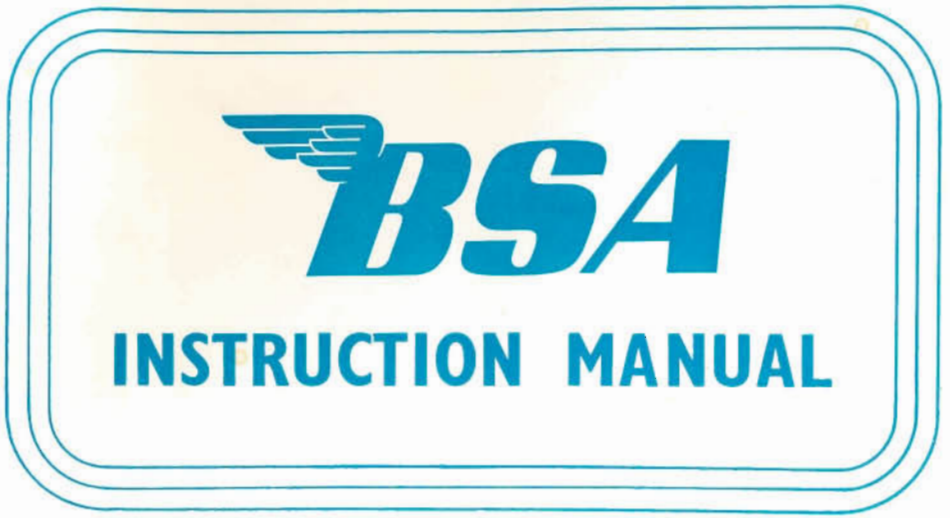

INSTRUCTION MANUAL

441 c.c. O.H.V.

VICTOR ENDURO

VICTOR SPECIAL

INSTRUCTION MANUAL

441 cc VICTOR ENDURO
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B.S.A. MOTOR CYCLES LIMITED

ARMOURY ROAD, BIRMINGHAM 11, ENGLAND

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Telegrams and Cables: "SELMOTO", Birmingham

WESTERN U.S.A.
B.S.A. Motorcycles-Western
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EASTERN U.S.A.
B.S.A. Incorporated,
639 Passaic Avenue,
NUTLEY, NEW JERSEY.

MC1442 *Printed in England* June 1966

TECHNICAL DATA

Engine Number On left side of crankcase below the cylinder

Frame Number At the top of the steering head tube

ENGINE:

Capacity (c.c.)	441
Cylinder bore (mm.)	79
Stroke (mm.)	90
Compression ratio	9:4
Valve timing (at ·015 in. clearance):	
inlet opens b.t.d.c.	51°
inlet closes a.b.d.c.	68°
exhst. opens b.b.d.c.	78°
exhst. closes a.t.d.c.	37°
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° (F.A.)
contact breaker gap (in.)	·015

TRANSMISSION:

Gear ratios—top	5·36
third	6·70
second	8·84
first	14·20
Clutch friction plates	4
Chain sizes—front (in.)	$\frac{3}{8}$×70 pitches (Duplex)
rear (in.)	$\frac{5}{8}$×117 pitches
Teeth on:	
engine sprocket	28T
gearbox sprocket	17T
clutch sprocket	52T
rear chainwheel	49T

CAPACITIES:

Fuel tank (gal.)	2
Oil tank (pints)	5
Gearbox	$\frac{1}{2}$
Front forks (pints—each leg)	$\frac{1}{3}$
Primary chaincase (pints)	$\frac{1}{4}$

WHEELS:

Tyre size—front	3·25–19
rear	4·00–18
Tyre pressures:	
front (p.s.i.)	16
rear (p.s.i.)	16
Brakes, dia. × width:	
front (in.)	7×1$\frac{1}{8}$
rear (in.)	7×1$\frac{1}{8}$

CARBURATION (AMAL):

Bore	30mm.
Main jet	220
Pilot jet	25
Throttle valve	3
Needle position	2
Needle jet	·107

GENERAL DETAILS

Front suspension movement (in.)	5$\frac{3}{4}$
Rear suspension movement (in.)	2$\frac{3}{4}$
Overall length (in.)	82
Wheelbase (in.)	53
Ground clearance (in.)	8
Seat height (in.)	32
Overall height (in.)	41
Handlebar width (in.)	32
Weight (lbs.)	288

The recommended inflation pressures are based on a rider's weight of 140 lb. If the rider's weight exceeds 140 lb. increase the tyre pressures as follows:—

Front tyre: Add one lb. per square inch for every 28 lb. increase above 140 lb.

Rear tyre: Add one lb. per square inch for every 14 lb. increase above 140 lb.

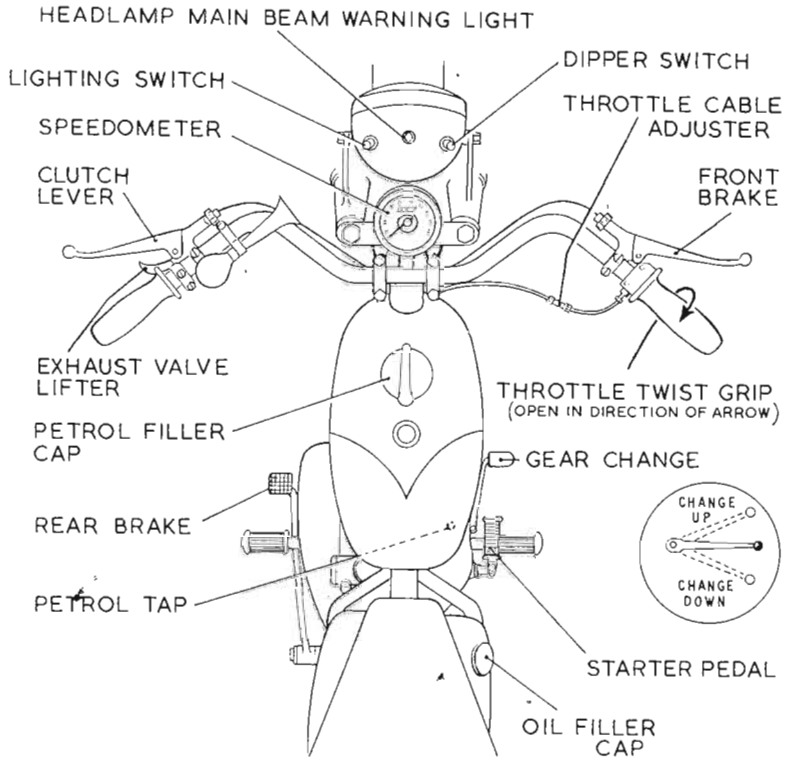

Fig. 1. The controls

TAKING OVER THE MACHINE

Before running the machine make sure that the oil tank, gearbox, primary chaincase and front forks are properly topped up with oil (see appropriate chapters for filling instructions). Normally these preparations will be carried out by the dealer who is selling the machine and the new owner has only to arrange the controls to his liking for the machine to be ready for the road.

The Controls

The new rider should make sure that he is quite familiar with all the controls before attempting to ride the machine. The foot controls are adjustable, and should be positioned so that they can be reached without moving the feet from the footrests. Handlebars should be adjusted so that a comfortable and natural riding position is achieved. Both footrest retaining nuts have right hand threads.

Make sure that the bolts retaining the handlebar clamps are tight after completing any adjustment and after adjusting the footrests, reset the brake pedal stop pin, so that the pedal is situated comfortably below the foot.

Handlebar Controls

Twist Grip—Mounted on the right handlebar, it controls the throttle opening and consequently the engine speed. To open the throttle (i.e. to increase engine speed) turn the grip so that the top moves towards the rider. Excess slackness in the cable can be removed by means of an adjuster incorporated in the cable. The rotary stiffness of the twist-grip can be varied by means of the adjuster screw and locknut. It is set for average requirements when leaving the factory, but can be re-adjusted to suit individual preference.

Front Brake—Lever mounted on the right handlebar in front of the throttle control. Grip the lever gently to operate the brake. Finger adjustment for the cable is provided at the adaptor on the lever, and at the brake plate.

Clutch—The lever is mounted on the left handlebar. Grip the lever to free the clutch, i.e. disengage the drive between the engine and the rear wheel. Finger adjustment for the clutch cable is provided at the adaptor on the lever.

Exhaust Valve Lifter—This is the small lever mounted on the left handlebar and it must be depressed in order to raise the exhaust valve and therefore relieve engine compression.

Horn—The bulb horn is mounted on the handlebar.

Other Hand Controls

Headlight Dipper Switch—This is a "push button" control mounted on the right hand side of the headlight and controls the switching from the main to dipped headlamp beam.

Headlight Switch—This is mounted to the left of the headlight and is in the "off" position when the switch is straight ahead. When the switch is rotated either to the left or to the right, the headlight is switched on and the dipping of the beam is controlled by a separate push button. Due to the fact that the machine is equipped with Energy transfer ignition, the light is only operative when the engine is running.

Tickler (Carburetter)—The carburetter float chamber is fitted with a spring loaded plunger which, when depressed, prevents the float from rising, thus rapidly replenishing the level of fuel in the chamber. The plunger (or tickler) should be used for a brief interval only, otherwise the level of petrol in the float chamber will rise excessively, resulting in flooding of the carburetter and loss of fuel. (See starting instructions Page 8).

Petrol Tap—Under the right-hand rear end of the tank. To turn on the petrol pull out the serrated button and turn anti-clockwise to lock. To turn off the petrol, reverse this procedure.

Speedometer—The "trip" mileage can be reset to zero by rotation of the control knob on the side of the instrument.

Foot Controls

Gear Change Pedal—Operated by the right foot, the gear change mechanism is of the positive stop type and following a change of gear, the lever returns to its central position as soon as foot pressure is released.

Neutral position is between first and second gears, and downward movement of the lever selects a lower gear, whilst an upward movement selects a higher one. The pedal can be re-positioned as required after releasing its pinch bolt.

Rear Brake Pedal—Operated by the left foot. The pedal is equipped with an adjustable stop which should be set so that the pedal pad lies comfortably below the foot ready for instant use. Any adjustment to this pedal position may require re-adjustment of the rear brake.

Stoplight Switch—Actuated by an extension from the brake pedal rod this switch controls the stoplight in the tail lamp. Whenever the brake pedal is adjusted check that the switch still functions and if necessary re-position the extension arm slightly to ensure this condition.

Starter Pedal—The folding pedal on the right-hand side of the machine behind the footrest. Depression of the pedal rotates the engine.

DRIVING

To Start the Engine

Stand astride the machine and make sure that the gears are in the neutral position, which lies between the first and second gears. If there is any doubt about this, depress the gearchange pedal fully two or three times to engage successively lower gears, at the same time easing the machine backwards and forwards to allow the gears to rotate a little, and so facilitate gear engagement. When it is certain that first gear is obtained, raise the pedal through half of its normal stroke, so selecting the neutral position. Should the machine be in gear it will move forward as the starter is depressed.

If the engine is quite cold, depress the carburetter tickler momentarily. Note that it is neither necessary nor desirable to oscillate the plunger rapidly, as this may damage the float.

Open the twist-grip a small amount only, as excessive opening may prevent easy starting, and push the starter pedal down slowly until resistance is felt; then depress and immediately release the exhaust valve lifter lever, and give the pedal a firm downward swing which should set the engine in motion. If the engine fails to start at the first attempt, repeat this procedure, being careful to avoid rapid kicking at the pedal which will serve no purpose and may damage the operating mechanism. The ignition control is set automatically in the retarded position for starting, and advances as the engine speeds up.

Note that while it is necessary to use the tickler when starting from cold, this may not be necessary when the engine is warm and should certainly not be so if a restart is made after a short wait only. When starting an engine which has already reached its normal running temperature, it should not be necessary to use the tickler at all.

Engaging First Gear

With the engine running slowly, disengage the clutch by gripping the left handlebar lever and after a brief interval press down the gear-change pedal as far as it will go, so selecting first gear. If the pedal will not move through its full travel, so that the gear does not engage, ease the machine backwards or forwards slightly, maintaining a light pressure on the pedal, until the gear is felt to engage.

Moving Off

Open the throttle slightly, and gently release the clutch lever part way, until the clutch can be felt to take up the drive, and the machine tends to move forward. Open the throttle a little more to prevent the possibility of stalling the engine, and slowly release the clutch lever as the machine moves away. Until the lever is completely released the clutch is not fully engaged, so that the engine should not be speeded

up excessively or the clutch remain partly engaged, for longer than is necessary to get the machine away in first gear.

Changing Gear (Up)

When the machine is moving steadily with the clutch fully engaged, the next operation is to engage second gear. Close the throttle, dis-engage the clutch, and raise the gearchange pedal as far as it will go, the three movements being performed simultaneously. Immediately the gear is felt to engage, re-open the throttle and re-engage the clutch. A similar procedure is necessary for each upward gear change.

Changing Gear (Down)

Open the throttle slightly, disengage the clutch and press the gear-change pedal down as far as it will go. Re-engage the clutch as soon as the gear is felt to engage. Violent pressure on the gear lever is unnecessary, a steady movement of the pedal being most effective. All downward gearchanges should be made in a similar manner.

To Select Neutral

Neutral is situated between first and second gear. To select neutral from first gear, withdraw the clutch and raise the gearchange pedal gently until it is felt to engage with the neutral position. If the lever is raised too far it will travel through to the second gear position.

To Stop the Engine

Select the neutral gear position and close the throttle, so reducing the engine speed to "tick over", and depress the exhaust valve lifter lever.

Notes on Gearchanging

When changing gear, not only should a suitable road speed be selected at which to perform the operation, but the gearchange should be timed in such a way that the relative speeds of the engine and gear-box coincide as closely as possible.

For this reason, when changing up, the throttle is momentarily closed when disengaging the clutch, allowing the engine (and corresponding gearbox pinions) to slow down to the lower speed at which they will operate in the next higher gear.

When changing to a lower gear, the engine speed has to be increased relative to the road speed and, the throttle should not therefore be closed, but even opened slightly, while making the change. As soon as the clutch lever is gripped, the engine will automatically increase in speed and the lower gear will engage quietly at the correct speed.

Changing gear, therefore, whilst appearing complicated, is mainly concerned with the synchronisation of engine speed and road speed, by co-ordination of hand and foot operations. After a little practice, smooth and quiet gear changes will be possible at all times, and eventually become a purely automatic action.

Using the Gearbox

Correct use of the gearbox must be made in order to obtain best results in all-round performance, especially with regard to acceleration and hill-climbing capabilities, and to the attainment of maximum speeds by sports models.

It is not always appreciated that the power delivered by an I.C. engine depends upon the engine speed. Hence, on a machine travelling uphill the engine speed will fall as a result of the increased load, with a corresponding fall in power output. In order to maintain sufficient power, a lower gear must be selected in order to increase the engine speed and so obtain more power.

Similarly, for good acceleration from moderate speeds in top gear, more power is required and, here again, the solution is to change down to a lower gear. **It is better to allow the engine to "rev" in a lower gear than to labour in a higher one.**

It follows that engine speed must be kept high in order to develop maximum power and this means that for *maximum* acceleration and *maximum* speed the engine must be driven up to peak r.p.m. in the gears. In particular to obtain maximum speed it is essential to obtain peak r.p.m. in third gear before changing into top gear.

Riding Hints

Use the throttle to control the speed of the machine, as gentle but definite braking is obtained by merely closing the throttle. On wet roads and particularly under icy conditions, the use of the engine as a brake is to be recommended. A change to lower gear increases the braking effect.

Try to anticipate the need to change gear or to brake, so that changes in speed are smoothly carried out. Always use both brakes together and apply them smoothly and progressively. Never accelerate or brake fiercely, especially on bends or wet roads. Both actions are signs of an inconsiderate driver and always remember: **A good driver is the most unobtrusive.**

RUNNING IN

The rider who has just purchased a new machine will do well to remember that all the internal parts are just as new as the enamel and plating which can be seen, and they must be well "run-in" before the engine can be given any really hard work.

The "running-in" process is the most important period in the life of the engine, and the handling it receives during the first 1,000 to 1,500 miles will determine the service it will provide in return.

Running-in should commence at one third to half throttle and for the first 500 miles the speeds should not exceed those given on the running-in label. Thereafter the throttle opening may be progressively increased as the mileage builds up until at the end of the running-in period full throttle can be employed.

If excessive speeds are used in the early stages there is risk of seizure and other troubles and in any case until the machine has been properly "run-in" it cannot be expected to give its best performance.

Smooth throttle control and selection of the correct gear for the prevailing conditions will ease the work of the engine. In particular avoid violent acceleration and do not allow the engine to labour on hills in a high gear when a change to a lower gear would ease the load. This ensures that all parts of the machine are properly run-in and are quite free.

Do not let the oil level in the tank get too low, as economy in oil may prove very expensive at a later date and running consistently with the oil level too low may cause the oil to become unduly hot. It must be remembered that oil cools as well as lubricates, and a new engine tends to run a little hotter than one that is well "run-in". After the first 250 miles, and again at 500 miles, drain and refill the oil tank with fresh oil and clean the filters. The correct grades of oil are given in the lubrication chart. The oil in the gearbox should also be changed after the first 500 miles.

Further oil changes should be carried out in accordance with the instructions under "Routine Lubrication".

During the "running-in" period it is advisable to check the various adjustments such as valve clearances, contact breaker gap, clutch adjustment, etc, etc., rather more frequently than is usual, and to check the tightness of all nuts and bolts to make sure that the initial bedding down does not loosen any components.

ROUTINE MAINTENANCE

The following list of items requiring regular attention will serve as a guide as to when maintenance should be carried out. The method of carrying out the various adjustments will be found under the appropriate headings in the later chapters. **The mileage figures quoted are based on normal road work and for machines used for competition purposes, the periods between servicing should generally be reduced.**

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 reassembly. 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, but spanners of greater than standard length should not be employed as they may cause failure through overtightening.

Take care when cleaning the machine that dirt is not introduced into the carburetters, hubs, etc. Do not attempt to rub off dry dirt or mud as this will damage the enamel or plating. Wash off any dirt with a copious supply of clean water, preferably from a hose. Any oily areas should be treated with a proprietary detergent before being hosed down. Dry the machine with a piece of clean rag and if possible clean it on a warm dry day so that all moisture is removed.

Every Week

Every 1,000 Miles

Every 2,000 Miles

Every 5,000 Miles

Every 10,000 Miles

ENGINE MAINTENANCE DETAILS

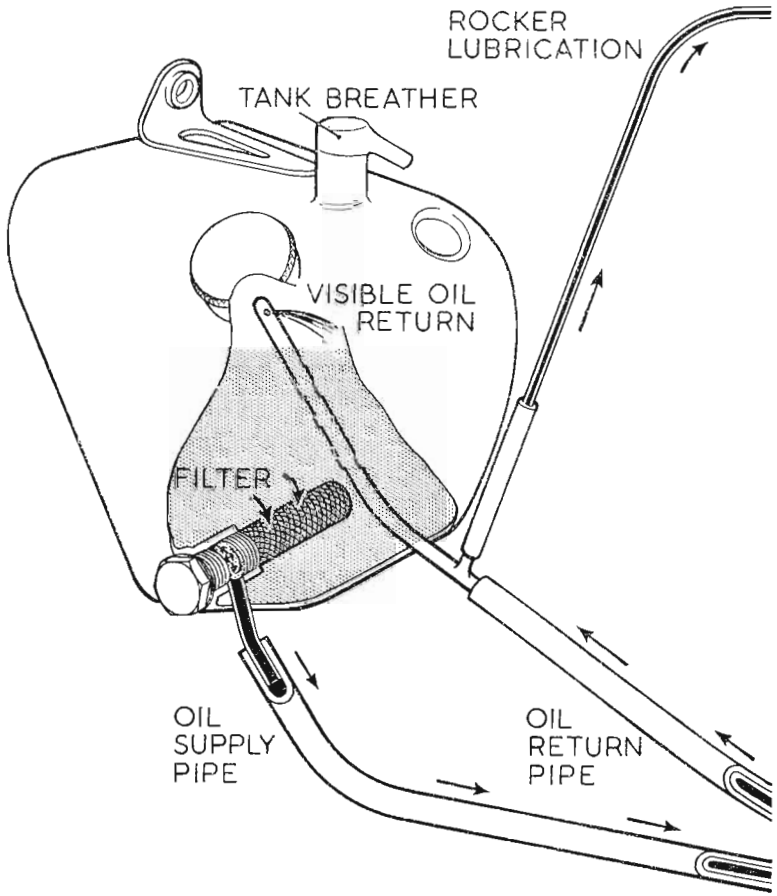

Fig. 2. The oil tank.

Changing the Oil

This should preferably be done immediately after running, so that the oil is warm and will, therefore, flow more freely. Unscrew the filter (Fig. 2) and drain off the oil into a suitable receptacle. After cleaning the filter, re-fill with engine oil in accordance with the recommendations in the lubrication chart. The tank capacity is 5 pints.

Filters

Remove the oil tank and crankcase filters for cleaning at regular intervals (see **Routine Lubrication,** page 31) and this can be carried

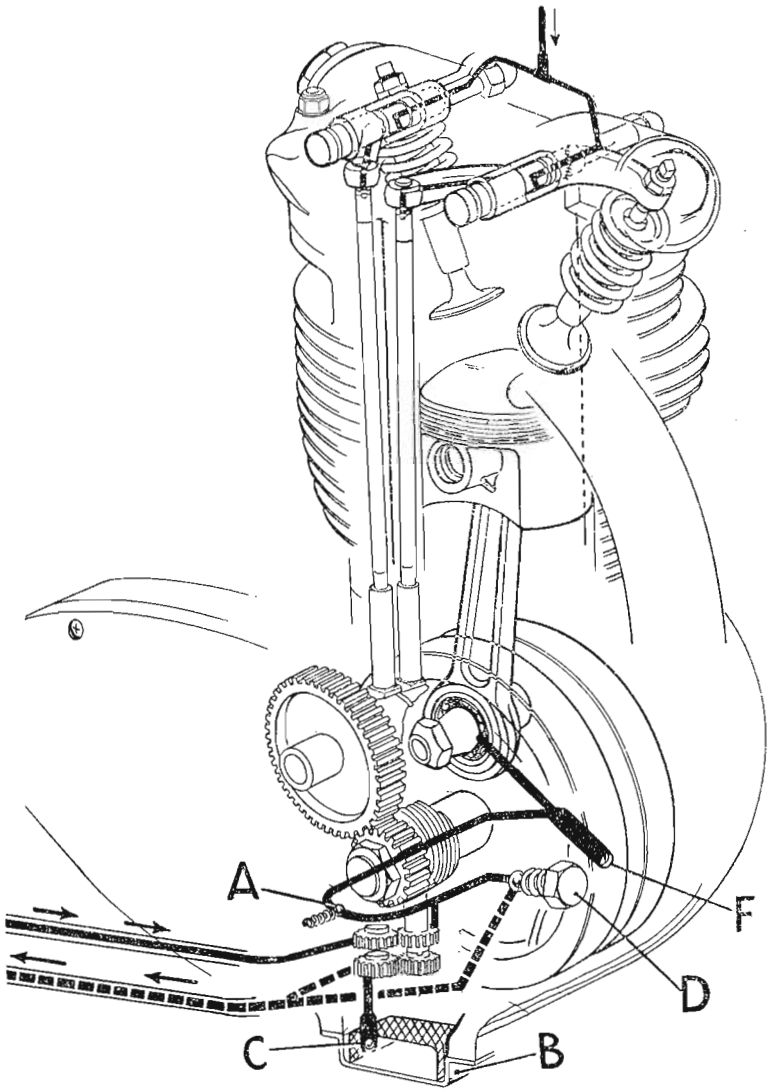

Fig. 3. The engine lubrication system showing the ball valves.

out in conjunction with the change of oil. Wash thoroughly in petrol and make sure that all petrol has evaporated before replacing. Refill with the correct grade of oil

The crankcase filter is built-in with the sump B (Fig. 3) 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.

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.

Oil Pipes

If at any time the oil pipes are disconnected, it is essential for the delivery pipe from the oil tank filter to be attached to the inner crankcase union pipe when they are reconnected, i.e. the pipes cross over.

Lubrication System

The lubrication 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 (see Fig. 3). The oil tank capacity is five pints and oil is drawn from the tank to the supply pump (top set of gears). It is then pumped past the non-return valve A, and along the hollow mainshaft to the big-end.

After lubricating the engine the oil flows down through a filter to the bottom of the crankcase from which it is drawn by the return pump (lower set of gears) past the non-return oil valve C, and delivered up the return pipe to the tank. At the tank a by-pass pipe leads a supply of oil to the rockers, push-rod ends, etc.

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

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

Pump Ball Valve

When the crankcase filter is removed for cleaning, it is a good opportunity to check the ball valve C (Fig. 3), carried in the pump 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.

Valve Clearances

These must be set when the engine is quite cold and the clearances should be, ·008 in. (inlet) and ·010 in. (exhaust).

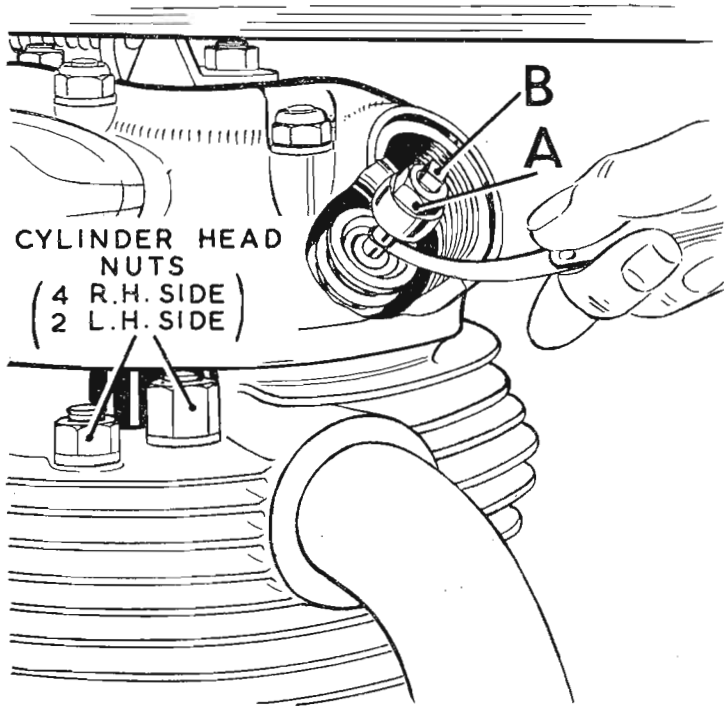

Fig. 4. Checking the valve clearances.

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 carburetter flange nuts to provide clearance for the removal of the inlet rocker cap. Rotate the engine forward until the inlet valve has just closed *i.e.* the push rod is just free to rotate. This is the correct position for checking or adjusting the exhaust valve clearance.

When the exhaust valve clearance has been adjusted, rotate the engine forward again until this clearance is just taken up, *i.e.* just before the valve actually starts to open. This is the correct position for checking and adjusting the inlet valve clearance. 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 a feeler gauge of the correct thickness will just slide between the valve and pin.

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

When the adjustment is complete, replace the sparking plug and the rocker caps, taking care not to damage the washers.

Contact Breaker

After the first 500 miles and thereafter every 2,000 miles, the contact points gap should be examined and reset if necessary.

The contact breaker is housed in the right side of the crankcase and is exposed by removal of the circular cover (Fig. 6). 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 the 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.)

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.

To take out the moving contact, first remove the terminal nut on the capacitor (Fig. 6) 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 road speed.

Inspect the mechanism when checking the contact breaker adjustment, and make sure that the two governor weights, Fig. 6, 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 final setting is in accordance with the recommendation.

Remove the sparking plug so that the engine can be rotated without resistance due to compression, and engage top gear to enable the engine to be turned either backwards or forwards by rotation of the back wheel.

The engine can be timed accurately with the aid of a degree plate, for which purpose the primary chaincase cover must be removed and the plate mounted centrally on the mainshaft (Fig. 5). A pointer should be attached to some convenient part of the engine.

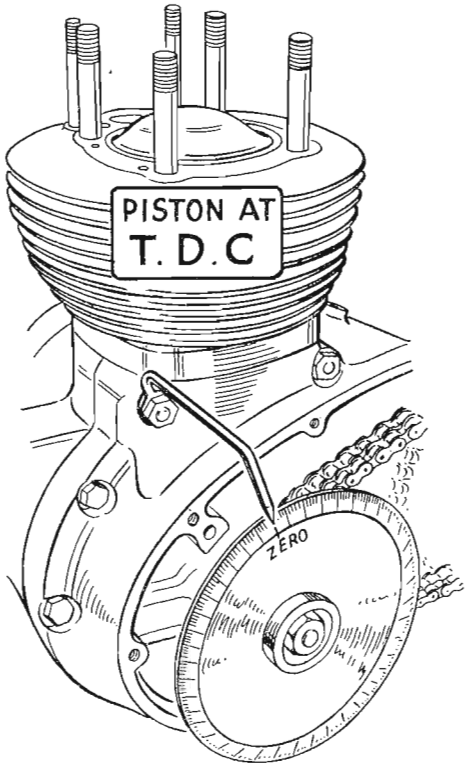

Fig. 5. The mounting of the degree plate.

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. 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 mid-way between them is easy to calculate and this will be at precise top dead centre; the pointer and the zero position on the plate should coincide. 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. Alternatively, a dial gauge can be used to measure the piston movement, and so enable top dead centre to be determined accurately.

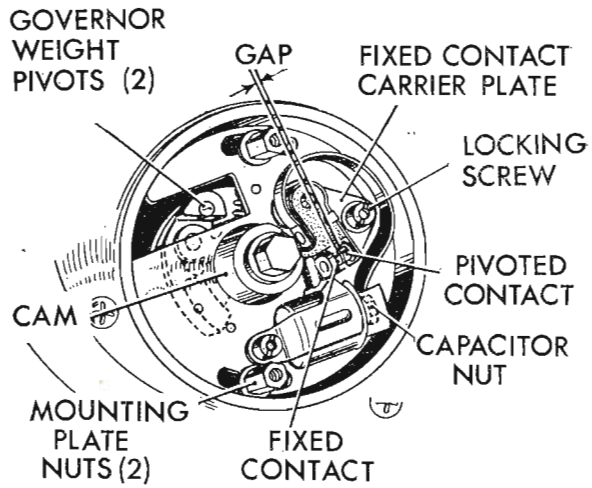

Fig. 6. The contact breaker.

(Part of the auto-advance mechanism is shown behind the mounting plate)

The next step is to set the auto-advance mechanism of the contact breaker in the fully advanced position. (The governor weights in the mechanism will automatically have returned to the retarded position when the engine is stationary). Carefully remove the central securing bolt to avoid releasing the whole mechanism, withdraw the washer and temporarily replace the latter with another washer having a hole just large enough to fit over the cam bearing, thus allowing the washer to bear against the side face of the cam. Replace the bolt, but before tightening, rotate the cam to its limit in an anti-clockwise direction,

hold in position, and tighten the bolt. This will lock the auto-advance mechanism in the fully advanced position which is the correct position for timing the ignition.

To check the ignition setting, first determine the top dead centre position of the piston (compression stroke) by the above method, at which point both valves will be closed. Rotate the engine backwards about 45° and then bring it forward slowly until the contact breaker points are just opening. (A battery and bulb in series with the contact breaker points will indicate the instant at which they separate). The crankshaft should then be 28° before top dead centre. Alternatively, the piston should be ·265 ins. before the top of its stroke.

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, and do not forget to remove the special washer fitted temporarily behind the contact breaker securing bolt, otherwise the auto-advance mechanism will be inoperative.

It cannot be too strongly emphasised that the ignition timing must be correctly set for satisfactory engine performance, and that any attempt to "improve" on the above setting should be avoided, as it has been determined after careful development.

Ignition Timing by "Strobelight"

Whilst the previous method of timing the ignition will give quite good results in experienced hands, the best method of obtaining a precise ignition setting is by means of a "strobelight", an instrument possessed by most B.S.A. Dealers.

Provision is made on Victor engines for the use of this device, comprising a pointer on the interior of the chaincase cover and marker line on the alternator rotor, both of which are exposed after the removal of the circular cover on the front of the chaincase. The strobelight must be connected in accordance with the manufacturer's instructions.

With the engine running at a speed high enough to ensure that the automatic ignition control has moved the ignition timing to the fully advanced position, the line and pointer should coincide when examined under the flashing light of the strobelight, if the ignition setting is correct. Should adjustment be required, slacken the two mounting plate nuts (Fig. 6), thus allowing the position of the plate to be adjusted (so altering the point of the opening of the contacts), until the above condition is obtained. Retighten the nuts securely.

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. 7) when the piston should be at the top of its stroke.

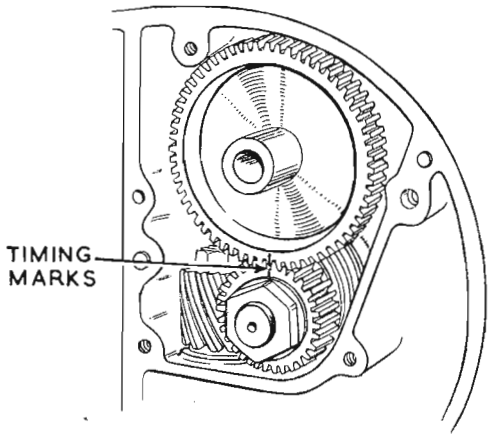

Fig. 7. Valve timing marks.

Decarbonisation and Top Overhaul

Decarbonisation should only be carried out when there are definite symptoms that excessive carbon build-up inside the combustion chamber is interfering with performance. The usual symptoms are an increased tendency to "pink" (a metallic knocking when under heavy load) and a general falling off in performance with a tendency for the engine to run hotter than usual.

It is customary to attend to the valves during decarbonisation as this provides a reasonable interval between valve overhaul and avoids the necessity for dismantling the engine specially for this purpose at a later date.

Removing the Cylinder Head

The clearance between the 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 method is to extract the five central rocker box studs, allowing the rocker box to be removed, 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).

Set the piston at top dead centre on the compression stroke (i.e. both valves closed) and take off the nuts (Fig. 4) holding the cylinder head to the barrel. Leave the rocker box assembly in position on the cylinder head, and raise the latter until it clears its fixing studs.

Lift out the push rods. The rocker box can now be removed from the cylinder head, thus exposing the valves and springs. If it is necessary to dismantle the rockers and spindles take care not to damage the rubber sealing rings, when inserting the spindles into the rocker box.

Removal of the Engine

First, remove the petrol tank. There is no need to drain this but only to turn off the tap and disconnect the pipe. 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 front connection and the clip at the entrance to the silencer.

Drain the oil tank and then remove the crankcase shield. Disconnect the oil pipes union at the crankcase and remove the rocker spindle oil feed connections. Disconnect the snap connectors in the cables from the generator and the high-tension lead from the sparking plug.

Now remove the engine steady tie-bar, uncouple the exhaust valve lifter cable and take off its bracket. The clutch cable can be disconnected at its lever on the engine.

The flexible connection between the air cleaner and carburetter is retained by a clip. After releasing this, remove the connection, when the carburetter can be withdrawn from its studs and tied up out of the way still attached to its cable. 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 a stud passing through two yoke plates. 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 may move suddenly, so that great care should be taken to ensure that the fingers are not trapped.

Raise the engine until it is clear of the front and rear frame mountings, incline to the left, and lift out from the left side of the frame.

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, then they should be replaced. The correct free length of these springs when new is: inner spring 1½ in.; outer spring 1·67 in.

Decarbonising

Scrape off all the carbon on the top of the piston, taking great care that the soft aluminium surface of the piston is not scored. The best tool for this job is an old screwdriver, the edges of which have been rounded by wear and provided that a little patience is employed, all traces of carbon can be removed to leave the surface smooth and unmarked.

Also 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.

Valve Grinding

If the valves and their seats are only discoloured or lightly pitted, then it will be sufficient merely to grind them in with a little grinding paste. If there is considerable evidence of pitting, then the faces must be recut with proper equipment, as attempts to grind the valve in with grinding paste will only cause premature wear of the valve seat. Usually the valve seat in the cylinder head will still be in good condition, but if pitted it should be refaced with a piloted valve seat cutting tool. The valve seat angle is 45 degrees.

With the valves and seats in good condition or if they have been 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. 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.

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 shouldered drift applied from the combustion chamber. Note that the exhaust guide is counterbored at the end which protudes into the port.

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

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 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 followed by the spring cup and then compress the springs with the service tool until the collets can be inserted into the top collar. A little grease on the valve stem will assist in keeping the collets in position as the valve springs are released. Make sure that the collets (which retain the valve spring collar) are correctly seated in the recess on the valve stem.

When replacing the valve springs 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 excessive blue smoke in the exhaust and by lack of compression, although if the valves are in poor condition this is most likely to be the cause of the latter symptom.

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.

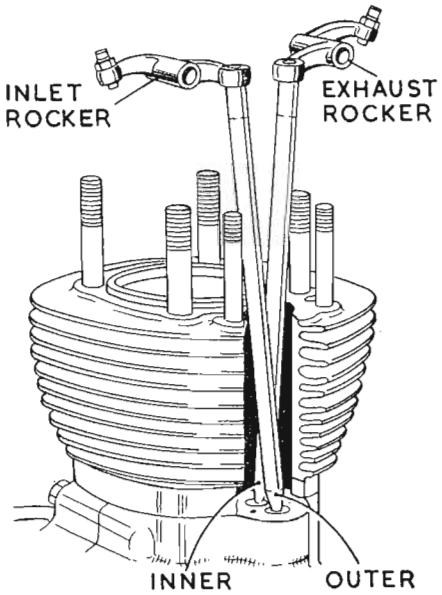

Fig. 8.
The correct assembly of the push rods.

Examine the cylinder carefully for wear and if a deep ridge has formed at the top of the bore then a rebore will be necessary especially if the compression plate is to be removed. Matched barrels and pistons ·010ins. and ·020ins. oversize are available for rebore purposes. The barrel will also require a rebore if there are any deep scores as this will cause loss of compression and excessive oil consumption.

The Piston Rings

The outside faces of the piston rings should possess a smooth metallic surface and any signs of discoloration mean that the ring 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 a piece of 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 that 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 in. and although an increase of a few thousandths of an inch is not important, any large increase to say, ·025 in. means that the ring should be replaced. Note that the top compression ring is chromium plated and the lower one has a tapered face. It is important that this ring is fitted correctly in accordance with its marking, i.e., the surface marked 'T' must be uppermost.

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, first 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 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 withdraw the gudgeon pin with a suitable extractor. 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 in. side-float and this permits some sideways movement at the other end of the connecting rod.

Re-assembly

Scrupulous cleanliness must be observed when re-assembling, 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 eased over the piston, at the same time compressing the rings so that they pass smoothly into the lower end of the bore. Take care that the rings are not trapped or damaged and if the job is being done singlehanded a band for compressing the piston rings will facilitate the operation.

Insert the two push-rods down the barrel aperture onto their respective tappets, the outer one operating the inlet push rod, Fig. 8.

Refit the cylinder head with the rocker box already assembled to it, but with the push rod inspection cover removed. This is necessary so that the upper ends 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 top dead centre on the compression stroke.

Now tighten the cylinder head fixing nuts firmly and evenly. Check that the push rods are in their proper positions and replace the inspection cover and sealing washer.

Replace the engine in the frame and tighten its mounting bolts. Re-connect the oil lines (see page 15), fit the crankcase shield and re-join the generator cables. Fit the carburetter with its air cleaner connection, followed by the exhaust system, engine steady and exhaust valve lifter unit. Next, adjust the valve clearances (page 16) and replace the sparking plug.

Finally replace the petrol tank and re-connect the pipe line.

Sparking Plug

The sparking plug is of great importance to satisfactory engine performance, and it is necessary that it should be the correct type and in good condition. Champion type N64Y is recommended.

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 the correct temperature in a healthy engine will be indicated by blackish or greyish-tan deposits on the end of the plug body and earth electrode. The firing end of the insulator will vary from a very light tan to a darkish brown.

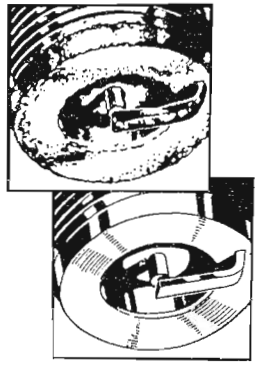

Fig. 9. The sparking plug.
(Above)—Fouled with burnt oil, or soot.
(Below)—Correct.

A sooty deposit on the firing end of the plug is generally an indication of an over-rich mixture, whereas a light grey deposit on the end of the plug and a whitish appearance on the firing end of the insulator may indicate a lean mixture. If the 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.

The plug should be cleaned on an abrasive blast machine and afterwards, the sparking surfaces of the electrodes on standard type plugs should be dressed with a fine file in order to restore clean, flat, parallel faces. It is most important that the gap should be re-set to specification, ·020—·025 ins. Gap adjustment should be made by bending the side wire. The threads of the plug, and the gasket seat, should be wiped clean before refitting 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 grime or dust etc., as such deposits can be conductive, and result in poor plug performance.

The special non-detachable steel gaskets fitted to Champion standard sparking plugs are designed to last the life of the plug.

When refitting 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 AMAL CARBURETTER
(with concentric float chamber)

The twist-grip controls the supply of air to the engine by means of the throttle slide and its attached needle controls the supply of fuel, thus providing a balanced mixture. The needle has a number of notches at its upper end depending on the type of carburetter and

9. Needle
11. Throttle slide
14. Pilot jet
15. Needle jet
16. Needle jet holder
17. Main jet
18. Float needle
19. Float
26. Throttle stop screw
27. Pilot air screw

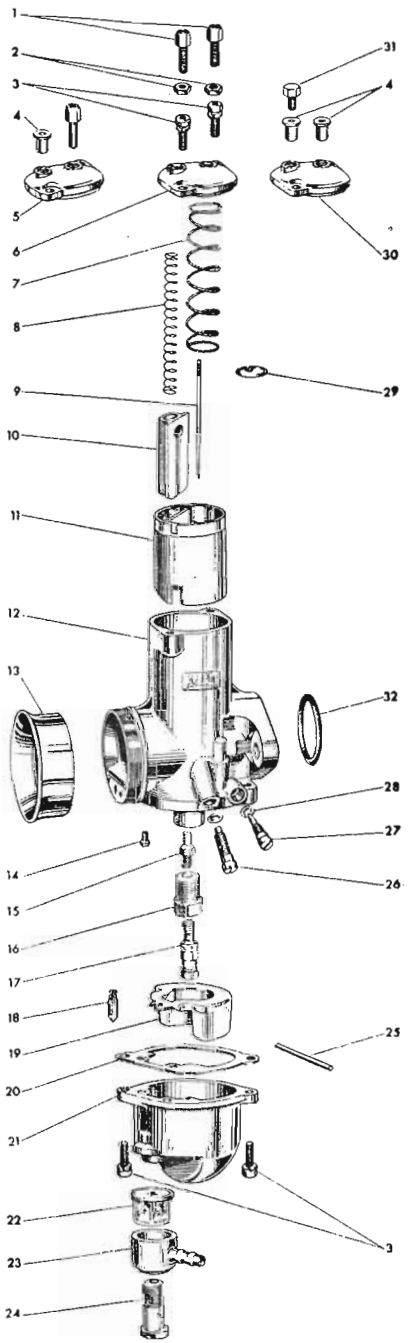

Fig. 10. The Amal carburetter (with concentric float chamber)

Note. The air slide (10) is not fitted to the carburetter used on the Victor.

it is secured in the throttle slide by a spring clip which locates in one of these notches. The throttle valve size and the needle position are carefully set before despatch from the factory and no alteration to these settings is necessary or desirable.

Mixture control at tick-over and low speeds is controlled by the pilot jet which has an adjustable air supply. An adjustable throttle stop is also provided to regulate the slow-running speed.

For normal road purposes, the standard settings will prove suitable. Under racing conditions the main jet size may require some alteration to comply with the atmospheric conditions, and the fuel used. 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 cutaway for correct pick-up from idling.

(4) Needle position for good acceleration from quarter to three-quarter throttle

(5) Finally re-adjust the pilot jet setting.

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 26, it can provide an indication of whether the mixture is correct. After a run at full throttle stop the engine at once, 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 jet black, but if it is a sooty black, the mixture may be too rich. The air lever must be fully open during these tests.

Alternative methods of checking the main jet size are as follows: ride at low speed in top gear and then open the throttle wide when, if the carburetter is properly jetted, the machine should accelerate steadily to maximum speed. If the engine misfires (below maximum speed) reduce the throttle opening and if the speed increases, the jet is too large. Fit a size smaller jet and repeat the test.

If it is suspected that the jet is too small, ride at full throttle in top gear and if the engine misfires and the speed does not increase when the throttle opening is reduced, then the jet is too small. This condition should be corrected as soon as possible otherwise piston selzure may occur.

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 until a steady and even tick-over is achieved. If considerable alteration to the throttle stop has been made, the pilot air screw should be re-adjusted. Both throttle stop and pilot air screw are fitted with "O" rings to retain the adjustment by friction. Do not attempt to obtain an excessively slow tick-over as it will probably become unreliable under different atmospheric conditions.

Throttle Valve Cutaway

When the pilot adjuster is correctly set, open the throttle progressively up to quarter-throttle and if spitting back occurs, this indicates a weak mixture and a valve with a smaller cut-away should be fitted. If the engine runs "roughly" under load at this throttle opening, a rich mixture is indicated, when either the jet needle must be lowered or a new valve with a larger cut-away is required.

Jet Needle Position

The needle jet is the major controlling factor from quarter to three-quarter 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 only be moved 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 4 are those normally recommended and will be suitable for most atmospheric conditions. They are intended for use at altitudes of 0—3,000 feet. Above this height some reduction in main jet size is necessary to provide a balanced mixture. At altitudes of 3,000—6,000 feet a reduction in main jet size of 5% is usually necessary and for every 3,000 feet increase over 6,000 feet a further 4% reduction is required.

Air Cleaner

The air cleaner is contained within the housing on the left side of the frame. At regular intervals remove the cover, thus releasing the filter element which should be washed in petrol. Dry thoroughly before replacing.

If the machine is being used regularly for competition work or under exceptionally severe conditions, the filter should be cleaned at intervals of not more than one week and preferably before every event.

ROUTINE LUBRICATION

Ref. No.		
	Weekly	
2	Check oil level in tank	
12	Oil brake pedal pivot	
4	Oil exposed cables and control rod joints	
	Every 500 Miles	
10	Check oil level in primary chaincase ...	Page 35
	Every 2,000 Miles	
2	Drain and refill the oil tank	Page 13
9	Check oil level in gearbox	Page 37
2	Clean oil tank and crankcase filters	Page 13
	Lubricate prop stand (oil)	
11	Oil front brake cam spindle	Page 39
5	Grease rear brake cam spindle	Page 39
1	Oil rear chain	Page 34
	Every 5,000 Miles	
6	Grease speedometer drive	Page 37
3	Lubricate contact breaker cam	Page 17
3	Lubricate auto-advance mechanism ...	Page 17
9	Drain and refill gearbox	Page 37
10	Drain and refill primary chaincase	Page 35
	Every 10,000 Miles	
13	Drain and refill front forks	Page 42

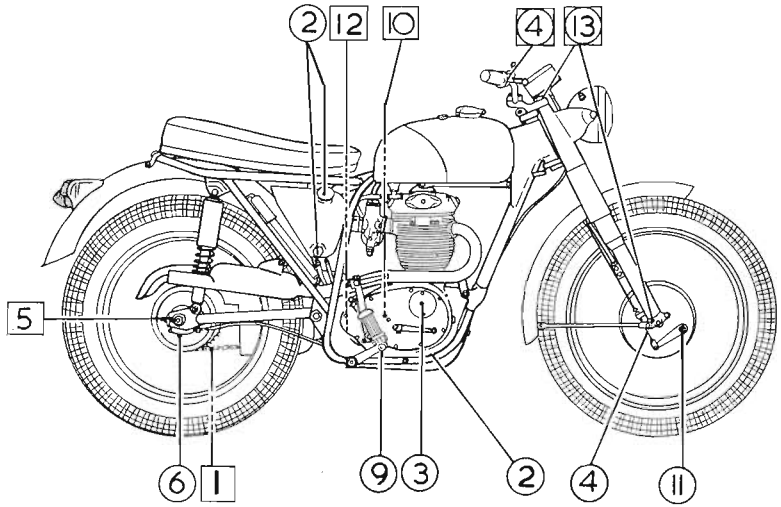

Fig. 11. Key Lubrication points.
(Numbers in circles refer to right side of machine.)
(Numbers in squares refer to left side of machine)

RECOMMENDED LUBRICANTS				
	OILS Engine and Gearbox		**OIL** Front Forks and Primary Chain	**GREASE**
Brand	Summer	Winter		
Mobiloil	BB	A	Arctic	Mobilgrease MP
Shell	X100–40	X100–30	X100–20W	Retinax A
Castrol	XXL	XL	Castrolite	Castrolease LM
Esso	Esso Motor Oil 40/50	Esso Motor Oil 20W/30	Esso Motor 20W/30 Oil	Esso Multi-purpose Grease H
B.P. Energol	S.A.E. 40	S.A.E. 30	S.A.E. 20W	Energrease L2
Regent	Havoline S.A.E. 40	Havoline S.A.E. 30	Havoline S.A.E. 20W	Marfak Multi-purpose 2

The grade of lubricant used depends to a certain extent on the use to which the machine is being put and the ambient temperature. The chart gives recommendations for conditions in temperate countries. In countries where the climatic conditions are extreme some alteration may be necessary, bearing in mind that the higher the temperature the higher is the S.A.E. number required.

All the above are mineral oils, but if it is desired to use vegetable oil (which must be of S.A.E. 30 grade only) then the engine and oil tank must be thoroughly cleaned out with flushing oil before changing over.

In no circumstances must the two types of oil be mixed. If they are, a sludge will be formed which may damage the engine. For similar reasons, B.S.A. oil (U.S.A.) (non-detergent) should not be replaced with a detergent oil.

It is always advisable to make sure that the oil is warm before driving the engine hard. When taking part in competitive events advantage should be taken of any warming up period to get the engine warm and the oil circulated.

RECOMMENDED OILS FOR U.S.A. ONLY		
We strongly recommend B.S.A. oils for use in B.S.A motor-cycles, as detailed below:—		
Engine and Gearbox		**Front Forks and Primary chaincase**
Summer	Winter	
S.A.E. 40	S.A.E. 30	S.A.E. 20

TRANSMISSION

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.

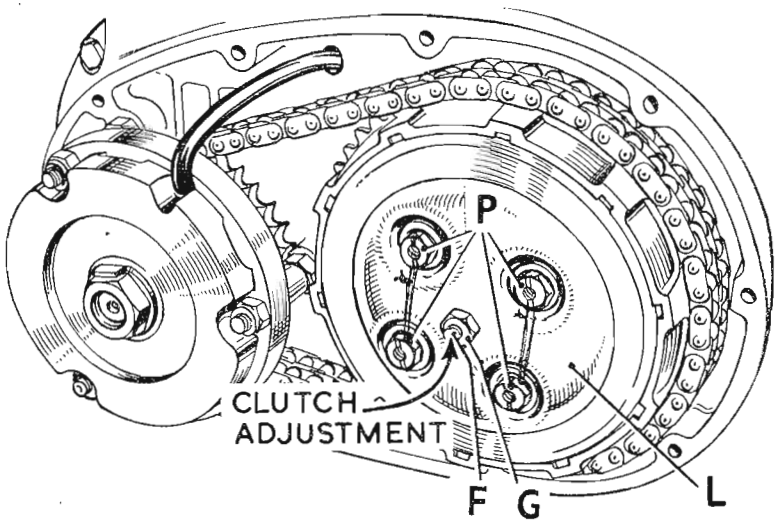

Fig. 12. The primary transmission and clutch.

The only maintenance required is to ensure a satisfactory oil level in the chaincase (see page 35).

Care of the Rear Chain

Lubrication is provided by a chain oiler from the rear of the primary chaincase, which provides a metered supply of lubricant, and should keep the chain in good condition. **This supply is dependent on correct maintenance of the oil level in the primary chaincase (see page 35).** If maximum life is to be achieved, however, 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).

Rear chain adjustment involves moving the rear wheel and is described on page 40.

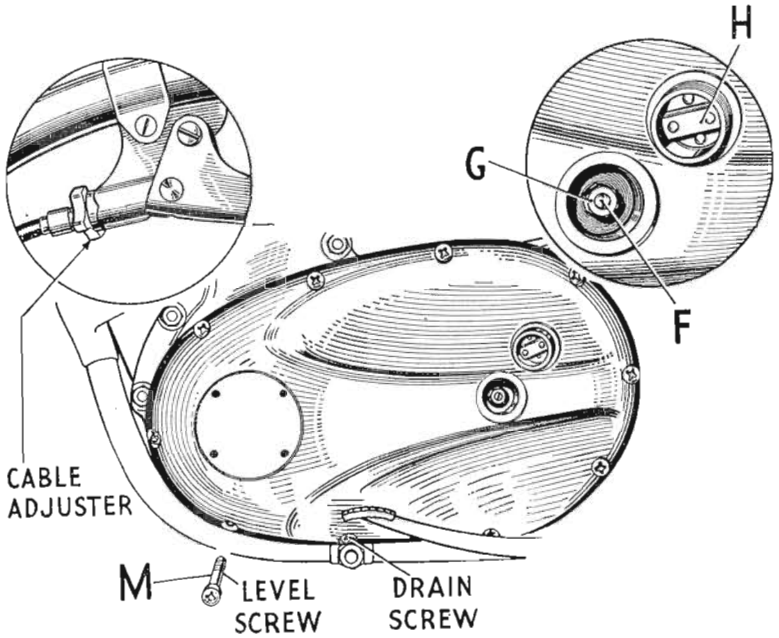

Fig. 13. Clutch adjustment and chaincase oil level.

Clutch Control Adjustment (Fig. 13)

The main adjustment consists of a screw pin F and locknut G mounted on the clutch pressure plate. These are accessible after removal of the inspection cover H (Fig. 13).

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. 14).

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. 13) 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.

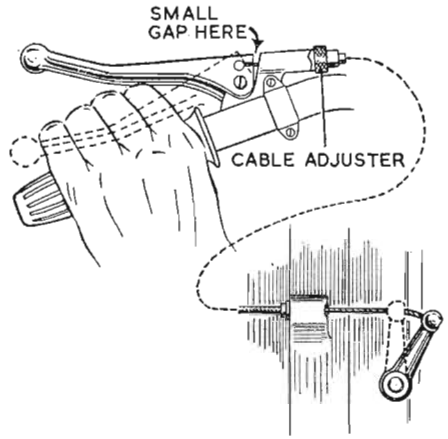

Fig. 14. Setting the clutch operating lever.

Primary Chaincase

The outer cover is retained by screws of three different lengths, and one of these M (Fig. 13), which is painted red determines the oil level. To replenish with oil, first remove this screw and then the clutch inspection cover H (Fig. 13,) the latter acting as a filling orifice. Add oil of the correct grade (see **Recommended Lubricants,** page 32) 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.

Clutch Dismantling

Remove the four spring retaining nuts P (Fig. 12), 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 will not normally require replacing for a considerable mileage.

Clutch Spring Pressure

Whenever the clutch has been dismantled, the spring pressure must be reset carefully. The four retaining nuts P (Fig. 12), 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 spring pressure plate rotates truly or not. If necessary, adjust the nuts individually until true running is obtained.

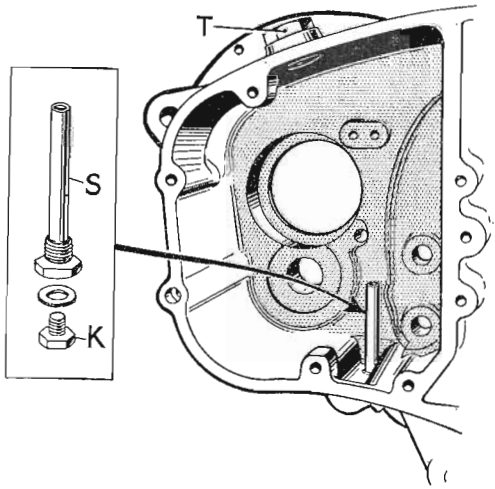

Fig. 15. The gearbox drain plug.

Gearbox

Apart from topping-up at regular intervals, very little maintenance should be required. The gearbox drain plug S incorporates a level plug K and, to top-up, remove the filler plug T (Fig. 15), 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, 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 $\frac{1}{2}$ pint and suitable oils are detailed on page 32.

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 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.

WHEELS

Both wheels are fitted with ball journal bearings which do not require adjustment. The bearings are packed with grease during assembly and no further greasing is required until the hubs are dismantled for overhaul.

Speedometer Gearbox

The unit requires no attention apart from lubrication at intervals (see page 31). Grease with two applications from a **hand grease gun** only.

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 brakes must not be adjusted so closely however, that they are continually in contact with the drum, otherwise excessive heat may be generated, resulting in deterioration of braking efficiency.

The front brake adjuster is situated at the cable stop on the front fork. Tighten the locking ring against the stop when the adjustment is completed.

The rear brake is adjusted by turning the self-locking sleeve (Fig. 18), 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 and cable or rod should not exceed 90 degrees when the brake is fully applied.

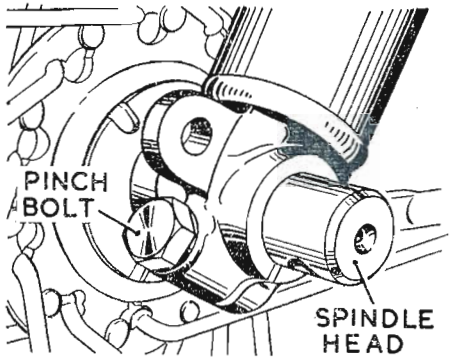

Fig. 16A. Removing the front wheel.

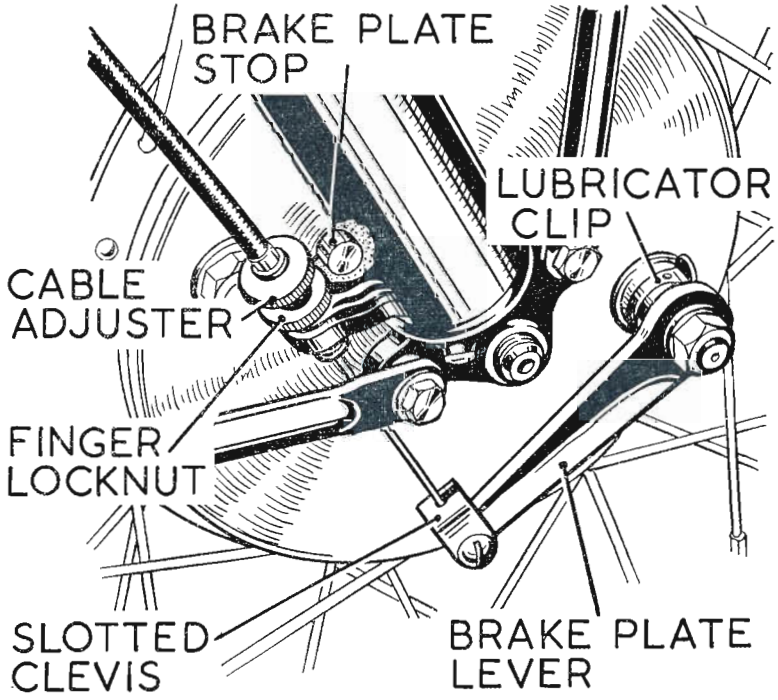

Fig. 16B.

Front Wheel Removal and Replacement

To remove the front wheel, first unhook the cable from the slotted clevis on the brake plate lever and then slacken the pinch bolt 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.

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 repositioned with the aid of the wheel spindle.

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.

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 left side fork end to position itself on the spindle. If this precaution is not observed, the fork leg may be clipped out of position and will not function correctly.

Rear Brake Cam Spindle Lubrication

One stroke of a hand grease gun is all that is required at intervals of 2,000 miles.

Front Brake Cam Spindle Lubrication

Move aside the spring clip on the spindle boss and apply two or three spots of engine oil every 2,000 miles. Excessive oiling may allow the lubricant to reach the brake linings.

Rear Wheel Removal and Replacement

Removal of the rear wheel does not affect the chain or brake adjustment. Disconnect the speedometer driving cable at the hub and unscrew the spindle "D" (Fig. 17) from the right-hand side. It has a normal right-hand thread and therefore unscrews in an anti-clockwise direction. It is also drilled to accept a tommy-bar to facilitate withdrawal. The spacing sleeve "E" between the speedometer drive and the fork end can then be removed and the wheel 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.

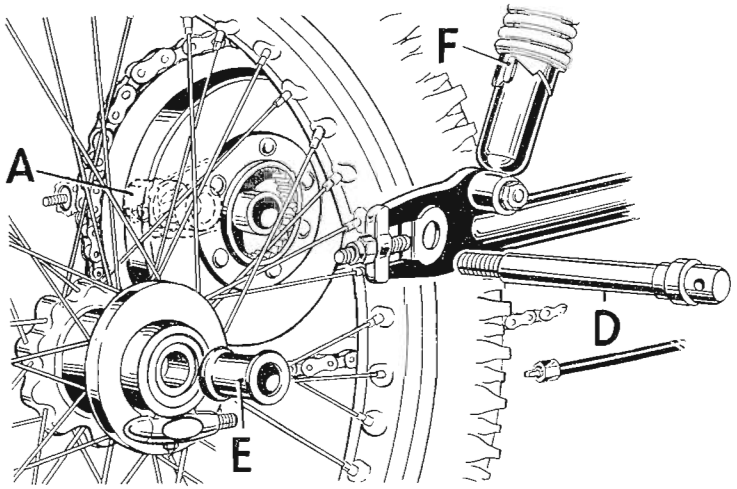

Fig. 17. Removal of the rear wheel.

Take care not to disturb the setting of the chain adjusters while the wheel is out of the frame and when replacing the wheel make certain that the adjusters are pressed firmly against the end of the forks.

Rear Chain Adjustment

The rear chain must be adjusted when the machine is on its centre stand so that the wheel is at the lowest point in the suspension. Rotate

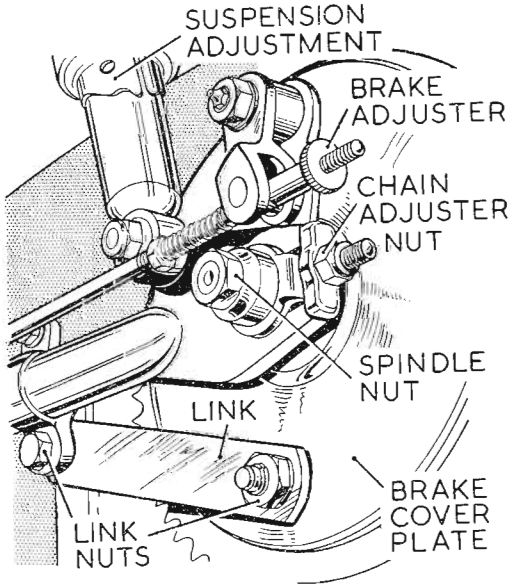

Fig. 18. Rear chain adjustment.

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 1½ ins. and if it varies from this setting, then the chain must be adjusted by moving the rear wheel, usually in a rearward direction.

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. 18) 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 in accordance with the instructions on page 37.

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 tyre 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.

Brake Shoe Removal and Replacement

First remove the wheel (page 39), and after the brake plate assembly has been withdrawn, the operating lever should be detached and the cam spindle pushed in slightly to allow the shoes to clear the brake plate. The levers have serrated holes and can be replaced in a new position if required.

Insert a screwdriver between the brake shoes at the fulcrum pin and twist the screwdriver so as to open the shoes at this point. Insert a small lever between one of the shoes and the brake plate and lever the shoe away from the plate until the spring pressure is released. Both shoes can then be lifted away from the plate.

To replace the shoes, first hook the springs on to the shoes and then place the ends of the shoes in position on the fulcrum pin and cam lever. Push the shoes downwards until the springs pull them into their correct position.

Note: The brake shoe springs are quite strong and care should be taken that the fingers are not trapped by the brake shoes during these operations.

When new shoes have been fitted to the front brake they must be centralized. To do this, replace the brake cover plate, complete with shoes, fulcrum pin and cam, in the brake drum. Slacken the fulcrum pin nut and turn the cam so as to open the brake shoes in the normal manner. The fulcrum pin will then move in its housing until both shoes are pressing equally on to the drum. Tighten the fulcrum pin firmly and release the brake.

SUSPENSION AND STEERING

Front Forks

Under normal conditions the only servicing which the front fork requires is occasional renewal of the oil. The need for this may be indicated by excessive movement of the fork, but it should only be necessary after considerable mileage.

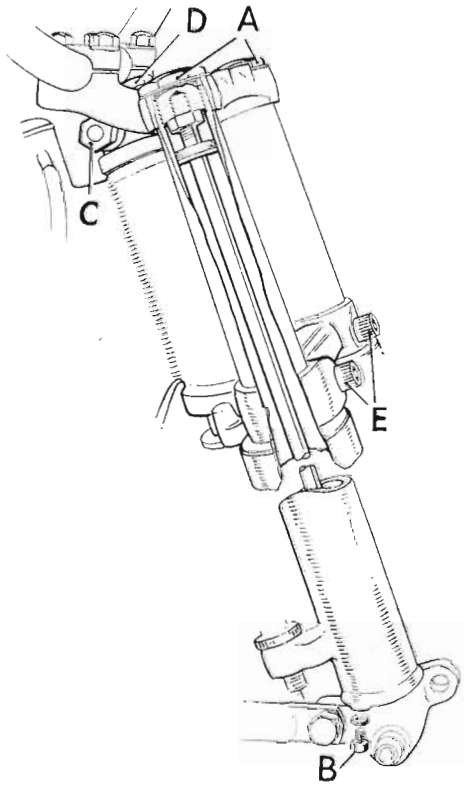

Fig. 19. Front fork and steering head.

Unscrew the nuts A (Fig. 19), and the drain plugs in the lower end of the fork sliding members as shown at B in (Fig. 19). Allow all the oil to drain out, then standing astride the machine, apply the front brake and depress the forks a few times to drive 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 leg (see page 4). Replace the top nuts and tighten firmly.

Recommended oils are given on page 32.

Steering Head Adjustment

The steering head should be tested occasionally for play and to ensure that the forks rotate freely. 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 clamping nuts C and E (Fig. 19), then tighten down the cap nut D until the adjustment is correct. Hold the handlebars lightly and move them round slowly. The steering 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 ballraces are damaged. When the adjustment is correct, tighten the clamping 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 a coil spring. The hydraulic dampers require no attention whatever. They are sealed during manufacture and if they suffer damage or become ineffective they must be replaced.

The load on the springs can be varied by means of a three-position cam adjuster "F" (Fig. 17) at the lower end of the unit and the springs can therefore be adjusted to suit the load conditions or nature of the ground. A suitable spanner for this adjustment is provided in the toolkit.

THE ELECTRICAL EQUIPMENT

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

Electrical energy for ignition (and lighting when fitted) is provided by the alternator. This alternator has six stator windings of which

four are used for ignition purposes the remaining two coils being available to serve the needs of any lighting circuits—exclusive of the stop lamp which, when fitted, is fed from a tapping off one of the ignition coils. The alternator has an engine-driven rotor containing six high-energy permanent magnets.

Energy Transfer Ignition

The four ignition windings of the stator are connected in series with each other and with the primary winding of a separately mounted ignition coil—an ignition coil designed specially to operate on the energy transfer principle. The contact breaker mechanism has its contacts connected in parallel with the ignition coil primary winding. Since one side of the stator windings, and of the ignition coil primary winding, and of the contact breaker is earthed, these three parts of the circuit are, in effect connected mutually in parallel. Closure of the contact breaker contacts thus short-circuits the ignition coil primary winding and, at the same time, creates a closed circuit of the four series-connected stator ignition 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 winding is to induce a high voltage in the ignition coil secondary winding, and this high-tension voltage is applied by way of the distributor to the appropriate sparking plug.

Timing (see page 18)

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

Alternator

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

Ignition Coil

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

Lighting Equipment—Headlamp Beam Setting

When the motor-cycle carries its normal load the headlamp driving beam should be projected straight ahead and parallel with the road surface.

Note: This instruction may require amendment to suit local (overseas) lighting regulations.

When checking setting:—

(*a*) Front of motor-cycle to be square with screen.

(*b*) Motor-cycle to be carrying normal load and standing on level ground.

(*c*) Recommended distance for setting is at least 25 feet.

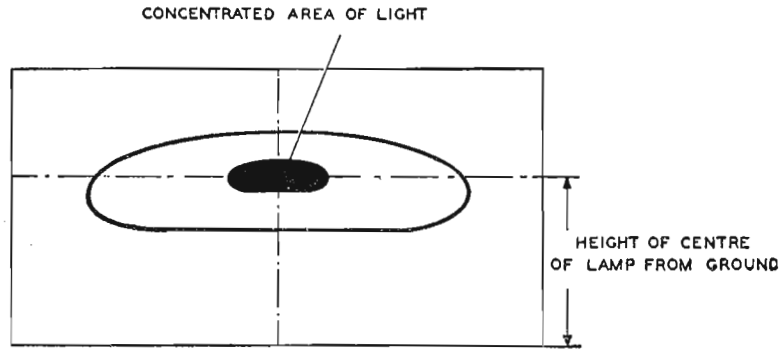

Fig. 20. Headlight beam setting pattern.

To make an adjustment slacken the screws securing the headlight and move it until the correct setting is obtained. Finally, retighten the securing screws.

With the Lucas pre-focus bulbs fitted in these lamps, the filament is correctly positioned during manufacture in relation to the focal point of the reflector. No further focusing is necessary.

Bulb Replacement—Headlight

Lucas bulb, 6-volt 24/24-watt pre-focus. To gain access to the headlight bulb, slacken the front rim retaining screw, situated at the top of the body. Disengage and withdraw the front rim and light unit assembly removing the upper edge first. Press the adapter inwards and turn it to the left. Lift off the adaptor and withdraw the defective bulb. After fitting the replacement bulb, reverse the above procedure to reassemble the lamp.

Headlight Main Beam Warning Light

Lucas bulb, 6-volt 0·6 watt. The bulb holder is accessible from within the headlamp shell. Withdraw the holder and to remove the bulb, depress and turn.

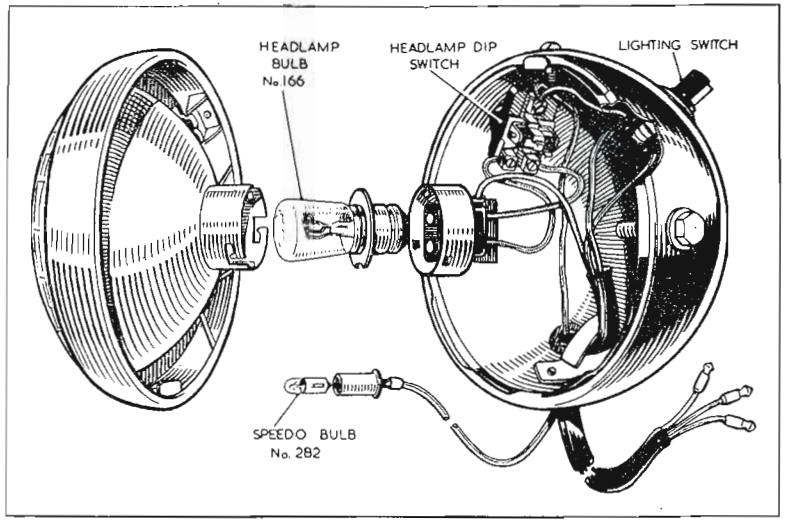

Fig. 21. Headlight dismantled for bulb renewal.

Stop/Tail Light

Lucas bulb, 6-volt 6/18-watt. Access to the bulb is gained by slackening the two lens retaining screws. When fitting the replacement bulb note that the securing pins are offset to ensure correct insertion into the bulbholder.

Wiring Diagram

A diagram of the electrical circuit appears on page 47. The insulation of the wires is individually coloured and these colours are indicated on the diagram.

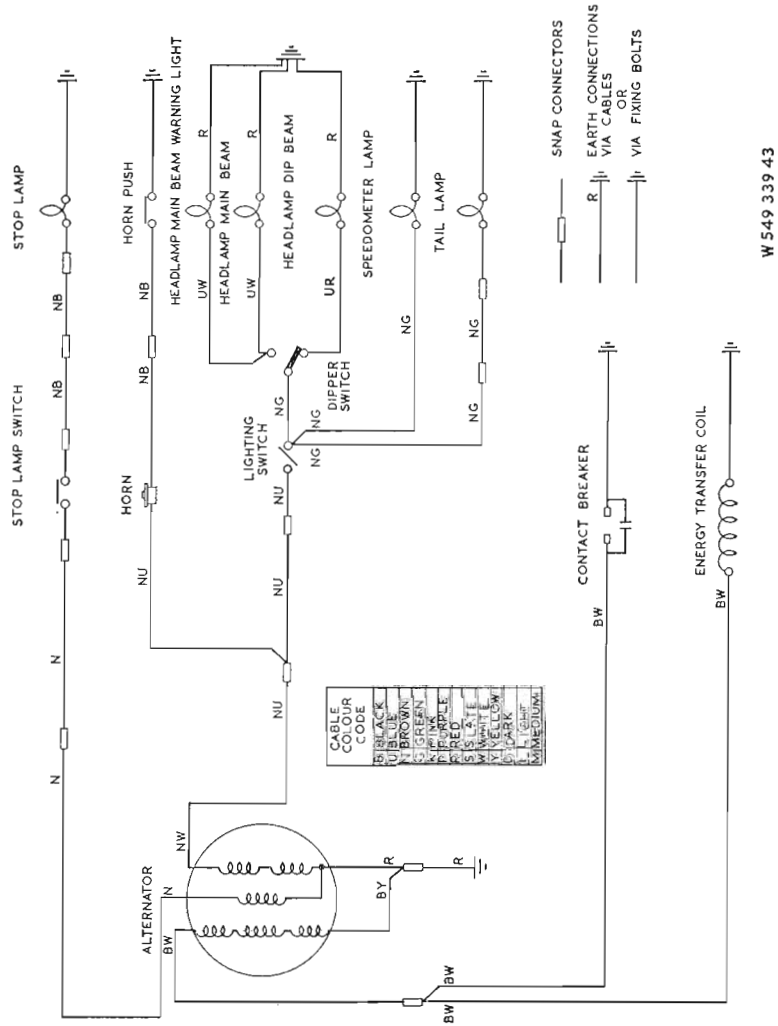

Fig. 22. Wiring diagram.