BSA

INSTRUCTION MANUAL

VICTOR
GRAND PRIX
Model B44

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VICTOR GRAND PRIX

Model B44

B.S.A. MOTOR CYCLES LTD., ARMOURY ROAD, BIRMINGHAM, 11

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This instruction manual is intended to acquaint the Victor owner with details of the controls, general maintenance and technical data which may be required for normal operation of the machine.

It does not contain the information necessary to carry out stripping for major overhauls, but if any owner feels competent to carry out this type of work, Service Charts and an illustrated Spares Catalogue can be obtained from the B.S.A. spares stockist or local dealer.

Owners in the British Isles can obtain these publications direct from B.S.A. Motor Cycles Ltd., Service Department, Armoury Road, Birmingham, 11. Always quote full engine and frame numbers when ordering these publications.

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TECHNICAL DATA

Engine Number On left side of crankcase

Frame Number On steering head

ENGINE:

Capacity (c.c.)	441
Cylinder bore (mm.)	79
Stroke (mm.)	90
Compression ratio	11·4
Contact breaker gap (in.)	·015
Valve timing:	
inlet opens b.t.d.c.	63°
inlet closes a.b.d.c.	72°
exhst. opens b.b.d.c.	80°
exhst. closes a.t.d.c.	55°
Piston rings:	
compression (in. wide)	$\frac{1}{16}$
scraper (in. wide)	$\frac{1}{8}$
Piston ring gaps:	
minimum (in.)	·009
maximum (in.)	·014
Sparking plug:	
Champion	N64Y
Plug points gap:	
minimum (in.)	·020
maximum (in.)	·025
Ignition setting	28° (B.T.D.C.)

TRANSMISSION:

Gear ratios—top	6·97
third	8·65
second	11·42
first	15·4
Clutch friction plates	4
Chain sizes—front (in.)	$\frac{3}{8}\times 70$ pitches (Duplex)
rear (in.)	$\frac{1}{2}\times$ ·355 roller (128 pitches)
Teeth on:	
engine sprocket	28T
gearbox sprocket	16T
clutch sprocket	52T
rear chainwheel	60T

CAPACITIES:

Fuel tank (gal.)	$1\frac{1}{2}$
Oil capacity (pints)	$4\frac{1}{4}$
Gearbox (pints)	$\frac{1}{2}$
Front forks (pints—each leg)	$\frac{1}{3}$
Primary chaincase (pints)	$\frac{1}{4}$

WHEELS:

Rim size—front	WM1-20
rear	WM3-18
Tyre size—front	3·00-20
rear	4·00-18
Brakes, dia.× width:	
front (in.)	$7\times 1\frac{1}{8}$
rear (in.)	$7\times 1\frac{1}{8}$

CARBURATION (AMAL):

Bore (in.)	$1\frac{5}{32}$
Main jet	310
Pilot jet	25
Throttle valve	$389/3\frac{1}{2}$
Needle position	3
Needle jet	·106

GENERAL DETAILS:

Overall length (in.)	$81\frac{1}{2}$
Wheelbase (in.)	$52\frac{3}{4}$
Ground clearance (in.)	8
Seat height (in.)	32
Handlebar width (in.)	32
Steering head angle	63°
Weight (lbs.)	255

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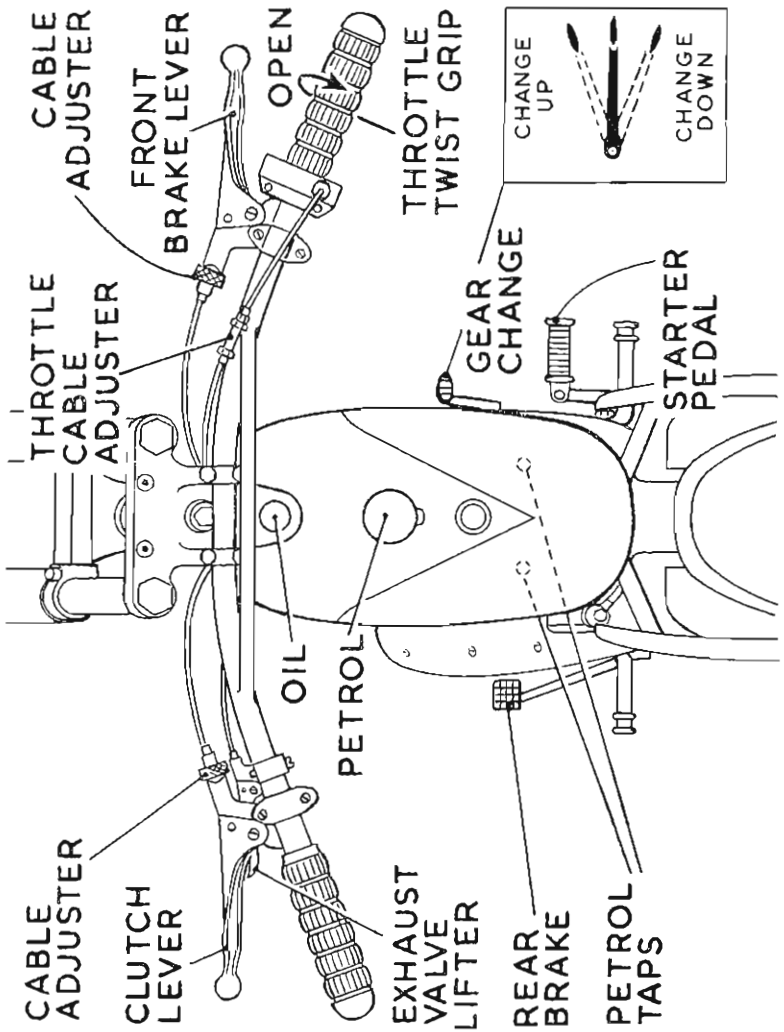

Fig. 1. The controls.

PREPARING THE MACHINE

The Controls

These are shown in Fig. 1. The hand controls are adjustable and some time should be spent in setting the handlebar position and the control levers to the riders own liking. The twist grip has a quick action and the gear lever has to be depressed to change to a lower gear, raising the lever for the selection of a higher gear. Neutral is between first and second gears.

Note: The camplate can be reversed if required, to give a reversed action.

Running-in

Every care is taken during the manufacture of the Victor to ensure that each component will play its part in providing satisfaction for the scrambles enthusiast, and in furtherance of this policy, the engine units are first given a functioning test to remove the initial stiffness inherent in a new engine, followed by a power test in order to maintain a consistently high standard of performance.

As far as is practicable therefore, the machine leaves the factory ready for a certain amount of hard work, but it cannot be considered as suitable for racing immediately after purchase, because the running-in process is not complete. This is an operation which must be left to the rider.

For obvious reasons the Victor cannot be used on the public highway so that, before engaging in serious competition work, every opportunity should be taken for "off the road" riding until the owner is satisfied that the working parts are fully bedded down. Running-in should commence at about half throttle, the amount of throttle opening being progressively increased until full throttle can be employed after several hours running. **The Victor cannot be expected to give its maximum performance unless it has been run-in correctly.**

Do not allow the oil level to fall too low, as economy in oil may prove very expensive at a later date and running consistently with too low a level may cause the oil to become unduly hot. It must be remembered that the oil cools as well as lubricates, and a new engine tends to run a little hotter than one which is well run-in. When the running-in process is completed, drain off all the engine oil, clean the filters (Figs. 2 and 3), and re-fill with fresh oil (page 13). At the same time the gearbox oil should be changed.

During running-in it is advisable to examine the various adjustable clearances such as contact breaker gap, valve clearance, clutch mechanism, etc., and to check the tightness of all nuts and bolts to make sure that the initial bedding down does not loosen any components.

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Special Note:

It is always advisable to make sure that the oil is warm before driving the engine hard. When taking part in scrambles, advantage should be taken of any warming-up period to get the engine warm and the oil circulated. Always start the race with a full tank and check the oil flow (page 12).

Maintenance

A good rider always prepares his machine with meticulous care before a scrambles meeting — the paddock is not the proper place for routine maintenance — and the list which follows is of items which should be examined, and if necessary adjusted, prior to every meeting. The method of carrying out the various adjustments will be found under the appropriate headings in the later chapters.

Whenever any work is carried out on the machine, attention to detail and scrupulous cleanliness must be observed. All joints must be clean and gaskets in good condition before assembly. Threads must be kept clean and free from grit and exposed threads should be oiled or greased before assembly. Good fitting spanners should be used at all times and nuts must be tightened firmly. Spanners of greater length than standard should not be employed, as they may cause thread failure through over-tightening.

If a hose is used when washing the machine after an event, take care that water and dirt is not introduced into the carburettor, air filters, etc. Oily areas should be treated with a proprietary detergent before hosing down.

MAINTENANCE CHECK LIST

Page 30	Brake adjustment	—At the same time examine the brake linings, clean any dust from the brake drums, and check the action of the front brake cam housing.
	All nuts and bolts	—Although the majority of nuts are of the self-locking type, conditions of use are such that checking is advisable.
Page 21	Air filters	—Examine before every scrambles meeting. Replace as required.
Page 14	Valve clearances	
Page 18	Sparking plug	
Page 15	Contact breaker gap	—If this is adjusted or cleaned, then the ignition timing must also be checked (Page 16).
Page 16	Auto-advance mechanism	
Page 13	Crankcase breather	
Page 24	Clutch operation	
Page 26	Rear chain adjustment	

Page 27	Wheel alignment	
Page 32	Steering head	
Page 31	Front suspension	
Page 32	Rear suspension	
	Petrol tap filter	
	Tyre pressures	—These will normally be adjusted to suit the riders requirements and the nature of the terrain.

Lubrication

Correct lubrication, not only of the engine/gearbox unit, but of all other working parts is of vital importance in ensuring their satisfactory operation, immediate response to controls, etc., and as with mechanical maintenance, a good rider will make certain that all lubrication is carried out as a matter of routine before every scrambles meeting. A list is given below of those items requiring lubrication attention and where amplification is considered necessary, this is provided in the later chapters.

LUBRICATION CHECK LIST

Page 13	Oil level	—Visible through filling orifice (Fig. 3) after removing baffle. Recommended lubricants Page 10. Drain by removal of oil pipe connection at bottom of front down tube.
Page 13	Oil filter (header tank)	—Located at the front of the tank in conjunction with oil pipe union (Fig. 3).
Page 13	Oil filter (crankcase)	—Incorporated in sump cover plate beneath crankcase (Fig. 2).
Page 13	Pump ball valve	—Visible when sump cover plate is removed (Fig. 2).
Page 22	Primary chaincase	—Left side of crankcase. Level and drain screws painted red (Fig. 9).
	Brake pedal	—Use engine oil.
Page 25	Gearbox	—Filler on top of the gearbox. Combined drain and level plugs below. Recommended lubricants Page 10.
Page 29, 30	Brake cam spindles	—Grease rear; oil front.
Page 27	Rear chain	—Use engine oil or graphited grease.
Page 15	Contact breaker cam	—Use engine oil or thin grease.
Page 16	Auto-advance mechanism	—Use a light oil.
	Exposed cables	—Engine oil or grease.
	Control rod joints	—Engine oil or grease.
Page 31	Front forks	—Drain screw at bottom and filler cap at top of each leg (Fig. 16).

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Lubricating Oils

Engine. A vegetable base oil of S.A.E. 30 viscosity is recommended for use in the Victor engine. If a mineral oil is preferred (see special note below), then the grade of oil must be of S.A.E. 40 viscosity.

Gearbox. A lubricating oil of 90 E.P. grade should be used for this purpose.

Primary Chaincase. A mineral-base oil of S.A.E. 20 viscosity is essential for lubrication of the primary chain. **A vegetable-base oil should not** be used because of the possibility of harmful effects on the electrical equipment.

Front Forks. Use an S.A.E. 20 viscosity mineral-base oil. (See also page 31.)

Special Note:

During factory testing, the engine is run on a vegetable-base oil and a similar type of oil should be used thereafter. If however it is desired to use a mineral-base oil, the engine lubricating system must be thoroughly cleansed of the previous lubricant. If the two types of oil are mixed, an emulsion will be formed which may damage the engine.

Lubricant Manufacturers

The following brands of oil have been approved as being satisfactory for use in Victor engines:— Castrol (R30), Shell, Esso, Mobiloil, Regent and B.P.

Greases

The following greases are suitable for use on all B.S.A. motor cycles:— Shell Retinax A, Castrolease LM, Esso multi-purpose grease H, Mobilgrease MP, Marfak multi-purpose 2 and Energrease L2.

THE LUBRICATION SYSTEM

The system is of the dry sump type and is operated by a double gear pump situated in the bottom of the crankcase on the right-hand side (Fig. 2). The oil capacity is 4¼ pints carried in the frame tubes and a "header" tank, and oil is drawn from here to the supply pump (top set of gears). It is then pumped past the non-return valve A, through the hollow mainshaft to the big-end.

After lubricating the engine, the oil flows down through a filter to a small sump B in the bottom of the crankcase from which it is drawn by scavenge pump (lower set of gears) past another non-return valve C and delivered up the return pipe to the frame top tube. A by-pass pipe feeds oil from the return pipe to the rockers, push-rod ends, etc.

The valve A prevents oil transfer from the supply system to the crankcase while the machine is standing and, together with sludge trap F, does not require attention until such time as the engine is

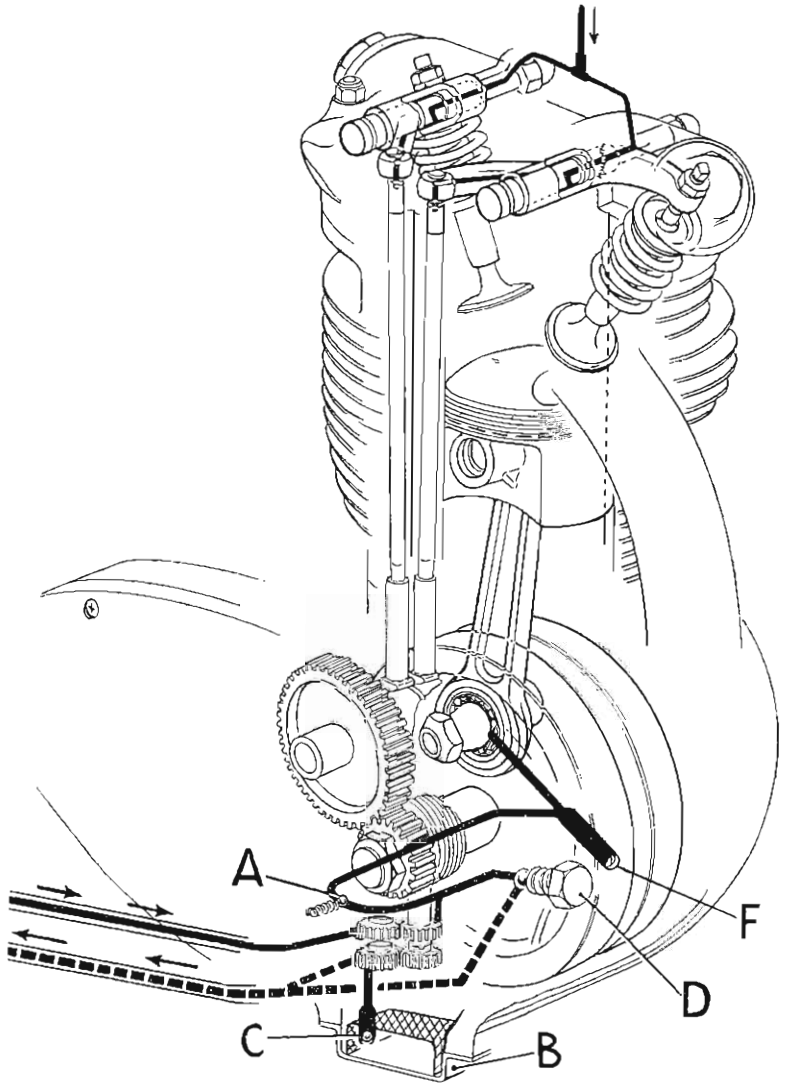

Fig. 2. The engine lubrication system showing the ball valves.

completely dismantled. It should be specially noted that if the outer timing cover is removed, the screw retaining valve A and its spring will be exposed, and as previously mentioned it should not be disturbed.

A by-pass valve D ensures a constant pressure in the system and allows surplus quantities of oil to be discharged into the scavenge oilway between the pump and the tank. This valve should not be removed until the engine is completely dismantled for servicing.

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Oil Flow

This can be examined if the oil filler cap and baffle unit are removed whilst the engine is running, when the returning oil should be seen issuing from the return pipe. The flow of oil will in all probability contain air bubbles, but this is a normal condition due to the larger capacity of the return pump. If there is no oil flow from the return pipe, stop the engine immediately and investigate the cause.

Provided that the oil lines are externally clean, the oil should also be seen circulating round the system, and if the oil level should accidentally become too low, it can be detected immediately.

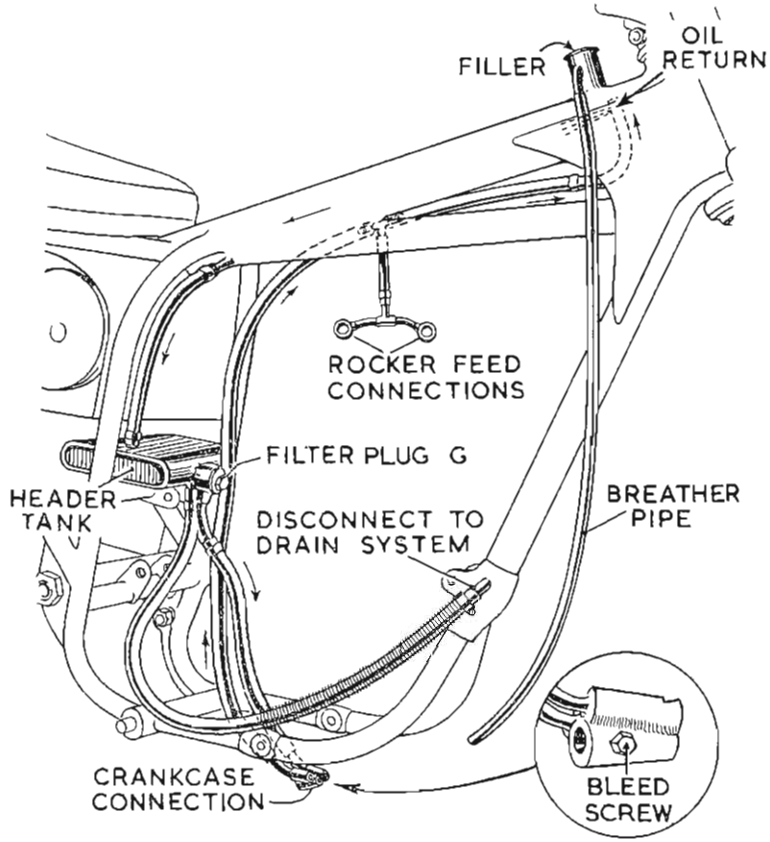

Fig. 3. The lubrication circuit.

The Oil Pipes

The pipes are made of a transparent plastic material and attached to short metal pipes by special clips. It is essential that these connections are in good order and if there is any doubt about the efficiency

of a joint, it should be re-made. Examine the connections regularly to ensure that this condition is maintained.

Changing the Oil

This should be done immediately after running, so that the oil is warm and will therefore flow more freely. The oil pipe connection at the bottom of the frame front down tube is fitted with a screw-type clip and when this is released, the flexible pipe can be withdrawn from its frame union and the oil will flow from both portions of the connection (Fig. 3). Also disconnect the supply and scavenge pipes at their union with the crankcase. Replace the pipe lines, re-make the joints carefully, and re-fill the system with one of the oils recommended on page 10.

Note 1: Remove the baffle unit in the filler orifice and re-fill with oil to the correct level (i.e. until it is visible at the bottom of the filler neck). In order to avoid any possibility of an air-lock in the system, the filter plug G must be slackened and the bleed screw removed when re-filling, both being re-tightened only when oil issues from the connection and the hole respectively. The bleed screw is accessible through the aperture in the crankcase shield. The machine should then be ridden for about 10 minutes and the oil level checked, replenishing if necessary to fill the system completely.

Note 2: After draining and refilling the lubricating system, there will be some delay before the oil is seen issuing from the return pipe. This is due to the fact that, initially, the crankcase sump is clear of oil. Be sure to replace the baffle unit.

Filters

Remove the header tank and crankcase filters for cleaning whenever the oil is changed.

The header tank filter is removed by unscrewing the plug G (Fig. 3). Take care of the washers fitted to both sides of the banjo union as these make the joint oil tight.

The crankcase filter is built-in with the sump B (Fig. 2) which is released following removal of four nuts of the self-locking type. They must always be used at this point, and replaced when worn.

Both filters are of gauze and they should be washed thoroughly in petrol, dried, and replaced.

The oil pump should not be disturbed unnecessarily and in any case it is most reliable and unlikely to give trouble.

Crankcase Breather

The breather pipe which emerges from the timing case near the clutch cable must be examined regularly and maintained clear of any obstruction.

Pump Ball Valve

When the crankcase filter is removed for cleaning, it is a good opportunity to check the ball valve C (Fig. 2), carried in the pump

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suction pipe. The ball must be free on its seating and this can be verified by inserting a piece of wire into the valve orifice. If the ball adheres to its seating, there will not be a return flow of oil to the tank. Alternatively, if the crankcase contains an excessive quantity of oil after, say, an overnight stop, this may be due to the ball not seating properly caused by a particle of foreign matter, so allowing oil to pass through the pump to the crankcase.

ENGINE MAINTENANCE DETAILS

Valve Clearances

These must be set when the engine is quite cold and the clearances should be ·015 in. for both inlet and exhaust valves.

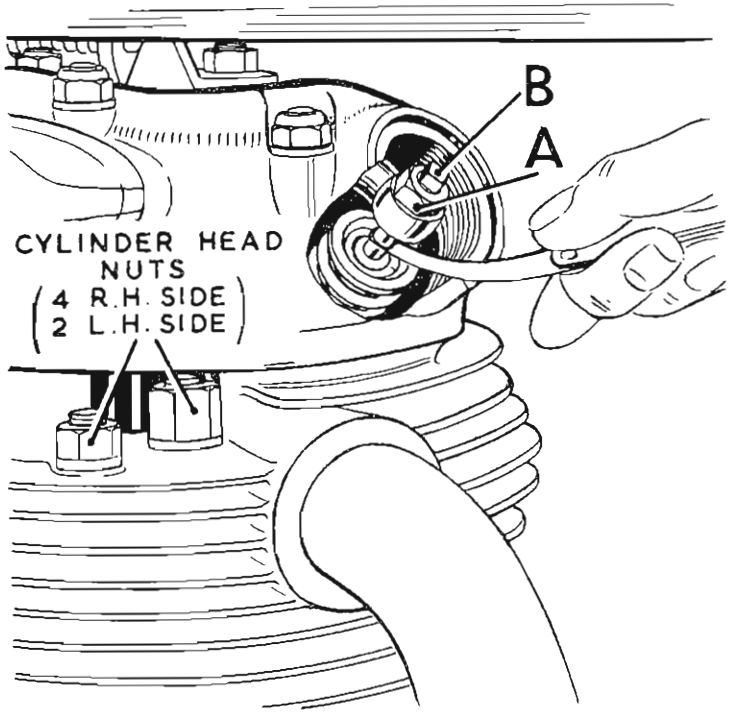

Fig. 4. Checking the valve clearances.

Remove the rocker caps and take out the sparking plug so that the engine can be rotated easily by hand. It may be necessary to slacken the carburettor flange nuts to provide clearance for the removal of the inlet rocker cap. Set the piston at T.D.C. on the compression stroke and then check the valve clearances by sliding a feeler gauge between valve stem and adjusting pin, as shown in Fig. 4.

If the clearance requires adjusting, slacken the locknut A and adjust pin B until the correct gauge will just slide between the valve and pin.

Holding the pin in its new position, re-righten the locknut Check the clearance again to make sure that tightening the locknut has not affected the setting.

Contact Breaker (Fig. 5)

The contact breaker is housed in the right side of the crankcase and is exposed by removal of the circular cover. The gap between the points should be ·015 in. when they are fully open. To check, rotate the engine slowly until the pivoted contact arm is on the peak of the cam and then check the gap with feeler gauges. If the gap is incorrect, slacken the screw securing the fixed contact plate and adjust this until the gap is correct. Retighten the screw and re-check the adjustment.

Do not allow oil or grease to find its way on to the contact breaker points, which should always be clean and dry.

It is advisable to check over the timing after carrying out any adjustment to the contact breaker points as a variation of the points gap tends to alter the timing. (Opening the points advances the timing, closing them retards the timing.) **Accurate timing is important in the operation of energy transfer ignition system.**

Cleaning

The contacts must be free from grease or oil. If they are burned or blackened, clean with fine carborundum stone or very fine emery cloth, afterwards wiping away any traces of dirt or metal dust with a clean petrol-moistened cloth. Cleaning of the contacts is made easier if the contact breaker lever carrying the moving contact is removed.

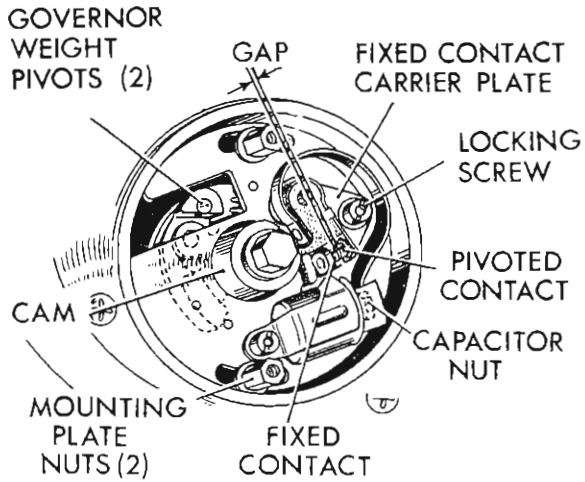

Fig. 5. The contact breaker (part of the auto-advance mechanism is shown behind the mounting plate).

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To take out the moving contact, first remove the terminal nut on the capacitor (Fig. 5) when the contact breaker spring and heel can be lifted off the spindle. It is essential that the insulating washer beneath the heel is replaced when reassembling. After cleaning the contact points, check the gap for accuracy, adjusting as necessary.

Lubrication

No grease or oil must be allowed to get on or near the contacts when carrying out the following procedure. Smear the surface of the cam very lightly with grease or, if this is not available, clean engine oil (S.A.E. 30–40) may be used.

Advance and Retard Mechanism

The timing is automatically advanced and retarded by means of a governor mechanism behind the contact breaker. When the engine is stationary the timing is fully retarded and as the engine speed increases the ignition timing is rapidly advanced until it is fully advanced at normal operating speed.

Inspect the mechanism when checking the contact breaker adjustment, and make sure that the two governor weights, Fig. 5, move freely. Oil each bearing with a drop of light oil. Do not over lubricate or the excess oil may find its way on to the contact breaker points.

Ignition Timing

Before carrying out any check on the ignition timing, the contact breaker gap should first be verified and, if necessary re-adjusted as above.

The importance of accurate ignition timing cannot be over emphasised. Care and patience must be used to ensure that the final setting is in accordance with the recommendation.

The method by which the exact point of opening of the contact breaker points is determined, is very important. If the engine is being timed with the aid of a degree plate, a battery and bulb in series with the contact breaker points will give a good indication of the point of opening. Without a degree plate it is difficult to see how far the engine rotates at the moment the bulb is extinguished.

In these circumstances the point of opening is best determined by inserting a piece of very fine paper (such as cigarette paper) between the points. The correct position for timing is when the paper is just lightly gripped between the points and can be withdrawn with a gentle pull.

Whichever system is adopted, it should be used on every occasion that the engine is retimed, in order to ensure consistent results.

The correct ignition setting before top dead centre with the contact breaker governor set in the **fully advance position** is:— piston position from top dead centre ·265 in. or, using a degree plate, 28 degrees.

A greater degree of accuracy in timing is obtained using the fully

advanced position and for this purpose the governor weights must be locked in place (with the engine stationary, they will automatically be in the fully retarded position). Remove the central bolt from the contact breaker and fit beneath its head a washer with a hole that is a little larger than the cam bearing. Replace the bolt, but before tightening against the special washer, rotate the cam to its limit, hold in position, and tighten bolt. The washer will then press firmly against the face of the cam, so preventing it from returning to the retarded position.

If the piston distance before top dead centre is being measured, it should be done with a slim steel rod inserted through the sparking plug hole. Keep the rod as vertical as possible and try to keep its lower end maintained at one spot on the piston, as movement of the rod can cause a diversion of setting.

The degree plate method should be adopted whenever possible as this tends towards greater accuracy. The primary chaincase must be removed, and the degree plate mounted centrally on the mainshaft.

Rotation of the engine through several degrees near the top dead centre position produces a very small movement of the piston, which is extremely difficult to detect. A dial gauge used to measure the piston movement will enable top dead centre to be determined accurately, but otherwise it is preferable to have some form of stop (such as a dummy plug with a projection into the cylinder head) so that the piston can be brought gently against it by rotating the engine as far as it will go in each direction.

If degree plate readings are taken in each position, the point midway between them is easy to calculate and this will be an accurate top dead centre.

If the dummy plug type of stop is adopted, take care that it is constructed so that the valves cannot touch it when they are fully open. Should the cylinder head be off when the engine is timed, a straight edge placed across the top of the cylinder barrel will act as a suitable stop.

To check the ignition setting, first determine the top dead centre position of the piston (compression stroke) by one of the above methods. Rotate the engine backwards about 45 degrees then bring it forward slowly until the contact breaker points are just opening. The piston should then be in the position before top dead centre specified above.

Note: With the engine in the frame, the easiest way to rotate it is to engage top gear and turn the rear wheel forwards or backwards as necessary.

If the ignition setting is not correct, slacken the two contact breaker back plate screws, thus allowing the position of the plate to be adjusted (so altering the point of opening of the contacts), until the above condition is obtained. Firmly tighten the screws.

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Valve Timing

The timing gears are situated within the inner cover on the right side of the engine. Under normal conditions the valve timing cannot become disturbed and it is inadvisable to dismantle the gears unless it is absolutely essential.

For the convenience of owners who find it necessary to dismantle the gears, the valve timing will be correctly set if the marks on the gears are positioned in accordance with the illustration (Fig. 6) when the piston should be at the top of its compression stroke.

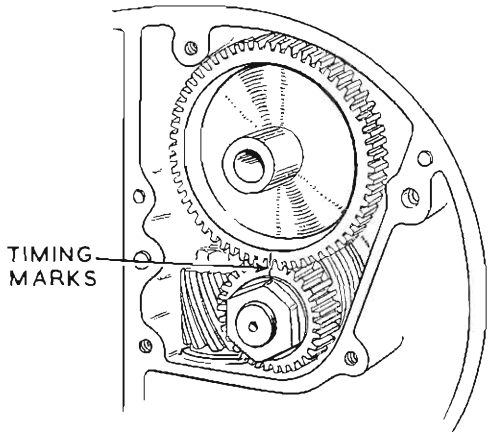

Fig. 6. Valve timing marks.

SPARKING PLUG

The plug is of great importance to satisfactory engine performance and it is necessary that it should be of the correct type and in good condition. Champion type N64Y is approved for use in Victor engines.

The condition of a sparking plug can be helpful in determining the condition and tune of an engine and it is recommended that the plug be removed from time to time for examination.

A plug running at correct temperature in a healthy engine, will be indicated by blackish or greyish-tan deposits on the end of the plug body and earth electrodes. The firing end of the insulator will vary from a very light tan to a darkish brown. A sooty deposit on the firing end of the plug is generally an indication of an over-rich mixture, whereas a fine light grey deposit on the end of the plug body and a whitish appearance on the firing end of the insulator may indicate a lean mixture. If carburation appears correct but the plug insulator at the firing end is black with carbon or oily deposit, this is generally an indication that the grade of plug is too cold.

Plugs should be cleaned on an abrasive blast machine and afterwards, the sparking surfaces of the electrodes should be dressed with a fine file in order to restore clean, flat, parallel surfaces. It is most important that the gap should be re-set to specification (·020 in. to ·025 in.). Gap adjustment should be made by bending the side wire and a special gap tool complete with feeler gauges, is obtainable from either a Champion plug stockist or direct from Champion Sparking Plug Co. Ltd., Feltham, Middlesex.

The threads of the plug, and the gasket and gasket seat, should be wiped clean before re-fitting the plug to the engine. The upper portion of the insulator should also be wiped clean after fitting and prior to connecting the H.T. cable. It is good practice to wipe periodically the top of the insulator with a clean cloth, in order to remove any accumulation of mud, etc., as such deposits are conductive and result in poor plug performance. The special non-detachable steel gaskets fitted to Champion Sparking plugs are designed to last the life of the plug.

When re-fitting the plug, screw in as far as possible by hand, and then use a box spanner for final tightening to avoid possibility of damage to the insulator. An adjustable spanner should not be used.

THE CARBURETTOR

An exploded view of the carburettor is shown in Fig. 7. Opening the twist grip throttle control raises the throttle slightly, thus controlling the supply of air to the engine. The tapered needle controlling the supply of fuel is attached to the throttle slide so that a balanced mixture is always provided. The needle has five notches at its upper end and is secured in the throttle slide by a spring clip which locates in one of these notches. The throttle valve size and needle position are determined before despatch from the factory and no alteration should be necessary to these settings. Mixture control at low speeds is by means of a pilot jet which has an adjustable air supply.

Under scrambles conditions the main jet size may require some alteration to suit atmospheric conditions and the fuel used.

To tune the carburettor, always check the carburation in the following order and always at normal engine temperature.

1. Main jet for power at full throttle.
2. Pilot jet for idling.
3. Throttle cut-away for correct pick up from idling.
4. Needle position for good acceleration from $\frac{1}{4}$ to $\frac{3}{4}$ throttle.
5. Finally re-adjust the pilot jet setting.

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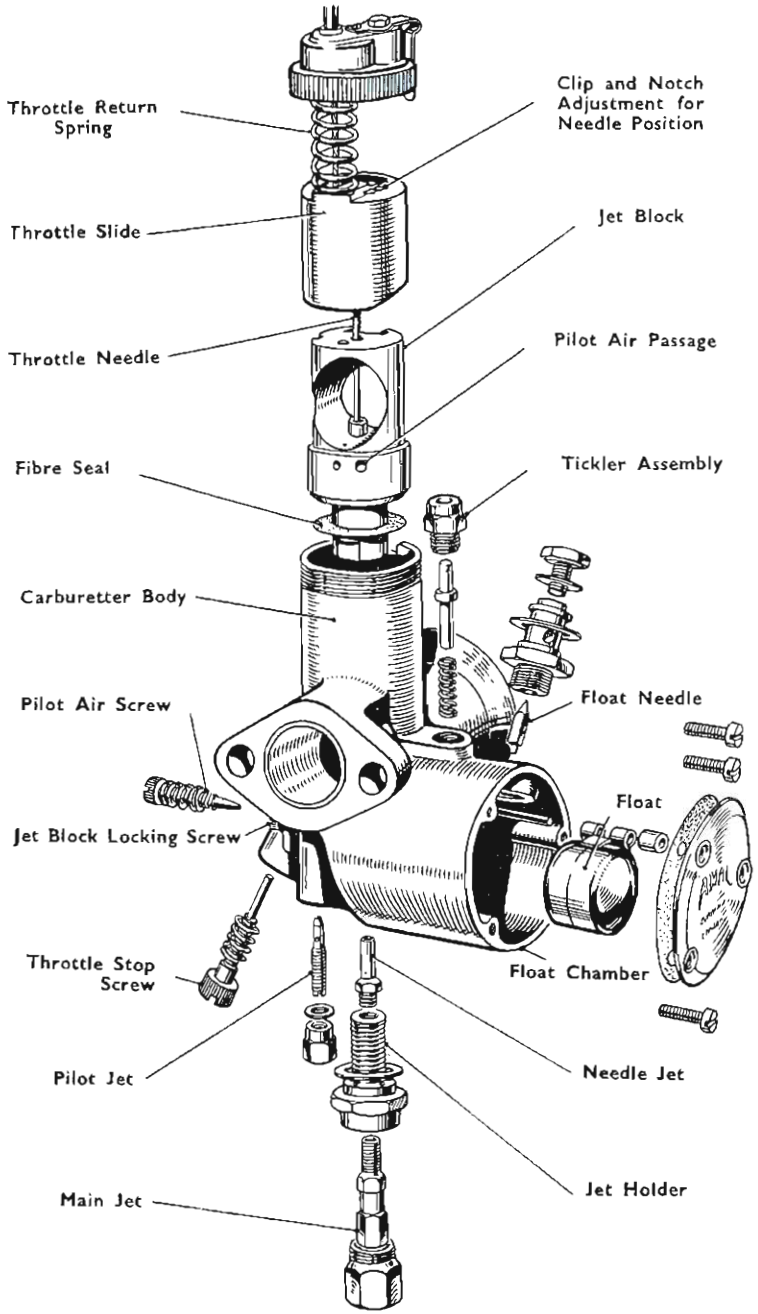

Fig. 10. The carburetter.

Main Jet Size

The smallest jet which gives the greatest maximum speed should be selected, keeping in mind that if too small a jet is fitted, overheating may occur. Provided that the correct sparking plug is being used (see page 18), it can provide an indication of whether or not the mixture is correct.

After a run at full throttle, stop the engine without allowing it to run slowly, and remove the plug. If the plug end is grey put in a bigger main jet. The plug end should be a smooth black, but if it is a sooty-black the mixture is too rich.

Pilot Jet Adjustment

Screwing in the pilot air screw restricts the air supply thus giving a richer mixture and unscrewing it weakens the mixture.

The best way to adjust, is to screw in the pilot air screw until the mixture is obviously too rich and the engine starts to run irregularly; then unscrew the adjuster until the engine runs evenly.

When the proper adjustment has been determined, the engine may be running too fast and in this case the throttle stop should be unscrewed a little. If considerable alteration to the throttle stop has been made the pilot air screw should be re-adjusted.

Throttle Valve Cut-away

When the pilot adjuster is correctly set, open the throttle progressively up to $\frac{1}{4}$ throttle and observe any points where the exhaust note becomes irregular. If such a point is reached fit another throttle valve with more cut-away to cure rich mixture, and to counteract weakness less cut-away is required.

Needle Jet Position

The needle jet is the major controlling factor from $\frac{1}{4}$ to $\frac{3}{4}$ throttle. Run the machine at these throttle openings and test for rich or weak spots. The needle can be raised or lowered by re-locating the spring clip in one of the grooves at the top of the needle. Raising the needle gives a richer mixture and vice versa, but normally the needle should be moved only one notch at a time.

Finally, re-adjust the pilot jet and then a properly balanced mixture should be obtained throughout the full throttle range.

The settings given on page 5 are those normally recommended and will be suitable for most atmospheric conditions. They are intended for use at altitudes of 0–3,000 feet.

Air Cleaners

The carburettor draws filtered air from two highly efficient filters (one each side on the machine) via a compartment centrally disposed beneath the seat.

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The filters are accessible following removal of their outer covers (retained by snap connectors) and can be taken off when the central fixing screw is released (Fig. 8).

The filters are composed of paper elements and should be replaced in their entirety when choked. The soft rubber facings must be in good order to ensure an air tight joint.

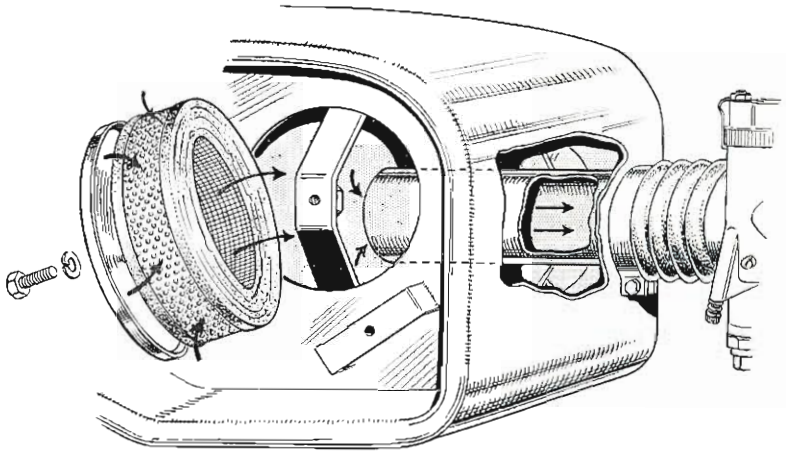

Fig. 8. The air-cleaner mountings (similar on opposite side of machine).

TRANSMISSION

Primary Chain

The unit construction of the engine and gearbox allows the use of fixed centres between clutch and engine sprockets, so that a pre-stretched endless chain of the duplex type is fitted. A spring link connection is not provided.

Primary Chaincase

The outer cover is retained by screws of three different lengths, and one of these M, Fig. 9, which is painted red, determines the oil level. To replenish with oil, first remove this screw and then the clutch inspection cover H, Fig. 9, the latter acting as a filling orifice. Add oil of the correct grade (see Lubricating Oils, page 10) and allow to stand until any surplus oil has drained away. Replace the level screw and inspection cap. The machine should be on horizontal ground when this operation is carried out. Note that the screw behind M is also painted red and is used for drainage purposes.

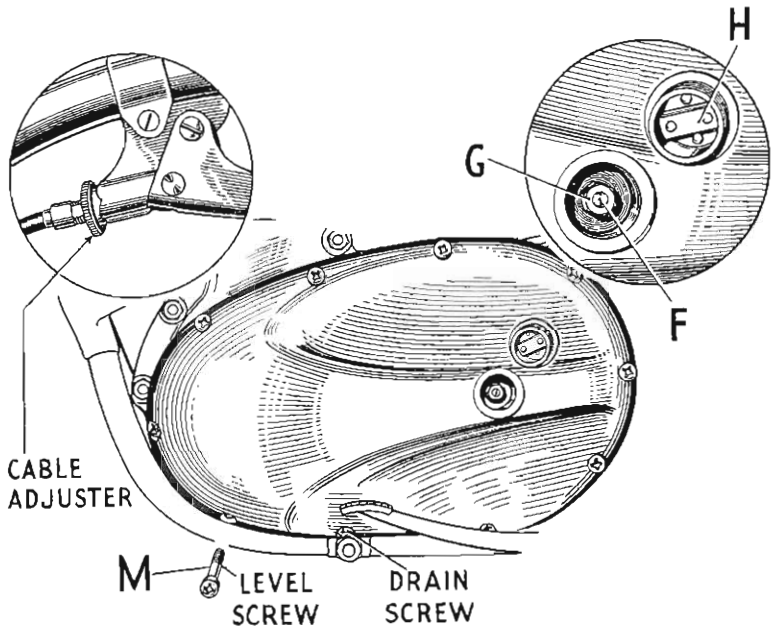

Fig. 9. Clutch adjustment and chaincase oil level.

Clutch Dismantling

Remove locking wires and the four spring retaining nuts P, Fig. 10, and withdraw the springs and their cups. The pressure plate L and the remaining clutch plates can then be withdrawn, and if these are the only items requiring attention, the clutch need not be dismantled further. The steel plates should be smooth, and if badly scored, they should be replaced. The segments on the driving plates are bonded in position, and if badly worn, burnt, or displaced, the complete plate must be replaced.

Clutch Spring Pressure

Whenever the clutch has been dismantled, the spring pressure must be reset carefully. The four retaining nuts P, Fig. 10, should be screwed in until the underside of the head of each nut is approximately $\frac{1}{16}$ in. from the face of a spring cup. This figure is an arbitrary one and it is a simple matter to vary it according to circumstances. If the springs are compressed excessively, the handlebar lever will be stiff to operate and tiring to the hand; alternatively, if the spring pressure is insufficient, the clutch will tend to slip.

Adjust for true running of the plates by declutching and then operating the starter pedal, when it will be seen whether the pressure plate

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rotates truly or not. If necessary, adjust the nuts individually until true running is obtained. Renew the locking wires.

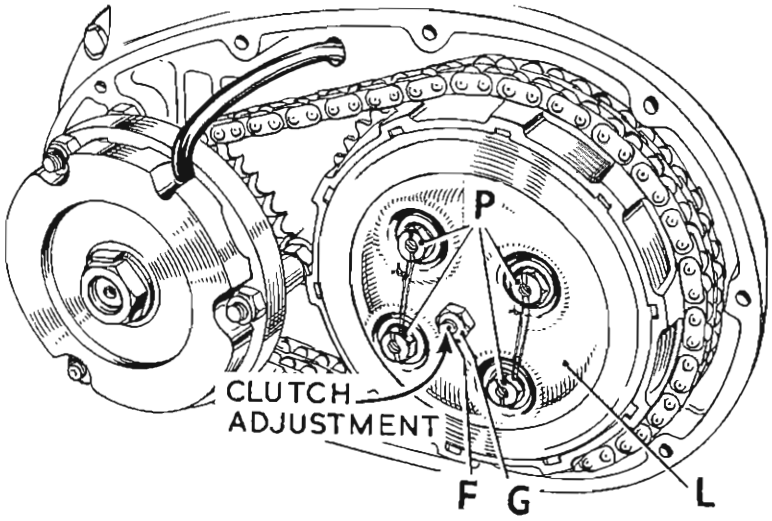

Fig. 10. The primary transmission and clutch.

Clutch Control Adjustment

The main adjustment consists of a screw pin F and locknut G, Fig. 10, mounted on the clutch pressure plate. These are accessible after removal of the inspection cover H, Fig. 9.

The control is in correct adjustment when, with the handlebar lever released, the control arm above the timing cover on the right side of the engine is inclined outwards by a small amount. **In this position there must be a small amount of free play at the lever.** When the handlebar lever is gripped, the control lever should take up a position approximately parallel with the timing cover joint face (Fig. 11).

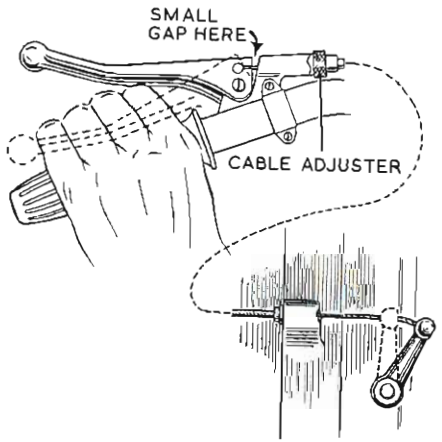

Fig. 11. Setting the clutch operating lever.

If adjustment is necessary, slacken locknut G and turn the pin F until the above condition is obtained, re-tightening the locknut afterwards. Provision is made for cable adjustment at the handlebar (Fig. 10) and is intended for fine adjustment of the cable only.

The clutch cable can readily be detached or replaced if the handlebar adjustment is first slackened off to its fullest extent and the control arm rotated inwards, when the cable ends can be removed from their sockets.

Gearbox

In addition to topping-up and draining at regular intervals, the gears should be examined periodically to ensure that they are in good condition. The gearbox drain plug S incorporates a level plug K and, to top-up, remove the filler plug T, Fig. 12, take out the level plug and replenish with the correct grade of oil until it starts to flow out through the level plug hole.

To drain the oil, an operation which should preferably be undertaken while the oil is warm after a run, unscrew the drain plug S, carrying the level plug with it. The capacity of the gearbox is approximately ½ pint and suitable oils are detailed on page 10.

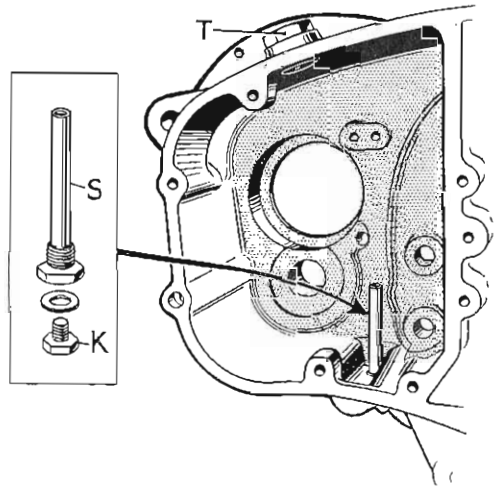

Fig. 12. The gearbox drain plug.

Starter Pedal Spring

The starter pedal spring is exposed by removal of the outer timing cover. Before this is taken off, remove the contact breaker lead at its snap connector, then the circular plate and rotate the engine into such

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a position that the contact points are closed, which will ensure clearance between the cam and the heel of the moving contact, thus facilitating removal and replacement. Next remove the gear-change and starter pedals, followed by the cover itself. The recessed-head screws retaining the cover require a screwdriver of a special type and a standard screwdriver must not be used.

It is important to note that the starter spindle housing carries an oil seal and the timing cover and spindle must be reassembled with great care to avoid damage to the seal.

Rear Chain Adjustment

The rear chain must be adjusted when the wheel is at the lowest point in the suspension. Rotate the wheel slowly until the tightest point on the chain is found, then check its up and down movement in the centre of the chain run. The total movement should be 1⅛ in. and if it varies from this setting then the chain must be adjusted by moving the rear wheel usually in a rearward direction.

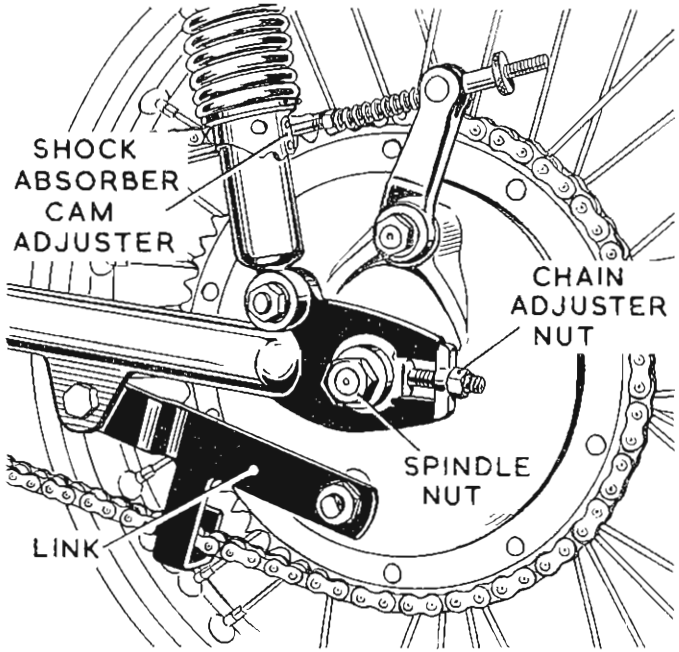

Fig. 13. Rear chain adjustment.

First slacken the nuts at both ends of the link (between the brake plate and the swinging fork tube) and then the brake rod adjuster. Loosen the spindle head on the right side of the machine by one or two turns, followed by a similar action to the spindle nut on the left side.

Cycle type chain adjusters are used at both ends of the spindle and their nuts (Fig. 13) must be tightened by the same amount on each side until the chain slackness conforms to the figure given above. Re-tighten the left spindle nut first, and then the main spindle head on the right-hand side. Tighten the link nuts and then adjust the brake.

Wheel Alignment

It is advisable to check the wheel alignment whenever the rear chain is adjusted, and this is checked preferably by means of a long straight-edge placed along the sides of the wheels, but it must be remembered that the edge must be stepped to suit the difference in trye sizes between front and rear wheels. Apply the straight-edge at a point as much above ground level as possible and keep in a horizontal position. With the front wheel set straight ahead, the straight-edge should touch both wheels at two points.

Care of the Rear Chain

If maximum life is to be achieved, periodically remove the chain and wash it thoroughly in petrol to remove all dirt and grease. Allow the chain to dry completely then immerse it in a tray containing warm graphited grease. When replacing the chain make sure that the spring clip of the connecting link has its closed end pointing in the direction of travel of the chain (i.e. forwards on the top run).

WHEELS AND BRAKES

Both wheels are fitted with ball journal bearings which do not require adjustment.

The bearings are packed with grease during assembly and this should last until the wheels are completely dismantled for overhaul.

Front Wheel Removal and Replacement Fig. 14 (a) and (b)

To remove the front wheel, first unhook the cable from the slotted clevis on the brake plate lever, Fig. 14 (a), and then slacken the pinch bolt, Fig. 14 (b), at the bottom of the nearside fork leg. Insert a stout tommybar through the hole at the head of the wheel spindle and unscrew it from the hub. Note that it has a left-hand thread and unscrews by turning in a clockwise direction. Support the wheel as the spindle is withdrawn, and when it is clear, the wheel can be pulled away from the offside fork leg and removed from the machine.

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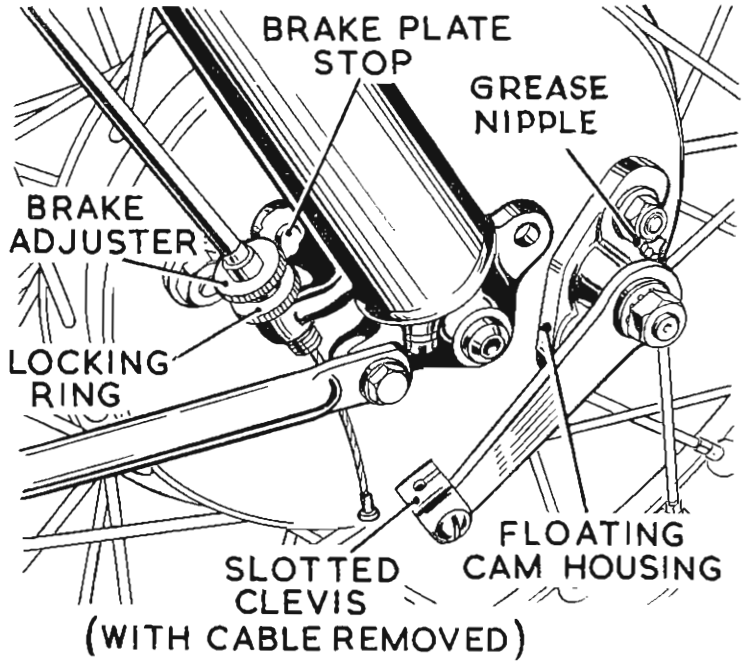

Fig. 14 (a). Removal of the front wheel (R.H. side).

After removal do not allow the wheel to fall on to the bush which projects from the brake drum side of the hub. Although the bush is pressed in, it may, if subjected to a sharp blow, be forced back into the hub. If this should happen, the bush can be retrieved and re-positioned with the aid of the wheel spindle.

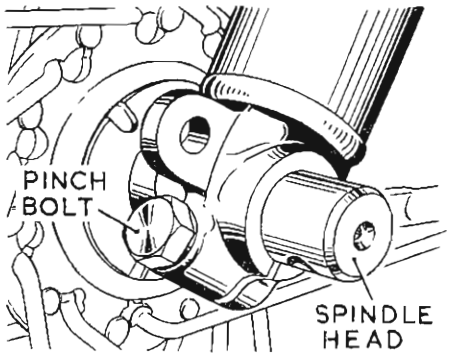

Fig. 14 (b). Removal of the front wheel (L.H. side).

When replacing the wheel, note especially that the brake plate stop must be located in its recess at the rear of the offside fork leg, Fig. 14 (a). **It is most important that after the spindle has been tightened and before the pinch bolt is locked up, the forks are depressed once or twice to enable the nearside fork end to position itself on the spindle, Fig. 14 (b).** If this precaution is not observed, the fork leg may be clipped out of position and will not function correctly.

Front Brake Cam

The housing carrying the brake cam is designed with lateral movement, thus allowing the brake shoes to be automatically centralised and providing a limited degree of servo-action. The housing must always be free to move, but without excessive freedom and this point should be checked frequently.

Lubrication of the cam spindle is via a grease nipple in the boss. One stroke of a hand grease gun is all that is required.

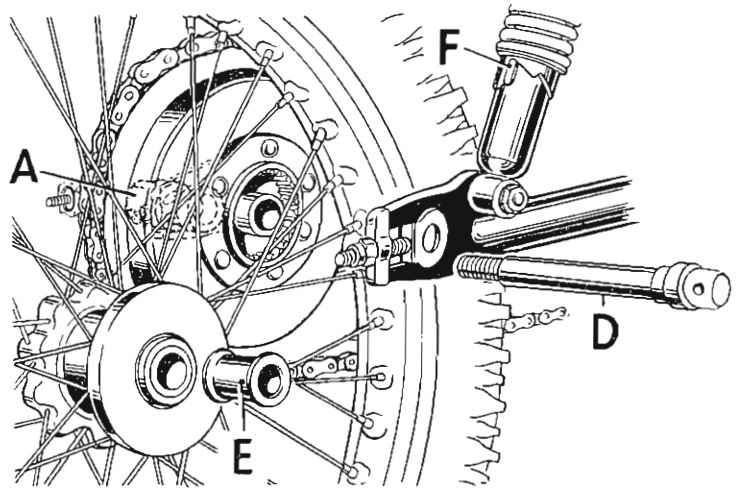

Fig. 15. Removal of the rear wheel.

Rear Wheel Removal

Removal of the wheel does not affect the chain or brake adjustment. Remove the spindle D, Fig. 15. It has a normal right-hand thread and therefore unscrews in an anti-clockwise direction. The distance bush E falls clear when the spindle is removed and the wheel can then be pulled away from the brake drum and withdrawn from the machine. When detaching the rear wheel it is unnecessary to touch the hexagon nut A on the left-hand side, as this retains the brake drum assembly in position.

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Before replacing the spindle remove all traces of dirt from the threads and lightly coat with grease.

Rear Brake Cam

The spindle carries a grease nipple but grease should be applied sparingly at this point — sufficient only to ensure that the cam can be operated easily.

Brake Adjustment

For obvious reasons the brakes should always be kept at maximum efficiency and for this to be maintained, the shoes should be just clear of the drum when the brake is off, and close enough for immediate contact when the brake is applied.

The front brake adjuster is situated on the lower fork leg, Fig. 14 (a), and rotation of the screwed sleeve alters the effective length of the cable, so adjusting the position of the shoes in the drum. Be sure to tighten the locknut after adjustment.

The cable can also be adjusted at the handlebar lever if required (see Fig. 1).

The rear brake is adjusted by turning the self-locking sleeve, Fig. 13, in a clockwise direction, (viewed from the rear of the machine), to shorten the effective length of the brake rod, and open the shoes in the drum.

Note that for maximum efficiency the angle between the operating lever on the brake plate and cable or rod should not exceed 90° when the brake is fully applied.

Brake Shoes

The rear brake shoes are of the floating type (i.e. they are not pivoted on a fulcrum). As the only difference between the two shoes is in the position of the linings, careful note must be made of these positions for re-assembly purposes. Great care must be exercised in ensuring that the leading and trailing shoes are assembled in their correct order.

Both front and rear brake operating levers have serrated holes at the cam, enabling them to be removed and replaced in a new position if required. The front brake lever can also be turned over before replacement to give a finer adjustment.

When dismantling the brakes take care that the fingers are not trapped by the shoes during the operation, as the springs are very strong.

If the brake linings require replacement, advantage can be taken of the B.S.A. Exchange Replacement Service, when complete re-lined shoes can be obtained in exchange for the old ones at a moderate charge. This scheme applies to the British Isles only.

SUSPENSION AND STEERING

Front Forks

The only servicing that the front forks require is frequent renewal of the oil. The need for this is also indicated by excess movement of the fork.

Unscrew the nuts A and the drain plugs in the lower end of the fork sliding members as shown at B, Fig. 16. Allow all the oil to drain out, then, standing astride the machine, apply the front brake and depress the forks a few times to drain out any oil remaining in the system.

Replace the drain plugs, raise the cap nuts A a few inches, and pour the correct amount of oil into each fork. This is ½ of a pint of S.A.E. 20 grade oil, but under some circumstances it is permissible to alter the

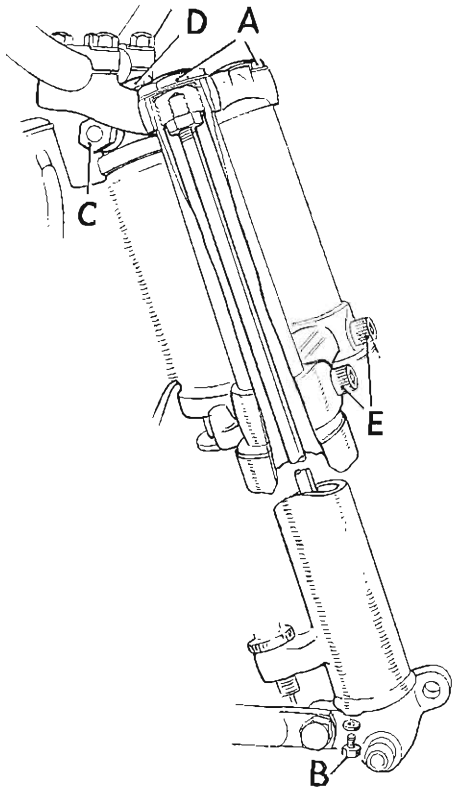

Fig. 16.
Adjustment of the steering head, also showing the oil drain plug.

grade, (e.g. under extremely hot conditions use S.A.E. 30, or for extreme cold use S.A.E. 10 grade). Replace the top plugs and tighten firmly. Recommended oils are given on page 10.

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Steering Head Adjustment

The steering head should be checked frequently for play when new to ensure that this is not excessive, and regularly checked thereafter. Support the crankcase on a box so that the front wheel is clear of the ground, then grasp the front fork legs and attempt to push them backwards and forwards. If any play is detected the steering head must be adjusted.

The bearings are of the cup-and-cone type and if excessive play is allowed to develop and the machine used in this condition, there is a risk that the bearings will indent their races, making proper adjustment impossible and the steering unsteady.

Slacken the clamp nuts C and E, Fig. 16, then tighten down the adjusting nut D until adjustment is correct. Hold the handlebars lightly and move them round slowly. The steering head must be free and the forks must rotate smoothly. If the movement is "lumpy" it is a sign that the adjustment is too tight, or that the ball races are damaged.

When the adjustment is correct, tighten the clamp nuts C and E. The latter clamp the fork shafts and must be quite tight.

Rear Suspension

The swinging fork is pivoted on a bonded-rubber type bush and no adjustment or lubrication is required.

The two suspension units comprise a telescopic damper unit and coil spring. The hydraulic dampers will not normally require any attention, but if they suffer damage or become ineffective, they can be returned to the manufacturer for re-conditioning.

The loading of the springs can be adjusted by means of a three position cam adjuster at the lower end of the unit F, Fig. 15, and the springs can therefore be adjusted to suit the prevailing conditions.

ELECTRICAL EQUIPMENT

The Victor is equipped with an ignition system known as "energy transfer" ignition. This system incorporates certain characteristics of both magneto and coil ignition.

Electrical energy for the ignition is provided by the alternator, which is encapsulated to provide additional protection from the chain case lubricant. In this connection it should be noted that a vegetable base oil must not be used, see page 10.

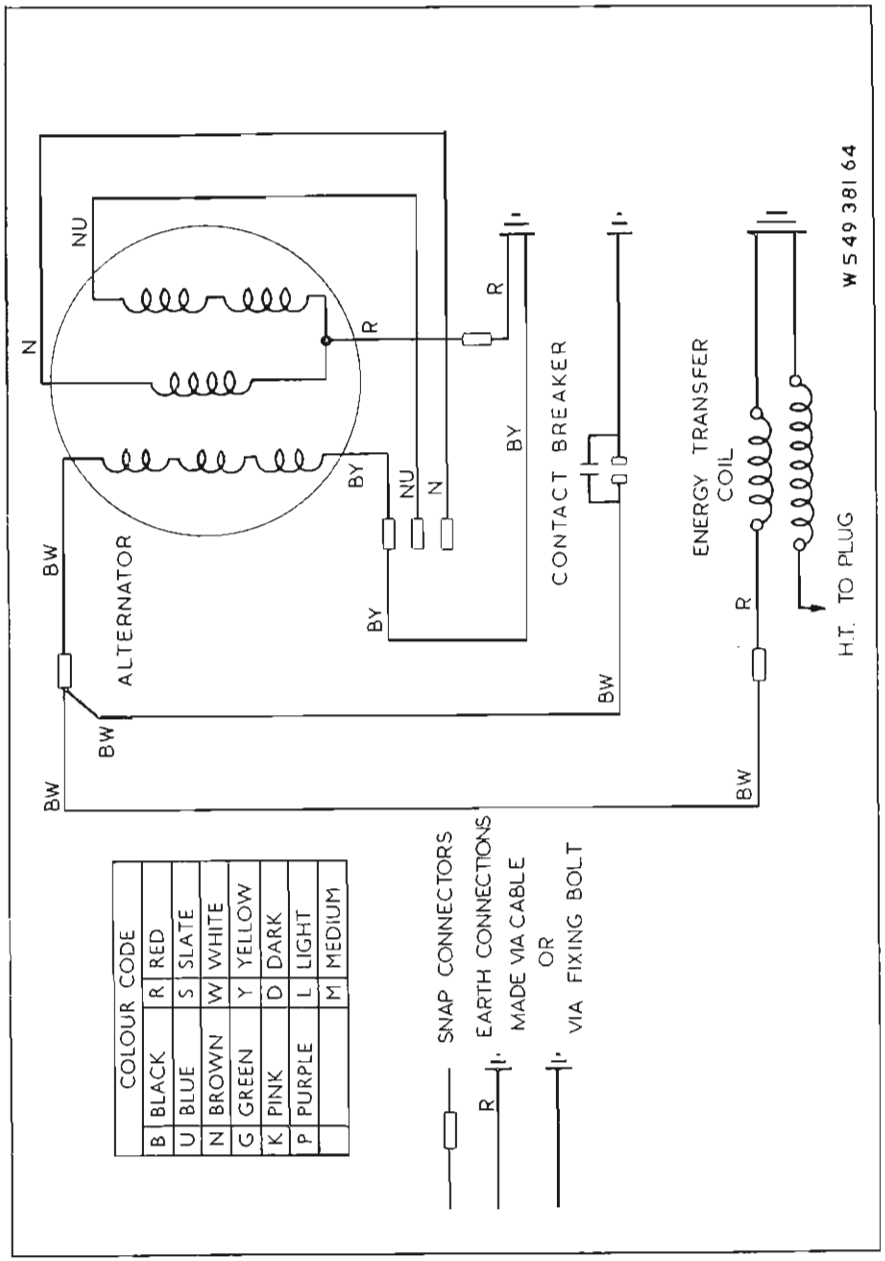

Fig. 17. The wiring diagram.

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The alternator has six stator windings, and an engine shaft rotor containing six high-energy permanent magnets.

Energy Transfer Ignition

The ignition coil is designed specially to operate on the energy transfer principle. Closure of the contact breaker points short-circuits the ignition coil primary winding and, at the same time, creates a closed circuit of the series connected stator windings. As the magnet rotor turns, voltages are induced in the stator windings giving rise to alternating currents during the period that the contacts are closed. At the instant of contact opening, however, a pulse of electro-magnetic energy developed by the alternator during the contacts closed period, is discharged through the ignition coil primary winding. The effect of this energy pulse in the primary windings is to induce a high voltage in the ignition coil secondary winding, and this high-tension voltage is applied to the sparking plug.

The Ignition Timing

Accurate ignition timing is an important requirement in the operation of the energy transfer system, see page 16. The contact breaker is arranged to open only at peak instants in the alternating current cycle, in order that maximum electro-magnetic energy is transfered from the alternator to the ignition coil and good spark obtained at the plug.

Alternator

Except for occasional inspection of the snap connectors in the output cables — these contactors must be clean and tight — the alternator requires no maintenance.

H.T. Ignition Coil

The coil requires no attention beyond keeping its exterior clean, particularly its terminals, and occasionally checking that the connections are tight.

Wiring Diagram

A diagram of the electrical circuit appears on page 33. The insulation of the wires is individually coloured and these colours are indicated on the diagram.

TOP OVERHAUL

Decarbonising

The Victor engine is built specially for use in scrambles and hence it will almost never be necessary to dismantle the engine solely for decarbonising, as is usual with a machine for normal road purposes.

The need will invariably be for attention to the valves, especially if maximum r.p.m. have been exceeded to the extent of causing valve bounce, when there is always the possibility of the valve heads touching the piston and distorting the seats, or even bending the valve stem. Advantage should be taken of this situation to clear all parts of carbon,

such as the combustion chambers, piston crown, ports, etc., and to restore a smooth finish to these surfaces.

The clearance between cylinder head and frame top tube is not sufficient to allow the head to be lifted off and it will therefore be necessary to take the engine out of the frame. (An alternative to this is to extract all the rocker box studs, allowing the rocker box to be removed from one side, so providing the necessary clearance for removal of the cylinder head, but continual extraction of the studs will eventually impair the threads in the head and it is preferable to remove the complete engine.)

Removal of the Engine

First, remove the petrol tank, There is no need to drain this but only to remove the front tie-bar, turn off the taps and disconnect the pipes. The tank is mounted on rubber pads and secured by a nut on a single bolt which passes through a rubber sleeve in the centre of the tank, to its anchorage on the frame top tube.

The exhaust pipe is a push fit in the cylinder head and can be withdrawn after releasing the connections at the front and at the expansion box.

Remove the crankcase shield and drain the engine oil as detailed on page 13. Uncouple the rocker spindle oil feed connections, followed by the supply and scavenge pipes union beneath the crankcase. Disconnect the snap connectors in the cables from the generator and the H.T. lead from the sparking plug.

Now remove the engine steady tie-bar and uncouple the exhaust valve lifter cable and clutch cable at their levers on the engine.

The flexible connection between the air cleaner and carburettor is retained by clips. After releasing these, remove the connection when the carburettor can be withdrawn from its studs and tied up out of the way, still attached to its cable. Lastly, uncouple the rear chain at its spring link and unwind it from the gearbox sprocket.

The engine is mounted in the frame at three points. At the rear, the attachment is by two yoke plates which must be removed (three bolts). A second fixing point is located below the crankcase, comprising a long bolt passing through crankcase and frame lugs. The third attachment point is at the frame front down tube. The attachment bolts must be withdrawn and as the final bolt is removed, the engine will be likely to shift its position suddenly so that great care should be taken to ensure that the fingers are not trapped.

Raise the engine at the front until it is clear of the frame lug, tilt the engine to incline backwards and lift out from the left side of the frame.

Removing the Cylinder Head

Set the piston at T.D.C. on the compression stroke (when both valves will be closed and the springs relieved from any load) and take

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off the rocker box complete with rockers, spindles, etc., to expose the valves and springs. If it is necessary to dismantle the rockers and spindles take care not to damage the sealing rings when inserting the spindles into the rocker box. Lift out both push rods. The cylinder head is retained by six nuts all of which can now be taken off and the head removed, followed by the gasket.

Removing the Valves and Springs

Compress each valve spring with the aid of a compressor such as B.S.A. service tool No. 61-3340, until the split collets can be removed. This will enable the springs to be released and the valves can then be withdrawn from the cylinder head.

Examine the valve springs and if they have shortened appreciably they should be replaced.

The correct free length of these springs when new is:— inner spring 1·50 inches, outer spring 1·67 inches.

The Valve Guides

Examine the valve guides and if worn, warm the cylinder head in hot water and drive out the guides by means of a simple punch applied from the combustion chamber. Note that the exhaust guide is counterbored at the end which protrudes into the port.

Whenever new guides have been fitted, the valve seats must be refaced with a proper valve seat cutter to ensure that the seat is concentric with the guide bore.

Valve Grinding

If the valves are damaged in any way they must be replaced. In the unlikely event of the valve faces being pitted, then they must be reground on a valve grinding machine.

In all probability the valve seat in the cylinder head will still be in good condition, but if it is marked, the seat should be refaced with a proper valve seat cutter tool. The seat angle is 45 degrees.

If the valves have been renewed or refaced, then they will require lightly grinding-in to ensure that a good gas seal is created. Smear a small quantity of fine grinding paste on to the face of the valve head and return the valve to its seat. A light spring inserted under the valve head greatly facilitates the grinding operation as it assists in raising the valve so that it can be rotated to a new position. Rotate the valve backwards and forwards by means of a rubber suction tool at the same time maintaining a slight pressure.

Raise the valve and turn it to a new position after every few movements. Grinding should be continued until the mating surface of the valve and seat show uniform metallic surfaces all round.

While the head is dismantled it will be an opportune time to scrape the carbon from the ports and combustion chamber, taking care not to damage the valve seat faces with the decarbonising tool. It is not

advisable to decarbonise the cylinder head by immersing it in caustic soda solution, because of the harmful effect this solution has on aluminium. Also scrape off all the carbon from the top of the piston, taking great care that the soft aluminium surface of the piston is not scored. Provided a little patience is employed, all traces of carbon can be removed, to leave the surfaces of the piston crown and the ports unmarked.

Reassembling the Cylinder Head

Examine the cylinder head gasket carefully. Both sides should be clean and bright and if any dark patches are found on either surface, a new gasket should be fitted.

Before reassembling the valves and springs into the cylinder head, all traces of grinding paste must be removed from both the valve and seat, and the valve stem smeared with clean engine oil.

Replace the valve, then compress the spring with the service tool until the collets can be inserted. A little grease on the valve stem will assist in keeping the collets in position as the spring is released. Make sure that the split collets, which retain the valve spring collar, are correctly seated in the recess of the valve stem.

When replacing the valve spring, the close coils should be at the bottom.

Removing the Cylinder Barrel

It should not be necessary to remove the cylinder barrel unless it is felt that the piston rings require attention. This may be shown by such symptoms as lack of compression, although if the valves are in poor condition this is most likely to be the cause.

Rotate the engine until the piston is at the bottom of its travel, then lift the barrel upwards until the piston emerges from the bottom of the bore.

Steady the piston as it comes free from the cylinder so that it is not damaged by violent contact with the crankcase mouth. As soon as the cylinder has been withdrawn, cover the crankcase with a clean piece of rag to prevent the entry of foreign matter.

Examine the cylinder carefully for wear and if a deep ridge has formed at the top of the bore, then a replacement barrel may be necessary.

The barrel will also require replacement if there are any deep scores, as this will cause a loss of compression.

The Piston Rings

The outside faces of the piston rings should possess a smooth

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metallic surface and any signs of discoloration mean that the rings must be replaced.

The rings must also possess a certain amount of "springiness" so that the ends lie at least $\frac{3}{16}$ in. apart when released from the barrel.

The rings should be free in their grooves but with a minimum side clearance. If the rings are stuck in the grooves, remove them and clean out all the carbon from the groove and the inside face of the ring. Care is necessary when removing the rings, as they are brittle and only permit a minimum amount of movement. A suitable tool for removing the carbon from the ring grooves is an old piston ring ground as a chisel.

To check the piston ring gaps, place each ring in the least worn part of the cylinder bore (usually at the bottom) and make sure it is square in the bore by locating it with the top of the piston. Measure the gap between the ends of the ring with a feeler gauge. The correct gap when new is ·009–·014 inches and although an increase of a few thousandths of an inch is not important, any large increase to, say, ·025 inches, means that the ring must be replaced. Both compression rings have tapered thrust faces and one of the horizontal faces is marked "top", to ensure that the ring is fitted correctly. If the rings are fitted upside down, oil consumption will most likely prove excessive.

Note: Chromium plated rings must not be fitted.

The Piston

It is not necessary to remove the piston unless it requires replacement, or further dismantling of the engine is to be carried out.

If removal is necessary, prise out one of the gudgeon pin circlips by inserting a suitable pointed instrument in the notch provided. Before the gudgeon pin can be withdrawn, the piston must be thoroughly warmed by wrapping it in rag that has been soaked in boiling water and wrung out. Alternatively, an electric iron can be applied to the crown of the piston until it is thoroughly warmed.

When the piston is warm, remove the gudgeon pin with a suitable extractor. If an extractor is not available, the gudgeon pin can be driven out with a good fitting drift, but the piston must be carefully supported to avoid any side strain on the connecting rod. As soon as the piston is removed, mark the inside of the skirt so that it can be replaced the correct way round.

Connecting Rod and Big-end

While the cylinder barrel is off the crankcase, it is a good opportunity to test the connecting rod for signs of wear.

The rod should revolve freely without any signs of up and down movement at the big-end. Rotate the flywheels until the crankpin is uppermost, with the connecting rod vertical. Grasp the rod firmly and try to move it up and down. If any play can be detected, the big-end and connecting rod assembly will require replacement.

Do not confuse sideways movement at the little end with up and down play. The big-end should have approximately ·020 inches side-float and this permits some sideways movement at the other end of the connecting rod.

Reassembly

Scrupulous cleanliness must be observed when reassembling and the components should be smeared with fresh oil before replacing. Warm the piston before inserting the gudgeon pin and make sure that the new circlip is correctly located in its groove. Slide each piston ring carefully over the piston until it reaches its groove. The barrel should be slid over the piston, at the same time compressing the rings so that they pass smoothly into its lower end of the bore. Take care that the rings are not trapped or damaged, and if the job is being done single handed, a band for compressing the piston rings will facilitate the operation.

Refit the cylinder head gasket, followed by the head complete with valves, springs, etc., and tighten the six nuts firmly and evenly.

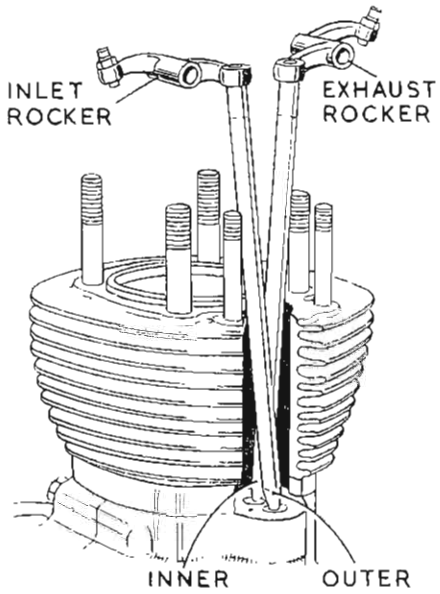

Fig. 18.
The correct assembly of the push rods.

Insert the two push rods down the barrel aperture on to their respective tappets, the outer one operating the inlet push rod (Fig. 18). Replace the rocker box assembly but with the push rod inspection cover removed. This is necessary so that the upper end of the rods can be fitted to their appropriate rocker arms, and in order to avoid any undue strain on the head or rocker box from valve spring pressure, the piston should be set at T.D.C. on the compression stroke.

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Now tighten the rocker box nuts firmly and evenly. Check that the push rods are in their proper positions and replace the inspection cover and sealing washer. Finally check the valve clearances as described on page 14, and replace the sparking plug.

The complete engine/gearbox unit is then ready for replacing in the frame. During this process take care not to damage the P.V.C. oil pipes and to ensure that their connections are tight.

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