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THE BOOK OF THE A.J.S.

A COMPLETE GUIDE FOR OWNERS AND PROSPECTIVE PURCHASERS OF 1932–7 A.J.S. MOTOR-CYCLES

BY

W. C. HAYCRAFT

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

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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 fourth 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 1932–7 A.J.S. models with the exception of the overhead-camshaft "Trophy" and competition 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 thirteen all told.

The A.J.S. range of models undoubtedly merits most careful consideration by all intending purchasers and is fully described after the last chapter of this book. 1935 saw three models of entirely new design and with dry-sump lubrication engines with coil or magneto ignition. The 1936–7 range comprises still further improved versions of already well proved and popular types embodying all that is best and modern in motor-cycle engineering practice (see pp. 24 and 127).

For the benefit of absolute novices I have described in simple non-technical language how the four-stroke engine works, and have included chapters on driving and the various preliminaries which it behoves the tyro to attend to before venturing forth on the highway. The legal aspect of driving has also been dealt with, special reference being made to the latest "Belisha" additions to the numerous motoring regulations (such as driving tests, new signs, pedestrian crossings, etc.).

To avoid roadside breakdowns and to maintain A1 performance I would emphasize the vital importance of correct 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 within the covers of this book.

If you should run up against a spot of bother, or if the advice you need has been omitted in this book do not hesitate to write to me, c/o Sir Isaac Pitman & Sons, Ltd. You should be brief, and to ensure a reply without delay enclose a stamped, addressed envelope.

W. C. H.

CONTENTS

1938 SUPPLEMENT

TO THE BOOK OF THE A.J.S.

ALTOGETHER sixteen machines are available for 1938 with engine capacities ranging from 246 c.c. to 990 c.c. Twelve of last year's models are retained with detail improvements, and there are also, in addition to these and the special overhead camshaft racing model, three new "Silver Streak" models. The specification of the single-cylinder models follows very similar lines throughout the A.J.S. range and is even more complete than hitherto.

Improvements to the Singles. Last year's models proved so successful that no radical changes in engine design have been found necessary. All engines, however, which are ingeniously protected against damage when negotiating "rough stuff" by a

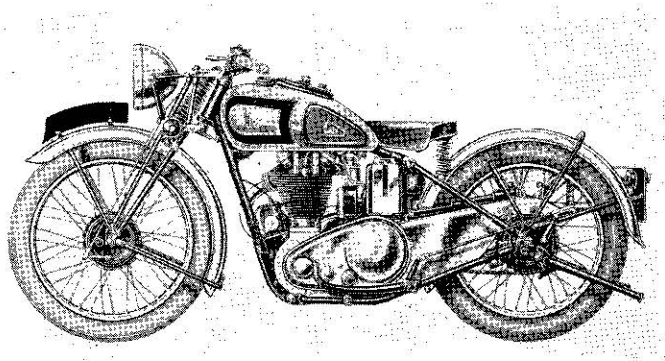

FIG. 78. TRANSMISSION SIDE OF THE NEW "SILVER STREAK" A.J.S.
(This machine is obtainable in the 250, 350, 500 c.c. class.)

combined crankcase shield and front lug, now have Amal carburettors with a vertical instead of a horizontal mixing chamber previously used on some machines. The 18 mm. sparking plug has also been replaced by the 14 mm. type.

With regard to the lubrication system, a few detail modifications have been made. For instance, the crankcase has been modified so that the delivery and return oil pipes are connected to the pump housing at the rear instead of the front, thereby

giving straight line oil passages and rendering the pipes less susceptible to damage. To guard against oil contamination sometimes caused by careless replenishment with a dirty measure, the fabric filter (Fig. 73) has been supplemented by an additional gauze filter on the delivery side of the tank. Yet another lubrication improvement is the provision of a grease nipple on the magneto chain case of models with magneto ignition. The chain case this year has been highly polished and to facilitate cleaning and improve looks the chain case cover (where fitted) and also the timing case cover have been neatly rounded off. Constant voltage control is included in the specification of all models.

A marked increase in braking power has been obtained by altering the control lay-out of the rear brake. Instead of a short pedal being mounted in front of the footrests as formerly, a very long pedal is pivoted some distance behind and slightly below the footrests. Most motor-cyclists like to be able to adjust the position of the rear brake pedal, and on the 1938 models this can be done by means of an adjustable pedal stop. New type brake linings giving more friction have been used and the shoe plates and anchor arms are now fashioned in one.

As probably most readers are aware, a new amendment to the Ministry of Transport regulations stipulates that from 1st October, 1937, every motor-cycle above 100 c.c. *registered for the first time* must have a speedometer fitted. A.J.S. buyers have the option of a non-trip or trip type Smith speedometer priced at £2 5s. and £2 10s. (extra) respectively. The speedometer drive is neatly enclosed in the front hub and the instrument itself, which is illuminated by night, may be conveniently mounted above the front forks, which is undoubtedly the safest position.

A new feature which will appeal to many is the fitting of almost complete rear chain enclosure. As may be seen in Fig. 78, the guard is brought down deeply on both sides of the chain and the net result is better protection for both the chain and the rider's legs. The mudguards are wider still and are ribbed for strength and have flared ends with a hinged tail piece in the case of the rear guard. Other minor improvements include the provision of a pressed-steel tool-box, a low-lift spring-up rear stand instead of a centre stand, and the fitting of an attractive coloured enamel A.J.S. medallion in the centre of the steering damper knob.

Three Side-valve Models. These consist of a single and two Big Twins, namely Models 38/9, 38/2 and 38/2A priced at 56, 78 and 78 guineas respectively with full lighting equipment and horn, but without speedometer.

Model 38/9, which has a 498 c.c. engine with detachable head is identical to last year's model (Fig. 72) except for the improvements mentioned above. The English and Export 990 c.c. Models 38/2 and 38/2A (see Fig. 74) also show no change except for a few details such as improved rear brakes, the fitting of a new rear chain guard and twin pressed-steel tool-boxes.

The Standard Overhead-valve Models. There are as for last year six standard overhead-valve machines. They are models 38/12, 38/22, 38/16, 38/26, 38/8 and 39/18, and their prices with electric lighting and horn are 45, 50, 48, 53, 62, and 62 guineas respectively.

Models 38/12 and 38/22 have engines of 246 c.c. capacity with a 6s. 3d. quarterly tax, while Models 38/16 and 38/26 have 347 c.c. engines. The other two machines are 498 c.c. models. Two-port cylinder heads with a dual exhaust system are provided on Models 38/22, 38/26, and 38/8. The whole of the above range is similar to the corresponding 1937 models except for the embodying of the various improvements mentioned in a previous paragraph.

The Competition Models. Three special single-port Competition models are available, Models 38/22T, 38/26T, and 38/18T, and they are listed at 55, 58, and 67 guineas with horn and lighting. They are similar to last year's models (see page 130), and have full competition equipment. Improvements included on the standard models have been incorporated. High compression pistons giving compression ratios of 7·5 to 1 or 11 to 1 are obtainable as an extra.

The New "Silver Streaks." These are perhaps the "stars" of the 1938 programme and are sure to attract much attention. The "Silver Streaks" are super-sports machines with tuned engines and a special finish and are known officially as Models 38/22SS, 38/26SS, and 38/18SS. Prices with lighting and horn are 54, 57, and 66 guineas respectively. The specification is similar to that of the corresponding standard models and all the improvements on the latter are included. The "Silver Streaks" (see Fig. 78), however, differ from the standard machines in that they have tuned O.H.V. engines with polished single-port cylinder heads and ports, and a glistening finish in chromium is used for the chain cases, mudguards, rims, spokes, handlebars, mudguards, headlamp, fork springs, oil tank, saddle springs, tool-box, etc. High compression pistons can be specified if desired. Maximum speed in the case of the "SS 500" is about 85 m.p.h. The large 3 gal. saddle tanks have the chromium relieved by black with a silver and blue lining. The specification includes Dunlop tyres (26 in. × 3·5 rear), Burman four-speed gearbox with positive foot change, dry sump lubrication, oil-bath chain case, etc.

MAINTENANCE HINTS

Since the 1938 machines differ so little in design from the 1937 models it follows that most of the running and maintenance instructions given on pages 32-126 are still applicable. Here are a few extra hints.

Fuels for "Silver Streaks." Ordinary No. 1 petrol is suitable where a standard piston is fitted, but if a high compression piston giving a C.R. of 7·5 to 1 is fitted it is advisable to run on a 50/50 petrol-benzole mixture, a good Ethyl fuel or Cleveland Discol. An alcohol fuel is required if the alternative 11 to 1 piston is used.

Suitable Plugs. All 1938 single-cylinder models require 14mm. plugs such as the Lodge H14.

Valve Clearances. The correct "SS" valve clearances are the same as on the corresponding 1937 standard overhead-valve engines (see page 87).

Jet Sizes and Ignition Timings. These also are identical on the "SS" models to those used on the standard O.H.V.s (see pages 67, 105).

Lubrication of Magneto Chain. On the 1938 magneto ignition models the grease-gun should be applied to the nipple on the chain case cover about every 500 miles.

The Gauze Filter. 1938 oil tanks have a gauze filter at the petrol pipe union, but it is unnecessary to remove it for cleaning except at rare intervals, as the swishing of the petrol keeps it clear.

Valve Timings. The "SS" and standard O.H.V. valve timings are identical and the dot system of marking the timing wheels (see page 106) is retained.

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THE BOOK OF THE A.J.S.

CHAPTER I

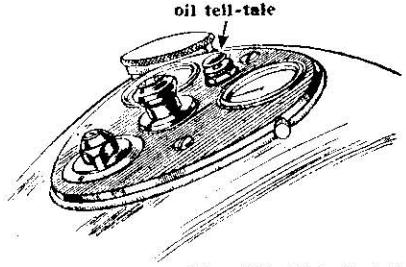
THE 1935–6 A.J.S. RANGE

FIFTEEN models are available for 1935, and from this range the prospective purchaser should have little difficulty in selecting the machine which suits his taste and is in accordance with the capacity of his banking account. If preferred instead of paying C.O.D. the full amount, advantage may be taken of very generous hire-purchase terms. The 1935 range comprises six side-valve models, seven overhead-valve models and two special overhead-camshaft models. All fifteen machines with the exception of two O.H.V. "two-fifties" (Model 35/12, 35/22) introduced this year, are taxed at the rate of £2 5s. per annum unless a sidecar is attached in which case the annual tax is £3. The duty payable on the "two-fifties" is only £1 2s. 6d. per annum.

The Side-valve Models. The six side-valve models are Models 35/5, 35/4, 35/14, 35/9, 35/2 (English), 35/2 (Export) and their prices which include electric lighting equipment are £47 10s., £49 10s., £52 10s., £56 2s. 6d., £72 15s. and £72 15s. respectively. The first four constitute splendid solo models and are specially recommended for beginners and those who desire machines which will hold their tune with the minimum amount of attention and give exceptionally economical running. If you want something really snappy with rocket-like acceleration, however, you should plump for an overhead-valve model. A detachable aluminium alloy cylinder head is provided on Model 35/9, a feature which is not to be found on many modern side-valves. Those who fancy coil ignition will find this fitted on Model 35/4 which is one of the entirely new models. Model 35/14 is similar but has magneto ignition. Model 35/2 is the popular Big Twin for the family man and with its powerful engine will make light work of the most strenuous passenger carrying. As hitherto, it is available with either an English or Export specification.

The Overhead-valve Models. The seven overhead-valve models comprise: Models 35/12, 35/22, 35/16, 35/26, 35/18, 35/6, 35/8, and their prices complete with electric lighting equipment are £39 18s., £44, £42, £46, £57 10s., £57 10s., and £62 10s. respectively.

Without exception all these models possess real "pep" and stamina which is somewhat belied by the pleasantly quiet exhaust note. Model 35/12 is the O.H.V. "two-fifty" with coil ignition. Model 35/16 is a slightly more powerful model of similar design and also fitted with coil ignition. Both these machines can be had with magneto ignition (Models 35/22, 35/26). The remaining three machines are magnificent sports models with a fine turn of speed and tenacious road holding qualities on full throttle. If you want something really "hot" you cannot do better than invest in one of these machines which will fetch excellent second-hand prices after considerable use. Two-port engines are pro-



(From "The Motor Cycle")

FIG. 1. SHOWING THE NEAT FLUSH FITTING INSTRUMENT PANEL

vided on Models 35/6, 35/8 but Model 35/18 has a single-port engine.

The Overhead-camshaft Models. These A.J.S. "specials" are Models 35/7 and 35/10 and according to whether they have competition or racing specification, are priced at £65 or £70 and £75 or £80 respectively. Electric lighting is extra. Both these models, which have the famous chain-driven O.H.C. engine, are built throughout for competition and racing purposes and have proved very successful in the hands of skilful riders. If you have a good nerve and plenty of riding skill no better opportunity for using them is presented than by owning one of these models.

1935 A.J.S. FEATURES

Tank-mounted Instrument Panels. Flush fitting tank-mounted instrument panels are fitted as standard on all except the two overhead-camshaft models. The panel, illustrated in Fig. 1, contains at the rear the main lighting switch, in the centre a panel illuminating lamp which is detachable for use as an inspection lamp, and at the front (Big Twins) an oil tell-tale to show if the oil pump is functioning. To the left of the tell-tale is the

ammeter and on the right-hand side provision is made for an eight-day clock (30s. extra). The speedometer is not fitted on the panel but where specified (£2 5s. trip type) is mounted over the front forks and driven off the gear-box. This arrangement is much to be preferred as it enables a watchful eye to be kept on the speedometer needle in "built-up" areas without it being necessary to take the eyes off the road ahead even momentarily. On coil ignition models a red warning lamp is included on the panel.

Lighting Equipment. No extra charge is made for lighting equipment except on the O.H.C. models. It comprises on all

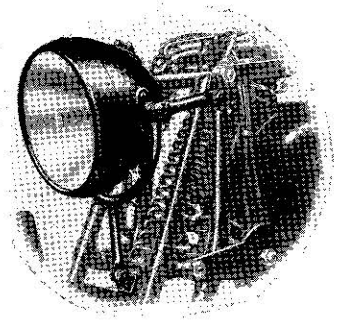


FIG. 1A. SHOWING NEAT METHOD OF MOUNTING HEADLAMP

magneto ignition models, except Models 35/14, 35/22, 35/26 a Lucas "Magdyno" (with dynamo portion detachable), a tank-mounted instrument panel (described above), a 12 amp.-hr. battery and a D142 headlamp. On the two O.H.C. competition models the above equipment may be specified for £5 17s. 6d. extra. On the two O.H.C. racing models, however, a Lucas H52 headlamp with switch at the back of the lamp may be fitted instead of a D142 headlamp with instrument panel. The extra charge for this "Magdyno"equipment is £5 10s. On Models 35/14, 35/22, 35/26 a Lucas E3D dynamo is used with a D142B headlamp.

On the three new coil ignition models Miller lighting equipment is standardized, the equipment comprising in addition to the flush fitting instrument panel a DM3T 30-watt dynamo, 13 amp.-hr. battery and 70E headlamp. On all models an electric horn is fitted as standard.

Adjustable Saddle. A really excellent feature on heavyweight A.J.S. machines is the manner of mounting the saddle to make

adequate allowance for the variations in physical stature of different riders. As may be seen in Fig. 2, in the case of many

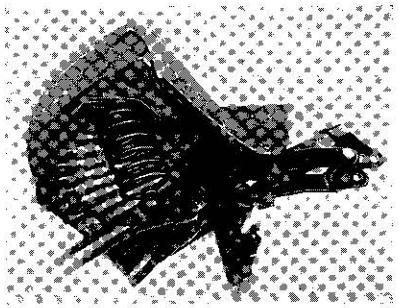


FIG. 2. THE ADJUSTABLE SADDLE

1932–5 A.J.S. models, the saddle undercarriage at the front end is provided with a bolt which may be inserted in either of three holes in a lug on the top tube, and the rear end of the undercarriage is slotted to allow of the saddle being moved backwards

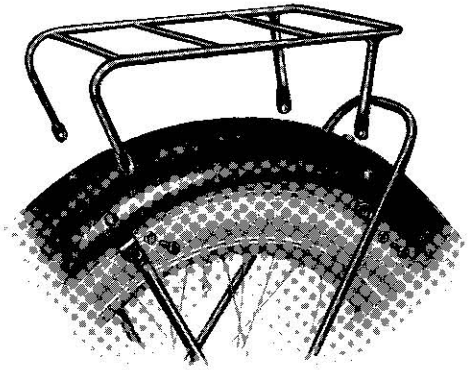


FIG. 3. THE DETACHABLE CARRIER

or forwards. As the illustration shows, the bottom of the coil spring is permanently attached to the frame.

"Clean" Handlebars. Considerable attention has recently been paid to cleaning up the handlebars. As may be observed

by a glance at Fig. 31, the arrangement is now not only exceptionally tidy, but the various levers and controls are situated so as to fall easily to the hands. Their mountings are also made integral with the bars, so that the possibility of vibration loosening them does not exist.

Detachable Rear Carrier. Many riders who find a carrier sometimes invaluable, but who declare that this fitment detracts

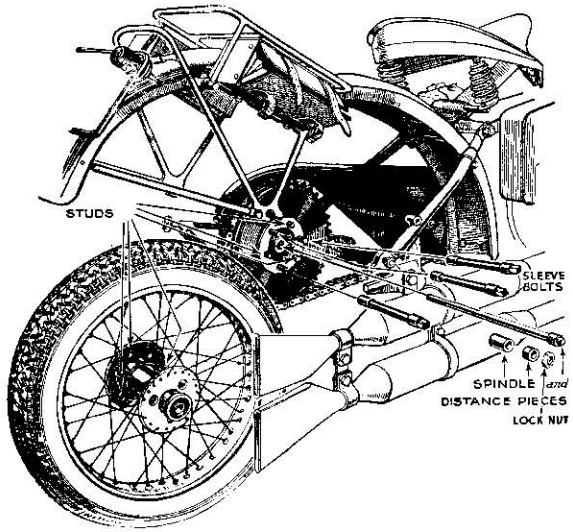


FIG. 4. SHOWING ARRANGEMENT OF QUICKLY DETACHABLE REAR WHEEL AND HINGED MUDGUARD

Above is shown the rear wheel removed from a 35/2 Big Twin on which machine both wheels are quickly detachable and interchangeable. A quickly detachable rear wheel is also provided on Models 35/6, 35/7, 35/18, 35/8, 35/9 and 35/10

from the appearance of a sports model, are catered for by the designers of the A.J.S. For an extra charge of 12s. 6d. the carrier shown in Fig. 3 may be specified. Once fitted, its instant removal requires only the taking off of four nuts and bolts, leaving the rear guard absolutely clear. The carrier itself is constructed of steel tube, oxy-acetylene welded. It is standard on Models 35/9, 35/6, 35/8, 35/2.

Quickly Detachable Rear Wheels. Punctures are rare nowadays, but such things do occur when tyre treads begin to show wear. It is then that a quickly removable rear wheel is an absolute boon

to the rider. To facilitate removal of the wheel the mudguard on Models 35/9, 35/18, 35/6, 35/8, 35/2 is hinged. This, in conjunction with the special method of securing the rear wheel, renders removal of the latter an extraordinarily simple operation devoid of any "snags." No interference with wheel alinement, brake adjustment, or transmission is involved. All the rider has to do is to remove three sleeve bolts, a centre spindle and a distance piece. It would be difficult to imagine a more simple yet

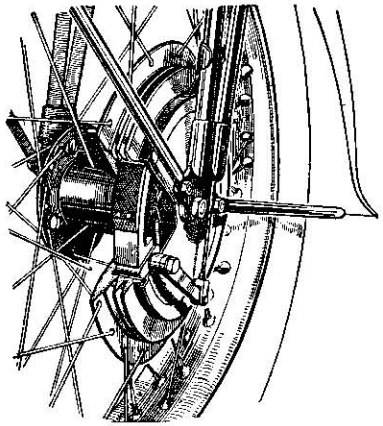


FIG. 5. THE 1935 FRONT BRAKE OPERATION

Observe the neat manner in which the cable is concealed by passing through the front fork tube. Note also the ribbed iron alloy brake drum which ensures strength and adequate cooling. The brake shoes are of aluminium alloy. The design shown applies to all except seven models.

absolutely efficient system. 1935 Models have a locking device on the sleeve bolts.

Front Brake Operation. On all models except Models 35/12, 35/22, 35/5, 35/16, 35/26, 35/4, 35/14 the operating cable of the front brake passes down the front fork blade. It is thus completely enclosed but for the small portion protruding close to the operating lever to which it is attached. Adjustment for the Bowden cable is provided at the top of the forks (see Fig. 68).

Ribbed Front Brake Drums. On the heavier 1935 models the seven inch diameter front brake drums (see Fig. 5) are made of iron alloy and are ribbed, which serves to stiffen the drums against distortion and keep them cool.

Four-speed Gear-boxes. Four-speed gear-boxes are fitted as standard except on Models 35/5, 35/9, but may also be specified

for £1 on those two models. The ratios have been carefully chosen so as to provide a first-class, all-round performance. Acceleration and hill climbing capacity are greatly improved by

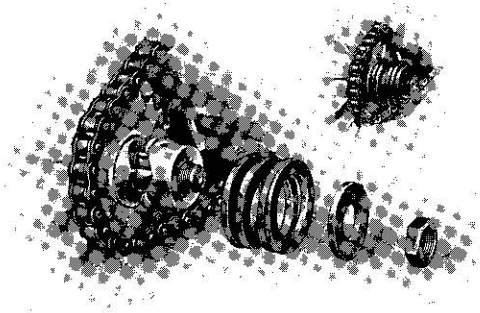
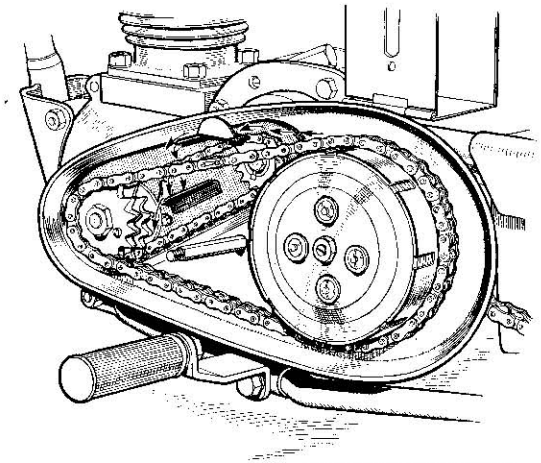


FIG. 6. SHOWING DETAILS OF TRANSMISSION SHOCK ABSORBER

the inclusion of this extra speed. Foot control is available as an extra on some models and on the Big Twin three speeds and *reverse* may be specified.

Transmission Shock-absorber. An efficient shock-absorber, details of which are shown in Fig. 6, is fitted to the engine shaft of



(*From "The Motor Cycle"*)

FIG. 7. THE OIL BATH CHAIN CASE ON THE NEW COIL IGNITION MODELS

all models. It provides a very even torque and damps out all transmission shocks, thus imparting a sweeter top gear performance when travelling at low speeds.

Totally Enclosed Primary Drive. Every 1935 A.J.S. has the entire front chain, and also the clutch, enclosed in an oil-bath chain case. The primary chain thus requires only periodical attention in order to maintain the proper oil level. An inspection disc at the base of the case constitutes an oil level indicator.

On the three new coil ignition models (35/4, 35/12, 35/16) the primary chain, clutch and dynamo chain are all completely enclosed in an oil-bath chain case, special oil ducts being provided

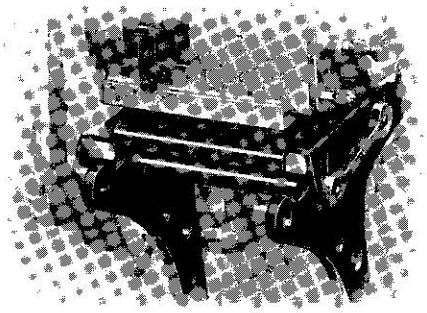


FIG. 8. ADJUSTABLE MAGNETO PLATFORM FOR TAKING UP CHAIN SLACKNESS

to ensure proper lubrication of the two chains. The chain case is illustrated in Fig. 7.

Coil Ignition. Some motor-cyclists prefer coil to magneto ignition on account of the somewhat easier and more reliable starting provided by a constant voltage H.T. current, and such riders are catered for by the three new Models 35/4, 35/12, 35/16 which have this type of ignition. The ignition system comprises a 36-watt Miller dynamo driven by chain off a sprocket on the engine shaft, for supplying the L.T. current for the Exide battery; a neatly placed ignition coil; and a contact breaker which is neatly built into the timing case cover and driven from an extension of the exhaust camshaft.

Adjustable Magneto Platform. The tension of the magneto driving chain can, on most A.J.S. machines, be adjusted in a very simple manner due to the provision of a special design of platform to which the magneto is secured. This adjustable platform is shown in Fig. 8. As may be seen, the platform has a radial slot

which permits of the platform being tilted sufficiently to take up any reasonable amount of slack. Two long threaded bolts pass through the platform and screw into a tapped link on the opposite side. These only have to be loosened in order to raise or depress the front of the platform.

Vernier Magneto Timing. All except the coil ignition models and Model 35/2, 35/14, 35/22 and 35/26 have the patented system of vernier magneto timing, which enables the magneto to be timed quickly and with great precision (see page 102).

"Lo-Ex" Aluminium Alloy Pistons. Divided-skirt aluminium alloy "Lo-Ex" pistons with a slit on the thrust face and a junction between the crown and skirt at the piston bosses only are provided on all present A.J.S. engines except the overhead-camshaft types. These pistons give remarkable freedom from that irritating noise piston slap during the warming up of an engine and while accelerating. Owing to their great lightness they also contribute to good acceleration which to-day is one of the most desirable features. Four piston rings and fully floating gudgeon pins are provided.

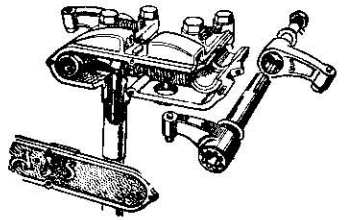


FIG. 9. THE ROCKER-BOX ASSEMBLY ON THE HEAVYWEIGHT MODELS

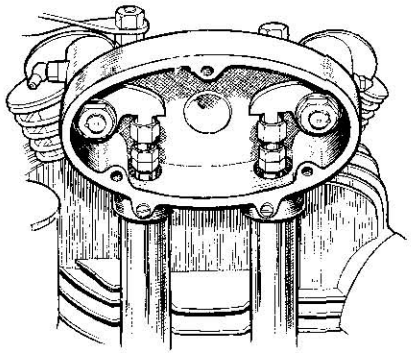
The rocker gear shown is fitted on Models 35/6, 35/8, and 35/18. The exhaust rockers have been removed to show method of attachment to the rocker spindle, and the rocker-box has been cut away on this side to show the large diameter bearing bushes

Improved O.H. Valve Gear. The overhead-valve gear provided on the O.H.V. models is of the most modern and efficient design and comprises two distinct types. The design used on Models 35/6, 35/18, and 35/8 is shown in Fig. 9. The enclosed ball-ended duralumin push-rods actuate the valves, which have duplex springs, through forged duralumin overhead rockers attached by means of splines to the hollow alloy steel rocker spindles. Phosphor-bronze bushes are used for the rocker spindles, and as may be seen in Fig. 9, the bushes are of very large diameter, which ensures a big mileage being obtained before any appreciable play develops. Grease gun lubrication is retained for the overhead rockers and valve clearance adjustment is by means of adjusters at the base of each push-rod.

On the four entirely new O.H.V. engines (Models 35/12, 35/22, 35/16, 35/26) an entirely different type of overhead valve gear is used and the design is illustrated in Fig. 10. As may be seen, by removal of the oval-shaped rocker-box cover access is given to the valve clearance adjusters which are provided at the tops

of the push-rods. Steel rockers are used together with plain phosphor-bronze bearings and the push-rods and inside rockers are both completely enclosed.

Detachable S.V. Cylinder Head. One side-valve model has a detachable aluminium alloy cylinder head designed so that removal of the head for decarbonizing leaves the carburettor and valves undisturbed (see Fig. 11). The shape of the combustion chamber is excellent with this arrangement, and the lightness of the alloy results in a very appreciable reduction in weight.



(From "The Motor Cycle")

FIG. 10. THE ROCKER-BOX AND OVERHEAD-VALVE GEAR FITTED ON THE NEW TYPE A.J.S. MODELS

The rocker-box cover has been detached to show the valve clearance adjustment at the upper ends of the push-rods. Models 35/12, 35/22, 35/16 and 35/26 have this design of overhead-valve gear

Twin-port Exhaust System. Models 35/6, 35/8, 35/22, 35/26 have twin ports and dual silencers of large capacity. This reduces exhaust noise to a not unpleasant "zoom" to which no one can take offence. The silencers, which embody the blind-ended drilled tube principle without fishtail ends, are substantially made of sheet steel and are heavily chromium plated.

Improved Mechanical Lubrication. This system, where the oil in a separate tank is fed to and circulated throughout the engine by a double-action mechanical pump, is used on all S.V. and O.H.V. "singles," except Models 35/12, 35/22, 35/16, 35/26, 35/4, 35/14. Once the correct regulator setting has been obtained no attention is necessary other than occasional draining of the crank-case and regular replenishment of the oil tank. The system is fully described on page 72. It should be mentioned here, however,

TWO SIDE-VALVE REFINEMENTS

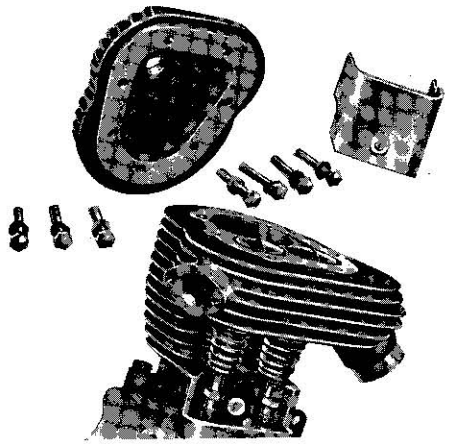
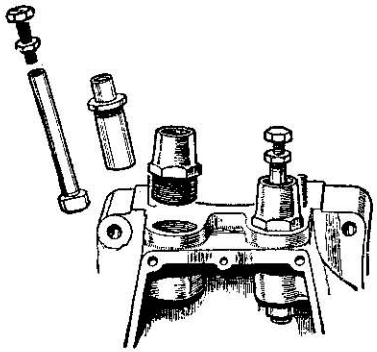


FIG. 11. THE CAR TYPE DETACHABLE ALUMINIUM ALLOY S.V. CYLINDER HEAD ON MODEL 35/9

This assists cooling of the combustion chamber and expedites decarbonizing. Detachable heads are used on Models 35/2, 35/4, 35/14 but these are of cast iron



(From "The Motor Cycle")

FIG. 12. OIL RETAINING TAPPET GUIDES ON THE S.V. ENGINES

These prevent the engine getting dirty and oil being wasted

that although oil is returned to the tank, this oil does not circulate through the engine. One end of the double-acting pump draws oil from the tank and immediately returns it to the tank so that by removing the filler cap it can be ascertained at a glance whether the oil pump is working. In addition to this means of checking the functioning of the lubrication system, a watchful eye should always be kept on the exhaust (see page 34). It may be mentioned here that mechanical lubrication is a "total loss" or "wet

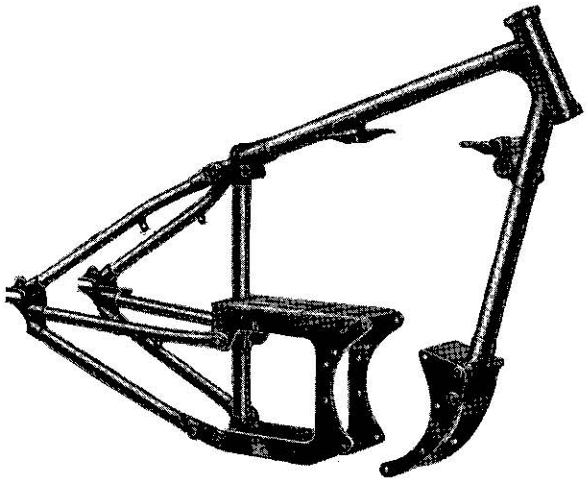


FIG. 13. THE STURDY SEMI-CRADLE FRAME

sump" system in which the whole of the oil in the tank is used up by the engine, the sump of which is not drained of surplus oil by the pump.

Dry Sump Lubrication. Dry sump lubrication in which the whole of the oil in the tank and engine is kept in constant circulation is incorporated on the overhead-camshaft models and on the three new coil ignition models and their magneto ignition versions. This system (see page 77) is very reliable and requires practically no attention other than regular replenishment and occasional cleaning of the tank and filters. As with the mechanical lubrication system described in the preceding paragraph, it is, of course, possible to check oil circulation by removing the tank filler cap.

Sturdy Frames and Forks. All A.J.S. machines are renowned

for their splendid road holding qualities and this is due chiefly to the sturdy and carefully designed frames and forks which have to a large extent been evolved from valuable experience gained in racing. Cradle, semi-cradle and duplex loop frames are used on the various models and the semi-cradle type is illustrated in Fig. 13. Observe the triple rear fork members and the immensely strong engine and gear-box mountings. Good stability and manœuvrability are obtained by using a low centre of gravity and a short wheel base and well sprung and rigid front forks which are of the tubular blade type with central barrel spring, adjustable fork spindles and hand-operated shock absorber.

THE 1935 RANGE

The author will not bore the reader with lengthy and technical descriptions of the 1935 models. Such matter could interest none

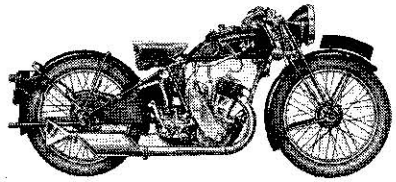


FIG. 14. MODEL 35/5

but prospective buyers and such are strongly advised to go to the nearest A.J.S. agent and scrutinize the models for themselves. What seems ideal on paper does not always prove the best in practice and there is nothing like straddling a "bus" and fingering the controls to find whether it suits an individual's requirements as regards general lay-out. Herewith are abridged specifications of the fifteen 1935 models—

The 3·49 h.p. S.V. Model 35/5. This reliable little mount which is the cheapest of all the side-valves has an inclined single-port engine of characteristic A.J.S. design with a bore and stroke of 74 mm. × 81 mm., giving a capacity of 349 c.c. On this engine a detachable cylinder head is not fitted, but this constitutes no real handicap as regards decarbonizing, for S.V. engines are notoriously easy to "decoke." The valves and tappets are enclosed by a neat and quickly-detachable cover and are operated by a twin-camshaft timing gear. The "Lo-Ex" piston which is of aluminium alloy has four rings and a fully floating gudgeon pin, and the connecting-rod to which it is attached has a heavy duty roller big-end bearing. On the driving side of the crankshaft there is a double-row ball bearing and on the timing side a single-row ball bearing. Mechanical lubrication is fitted, a gear-driven

pump integral with the magneto chain case cover being used to supply oil to the engine. At the opposite end of the cover there is an inspection disc giving access to a vernier ignition timing device for the Lucas "Magdyno." Carburation is by an Amal needle jet instrument with twist-grip control for the throttle which has a "tick-over" stop. Silence of running is exceptional thanks to valve enclosure and a sweeping exhaust pipe of large diameter terminating in a large silencer and fishtail.

The transmission comprises a ½ in. × ·305 in. Hans Renold primary chain running in an oil-bath chain case; an engine shaft shock absorber; a three-speed Sturmey-Archer gear-box giving solo ratios of 5·8, 9, and 16 to 1, with hand control and enclosed

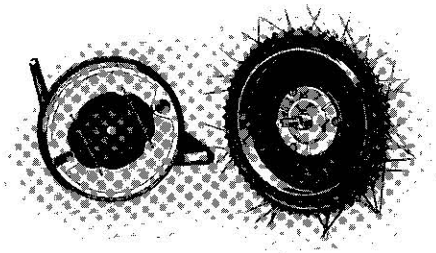


FIG. 14A. SHOWING REAR BRAKE DRUM AND ANCHOR PLATE WITH SHOES

kick-starter mechanism and a single-plate clutch having an adjustment on both the actuating rod and the cable also; and a ½ in. × ·305 in. rear chain protected by a chain guard.

Included in the specification are a rigid frame specially designed for steadiness, centre barrel spring type front forks with hand-adjusted shock absorber and multi-plate steering damper, adjustable semi-sports handlebars of the "clean" type, with integral controls and black enamel finish (chromium-plated levers), wheels with adjustable taper roller bearings front and rear and 25 in. × 3 in. Firestone Cord tyres, 5½ in. diameter internal-expanding brakes with hand adjusters and water and dust excluders, a petrol tank holding 1¾ gal. with black and gold finish and a flush-fitting instrument panel, an oil tank of 3½ pints capacity, a flexible top Lycett saddle capable of adjustment in all directions, adjustable footrests, a comprehensive tool kit, grease gun and tyre inflator.

The 4·98 h.p. S.V. Model 35/4. One of the new coil ignition jobs, this should prove a very popular light "five-hundred." It is swift, reliable and decidedly good-looking. The single-port

engine which is installed vertically in the frame has a bore and stroke of 82·5 mm. × 93 mm., giving a cubic capacity of 498 c.c. Prominent features in a modern design are a detachable car type cylinder head having the latest semi-turbulent combustion chamber, a "Lo-Ex" alloy piston, enclosed valves and flat base tappets, a twin-camshaft timing gear, a contact breaker driven off an extension of the exhaust camshaft, full dry sump lubrication with fabric filter, an Amal carburettor supplying the engine through a "straight-flow" inlet port, and a tubular silencer.

The transmission includes ½ in. × ·305 in. primary and ⅝ in. × ⅜ in. secondary Hans Renold chains, with oil-bath chain case for

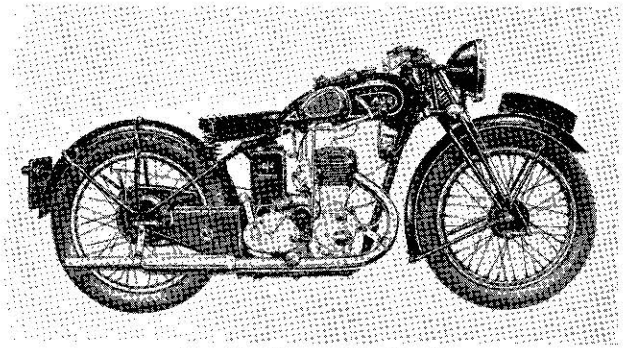


FIG. 15. MODEL 35/4 (COIL)

the primary and a guard for the secondary; an engine shaft shock absorber; a Burman heavyweight four-speed gear-box with hand control providing ratios of 5·1, 6·2, 8·9, and 13·6 to 1.

Completing a thorough specification are standard type A.J.S. front forks with hand-adjusted shock absorber, wheels with adjustable roller bearing hubs and 26 in. × 3·25 in. Firestone Cord tyres, 5½ in. brakes with finger adjustment and mud and dust excluders, dome section mudguards with a detachable back portion to the rear one, 2½ gal. and 3 pint fuel and oil tanks, a Lycett Aero spring seat, spring-up central stand, separate front stand, etc.

The 4·98 h.p. S.V. Model 35/14. This machine shown in Fig. 16 has a specification identical to that of Model 35/4 with the exception that separate magneto ignition is used instead of coil ignition, the magneto being chain-driven off an extension of the exhaust camshaft. The magneto chain is enclosed in a cast-aluminium chain case which necessitates a less sharply curved exhaust pipe.

The petrol tank is also chromium-plated in the usual A.J.S. *de luxe* style.

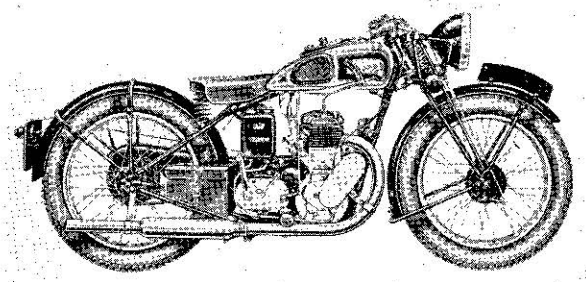


FIG. 16. MODEL 35/14

The 4·98 h.p. S.V. De Luxe Model 35/9. The engine of this *de luxe* side-valve model is built on similar lines to the 35/5 engine described on page 13, but the bore and stroke are increased to 84 × 90 mm., giving a cubic capacity of 498 c.c., and a detachable aluminium alloy cylinder head is provided to facilitate decarbonizing and assist cooling of the combustion chamber.

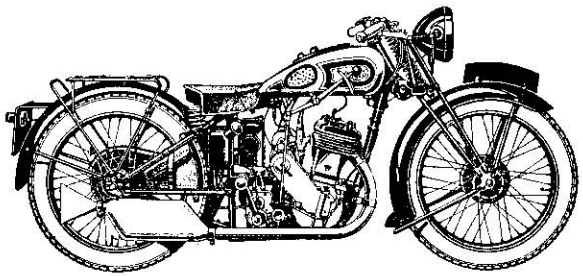


FIG. 17. MODEL 35/9 (ALLOY CYLINDER HEAD)
The silencer shown is not fitted as standard, this being of the tubular type

The engine is installed in a semi-cradle frame which has duplex chain stays and torque tubes and standard type A.J.S. front forks with hand-adjusted shock absorber, and transmits its power through a Sturmey-Archer gear-box made to A.J.S. design and provided with hand control giving ratios of 4·81, 7·06 and 12·85 to 1. The clutch is a multi-plate type with dual adjustment and

primary and secondary transmission is by ½ in. × ·305 in. and ⅝ in. × ⅜ in. Hans Renold chains, the primary running in an oil-bath chain case and the secondary protected by a guard. All tendency for transmission snatch is eliminated by an engine shaft shock absorber. Adjustable taper bearings are fitted to both wheels which have chromium-plated rims and are shod with 26 in. × 3·25 in. Firestone Cord tyres. The rear wheel is quickly detachable and a locking device is provided on the sleeve bolts. Ample mudguarding is provided, the front mudguard being deeply valanced. To facilitate rear wheel removal and tyre repairs the back portion of the rear mudguard is hinged. Both brakes, which have finger adjustment, are of 7 in. diameter, the brake drums being made of special iron alloy with cooling fins for the front one. Dust and water excluders are fitted.

The petrol tank, which holds 2½ gal., is finished in chromium and black and a flush-fitting instrument panel and quick-release filler cap are included. A quick-release filler cap is also provided for the oil tank which has a capacity of 4½ pints. Included in the specification are a Lycett soft top saddle with three-point suspension, adjustable "clean" handlebars with integral controls, adjustable footrests, a spring-up central stand, rear carrier, etc.

The 9·9 h.p. S.V. Model 35/2 (English). This delightful passenger model has a high efficiency 50-degree twin-cylinder engine with bore and stroke of 85·5 mm. × 85·5 mm. Detachable cylinder heads are provided which when removed leave the valves undisturbed. "Lo-Ex" anti-slap lightweight pistons are fitted and the improved crankshaft assembly includes roller big-end bearings. Lubrication is of the full dry sump type with fabric oil filter and an oil tell-tale is mounted on the instrument panel. The timing gears run submerged in oil and the tappets and valve gear are totally enclosed and lubricated. Ignition is by a Lucas "Magdyno" chain-driven off an extension of the single camshaft, and the mixture is supplied by an Amal carburettor fixed to the horizontal induction manifold.

The four-speed pivot-mounted Burman gear-box has hand control on the right-hand side, but foot control may be fitted instead at 15s. extra. The gear ratios have been selected to provide the best all-round performance and both solo and sidecar ratios are available. The clutch which has finger adjustment is of the multi-plate type with Ferodo and cork inserts.

The frame is of the cradle type with a low position for the pan seat saddle which has three-point suspension, and the front forks are of standard A.J.S. type with hand-adjusted shock absorber. A steering damper also is, of course, provided. The petrol tank, which is chromium-plated with the usual black and gold side panels, has a capacity of no less than 2½ gal. which is sufficient for

long cruises. On top of the tank is the flush-fitting instrument panel. An oil tank holding 5 pints is secured to the off-side of the saddle pillar and the filler cap is very accessible. Both wheels are quickly detachable and interchangeable and are of extra heavy pattern to withstand strenuous passenger work. Adjustable roller bearings are used for the hubs and the wheels have 27 in. × 4 in. Firestone Cord tyres. The front mudguard is deeply valanced and the rear is quickly detachable. Good braking is obtained by the use of a 7 in. front brake with ribbed iron alloy drum and a $7\frac{3}{4}$ in. rear brake. Hand control is provided for the front brake and the rear has a foot pedal. Both have finger adjustment and also water and dust excluders. Hans Renold

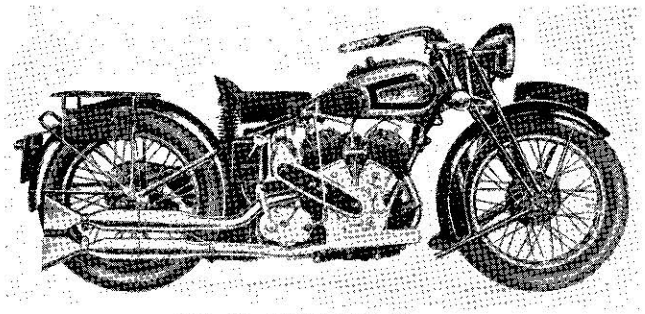


FIG. 18. MODEL 35/2 (EXPORT)

chains are used ($\frac{1}{2}$ in. × ·305 in. front, $\frac{5}{8}$ in. × $\frac{3}{8}$ in. rear), and smooth transmission is ensured by an engine shaft shock absorber.

Among other items in a luxurious specification may be mentioned semi-sports "clean" handlebars finished in black enamel with chromium-plated levers, a welded steel tubular carrier with quickly detachable top, two pannier bags and a really complete set of tools.

The 9·90 h.p. S.V. Model 35/2 (Export). Intended for use overseas, this model has a specification which differs from the English model in regard to a few points only. The principal differences in specification are as follows: the handlebars are of long touring pattern; a left-hand instead of a right-hand gear change lever is fitted; the foot brake has ratchet control; the clutch has pedal control on the near side; rubber footboards instead of footrests are specified; an air cleaner is fitted to the carburettor.

The 2·46 h.p. O.H.V. Model 35/12. This trim-looking newcomer is the "baby" A.J.S. and combines an excellent performance with

very low running costs. Although the cheapest machine in the A.J.S. range, the standard of design and workmanship is as good as that of the most expensive models. The single-port engine is mounted vertically in a sturdy duplex loop frame with single down tube and differs considerably in lay-out from the more powerful engines. For instance, the overhead valve gear (see page 10) is of quite new design with valve clearance adjustment at the tops of the push-rods which are operated by a twin-camshaft timing gear running in an oil-bath. The bore and stroke are 62·5 mm. × 80 mm., giving a cubic capacity of 246 c.c. As may be seen in Fig. 19, a down-draught Amal carburettor is provided and coil ignition is used, the Miller DM3T dynamo being

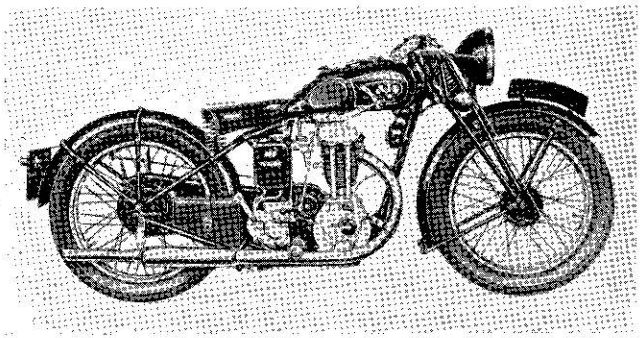


FIG. 19. MODEL 35/12 (COIL)

chain-driven off the engine shaft and the contact breaker neatly operated off the exhaust camshaft. The piston is of the "Lo-Ex" alloy type and the connecting-rod has a roller big-end bearing. The brake horse-power of the engine is remarkably high and the engine has all the latest improvements built into it including full dry sump lubrication with pressure-type fabric oil filter.

A Burman gear-box is fitted and this gives ratios of 6·0, 8·4, 10·75 and 17·8 to 1. Although hand control is standard, foot control may be specified for 12s. 6d. extra if preferred. The kick-starter mechanism is completely enclosed. The primary chain runs in an oil-bath. Included in a very complete specification are the following: standard forks with adjustable shock absorber; semi-sports handlebars; a $2\frac{1}{2}$ gal. petrol tank with instrument panel; an oil tank of 3 pints capacity; a Lycett flexible top saddle; 26 in. × 3·25 in. tyres; $5\frac{1}{2}$ in. brakes with hand adjustment and dust and water excluders; roller bearing wheels; central stand; detachable rear mudguard; tool kit, etc.

The 2·46 h.p. O.H.V. Model 35/22. The specification of this machine differs from that of Model 35/12 only as follows: As

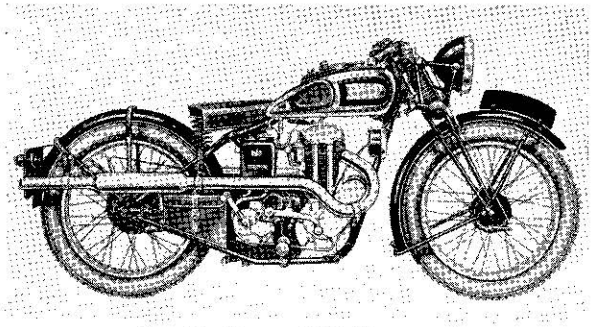


FIG. 20. MODEL 35/22 (TWO-PORT)

in the case of Model 35/14, a separate magneto chain-driven off the exhaust camshaft is substituted for coil ignition, the chain drive being enclosed in a neat chain case of cast-aluminium. The single-port cylinder head is replaced by an efficient two-port head

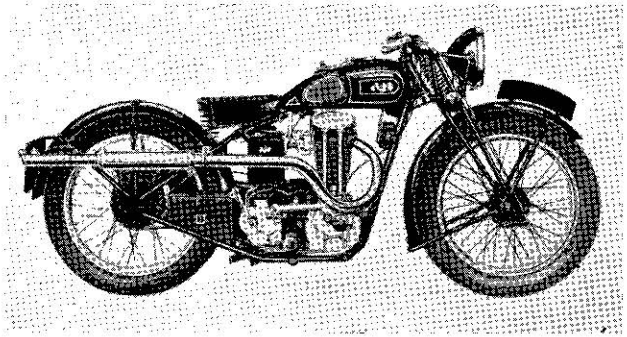


FIG. 21. MODEL 35/16 (COIL)

from which the exhaust gases are expelled into two upraised or downswept pipes terminating in tubular silencers and tail pipes. The petrol tank is chromium-plated in *de luxe* A.J.S. style and either hand or foot gear control is available (foot 12s. 6d. extra).

The 3·47 h.p. O.H.V. Model 35/16. This coil ignition "three-fifty" is a more powerful version of Model 35/12 which it resembles

in all respects other than the following: the 347 c.c. single-port engine has a bore and stroke of 69 mm. × 93 mm. and the

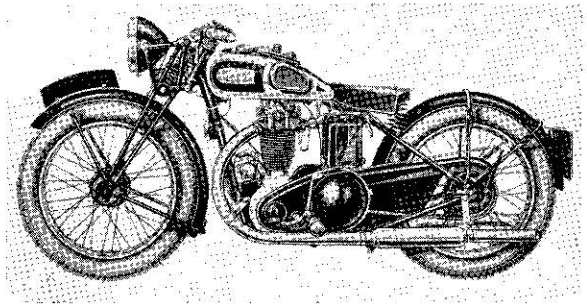


FIG. 22. MODEL 35/26 (TWO-PORT)

four-speed Burman gear-box gives ratios of 5·32, 7·46, 9·55 and 15·81 to 1. Foot control is shown in Fig. 21 but this costs 12s. 6d. extra, hand control being fitted as standard.

The 3·47 h.p. O.H.V. Model 35/26. The specification is the same as that of Model 35/16 with the exception that magneto ignition

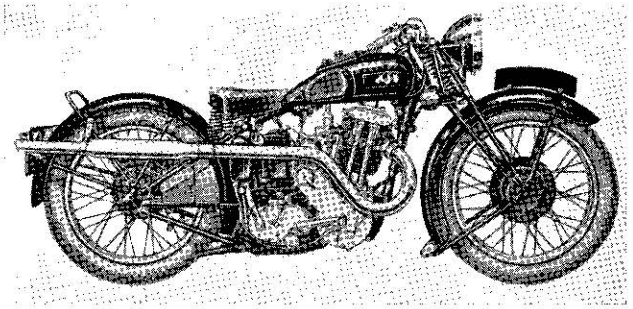
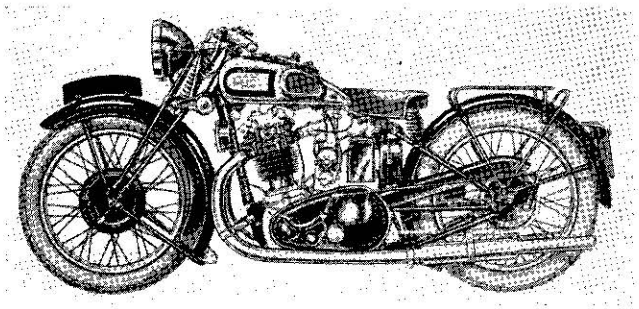


FIG. 23. MODEL 35/18

is used, the engine has a two-port head with twin silencers, and the tank has a chromium-plated finish.

The 4·98 h.p. O.H.V. Model 35/18. The general specification of this speedy "five-hundred" is similar to that of the side-valve Model 35/9, the differences being in regard to the engine and gear-box. The engine which is inclined forwards in the semi-cradle frame is of the single-port type and has a bore and stroke of

84 mm. × 90 mm., the same as on the side-valve model. Like the side-valve model, the engine is lubricated by a mechanical lubrication system comprising a gear-driven pump integral with the magneto chain case cover which has an inspection cover for the vernier setting device for the ignition timing. The compression ratio is 6 to 1 and a four-ring aluminium alloy piston with fully floating gudgeon pin is fitted. The connecting-rod has a roller big-end bearing and the crankshaft has a single-row ball bearing for the timing side and a double-row ball bearing for the driving side. The valves which have duplex springs are operated by enclosed duralumin overhead rockers and push-rods from a twin-camshaft timing gear. The exhaust valve lifter is enclosed and



FIGS. 24, 25. MODELS 35/6, 35/8 (TWO-PORT)

the exhaust pipe has a finned locking ring. Either a downswept or an upswept pipe may be specified and the usual tubular silencer with tail pipe is provided.

A Burman four-speed gear-box made to A.J.S. design gives ratios of 5, 6·3, 7·85 and 13·25 to 1. Foot or hand control are optional.

The 3·49 h.p. O.H.V. Model 35/6. This *de luxe* O.H.V. model is of similar design to Model 35/18 described above but the engine has a two-port cylinder head with twin tubular silencers. The bore and stroke are 74 mm. × 81 mm., giving a cubic capacity of 349 c.c. The four-speed gear-box which has an enclosed kick-starter and speedometer drive provides ratios of 5·8, 7·0,12·6 and 17·4 to 1.

The 4·98 h.p. O.H.V. Model 35/8. Model 35/8 is a *de luxe* two-port model exactly the same as Model 35/6 but for the fact that the bore and stroke are 84 mm. × 90 mm. and the Burman gear-box gives gear ratios of 5, 6·9, 8·8 and 13·35 to 1.

The 3·46 h.p. O.H.C. Model 35/7. This model can be had with

either a competition or racing specification and is a specially built model throughout. The specification includes a 346 c.c. single-port O.H.C. engine having the overhead camshaft chain-driven with a patent chain tensioning device, a bore and stroke of 70 mm. × 90 mm. and full dry sump lubrication; a four-speed heavyweight S.A. gear-box and multi-plate clutch; a semi-duplex frame with centre barrel spring type forks having hand-adjusted shock absorber and a reaction damper; quickly detachable roller bearing wheels; 26 in. × 3·25 in. Firestone Cord tyres (on racing model 26 in. × 3 in. ribbed front and 26 in. × 3·25 in. studded rear); extra powerful brakes; sports mudguards; a two gallon fuel tank (3½ gal. on racing model); Hans Renold chains; bolt-on handlebar controls; central stand, etc.

The 4·95 h.p. O.H.C. Model 35/10. This more powerful and exceedingly fast machine has a specification which, except for the

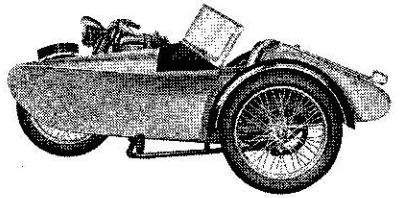


FIG. 26. RACY AND COMFORTABLE—MODEL D SIDECAR

engine, is similar to that of Model 35/7. It is obtainable with competition or racing specification. The 495 c.c. O.H.C. engine which has dry sump lubrication is designed throughout to give a huge power output on full throttle, and all internal parts are exceedingly massive and on the racing edition are highly polished. The high-efficiency cylinder head has the two valves provided with hairpin valve springs and a down-draught Amal large bore carburettor is fitted. A three-row roller big-end bearing is provided and special H.C. pistons are available for running on alcohol fuels. The standard compression ratios are 6 to 1 and 7·5 to 1 in the case of the competition and racing engines respectively.

Three Attractive Sidecars. For those who prefer a sidecar outfit to a solo model, there are three most attractive A.J.S. sidecars from which to choose, namely Models B, C, D, priced at £17 15s., £25 5s., and £23 respectively.

1936 IMPROVEMENTS

The principal detail improvements incorporated on the 1936 A.J.S.s are described hereunder and are supplementary to the complete 1935 specifications already dealt with.

Model 36/5. This 349 c.c. side-valve with one-piece cylinder and cylinder head is practically identical to Model 35/5 (page 13), but a four-speed gear-box is provided and the valve stems as on all 1936 models are chromium-plated to prevent them sticking in their guides.

Model 36/4. The specification of this 498 c.c. side-valve coil ignition model is similar to that of Model 35/4 (page 14), but includes many important improvements. The fuel tank, which is considerably deeper now holds as much as 3 gal., and the oil tank which is much neater has a capacity of ½ gal.—both admirable features from the tourist's point of view. Braking, hitherto good, is now better. Although the brake drums are of the same size

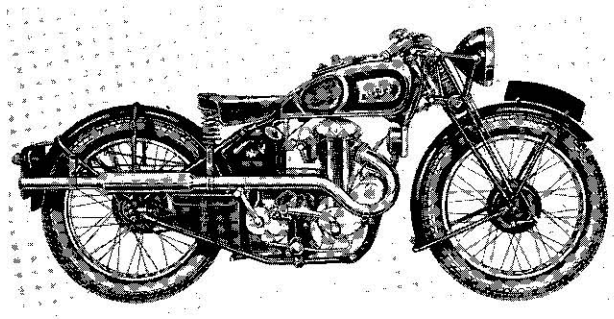


FIG. 27. MODEL 36/22 (TWO-PORT)

as formerly, they are cast of a chromium alloy and are well stiffened, the front one being ribbed and the rear integral with chain sprocket. The chain clearance incidentally is greater to permit of oversize 26 in. × 3·5 in. tyres being safely used. A further good improvement is the fitting of a re-designed prop stand, having an increased lift.

Model 36/14. This magneto ignition model is the same as Model 35/14 (page 15) except for the improvements mentioned above in the case of Model 36/4.

Model 36/9. The 498 c.c. side-valve *de luxe* machine (with detachable alloy head) differs little from Model 35/9 (page 16), but a four- instead of a three-speed gear-box is incorporated and the quickly detachable rear wheel now has a spindle running right through the hub instead of a bolt screwing into a dummy spindle.

Model 36/2. Both the English and Export 990 c.c. Big Twins (pages 17, 18) embody detail improvements. In the case of the

engine, sweeter running is claimed by the adoption of forked big-ends and the pressed steel "Magdyno" chain case has been scrapped in favour of a cast-aluminium case which looks much neater. The frame in which the engine is installed now has more robust rear tubes, and re-designed front fork spindles and links are used, the links being positively secured to the spindles at both ends. The rear quickly-detachable wheel spindle is improved as on Model 36/9. Clutch operation on the Export model is now by means of a rod instead of cable.

Model 36/12. The single-port overhead-valve "250" with coil ignition is similar to last year's Model 35/12, but has the improvements mentioned for Model 36/4. A more accessible rocker-box is also fitted and a grease nipple is provided for the inlet valve guide.

Model 36/22. The two-port overhead-valve "250" with magneto ignition (Fig. 27) has the same specification as Model 35/22 (page 20) except for the improvements mentioned included on Model 36/12.

Model 36/16. Here again the 347 c.c. coil ignition overhead-valve model has a specification similar to that of Model 35/16 (page 20) plus the improvements common to the dry sump singles. The cylinder head and barrel, however, have been re-designed with more numerous and deeper fins and a greater radius at the cylinder flange.

Model 36/26. This replaces Model 35/26 (page 21) and has the same improvements as Model 36/16. The 347 c.c. engine has magneto ignition.

Model 36/8. Practically speaking, this may be considered a new model. Although the 498 c.c. overhead-valve two-port *de luxe* model retains most of the features of Model 35/8 (page 22), there are numerous detail improvements. The engine has now been set vertical, the fuel tank improved, fork spindles and links re-designed, and a new quickly-detachable rear wheel assembly provided. Gear change is by foot only.

Model 36/18. Except for the fact that this machine has a single-port cylinder head and a black finish for the tank it is the same as Model 36/8.

Models 36/7, 36/10. The two overhead-camshaft models are now of similar design, both having hairpin valve springs, horizontal cylinder head finning and gear type oil pumps. The general specification is as given on page 23.

THE 1937 RANGE

For 1937 a dozen A.J.S. models are being marketed and particulars of them, together with illustrations, will be found on page 127.

CHAPTER II

VARIOUS PRELIMINARIES

IN this chapter we assume that the reader has selected and ordered his new mount, and desires to get it on the road as soon as the various legal formalities and requirements have been satisfied.

Registration and Tax. All motor-cycles are subject to registration and taxation, and a machine cannot be used on the highway until a registration number has been allotted to it and a licence obtained from the local borough or county council office. This registration or index number belongs to a machine until such machine is no longer used on the highway. If, after expiry of a licence, no renewal is made for a prolonged period, the authorities must be informed of the reason in advance. In the case of motor-cycles the tax is now on cubic capacity, not a weight basis.

The costs of the registration licences are as follows—

	For a Year £ s. d.	*For a Quarter* £ s. d.
1. Solo machines not exceeding 224 lb. in weight and registered prior to 1st January, 1933	1 2 6	6 3
2. Solo machines having an engine capacity not exceeding 150 c.c.	12 0	3 4
3. Solo machines exceeding 150 c.c. but not 250 c.c.	1 2 6	6 3
4. Solo machines exceeding 250 c.c.	2 5 0	12 5
5. Sidecar outfits (additional duty)	15 0	4 2

A licence application form (R.F. 1/2) is obtainable from any head post office, and must be very carefully filled in and posted together with a "certificate of insurance" (see page 29) and the registration fee to the licences department of the county council in whose area the machine is usually kept. Certain data, e.g. engine No. and frame No., will have to be first obtained from the dealer, if the machine is not delivered by rail. From the table above it will be observed that quarterly licences as well as annual licences may be taken out at the rider's discretion. Common sense dictates what licence should be taken out under the prevailing circumstances. A point to be noted, however, is that a post office can only issue renewals of the same type as already existing, that is to say, that a quarterly licence can only be renewed as a quarterly licence, and an annual one as an annual one. Application for annual licence renewal must be made between the 1st and 15th January each year. When selling a machine, the licence, if unexpired, may be handed over to the new owner, and the registration

book must be handed over to the new owner, who is required to pass it on to the registration authority after entering particulars of ownership. Both vendor and purchaser must notify the authorities of the transaction. It should be thoroughly understood that every taxation licence is issued for use with *one* machine, and one only. It is kept for use with that machine, whatever changes of ownership may occur. In the registration book all changes of ownership are recorded, as well as full particulars of licences issued. The book thus forms a complete record of the machine's history, and, incidentally, is of no little interest to the purchaser of a second-hand machine.

If a motor-cycle is registered as a solo machine, and the motorist decides to attach a sidecar, he must take out a fresh licence, and return the existing one, plus the balance due on a sidecar, i.e. 15s. All 1937 solo A.J.S. machines, except Models 37/12, 37/22, 37/22T are taxed at the rate of £2 5s. per annum. These three O.H.V. models, under 250 c.c. capacity, are subject to a £1 2s. 6d. per annum tax.

When the machine is on the road it must carry the licence—which is in the form of a disc—in a conspicuous position, visible always by daylight from the near side of the machine. The licence should be carried in a weatherproof holder, and may be mounted (1) on the front number plate, (2) on the handlebars, (3) at the side of the forks, (4) in the case of sidecar machines on the side panel of the sidecar body. The licence is of a distinctive colour, which is changed annually, and therefore a police officer can tell at a glance when an annual licence is out of date. Fourteen days' grace, however, is allowed from the expiry to the renewal of an annual licence.

Driving Licence. It is unlawful to drive any motor vehicle on the road without a driving licence bearing the rider's signature, which may at any time be demanded by a police officer together with a "certificate of insurance." Five days' grace is now allowed, however, for the licence to be produced *in person* at a police station specified. The fee for a licence is 5s., and it is valid for one year from the day it is issued. Applications should be made to the licences department of the county council in whose area the motor-cyclist normally resides. If the applicant is 16 years of age, he can, subject to a certain standard of physical fitness, obtain a licence to drive a motor-cycle only; but if he be 17 or over, a licence enabling him to drive a car or motor-cycle is, subject to the same condition, obtainable. For forging or altering a licence, the offender makes himself liable to two years' imprisonment.

With regard to physical fitness, no test is *compulsory*, but a driver is required to make a declaration on Form DL1 that he

suffers from "*no such physical infirmity*" *as to render him a source of danger to the public.* A "source of danger" includes a man having abnormal eyesight to the extent that he cannot *read a car number plate at a distance of* 25 *yd.*, has lost a limb, has muscular paralysis, is liable to fainting or giddiness, or suffers from any form of epilepsy. It should be stated, however, that if after the licence application form has been filled up, the licensing authorities are doubtful as to the driver's fitness, they may decline to issue a licence, but the would-be motor-cyclist can demand an official test for driving fitness, the fee for which is now 5s. Defective eyesight, epilepsy, or giddiness definitely bar a man from obtaining a licence. The penalty for making a false declaration is a fine not exceeding £50, and if done deliberately may incur imprisonment. The driving licence is strictly non-transferable, and is liable to be endorsed or even suspended at the jurisdiction of any magistrate for certain "criminal offences." No police officer may lawfully peruse the endorsements at the back of a licence. This eliminates prejudice that the officer might have against the offending motorist before deciding to report him for contravening the law. It is not, however, wise to roundly abuse an officer for this, or for any other reason. Remember that the British policeman, in spite of all the intolerance often unjustly attributed to him, is a very fair, reasonable, and just man, when treated with due respect. When treated otherwise, however, he is a decidedly stiff proposition to deal with.

Compulsory Driving Tests. If the applicant has never, before 1st April, 1934, held a licence he must undergo a driving test, the fee for which is now 5s., and the application form DL26. A machine must be provided for the test and provisional licences to enable riders to learn to drive are obtainable over the counter for 5s. Learners must be accompanied by an expert driver and "L" plates must be carried at the front and rear of the machines. After passing the test (which includes a knowledge of the Highway Code, ability to give signals correctly, start, stop and so forth) the ordinary driving licence is obtainable for 5s. as described in the previous paragraph.

Third-party Insurance. It is compulsory for every motor-cyclist to insure himself against third-party risks (including pillion riding). The law now requires that every person knocked down by reason of careless or negligent driving shall be able to recover from the motorist or motor-cyclist through the insurance company, damages up to £25 for every accident he may be involved in. The premium for third-party cover is very reasonable, being about £2 per annum unless you happen to belong to one of the Services or the policy covers the driving of more than one machine, in which case a higher rate is charged.

If a pillion passenger is carried or not, the insurance policy must cover him, and any sidecar passengers. On paying the insurance premium and supplying all necessary information to the company, they will issue to the applicant the all-important "Certificate of Insurance," which must be sent with the driving licence application form and afterwards produced on demand. Riders already insured thereafter receive reminders from their insurance companies before the policy expires, and on renewing them automatically receive their new "certificates." Altering or forging a "certificate" is a criminal offence. If a certificate cannot be produced on demand a summons will follow unless the rider can produce the certificate at a police station specified within five days.

In the case of a new machine it is, of course, desirable to take out an insurance policy covering besides third-party risks damage to the machine. If the machine is bought on the hire-purchase system this will be insisted on.

It is best to take out a comprehensive policy with a reputable company. Most insurance companies give no-claim bonuses. It therefore does not pay to worry a company over trifling and inexpensive details. All risks can be covered for a medium power machine for about £6 per annum. The insured should guard against any conduct likely to invalidate his policy. All clauses should be very carefully studied and complied with; otherwise in the hour of need the insurance company will remain neutral and repudiate liability, citing as its reason the violation of some clause of its policy by the insured person, and the rider may have to foot the bill himself.

Number Plates. It is not sufficient merely to have a number plate on the machine. The number plate must be in accordance with a definite scheme and definite dimensions laid down. Up till 6th October, 1930, both number plates were permitted to be in accordance with the dimensions given at *A* (Fig. 28). This still holds good in respect to the *front* number plate, but as regards the rear plate new dimensions are now specified. They must be as shown at *B* (Fig. 28). All letters and figures must be $2\frac{1}{2}$ in. high, with a total width for each letter or number of $1\frac{3}{4}$ in., except in the case of the figure 1. Every part of every letter and figure must be $\frac{3}{8}$ in. broad. The space between adjoining letters and between adjoining figures must be $\frac{1}{2}$ in., and there must be a margin between the nearest part of any letter or figure, and the top, bottom, and sides of the black background of at least $\frac{1}{2}$ in. The lettering if placed above the numbers need not be centralized, but the letters themselves cannot be separated more than the prescribed $\frac{1}{2}$ in., and there must be $\frac{1}{2}$ in. space between the bottom of the lettering and the top of the numbers. The rear plate must be

illuminated after dark by a suitable tail light and must be kept legible.

Audible Warning of Approach. The exhaust noise does not come within this category; the law stipulates that an independent warning mechanism must be provided on the machine. This may be in the form of a mechanical, electric, or bulb type horn. They all have their merits. For touring purposes a bulb type is suitable,

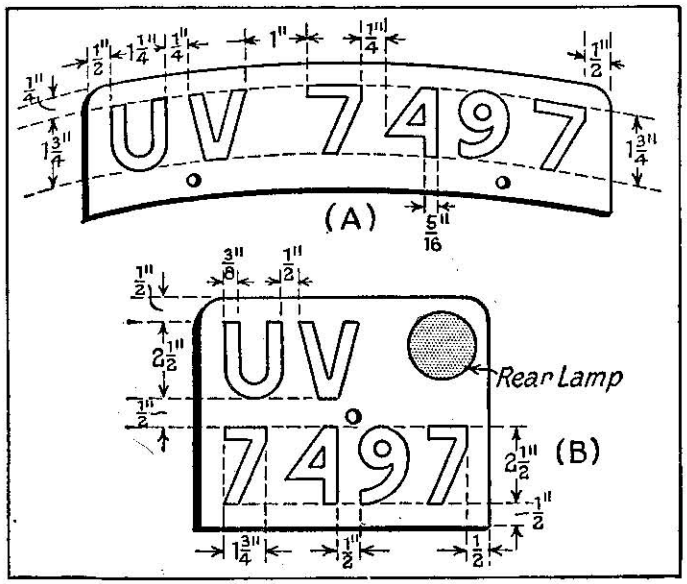


FIG. 28 NUMBER PLATE DIMENSIONS
At *A* are shown the old dimensions still used for a front plate and at *B* the new dimensions required for rear plates

but for the sports rider, mounted on a fast and perhaps slightly noisy machine, a mechanical horn, mounted on the handlebars, or an H.F. electric horn, is invaluable. The ideal is to have two, but do not buy one of those cheap horns which begin by sliding down the handlebar towards the steering head, and end by dissolving into their component parts. All 1937 A.J.S.'s have electric horns fitted as standard.

Never use a horn unnecessarily for it is apt to offend people when thus used, and remember the sounding of the horn with the machine stationary or between 11.30 p.m. and 7 a.m. is an offence!

Lamps. During the period between one hour after sunset and one hour before dawn (summer time) it is compulsory to show a white light facing to the front and a red one to the rear in the case of both solo and sidecar machines. The sidecar lamps must be fitted on the offside so as to indicate the entire width of the vehicle. At present it is compulsory to fit a rear lamp, not just a reflector. Recent legislation now makes it a punishable offence to take any mechanically driven vehicle on the highway at night without a red rear lamp fitted. Reflectors are allowed only on pedal cycles.

Lighting sets are either of the acetylene or electric type. Electric lighting has now become almost universal, and has revolutionized night riding; for there can be no possible doubt that it is far and away the best of the two types. It is fitted as standard on all 1936–7 models except the two 1936 overhead-camshaft machines (see page 3).

Other legal aspects affecting, chiefly, the conduct of the driver, will be considered in Chapter III. We may assume that the makers have complied with the law in the fitting of brakes and sidecar. The former, however, must be kept in proper order, otherwise a breach of the law is incurred.

Speedometer. Many people are apt to regard this instrument as a pure luxury. This view is wrong; to-day, with the introduction of a 30 m.p.h. speed limit, it is an absolute necessity to avoid unpleasant contact with magistrates. Also by its agency both your tyre mileage and your fuel consumption can be accurately estimated; it is of vast service in watching the tune of your engine by informing you when the machine is losing speed, or climbing a hill slower than it used to do, and by indicating whether any mechanical adjustments that you may have made result in an increase of engine revolutions. Watching the fluctuations of a speedometer needle is at all times fascinating, and in long distance tours the instrument is of great assistance. "Smith" speedometers driven from the gear-box and mounted on the front forks are not standardized on any model, but can be had as an extra. Engine r.p.m. indicators are also available for the O.H.C. models.

Note to "Learners." See that your "L" plates are correct or you may be "pinched" before acquiring a licence! Plates must be 7 in. square and the L, which must be red on a white background, must be 4 in. high and 3½ in. broad with 1½ in. width for the arms of the letter.

CHAPTER III

DRIVING HINTS AND TIPS

Preliminary Instruction. At this point in the proceedings we take it that the reader's mount has been fully equipped for taking the public highway, and is now garaged awaiting its first run on the road. This first trip is always regarded by the "tyro" with something approaching awe. Any preliminary nervousness, however, disappears almost instantly on taking the road, and confidence is gradually, and then rapidly, acquired. Thereafter progress is very rapid indeed, and after about a dozen runs or so the rider usually feels capable of undertaking his first long cross-country trip, and begins to thoroughly enjoy the sport; for motor-cycling is undoubtedly one of the finest tonics in the world for the average man, distracting, as it does, the mind from all business and domestic worries. But the rider should guard against becoming prematurely over-confident of his own abilities, and keep his speed down to reasonable proportions for some considerable time. Failure to do this usually results in his having some hairbreadth escapes, which quickly remind him that he is yet a beginner, and that, if he pursues his suicidal tendencies, he will be a beginner somewhere else. Indeed, very high speed should not be indulged in until the subconscious mind can be trusted completely to carry out the various muscular control movements automatically in the lightning emergencies which all road users are bound to be confronted with, sooner or later.

We will now turn to the question of actually preparing for the first run, which should be taken over a road well known to the rider and comparatively deserted. Firstly, it is advisable to read carefully through the maker's instruction handbook, carefully noting and, if possible, memorizing the more important details, especially those regarding gear changing; for the gear-box, remember, is a very expensive item of the equipment, and is subject to much damage if carelessly handled. Then place the machine on its stand by releasing the latter and dragging the machine upwards and backwards upon it. Pump up the tyres if they need it (for correct inflation pressures see page 42), and replenish the tanks. When filling the petrol tank, which holds about 3 gallons, take care to use a good size funnel with gauze filter when filling from a can; otherwise you may allow dirt or grit to find its way into the petrol system, and, perhaps, choke a carburettor jet, though this is unlikely, since there are filters in the system itself. As regards

fuel, the author would mention that No. 1 petrol is suitable for all models, but on the big O.H.V. models No. 1 petrol and benzol (equal proportions) gives the best results. For racing, alcohol fuels are desirable, but these require special compression ratios, and are really beyond the scope of this handbook. Always replenish the oil tank with the same lubricant. The A.J.S. Co. advise the use of none but the finest brand of oil for lubrication. Engine oils suitable for all purposes (except racing) are Patent Castrol "XL," (use Patent Castrol "XXL" during the summer) "Aeroshell" and Mobiloil "D." The gear-box oil level should be roughly ascertained by removing the oval metal cap on the gearbox top cover.

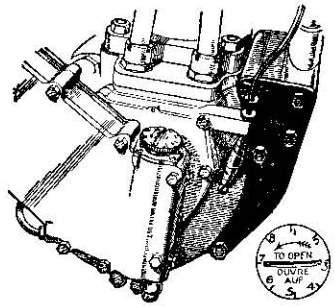


FIG. 29. SHOWING THE OIL REGULATOR PROVIDED ON THE 1932–6 MECHANICAL LUBRICATION MODELS

This adjustment is fitted on Models 35/5, 35/6, 35/8, 35/18, 35/9. Other 1935 7 models have dry sump lubrication with no adjustment

Wakefield Castrolease Medium, Mobilgrease No. 2 or Shell Motor Grease (soft) are recommended (for instructions see page 81). Open the petrol cock by pushing the press button fully forward.

Engine Lubrication. All A.J.S. machines, except some 1932–6 models, now have full dry-sump lubrication, so that no attention whatsoever is required other than seeing that the oil level in the tank is kept at the correct level (above half full and not above 1 in. below the return pipe outlet) and occasionally cleaning the tank and filters and verifying oil circulation by removing the oil tank filler cap and noting whether oil issues from the return pipe (see Fig. 46). The amount of oil pumped to the engine can on the mechanical lubrication models be varied by altering the setting of the control knob on the pump unit (Fig. 29). Screwing this knob down, i.e. in a clockwise direction, cuts down the supply of oil, while turning it the reverse way increases the supply. As may be seen in Fig. 29, a stop below the control knob

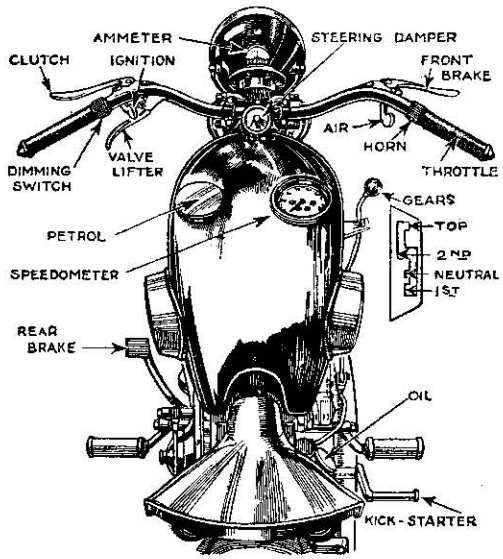
prevents the oil supply being cut right off. When the engine leaves the factory the oil supply is set on the generous side, and after the engine has been well run-in, say after a mileage of 500 to 600, or if the engine smokes excessively, the control knob should be screwed down about one-eighth of a turn and then re-tested for about 50 miles. If the oil supply is excessive, continue to cut it down by turning the control knob a further eighth of a turn, and so on, until the correct degree of lubrication is obtained. It is best to adjust the regulator until it is found that on accelerating the engine in bottom gear or neutral a puff of blue smoke emerges at the exhaust. *An approximately correct setting is arrived at by screwing the control knob lightly down to the stop and then unscrewing half a turn.* If the lubrication system is functioning correctly, oil should be observed flowing from the small pipe inside the oil tank immediately below the filler cap. On 1933-6 Twins an oil tell-tale is provided on the instrument panel and its action should be watched. On the mechanical lubrication models the oil level in the tank is not of great consequence, but keep the level an inch or two below the return pipe orifice. With mechanical lubrication it is necessary occasionally to drain the crankcase (see page 80).

Before actually starting up the engine, it is best to take a good look over the machine and get thoroughly conversant with the positions and actions of the various controls. Experiments may afterwards be made with them with the engine running on the stand.

The A.J.S. Controls. The reader should not merely content himself with knowing how the various controls work, but he should understand their exact functions. He should also understand the four-stroke principle which is described in Chapter IV. He will then not drive the machine like a Robot, but like an intelligent being. It is a popular idea that motor-cycling requires little intelligence. This is not so; skilful driving requires deep concentration and thought. In fact, nearly all the faculties are brought into active play while driving a motor-cycle; and hence the satisfaction and pleasure that the motor-cyclist derives.

Motor-cycle controls are of two types: (1) engine controls, (2) cycle controls. The former are the most sensitive and important; they are analogous to delicate nerves which convey impulses from the driver's hands to the interior of the engine. If the reader has ridden a three-speed pedal cycle, he will understand the purposes of the gear-box. It is to be hoped, anyway, that he has ridden a "push-bike," for he will then have no difficulty in balancing the motor-cycle straight away. Moreover, he will have acquired some road sense which only experience can give. A sketch of the 1932, 1933–7 A.J.S. controls are shown in Figs.

30, 31. The engine controls are all mounted on the handlebars and comprise four: (1) throttle twist-grip; (2) air lever; (3) lever for advancing and retarding spark, (4) exhaust valve lifter. On coil ignition models an ignition switch combined with the lighting switch is also provided. The two carburettor lever controls are mounted on the right-hand side of the handlebars. A twist-grip

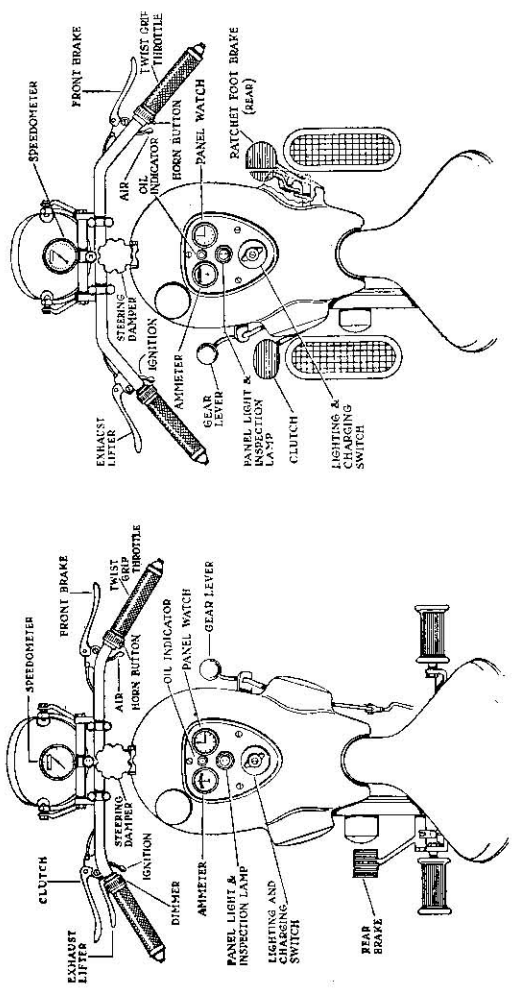


(From "The Motor Cycle")

FIG. 30. 1932 A.J.S. SHOWING CONTROL LAY-OUT

The arrangement of the controls on 1933–7 models is similar (see Fig. 31) except that the lighting switch and ammeter are mounted on a tank panel

(opening inwards) constitutes the throttle which regulates the supply of gas to the engine, and a short trigger or lever next to it, the air lever, which likewise controls the air supply. The air trigger is opened by pushing to the right. Their functions will be explained in that section of Chapter IV dealing with the carburettor. The exhaust valve lifter, which may be seen on the left-hand side, is primarily intended as a decompressor for facilitating starting. All controls advance or open by an inward movement of the various levers. For all normal purposes the ignition lever should be kept advanced as far as possible, except for starting, when it should be a quarter to half retarded to



FIGS. 31, 31A. SHOWING (LEFT) CONTROL LAYOUT ON THE 1933–7 SINGLES AND BIG TWIN (ENGLISH) AND (RIGHT) CONTROL LAY-OUT ON THE BIG TWIN (EXPORT)

On the coil ignition models there is an ignition switch combined with the lighting switch and an ignition warning lamp is included on the instrument panel. The controls on Model 37/2A Export are specially adapted for overseas driving. All 1937 models except 37/2 have foot gear change

prevent the engine back-firing, and thereby delivering a nasty blow to the foot operating the kick-starter. The novice may disregard this lever, leaving it on half advance.

On coil ignition models the engine cannot be started until the ignition (and lighting) switch is turned to the "C," "H," or "L" position, and the ignition must never be left switched on with the engine stationary, otherwise the battery may discharge itself if the contact breaker contacts are closed. If the ignition is left on a red warning lamp lights up.

On machines having a down-draught carburettor it is *very* important not to leave the petrol tap on with the machine stationary as there is an appreciable risk of neat petrol dripping into the cylinder in the event of the carburettor flooding.

The cycle controls consist of the clutch, the gear-change lever, and the two brakes. The front brake for the present may also be disregarded. Later on use both brakes simultaneously. The clutch is for coupling up the engine to the gear-box. The general principle of the latter should be thoroughly grasped.

Function of the Gear-box. This is made clear if the simple principles involved are understood. The reader will agree that work done is proportional to horse-power developed (neglecting transmission losses). An engine may be called upon to do the same amount of work climbing a gradient a quarter of a mile long as it does on a level mile. The essential difference is that the rate of work is much greater in the former case; that is to say, the work is distributed over a shorter distance. Assuming the speed of the motor-cycle to be kept constant in both cases, four times as much work will have to be done in the same time. The number of firing strokes in the case of a direct driven machine is, of course, the same in both cases, and therefore the power of each stroke will have to be increased by enriching the explosive mixture, i.e. by opening the throttle. But suppose that the throttle is wide open, and the output of work does not exceed the load imposed by gravity when climbing; then, naturally, the machine will slow up and probably stop. There is only one way out of the problem, and that is to increase the number of power strokes until the power output is quadrupled in the given time. This means, incidentally, quadrupling the engine revolutions. This can be done by incorporating a gear-box whereby the ratio of engine speed to rear wheel speed can be varied at the will of the driver. The principle on which all gear-box designs are based is the fact that the larger the circumference of a rotating wheel is, the greater is the speed of any point on that circumference relative to the axial speed. Thus a combination of wheels or pinions can be arranged on a countershaft (i.e. a shaft between engine and rear wheel) such that, by the engagement of different pinions of

varying sizes, variations of the relative speeds of engine and rear wheel can be obtained.

That destructive weapon of war—the tank—is a good example of how huge driving force can be obtained from a comparatively small motor by the employment of a sufficiently low gear. Up to a point the brake horse-power developed is proportional to the engine revolutions, or (to use an apparently contradictory statement) the power curve is a straight line. The reason for this is apparent if a moment's thought is given to the subject.

The novice is recommended to experiment with gear changes on the stand with the engine shut off. This may be done by moving the rear wheel and coaxing the gears and dogs into engagement. But never force a gear into engagement. The gear-box is not designed for such treatment, and will not stand it for long. See page 111.

Starting the Engine. We presume that the petrol has been turned on. For easy starting the throttle setting is important. To find the correct setting, first shut the throttle and air controls right back. Now on machines with lever control open the throttle about one-quarter of its travel or less. In the case of twist-grip control the air control is a separate lever. The twist-grip is operated by turning inwards to open and outwards to shut. Shut the twist-grip right back, and then turn the twist-grip inwards very slightly so that there is about $\frac{1}{8}$ in. pull on the wire after you have felt the resistance of the throttle spring. For these settings to be correct there must be no slack in the controls; that is to say, when the lever or twist grip is shut right back, a slight movement should begin to move the throttle; if it does not do so, the slack should be taken up by means of the adjusting screw on the top of the carburettor. Do not forget the throttle stop. Leave the air lever or trigger slightly open, unless the engine is stone cold, when it is advisable to close it completely. The ignition lever or trigger should be retarded about one-quarter or one-half its travel. Before getting astride the saddle satisfy yourself that the gear lever is placed in "neutral" position and flood the carburettor by "tickling" the needle for a second until petrol begins to drip from the float chamber. Be careful not to flood excessively on models having a down-draught carburettor. Now raise the exhaust lifter and engage the starter with the right foot. Turn the engine over several times with the aid of exhaust lifter, thereby sucking the mixture in. It is best to use the lifter merely for overcoming compression. If this is done, full suction will occur on each inlet stroke. On coil ignition models when "sucking in," the ignition must, of course, be switched off, i.e. turned to the "off" or "pk" position. As soon as the cylinder is charged give "CONTACT" by switching on. Then give one vigorous kick, dropping the

exhaust lifter just before the foot reaches the bottom. The engine should now fire. Take the foot off the starter instantly it does so, but do not allow it to spring back with a "bang" after starting the engine. Bring the foot back with the pedal and thereby prevent a heavy blow being given to the stop. If only a few muffled explosions occur, open the air lever slightly and also give more gas. The engine should then fire instantly. No carburation difficulty should be experienced once the engine warms up. As soon as the engine starts push open the air lever to its full extent. When the engine has just started from cold with the air lever fully closed it will be found that the mixture is very rich, so steadily open the control until the engine runs smoothly. After the engine has warmed up full air may be given. Never leave the engine running by itself. As soon as the oil circulates properly, and the engine gets into its stride, the revolutions will increase greatly, and the throttle must be closed accordingly. On no account race the engine while cold and do not allow it to "tick-over" too slowly as this reduces oil circulation to perhaps a dangerous extent. In regard to easy starting (as may be understood by referring to the context and diagram of the Amal carburettor on pages 64–66) it is essential to keep the throttle nearly closed, so as to induce a high velocity air current over the smaller, or pilot jet. Under such circumstances it is worse than useless to attempt to start up with the throttle wide open. Refusal to start is always due to some definite cause, and repeated operation of the kick-starter under the same conditions is futile, besides being very exhausting and exasperating. If the engine does not start easily after the first attempt, the rider is usually inclined to flood the carburettor excessively, and so cause the mixture to become much too rich. In this case open the throttle and air lever fully, raise the exhaust valve lifter, and kick the engine over several times. This will result in the excess petrol being cleared out. When starting with the engine warm keep the air lever or mixture control fully open. Most modern machines, however, are not addicted to starting trouble, except on rare occasions, and it is usually due to faulty control setting or a dirty plug.

THE FIRST RUN

A tip worth noting is, "Don't go out for a ten minute spin; stop on the road until you get the 'feel' and handling of the machine thoroughly—even if you do keep your lunch waiting." You will then reduce to the minimum the time during which you are a potential source of danger to yourself and all other road users. Now for the first run. Don't forget the driving licence and the insurance "certificate" and "L" plate if required.

Standing on the left-hand side of the machine, push it gently off the stand with the engine still revving and the gear in neutral. The machine will undoubtedly, to the new rider, appear at first rather unwieldy. Therefore, stand close up to your mount when wheeling it about, otherwise you may find yourself underneath the machine. Take things coolly, as though you had driven all your life, and, sitting on the saddle, raise the clutch and push the gear lever into first gear position. Then speed up the engine slightly by opening the throttle and engage the clutch by gently and slowly releasing the lever. You will then move off. It is best not to place the feet on the rests just at first, but to let them dangle on the road ready to support the machine if you find balance difficult. But place them there as soon as you feel able to do so. Bear in mind that you can stop the machine instantly you are in difficulties by raising the exhaust lifter or declutching, and applying the brakes. Never attempt to use any of the gears without first declutching. The novice always gets the impression that he is travelling very fast on first gear, and does not at first feel equal to changing into "second." Moreover, when changing, he feels it imperative to look down at the gear position to verify the gear lever position. If the gears are fumbled, instantly whip out the clutch and start afresh. It is advisable, therefore, to travel some considerable distance on bottom gear, and practise going back into "neutral" without stopping the engine. After getting accustomed to driving on first gear, a change should be made into "second" on a piece of road with no cross-roads. Speed up the machine, and then throttle down, lift the clutch, and push gear lever into position, afterwards letting in clutch again. It is worth while, now you are getting "warmed up," to go a step further, and get into top gear by repeating the former operations. Be careful not to allow the engine to "knock," which it will do if driven too slowly under load. "Knocking" is intensely injurious to an engine, and is usually due to pre-ignition. Therefore, open the throttle to speed the engine up, and slightly retard the ignition temporarily. It is always advisable to ease the clutch a little until the engine impulses become uniform and smooth. Once in top gear, it will be found that riding is much easier, and you will now begin to acquire considerable confidence. The pleasant "zoom" of the exhaust seems very stimulating after the comparative clatter and "fuss" that is noticeable when driving on low gear. You will probably be tempted almost immediately to open up a bit—even have a burst of speed. There is no harm in this if the road is clear and straight; but for heaven's sake don't do it if there is a suspicion of an obstruction ahead. Also remember that you are driving a new engine (see page 42). When slowing up, leave a good margin of safety. On changing down, the machine should be slowed up until it is travelling at a speed at which it normally does on the gear that is about to be engaged, and the engine must be revved up slightly.

To engage bottom gear from neutral in the case of heavyweight models with foot gear control, an *upward* pressure with the right foot is needed, followed by a *downward* movement in order to change up into the remaining gears. With the lightweight models (12, 16, 22, 22T, 26, 26T) bottom gear is obtained from neutral by a *downward* pressure and the other gears by an *upward* pressure on the foot pedal.

HINTS ON DRIVING

Use of Gear-box and Clutch. This has been dealt with to some extent in the foregoing paragraphs, and the remarks there should be carefully borne in mind, and if carefully observed should enable perfect gear changes to be made. A few additional remarks regarding possible abuses of the gear-box and clutch that may unknowingly be committed are added herewith—

Never employ a low gear for braking purposes; that is to say, never engage a low gear when travelling fast in order to pull up, and do not use a low gear when descending hills, unless they are quite out of the ordinary, for the internal expanding type brakes should be capable of fulfilling all requirements in this direction.

The machine should also never be run unnecessarily on first gear. This gear is only provided for ease of starting and climbing steep gradients, or when negotiating very heavy traffic demanding a very slow rate of progress. Using the first gear unnecessarily simply means extra wear and tear, high petrol consumption, and shortens the life of the engine and transmission.

Never slip the clutch as an alternative to gear changing. Prolonged slipping under load will burn out the cork inserts. Moderate slipping on the level at low speed does no harm.

Take care never to allow oil to find its way on to the clutch plates.

Tyre Inflation. Tyres should always be pumped up to a definite pressure by consulting a pressure gauge. On the Firestone tyres, used on all A.J.S. machines, Schrader valves are fitted, and a Schrader pressure gauge is obtainable. The tyres must not be soft or rolling will occur on corners and the covers will wear badly. Soft tyres are also liable to creep and thereby cause damage to the inner tubes. If, on the other hand, tyres are over-inflated, excessive vibration will result, with horrible discomfort to the driver. Needless to say, the rear tyre usually requires more inflation than the front one. Well inflated tyres have least skidding tendency, and produce the minimum amount of wheel slip at speed. In the case of the 1935 3·49 h.p. S.V. Model 35/5 the 25 in. × 3 in.

tyres should be inflated to the following pressures: front tyre, 15–16 lb.; rear tyre, 22–24 lb. On Models 35/4, 35/14, 35/12, 35/22, 35/16, 35/26 the correct inflation pressures for the 26 in. × 3·25 in. tyres are 14–15 lb. for the front tyre and 20–22 lb. for the rear tyre. On these models the sidecar tyre should be inflated to 14–15 lb. The above pressures apply to all 1936–7 singles.

With the heavyweight passenger machines (Models 37/2, 37/2A) with 26 in. × 4·00 in. tyres, recommended pressures are: front tyre, solo, 14–15 lb.; single S.C., 15–16 lb.; double S.C., 15–16 lb. Rear tyre: solo, 16–17 lb.; single S.C., 16–17 lb.; double S.C., 17–18 lb. Sidecar tyre: single, S.C., 15–16 lb.; double S.C., 17–18 lb. The above recommendations apply to average weight drivers, pre-1935 and 1936–7 models. For abnormal weight or carrying pillion passenger add 2 lb. to rear tyre pressure only.

"Running-in" a New Engine. When an engine is assembled the bearings are made as tight a fit as is reasonably possible. Owing to the crystalline nature of metal, an extensive and prolonged smooth rubbing will compress the bearing surfaces of the metal together until they attain a glass-like uniformity and hardness. During the process, of course, a certain amount of play arises in the bearings—just sufficient for good running fits. Thereafter wear is very slow. But imagine what will happen if the bearings are straight away subjected to violent friction and heat. Instead of the surfaces acquiring a glassy surface, they will rapidly wear down and become scored or abraded, and continue to be rather soft. Another important point to consider is the fact that until there are good running fits throughout the engine, oil will be unable to find its way about in any quantity over the bearing surfaces, which in consequence will remain partially dry if the engine is unduly worked, with the attendant danger of seizure. Distortion through overheating is also liable to arise. Distortion is of two kinds—temporary and permanent. If permanent distortion of the valve seatings takes place, an engine will never be fully efficient afterwards. All A.J.S. machines are tested on the road at Plumstead before leaving the manufacturers; but as the mileage they do is not great, the rider should therefore not drive above 30 m.p.h. or use much throttle until at least 500 to 1000 miles on the road have been covered.

Sparking Plugs. Always run with a decent plug in the "pot." There are many good plugs now available, such as the Lodge H.1, or K.L.G. KS5 (777 on S.V.). A cheap plug causes loss of power and pre-ignition. A suitable 14 mm. plug (O.H.C.) is the K.L.G. LKS5.

Keeping an Engine Cool. If an engine's tune is to be maintained, it is essential not to overheat it. In spite of plenty of cylinder finning, all air cooled engines are liable to become overheated. To prevent this the controls should be handled carefully.

Always drive with the air lever of the carburettor open as far as possible, consistent with even running, and the spark lever well advanced.

After climbing a stiff gradient, never open out on the other side; allow the engine to cool either by raising the exhaust lifter, or by nearly closing the throttle and opening the air lever. The throttle must not be completely closed, otherwise no cooling air enters the cylinder and the oil is liable to be sucked into the combustion chamber by the vacuum thereby created which, of course, accelerates carbonization. Some of the bad effects of overheating have already been mentioned.

Methods of Controlling Speed. Speed can actually be controlled in two ways—(1) driving on the throttle, (2) using the exhaust lifter. The latter method is bad practice, and on the O.H.V. models may cause bent exhaust valves, for if the exhaust valve is held up while the throttle is left open enough to produce a combustible mixture, it will be continually swept by a high temperature flame. That this does happen is indicated by the banging that usually occurs along the exhaust pipe and silencer when this practice is adopted. Moreover, the use of the exhaust valve lifter necessitates complete removal of fingers from the throttle, which is in itself dangerous. Driving on the throttle has many points in its favour. Closing the throttle exerts a powerful braking effect, which can be used to advantage both when driving on the level and descending hills. Indeed, the really good driver seldom uses his brakes. He cultivates such good judgment of speed and distance that he does not often require them. An occasional jab of a brake is all that he needs. A front brake must never be used suddenly; a skid will probably ensue. The rear brake should always be applied first.

Cruising Speed. Every machine has what, for want of a better name, may be called its cruising speed. By this we mean the speed at which the engine runs most sweetly. It usually lies somewhere between 25 and 30 miles an hour. The rider should find out what this speed is in the case of his own mount, and drive most frequently at that speed. If a long life is desired of an engine it should always be driven well within its maximum capacity, that is to say, not on full throttle. In the case of most riders there is not much danger of doing this owing to the winding nature of the roads in this country and the numerous "built-up" areas.

Cornering. The art of cornering takes some time to master. We all know that for a bicycle or motor-cycle to get round a bend fast without skidding it is necessary that the machine should be

banked, i.e. the rider must lean the machine inwards towards the centre of the circle. The reason for this is as follows—every moving body possesses momentum, and that momentum at any given time acts in the direction that the body is moving at that time. In the instance of a body describing a circle it is evident that the body is continually changing its direction (a circle theoretically consists of an infinite number of straight lines), and consequently the momentum acts tangentially. Thus there are resultant forces continually urging the centre of gravity of the motor-cycle outwards from the centre, when rounding a bend. But this can be counteracted by inclining the body and machine inwards. A better method, used by some fast drivers, is to incline the machine inwards and the body outwards. Using this method, one may corner almost on the exhaust pipe. Make a habit of always cornering close in at the blindest part, and indicate your intentions well before actually turning off at a sharp bend. It is no consolation to be able to say that you gave a hand signal, after a high-powered car has buckled up your rear wheel. Never omit to sound the horn at all corners. Sometimes it pays to swerve slightly to the offside before approaching a moderate bend at high speed, throttle down, and bank inwards, thereby cutting the corner somewhat and at the same time keeping close in. The throttle may be opened up again half way round the bend. This kind of cornering, however, comes under the heading of " stunt " driving, which is not recommended to any but the experienced driver.

When cornering with a pillion passenger for the first time, reduce speed well below that at which you generally take a corner solo. Failure to do this will probably cause you to drift well away from your proper side of the road—a most risky procedure—because you are afraid of banking too steeply. It is, undoubtedly, unpleasant to bank steeply with a passenger riding pillion. We will deal with pillion riding again later.

Left-hand corners demand special caution on the part of the driver of a sidecar outfit, according to the speed at which corners are taken. He should throw the weight of his body towards the left. A passenger may assist the driver by leaning in towards the centre of the bend; but he should not adopt "T.T." acrobatic methods. Your passenger might easily break his neck against a lamp-post, to say nothing of the indignation and terror that would be caused to any witnesses of the occurrence. The proper manner to navigate a sidecar round a left-hand corner is as follows: approach the corner at a pace well below that which safety requires, and open the throttle gradually and cautiously on the bend ; the outfit will then pivot on the sidecar wheel, which is precisely what is required. Conversely, on a right-hand corner

either close the throttle or apply the brake a little as the outfit is actually swinging round the bend ; it will then pivot on the rear wheel of the motor-cycle. Always endeavour to take corners with a sidecar at a reasonable speed, especially when turning to the left, as centrifugal force puts a great lateral strain on the machine. When turning to the right the lateral strain is reversed in direction and has a crushing effect on the sidecar axle via the torque arms. At high speed the strain is terrific, and a sidecar axle may break. Result, an inquest. Difficulty is often experienced in the management of an empty sidecar while cornering. Ballast substituted for the passenger is of great assistance in this connection.

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 121). 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.

Hill Climbing. There are few hills likely to be encountered by A.J.S. riders which present any serious difficulties. It is purely a question of making the best job of it, or in other words, a climb that will not bring the blush of shame if there should happen to be critical motor-cyclists watching hill ascents, as is often the case, by the side of the road. It is advisable, before an ascent is made, to allow the engine to cool down very thoroughly first. Unless the road is notoriously bad, take a fast determined rush at the hill, and get up as far as possible on top gear. But never allow the engine to labour. As the machine slows up it will be necessary to give less air and retard the ignition gradually. Change to a lower gear instantly the revolutions fall seriously, and there is danger of overstraining the engine.

Coasting. Running declutched down hill with engine stopped is very popular among riders. It cannot be denied that the smoothness and noiselessness of it is altogether a delightful sensation. This procedure, however, unless the hill be very long, does not lend itself to cooling the engine very well, and we must assume that the driver has been climbing—unless, of course, his garage is situated on the top of a hill. It is far better to use the exhaust lifter or, if the hill is steep, to open the air lever and partially close the throttle. When letting in the clutch again, it is desirable that it should not be let in under full compression with the machine travelling fast ; such action may result in a bad skid, and damage the rear tyre. Wait until your mount has slowed up to about 12 m.p.h. ; then raise the exhaust valve and let the clutch in gently ; when the click and whirr of the valves

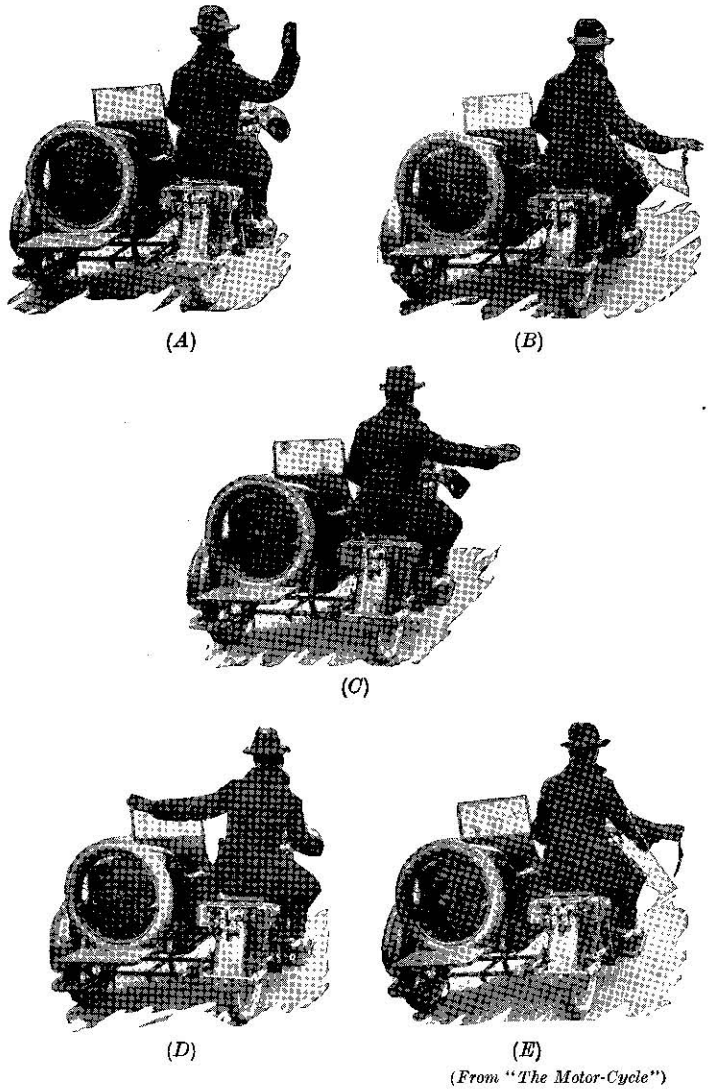
indicate that the engine is coupled up again, drop the exhaust valve. The throttle being only slightly open, the power strokes will be resumed gradually.

Pillion Riding. We will not enter into the question whether pillion riding is dangerous or not. Undoubtedly much depends upon the qualities of the driver and the circumstances under which it is undertaken. The fact remains that, as the law stands at present, the only legal requirements are that the pillion passenger shall sit *astride* a suitable pillion seat *fixed* to the machine and shall be covered by insurance.

Always Give Hand Signals. Do this even if you think you are alone on the earth. If a habit is made of it, you will give them instinctively. Remember, however, to give signals in ample time. When stopping, either put your right hand up, as shown in Fig. 32, or move the left hand up and down vertically, as many people do. In any case make your intentions *clear*. A signal that is rarely used, but which is sometimes invaluable, is the signal indicating that you intend to proceed straight ahead. This should be given when you are confronted with oncoming traffic which doubts your intentions at a cross-road. In any doubtful situation, instantly whip out your hand to show what you are going to do, and do it. Everybody knows the utter folly of two people dodging each other. On the pavement two pedestrians doing this invariably fail to clear each other, unless one stops or gives way. The hand signal shown at *D* in Fig. 32 has now been changed and the officially recognized signal for turning left is to extend the *right* arm straight out from the shoulder and slowly rotate it in an anti-clockwise direction. The sign illustrated is in all conscience clear enough and it puzzles the author why it has been changed for motor-cycles. Actually correct signals are not compulsory although they count in case of trouble and the author still prefers to use the sign shown at *D* which is unmistakably clear to following traffic.

Some Don'ts Worth Remembering. The following hints are well worth taking note of and if observed the rider will do his duty towards helping to reduce road accidents and will keep out of trouble.

1. Don't go over "white lines."
2. Don't cut-in.
3. Don't drive on the brakes.
4. Don't flog your engine continuously.
5. Don't cross tramlines in front of lorries.
6. Don't take unnecessary risks.
7. Don't fail to give hand signals *in time*.
8. Don't let your thoughts wander from driving.
9. Don't forget to set a good example to others.



(From "The Motor-Cycle")

FIG. 32. RECOGNIZED SIGNALS TO BE USED BY DRIVERS

A = Signal to stop
B = Slowing down
C = Turning to right
D = Turning to left
E = Over-take me

(see opposite)

10. Don't refuse an SOS.
11. Don't forget you are only young once, and only live once.
12. Don't forget your driving licence and insurance certificate.
13. Don't carry a pillion passenger unless he or she is to be trusted in an emergency.
14. Don't omit to read the Highway Code.
15. Don't run with smooth tyres (this is an offence).
16. Don't make a noise in the lower gears.
17. Don't sound your horn between the hours of 11.30 p.m. and 7 a.m. (this is an offence in "built-up" areas).
18. Don't speed near "Belisha" crossings (pedestrians have right of way).
19. Don't forget when you are in a "built-up" area (30 m.p.h. limit).
20. Don't race traffic lights (i.e. don't cut across when amber follows green).
21. Don't hesitate. Remember the old saying.
22. Don't take cross-roads at more than a crawl.
23. Don't forget the battery.
24. Don't omit to check oil circulation before a run.
25. Don't accept evidence from *one* witness if you are prosecuted for speed.
26. Don't forget to check your speedometer occasionally.

Cultivate Imagination. Always ride in a state of constantly expecting the unexpected, especially over unfamiliar roads, and always assume the other fellow may do the wrong thing. Remember that bad accidents always arise from some unexpected or sudden incident.

Dangerous Driving. This, heavily punished, means driving at a speed or manner *dangerous having regard to all the circumstances* actual or hypothetical, i.e. having regard to other traffic or pedestrians that are in the vicinity or might reasonably be expected to be there.

In order to meet cases of negligent driving of an unpremeditated nature, such as failure to give hand signals, "careless driving" is made an offence with which a motorist may be charged, and the penalties for this are not quite so severe as for "dangerous driving." Passing on corners and cutting-in would come under the first heading, however. "Drunk in charge" usually means imprisonment and automatic suspension of the driving licence. A summons must be served within fourteen days of an alleged offence, and the driver must be notified at the time of committing it that prosecution will be considered.

Road Signs. There are various types of signs scattered about the country; they should be implicitly obeyed. Fig. 33 shows three important types. Those shown at *A*, *B*, *C* are the speed limit, derestriction, pedestrian crossing signs respectively. A special sign designed to show when a driver is approaching a main road from a subsidiary road is now in common use, and to ignore this is an offence. It should not be confused with the "Go Slow" sign used at some road junctions.

Skidding. Nerve is the best antidote to skidding. A bold rider seldom skids, and when he does he usually corrects it. Skids seldom occur on dry roads. Too violent braking or crossing tramlines in a timid fashion is usually the cause. Brakes

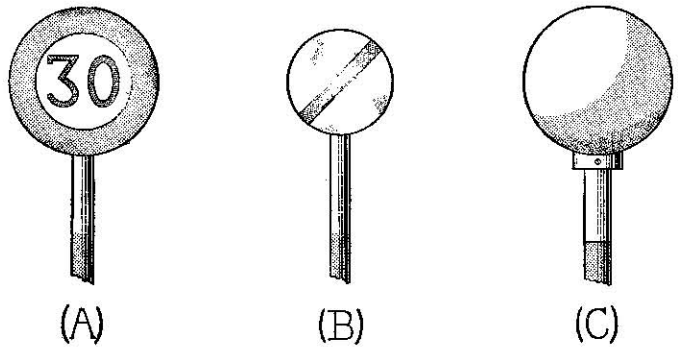


FIG. 33. THREE SIGNS YOU MUST LOOK OUT FOR

At *A*, *B*, *C* are shown respectively the 30 m.p.h. speed limit sign indicating a "built-up" area, the derestriction sign (this is now the same size as the speed limit sign) which means you can "let her out," and the "Belisha" beacon denoting a pedestrian crossing, where you must give way to persons crossing the road. Another sign to look out for is a triangle within a circle with the words below "HALT AT MAJOR ROAD AHEAD." To disregard this sign is an offence

should be very gingerly applied on wet roads, and tramlines should be negotiated fearlessly at a good speed and at a sharp angle. A rear tyre with worn tread usually facilitates skidding. Therefore, during the winter months, if the rear tyre is worn badly, change it over to the front. This procedure is recommended, anyway; for it enables the best tyre mileage to be obtained. If a skid does occur, instantly declutch and turn the machine in the direction of the skid, braking at the same time. If you do not go over, carry straight on without stopping.

Dazzle. When driving by night, cars with glaring headlights are frequently met. If the eyes are allowed to face such lights, the pupils contract to such an extent that temporary blindness ensues immediately after the lights have passed. This is very dangerous if there is any traffic immediately ahead of

you. Make it a rule to keep the eyes focused on the ground in front, and "concentrate" them at the moment of passing. This should entirely eliminate what is usually called "dazzle." It is purely a question of using a certain amount of will power and common sense. On a model provided with Lucas electric lighting always dim the headlamp when approaching a brightly illuminated vehicle. Its driver, if he is a gentleman, will then cut out the glare from his lamp or lamps.

SOME POINTS ABOUT THE LAW

The legal matters regarding licensing and registration having been disposed of it remains to deal with questions concerning breakage of the law. It is wise to remember that in all cases of accidents or of legal trouble the legal departments of the Automobile Association and other road organizations are always ready to assist members on receipt of an SOS, and to give free legal defence in the case of certain offences. The following information is given because in law "ignorance is no defence."

What to do in Case of Accident. The first thing to do in case of accident is to obtain the names and addresses of at least two independent witnesses who are *likely to assist your case.* Carefully jot down on paper all particulars of road width, place of accident, your speed at time of accident, whether horn was sounded, and all other particulars relating to the accident. Remember that insurance companies rely mainly upon the police reports. Therefore, it is essential to summon a police officer so that he can take down *signed* statements from both parties, both for perusal by police headquarters and for the benefit of the insurance companies concerned. A full truthful statement must be made. Anything withheld will react unfavourably against the driver later on. If an injured person is likely to make a claim, an independent medical man should be called to examine him and make a report. Do not engage in any correspondence without legal advice, or if this is not taken, make clear that all your statements in the letter are made without prejudice to your case; and refrain from making statements either at the time of accident or afterwards, which might be construed as admission of liability. Never offer money to the injured person, for motives of sympathy are often construed into admissions of legal liability.

Name and Address. To anyone who complains that the motorist has committed an offence of driving to the common danger, the driver must give his name and address. The maximum penalty for refusing, or for giving a false name and address, is £20, with heavier penalties for subsequent offences.

The Order to Stop. A person in charge of a horse may order a motor-cyclist to stop, and so may a constable in uniform, or a man injured by your machine. To fail to do so is an offence. In any case an order to stop should rarely be ignored. The signal to stop should be made as already noted on page 47.

Endorsement of Licence. Convictions under the New Road Traffic Act, may be endorsed on the back of the licence, except a conviction for obstruction. In the case of "dangerous driving" (page 48) an endorsement and usually suspension automatically follows. It is not widely known that a driver who has had his licence endorsed can obtain a clean licence at any time for the fee of 5s., provided that he has not, during a continuous period of not less than three years, had any conviction endorsed.

Drunkenness. A person found in charge of a motor-cycle while under the influence of drink is liable to imprisonment without the option of a fine, and on conviction his licence is automatically suspended.

Warning of Approach. It is compulsory to give audible warning of approach between 7 a.m. and 11.30 p.m. Failure to do so renders the driver liable to conviction for "dangerous driving," and to an action for negligence if anybody is injured as a result.

Exhaust Cut-out. It is illegal to use an exhaust cut-out, or any contrivance enabling the exhaust gases to escape into the atmosphere without first passing through an effective silencer.

Arrest. The driver is liable to arrest by a police constable (whether in uniform or not) if he refuses to give his name and address, refuses to produce his licence on demand, or if his machine does not bear the identification (registration) marks.

Rules Regarding Number Plates. The driver of a motor-cycle is guilty of an offence if the number plates are not properly fixed, or if they are in any way obscured or rendered illegible or not properly illuminated, unless he can prove that he has taken reasonable steps to prevent this, and if the driver is not the owner the latter may be charged with aiding and abetting.

Illumination (see also Chapter II). The driver must always comply with the existing lighting regulations; otherwise he may be summoned. The rear plate must be properly illuminated.

Regarding the Registration Book. When a licence is issued a registration book is issued to the owner, and this must be sent to the Council with whom the vehicle is registered as follows—

1. When any alteration is made to the vehicle.
2. On sale or change of ownership.
3. On change of address.
4. When vehicle is broken up, destroyed, or permanently sent out of the United Kingdom.

Obstruction. The machine must not be left for an unreasonable

or unnecessary time on the highway in such a position that it constitutes an obstruction to other traffic or pedestrians.

Time Limit for Summons. Unless previously warned at the time the offence is committed, notice of an intending prosecution for committing any motor-cycling offence must be given to the driver or the registered owner of the motor-cycle within 21 days of the alleged offence.

Right of Appeal. A person convicted of an offence under the New Road Traffic Act, has the right to appeal to next Court of General Quarter Sessions. A right of appeal lies against an order disqualifying any person from obtaining a driver's licence.

Speed Limit. A general speed limit of 30 m.p.h. has been introduced for all built-up areas having a system of street lighting with the lamps not more than 200 yd. apart, or classified as such by the Minister of Transport. The signs used for indicating the beginning and end of a 30 m.p.h. limit are shown at *A* and *B* respectively in Fig. 33. In such areas watch the speedometer and be careful not to exceed 30 m.p.h. when passing a car which may be a "Q" patrol.

Leaving the Machine. A motor-cycle may not be left with the engine running while the owner is absent, however short the period. When left at night both lamps must be lit.

Police Warnings. A new system of dealing with first offences of a minor nature has recently been introduced. Under this system it is customary, unless the offence be serious, to give the offender an official warning instead of bringing a prosecution. Whether or not the offender be prosecuted is left to the discretion of the Commissioner of Police. This system is a step in the right direction and does much to avoid frivolous prosecutions.

Petrol Storage. Those who desire to possess a petrol "dump" on their own property should remember that a maximum of 60 gallons in 2-gallon tins is permissible, and it must be located at least 20 ft. from an occupied building. Also the store must be arranged such that, in the event of fire and leakage from the tins, the inflammable liquid will not escape. Suitable ventilation must be provided, and when any petrol is kept other than in the fuel tank, a fire extinguisher or sand must be kept on the premises.

CHAPTER IV

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. 34, 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

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

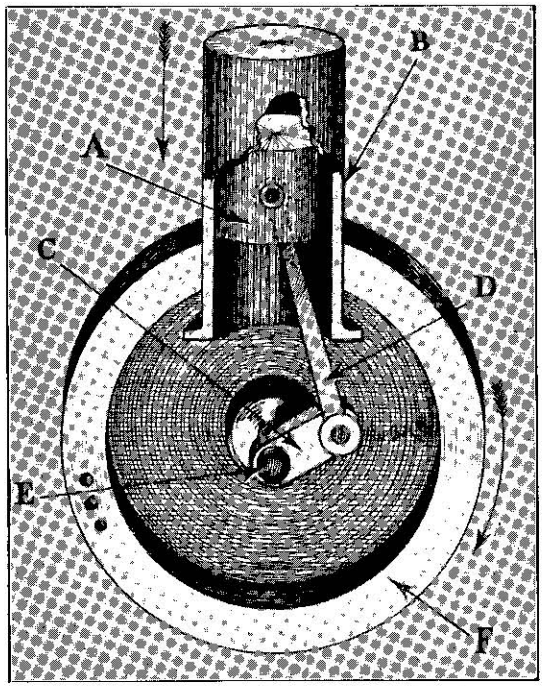


FIG. 34. DIAGRAM ILLUSTRATING HOW A PISTON (*A*), SLIDING IN A CYLINDER (*B*), ROTATES THE FLYWHEEL (*F*)

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 cycle. Let us refer to Fig. 35, 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

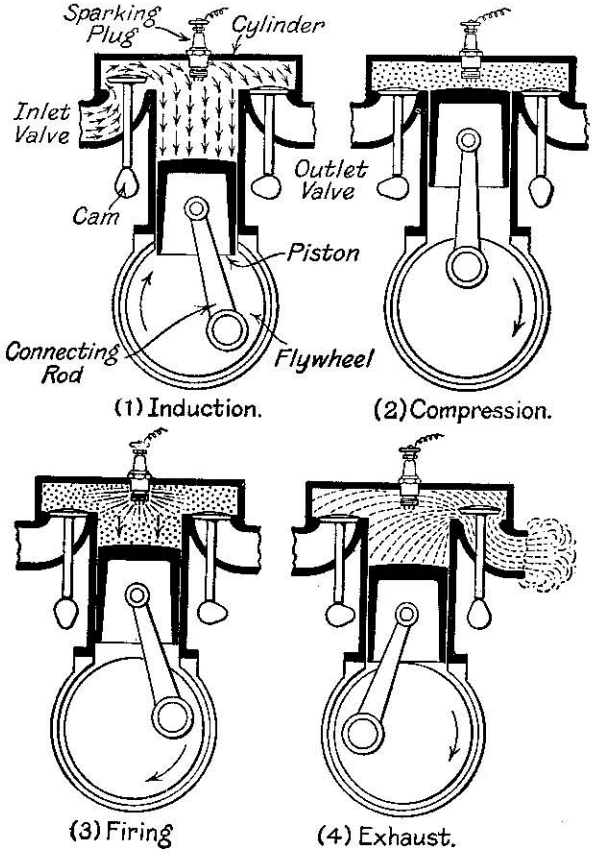


FIG. 35. THE PRINCIPLE OF THE FOUR-STROKE ENGINE

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 open 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. 36 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. 59.

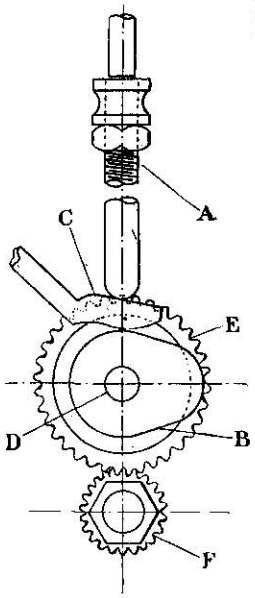


FIG. 36. VALVE CAM ACTION

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 into the atmosphere.

THE PRINCIPLE OF THE CARBURETTOR

The problem of perfect carburation is a very complex one, and as yet unsolved, for it is dependent on many factors. The chief difficulty which presents itself is the constantly varying engine speed and load. A certain mixture of petrol vapour and air is only suitable for an engine running at a certain speed and with a certain load, and should the speed or the load vary, the mixture should also be varied to meet the new conditions. Up to now it has not been possible to construct an instrument which will produce the necessary alterations exactly, and the best carburetting system is, therefore, a compromise. Other complications introduced are : the temperature of the engine and of the air, density of the atmosphere, and quality of the fuel. Petrol spirit used for ordinary motor work is a doubly distilled, deodorized spirit, of about ·700 specific gravity, derived from crude petroleum. Other fuels, however, including benzole and paraffin, may also be used, but are not satisfactory except in the case of benzole, which is commonly used. Discol is frequently used for racing purposes. It is essential that a high-speed engine should run on a fuel having a high degree of volatility.

The carburettor is an *atomizer*, and its duty is to convert liquid petrol into a mixture of air saturated with the finest particles of

fuel in the right proportions under all conditions ; the correctness (approximate) is attained by either automatic, semi-automatic, or controlled means. In the case of the Amal carburettor (see page 64), used on all A.J.S. machines, the action is semi-automatic. The general principle on which all carburettors work will now be reviewed.

It has been found by experiment that the most satisfactory way of encouraging petrol to evaporate is to drive it under pressure through a very tiny hole, called a jet, and the process is assisted by heating the spraying device. Owing to the proximity of the carburettor to the combustion chamber, ample heat is, of course, conducted to it via the induction pipe, once the engine has warmed up. In practice it is not common to employ forced induction, or *supercharging* (i.e. to blow the mixture into the cylinder). Moreover, it is entirely unnecessary for normal requirements in the case of motor-cycle engines. The powerful suction through the inlet pipe on the inlet stroke can be relied upon to atomize the fuel completely. Let us refer to Fig. 37, which shows the salient features of a carburettor in action. It will be observed that the petrol level in the jet must be below the orifice at the top ; otherwise the petrol will overflow and cause *flooding* of the carburettor. The level is automatically regulated by the action of a *float* attached to a spindle, which operates a needle valve, thereby cutting off the petrol supply immediately the level in the chamber reaches the height of the jet orifice. On the downward stroke of the piston, air is sucked in through the air intake, past the partially open throttle, which is a closely fitting hand controlled slide, operating up and down in a barrel, past the jet, past the inlet valve, and thence into the cylinder. The extremely high velocity air current that must obviously sweep over the jet causes the fuel to issue in a small fountain, and simultaneously causes the spirit to be atomized and diffused with the air rushing in towards the combustion chamber. This, briefly, is the principle of the carburettor.

Actually, no carburettor is by any means as simple as that shown in the diagram, for consider the failings of such a carburettor. The rider will wish to vary the speed of his engine to meet various conditions ; he could do so by opening or closing the butterfly throttle valve or gas tap shown in the diagram. But, unfortunately, petrol and air are dissimilar vapours, and do not respond evenly to varying suctions ; so the carburettor illustrated will give a mixture of different proportions for every throttle setting, and since petrol and air are only highly explosive when mixed roughly in the proportions of 13 : 1, only one of these settings will be correct. This might work tolerably well in the case of a stationary gas engine with a governor, but would be quite hopeless

for all locomotion purposes. Thus it is essential to be able to control the gas and air independently. This can be done by having two slides working independently—one for throttling the air intake and one for throttling the entry to the induction pipe (see Fig. 41). Hence, although the air intake may be fully open, a high velocity air current over the jet can still be obtained with the gas throttle only slightly open. And so the amounts of gas and air can be varied at will to suit the conditions.

The various refinements and complications that are incorporated in all modern proprietary carburettors (including the Amal)

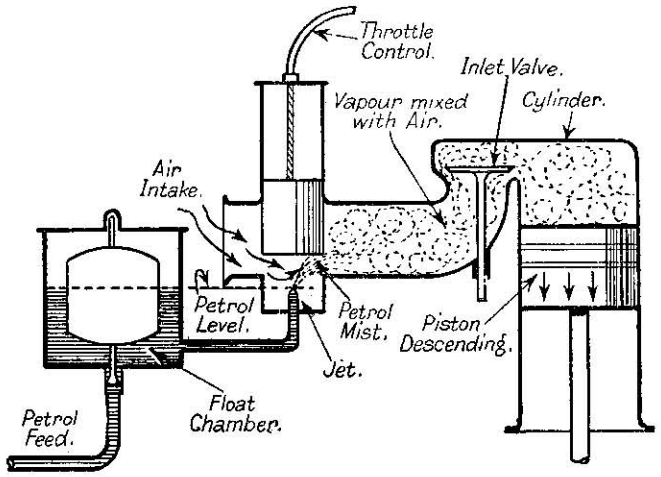


FIG. 37. ILLUSTRATING PRINCIPLE OF THE CARBURETTOR

are designed to (1) make the mixture as homogeneous as possible, (2) simplify the control, (3) enable automatic slow running to be obtained, (4) enable settings for special purposes to be made.

THE IGNITION SYSTEM

The High Tension Magneto. This (or the magneto portion of the Lucas "Magdyno") is so called because, unlike a dynamo, it generates a small current at a very high voltage. An experiment that demonstrates this very convincingly(?) is to place a finger on the plug terminal while the engine is "ticking-over." The instrument is very complicated, and requires very delicate handling when being taken to pieces; no amateur ever dreams of dissecting a magneto. Magnetos of to-day are extraordinarily reliable

instruments, and seldom give trouble. When trouble does arise, it can usually be located in the contact breaker (see page 99), and can be remedied easily by almost anyone. Therefore, we will conclude this chapter with the briefest description of the magneto, and how it works.

The magneto primarily consists of three 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 102), it must also be timed to occur at the moment when the bobbin is having the greatest effect on the magnetic field (see Fig. 38).

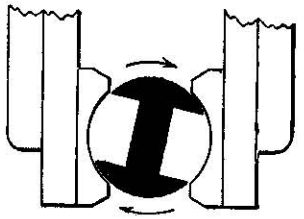


FIG. 38. POSITION OF MAGNETO ARMATURE WHEN CONTACTS SHOULD OPEN

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

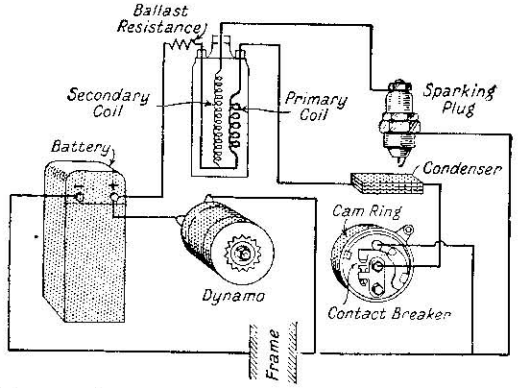


FIG. 39. THE ESSENTIAL COMPONENTS OF COIL IGNITION
On the two A.J.S. models a ballast resistance is not used and the contact breaker is of a somewhat different type to that shown. It should be noted that the above sketch is purely diagrammatic and that the condenser is in parallel with the contact breaker and not in series as is suggested

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 36/4, 36/12, 36/16, 37/12, 37/16. It is shown diagrammatically in Fig. 39. It will be observed that in addition to the battery, dynamo, coils, and contact-breaker, there is a *condenser* in series with the contact-breaker, as on the magneto. Other features (not shown) are the "tell-tale" warning lamp which shows when the ignition is switched on (see page 37), the dynamo cut-out, which prevents battery discharge to dynamo, and the panel ignition switch which earths the primary current.

The Sparking Plug. Passing reference has been made in respect of the " results " end of the system, i.e. the sparking plug. This

small member requires and deserves some further consideration. It is astonishing how efficient modern sparking plugs are, considering the enormous heat they are subjected to, and the millions of hot sparks they are called upon to deliver during their working lives. The " expectation of life " of the present plug is nearly double that of plugs made a few years back.

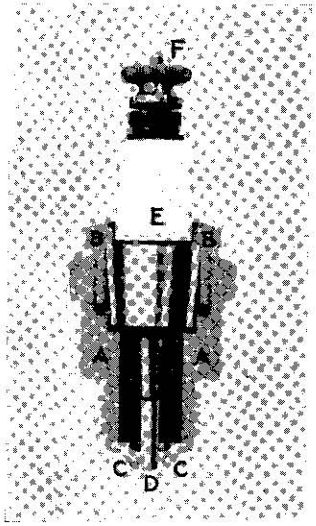


FIG. 40. THE LODGE SPARKING PLUG

The purpose of the sparking plug is to provide at regular intervals a spark in the combustion chamber. The electric current for this job is generated, as we have seen, by the magneto. Fig. 40 shows the construction of a Lodge plug. That shown is partly sectioned. It comprises a piece of insulating material *E* held in a metal support consisting of the plug *A* and the gland nut *B* which are locked together firmly and screw into the cylinder head. Down through the centre of this insulator (usually mica, porcelain, or steatite) passes a thin metal rod *D* which is known as the *centre electrode*. To its upper end is attached a terminal *F* which holds fast the H.T. " juice " wire from the " mag." At its bottom end are placed either one or two *earthed electrodes* (the plug shown has two) in close contact with, but not touching, the central electrode. Sparks jump from the centre to the earthed electrodes as soon as a current of sufficient voltage to jump the gap at the electrodes is generated by the magneto. Clearly the gap at the electrodes is of great importance (see page 97).

According to whether there are one or two earthed electrodes so is the sparking plug known as a " single point " or a " two point."

CHAPTER V

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 and with jet sizes giving the best all-round performance. In the ordinary way it is not wise to alter the maker's setting, but sometimes it is necessary to retune the carburettor, when, for instance, the original setting has been interfered with or the rider wishes to indulge in racing. In this chapter the author has given full information and tuning instructions for the Amal semi-automatic needle jet carburettor fitted on the 1936–7 A.J.S. models.

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 used only to facilitate starting and occasionally under very adverse circumstances. The carburettor slides are chromium plated to provide hard wearing surfaces. The air slide is operated by a trigger type handlebar lever 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. 41A,) 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

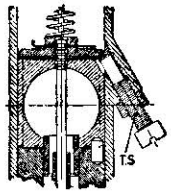


FIG. 41A. AMAL THROTTLE STOP

FIG. 41. SECTIONAL VIEW OF AMAL SEMI-AUTOMATIC TWO-LEVER CARBURETTOR

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.

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. 42) 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*

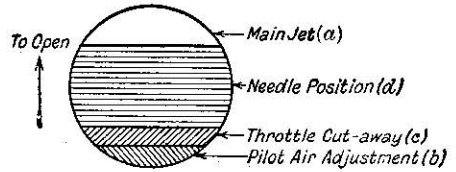


FIG. 42. RANGE AND SEQUENCE OF AMAL ADJUSTMENTS

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.

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

(*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 one-eighth 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 completely 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 V. with a 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 68, 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 97), Possibly the spark is excessively advanced or the contact-breaker needs attention (see page 99). 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 genuine fifty-fifty petrol benzole mixture is suitable used in conjunction with a high-compression piston, but for speed work an alcohol fuel such as R.D.I. gives perhaps the best results. 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. 41) 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 holding the carburettor on the induction pipe. 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 $\frac{1}{8}$ 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.

CHAPTER VI

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

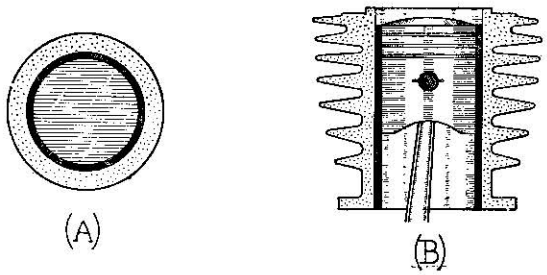


FIG. 43. SHOWING GENERAL PRINCIPLE OF LUBRICATION

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. 43. 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).

1932–35 Improved Mechanical Lubrication. All 1932 to 1935 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. 29) is gear-driven from the crankshaft.

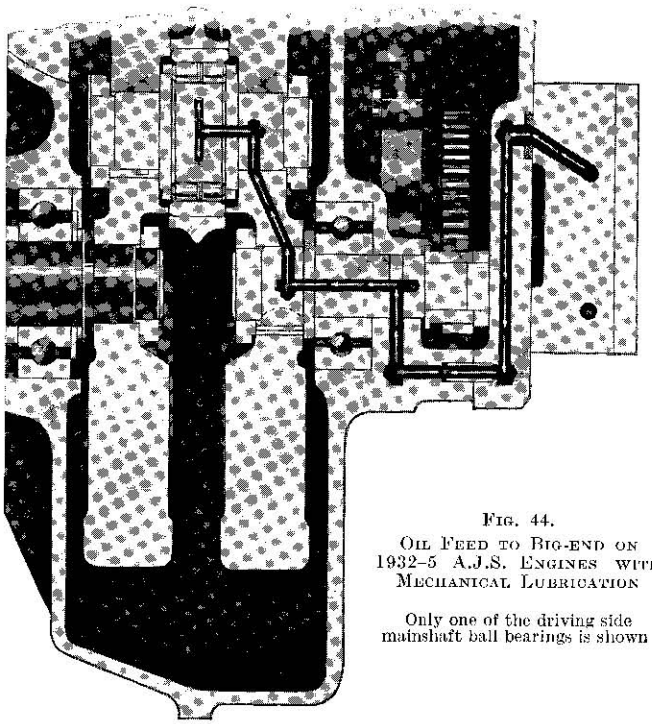


FIG. 44.
OIL FEED TO BIG-END ON 1932–5 A.J.S. ENGINES WITH MECHANICAL LUBRICATION

Only one of the driving side mainshaft ball bearings is shown

The upper plunger of the pump sucks 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. 44. 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 supply can now be controlled by means of the regulator on top of the pump, illustrated on page 33. 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 (see page 33) 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 1932–7 twin-cylinder engines.

It is a force-feed, constant circulation type with dry sump. Briefly its working is as follows: Oil is *sucked* from the tank, distributed throughout the engine, and finally returned to the tank by a duplex internal pump. This comprises a single double-acting, steel plunger (Fig. 45), 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 75, by the fact that while a positive rotation at one-fifteenth engine speed is effected by direct engagement of a central hobbed portion with a worm cut on the mainshaft, an 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 two ends of the reciprocating plunger, one end being of greater diameter than the other 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. 45. The small end of the plunger (i.e. the front one) forces oil up 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 some of it 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 and mainshaft concerned, respectively. 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 76) 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, however, that on all Big Twin models the provision of a tell-tale on the instrument panel, illuminated at night, obviates the necessity for removing the filler cap, 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 37/2 dry sump lubrication system has already been given, and Fig. 45 shows how the oil is circulated. It remains to deal with the action of the pump which also applies to most of the 1935–7 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. 45) 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

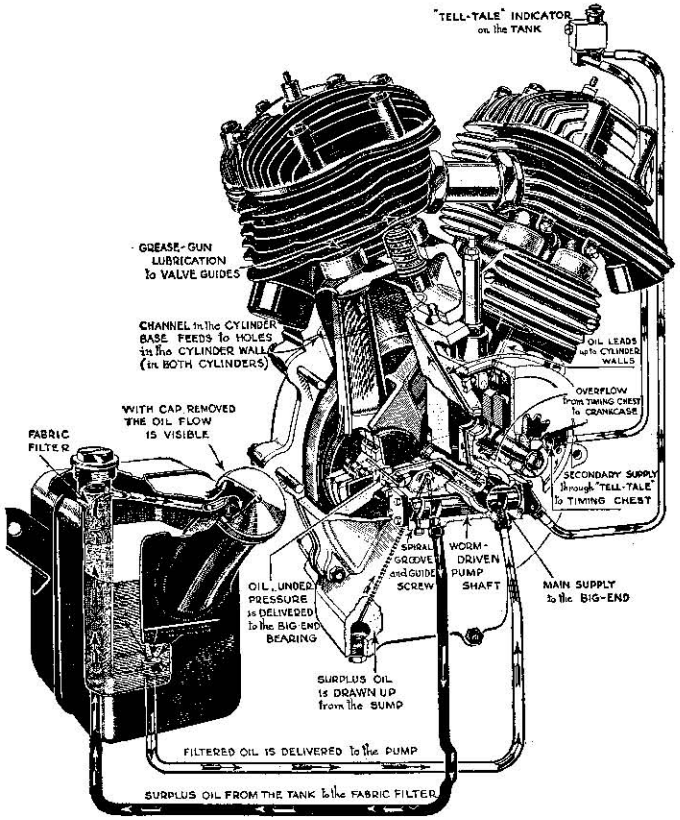


FIG. 45. DETAILS OF THE DRY SUMP SYSTEM ON THE 1937 BIG TWINS

of the delivery portion, so that the sump is always kept clear of oil. Fig. 45 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. 1) is provided, 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. Since 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 all 1937 S.V. and O.H.V. models (see page 127) is similar in principle and design to the system employed on the Big Twins as may be realized by comparing Figs. 45 and 73. As may be seen in Fig. 73, 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

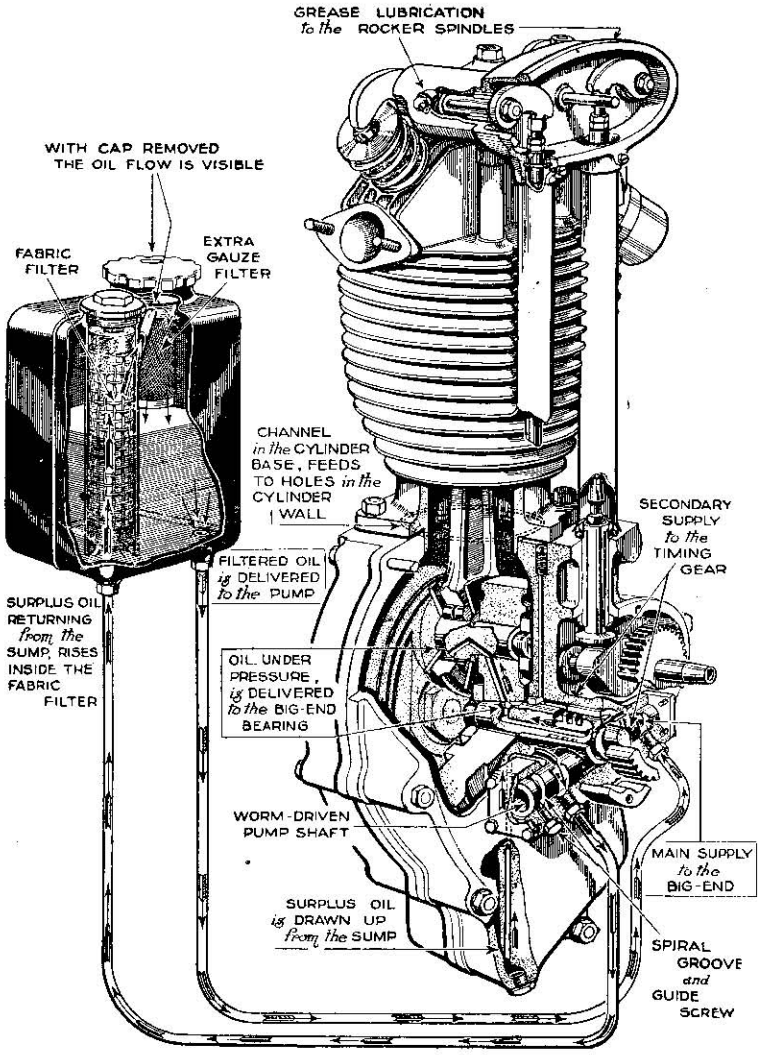


FIG. 46. SHOWING THE DRY SUMP LUBRICATION SYSTEM ON MOST 1935–6 S.V. AND O.H.V. SINGLES

The general arrangement is similar to that provided on the Big Twins (see Fig. 15). 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 O.H.V. engine is shown on page 128

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 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 a double system of filtering the oil. In addition to the gauze screen in the filler cap orifice which filters the oil during replenishment, a second 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 every 1000 miles with petrol.

Dismantling Oil Pump (Dry Sump). See notes on page 110.

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. The author (and the manufacturers also) recommends the use of one of the following engine oils on all 1932–7 A.J.S. engines: Patent Castrol "XL," (use "XXL" in the summer) Mobiloil "D" or Aeroshell. 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 "XL." 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 1932–7 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 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 1932–5 mechanical lubrication models and on new engines this is set to deliver a rather liberal supply of oil. After running-in (page 42) has been completed it is usually found desirable to cut down the supply a little and clear instructions for doing this will be found on page 33.

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. 46) 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 1932–7 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 1932–7 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. 1). Although, as has been mentioned on page 75, 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 74, 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 1932–7 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.

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 85, 97).

"Magdyno" Lubrication. The bearings and gears are on the Lucas "Magdyno" 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 getting oil on the contacts (see page 100).

Dynamo Lubrication (Coil Ignition Models). The Miller DM3T dynamo on 1935–7 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 and every 1000 miles press a small quantity of grease into the hole on the commutator end. Avoid using too much grease or excessive pressure, otherwise grease may be forced through the bearing on to the commutator and cause trouble.

Dynamo Lubrication (Magneto Ignition). The bearings on the Lucas E3D 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.

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 1000 miles the metal cap on top of the gear-box should be removed and 1–2 oz. of Wakefield's "Castrolease Medium," Mobilgrease No. 2, or Shell Motor Grease (Soft) should be injected through the filler orifice. Do not fill the gear-box completely. It is designed to run *two-thirds full* and this is adequate for proper lubrication. If difficulty is experienced in removing the gear-box

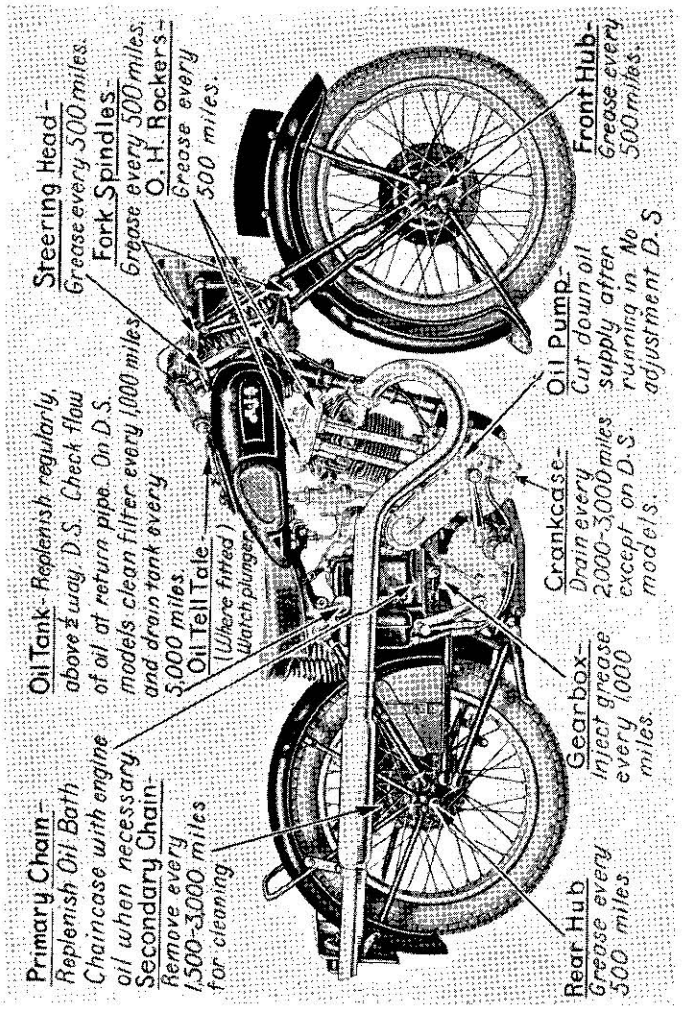


FIG. 47. SHOWING THE PRINCIPAL A.J.S. LUBRICATION POINTS

The above lubrication chart which shows an O.H.V. Model 35/18 with mechanical lubrication is applicable to all 1932–7 A.J.S. machines, but on the 1937 O.H.V.s there is, of course, no overhead rocker gear to lubricate and on the magneto models (35/14, 35/22, 37/26) the magneto chain case requires occasional packing with grease (page 84). Small lubrication points such as the brake fulcrum pins, gear control, etc., are not shown. If you follow the above chart you will not go far wrong. When using the grease gun check over the various nuts with a spanner

filler cap, apply leverage to it by inserting a suitable tool in the slot provided. On 1937 Big Twins a grease nipple is provided.

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 1000 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 1932–7 models the primary chain (and on some 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 79). The inspection cap orifice determines the correct oil level and oil should be poured in until it begins to trickle out through the filler orifice. Obviously it is a practical impossibility to overfill the chain case.

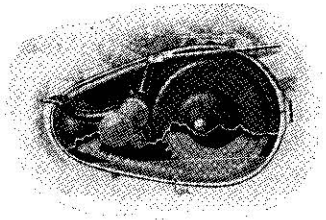


FIG. 48. OIL BATH CHAIN CASE

A.J.S. models with separate dynamo have the primary and dynamo chains completely enclosed in an oil bath chain case (Fig. 7)

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 1932–7 models the secondary chain requires to be smeared with grease about every 1000 miles. About once every 3000 miles in summer and every 1500 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 1935–7 models with

separate dynamos the primary chain is enclosed together with the dynamo chain in an oil-bath chain case (Fig. 7) and therefore, provided the primary chain is properly lubricated, it necessarily follows that the dynamo chain is also.

Magneto Chain Lubrication. On models with magneto ignition the magneto 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 (page 106).

Grease Fork Spindles and Steering Head Every 500 Miles. About every 500 miles 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 incidently be obtained in special push-down lid canisters for easily filling the grease gun, and these canisters are obtainable in ½ 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, clutch and gear control. These should be oiled occasionally, especially in bad weather. Thin cycle oil is quite suitable.

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 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 Models). As may be observed from the illustration on page 128, the 1937 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 a *half revolution* from right home.

Lubrication of Valve Stems (1937 S.V. Models). On the 500 c.c. and 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.

CHAPTER VII

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 flaws or cracks, 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 index mechanism.

The examination should also include all control rods and cables, tank filters, 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 (see lubrication chart, Fig. 47), 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 by the machine giving long service, perfect running at small cost. Overhauling is by no means as tedious a business as appears on paper ; experience and common sense soon enable all overhauling to be done rapidly and easily, as it is required. For the guidance of those who are not yet proficient in the art of overhaul, or those who wish to have a work of reference, we will conclude this chapter by giving detailed instructions appertaining to all types of overhaul of A.J.S. motor-cycles.

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 value rapidly 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.

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 studs 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. 49 illustrates the point where the clearance should exist (*C*) and the means of adjustment (*A*) on both S.V. and O.H.V. type engines. This clearance should, on the 1932–7 S.V. models (except the 1935–7 D.S. singles) be ·004 in. and ·006 in. in the case of the inlet and exhaust valves respectively with a *warm* engine. In the case of the 1935–7 singles with D.S. lubrication the correct inlet and exhaust valve clearances with a *warm* engine are ·006 in., and ·006 in. respectively. On all 1932–7 O.H.V. models the clearance recommended with the engine *cold* is the nearest approach to nil possible. To check and adjust clearances proceed as follows—

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

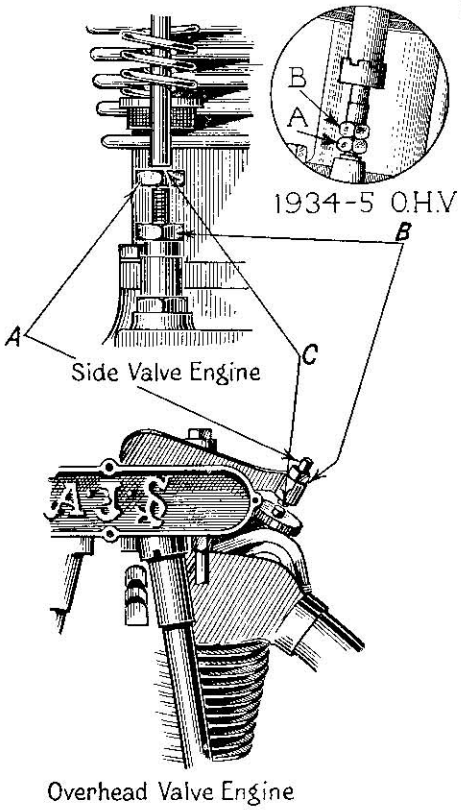


FIG. 49. VALVE CLEARANCE ADJUSTMENT (1932–3)

The four 1935 models with D.S. lubrication have an adjustment at the tops of the push-rods (Fig. 10)

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. 49, inset) and adjust each hexagon *A*.

To adjust the valve clearances on the 1935–7 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. 46), 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.

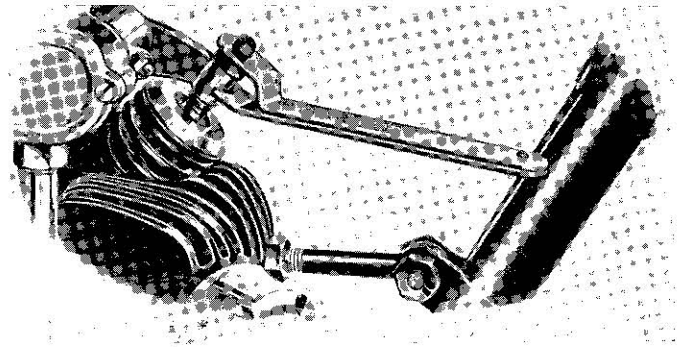


FIG. 50. THE A.J.S. PUSH-ROD EXTRACTOR (1932–3)

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.

Decarbonizing the Engine. After about 2,000 miles on the road 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 the 3·49 h.p. lightweight Model 35/5 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* 35/5 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* 35–7/9 with detachable aluminium alloy head the only preliminary operation necessary before removing the head is to disconnect the H.T. lead. 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 pipes, 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. Removal of the cylinder head entails preliminary raising of the petrol tank by removing the four tank fixing bolts and raising the tank on a wooden block placed across each support bar. This procedure is necessary only on the dry sump O.H.V. models.

Push-rod Removal. To remove the push-rods on 1932–3 O.H.V. engines the special extractor tool (obtainable for 1s.) 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. 50) 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 tappet 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 1934–7 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 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 (1934-7). After telescoping the push-rod covers all that is necessary is to 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.

Removing Cylinder Head. Next remove the bolts holding down the cylinder 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, inserting if necessary a screwdriver, or similar tool, between the top cylinder-fin and head, prising *upwards* the head carefully off the barrel on both sides. Avoid scratching the cylinder head or the gasket, and be most careful not to lose the small hardened steel valve stem caps where fitted.

Drawing Off Cylinder Barrel. When the head is removed it is 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.

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 exhaust pipes 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. To ensure correct replacement it should be marked on the inside 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 35/5 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. 51 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.

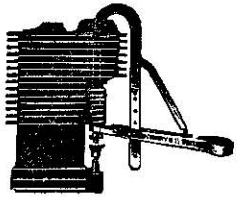


FIG. 51. TERRY VALVE SPRING COMPRESSOR FOR S.V. ENGINES

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 (price 6s. 6d.) 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

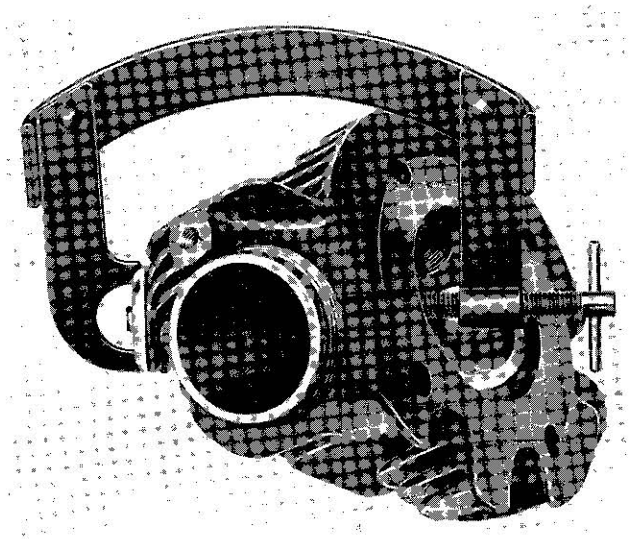


FIG. 52. THE A.J.S. OVERHEAD VALVE EXTRACTOR

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

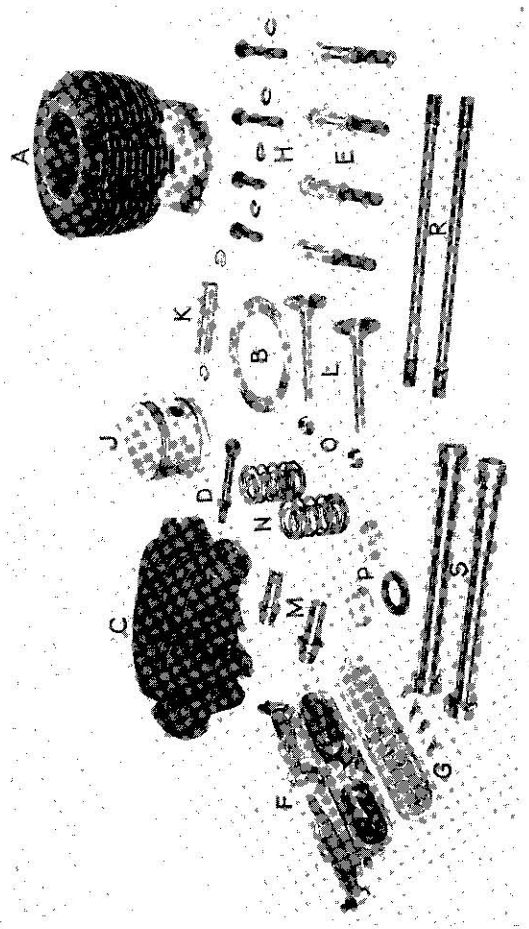


FIG. 53. COMPONENT PARTS OF A.J.S. OVERHEAD VALVE MECHANISM

The engine parts shown are not those of a 1932-7 power unit, but nevertheless very similar to those of recent mechanical lubrication models

A = Cylinder barrel
B = Cylinder head gasket
C = Cylinder head
D = Cylinder steady bolt
E = Cylinder head bolts
F = Rocker box complete with rockers
G = Rocker box cover and screws
H = Rocker box bolts
J = Piston
K = Gudgeon pin and circlips
L = Valves (tulip)
M = Valve guides
N = Valve springs
O = Split cones
P = Valve spring caps
R = Push-rods
S = Push-rod covers

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 carborundum (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

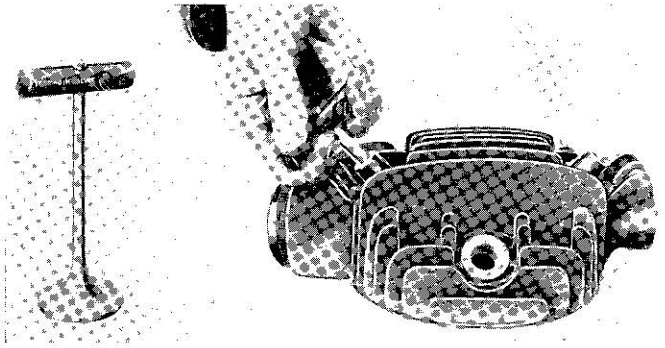


FIG. 54. USING THE A.J.S. VALVE GRINDING TOOL

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 for 6d.

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 the 3·49 h.p. lightweight Model 35/5. 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. 55. 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 rings are made to very accurate dimensions, and it is very bad practice to attempt to "fit "oversize or undersize rings unless

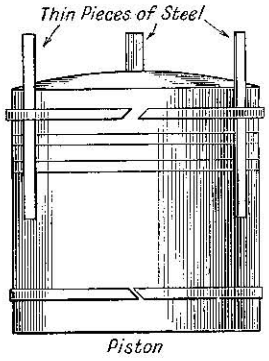


Fig. 55. How to Remove Piston Rings

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

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.

Lubricating O.H.V. Rockers. 1932–6 rockers have grease nipples provided (see page 81). 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 (see Fig. 53). 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. Thoroughly 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 ·018 in. with "Magdyno" and magneto ignition and ·025 in. with coil ignition. The reach of the sparking plug is also of importance. The sparking plug should be frequently inspected. It is susceptible to oiling-up. Use only good plugs such as a Lodge H1 or KLG 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 rear 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 some 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 $\frac{1}{4}$ 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 87). 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. Do not stand on the kickstarter, as this puts an ill-advised strain on 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 1932–7 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 79–81.

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 81).

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," shown by the arrow (Fig. 56), 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 the contact-breaker off for some reason, 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 clean and free from oil.

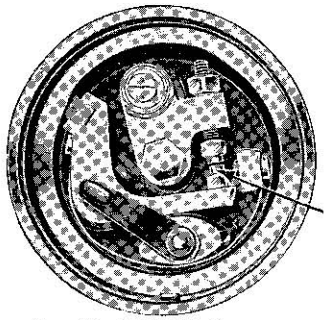


Fig. 56. Magneto Contact-Breaker

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

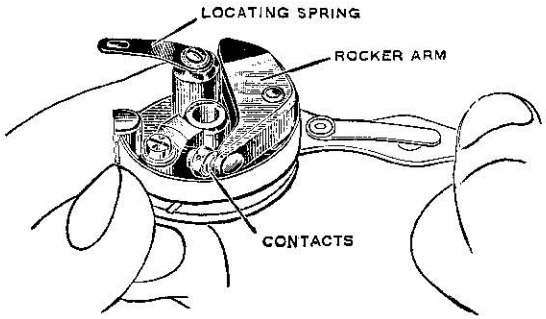
Beyond the above-mentioned points, the magneto should not be interfered with. If internal trouble develops, return the instrument to the makers for repair.

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 125), 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



(Messrs. Joseph Lucas, Ltd.)

FIG. 57. 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 (*F*, Fig. 70) 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 vaseline on the cam, if dry, to prevent wear of the fibre heel of the rocker arm, no lubrication is necessary.

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 (*C*, Fig. 70) 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 on Fig. 57. 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 81.

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 (1932-5 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. 58), 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 105) 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.

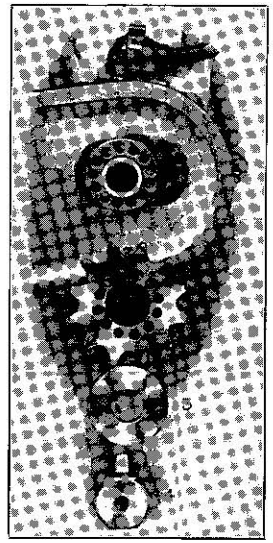


FIG. 58. THE VERNIER TIMING ADJUSTMENT

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 1932–7 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). 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.

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," which is fitted to 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.

1932-7 Ignition Settings. The correct procedure for retiming the ignition on the various 1932–7 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 35–7/12 and 35-7/16 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 35–7/22, 35–7/18, 37/8 and 35–7/26; $\frac{1}{4}$ in. for Model 37/9 and Models 37/2, 37/2A.

To measure the distance which varies on different engines as given above, the cylinder head should be removed on side-valve engines, but on the 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. by tilting from the forward end the magneto on the platform (see Fig. 8), in an

upward direction after unscrewing the front and rear bolts a turn or two. When the correct tension has been obtained screw the bolts up again tightly. Should the chain cover be removed, oil the chain before replacing the cover.

To Adjust Dynamo Chain (All D.S. Singles). On the 1935–7 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.

To Adjust Magneto Chain (Magneto Ignition). If the magneto chain has a whip or 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 84).

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 to enable the setting to be always kept. On the small timing pinion (see opposite) will be found a single dot and a double dot. These dots correspond to similar marks on the inlet and exhaust camwheels. To replace the inlet camwheel correctly, place the single dot found stamped thereon in register with the single dot on the small pinion, and similarly in the case of the exhaust wheel which has two dots stamped on it.

1932–7 Big Twins which have only one camwheel (see Fig. 60) have a single mark on the engine pinion registering with one mark on the camwheel.

An unusual feature about the Big Twin engine is that the timing

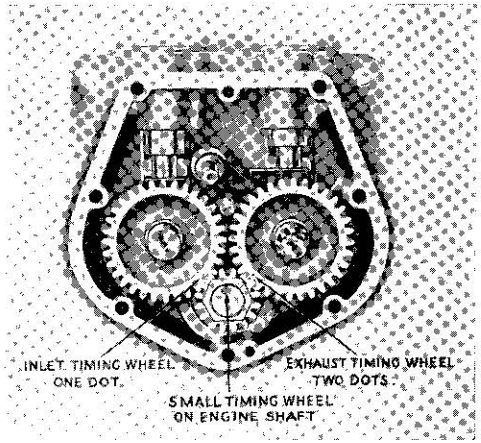


FIG. 59. SINGLE CYLINDER TIMING GEAR (1932–5)

The timing year on the 1935–7 D.S. models is slightly different and includes flat base tappets (Fig. 73)

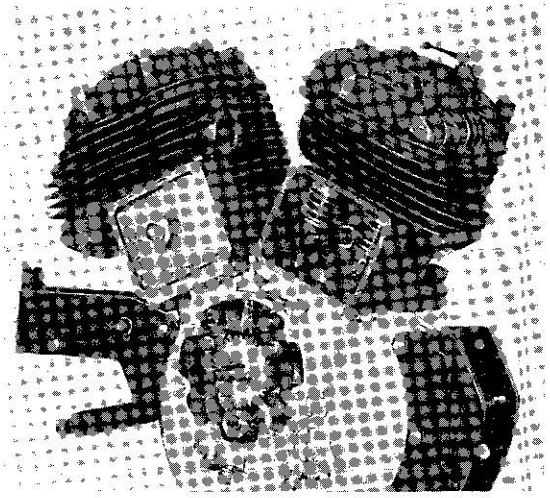


FIG. 60. TWIN CYLINDER TIMING GEAR (1932–5)

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.

To Remove the Camwheel (1932-7 Big Twins). After the timing gear cover has been taken off, it is necessary to revolve the engine until the marks referred to coincide, after which, raise the front inlet valve by means of a screwdriver or suitable lever, when the camwheel can be freely withdrawn. To replace this wheel it is necessary, unless help is available, to hold the front inlet valve in a raised position by means of a small block of suitable height inserted between the cylinder base and the lower valve spring cap. Then holding all four cam levers up with the fingers, gently insert the camwheel, taking care to see that the marks coincide.

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. A knife, file, or emery cloth should not be used to effect its removal, as damage to faces would probably result.

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. A clear impression is thus made on the paper, and the portions not required may be then cut away. The washer should be well oiled before insertion.

Removing a Tight Valve Cap. A valve cap that has resisted ordinary methods of removal may sometimes be removed by the introduction of a little cold water in the hollow of the cap when the engine is hot, the spanner being applied immediately. The remaining method of removal, if absolutely necessary, is to drill a series of holes across the diameter of the cap. Also soak in paraffin. Never use excessive force with the cylinder in place. It may strain or distort it.

Removing Tight Nuts. If a nut is very stiff indeed, try heating a spanner or pair of pliers and grip the nut firmly when the spanner is nearly red hot. The heat will be conducted to the nut and it will expand, thereby becoming a looser fit on the bolt which is still comparatively cold. Care must be used not to apply excessive force except as a last resort, for it is apt to strip the thread right off. Should partial stripping occur, employ a packing washer, or, if possible, renew both nut and bolt.

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

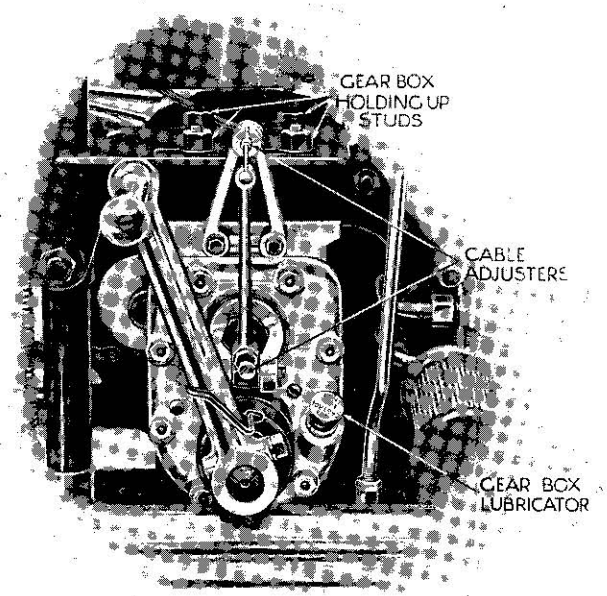


FIG. 61. THE HEAVYWEIGHT STURMEY-ARCHER GEAR-BOX

to fit a new big-end bearing the best plan is to forward the complete crankcase to Plumstead.

If You Do Split the Crankcase. Be very careful first to withdraw the oil pump plunger on the dry sump models, otherwise serious damage may 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. Instructions regarding gear changing with the hand control have been given on page 40 and the use of the foot control has been mentioned too. There is one very important point, however, 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 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.

The 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 top gear-box fixing bolt. Always adjust the primary chain before the secondary, and after making an adjustment check and if necessary adjust the gear control (page 112).

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 on page 112.

Adjustment of Rear Chain. On all 1932–7 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 121). 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 move-

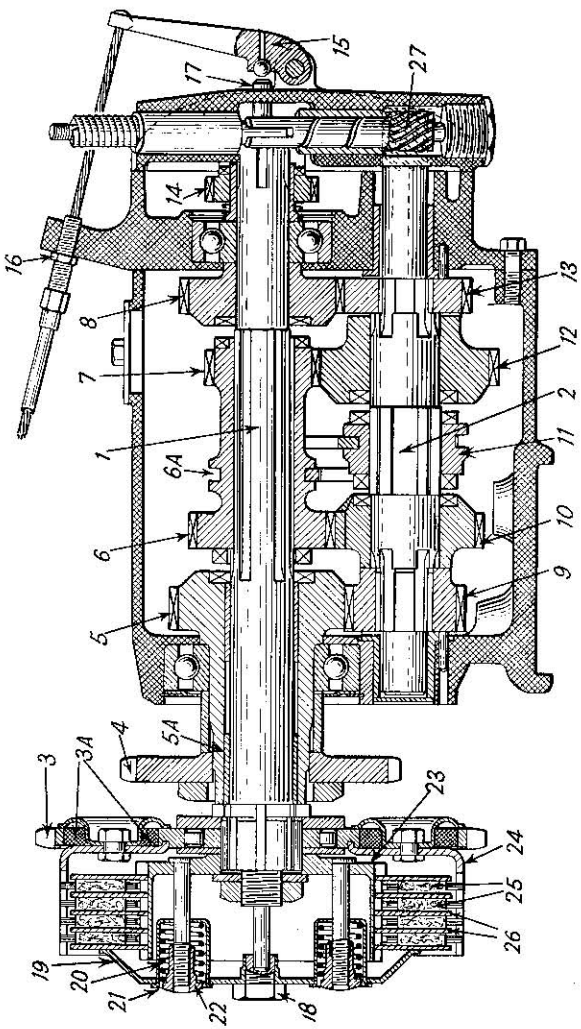
KEY TO FIGS. 62 & 63

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

ment of $\frac{1}{2}$ in. to $\frac{3}{4}$ in. as the chain is lightly pressed up and down midway between the sprockets.

Gear Control Adjustment. Both 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



FIGS. 62 & 63. 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

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. Multi-spring S.A.S. have 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 $\frac{3}{16}$ 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. 61. A further adjustment is also provided at the arm through which the cable passes; on Burman gear-box models take up slack by means of the cable adjustment. If the clutch slips after making this adjustment, screw in each of the clutch spring adjuster nuts *half a turn*. Normally they should be uniformly adjusted five complete turns from right home.

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.

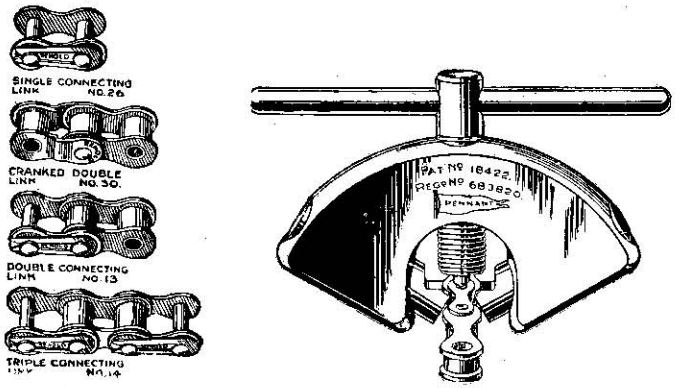
In the case of a single spring clutch, first unscrew the end cap, using either a special spanner or a hammer and punch. Note should be taken that it has a R.H. thread and must be unscrewed in an anti-clockwise direction. Now unscrew the clutch adjuster nut which is exposed and has also a R.H. thread. 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 carry this out it is only necessary to remove the footrest arm and distance pieces, brake rod, yoke end pin and brake pedal and then 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.

Coupling up a Chain. Always reconnect a chain with the spring link on the sprocket. This makes it perfectly easy, as all tension



FIGS. 64, 65. CHAIN REPAIR PARTS AND RIVET EXTRACTOR

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 inside of the chain.

Chain Repairs. Chain repairs are rarely necessary, but broken rollers may occasionally be found. When they are, they may be readily repaired with the aid of a box of chain repair parts and a "Pennant" chain rivet extractor. Fig. 64 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. 65, 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. 64). 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 in steering head 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 to 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.

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 (see Fig. 2) 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.

Removing Rear Wheel. The rear wheel on many 1932–7 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

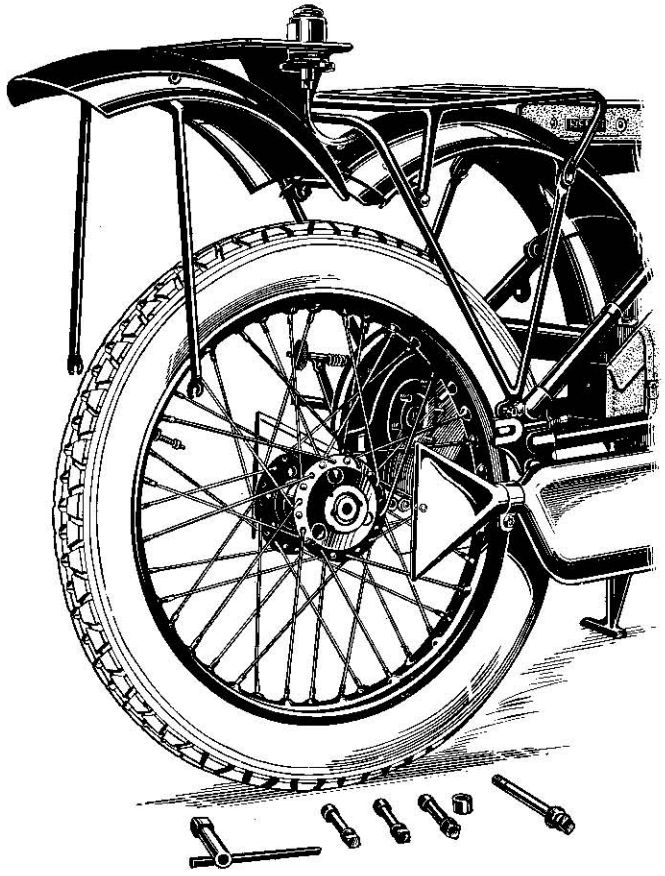


FIG. 66. REAR DETACHABLE WHEEL REMOVAL

The latest pattern detachable rear wheel is shown on page 5

it is necessary to detach the rear portion of the chain cover by unfastening the chain stay fixing. Unscrew the brake drum anchor pin sufficient to clear the fork ends, and disconnect the yoke end of the brake pedal rod. Next unfasten the chain by

means of the spring clip coupling, finally slacking off the spindle nuts on either side of the fork ends, when the wheel can be dropped out. The chain must, of course, be removed first.

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 put the machine in gear to prevent the wheel rotating, and with the box spanner provided first unscrew the three sleeve-nuts which pass through the hub flanges. These three sleeve-nuts extend right through the wheel and rear hub flange, 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.

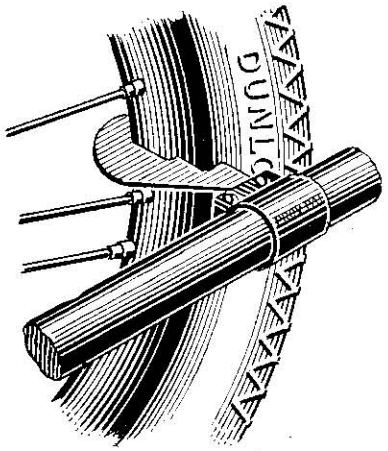


FIG. 67. REAR WHEEL ALINEMENT GAUGE (1932–5 Heavyweights)

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 120). 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.

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. 67). 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 Wheel 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, adjust disc until *all* play disappears. Then slacken disc one quarter of a turn and retighten nut. 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-nut 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 $\frac{1}{128}$ 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 ·001 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 yoke end from brake operating lever, remove anchor plate bolt from fork end, and after slackening off spindle nuts 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, except on the lightweights, where a milled nut is 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.

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

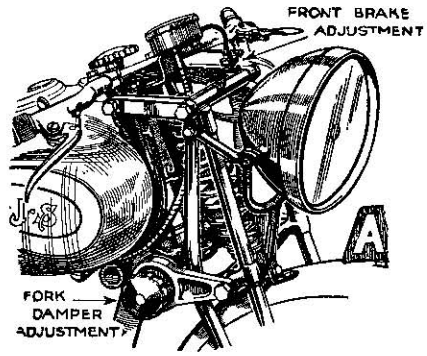


FIG. 68. 1935 FRONT BRAKE AND FORK DAMPER ADJUSTMENT

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 84).

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. 69). The cycle should be fixed so that it is dead upright or leaning

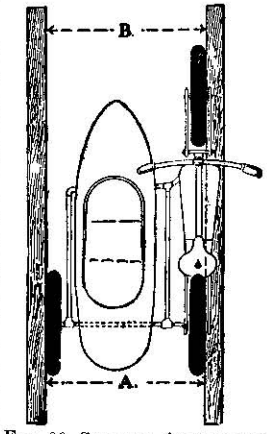
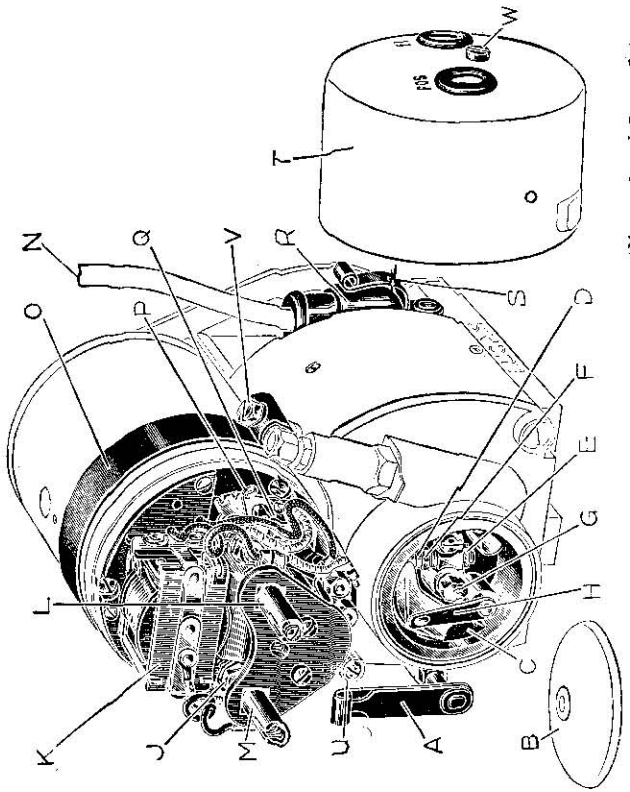


FIG. 69. SIDECAR ALINEMENT
The distances *A* and *B* must be equal



(*Messrs. Joseph Lucas, Ltd.*)

FIG. 70. THE LUCAS "MAGDYNO" WITH COVERS REMOVED

KEY TO FIG. 70

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 "Yos."
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

in very slightly. (See also page 45.) On a solo model see that the board or straight edge touches each tyre at the front and rear.

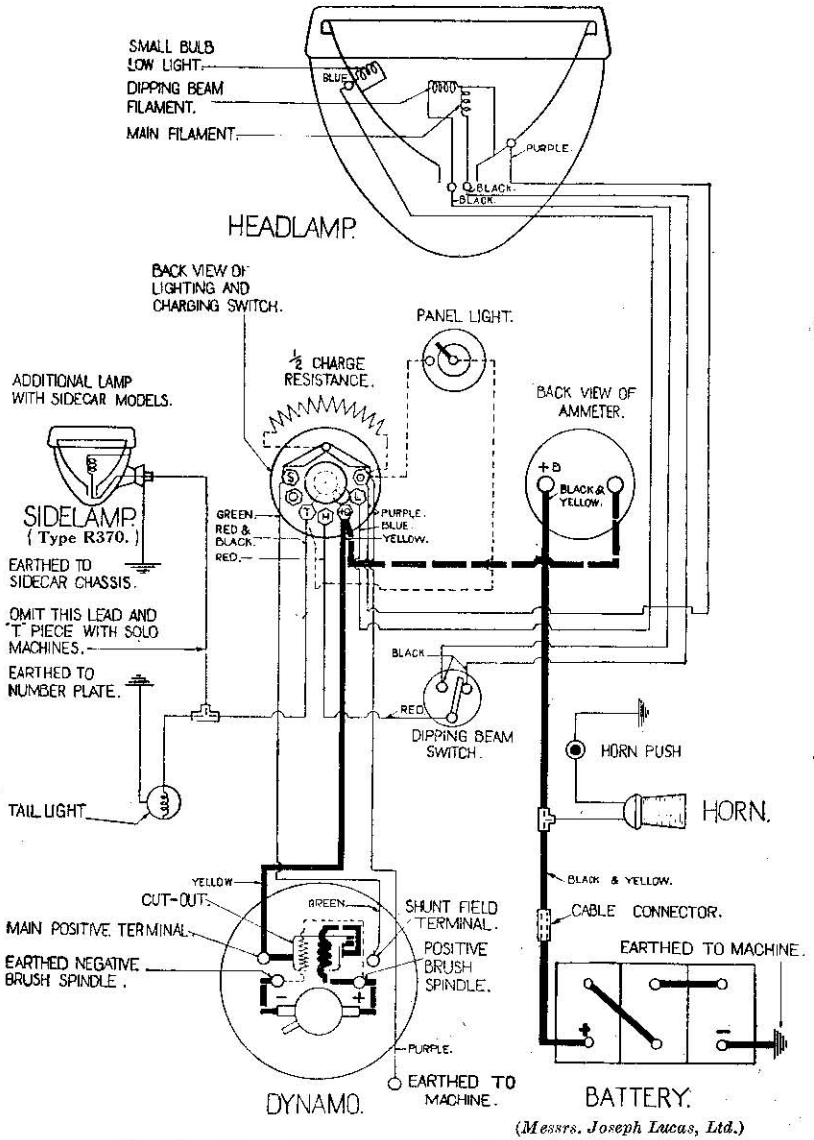
Tuning for Speed Work. The task before the aspirant to coveted speed honours, apart from the physical aspects of riding, may be summed up as coaxing an engine to "rev" as fast as possible. To do this friction must be reduced to the absolute minimum, and all moving parts reduced to the lowest weight consistent with reliability. As much gas as possible must be charged into the cylinder, and the burnt products must be expelled as completely and rapidly as possible. Therefore, the valves must work with clock-like precision. The valves must seat properly and their spring pressure must be exact, and the valves should glide frictionlessly in their guides. Valve timing must be correct to a hair. All cylinder head gas passages and chambers must be burnished by hand until they offer no "skin friction" to the incoming and outgoing gases. Every shaft and bush in the engine must be a perfect fit, dead true, with no friction or play. Experiments should be made with various ignition timings, and the carburettor tuned for speed. Gear ratios should receive the most careful consideration, and finally the machine must be put into condition suitable to house so worthy an engine.

It is all a question of having real mechanical aptitude, plenty of courage, a good workshop, and making the best use of all of them. Hours of laborious work are needed to put a machine into real racing trim, that is to say, to be prepared for seriously challenging machines of the same class holding speed records. Another point to remember is this. Out of a batch of, say, 100 engines, one engine will be singled out as having an exceptional performance. This engine will be installed in one of a firm's crack racing machines. Obviously, then, the amateur speedman is up against a tough proposition. In spite of this, however, many young amateur enthusiasts are very successful.

CARE OF ELECTRICAL EQUIPMENT

As mentioned on page 3, Lucas electric lighting is standard on all A.J.S. machines except the coil ignition models, the generator used being the "Magdyno" (with detachable dynamo portion) or E3D dynamo. With the "Magdyno" a 12 amp.-hr. battery is used with a D142 headlamp (instrument panel models), or DU142 headlamp (no panel). With the coil ignition models a DM3T Miller dynamo is used in conjunction with a 70E headlamp.

Bulb Replacements. The DU142 and D142 lamps take a double-filament No. 624 DVMC main bulb and a B.A.S. No. 8S pilot. The 70E lamp takes a 6V. 18/18W. gas-filled main bulb, and a 6V. 3W. S.C.C. Vacuum pilot. For both sidecar and tail lamps use similar bulbs.

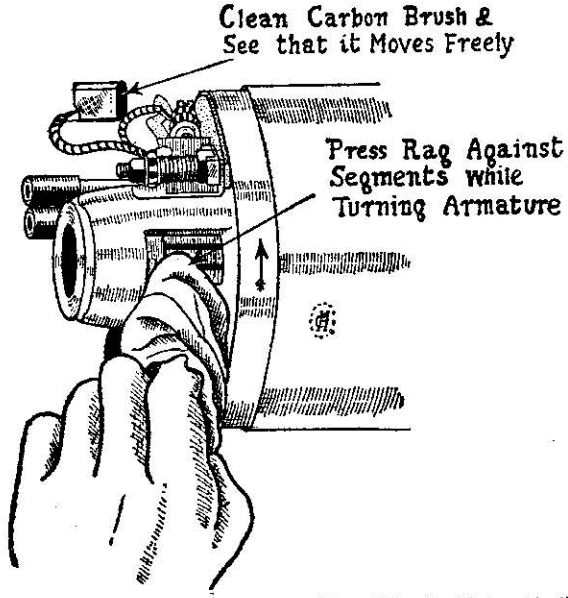


(Messrs. Joseph Lucas, Ltd.)

FIG. 70A. WIRING DIAGRAM FOR THE LUCAS "MAGDYNO" LIGHTING EQUIPMENT WITH D142 HEADLAMP

The D142 headlamp now replaces the MC140 type used in conjunction with an instrument panel

Care of Lamps. When replacing a Lucas bulb, screw it out two or three turns in an anti-clockwise direction. This releases the pressure on the bulb contacts and enables the bulb to be readily withdrawn. *Be sure the bulb is fitted with the dipped beam*



(From "Popular Motorcycling")

FIG. 71. COMMUTATOR END OF MILLER DYNAMO SHOWING SEGMENTS BEING CLEANED AND ONE BRUSH REMOVED

filament above the centre filament. When cleaning reflectors, use a soft cloth or chamois leather. On no account use metal polish, but instead a good furniture or car polish.

Battery Maintenance. Always keep the battery (which is of the lead-acid type) well charged. When running by day keep the headlamp or panel switch in the "C" position (half full charge) for at least one hour daily, and if much night riding is undertaken or the specific gravity of the acid solution is 1·210 or below, increase this period. Periodically test the S.G. with a hydrometer. On full charge the "Magdyno" should give an ammeter reading of 4–5 amp. *Never leave the battery fully discharged,* or the battery will suffer. Over-charging only results in loss of acid by "gassing." After stopping the engine always turn the switch to the "OFF"

position to prevent possible discharge due to a sticking cut-out. At least once a month remove the vent plugs and examine the acid level. If this is below ¼ in. above the top of the plates, top-up with *distilled* water. If acid has been lost by spilling or "gassing," replenish with distilled sulphuric acid solution of 1·285 S.G. *Once a year renew the whole of the acid.* If your machine is laid up during the winter, charge the battery once a fortnight at a garage or wireless shop.

Running with Battery Disconnected. If this is done on a "Mag-dyno" machine *it is essential to keep the switch in the* "OFF" *position.*

Commutator Brushes. Before removing the dynamo cover for inspecting the brushes or for any other reason, disconnect the positive battery terminal lead to avoid reversing the dynamo polarity or causing a short circuit. Examine the brushes (Fig. 70) every 300 miles. Clean with a petrol-damped rag if necessary and see that they bed down on the commutator segments. Test for freedom of movement by holding back each spring lever and gently pulling on its flexible lead. It should return to its original position immediately the lead is released. If the springs are weak, renew. See page 81 regarding Lubrication.

The Commutator. This must be kept free from oil and carbon dust. Clean occasionally by removing a brush from its holder and inserting part of a fine duster held by a suitable piece of wood against the commutator surface while rotating the armature.

The Cut-out. This prevents the battery discharging through the dynamo by opening with solenoids the charging circuit as soon as the dynamo voltage falls below the battery voltage. Similarly, when the dynamo voltage exceeds battery voltage it closes the circuit. Never interfere with the cut-out except to correct dynamo polarity, in which case run the engine slowly with the switch in the "C" position and the cut-out contacts pressed together.

CHAPTER VIII

THE 1937 A.J.S. RANGE

THE general policy of the makers of A.J.S. machines during recent years has been the introduction of numerous detail refinements, concentration on improving the appearance of the machines, bettering performance and the production of a comprehensive range without excessive divergencies in general specification.

Twelve Models Available. For 1937 there are marketed exactly a dozen machines of most refined appearance and remarkably

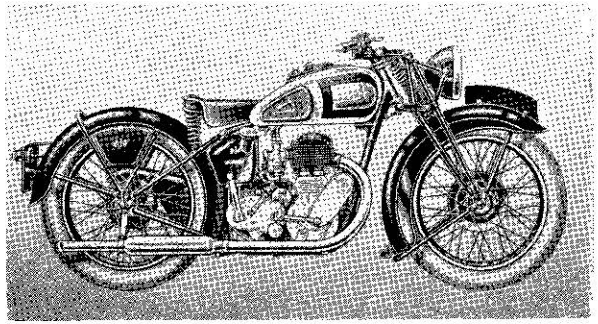


FIG. 72. THE 4·98 H.P. SIDE VALVE SINGLE—MODEL 37/9

good performance. At one end of the range is a small O.H.V. "two-fifty" eligible for a 6s. 3d. quarterly tax and giving very low running costs, and at the other end the popular Big Twin in much improved form with its powerful 990 c.c. engine capable of hauling a heavy family anywhere at any time. With the increased efficiency of the O.H.V. engine, the popularity of the side-valve motor is waning and the A.J.S. range now contains only one side-valve single—a fast "five-hundred" with foot gear change, magneto ignition and finned valve chest. It is interesting and pleasing to note that foot gear control is now standard on all machines except the "Export" edition of the Big Twin. Four-speed gear-boxes and vertical engines with full dry sump lubrication are universal; tanks are of generous proportions with a particularly pleasing finish and attention has been paid to improving the overhead valve gear which is now automatically lubricated

and contained in an improved rocker-box from which an oil pipe is taken to the inlet valve guide. Both valves are totally enclosed. Much attention has also been paid to improving the design of the

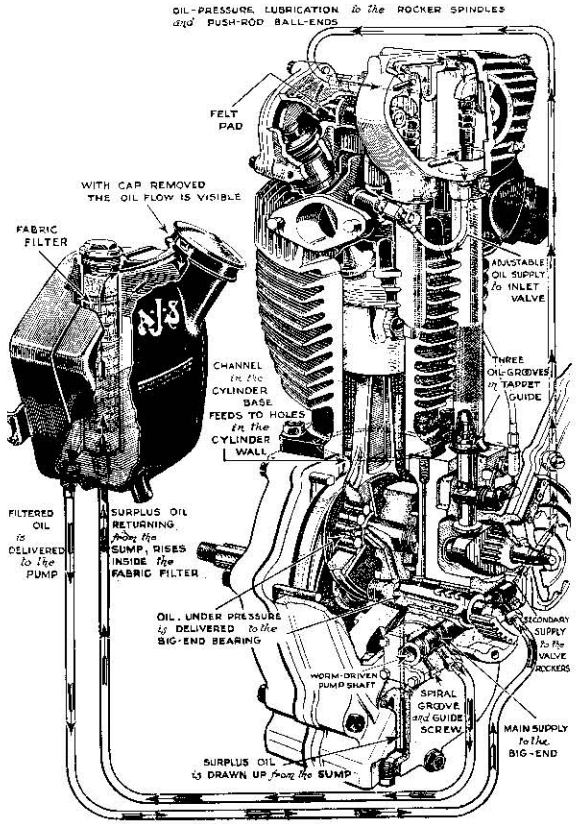


FIG. 73. SHOWING CONSTRUCTIONAL FEATURES AND GENERAL DESIGN OF THE 1937 O.H.V. ENGINE

cylinder finning on all models. All engines have roller big-ends and anti-slap "Lo-ex" alloy pistons. For trials enthusiasts special competition models can be obtained. Considered as a whole, the new range is the "best yet" as may be gathered from the accompanying photographs and should make a wide appeal. The principal

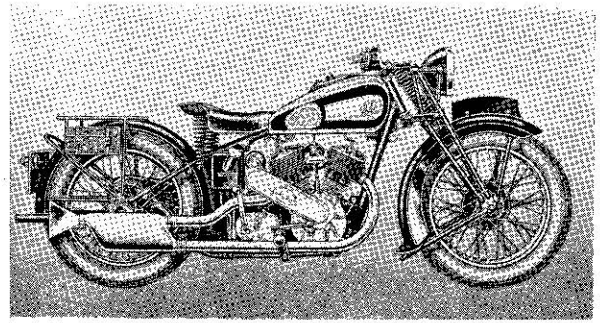


FIG. 74. ENGLISH VERSION OF THE 9·90 H.P. BIG TWIN-MODEL 37/2

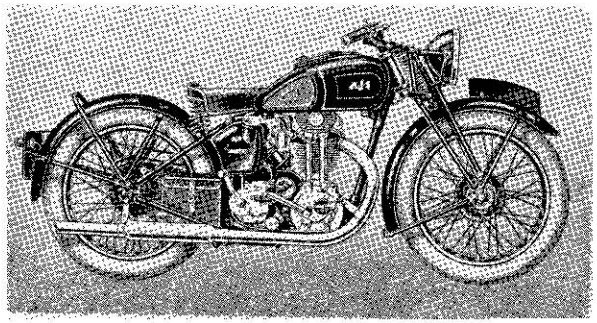


FIG. 75. THE "BABY" A.J.S. THE 2·46 H.P. MODEL 37/12

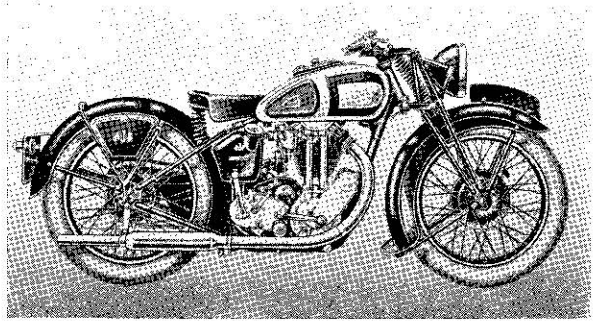


FIG. 76. THE STURDY LOOKING 4·98 H.P. MODEL 37/8

features of the 1937 O.H.V. engine are clearly shown in the sectioned drawing, page 128, and the fullest particulars can be had from the makers on request. Electric lighting is fitted as standard throughout.

The Side-valve Range. These comprise Models 37/9, 37/2, 37/2A priced at 52, 73, 73 guineas respectively. Model 37/9 is a general

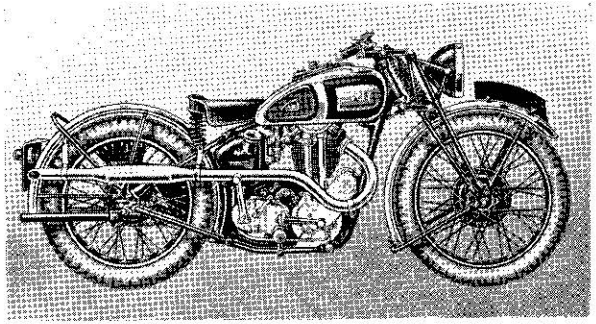


FIG. 77. MODEL 37/18T WITH TRIALS SPECIFICATION

purpose 4·98 h.p. model ideal for those who fancy the proverbial reliability and stamina of the S.V. "five-hundred." As already stated, it has foot gear change, a finned valve chest and magneto ignition. It also has a car type detachable cylinder head and valve springs insulated from the heat of the engine. Models 37/2, 37/2A are the English and Export versions of the popular Big Twin. The former has foot gear change and the latter hand control.

The Standard Overhead-valve Range. These comprise Models 37/12, 37/22, 37/16, 37/26, 37/8, 37/18 and their prices are 40, 45, 43, 48, 58, 58 guineas respectively. Models 37/12, 37/22 have 2·46 h.p. engines, the former with coil and the latter with magneto ignition and two-port cylinder head with high level exhaust. Models 37/16, 37/26 are similar machines with a 3·47 h.p. engine. Models 37/8, 37/18 are higher powered versions with 4·98 h.p. engines. Both have magneto ignition and Model 37/8 has a two-port cylinder head.

Special Competition Models. Three special competition models are marketed, namely, Models 37/22T, 37/26T, 37/18T and their prices are 51, 54, 63 guineas respectively. Engine capacities are 246 c.c., 347 c.c. and 498 c.c. All have single-port cylinder heads, crankcase shields, competition gear-boxes, tuned and polished engines, Trials mudguards, high level pipes, etc. The general specification is as illustrated.

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