, cleaned with very fine emery cloth. The gap between the contacts should be checked and adjusted to the thickness of the feeler gauge on the spanner supplied with the machine.

If at any time trouble occurs which users are unable to overcome, they are urged to communicate with the British Thomson-Houston Co. Ltd., or with one of the B.T.H. magneto service stations, when advice and the necessary information to overcome the trouble will be gladly given. When returning a magneto for overhaul, care should be taken to detach and retain any sprockets or couplings.

TUNING HINTS.

There are two important points to observe when tuning a machine for racing, viz., accuracy in assembling and cleanliness. In order to dismantle the engine for decarbonizing proceed as follows:—

Detach the exhaust pipe and carburetter, then turn the engine over until the Piston is half way up the cylinder on the compression stroke. The push rods can then be taken out with a screwdriver, or better still, with a special tool which has been designed for the job (this tool is illustrated on page 99). Next unscrew the four bolts which hold the head and barrel in position.

Remove the head complete, then raise the cylinder, placing a piece of clean rag over the crankcase before the piston is exposed.

Before removing the gudgeon pin and piston, MARK THE PISTON INSIDE, so that it may be fitted the same way round on re-assembly. The gudgeon pin is held in position by special circlips—to remove these, place a pointed piece of ¼" bar (like a scriber), behind the circlip where the piston is slotted for the purpose, the circlip will spring out when a little force is applied.

It is a wise precaution to fit new circlips each time, as if the circlips lose their tension, damage to cylinder and piston may occur.

To fit circlips, put a slight set in the circlip, sideways, and fit one end into the groove in the gudgeon pin boss and force into position.

Examine piston carefully for seizures or bright high spots; any high spots should be removed with a superfine file (do not use emery cloth).

Remove and check piston rings for gap (as described on page 78).

For racing purposes the ring gap should be 25 to 35 thousandths of an inch; should the gap be in excess of these figures, new rings should be fitted.

Next clean and polish the piston top.

Examine the gudgeon pin for traces of wear, or signs of seizing, before re-assembling the piston and cylinder to the crankcase.

It is necessary to remove the rockers before attempting to take out the valves and springs.

The triple valve springs are very strong and a special compressor must be used (a suitable tool is illustrated on page 100).

Remove the valves and springs and thoroughly clean and polish all the parts.

Examine the valves for traces of wear, or signs of seizing, and replace if necessary; next examine the valve springs and renew should any signs of weakness be shown.

Smear the valve stems with clean engine oil and replace.

Re-assemble the rockers and the head can then be re-fitted.

Great care must be taken when replacing the head to see that the joint between the two faces is perfect. Examine the faces of the head and barrel and see if any sign of discolouration is shown. The head face should be ground to the face on the barrel. This is done by using a little very fine emery paste on the surface. The barrel should be held lightly in a vice and the head rotated backwards and forwards until the whole of the face is perfectly clean. Do the above while the head is completely dismantled, and after this grinding has been done the whole parts must be thoroughly washed again to remove all traces of emery. This is very IMPORTANT. Washers are never used between these two faces as the only perfect joint is by grinding the two metal surfaces together. If washers are used there is always a chance of their blowing and causing trouble.

When tightening the cylinder head bolts, care should be taken that the bolts are pulled down quite evenly, working from corner to corner. Now re-assemble the remaining parts.

It is necessary frequently to examine the timing gear, to see if any wear has taken place. The timing gear consists of two cams (exhaust and inlet) independent of each other and operated by hardened rocker arms.

The most important parts are the rocker arms. Examine carefully for wear, and if in any way worn, they should be changed.

Examine the surface of the cams and if these are found to be at all marked, they should carefully be polished up with smooth emery cloth. NOTE.—Keep each rocker to its own cam.

When everything is all perfectly clean and ready for re-assembling smear rockers with plenty of oil to make sure that they are not dry when the engine starts. This is very IMPORTANT.

TAPPET ADJUSTMENT.

Tappet adjustment is provided in the overhead rockers, direct to the valves. Adjust when the engine is cold, until the valve end caps can be revolved, but have no up and down play.

A second adjustment is provided on the tappet itself beneath the push rod cover tube; this is provided for use when the compression ratio is raised (by removing the cylinder base washers), the tappet being adjusted accordingly at this point, by means of the tappet head nut and locknut.

INSTRUCTIONS FOR TUNING AMAL ROAD RACING CARBURETTER. Type T.T.34.

JETS.

The pilot jet, for starting off with, is unlike the standard Amal touring pilot jet because the adjustment regulates the fuel flow and not the air. This adjustment gives a wider range for any fuel which is mixed with air coming through the small hole under the carburetter—this mixture for idling and "starting off" passes through into the carburetter outlet just behind the throttle, and is again mixed with air coming under the throttle through the main bore.

The main jet can be got at easily without disturbing the float chamber, by removing the hexagon cap in the holding bolt. In shape the jet is like the T.T.32 carburetter jet, but it is marked in c.c. flow instead of the T.T.32 cypher, as this c.c. flow figure simplifies calculation. However, if you have been used to the old numbers, the corresponding sizes are as follows:—

T.T.32 No.	T.T.34 in cc. flow	T.T.32 No.	T.T.34 in cc. flow	T.T.32 No.	T.T.34 in cc. flow	T.T.32 No.	T.T.34 in cc. flow	T.T.32 No.	T.T.34 in cc. flow
32	100	50	250	63	400	77	600	95	900
33	110	51	260	—	410	78	620	—	920
35	120	52	270	64	420	80	640	97	940
36	130	53	280	65	430	81	660	—	960
38	140	54	290	66	440	82	680	98	980
39	150	55	300	67	450	84	700	100	1000
40	160	56	310	68	460	85	720	105	1100
41	170	57	320	69	470	86	740	110	1200
43	180	—	330	70	480	88	760	115	1300
44	190	58	340	—	490	89	780	118	1400
45	200	59	350	71	500	90	800	122	1500
46	210	60	360	72	520	91	820	127	1600
47	220	61	370	74	540	92	840	130	1700
48	230	62	380	75	560	93	860		
49	240	—	390	76	580	94	880		

To get carburation for any stated fuel when the choke bore is correct for the peak revs. of the engine and the correct needle jet for the fuel to be used, the procedure is simple. Start off with an assumed setting, and then tune as follows. There are four phases:

(1) Main jet for power at full throttle.
(2) Pilot jet for "idling.
(3) Throttle cut-away to take off from the pilot jet.
(4) Needle position for snappy mixture at ¼ to ¾ throttle; then final idling adjustment of the pilot jet.

Always tune in this order, then any alteration will not upset a correct phase.

SEQUENCE OF TUNING.

(1) Main Jet Size, (2) Pilot Jet Adjustment, (3) Throttle Valve Cut-away, (4) Needle Attachment.

1. **Main Jet Size.** This should be determined first: the smallest jet which gives the greatest maximum speed should be selected, keeping in mind the safety factor for cooling (the air lever should be fully open during these tests).

2. **Pilot Jet Adjustment.** Before attempting to set the pilot adjuster the engine should be at its normal running temperature, otherwise a faulty adjustment is possible, which will upset the correct selection of the throttle valve. The pilot adjuster which controls the amount of fuel past, is rotated clockwise to weaken the mixture, and anti-clockwise to enrich it. Adjust this very gradually, until a satisfactory tick-over is obtained, but take care that the achievement of not too slow a tick-over, that is, slower than actually necessary—does not lead to a "spot" which may cause stalling when the throttle is very slightly open.

3. Having set the pilot adjuster, open the throttle progressively and note positions where, if at all, the exhaust note becomes irregular. If this is noticed, leave the throttle open at this position, and close the air lever slightly, this will indicate whether the spot is rich or weak. If it is a rich spot, fit a throttle valve with more cut-away on the air intake side (or vice-versa if weak).

4. This tuning sequence will affect carburation up to somewhere over ¼ throttle, after which the jet needle, which is suspended from the throttle valve, comes into action, and when the throttle is opened further and tests are again made for rich or weak spots, as previously outlined, the needle can be raised to enrich or lowered to weaken the mixture, whichever may be found necessary. With these adjustments correctly made, and the main jet size settled, a perfectly progressive mixture will be obtainable from tick-over to full throttle.

Needle Jet. It is not necessary to alter the needle jet when tuning, but before attempting to set the carburetter, the rider should make sure that the correct needle jet is fitted. The following are the needle jets which should be used:—

Carburetters up to 1 1/32" bore: petrol fuel; needle jet .1075.
Carburetters over 1 1/32" bore: petrol fuel; needle jet .109.
Carburetters used with alcohol fuel; needle jet .113.

Alcohol Fuels. When alcohol fuel is used, the needle jet mentioned above must be fitted, and it is also necessary to increase the main jet by the following amounts:—

Using Esso Racing Ethyl or B.P. Ethyl increase jet size by 250 per. cent., the percentage being based on the latest method of jet enumeration in c.c. flow.

TUNING THE AMAL TRACK RACING TYPE CARBURETTER.

The tuning of the track racing carburetter is carried out in three stages, these being:—

1. The Main Jet (three-quarter to full throttle).
2. The Pilot Screw (closed to one-eighth throttle).
3. The Throttle Valve cut-away (one-eighth to three-quarter throttle)

The Tuning should be carried out in the order mentioned.

The condition of the sparking plug should be carefully observed each time trial is made, this being used as an indication of a full throttle mixture strength, or, in other words, whether the main jet is weak or rich, a dry grey appearance being an indication of weak mixture, and of course a sooty appearance denoting rich mixture or too large a main jet, but attention would be drawn especially to the fact that the condition of the sparking plug can only be used to indicate the mixture strength at full throttle, and it should not be assumed that the main jet is too big if, after normal running, the sparking plug is found to be sooty, and this may quite easily have accumulated from too rich a slow-running mixture.

1. **To Obtain Main Jet Size:—**

Select the smallest size jet which gives the maximum speed, the air lever being about the three-quarter open position during these tests.

2. **Pilot Adjustment.**

To weaken slow running mixture, screw pilot air adjuster outwards.

TO RICHEN SLOW RUNNING MIXTURE screw pilot air adjuster inwards.

TO START, slightly flood the float chamber by gently depressing the tickler until fuel can be observed overflowing from the mixing chamber.

Set magneto half advanced, throttle slightly open; close air lever, and start up ENGINE.

After having warmed up the engine, the pilot can now be adjusted. It will be found that as the pilot air screw is screwed out, or weakened, the engine revs. will increase, necessitating the throttle being closed slightly, and it is a combination of throttle position and air adjustment which will give the desired idling or tick-over.

It is sometimes necessary to fully retard the magneto before good idling is obtained, this being, of course, the case when excessive valve overlap or any early ignition timing is employed.

Failure to secure good idling will probably be traced to one of the following causes:—

Air leaks at junction of carburetter and engine, or due to worn inlet valve stem or valve guide.
Faulty inlet or exhaust valve seatings.
Oily sparking plugs.
Magneto contact breaker points dirty or too closely adjusted.
Short in high tension cable.
Sparking plug points too closely set.

3. **Throttle Valve Cut-away.**

After having set the slow running as explained above, slowly open the throttle valve, when, if the engine responds regularly, the valve cut-away is correct.

A WEAK MIXTURE is indicated by spitting back through the air intake and as a second check on this weak flat spot it will be found that if the air lever is closed the flatness will disappear, this pointing to the fact that a throttle valve with less cut-away is required.

A RICH MIXTURE, which is shown by black smoke from the exhaust, coupled with erratic running or eight-stroking, and which again is accentuated when the air valve is closed, points to the fact that the

throttle valve with more cut-away is required. The number of cut-away is stamped on the top of the throttle valve, the higher the number the greater the cut-away.

Having obtained correct "idling," throttle valve number and main jet size, the setting should now be in order.

The pilot slow-running air screw is normally unscrewed about 2½ turns for petrol and about one-half turn for alcohol fuels.

It is also unnecessary to alter the throttle valve cut-away when changing from petrol to alcohol fuel.

We recommend the use of twin float chambers with alcohol fuels on 350 c.c. machines, and twin fuel feeds on 250 c.c. machines.

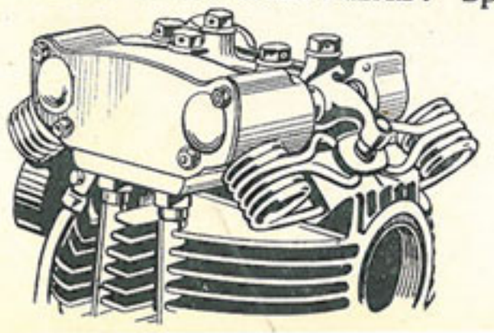
The jet size should be increased by 250 per cent. approximately when using Esso Racing Ethyl or B.P. Racing Ethyl, the percentage being based on the latest method of jet numeration, in c.c. flow.

APPROXIMATE ENGINE REVOLUTIONS.

At different speeds—miles per hour. Diameter of driving wheel—26in.

Gear Ratio	4	4¼	4½	4¾	5	5¼	5½	5¾	6	6¼	6½	6¾	7
SPEED in Miles per hour													
5	260	276	292	309	325	346	358	374	388	404	420	437	453
10	520	552	584	618	650	692	716	748	775	808	840	875	905
15	780	828	876	927	975	1038	1074	1122	1160	1210	1260	1310	1360
20	1040	1104	1168	1236	1300	1384	1432	1496	1550	1615	1680	1750	1810
25	1300	1380	1460	1545	1625	1730	1790	1870	1940	2020	2100	2180	2265
30	1560	1656	1752	1854	1950	2076	2148	2244	2320	2420	2520	2620	2720
35	1820	1932	2044	2163	2275	2422	2506	2618	2710	2830	2950	3060	3170
40	2080	2208	2336	2472	2600	2768	2864	2992	3100	3230	3370	3490	3620
45	2340	2484	2628	2781	2925	3114	3222	3366	3490	3640	3790	3940	4070
50	2600	2760	2920	3090	3250	3460	3580	3740	3880	4040	4210	4370	4530
55	2860	3036	3212	3399	3575	3806	3938	4114	4270	4440	4630	4800	4980
60	3120	3312	3504	3708	3900	4152	4296	4488	4650	4850	5040	5240	5440
65	3380	3588	3796	4017	4225	4498	4654	4862	5038	5254	5460	5677	5893
70	3640	3864	4088	4326	4550	4844	5012	5236	5425	5658	5880	6015	6345
75	3900	4140	4380	4635	4875	5190	5370	5610	5810	6060	6300	6550	6800
80	4160	4416	4672	4944	5200	5536	5728	5984	6200	6465	6720	7000	7250
85	4420	4692	4964	5253	5525	5882	6086	6358	6590	6870	7140	—	—
90	4680	4968	5256	5562	5850	6228	6444	6732	7000	7270	—	—	—
95	4940	5244	5548	5871	6175	6574	6802	7106	—	—	—	—	—
100	5200	5520	5840	6180	6500	6920	7160	—	—	—	—	—	—

ALLOY CYLINDER HEAD. Special 250 c.c. Model 50.



A separate list of Tuning Hints are supplied with each machine of this type to the owner.

This cylinder head with hairpin valve springs is not interchangeable with the bronze head Racing Models 50 and 60.

Illustration No. 54.

Part 4.

Spring Frames

For Unidyno Models 36S and 46S (250 c.c. and 350 c.c.).

GENERAL LAYOUT.

The spring frame layout conforms to the standard solid type frame for the Models 36 and 46—except that the rear portion of the frame is sprung. The main bearing of this frame is of very large diameter, fitted with taper roll bearings which are adjustable. Between the rear frame stays and the roller bearings large knurled dust covers are fitted. These not only prevent dust gaining access, but act as the adjusters for taking up any play which may occur in the bearings.

The spring frame is fitted with a hand adjustable damper which can be operated whilst riding. To get maximum comfort and efficiency it is necessary to make good use of this damper. It will be found that when travelling at high speeds considerably more damping effect is necessary than when travelling at slow speeds. The front fork is fitted with an adjustable damper which can also be adjusted when riding. The damping of the front fork movement, to ensure comfortable riding, is just as important as damping the frame movement, and with a little practice riders will find that they can work these two dampers in conjunction with each other, to get absolutely smooth and vibrationless running over roads varying from rough to smooth.

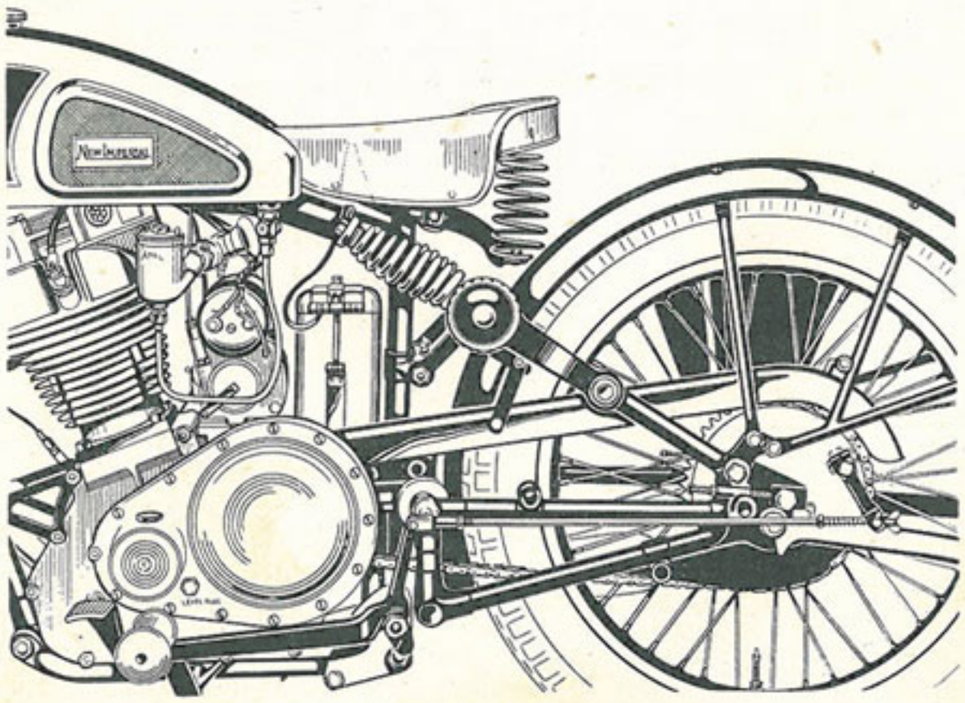


Illustration No. 55.

Care and Maintenance

SPRING FRAME GREASING AND ADJUSTMENT

(Models 36S and 46S).

Adjustment. The spring frame rear bearing can be checked for side play by placing a box under the engine so that the rear wheel is clear of the ground; then, by moving the rear wheel sideways any play will be felt. Adjust by undoing the locknut on the main spindle and turning the knurled dust cap on the primary drive side of the machine in a clockwise direction, until there is no play whatever. Re-tighten the locknut to complete the adjustment. No tools of any description must be used on the knurled nut, the hand only is necessary to obtain the correct adjustment.

Greasing. All moving parts of the spring frame are fitted with grease gun nipples, and it is most important to use these nipples often, and so ensure that all parts receive an adequate supply of lubricant, otherwise unnecessary wear will take place.

SPRING FRAME. FRICTION DAMPER.

Refer to Illustration No. 55 which shows the hand adjuster wheel with a small aluminium disc in the centre.

This disc can be prised out with a screwdriver in order to expose the two nuts which hold the damper together. These may be undone with a box spanner in an anti-clockwise direction, and the hand adjuster wheel screwed off in the same direction, allowing the damper plates and friction discs to be removed.

Replace worn parts and re-assemble in the reverse order.

FORK END FULCRUM.

Refer to Illustration No. 55. At the base of the seat stay tubes is situated a fulcrum pin—which allows free movement at this point; all play is taken up by a fibre washer, but as the movement is so slight, wear is practically nil. Should, however, the washer break up a new one must be fitted immediately.

The fulcrum pin unscrews in an anti-clockwise direction.

Part 5.

Sidecars.

SIDE-CARS.

When a machine previously used for solo work is to be fitted with a side-car, there are two important items which must be altered.

(1) Gear ratio must be altered. (For correct side-car sprocket on the various Models see table below.)

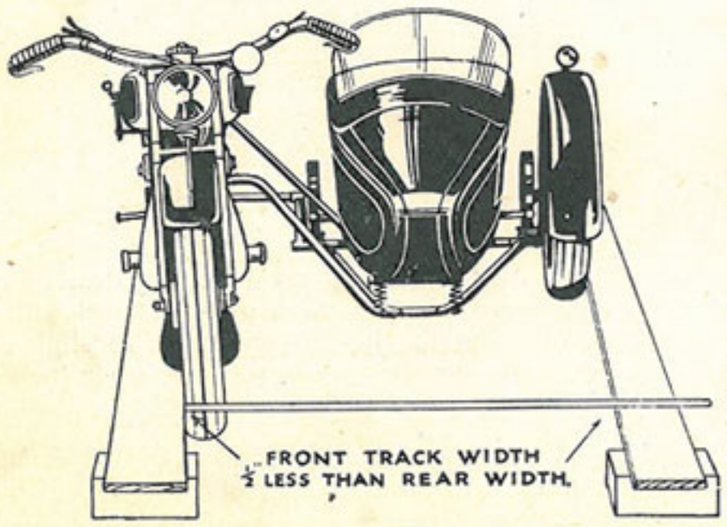
(2) A longer and stronger fork spring to be fitted to counteract the additional weight of the side-car and passenger. A spring ½" longer and exerting a greater poundage should be obtained from the Works or our Stockists.

	Solo Sprocket.	Side-car Sprocket.
Model 40 ...	42 T.	46 T.
,, 46 ...	50 T.	57 T.
,, 70 ..	46 T.	46 T.
,, 76 ...	40 T.	46 T.
,, 80 ...	40 T.	46 T.
,, 100 ...	50 T.	57 T.

TO FIT SIDE-CAR.

When a side-car has been fitted to the machine it is advisable to check for correct alignment. This is done by placing straight edges on each side of the combination as per illustration and adjusting by telescopic tubes at front and rear until parallel or about ½" narrower at front, with machine leaning slightly outward on level floor. Keep side-car close to motor cycle, the narrower the track the easier it is for the engine. Tighten all bolts, and lastly fit fourth point arm when provided.

When the combination is fitted up to your satisfaction, loosen nuts as if you were going to take off the side-car. If any bolts are difficult to draw or any attachment springs apart, there is undue strain somewhere which must be overcome. Find out the fault and rectify.



When the Motor Cycle is allowed to lean outwards slightly the Sidecar Chassis receives remarkable support.

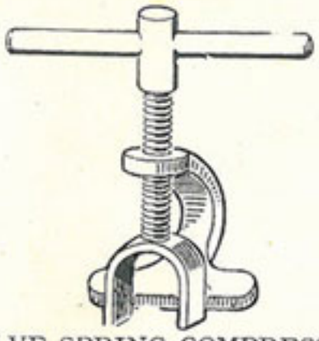
An extra hour spent on fitting is never wasted. All nuts and bolts should be carefully tightened after the first run, particular attention being paid to the mudguard.

Illustration No. 56.

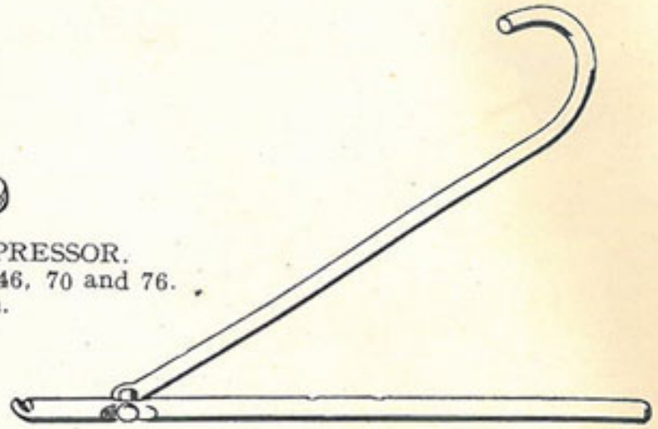
Part 6.

TOOLS TO ASSIST IN DECARBONIZING.

Illustration No. 57.

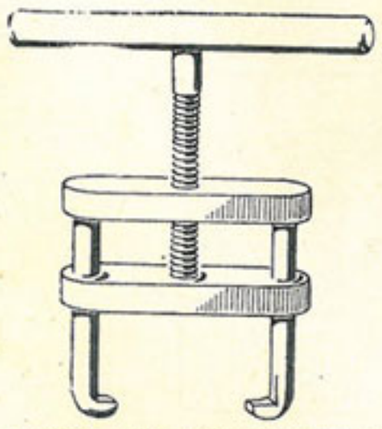


VALVE SPRING COMPRESSOR.
For Models 23. 30, 36, 40, 46, 70 and 76.
Price 4/6 each.

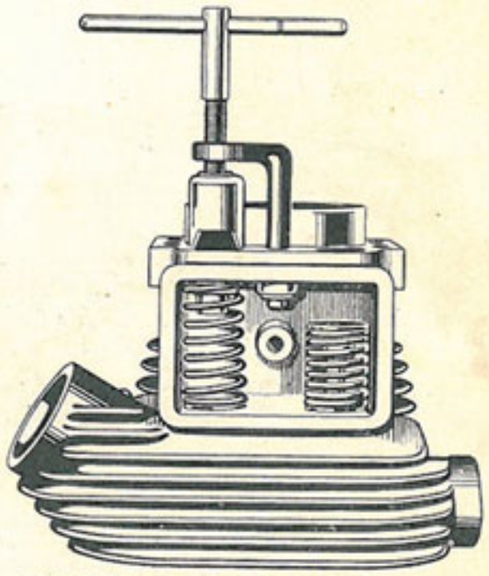


PUSH ROD AND COVER TUBE TOOL.
For Models 23, 30, 36, 40 and 46. **Price 1/9 each.**
For Models 90, 100, 50 and 60. **Price 3/- each.**

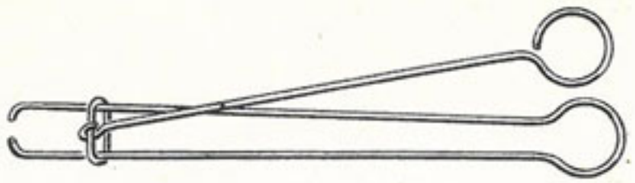
VALVE STEM HOLDER.
Price 1/-.
(Please state whether $\frac{5}{16}$in. or $\frac{3}{8}$in. valve.)



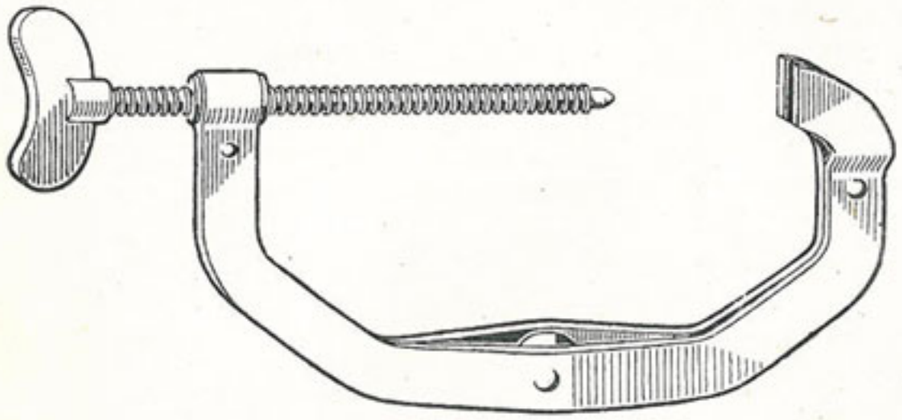
SHOCK ABSORBER SPRING TOOL OR SPROCKET WITHDRAWAL TOOL.
Price 5/-.



VALVE SPRING COMPRESSOR.
For Model 80.
Price 6/6 each.

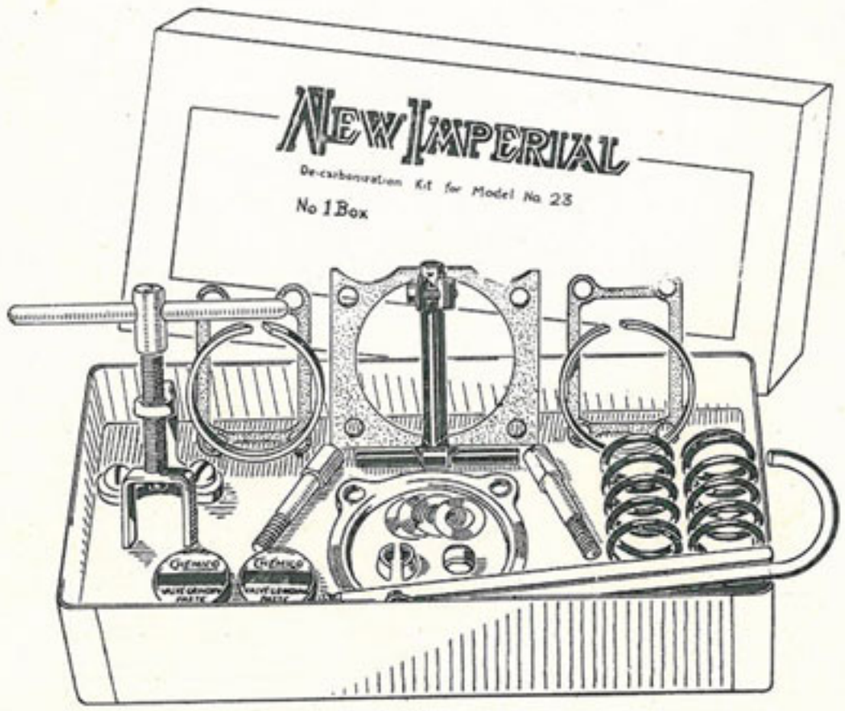


CHAIN TOOL.
Price 6d.



VALVE SPRING COMPRESSOR.
For Models 90, 100, 50 and 60.
Price 8/6 each.

Illustration No. 58.



Prices from 6/9 each to 20/- each.

For Prices and Contents of various Decarbonizing Kits, see page 101.

NOTE.—It is important that the Model No. or Frame and Engine No. of machine is quoted when ordering these kits.

Also send Box No. of Kit required. See page 101.

Decarbonizing Kits.

Decarbonizing Kits for the under-mentioned Machines are made up as follows:—

MODELS 23, 30, 36, 40 and 46.

1 Push rod removal tool.
1 Valve spring compressor.
1 Valve grinding tool.
1 Tin grinding compound.
1 Cylinder head gasket.
2 Outer valve springs.
2 Inner ,, ,,
2 Cylinder head bolts.
2 Rocker box oil washers.
1 Compression piston ring.
1 Scraper Piston ring, slotted.
4 Rocker spindle shims.
1 pair valve split cotters.
1 Cylinder base washer.
1 Valve stem thimble.
2 Gudgeon pin circlips.

		Price
No. 5	Box for Model 23 ...	**16/9**
,, 5A	,, ,, ,, 30 ...	**16/9**
,, 5B	,, ,, ,, 36 ...	**16/9**
,, 5C	,, ,, ,, 40 ...	**16/9**
,, 5D	,, ,, ,, 46 ...	**16/9**
,, 5E	,, ,, ,, 23 ...	**12/9**
,, 5F	,, ,, ,, 30 ...	**12/9**
,, 5G	,, ,, ,, 36 ...	**12/9**
,, 5H	,, ,, ,, 40 ...	**12/9**
,, 5J	,, ,, ,, 46 ...	**12/9**

Boxes 5E, 5F, 5G, 5H, 5J do not contain valve spring compressor.

MODELS 70 and 76.

1 Valve spring compressor.
1 Valve grinding tool.
1 Tin grinding paste.
1 Cylinder head gasket.
2 Outer valve springs .
2 Inner ,, ,,
2 Cylinder head bolts.
2 Rocker box washers.
2 Push rod tunnel washers.
1 Tappet cover washer.
2 Compression piston rings.
1 Scraper piston ring, slotted.
4 Rocker spindle shims.
1 Pair valve split cones.
1 Cylinder base washer.
1 Valve stem thimble.
2 Gudgeon pin circlips.

		Price
No. 6	Box for Model 70 ...	**18/9**
,, 6A	,, ,, ,, 76 ...	**18/9**
,, 6B	,, ,, ,, 70 ...	**14/9**
,, 6C	,, ,, ,, 76 ...	**14/9**

Boxes 6B and 6C do not contain valve spring compressor.

MODEL 80.

1 Valve spring compressor.
1 Tin grinding compound.
1 Cylinder head washer.
1 Cylinder base washer.
1 Pair valve springs.
2 Compression piston rings.
1 Scraper piston ring, slotted.
1 Tappet chest washer.

		Price
No. 7	Box for Model 80 ...	**12/9**
,, 7A	,, ,, ,, 80 ...	**6/9**

Box No. 7A does not contain valve spring compressor.

MODELS 90 and 100.

1 Valve spring compressor.
1 Valve grinding tool.
1 Tin grinding paste.
2 Outer valve springs.
2 Inner ,, ,,
1 Pair valve cotters.
1 Valve stem thimble.
4 Rocker spindle shims.
1 Compression piston ring.
1 Scraper piston ring, slotted.
1 Push rod removal tool.
2 Gudgeon pin circlips.

		Price
No. 8	Box for Model 90 ...	**20/–**
,, 8A	,, ,, ,, 100 ...	**20/–**
,, 8B	,, ,, ,, 90 ...	**12/–**
,, 8C	,, ,, ,, 100 ...	**12/–**

Boxes 8B and 8C do not contain valve spring compressor.

CHAIN SPARES.

Chain Links, per box	**2/–**
Chain rivet extractor, each ...	**4/6**

Special boxes of decarbonizing kits made up to order. Prices on application.

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SPECIFICATION

FRAME—Best quality steel tubing and lugs. WHEELS—24x1⅜ins. or 26x1½ins. Chromium plated, with black centres and lined. Dunlop rims. TYRES—Dunlop. HANDLEBAR raised, with screwed lever fulcrums. Chromium plated. BRAKES—Double roller lever (front and rear). PEDALS Rubber. FREE WHEEL—Villiers. GEAR—48 or 64. MUDGUARDS—Domed, heavy gauge, lined to match frame. SADDLE—Brooks Boy's, 3 coil. FINISH—Rust-proof. Enamelled Black, and lined double gold. Usual bright parts heavily chromed. ACCESSORIES—Leather tool bag, spanner, oiler and Bluemel's reflector.

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Deposit 5/- and twelve monthly payments of 7/8

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Deposit 5/- and twelve monthly payments of 7/8

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Spring Frame Adjustment	–	–	–	97	–	–	–	–
,, ,, Friction Damper ..	–	–	–	97	–	–	–	–
,, ,, Fulcrum	–	–	–	97	–	–	–	–
,, ,, Greasing	–	–	–	97	–	–	–	–
Starting	7	7	7	8	–	8	8	73
Steering, Adjustment of	10	10	10	10	10	10	10	10
Steering Damper	–	70	70	70	70	70	70	70
Steering Head	70	70	70	70	70	70	70	70
Stopping	9	9	9	9	9	9	9	9
Tapped Adjustment	12	12	12	12	92	12	13	74
Timing Ignition	17	17	18	18	86	19	20	74
Timing Valves	17	17	18	18	86	19	20	74
Twist Grips	35	35	35	35	84	35	35	84
Tyres, Maintenance and Removal ..	63	63	63	63	63	63	63	63
Tyre Pressures	16	16	16	16	88	16	16	79
Unit Construction	4	4	4	4	–	4	4	–
Useful Information	17	17	18	18	86	19	20	74
Valves, How to Retime	65	65	65	65	–	65	65	–
Valve Timing	17	17	18	18	86	19	20	74
Wheels Alignment..	11	11	11	11	11	11	11	11
,, Removal of	31	31	31	31	31	31	31	31

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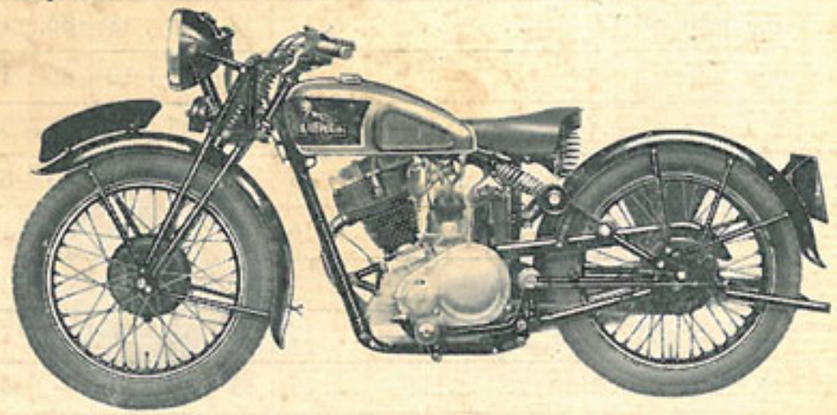

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