THE BOOK OF THE A.J.S.

2/- NET

...Price in Great Britain

...LIBRARY

THE BOOK OF THE A.J.S

by W. G. HAYCRAFT

PITMAN

2/- NET

PITMAN'S MOTOR CYCLISTS LIBRARY

The BOOK *of the* A.J.S.

W. C. HAYCRAFT

THE BOOK OF THE A.J.S.

PITMAN'S MOTOR CYCLISTS LIBRARY

THE BOOK OF THE A.J.S.

A COMPLETE GUIDE FOR OWNERS
AND PROSPECTIVE PURCHASERS
OF 1932–9 A.J.S. MOTOR-CYCLES

BY

W. C. HAYCRAFT

DEALING WITH EVERY PHASE OF THE SUBJECT, INCLUDING CHAPTERS ON I.C. ENGINE THEORY, CARBURATION, LUBRICATION, LIGHTING EQUIPMENT, AND OVERHAULING

FIFTH EDITION

LONDON
SIR ISAAC PITMAN & SONS, LTD.
1939

SIR ISAAC PITMAN & SONS, LTD.
PITMAN HOUSE, PARKER STREET, KINGSWAY, LONDON, W.C.2
THE PITMAN PRESS, BATH
PITMAN HOUSE, LITTLE COLLINS STREET, MELBOURNE

ASSOCIATED COMPANIES
PITMAN PUBLISHING CORPORATION
2 WEST 45TH STREET, NEW YORK
205 WEST MONROE STREET, CHICAGO
SIR ISAAC PITMAN & SONS (CANADA), LTD.
(INCORPORATING THE COMMERCIAL TEXT BOOK COMPANY)
PITMAN HOUSE, 381–383 CHURCH STREET, TORONTO

MADE IN GREAT BRITAIN AT THE PITMAN PRESS, BATH
C9—(T.5312)

PREFACE

THIS handbook has during the past few years proved decidedly popular among A.J.S. riders and I hope it has been the means of assisting many a rider to obtain trouble-free and pleasurable motor-cycling. In preparing this fifth edition I have aimed at making the book still more useful as a general reference guide for A.J.S. riders, both experienced and inexperienced.

The present edition fully covers all 1932–9 A.J.S. models with the exception of the overhead-camshaft "Trophy" and the racing models. These machines, although outstanding in their class, are not designed for ordinary road use and are consequently owned by only a relatively small percentage of the thousands of A.J.S. riders. For this reason I do not feel justified in dealing with them at the expense of the other road models, which now number seventeen all told.

The A.J.S. range of models undoubtedly merits most careful consideration by all intending purchasers. Those who want snappy performance plus good looks should write to Messrs. A.J.S. Motor Cycles, of Plumstead Road, London, S.E.18, for a copy of their latest catalogue. A.J.S. prices run from 44 guineas to 90 guineas, and every machine has electric lighting and automatic voltage control.

For the benefit of absolute novices I have described in simple non-technical language how the four-stroke engine works.

To avoid roadside breakdowns and to maintain A1 performance I would emphasize the importance of carburation, lubrication, and regular attention to adjustments and overhauling. I have comprehensively dealt with all these matters and you should find all the information you are likely to require.

W. C. H.

CONTENTS

CHAP.		PAGE
	PREFACE	v
I.	HOW THE ENGINE WORKS	1
II.	THE AMAL CARBURETTOR	8
III.	ALL ABOUT LUBRICATION	16
IV.	OVERHAULING	32
V.	CARE OF LIGHTING EQUIPMENT	77
	INDEX	88

THE BOOK OF THE A.J.S.

CHAPTER I

HOW THE ENGINE WORKS

THIS chapter is written solely for the absolute novice who is ignorant of the principles of the four-stroke engine and of the carburation and ignition systems. Expert riders can skip the whole of the chapter.

THE FOUR-STROKE ENGINE

Coal gas and several other gases become explosive when mixed with certain percentages of air (or oxygen), the percentage varying with the particular gas used, and, to a lesser extent, with the character and temperature of the atmosphere, so that a certain gaseous mixture imprisoned in a space (called the combustion chamber) will, if ignited, exert a pressure in all directions due to the rapid rise of temperature on combustion ; and here it is well to impress upon the reader the fact that all internal combustion engines are heat engines.

A crude illustration of the basis of gas engine or petrol motor construction may be given if a coffee canister with tight-fitting lid be imagined to be filled with the explosive mixture, and by some means the contents ignited ; the result would be that, the pressure in all directions being equal, a violent explosion would hurl the lid far away ; but if for that loose lid we substitute the piston *A*, Fig. 1, a close sliding fit in a fixed cylinder *B*, the piston being directly coupled to a crank *C*, by a connecting rod *D*, the shaft *E*, on which the crank is fitted, will now have reciprocatory movement of the piston transformed into rotary movement of the shaft, and, at the moment of explosion, the shaft will begin to rotate. Suppose the shaft *E* is attached to a wheel *F* called the flywheel ; then this wheel will be set in rotation also. Being purposely made heavy, it will go on spinning for some time—in fact, if there were no friction it would go on for ever—owing to the kinetic energy it derives from the initial explosion by virtue of its inertia, and will cause the piston to reciprocate in the cylinder. It can clearly be seen that the piston makes two strokes for every revolution of the flywheel. Let us assume that the explosion has just occurred, and that the piston

after reaching the bottom of its stroke, is ascending again. Imagine a valve at the top of the cylinder to be open during this stroke. Then the products of combustion will be swept out of the cylinder. Similarly it is easy to see that, if on the commencement of another down stroke, a second valve opens admitting an explosive

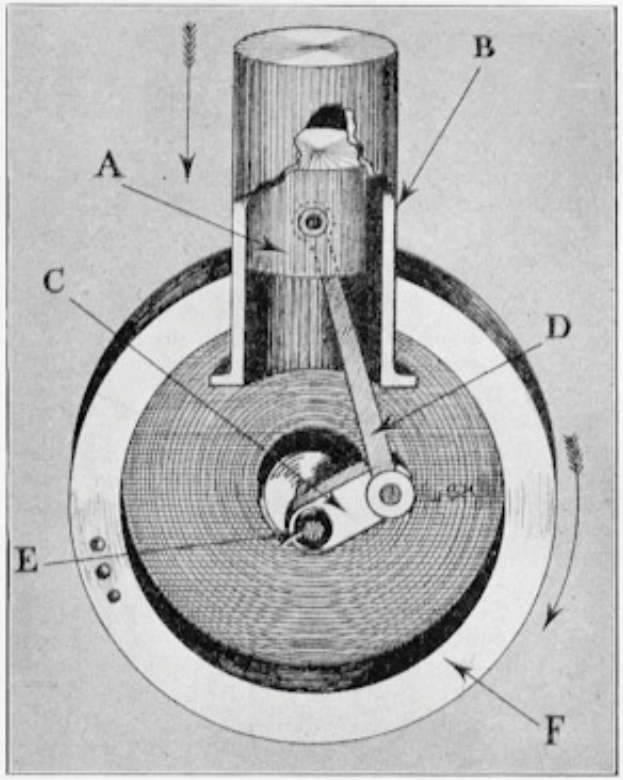


Fig. 1. Diagram Illustrating How a Piston (*A*), Sliding in a Cylinder (*B*), Rotates the Flywheel (*F*)

mixture, while the first valve closes, the cylinder can be recharged with gas during this down stroke. If, on again reaching the bottom of its stroke, both valves close, the charge of gas will be trapped and compressed during the ensuing upward stroke ready for the next explosion. Thus, clearly, the flywheel can be made to rotate continuously, so long as provision is made for supplying the explosive mixture and causing a spark to take place at the right time. The explosive mixture is supplied by what we call a

carburettor, and the spark by a *magneto*. We will for the present confine ourselves to a more detailed description of the four-stroke

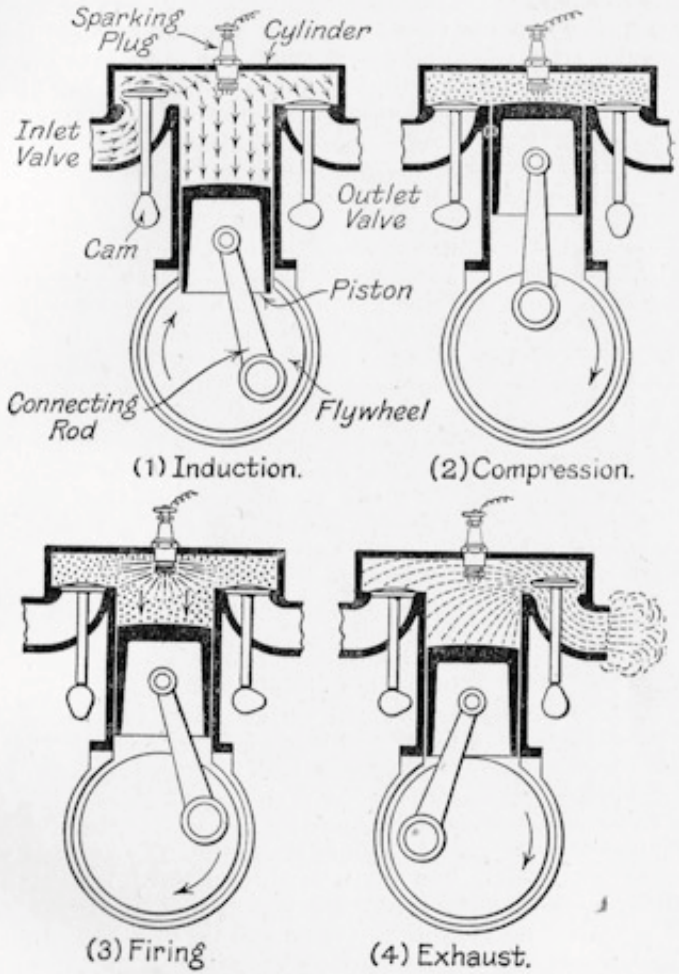


Fig. 2. The Principle of the Four-Stroke Engine

cycle. Let us refer to Fig. 2, which illustrates the cycle of operations very clearly.

Two valves are fitted in the cylinder head, namely, the *inlet valve* and the *exhaust valve*. When both these valves are closed upon their seatings, the space above the piston is a sealed chamber. If the *inlet valve* is open, the cylinder is in communication through

the *induction pipe* with the carburettor. If the *exhaust valve* is open, the cylinder is in communication through the *exhaust pipe* with the silencer.

We will now suppose that the piston has just reached the top of its stroke after sweeping out through the open exhaust valve the hot gases left in the cylinder after a firing stroke. During this upward stroke the inlet valve has, of course, remained closed, for otherwise the hot gases would have had access to the carburettor via the inlet valve, with dire consequences that may be left to the imagination. The two valves are opened and closed at the correct moments by cams upon the *half-time shafts* driven by gearing off the engine shaft at half engine speed. Fig. 3 illustrates how a valve tappet *A* is operated by a cam *B*, with rocker *C*, on a half-time shaft *D*, driven by a gear wheel *E*, off the engine pinion *F*. See also Fig. 11.

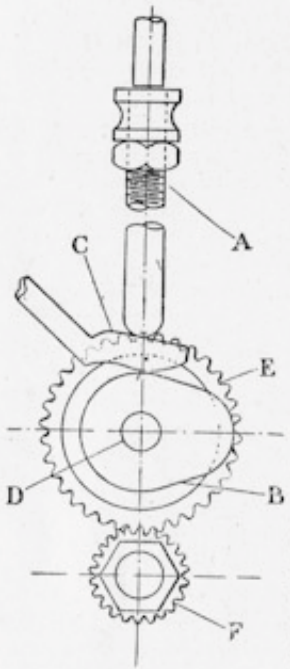


FIG. 3. VALVE CAM ACTION

As the piston reaches the top of its "sweeping-out," or exhaust stroke, the exhaust valve closes, and a moment afterwards the inlet valve opens. This is the point from which we shall assume our four-stroke cycle to begin, and we shall consider exactly what happens during the four strokes which take place before we arrive back to the starting point and begin a fresh cycle. The four strokes are called the *induction* or *inlet* stroke, the *compression* stroke, the *firing* stroke, and the *exhaust* stroke.

1. Induction Stroke. The exhaust valve has now closed, and the inlet valve has opened. The downwardly moving piston has to fill the space behind it with air. This produces an intense draught or suction through the induction pipe and carburettor. The blast of air sweeping over the small aperture, or "jet," to which a supply of petrol is constantly fed, causes a fine jet of petrol to rise like a fountain in the carburettor. The fountain resolves itself into spray, or is "atomized," and the "mixture," consisting as it were of air converted into a fog by the tiny petrol particles, passes along the induction pipe into the cylinder. If the induction pipe is warm the fog may, of course, evaporate before it reaches the cylinder, a true mixture of air with the petrol vapour being then supplied. In any case the fog will be evaporated by the warmth within the cylinder itself. At the end of the downward stroke of the piston the inlet valve closes, and the cylinder becomes a sealed chamber containing the explosive mixture.

2. Compression Stroke. The crank on the engine shaft, assisted by the flywheels, passes over its dead point, and the piston commences its upward stroke. The well-fitting piston rings prevent the escape of the mixture on charge into the crankcase chambers, and the charge undergoes compression. The amount of compression effected during the stroke depends, of course, upon the design of the engine, that is to say, upon the relative volume of the whole cylinder when the piston is at the bottom of its stroke to the space left above the piston when it has reached the top of its stroke. This is called the *compression ratio*. Gases, as we all know, are heated by compression, and consequently, if a gas is quickly compressed to, say, one-fifth of its original volume, its pressure is increased considerably more than five times. As a result, the pressure at the end of the compression stroke in an engine having a 5 : 1 compression ratio is well over one hundred pounds to the square inch.

3. Firing Stroke. We have now reached the moment at which the charge is to be fired. The inlet and exhaust valves are closed, the charge is fully compressed, and all is ready for the explosion. This, of course, is brought about by the properly timed passage of an electric spark between the *electrodes*, or points, of the sparking plug. It might be supposed that this spark should occur just as the piston reaches the top of its compression stroke. This, however, is not the case. The correct time for the spark depends upon the speed at which the engine is running. The reason for this is clear when we consider that no explosion—not even the explosion of cordite in the breech of a howitzer—is absolutely instantaneous. In the case of an explosive mixture of air and petrol vapour, the explosion takes quite an appreciable time, and there is a lag, so to speak, between the passage of the spark and the moment when the exploded charge reaches its maximum temperature and pressure. If, therefore, the engine is running fast, the ignition must be so far advanced (i.e. timed to take place early) as to allow the maximum pressure to occur when the piston has only just passed over its dead point. When ignition timing is correct, the maximum pressure may be taken as about 450 lb., and the average pressure during the working stroke as about 100 lb. per square inch. Of course, if the ignition is too far advanced, the exploding gases may administer a blow on the head of the rising piston, and produce a *knock*. *The phenomenon of knocking* is very curious, and is often the subject of heated argument. If,

on the other hand, the ignition is not advanced proportionally to the engine speed, the full pressure will not be reached until the piston has moved an appreciable distance on its downward stroke, and some of the energy of the explosion will be lost.

If by some mischance a gross error of timing were made in the direction of retardation, or lateness, so that the piston had moved far down the cylinder before the explosion occurred, the mixture would burn slowly instead of exploding, there would be little power, and the exhaust gases would be still flaming when they were finally allowed to escape, so the exhaust valve would be liable to be badly burnt. It is for a similar reason, namely, slow and imperfect combustion, that a weak mixture, containing an excess of air compared with the amount of petrol present, may cause burning of the exhaust valve. This effect of a weak mixture sometimes appears to the novice rather paradoxical. In point of fact, of course, the whole object of the internal combustion engine is firstly to develop heat, and then to convert it into work. If through the use of an unsuitable mixture, or by faulty timing of the ignition, the working conditions of the engine are such that the heat cannot entirely be transformed into work, we get the dual conditions of (1) loss of power, and (2) an excess of heat in the exhaust gases with consequent damage to the exhaust valve during the exhaust stroke.

4. Exhaust Stroke. The exhaust valve now opens, and the products of combustion are ejected from the cylinder into the exhaust pipe and silencer by the ascending piston. After undergoing cooling the burnt gases are now finally allowed to escape.

The Magneto. This consists of three main parts—(1) the *armature*, (2) a "U" shaped *magnet*, (3) the *contact-breaker*.

The armature comprises an iron core or bobbin of "H" section, on which are two *windings*: firstly, a short winding of fairly heavy gauge wire, and secondly, on top of the former, a very big winding of fine wire. The first winding is known as the *primary* and the second as the *secondary*. The armature, which can rotate on ball bearings, is placed so that on rotation it periodically cuts across the *magnetic field* of the magnet, and creates a current in the primary winding. Incidentally, the contact-breaker forms part of the primary circuit. This current, however, is at a very low voltage—far and away too small to produce anything in the nature of a spark. But if a *break* is suddenly caused in the primary by separating the platinum contacts when the current is at its maximum flow, a high voltage or tension current will be instantly *induced* in the secondary winding—sufficient to jump a small space, if the circuit be incomplete. In this circuit the sparking plug is included, and things are so arranged that, in order for the secondary circuit to

be complete, the current must jump across the electrodes of the plug, or, in other words, a spark must occur. Now in the case of a single cylinder engine, the points in the rotating contact-breaker separate once in every armature revolution (there being one cam only), and the armature to which the contact-breaker is fitted being driven off the inlet camshaft by sprockets and chain consequently runs at half engine speed; that is to say, a "break" takes place once every two engine revolutions, i.e. four strokes of the piston. Hence if the initial "break" be timed to occur when the piston is at the top of the compression stroke, all the other "breaks" (and therefore sparks) will occur at this point also, and thus the engine will go on firing correctly. Besides the "break" being timed to take place when the piston is in a certain position (which we call "timing the magneto," see page 51), it must also be timed to occur at the moment when the bobbin is having the greatest effect on the magnetic field (see Fig. 4).

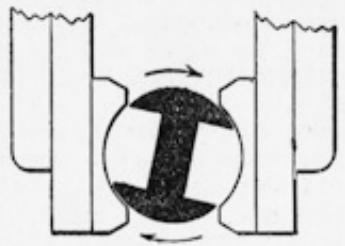


FIG. 4. POSITION OF MAGNETO ARMATURE WHEN CONTACTS SHOULD OPEN

Coil Ignition. This has many features in common with magneto ignition, but there are certain very distinct variations. Its principal characteristic is that it generates a high-tension current of practically *constant voltage*, and is thus admirably suited for easy starting and efficiency at low engine speeds. On the magneto the high-tension current is induced in the secondary winding by the interruption of the primary circuit, which depends for its voltage upon the speed at which the armature is rotating. With coil ignition a low-tension current is generated by a *dynamo* and led straight to a *battery*, from which the current is supplied at a practically fixed voltage to the primary *coil*; and the high-tension current is generated in the secondary coil by induction as on the magneto, a *contact-breaker* driven off the exhaust camshaft at half engine speed interrupting the primary circuit at predetermined intervals. Coil ignition is used on Models 39/12, 39/16. It should be noted that in addition to the battery, dynamo, coils, and contact-breaker, there is a *condenser* in parallel with the contact-breaker, as on the magneto. Other features are the "tell-tale" warning lamp which shows when the ignition is switched on (see page 15), the dynamo cut-out, or automatic voltage control, and the panel ignition switch which earths the primary current.

CHAPTER II

THE AMAL CARBURETTOR

SATISFACTORY engine performance naturally depends to a great extent on correct carburation. All A.J.S. models are sent out from the works with the carburettors carefully tuned.

How It Works. The carburettor fitted to all except the racing O.H.C. engines is of the two-lever needle jet type, the mixture at slow or idling speeds being controlled by a readily adjustable pilot jet, whilst at higher speeds the mixture is controlled by means of a needle attached to the throttle slide and working in a restriction jet. The two-lever control must not be confused with the type of control that was used a considerable time ago on the two-lever carburettor, in which it was necessary to constantly adjust the air lever in accordance with the conditions under which the machine was running. This carburettor is for all practical purposes automatic, the air lever being closed only to facilitate starting. At all other times it should be fully opened. The carburettor slides are chromium plated to provide hard wearing surfaces. The air slide is operated by a trigger or lever type handlebar control and the throttle by a twist-grip.

In connection with the float chamber of the Amal it should be pointed out that alteration in the float position can only have detrimental results.

Referring to the sectional diagram which illustrates the construction, *A* is the carburettor body or mixing chamber, the upper part of which has a throttle valve *B*, with taper needle *C* attached by the needle clip. The throttle valve regulates the quantity of mixture supplied to the engine. Passing through the throttle valve is the air valve *D*, independently operated and serving the purpose of obstructing the main air passage for starting and mixture regulation. Fixed to the underside of the mixing chamber by the union nut *E* is the jet block *F*, and interposed between them is a fibre washer to ensure a petrol-tight joint. On the upper part of the jet block is the adaptor body *H*, forming a clean through-way. Integral with the jet block is the pilot jet *J*, supplied through the passage *K*. The adjustable pilot air intake *L* communicates with a chamber, from which issues the pilot outlet *M* and the by-pass *N*. An adjusting screw (*TS*, Fig. 6,) is provided on the mixing chamber, by which the position of the throttle valve for tick-over is regulated independently of the cable adjustment. The needle jet *O* is screwed in the underside

of the jet block, and carries at its bottom end the main jet *P*. Both these jets are removable when the jet plug *Q*, which bolts the mixing chamber and the float chamber together, is removed. The float chamber, which has bottom feed, consists of a cup *R* suitably mounted on a platform *S* containing the float *T* and the needle valve *U* attached by the clip *V*. The float chamber cover *W* has a lock screw *X* for security.

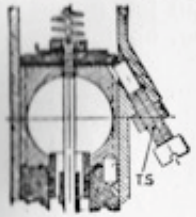


FIG. 6. AMAL THROTTLE STOP

FIG. 5. SECTIONAL VIEW OF AMAL NEEDLE JET TWO-LEVER CARBURETTOR

A flange fixing now replaces the clip fixing illustrated

The petrol tap having been turned on, petrol will flow past the needle valve *U* until the quantity of petrol in the chamber *R* is sufficient to raise the float *T*, when the needle valve *U* will prevent a further supply entering the float chamber until some in the chamber has already been used up by the engine. The float chamber having filled to its correct level, the fuel passes along the passages through the diagonal holes in the jet plug *Q*, when it will be in communication with the main jet *P* and the pilot feed hole *K*; the level in these jets being, obviously, the same as that maintained in the float chamber.

Imagine the throttle valve *B* very slightly open. As the piston descends, a partial vacuum is created in the carburettor, causing a rush of air through the pilot air hole *L* and drawing fuel from the pilot jet *J*. The mixture of air and fuel is admitted to the engine through the pilot outlet *M*. The quantity of mixture capable of being passed by the pilot outlet *M* is insufficient to run the engine. This mixture also carries excess of fuel. Consequently, before a combustible mixture is admitted, throttle valve *B* must be slightly raised, admitting a further supply of air from the main air intake. The farther the throttle valve is opened, the less will be the depression on the outlet *M*, but, in turn, a higher depression will be created on the by-pass *N*, and the pilot mixture will flow from this passage as well as from the outlet *M*. The mixture supplied by the pilot and by-pass system is supplemented at about one-eighth throttle by fuel from the main jet *P*, the throttle valve cut-away determining the mixture strength from here to one-quarter throttle. Proceeding up the throttle range, mixture control by the needle position occurs from one-quarter to three-quarters throttle, and from this point the main jet is the only regulation.

The air valve *D*, which is cable-operated on the two-lever carburettor, has the effect of obstructing the main through-way and, in consequence, increasing the depression on the main jet, enriching the mixture.

Tuning the Amal Carburettor. The standard setting is usually entirely satisfactory, but better results and more power may sometimes be obtained by the use of a slightly larger main jet or by making other adjustments. Various sized jets are obtainable from A.J.S. spare parts stockists, or from the manufacturers.

Should the setting of this instrument not give entire satisfaction for particular requirements, there are four separate ways of rectifying matters as given herewith, and the adjustments should be made in this order: (*a*) Main jet ($\frac{3}{4}$ to full throttle); (*b*) pilot air adjustment (closed to $\frac{1}{8}$ throttle); (*c*) throttle valve cut-away on the air intake side ($\frac{1}{8}$ to $\frac{1}{4}$ throttle); and (*d*) needle position ($\frac{1}{4}$ to

$\frac{3}{4}$ throttle). The diagram (Fig. 7) clearly indicates the part of the throttle range over which each adjustment is effective.

(*a*) To obtain the correct main jet size, several jets should be experimented with, and that selected should be the *one which*

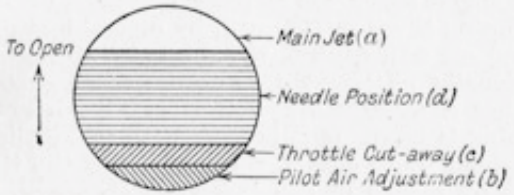


Fig. 7. Range and Sequence of Amal Adjustments

gives maximum power and speed on full throttle with the air lever three-quarters open. If maximum speed is the chief consideration, the jet size should be selected with the air lever fully open. For touring, to determine whether the jet is too large or too small, with throttle fully open, gradually close the air lever. If an increase in power is noticed, the jet is on the small size. If, however, when the air lever is opened fully, an increase of power is obtained, the jet is too large.

(*b*) To weaken slow-running mixture, screw pilot air adjuster outwards, and to enrich, screw pilot air adjuster inwards.

Screw pilot air adjuster home in a clockwise direction. Place gear lever in "neutral." Slightly flood the float chamber by gently depressing the tickler, unless the latest Amal "pump" device is provided. Set magneto at half advance, throttle approximately

Standard Amal Carburettor Settings for 1935 A.J.S. Models
(Applicable also to Corresponding 1936–7 Models)

Model	Carburettor	Main Jet	Needle Jet	Needle Position	Throttle Valve
			In.		
35/5	5/148	100	·1065	4	5/4
35/4, 35/14	6/165	130	·1065	2	6/4
35/9	76/004	150	·1065	3	6/4
35/2	76/012	140	·1065	2	6/3
35/12, 35/22	75/154	120	·1065	2	5/3
35/16, 35/26	75/154	150	·1065	3	6/4
35/18	89/148	180	·1065	2	29/4
35/6 (350 O.H.V.)	76/014	150	·1065	2	6/4
35/8 (500 O.H.V.)	89/148	180	·1065	3	29/4
35/7 (Competition)	6/139	160	·1065	2	6/4
35/7 (Racing)	T15TT32	270	·109	4	4
35/10 (Competition)	6/164	160	·1065	2	6/5
35/10 (Racing)	10/TT32	310 c.c.	·109	3	4

one-sixth open, close the air lever, start the engine, and warm up. After warming up, reduce the engine revolutions by gently throttling down. The slow-running mixture will prove over-rich unless air leaks exist. Very gradually unscrew the pilot jet adjuster. The engine speed will increase, and must again be reduced by gently closing the throttle until, by a combination of throttle positions and air adjustment, the desired "idling" is obtained. It is occasionally necessary to retard the magneto somewhat before getting a satisfactory tick-over, especially when early ignition timing is used. If it is desired to make the engine idle with the throttle quite closed, the position of the throttle valve must be set by means of the throttle stop screw, the throttle lever during this adjustment being pushed right home. Alternatively, if the screw is adjusted clear of the throttle valve, the engine will be shut off in the normal way by the control lever.

(*c*) Given satisfactory "tick-over," set the magneto control at half-advance with the air lever fully open. Very slowly open the throttle valve, when, if the engine responds regularly up to one-quarter throttle, the valve cut-away is correct.

A weak mixture is indicated by spitting back through the air intake, with blue flames, and hesitation in picking up, which disappears when the air lever is closed down. This can be remedied by fitting a throttle valve with less cut-away. A rich mixture is shown by a black, sooty exhaust, and the engine falters when the air valve is closed. The remedy for this is a throttle valve with greater cut-away. Each Amal valve is stamped with two numbers, the first indicating the type number of the carburettor, and the second figure the amount of cut-away on the intake side of the valve in sixteenths of an inch, e.g. 6/4 is a type 6 valve with a $\frac{4}{16}$ in —i.e. a $\frac{1}{4}$ in. cut-away.

(*d*) Open air lever fully and the throttle half-way. Note if the exhaust is crisp and the engine flexible. Close the air valve slightly below the throttle, when the exhaust note and engine revolutions should remain constant. Should popping back and spitting occur with blue flames from the intake, the mixture is weak, and the needle should be slightly raised. Test by lowering the air valve gently. The engine revolutions will rise when the air valve is lowered slightly below the throttle valve.

If the engine speed does not increase progressively with raising of the throttle, and a smoky exhaust is apparent with heavy, laboured running, and tendency to eight-stroke, the mixture is too rich and the needle should be lowered in the throttle valve. Having found the correct needle position, the carburettor setting is now complete, and it will be found that the driving is practically automatic once the engine is warmed up. For speed work the main jet may be increased by 10 per cent, when the air lever

should be fully open on full throttle. If extreme economy is desired, lower the needle one groove farther after carrying out the four above-mentioned tests.

Possible Causes of Bad Slow-running. If it is found impossible to obtain good slow-running by making the pilot air adjustment as described in paragraph (*b*) on page 11, it is probable that some defect other than carburation is responsible for preventing the engine running slowly at low revolutions. Air leaks are a possible cause which should be looked for. They may be due to a poor joint at the carburettor attachment to the cylinder and/or a worn inlet valve guide. Badly seating valves will also weaken the mixture. Defects in the ignition system may also be responsible for poor tick-over. The sparking plug may be oily, or the points set too close (see page 44). Possibly the spark is excessively advanced or the contact-breaker needs attention (see page 46). Examine the slip ring for oil and see that the pick-up brush is bedding down and in good condition. Also examine the H.T. cable for signs of shorting.

For Racing. A 50 per cent petrol and 50 per cent pure benzole mixture is suitable with a high-compression piston, but for speed work with an alcohol fuel fit an ultra high compression piston. Tune for speed and disregard fuel consumption. The main jet may be increased by about 10 per cent for speed work (much more for alcohol fuels). In the case of the overhead camshaft models a special road-racing carburettor is substituted for the standard carburettor. This racing carburettor has been used by the A.J.S. racing men with great success in all the big international road races. It goes without saying that to obtain very high speeds, in addition to tuning the carburettor with great care, it is essential to tune the engine thoroughly, cut down weight where possible, and select the most suitable gear ratios for the particular purpose in mind.

Down-draught Carburettors—Important Warning. On certain models with down-draught carburettors, including Models 35/12, 35/16, 35/22, 35/26, it is very important to turn off the petrol immediately after a run. The reason is that with a downswept inlet port there is a decided risk of neat petrol entering the cylinder in the event of the carburettor flooding. If this should occur it would not only thin down the oil but also subject the machine to a grave risk of fire and engine seizure.

Maintenance of the Amal Carburettor. Periodical cleaning is necessary to maintain efficient functioning of the carburettor, and should be carried out in the following sequence—

Disconnect petrol pipe. Unscrew holding bolt *Q* (Fig. 6) and remove float chamber complete. With box or set spanner, slacken the mixing chamber union nut *E*. Mixing chamber complete may

now be removed from engine, either by unscrewing the clip pin or the two flange nuts holding the carburettor. Unscrew mixing chamber lock ring, and pull out throttle valve, needle and air valve. Remove main jet *P* and needle jet *O*. Mixing chamber union nut *E* may then be removed and jet block complete pushed out. If this is obstinate, tap gently, using a wooden stump inside the mixing chamber. Unscrew float chamber cover *W* and slacken lock screw *X*. Withdraw the float by pinching the clip *V* inwards, and at the same time pull gently upwards.

Generally it is sufficient to wash all the parts in clean petrol, but if the carburettor has had extended service, check the following—

(*a*) FLOAT CHAMBER NEEDLE *U*. If a distinct shoulder is visible on the point of seating, renew this as soon as convenient.

(*b*) THROTTLE VALVE. Test in mixing chamber, and if excessive play is present it is advisable to renew this without delay.

(*c*) THROTTLE NEEDLE CLIP. This part must securely grip needle. *Free rotation must not take place*, otherwise the needle groove will become worn and necessitate a new part being fitted. *Be sure to refit the clip in the same groove.*

(*d*) JET BLOCK. If trouble has been experienced with erratic "idling," ascertain by means of a fine bristle that the pilot jet *J* is clear, and that the pilot outlet *M* in the mixing chamber is unobstructed.

To Reassemble. Refit jet block *F* with washer on underside, and screw on lightly mixing chamber union nut *E*. Screw in needle jet *O* and main jet *P*. Open air lever $\frac{3}{4}$ in., throttle lever half-way; grasp the air slide between the thumb and the finger; *make sure that the needle enters the central hole in the adaptor top.* Slightly twist the throttle valve until it enters the adaptor guide, when on pushing down the valves the air valve should enter its guide. If not, slightly move the mixing chamber top, when the air valve will slide into place. Screw on mixing chamber lock-nut. *No brute force is necessary.*

Attach carburettor to the cylinder, pushing right home, and examine washer if flange fitting. Insert holding bolt *Q*, and thoroughly tighten union nut *E* by means of a fixed spanner. Refit float and needle, holding the needle head against its seating by means of a pencil until the float and the clip *V* are slipped into position. Make sure that the clip enters the groove provided. Screw on the cover tightly and lock in position by means of the lock screw *X*. Fit holding bolt in float chamber with one washer above and one below the lug. Screw holding bolt into mixing chamber and lock securely. Clean petrol pipe and filter if fitted and replace. It will be necessary to re-check the pilot setting if this has been disturbed.

Persistent Flooding. Possible causes of flooding are (*a*) a bent float chamber needle, (*b*) a distorted needle clip, (*c*) dirt or grit lodged between the needle valve and its seat, (*d*) a punctured float. When dismantling the carburettor, clean the float chamber very thoroughly and renew any damaged parts. Polish the valve by pulling the needle against its seat and rotating it, but be sure to hold it vertical.

AMAL CARBURETTOR SETTINGS FOR 1938–9 A.J.S. MODELS

Model	Carburettor	Main Jet	Needle Jet (in.)	Needle Position	Throttle Valve
250 c.c. O.H.V.	75/014	120	·1065	2	5/3
350 c.c. O.H.V.	76/014	150	·1065	3	6/4
500 c.c. O.H.V.	89/004	180	·1065	3	29/4
500 c.c. S.V.	76/001	150	·1065	3	6/4
1000 c.c. S.V. (Home)	76/012	130	·1065	2	6/4
1000 c.c. S.V. (Export)	6/168	140	·1065	2	6/3

Wear of Needle Jet. The needle itself does *not* become worn. Should the mixture be still too rich with the clip in No. 1 groove (nearest the end), it is probable that the needle jet requires replacement due to wear. This is assuming that the carburettor has been correctly tuned and that no flooding is taking place.

Tuning the Pump Type Carburettor. Correct procedure is the same as for the standard instrument without the pump, but it should be noted that a 15 per cent larger main jet is needed and the needle should be lowered *one notch*. Production models have not been fitted with pump type carburettor.

CHAPTER III

ALL ABOUT LUBRICATION

THE lubrication system on A.J.S. models has been steadily improved during recent years and all present engines incorporate the most modern type of automatic dry sump or constant circulation system, ensuring correct lubrication of all the working

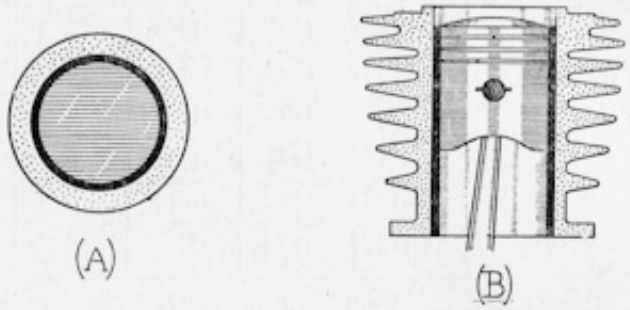


FIG. 8. SHOWING GENERAL PRINCIPLE OF LUBRICATION

The diagrams at *A* and *B* show how an oil film keeps a shaft apart from its bearing and a piston apart from its cylinder respectively

parts with the minimum amount of attention. Some attention on the part of the rider is, however, necessary and can never safely be neglected if a host of evil troubles is to be avoided. Motor-cycling can be cheap but it can also with neglect be quite the reverse.

What Lubrication Is For. The fundamental principle of lubrication is that to avoid friction and heat, or in other words wear and tear, between close-fitting moving surfaces it is imperative to maintain an oil or grease film between them which does in effect actually keep them apart. The idea is made clear in Fig. 8. On a motor-cycle the oil film has a thickness varying from about ·0002 in. to ·0008 in. and the duty of the rider in regard to engine lubrication is to see that: (*a*) good quality oil is used, (*b*) a sufficient quantity of oil is kept in circulation, (*c*) the oil is kept clean and free from dilution (petrol gradually creeps past the piston rings).

1932–36 Improved Mechanical Lubrication. All 1932 to 1936 engines, except the dry sump lubricated engines, incorporate an

improved mechanical lubrication system quite different from the dry sump system in principle as well as design. The oil in the tank is not kept in constant circulation, and the duplex pump (Fig. 30) is gear-driven from the crankshaft.

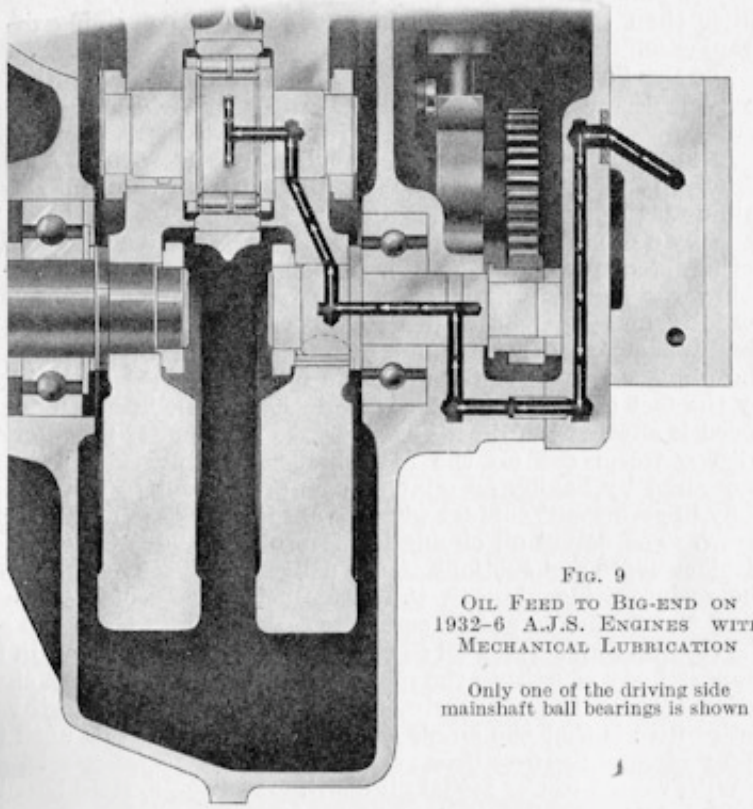


FIG. 9

OIL FEED TO BIG-END ON 1932–6 A.J.S. ENGINES WITH MECHANICAL LUBRICATION

Only one of the driving side mainshaft ball bearings is shown

The upper plunger of the pump takes oil from the tank via the delivery pipe, and delivers it direct to a false bearing on the timing side, not the driving side, of the crankshaft. The oil-way is totally enclosed, no pipe being used as on earlier systems. The oil is then pressure-fed to the big-end bearing, as shown in Fig. 9. Some of it is also forced to the timing gear. Surplus oil drops down from the big-end on to the flywheels and is distributed by splash throughout the engine. The lower pump plunger collects some oil from a by-pass from the main feed and returns it to the tank via the return pipe, from whose orifice oil may be seen

emerging on removing the filler cap. There is no separate oil feed to the cylinder walls as on the D.S. system, but the main oil supply can be controlled by means of the regulator on top of the pump. The oil return to the tank only shows that the pump is working and is not infallible proof of proper lubrication. Once the correct pump setting has been obtained no attention is necessary other than tank replenishment and occasional draining of the crankcase.

The Dry Sump Lubrication System (Big Twins). The lubrication system described below applies to all 1932–9 twin-cylinder engines.

It is a force-feed, constant circulation type with dry sump. Briefly its working is as follows: Oil, fed from the tank, is distributed throughout the engine, and finally returned to the tank by a duplex internal pump. This comprises a single double-acting, steel plunger (Fig. 10), housed in the crankcase casting below the timing case between two rectangular end caps horizontally and at right angles to the crankshaft axis, and able simultaneously to rotate and reciprocate. This dual action of the plunger is obtained, as is more fully explained on page 19, by the fact that while a positive rotation at one-fifteenth engine speed is effected by direct engagement of the spiral gear portion with a worm cut on the mainshaft, and endwise movement is secured by having an annular cam groove cut in the plunger body in permanent contact with the hardened end of a fixed guide screw. The actual oil circulation is brought about by alternate displacements and suctions at the delivery and scavenge ends of the reciprocating plunger, the latter being of greater diameter than the former to ensure complete scavenging of the sump and the return of all surplus oil to the tank. Two segments cut in the plunger body constitute the main ports which regulate the circulation. There is no adjustment however. A point worthy of notice here is that the crankcase cannot safely be split until the pump plunger has first been removed.

With regard to the actual oil distribution, the system adopted is made clear by reference to Fig. 10. The small end of the plunger (i.e. the front one) injects oil into the timing case to a predetermined level, such that the camshaft bearings and drive are adequately lubricated. All surplus oil overflows into the flywheel chamber, and is eventually returned to the sump, although a little is caught up by the flywheels and splashed upon the big-ends and the cylinders. Splash lubrication, however, is not relied upon to any extent owing to the small volume of oil remaining at any time in the sump. Oil is forced under pressure direct to the big-end bearings and to the crankshaft bearing on the timing side by means of carefully drilled passages in the

flywheel, the crankpin and the off-side mainshaft. Oil is also fed to three points on each of the cylinder walls in such a position that the bulk of the oil is discharged on to that part of the thrust side of the cylinder walls where the maximum cooling effect upon the pistons is required. A ball valve regulates the supply.

The constant circulation system with fabric filter (see page 20) guarantees a continual supply of clean, cool oil to the engine whenever the latter is running. The oil circulation may be verified occasionally by removing the oil tank filler cap and noting whether oil is being ejected from the return pipe orifice. This check upon the oil circulation should be made preferably upon starting up the engine from cold. Remember the fact that when the engine has been left stationary for some time, oil from various parts of the engine has drained to the sump, and, until this surplus has been cleared, the return to the tank is very positive, whereas normally it is somewhat spasmodic and, perhaps, mixed with air bubbles, due partly to the fact that the capacity of the return part of the pump is greater than that of the delivery portion, and partly to the fact that there are considerable variations in the amount of oil held in suspense in the crankcase. For example, upon suddenly accelerating, the return flow may decrease entirely for a time only, of course, to resume at a greater rate than before when decelerating. It may be mentioned that on most 1933–8 Big Twins the provision of a tell-tale on the instrument panel, illuminated at night, enables oil circulation to be noted while riding (only after oil warms up), the oil supply to the timing-box being first by-passed up to the panel. It is important that no air leaks occur in this system.

The Double-acting Oil Pump. A general description of the 2, 2A dry sump lubrication system has already been given, and Fig. 10 shows how the oil is circulated. It remains to deal with the action of the pump, which also applies to most of the 1935–9 single-cylinder models.

The pump has only one moving part—a steel plunger driven at $\frac{1}{15}$ engine speed by a worm cut on the engine mainshaft. This plunger slowly oscillates to and fro, its precise travel being determined by the relieved end of a guide screw (Fig. 10) screwed into the rear of the pump housing and engaging with a profiled cam groove at the large return end of the plunger. This groove plays an all-important part. In addition to causing the plunger to oscillate and thereby obtain a pumping action at each end (for the plunger is completely enclosed by its housing and end caps), its carefully planned contour enables the pumping impulses to be synchronized with the opening and closing of two main ports and a small auxiliary port, thus definitely regulating the oil

circulation and controlling the supply of oil to the engine and the return of oil to the tank.

The plunger itself has two diameters, and, therefore, the capacity of the return portion of the pump is greater than that

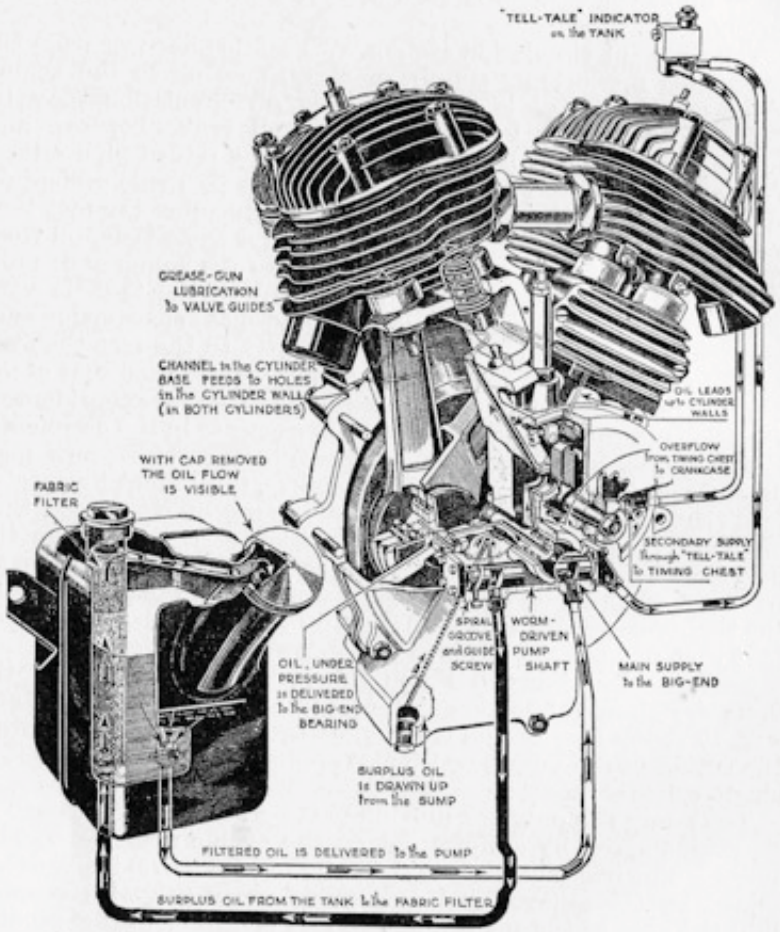


Fig. 10. Details of the Dry Sump System on the 1937–8 A.J.S Big Twins

of the delivery portion, so that the sump is always kept clear of oil. Fig. 10 enables the action of the pump to be understood. Oil flows by gravity, assisted by suction, from the tank to a point in the pump housing, such that no further passage can take place

until the plunger has moved to a point, approximately, as shown when oil flows into the hollowed end via the cut-away segment constituting the delivery port. Then as the plunger continues to advance with simultaneous reciprocation, the oil which has completely filled the hollowed end is momentarily retained and the bulk of it finally ejected by displacement from this port into an oil passage opposite the point of entry, and forced to the cylinder walls and main engine bearings. During the advance of the plunger culminating in the automatic injection of fresh oil into the engine, the receding of the large end of the plunger causes a strong vacuum directly opposite an oil passage leading from the sump base, and communicating with the plunger interior only when the return port is in a suitable position. All surplus oil in the sump is, therefore, sucked up as the plunger advances, and retained when the port closes until the plunger begins to reverse its motion, when, the return port coming into line with the return pipe passage, the oil is forcibly ejected by displacement into this pipe, and so to the oil tank, where its intermittent emergence can, though a tell-tale (Fig. 15) is provided (1933–8), be observed.

Thus it will be seen that so long as the engine is running, fresh oil is being constantly fed to it and then, after circulation, sucked from the sump and forced up back into the tank to be recirculated *ad infinitum*. Coincident with the ejection of oil from the main delivery port a supply of oil is forced out of an auxiliary port to the timing box. Where a tell-tale is provided it is first forced up into the panel, whence it flows by gravity to the respective parts requiring lubrication. Only a small portion of the total oil feed to the engine is diverted in this manner, but this portion is important and a definite index as to the correct functioning of the whole D.S. lubrication system, for only when the pump is forcing oil into the engine at a certain pressure can the rise of the tell-tale plunger be observed. The action of the pump plunger is almost fool-proof, but care must be taken to remove the plunger before separating the crankcase, and the guide screw must always be kept fully tightened. A point worthy of note is that with the plunger stationary no oil can possibly enter the engine. For this reason no oil taps are provided.

The Dry Sump Lubrication System (S.V. and O.H.V. Singles). The dry sump lubrication system provided on 1935–9 S.V. and O.H.V. singles is substantially similar in principle and design to the system employed on the Big Twins as may be realized by comparing Figs. 10 and 12. As may be seen in Fig. 12, a double-acting oil pump of the same type as that already described draws oil from the tank and forces it through the drilled timing side mainshaft and flywheel to the big-end bearing and crankshaft bearings. From the big-end some oil is splashed on to the cylinder

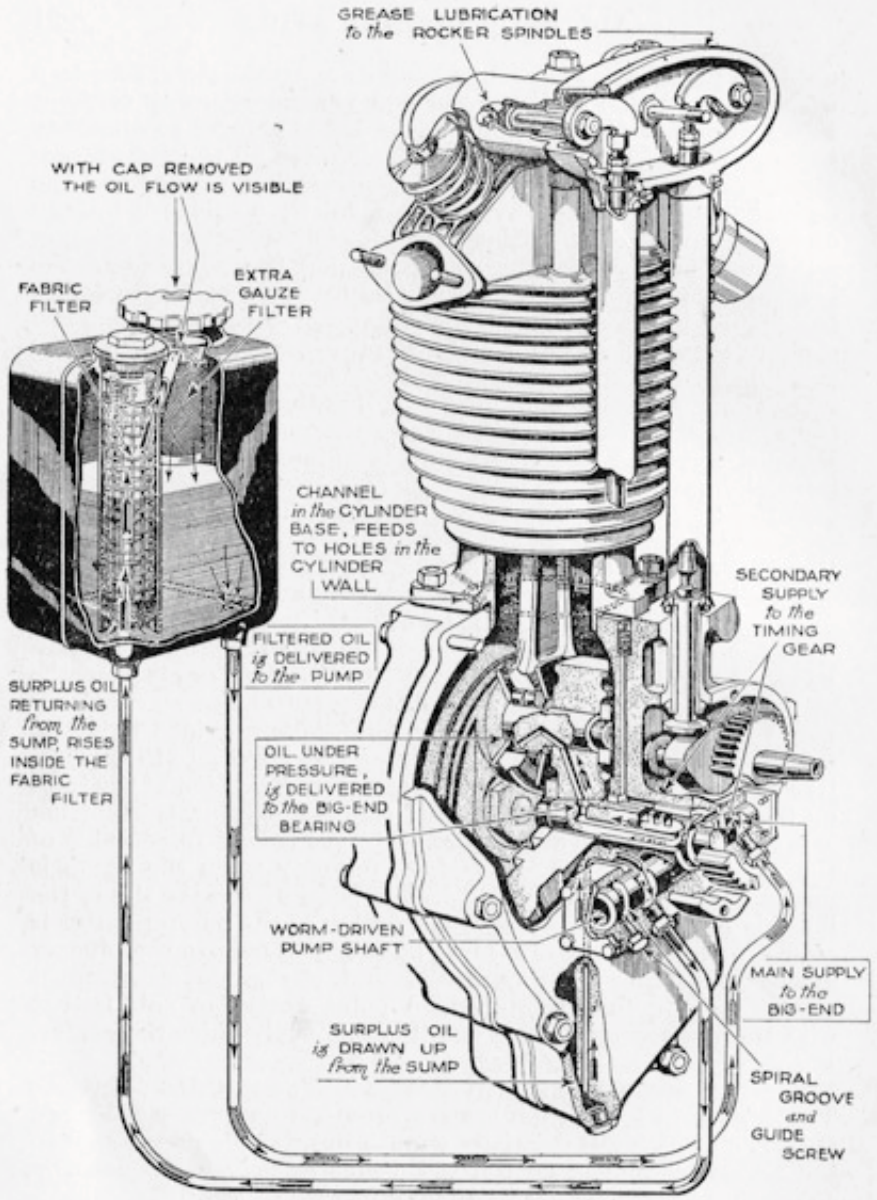


FIG. 11. SHOWING THE DRY SUMP LUBRICATION SYSTEM ON MOST 1935–6 S.V. AND O.H.V. SINGLES

The general arrangement is similar to that provided on the Big Twins (see Fig. 10). Above is illustrated a partly sectioned and cut-away 2·46 h.p. O.H.V. engine. Note the ball valve which controls the oil supply to the holes in the cylinder wall. The 1937-8 O.H.V. engine is shown on page 26

walls, but cylinder lubrication relies mainly on oil fed from a channel to holes in the cylinder wall. A secondary supply is taken to the timing gear and rocker-box (1937–9 O.H.V.), surplus oil draining into the sump from which it is drawn by the large end of the worm-driven pump plunger and returned to the tank which has an ample system of filtering the oil. In addition to the gauze screen in the filler cap orifice which filters the oil during replenishment, a large fabric filter is included. This comprises a felt cartridge through which the oil from the return pipe is forced to pass before emerging from the orifice just below the filler cap. With this D.S. lubrication system no attention is necessary other than regular replenishment, checking oil circulation by removing the filler cap and cleaning the filter when decarbonizing.

Dismantling Oil Pump (Dry Sump). See notes on page 61.

Use Recommended Engine Oils Only. The importance of using nothing but recommended brands of lubricating oil cannot be over emphasized. The use of inferior quality engine oil even for a short period may have very serious consequences and any attempt to economize on lubricating oil is likely in the long run to prove very expensive indeed. All A.J.S. engines are of the high-efficiency type and will only give the performance they are designed to give for long periods provided they are correctly lubricated. Five suitable engine oils are: Patent Castrol "XXL" (summer and winter), Golden Shell (Extra Heavy), Mobiloil "D" ("BB" during winter), Price's Motorine "B" de Luxe (summer and winter), and Essolube Racer. All these oils have good heat-resisting qualities and their viscosity is such that easy starting is obtainable in cold weather. If a sports model is used for competition or racing purposes, Patent Castrol "R" is recommended, but it should be particularly noted that this oil must *on no account* be mixed with other mineral-base oils such as Patent Castrol "XXL." When replenishing with Patent Castrol "R" the oil tank should first be completely drained and cleaned out with petrol.

No Oil Pump Adjustment Provided on Dry Sump Models. The dry sump lubrication system fitted on most 1932–9 S.V. and O.H.V. models is designed to deliver the correct amount of oil to the engine under all running conditions and therefore no adjustment whatever is provided. On the 1937-9 O.H.V. models, however, there is an adjustment for the feed to the inlet valve guide.

To Adjust Oil Pump on Mechanical Lubrication Models. An oil regulator is provided on 1932–6 mechanical lubrication models and on new engines this is set to deliver a rather liberal supply of oil. After running-in has been completed it is usually found desirable to cut down the supply a little. See also page 60.

Frequent Replenishment Is Advised. On dry sump models it

is advisable to replenish the oil tank frequently. The oil level should be maintained as far as possible within *one inch* of the return pipe orifice below the filler cap (Fig. 12) and must never be allowed to fall below the half-full mark with the engine cold. The more oil there is in the tank, the cooler will it be, for with D.S. lubrication the whole of the oil is in constant circulation. Further, the oil is less likely to become contaminated or diluted, both of which are very detrimental to the engine.

In the case of models with mechanical or "wet sump" lubrication the actual amount of oil in the tank is immaterial so long as there is sufficient to ensure the oil pump being fed properly. No heating up of the oil occurs, as this is not in constant circulation throughout the engine and tank as with the D.S. lubrication system.

To Verify Oil Circulation (Dry Sump). On the 1932–9 dry sump models it is possible to check oil circulation by removing the oil tank filler cap and observing whether oil is being ejected steadily from the return pipe orifice. This check should be made prior to every run. On 1933–7 Twins with D.S. lubrication and a flush-fitting instrument panel on the tank an eye should be kept on the oil tell-tale (Fig. 15). Although, as has been mentioned on page 21, only a small portion of the main oil supply is diverted to the tell-tale, this portion provides definite evidence as to the correct functioning of the whole lubrication system. In the event of the tell-tale plunger failing to rise with the engine running, stop the engine and investigate the cause immediately.

To Check Pump Working (Mechanical Lubrication). Remove the tank filler cap and see if oil is issuing from the return pipe orifice. If it is, all is well with the oil pump, but as has been mentioned on page 18, this is no proof of oil circulation through the engine, which can be verified only by noting the exhaust and the behaviour of the engine.

Clean Oil Tank and Replenish with New Oil About Every 5000 miles (Dry Sump). At least once every 5000 miles (or once every season) the entire oil tank on the 1932–9 dry sump models should be removed from the machine, washed out with petrol and after refitting replenished with new oil up to the correct level. In order to avoid undue waste, it is quite in order to arrange for this to be done when the oil is at the lowest recommended level, although ordinarily the oil should be kept well above the half-way mark. Clean the filter(s) with petrol when decarbonizing.

Drain Crankcase Every 2000–3000 Miles (Mechanical Lubrication). Every 2000–3000 miles all oil should be drained from the crankcase of mechanical lubrication models and replaced by ½ pint of clean oil. A plug at the base of the crankcase and another near the base of the cylinder on the driving side are

provided for this purpose. Do not swill out the crankcase with paraffin or petrol as this may subsequently be difficult to remove completely.

Grease Overhead Rockers Every 500 Miles. Some oil mist reaches the 1932–6 rockers via the push-rod covers, but this is insufficient for adequate lubrication of the O.H. rockers and the grease gun should be applied to the nipples provided at least once every 500 miles, earlier if much hard riding is undertaken. Grease should be injected until it begins to exude at the bearings. A good heat-resisting grease such as Price's H.M.P. should be utilized for lubrication of the O.H. rockers (see also pages 30, 31).

Lucas "Magdyno" and Magneto Lubrication. The bearings and gears are packed with grease during assembly and for this reason no lubricators are provided. However, after many thousands of miles running the instrument should be returned to the makers for dismantling, cleaning and repacking of the bearings with grease. A wrinkle worth remembering is to put just a spot (no more) of oil on the heel of the contact-breaker rocker arm which, if allowed to operate quite dry, is apt to wear somewhat more quickly. But beware of getting oil on the contacts. This applies to ring cam type contact-breakers of earlier design. If the rocker arm is stiff, put a spot of oil on its pivot.

In the case of later instruments with ring type cam, withdraw the cam ring and put a few drops of oil (thin) on the felt wick. Lubrication of the wick should be attended to about every 5000 miles. All 1938–9 magnetos have a face cam type contact-breaker, and to gain access to the wick it is necessary to remove the spring arm which carries the contact and withdraw the screw to which the wick is attached. When refitting the arm be sure that the small backing spring is correctly replaced. Every 500 miles a few drops of thin oil should be inserted through the lubricator provided on the brush gear cover of the dynamo portion of recent type "Magdynos."

Dynamo Lubrication (Coil Ignition Models). The Miller type dynamo on 1935–9 coil ignition models requires some periodical lubrication in order to maintain its efficiency, but oil should be used very sparingly. Every 500 miles insert a drop of oil through the lubricator on the driving end of the dynamo. The armature bearings are packed with grease on assembly, and under normal conditions this grease should suffice for 10,000–15,000 miles. At the end of this period the dynamo should be returned to a Miller agent for dismantling, cleaning, and re-greasing.

Dynamo Lubrication (Magneto Ignition). The bearings on the Lucas type dynamo (magneto models) are packed with grease before leaving the manufacturers and consequently no lubricators are provided. After a big mileage has been covered

it is advisable to return the instrument to a Lucas Service depot for dismantling, cleaning, adjustment and repacking of the bearings with grease.

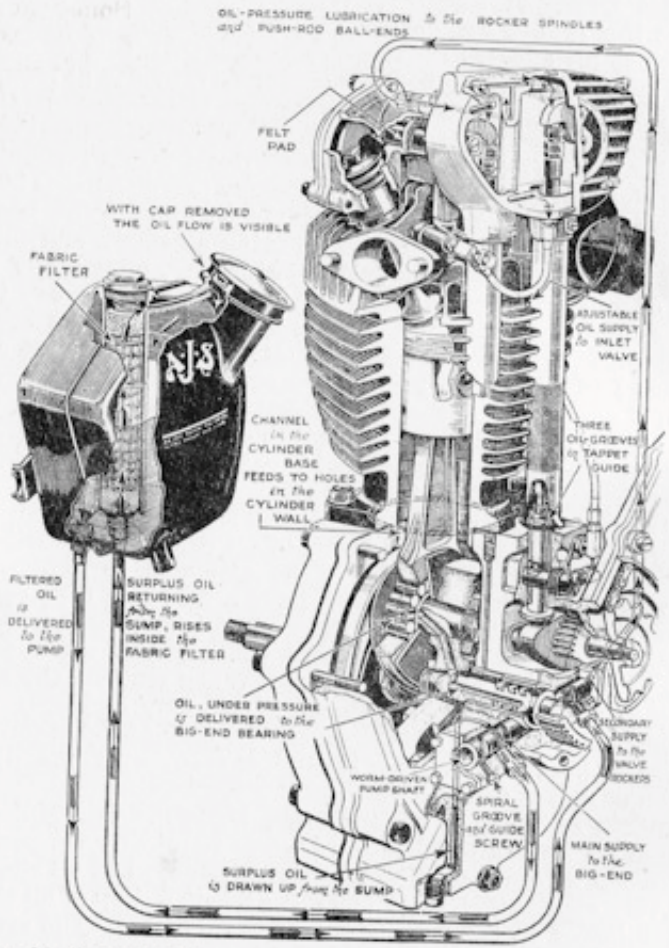


Fig. 12. Showing Constructional Features and Lubrication System of the 1937-8 O.H.V. Engine

Burman Gear-box Lubrication. New Burman gear-boxes are charged with sufficient grease for at least 1000 miles' running without any attention. At the end of this period and subsequently every 1500 miles the gearbox should be replenished with 2–3 oz. of grease. In order to obtain the most satisfactory results the

gearbox should always be maintained about *one-third* full. On no account replenish with thick grease, as this may cause damage to the gears and bearings. Suitable greases for Burman gearbox lubrication are: Castrolease Medium, Mobilgrease No. 2, Shell Motor Grease (Soft), Price's Belmoline D, and Esso Grease. In case of emergency it is permissible to use a thicker grease mixed with engine oil. For long distance racing or very fast road work it is advisable to add about 25 per cent of engine oil to the grease, and for sprint work engine oil alone may be used temporarily.

In the case of 1937 and earlier gearboxes having an external clutch operating lever (also on some 1939 models) it is best to inject the grease through the aperture on top of the gearbox after removing the oval metal cap, which is secured by two nuts. These nuts need not be actually removed as the cap is slotted at one end to enable it to be twisted round until the gearbox aperture is exposed. With this type of gearbox a small quantity of grease should be injected into the grease nipples about once a week. Two nipples which should not be overlooked are those for the kick-starter axle and the foot change mechanism (where fitted). Both are screwed into the gearbox end cover. This does not apply to 1938–9 models.

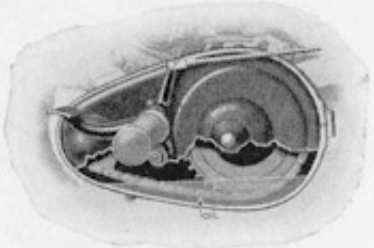


Fig. 13. The 1932-5 Oil Bath

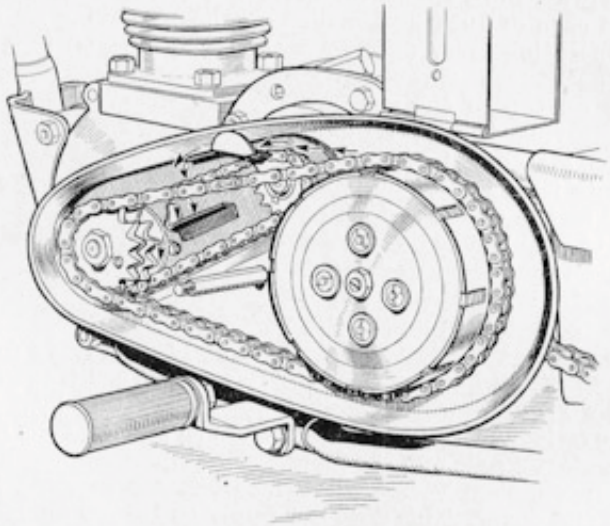
1935–9 A.J.S. models with coil or magneto ignition have the primary and dynamo chains completely enclosed in an oil bath chain case (Fig. 14)

On most gearboxes fitted during 1938 onwards the clutch-operating mechanism is completely enclosed and "one-shot" lubrication is provided, a single grease nipple sufficing to lubricate the entire gearbox, including the gear change and kick-starter mechanism. Replenish with grease as indicated in a previous paragraph. Gentle operation of the kick-starter will assist filling.

Occasionally it is desirable to remove the clutch operating rod and also the clutch cable and grease them thoroughly. About every 5000–7000 miles the clutch roller race should be repacked with grease.

Sturmey-Archer Gear-box Lubrication. This gear-box fitted on many 1932–5 models requires lubrication at the same period as the Burman gear-box. Every 1500 miles a small quantity of Castrol D gear oil should be injected into the gear-box. Occasionally verify the level of lubricant in the gear-box, which should be from *one-third to half full.* If the period recommended above for gear-box lubrication does not maintain this level, reduce the period accordingly.

Replenish Oil Bath Chain Case When Necessary. On all 1932–9 models the primary chain (and on most models the dynamo chain also) runs completely enclosed in an oil-bath chain case, and in order to ensure thorough lubrication of the chain all that is necessary is to remove the inspection cap on the chain case occasionally and replenish the oil-bath with engine oil (see page 23). The inspection cap orifice determines the correct oil level and oil should be poured in until it begins to trickle out through



(From "The Motor Cycle")

Fig. 14. The Oil Bath Chain Case on Magneto, Coil Ignition Models (1935–9)

the filler orifice. Obviously it is a practical impossibility to overfill the chain case.

To obtain the most satisfactory service from the primary chain the oil-bath chain case should be kept filled to the correct level by frequent (say, weekly) examination of the oil level and replenishment when necessary. It is exceedingly important that the oil level should not fall more than about $\frac{1}{16}$ in. below the bottom edge of the filler orifice, otherwise there is a risk of the chain running in a semi-dry state which will cause rapid wear of the rollers and quick breaking up of the chain.

Secondary Chain Lubrication. On all 1932–9 models the secondary chain should be smeared with grease whenever it appears to be dry. About once every 1500–2000 miles in summer and every 1000 miles in winter it is advisable to take the secondary

chain off the sprockets and immerse it in a paraffin bath, allowing it to soak thoroughly so as to remove all traces of dirt. After being carefully wiped the chain should then, before being refitted, be dipped in a bath of molten tallow, or as a poorer substitute, engine oil. If engine oil is used the chain should be allowed to soak overnight so that the oil can penetrate to all the link joints.

Dynamo Chain Lubrication. On the 1935–9 models with separate dynamos the primary chain is enclosed together with the dynamo chain in an oil-bath chain case (Fig. 14) and therefore, provided the primary chain is properly lubricated, it necessarily follows that the dynamo chain is also.

Magneto Chain Lubrication. On pre-1938 models with forward magneto the chain case is packed with grease during assembly and this grease will be found ample for at least 5000 miles, after which the case should be taken off and packed with fresh grease. When doing this check, and if necessary adjust, the chain tension (see also page 30).

Grease Fork Spindles and Steering Head. About every 1000, 500 miles, respectively, the grease gun should be applied to the nipples provided for lubricating both the steering head and the fork spindles. If the former is neglected some steering stiffness may arise and the bearings become damaged. If the latter are overlooked nice front fork action will be unattainable. Suitable greases to use for these and all other grease gun points are: Castrolease Medium, Mobilgrease No. 2, or Shell Motor Grease (Soft). Castrolease Medium can incidentally be obtained in special push-down lid canisters for easily filling the grease gun, and these canisters are obtainable in $\frac{1}{2}$ lb., 1 lb. and 2 lb. sizes.

Also Both Hubs. The roller bearing hubs are tightly packed with grease on assembly, but to prevent the ingress of mud and water while riding it is advisable to inject a small quantity of grease through the hub greasers about every 500 miles, or more frequently in very dirty weather. Where a sidecar is attached do not forget the sidecar hub. Avoid injecting excessive grease, owing to the danger of its getting on the brake linings and spoiling the efficiency of the brakes.

Points Which Should Not Be Overlooked. When lubricating the machine many riders are apt to overlook some small points which although not in themselves enormously important do materially contribute to general efficiency. Among such points may be mentioned moving parts such as the brake pedal bearing, and the brake cam nipple. These should be greased occasionally, especially in bad weather. Thin oil is quite suitable for brake rod joints, control levers, etc.

Worth Buying. For the sum of 5s. 9d. it is possible to buy a special oil gun for lubricating the Bowden control cables on recent

A.J.S. models, and the author strongly advocates the purchase of one of these guns by all readers of this book. It will enable all control cables to be kept lubricated such that they slide without friction in their casings and frequent fraying and breakages become a thing of the past. With the specially designed oil gun it is possible to flood a Bowden cable with oil in a few seconds and the effect is surprising to those who have never before tried it. Oil is injected through a small bared patch on the outer casing and is forced through the spiral casing along the inner wire. Metal clips protect each bared patch which is near the centre of the casing, and to apply the oil gun it is only necessary to slide the clip along the casing to permit of the oil gun being clamped with

(From "The Motor Cycle")

FIG. 15. SHOWING THE OIL TELL-TALE ON THE 1933–8 BIG TWINS

An instrument panel is fitted as standard on all 1939 models except the Competition models

the bared patch occupying a central position on the rubber pad on the nozzle of the oil gun. Then to flood the cable with oil it is only required to give a few turns to the screwed plunger.

Lubrication of Overhead Valve Gear (1937–8 Models). As may be seen from the illustration on page 26, the 1937–8 O.H.V. engine has a force feed to the rocker-box, the rocker spindles and ball ends of the push-rods thus being lubricated automatically. No grease nipples are provided. Automatic lubrication of the inlet valve guide is also included and the oil supply is capable of being adjusted if necessary by means of a needle-pointed screw-down control which once properly regulated needs practically no further attention unless valve squeak develops or the valve stem becomes gummy due to excess oil. To obtain approximately the correct setting the control should be screwed until it is *one-sixth to one-half (maximum) of a complete turn from the fully-closed position*. Excessive oil consumption, an oiled plug, a smoky

exhaust, and oil leakage from the rocker-box are symptoms of the needle valve passing excessive oil.

Lubrication of Valve Stems (1937-9 S.V. Models). On the 500 c.c., 990 c.c. side-valve models grease nipples are provided for lubrication of the valve stems and a small quantity of grease should be injected every 500 miles.

Lubrication of Overhead Valve Gear (1939 Onwards). On the 1939 O.H.V. engines a separate feed from the front oil pump housing cap is led by an external pipe to the rocker-box and force feeds the rocker spindles as on 1937–8 engines. There is also an adjustable feed to the inlet valve guide, the supply of oil being regulated by a needle valve (see previous paragraph). The 1939 engines, however, have no external pipe as used the previous year and the exhaust valve guide receives a supply of oil from the rocker-box through a diagonal drill-way in the cylinder head. Surplus oil passes from the guide through another drill-way to the push-rod tube holes and then drains to the timing case and crankcase. This method of lubrication prevents the oil becoming burnt and thereby choking the passage. Surplus oil from the rocker spindles drains on to the push-rod cups and into the push-rod chamber; it is from this point that the oil is conducted to both the inlet and exhaust valve guides.

Magneto Chain Lubrication (1938–9). The magneto chain case is packed with grease on assembly and subsequently at intervals of 1000 miles a small quantity of grease should be injected through the grease nipple provided on the outer cover.

Possible Cause of High Oil Consumption. If an A.J.S. engine begins to run up big oil bills, suspect a choked or dirty oil filter cartridge (Part No. STD786). Replace the cartridge immediately if thorough soaking and washing in petrol does not remedy matters.

To Lubricate Speedometer. Inject about every 500 miles some grease into the speedometer gearbox nipple. The gearbox is located on the front brake cover plate and the nipple is sunk in its end.

CHAPTER IV

OVERHAULING

If a machine is to be kept in efficient condition and its depreciation and repair bill reduced to the absolute minimum, it is essential that the rider should devote some considerable time to its periodic overhaul. Overhauls are of two types—(1) the complete overhaul, (2) the ordinary overhaul. A *complete overhaul* is usually undertaken once every 8000 miles, or about once a year. This overhaul should be treated seriously, and the whole machine should be dismantled completely. Every component should be cleaned, scrutinized and, if necessary, replaced. The engine and gear-box must, of course, be removed from the frame for this operation. Special points to be noted in the complete overhaul are set out herewith—

Frame. Alinement, existence of damaged tubes, play in spring forks, looseness of steering head, wear caused by friction of all attached parts, condition of enamel.

Wheels. Condition of taper roller bearings, truth of wheels, alinement, loose spokes, condition of rims, wear of tyres, valves.

Chains. Excessive wear, cracked or broken rollers, joints.

Engine. Oil leaks, compression leaks, main bearings, valves, valve guides and tappets, overhead valve rockers, valve springs, valve seats and faces, cotters, condition of cylinder bore, piston, piston rings, play in big-end and small-end bearings, timing wheels, shafts and bearings, cams, cleanliness of oilways.

Gears. Condition of teeth on sprockets and pinions, damaged ball races, and loose parts generally. Do not forget the kick-starter and foot gear change mechanism.

The examination should also include all control rods and cables, tank filter(s), clutch and brake linings, etc. To sum up, everything should be dismantled, cleaned, and readjusted.

An *ordinary overhaul* should be undertaken every 1,500–2,000 miles. This should comprise decarbonizing of the engine, valve clearance adjustment, adjustments of contact-breaker and plug points, valve grinding, general lubrication (see previous chapter), and sundry adjustments.

Apart from these overhauls the rider should make a point of regularly going over the various nuts with a spanner. Vibration frequently loosens them. All working parts must also be kept well lubricated with oil or grease as required, and odd adjustments made as they are needed. The rider who callously runs a machine until " something happens " is asking for trouble and,

moreover, will assuredly get it ! If a machine is properly overhauled and cleaned the owner will be amply rewarded for his pains.

Cleaning. Cleaning the machine is highly important ; it is a necessary preliminary to overhaul. If neglected it renders overhaul difficult and results also in great deterioration of the plating and enamel, and the machine soon becomes shabby, and its market valuerapidly falls. After a dirty ride in wet weather cleaning may occupy at least an hour. It entails the use of stiff bristle brushes and paraffin for removing the filth from the lower part of the machine, together with cloths, leather, and polishes for the bright upper surfaces. On no account should the machine be left soaking wet overnight. A serious amount of rusting may occur. If the rider has not the time available for systematic cleaning, the machine should be thoroughly greased all over before use.

It is most important when cleaning the enamelled parts not to rub or brush the mud off when dry. All surfaces should be wiped over with a leather, using plenty of water. A good polish is " Flazpole."

In the case of the chromium-plated parts, on no account use metal polish or paste ; all that is necessary is to clean them frequently with a damp and soft chamois leather. If the lustre deteriorates after some time, apply some special chromium cleaning compound.

Valve Clearances. In order that the valves shall seat properly at all engine temperatures it is necessary that clearances should exist between the valve stems and the rocker arms or tappet heads, as the case may be, when the engine is warm. The clearance should be checked now and again with the feeler gauge on the magneto spanner, although it is unlikely that adjustment will be required unless the valves have been ground-in or the engine partly dismantled. In the case of a new engine, however, the clearances will increase until the engine has been thoroughly run-in. Fig. 16 illustrates the point where the clearance should exist (*C*) and the means of adjustment (*A*) on 1932–5 S.V., O.H.V. type engines. This clearance should, on the 1932–9 S.V. models be ·004 in. and ·006 in. in the case of the inlet and exhaust valves respectively with a *warm* engine. In the case of 1932–4 O.H.V. models and Models 35/6, 35/8, 35/18, 36/8, 36/18 (mechanical lubrication) the correct inlet and exhaust valve clearances with a *warm* engine are ·006 in. and ·008 in. respectively. On all other 1935–9 O.H.V. models (D.S.) the clearance recommended with the engine *cold* is the nearest approach to nil possible.

Turn the engine over until compression is felt ; then raise the exhaust lifter and turn over a trifle more until the piston is at the top of its stroke. Before checking the clearance make quite sure that the exhaust valve lifter is not determining in any way the position of the exhaust valve tappet head or the rocker. There

should be a small interval between the time when the lifter is raised and the tappet head or the O.H.V. rocker commences to move. If this is not so the tappet foot or the toggle will not be resting on its cam. If the valve clearances are not correct they must be rectified. In the case of the S.V. engine, hold the tappet head with a spanner and loosen the lock-nut (*B*) below with another spanner; now screw up or unscrew the tappet head (*A*) until the correct clearance is obtained, and retighten the lock-nut.

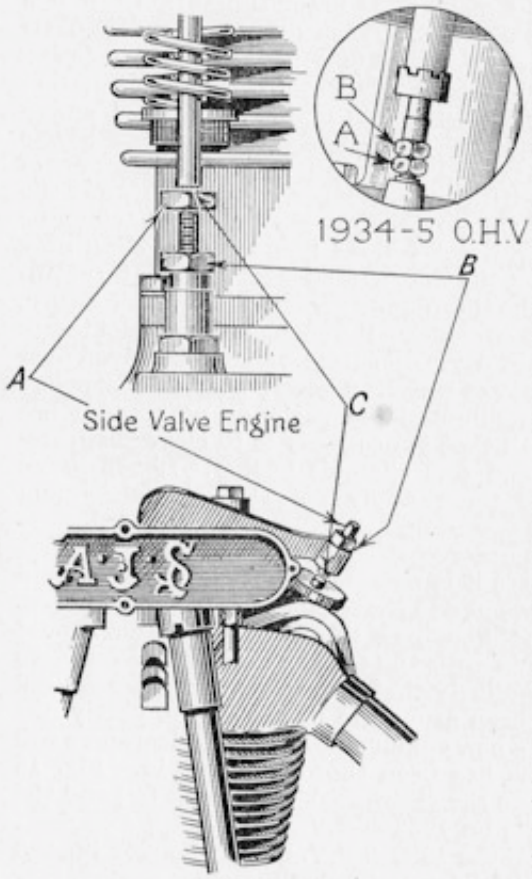


Fig. 16. Valve Clearance Adjustment (1932–3)

The four 1935 models with D.S. lubrication have an adjustment at the tops of the push-rods (Fig. 11)

Check again after tightening the nut. In the case of the 1932–3 O.H.V. engines, first loosen the lock-nut (*B*) which is provided for securing the adjustable grub screw (*A*), adjust the latter, check the clearance at (*C*), and retighten. Check again afterwards. It is worth while adjusting the valve clearances carefully, for excessive clearance will produce noise accompanied by considerable loss of power, while insufficient clearance may cause actual damage to the valves, especially the exhaust valve, as well as loss of power. In the case of the the 1934–5 O.H.V. engines with mechanical lubrication the valve clearance adjusters are situated at the bottom of the push-rods, and to adjust the clearances it is necessary to telescope each push-rod cover, loosen lock-nut *B* (Fig. 16, inset), and adjust each hexagon *A*.

To adjust the valve clearances on the 1935–9 O.H.V. models with D.S. lubrication it is first necessary to remove the rocker box cover by taking off the securing nuts. Then revolve the engine until both valves are closed and loosen the lock-nut securing the adjustable push-rod end. Next screw up or unscrew the adjustable push-rod end until the correct clearance is obtained (see Fig. 11), afterwards tightening the lock-nut and checking the clearance. The push-rods should be just free to rotate without causing any rocker movement.

Hardened steel valve end caps are provided on some O.H.V.

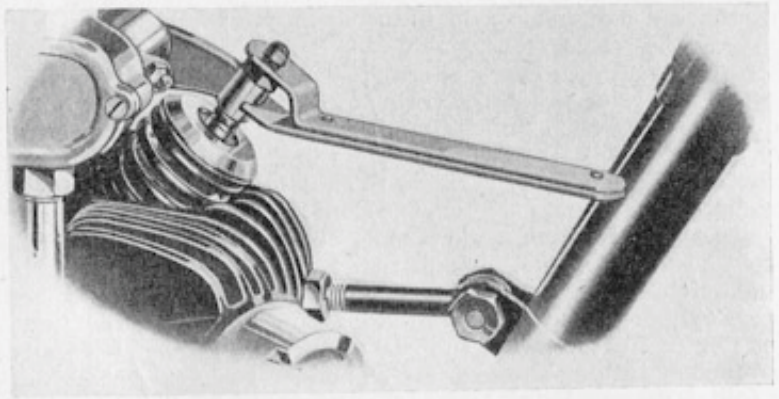


Fig. 17. The A.J.S. Push-rod Extractor (1932–3)

engines, and when the valve clearances are correctly adjusted it should be possible to revolve these freely without there being any perceptible up-and-down movement of the rockers.

On the 1939 O.H.V. engines with the entirely new type of rocker-box there are two screwed caps immediately over the valves and rocker arm ends. When checking the valve clearances (see above) these caps should be removed by applying a spanner to the hexagons provided. The caps are provided solely for inspection purposes. On 1937–8 engines the detachable valve spring caps are each secured by cheese head screws. In the case of all engines of recent manufacture it is extremely important when checking the valve clearances first to see that the piston is at *the extreme top* of the compression stroke, for only in this position are the tappets absolutely clear of the cam quietening curves. This applies also when retiming the valves (on the exhaust stroke). When replacing the rocker-box cover, avoid excessive tightening of the nuts because on most engines the joint is made

with a rubber fillet, and only a reasonable pressure is needed to provide an oil-tight joint.

Decarbonizing the Engine. After about 1500–2000 miles the exhaust note becomes "woolly," instead of being a crisp "bark," and the engine sluggish and very prone to "knock." These symptoms clearly indicate that the time has arrived when the engine must be decarbonized, that is to say, all carbon deposits on the piston head and in the combustion chamber must be removed after taking off the detachable cylinder head(s). Carbon deposits, incidentally, are due to three things—(1) incomplete combustion of fuel, (2) carbonization of road dust entering the cylinder, (3) burnt lubricating oil. When decarbonizing (every alternate decarbonizing on the S.V. models) it always pays to inspect the valve faces and seats, and grind in the valves if necessary and also every alternate decarbonizing to remove the piston and inspect the piston rings. In any case, removal of the valves enables the combustion chamber and also the ports to be very thoroughly cleaned. Dismantling is quite simple and whether the engine is a single S.V., a twin S.V., or an O.H.V. model, the procedure is much the same. Overhead valve mechanism is apt to frighten some people, but actually there is nothing in it at all. All A.J.S. engines, except some 1932–6 3.49 h.p. lightweights, have detachable cylinder heads. This greatly facilitates cylinder removal; there is no expert juggling required to get it off. Furthermore, the carbon may be removed if desired without disturbing the cylinder at all.

Initial Preparations. In the case of *Model* 35–6/5 the cylinder barrel and head are in one piece and the latter cannot therefore be detached as on other models. Preparatory to removing the cylinder barrel on this machine it is necessary to detach the H.T. lead to the sparking plug, and disconnect the exhaust pipe and the steady between the cylinder and front down tube. Remove the steady bolt. The Amal carburettor may either be left in place on the cylinder by removing the slides and the petrol pipe from the base of the float chamber, or, alternatively, the carburettor may be taken off by undoing the screw-in fastening.

If dealing with *Model* 35–9/9 with detachable aluminium alloy head the only preliminary operation necessary before removing the head is to remove the sparking plug. In the case of the twin cylinder engine disconnect the H.T. leads and remove the plugs. If the reader's mount is of the O.H.V. type, first disconnect all fitments, such as exhaust pipe(s), carburettor slides, cylinder steady when fitted, plug, petrol pipes, rocker-box pipe, etc., and then proceed to remove the push-rods and rocker-box.

On Models of O.H.V. Type. Complete removal of the petrol tank is a necessary preliminary to decarbonizing the 1939 O.H.V.

models, except in the case of the 250 c.c. machines, where it is possible to decarbonize after first raising the tank. Raising of the tank is also sufficient in the case of most pre-1939 models. Obviously on the S.V. machines with detachable cylinder heads it is quite unnecessary to disturb the tank at all.

To raise the petrol tank, first remove the petrol pipe and drain the tank of petrol. Then remove the tank connection pipe and unscrew the four base fixing bolts. Now raise the tank and slide back on to the nose of the saddle, at the same time supporting the front end by placing a suitable block of wood across the support bars.

Removal of the petrol tank on 1939 models is simple, as the tank has been redesigned to permit of removal without interfering with the wiring of the panel which houses the ammeter and lighting switch. To remove the tank, first disconnect the main lead from the battery so as to avoid the risk of a short circuit. Next remove the petrol pipe, drain the tank and remove the connection pipe. Having done this, proceed to remove the four base bolts and the inspection lamp from the panel. The three screws holding the panel to the tank can then be taken out and the tank itself lifted away. While doing this, pass the panel through the slot between the two halves of the tank.

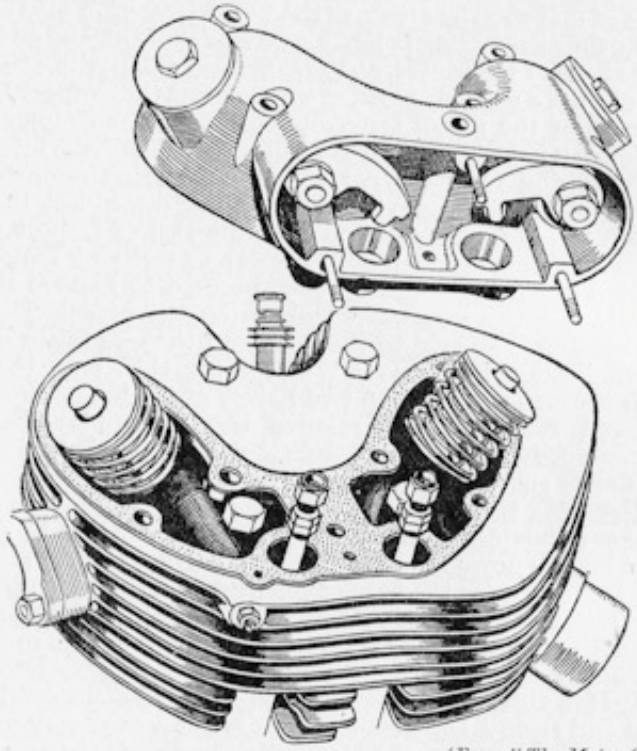
Push-rod Removal. To remove the push-rods on 1932–3 O.H.V. engines the special extractor tool illustrated in Fig. 17 must be used after shortening the two covers by undoing the lock-nuts and telescoping them. The end of the tool is arranged to fit over the rocker adjusting screw (Fig. 17) in such a way that by pressing the tool handle down it compresses the valve spring. Press down on this tool and seize the base of the push-rod tube with the other hand. The push-rods may then be withdrawn by lifting their hollow cups off the tappets complete with covers. The rocker-box should now be removed.

On 1934–9 O.H.V. engines the extractor tool mentioned cannot be used and removal of the push-rods is not a necessary preliminary to rocker-box removal. All that is necessary is to unscrew the lower push-rod cover tube nuts (where fitted) and telescope the tubes by forcing the bottom portion upwards. On 1937-9 models, remove the detachable valve spring caps.

Rocker-box Removal (1932-3). To remove the rocker-box for the purpose of giving access to cylinder removal, the lock-nuts at the top and bottom of the push-rod covers will, of course, have to be dealt with as just described. Next unscrew the four pins holding down the rocker-box. The two pins at the right or push-rod side of the rocker-box need only be unscrewed until they are free, but those nearest to the valves must be withdrawn entirely. The rocker-box can now be drawn off the cylinder head from the right side.

Rocker-box Removal (1934-8). After telescoping the push-rod covers (used on some 1934–5 models), rotate the engine until both valves are closed and then unscrew the four bolts which secure the rocker-box assembly.

The rocker-box can then be lifted off together with the push-rods and covers.



(*From "The Motor Cycle"*)

FIG. 18. THE 1939 O.H.V. CYLINDER HEAD AND ROCKER-BOX

Note the method of valve enclosure, the upper push-rod adjustment, and the neat rocker-box with Hallite washer

Rocker-box Removal (1939). Unscrew the four bolts which pass vertically downwards through the rocker-box and lift the latter off. A Hallite washer is fitted between the rocker-box and cylinder head and care must be taken not to damage this, otherwise oil leakage will result. On the 1939 engines the push-rod covers do not extend to the rocker-box and are removed with the cylinder head (see below). After removing the rocker-box withdraw both push-rods.

Removing Cylinder Head. Next remove the bolts or nuts holding down the head, and remove the latter. Care should be taken to relieve the pressure evenly on both sides while untensioning the bolts. The head can then be removed by lifting it off the cylinder barrel. No difficulty should be experienced in breaking the joint by hand pressure only. Afterwards cover up the cylinder bore with a rag. Avoid scratching the cylinder head or the gasket, and be most careful not to lose the small hardened steel valve stem caps where fitted.

If during cylinder head removal the fixing nuts or bolts are found to have a dry, rusty appearance, they should be soaked with paraffin before applying the spanner. The copper or copper and asbestos washer should be thoroughly cleaned on *both* sides and deposited in a safe place, and the same applies to the rocker-box. To facilitate subsequent reassembly, the rocker-box end cover should be removed, if this has not already been done. It is also a good plan to smear some graphite paste on the threads of the cylinder head bolts or studs.

On 1939 Engines. The cylinder head (see Fig. 18) should be removed with the push-rod cover tubes attached at their upper ends to the head. The two one-piece covers are sandwiched between the head and the top face of the crankcase, oil leakage being prevented by a composition joint at the top and a rubber gland (like an umbrella rubber ring) joint at the bottom. If these joints should be damaged, immediate renewal should be made.

Drawing off Cylinder Barrel. Undo the base nuts. It is then a simple matter to draw off the cylinder barrel. When doing this the engine should be turned over until the piston is at the lowest position of its stroke, and the barrel gently slid off, care being required to prevent the loose piston falling sharply against the connecting-rod which might damage or distort the piston skirt. Be careful with the cylinder base washer.

It should be noted that on the Big Twin one of the cylinder barrel retaining nuts is *inside* the valve chest and on this model it is necessary to remove the inlet manifold before the cylinders can be withdrawn.

Having removed the cylinder, wrap a clean rag round underneath the piston, so as not to allow dirt or foreign matter to enter the crankcase. Remember, that should you by some mischance allow even the smallest article to fall into the crankcase (which the author confesses to having done once) it may be necessary to take the engine right out of the frame in order to extract the offending article. Anyway, fishing for a small nut with a piece of wire is at the best of times depressing, especially on a fine afternoon! Before actually starting to remove any

carbon the piston should be be taken off. It is desirable to mark the interior of the piston to ensure its correct replacement.

Piston Removal. Decarbonizing can be carried out without removing the piston, but each alternate occasion it is advisable to remove the piston so that the ring grooves can be cleaned. On all A.J.S. engines the gudgeon-pin is of the "floating" type, and is secured in position by two small retaining springs, one on each side. These springs fit into recessed rings in the piston bosses, and to be withdrawn the ends must be squeezed together with a pair of small round nose pliers. Afterwards the gudgeon-pin may be pushed out from the driving or timing side. The piston can then be removed from the connecting-rod. On replacing, see that the split on the skirt faces to the front and on a Big Twin see that there is no possibility of the two pistons being interchanged.

Removing the Valves. Valves of the side-by-side type can be removed, if desired, without disturbing the cylinder. Take off the valve chest cover and the valve caps in the case of a 35–6/5 engine, or remove the cylinder head in the case of other engines and place the hooked end of a proprietary valve spring compressor such as the Terry illustrated in Fig. 19 on the top of the valve and the forked end over the lower valve spring cap. Then exert sufficient leverage to lift the valve spring to allow the split collet to be withdrawn. The valve can then be pushed up and drawn out of the head. Remove the other valve similarly. Remember that side valves are readily removed with the cylinder in situ and a stout screwdriver can be used.

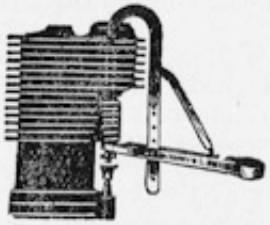


Fig. 19. Terry Valve Spring Compressor for S.V. Engines

In the case of the engine with overhead valves it is necessary to remove the cylinder head entirely from the engine to enable the special valve extractor (see Fig. 20) to be used. This is a clamp-like tool for extracting the valves readily. For portability the tool is made to fold up. Unfold it and place the end opposite the screw over the upper valve spring cap in the manner illustrated on the next page. Screw up until the point of the screw presses inside the hollow of the valve head. Hold the cylinder head firmly, keep screwing, and it will be found that the spring is compressed. Then the two small split cones can be taken away from the recess in the valve stem, and the valve may be withdrawn. Repeat this operation for each valve. When removing valves, note where they come from and replace them in the same order. The valves are interchangeable on some engines, but it is best never to change them about, as different steel is used.

Removing the Carbon. Procure an old screw-driver, or similar

tool, and scrape off all carbon from the piston head. If this is done with the piston not removed be careful not to impose side strain on the connecting-rod. The piston may then be polished with very fine emery cloth, but do not touch the sides of the piston at all. With aluminium pistons the use of emery cloth is not advised, and if used great care must be taken to remove abrasive particles. If the deposit is very hard it may be necessary to allow the piston to soak in paraffin in order to soften the carbon. Now

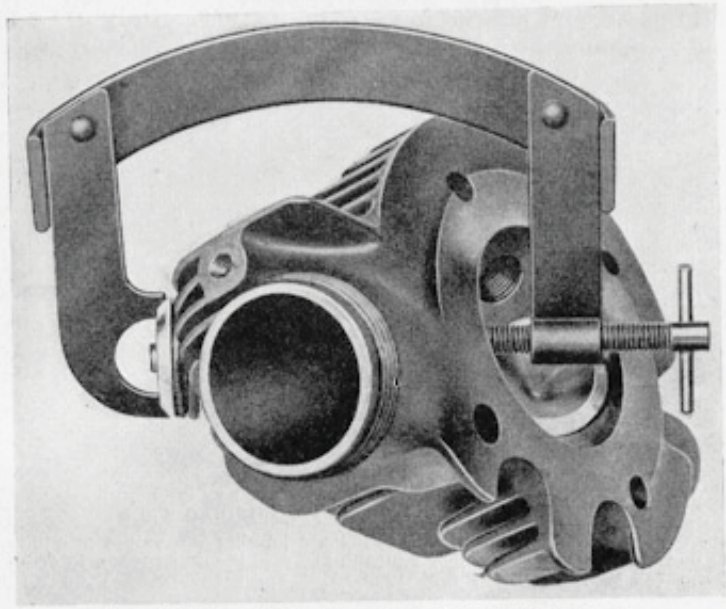


Fig. 20. The A.J.S. Overhead Valve Extractor

The extractor shown (price 6s. 6d.) is unsuitable for 1939 engines. If no extractor is available, shape a piece of wood to fit the combustion chamber, and then press down on the valve spring caps with a spanner or other tool

scrape off all deposits in the cylinder head, being careful not to scratch deeply the walls of the combustion chamber during this operation. Incidentally, it should be mentioned that carbon deposits form less rapidly on smooth surfaces, and therefore it is worth doing the job thoroughly. On no account use emery cloth or, indeed, any abrasive on either the combustion chamber or cylinder walls. Any abrasive particles left would cause very serious damage in the event of their finding their way between the piston and cylinder. Chip off all deposits around the valve pockets and the ports, afterwards wiping all surfaces over with a clean rag slightly damped with paraffin.

Grinding-in the Valves. Should the valves or valve seats show signs of "pitting," the valves will have to be ground-in. This requires considerable patience and care. We will deal first with the S.V. type of engine. Stuff a rag into the combustion chamber or cylinder to prevent dirt getting in, and then, if removed, place the cylinder firmly on a bench with valve seats uppermost. The best preparation for valve-grinding is a compound such as Richford's (supplied in two grades, coarse and fine).

Smear the valve face lightly with some of the coarse carborundum paste, and insert the valve on its seat. Only use a little of the compound at a time. Now oscillate the valve repeatedly

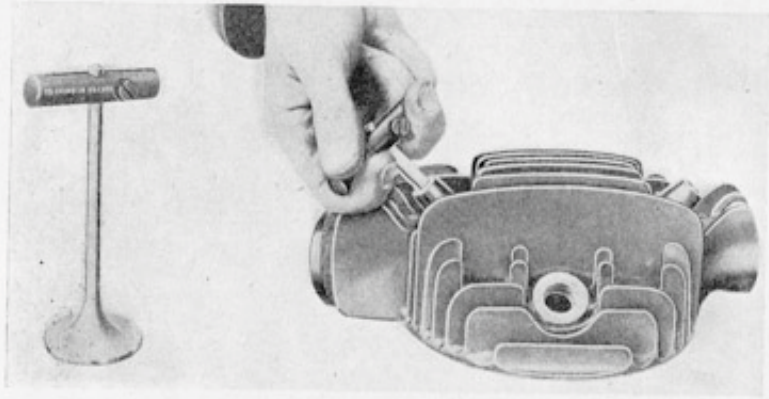


FIG. 21. USING A.J.S. VALVE GRINDING TOOL

On S.V. engines with detachable heads not housing the valves grinding-in does not necessitate cylinder removal, but care should be taken to screw down the tappet heads a few turns to ensure the valves seating with piston on T.D.C.

under moderate pressure with the aid of a screw-driver or a screw-driver blade gripped in a brace. Lift the valve at intervals, and turn it round a few degrees before dropping it again. Remove it at intervals, wipe and inspect the face. If there are still signs of "pitting," apply more paste and carry on. When there is a bright ring contact all the way round, and the little brown or black pock-marks have disappeared, the valve is a good fit again, and may be refitted. It is a refinement to finish off with a fine grade of abrasive, or even with rouge or metal polish. After grinding-in both valves, carefully remove every particle of abrasive from the cylinder head. Never attempt to grind-in a very badly pitted valve; it should be returned to the makers to be refaced. To grind-in such a valve effectively would cause very bad wearing down of the valve seat, and would ultimately result

in the valve becoming "pocketed," with consequent loss of power. A light spring under the valve will assist grinding-in.

Grinding-in overhead type valves is very similar to the procedure described above; but, of course, the valves, instead of being pressed down upon their seats, have to be pulled up against them. For this purpose a special tool is obtainable.

Having ground-in the valves and thoroughly cleaned out all dirt and abrasive, as well as any fluff on the valve seats, proceed to replace the valves and valve springs, together with the valve caps in the case of 3·49 h.p. lightweight Models 32–6/5. When replacing valve caps, smear a jointing medium, such as "Metalestine," on the threads, also see that all copper-asbestos washers are in sound condition. Valves should be replaced in their correct places. The colour of the steel usually indicates which is the exhaust valve. As a rule this valve is rather blue. If it is greatly discoloured it is a sign of overheating having occurred.

Examining and Removing Piston Rings. The piston rings are the main guard of the compression. They must, therefore, be full of spring, free in their grooves, and set with their slots equally spaced round the piston to maintain compression. If all the rings are bright all the way round they are obviously being polished against the cylinder walls, and are perfect, and should be left alone. If, on the other hand, they are dull or stained at some points, they are not in proper contact with the walls of the cylinder. Perhaps they are stuck in their grooves with burnt oil, and will function properly if the grooves are cleaned. If vertically loose in their grooves or very badly marked, the rings must be renewed. Piston rings are of cast iron, and being of very small section must be handled very, very carefully. If not, they will certainly be broken. They cannot safely be opened out wider than will allow them to slip over the crown of the piston. Therefore, to put them on or remove them requires the insertion of small strips of metal, about ¼ in. wide, which are placed in the manner illustrated by Fig. 22. When fitting new piston rings, thoroughly clean the grooves into which they fit, as any deposit left at the back of new rings forces them out, and makes them too tight a fit. Paraffin usually loosens stuck piston rings. Piston

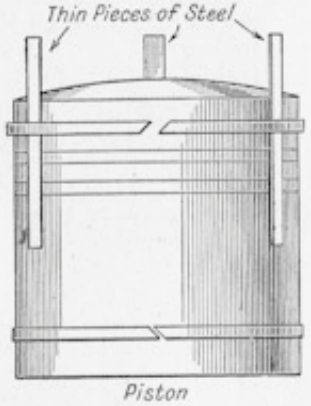


FIG. 22. HOW TO REMOVE PISTON RINGS

The above is the accepted method, unless one has a special tool available

rings are made to very accurate dimensions, and it is very bad practice to attempt to "fit "oversize or undersize rings unless you know exactly what you are doing. Lapping-in oversize piston rings is a skilful job, and unless the slot sizes are exactly right the rings will not function well, and may even produce an engine "seizure." Therefore, always use piston rings guaranteed to be of A.J.S. manufacture. On O.H.V. engines of 350 c.c. the correct slot sizes are ·006 in. for the top ring, ·006 in. for the middle ring, and ·004 in. for the bottom ring. For 250 c.c. and 500 c.c. engines deduct ·001 in. or add ·001 in. respectively. All pistons are fitted with three rings, the bottom ring being extra wide on recent engines to allow of a scraper ring being fitted if desired after a considerable mileage.

Lubricating O.H.V. Rockers. 1932–6 rockers have grease nipples provided (see page 25). A nipple is also provided to lubricate the upper ball joints of the push-rods. In the centre of the cover will be found a "Tecalemit" grease gun nipple.

Grease should, *with both valves closed*, be forced through this nipple, when it will automatically find its way to the two ball joints. It is important when this is being done that both valves are in a closed position. If the inspection cover is removed, care should be taken to see that the two coil springs, which fit inside the rocker spindles, are not lost. These coil springs press against the inside of the cover, and have their other bearing against the end of the hollow rocker spindle.

Cleaning the Outside of Cylinder. Rain and heat soon make the outside of an air-cooled cylinder look red and rusty. This does not affect the running, but does not improve the appearance of the machine, and to a very small extent reduces heat radiation. To remedy this the cylinder head and the cylinder radiating fins should be cleaned with a stiff brush soaked in paraffin, and afterwards painted with cylinder black. There are plenty of such compounds on the market.

The Sparking Plug. Occasionally clean the sparking plug with petrol and scrape the electrode points lightly with a sharp pocket-knife, afterwards checking the gap between them, which should be ·020 in. with "Magdyno" and magneto ignition and ·025 in. with coil ignition ('020 in., K.L.G.). The reach of the plug is of importance. The sparking plug should be frequently inspected. It is susceptible to oiling-up, especially during the running-in period and after decarbonizing or reboring.

An excellent gadget for quick plug cleaning consists of a metal reservoir containing petrol and steel wires. The plug is screwed into this and then vigorously shaken until clean. However, at considerable intervals it is wise to dismantle the plug and clean it thoroughly, which is not really possible without removing the

insulated electrode of the plug from its shell. When dismantling, first unscrew the gland nut with a plug detacher or else with a box spanner. On no account squeeze the body in a vice. All metal parts should be scraped with a knife and then wiped over with a rag damped with petrol. Do not scrape the insulation, but clean internally and externally with a petrol-damped rag. After cleaning the components, polish the electrode points with some fine emery paper and reassemble, taking care to retighten the gland nut securely and to see that there is no grit between the insulator and metal body. Also make sure that the small internal copper washer is correctly fitted so as to give a gas-tight joint. Finally, check the gap, examine the external copper washer, and clean the threads.

Suitable Plugs for A.J.S. Engines. Lodge and K.L.G. plugs both give excellent service. On all 1939 S.V. engines a Lodge C14 plug is fitted, while on the O.H.V. engines a Lodge H53 is standard. Both types have a 14 mm. thread which has been used on all 1938 models onwards. The Lodge H53 is designed for consistently fast road work, but the H14 (fitted in 1938) will be found satisfactory also. Suitable plugs (14 mm.) in the K.L.G. range are the 777 for S.V. engines and the 831 for O.H.V. engines. Owners of earlier A.J.S.'s requiring an 18 mm. plug should fit a Lodge H1 or a K.L.G. KS5.

Reassembly of Engine. After thorough decarbonizing, the engine may be reassembled. Care should be taken to replace all paper washers and C. and A. or soft copper washers if fitted; any damaged washers should be at once renewed when reassembling the engine.

On O.H.V. engines having a soft copper cylinder head gasket if signs of leakage are observed it is advisable to anneal the gasket before replacing it. To do this, heat it to a dull red and then suddenly plunge it into cold water. It is not necessary and not advisable to use any form of jointing compound where a cylinder head gasket is provided.

The piston should be oiled before being attached to the connecting rod with the gudgeon pin. It must be replaced the same way round as taken off with the rings properly spaced. Do not forget the retaining springs. These must be a snug fit. Hold the cylinder in the front angle of the frame, and place the piston a little before bottom dead centre on the downward stroke. By pressing the rings in with the fingers without disturbing the slot positions, the barrel may be slid over the piston. When replacing the cylinder on early models remember that it must be tightened down before the steady is again attached to the down tube. When the cylinder has been finally tightened down, then the stay of the steady can be adjusted so that the pin passes through the clip on the down tube

and eye of the stay without force. The rest of the assembly is quite straightforward. There are three points to be noted, however: (1) Be careful to tighten all cylinder and cylinder head nuts and bolts evenly. They should be tightened finger-tight first and then done up in a diagonal order ¼ of a turn each until all are quite tight; (2) see that the overhead valve rocker bearings are lubricated; (3) make certain that the hardened steel caps on the ends of the valve stems are properly replaced and that the valve clearances are correct (page 33). Before replacing the rocker-box on the O.H.V. engines it is advisable to remove the cover plate so as to verify that the O.H. rocker ends properly enter the cupped push-rod ends. Be sure push-rods engage tappets.

After assembly, test the engine compression by trying to pull the rear wheel over with top gear engaged and throttle open. Do not stand on the kickstarter, as this may strain the gear-box layshaft bearings. It should offer powerful resistance for several seconds on full compression. But bear in mind that the compression will improve still further when the oil has circulated again throughout the engine, and the valves and piston rings have rebedded themselves again. The machine is now ready for the road again, but before putting it on "active service" warm up the engine and then check over the various nuts and bolts (especially the cylinder head bolts), tightening those which are found to "give" to a spanner.

Carburettor Fitting. All 1932–9 machines, except a few, have flanged fitting carburettors, and if the carburettor is removed great care must be taken to ensure on refitting an absolutely air-tight joint. If the washer is damaged fit a new one at once or the bad joint will result in air leaks and erratic running of the engine.

Engine Lubrication. Full particulars concerning engine lubrication will be found on pages 16–25.

Care of Lucas Magneto. The Lucas magneto is provided with ball bearings throughout, which are packed with grease before leaving the manufacturers. Fresh lubricant should not be required under normal circumstances before some 12,000 miles (see page 25).

The contacts of the contact-breaker should be examined on a new machine after the first 100 miles, again after 300 miles and subsequently about every 1000 miles, and, if the "break," with the contacts full open, should be considerably more or less than will just hold a 12 thou' blade of a feeler gauge, they should be adjusted. Too great a gap will advance the timing. A special magneto spanner is provided, which includes a gauge for checking the "break." It is unnecessary to remove the contact-breaker to make this adjustment. All that is necessary is to revolve the engine until the contacts are wide open, slacken the

nut securing the fixed contact screw and then adjust the screw until the correct gap is obtained.

If it becomes necessary to take a ring cam type contact-breaker off, unscrew the long taper fixing screw, and withdraw the contact-breaker bodily. The contacts only need attention at long intervals, and the reader should not interfere unnecessarily with them. The contact points must only be dressed with a fine carborundum stone or emery cloth if the surfaces have become at all pitted, and then the least possible amount taken off. The greatest care must be exercised. Always keep the contact-breaker scrupulously

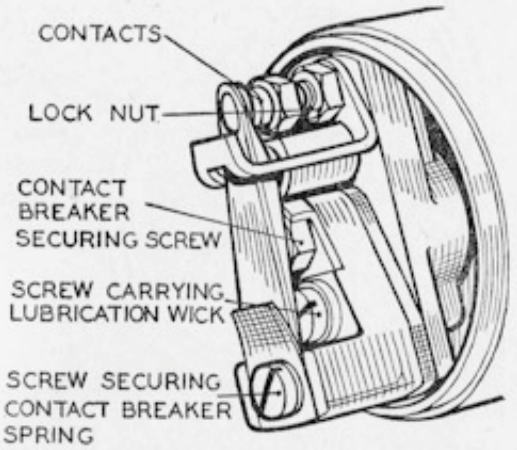


Fig. 23. The Lucas Face Cam Type Contact-breaker

This contact-breaker is fitted on all present magnetos, but is not used on the "Magdynos"

clean and free from oil. To remove the rocker arm, proceed as described on page 50. When replacing the contact-breaker, be sure that the projecting key on the tapered portion of the contact-breaker base engages the key-way cut in the armature spindle, otherwise the timing of the magneto will be upset. Also, when tightening the fixing screw, be most careful not to use excessive force. Lubrication has been already dealt with on page 25.

All recent Lucas magnetos have a face cam type contact-breaker (Fig. 23), and in order to clean and dress the contacts the spring arm carrying the moving contact should be removed by withdrawing the fixing screw. When replacing the arm, make certain that the small backing spring is fitted in its original position, i.e. immediately beneath the securing screw and spring washer, with the bent portion facing outwards.

The moulding of the H.T. pick-up should occasionally be cleaned with a dry cloth and the pick-up brush should be examined. The brush should move freely in its holder and bed down on to the track of the slip-ring. Avoid undue stretching of the brush spring.

It will prevent misfiring and render starting easier if the slip-ring is cleaned occasionally. This is done by taking off the H.T.

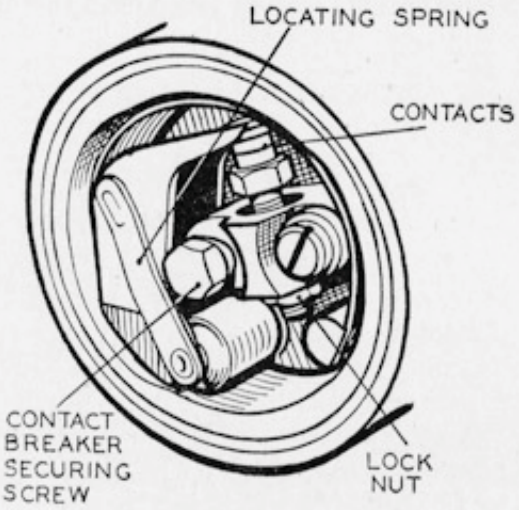


Fig. 24. The Lucas Ring Cam Type Contact-breaker

This design is provided on present "Magdynos" and has been used on 1932–7 pattern magnetos

terminal and, while the magneto is being revolved by slowly turning the engine over, inserting a lead pencil, the end of which is covered with a clean rag moistened with petrol. The pencil should be pressed against the rotating slip-ring.

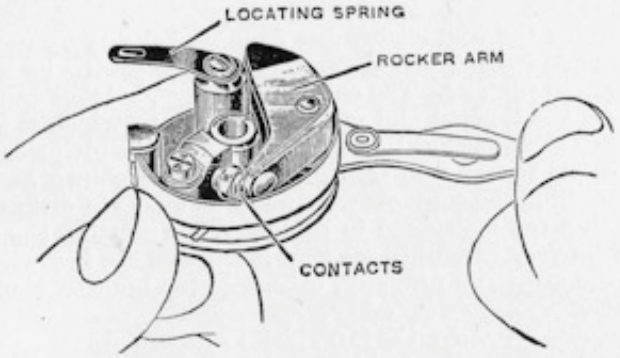
Beyond the above-mentioned points, the magneto should not be interfered with. If internal trouble develops, return the instrument to the makers for repair.

When Ignition Trouble is Suspected. Before interfering with the magneto verify that the sparking plug, the cable, and connections are correct. If these are in order turn the engine over slowly and watch if the contact breaker arm works properly. This is bedded in a fibre insulating bush, and in moist weather there is an occasional danger of the material swelling. If this happens prise the rocker arm off its bearings and clean the pin on which it works

with fine emery cloth, and smear a very small quantity of oil on it before replacing. Do not take the magneto to pieces needlessly. It is easily possible to damage it.

Care of "Magdyno" (Ignition Unit). Little attention is required (for maintenance of dynamo unit, see page 77), and if any serious trouble arises it is best to return the instrument to the makers for attention. Never attempt to remove the armature.

The contact points in the contact-breaker should be kept adjusted so that they open to an extent equal to the thickness



(Joseph Lucas, Ltd.)

Fig. 25. Showing "Magdyno" Contact-breaker and Method of Removing the Rocker Arm for Polishing the Contacts

of the gauge on the magneto spanner (·012 in.). One of the contacts (Fig. 24) will be found to be adjustable, and care must be taken to slacken the lock-nut before attempting to adjust the contact. The contact-breaker is designed to run without lubrication, and, except for very occasionally putting a spot of oil on the wick, if dry, to prevent wear of the fibre heel of the rocker arm, no lubrication is necessary (see page 25).

Occasionally, if the machine has been kept in a damp place, the fibre bush on which the rocker arm works will swell and cause the arm to stick causing irregular firing of the engine. If the contacts remain permanently open the engine cannot be started, for no spark at the plug can occur. The best cure is to remove the contact-breaker and rocker (see below) and rub the whole of the inside of the rocker bush with the head of a live safety match, which is usually sufficient to effect a cure. In exceptional cases something rougher may be needed.

The contact points themselves must be kept scrupulously clean. On examination after a big mileage the contacts may be

found to have irregular and dull surfaces due to burning (especially if the contacts have not been kept clean and properly adjusted), and if such is found to be the case it is necessary to polish them up, otherwise misfiring and rapid deterioration of the contacts will inevitably follow. To polish up the contacts, use a fine carborundum stone or emery cloth (do not use a file) and with the contact-breaker and rocker arm removed polish the contacts until all pitting is removed and the contact surfaces are bright all over. Be careful to keep the surfaces "square" as well as uniform. To remove the contact-breaker and rocker arm, proceed as follows—

Withdraw the contact-breaker from its housing by unscrewing the hexagon-headed screw (Fig. 24) in the centre by means of the magneto spanner. The complete contact-breaker can then be pulled off the tapered end of the armature to which it is keyed. Next push aside the locating spring and with the magneto spanner prise off the rocker arm from its bearings as shown in Fig. 25. After polishing the contacts wipe away all traces of dirt and metal dust with a rag moistened in petrol. When refitting the contact-breaker be very careful to see that it engages the key-way on the end of the armature properly, otherwise the ignition timing may be upset.

Occasionally remove the H.T. pick-up (there are two on the Big Twin) and examine the carbon brush. It should work freely in its guide and not be unduly worn. When examining the brush avoid stretching the pick-up brush spring unduly, or a new one will be required. Renew both the brush and spring if they are in questionable condition. Also occasionally clean the slip ring track and flanges by inserting a small rag wrapped around a pencil through the pick-up hole and slowly revolving the engine. Little attention is required in regard to lubrication of the armature bearings and this is referred to on page 25.

The Miller Contact-breaker (Coil Ignition). Occasionally remove the moulded cover and inspect the contact-breaker which is fitted on the timing case of coil ignition models. The Miller contact-breaker is somewhat different to the Lucas contact-breaker. There is an adjustable contact point attached to an insulated terminal post; and a second contact, fixed to an uninsulated lever on which is a pad, which presses firmly on a cam fixed to the exhaust camshaft. Every two engine revolutions, the lever pad coming upon the raised portion of the cam, causes the contacts to open momentarily. During the remaining period of the cam's rotation, the cam leaves the pad, and this allows the contacts to meet and close the primary coil circuit. The contacts should be pressed firmly together by means of the spring. Binding at the pivot-pin bearing will weaken this pressure and prevent

the smart make-and-break so essential for satisfactory results. To obviate this, occasional lubrication is necessary. The cam should be smeared lightly with vaseline and the rocker-arm bearing pin, if tight, should be oiled slightly.

About every 1000 miles the contact-breaker cover should be removed, and the contacts should be examined and the "break" checked with a feeler gauge. This should be ·018 in. to ·02 in. If the clearance is excessive, the timing will be advanced, and the primary circuit will not remain closed sufficiently long. Misfiring of some kind will probably occur. Provided the contacts are kept clean and free from oil, adjustment is required only at long intervals. If adjustment is required, rotate the engine slowly until the points are fully open; and then, using the magneto spanner, slacken the lock-nut and rotate the fixed contact screw by its hexagonal head until the correct "break" is obtained, as indicated by a suitable feeler gauge. Afterwards retighten the lock-nut. Check the "break" after the first 100–300 miles.

If examination reveals that the contacts, instead of having a grey-frosted appearance, are burned or blackened (due to the presence of dirt or oil), it is advisable to clean them with *very fine* emery cloth and afterwards wipe over with a cloth damped in petrol. Every trace of dirt and oil must be removed. Should the contact surfaces be pitted and uneven, it is necessary to true them up with a fine carborundum stone. Only the barest amount of metal must be removed, and it will greatly facilitate matters if the contact-breaker mechanism be firstly taken off the timing-case cover.

Re-timing the Ignition (1932-6 Single-cylinder Models with Mechanical Lubrication). If the magneto or "Magdyno" has been removed from the machine, or the drive disturbed, it will be necessary to see that it is re-timed correctly after it is fitted again. The engine magneto driving sprocket is secured to its shaft by means of castellations, which render wrong replacement impossible. The sprocket on the armature shaft of the magneto is supplied with a Vernier timing adjustment (see Fig. 26), which allows a very accurate and certain method of fixing the drive after the correct setting has been arrived at. The setting of this Vernier adjustment may at first sound a trifle complicated, but in reality it is perfectly simple.

Keyed to the armature shaft of the magneto or "Magdyno" is a sleeve (1) which has thirteen holes ranged in a circle. Fitting over a collar on this sleeve is the chain sprocket (2), which has twelve holes similarly arranged. Now on the sprocket on the engine shaft and on the magneto shaft an arrow will be found. These must point to each other before anything else is done. The first thing then in re-timing is to set these arrows so that they

exactly face towards each other. To do this turn the engine over until the arrow on the driving sprocket is pointing directly towards the arrow on the magneto sprocket. The latter should be held free in the fingers and moved a tooth backwards or forwards in the chain until the correct setting is arrived at. When this is so, place the magneto sprocket on to the sleeve, and rotate armature shaft of magneto until a mark found punched over one of the twelve holes on the sprocket exactly registers with a similar mark on the outside of the sleeve collar. It will now be found that the marked holes in sleeve and sprocket, respectively, coincide exactly, so that all that has to be done is to push the peg washer (3) into these holes, which effectively prevents the sprocket from moving from its correct setting, and tightly screw up the sleeve lock-nut (4), which can be done without fear of the timing shifting in the process, as is often the case with other methods. Set the piston at its correct distance (given in a later paragraph (page 54) from the top of the compression stroke—make sure that it is not on the exhaust stroke. With the engine in this position, take off the sleeve lock-nut on magneto sprocket, and remove peg washer. This will now leave the armature free from the engine drive, but still connected via the chain to the engine. See that the sprockets have their arrows facing as previously mentioned. Move the spark lever to the limit of its motion of advance. Remove the cover of contact-breaker and slowly turn the armature till the fibre block of the make-and-break lever rises on the inclined plane of the steel segment sufficiently to just separate the contact points. This is the firing point, and in this position the markings previously referred to on the sleeve and sprocket should register if correctly fitted up. If so, the drive should be fixed up as before detailed. It is, however, always advisable to check the timing after tightening up.

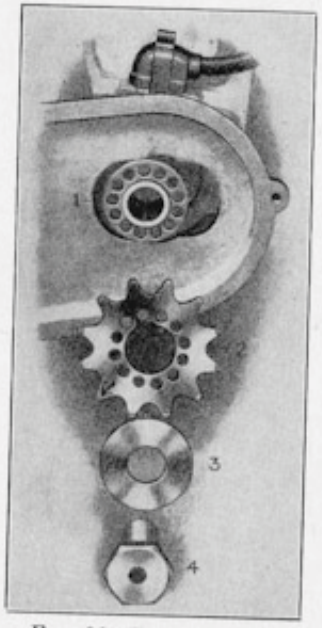


Fig. 26. The Vernier Timing Adjustment

It can be understood that so long as the sleeve (No. 1) has not been removed (i.e. its position relative to the armature shaft altered), all components can be replaced exactly as taken off, and therefore the timing is unaltered, but it should be checked.

The taper on the sleeve is very gradual, and hence the sleeve will remain firm even with the lock-nut removed. Should the sleeve have to be taken off, the magneto will have to be timed in the usual way, and the correct sleeve position on the armature shaft found afterwards. In the case where the sleeve is keyed the Vernier adjustment always holds good.

Retiming Ignition (Big Twins). In the case of the 1932–9 Big Twins, the "Magdyno" must be timed on No. 1 cylinder, that is, the one that fires first. This is the back cylinder and No. 1 cam is the one farthest from the rear cylinder when looking at the contact-breaker end (the lowest, 1937–9). The "Magdyno" chain sprockets are both plain taper bore, and to re-time after dismantling, reassemble in the usual manner and tighten the sprocket on "Magdyno" armature securely, but leave the sprocket on the camshaft loosely fixed. Then revolve the engine by hand until the back piston is approximately one-quarter of an inch from the top of the compression stroke (i.e. the stroke upwards immediately after inlet has closed). Then with ignition lever in fully advanced position, and camshaft sprocket loose on shaft (the other sprocket having been previously tightened) turn the "Magdyno" armature backwards until the points are just about to break on the No. 1 cam. Holding carefully in this position, tighten up the camshaft sprocket nut.

There are two important points to which the author would draw attention. Firstly, do not forget to check the contact-breaker gap before commencing to retime; secondly, should it be necessary to remove the sprocket from the "Magdyno" armature for any reason, remember that it is absolutely essential before removing the sprocket locking nut first to detach the spring locking ring which encircles the nut and the locking washer next to it.

The "Magdyno" terminals are numbered on the body of the instrument, and care must be taken to see that the H.T. leads are connected to the corresponding cylinders.

The Lucas "Maglita." Vernier timing is not used in conjunction with the Lucas "Maglita," fitted to 1932–3 Models T5 and TB6 and driven by a special duplex chain off the inlet camshaft.

To Re-time Ignition (All Coil Ignition Models). First remove the bakelite contact-breaker cap and slacken the screw securing the contact-breaker cam. Then with a small punch operating in one of the slots in this cam, give a sharp but light tap. This will loosen the cam on the taper end of the shaft to which it is fitted. Now set the piston the correct distance before T.D.C. and the ignition lever fully advanced, after which gently turn the cam with the fingers in an anti-clockwise direction until the contact points are just about to part, in which position carefully re-tighten

the cam fixing screw and replace the bakelite cap. It is essential, in this ignition setting operation, to obtain exactly the prescribed piston setting on the compression stroke, i.e. the stroke at the top of which both valves are closed, and to check the contact-breaker gap before setting the timing.

To Re-time Ignition (Models with Separate Magnetos). First remove the outer portion of the aluminium magneto chain cover and slack off the nut securing the lower sprocket. Then, with a stout screwdriver, or the hooked end of a stout tyre lever, gently lever the sprocket loose from the taper on the camshaft to which it is attached. Then carefully turn the engine until the piston is at the correct distance before T.D.C., observing that it is on the stroke at which both valves are closed. Now fully advance the ignition and remove the contact-breaker cap, after which gently turn the magneto with the fingers in its ordinary direction (i.e. counter-clockwise when looking at the sprocket end) until the contact points are just about to break, in which position the sprocket fixing nut must be carefully re-tightened. Needless to add, it is of vital importance to correctly obtain the correct piston position and to secure the chain sprocket at the exact position at which the contact points commence to part. To find the exact point of break, place a piece of cigarette paper between the points and turn the magneto armature until the paper is just released, and no more, upon a gentle pull.

1932-9 Ignition Settings. The correct procedure for retiming the ignition on the various 1932–9 models has already been described, and it remains to give the actual settings of the piston before the top dead centre (B.T.D.C.) on the compression stroke when the "break" should occur with the spark lever fully advanced. These settings are as follows: On Models 32–5/5, 32–4/B6, 33–4/12, 33–5/2 the spark should occur $\frac{3}{8}$ in. B.T.D.C. On Model 32–5/6 the setting is $\frac{7}{16}$ in. B.T.D.C. On Models 32–5/8, 32–4/B8 and 32–5/9 the correct setting is $\frac{1}{2}$ in. B.T.D.C. In the case of Models 35–9/12 and 35–9/16 give an advance of $\frac{5}{16}$ in. B.T.D.C. Give $\frac{1}{4}$ in. in B.T.D.C. for Model 35/4; $\frac{1}{8}$ in. B.T.D.C. for Model 35/14; and $\frac{7}{16}$ in. B.T.D.C. for Models 35–9/22, 35–9/18, 36–9/8 and 35–9/26; $\frac{1}{4}$ in. for Model 37–9/9 and Models 37–9/2, 37–9/2A.

To measure the distance which varies on different engines as given above, the cylinder head need not be removed.

On side-valve, overhead-valve engines it is only necessary to remove the sparking plug and gauge the distance by means of a piece of wire inserted through the plug hole. Two marks must, of course, be scratched on the wire, one indicating top dead centre, and the other above it the spark advance.

Some riders prefer to time the ignition by measuring degrees of crankshaft rotation, and in this case a degree disc must be

attached to the crankshaft. The author is of the opinion, however, that this method is really "splitting hairs" and quite unnecessary and apt to entail a considerable amount of bother. Measurements taken on the piston stroke are sufficiently accurate.

"Magdyno" Chain Adjustment. Examine the driving chain occasionally and, if slack, tighten it until there is a whip in the centre of the upper chain run of about $\frac{1}{4}$ in. to $\frac{3}{8}$ in. when the chain is pressed lightly up and down. If chain adjustment is needed, the outer half of the aluminium chain case should first be removed. Then with a spanner slacken off slightly the two "Magdyno" platform fixing bolts and insert a lever or suitable tool under the front end of the platform and gently lever it up

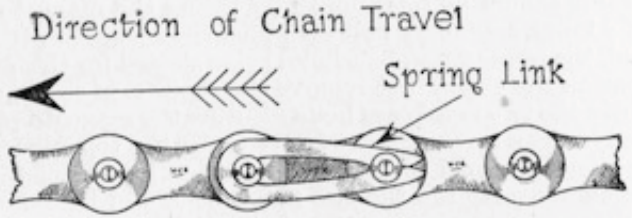


FIG. 27. THE CORRECT METHOD OF REPLACING THE SPRING LINK ON A CHAIN

It is unsafe to fit a spring link with the open end facing the direction of motion

until the above-mentioned chain tension is obtained. Afterwards firmly retighten the platform, fixing bolts, grease the chain if it appears to be dry, and finally refit the chain case cover. It should be noted that the platform, fixing bolt nearest the cylinder operates in slotted holes to permit of the necessary tilting being obtained.

To Adjust Dynamo Chain (All D.S. Singles). On the 1935–9 single-cylinder models with dry sump lubrication to adjust the dynamo chain it is necessary to rotate the dynamo in its cradle mounting until there is a movement of $\frac{1}{4}$ in. to $\frac{3}{8}$ in. as the top run of the chain is lightly pressed up and down in the centre. Always check the chain whip with the chain in its tightest position. To adjust the chain tension, first slacken the dynamo clamp bolt and then twist the unit bodily in its mounting *clockwise* to tighten. It should be noted that it is possible to check the tension of both the dynamo and primary chains by passing the fingers through the inspection cap orifice. To release the cap unscrew the knurled edge screw.

When turning the dynamo in its mounting a spanner should be applied to the flats cast on the dynamo end plate. A suitable spanner is provided in the tool-kit to enable this operation to be done positively, readily, and safely.

An Essential Precaution. Owners of single-cylinder models should note that if for some reason removal of the dynamo sprocket becomes necessary it is essential to hold the sprocket with a spanner applied to the flats on the sprocket boss when loosening or tightening the nut. Unless this precaution is taken, there is risk of subjecting the dynamo armature to a bending strain with serious consequences. Before removing the sprocket nut, first remove the spring locking ring which encircles the nut and the locking washer adjacent to it.

To Adjust Magneto Chain (Magneto Ignition). If the magneto chain has a whip of more than about $\frac{1}{4}$ in. when the chain is gently pressed up and down mid-way between the chain sprockets it should be retensioned by tilting the magneto bodily upon the lower crankcase bolt on which the magneto platform is mounted, the upper fixing bolt holes being slotted for this purpose. To retension the chain, first remove the chain case cover, slacken off slightly the two crankcase bolts securing the magneto platform and then insert a lever or screwdriver under the top edge to force the back end up until correct chain tension is obtained. Afterwards securely retighten the two fixing bolts and before refitting the chain case cover smear the chain with grease if necessary (see page 29).

Engine Timing. No useful results can be obtained by tampering with the valve timing. On the contrary, all results following such action are likely to have a negative value, if they do not completely spoil the engine performance. The makers have arrived at the setting after very careful consideration, and have marked the pinions with a dot system of identification (line marks used 1937 onwards) to enable the setting to be always kept. The correct valve timings in degrees of crankshaft rotation for the single-cylinder and twin-cylinder engines are shown in Fig. 30.

To reset the valve timing after dismantling a single-cylinder engine, proceed as follows. Rotate the engine until the mark on the small timing pinion is in line with the centre of the inlet (rear) camwheel bush. Then insert the inlet camwheel so that the mark on it meshes with the marked tooth on the small engine pinion. Now rotate the engine slowly *forwards* until the mark on the engine pinion is in line with the centre of the exhaust (front) camwheel bush. Finally, insert the exhaust camwheel so that its mark is in mesh with that on the engine pinion.

The Big Twins have a single camwheel timing gear (Fig. 29), and in order to obtain the correct valve timing it is only necessary to replace the camwheel such that its mark exactly faces the mark on the small engine pinion. To facilitate replacement of the camwheel the valve pressure should be taken off the cam followers by placing bolts or pieces of metal rod (four), about $1\frac{3}{8}$ in. long,

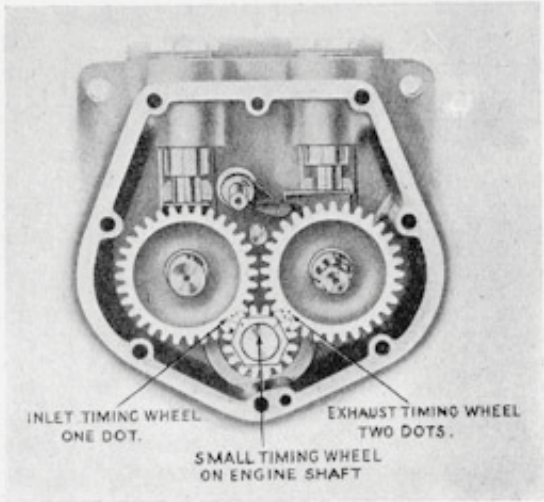


Fig. 28. Single-cylinder Timing Gear (1932–5)

The timing gear on the 1935–9 D.S. models is slightly different and includes flat base tappets (Fig. 11)

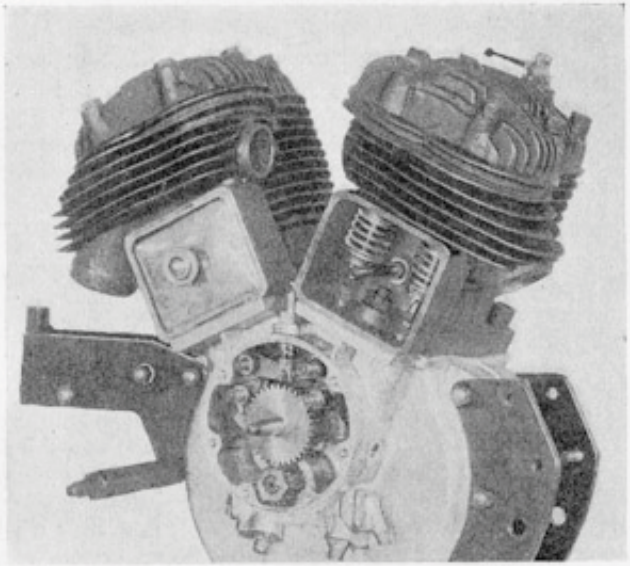


Fig. 29. Twin-cylinder Timing Gear (1932–5)

between the valve spring bottom collars and the base of the valve chest.

An unusual feature about the Big Twin engine is that the timing gears run submerged in oil, and if the timing cover is removed for any purpose, a dish or some other receptacle should be used to catch the oil. It is unnecessary to fill the timing chest before replacing the cover, as a special feed is carried from the oil pump to the timing gear chamber for this purpose, and after the engine has been started up the correct level is quickly obtained.

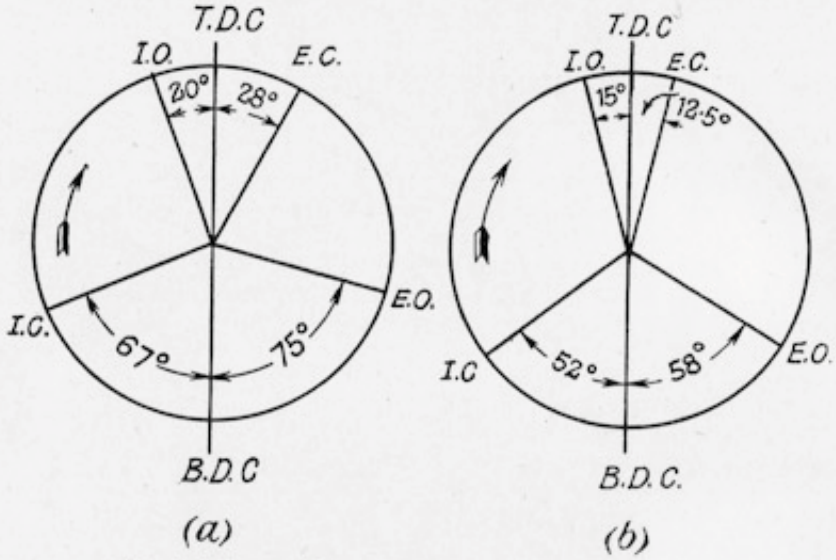


Fig. 30. Valve Timing Diagrams for A.J.S. Engines

The timing shown at (*a*) is correct for single-cylinder engines made since 1935 with the exception of the 1935 models 5, 6, 8, 18 and the 1936 models 5, 8, 9, 18. On these models the same valve timing is employed as for the corresponding 1934 models. At (*b*) is shown the correct valve timing for all twin-cylinder engines made in 1932 onwards. Note that timing must be checked with ·016 in. valve clearance (both valves) for single- and twin-cylinder engines

To Dismantle Single-cylinder Timing Gear. The gear control foot pedal (where fitted) should be removed. On machines with magneto ignition, remove the magneto chain case cover by taking out the six screws. Then unscrew the nut retaining the sprocket to the magneto armature and remove the nut and the washer behind it. By levering with a suitable tool, or using a sprocket drawer, the sprocket may be taken off. Next unscrew the nut (R.H. thread) securing the sprocket to the camshaft and remove

the nut and its washer. Having done this, remove the camshaft sprocket similarly to the magneto armature sprocket. With both magneto driving chain sprockets removed, take out the five screws from the timing case and remove the cover. In the case of the coil ignition models there is, of course, no driving chain to remove and the timing case cover can immediately be removed after first removing the contact-breaker and cam.

To dismantle the timing gears, unscrew the nut which retains the small engine pinion (L.H. thread) and remove the nut. Afterwards rotate the engine until both valves are closed and pull away both camwheels in turn. Then remove the small engine pinion with a withdrawal tool or by leverage. It should be observed that the pinion is a taper fit on the mainshaft, and is located by a key. To reassemble, reverse the above procedure, taking care not to over-tighten the nut which secures the small engine pinion.

Maintaining Compression. If piston rings and valves are in good condition, the only other possible sources of leakage are the valve caps, the cylinder head joint, and the sparking plug. The washers belonging to all these parts should be renewed as soon as they become at all distorted or uneven, and a jointing medium should be used when screwing up the valve caps. Test for compression leakage by putting thick oil on the sides of the joints and observing whether bubbles occur when the engine is running.

Testing for Spark at the Plug. The accepted method of doing this is to place a wooden-handled screw-driver with steel blade across the terminal and just touching the cylinder fin. Now depress the kick-starter and see if there is any sparking at the blade tip. It is just possible that the plug insulation is defective if the foregoing experiment produces a "juicy" spark, and yet the engine refuses to fire, assuming there are no carburation troubles. In this case take the plug out and lay it on the cylinder head, taking care that the terminal is insulated from the cylinder, and reconnect the H.T. lead. Now again depress the kick starter and see if anything happens. If no spark occurs now, we may take it that the plug is faulty, and it should be scrapped.

Air Leaks in Induction System. The chief source of air leaks, apart from leaks at induction pipe connections and carburettor, is at the inlet valve guide. Should this guide become badly worn it must be renewed or the engine will run irregularly at low speeds. The occasional addition of a little upper cylinder lubricant such as "Mixtrol" undoubtedly lengthens the life of the valve guides.

Absence of Compression after Valve Grinding. This temporary phenomenon is common to all engines. Usually it is due to some foreign particles existing between the valve seats and faces. After a short mileage the engine regains its full compression.

Cleaning Dirty Exhaust Valves. Sometimes, when an exhaust valve is removed, the portion of the bevel face which does not bear on the seat is found to be thickly carbonized (due usually to running on an over-rich mixture). This deposit should be cleaned off before the part of the face which beds on the seat is attended to ; otherwise the upper portion of the valve face may be damaged and in any case it will prevent the valve head from taking a central bearing on its seat during the operation of valve-grinding. Such carbon is fairly easy to remove when it has been soaked in paraffin for an hour, after which a stiff brush will scour it off.

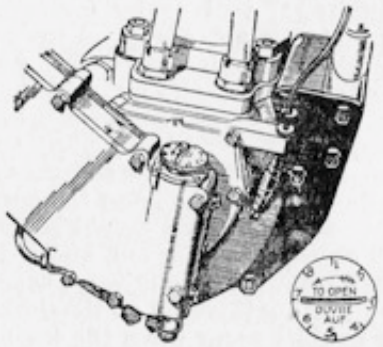


Fig. 30. Oil Pump Adjustmemt (1932–6 Models)

The regulator shown is used on 1932–6 models with mechanical lubrication (page 23) and a normal adjustment is to turn the knob half a turn from the fully closed position

If an exhaust or inlet valve stem is discoloured, clean with some fine emery cloth held between the thumb and forefinger.

Paper Washers. These are useful in preventing leakage, and may be made by placing a sheet of paper over the part for which the washer is intended and rubbing round the edge.

Fitting New Small End Bush. Amateurs sometimes drive out these bushes with disastrous results. The correct procedure is as follows : Get an old bush slightly smaller than the one which is to be extracted and a larger one for it to fit into. An iron bolt is then run through the connecting rod, and the two bushes placed one on each side of the latter. By slowly tightening a nut on the bolt with a long spanner, the bush in the connecting rod can be slowly pressed out. A new bush may be fitted in like manner, and if a trifle large externally can be eased off with emery cloth. See that oil grooves are provided on the new bush.

Assembling Flywheels. Strictly speaking, a lathe and dial indicator are required for this job, but it can be done with a vast

amount of patience. The final test of truth is the absolute free running of the wheels when the crankcase is bolted up. The slightest suspicion of binding indicates that the wheels are not true. When the time comes for separating the flywheels in order to fit a new big-end bearing the best plan is to forward the complete crankcase to Plumstead.

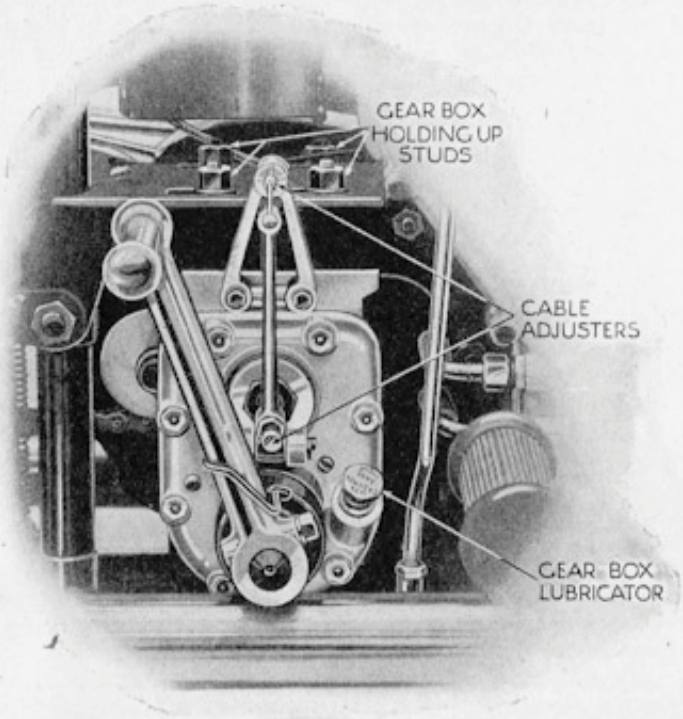


Fig. 31. The Heavyweight Sturmey-Archer Gear-box (1932–36)

If You Do Split the Crankcase. Be very careful first to withdraw the oil pump plunger on the dry sump models, otherwise serious damage will be caused. In order to withdraw the plunger first remove both end caps and also the guide screw and then push the plunger out large end first. When reassembling, the plunger must be replaced after the crankcase halves have been bolted together, and *before* you replace the end caps you must refit the guide screw with its relieved tip engaging the profiled cam groove in the plunger. By moving the plunger to and fro while introducing

the guide screw it is possible to find the correct location of the groove. The guide screw must finally be firmly screwed home.

How to Use the Foot Gear Control Without Causing Damage. There is one very important point which should be mentioned and this is the need for care in avoiding the application of excessive leverage on the foot pedal. With foot control it is very easy, especially in the case of muscular individuals, to put excessive force on the lever and possibly damage the control mechanism or gear selectors. On no account give a violent kick to the pedal, a steady pressure being quite sufficient. When changing gear the clutch should be released and the pedal moved simultaneously with

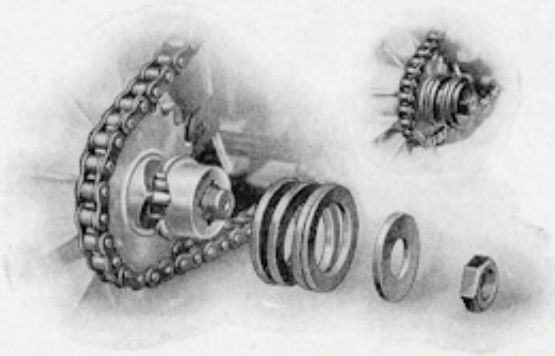


FIG. 32. THE TRANSMISSION SHOCK-ABSORBER

No attention in regard to lubrication or adjustment of the engine shaft shock-absorber is needed

a steady movement of the toe. On reaching the end of the pedal travel the pedal should be firmly held with the foot until the clutch has been re-engaged. It is not sufficient to merely kick the pedal and remove the foot when the end of the travel has been reached.

Primary Chain Adjustment (Burman Gear-box Models). To adjust the primary chain, it is possible to swing the gear-box bodily on its lower pivot bolt, and to carry out this adjustment the following instructions should be observed. Loosen pivot bolt nut. Then offside nut on the top gear-box fixing bolt must be slackened off. In tightening the front chain first slack off the nut on the adjuster bolt nearest the engine and turn the nut farthest from the engine clockwise, until a correct chain tension is obtained. To ascertain this, remove the small inspection disc on the chain cover; the tension of the chain can then be felt with the fingers. It is most important to leave about $\frac{3}{8}$ in. to $\frac{1}{2}$ in. up-and-down movement. When the correct chain tension has been arrived at, re-tighten the nut nearest the engine on the adjuster and also

the gear-box fixing bolts. Always adjust the primary chain before the secondary, and after making an adjustment check and if necessary adjust the gear control.

Adjusting the Primary Chain (Sturmey-Archer Gear-box Models). To adjust the chain slack off the nuts on top of bracket and slide the box bodily backwards by means of the adjusting bolt the necessary amount. It is important that the nuts are screwed tightly again after adjustment. The chain should be adjusted, and kept adjusted, so that the bottom run of the chain (visible on detaching the oil-bath inspection cover) can be pressed down in the centre with the finger about $\frac{3}{8}$ in. to $\frac{1}{2}$ in. After primary chain adjustment it is usually necessary slightly to alter the adjustment of the gear control, as described below.

Adjustment of Rear Chain. On all 1932–9 models, adjustment of the rear chain is obtained by sliding the rear wheel bodily backwards in the slotted fork ends. To adjust, first slack off the nuts on each side of wheel axle and screw the adjuster bolt in each fork end to exactly the same extent, taking care to leave the wheel in correct alinement (see page 74). It may be found that moving the wheel back will cause the rear brake to bind. This possibility should not be overlooked, and the necessary adjustment is easily made by means of the brake rod adjustment. The correct adjustment for the rear chain should allow a movement of $\frac{1}{2}$ in. to $\frac{3}{4}$ in. as the chain is lightly pressed up and down midway between the sprockets. It should be noted that it is advisable to check and if necessary adjust the tension of the primary chain before dealing with the secondary. For shortening a chain, a rivet extractor (price 5s. 6d.) can be obtained from Messrs. A.J.S. Motor Cycles.

In the case of machines with quickly detachable wheels (above 350 c.c.) it is necessary when slackening the wheel spindle nuts preparatory to chain adjustment also to slacken the large nut securing the brake drum dummy spindle. Both nuts are on the near side and concentric to each other.

Gear Control Adjustment (Hand). The Sturmey-Archer and Burman gear-boxes have a system of internal indexing of the various gear positions which makes adjustment of the gear control very simple.

To check the gear control adjustment on hand control models proceed as follows: Place the machine on the stand and remove the split pin from the top gear rod yoke end pin (i.e. the pin which passes through the end of the gear lever). Also at the same time slack off the lock-nut securing this top gear rod yoke end. Now place the gear lever into third gear position, and after removing the top yoke end pin from which split pin has already been withdrawn, lightly alternatively pull and push the gear rod by hand

in order to feel the action of the gear-box internal spring indexing plunger. As the sliding gears move either side of the correct third gear position the resistance of the spring plunger will be plainly felt, and the exact position at which this plunger is in full engagement with the third gear notch must be accurately and definitely found. Having established this correct position, offer up the gear rod to gear lever, which latter must, of course, be in the third gear position, in the case of four-speed models (second gear position on three-speed models) and screw the top yoke end up or down as the need may be until the pin can be quite freely inserted. Before locking the yoke end into position, it is advisable to again

KEY TO FIG. 33

1 = Mainshaft (splined)
2 = Layshaft (splined)
3 = Clutch sprocket
3A = Clutch shock-absorber
4 = Gearbox sprocket
5 = Mainshaft fourth gear
5A = Mainshaft sleeve
6 = Mainshaft second (sliding) gear
6A = Groove for striking fork
7 = Mainshaft first (sliding) gear
8 = Mainshaft third gear
9 = Layshaft driving pinion (keyed)
10 = Layshaft second gear
11 = Layshaft clutch
12 = Layshaft first gear
13 = Layshaft third gear (keyed)
14 = Mainshaft K.S. pinion
15 = Clutch actuating lever
16 = Clutch cable adjustment
17 = Clutch operating plunger
18 = Clutch adjuster screw and locknut
19 = Clutch spring plate
20 = Clutch springs
21 = Clutch spring cup
22 = Clutch spring adjuster
23 = Clutch centre
24 = Clutch disked back-plate
25 = Clutch friction insert plates
26 = Clutch-driven steel plates
27 = Worm speedometer drive

obtain by hand the exact position of third gear as already described, and check the rod length for correct setting, after which the yoke end may be secured by means of its lock-nut and the pin refitted. It must be understood that if the correct adjustment is obtained for the third gear all the remaining gears will also be correct as regards rod adjustment.

Attention to Clutch (Sturmey-Archer). This has no adjustment for the spring tension and the pins must always be screwed up dead tight, but the rider should always see that there is a little backlash in the handlebar lever so that the clutch springs can always exert their full pressure. To give the correct (about ½ in.) backlash in the Bowden lever on the handlebar, adjust on the S.A. gear-box models by means of the operating shaft adjustment screw shown in Fig. 31. A further adjustment is also provided at the arm through which the cable passes.

Attention to Clutch (Burman). Two separate adjustments are provided to compensate for stretch of the clutch cable and wear of the clutch thrust rod. With the clutch correctly adjusted it should be possible to move the handlebar lever about ½ in. (measured at the lever end) before actual declutching commences. Minor adjustment may be made by means of the cable stop and

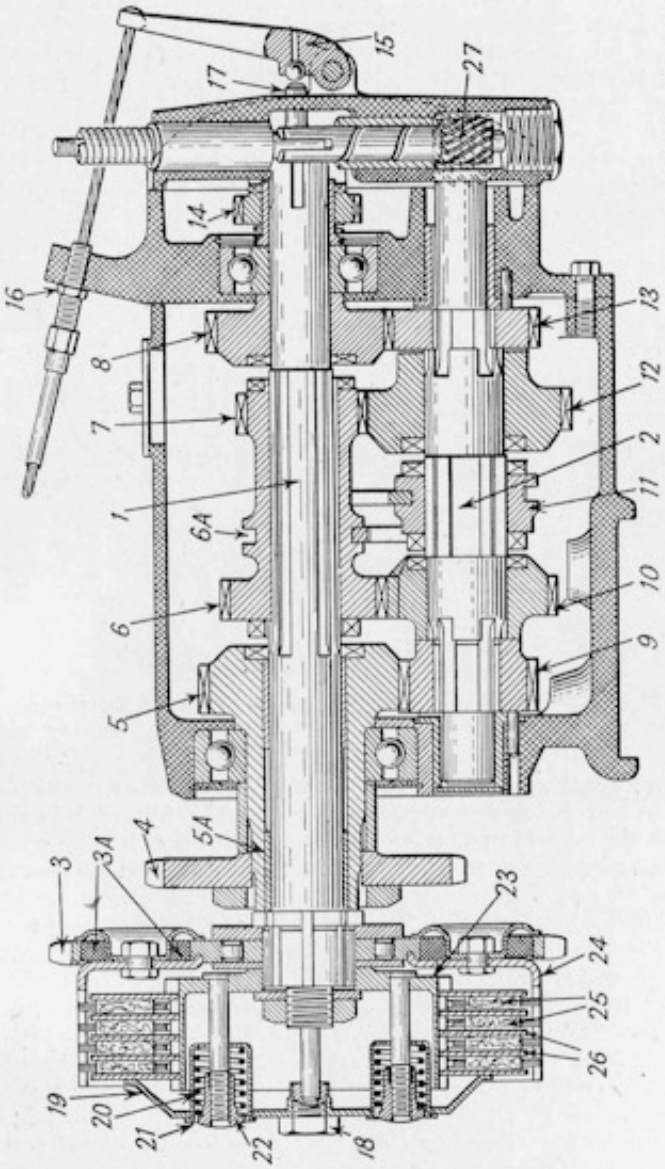


FIG. 33. SECTIONAL VIEW OF BURMAN FOUR-SPEED GEAR-BOX AND FOUR-PLATE SHOCK-ABSORBER CLUTCH
The key to the number parts is given opposite. This gear-box assembly is fitted to most 1932–7 models

lock-nut (see Figs. 33, 34). Major adjustment is effected as follows.

On the latest gearboxes with enclosed clutch mechanism (Fig. 34) the fulcrum of the gearbox clutch lever is adjustable. To adjust, remove the small raised plate secured to the gearbox end cover by two screws, and then turn the sleeve nut exposed *anti-clockwise* to take up wear between the clutch thrust rod and the operating lever, or *clockwise*, if the lever is bearing on the clutch thrust rod and causing slip.

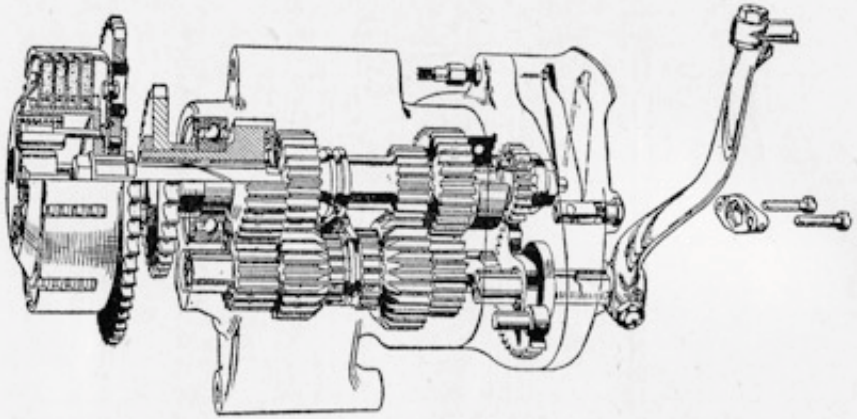


FIG. 34. 1938–9 BURMAN FOUR-SPEED GEARBOX WITH ENCLOSED KICK-STARTER AND CLUTCH MECHANISM

On some gearboxes (H.P. type) there is a centre screw and lock-nut in the clutch spring pressure plate (Fig. 33), and wear on the clutch thrust rod may readily be taken up by the screw.

On other gearboxes (CAP, BAP type) the adjustment consists of a screw on the clutch operating lever on the gearbox. Access to the screw is by disconnecting the clutch cable from the operating lever. This enables the lever to be hinged downwards and the screw adjusted.

To Disconnect Clutch Cable. If it is necessary to disconnect the clutch cable for replacement or repair in the case of a gearbox with enclosed clutch mechanism, unscrew the large plated knurled nut on the top edge of the gearbox end cover, or on some 250 c.c. and 350 c.c. machines remove the steel plate (held by two nuts) from the front of the gearbox immediately below the point where the clutch cable enters.

If the Clutch Slips. First of all attend to the above adjustments, but if slip persists, screw in the spring adjuster nuts (22, Fig. 33)

exactly *half a turn*, test for slip and repeat, if necessary. The correct adjustment of these nuts is normally *five* complete turns from fully home. Be very careful to tighten the nuts all the same amount and not excessively, otherwise difficulty in releasing the clutch will be experienced.

Dismantling Burman Clutch. To remove the clutch plates, unscrew the spring adjuster nuts and remove the springs, spring cups, and take off the outer pressure plate, when the other plates may be withdrawn. If desired, the complete clutch assembly may be removed after taking off the spring plate, by unscrewing the nut which holds the clutch body on the castellated main-shaft. All 1939 clutches have three friction plates, except those fitted to the Competition models, which have four.

Dismantling Sturmey-Archer Clutch. The Sturmey-Archer clutches used with the three-speed and four-speed gear-boxes are of the single and multiple spring pattern. Dismantling of either type is a comparatively simple matter.

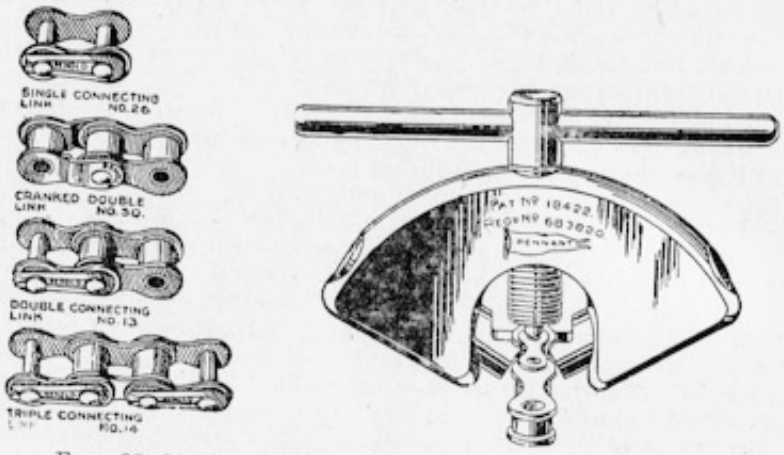
In the case of a single spring clutch, first unscrew the end cap, using either a special spanner or a hammer and punch. Note should be taken that it has a R.H. thread and must be unscrewed in an anti-clockwise direction. Now unscrew the clutch adjuster nut which is exposed and has also a R.H. thread. The clutch spring and collar can then be removed, allowing the clutch plates to be withdrawn. Be most careful when doing this to note the exact position of each plate so as to ensure their being replaced correctly. If the clutch inserts are thin but otherwise sound, extra spring tension may be obtained by removing one of the washers placed under the clutch adjuster nut. After reassembly be quite sure that the end cap is screwed up thoroughly tight.

With a multi-spring clutch unscrew the six screws which hold the clutch springs and then remove the springs and their boxes. It is then possible to lift off the spring box plate and withdraw the other plates as in the case of the single spring clutch. After reassembly it is important to tighten up fully each of the screws holding the springs so as to ensure the springs maintaining an even pressure all round. If this is not done some clutch "drag" may occur.

Removing Oil-bath Chain Case Cover. To do this on 1932–5 "Magdyno" singles, first remove the footrest arm and distance pieces, brake rod, yoke end pin and brake pedal. On 1938–9 Twins dismantle the clutch. Remove the securing pin in the aluminium band round the chain cover, after which it is possible to take away the outside half of the front chain cover. The replacement of these parts is quite a simple matter, and the remaking of an oil-tight joint round the edge of the cover is not difficult, as a rubber seal is used underneath the aluminium retaining strap. See Figs. 13, 14.

Coupling up a Chain. Always reconnect a chain with the spring link on a sprocket. This makes it perfectly easy, as all tension can be resisted by the teeth, and not by stretching the chain by hand. Also see that the open end of the spring faces the opposite direction of chain rotation. Also fit the plate and spring clip so that they are on the outside of the chain.

Chain Repairs. Chain repairs are rarely necessary, but broken rollers may occasionally be found. When they are, they may be



FIGS. 35, 36. CHAIN REPAIR PARTS AND RIVET EXTRACTOR

readily repaired with the aid of a box of chain repair parts and a "Pennant" chain rivet extractor. Fig. 35 illustrates all the parts necessary to repair any fracture. To shorten a chain having an even number of pitches, replace by parts No. 30 and 26. To shorten a chain containing an odd number of pitches, replace by parts No. 13. To repair a chain with a broken roller or faulty inside link, replace by parts No. 14. For joining up lengths with inside ends, use part No. 26.

The "Pennant" rivet extractor is shown in Fig. 36, where the outer link of a chain is shown ready for rivet removal, the rivet which is case-hardened and incapable of being filed down, being forced through the bush by screw pressure. Before attempting to extract a rivet, compress the ends of the jaws to obtain a grip on the chain roller. To remove complete links, screw down the punch on to the head of each rivet in turn through the top plate (Fig. 35). Both rivets should be pushed out from the same side of the chain. To remove broken links, insert the chain roller between the jaws and then screw down the punch until the rivet

head is pressed through the top plate. On removing the extractor the link will fall out.

Play in Steering Head. All play on earlier models should be taken up by means of the domed lock-nut and nut adjustment. The adjustment should not be too tight, or the balls in the steering head may be damaged. Keep this bearing well lubricated. To take up slack loosen the domed nut and screw down the nut below. It is advisable in all cases when adjusting the steering head to place a box or some other article beneath the engine so as to take the weight off the front wheel and allow the forks to move freely. Also slacken off the steering damper.

On all A.J.S.'s of recent manufacture the steering head races are of the floating self-alining type with spherical seats. Occasionally test the head for slackness by exerting pressure upwards from the extreme tips of the handlebars with the steering damper completely slacked off. If any shake be noticed, slacken the pinch bolt of the handlebar clip lug which encircles the steering column, and screw down the large nut beneath the steering damper knob. As already stated, the front wheel should have the weight taken off it.

Handlebar Adjustment. All A.J.S. machines are fitted with adjustable handlebars. If the rider wishes to make any adjustments, slacken off the bolts which pass through the split lugs which connect handlebars to forks. It is important, however, that these bolts are carefully tightened up after this operation.

How to Adjust the Saddle Position. To adjust the position of the saddle, the pin and nut at the front (early models) should be unscrewed, and the nut that fastens the top of the coil springs to the undercarriage should be slacked off enough to allow the saddle to be moved into whichever of the three positions the rider desires. Afterwards the pin and nut must be tightened up and the rear spring again securely fastened down.

Spring Fork Adjustment. To take up any play that may have developed in the side links, unscrew the spindle lock-nuts on both sides of the forks and (looking at the machine from the front) turn the spindles by means of the hexagon heads seen on the left-hand side until all slack is taken up. Afterwards tighten up lock-nuts.

The need for adjusting the fork spindles is indicated usually by a click or creaking noise when the steering is sharply turned. To ascertain exactly which spindle or spindles require adjusting turn the steering head with the fingers partly over the spindle link end and partly upon the spindle lug. The spindles are tightened by *clockwise* rotation and, when adjusting, rotate half a revolution at a time before testing with the nuts tightened. Be careful not to overtighten the spindles, as this will cause unpleasant stiff

fork action. The fork shock-absorbers have an entirely independent adjustment.

Fork Shock-absorber Adjustment. Ride the motor-cycle to a corrugated patch of road such as occurs on lively bus routes, and then tighten down the ebonite damper knob until the fork

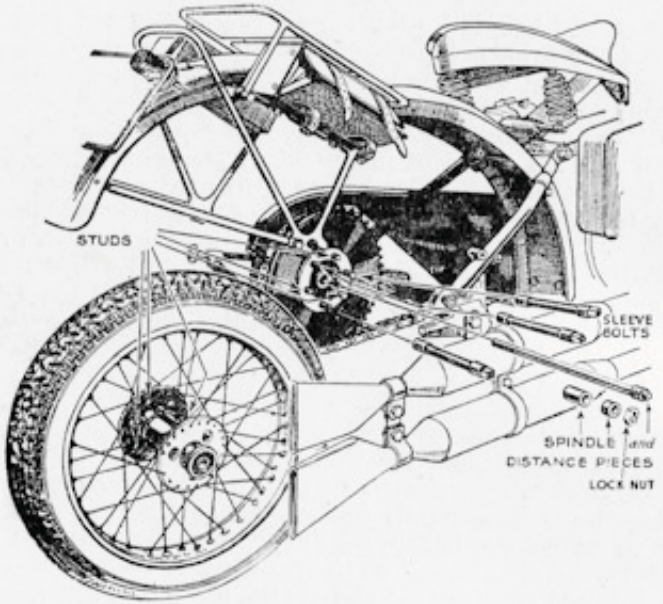


FIG. 37. SHOWING ARRANGEMENT OF QUICKLY DETACHABLE REAR WHEEL AND HINGED MUDGUARD

Above is shown the rear wheel removed from a Big Twin on which machine both wheels are quickly detachable and interchangeable. A quickly detachable rear wheel is also provided on 500 c.c. Models

action becomes just sluggish. On normal roads maximum comfort will then be obtained.

Removing Rear Wheel. The rear wheel on many 1932–9 A.J.S. machines is of the quickly detachable type. It can be removed in 30 seconds! In the case of other models, the wheel and driving sprocket are permanently bolted together. To remove the wheel it is necessary to remove the rear chain guard and the adjustable nut on the brake rod, also the spring. Next proceed to remove completely the brake anchor plate pin and raise the tail portion of the rear mudguard by unscrewing the stay bolts. The wheel can then be removed after disconnecting the secondary chain and undoing the spindle nuts.

To remove the detachable wheel proceed as follows: On machines with the detachable wheel put the machine on the stand and unscrew the two pins, holding the stays of the hinged portion of the rear mudguard to the frame. This hinged portion can then be swung out of the way. Now remove the axle nut on the left-hand side, and with the box spanner provided then unscrew the three sleeve-nuts which pass through the hub flanges. These three sleeve-nuts extend right through the wheel and rear hub flange (as may be clearly understood by reference to the illustration on page 70), and screw on to the three threaded studs on the driving sprocket. There are also three plain studs on the sprocket which act as dummy drivers. These fit into the three remaining holes in the hub flange. After the sleeve-nuts have been unscrewed, then unscrew the centre pin and draw it out completely, together with distance piece(s). The space now left by the inner distance piece will enable the wheel to be drawn off the driving studs on the sprocket and removed from the fork ends.

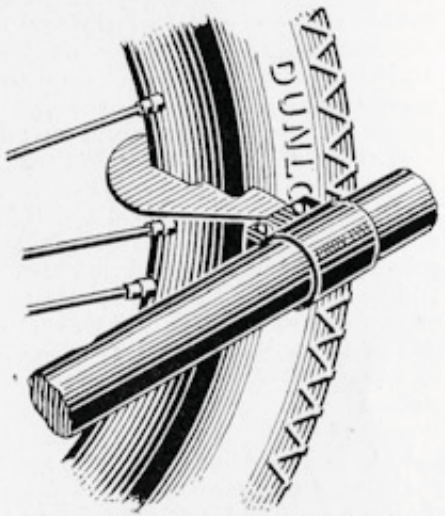


FIG. 38. REAR WHEEL ALINEMENT GAUGE (1932–5 Heavyweights)

To replace the wheel, push it squarely on to the driving studs and next (with the distance piece(s) in position) screw up the centre pin moderately tight. The three sleeve-nuts can now be screwed up tightly, afterwards giving a final turn to the centre-pin. It is exceedingly important to point out that when the centre pin is removed, the wheel is hanging on one fork only, so any rough treatment must be carefully avoided, or there is great danger of straining or breaking the fork end. UNDER NO CIRCUMSTANCES MUST THE CENTRE PIN BE REMOVED UNTIL THE MACHINE IS JACKED UP, and the pin must always be in position before the machine is run off the stand. If the wheel is difficult to pull off the driving studs, screw in centre pin a few turns (without distance piece). This will steady the wheel while drawing off the driving studs. Periodically test the centre pin and sleeve-nuts with a spanner and keep them tight. If the sleeve-nuts are loose a dull hammering is perceptible at low speeds. If this is noticed,

tighten instantly. If desired, of course, the wheel can be taken out complete with chain sprocket and brake drum, as in the case of models without quickly detachable wheels. All wheels are now disc-adjusting. Don't allow the hubs to run loosely, but see also that they are not over tight (page 73). Sidecar outfits have all three wheels interchangeable.

To Fit a Tube Without Removing the Wheel. On models having quickly detachable wheels a new tube can be fitted with the wheel in position. Lever off one side of the tyre cover and detach the tube in the usual way. Then remove the centre pin and distance piece only, leaving the sleeve nuts intact. This will leave ample room to enable the tube to be drawn out and other one passed through. Replace the distance piece and centre pin and proceed to refit the tube and cover in the usual way.

A Faulty Kick-starter Return Spring. If any difficulty is experienced with the return of the kickstarter crank after starting up the engine, this would be due to the spring not having enough tension. To overcome this difficulty, the kickstarter crank should be removed and also the cover for the spring. You will then notice that the end of the spring is fitted into the first of a series of holes to the right. To get additional tension, the end of the spring should be fitted into one or more holes farther to the right, which should produce the desired effect. Under no circumstances whatever should the spring be given an additional complete turn. The above applies to S.A. gearboxes.

Rear Wheel Alinement. On the right-hand side of the bottom chain stay is a piece of sheet metal, held in position by a clip, on some 1932–5 A.J.S. models. In the tool kit will be found a flat gauge that can be fitted round the rim (see Fig. 38). When replacing the rear wheel after removal, or after making a chain adjustment, place the gauge on the rim with the extension to the right, and set the wheel so that the edge of the gauge just touches the plate that is held in position by the clip on the chain stay. This ensures the wheel being correctly alined, and must be done before finally tightening up the spindle nuts. Do not attempt to unscrew the clip from the chain stay, as the position of the plate is set correctly before the machine leaves the factory. It is important that the gauge should bed properly on to the rim on both sides; the best method of ensuring this is to see that the hooked end is properly encircling the bead of the rim. Then pull the gauge end into place firmly. Some pressure is necessary to apply the gauge when the tyre is highly inflated.

Care of Ball Bearings. Periodically shake and pull the road wheels sideways with machine on the stand to see if there is any shake. If any side play exists, slacken locking ring and turn adjuster ring until *all* play disappears. Then slacken ring one

quarter of a turn and retighten locking ring. The wheel should be free enough for the weight of the valve to determine its position.

Dismantling and Re-assembling Taper Roller Bearings. To dismantle, release the locking-ring and screw out the adjusting ring. The dished plate containing felt washer and plain plate will then drop out. Take out spring ring from the opposite side of hub and remove felt washer and holder consisting of two plates and retaining ring, the latter being between the two plates. The spindle can now be pressed or driven out from either end, bringing with it one of the outer races. The other race can then be driven out.

To re-assemble, press in outer race on fixed or plain end of hub, *taking great care that it goes in square.* This race is pressed in about $\frac{1}{32}$ in. beyond its actual position, to enable the felt washer and its retaining ring together with the two plates to be put in, and the spring ring to snap into its groove. *Care must be taken to put the plate with the larger hole in last. This is most important.* This outer race can now be forced back until the plates are tight on the spring ring. The spindle can now be inserted, the short end being placed in first. *The long end of the spindle must be on the adjusting side.* The other race can now be pressed in until there is about $\frac{1}{16}$ in. *end play in the spindle.* Insert plain plate and dished plate with felt washer, screw in adjusting ring, *and gradually screw down until there is just a fraction of end play in the spindle.* This should be ·002 of an inch.

It is of the utmost importance that the bearings are not adjusted too tight, as this would ruin them in a few miles. Having got this adjustment correct, the locking ring can be put on and tightened up, *again taking care that the adjusting ring does not creep forward and make the bearings too tight.*

Removing Front Wheel. Disconnect cable or rod yoke end from brake operating lever, remove anchor plate bolt (where fitted) from fork end, and after slackening off spindle nits the wheel will fall out of the slots in the fork ends.

Brake Adjustments. The brakes require no attention, with the exception of occasional adjustment of the control mechanism. In the case of the rear brake, this is effected by giving a few turns to the adjusting disc. The front brake adjustment is carried out in a similar manner by finger adjustment on top of the fork girder, or else on recent models by a milled nut at the side of the forks. If the ratchet rear brake on an "Export" model does not operate correctly, it is due to the brake adjustment being either too fine or the reverse. Move the adjuster at the end of the brake rod backwards or forwards until the position in which the ratchet device functions perfectly is found. See also page 76.

Frayed Control Wires. As soon as control wires show signs of bad fraying, renew. Once they start to wear badly their end is

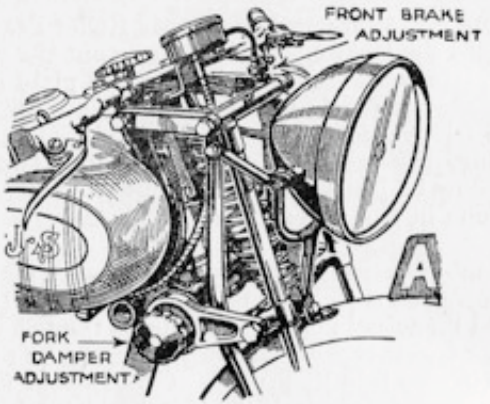


FIG. 39. 1935 FRONT BRAKE AND FORK DAMPER ADJUSTMENT

imminent, and should this take place while out on a long run great inconvenience may be caused. Always keep cables well lubricated at exposed places and where they bind (see page 29).

Loose Spokes. If spokes work loose in either wheel, retighten with a spoke key. Be careful while doing this to maintain the truth of the wheels. All spokes should be equally tensioned. On plucking with the finger they should all emit a note of the same pitch. The alinement gauge should assist truing the rear wheel, if this is required. Perhaps the best method of truing is to hold a piece of chalk against the rotating rim and observe by the chalkmarks the evenness of contact, adjusting spokes accordingly.

Wheel Alinement. This is highly important, having regard to tyre wear. Check by means of straight-edges placed across the wheels. Needless to say the axes of all three wheels on a sidecar must be parallel. Some riders prefer to make distance *B* $\frac{1}{4}$ in. less than distance *A*. The method of precedure is self-evident (Fig. 40). The cycle should be fixed so that it is dead upright or leaning

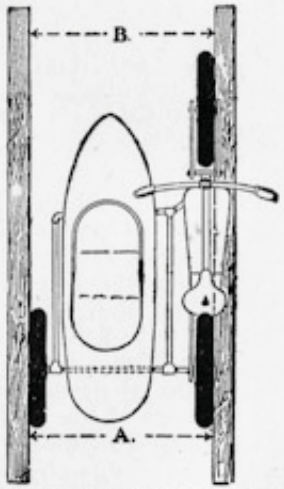


FIG. 40. SIDECAR ALINEMENT
The distances *A* and *B* must be equal

in very slightly. (See also page 72.) On a solo model see that the board or straight edge touches each tyre at the front and rear.

Sidecar Alinement. If a sidecar outfit has a tendency to steer to the right or left due to reasons other than road camber, the motor-cycle is probably not upright or else the sidecar itself is out of alinement (see page 74). After a new A.J.S. sidecar has done a considerable mileage it occasionally happens that the sidecar fittings take a permanent "set," causing the machine to lean slightly towards the sidecar. This trouble can be easily cured by means of the adjustable arms.

Keep Tyre Pressures Correct. Upon the maintenance of correct inflation pressures depends comfortable riding, freedom from skidding, and, most important of all, long life from the tyres.

TYRE PRESSURES FOR SINGLE-CYLINDER MODELS

Tyre	Section	Pressure (Solo)	Pressure (With pillion)
Front	26 × 3·25	16–18 lb.	18–20 lb.
Front	26 × 3·00	20–22 lb.	22–24 lb.
Rear	26 × 3·25	20–22 lb.	22–24 lb.
Rear	26 × 3·50	16–18 lb.	18–20 lb.
Sidecar	26 × 3·25	—	14–15 lb.

Pressures should be checked weekly with a Schrader pressure gauge, and if found above or below the recommended pressures, rectified accordingly. The correct pressures for A.J.S. machines

TYRE PRESSURES FOR TWIN-CYLINDER MODELS

Tyre	Section	Solo	Single S/c	Double S/c
Front	27 × 4·00	14–15 lb.	15–16 lb.	15–16 lb.
Rear	27 × 4·00	16–18 lb.	18–20 lb.	20–22 lb.

are tabulated above. If the driver is abnormally heavy or a heavy pillion passenger is carried, 2 lb. per sq. in. should be added to the rear tyre only.

When Replacing a Cover. It is important when replacing a wired-on cover to see that the cover runs truly, otherwise the steering may be affected. Avoid straining the wires when replacing or removing it. The proper method of removing a cover is to deflate the tube and then push the edge of the cover right

down into the base of the rim exactly opposite the valve before beginning to take the cover off, which should be done without using force. When refitting a cover, slightly inflate the tube and put the cover on, starting opposite the valve. The cover should slip on readily, provided the edge is kept bedded down into the rim right round. Finally, half inflate and make sure that the edges are properly located. Both before and after full inflation the wheel should be spun in order to check the truth of running of the cover.

Note Regarding 1939 Brake Shoes. The brake shoes on all 1939 models incorporate adjustable hardened steel pads to take the load of the brake expander cam and allow the full life of the friction lining to be utilized. To take up lining wear, remove the pads and place shim washers on the heel pad stems sufficient to centralize the brake expander. It is hardly necessary to mention that the steel pads prevent the wear that normally occurs when the expander bears directly on the aluminium shoes.

CHAPTER V

CARE OF LIGHTING EQUIPMENT

THIS chapter deals solely with the lighting system, the ignition components having been dealt with in the previous chapter. On single-cylinder A.J.S. models of recent years a separate Lucas dynamo is fitted (magneto ignition machines) or else a Miller dynamo (coil ignition machines). Many earlier type singles, however, have Lucas "Magdyno" equipment, and this is provided on present and past twin-cylinder models. Since 1937 automatic voltage control has been a feature common to all models. Conversion sets are available for earlier Lucas dynamos.

DYNAMO MAINTENANCE

Before Removing the Dynamo Cover. Disconnect the positive lead of the battery* to prevent the possibility of the dynamo polarity being reversed or the battery being short-circuited and the ammeter burnt out.

On Lucas equipment a brass connector connects the lead from the positive terminal of the battery to the switch lead, and to disconnect first remove the rubber shield and then unscrew the cable connector, taking care that it does not touch any metal part of the frame. If it does touch, a spark will show that the battery has been well and truly shorted. Pull the rubber shield well over the connector when again reconnecting.

If at any time the motor-cycle must be ridden with the battery disconnected, or in any way out of service, it is essential to run with the switch in the "OFF" position. This does not apply when automatic voltage control is fitted.

The Commutator and Brushes. With a new dynamo no attention to the commutator is needed for several thousand miles, but afterwards it is advisable to remove the commutator cover about every 1000 miles and inspect the carbon brushes, which must be absolutely clean and able to move freely in their holders, on holding back the retaining spring and gently pulling the leads and then releasing them. There must also be perfect contact between the brushes and the copper segments; the brush faces in contact with the commutator should be uniformly polished. To clean the brushes with a petrol moistened cloth, pull back each brush-retaining spring and remove the brush by pulling on

* For safety's sake it is advisable to do this whenever any alterations to the wiring are made or whenever any of the leads are disconnected.

its lead, being careful to see that the brush pressure spring is clear of the brush holder. Examine the brushes for wear and unevenness and true up if necessary. Generally it is best to replace the brushes before serious wear develops, as this prevents sparking which causes blackening of the commutator and an unsteady charging current.

If Lucas brushes become so badly worn that it is necessary to remove them, this can easily be done as follows: Release the eyelet on the brush lead by unscrewing the hexagonal nut or screw

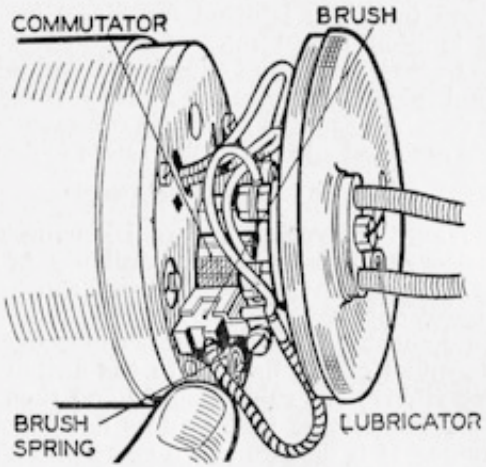
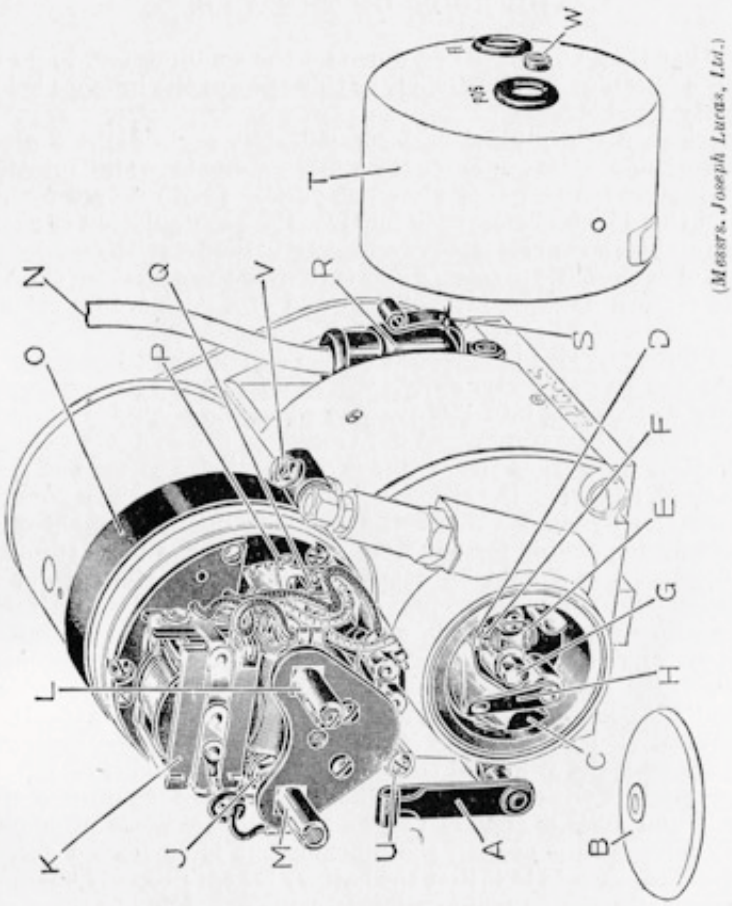


FIG. 41. COMMUTATOR END OF LATEST LUCAS DYNAMO

As may be seen, the "third brush" and cut-out are omitted on all recent generators which have automatic voltage control. Some thin machine oil should be inserted in the lubricator every 4000–5000 miles

at the terminal; then, holding back the spring lever out of the way, withdraw the brush from its holder. Replace with genuine Lucas brushes.

The brush springs should be inspected occasionally to see that they have sufficient tension to keep the brushes firmly pressed against the commutator when the machine is running. It is particularly necessary to keep this in mind when the brushes have been in use a long time and are very much worn down. Owners are cautioned that it is unwise to insert brushes of a grade other than that supplied with the machine, or to change the tension springs. The arrangement provided has been made only after many years' experience, and will be found to give the best results and the longest life. It is really best when the brushes become so



KEY TO FIG. 42

A = Securing spring for contact-breaker cover
B = Contact-breaker cover
C = Fibre heel
D = Contact points
E = Locking nut
F = Adjustable contact point
G = Contact-breaker fixing screw
H = Locating spring
J = Nut securing brush eyelet
K = Cut-out
L = Terminal marked "F1"
M = Terminal marked "Pos."
N = Cable to sparking plug
O = Dynamo securing strap
P = Spring lever holding brush in position
Q = Carbon brush
R = Pick-up
S = Securing spring for pick-up
T = Cover
U = Earthing terminal
V = Screw securing dynamo strap
W = Cover fixing screw

FIG. 42. THE LUCAS "MAGDYNO" WITHOUT AUTOMATIC VOLTAGE CONTROL

(*Messrs. Joseph Lucas, Ltd.*)

worn that they no longer bed down on the commutator, to go to a Lucas or Miller Service Depot, as this ensures the brushes being properly "bedded."

To clean a badly blackened commutator, press (with a piece of wood) fine glass-paper against the segments while rotating the armature; afterwards blow out particles with a tyre pump. Should there be no blackening but just the accumulation of some grease and carbon dust, remove a brush and hold a cloth moistened in petrol against the segments and turn over the armature slowly. If the segments are highly polished and of a *dark bronze* colour, leave them alone.

The Cut-out. This is mounted on the dynamo end bracket and constitutes an automatic switch whose duty it is to prevent the battery discharging into the dynamo when the engine is running slowly or is stationary. When the voltage at the dynamo exceeds the battery voltage as the engine is accelerated, the cut-out contacts close, and when the speed is reduced and the battery voltage exceeds the dynamo voltage the contacts open, so making it absolutely impossible for the battery to discharge back through the dynamo. It should be noted, however, that the cut-out is not intended to and cannot prevent over-charging of the battery. Automatic voltage control, however, does prevent over-charging.

If by any unlucky chance the dynamo polarity becomes reversed, the remedy is to run the engine *slowly* with the switch in the "C" position and then press the cut-out contacts together momentarily. In the case of Miller dynamos, press the contacts together with the switch in the "H" position. (See below.)

Automatic Voltage Control. The control unit comprises the cut-out and voltage control (working on the trembler principle) neatly housed in a box on the machine. It is connected across the brushes and sees to it that the battery is kept properly charged automatically, the dynamo output varying according to the state of charge of the battery and the load. The regulator begins to operate when the dynamo voltage reaches about 7·3 volt. With this equipment the switch resistance is omitted and there are only three positions—"Off," "L," and "H," for the switch. In all three positions the dynamo gives a controlled output, thus relieving the rider of much responsibility. During daylight running when the battery is well charged the ammeter may indicate a charge of only 1 or 2 amperes, for the dynamo gives only a trickle charge. This may occur with the switch "Off." If the battery is low the ammeter may show 6 amp. The voltage control unit is sealed by the makers and should not be tampered with, the only likely trouble being oxidizing or welding together of the contacts due to accidental crossing of the dynamo field and positive leads. If a "Lucas-Knife" battery is fitted, the

regulator should be changed at a Lucas service depot. Excellent service is given at Lucas and Miller depots and the reader is advised to call at one whenever any spot of bother is encountered in regard to the electrical equipment.

Keep the battery connections clean and tight, otherwise the ammeter readings will suggest a fully charged battery when such is not the case. Also do not neglect a badly discharged battery. See that the dynamo to regulator cable insulations are correct and that the connections are good. The earth contact of the regulator must also be perfect.

What the Ammeter is For. This centre-zero instrument which shows a charge on one side and a discharge on the other is provided to give a reading of the amount of current flowing to and from the battery. It indicates whether or not the electrical equipment is functioning satisfactorily.

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

Lucas Terminals. The positive dynamo terminal, marked "D," and the shunt-field terminal, marked "F1," are situated on either side of the cover (Fig. 42). To connect up, the cables merely have to be bared and clamped in their terminals by means of grub screws.

On the latest generator (Fig. 41) with separate voltage control unit the positive dynamo terminal is marked "D" and the shunt-field terminal "F" on the cover. To connect up, first slacken the fixing screw on the terminal block and remove the clamping plate. Then withdraw the metal sleeve from each terminal. The cables should then be passed through the clamping plate holes and bared at the ends for $\frac{3}{8}$ in. Now fit the sleeves over the cables, bend back the wires over them and push the sleeves home into the terminals, finally screwing down the clamping plate.

CARE OF THE BATTERY (LEAD-ACID TYPE)

It is of the utmost importance that the battery should receive regular attention to keep it in good condition.

The following are the most important maintenance hints—

1. Keep the acid level to the top of the separators.
2. Add only distilled water, never tap water.
3. Test the condition of the battery by taking readings of the specific gravity of the acid with a hydrometer.
4. The battery must never be left in a discharged condition.

Topping Up. Examine the acid level about once a month, and even more frequently in hot weather and tropical climates. Be careful not to hold a naked light near the vent holes. If the

level is below the tops of the separators, add distilled water as required. This should be added just before a charge run, as the agitation due to running and the gassing will thoroughly mix the solution. If the solution has been spilled by accident, add diluted sulphuric acid of equal specific gravity to that in the remaining cells. When the inspection is carried out, hydrometer readings (specific gravity values) should be taken of the solution in one of the cells, and occasionally of that in all the cells. These readings are the most reliable method of indicating accurately the condition of the cells. Keep the battery connections clean and free from acid. Smear well with vaseline to prevent corrosion.

Charging Hints. The amount of charging on machines without automatic voltage control varies considerably owing to various running conditions. If the light is poor and falls off when the machine is standing, charging should be immediately carried out. It is difficult to lay down rigid instructions on the question of charging, since it largely depends upon the extent to which the lamps are used. With the coil ignition models more charging is necessary than with the magneto ignition models, since the current is used for ignition and lighting. The following suggestion may serve as a rough guide: leave the switch in the "charge" position during the day for about 50 per cent of the night riding (a slight charge should flow to the battery when running with lamps on). Charging a battery after discharge raises the specific gravity, and discharging lowers the specific gravity. Place on charge, either by running the engine or using an independent electrical supply, immediately any battery whose specific gravity has fallen as low as 1·210. Take hydrometer readings whenever trouble is experienced with any part of the electrical system. *The correct specific gravity reading is* 1·260–1·280 in the case of the Miller batteries (fully charged at 60° F.) and 1·285–1·300 for Lucas batteries.

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

LAMPS

How to Adjust Focus (Miller Headlamps). To detach the lamp front, release the spring clip at the bottom and pull the front off. To focus the bulb, insert it in the bulb-holder until the bayonet fixing pins are right home and give a further twist to the right. This will enable the bulb and holder to be slid backwards or

forwards until the correct focus is obtained. On releasing the extra twist, the bulb is securely held.

A good method of focusing the headlamp is to take the machine to a level plot of ground and place it so that the lamp is about 40 yards from a fence or wall and measure the distance from the centre of the headlamp to the ground and chalk on the fence or wall a mark at the same height. Then switch on the main bulb and note if the centre of the beam coincides with the mark. If it does not do so, loosen the headlamp bracket nuts and tilt the lamp as required. Then proceed to focus for intensity of light as described in the preceding paragraph.

How to Adjust Focus (Lucas Headlamps). On machines with or without an instrument panel the focusing of the headlamp is carried out in the same manner. To focus the main bulb it is necessary to remove the lamp front and reflector by pressing back the fixing clip. Then slacken the clamping screw which secures the bulb-holder and move the bulb-holder and bulb until correct focus is obtained. Afterwards tighten the clamping screw. To remove the bulb-holder it is only necessary to press back the two securing springs. When replacing the lamp front and reflector the top of the rim should be located first.

Miller Bulb Replacements. The correct bulbs to fit are as follows. On coil ignition models fit a 6V. 24–24 W. double-filament main bulb and 6V. 3 W. S.C.C. sidecar, pilot and tail bulbs. For the ignition tell-tale a 2·5 V. flashlamp bulb is suitable except where automatic voltage control is fitted. In the latter case 8 V. ·1 amp bulb should be used.

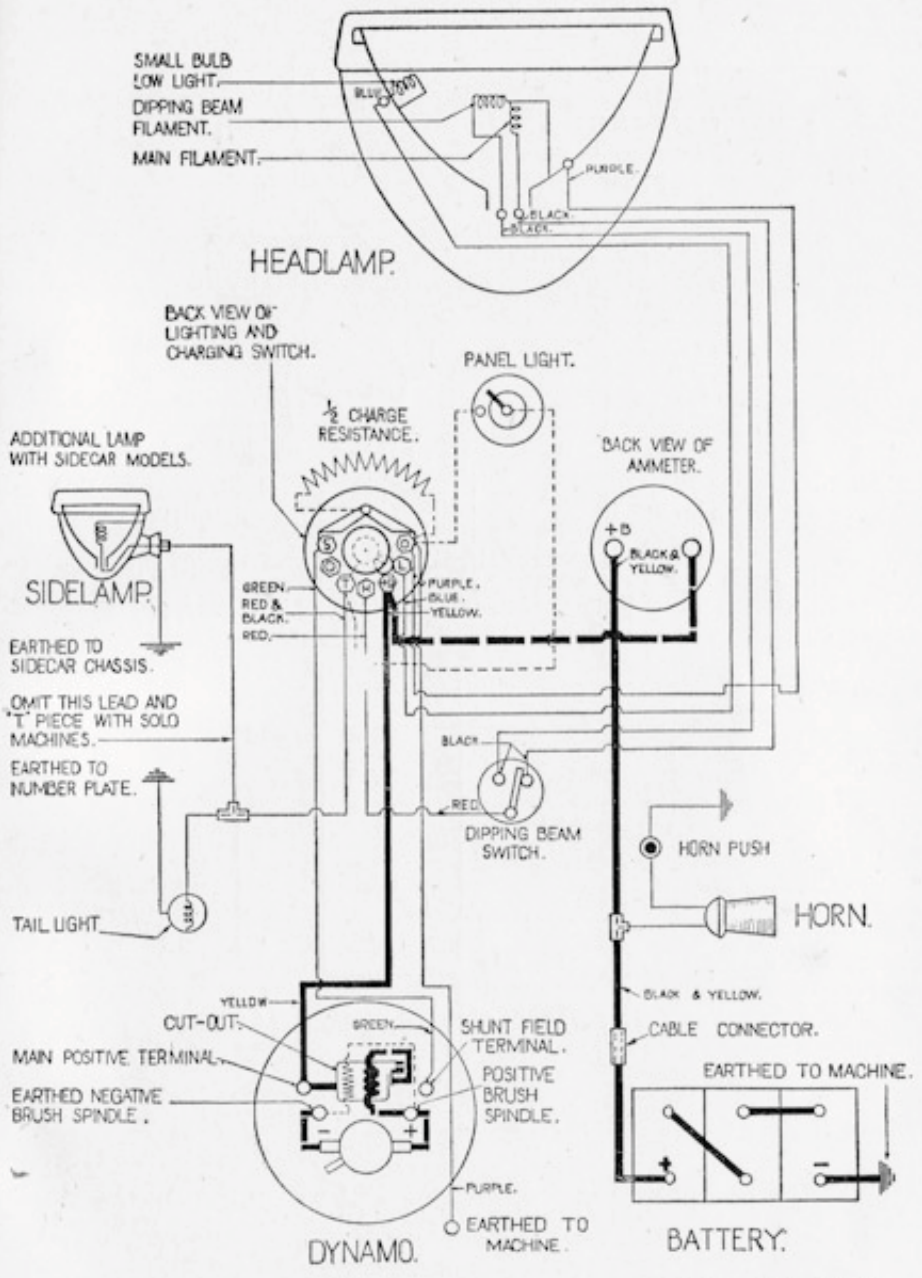
Replacement of Lucas Bulbs. When the replacement of any bulb is necessary, genuine Lucas bulbs should be used. The filaments are arranged to be in focus, and give the best results with Lucas reflectors. When it is found necessary to replace the main headlamp bulb, screw it out two or three turns in an anti-clockwise direction. This will release the pressure on the bulb contacts and enable the bulb to be withdrawn easily. Care should be taken that the bulb is fitted the correct way round, i.e. with the dipped beam filament above the centre filament. Always focus the leadlamp after fitting a new bulb.

The number of the bulb for the headlamp driving and dipped beam light is 70; and that of the headlamp pilot, side-car, panel, and tail lights, 200. These two bulbs are of the gas-filled and centre contact type respectively.

Keep the Reflectors Clean. Wipe over chromium-plated surfaces with a damp cloth to remove dirt or dust and polish ebony black surfaces with a good furniture or car polish. Metal polish is taboo. Lightly polish with a soft cloth or chamois leather the transparent reflected covering.

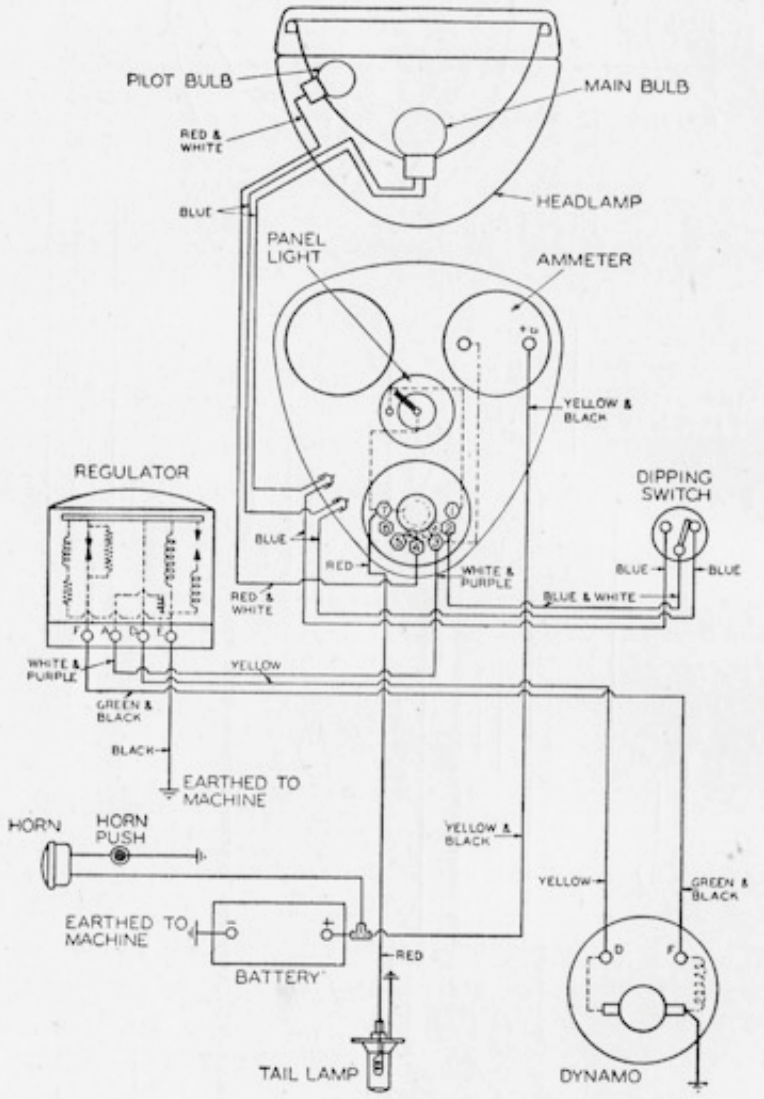
Examine the Wiring Occasionally. See that none of the wires have become chafed or disconnected, particularly the battery leads and the positive lead from the dynamo to the switch panel. Should the dynamo go on strike, possibly it may be due to a faulty lead. As a makeshift measure, disconnect the field circuit lead (green marking) from the dynamo. This will not cause the dynamo to charge, but it will prevent it from being damaged.

The ends of all the cables are identified by means of coloured sleevings as shown on the following wiring diagrams. When making a connection, proceed as follows: bare about $\frac{3}{8}$ in. of the cable, twist the wire strands together, and turn back about $\frac{1}{8}$ in. so as to form a small ball. Remove the grub screw from the appropriate terminal and insert the wire so that the ball fits in the terminal post. Now replace and tighten the grub screw; this will compress the ball to make a good electrical connection.



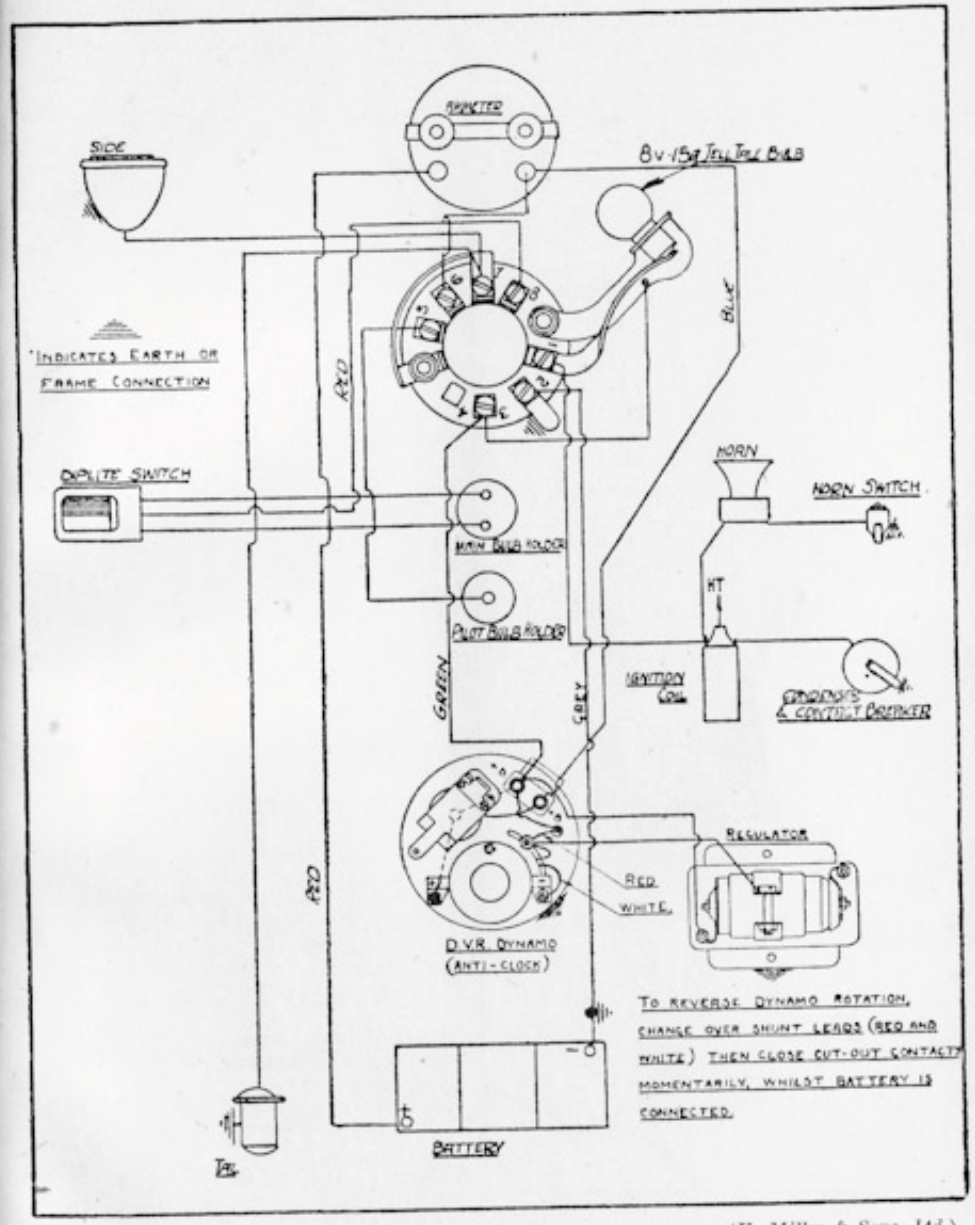
(*Joseph Lucas, Ltd.*)

FIG. 43. WIRING DIAGRAM FOR THE LUCAS LIGHTING EQUIPMENT WITHOUT AUTOMATIC VOLTAGE CONTROL



(Joseph Lucas, Ltd.)

FIG. 44. WIRING DIAGRAM FOR "LUCAS" LIGHTING EQUIPMENT WITH AUTOMATIC VOLTAGE CONTROL



(H. Miller & Sons, Ltd.)

FIG. 45. WIRING DIAGRAM FOR MILLER LIGHTING AND COIL IGNITION EQUIPMENT WITH AUTOMATIC VOLTAGE CONTROL

INDEX

Absence of compression after valve grinding, 59
Amal carburettor, 8
Annual overhaul, 32
Automatic voltage control, 80

Battery maintenance, 81
Brake adjustments, 73
Bulb replacements, 83

Carbon, removing, 40
Carburettor, principle of, 8
Chain adjustment, 63
—— lubrication, 28
Clutch adjustment, 64
Commutator, 77
Contact-breaker, Lucas, 46
——, Miller, 50
Coupling a chain, 68
Crankcase, draining, 24
Cylinder, removing, 36

Decarbonizing, 36
Dismantling engine, 36
Dry sump lubrication, 18–23
Dynamo lubrication, 25

Engine lubrication, 16

Flywheels, assembling, 60
Foot gear change, use of, 62
Fork spindles, 29, 69
Four-stroke engine, principle of, 1–6

Gear control adjustment, 63
Gear-box lubrication, 26
Grinding-in valves, 42

Hub lubrication, 29

Ignition system, principles of, 6
—— timing, 51–55
—— trouble, 48
Inlet stroke, 4
Instrument panel, 30

Lubricating oils recommended, 23
Lubrication, 16
——, gearbox, 26

"Magdyno" care of, 25, 49
Magneto, care of, 46
Mechanical lubrication, 16

Oil circulation, checking, 24
—— pump adjustment, 23
—— tank, draining, 24
Oilbath chain case, 28

Piston removal, 40
—— rings, 43
Pump adjustments, oil, 23
Push-rod removal, 37

Quickly detachable rear wheel, 70

Rear-Wheel adjustment, 72
Rocker-box removal, 37
Rockers, O.H., lubrication of, 25, 31
Running-in, 31

Shock-absorber, transmission, 62
Sidecar alinement, 74
Sparking plug, 44
Spokes, loose, 74
Steering head, 29, 69

Tube, fitting, 72
Tuning Amal carburetter, 10
Tyre pressures, 75

Valve clearances, 33
—— timing, 56
Valves, removing, 40

Wheel alinement, 72, 74
—— bearings, care of, 72
—— removal, 73
Wiring diagrams, 85–87

MADE IN GREAT BRITAIN AT THE PITMAN PRESS, BATH
C9—(T.5312)

THE
INDISPENSABLE COMPANION VOLUME
To "YOUR DRIVING TEST"

✦

YOUR ORAL DRIVING TEST
HOW TO PASS IT

By

R. F. TOWL
R.A.C. Certified Driving Instructor

CANDIDATES who read this book in conjunction with Oliver Stewart's "Your Driving Test" will approach their driving test with complete confidence, armed at all points with full information on every possible matter upon which they may be questioned. Concise, practical and authoritative, it ensures that every reader gives the correct answer to the examiner's questions without hesitation.

Price **6d.** net

PUBLISHED BY PITMAN