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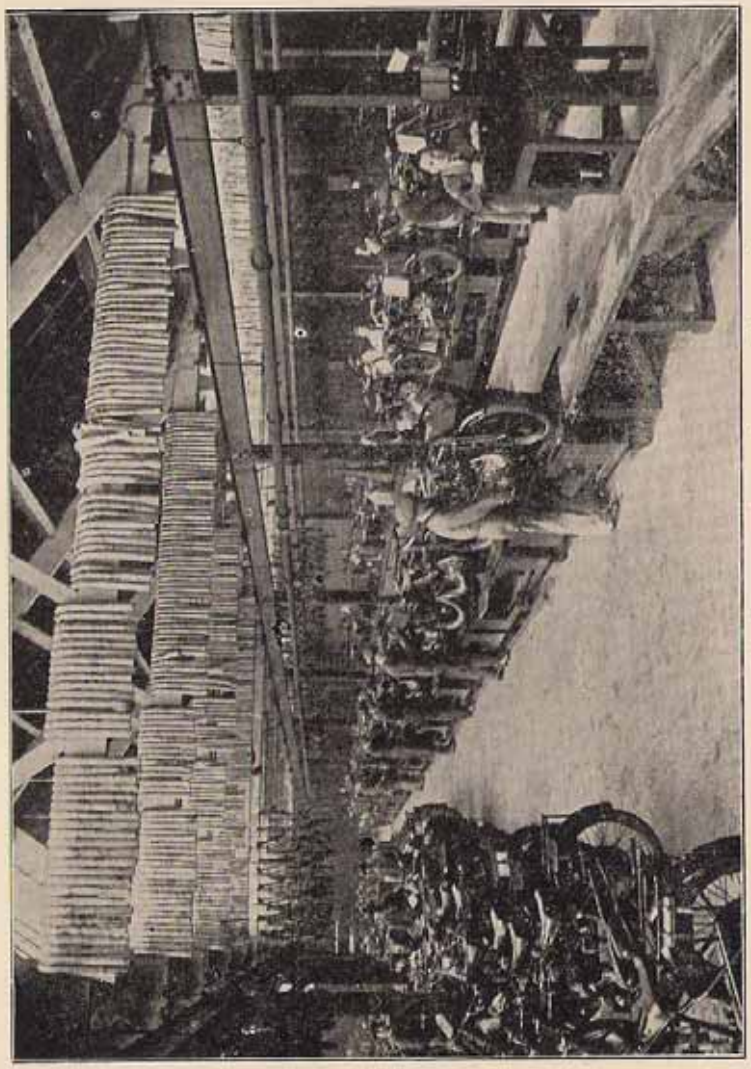

SECTION OF THE A.J.S. ERECTING SHOP, SHOWING TRUCK SYSTEM [*Frontispiece*

THE MOTOR-CYCLIST'S LIBRARY

THE BOOK OF THE A.J.S.

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

BY

W. C. HAYCRAFT

DEALING WITH EVERY PHASE OF THE SUBJECT, INCLUDING CHAPTERS ON DRIVING, TOURING, LEGAL MATTERS, INSURANCE, TRACING FAULTS, AND OVERHAULING

SECOND EDITION

LONDON
SIR ISAAC PITMAN & SONS, LTD.
PARKER STREET, KINGSWAY, W.C.2
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1929

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PREFACE

It is with much pleasure that the author prepares for press a second edition of this small manual. The ground covered is substantially the same as in the original edition which, judging by numerous appreciative and decidedly helpful letters received from A.J.S. riders in various parts of the world, including India, seems to be satisfactory.

As in the first edition, the writer has given primary consideration to the chapter on overhauling, and he has done his best to include *all* essential information and to get this strictly accurate. In the words of a certain reviewer, the book is of value to the "most crusted" of motor cyclists. The new camshaft engines are, of course, dealt with, and a full description given of the dry sump lubrication system used on all of the present "M" models. "H" and "K" class machines have not, however, been neglected.

A quick glance at the illustrations will convince the reader of the striking changes recently made. A.J.S. motor-cycles are now remarkable value for money, and worth caring for to the best of one's ability. To this end the present volume is dedicated.

In conclusion the author wishes to point out, once again, that he is willing to help any riders who may run up against trouble, the solution of which is not found in these pages.

Any criticisms are also welcome and will receive careful consideration when a third edition is published. Finally, don't forget to tell your A.J.S. friends about this book. They would probably be glad of a copy.

W. C. H.

PREFACE TO FIRST EDITION

This handbook is intended as a work of reference for all owners and prospective buyers of A.J.S. motor-cycles. It is also hoped that the book will have an appeal to all interested in the latest products of A. J. Stevens & Co. (1914), Ltd., Wolverhampton.

While primarily written to meet the needs of the novice who has had absolutely no previous experience with motor-cycles, this handbook contains much information that should be of general interest to the most experienced of drivers.

It will be readily apparent that much of the information is of a general character, and applies equally well to other makes.

Carburation, for instance, is a subject on which information cannot be said to apply to any one make—it applies, of course, to all internal combustion engines—but where details of practice and design differ, those details applicable to the A.J.S. machines are dealt with separately.

The novice is recommended to read through carefully the chapters on preliminaries and driving, and also the chapter dealing with the principle of the four-stroke engine before taking the highway.

The author has dealt fairly extensively with the descriptions of the various A.J.S. mounts, for very often a man who buys a certain type of machine will purchase a more expensive machine of the same make later on, when he can afford it, and then a detailed and illustrated summary of the A.J.S. machines will come in handy for purposes of reference and comparison. Does not every S.V. owner want to turn over to the O.H.V. class when he has the opportunity ?

The chapter dealing with overhauling has been dealt with at greater length than any other subject in this book. The information contained therein should meet the needs of both experienced and inexperienced motorists. The various operations involved in overhauling A.J.S. machines have all been fully dealt with, and no difficulty should be experienced in this connection. After all, overhauling is one of the most important subjects. The novice soon becomes an expert in most matters, but doubtful points connected with overhaul crop up every now and then. It is here that an authoritative work of reference is invaluable. The information in this chapter has been compiled in close collaboration with the manufacturers as well as from practical experience, and the information contained therein is therefore absolutely trustworthy and up to date.

Some space in this book has also been devoted to the buying and selling of an old mount. Sooner or later the reader will wish to dispose of his machine, and the advice given in this chapter may be of some assistance.

The chapter dealing with faults and their remedies has been written from practical experience gained from many years of riding on A.J.S. and other machines.

Should any special difficulties arise, a letter addressed W. C. Haycraft, c/o the Publishers, will receive prompt attention.

It is only fair to conclude by saying that the author has no present or past connection or interest with the manufacturers of A.J.S. machines, to whom, however, he is deeply indebted for generous assistance and for many photographs in the compilation of this small handbook.

W. C. HAYCRAFT.

CONTENTS

THE BOOK OF THE A.J.S.

CHAPTER I

THE A.J.S. SERIES

How many people, when they see on the road or in the shop window a motor-cycle whose tank bears the monogram "A.J.S.," realize what a vast organization the letters A.J.S. stand for?

Wolverhampton. A visit to the works of A. J. Stevens & Co., (1914), Ltd., Wolverhampton, leaves a very vivid and lasting impression on the memory—and a very pleasing one. Mass production is in evidence everywhere, and the ingenuity displayed to secure the same is something to marvel at.

Firstly, one enters the machine shops, alive with the incessant hum of overhead shafting and lathes. The thousand and one parts that go to make up a motor-cycle are here being shaped to precision by hundreds of skilled mechanics.

In a well-lighted and spacious shop adjoining, the engine components are being assembled and trued up, and rows of engines are beginning to take shape. Right in front of all these are scores of finished engines waiting patiently to undergo brake horse-power tests on the dynamometer. In another shop the bicycle parts are under erection, engine plates being fitted ready to receive the motors as soon as they leave the test bench.

In sudden contrast to all these places, a visit is now paid to the sandblasting room, where certain metal work receives a special finish. At the entrance is pinned a warning notice, "DO NOT LEAVE THIS DOOR OPEN." Slightly opening the door and peering in, an amazing sight—almost uncanny—confronts the eyes. The interior is almost void of light, caused by dense whirling steam and sand blocking out all natural illumination. Amidst this ghastly atmosphere a weird phantom-like figure, clothed in what looks like a diving suit, is bending over and attending to something that one cannot define in the intense gloom. Indeed, this room reminds one of nothing so much as a place in the next world, whither some of us are expected to go! Some of the modern applications of science are extraordinary, and grimly fascinating to watch.

The last of these shops contains hundreds of finished motor-cycles, which in rotation are tried out and tuned on the road by

crack riders at Wolverhampton before being finally handed over to the Sales Department, whence they are distributed throughout the world.

Racing and Design. A.J.S. machines have gained a world-wide reputation for general all round efficiency. This outstanding efficiency has been won largely through racing experience. Into every searching endurance test, international or otherwise, the A.J.S. company sends along a challenger. The names Spann and Handley are predominant in this connection.

It has been generally accepted that high speed racing subjects a machine to the most exhaustive tests conceivable, and the experience gained thereby is of incalculable value, and has a direct bearing on the performance of machines sold to the public. The latter purchase a machine that is, in many cases, almost a replica of the racing model, embodying at the same time those characteristics insisted on by the ordinary touring motor-cyclist. Thus, when a racing mount suffers a mechanical failure while hurtling along the track at close on 100 m.p.h., the cause is fully investigated and, more often than not, the modified component is incorporated in the next machine of the same type sold to the public. And so the evolutionary business continues. The net result is that the factor of safety of each part steadily rises, with consequent increased reliability of the whole.

"What shall I Buy?" The 1929 models (officially known as series M) are, indeed, wonderful creations, and no man need hesitate to buy on the score of unreliability, noisiness, complexity, or in fact, any reason, for they do to-day represent the high-water mark of British design and construction. All A.J.S. motor-cycles belong to the four-stroke type, and prices range from £40 to £100. The first A.J.S. was an inclined engine model, built in 1897.

The prospective motor-cyclist is often bewildered by the vast number of types of machines sold to the public. This bewilderment, however, is short lived. Later on he begins to realize that the reason is that the trade recognizes that all men have individual temperaments, fads, and so forth, and caters to the public accordingly. Temperament plays a great part in the selection of a mount. If the would-be purchaser has an adventurous, excitement-loving disposition, only a sports mount will give him genuine satisfaction. Cravings for speed and thrills can then be met as they arise! If, on the other hand, the purchaser regards with scorn the question so many young enthusiasts ask first, namely, "What can she do?" and places comfort and reliability without much attention foremost, then the touring models are "the goods" (to use a rather slang but clear expression).

Owing to their greater popularity we will endeavour to describe the sports models first.

The Sporting Models. All these models have very rakish and sporty lines, and should satisfy the most exacting in this respect. Their low riding position and centre of gravity render them peculiarly stable when the speedometer needle is creeping forward. Those catalogued are as follows—M5, M4,* M6, MR6, M7, M8, MR8 and M10, and their respective prices are £45, £48 10s., £54 10s., £62, £62, £62, £72, and £72. It should be mentioned here that the MR6 and the MR8 are special racing editions of the Models M6 and M8 respectively, which may be had with single or two-port exhausts.

Models M4 and M5 have side valve engines, while the remainder have overhead valve or overhead camshaft engines. The essential difference between the two types is (as might be expected) that the S.V. engine has its valves placed side by side with stems towards the crankcase, and in consequence not directly over the piston, while the O.H.V. and O.H.C. engines have their valves in the detachable head directly over the piston. Their respective merits may be considered later; but it should be understood that really fast machines invariably have engines of the overhead valve or O.H.C. type. A mile a minute is about the top speed that can reasonably be expected from the S.V. range. This speed is ample for the average sportsman who uses his machine on the road for pleasure only; but the man who has a weakness for record smashing and competition will literally frown at it and, of necessity, must turn to the O.H.V. or O.H.C. class, where there are machines capable of about 90 m.p.h., when tuned. The O.H.V. and O.H.C. engines are deliberately designed for high speed and fierce acceleration; but this type of engine is invariably more expensive than its side valve brother of the same cubic capacity—probably some £10 or more. From the foregoing remarks it is not to be inferred that the A.J.S., O.H.V., and O.H.C. engines belong to that type of engine which can with difficulty be restrained, and is only in its element when on the open straight with flames belching out of its exhaust; on the contrary, the A.J.S. engines all possess that indefinable smooth "tick over" so beloved by the enthusiast; and are very flexible even at low revolutions, while they can, at a few seconds' notice, pull out that vicious 60 m.p.h. roar.

The side valve sports models are modified touring mounts, the modifications comprising a specially tuned engine, "T.T."

* Dynamo lighting (Miller S.U.S.) can be fitted to any solo mount at £5 5s. extra, or to any combination at £5 15s. extra. All models are also obtainable on hire-purchase system.

handlebars and footrests in lieu of tourist bars and footboards respectively, with sports exhaust system.

Very extensive alterations have been made since 1928 to all models. New type frames are employed; dry sump lubrication has been universally adopted; saddle tanks are fitted to all machines; a new type of fork is incorporated; other modifications comprise enclosed valve gear, re-designed cylinder heads, and tank-mounted speedometers.

THE 3·49 H.P. STANDARD SPORTING MODEL M5

This machine (shown by Fig. 1) is far and away the cheapest of the sports range. A very similar machine is the De Luxe

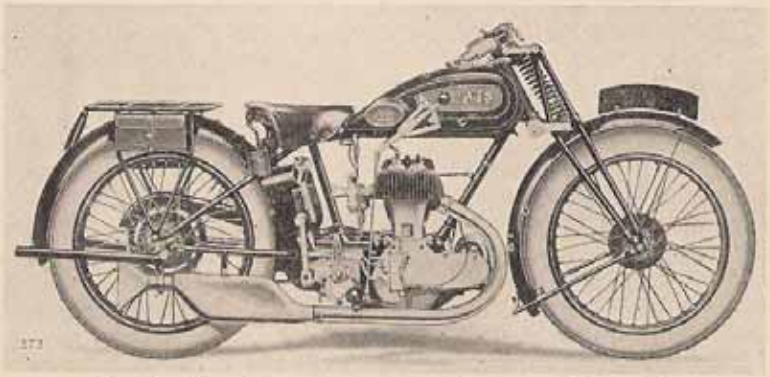


FIG. 1. THE 3·49 H.P. STANDARD SPORTING MODEL M5

Sporting Model M4. This machine is fitted, unlike the M5, with a built-in tank mounted speedometer and steering damper. It seems well advisable to pay the extra £3 10s. involved to include in the specification these items, together with other refinements. One of the most striking points in the specification is the new A.J.S. dry sump lubrication system. Dry sump lubrication undoubtedly relieves the rider of a source of constant anxiety and annoyance; and also saves him no small amount of money in the long run on the score of economy in engine oil. Moreover, correct lubrication ensures the minimum production of carbon deposits on the piston crown and combustion chamber, and thereby gives the maximum mileage before the rather odious, but nevertheless easy, job of decarbonization becomes necessary. This mileage should approximate 2,000. In practice, however, the owner usually " decokes " as soon as an appreciable loss of power and tendency to " knock " become manifest.

The Standard Sporting Model M5 is a general-purpose, medium-power sports machine, capable of maintaining high average speed under normal conditions. Owing to the extremely low figure at which it is catalogued, namely, £45, it makes a very strong appeal to the man of limited means who desires a lively mount with a good all round performance. Its specification, which applies also to all the other 3·49 h.p. machines, with certain modifications, is as follows—

ENGINE. This, like all the other engines, is of A.J.S. design and construction. The keynote of the design is simplicity and sturdiness. It is a side valve, vertical single cylinder, four-stroke engine of 74 mm. bore, and 81 mm. stroke, giving a capacity of

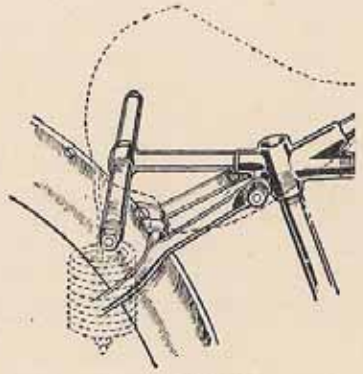


FIG. 2. THE NEAT A.J.S. SADDLE FIXING.

349 c.c., or (according to A.C.U. rating) 3·49 h.p. A four-ring aluminium-alloy piston reciprocates in a cast-iron cylinder with vertically finned detachable head, both being held down separately by means of long bolts. The head on the M5 cylinder departs from H5 (1927 model) practice in that no longer is the hitherto special A.J.S. method of holding down the cylinder head and barrel retained; this comprised a central bridge piece and two long bolts with turnbuckle adjustment. In this head two large interchangeable and mechanically operated valves of heat resisting alloy steel are placed side by side in deep removable guides. The large area of these valves ensures perfect charging and scavenging of the cylinder, besides giving good heat dissipation and freedom from distortion and pitting of the valves themselves. The tappets operating these valves have, of course, adjustable heads to give correct clearances of ·006 in. and ·008 in. in the case of the inlet and the exhaust valves, respectively, when the

engine is at its normal working temperature. A neat aluminium cover excludes dirt from the valve stems and effects a very marked reduction in noise. New type tappet guides are employed.

Within the cast aluminium crankcase is the crankshaft assembly, comprising two heavy rimmed cast-iron flywheels, with their main shafts running in roller bearings, and the crankpin upon which the big end roller bearing of the connecting rod is mounted.

The timing gear is extraordinarily simple, and therefore does its duty in a noiseless and trouble-free manner. It consists of the engine main shaft small pinion and two large half-time cam wheels. The cams act directly on the tappets. Tappet and valve stem centres are slightly offset, so as to produce automatic rotary movement and even wear of the surfaces in periodic contact when the engine is running.

The new type silencer and fishtail are very effective in reducing the exhaust noise, and should absolutely guarantee the rider against police prosecution for noise, which has recently become so prevalent. The principle employed consists of the use of blind ended, and drilled, extensions to the two pipes; and it is thus utterly impossible for the gases to flow straight through. This system was thoroughly tried out before being standardized for use on the M5, M4, M3, and M6 engines, and it was found that the resultant back pressure was negligible. Both silencer and exhaust pipes are heavily plated. A union nut now replaces a clip-fastening on the induction pipe for the carburettor.

CARBURETTOR. A No. 25A Amal, 2 jet, 2 lever, semi-automatic carburettor with bottom petrol feed is fitted, and the standard setting is—main jet, 80; needle position, 3; type of valve, 4/5. This gives fierce acceleration and perfect slow running.

IGNITION. The current is generated by a H.T. Lucas, variable ignition, type K.S.A.1 magneto, chain driven off a sprocket keyed to the exhaust camshaft. The other sprocket is a push-on taper fit on the armature shaft, and has a vernier adjustment for securing accurate timing. Actually, the flash across the plug electrodes is timed to occur $\frac{7}{16}$ in. before the top of the compression stroke, on full advance. The sparking plug used is of the two point type. The magneto is a well-protected instrument, and has, of course, a clockwise armature rotation, viewed from the contact-breaker side. A steel guard shields the instrument.

LUBRICATION. A new type of dry sump lubrication is employed. Oil is pressure-fed into the crankcase by a duplex pump continually, and is returned by this pump to the tank after circulating throughout the engine (see page 83). The flywheels splash it on to the cylinder walls, and oil is also pressure-fed into the timing case, whence it drains to the sump. The makers recommend the use of only the highest quality oil for lubrication.

FRAME AND FORKS. These two supplementary units have been designed to give, together, a wheel base of 4 ft. 5 in., and a saddle height of 27½ in. Special care has been taken to ensure good general stability at speed and on treacherous road surfaces. The A.J.S. forks are of quite new construction, and efficient shock absorbers are incorporated at the forward end of the lower fork links. The links are adjustable for side play. Integral with one of the fork spindle casings are two sockets which permit of a lamp being bracketed in a very low position that greatly enhances the appearance. A centrally placed compression spring is embodied in the new design this year, and a steering damper included on all except M5 and M12 models. This produces excellent steering without loosenes, and, if a proprietary steering damper were indulged in, the machine would be absolutely perfect in this respect. The forks are provided with grease-gun lubrication. The frame itself is of orthodox triangular form of high tensile steel (see Figs. 1 and 49).

GEAR-BOX. The gear-box is an A.J.S. countershaft three-speed gear, fitted throughout with ball bearings, and is standard for all models. It is operated by a right-hand gate change lever, affixed to the tank on the right-hand side; and it gives gear ratios of 5·8, 9·7, and 14·8 to 1.

Intermediate gear is by pinion engagement, and the remainder by dog clutch engagement. Moving the lever forward from rear to front position, the consecutive gears engaged are—low; neutral; middle; top. On to an extension of the new splined main shaft, which has a very robust thrust bearing on the driving side, are fitted two sprockets—one small and one large—for primary and secondary drives, respectively. The larger sprocket, incidentally, is part of the clutch (actually the teeth are on the periphery of the centre disc), which is of the multiple plate and cork insert type, and has handlebar control on the left-hand side. Adjacent to the clutch and pegged to the outside clutch plate is a ratchet wheel with which the kick-starter quadrant engages. The kick-starter lever (seen in Fig. 3) is in a position such that ample leverage can be exerted upon it with the foot while astride the saddle. Only a high grade oil made by a firm of repute should be used for gear-box lubrication, and the oil level is checked by a small plug on the side of the gear-box.

TRANSMISSION. Both primary and secondary drive are by substantial ½ in. pitch by ·310 in. wide Hans Renold roller chain. The chain of the former is covered by a guard, while that of the latter has a protecting guard on the upper half only, giving easy access to the chain for inspection and lubrication purposes. These guards are designed to protect both rider and chains.

An efficient shock absorber on the engine mainshaft allows the

power to be absorbed gradually, and thereby eliminates "snatch," which soon ruins any chain. As things stand, it is a very rare occurrence for a properly tensioned and lubricated chain to break on the road. The chain wears out completely long before this.

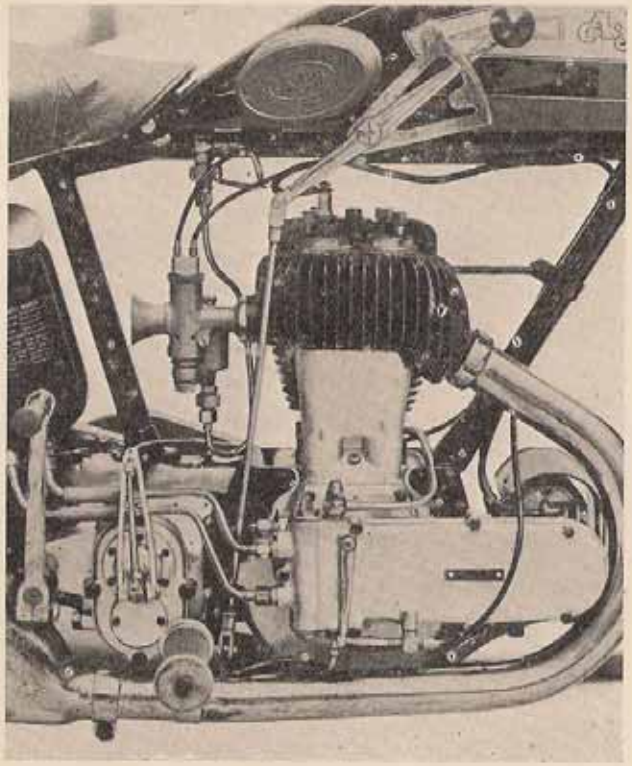


FIG. 3. THE 3·49 H.P. SIDE VALVE MODEL M5

This close up view of the M5 gives an excellent idea of the installation and principal features of the 1929 3·49 h.p. S.V. power unit. Note the aluminium cover which encloses the valve stems and the tappets. Observe also the partially enclosed exhaust valve lifter mechanism, the clutch and gear box operation and the arrangement of the dry sump lubrication system.

BRAKES, WHEELS, AND TYRES. Quick adjusted, internal expanding brakes are fitted to both front and rear wheels, which are tyred with 26 in. by 3·00 in., wired-on, heavy type "Non-Skid" Avons with Schräder valves. The rear brake is operated by a foot pedal on the left-hand side; and the front brake is controlled by a handlebar lever on the right side. Both brakes

are very smooth and powerful in action. Rear wheel quick detachable.

TANKS. A handsome, black enamelled, and bulbous nosed saddle petrol tank of welded steel is secured by bolts to the bottom frame tube, and has a capacity of 2 gallons, 3½ pints of petrol. The filler cap is of large screw-on type. On to two special tank projections are rigidly attached good quality rubber knee-grips. The tank is finished in black and gold with a magenta panel. A separate oil tank behind the down tube holds 3½ pints.

MISCELLANEOUS DETAILS. The semi- "T.T." adjustable handlebars have celluloid grips; and just below the gear-box are two rubber footrests, adjustable for position. This combination gives a very comfortable and natural riding position. The saddle itself is a Terry "Spring Seat" No. 3. Non-valenced racing mudguards are fitted. Over the rear mudguard is a strong carrier capable of safely supporting a passenger; but it is not exactly a flapper-bracket (to use the latest newspaper description of a pillion seat); it is really intended for luggage. At its sides are secured two pannier bags with a full kit of tools. Two kick-up stands are provided. The general finish, including the handlebars, is black enamel on a special anti-rust process. The usual parts are all heavily plated. All oil and petrol cocks are of the quick action, push type. The overall length is 6 ft. 9½ in.

Lucas electric lighting can be had to order at £6 15s. solo, and at £7 5s. extra for a combination. This applies to all A.J.S. mounts.

WEIGHT. Approximately 253 lb.

MAXIMUM SPEED. Approximately 58 m.p.h.

THE 3·49 H.P. DE LUXE SPORTING MODEL M4

The specification of this machine is identical to that of model M5, other than the following—

The engine is specially tuned; a Smith non-trip 60 m.p.h. speedometer is mounted flush with the petrol tank; a steering damper is included; better type valenced mudguards and saddle are provided; weight, 261 lb.

THE 3·49 H.P. OVERHEAD VALVE SPORTING MODEL M6

Next in order of popularity is the O.H.V. 349 c.c. Model M6 (see Fig. 4). This machine, which is a fast mount possessing an admirable competition record, embodies all those improvements incorporated on the 1929 Model M4. It is, in fact, a replica of this mount with certain important modifications.

ENGINE. The power unit is of the overhead valve type. Two large diameter, alloy steel, tulip valves, hollowed out for lightness, are symmetrically placed at 82½° to each other in the detachable cylinder head so that, when seated, their heads are roughly flush

with the walls of the hemispherical combustion chamber ; slightly in front, on the left-hand side of the cylinder, is a sparking plug with its electrode points pocketed within the chamber. This arrangement is ideal, having regard to instantaneous combustion, good cylinder charging and exhaustion, and last, but by no means least, good turbulence.

The valves are operated by polished duralumin rockers, mounted on the spindles carried by a sturdily built rocker box, and carrying at their extremities grub screws and lock-nuts, which enable tappet adjustment to be effected at the top of the push rods, instead of at the bottom. The whole of the overhead valve

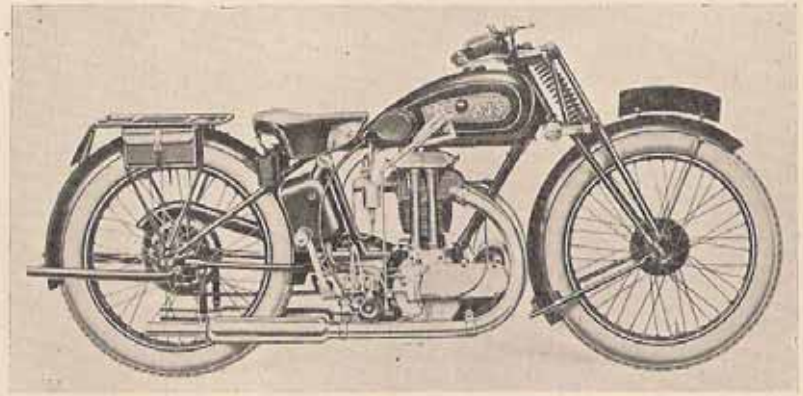


FIG. 4. THE 3·49 H.P. O.H.V. MODEL M6 (TWO PORT)

mechanism and the two duralumin push rods are totally enclosed and adequately lubricated. The engine may be had either as a single port or a two-port model. Clearance between inlet valve and rocker is ·006 in., and the exhaust clearance is ·008 in. Grease-gun lubrication is provided for these rockers, which have large area plain bearings. The crankcase valve actuating mechanism is, of course, the same as on the M5 engine. The valve springs are noteworthy, being of the two-in-one variety. The valve movement slightly overlaps the piston stroke, and in consequence two small segments are cut out of the piston head dome to prevent fouling of the valves.

The piston is of aluminium alloy, and has four narrow width rings, the bottom ring being primarily designed to prevent ingress of oil into the combustion chamber. The gudgeon pin is hollow, and is secured in position by two small springs. This piston, unlike many of its type, does not suffer from that distressing malady, " piston slap." The two port engine is remarkably quiet,

the gases being led by the dual pipes to a couple of nickel-plated Carbjector silencers. The magneto is a Lucas type K.L.1. Ignition timing is $\frac{5}{16}$ in. before before T.D.C. on full advance.

CARBURETTOR. The carburettor is a No. 33A Amal, 2 jet, 2 lever, semi-automatic model with bottom petrol feed and twist grip control. The standard setting is—main jet, 110; needle position, 3 ; type of valve, 5/5. If Discol P.M.S. or R.D.1 is used on the M6 or M.R.6, use jet 170.

GEAR-BOX. This is a close ratio type of gear-box giving ratios of 5·8, 7·1, and 10·9 to 1, with a 21-tooth sprocket ; but a wide ratio type of box may be had if required.

Beyond the fact that mudguards are of the racing pattern, Model M6 does not further differ materially from Model M4 in specification.

WEIGHT. About 273 lb.

MAXIMUM SPEED. About 65 m.p.h.

THE 3.49 H.P. O.H.V. SPECIAL SPORTS MACHINE, MR6

This is one of the four special A.J.S. racing machines, and is essentially a mount for the speedman who requires snappy acceleration, stability at very high speeds, and great stamina. It will stand up to prolonged full throttle work without " cracking-up." It embodies many special features which it has been found desirable to include on a machine built for track and road racing. In spite, however, of its being a " special," its specification is not greatly different from the standard M6 machine. Actually the differences are as follows—The single port engine is tuned for speed and instead of the mainshaft bearings being of the plain journal type, they are of the ball-bearing pattern. This eliminates the danger of seizure and enables extra revolutions to be got out of the engine.

Two pistons are supplied—one a low compression unit for use with normal petrol, benzol, ethyl petrol, or petrol-benzol mixtures, and the other a high compression member to be used with special alcohol racing fuels, such as P.M.S. 2 and R.D. 2 or R.D. 1. The carburettor is an Amal No. 45A with a 170 main jet and needle valve 6/5 with position 4. The gear ratios are close, namely, 5·2, 6·78 and 10·38 to 1. Equipment includes a special, non-detachable rear wheel fitted with a lightened hub and brake drum and shod with 26 in. × 2·375 in. studded Avon cover, a ribbed front tyre, and a spacious metal tool box mounted on the tank which also acts as a " tummy-rest." No carrier or front stand is provided, these being considered superfluous on a racing mount. The maximum speed of this machine is approximately 70 m.p.h., but this could be slightly exceeded by very careful tuning and

skilful riding. There are few other 'buses on the road to-day of the same capacity that are capable of showing a rear plate to this mount.

THE 3.49 H.P. OVERHEAD CAMSHAFT MODEL M7

The two camshaft A.J.S.'s, the M7 and the M10, are two of the finest motor-cycle jobs to be had on the market. They were introduced at the 1928 Olympia show, although prior to being put into production they have been severely tried out on the

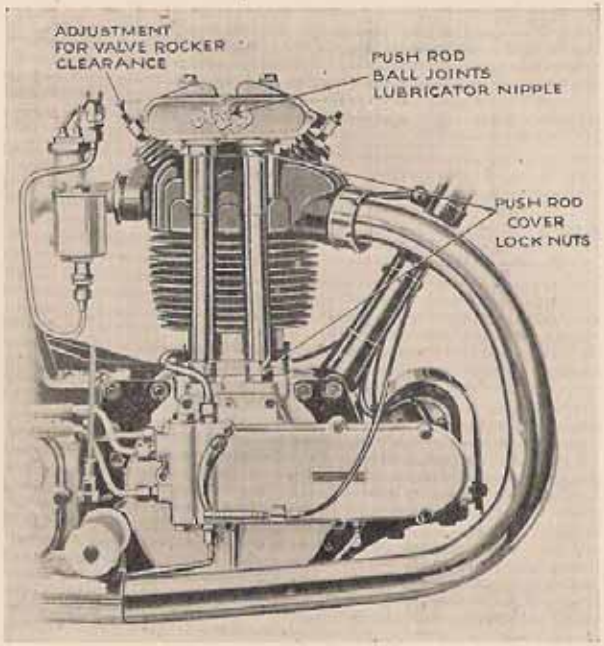


Fig. 5. The 3·49 h.p. O.H.V. Engine Model M6

track at Brooklands and 350 c.c. camshaft mounts were entered for the 1927 T.T. races (four-speed camshafts were entered this year). Soon after their startling appearance they proved victorious in such important road races as the 350 c.c. German Grand Prix, the Austrian Grand Prix, the South African Grand Prix, and numerous other events. In the three above-mentioned races first place in each case was secured by a 3·49 h.p. O.H.C. mount. A similar machine secured second place in the 1929 T.T.

On 23rd March, 1929, C. E. Denley, who has recently been

appointed to, and has taken over the chief responsibility of, the A.J.S. racing department, at Brooklands attained a speed of 106·42 m.p.h., riding a chromium plated O.H.C. A.J.S. This constituted a world's record. The camshaft A.J.S.'s, however, in spite of their prodigious speed qualifications, are comparatively docile. We reproduce herewith an extract from a report in the *Motor-cycle* of 28th March, 1929, with reference to a short test of the "Three-fifty" camshaft A.J.S.: "... the engine is one of the smoothest running imaginable. The whole machine gave the impression of a docile thoroughbred, for it ran like oiled silk and was in no way harsh and intractable."

General Specification. The general specification of the machine is similar to that of the MR6. The standard gear ratios are

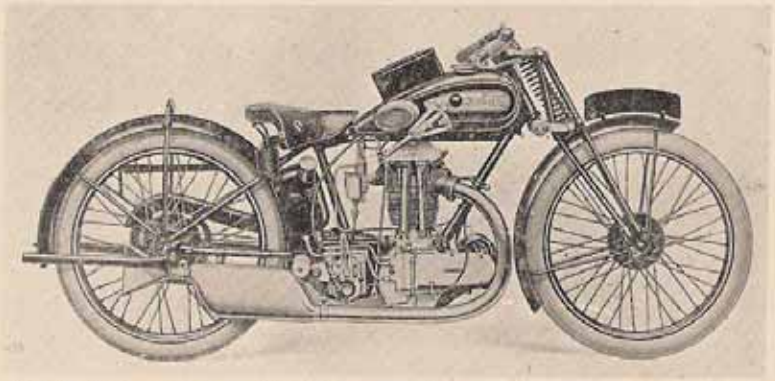


Fig. 6. The 3·49 h.p. O.H.V. Special Sports Machine Model MR6

5·5, 6·7, and 10.3 to 1. A wide ratio gear-box may be obtained if preferred. The all-on weight of the machine is 260 lb. and the maximum speed roughly 75 m.p.h. The engine, of course, is a unit differing very greatly from any of the hitherto described A.J.S. power plants, and merits a brief description.

The 3.49 h.p. O.H.C. Engine. An excellent general idea of the layout of this engine may be gathered by reference to Fig. 7, where the salient features may be observed. It will be noticed that both the magneto and the camshaft in the cylinder head are driven by means of chains and sprockets from a common half-time shaft. It might at first be imagined, especially by those who abhor chains of all kinds, that this system would contain some serious inherent defects, having regard to the fact that valve timing must be "correct to a hair." Such is not the case, however, and it is a tribute to the ingenuity and skill of the designer that this chain-driven camshaft engine has been found

in practice to perform extremely well and to possess a great degree of reliability. In connection with the camshaft drive there are two important features. They are the special chain

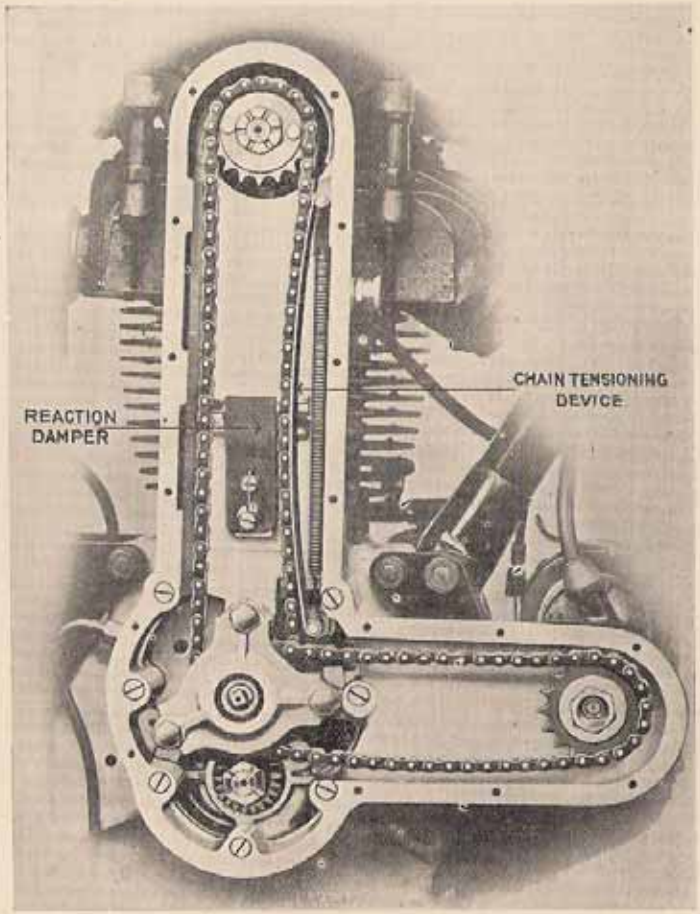


FIG. 7. A VIEW OF THE 3·49 H.P. OVERHEAD CAMSHAFT ENGINE
The chain covers are removed exposing the magneto and camshaft drives, also the reaction damper and the patent chain tensioning device.

tensioning device and the reaction damper whose duty is constantly to maintain the chain in a uniform state of tension, prevent chain "whip," and reduce noise. The tensioning device comprises a very hard, thin steel blade which, by the agency of a coil tension spring, is kept pressed up against one side of the

chain in the manner shown in the reproduced photograph. It will at once be realized that what little chain stretch may occur (and since the sole loading occurs when the valve springs are intermittently compressed chain stretch must be insignificant) is automatically compensated for, and the relative positions of the sprockets on the camshaft and the half-time shaft remain unchanged with, therefore, no alteration whatever to the valve timing. Should the camshaft driving chain be removed from the sprockets, the valve timing may readily be readjusted (see page 167).

It should be pointed out that neither of the two sprockets nor the chain itself need be removed when taking off the cylinder

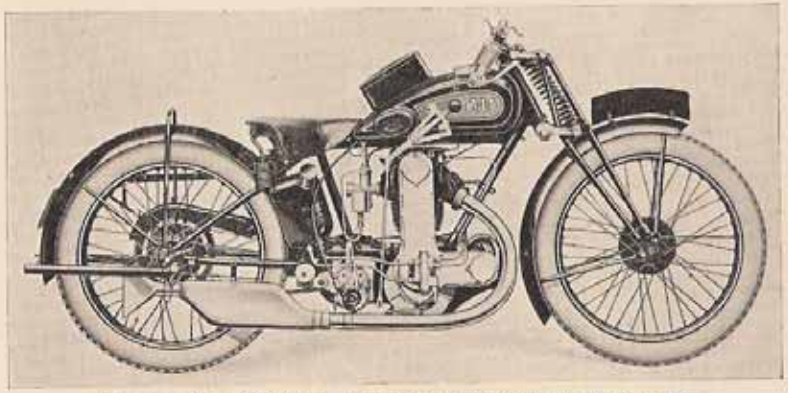


FIG. 8. THE 3·49 H.P. OVERHEAD CAMSHAFT MODEL M7

head for the purpose of decarbonization. Beyond the embodiment of the special camshaft-operated valves, the 3·49 h.p. O.H.C. engine is in design substantially the same as the 3·49 h.p. O.H.V. engine. Dry sump lubrication is, of course, utilized. Valve clearances on this engine (see page 92) are highly important. They are, with engine cold, ·016 and ·018 in the case of the inlet and exhaust valves respectively. The correct ignition advance is $\frac{3}{4}$ in. before T.D.C.

THE 4·98 H.P. OVERHEAD VALVE MODEL M8

This machine is a very fast sporting "500." Owing to its great speed and immense power reserve, this model essentially belongs to the sports class; but it is not, however, a pure sports mount. It is rather a dual purpose machine suitable also for long distance high speed touring. To this end ample mudguarding is provided. A racing version of this machine, the MR8, similar

to model MR6, is obtainable. Model M8 is obtainable with either a single or a two-port exhaust, the difference in price being £3 10s.

Model M8 has a wheel-base slightly greater than that of any of the models hitherto described. It is 4 ft. 7 in. The saddle height remains unaltered, namely, 27½ in., while the ground clearance is 4½ in. 1929 modifications to this mount, which was introduced in 1926, include larger sized tyres (26 in. by 3·25 in.), the new type of forks, the substitution of a gate change speed lever for the bell crank system previously employed, valve clearance adjustment at upper ends of push-rods instead of at lower ends,

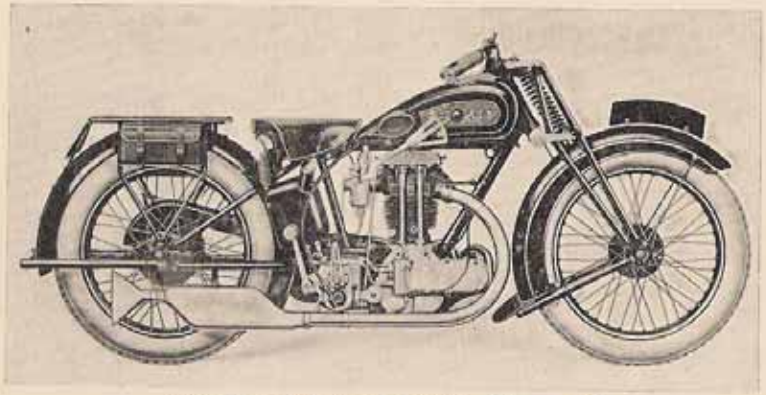


FIG. 9. THE 4·98 H.P. O.H.V. MODEL M8

new type of cylinder head and enclosed rocker gear with telescopic push-rod covers; a two-lever Amal carburettor; a Carbjector silencer, sump lubrication, and other improvements.

ENGINE. The general layout of this engine, which has performed so creditably in the Tourist Trophy Races, is similar to that of the 3·49 h.p. O.H.V. engine; some parts are actually interchangeable, chief among which are valves, valve actuating mechanism, magneto drive and main shafts. It is of 84 by 90 mm. bore and stroke, giving 498 c.c. capacity. Like Model M6 engine, it is fitted with a detachable cylinder head, enclosed valve lifter mechanism, an aluminium alloy piston with non-segmented dome, and compound type valve springs. The correct valve clearance is ·006 in. for the inlet, and ·008 in. for the exhaust valve, and the ignition advance, $\frac{7}{16}$ in. before T.D.C. The big end bearing, having regard to the high stresses that it can be subjected to under full throttle on this machine, is of compound type. The long silencer is fitted in the same position as the one fitted

in the case of model M5. The plated exhaust system is thus very imposing.

LUBRICATION. This is by means of a dry sump system with an auxiliary feed direct to the cylinder wall. (See page 84.)

GEAR-BOX AND TRANSMISSION. The gear-box, of the same type as mounted on all the other machines, gives ratios of 4·7, 5·6, and 9·2 to 1. A wide ratio gear-box may be fitted as an alternative. Transmission is by ⅝ in. pitch by ⅜ in. wide, Hans Renold chains.

FRAME AND TANK. The frame is of "K" quality steel tubing, scientifically constructed, with sidecar lugs integral. The petrol tank holds 2 gallons and the oil tank 4 gallons.

The remainder of the equipment specification is identical with that of the 3·49 h.p. O.H.V. model M6.

WEIGHT. Approximately 312 lb.

WHEEL BASE. 4 ft. 7 ins.

MAXIMUM SPEED. Roughly 70 to 75 m.p.h.

THE 4·98 H.P. O.H.V. SPECIAL SPORTS MACHINE, MR8

This special racing edition of model M8 is easily the fastest of the A.J.S. O.H.V. range, although possibly a few miles an hour slower than the O.H.C. mount of the same cubic capacity. Its full throttle speed, as given by the manufacturers, is 85 miles per hour. It will attain this speed as delivered from the Wolverhampton factory, where the utmost care is taken in its erection, tuning, and testing. There is no doubt, however, that the crack rider who has the time, skill, and patience available can still further improve upon this very excellent performance and, given a certain amount of luck, could "boost" the machine up to a speed of 90 m.p.h. To attain such a speed it would, of course, be essential to run on an alcohol fuel with a high-compression piston and the correct sized carburettor jet. As a matter of fact, two aluminium pistons are supplied with the machine. One is a low-compression member for use with ordinary petrol and petrol-benzole mixtures, and gives a compression ratio of 5·25 to 1. The other is a high-compression piston which provides a ratio of 6·54 to 1. This is a comparatively high ratio, and permits of every available ounce of fuel energy being utilized in the production of power with the rapidity of combustion at its highest value. Only by exceptionally rapid and complete gas combustion can mean piston speeds of approximately 30 m.p.h. be obtained (and this is the piston speed corresponding roughly to a road speed of 90 m.p.h. with a gear ratio of 5 to 1). It needs little imagination to realize what large inertia forces the connecting rod and bearings are called upon to resist in view of the fact that at 90 m.p.h. the piston is undergoing alternately positive

and negative accelerations of a very high order, nearly 200 times every second! The connecting rod and needle taper roller bearings fitted to the big end are thus of very robust construction to stand up to the gruelling ordeal to which, on occasions, they are submitted. The engine mainshafts rotate on ball bearings. The general specification of model MR8, which follows closely MR6 (compare Figs. 6, 10, and 11) is, except for the following modifications and the fact that alternative pistons are supplied, as already mentioned, identical to that of the standard 4·98 h.p. O.H.V. model, M8.

The engine is obtainable with a single exhaust port only; a close ratio gear-box is specified, having ratios of 4·9, 5·6, and 9·2 to 1; the rear non-quick detachable wheel has a specially-lightened

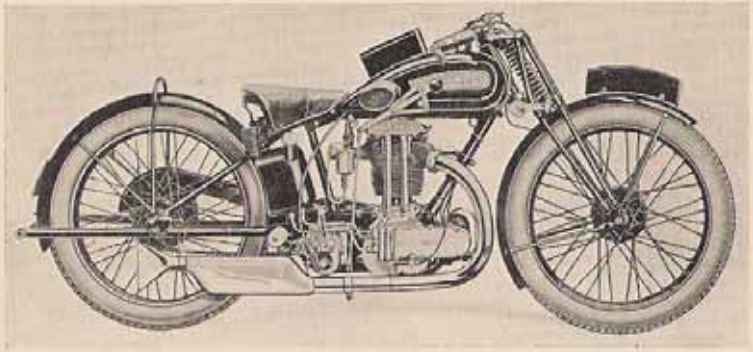


Fig. 10. The 4·98 h.p. O.H.V. Special Sports Model MR8

hub and brake drum, and is shod, as in the case of the front wheel, with a 27 in. × 2·75 in. Avon; a convenient tool case is mounted upon the top of the petrol tank.

The size of the main jet used in the AA8850 Amal carburettor is 180 and the needle valve used is model 6/5. Ignition advance, as in the case of model M8, is ¾ in. before T.D.C.

THE 4·98 H.P. OVERHEAD CAMSHAFT MODEL M10

This machine, the larger of the two camshaft models, has a general specification very similar to the O.H.V. "special" just described and illustrated in Fig. 10. The engine itself is almost identical to the 3·49 O.H.C. unit (described on page 13), although the dimensions, of course, are the same as those of model M8, which has a bore and stroke of 84 mm. × 90 mm.

In appearance, the machine is barely distinguishable from model M7 (shown on page 15), and includes all the special features embodied in that mount, such as ball bearings to main shafts and

timing shafts, tank-mounted tool box, adjustable semi T.T. type handlebars, narrow racing type mudguards, and specially lightened hub and brake drum. The rear wheel is not quickly detachable neither are stands nor a carrier fitted.

The gear-box is a close ratio one, the ratios available being 4·6, 5·6, and 9·2 to 1. A wide ratio box, giving ratios of 4·6, 8·4, and 5·2 to 1, can, however, be obtained if so desired. The ignition advance is ¾ in. before T.D.C., the weight 297 lb., and the maximum speed slightly in excess of 90 m.p.h.

THE A.J.S. DIRT TRACK MACHINES

In order to cater for the widespread demand for a high-class D.T.R. machine, the A.J.S. Company now market two models

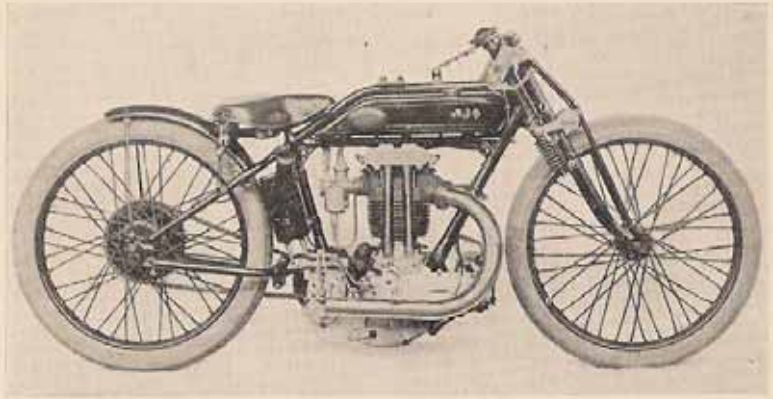


Fig. 11. The A.J.S. Dirt Track Racer

—a "350" and a "500." Both these models are sound jobs designed specifically for cinder sliding and since their inception have appeared and been ridden with great success on the majority of the leading tracks in this country. They handle very sensitively, and can be "laid over" to a steep angle with absolute safety. Except for the engines, the specifications are much the same in each case. The prices are £65 and £76 15s. respectively. It is sometimes a matter for considerable surprise that dirt track models, which to the uninitiated are merely stripped production models, should be listed at higher prices. The important thing to remember, however, is that they definitely are *not* production models. They are specially built throughout and, in consequence, are somewhat more expensive to manufacture than the standard machines which are produced on a carefully and economically planned mass production basis. Fig. 11 illustrates the 1929

" dracer " (to use a recently introduced and abbreviated term), and its salient characteristics may therein be noted. The power units installed are precisely the same as those housed in the MR6 and the MR8 road racers, and the same dry sump lubrication system is utilized. The instructions regarding valve clearance, ignition advance, and general overhauling hints, contained in this manual are therefore applicable in the case of the two D.T.R.'s which, by-the-way, have no series numbers but can at short notice be supplied to order.

The frame, which is of the diamond pattern and constructed of aero quality seamless steel tubing, is immensely powerful and scientifically strengthened at various points, so as to resist the tendency for lateral flexion that must necessarily occur when the machine is put into various unnatural attitudes which constitute broadsiding. The ordinary frame used on the road models is seldom, if ever (except when, say, resisting the equal and opposite reaction of a steam roller) called upon to counteract severe torsional stresses. Rigidity is the keynote of the D.T.R. frame. Second in importance to structural strength is good weight distribution. In a machine used for broadsiding it is desirable to have the C.G. as low as possible consistent with an adequate ground clearance and placed as near the centre of the wheel base as possible, so as to render simultaneous front and rear wheel skid correction as simple a matter as possible. In the A.J.S. all these questions of dynamics have received very careful attention, and the machine is a far more complicated and well thought out job than might be imagined by a cursory glance at the machine and its specification. The forks are not of normal design but constructed having regard to the special requirements of cinder-track racing.

The petrol tank, which is not of the new saddle type, has a capacity of 1¾ gallons, and is housed in the old manner between top and bottom tubes. It is of welded steel reinforced at places liable to come into impact with obstacles in the event of crashes. Rubber knee grips are fitted. The separate oil tank attached to the rear down tube holds 3 pints of oil.

Equipment includes footrest on off-side only, a steel exhaust pipe. Lucas magneto, handlebar " cut-out " switch, a single 8 to 1 ratio countershaft gear (other ratios obtained by changing sprockets) with multi-plate cork-insert friction clutch, a special rear wheel with lightened hubs and no brakes, a Brooks saddle, racing handlebars, quick-action twist grip to the Amal carburettor, and Avon tyres, the front being ribbed and measuring 26 in. × 2·375 in., and the back studded and of size 27 in × 2·75 in.

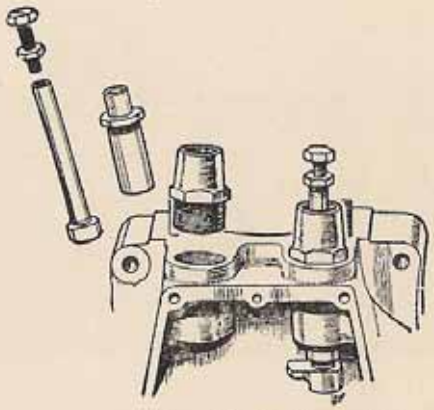
The ground clearance of the machine is 2¾ in., the wheel base approximately 50 in. Maximum speed of the " 350 " is about

70 m.p.h., and of the " 500 " 75 m.p.h. The top speed, of course, is dependent upon the gear ratio used. The dirt tracks in this country are in the main of small radius and acceleration is a factor of greater importance than sheer speed in achieving success.

The ambitious youth aspiring to silver helmets and all the glory attached to them, might well do worse than select as his steed the A.J.S. dirt-track racer.

THE TOURING MODELS

These are models M12, M3, M9, M2, and M1, and their respective prices are £39 17s. 6d., £48 10s., £54, £66, and £76 10s. The first



(From the " Motor Cycle ")

Fig. 12. The New Oil Retaining Tappet Guides on the S.V. Engines

three are solo mounts, while the remainder are twin cylinder sidecar outfits. Besides these combinations there are listed several attractive sporting and touring sidecars that may be attached to any of the A.J.S. models, and some that can be fitted to certain models only. We will deal briefly with the solo mounts first, and the sidecars afterwards, in the above-placed order.

The 2·48 h.p. Lightweight Model, M12. This recently introduced model, illustrated in Fig. 13, is the " baby " of the A.J.S. range. In fact mathematically (?) we may say the M12 is to the M7 as the Austin " 7 " is to the Austin " 12." In spite of its " babyness," however, the machine is such a thoroughbred, and so well proportioned, that it is a matter of some difficulty to differentiate between this 248 c.c. job and the 349 c.c. jobs. An amusing contrast in sizes will be found on page 151 where an

M12 is shown dwarfed by the huge form of a 54 h.p. A.J.S. commercial chassis. This lightweight, which is taxed at 30s. per annum only, is really remarkable value for money, having regard to the very complete specification, and is an ideal machine for the youngster who first starts riding, the utility rider, and the more pacifist of experienced riders.

There is, of course, a definite class of rider who, on the score of general handiness and ease of operation, much prefers the lightweight to the heavyweight machine, and it is to this class of the motor-cycling community that the small 2·48 h.p. should make a very strong appeal. There are certainly few other lightweights with

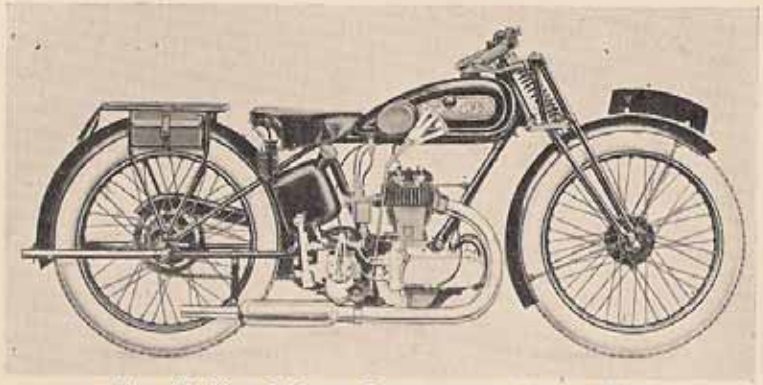


Fig. 13. The 2·48 h.p. Lightweight Model M12

such an excellent performance, such a comprehensive specification, and with such a " full scale " appearance on the market to-day. The general specification is not unlike that of model M5. The engine, which has dry sump lubrication, an aluminium piston, enclosed valve gear, a detachable cylinder head, roller bearing big end, and other features common to the 3·49 h.p. S.V. engines, is of 65 × 75 mm. bore and stroke. An Amal 2-lever carburettor, No. 21A, with a size 70 main jet and 4/5 needle valve is fitted. The exhaust system comprises a long nickel-plated steel pipe and a Carbjector silencer. The frame and forks are similar to those used on the higher-powered models but give a wheel base of 4 ft. 3½ in., and overall length of 6 ft. 7 in. to the machine. The welded steel saddle petrol tank holds 2 gallons, ½ pint, and the oil tank 3½ pints.

Transmission is by ½ in. pitch × ·205 in. wide Hans Renold chains with a cover to the top half of the chain only. The gearbox is a normal three-speed pattern fitted throughout with ball bearings and giving ratios of 6·1, 10·3, and 15·8 to 1. A three-plate clutch with cork inserts is used. The wheels measure

25 in. × 3 in., and are provided with Avon light " non-skid " tyres. The rear wheel is quickly detachable. Both wheels have large diameter internal expanding brakes which are quickly adjusted by means of wing nuts, which automatically lock in the desired position. Standard forks are provided, but they are of slightly smaller dimensions than those used on the 349 c.c. machines and with the frame give a wheel base of 4 ft. 3½ in. instead of 4 ft. 5 in. Equipment includes semi " T.T." handlebars, adjustable footrests, a strong " Kick-up " rear stand, an oxy-acetylene welded steel tube carrier with pannier tool bags in steel outer cases, one on each side, a full kit of tools, enclosed

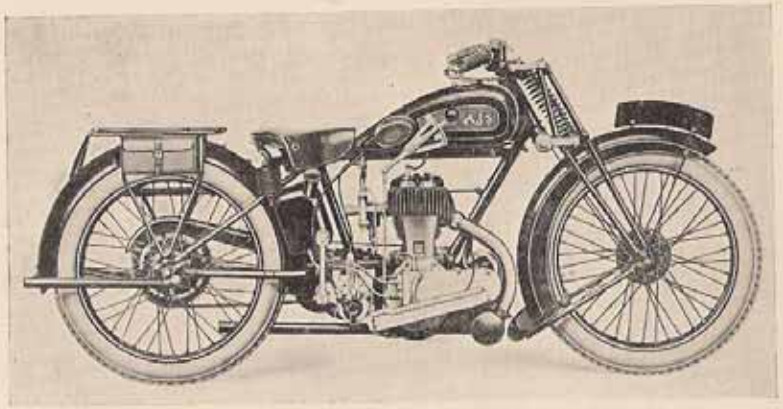


Fig. 14. The 3·49 h.p. De Luxe Touring Model M3

K.S. mechanism, a Terry " Spring Seat." The overall length of M12 is 6 ft. 7 in., and the weight 193 lb. The maximum speed is roughly 55 m.p.h. The ignition timing is $\frac{7}{16}$ in. before T.D.C.

The 3·49 h.p. De Luxe Touring Model M3. This machine (shown in Fig. 14) differs from the De Luxe Sporting Model H4 only in that the engine is not specially tuned for speed ; footboards replace footrests ; touring pattern handlebars are fitted ; the silencer is fitted in front of the engine. The weight is 264 lb.

The 4.98 h.p. De Luxe Touring Model M9. This 4·98 h.p. S.V. touring model, which made its debut at Olympia in 1926, is exactly the same as the 4·98 h.p. O.H.V. model with the overhead valve mechanism replaced by side valves. Thus marketed, Model M9 weighs only 12 lb. less than does Model M8, while the former is cheaper than the latter by £5 10s. The speed of the S.V. machine is appreciably lower than that of the O.H.V. machine (which is best described as concentrated " pep "), but

its performance is, nevertheless, very remarkable; 60 m.p.h. is well within its capacity.

This speed is ample for the ordinary tourist. A comfortable cruising speed of 40-45 m.p.h. can be sustained more or less indefinitely with absolutely no risk of engine failure due to overheating or valve trouble. The correct valve clearances on all A.J.S. side-valve engines are ·006 and ·008 in the case of the inlet and exhaust valves respectively. Tappet adjustment on the M9 is seldom called for, but it should be kept to the above dimensions if maximum efficiency is desired (see page 92). The ignition timing is $\frac{7}{16}$ in. before T.D.C. on full advance. A close ratio

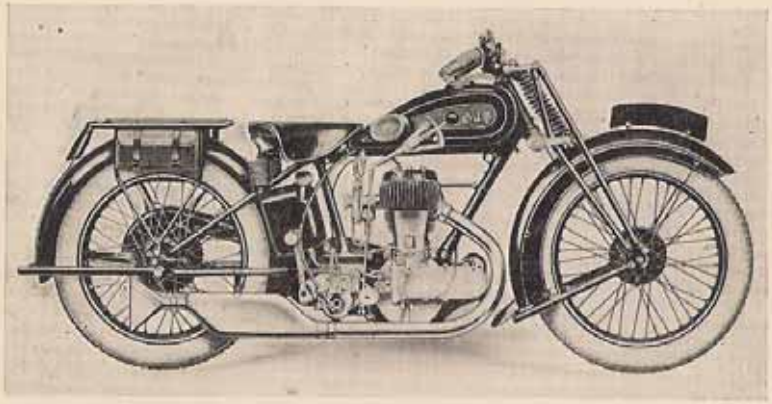


FIG. 15. THE 4·98 H.P. DE LUXE TOURING MODEL M9

gear-box with ratios of 4·9, 5·9, and 9·6 is fitted as standard, but a wide ratio box can be obtained if desired.

THE 9·96 H.P. TWIN CYLINDER MODELS

The 9·96 h.p. De Luxe Machine. This powerful twin should satisfy, not the man who wants room for an occasional "flapper," but the man whose "flapper" has "ceased flapping"—in other words, the family man. Owing to its high horse-power and low bottom gear, this machine is capable of going practically anywhere. At the same time it has a good turn of speed. Comfort and reliability have been taken as the primary considerations in its design. This year the A.J.S. big-twin has been brought up to almost the full limit of the 1,000 c.c. class. Previously the engine was of 799 c.c., but this year it has been increased very wisely to 996 c.c., and thus has a great power reserve for sidecar purposes. Both the de luxe and standard twin cylinder models can be

obtained solo or with various sidecars hereafter described and illustrated.

The "Vee" twin cylinder engine, which provides the motive power, is fitted to this model and the standard twin cylinder model M2 alone. This engine closely follows general A.J.S. practice, but it has several noteworthy features. The specification is as follows—

ENGINE. Rated at 9·96 h.p., this S.V. engine, with cylinders placed at 50° to each other, and provided with detachable heads, has a 84 mm. bore and 90 mm. stroke. The cylinders, of similar type to those fitted on the A.J.S. single cylinders, have a common induction manifold to which the carburettor is attached. They are held down in position in a very neat manner by four nuts and bolts at the cylinder bases. Four hexagon-headed studs are also used for the retention of the cylinder heads to the barrels.

Cylinder gaskets are fitted to this engine alone. Pistons are of aluminium alloy and valves are of standard pattern, having clearances of ·006 and ·008 in the case of the inlet and exhaust valves respectively. Ignition timing is $\frac{3}{8}$ in. before T.D.C. on full advance. The connecting rods, to which the pistons are attached, are mounted independently, side by side, on the crank-pin. There is no fork-ended master connecting rod (see Fig. 48). This is rather unorthodox practice; but results have justified its adoption. Roller bearings are fitted to both of the connecting rods big end bearings. The valve timing gear comprises the small main shaft pinion, two half-time exhaust camwheels driven off the same, and a double inlet cam wheel driven off the front exhaust cam wheel. One toggle only is used, this being interposed between the double cam wheel and front inlet tappet. On this engine, owing to the increased load on the drive, the "Magdyno" sprocket is keyed to the armature shaft; on all the others it is a friction fit. The other sprocket is splined to the exhaust camshaft. A large box type silencer and fishtail is fitted to the rear of the exhaust system. All external engine details are well illustrated by Fig. 17, and the timing gear by Fig. 67.

CARBURETTOR. This is a No. 39A Amal. Particulars—main jet 130; throttle valve 5/5.

IGNITION. Lucas magneto with vernier timing adjustment. Champion sparking plugs.

LUBRICATION. Dry sump system with mechanical pump and auxiliary feed to cylinder wall.

TRANSMISSION. $\frac{1}{2}$ in. pitch by $\frac{3}{8}$ in. wide, Hans Renold chain, totally-enclosed chain cases, shock absorber on engine mainshaft.

CLUTCH AND GEAR-BOX. The clutch is of the multiple plate and cork insert type, hand controlled. Gear-box is a three-speed

bottom bracket type with ratios of 4·2, 7·6, and 13·8 to 1 solo and 4·9, 8·8, and 16 to 1 combination.

WHEELS, TYRES, AND BRAKES. Both of the wheels quickly detachable and interchangeable, with 26 in. by 3·5 in. wired on, heavy type, non-skid Avon cord tyres. Brakes of internal expanding type. Both front and rear brakes are operated by foot pedals situated on the right and left-hand sides respectively, quick adjustment is afforded.

TANKS. The petrol tank has capacity for 3 gallons and 1 pint of petrol. The oil tank holds 4½ pints. Petrol injectors to cylinders.

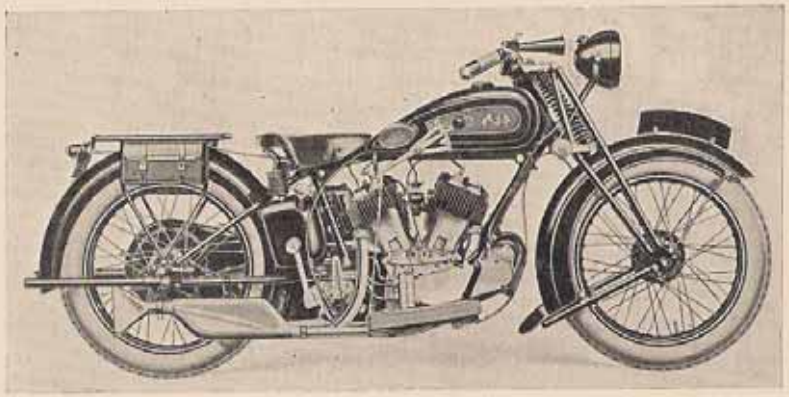


FIG. 16. THE MODEL M1 DE LUXE 9·96 H.P. TWIN

MUDGUARDS. Well balanced and fitted with drip channels. Rear: 7 in. wide.

MISCELLANEOUS. Included in specification are—Terry Spring Seat No. 3 De Luxe, rubber footboards with deep tread and heel rest, stands to front and rear wheels, a complete set of tools, and a Lucas Magdyno electric lighting set and switch box.

WEIGHT. Approximately 385 lb.

The 9·96 h.p. Standard Machine, Model M2. This machine, which, as a solo mount, sells ten guineas cheaper then Model M1, is a less luxuriously equipped edition of the same machine. It has no lighting set, and no electric horn. Both the motor-cycle wheels are interchangeable and quickly detachable. A chain guard only is fitted.

The above are the principal points on which the specification differs from that of the previously described machine. Model M2, without sidecar, weighs 345 lb.—40 lb. less than solo Model M1.

The maximum speed of both machines is approximately 60 m.p.h. and 50 m.p.h. with a sidecar.

So much, then, with regard to the various A.J.S. motor-cycles which are available this year. Having disposed of these we will summarize briefly the range of sidecars, which are thirteen in number. Four of them, however, are commercial vehicles, and

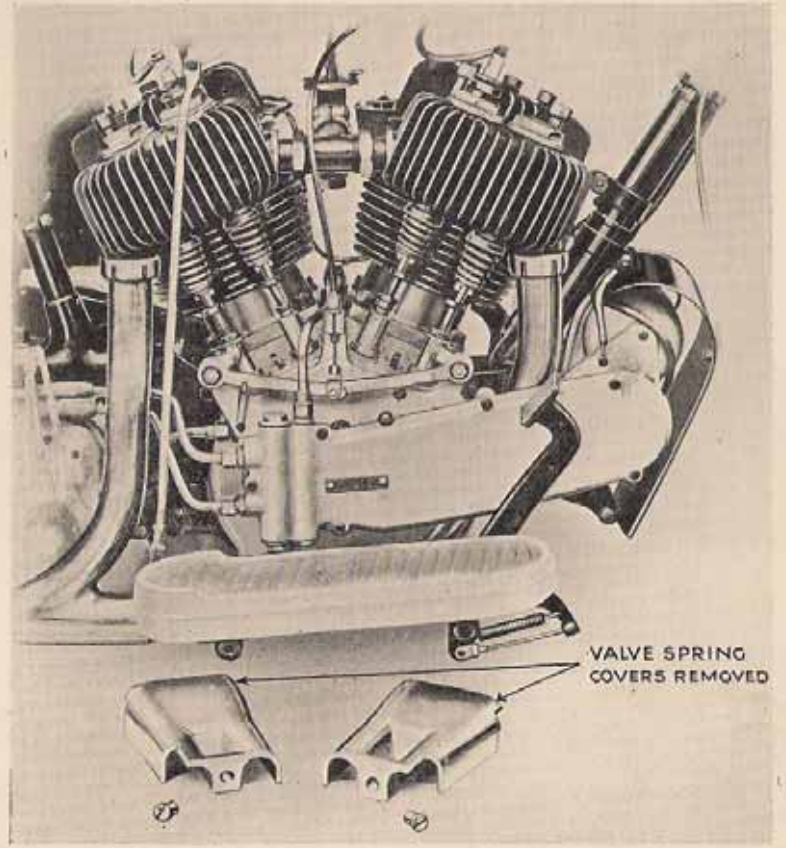


FIG. 17. THE MODEL M1 TWIN CYLINDER ENGINE, 9·96 H.P.

since the author considers the transportation of "humans" to be of greater importance than of milk churns, we will deal with the eight passenger sidecars first.

THE A.J.S. PASSENGER SIDECARS

The eight passenger sidecars, which are all of exceptionally fine workmanship, beautifully upholstered, and of very pleasing

contour, differ greatly in design, so that there should be little difficulty in a rider selecting from the range a sidecar which suits his tastes and special requirements. Where a lady is concerned, the choice of a good sidecar is of paramount importance, both from the lady's and the man's point of view. Many a home has been wrecked by a badly-sprung sidecar! The average woman's physique, it should be remembered, in spite of all the sex equality nonsense, does not approach that of a normal adult man, and she cannot be expected to withstand the severe vibration and jostling that occurs with a second-rate and badly-sprung sidecar, particularly over long distances and bad roads. The springing

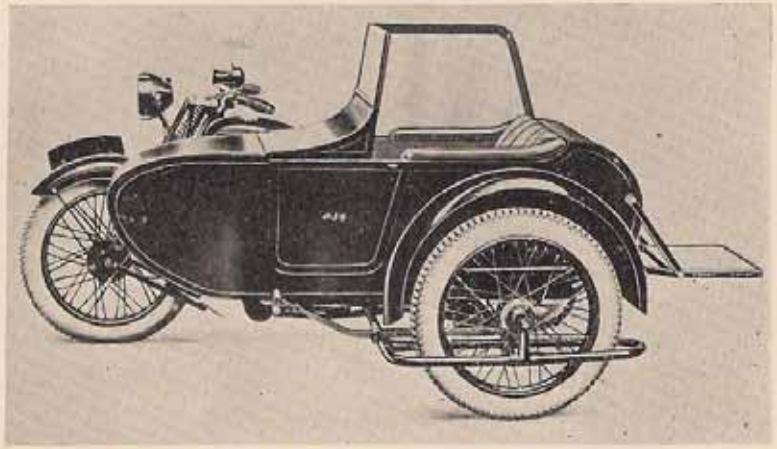


FIG. 18. THE M1 DE LUXE SIDECAR, TYPE MG2

of all A.J.S. sidecars is delightfully smooth and earns the praise of all who use them.

The passenger models are known by the following type numbers—MG2, MH2, MJ2, ME2, MB2, MU2, MN2, and MC2. In addition to these models, a special racing sidecar can be obtained and also a tandem two-seater touring sidecar. The reader, on perusing the few remaining pages of this chapter, will notice that in the sidecar illustrations four of the motor-cycles attached are of the old pattern without saddle tanks. These illustrations, however, are intended to show the characteristics of the sidecars only, and the logical deduction follows that in four cases the sidecars remain unaltered since the year in which this book was first printed. We will deal with the sidecars in the above given order.

The M1 De Luxe Sidecar, type MG2. This is an entirely new type of body which has been introduced this season for use with the 9·96 h.p. twin cylinder machines. The body, though of touring pattern, is in harmony with the fine sporting lines of the motor-cycle itself and is conducive to great comfort. The body is covered with fabric and beautifully upholstered. Supple coil-springs are fitted to the front and back of the seat. An excellent feature in the design of the chassis is the provision of a protective

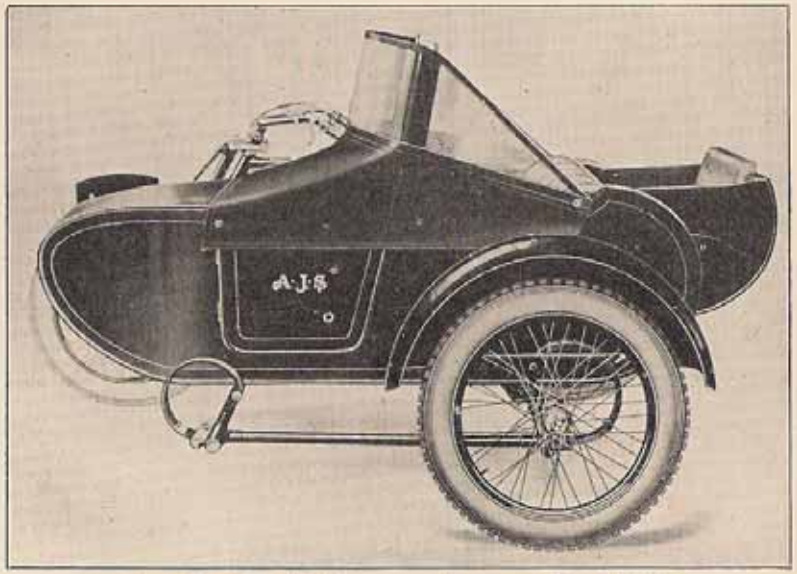


FIG. 19. THE M2 STANDARD SIDECAR, TYPE MH2

steel girdle immediately below the sidecar wheel hub centre which entirely surrounds the wheel (see Fig. 18) and would doubtless prevent damage to the latter in the event of a minor accident. Equipment includes windscreen, sidescreen, storm-proof apron, sidecar stand, luggage carrier, and sidecar lamp. The sidecar wheel is instantly detachable and interchangeable with that of the model M1 motor-cycle. Fitted to the 9·96 h.p. De Luxe chassis the price is £23, and to the Standard chassis £22.

The M2 Standard Sidecar, Type MH2. The Standard sidecar for use with the M2 twin cylinder model, is illustrated in Fig. 19, where the spacious locker at the back is shown open. A child may be accommodated in this locker if necessary. Standard equipment includes windscreen, sidescreens, and storm-proof apron. The M2 Standard Chassis does not include a quick

detachable and interchangeable wheel. It may be fitted to the standard 9·96 h.p. M2 chassis for £18.

The Occasional Two-seater Type MJ2. As its name implies, this sidecar (illustrated by Fig. 20) has been designed to meet the requirements of those who desire a body which can, if required, be called into requisition to accommodate a second passenger, or it can be used as luggage space. The sidecar illustrated will be found to be ideal for this purpose. The second seat is housed in the extension at the rear of the body, and when not in use is folded up so compactly that the appearance is that of a single-seater body only. The seat will hold an adult with ease, and

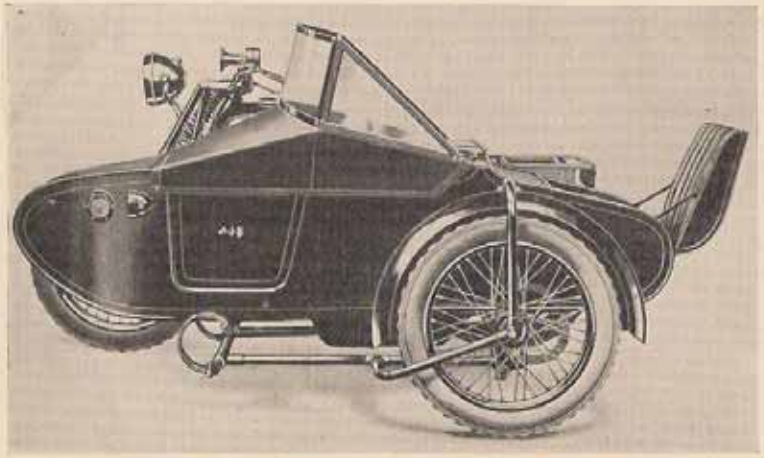


Fig. 20. The Occasional Two Seater, Type MJ2

ample leg room is afforded by a well in the floor of the body. Specification includes windscreen and storm-proof apron. For use with Model M2F chassis, it sells at £23, and for Model M2G chassis at £26 5s.

The 4·98 h.p. Sidecar, Type ME2. The A.J.S. company have introduced a special touring sidecar for use with their 4·98 h.p. model, which is illustrated by Fig. 21. The workmanship and materials are of the very best quality, and the graceful lines are apparent from the illustration. A large locker is provided. The ME2 sidecar costs £18 5s.

The Standard Aluminium Sports Sidecar, Type MB2. Fig. 22 illustrates the Standard Aluminium Sports sidecar attached to the 9·96 h.p. machine. The body is coach built, and covered with aluminium panels with special "frosted finish." It is roomy and comfortable, fitted with spring back, and upholstered

in fine quality material. A large locker is fitted at the rear. The chassis is of great strength with duplex axle tubes. "C" spring suspension is provided at front and rear. The general appearance

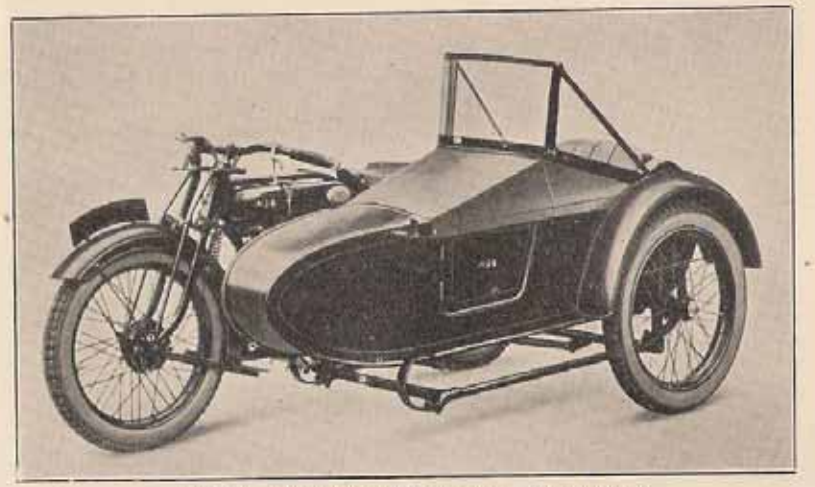


Fig. 21. The 4·98 h.p. Sidecar, Type ME2

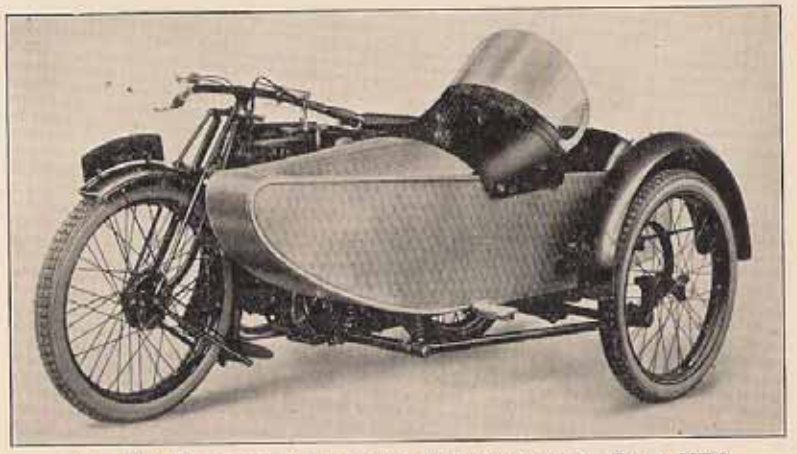


Fig. 22. Standard Aluminium Sports Sidecar, Type MB2

is most attractive and should strongly appeal to the motor-cyclist of sporting instincts who appreciates a "racy" look combined with comfort. Equipment includes windscreen and apron. The MB2 sidecar can be fitted to models M2 and M1 at £21 and

£19 respectively. In addition, it may be attached to the M12 lightweight at £17 5s. and to the 4·98 machines for £18 15s.

The Semi-sports Sidecar, Type MU2. This is another sidecar of the semi-sports class (see Fig. 23) which is an ideal " chair " for side-valve touring models. Although not possessing such clearly-defined sporting lines as type MB2, it has, nevertheless, an air of speed about it. The body is covered with a special durable weather-proof fabric, and the interior is artistically finished in leather cloth and the seat is of semi-bucket type. This, combined

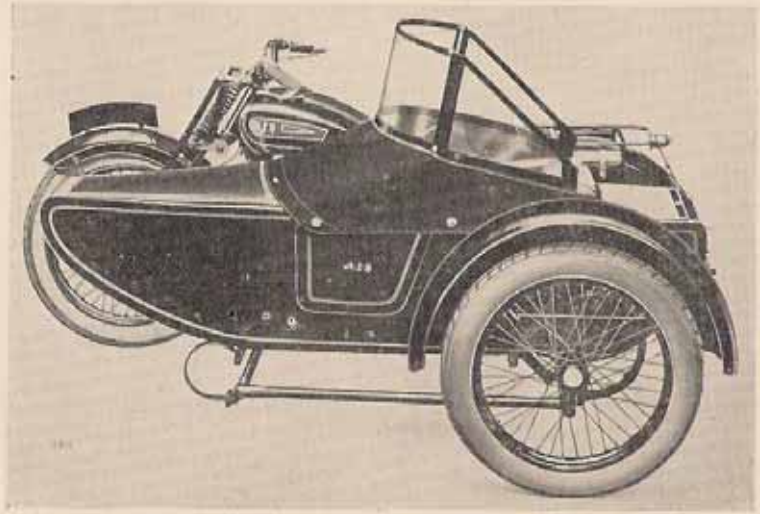


FIG. 23. THE SEMI-SPORTS SIDECAR, TYPE MU2

with a well-sprung cushion, gives an extremely comfortable seating position. A roomy locker is provided at the rear, the lid of which is covered with rubber matting and edged with nickel-plated beading, forming a substantial luggage grid. Specification includes a protective screen, carpet mat, and water-proof apron. The MU2 sidecar may be fitted to models M2, M1, and M12 at £25 15s., £23 15s., and £22 respectively. It may also be fitted to the 4·98 h.p. chassis for £23 10s.

The Launch Sidecar, Type MN2. This novel design was first introduced in the spring of 1928. It expresses the graceful lines of a launch and, at the same time, combines the sporting appearance and comfort of a touring sidecar. The body is finished in durable weather-proof aluminium fabric, with handsome frosted effect. The top " decking " is of metal, grained to resemble polished mahogany and secured with nickel-plated screws, giving

a most attractive appearance. The upholstery is of finest quality leather cloth and the cushion well padded and sprung, with a low and comfortable seating position. A nickel-plated cowl adds

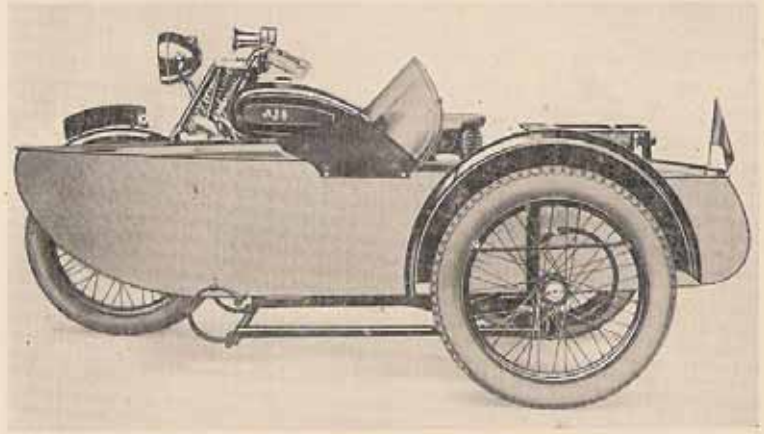


FIG. 24. THE LAUNCH SIDECAR, TYPE MN2

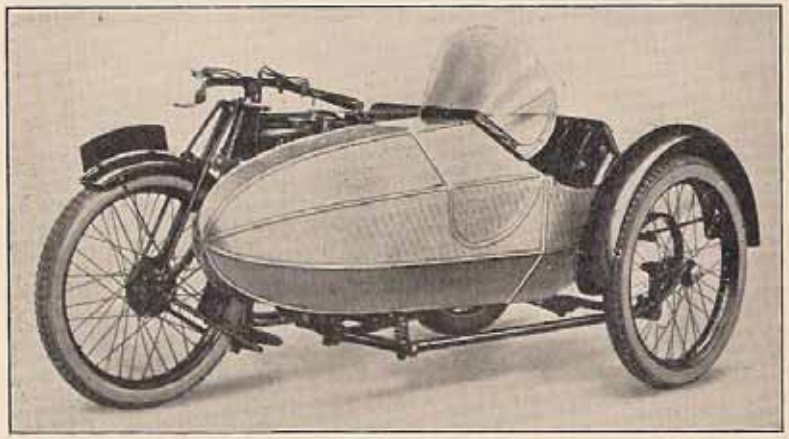


FIG. 25. THE SUPER-SPORTS SIDECAR TYPE MC2

realism to the " bows," whilst a pennant is attached to the stern. Fitted to the lightweight, it costs £20; to the M2, £25; to the M1, £23, and to the 4·98 h.p. chassis, £21 10s.

The Super-Sports Aluminium Sidecar, Type MC2. Owing to its correct stream line, the sidecar shown in Fig. 25 is suitable

for track, road racing, or the sportsman on tour. It represents the last word in sporting outfits. The body is coach built with special "frosted finish" aluminium panels. The lift-up dash also forms the door. This sidecar can be fitted to the 2·48 h.p., the 4·98 h.p., and the 9·96 h.p. chassis at £21, £22, and £26 respectively.

The Special Racing Sidecar. This sidecar (see Fig. 26) is very similar to the Super-Sports type, but it is intended for serious business. Four point attachment is provided to the motor-cycle. There are also special cushions on the top of the mudguard, and

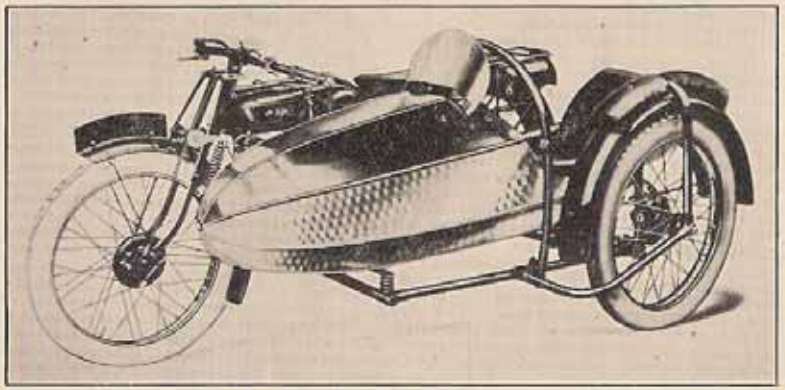


Fig. 26. The Special Racing Sidecar

a loop frame over the passenger for cornering purposes. It can be fitted to all the larger A.J.S. models at a moderate cost.

This concludes what it is hoped may be an interesting and useful summary of all A.J.S. passenger machines manufactured and catalogued for 1929.

THE A.J.S. COMMERCIAL SIDECARS

Five commercial sidecars are marketed and should prove immensely popular among commercial travellers and firms who require the transportation of small goods at high speed and at low overhead charges and running costs over various parts of the country. Of recent years the application of motor-cycles to the needs of business has grown in extent enormously, and has proved an unqualified success. Practically all large motor-cycle manufacturers market this class of vehicle, and the firm of A. J. Stevens & Co. have a particularly fine range to suit the needs of one and all. The two illustrations in this chapter are typical examples, and demonstrate the general lines on which these

sidecars are built. Attached to the M motor-cycles, they are superlative in appearance—and appearance in business is generally accepted without dispute as being of no little importance—and represent amazingly good value for money. The type

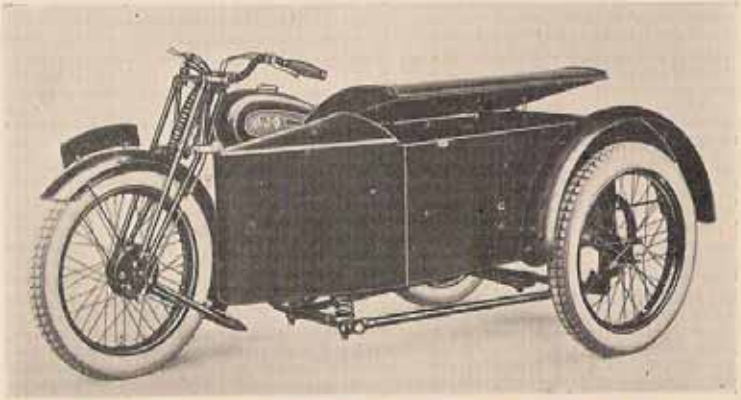


Fig. 27. The Lightweight Commercial Sidecar MT2

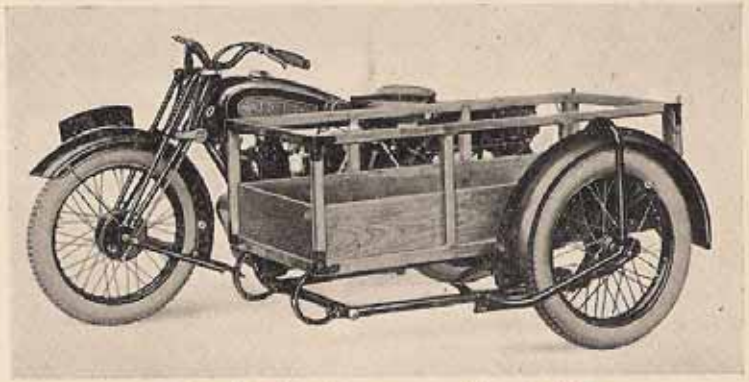


Fig. 28. The Commercial Truck, MS2

numbers of these sidecars are MM2, MT2 (illustrated above), MR2, MP2, and MS2 (also illustrated), and the respective prices (subject to immediate revision) are £17 15s., £15, £24 15s., £23, and £24 5s.

The Heavy-weight Commercial Sidecar MN2. This constitutes a well-finished rectangular box, with slightly convex-shaped lid, of high grade ply-wood covered with a durable, weather-proof

fabric and mounted on a rigid tubular frame with " C " springs front and rear. It is admirably suited for holding fairly large packages or mails, and has the following dimensions—

Length	3 ft. 11½ in.
Height	18¾ in
Width	15¾ in.

The Lightweight Commercial Sidecar MT2. The lightweight model, shown fitted to the standard lightweight chassis, is constructed similarly to the above but has a pointed nose (Fig. 27), and its dimensions are as set out below—

Length	4 ft. 5⅜ in.
Height	15⅜ in.
Width	15½ in.

The Wide Heavy-weight Commercial Van MR2. The body of this model, while in general design not unlike the foregoing models, differs in that it has no lid extending the length of the body; instead, a small " lift-up " lid is provided at the front and a *door* at the rear. The inside dimensions are—

Length	4 ft. 5 in.
Height	27½ in.
Width	25 in.

The Wide Heavy-weight Commercial Sidecar MP2. Similar in appearance to the Standard heavy-weight body and fitted to the specially wide chassis, it has the dimensions—

Length	4 ft. 0 in.
Height	17½ in.
Width	25 in.

The Commercial Truck, MS2. The truck shown in Fig. 28 forms an ideal medium for the conveyance of milk churns and such-like bulky articles which do not require being enclosed. The framework is of well-seasoned ash, reinforced at all four corners with steel angle-plates and the dimensions are—

Length	4 ft. 6 in.
Height	15½ in.
Width	24½ in.

The foregoing pages contain an accurate description of the present range of A.J.S. motor-cycles, a range which, by the American Press, is sometimes referred to as " Black Beauties " and one which does great credit to the British motor-cycle industry.

CHAPTER II

LICENCES, EQUIPMENT, AND INSURANCE

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.

The absolute novice is strongly advised not to attempt to ride the machine away from the works. This is courting disaster if the route involves driving through much traffic. Often an expert driver, who has been accustomed for years to driving a machine with throttle control action working in the reverse direction to that of the new machine, finds that he is not quite happy on this mount for several days. As we all know, the subconscious mind plays a great part in driving, and especially in a sudden emergency. The strong probability is that, when confronted with sudden danger and an instantaneous and unpremeditated decision has to be made, the wrong action would instinctively be taken, that is to say, the throttle would be opened wide instead of being shut, or vice versa, with appalling results. This has actually happened in quite a number of instances. The wisest course is to make arrangements with the nearest agent to have the motor-cycle delivered for a nominal charge by one of his employees. A.J.S. agents are scattered widely throughout the United Kingdom, and no difficulty should be experienced in this connection. One of the largest and most conveniently situated agents in the Metropolitan area is H. Taylor & Co., Ltd., of 49-53 Sussex Place, South Kensington. A list of other agents is appended at the end of this volume. Spare parts, as well as general service, are obtainable from all these places. If the procedure suggested is adopted, it will be necessary first to supply the agent with the registration licence before the machine can be delivered.

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 not on horse-power, but on a weight basis. There has been persistent urging by many people for the reintroduction of a petrol tax, but so far no change has been made. If

it is reintroduced, the motor-cyclist will benefit considerably thereby.

A licence application form is obtainable from any head post office, and must be very carefully filled in and posted to the licences dept. 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 agent, if the machine has not been delivered by rail. On page 39 a portion of the application form is reproduced. 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 of January each year. In calculating the weight unladen, the weight of all parts normally used must be included, exception being given only in the case of fuel, water, oil, accumulators, and loose equipment. The registration authorities, if they doubted the accuracy of a weight declaration, might call upon the owner to have the machine weighed on an approved weighbridge in the presence of authorized officials. When selling a machine, the licence, if unexpired, must be handed over to the new owner, and the registration book must be sent to the registration authority, who pass it on to the new owner. 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. 20s.

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 tank, (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 between the expiry and renewal of an annual licence.

Driving Licence. Before any person is legally entitled to ride a motor-cycle on the public highway, he must hold a driving licence. This is obtained, either by postal or by personal application, from the town council or corporation of the county borough in which the prospective motor-cyclist resides, or from the county council, if he resides outside a county borough. The fee is 5s., and the licence remains in force for twelve months from the date of issue. It may be renewed from time to time at the same charge. As the law stands up to the moment of going to press, there is no qualification needed for one to obtain a driving licence other than age. Marked physical infirmities do not bar a person from driving on the highway. No licence is issued to anyone under 14 years of age. A person over 17 years of age can obtain at the same fee a licence entitling him to drive either a car or a motor-cycle. It therefore always pays to fill up a licence form to include both items. This licence is strictly non-transferable, and must be produced immediately on demand by any police officer. Failure to do this always entails a summons. It is liable to be endorsed or even suspended at the jurisdiction of any magistrate, under the Motor Car Act of 1903. No police officer may lawfully peruse the endorsements at the back of a licence. This eliminates

I apply for a licence expiring* on 192 , for a :	Annual Licences expiring on 31st December	Quarterly licences expiring on 24th March, 30th June, 30th Sept., or 31st December
Motor-Cycle (or motor scooter or cycle with auto-wheel or other motor attachment). Note : Motor-cycles exceeding 8 cwt. in weight unladen are chargeable to duty as cars.	Duty £ s. d.	Duty £ s. d.
(*a*) Bicycle—		
Weight unladen, not exceeding 224 lb. .	1 10 –	8 3
Weight unladen, not exceeding 200 lb. with right to draw trailer or sidecar . .	2 10 –	13 9
Weight unladen exceeding 224 lb., but not exceeding 8 cwt.	3 – –	16 6
Weight unladen exceeding 224 lb. with right to draw trailer or sidecar . . .	4 – –	1 2 –
(*b*) Tricycle (not exceeding 8 cwt. in weight unladen)	4 – –	1 2 –

* A refund can now be obtained for the unexpired period of a licence, on surrender, so long as it is not less than one month.

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.

Number Plates. It is not sufficient to merely have a number plate on the machine. The number plate must be in accordance with a definite scheme and definite dimensions laid down as

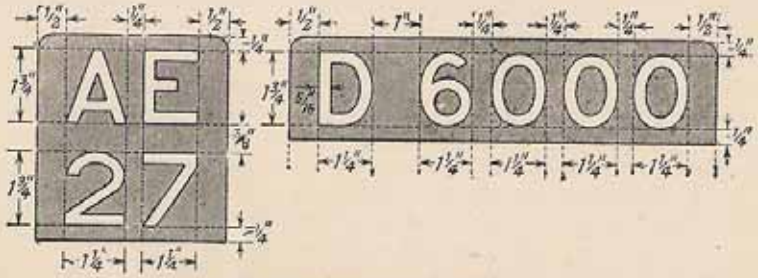


FIG. 29. NUMBER PLATE DIMENSIONS

standard. This scheme is shown by Fig. 29, and the number plate must be of the design of one of the patterns illustrated. No other form will be recognized by the police. The numbers must be painted white on a black background on each side of the plate, and must always be kept in such a condition that they may easily be read at a reasonable distance.

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 or bulb type horn. Both have their merits. For touring purposes a bulb type is preferable; but for the sports rider, mounted on a fast and perhaps slightly noisy machine, a mechanical horn, mounted on the top frame tube, is invaluable. The ideal is to have both. 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.

Never use a horn unnecessarily—particularly the mechanical type—for it is apt to offend people when thus used.

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 off side so as to indicate the entire width of the vehicle. At present it is compulsory to fit a rear lamp on all solo machines. Recent legislation now makes it a punishable offence to take any vehicle on the highway without a red rear lamp fitted.

Lighting sets are either of the acetylene or electric type. Electric lighting is now becoming exceedingly popular, and bids fair to revolutionize night riding; for there can be no possible doubt that it is far and away the best of the two types. It is, of course, purely a matter of expense.

Other legal aspects affecting, chiefly, the conduct of the driver, will be considered in Chapter IX. 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; it is practically a necessity. 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. Tank-fitted "Smith" speedometers are now standardized on all save the Models M5 and M12.

All speedometers work on one of two principles—the centrifugal or the magnetic—and the average cost of an instrument is about £3. Most popular among the centrifugal type are the "Cowey," the "Smith," and the "Watford." The "Stewart" works on the magnetic principle, however. All these instruments are wonderfully accurate, and require little attention. An ultra-modern instrument is the "Bonniksen" time speedometer, which registers both time and distance, thereby elucidating the average speed. Those owners of A.J.S. motor-cycles of earlier date than 1929 are strongly advised to fit one of the above mentioned instruments to their machines.

Joining a Club. At the present time there are numerous clubs throughout the country that are willing to accept members for a small fee. These clubs frequently hold meetings, including hill climbs, reliability trials, and social events. There is no doubt that one derives many advantages from joining a local club. But if you value your machine do not enter for one of those freak scrambles which occasionally take place, which assume the form of paper

chases, in which paper is substituted by fragments of the leading pack in the form of fish tails, silencers, and sundry loose equipment.

Besides these smaller clubs there are three great road organizations, one of which it is advisable to join. Innumerable benefits are obtainable on payment of a nominal annual subscription. They comprise, among other things, free legal advice, "get-you-home" schemes, general road assistance, and use of road telephones.

In some cases the smaller clubs are affiliated to one of these bodies. The addresses of these clubs are as follows—

Auto-Cycle Union,
83 Pall Mall,
London, S.W.1.

Royal Automobile Club,
89–91 Pall Mall,
London, S.W.1.

Automobile Association and Motor Union,
Fanum House,
New Coventry Street, W.1,

and

7 and 8 New Coventry Street,
London, W.1.

Insurance. It is the bounden duty of every motor-cyclist to insure against third party risks. If he does not do so, he is behaving in a selfish and irresponsible manner. Whether he insures the machine itself against damage, fire, and theft, is a secondary consideration (though apparently many individuals do not think so). Think what might happen if you permanently crippled a man while driving. You might be found not guilty of criminal negligence, but guilty of civil negligence. You would be acquitted on the criminal charge, but later on you might be sued for a considerable sum in a civil court. Perhaps, if the man were the bread winner, and a sympathetic jury were persuaded to return a verdict against you, about £2,000 damages might be awarded; probably an extended order for payment would be made, and your life would henceforth become a burden. Bankruptcy through a motor smash may come to quite a prosperous man in a twinkling of an eye. Worse to some men than crippling or bankruptcy would be the consciousness that helpless women and children were reduced to poverty and suffering because the delinquent had been unwilling to spare the paltry premium for an insurance policy. Indeed, in view of the large number of accidents that now occur daily, a strong agitation is being made to make insurance against third party risks compulsory.

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, and third party risks alone for about 30s. Insurance companies raise the premium

when pillion riding is indulged in. 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.

CHAPTER III

DRIVING

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 manual, 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 improperly handled. Then place the machine on its stand by releasing the latter from its clip with a smart blow of the foot and by dragging the machine upwards and backwards upon it. Pump up the tyres if they need it (they probably don't), and replenish the tanks. When filling the petrol tank, which is the rear of the two, take care to use a good size funnel with gauze filter; 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. 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. Any reputable oil firm will give the reader advice on the particular grade to use. The gear-box oil level should be ascertained by removing the plug seen on the left-hand side of the gear-box (see Fig. 69). The chamber should be nearly full. Open the petrol cock by pushing the press button forward, as indicated on the cock itself.

Lubrication. All A.J.S. machines, without exception, now have dry sump lubrication, so that no attention whatsoever is required other than seeing that the oil level in the tank is kept to the point marked thereon. When using the machine for racing, the needle valve seen in Fig. 46 should be unscrewed one or two turns. This feeds oil direct to the piston. On A.J.S. motor-cycles designed prior to 1929, Pilgrim mechanical pumps were fitted, supplemented by an auxiliary hand pump. In this case one increases the supply by rotating the regulating disc on the side of the pump in an anti-clockwise direction $\frac{1}{16}$ in. at a time, or giving a separate charge of oil from the auxiliary hand pump. AN ENGINE SHOULD BE LUBRICATED SO THAT ON ACCELERATING A PUFF OF BLUE SMOKE ISSUES FROM THE EXHAUST. Once this ideal is obtained, leave the pump alone. While learning to drive, the lower gears are used very much, and consequently lack of good air cooling makes the engine rather hot. Therefore, before setting out on the first run, it is advisable to give more oil than would normally be given. To operate the hand-pump, depress the plunger to its full extent. This fills the barrel with oil, and the plunger, being spring loaded, will automatically ascend, and, while doing so, injects the oil directly into the crank-case. The lubricator can be put out of action by depressing the plunger, and fixing it in its fully depressed position by means of the small catch provided for that purpose. In the case of a machine equipped with hand-pump only, a full charge should be given every six or seven miles, and, when the engine is being unduly worked, small injections should be frequently made.

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 the next chapter. 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 from his pastime.

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

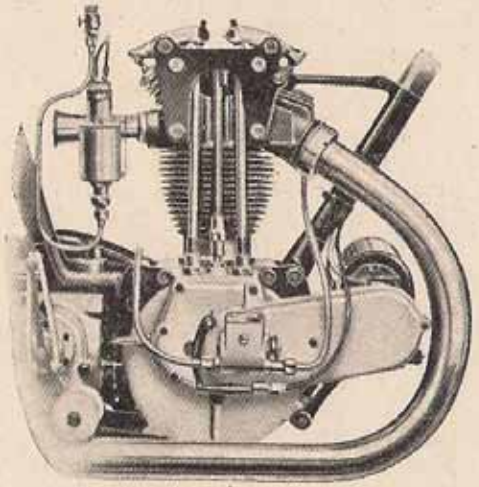


FIG. 29. SHOWING THE MECHANICAL PUMP ON A 1927 3·49 H.P. H6 OVERHEAD VALVE A.J.S. ENGINE

Mechanical pumps of the Pilgrim oscillating plunger type were fitted to most A.J.S. machines manufactured during the period 1927–1928 inclusive. There are, of course, numerous A.J.S. machines with this type of lubrication system in use, and in practice it functions very well. As in the case of the duplex pump, used in connection with the dry sump system of the "M" series, the Pilgrim pump is driven by a metal coupling off the half-time shaft, 20–25 drops per minute is a good average setting. Great care should be taken when removing the timing gear cover to see that this loose coupling is replaced.

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 A.J.S. controls is shown in Fig. 30. The engine controls are all mounted on the handlebars and comprise four levers: (1) throttle, (2) air lever, (3) lever for advancing and retarding spark, (4) exhaust valve lifter. The two carburettor

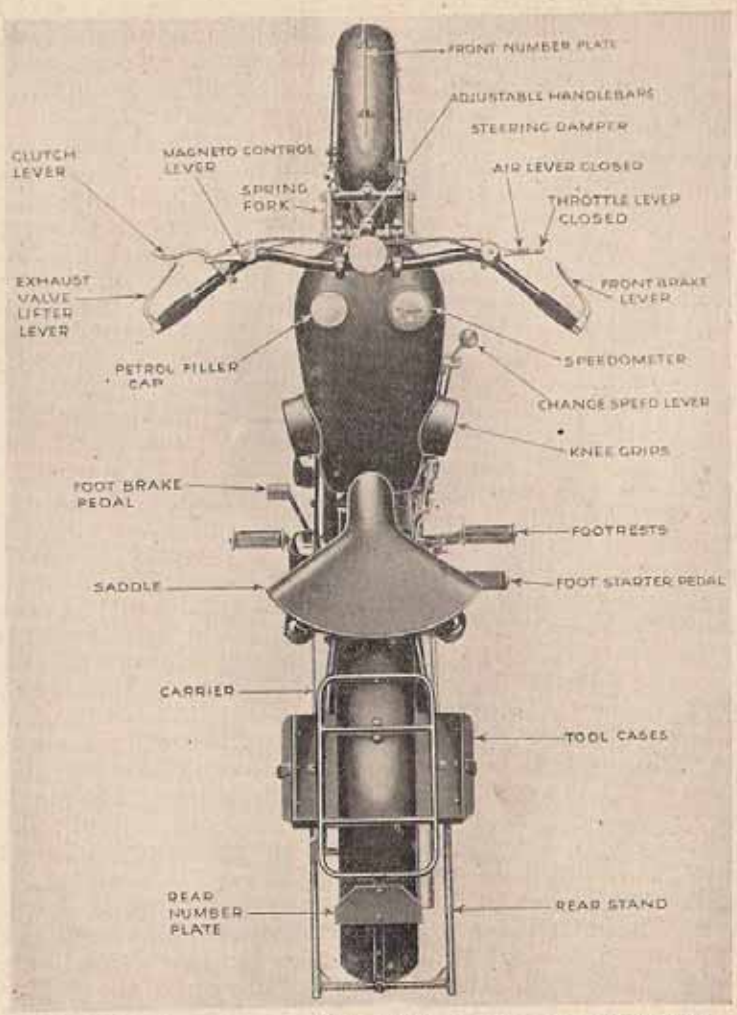


FIG. 30. PLAN VIEW OF 3·49 A.J.S., SHOWING THE CONTROLS

The above is applicable to models M3, M4, M5, and M12. In the case of models M6, M7, M8, M9, and M10, the lay-out is similar except that twist-grip throttle control is provided and the spark lever replaces the throttle lever. The controls of M1 and M2 are the same as those illustrated, except that both brakes are pedal-operated and the exhaust valve lever is situated on the right-hand side.

levers are placed (unless twist-grip control is fitted) on top of the right-hand bar, the longer of the two being the throttle which regulates the supply of gas to the engine, and the shorter one the air lever, which likewise controls the air supply. Both controls open inwards. They will be dealt with in greater detail in that section of Chapter IV dealing with the Amal carburettor. The exhaust valve lifter, which may be seen on the left-hand side, is primarily intended as a decompressor for facilitating starting. The magneto lever (the reason for whose existence is also made clear in the next chapter) advances the spark by inward movement. For all normal purposes it may be left on three-quarter advance, except for starting, when it should be fully retarded to prevent the engine back-firing, and thereby delivering a nasty blow to the foot operating the kick-starter. The novice may therefore practically disregard this lever.

The cycle controls consist of the clutch, the gear-box lever, and the two brakes. The front brake is seldom used, and for the present may also be disregarded. 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 mechanical features of the A.J.S. three-speed gear-boxes will be dealt with later. The novice is recommended to experiment with gear changes on the stand with the engine cut 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.

Starting the Engine. We presume that petrol and oil cocks are left open. For easy starting the throttle setting is important. To find the correct setting, first shut the throttle and air levers right back. Now open the throttle about one quarter of its travel or less. In the case of twist-grip control the air lever is a separate fitment. The twist-grip is operated by turning inwards to open and outwards to shut. Shut the twist-grip right back, and then open by a movement of one quarter the circumference of the rubber twist-grip. 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 lift 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 (the one nearest the cylinder). Leave the air lever slightly open, unless the engine is stone cold, when it may be necessary to close it completely. The ignition lever should be retarded about one quarter or one half its travel. Before getting astride the saddle satisfy yourself that the gear lever is locked in " neutral " position and flood the carburettor by " tickling " the needle for a second. Now raise the exhaust lifter and engage the starter with the right foot (using the instep of the boot). 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. Should the engine be very stiff, it may be necessary to prime it by opening the cock on top of the cylinder, and allowing a few drops of petrol to enter by means of the small priming pipe provided. This should free the " gummed-up " piston. But do not prime unless

absolutely necessary. Raising the valve lifter will facilitate priming. 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 will then fire instantly. No carburation difficulty is experienced once the engine warms up. When the engine has just started, never leave it 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. In regard to easy starting (as may be understood by referring to the context and diagram of the Amal carburettor on pages 78 and 80) 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. Most modern machines, however, are not addicted to starting trouble, except on rare occasions. We will deal with these and their remedies later.

THE FIRST RUN

A tip worth taking here 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.

Standing on the left-hand side of the machine, run 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 low gear position. Then 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 low 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 quadrant 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 low 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 farther, 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 53). 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. The two engaging pinions will then be running at the same speed. No changes down should ever be made while travelling over 15 m.p.h

It is a good plan now to draw the machine up by the side of the road, light a cigarette, and have a short rest during which you may give some thought to the subject of gear changing, and allow the engine to cool before starting on the homeward journey, which you will assuredly accomplish quite easily. On the way back try and change gear without looking down at the quadrant. When putting the machine away in its lair, be sure to leave the gear lever in " neutral," and turn off petrol and oil cocks.

This is about all that need be said regarding the first run. We will conclude this chapter with some general hints on driving, and a survey of the chief dangers of motor-cycling.

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 low 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 low 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. Strictly speaking, tyres should always be pumped up to a definite pressure by consulting a pressure gauge. On the Dunlop tyres, used on all A.J.S. machines, Schräder valves are fitted, and a Schräder pressure gauge is obtainable. We lazy motor-cyclists, however, seldom think about pressure gauges, let alone use them. The normal procedure is to give a kick on the rear tyre, or press the thumb against it. With the rider seated, the tyre should bulge slightly. This practice seems to give quite satisfactory results ; for after all, a tyre in good condition only needs pumping up about once a fortnight. The driver can soon tell what is the best pressure, having regard to comfort. The tyres, however, 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. It is best to choose the "happy medium." 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. Experience is the best guide for tyre inflation ; 26-29 lb. for the front and 29-33 lb. rear is recommended by Dunlops.

"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 Wolverhampton before leaving the manufacturers ; but as the mileage they do is not great, the rider should therefore restrain his desire to drive the engine hard until at least 200 to 300 miles on the road have been covered.

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 may normally be controlled in two ways—(1) driving on the throttle, (2) using the exhaust lifter. The latter method is considered by most experienced drivers to be atrociously bad practice ; 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 inevitably ensue. The rear brake should always be applied first.

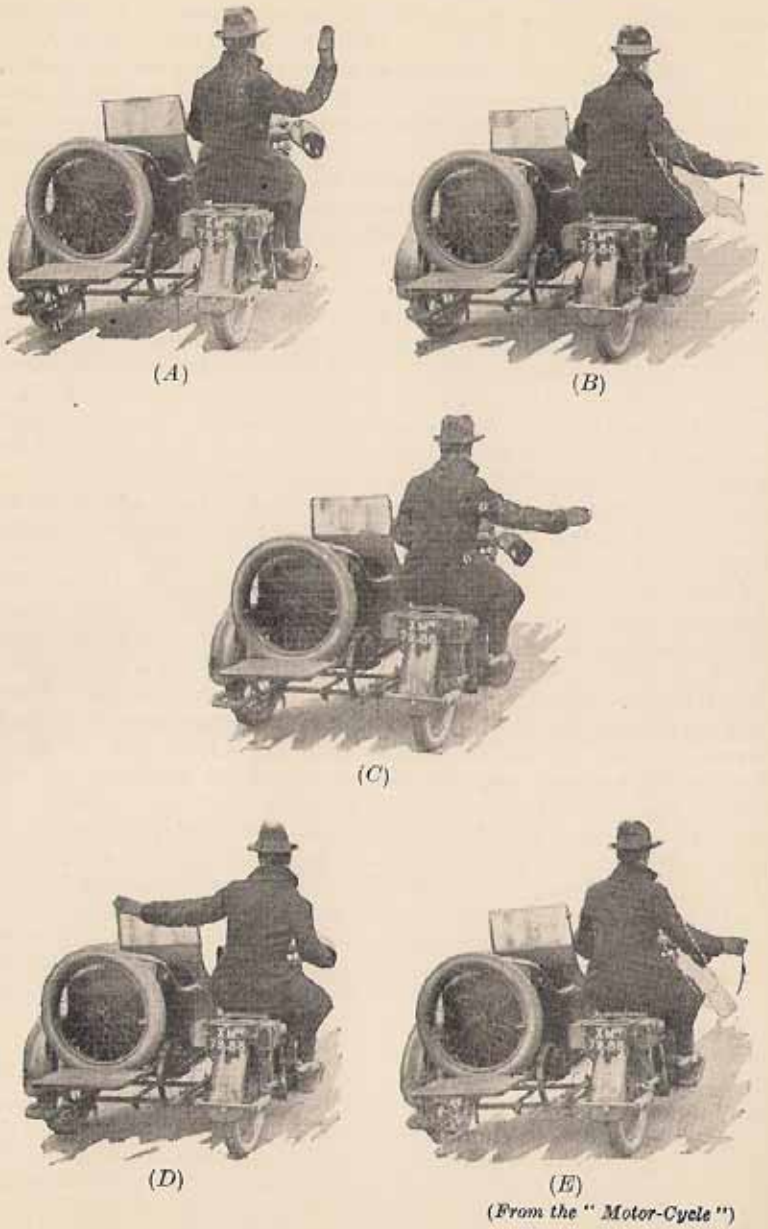
Cruising Speed. Every machine has what, for want of a better name, may be called its cruising speed. By this we mean the speed at which the engine runs most sweetly. It usually lies somewhere between 25 and 30 miles an hour. The rider should find out what this speed is in the case of his own mount, and 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, on about ¾ 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. At 65 m.p.h. what appears normally to be a straight road often becomes suddenly full of nasty bends which have to be negotiated carefully. Nevertheless it is easy to over-drive an engine in hilly districts. While on the subject of speed we will deal with that so hotly-discussed problem, "What is a safe speed?" The answer to this question is, "A speed at which the driver has complete mastery over his mount in the given circumstances." In many cases the man with leather helmet and goggles hurtling along at 60 m.p.h. is far less dangerous than the sublime idiot who leisurely careers over minor cross-roads at speeds varying from 15 to 20 miles an hour. When somebody on the main road nearly dispatches him and himself to eternity (the best place for him), he miserably complains that he was only doing 20 m.p.h.—20 m.p.h. across a main road! Such people ought not to be charged with exceeding the speed limit, but with attempted murder and suicide! The author has had the misfortune to run up against one of these maniacs, and realizes the nasty sensations that surge up when crashing broadside on into a vehicle, as well as the nasty repair bill that must inevitably follow. A theory has actually been advanced by some motor-cyclists that it is safer to take cross-roads at high speed because there is less time during which you may hit anything

coming across. This line of thought is analogous to that of the Irishman who, when stopped for speeding, said that he was racing to get home as quickly as possible because his brakes had failed, and he was afraid of smashing into anything! Comment on this illogical and suicidal reasoning is needless.

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 all fast drivers, is to incline the machine inwards and the body outwards. Using this method one may practically corner 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. A passenger may assist the driver by leaning in towards the centre of the bend; but do not adopt "T.T." acrobatic methods. Your passenger might easily break his neck against a lamp-post, to say nothing of the indignation



(A) (B) (C) (D) (E)

(*From the "Motor-Cycle"*)

FIG. 31. RECOGNIZED SIGNALS TO BE USED BY DRIVERS

A = Signal to stop
B = Slowing down
C = Turning to right
D = Turning to left
E = Overtake me

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. 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.

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. Do not race the engine on low gear; for racing an engine takes more wear out of it than hundreds of miles of normal usage. If a bad patch of road looms ahead which will necessitate changing down again, change down before you reach it. Choose your path carefully, and swing wide round all corners that are not blind. It is preferable to drive at a good speed on some bad surfaces. This also applies to driving on "wavy" level roads. It will be found that periodic "plunging" does not then occur. Sometimes speed variations will also produce the desired effect. Having made a hill ascent, allow the engine to cool either by stopping it or by using the exhaust lifter while descending the next hill.

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 20 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 as to 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, it cannot be prohibited, and, moreover, is very popular. We will, therefore, give a few hints which, if observed, will contribute to safety.

1. The pillion rider should sit astride as close to the driver as possible, so as to put the minimum weight on the tail of the machine. Preferably he, or she, should hold the driver lightly by the waist, and sit on the machine as limply as possible.

2. Footrests should always be provided for the passenger. The feet cannot then foul any of the mechanism, or interfere with the stability of the machine.

3. The driver should not engage in protracted conversation with his passenger while driving.

4. If the roads are greasy do not take a passenger on the back. Crossing and recrossing greasy tramlines on top gear with a passenger is a risky business. It is safer to engage a low gear, and place the feet on the road.

5. Never swerve or bank violently, two-up. The passenger may get terrified, and cause a disaster by leaning one way or the other.

6. Never take a pillion passenger on a long distance night run.

GENERAL HINTS

1. Use the hooter as sparingly as possible. When essential, deliver two or three quick imperious blasts, and be always prepared to stop abruptly. Sometimes it may be found essential to yell out to somebody rather than use the horn. The language is usually highly coloured, but under such circumstances politeness is criminal. Always use the horn at cross-roads and corners.

2. Always give hand signals, 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. 31, 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 will 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.

3. Never hesitate. Do the wrong thing rather than run amock. You will then retain your nerve and keep your wits about you.

4. If you should have to choose between killing someone or risking death yourself, do not be a coward, but take the risk. It is usually possible to slip backwards over the carrier at the last moment.

5. Approach cross-roads dead slow.

6. Keep the eyes well ahead. By doing this it is often possible to see over hedges traffic that is rapidly approaching. The habit of taking a sweeping survey of the view ahead is invaluable, and after a time becomes second nature.

FIG. 32. THE 1928 3·49 H.P. A.J.S. OVERHEAD VALVE ENGINE

7. Always remember that cows and sheep believe strongly in obstruction.

8. Obey all special speed limits and notices (see Fig. 33) and respect the *white line*.

By disregard of these you bring contempt upon motor-cyclists as a body.

9. Never take things too fine. In ninety-nine cases out of a hundred you will escape, but on the hundredth you may crash. This particularly applies to "cutting in."

10. When streets are greasy, give and take as much room as possible. A side slip on the open road, at reasonable speed, seldom does much harm; but a skid in front of a lorry means either the hospital or the cemetery. Therefore, never behave rashly in front of heavy vehicles.

11. Always have a finger close to the throttle and a foot ready for the brake.

12. Always ensure that the oil tank and gear-box contain sufficient lubricating oil.

ROAD DANGERS AND THEIR PREVENTION

Nowadays road dangers constitute a very real menace to life and limb; but most of them can be effectively counteracted.

Some are unavoidable. Others are caused by the selfishness or inexperience of the drivers themselves. The golden rule is this: "Cultivate sufficient imagination to ride in a state of constantly expecting the unexpected, especially over unfamiliar roads, and

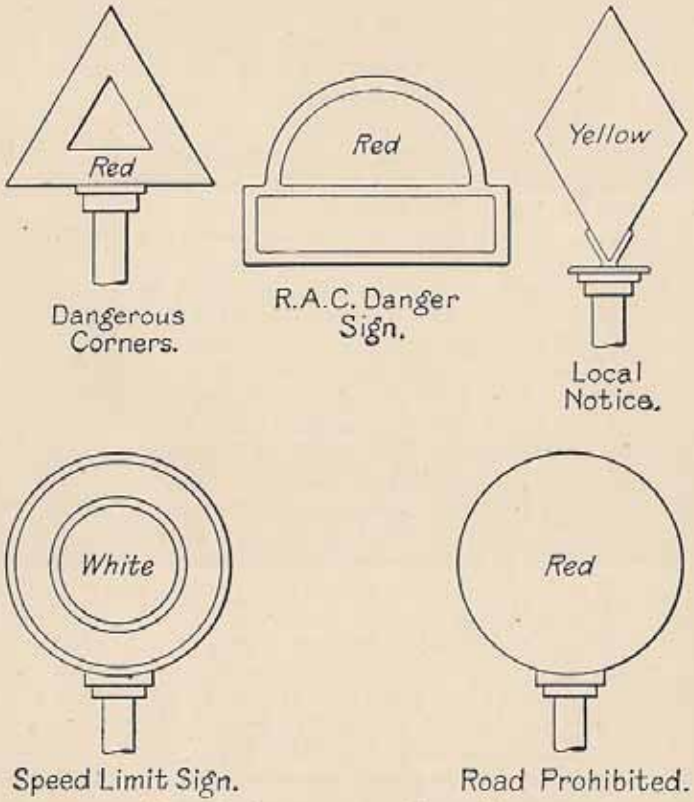


FIG. 33. CONVENTIONAL ROAD SIGNS

always assume the other fellow may do the wrong thing." Remember that bad accidents always arise from some unexpected or sudden incident, e.g.—

A child suddenly darting across the highway.

Vehicles in front stopping suddenly (beware four-wheeled brakes).

Cars you are overtaking drawing out.

A steam roller round the corner.

Cyclists riding abreast the other side of a canal bridge.

Speedman's wobble.

Sudden brake failure.

Snap of a throttle cable.

Attempted suicide by dogs, poultry, drunken men, old ladies.

Skid of a motor-cycle in front.

Passengers dismounting from tramcars.

Pedestrian stepping off the kerb with eyes skywards.

Man emerging from behind stationary vehicle.

There are a thousand and one other contingencies that the mind can conjure up, any or all of which may arise in lightning fashion. It therefore behoves the motor-cyclist to concentrate on his job, and never to allow either his mind or his eyes to wander. When driving in traffic, a glance to ascertain whether any blue smoke is issuing from the exhaust may easily cost a man his life. Absent-mindedness in the professor's study is said to be a sign of genius, but on the road it is a sure passport to eternity.

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 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.

Animals on the Road. Animals that the motor-cyclist encounters on the road vary from small Pekingese dogs, complete with pink ribbons, to vicious-looking bulls. The former may be completely ignored, but the latter must be treated very cautiously. If a fierce terrier, or an Alsatian wolfhound, leaps at you, it is safer to deal severely with it, rather than say, "Good dog," or something to that effect. By this we mean throttle up and either kick out or land out with a clenched fist. This action is unlikely to harm the dog, but the suddenness of it will momentarily deter it from its canine instincts and will enable you to accelerate clear. A dog jumping about under the front wheel is decidedly dangerous and do not be afraid of accelerating. A dog can always get clear of a single track motor-cycle, but not a car. A car driver should always slow down. Straying cattle are sometimes encountered on country roads at night, and the rider should be prepared to meet with unlighted objects accordingly.

Always throttle right down when passing horses. If you are signalled to stop and fail to do it you are violating the law. Apart from this, a horse is a very faithful and intelligent animal, and you have no right to frighten it by roaring past. Such action is contemptible.

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 commonsense.

Fog. Only one other man fears fog more than the motorist or motor-cyclist, and that is the air pilot. To him fog is truly appalling, and he always chooses a landing ground instantly he realizes that fog is accumulating. The motor-cyclist, however, need have no such qualms—at the worst he can garage his mount and complete the journey by bus or rail—for he can throttle down to the merest crawl. When a fog is coming on before dark, it is imperative not to waste a second during daylight if bound on a long run with little prospect of "getting there" by any other means. There are three reasons for this—(1) As soon as the ground temperature falls on the approach of night, the fog will rapidly thicken, (2) lights in fog are worse than useless for picking out one's way, (3) the fog will drive most road users off the road, and there will be little likelihood of any assistance forthcoming, should you have any trouble. If engine trouble should develop just before dusk, you will have to do one of two things—either work like a Trojan and get the engine running again, or abandon all attempts to proceed farther. Driving long distances in thick fog requires all the courage and nerve that you can summon up. If a vehicle ahead is making good progress, follow its tail light. It is astonishing how a man can steer his machine dead straight, so long as he has a sense of direction, even though he may be unable to see the road at all. In some cases frost-covered telegraph wires show up above a low lying fog and give considerable assistance. Similarly tramlines are very useful. A dense fog is often accompanied by icebound roads. Driving on an icebound and fogbound road by night is not one of the best forms of amusement. Skilful use of the throttle has to be made to eliminate wheel spin, and brakes have to be used super-cautiously. Driving in fog, in spite of its dangers, has attractions to some people. It undoubtedly tests to the utmost the driver's abilities and endurance.

GENERAL REMARKS

Obey the law not only in letter but in spirit, and be courteous to all other road users. Never pass by a stranded motor-cyclist without asking whether you cannot assist. Nothing fills a rider with such disgust as for men to roar past when it is obvious that the driver requires help. It may be only a special size spanner that he requires; but stop to inquire. Remember, the modern motor-cycle is a ghastly thing to push up hills. Troubles that may beset the rider are many, but, actually, troubles are few and far between. All possible troubles are fully dealt with in Chapter VI. After considerable experience on the road the driver can tell by the sound and behaviour of his engine whether it is running as it should, and can diagnose trouble instantly it occurs. In fact, the machine becomes an open book to him, and he never lets the idea of getting stranded enter his head; also he feels confident of rectifying any trouble that may occur. Every engine has a personality of its own which only the driver who has studied it understands, and it will only give of its best to this driver.

Road Accidents. To conclude this chapter the author feels he must emphasize the very real need for the cultivation of driving skill and road sense among all motor-cyclists. Statistics of road accidents for the past year, recently issued by the Ministry of Transport, and which the author has before him as he writes these words, make appalling reading. No less than 5,000 people met their deaths on the road in 1928—an average of fifteen per day. Altogether there were about 150,000 accidents known to the police as compared with 40,000 in 1918. Thus in ten years road accidents have practically quadrupled, and the proportion of motor-cycle accidents does not show in a favourable light. Something must be done to stop this wanton destruction and maiming of human beings! It is your bounden duty as an A.J.S. motor-cyclist to see that *you* do not contribute to the list of killed and injured on the roads of Great Britain during the forthcoming years, when motorists and motor-cyclists will become more and more numerous. Remember A. J. Stevens & Co. is not a munition factory. It is a firm which builds high grade motor-cycles for pleasure and happiness!

Finally, a word of advice. Should you or somebody else receive a severe abrasion or cut, remember that *clear* petrol is a marvellous antiseptic and will ward off the danger of lock-jaw. But do not use Ethyl for medical purposes. The application of tetra-ethyl of lead is not beneficial to the human body—in fact it is harmful, if not poisonous.

CHAPTER IV

HOW THE ENGINE WORKS

In these days, when the internal combustion engine is of such vast service in so many spheres of locomotion—when it provides the motive power for airways that are rapidly spreading throughout the world, when it is mechanicalizing great armies, and when it is giving millions of people the facilities for enjoying healthy recreation in the way of motoring, yachting, and other sports—there are, perhaps, few people who have no glimmering as to how the four-stroke internal combustion engine works. Nevertheless, in a book primarily designed to meet the needs of the novice, a brief explanation of the behaviour of the four-stroke cycle engine can scarcely be omitted.

During the titanic struggle in Europe, which waged incessantly from 1914 to 1918, the petrol engine progressed by leaps and bounds. This was brought about through dire necessity. The belligerent which had the mastery of the air was at liberty to bomb and photograph every part of the enemy's lines, and to wreak havoc and destruction miles in their rear. Thus the frantic race for supremacy in engine design went on year after year, for the performance of aeroplanes depends largely upon the weight/horse-power ratios of the engines installed. But the fundamental principle upon which the four-stroke engine works has not altered one iota, and probably never will. True it is that wonderful inventions are made from time to time—take, for example, the Constantinesco Torque Convertor—but basic principles remain unaltered. Those who have some knowledge of the "Otto," or "four-cycle" stationary gas or oil engine, start with a considerable advantage in the study of the petrol motor, because the principles involved are identical in each case, although the mechanical differences are very great.

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

motors are heat engines, i.e. they derive their power from the intensely rapid production of heat at the moment of explosion; and it should further be noted that the more rapid the ignition, and the more complete the combustion, the greater will be the power of explosion. Strictly speaking (turning to the ridiculous), an H.E. bomb is a heat engine—an engine capable of vast destruction, including itself! To effect complete combustion it is essential that the mixture is correct. In the case of the petrol engine, a good explosive mixture contains by weight about 93 per cent of air and 7 per cent of petrol. Any variations from this proportion will result in the combustion being incomplete, or slow. In the latter case the mixture will burn rather than explode—after all, the only difference between burning and exploding is that intensely rapid burning generates great heat in an infinitesimally small period, with the result that a loud bang (called an explosion) occurs when the hot exhaust gases come up against the atmosphere. The importance of having complete combustion will be seen later. Incomplete combustion necessarily entails a considerable loss of power.

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 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

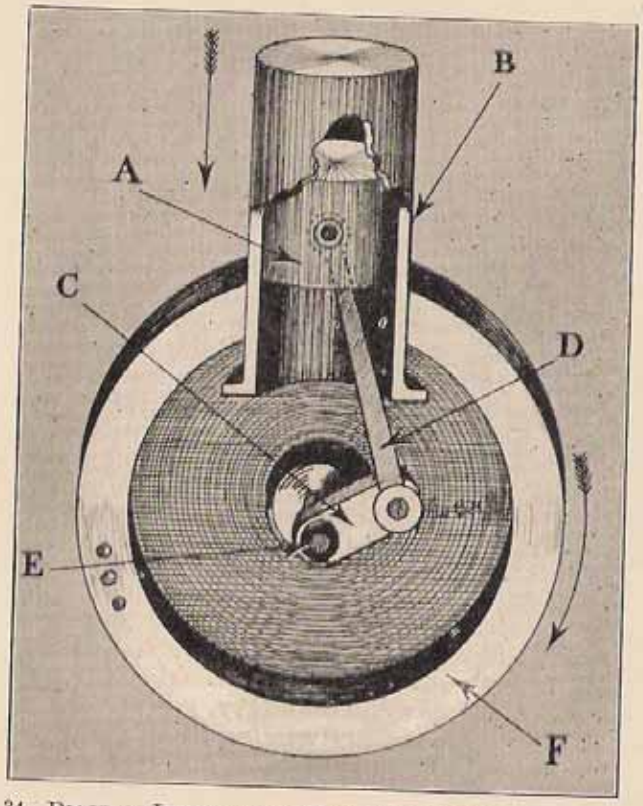


FIG. 34. DIAGRAM ILLUSTRATING HOW A PISTON (*A*), SLIDING IN A CYLINDER (*B*), ROTATES THE FLYWHEEL (*F*)

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 the *induction pipe* with the carburettor. If the *exhaust valve* is

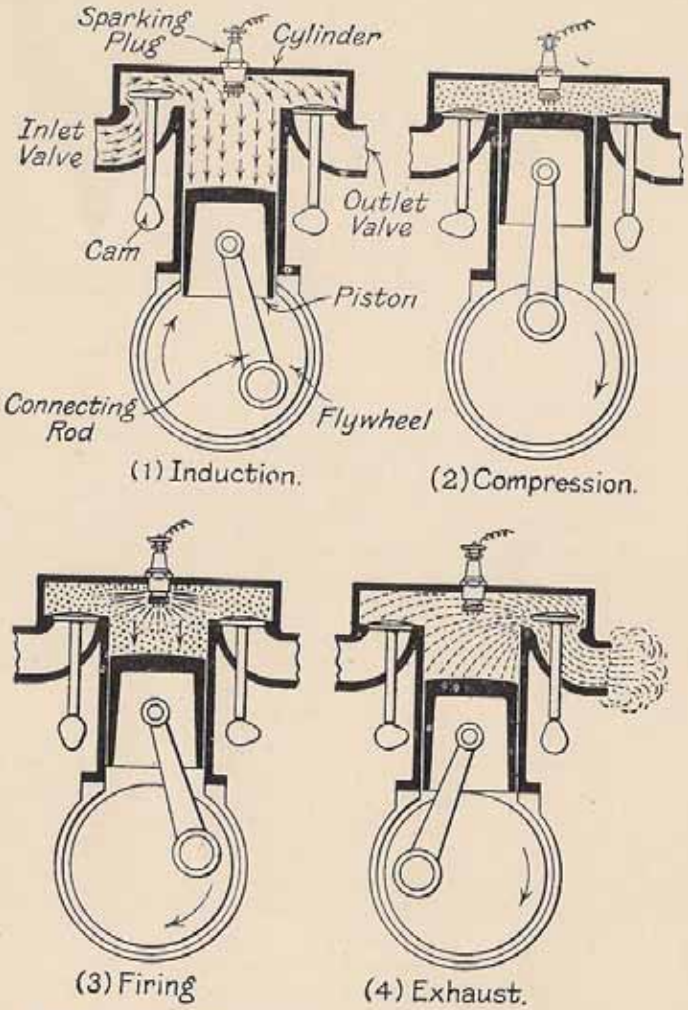


FIG. 35. THE PRINCIPLE OF THE FOUR-STROKE ENGINE

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. 67.

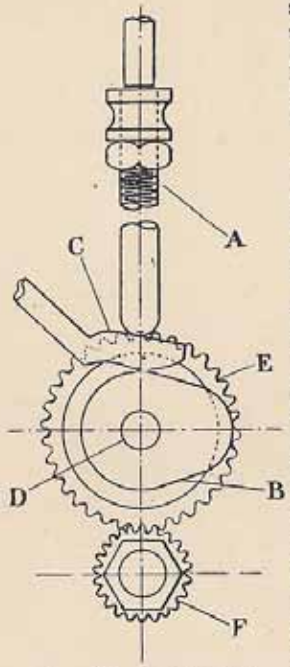


FIG. 36. VALVE CAM ACTION

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* 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

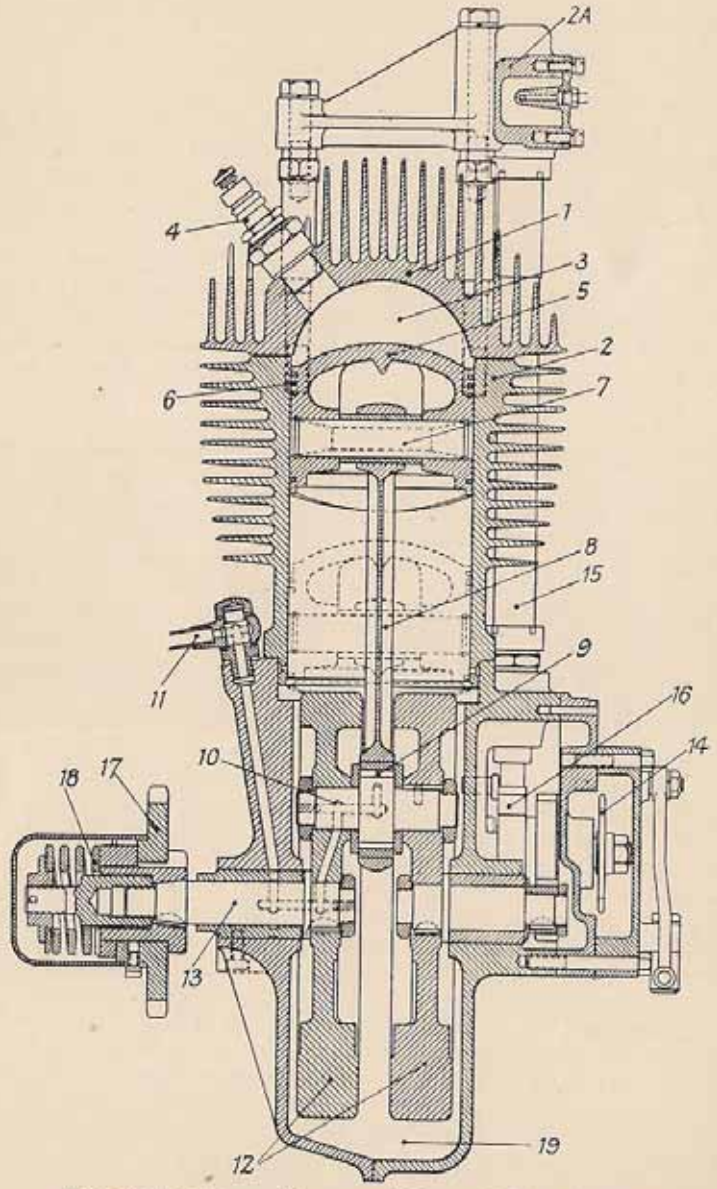


FIG. 37. SECTIONAL VIEW OF 4-98 H.P. O.H.V. ENGINE
This drawing, if studied closely, is very instructive. A key to the principal parts is given on the opposite page
This drawing should also be compared with Fig. 46

KEY TO FIG. 37

1. Detachable cylinder head.
2. Cylinder barrel
2A. Rocker box
3. Combustion chamber
4. Sparking plug
5. Piston
6. Piston rings
7. Gudgeon pin
8. Connecting rod
9. Big-end roller bearing
10. Crank pin
11. Pressure feed to big-end bearing
12. Flywheels
13. Crankshaft
14. Half-time sprocket for magneto drive
15. Push rod telescopic cover
16. Cam wheel
17. Engine sprocket
18. Shock absorber
19. Sump

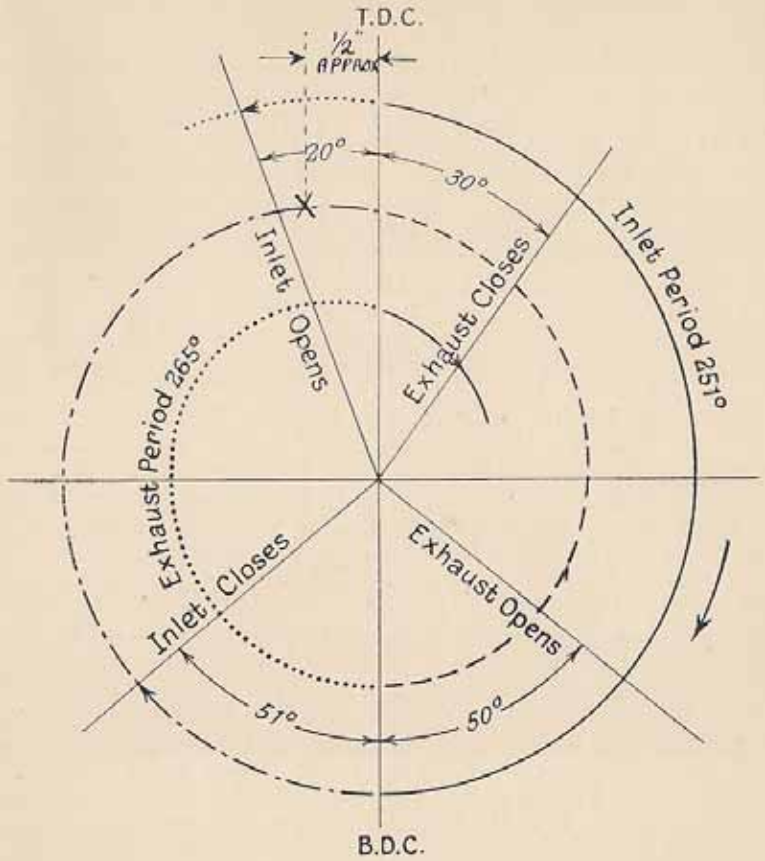
the direction of retardation, or lateness, so that the piston had moved far down the cylinder before the explosion occurred, the mixture would burn slowly instead of exploding, there would be little power, and the exhaust gases would be still flaming when they were finally allowed to escape, so the exhaust 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 benzol and paraffin, may also be used, but are not satisfactory except in the case of benzol, 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



Inlet Stroke ———————

Compression Stroke —·—·—·—

Firing Stroke – – – – – –

Exhaust Stroke ·····

*Ignition Advance (Full)** ×

FIG. 38. VALVE TIMING DIAGRAM OF M3, M4, M5, M6, M8, AND M9 ENGINES

Measured in degrees of crankshaft rotation with a valve clearance of ·006 in., giving a valve lift of ·3125 in. This diagram is interesting from a theoretical aspect only, for in practice the motor-cyclist never has occasion to retime his valve since the timing pinions are carefully marked (see page 110)

* The correct ignition advance in the case of all A.J.S. engines will be found in the specifications in Chapter I.

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 78), 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. 39, 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. 43). 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)

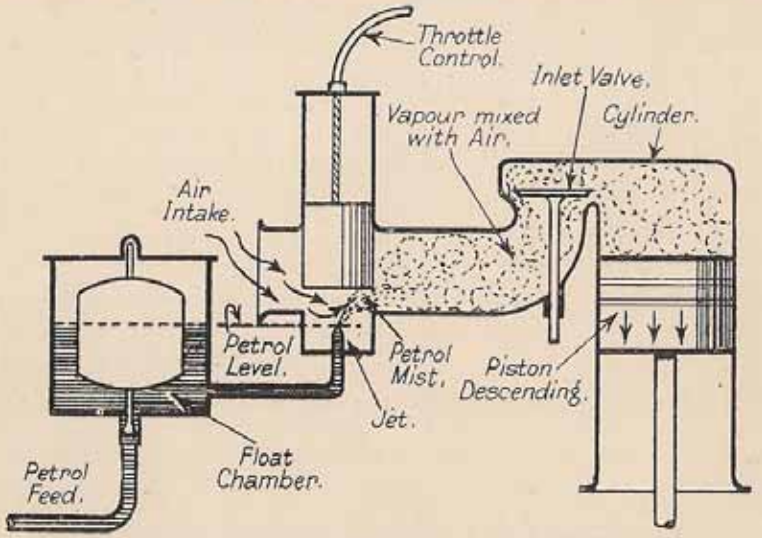


Fig. 39. Illustrating Principle of the Carburettor

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 (a Lucas on all A.J.S. machines) is so called because, unlike an ordinary 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 105), 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 such 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 exhaust camshaft by sprockets and chain (see Fig. 64) 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 105), it must also be timed to occur at the moment when the bobbin is having the greatest effect on the magnetic field (see Fig. 40).

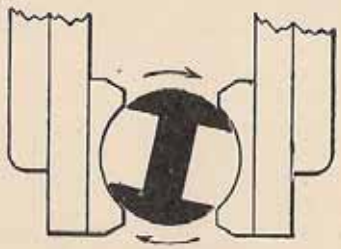


FIG. 40. POSITION OF MAGNETO ARMATURE WHEN CONTACTS SHOULD OPEN

This, of course, is allowed for in the design of the magneto, and does not really concern the reader. Also, it is essential that the primary circuit should be complete (i.e. the contacts must be properly closed) both before and after the " break," which should be of very short duration.

The *cam ring*, against which the cam of the contact breaker works, can be rotated by handlebar control through about 30°, thereby giving means of advancing and retarding the spark.

The *condenser* is a device for the purpose of eliminating "*arcing*," and the *distributor*, a " brush " mechanism for distributing

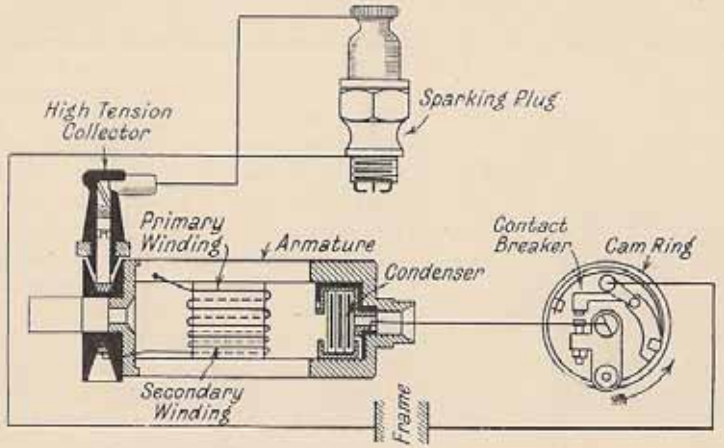


FIG. 41. MAGNETO IGNITION WIRING DIAGRAM

the H.T. current collected off the *slip-ring* (which is connected to the secondary) and to the H.T. plug leads. A distributor is, of course, fitted only in the case of twin and multi-cylinder engines.

For convenience in enabling the reader to obtain a better idea of the relation between the various parts and how they function as a whole, a wiring diagram of a simple magneto ignition system is given on this page. This diagram, if studied carefully in conjunction with the above general description of the H.T. magneto, should give an excellent idea of how that instrument, so often regarded as a complete mystery, operates. We will not enter into details of the method of construction since, as previously pointed out, beyond attention to the contact breaker (see page 105) the motor-cyclist is never likely to have cause to tamper with the magneto and is certainly ill-advised to do so. So much, then, with regard to the generating portion of the ignition system.

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.

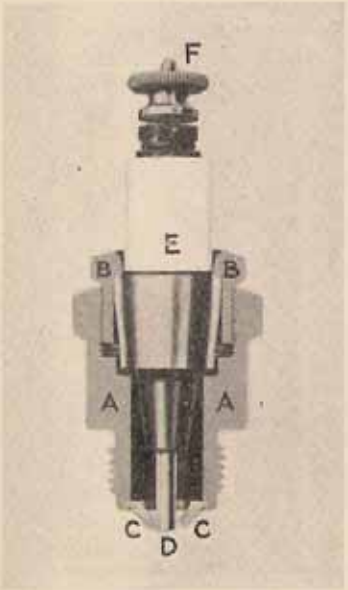


FIG. 42. A TYPICAL SPARKING PLUG

The 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. 42 shows the construction of a typical 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 103).

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

SOME A.J.S. MECHANICAL DETAILS

The Amal Carburettor. This instrument, which replaces the Binks used on A.J.S. machines last year, and a description and tuning hints of which we have retained in this volume for the benefit of those not fortunate enough to get hold of one of the latest A.J.S. 'buses, combines the best and most useful characteristics of both Amac and Brown and Barlow instruments. It is thus a thoroughly "brainy" job, and gives remarkable results. On the following page is shown a section view of the Amal two-lever carburettor, and its working will now be described. It is presumed that the reader is cognizant of the principle of the carburettor already clearly set forth. Space and time will therefore not be wasted in proffering redundant information on the action of the float, etc.

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

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

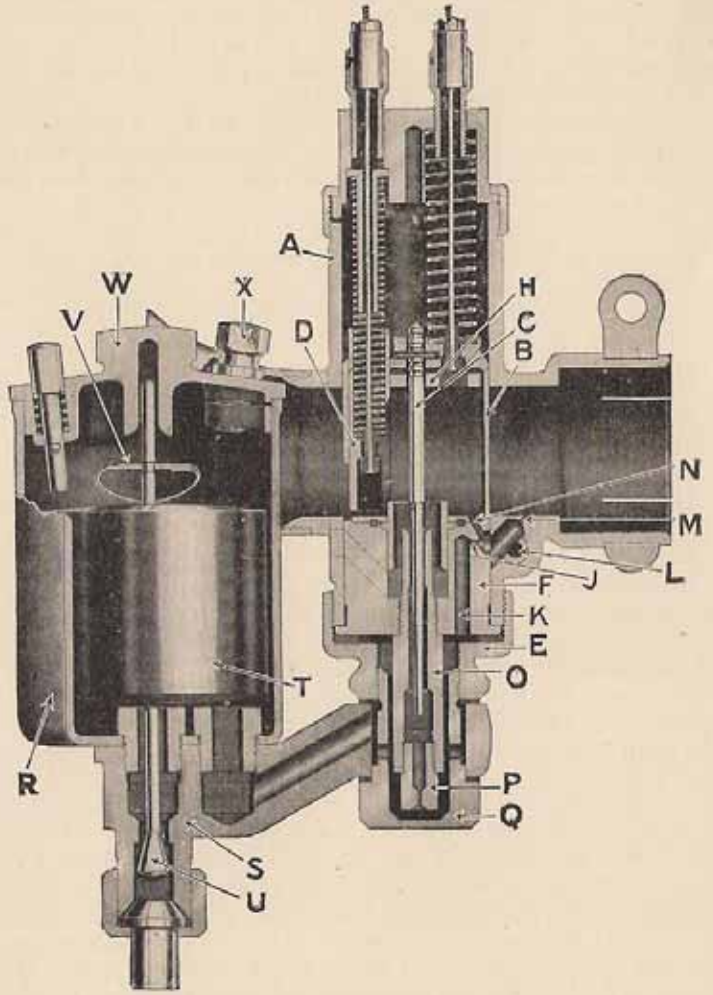


FIG. 43. SECTIONAL VIEW OF AMAL TWO-LEVER CARBURETTOR

This carburettor is now fitted to the whole of the A.J.S. range and replaces the Binks model. The manufacturers of Amac, B and B, Binks carburettors have now amalgamated, and the Amal carburettor is their latest achievement. Amal-Binks, Amal-B and B designs can still be obtained

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*. As the throttle valve is farther opened the fuel passes the main jet *P*, and this jet governs the mixture strength from seven-eighths to full throttle. For intermediate throttle positions the taper needle *C* working in the needle jet *O* is the governing factor. The farther the throttle valve is lifted, the greater the quantity of air admitted to the engine, and a suitable graduation of fuel supply is maintained by means of the taper needle. The air valve *D*, which is cable-operated on the two-lever carburettor, has the effect of obstructing the main throughway, and, in consequence, increasing the depression on the main jet, enriching the mixture.

Tuning and maintenance hints will be found in Chapter V.

The Binks Carburettor. The carburettor (see Fig. 44) consists of a vertical barrel divided into two vertical chambers. The main airway through the carburettor passes at right angles through these two chambers, first through the main jet chamber and then through the pilot jet chamber and onwards into the engine. The pilot jet chamber contains a " D " shaped throttle working up and down, the main jet chamber is like a keyhole containing a plunger to vary its area, and the plunger is operated from the handlebar. The two jets, having their orifices at the bottom instead of at the top, are of the non-spilling type, and are very difficult to choke up. The outlet of the main jet is considerably above the petrol level, consequently its action is delayed until the pilot jet has effectually started the engine going. The pilot jet is situated underneath the " D " shaped throttle, so that as the throttle is closed the area in which the jet is placed is reduced. A ribbon of air passes under the throttle and across the jet, so it is easy to see that as the throttle is closed the rush of air across the jet, instead of being lessened in intensity, is maintained; the volume, however, is reduced. The more the throttle is opened the bigger is the area in which the pilot jet finds itself, and consequently the suction is lessened, because the throttle has receded from the jet plate. The air proceeding to the pilot jet goes through the main choke tube, but at small throttle openings the velocity

of air around the main jet is so slow that the jet is scarcely affected. However, as the throttle is opened wider and the suction is increased, the main jet comes into operation automatically. Again, the wider the throttle is opened the bigger is the air blast on the

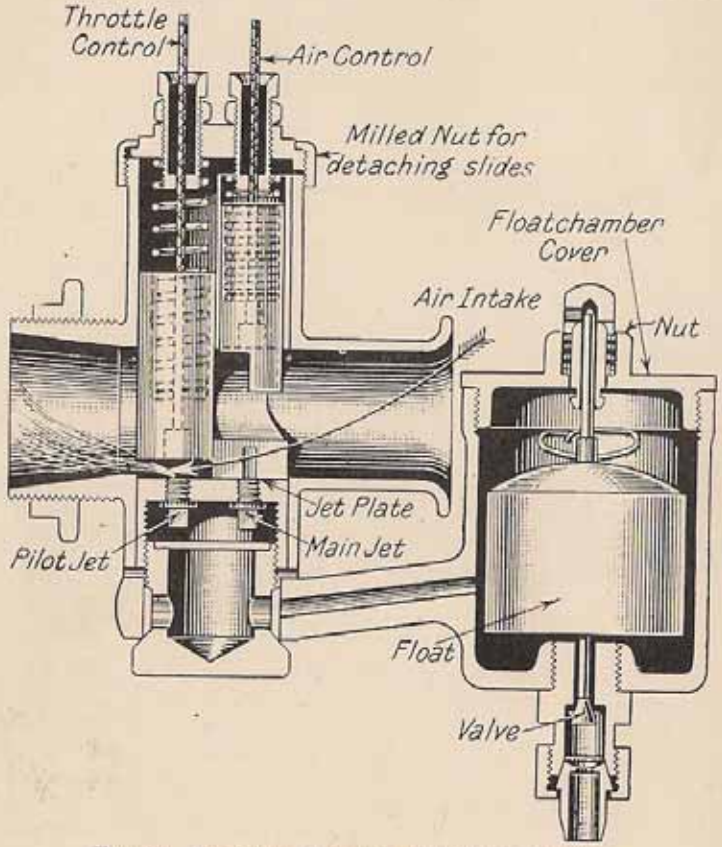


Fig. 44. Sectional View of Binks Carburettor

main jet, yet the intensity of the suction on the pilot jet is lessened.

A see-saw action takes place on the two jets, because the closing of the throttle lessens the suction on the main jet and increases it on the smaller jet, and vice versa. The pilot jet, however, is always in action if the engine is running. Two suitable jets in the carburettor, the pilot jet being much the smaller, give a practically automatic range of mixture. The air lever operating

the plunger in the main choke tube rectifies the mixture as necessity arises. A few minutes' thought about the functioning of the carburettor reveals the secret of slow running, namely, the fact that a minute quantity of air is drawn at a very high velocity across a tiny jet, thus ensuring that the petrol supplied is properly atomized. Power is obtained independently by having a big jet in the large choke tube, so that there is no sacrifice in having obtained good slow running. One of the many convenient features of this carburettor is that when closing the throttle to

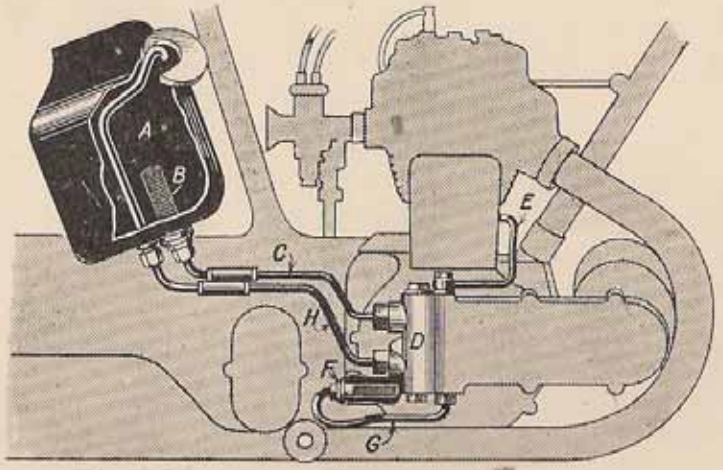


Fig. 45. Diagram of A.J.S. Dry Sump Lubrication
(See also Figs. 3 and 46)

run in traffic the mixture is practically automatic, and there is no need to fiddle about with the air lever to keep the engine running evenly and quietly when declutched.

The Dry Sump Lubrication System. Hitherto it has been the practice for the A.J.S. concern to fit to all production models an engine lubrication system, comprising a Pilgrim mechanical pump (see page 46) gravity-fed from the oil compartment of the tank, and an auxiliary spring-loaded hand pump, or in some cases a hand pump only. This system has worked pretty well, but its day is now definitely past. During the past couple of years a new and infinitely better system of lubrication has been evolved and perfected by the experimental and research department, and it is known as the A.J.S. patent dry sump lubrication. The first machines fitted with this system were overhead valve racing machines, and these, later on, were followed by the now famous

camshaft models. Various races were entered, including the T.T. races, and the functioning of the lubrication carefully noted, and various minor defects afterwards remedied, with the result that to-day it is well-nigh perfect after a few initial disappointments, and is standardized on all models.

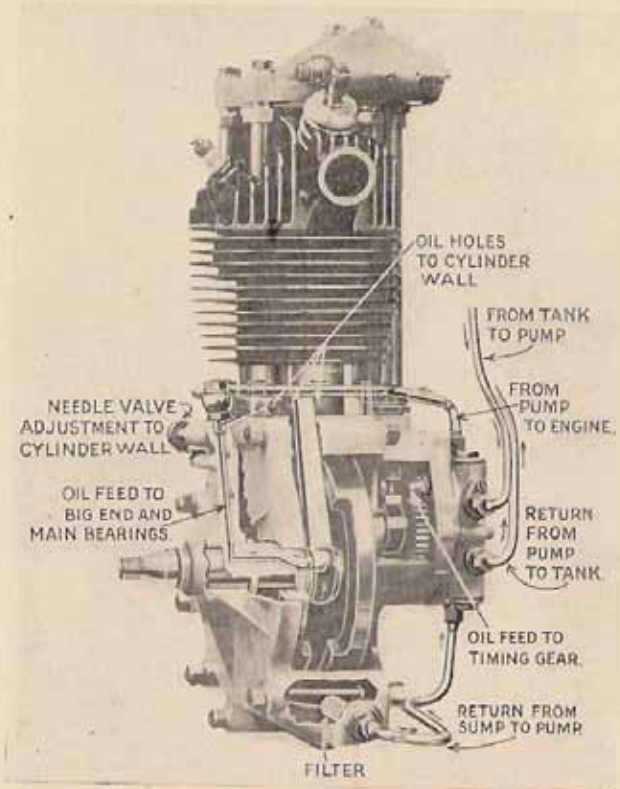


Fig. 46. Cut-away View of O.H.V. Engine, showing the Oil Circulation

The essential difference between the dry sump system and other methods is that in the former case a large quantity of oil is in continuous circulation throughout the engine and tank, while in the latter case only a comparatively small volume of oil at any given time is circulating. Chief among the advantages accruing to the new system are the following: (*a*) No attention is required by the rider other than maintaining the oil in the separate tank mounted on the rear down tube at the correct level.

(*b*) Superior cooling of the engine lubricant is obtained. (*c*) Simple means for filtering the oil and preventing the rapid accumulation of pulverized carbon deposits can be provided. (*d*) There is no possibility of the engine being greatly over-oiled since the sump remains practically "dry," all superfluous oil being returned to the tank by the duplex pump. (*e*) Oil consumption remains remarkably low, due to a minimum of leakage or combustion taking place. So much, then, regarding the merits of the system. We will now inquire into the construction and working of the A.J.S. system. This is shown diagramatically in Fig. 45, while Fig. 46 shows how the oil circulates through the engine. The "heart" of the circulation system is the duplex pump *D* driven by a metal coupling *X*, (Fig. 64) from the half-time shaft. Lubricating oil from the main tank *A* is drawn via the pipe *C*, after passing through the filter *B*, into the pump itself and thence projected along pipe *E* to the near side of the engine. It then passes down through a channel in the crankcase and is forced, under pressure, into the hollow mainshaft (see Fig. 46) along which it travels to the all-important big end roller bearing. This it very thoroughly lubricates as the oil oozes out and drips upon the flywheels which, by centrifugal force, splash it upon the cylinder walls. Oil mist, in fact, penetrates throughout the working parts. Oil is also pressure-fed to the timing case. It should be noted from Fig. 46 that by rotating the needle valve, seen on the left, a few turns, lubricant can be fed direct to the cylinder walls via a by-pass. This, however, is only intended for fast racing work. All lubricating oil, after effecting its purpose, eventually drains to the bottom of the sump, thence to be returned to the pump via the pipe *G* (Fig. 45) after passing the second filter *F*. Finally, it is forced under pressure up the pipe *H* and back into the tank again to be recirculated *ad infinitum*.

It is interesting to note that of five A.J.S. machines with D.S. lubrication, entered for the 1929 International Six Days Trial, not one failed to secure a gold medal. This speaks for itself.

The Three-Speed Countershaft Gear. Fig. 47 illustrates the gear-box used on the 3·49 h.p. machines. A similar type of gear-box is employed on the whole of the A.J.S. range. On the heavier machines, however, the gear-boxes are slightly more robust, likewise the clutches; otherwise they are identical.

Suppose the clutch sprocket (12) (driven off the engine sprocket) to be in motion, and the clutch plates pressed up against the cork inserts by the pressure of the clutch spring (14). Let us consider what happens. The high-gear dog wheel (8) and the gear-box sprocket (7) cannot move relatively to one another, but both are free to rotate by means of a common sleeve upon the *mainshaft* (5). Then clearly no positive motion is imparted to

either of them by the mainshaft itself. At the other end of the mainshaft is the low-gear dog wheel (10), free to rotate upon the shaft and in constant mesh with a pinion which, together with two others, is rigidly fixed to the *layshaft* (6). Now the layshaft pinion is also in constant mesh with the high gear dog wheel, and (the two pinions being of the same size) the gear-box sprocket will rotate at layshaft speed whenever the layshaft is in motion. This is equivalent to saying that the ratio of the speed of the gear-box sprocket to that of the clutch sprocket is proportional to the ratio of the mainshaft to layshaft speed. It is perfectly obvious

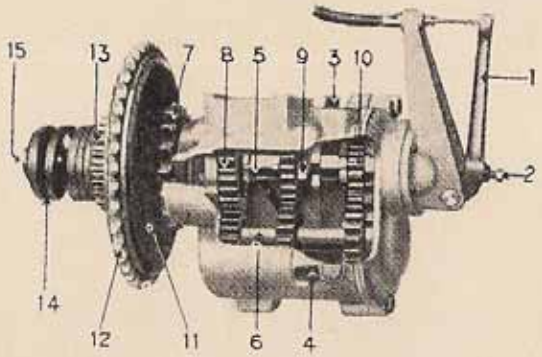


FIG. 47. THE A.J.S. GEAR-BOX

1. Clutch operating lever
2. Clutch push rod adjusting screw
3. Oil filler cap
4. Oil level indicator
5. Mainshaft
6. Layshaft
7. Sprocket for transmitting drive to rear wheel
8. High-gear dog wheel
9. Sliding sleeve
10. Low-gear dog wheel
11. Clutch fixed plate
12. Clutch sprocket receiving drive from engine
13. Footstarter ratchet wheel (the position of this has been changed)
14. Clutch spring
15. Clutch spring adjusting nut

that in the case illustrated, assuming the sliding pinion to be moved slightly to the right, the layshaft is not set in motion ; the mainshaft alone revolves, carrying with it one pinion alone, namely, the sliding pinion on the splined mainshaft, which is not in mesh with any other pinion. This means that we are in *neutral* or that no gears are engaged.

It will be observed that all pinions on the mainshaft have *dog clutches* which can be engaged by the sliding pinion ; also it may be noted that the sliding pinion may be put into mesh with one pinion on the layshaft. Take the case now of the dog on the sliding pinion being engaged with that of the low-gear dog wheel. Then clearly the layshaft will come into action, and, of course,

the gear-box sprocket will rotate at layshaft speed. In this case the difference in diameter of the low-gear dog wheel and the layshaft pinion will bring about a considerable reduction of speed to the layshaft relative to that of the mainshaft. This means that the clutch sprocket will revolve much faster than the gear-box sprocket (whence the main drive is taken), or, in other words, we are in *low gear*.

Let us now assume that the sliding pinion is moved to the left and put into mesh with the central layshaft pinion, as actually

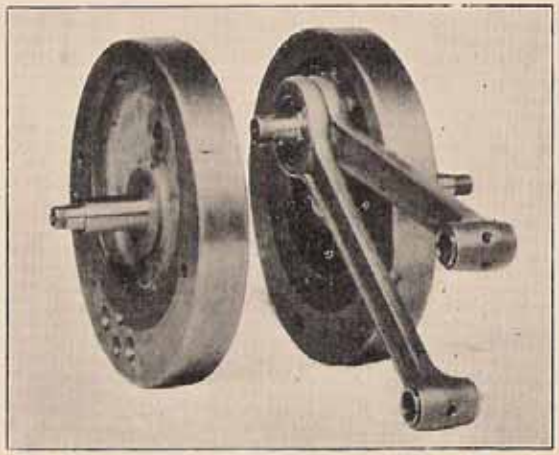


FIG. 48. THE TWIN BEARING CONNECTING-ROD MOUNTING OF TWIN CYLINDER 7·99 H.P. MODELS

illustrated in Fig. 47. Then a reduction in gear also takes place, but not so great ; that is to say, we are in *middle gear*.

Suppose, finally, the sliding pinion is brought right across until the dog engages with the dog on the high-gear dog wheel. Here again the layshaft remains idle, and the gear-box sprocket becomes locked to the mainshaft, which, of course, involves their simultaneous rotation at the same speed ; there is no gear reduction in the gear-box at all, and so we have *high gear*.

The foregoing should leave no doubt as to how the varying gear ratios are obtained. The illustration also clearly demonstrates the clutch operation (see also page 116) ; the lever (1), controlled from the handlebars by Bowden cable, operates a plunger which relieves the pressure exerted by the coil spring 14 against the clutch plate, thereby freeing the clutch sprocket, which can then rotate independently of anything else. The actual control of the sliding pinion is not shown, but follows orthodox practice.

The ratchet wheel 13, between the clutch and clutch spring, is for engagement with the kick-starter quadrant. It should be noted here that the kick-starter operation has this year been modified in that the quadrant operates a ratchet wheel placed on the gear-box side of the clutch, not as shown at 13 in Fig. 47, which illustrates a 1928 gear-box identical except in this respect.

The Shock-Absorber. A metallic shock-absorber is fitted on the engine shaft to "smooth-out" the engine torque at low

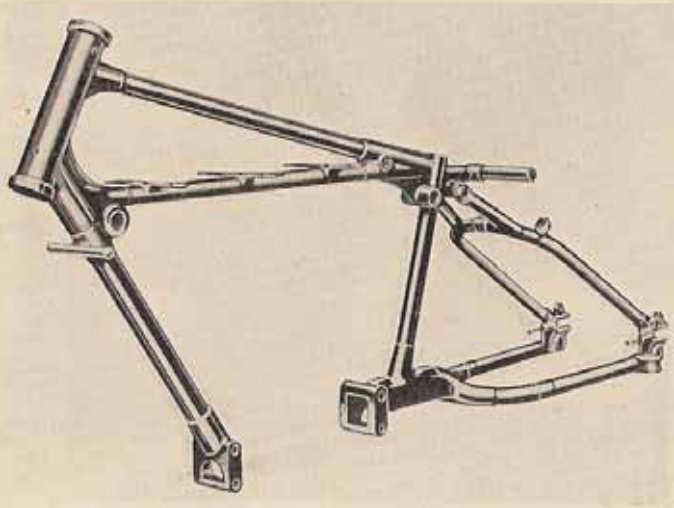


FIG. 49. THE NEW A.J.S. FRAME OF WELDLESS "K" QUALITY STEEL TUBE

revolutions. If such a device were not fitted the periodic impulses that would occur in the drive when the engine was firing at low speed on top gear—in fact, all gears—would result in great harshness and serious wear throughout the transmission, quite apart from the unpleasantness of driving such a machine. In the case of belt driven machines a shock-absorber is not required, for the flexibility of the belt itself satisfies all requirements in this direction.

The following is a brief outline of the principle. On that portion of the engine shaft inside the chain case two members are fitted, incorporating dogs or cams. The outside member is keyed to the engine shaft, and is held up to its work by a spring and lock nut. The member consisting of the chain sprocket is free on the shaft, and can move in either direction; but in doing so, it

naturally tries to force the outer member away by reason of the doglike formation of the two respective faces. Thus the "bite" of each engine impulse is partly absorbed in compressing this spring when the load is very great, as in the case of starting off or when travelling at low speed on top gear. In other words, it smoothes out the engine torque.

It is obvious that the shock-absorber functions mostly at low speed and least at high speed, which, naturally, is what is wanted.

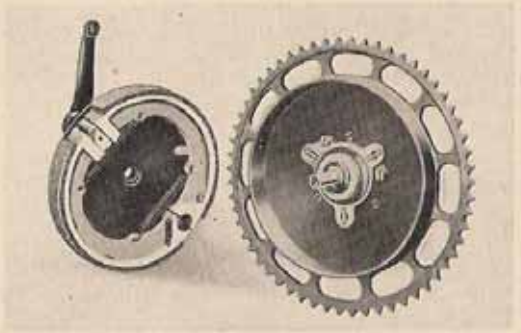


FIG. 50. THE COMPONENT PARTS OF THE REAR BRAKE

The amount of "back-lash" is, of course, limited by a stop. Needless to say, the clutch also functions as a shock-absorber, its effectiveness in this respect depending largely upon its adjustment and manipulation.

Quickly Detachable Rear Wheels. One of the outstanding features of the A.J.S. machines during the past fifteen years has been the patent detachable wheel which enormously simplifies tyre repairs. In the case of the twin cylinder engined mounts, M1 and M2, both front and rear wheels are detachable and interchangeable. The simple means of removing these wheels will be found in the next chapter, on OVERHAULING.

CHAPTER V

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 8,000 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 balls, cones, and cups, truth of wheels, alinement, loose spokes, condition of rims, wear of tyres.

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.

Gears. Condition of teeth on sprockets and pinions, damaged ball races and loose parts generally.

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

An *ordinary overhaul* should be undertaken about every 2,000 miles. This should comprise decarbonization of the engine, valve clearance adjustment, adjustments of contact breaker and plug points, valve grinding, general lubrication, 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. 51), and odd adjustments made as they are needed. The rider who callously runs a machine until "something happens" is asking for trouble and,

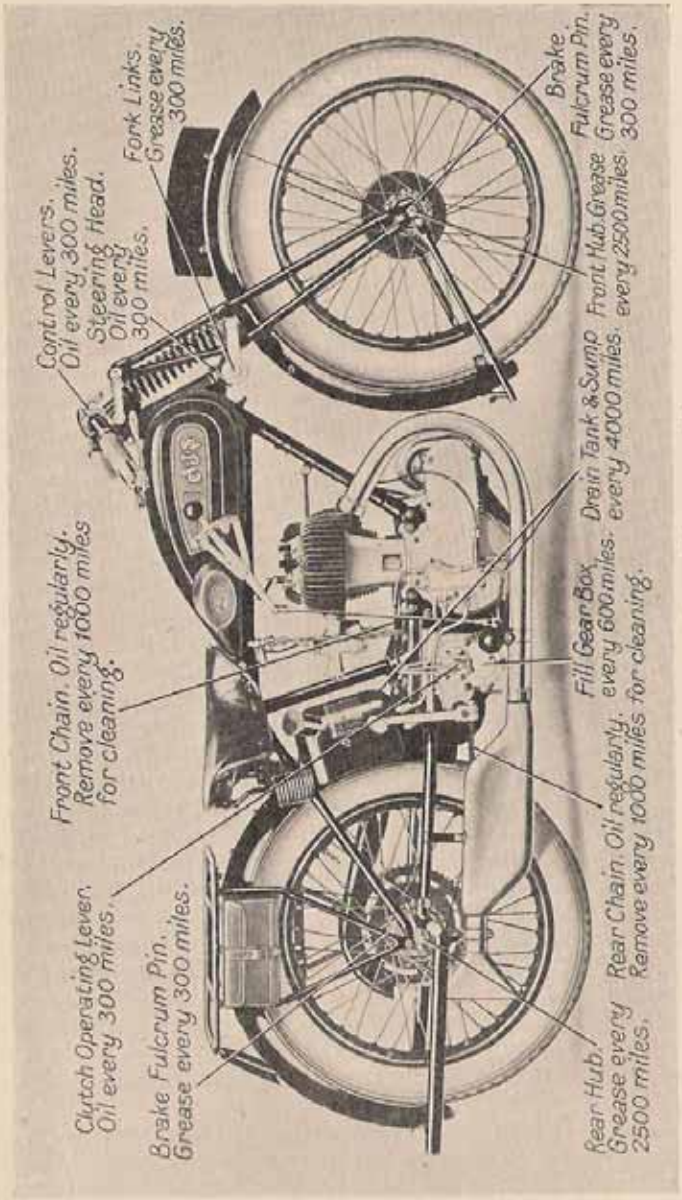


Fig. 51. The Important Parts Requiring Lubricating

The above chart, depicting an M5 A.J.S., is intended as a general guide and need not be, and certainly will not be, strictly adhered to. The above chart is applicable to the whole of the "M" range. In the case of the O.H.V. and O.H.C. models there are additional points such as the O.H.V. actuating gear requiring lubrication (see page 102)

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 Clearance. 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 hot. 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 clearance will increase until the engine has been thoroughly run-in. Fig. 52 illustrates the point where the clearance should exist (*C*) and the means of adjustment (*A*) in both S.V. and O.H.V. type engines. This clearance should be ·006 in. and ·008 in. in the case of the inlet and exhaust valves respectively with a *hot* engine. In the case of the O.H.C. engines the clearances should be with a *cold* engine ·016 in. and ·018 in. The clearance of the exhaust valve is slightly the greater because this valve is subjected to greater heat, and accordingly the stem expands somewhat more than that of the inlet valve. 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 rocker stud. 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 rocker in the timing case will not be resting on its cam. If the valve clearances are not correct this 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 until the correct clearance is obtained, and retighten the lock-nut.

Check again after tightening the nut. In the case of the O.H.V. and O.H.C. engines, loosen the lock-nut (*B*) on the rocker stud 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 O.H.C. engines valve clearances are comparatively large due to the fact that as the engines warm up the clearances decrease instead of increase, as they do with the S.V. and O.H.V. power units. An approximate setting can be obtained by screwing the rocker stud up with valves closed until contact is felt, slackening off half a turn and locking in position. It is, of course, much better to obtain the exact setting with a gauge.

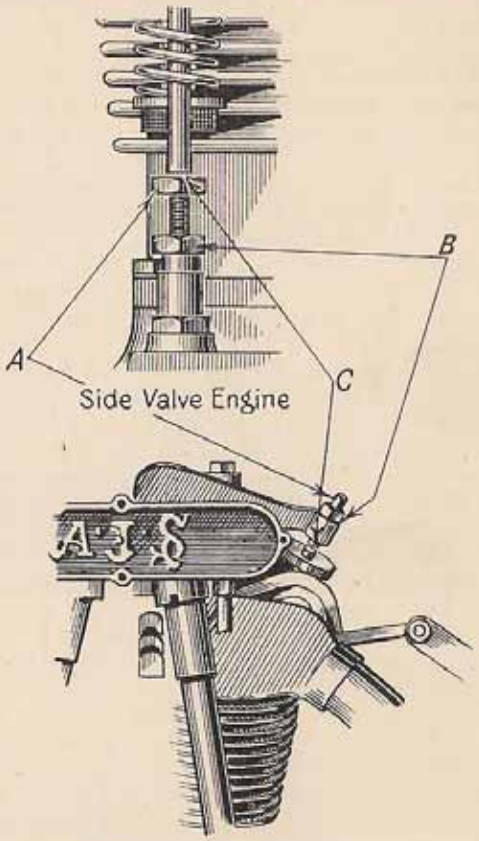


FIG. 52. VALVE CLEARANCE ADJUSTMENT

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. 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 it always pays to inspect the valve faces and seats, and grind in the valves if necessary. In any case, removal of the valves enables the combustion chamber and also the ports to be very thoroughly cleaned. Before decarbonizing, it is first necessary to remove the cylinder or cylinders, as the case may be; but whether the engine is a single S.V., a twin S.V., or an O.H.V. or O.H.C. 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, unlike many of their contemporaries, have detachable cylinder heads. This greatly facilitates cylinder removal; there is no expert juggling required to get it off. Furthermore, the valves may be attended to, if desired, without disturbing the cylinder at all, for the head can be removed complete with valve mechanism.

Removal of Cylinder. Firstly, disconnect the H.T. lead from the sparking plug terminal and remove the plug itself. Disconnect the inlet and exhaust pipes, and get them and the gadgets attached to them well out of the way. Both the induction pipe of the carburettor and the exhaust pipe have union nut connections, and these nuts can be undone by means of special "hook" spanners in the tool kit. In the case of the twin cylinder engine, these operations—in fact, most operations—will have to be performed, of course, on each cylinder. If the reader's mount is of the O.H.V. type, it will now be necessary to remove the tappet tubes or push rods, and to this end the special extractor tool must be used after first taking off the covers by undoing the lock-nuts and telescoping them. The end of the tool is arranged to fit over the rocker adjusting screw (see Fig. 53) 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 tappet tubes may then be withdrawn by lifting them off their hollow cups. The rocker-box should now be removed by unscrewing the four pins, holding it in position, and drawing it off the cylinder from the right-hand side. With the O.H.C. engine (Fig. 7) remove the cam box in a similar manner after taking off the cap and split fixing nut on the camshaft. While removing the cam box an assistant should hold

and steady the chain-wheel. Next remove the bolts holding down the cylinder, and remove the latter. Care should be taken to relieve the pressure evenly on both sides while tensioning the bolts. The head can then be removed by inserting a screwdriver, or similar tool, between the top cylinder-fin and head, prising *upwards* the head carefully off the barrel on both sides.

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

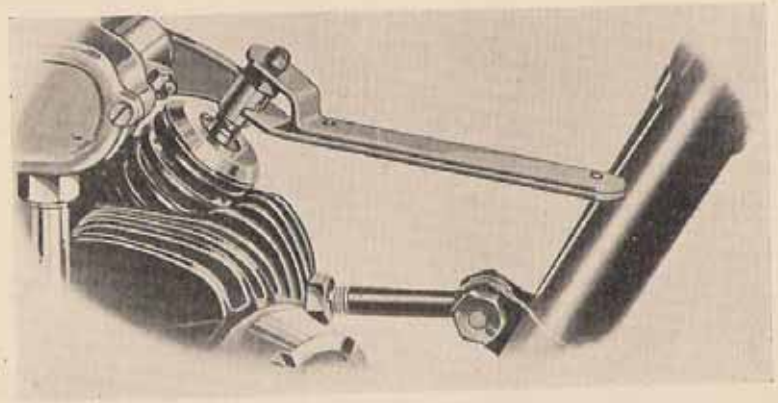


Fig. 53. The A.J.S. Tappet Tube Extractor

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. While turning the engine support the chain wheel with the fingers, or a suitable instrument, permitting of its unobstructed rotation. *On no account allow the chain wheel to fall out of the chain.* Use the special supporting tool. 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 taken off. It is desirable to mark the interior of the piston to ensure its correct replacement.

Piston Removal. 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 must be squeezed

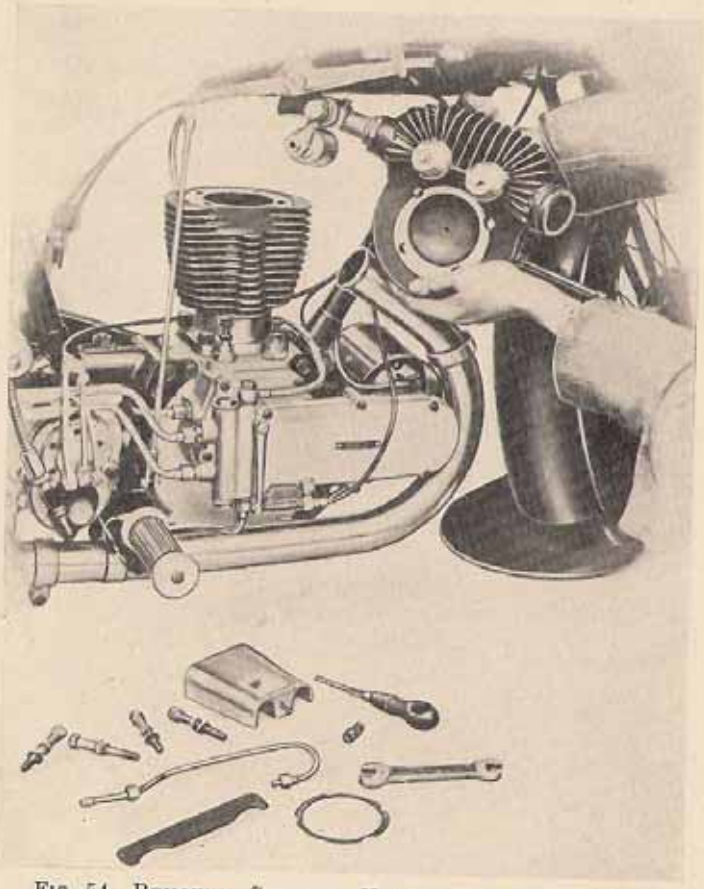


FIG. 54. REMOVING CYLINDER HEAD OF THE S.V. ENGINE

together with the special pliers provided. Afterwards the gudgeon-pin may be pushed out from the driving side. The piston can then be removed from the connecting-rod.

Removing the Valves. Valves of the side-by-side type can be removed, if desired, without disturbing either the cylinder head or cylinder. All that has to be done is to take out the valve caps

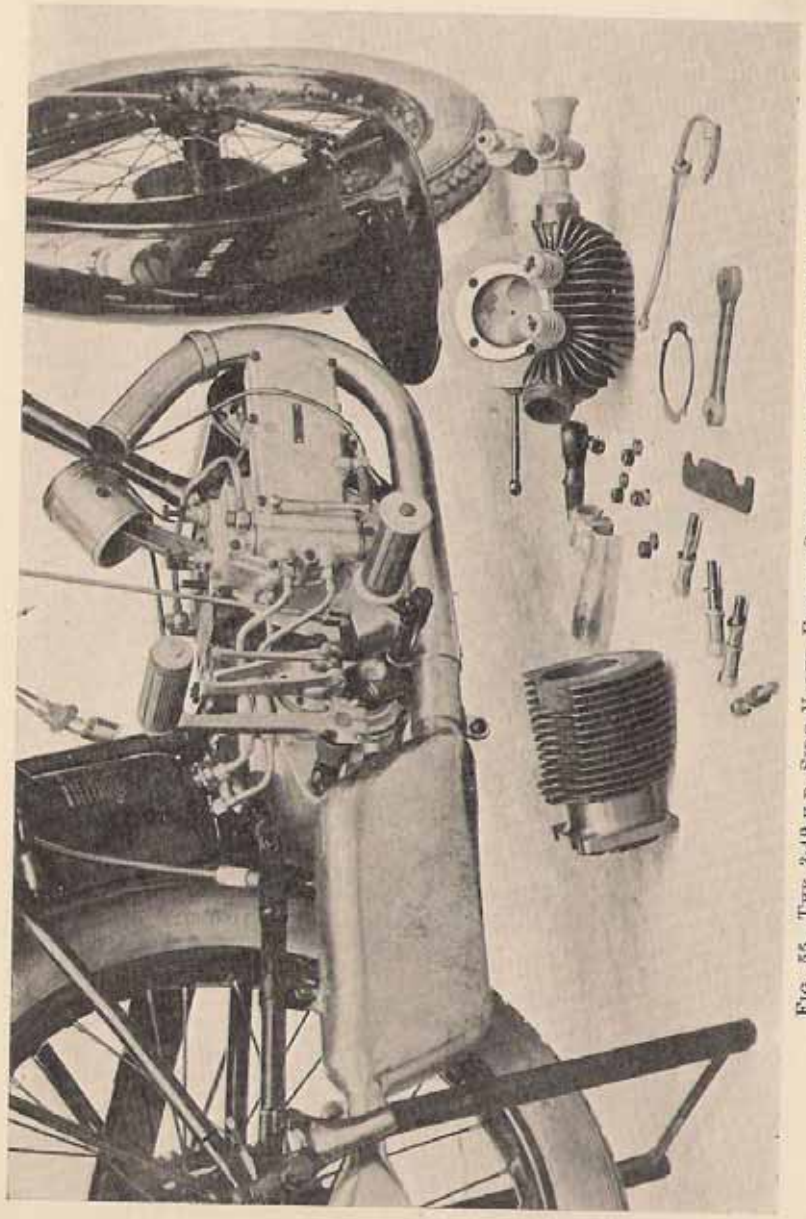


FIG. 55. THE 3-49 H.P. SIDE VALVE ENGINE STRIPPED FOR DECARBONIZATION

and place the hooked end of the special valve extractor on the top of the valve, using the valve cap spanner, which fits the bottom of the hook, for the necessary leverage to lift the valve spring to allow the cotter to be withdrawn. The valve can then be pushed up and drawn out of the head via the valve cap aperture. Remove the other valve similarly. Remember that valve caps are most readily removed with the cylinder head in situ.

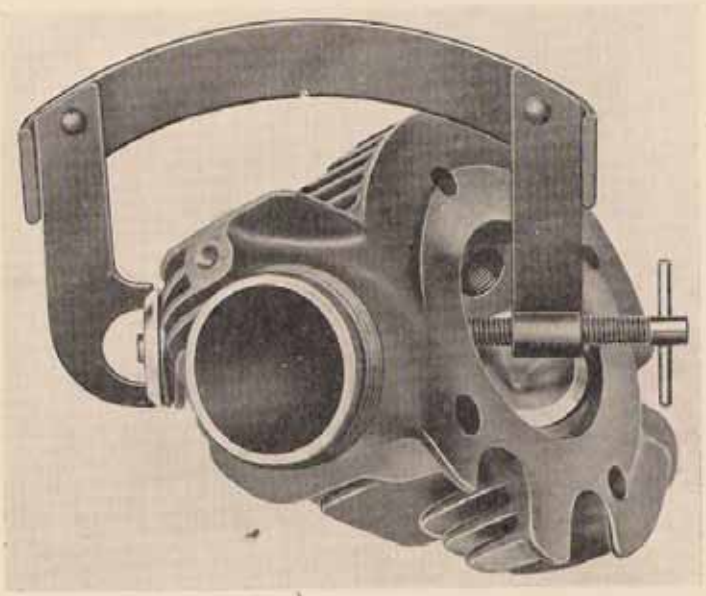


FIG. 56. THE A.J.S. O.H. VALVE EXTRACTOR

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 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 this 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

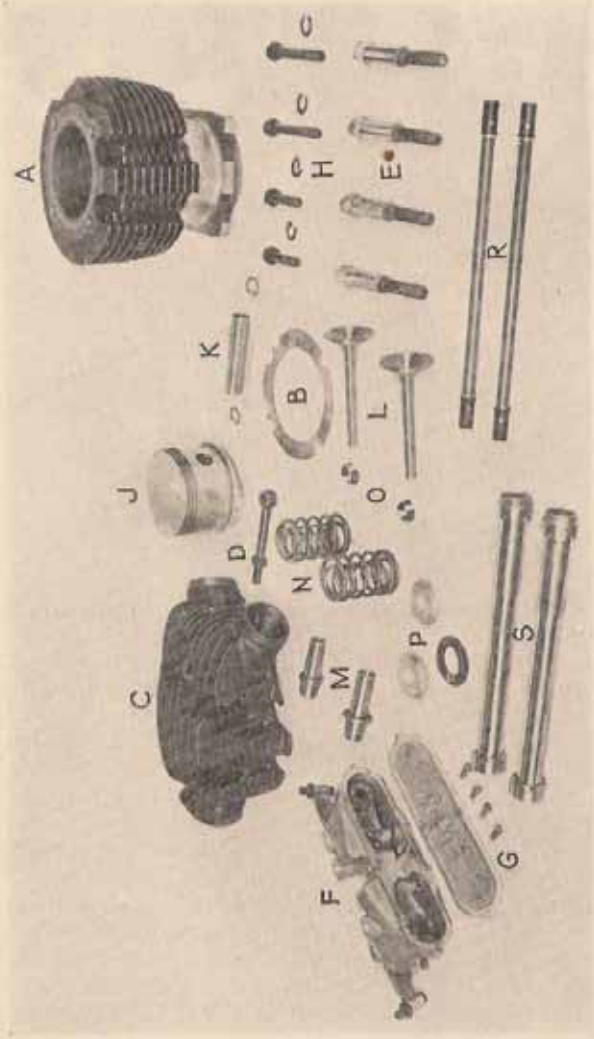


FIG. 57. COMPONENT PARTS OF OVERHEAD VALVE MECHANISM OF THE 3-49 H.P. AND 4-98 H.P. MODELS

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

interchangeable, but it is best not to change them about unless necessary.

Removing the Carbon. Procure an old screw-driver, or similar tool, and scrape off all carbon from the piston head. The latter may then be polished with very fine emery cloth, but do not touch the sides of the piston at all. 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 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

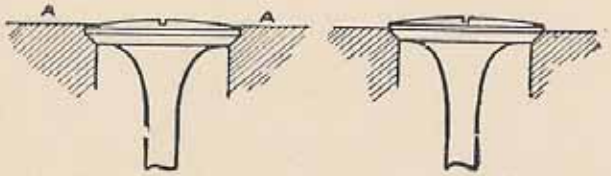


Fig. 58. Diagram Illustrating how Valves Become Pocketed after Frequent Regrinding

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. The valve seats and faces should now be inspected.

Grinding-in the Valves. Should the valves or valve seats show signs of "pitting," the valves will have to be ground-in. This requires considerable patience and care. We will deal first with the S.V. type of cylinder head. Stuff a rag into the combustion chamber to prevent dirt getting in, and then place the head firmly on a bench with valve seats uppermost. The best preparation for valve-grinding is one of the ready-made compounds such as Carborundum. This is supplied in two grades, coarse and fine. Smear the valve face lightly with a little 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 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

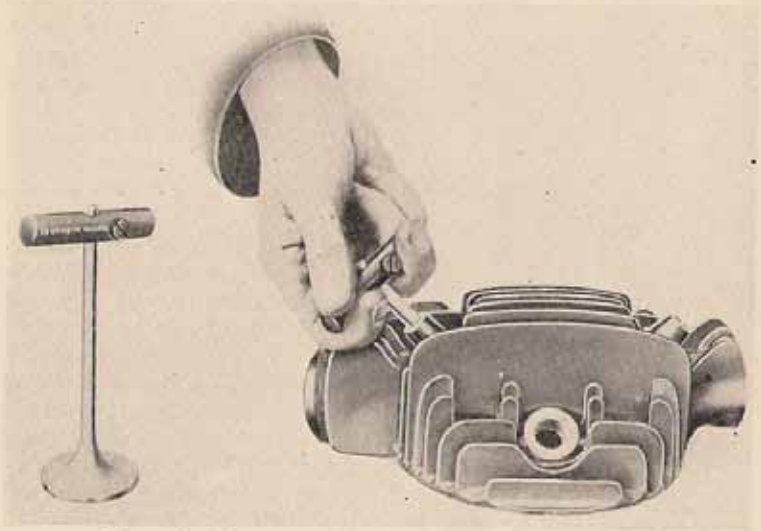


Fig. 59. Using the A.J.S. Valve Grinding Tool

bad wearing down of the valve seat, and would ultimately result in the valve becoming "pocketed," with consequent loss of power (see Fig. 58).

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 provided (see Fig. 59).

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 or rocker mechanism, as the case may be. 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, i.e. at distances of 120°. 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 $\frac{1}{4}$ in. wide, which are placed in the manner illustrated by Fig. 60. 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 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.

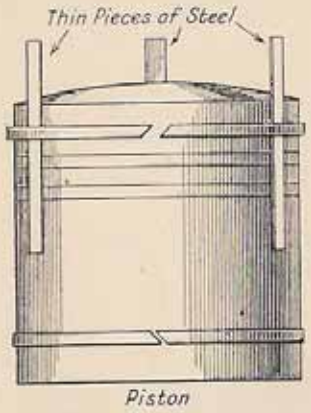


Fig. 60. How to Remove Piston Rings

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

Lubricating O.H.V. Rockers. The rocker gear can be inspected by removing the inspection cover, but this need not be taken off in order 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. 5). Grease should, *with both valves closed*, be forced through this nipple when it will automatically find its way to the two ball joints.

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

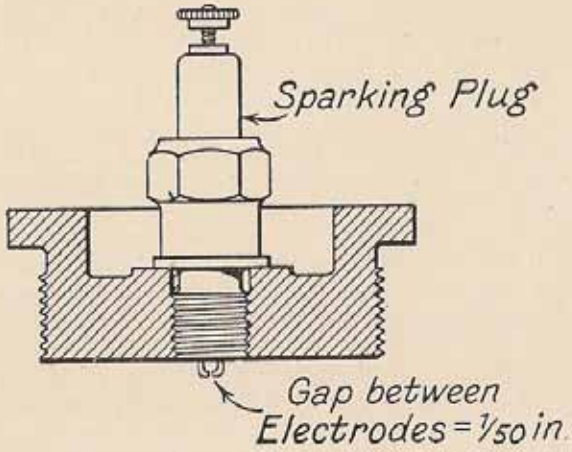


Fig. 61. Diagram Illustrating Reach of Sparking Plug

be about $\frac{1}{50}$ in. The reach of the sparking plug is also of importance. It should be set as shown by Fig. 61. The sparking plug should be frequently inspected. It is susceptible to oiling-up.

Reassembly of Engine. After all this has been done, the engine may be reassembled. Care should be taken to replace all paper washers, if fitted, and in the case of the twin cylinder engines, the packing washers, when replacing the cylinders. The piston should be oiled before being attached to the connecting rod with the gudgeon pin. Do not forget the retaining springs. 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 head on to the barrel, remember that the head must be tightened down before the steady is again attached to the

down tube. When the cylinder has been finally tightened down, then the length of 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 two points to be noted, however, (1) see that the overhead valve rocker bearings are lubricated, (2) make certain that the lift of the exhaust valve on the O.H.V. engine does not exceed $\frac{1}{16}$ in. when the exhaust lifter is raised. If the valve lifter lifts the valve, say, $\frac{1}{8}$ in., the inlet and exhaust valves may foul each other with disastrous consequences when the engine is restarted.

In the case of the camshaft engine, after replacing the cylinder and cylinder head fit the cam box, carefully placing the chain wheel on to the camshaft spigot and rotate the engine until the hole in the camshaft sleeve is opposite to the hole in the chain wheel. Now insert the washer with its special key and tighten the nut and fit the split cotter. Finally remove the tool supporting the chain wheel and replace the inspection cap in the chain case. The remainder of the assembly is straightforward.

After assembly, test the engine compression by standing on the kick-starter. 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.

Concerning Engine Lubrication. In the case of A.J.S. machines manufactured during the period 1926-1928, the motor-cyclist should take out the sparking plug occasionally, and see if it is unduly wet with oil. If the plug is not dead dry, cut down the supply of oil by turning the pointer on the side of the mechanical pump to the right, moving $\frac{1}{16}$ in. at a time until the engine gets a definite oil supply without oiling-up the plug. The sight indicator on the pump will show whether oil is being pumped in all right. Where a hand-pump alone is fitted the remedy is obvious—give less oil. Over-lubrication is shown by oil unduly working out from the tappet guides (although cups are fitted to A.J.S. engines to minimize this) and smoke issuing from the exhaust. If the oil supply is such that when the throttle is smartly opened on low gear a puff of blue smoke issues from the exhaust pipe, the lubrication is approximately correct.

In the case of the M class A.J.S.'s over-lubrication is practically impossible, and the rider has the satisfaction of knowing that his engine is at all times being fed with the correct quantity of lubricant, *provided that the oil level in the tank is correct.* The level should be checked periodically. As is the case with all internal combustion engines, a sediment gradually collects at the

bottom of the tank and oil sump, and should be eradicated by draining them about every 4,000 miles. When this is being done the two filters (see Fig. 45) should be removed and very thoroughly cleansed. Finally, the rider should satisfy himself that with the engine running, oil is issuing in the tank from the pipe *H* (Fig. 45). A period will necessarily elapse before proper oil circulation is restored.

Care of the 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 until the machine has covered some 12,000 miles.

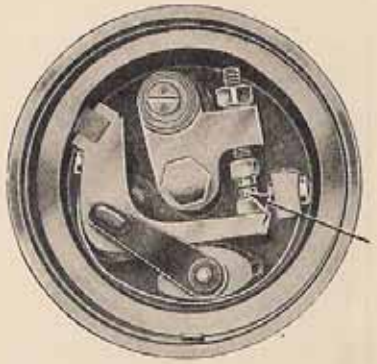


Fig. 62. The Contact Breaker

The platinum contacts of the contact breaker should be examined about every 1,000 miles and, if the "break," shown by the arrow (Fig. 62), should be more than will just hold a ·02 ($\frac{1}{2}$ mm.) 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. If it is 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 platinum points must only be dressed with a dead smooth file if the surfaces have become at all pitted, and then the least possible amount taken off. The greatest care must be exercised, as platinum is a very expensive metal. Always keep the contact breaker scrupulously clean.

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.

Retiming the Magneto. If the magneto has been removed

from the machine, or the drive disturbed, it will be necessary to see that it is retimed 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. 63), 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.

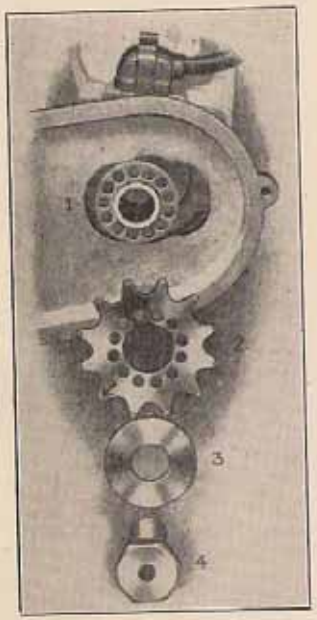


FIG. 63. THE VERNIER TIMING ADJUSTMENT

Keyed to the armature shaft of the magneto (in the case of the twin-cylinder engines only—in other cases it is a push-on taper fit) 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 timing up 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 Chapter I, Specifications)

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 arises on the inclined plane of the steel segment sufficiently to just separate the platinum point. 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.

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.

In the case of the "Vee" twin, the Magdyno must be timed on No. 1 cylinder, that is, the one that fires first. This is the back cylinder of the two. The magneto 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 cylinders corresponding with these numbers.

Magneto Chain Adjustment. Examine the driving chain occasionally (see Fig. 64), and, if slack, tighten it by moving the magneto along the platform in a forward direction after slacking off the four pins underneath. To do this it is unnecessary to remove the cover, an aperture being provided at the back. When the correct tension has been obtained (there should be just no droop) screw the pin up again tightly. Examine also the nuts securing the chain sprockets. Should the chain cover be removed, oil the chain before replacing the cover. Before coupling up the oil pipes to the mechanical pump (1926-1928 models), open oil cock and expel all air from the delivery pipe; otherwise, on starting the engine, air will be pumped in for some minutes. Be careful to replace the pump connection.

Engine Timing. No useful results can be obtained by tampering with the valve timing. On the contrary, all results following

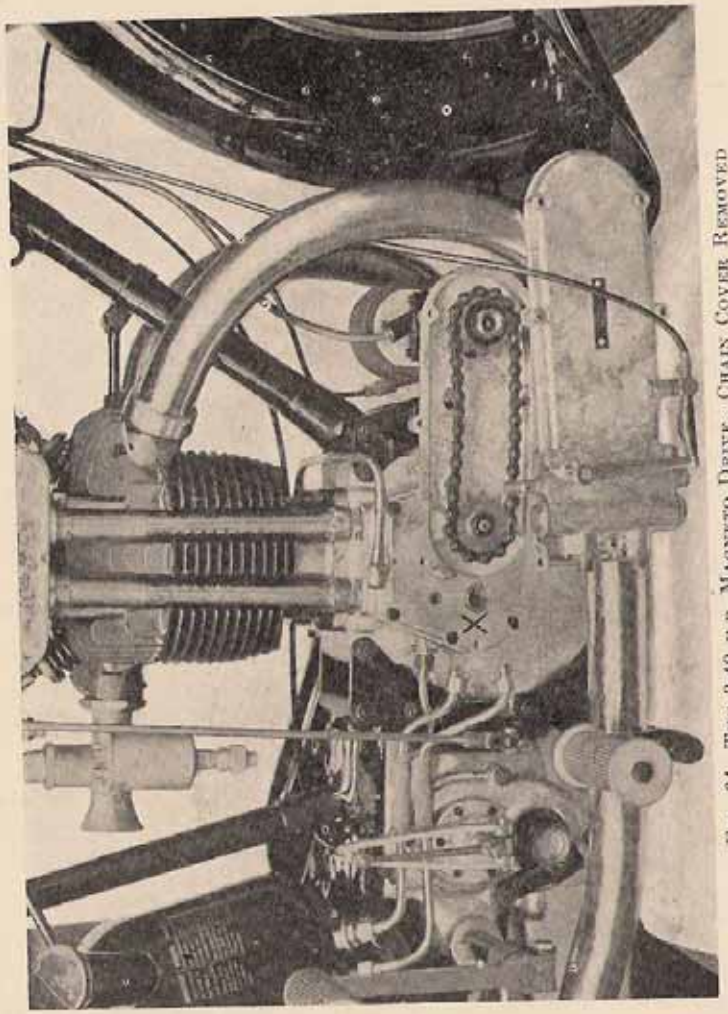


FIG. 64. THE 3-49 H.P. MAGNETO DRIVE. CHAIN COVER REMOVED
(Showing also at X the drive for the mechanical oil pump)

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 page 110) will be found a single dot and a double dot. These dots correspond to similar marks on the inlet and exhaust valve

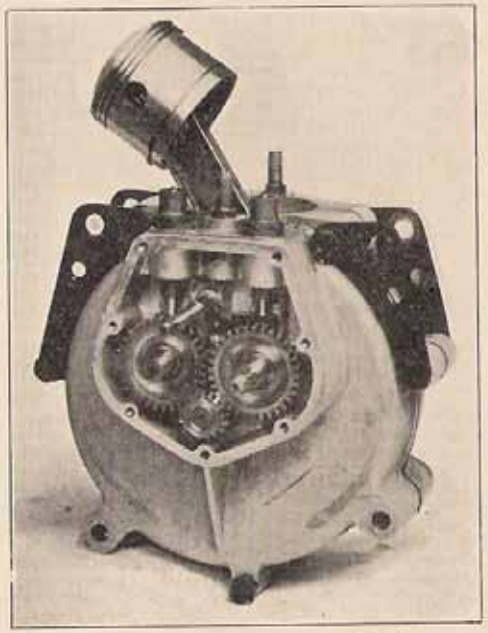


FIG. 65. THE 3-49 H.P. MODEL M6 ENGINE
Cylinder removed, showing connecting-rod and piston. The timing gears can also be clearly seen (see Figs. 66 and 67)

timing pinions. To set the inlet valve, 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. In the case of the 9·96 h.p. engines, the system is very similar, but the double inlet cam wheel has a dash registering mark to coincide with a dash on one of the exhaust cam wheels.

Maintaining Compression. If piston rings and valves are in good condition, the only other possible sources of leakage are the valve caps, the compression cock, 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

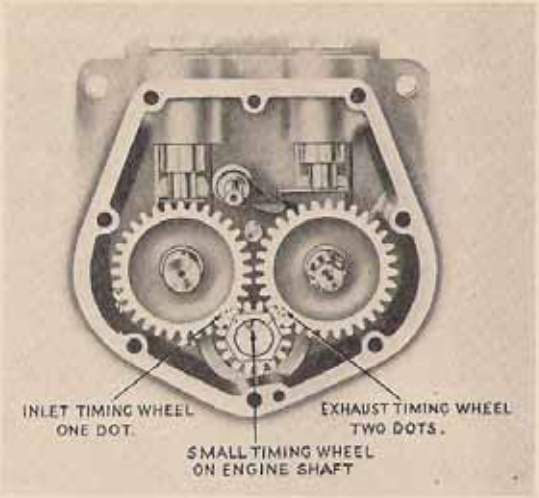


FIG. 66. SINGLE CYLINDER TIMING GEAR
(Applicable to all except the M7 and M10)

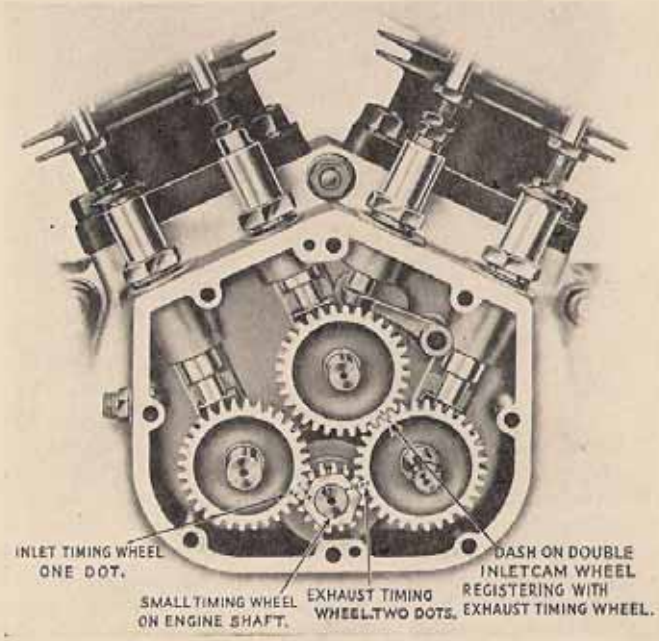


FIG. 67. TWIN CYLINDER TIMING GEAR

should be used when screwing up the plug, cock, or cap, as the case may be. Test for compression leakage by putting thick oil on the sides of the joints and observing whether bubbles occur when the engine is running. Sometimes the compression cock itself may leak. If so, it will have to be ground-in.

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 jump on 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 repeat the "jumping business," and see if anything happens. If no spark occurs now, we may take it that the plug is faulty, and it should be scrapped.

Tuning the Amal Carburettor. The Amal carburettor fitted to all present A.J.S. machines, is of comparatively simple construction, and has been described in considerable detail in Chapter IV. It may therefore be reasonably assumed that the reader is familiar with the principles of its design. If he is as yet unacquainted with its construction, he should refer to the paragraph dealing with this instrument, on page 78.

For general purposes it is usually found that the setting of the Amal carburettor, as made by the manufacturers prior to the delivery of the new machine, is satisfactory. There are, however, exceptions. If the rider resides in a district bordered by exceptionally steep hills, he may find the standard setting is not entirely satisfactory, and that better results and more power may be obtained by the use of a slightly larger main jet. Various sized jets are obtainable from A.J.S. spare parts stockists, a list of whom is given at the end of this volume. The fuel supply to the pilot jet is regulated by the taper needle valve, which should be adjusted to approximately three-quarters of one complete turn in an anti-clockwise direction from the closed position. It is very important to see that no undue force is exerted when shutting off the pilot needle valve.

"All-out" mixture strength, with the air lever and throttle fully open, is governed by the size of the main jet alone. The correct jet is the smallest which gives maximum speed. After this has been decided, intermediate and slow running should be dealt with. In the event of the mixture being found excessively rich, a throttle valve with more cut-away should be tried. On the other hand, if the mixture is on the weak side, a throttle valve

with less cut-away should be utilized. The higher the number stamped on the valve, the bigger is the cut-away. It is well to remember that the cut-away of the throttle valve has no effect on the " all-out " position.

Tuning the Binks Carburettor. Open the throttle about $\frac{1}{8}$ in. so that when the engine is turning over you can hear a hiss at the air intake. Lower the air shutter over the main jet, flood the carburettor, and get the engine started. When the engine has run two or three minutes on what appears to be a rich mixture, open the air lever to about $\frac{3}{4}$ wide open ; then get the engine to run as slowly as possible. If the engine runs on what is apparently too weak a mixture, increase the size of the pilot jet by one size. If the engine hunts and does not run better, try one size smaller. The range of the pilot jet alone is about $\frac{3}{16}$ in. movement of the throttle. While running with the throttle about $\frac{1}{8}$ in. open you can tell if the mixture is weak or strong by lowering or raising the air shutter over the main jet ; if the engine runs better in the closed position it shows that the pilot jet is too small. When you have found the pilot jet that will run steadily with the air valve $\frac{1}{4}$ open, that is $\frac{3}{4}$ of its movement above the main jet, you can proceed to tune the main jet.

Mount the machine and open up the throttle to about $\frac{1}{4}$ of its opening. If the machine gets away all right with the air shutter $\frac{1}{4}$ open, and runs better as you proceed to open the air valve wide, the main jet is probably too large, and you should try one jet smaller. If, on the other hand, when the throttle is opened $\frac{1}{4}$, you cannot get away without a lot of spluttering and back-firing which disappears if you close the shutter, this shows that the main jet is too small, and you should try a larger one.

The jets can be removed by undoing the large square or hexagon adaptor, which is also a filter underneath the barrel. The jet key supplied with the spares will remove the jets. Twin cylinder owners should make sure that both cylinders are firing. Try running the engine on each cylinder separately by shorting one plug at a time with a screw-driver. From time to time take the carburettor to pieces and thoroughly clean all parts, especially the float-chamber and filters.

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. It is sound practice to fit one of the proprietary valve attachments, such as the " F.E.W." or " Flexekas." These devices enable the valve stems to be continually and amply lubricated, thereby ensuring long life for the valve guides, and at the same time they eliminate all air leaks. Induction pipe air leaks are usually

caused by forcibly man-handling the pipe instead of coaxing it into position.

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 Sooted 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.

Synchronizing Twin Cylinder Magneto. See that the cams on the contact breaker are of equal height, as shown by measuring the gap between the platinum points at each " break." For this purpose use the " feeler " gauge. If the gaps differ, get them both to the exact distance recommended by the makers ($\frac{1}{2}$ mm.) shown by the gauge on the magneto spanner.

Magdyno Lubrication. The 9·96 h.p. twin cylinder model M1 is fitted with a Lucas magdyno as standard. This dual instrument supplies current both for the purposes of ignition and for illumination. The lubrication is the same as for the ordinary magneto. Generally ample grease percolates through from the gear wheel casing to lubricate all bearings on the driving end. The dynamo commutator end-bearing can readily be lubricated by removing the hexagon nut securing the end cover and placing a small quantity of grease or a few drops of oil in the bearing housing. The magneto bearing, at the contact-breaker end, should run perfectly without attention owing to the effective manner in which it is protected. Should the gears run completely dry they may be packed with a high melting paint grease.

Cleaning out Silencer. The A.J.S. silencer seldom needs cleaning, but if back-pressure through choking is suspected, strip the silencer and prick out all holes and carefully clean with paraffin and stiff brushes.

Handling Petrol Pipes. Petrol pipes should be handled more gingerly than any other details on the machine. They are easy to twist, and their soldered unions are easily rent asunder. Therefore, spanners should not be used as wrenches on the union nuts. Should a union spring a leak, soap will make as good a

caulking medium as anything. If a pipe is split, rubber tubing will serve temporarily to stop the leak. For this purpose a piece of rubber tubing from the acetylene generator may be utilized. Petrol pipes should never be coiled so that the coils have horizontal axes. This tends to create air locks.

Removing Tight Studs. Fig. 68 shows how obstinate studs may be removed for the purposes of replacement. Two nuts are locked together, and a spanner used on the bottom one to unscrew the stud.

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

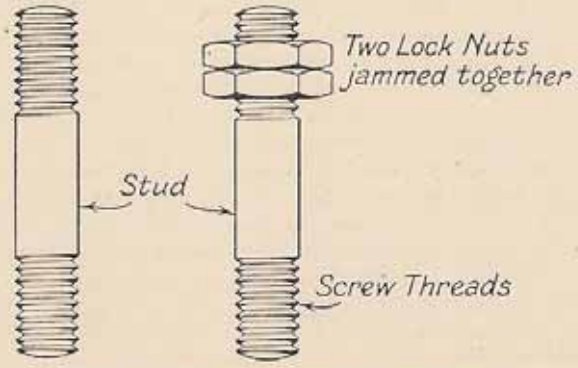


FIG. 68. HOW TO REMOVE TIGHT STUDS

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 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 head in place. It may strain or distort the cylinder.

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 is 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. A straight-edge will be useful in testing for alinement.

Attention to Gear-box. The gear-box needs no attention whatever with the exception of replenishing with oil every 500 to 800 miles. Oil as used for the engine is suitable, but in any case a thick oil is the most suitable. It will facilitate the entry of oil into the box if the back wheel is slowly revolved (with gear lever in neutral) while pouring in the oil. An oil level indicator is provided in the form of a plug on the left-hand side of gear-box, looking at it from the front (see Fig. 69). When pouring in oil leave the plug out, and as soon as oil begins to overflow, replace it. This is the correct level, and no more oil need be inserted.

Adjusting Chain from Engine to Gear-box. To adjust this chain it is only necessary to slack off the two nuts on top of bracket and slide the box bodily backwards by means of the adjusting sleeve (also seen in Fig. 69) situated at the rear of bottom bracket. It is important that the nuts are screwed tightly again after adjustment. The chain should be adjusted, and kept adjusted, so that it can be pressed down in the centre with the finger about $\frac{3}{8}$ in. After primary chain adjustment it is usually necessary slightly to alter the adjustment of the gear control. Place gear lever in low gear position, disconnect the vertical rod and adjust so that the rod, when replaced, is just under compression.

Dismantling Gear-box. To dismantle the box, the following procedure must be carried out—

First disconnect the speedometer drive (fitted to all models except M5 and M12) by unscrewing the lock-ring of the cable at the gear-box end. Then detach the Bowden cable from the clutch operating lever on gear-box, and also external connections to gear lever. To remove the cable mentioned press the lever

inwards sufficiently to allow the nipple of the cable to be slipped out of the slotted end. Next unscrew the six small pins round the cap, which hold this to the gear-box cover. The clutch operating mechanism can now be taken off entirely. Take care when doing this not to lose the short push-rod. It will be found that on the end of the mainshaft a thrust lock-nut is fitted. This

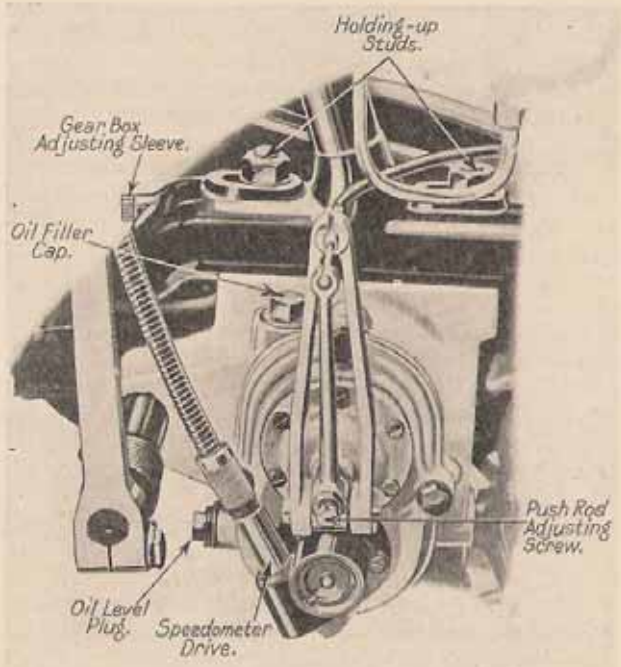


FIG. 69. SHOWING CLUTCH OPERATION AND SPEEDOMETER DRIVE
The clutch operation is identical on all models, but the speedometer drive is omitted on models M5 and M12

has a left-hand thread, and the punch provided in the tool kit should be used to unfasten it. An arrow will be found on this nut pointing towards the left; this is the direction in which the nut must be unscrewed. Behind this will be found the ball thrust nut; remove this and the thrust washer. To take this out push the mainshaft back a little so as to allow the washer to be withdrawn. This washer fits down on a dowel peg, and considerable care should be taken when replacing to ascertain that this is correctly in place. Now take out all the bolts round the cover of the box, and pull the cover off. The low gear dog wheel

and layshaft can then be taken out, also the sliding sleeve. The mainshaft, complete with clutch, etc., can be drawn out from the opposite side of the box. To reassemble simply reverse these operations.

Attention to Clutch. If the clutch should slip when climbing steep hills, tighten up the clutch spring a little by means of the adjusting nut on the end of the clutch shaft, and adjust the Bowden cable until there is a little play in the lever. Do not tighten up the spring more than necessary to obtain a perfect grip, or unnecessary strain will be put upon the Bowden control, etc., when the clutch is disengaged. Under no circumstances put oil into the clutch. To take up excessive backlash in the Bowden lever on the handlebar, adjust by means of the operating shaft adjusting screw shown in Fig. 69 (also in Fig. 3). A further adjustment is also provided at the point through which the cable passes. However, always allow a little backlash in the lever, or the clutch spring cannot exert all its pressure on the plates. If the clutch slips without any obvious reason, take it apart and ascertain whether any portion of the mechanism is fouling another, and so keeping the plates apart. If the key in boss of clutch plate (No. 2, Figs. 70 and 71) should foul the end of the slot in the shaft it would prevent the clutch engaging. If it becomes difficult to disengage the clutch, smear a little oil on that portion of the shaft on which the outer plate slides. To those riders who prefer a light adjustment of the clutch, the following hint may be useful. A clutch that is lightly adjusted will sometimes slip for a time after changing gear, but the slip will cease if the throttle is momentarily closed when the slip takes place. This is explained by the fact that for the moment the drive is taken off the clutch and allows the plates to settle down to their work. Oil the clutch operating lever occasionally.

Adjusting Chain from Gear-box to Rear Wheel. Slack off the nuts on each side of back hub spindle, and move the wheel backwards by means of the adjusting screws in fork ends. Care must be taken to adjust each side equally, or the wheel will be out of alinement (see notes on rear wheel alinement, page 124). The chain adjustment should be such that it can be depressed with the finger in the centre about ¾ in. Screw the spindle nuts up tightly again after the chain is properly adjusted. It may be found that moving the wheel has caused the brake to be "on." This is easily rectified by means of the brake adjustment.

Dismantling Clutch. To dismantle the 9·96 h.p. clutch take off the front portion of chain case by unscrewing the two pins, when the cover can be removed. The above applies also in the case of models M8, M9, and M10, but in addition, the brake rod will have to be detached by taking out the cotter pin of the front

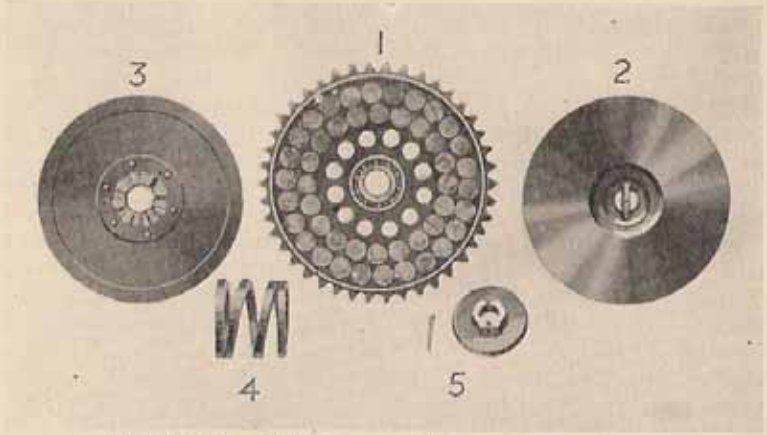


FIG. 70. THE 2·48 H.P. AND 3·49 H.P. CLUTCH PARTS

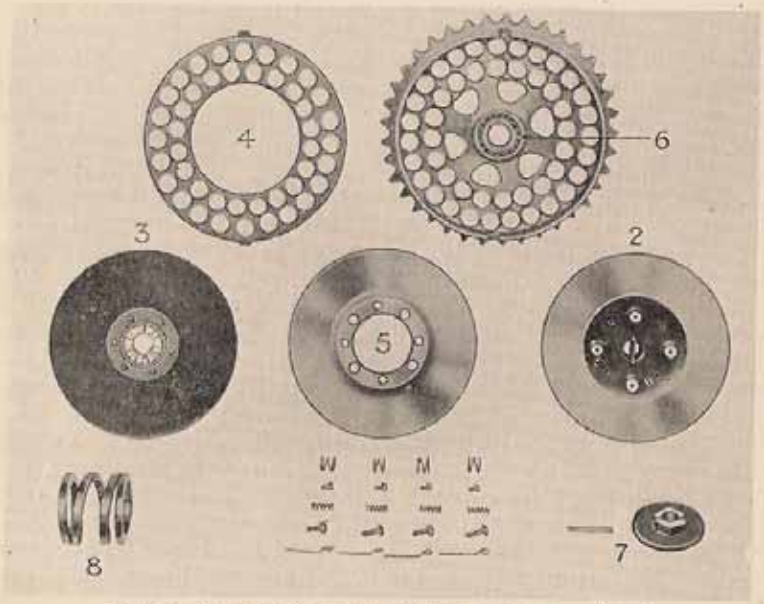


FIG. 71. THE 4·98 H.P. AND 7·99 H.P. CLUTCH PARTS

yoke end and moving this out of the way. In the case of M3, M4, M5, M6, and M12 the chain case complete will have to be detached. Unscrew the clutch spring adjusting nut (No. 7, Fig. 71 and No. 5, Fig. 70) and remove the spring (No. 8 and No. 4), after first removing the split cotter passing through the nut. This will allow the clutch plates to be drawn off the clutch shaft. Before replacing, wipe the clutch plates clean, and smear a thin film of oil on the portion of shaft on which the front clutch plate slides. Also, before replacing, examine the lock-nut which holds the fixed plate in position. If loose, see that it is carefully tightened up again. It is, of course, necessary to take the chain off the clutch sprocket before the latter can be removed. It will be found that a flat key passes through a slot in the end of the clutch shaft, and fits in the boss of front of sliding sleeve. Great care must be exercised to see that this key is in its proper position, or the clutch plate cannot be disengaged. To fit this key (No. 2, Fig. 70) when reassembling the clutch, turn the shaft till the slot is perfectly horizontal. Then put the key in the slot with each end projecting equally on each side of the shaft. The sliding plate should then be slipped on its shaft with its keyway in a corresponding horizontal position.

Clutch Plate Adjustment. Sometimes much difficulty is experienced in disengaging the clutch due to clutch " drag," caused by excessive lateral movement of the plates. This " drag " is generally caused through movement of plate 5 (Fig. 71). In the case of the 4·9 h.p. and 9·96 h.p. clutches, if the clutch plates Nos. 1 and 3 (Fig. 71) are removed, it will be found that plate No. 5 is driven by four pegs on the sliding plate No. 2. There will also be seen four adjusting pins which are secured by a locking device consisting of four short lengths of spring wire (Fig. 72) which fit into slots in the heads of the pins. The pins have two cross-cuts at right angles to each other, and the locking device wires are correctly set when the clutch plates are assembled by the makers.

When the adjusting pins require attention, all that has to be done is to raise the spring wires out of their cross-cuts, and push on one side. If plate No. 4 has too much movement between plates 2 and 5, screw up the four adjusting pins until there is little or no movement, but be quite sure that plate No. 4 is free to revolve between plates 2 and 5. After adjustment see that the locking wires fit in the cross-cuts of the adjusting screws.

Care of Chains. Chain adjustment hitherto described is very important. If a chain is too slack, it is apt to " whip," which intensifies the wear and tends to break the rollers, especially in the case of the front chain. If, on the other hand, it is too tight,

a crushing effect is produced on the rollers, and the whole chain is stressed unduly.

As the chains on all A.J.S. models, except the 9·96 h.p. ones, are only partially enclosed, it is a good plan to make a point of oiling the chains every day before starting out. One oiling will suffice for a day's riding, whatever mileage is done. An oil gun is the best means of oiling the chains. With this instrument draw a charge of oil from the oil compartment of the tank, and insert spout of oiler into the chain case oil plug hole, which will be found on top of the part of the chain case above the front chain.

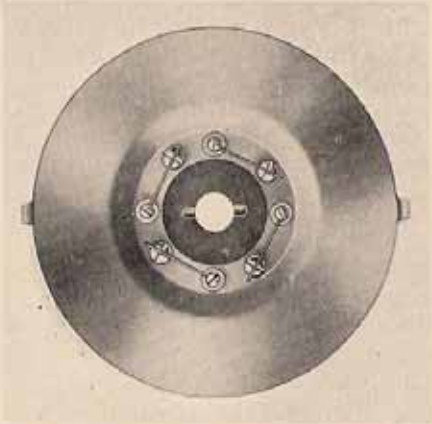


Fig. 72. Clutch Plate Adjustment

Lift the exhaust valve, and while pressing down plunger of oil gun, slowly turn the engine over with the foot starter, being careful to see that the oil from the oil gun is falling on the chain. This ensures the whole chain being well lubricated. Treat the rear chain in the same way by revolving the back wheel. Long life, less need of adjustment, and complete satisfaction with the transmission are assured if the rider will make a point of oiling his chain frequently. From time to time the chains should be removed and thoroughly cleaned in a paraffin bath. A method of testing a chain for serious wear is to remove it and note the amount of lateral flexion that can be given to it when extended to its full length. If the teeth of a sprocket have become badly hooked, the sprocket should be replaced or much damage to the chain will ensue.

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

can be resisted by the teeth, and not by stretching the chain by hand. Also see that the open end of the spring faces the direction of chain rotation.

Removing Chain Guard. On all 3·49 h.p. and 4·98 h.p. models the following procedure is necessary for removal of chain guard. First disconnect the rod from the foot pedal by undoing the yoke end pin. Then remove the two bolts found on the forward end of the guard, then the rear bolt on chain stay clip and the anchorage to carrier stay. The rear portion of guard can be removed independently of the front by means of the carrier stay anchorage previously referred to. It will be found, however, unnecessary to remove brake rod.

Chain Repairs. Chain repairs are rarely necessary. When they are, they may be readily effected with the aid of a box of spare links, and the rivet extractor in the tool kit.

Play in Steering Head. All play in steering head should be taken up by means of the split lug and lock-nut adjustment. The adjustment should not be too tight, or the balls in the steering head may be damaged. Keep this bearing well lubricated.

Handle-bar Adjustment. With the exception of model M12 all the 1929 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.

In the case of model M12, unscrew the bolt which will be found in the centre of the handlebars about four or five turns and give this a sharp tap with a hammer. Slacken the nut of the bolt which passes through the split lug round steering head and the bars can be raised or lowered as desired, afterwards tighten up the bolt. To adjust for any play in the ball head, slack off the split lug referred to and adjust by the large hexagon head nut on top of steering column, turning to the right to take up slack and vice versa. Afterwards tighten up the bolt of split lug.

Spring Fork Adjustment. To take up any play that may have developed in the side links, unscrew the spindle lock-nuts on the right-hand side of the forks (looking at the machine from the front), and turn the spindles by means of the adjusting bolts seen in Fig. 73 on the left-hand side until all slack is taken up. Afterwards tighten up lock-nuts. Use the grease gun on the five nipples every 300 miles.

Removing Rear Wheel. The rear wheel on all A.J.S. machines, with the exception of the lightweight and M7, is of the quickly detachable type. It can be removed in 30 seconds! In the case of the models just mentioned, the wheel and driving sprocket are

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. 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 model M12. In the case of the sidecar outfits all three wheels are interchangeable, and the rear wheel can be interchanged with the front ones.

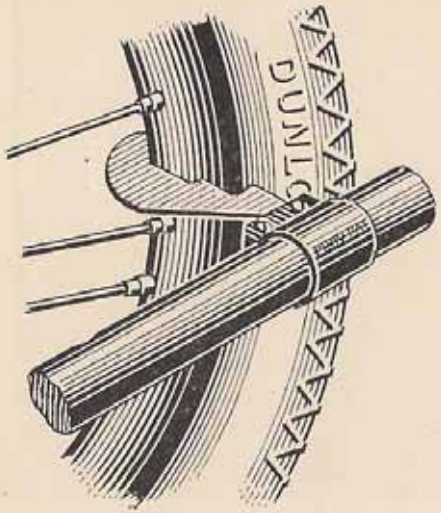


Fig. 75. Rear Wheel Alinement

Footstarter Adjustment. The footstarter shaft upon which the crank is mounted is splined, and the crank is split at its lower end and provided with a bolt which tightens the crank on the splined shaft. The return spring is carried around outside the shaft bearing tube, one end being anchored to the bolt. If this return spring has been removed, to refit pass a piece of cord under hook of the spring and pull it down until it is again hooked round the bolt. Afterwards tighten up the bolt. Should the footstarter crank be removed, refit so that it is just over vertical, i.e. inclined slightly to the rear of the machine. On pre-1929 models a cotter fixing is used.

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, which passes round the tube. In the tool kit will be found a flat gauge that can be fitted round the rim (see Fig. 75). 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.

Care of Wheel Bearings. Periodically shake and pull the road wheel 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. Lubricate the hubs with special hub lubricant every 2,000 or 3,000 miles.

Removing Front Wheel (2·48, 3·49, and 4·98 H.P. Models). 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 wing nut. The front brake adjustment is carried out in a similar manner.

Speedometer Lubrication. The speedometer requires no attention other than occasionally uncoupling the flexible drive and pouring some engine oil down between it and its casing. The instrument is let into the tank and held in position by a long pin which passes through the tank and is held by a fly-nut. To remove the instrument, unscrew the fly-nut and withdraw bolt and disconnect the cable drive from the gear-box.

Frayed Control Wires. As soon as control wires show signs of bad fraying, renew. Once they start to wear badly their end is 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. Before inserting a cable in its casing it should be liberally greased. If an exhaust lifter cable breaks, the engine may be started by opening the compression cock slightly in the manner of a decompressor, closing instantly the engine fires. Should a throttle control cable pull out of its nipple at the lever end, the cable should be splined out over the end of the casing, fixed up in a convenient position, and the few remaining miles of the journey completed by using the air lever and pulling on the cable casing when required. If possible get a mechanic to cut the frayed portion off and resolder after adjusting for length. This operation should only take about fifteen minutes. It is rarely advisable to do the soldering at home. Very hard solder must be used, and the job done thoroughly; otherwise the cable will be an endless source of worry and trouble.

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 chalk marks the evenness of contact, adjusting spokes accordingly.

Sidecar 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 must be parallel. The method of procedure is self-evident (Fig. 76). The cycle should be fixed so that it is dead upright.

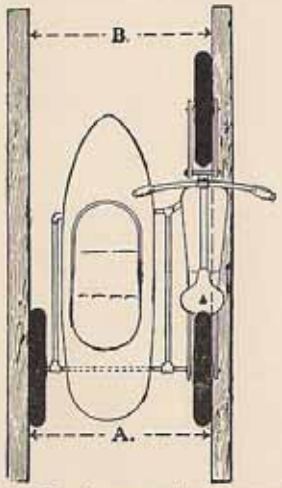


FIG. 76. SIDECAR ALINEMENT
The distance *A* and *B* must be equal

Maintenance of Lamps. Acetylene generators must be kept thoroughly clean throughout if proper gas generation is to be effected. Also the burner must be pricked out with fine wire frequently. An acetylene lamp must not be allowed to burn out, but should be blown out; otherwise the burner will very soon become choked with carbon. In the unfortunate event of the rider's lamp blowing out when no matches are available, the sparking plug may be used to light the lamp.

When a machine has a "Magdyno" lighting set, the accumulators should always be kept on charge, or they will rapidly deteriorate and become useless. When not in use, alternate slow charging and discharging keeps them in good condition. Two accumulators should be fitted, so that one may be kept on charge while the other is not in use.

Tyre Maintenance. Tyre inflation has already been dealt with in Chapter III. Never run even a short distance on a deflated cover. It seriously strains the fabric and shortens the effective tyre life very considerably. Make a practice of occasionally going over the tyres and pricking out all small flints with the aid of a sharp pen-knife. Never leave the machine standing days on end unjacked. This is very bad for both wheels and tyres. Also be careful not to allow oil to get on the rubber, it will soon cause rotting. When one is riding in a blazing sun on a hot summer day the air in the tubes expands very greatly, due to the tyres getting hot after a time owing to their contact with the scorched roads, and the pressure should be relieved now and again by touching the Schräder valve pin.

Re-enamelling. While on the job of overhaul the owner can,

if he likes, tackle the job of enamelling. But he cannot expect to get really lasting results, because he does not possess the means for stove-hardening the enamel like the manufacturers do. It is therefore best, if possible, to get the whole business done at Wolverhampton for quite a moderate charge. But remember the manufacturers cannot be expected to furnish an exact estimate until they have stripped the machine and know exactly how things stand. Therefore, do not inundate the repairs manager with queries regarding cost of plating and enamelling. Send the machine along and get an estimate afterwards. However, if the amateur decides to do it himself, the machine should be completely stripped and the old enamel scraped off to the metal with a knife, and then polished smooth with fine emery cloth. A coat of good quality enamel should then be applied with a brush. When dry it should be rubbed down with glass paper, and then another coat applied. This should be repeated until at least five coats have been applied, and then finish off with a coat of special varnish. When thoroughly dry the machine can be reassembled, and is now again ready to take the road. Black enamel gives the best service and, on the whole, the best appearance.

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 must be made with various ignition timings, and the carburettor tuned for speed. Gear ratios must 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 the 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.

A WARNING. Speed merchants who own camshaft models, and who wish to raise the compression ratio beyond the normal, should note that it is not possible to do so by lowering the effective length of the cylinder barrel by removing metal from either end, as this alters the chain centre. Similarly, the compression ratio cannot be lowered by the insertion of a cylinder gasket.

CHAPTER VI

FAULTS : THEIR LOCATION AND REMEDY

THE four tables given on succeeding pages enable faults to be located readily by means of a system of elimination. The experienced driver can narrow the possible causes of trouble to a very small field almost immediately. Troubles, however, are now so rare that little heed is paid to them until they actually arise. But it is advisable to be prepared for all contingencies. The chapter dealing with the engine should have given the reader a general idea of what troubles to expect. Remember that IF A CHARGE OF PROPERLY PROPORTIONED GAS IS COMPRESSED INTO THE CYLINDER, AND A SPARK OCCURS AT THE RIGHT TIME, THE ENGINE MUST FIRE. It cannot do otherwise. Troubles are usually due to faults either in (1) the ignition system, (2) the carburettor, (3) the engine mechanism itself. In tracking down the origin of engine trouble, it is highly important to make a mental note of the symptoms displayed immediately before the engine "gives up the ghost." This should greatly assist quick and accurate diagnosis. Do not get "hot and bothered" over an engine, and start vigorously pulling things to pieces—they have all to be replaced, by the way—but calmly reflect upon the probable cause of trouble and act accordingly. It may be mentioned that a complete engine stoppage is usually more easy to rectify than a partial one. We will now deal with some of the principal troubles and their remedies, starting with ignition troubles first, as they are by far the most frequent. The symptoms of any particular trouble may, of course, apply to other troubles, but a particular trouble always produces definite symptoms.

IGNITION TROUBLES

Pre-ignition

Symptoms. Sudden stoppage during hard work, either with a very dirty engine or a new sparking plug. Probably knocking occurs. Slight bouts of pre-ignition are often confined to hill work; the engine starts knocking and ceases work at once. In some cases it is due to overheating alone, and the engine will restart immediately after cooling. In others it is due to running with spark too far advanced.

Remedy. This varies with the cause. If due to carbon deposits, decarbonize; otherwise clean or renew sparking plug. If due to overheating alone, allow to cool and give more oil. Verify magneto timing.

Wet Plugs

Symptoms. Misfiring or stoppage of cylinder concerned due to shorting through water particles.

Remedy. Dry plugs and wrap terminals with insulating tape, if necessary.

Oily or Sooted Plug

Symptoms. Same as for wet plug.

Remedy. Clean or renew plug, and cut down oil supply.

Plug Points Too Far Apart

Symptoms. Great difficulty in starting but no trouble once started.

Remedy. Reset points with gauge.

Bad Condition of Contact Breaker Points

Symptoms. Misfiring or cessation of work.

Remedy. Adjust " break " and clean contacts. Make certain that contacts close properly.

Rocker Arm Sticking

Symptoms. Irregular firing of engine due to rocker arm of contact breaker sticking. This arm has a small fibre bush bearing, and in damp weather this occasionally swells and causes the rocker to stick intermittently.

Remedy. Remove bush and carefully ease it with emery cloth or a file. Do not oil it. This will produce further swelling.

Broken Contact Spring.

Symptoms. Sudden and complete stoppage.

Remedy. Replace spring, or effect temporary repair with a small elastic band.

Insulated Contact Points

Symptoms. Engine cannot be started. Insulation is caused by dirt or oil. It is a common practical joke to place a slip of paper between the points ; this insulates them also.

Remedy. Clean and reset points, or remove paper slip with as mild language as possible.

Loose Contact Points

Symptoms. Intermittent misfiring. Looseness discernible to eye on scrutiny.

Remedy. If the platinum itself is loose in screw, get the rivet soldered tightly in place by a jeweller. If screw is loose, tighten up lock-nut.

Weak Contact Breaker Spring

Symptoms. Missing at high speed after big mileage.

Remedy. Renew offending article.

Magneto, Loss of Magnetism

Symptoms. Great difficulty in starting unrectified by all ordinary adjustments. Engine runs fairly well at speed, but poorly at low speed. This trouble, however, is rare.

Remedy. Send to makers for re-magnetizing.

Condenser Broken Down

Symptoms. Misfiring or stoppage with heavy sparking across the contact-breaker points which are rapidly pitted and blackened. If a magneto suddenly starts eating up the platinum contacts, suspect a faulty condenser immediately.

Remedy. Return to factory.

Magneto Insulation Broken Down

Symptoms. No " juice " anywhere.

Remedy. Send back to makers.

Defective High Tension Cable

Symptoms. Occasional misfiring due to rubber on cable becoming burnt by contact with hot cylinder, or rotted, thereby causing defective insulation.

Crossed Wires

Symptoms. Usually the engine fails to start though inspection reveals a spark at each plug. Explosions may occur in the silencer, or the engine may backfire.

Remedy. Connect up the high tension cables to their respective plug terminals.

Slipped Magneto Timing

Symptoms. Very sudden stoppage after running perfectly. If the sleeve lock-nut on the armature shaft works loose, the timing may slip, but it rarely happens, and cannot possibly happen on the 9·96 h.p. engines. Symptoms are unmistakable.

Remedy. Re-time and do up nut securely.

Defective Carbon Brush

Symptoms. Rank misfiring or stoppage due to beads of water or grit between the contacts.

Remedy. Clean slip-ring and see that the carbon is not broken or cracked. Also see that brush is held down by the spring properly.

Incorrect Magneto Timing

Symptoms. If too far advanced, very difficult starting and pronounced tendency to knock at the least provocation. If over retarded, great loss of power with explosions in exhaust.

Remedy. Re-time magneto with vernier adjustment.

Broken Ignition Cable

Symptoms. Those of incorrect timing in the direction of lateness, producing loss of power and, perhaps, red-hot exhaust pipe.

Remedy. Obvious. Temporary repair may be effected by securing cam-ring on three-quarter advance position, and running on fixed ignition.

CARBURETTOR TROUBLES

Punctured Carburettor Float

Symptoms. The effects vary from complete flooding (when petrol is visibly dripping from carburettor) to choking and starting difficulties. An engine normally started easily with slight "tickling" will now be difficult to start, while an engine normally only started with liberal "tickling" will start readily. If the trouble is mild there may be merely slight overheating and excessive petrol consumption. When the float is removed and shaken, petrol may be heard splashing about inside.

Remedy. Immerse the float in boiling water, thereby volatilizing and expelling all petrol. Mark the puncture indicated by air bubbles, and send the float to a jeweller to get the hole sealed with a small blob of solder. When repaired, place the float in water and see whether it swims on an even keel. If not, correct balance by adding another spot of solder in an appropriate position; otherwise the float will tend to bind on its spindle in the carburettor.

Water in Petrol

Symptoms. Intermittent misfiring occasionally bad enough to cause a stoppage, and "popping back."

Remedy. If trouble does not rectify itself, drain tank, clean gauzes, and refill tank.

Choked Jet

Symptoms. Misfiring or stoppage.

Remedy. If a choked jet is suspected, take out the clutch and open the throttle wide for a few seconds. The extra suction concentrated on the jet by this violent acceleration will often clear the jet. Failing this, remove and clean, or insert a spare. A jet should be cleaned very carefully indeed. Blow through

orifice hard and see whether this removes obstruction. If it does, leave the jet alone afterwards.

Jets Wrong Size

Symptoms. Indifferent general performance of engine.

Remedy. Tune the carburettor (see page 111).

Incorrect Petrol Level

Symptoms. If too high, petrol will slowly drip from jet orifice and issue from bottom of spray chamber, and overheating and high petrol consumption will ensue. If too low, the engine will be difficult to start, and will run best at high speed, but never develop full power.

Remedy. Readjust by moving the float slightly upwards on its needle. First see that the carburettor is "square" with the engine. If tilted, the petrol level will be altered accordingly.

Needle Valve not Closing Properly

Symptoms. They vary from mild to profuse flooding of the carburettor.

Remedy. Clean valve seat and valve itself and grind-in with the fingers until a ring contact is evident. Be careful to hold needle quite vertically when doing this. See whether needle is bent, and renew if it is so. Verify float action.

Choked Petrol Pipe

Symptoms. Engine runs well at small throttle openings but weakly at speed and when hill climbing. Moreover, the carburettor cannot be flooded instantly.

Remedy. Remove and clean.

Sticking Carburettor Slides

Symptoms. Erratic behaviour of engine and uncertain response to control movements.

Remedy. Dismantle, clean, and adjust until they work up and down freely.

Choked Air Vent in Petrol Tank

Symptoms. This can easily be mistaken for a choked petrol pipe, there being, of course, insufficient fuel supplied to the carburettor owing to a partial vacuum caused by petrol displacement.

Remedy. Obvious.

Defective Control Cables

Symptoms. Control cables may be slack, broken, or stiff. In any case the engine will not respond correctly to the control lever movements, and erratic running will result.

Remedy If slack, take up the slack with adjusting screws; if broken, renew or repair; if stiff, remove frayed portions and grease, or if necessary, renew.

Petrol Spraying from Air Intake

Symptoms. Self explanatory. Wet petrol is blown against the hand held to the air intake. It is occasionally accompanied by loss of power, overheating, and heavy fuel consumption.

Remedy. If engine runs well do not pay much heed to this trouble. It occurs to a certain degree with 90 per cent of the petrol engines on the road. If the phenomenon is so marked as to impair running, renew the inlet valve spring.

Air Leaks at Induction Pipe

Symptoms. Difficulty in starting, slow acceleration, inability of engine to take full air.

Remedy. Bind with adhesive rubber tape, or better, use a jointing compound.

Carburettor Ablaze

Symptoms. Horribly obvious.

Remedy. Instantly switch off petrol and open throttle. The petrol in carburettor will be then used up rapidly. Also try and smother the seat of the fire with a rag or cap if available. No disastrous effects should then accrue. If, however, any delay is made before taking action, the flames will spread to the petrol tank, and if that ignites it will be fatal for the machine. When the fire is quenched the rider should ascertain the cause, and take such action as will prevent a recurrence. Common causes are petrol dripping on part of hot exhaust system, an electrical short circuit, and sticking inlet valve causing a blow-back of burning gas into the carburettor.

ENGINE TROUBLES

Gummed-up Piston

Symptoms. Impossibility of turning cold engine over fast enough to fire.

Remedy. Prime.

Seized Piston

Symptoms. If, when travelling on the road, the machine pulls up suddenly for no apparent reason, piston seizure can be suspected. If the rider is travelling fast when this occurs, a violent skid will ensue, which should be corrected by instantly declutching and tuning into the skid.

Remedy. After the cylinder has cooled down pump sufficient

oil into the engine to produce a smoky exhaust, get the engine re-started and proceed quietly until the machine can be examined by a competent mechanic.

Sticking Inlet Valve

Symptoms. If stuck permanently open, there is no compression and violent puff-backs can be heard emerging from the carburettor, sometimes accompanied by smoke or flame, or the carburettor may be even set on fire. If occasional sticking occurs there is loss of power and the foregoing symptoms disappear and reappear.

Remedy. Clean valve stem and examine spring. If weak, renew.

Wrong Valve Clearances

Symptoms. Loss of power, noise.

Remedy. Reset (as described in previous chapter) with gauge.

Piston Rings Stuck in Grooves

Symptoms. Loss of compression, hot crankcase, hissing heard in crankcase.

Remedy. Remove and clean grooves. If piston rings are discoloured, renew.

Exhaust Valve Stuck Open

Symptoms. If partial, loss of power, explosions in silencer; if jammed completely, no compression and cylinder ceases firing.

Remedy. Remove valve and examine seat for particle of grit that might prevent valve seating properly. Also inspect for dirt in guide, binding valve stem, no valve clearance, broken spring, wrong valve lifter adjustment, and anything likely to prevent the valve seating itself.

Insufficient Lubrication

Symptoms. If slight, weak running, especially on gradients, with tendency for pre-ignition. If gross, dreadful knocking, marked overheating, terminating in a partial or complete seizure.

Remedy. More oil or better quality oil.

Loose Gudgeon Pin Bearing

Symptoms. A slight metallic click, accelerating into a jingle at speed.

Remedy. Fit a new bush (see page 115).

Leaky Valves

Symptoms. Poor compression, power unsatisfactory. Inspection reveals pitted faces and seats.

Remedy. Grind-in.

Loose Bearings

Symptoms. Gradual power decline and development of rattly noises. A tight engine (not an engine full of alcohol!) should emit the following noises only, viz., click of the valves, suck of air intake, and puff of the exhaust. If in addition to these noises a rattling looseness becomes audible, the bearings are in a bad state.

Remedy. Give the machine a complete overhaul.

TABLE I

ENGINE REFUSES TO START

OBSERVATIONS			PRIMARY CAUSE
No petrol at jet			Needle of float sticking Air vent in tank choked Air lock in petrol pipe Choked petrol pipe No petrol in tank Petrol cock closed Choked jet
Carburettor floods when "tickled"	Spark at points of plug		Air leak Wrong setting of carb. levers Closed throttle Controls failing to work Magneto timing slipped Incorrect timing Weak spark
	No spark at plug	Spark at terminal	Weak spark Plug sooted Plug short-circuited
		No spark at terminal	Contact breaker sticking Contacts dirty or worn Short circuit H.T. cable detached Loose contact points Broken carbon brushes Insulation of mag. broken down Magnets need re-magnetizing Key of contact breaker sheared

TABLE II

ENGINE STOPS

OBSERVATIONS		PRIMARY CAUSE
Petrol supply Faulty		Closed petrol tap Jet choked No petrol Petrol pipe choked Float needle stuck Air vent in tank closed
Good compression	Carburettor O.K.	Under-lubrication Excessive valve clearance Overheating Defective controls Valve spring broken Air leak Valve broken Valve cotter broken Wrong timing
	Carburettor defective	Carburettor flooding Float needle sticking Punctured float Choked jet
Bad compression		Valve badly pitted Valve spring broken Valve cotter broken Rings gummed up Rings broken Ring slots in line Valve guide tight Cracked piston No valve clearance Cracked gudgeon pin

TABLE III

ENGINE RUNS BADLY

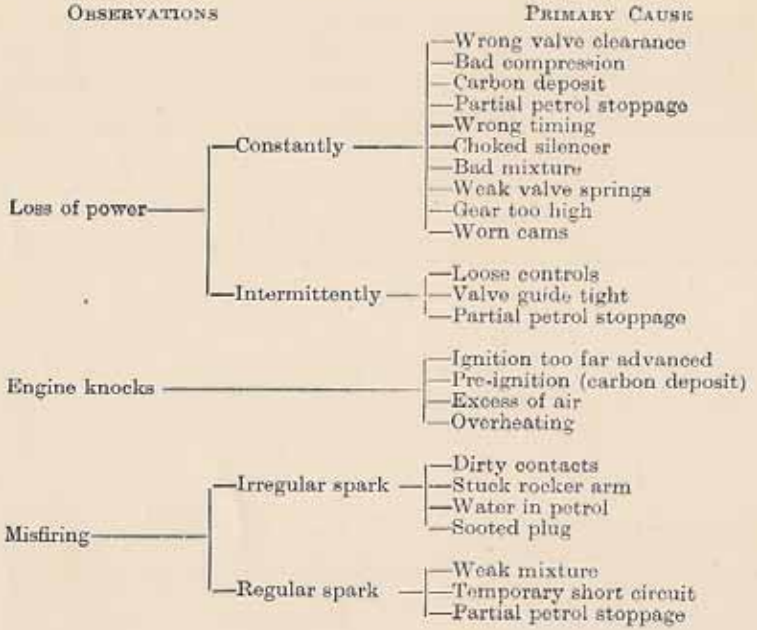
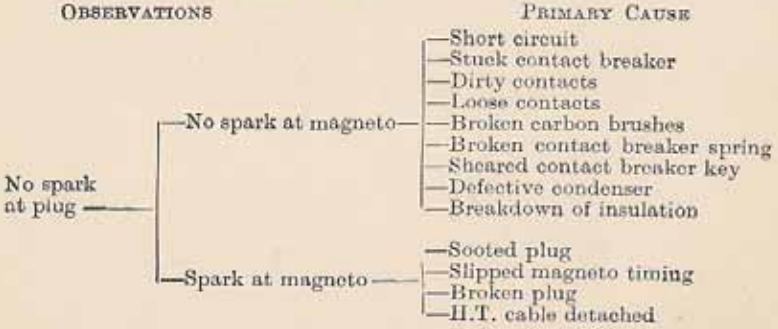


TABLE IV

ENGINE STOPS DUE TO IGNITION



CHAPTER VII

RUNNING COSTS AND TOURING

IN this chapter we will consider briefly the expenses connected with motor-cycling, and thereafter we will discuss some matters relating to touring. Every motor-cyclist, sooner or later, has a desire to extend his field of activities. He becomes tired of constantly wandering over his old routes, which are usually confined to a radius of about 50 miles from his home, and he wishes to set out on a long distance tour, either in this country or abroad. For the present let us deal with running costs.

RUNNING COSTS

Cost of the Machine. This is the principal cost of motor-cycling, representing as it does an initial outlay of some £50 or more, according to the type of machine purchased. But remember this is really an investment, and the expended capital can be recovered minus a certain sum representing depreciation on selling the machine.

Depreciation. This ugly item is an added reason for purchasing a reputable machine in the first place, for such machines always command a fair market price. It is a hideous fact, but nevertheless true, that the purchaser loses at least £5 in removing the machine from the shop window. From that time onwards the machine can no longer be regarded as new. It stands to reason that depreciation depends mainly on the way the machine is kept, but it also depends largely upon the age of the machine. Many people will not buy a machine that is more than three or four years old (old in the sense of date of design). Therefore, unless the rider intends to stick to the machine until it is thoroughly worn out, it usually pays to sell after a couple of years' riding. The vendor may then reasonably hope to recover at least 50 per cent of his capital expenditure. If the machine is in sound condition, and the appearance is still good, he may get back as much as 70 per cent. In reckoning the cost of motor-cycling, this factor must be taken into consideration. Reckless or careless driving and general neglect of the machine cause depreciation to be very rapid, and motor-cycling becomes a costly affair.

Cost of Licences. This has been already dealt with in Chapter II. It represents a very fair outlay to the motor-cyclist, and is rather disproportionate to the damage done to the highways.

However, under the present system of taxation, it must be faced cheerfully.

Garaging. Keeping a solo motor-cycle at a public garage costs about 2s. 6d. a week on the average, or £6 a year, and a combination an extra shilling a week. If circumstances permit, it is well worth while erecting a cheap shed or buying a portable and collapsible shed ready-made. Overhauls can then be carried out in perfect seclusion and, moreover, no objection can be made to coming in at "unearthly hours." Such a shed should not cost more than £7 or £8, and, of course, it will last indefinitely.

Petrol Consumption. Petrol consumption depends on many factors. Fast driving or driving on low gears results in a high consumption. Also a badly tuned carburettor will not contribute to fuel economy. Speaking generally, however, a 2¾ h.p. or 3½ h.p. machine should have a fuel consumption of at least 80 m.p.g., and when specially tuned should do about 90 to 100 miles on a gallon of spirit. A 4 h.p. machine should do at least 60 m.p.g., and an 8 h.p. machine at least 40 m.p.g. with sidecar. Ridden solo, these two last-mentioned machines should have a still smaller petrol consumption.

Oil Consumption. One quart of oil should suffice for a mileage of at least 500, with considerate driving of a solo machine up to 3½ h.p., and at least 350 in the case of the higher powered machines.

Tyres. Tyres, when well inflated, should have a useful life of from 4,000 to 8,000 miles. A certain amount of luck enters into the question, for a severe gash due to a piece of broken glass may practically ruin a new tyre ; but this rarely happens. Some words on tyre maintenance have already been given in Chapters III and V. When buying new tyres it always pays to get the best, and nothing but the best.

Sparking Plugs. Quality here again is important. Cheap plugs give poor service, and soon want renewal. Buy plugs as recommended by the makers. These should only need annual renewal. Unsatisfactory plugs often cause mysterious loss of power.

Buying Carbide. Always purchase carbide in 14 lb. lots ; it is infinitely cheaper than buying it 1 lb. at a time. After using the lamp, rake out the solid particles and use again. Failure to do this results in great wastage. As previously mentioned, the cost of maintaining electric lighting sets (Magdyno) is negligible.

TOURING

Dress. Long distance touring requires careful preliminary consideration regarding dress if any enjoyment is to be derived from the tour—or rather if acute discomfort is to be avoided. The all-weather motor-cyclist has to cope with every variety of heat and cold, wind and wet. For short distance runs dress does not matter much. All that is required is protection of the clothes and eyes from dirt. Clothing for this work is left to the rider's fancy. Some go about clad in flying suits, helmet, and so on. Others go about dressed in riding breeches, leggings, and a bright coloured béret. All this is a question of individual taste. But where touring is concerned, the rider must have plenty of warm waterproof clothing, and goggles should be worn. Constant and prolonged exposure of the eyes to cold and dust produces chronic inflammation, and is thoroughly bad for the eyes.

Goggles. Regarding goggles, the first consideration is the question of splinter-proof glass. One never knows when a machine is going to be involved in a smash, and the worst conceivable disaster would be irreparable damage to an eye or both eyes. Is it worth risking blindness for the sake of a few shillings ? No, of course not. Therefore, buy either "Triplex" goggles or some type guaranteed unsplinterable. There are many designs of goggles on the market. It is best to select a type giving the widest range of vision, that is to say, the glasses must be close to the eyes. Rubber type goggles are apt to be rather offensive in hot weather ; otherwise they are very good. We will leave the selection of goggles to the reader's discretion. Some riders detest goggles, and no printed words will ever induce them to use them. If no ill effects are produced to the eyes, there certainly seems no reason why goggles should be used, but when very high speeds are indulged in neglect to wear goggles is dangerous. Apart from the question of seeing at very high speed, a stone thrown up, or a fly entering the eye, at 70 m.p.h. can cause excruciating agony, and will probably result in the rider being thrown.

All Weather Riding. Whilst it cannot be denied that riding in spring and summer weather is very pleasant, winter riding has its charms. Many riders openly avow that they do not care what the weather is like. They get plenty of satisfaction under all conditions. This is, perhaps, true in the case of a certain class of rider, but not for the majority. This type of motor-cyclist keeps himself warm through sheer excitement, not woolly underclothing ! However, we will deal with the average rider, who places bodily warmth foremost.

The commonest type of winter dress consists of the ordinary buff waterproof coat and leggings, the latter either buttoning up the sides, or lacing. Most accessory dealers sell this type of apparel. They are, however, rather clumsy, and apt to get torn and become generally dilapidated looking. A far more satisfactory garment is one of the surplus R.A.F. Sidcot flying suits with fur collar, that can be obtained for the modest sum of about three guineas. Better still, get a leather coat and trousers to

match. No definite instructions regarding apparel can be given. It is all a question of taste and money available.

Headgear. A tight-fitting cap is the most suitable headgear for normal motor-cycling purposes. If predisposed to blow off, it may be reversed, that is, placed peak to the rear. Many riders are inclined to dispense with headgear altogether. This is all right provided that the hair is not liberally swamped with hair grease. In this case dust and grit accumulate horribly. For long distance touring, in cold weather, the helmet is unchallenged ; it keeps the ears and face warm and free from road dust. For competition riding (reliability trials excluded !) the crash helmet is essential. In all track racing it is compulsory to wear such a helmet.

Gloves. The problem of keeping the hands warm and at the same time enabling them to finger the controls sensitively is a difficult one. Many fast riders prefer to do without gloves, saying that they would rather have the finger tips cold than run the risk of being cold all over. Woollen gloves are dangerous, as they may open the throttle by catching on the lever when removing the hand to change gear. Gauntlets keep out the cold, but spoil the sensitiveness of control. An attempt to solve the glove difficulty has been made by several firms who market a rubber muff which fits over the handlebar grip and controls. This idea is very sound, and should the rider experience great discomfort through cold hands he cannot do better than obtain a pair of these muffs.

Preparing for a Tour. If the reader is contemplating an extensive tour, and is a member of one of the Associations mentioned in Chapter II, he should write to the secretary of the Association concerned and apprise him of the intended route. A detailed itinerary will then be supplied, and useful information concerning state of roads, etc., given. When undertaking a Continental tour, the society, if requested to do so, will obtain the member's passports, carnets, or tripliques, and thereby eliminate the necessity for leaving deposits when visiting a foreign country.

Maps and Guides. These are very necessary adjuncts to touring, and indeed the fascination of planning a tour is part of its pleasure. The route should be traced out in red ink on the map to facilitate reading. Large scale Ordnance Survey maps are the best, as they show all contours, and the route may be chosen so as to avoid all the worst gradients, unless the tourist wishes to include all the fine view points, and then, of course, he will select the hilly roads. The tourist, if his time is limited, should split up the route into sections, allotting so much time for each section. He can then run to a definite time schedule. For long distance touring in the United Kingdom, the Michelin guide is of great value, giving as it does all particulars regarding hotels, repairers, and other useful information.

Spares. There is little need to carry more than a repair outfit, pump, complete tool kit, spare plugs, spare tubes, spare chains and links, one spare valve complete with spring, washer, and cotter, and a complete repair outfit for tyres, as before mentioned.

Luggage. For touring purposes, it is obviously senseless to burden up the machine with luggage. Carry on the machine the absolute minimum amount necessary. Send the rest by rail. We will not defile these pages with a description of all the gear and tackle necessary to keep man in a civilized and respectable condition. We will leave that to the reader's common sense.

Taking the Machine Abroad. The triplique, referred to previously, enables the owner to travel in Finland, France, Italy, Holland, Belgium, Rumania, Spain, Portugal, Russia, Norway, and Sweden, or as an alternative a member may get an International Customs Pass, issued by the A.C.U. and A.A. to members and non-members, whereby the highest continental duty payable suffices for all the countries forming part of the convention.

International Travelling Passes (duration, 12 months) are also issued, enabling the holder to travel in all countries which are parties to the agreement, without obtaining the special licences or carrying special numbers in each country as hitherto. The Customs Pass concerns the customs duty payable ; the Travelling Pass is exclusively a licence for the machine and driver abroad.

It is no longer necessary for the tourist to be examined by a foreign official, to obtain foreign licences, or to undergo any other formalities. It is only necessary to obtain the International Pass and fix an oval plate to the machine with the letter G.B. painted in white on a black background. This plate must be illuminated by night.

Continental Rule of the Road, etc. As a general rule *Keep to the Left and Pass on the Right* in Austria-Hungary, Portugal, and Sweden.

As a general rule *Keep to the Right and Pass on the Left* in Belgium, France, Germany, Holland, Italy, Russia, Spain, Switzerland, and the following provinces of Austria-Hungary, viz., Carniola, Dalmatia, Tyrol, Istria, Carinthia.

The speed limit in Belgium is 40 kilom. an hour in the country and 15 in town. Special regulations apply to Brussels. Most Belgian roads are very bad.

Lighting-up time in France is 15 minutes after sunset. Rear number plates must be illuminated. French roads are, on the whole, good. Cars and motor-cycles entering Paris are stopped, the petrol in tanks measured, and *octroi* duty charged.

The roads in Holland are generally good, but narrow and winding. No special limit is fixed on country roads, but motorists

can be prosecuted for driving to the common danger. Some roads are closed to motor traffic.

The general rule of the road in Italy is to keep to the right, but it is frequently reversed in many districts and towns.

In Northern Italy and parts of Central Italy the roads are good and often excellent. In the Southern Provinces the roads are bad.

The speed limit in Spain is 7¼ m.p.h.

GENERAL HINTS ON TOURING

A few general hints on the subject of touring may well conclude this chapter and, if acted upon, will contribute to the pleasure derived by the tourist—

1. Before setting out on a long distance tour satisfy yourself that the machine is in sound mechanical condition and that the tyres, which can mar or make a tour, are likewise in good condition.
2. See that you have aboard a complete tool kit and repair outfit and a few vital spare parts.
3. If you are driving a combination, put a girl in the " chair."
4. When touring abroad remember that *you* are the foreigner, not those with whom you come in contact.
5. Never drive further in a day than you feel fit for, and keep the speed for the greater part at 25-30 m.p.h. Such a speed is not conducive to physical fatigue and enables you to *see* the country through which you are passing.
6. Avoid the big towns and cities as much as possible.
7. Plan the whole tour carefully before setting out.
8. See that you are fully insured against accident, and particularly against third party risks.

CHAPTER VIII

BUYING AND SELLING AN OLD MOUNT

Buying a Second-hand Machine. The inexperienced hand must proceed warily when contemplating the purchase of a second-hand motor-cycle. Preferably he, or she, should get the assistance and advice of an experienced driver when examining a machine with a view to its purchase. He should buy nothing but the best and most modern that can be afforded. There are plenty of first-rate bargains to be had, but at the same time there are numerous machines offered for sale at prices out of all proportion to their real values, and not a few absolute " fakes." It is worth while, therefore, making a fairly thorough examination and test of the machine.

Year of Make. First ascertain the year of make of the machine (this may be verified by referring to the registration book) by noting the engine and frame numbers. Also find out whether spare parts are obtainable by ascertaining whether the manufacturers are still in business or whether they have shared the fate of so many motor firms, i.e. been driven out of business by competition. A perusal of the advertising columns of one of the leading motor-cycle papers should give a fair estimate of the average sale price of a machine similar to what the prospective purchaser contemplates buying.

Examining the Machine. First take a general survey of the machine, noting the condition of the plating and enamel, but remember the machine may be in sound mechanical condition, even though its appearance is decidedly forlorn. Now scrutinize the frame carefully for the existence of cracks, rusting, and damage. Should the frame show signs of having met with an accident, turn the machine down at once. Now examine the forks for similar defects, and test their springiness ; also note whether there is excessive play in the forks, and if so, whether it can be taken up. Carefully examine the condition of the wheel bearings, tyres, accessories, and tools. If the machine is a sidecar outfit, examine the points of attachment, and state of sidecar springs. Do not be influenced by the owner's assertion that everything is O.K. Examine everything yourself, and verify his statements. Having satisfied yourself that the machine is in very fair condition, proceed to test the engine.

Testing the Engine. Begin by turning the engine over compression and noting the resistance offered. If the engine has

perfect compression, it should be possible for the kick-starter pedal (if such is fitted) to bear the weight of an average man for several seconds on full compression. Carefully note the result of this test, and if the compression is found to be bad, ascertain why it is so. Remember that some engines are designed for low compression (especially those of the horizontal twin type), and therefore negative results from this test will prove nothing. Now rotate the engine several times with the exhaust lifter raised, and see whether the engine sounds tight. If there is any suggestion of clanking or rattling, the bearings are not in good, in fact, probably very bad, condition. Ask permission to remove the exhaust valve, and examine the faces of both valve and seat. Note whether the valve is pocketed (refer back to Fig. 61). If it is so, it indicates either carelessness or old age, or both, and your views about other parts should be tempered accordingly. The valve gear mechanism should be exposed, and the wheels and cams carefully examined. If worn, they will require renewal.

The condition of the piston and cylinder can only be gauged by experience, but if detected (piston will " slap " in cylinder when engine is running), the price of the machine should be carefully weighed, for piston " slap " is by no means a minor defect—it is usually indicative of an oval cylinder, necessitating regrinding of the cylinder and a new (over size) piston. Unless all other parts are in exceptionally nice condition, it is best not to purchase. Remember, however, that an alloy piston is loosely fitting when cold, and this must not be mistaken for the bad fitting of a cast-iron piston in its cylinder. The rings may keep the compression good.

Trial Run. After the preliminary inspection the purchaser should insist on a trial run. In the case of a combination, the owner will probably ride in the sidecar ; otherwise he will probably demand a deposit to ensure a *bona fide* transaction. On this run the behaviour of the engine should be observed when running idle, accelerating, running at top speed, and last, but not least, when hill climbing. After a short run the crankcase should be felt. If hot it denotes serious gas leakage past the piston rings. Carefully note whether any noise beyond that of the tappets and valves is audible. If so, do not buy until you know the cause.

A Warning. The reader is advised to make quite sure that the vendor is the real owner of the machine, for if he purchases and subsequently the machine is claimed by the real owner, he must return the machine to the lawful owner, and has no redress except the doubtful one of suing the vendor, if he has not already decamped.

Selling a Second-hand Mount. The foregoing information indicates roughly the questions likely to be asked in the disposal of a second-hand machine, and before attempting to sell the

machine it should be put into reasonably good order both externally and internally. As such it will command a higher price than if the defects are left unremedied, and will avoid irritating correspondence between the parties concerned in the transaction.

Selling Through an Agency. Several firms undertake to sell second-hand machines, the procedure in most cases being to value the machine and to allow the agent a commission on that price. Such agents usually sell the machine at a higher price than the owner would obtain privately, so that it is usually well worth while to adopt this procedure, so long as only a reliable firm is dealt with.

Selling by Advertising in Trade Paper. This is usually an excellent method of selling, because the trade papers classify the machines, so that an intending purchaser of an A.J.S. machine has only to glance down the small advertisement columns of one of the motor-cycling papers (as previously mentioned) to see comparative prices. The fact cannot be ignored that a prospective purchaser of a second-hand machine buys either *Motor-cycling*, *the Motor-Cyclist Review*, or the *Motor-Cycle*, and this method of selling is advocated.

Advertising in the daily or local press is also an excellent method of selling.

The reader is reminded of the rules given in Chapter II (regarding the registration book) which apply when the machine changes hands. Do not let the machine pass hands until the purchase price is handed over. Beware of those who require a trial run upon part payment.

Selling the Machine Abroad. It is, perhaps, worth while mentioning here that when taking a motor-cycle abroad it is not possible to sell the machine in a foreign country without paying the importation duty, and the machine become a permanent possession abroad. Moreover, the sum of money (usually £10) deposited against the triptique or carnet is forfeited. However, motor-cyclists do not usually cross the Channel with the idea of selling their machines, but in some cases owners, who get fed-up with their mounts, are inclined to act on the spur of the moment.

CHAPTER IX

LEGAL NOTES

THE legal matters regarding licensing and registration having been disposed of in Chapter II, 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 S.O.S., 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 never be ignored. The signal to stop should be made as already noted on page 56.

Endorsement of Licence. All convictions under the Motor Car Act, 1903, may be endorsed on the back of the licence, except a conviction for obstruction, and the first and second convictions for exceeding the speed limit. 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.

Furious Driving. A person driving furiously renders himself liable to conviction for the following offences—

1. Driving to the common danger.
2. Exceeding the speed limit.
3. If anyone injured, indictment for causing bodily harm.
4. If anyone killed, indictment for manslaughter.
5. Arrest by any person, whether constable or not, who sees the offence committed, under the Highways Acts.

Warning of Approach. It is compulsory to give audible warning of approach whenever it is necessary. Failure to do so renders the driver liable to conviction for driving to the common danger, 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 Plate. The driver of a motor-cycle is guilty of an offence if the number plate is not properly fixed, or if it is 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. One number 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.

Staying Proceedings. For certain minor offences, such as using a motor-cycle with an expired licence, a Council may sometimes under the Roads Act, 1920, write to the offender saying that they will stay proceedings provided the delinquent hands over a certain sum, usually equivalent to the fine that would be imposed. Unless the motor-cyclist is sure of his case it is best to fall in with such an arrangement.

Time Limit for Summons. Unless previously warned at the time the offence is committed, notice of an intending prosecution for exceeding the speed limit 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 any offence under the Motor Car Act, 1903, has the right of appeal to next Court of General Quarter Sessions, provided he did not plead "Guilty," in Courts other than Metropolitan. A right of appeal lies against an order disqualifying any person from obtaining a driver's licence.

Speed Limit. Many riders believe that the speed limit has been abolished, but, at the present, at any rate, this is not so; and, according to the strict letter of the law, no vehicle may be driven at a speed exceeding 20 miles per hour on the highway. Special limits of 8 or 10 miles per hour are fixed in certain towns and villages. These must be strictly observed.

Leaving the Machine. A motor-cycle may not be left with the engine running while the owner is in a shop, however short the period.

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. The only person, as far as the author is aware, who has refused to take advantage of the scheme was a woman—and she was promptly summoned instead, and heavily fined! In view of the fact that these warnings apply to first offenders only, this paragraph will probably interest novices only—not hardened riders.

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.

SPECIAL NOTES

Readers of this book will be interested to know that the Walsall Street branch of the Wolverhampton concern now manufacture a powerful six-cylinder bus and lorry chassis whose design and workmanship are up to the standard of their high grade motor-cycles. This interesting product, whose engine develops 54 b.h.p. at 2,000 r.p.m., is illustrated below with an M12 machine alongside.

A.J.S. Brooches, Pennants, etc. It is not generally known that excellent little blue and gold enamelled brooches with the A.J.S.

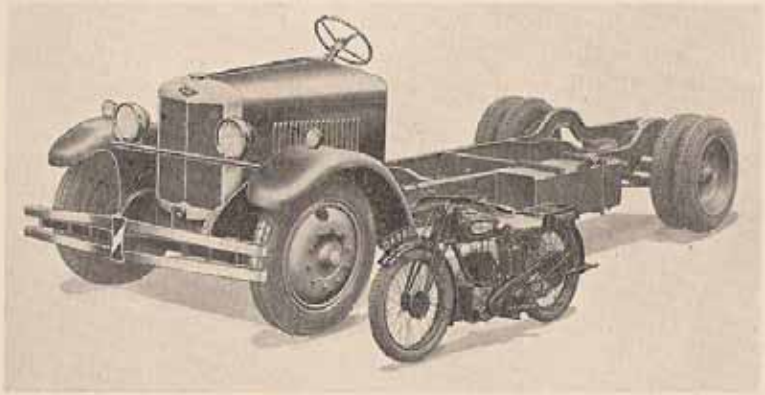


FIG. 77. CONTRAST—THE LITTLE 248 c.c. A.J.S. ALONGSIDE ITS BIG BROTHER, THE SIX-CYLINDER O.H.V. 3,800 c.c. COMMERCIAL CHASSIS

monogram can be obtained for a trifling sum. The wearing of these unobtrusive brooches enables A.J.S. owners to recognize one another at a glance, and is often the means of cultivating unexpected friendships.

Triangular pennants with steel masts, suitable for mounting on the number plate or handlebars, can also be obtained in various colours.

Spare Parts. Spare parts for A.J.S. motor-cycles can now be had by return C.O.D., if the full part number is quoted, from Wolverhampton. The maximum value of goods obtainable under this system is £40.

APPENDIX

SOME 1928 RACING SUCCESSES

Event	*Machine*	*Place*
BRITISH ISLES—		
Tourist Trophy Senior Races, Isle of Man	4·98 h.p.	SECOND
Yorkshire Open Speed Championship	3·49 h.p.	FIRST
British Beach Racing Championship	3·49 h.p	FIRST
Pendine 10 mile Open Speed Championship	3·49 h.p.	FIRST
Southport Speed Trials, 50 miles (500 class)	4·98 h.p. O.H.C.	FIRST
50 miles Unlimited Class	4·98 h.p. O.H.C.	FIRST
IRELAND—		
Temple " Sixty " Road Race	3·49 h.p.	SECOND, and Fastest Lap
Ulster Grand Prix	3·49 h.p. O.H.C.	SECOND
SCOTLAND—		
Scottish Speed Championships	3·49 h.p.	FIRST
,, ,, ,,	3·49 h.p.	SECOND
GERMANY—		
German T.T.	3·49 h.p. O.H.C.	FIRST
Peine Races, Hanover	4·98 h.p.	FIRST, and Fastest Time
Halle Hill Climb	3·49 h.p.	FIRST, and Fastest Time
Badberg Veiricks Race	4·98 h.p.	FIRST
Rochlitzer Hill Climb	4·98 h.p.	FIRST, and Fastest Time of Day
International Gabelbach Hill Climb	4·98 h.p. s/c	FIRST, and Fastest Time of Day
Solitude Race	4·98 h.p.	FIRST
Waure Speed Trials	3·49 h.p.	FIRST
BELGIUM—		
Grand Prix de Brussells	3·49 h.p.	FIRST, and Fastest Lap
Grand Prix de Bouillin	3·49 h.p.	FIRST, and Fastest Time of Day
Grand Prix de Spa	3·49 h.p.	FIRST
AUSTRIA—		
Austrian T.T.	4·98 h.p.	SECOND
Austrian Grand Prix	3·49 h.p. O.H.C.	FIRST, Won by 22 miles
,, ,,	4·98 h.p. O.H.C.	FIRST. Won by 19 miles

Event	*Machine*	*Place*
CZECHO-SLOVAKIA—		
Czecho-Slovakian Grand Prix	3·49 h.p.	First, in Record Time, and Fastest Lap
,, ,, ,,	4·98 h.p.	Record Fastest Lap
HOLLAND—		
Dutch T.T. . . .	4·98 h.p	Second, and Record Fastest Lap
POLAND—		
Polish Grand Prix . .	3·49 h.p.	First
SOUTH AFRICA—		
South African T.T. Jun. Race	3·49 h.p. O.H.C.	First
,, ,, Sen. Race	4·98 h.p.	Third
Brooklands—		
Maximum "Flat-out" Speed	4·98 h.p. O.H.C.	106·42 m.p.h.
1929 Junior T.T.	3·49 h.p. O.H.C.	Second

APPROXIMATE ENGINE REVOLUTIONS

At Different Speeds—Miles per Hour

Gear Ratio.	4	4¼	4½	4¾	5	5¼	5½	5¾	6	6¼	6½	6¾	7
Speed in Miles Hour 5	260	276	292	309	325	346	358	374	388	404	420	437	453
10	520	552	584	618	650	692	716	748	775	808	840	875	905
15	780	828	876	927	975	1038	1074	1122	1160	1210	1260	1310	1360
20	1040	1104	1168	1236	1300	1384	1432	1496	1550	1615	1680	1750	1810
25	1300	1380	1460	1545	1625	1730	1790	1870	1940	2020	2100	2180	2265
30	1560	1656	1752	1854	1950	2076	2148	2244	2320	2420	2520	2620	2720
35	1820	1932	2044	2163	2275	2422	2506	2618	2710	2830	2950	3060	3170
40	2080	2208	2336	2472	2600	2768	2864	2992	3100	3230	3370	3490	3620
45	2340	2484	2628	2781	2925	3114	3222	3366	3490	3640	3790	3940	4070
50	2600	2760	2920	3090	3250	3460	3580	3740	3880	4040	4210	4370	4530
55	2860	3036	3212	3399	3575	3806	3938	4114	4270	4440	4630	4800	4980
60	3120	3312	3504	3709	3900	4152	4296	4488	4650	4856	5040	5240	5440

Diameter of Driving Wheels, 26 in.
For 24 in. Wheels, multiply revolutions by 1·08. For 28 in. Wheels, multiply by 0·93.

USEFUL INFORMATION

TABLE OF GRADIENTS

Gradient	Per Cent	No. of Feet Rise or Fall in 1 Mile
1 in 2	50	2640
1 „ 2½	40	2112
1 „ 3	34	1760
1 „ 3½	28	1508
1 „ 4	25	1320
1 „ 5	20	1056
1 „ 6	17	880
1 „ 7	14	754
1 „ 8	12½	660
1 „ 9	11	587
1 „ 10	10	528
1 „ 11	9	480
1 „ 12	8	440
1 „ 13	7¾	406
1 „ 14	7	377
1 „ 15	6⅔	352
1 „ 16	6¼	330
1 „ 17	6	311
1 „ 18	5½	293
1 „ 19	5	278
1 „ 20	5	264
1 „ 25	4	211
1 „ 30	3·3	176
1 „ 35	2·8	154
1 „ 40	2½	132

EQUIVALENT SPEEDS

Speeds in M.P.H.	Time Taken to Cover 1 Mile.
10	6 minutes
15	4 „
20	3 „
25	2 „ 24 seconds
30	2 „
35	1 „ 42⅞ „
40	1 „ 30 „
50	1 „ 12 „
60	1 „

CYLINDER BORES AND STROKES IN MILLIMETRES AND INCHES

An Approximate Guide for Comparison

A Cylinder Measuring—		Is Equal to—
Millimetres		Inches
80 × 80	=	3⅛ × 3⅛
80 × 86	=	3⅛ × 3⅜
83 × 83	=	3¼ × 3¼
83 × 86	=	3¼ × 3⅜
86 × 86	=	3⅜ × 3⅜
84 × 90	=	3 5/16 × 3 5/16
90 × 90	=	3 7/16 × 3 9/16
90 × 110	=	3 7/16 × 4 5/16
95 × 115	=	3¾ × 4 9/16
100 × 115	=	3 15/16 × 4 9/16
105 × 118	=	4⅛ × 4⅝
108 × 120	=	4¼ × 4¾
110 × 125	=	4 5/16 × 4 15/16
112 × 128	=	4 7/16 × 5 1/16
114 × 130	=	4½ × 5⅛
116 × 134	=	4 9/16 × 5 5/16
118 × 138	=	4⅝ × 5 7/16
120 × 140	=	4¾ × 5½
122 × 143	=	4 13/16 × 5⅝
124 × 146	=	4⅞ × 5¾
126 × 148	=	4 15/16 × 5 13/16
128 × 150	=	5 1/16 × 5 15/16

FORMULAE FOR H.P.

S = Stroke in centimetres
D = Diameter of cylinder in centimetres
R = Revolutions per minute
N = Number of cylinders

R.A.C. Formula H.P. $= \frac{D^2 \times N}{16{\cdot}13}$

A.C.U. Formula = 100 c.c. = 1 h.p.

A more accurate formula is the Dendy Marshall, in which—

$$\text{H.P.} = \frac{D^2 \times S \times N \times R}{200{,}000}$$

TYRE SIZE EQUIVALENTS

65	Millimetres	=	2½ in.	650	Millimetres	=	26 in.
80	„	=	3 „	700	„	=	28 „
85	„	=	3¼ „	750	„	=	30 „
90	„	=	3½ „	800	„	=	32 „
100	„	=	4 „	870	„	=	34 „
105	„	=	4¼ „	910	„	=	36 „
120	„	=	5 „	1010	„	=	40 „

LIGHTING-UP TIME TABLE, 1929–1930

Date	London	Aberdeen	Manchester	Exeter	Date	London	Aberdeen	Manchester	Exeter
Jan. 7	4.38	4.17	4.37	4.57	July 7	10.17	10.58	10.38	10.25
,, 14	4.48	4.30	4.48	5. 7	,, 14	10.12	10.50	10.32	10.21
,, 21	4.59	4.44	5. 0	5.18	,, 21	10. 5	10.40	10.24	10.15
,, 28	5.12	4.59	5.14	5.30	,, 28	9.55	10.28	10.13	10. 5
Feb. 7	5.30	5.21	5.33	5.47	Aug. 7	9.38	10. 8	9.55	9.48
,, 14	5.42	5.36	5.46	5.58	,, 14	9.25	9.51	9.41	9.36
,, 21	5.55	5.52	6. 0	6.11	,, 21	9.12	9.34	9.26	9.23
,, 28	6. 8	6. 8	6.14	6.23	,, 28	8.57	9.15	9.10	9. 9
Mar. 7	6.20	6.23	6.28	6.36	Sept. 7	8.34	8.48	8.46	8.46
,, 14	6.32	6.38	6.40	6.46	,, 14	8.18	8.29	8.28	8.31
,, 21	6.44	6.54	6.53	6.58	,, 21	8. 2	8. 9	8.11	8.16
,, 28	6.56	7.10	7. 7	7. 9	,, 28	7.46	7.50	7.54	8. 1
April 7	7.12	7.29	7.24	7.24	Oct. 5	7.30	7.34	7.38	7.45
,, 14	7.24	7.45	7.37	7.36	,, 6	5.56	5.56	6. 3	6.11
,, 20	7.34	7.58	7.48	7.45	,, 14	5.41	5.39	5.47	5.57
,, 21	9. 6	9. 3	9.20	9.17	,, 21	5.25	5.19	5.30	5.41
,, 28	9.17	9.45	9.33	9.28	,, 28	5.11	5. 2	5.14	5.27
May 7	9.32	10. 3	9.49	9.42	Nov. 7	4.54	4.42	4 53	5 10
,, 14	9.43	10.17	10. 1	9 52	,, 14	4.43	4.27	4.39	5. 0
,, 21	9 53	10.30	10.13	10. 2	,, 21	4.34	4.15	4.26	4.52
,, 28	10. 3	10.41	10.24	10.11	,, 28	4.27	4. 4	4.15	4.46
June 7	10.13	10.55	10.34	10 21	Dec. 7	4.22	3.59	4.13	4.41
,, 14	10.18	11. 1	10.39	10.26	,, 14	4.21	3.58	4.14	4. 4
,, 21	10.21	11. 4	10.43	10.29	,, 21	4.24	4. 1	4.20	4.43
,, 28	10.21	11. 5	10.43	10.29	,, 28	4.29	4. 5	4.27	4.48

NOTE

Summer Time in 1929 started on 21st April, and ends on 6th October. The above Lighting-up Table is for 1929, but is practically identical for 1930, except that Summer Time begins on 13th April, and ends on 5th October. Hence in above Table 1¼ hours must be added to the times given for 14th and 20th April and taken off the time given for 6th October.

INTERNATIONAL MARKS

An oval plate is used, the distinguishing marks of the country of origin, consisting of one or two letters, painted in black upon a white ground.

A	Austria	F	France	NL	The Netherlands
B	Belgium	GB	Gt. Britain & Ireland	P	Portugal
BG	Bulgaria	GR	Greece	R	Russia
CH	Switzerland	H	Hungary	RM	Rumania
CS	Czecho-Slovakia	I	Italy	S	Sweden
D	Germany	MC	Monaco	US	U.S.A.
E	Spain				

SOME USEFUL ROAD MILEAGES (APPROXIMATE)

	Aberdeen	Birmingham	Bristol	Cambridge	Cardiff	Derby	Dover	Edinburgh	Exeter	Glasgow	Gloucester	Hull	Inverness	Lancaster	Leeds	Leicester	Lincoln	Liverpool	London	Manchester	Oxford	Penzance	Scarborough	Sheffield	Southampton
Aberdeen	—	408	491	462	499	385	580	112	540	142	456	348	105	271	322	412	386	388	509	340	520	644	312	370	516
Birmingham	408	—	85	99	101	39	181	281	156	294	52	144	459	119	167	36	88	86	110	80	62	260	158	72	125
Bristol	491	85	—	139	96	125	194	369	70	364	34	224	518	206	190	118	170	176	119	152	67	174	243	160	68
Cambridge	462	99	139	—	172	96	124	348	209	367	140	229	516	176	144	64	86	187	53	152	82	339	172	116	151
Cardiff	499	101	96	172	—	141	232	377	166	382	57	240	533	209	206	132	184	154	160	168	104	270	268	176	152
Derby	385	39	125	96	141	—	198	273	206	274	91	92	430	114	69	28	52	82	127	62	101	319	124	36	158
Dover	580	181	194	124	232	198	—	468	236	467	173	290	624	307	263	174	205	274	71	259	126	351	311	234	140
Edinburgh	112	281	369	348	377	273	468	—	439	44	334	236	156	162	208	315	264	209	397	209	393	552	200	236	457
Exeter	540	156	70	209	166	206	236	439	—	440	335	251	167	160	209	305	260	222	169	224	134	104	348	228	100
Glasgow	142	294	364	367	382	274	467	44	440	—	335	251	167	160	209	305	277	212	386	210	360	553	235	242	419
Gloucester	456	52	34	140	57	91	173	334	102	335	—	190	483	161	163	78	146	124	102	134	50	220	215	120	112
Hull	348	144	224	129	240	92	290	236	306	251	190	—	382	121	58	124	96	128	219	100	175	419	43	64	230
Inverness	105	459	518	516	533	430	624	156	594	167	483	382	—	312	365	467	442	380	553	380	421	713	357	413	584
Lancaster	271	119	206	179	209	114	307	162	282	160	161	121	312	—	67	138	139	53	236	56	184	391	126	90	248
Leeds	322	107	190	144	206	69	263	208	256	209	163	58	365	67	—	90	68	72	192	46	169	389	65	30	229
Leicester	412	36	118	64	132	28	174	315	208	306	78	124	467	138	90	—	52	119	98	84	64	312	145	60	124
Lincoln	386	88	170	86	184	52	205	264	260	277	146	96	442	139	68	52	—	110	134	92	126	378	109	44	175
Liverpool	388	86	176	187	154	82	274	209	222	212	124	128	380	53	72	119	110	—	201	35	149	326	139	72	223
London	509	110	119	53	160	127	71	397	169	396	102	219	553	236	192	98	134	201	—	188	148	352	108	96	208
Manchester	340	80	152	152	168	62	259	209	224	210	134	100	380	56	46	84	92	35	188	—	148	245	232	124	64
Oxford	520	62	67	82	104	101	126	393	134	360	50	175	521	184	169	64	126	149	55	148	—	443	330	221	
Penzance	644	260	174	339	270	319	351	552	104	553	220	419	713	391	389	312	352	245	—	443	—	94	283		
Scarborough	312	158	243	172	268	124	311	200	348	235	215	43	357	126	65	145	109	240	278	232	443	—	—	195	
Sheffield	370	72	160	116	176	36	234	236	226	242	120	64	413	90	30	60	44	72	162	36	124	330	94	—	
Southampton	516	125	68	151	152	158	140	457	100	419	112	230	584	248	229	124	175	223	76	208	64	221	283	195	—

LIST OF A.J.S. AGENTS AND SERVICE

All the agents in this list stock spare parts. Those indicated with an asterisk render special service.

ENGLAND

Town	Agent
Abingdon	G. Gibson & Co., Ltd., 32 Ock Street
Accrington	Horace Smith, 379 Blackburn Road
Albrighton	A. A. Lockley, Hayfield Garage
Alford, Lincs	W. H. Belton & Sons, Motor Engineers
Alcester*	Young & Somers, Motor Engineers
Aldershot	Phillips Bros., Birchett Road
Alfreton	J. H. Raynes, Station Garage
Alnwick	Messrs. Blackshaw & Co.
Andover	W. J. Randall, 3 High Street
Appleby	W. Atkinson, Market Place
Ardwick	The Motor Mart & Exchange Co., 217 Hyde Road
Ashford (Kent)	C. Hayward & Co., Ltd., 32 New Street
Ashby-de-la-Zouch	W. Hemsley, 63 Market Street
Ashington	J. W. Gibson, West End Garage
Ashton-under-Lyne	Hurst & Co., Stamford Street
Ashton-in-Makerfield	Andrews, Ltd., Haydock Park Garage, Warrington Road
Askern, nr. Doncaster	E. Claybourn, the White Garage
Atherton	Gore Bros, Market Street
Aylesbury	Eborn's Garage, 44 Walton Street
Aylesham	Cooper Bros., Red Lion Street
Banbury	G. L. Ginger, 17 Parsons Street
Barnard Castle	E. Watson, Galgate
Barnsley	Carr & Waterhouse, 23 Peel Street
Barnstaple	A. S. Jones, 70 High Street
Barrow-in-Furness*	J. H. Keat, West Mount Garage
Barton-on-Humber	T. H. Grassby, King Street
Bath	P. Pike & Co., Ltd., Abbey Gate Street
Beckenham, Kent	Deen's Garage, 529 Croydon Road
Beccles	L. Gales, Gale's Garage
Bedford*	Imperial Cycle Co., 58 St. Loyes
Belford	T. H. Nixon, South Garage
Belvedere	E. Davis & Son, 22 Station Road
Berwick-on-Tweed	T. Lilburn, Motor Agent
Beverley	T. S. Brough, Excelsior Garage, Walkergate
Bewdley	T. Jenks, Wribbenhall
Bexhill-on-Sea	F. A. Boggis, 22 Sackville Road
Bexley Heath	Clock Tower Garage
Bideford	H. W. Barrow & Son, Motor Agents, New Road
Birkenhead*	J. H. Marston, 50 Argyle Street
Birmingham	Smith's Garage, Maryvale Road, Bournville

Town	Agent
Birmingham*	Premier Motor Co., Aston Road
,,	F. Whitworth, Ltd., Easy Row
,,	F. Hallam, 88 Bristol Street
,,	C. E. Cope & Sons, 15 Upper Hagley Road, Edgbaston
,,	Colmore Depot, Colmore Row
,,	The Highgate Motor Co., 6 Highgate Road
Bishop Auckland	Motor Supplies, 164 Newgate Street
Bishop's Stortford	H. G. Green, 72 South Street
Blackburn	Marks & Baron, 6 Cart Street
Blackheath, Staffs	W. Bell, Long Lane Garage
Blackpool	John Hall, 143 Church Street
Blakeney, Norfolk	H. J. Pye, Marston Road Garage
Blandford	P. J. Lucas, 38 Salisbury Street
Bletchley	Fortesque Bros., Motor Dealers
Bolton	Horrockses Motor House, Bradshawgate
Bootle	Lambert Page, Ltd., 376 and 380 Stanley Road
Boston, Lincs	Stocks (1920) Ltd. Wide Bargate
Bournemouth*	A. G. H. Alsford, 41 Palmerston Road, Boscombe
Bovey Tracey.	A. E. Collins, Motor Agent
Bradford*	E. G. Merrick, 174 Listerhills Road
,,	A. Hodgson, 10 Horton Road
,,	C. Sidney, 140 Manningham Lane
Bradford-on-Avon	E. W. Stone, Station Garage
Braintree	G. Cox, Motor Agent
Brampton, Cumb	J. & S. C. Shipley, 32–34 Main Street
Brentwood	Rippon Bros., 26 High Street
Bridgnorth	S. Minshall, Falcon Garage
Bridgwater	F. A. Pine, Taunton Road
Bridlington	J. T. Kilvington, Hilderthorpe Road
Brigg	G. H. Layne & Co., Glanford Motor Works
Brighton*	F. T. Turpin, 29 Preston Road
Bristol*	S. J. Fair, 201 Cheltenham Road
Bromsgrove	W. H. Chapman, 119 High Street
Broughton	W. H. Jones, 415 New Road, Market Place
Burnley*	J. Hebden & Sons, 149 St. James' Street
Burslem*	F. Lycett, Market Place
Burton-on-Trent	Bargate Motors, Witmore Road
Bury*	J. Pilling, Rock Street
Bury St. Edmunds	R. Hawkes, Motor Agent
Caerphilly	C. G. Morgan, Piccadilly Square
Camborne	A. T. Wasley, 36 Trelowarren Street
Cambridge*	King & Harper, Bridge Street
Camelford	G. Braund, Motor Agent, The Bridge
Cannock*	Bird & Yates, Crown Garage, Walsall Road
Canterbury*	E. J. Philpot, Ltd., Rose Lane
Carlisle	J. J. A. Dias, 36 Warwick Road
Castle Hedingham, Essex	Tills V. Smith, The Garage
Castleford	J. H. Briggs, Bridge Street
Catterick Bridge, Yorks	J. Fawsett & Sons, Motor Engineers
Chapel en le Frith	Lomas Bros., Newfield's Garage
Chatteris, Cambs	J. F. Wilderspin, High Street
Chell	J. Holdcroft, Motor Dealer
Chelmsford	Cleale & Hadler, Ltd., London Road
Cheltenham*	L. Paynter, Bath Street
Chepstow	Hanbury's Garage

Town	Agent
Chester*	Marston's (Chester) Ltd., Bridge Street
Chesterfield	Jervis, Horns Garage
Chichester	Reeve's Garage, 15 North Street
Chipping Norton	Young & Major, Motor Engineers
,,	J. H. Hartwell, 19 High Street
Chorlton-cum-Hardy	Nicholson Smith, 156 Barlow Moor Road
Churchill, nr. Bristol	F. W. Owen, M.C. Depot
Cirencester	C. F. Edwards, Castle Street
Clacton-on-Sea	J. Derrett, Orwell Road
Clay Cross, Derbys.	H. Robotham, Chesterfield Road
Cleckheaton	The Shenborough Motor Agency
Clitheroe	J. F. Bentham, Market Place
Clowne, Chesterfield	E. Sherwin, 35 North Road
Coalville	Campion Depot, Belvoir Road
Cobham, Surrey	A. Goldsmith, next Post Office
Colchester*	Motor Cycle and Light Car Depot, 119 High St.
Coleford, Glos	Higgs & Niblett, Newland Street Garage
Consett	W. C. Nichol, Harvey Street
Coventry*	W. Brandish & Sons, Coliseum Buildings
Craven Arms	J. O. Harper, Stokesay Garage
Crewe	F. Wooldridge, High Street
Cromer	East Coast Garage, Church Street
Crook, Co. Durham	Gill Bros., 23 Hope Street
Croydon	Godfrey's, Ltd., 228 London Road
Crowle	F. L. Long, Motor Cycle Agent
Darlington*	Duplex Motor, Grange Road
Dartford	J. C. Beadle, Ltd., Spital Street
Daventry	Freeman & Masters, 72 High Street
Deal	Barnett, 83–85 High Street
Dent, Yorks	Len Haygarth, Motor Engineer
Derby*	H. Palin, Osmaston Road
Dereham (East)	Clarke and Sorrell
Devizes	G. Howley, 14 Estcourt Street
Didsbury	T. Spann, 29 Barlow Moor Road
Dinnington	J. Drabble & Sons, Doe Quarry Lane
Diss	F. W. D. Hammond, 41 Mere Street
Doncaster*	T. Stott & Sons, Westfield Park Garage
Dorchester	W. G. Churchill, "Top-o'-Town"
Dorking	Meeton Motors, 41 South Road
Dover	Kearnsey Motor Co., The Garage, Kearnsey
Downham Market	P. D. Watson, Shipton Garage
Driffield	A. E. Hillaby, Middle Street
Droitwich	Hunt Bros., Hanbury Road
Dudley	C. E. Cope & Sons, 193 High Street
Dunmow, Essex	A. Archer, High Street
Durham*	Fowler & Armstrong, 74 New Elvet
Dursley	Phillips & Sons, Silver Street
Eastbourne	F. Ray & Sons, 47 Seaside Road
,,	Eastbourne Motor Cycle Depot, 11 Victoria Place
East Grinstead	Foster's Garage, 32 Cantelupe Road
Eastwood	Clifford Motories, 21 Nottingham Road
Eccles, Lancs	A. Halliwell & Co., 116 Wellington Road
Edwinstowe	P. W. Morley, Motor Dealer
Egham	Egham Motor Co., 157 High Street
Egremont, Cumb	Stout's Garages

Town	Agent
Ely, Cambs	The Walbro Cycle Co., Lynn Road
Enfield	Howards, 72 Chase Side
Epsom	Taylor Himming, Hook Road
Evesham	F. Morrall, Ltd., 20 Port Street
Ewell	W. E. Line, Ewell Motors, High Street
Exeter*	P. Pike & Co., 7 Bath Road
,,	C. W. Hulse & Sons, 11 Holloway Street
Fakenham	Southgates Ltd. Motor Engineers
Farrington Gurney	H. Matthews & Son, The Garage
Fazeley, Staffs	B. Fidgeon, Motor Engineer
Felixstowe	Rose Bros. (F'stowe) Ltd., Motor Engineers
Fenstanton	Knight Bros. The Garage, High Street
Fernhill Heath	H. A. Preston, Motor Dealer
Flimby, West Cumb	R. G. Baxter, Central Garage
Folkingham	A. Palmer, Motor Dealer
Folkestone	Martin Walter, Ltd., 62 Sandgate Road
Framlingham	A. G. Potter, The Garage, Station Road
Frodsham	T. Booth
Frome	P. Difazio, 5 Catherine Street
Gainsborough	Baines Bros., Eagre Works, North Street
Gateshead-on-Tyne	O. Carmichael & Son, Motor Agents
Gilberdyke, Yorks	W. Clayton, Motor Cycle Agent
Gillingham	E. McGrath, Motor Engineer
Gloucester*	W. B. Gibb, 100 Northgate Street
Glyn Ceriog	H. Phillips, Motor Cycle Agent
Goldthorpe	A. Wigfeld, Furlong Road
Goodmayes, Essex	S. G. Swayne, 835 High Road
Goole	N. A. de Cobain, Bridge Street
Grantham	Campion Cycle Co., 26 High Street
Gravesend, Kent	Barty Motors, Ltd., Central Garage
Grays, Essex	Pratley's Garage
Gresford	Pinnington's Garage
Great Yarmouth	O. Atkinson, 24 Regent Road
Grimsby*	G. Hildred (Motors) Ltd., Hainton Square
Gt. Crosby	L. Myerscough, Liverpool Road
Guildford	Crow Bros., High Street
Hale, Ches.	C. R. Alexander, Ashley Road
Halesowen	Halesowen Motor Works, Whitehall Road
Halifax*	L. H. Carter, 14 Powell Street
Hanley	J. Pepper, 61 Piccadilly
Harrogate	Baines Bros., 23 Commercial Street
,,	G. H. Threlfall, High Street, Starbeck
Hastings	F. Ray & Sons, Ltd., 29 Havelock Road
Haywards Heath	C. S. Wood, Motor Cycle Depot, 192 Queen's Road
Heathfield	C. R. Ryder & Co., Ltd., Auto Engineers
Helmsley	H. Batter, Motor Dealer
Helston	C. G. Lory, 14 Wendron Street
Hereford*	C. F. King & Co., City Garage, Elgin Street
,,	Brook Bros., Motor Agents, Widemarsh Street
Highbridge, Som.	R. H. Tucker & Co., Auto. Engineers
High Wycombe	R. Newitt, 67 Easton Street
Hitchin, Herts	F. Chalkley & Son, Brand Street
Holmes Chapel	A. Henshaw, Motor Engineer
Honiton	Moor's Garage, Motor Engineers

Town	Agent
Horncastle, Lincs	C. Hudson, 6 West Street
Horsham	Rice Bros., 2 Worthing Road
Hove	Hewitt Bros, 94 Western Road
Hoyland, nr. Barnsley	G. Neil, Motor Cycle Agent
Huddersfield*	C. A. Earnshaw, 10 Cloth Hall Street
Hull*	Thompson's, Ltd., 74 Anlaby Road
,,	Jordan & Co., 93 Prospect Street
,,	N. Jordan, 20a Story Street
Huntingdon	Murkett Bros., Market Place
Hyde, Cheshire	R. Hibbert, 173 Market Place
Ilfracombe	G. Labett, 55 High Street
Ilkeston	Premier Garage, Market Street
Ipswich*	W. Popplewell & Son, Woodbridge Road
Ironbridge	E. Brown, Dale End Motor Garage
Keighley	A. Shuttleworth, Tanfield Garage
Kelvedon, Essex	T. F. Glover, Motor Engineer
Kendal	J. Parker & Sons, Longpool
Kettering	C. J. Rouse, 70 Wellington Street
Kidderminster	Castle Motor Co., Motor Engineers
Kingsbridge	Oke Bros., The Garage, Fore Street
King's Langley	E. McMillan, High Street
King's Lynn	W. J. Johnson & Sons, St. James's Street
Kingston-on-Thames	H. Taylor & Co., Ltd., 135 London Road
Kington	Edward's Garage, Bridge Street
Kirkby Lonsdale	S. Morris, 37 Main Street
Kirkbymoorside	W. Hodgson & Sons, Motor Agents
Kirkham	R. H. Millner, Wesham Garage, Wesham
Lancaster	A. & W. N. Jepson, Penney Street
Launceston	J. Wooldridge, Western Road
Leamington	D.R.'s Motor Cycle Depot, 20 The Parade
Ledbury	G. Hopkins & Son, New Street
Leeds*	Watson, Cairns & Co., Ltd., Lower Briggate
Leek	Charles Barnett
Leicester*	Chapman's Garage, Belgrave Road
,,	W. Warwick, 72a Hinckley Road
,,	Colmore Depot, High Street
Leigh	F. Timms & Co., Lord Street
Leighton Buzzard	A. Stratford, 25 Hockliffe Street
Leominster	Scandrett & Phelps, Mill Street
Lewes, Sussex	A. E. Rugg, 1–3 Fisher Street
Lichfield	D. R. Fox, Central Garage
Lincoln*	West's, Ltd., High Street
Liphook	Moss, Son & Bro., The Garage, Station Approach
Littlehampton	Progress Motor Works, Arundel Road
Littleport, Cambs	B. Hatch, Motor Agent
Liverpool*	O. Wade, 56 Renshaw Street
,,	James Kershaw, 39–41 Kensington
Llechryd	E. Griffiths, Express Garage
London*	H. Taylor & Co., Ltd., 49-53 Sussex Place, S.W.
,,	W. Whiteley, Ltd., Queen's Road, Bayswater, W.2
,,	Reys Ltd., 173 Great Portland Street, W.1
,,	Wauchope's, 9 Shoe Lane, E.C.
,,	A. G. Daw, 114 Brixton Hill, S.W.2
,,	Lamb's Ltd., opp. Hoe St. Station, Walthamstow, Ilford,* Tottenham, and Chingford*

Town	Agent
London	J. Morris, 171 Mare Street, Hackney, E.
,,	Rowland Smith Motors, Ltd., 78 High Street, Hampstead
,,	Burlington Motor Cycle Co., Clapham Common
,,	The Elite Motor Co., 29 High Street, Colier's Wood
,,	K. L. M. Motors, Ltd., 101 Brighton Road
,,	E. E. Atkinson, 415 Barking Road, East Ham
,,	Easton Motors, 145 High Street, North, E.6
,,	Marshall's Motor Exchange, Hight St., Edgware
,,	Tanner Bros., 41–43 Munster Road, Fulham
,,	Barking Station Garage
,,	G. Clarke & Co., 278 Brixton Hill
,,	E. H. Clarke, 490 High Road, Chiswick
,,	Empire Motor & Cycle Co., 147 High Street, Harlesden
,,	Edwards & Izgard, Dimsdale, N.W.10. Garage, Hertford
,,	Selfridge & Co., Ltd., Oxford Street, W.1
,,	Sprosen's, Ltd., 111 Gt. Portland Street, S.W.1
,,	W. Whitby & Son, 7 The Vale, Acton, W.3
,,	Burlington Motor-cycle Co., 7 South Side, Clapham Common, S.W.
,,	Cleare & Co., 125 High Street, Woolwich, S.E.
,,	Lovetts, Ltd., 418 Romford Road, Forest Gate, E.7
,,	T. J. Ross, 84-86 High Road, Lee, S.E.
,,	F. Parks & Son,* 10 Langley Road, Catford, S.E.6
,,	Godfreys, Ltd., 208 Great Portland Street, and 232 Stamford Hill
,,	Ralph & Co., 28-29 Spring Street, Paddington, W.2
,,	Longman Bros.,* 17 Bond Street, Ealing Broadway, W.5
,,	Maude's Motor Mart, 100 Great Portland Street, W.
,,	Rideezi Sales, Ltd., Balham, S.E.1
,,	C. A. Blay, 192 Heath Road, Twickenham
,,	The Crystal Palace Garage, Church Road, Upper Norwood
,,	Turner Bros., Green Lane, Palmers Green
,,	Naylors, 406 Garratt Lane, Earlsfield
,,	L. Stevens, 153 Goldhawk Road, Shepherd's Bush
,,	A. Rivett, 235 High Road, Leytonstone
,,	H. Nash, 391 King Street, Hammersmith
,,	Lawrence's Garage, 33, 68, and 338 Clapham Road
,,	South London Motors, 913–915 Old Kent Road
,,	Murphy & Croskell, Ltd., 17 Sheen Lane, Mattake, S.W.14
,,	Ward & Co., 51 Upper Richmond Road, Putney, S.W.
,,	L. Stevens, 153 Goldhawk Road, Shepherd's Bush, W.12
,,	Kelsey Motor Ex., 188A Portland Road, South Norwood, S.E.
,,	Service Motor Supply Depot, 225 Church Road, Willesden, N.W.10
,,	Ward & Co., 274 Imperial Parade, Wimbledon, S.W.19
,,	Clease & Co., 125 High Street, Woolwich, S.E.18
,,	The Service Co. Ltd., 272–274 High Holborn

Town	Agent
London	Eagles & Co., 275 High Street, Acton
,,	Studer Cycle Co., 157 Walton Road, E. Molesey
,,	Hackford Eng. Co., Coldharbour Lane
,,	South Eastern Motor Works, Peckham Rye
,,	Foster's Ltd., 74 Highbury Park, Highbury Barn
,,	Eton Street Motors, Richmond
,,	Kirk & Co., 22 Praed Street, Paddington
,,	J. Grose, Ltd., Euston Road, N.W.1
,,	Recorder Cycle Co., 325 Fore Street, Edmonton
,,	Broadway Garage, 65 High Street, Hounslow
,,	J. F. Temple, 11 Edgware Road, Marble Arch
,,	Barty's Motor Works, Central Garage, Gravesend
,,	Jones Garage, 71 Stroud Green Road, Finsbury Park
,,	Pneumo Motors, Lower Clapton Road
,,	Pratleys Garage, Grays, Essex
,,	S. & S. Motor Co., Ltd., 395 Edgware Road
,,	Craig's Garage, Ltd., 224 Fulham Palace Road
,,	Stanley's, 7–8 Bulstrode Parade, Hounslow
,,	T. Marris, 171 Mare Street, Hackney
,,	Ravenscroft Motors, Ltd., 640 London Road, Isleworth
,,	Walter Thomas Reynolds, 232 Upper Street, Islington
,,	S. E. Longman, 7 Exhibition Road, Kensington, S.W.6
,,	Bound's Garage, 223 High Road, Kilburn
,,	Harrods, Ltd., Old Brompton Road, London, W.
,,	Glanfield Lawrence Motors, Ltd., 230 Tottenham Court Road, W.1
Long Eaton	A. H. Moore, College Street
Longsight	C. R. Cowan, 560 Stockport Road
Longton*	Leese's Garage, Meir Lane, Meir
Loughborough	T. B. Bowler, 138 Nottingham Road
Louth, Lincs	L. T. Lill and J. C. Farrow
Lowestoft	Taylor Brothers, 75 London Road
Luton	Dickinson & Adams, Frederic Street
Lydney	Watts (Factors) Ltd., The Garage
Lyle	J. W. Walton, Stourbridge Road
Lymington	C. S. Barrow, 79 High Street
Macclesfield*	T. Simister, 24 Jordangate
Maidenhead	R. Harris, 59 King Street
Maidstone*	Anstey's, 30–34 Stone Street
Maldon, Essex	Bate's Motor Works, Ltd.
Maltby, nr. Rotherham	A. and H. Brown, Rotherham Road
Malton	C. Bower, Norton
Malvern Link	C. R. Lockyer, Malvernia Garage, Worcester Road
Manchester	Colmore Depot, 200 Deansgate
Mansfield*	W. Henstock, Church Street
Mansfield Woodhouse	R. S. Beard, Debdale Garage
March	Henry Rose, St. Peter's Road
Mareham-le-Fen	Gosling & Sons, Motor Engineers
Margate	D. Kerr, Kerr's Garage, Cliftonville
Market Drayton	Hallaway Bros., Chester Street
Market Harboro'	T. J. Marriott, Coventry Road
Market Rasen	W. R. Campbell, Waverley Garage

Town	Agent
Marlboro', Wilts	B. J. Richards, Bridge Garage
Melksham	F. W. Venton & Sons, Union Street
Melton Mowbray	Houghton & Willcox, 15 Nottingham Street
Mexborough	G. Smith, 52 Main Street
Middlesbrough*	William Armstrong, 242 Linthorpe Road
Millom, Cumb	J. H. Bennett, Holborn Hill
Monmouth	Love & Sons (Mon.), Ltd., Monmow Street
Morpeth	Geo. L. Jackson, Bridge End Garage
Nelson*	J. Hebden & Sons, 71 Scotland Road
Newark-on-Trent*	Pratt & Gelsthorpe, Balderton Road
Newbury, Berks	E. C. Wheeler, The Broadway
Newcastle-on-Tyne*	Percy Motor Co., 68 Northumberland Street
Newcastle, Staffs	T. P. Moorley, Ironmarket
Newmarket	N. V. Golding, Park Lane
Newport,* Salop	E. P. Everest, High Street
Newport,* Mon	V. T. Waite, 79 Commercial Street
New Tredegar	W. Williams & Sons, Motor Agents
Northampton*	F. J. Bull, 228 Wellingboro' Road
North Shields	Thomas Wakefield, Albion Road
Northwich	Eachus Bros., High Street
Norwich*	H. Chapman, 42 Duke Street
Nottingham	Widdowson & Co., 87 Arkwright Street
Oakham	H. Rimmington, 51 Brooke Road
Oakengates, Salop	W. Analow, 9 Holyhead Road
Okehampton	Glass & Sons, Motor Engineers
Oldbury	Watson & Sons, Birmingham Street
Oldham*	J. P. Parry, 68 George Street
Olney	F. Soul, High Street South
Ormskirk	Blamforth, Park Road
Oswestry	Messrs. L. J. Gittens, 35 Church Street
Oxford*	F. E. Wootten, Ltd., High Street
Peasmarsh, near Rye	E. E. Farley, Motor Engineer
Penrith*	J. B. Milburn, Ltd., Middlegate
Penzance	Taylor's Garage, Greenmarket
Peterborough*	Turnill, North & Co., 55 Broad Bridge Street
Petersfield*	W. J. Tew & Sons, 20 Lavant Street
Plymouth	T. D. A. Chapman, 83 Old Town Street
Pontefract	Ewbank & Sons, Motor Engineers
Preston	Merigold Bros., Church Street
,,	Marks & Baron, 215 Lancaster Road
Pulborough	Gray & Rowsell, Burygate
Radstock	E. & L. Wallace, Fortesque Road
Raglan, Mon.	W. L. Hampshire, Chestnut Works
Rainford	E. Burrill, Star Inn Garage
Ramsgate	Arter & Co., Broad Street
Raunds, Northants	Masters Bros., Motor Agents
Rawtenstall	J. & G. Sowerbutts, Queen's Garage
Reading*	H. Julian, 84 Broad Street
Redditch	Portman & Allbut, Easymac Road Garage
Redhill	Linter & Sons, 42 London Road
Redruth	W. E. Jones, A1 Cycle Depot
Reigate	E. Knight, 51a High Street
Retford, Notts	H. Rule, North Road

Town	Agent
Richmond, Surrey	Eton Motors, 11 Hill Rise
Rickmansworth	G. Jones & Son, Church Street
Ripley, Yorks	W. Ingle
Ripon	Fraser Simpson, North Street
Robertsbridge	T. B. Croft, 12 Station Road
Rochdale	A. E. Stott, 393 Manchester Road
Ross-on-Wye	A. W. Griffin, Motor Cycle Depot, Henry Street
Rotherham*	E. Cross, Effingham Square
Rugby	S. Robbins, Ltd., Bilton Road
Runcorn	G. Wainwright, Bridge Street
Saffron Walden	The Walbro Cycle Co., High Street
Salford	Windsor Motor Cycle Co., 31 Fisherton Street
Salisbury*	Longman's Garage, 97 Fisherton Street
Sandbach, Ches.	G. Wakefield, High Street
Saxmundham	Harvey & Lane, Motor Engineers
Scarborough	A. Wood, Roscoe Street
Scunthorpe	H. G. Betts, Ashby Corner, Brumby Road
Seaham Harbour	Harrison Bros.
Selby	J. Gotch, Bridge Foot
Settle	R. Haygarth & Sons, Station Road
Sevenoaks	S. Wells, St. John's Motor Cycle Depot
Sheffield*	F. B. Roper, 166 London Road
Shepshed	F. Woolley, Motor Engineer
Shepton Mallet	A. H. Millard, 39 High Street
Shirebrook	E. Nicholson, Central Garage
Shrewsbury*	T. C. Pickering, 49 Mardol
Sidcup	H. B. Simmons, Sidcup Hill
Skegness	R. H. Parker, 36 High Street
Skelmanthorpe	C. Bradbury, Commercial Road
Skipton	G. D. Medd
Sleaford, Lincs	Holland Bros., Motor Cycle Agents
Slough	Bates & Co., High Street
Soham, Cambs	Pollard & Son, Pratt Street
South Molton	Moor & Son
South Nutfield	South Nutfield Garage, Station Approach
Southampton*	B. B. Tebbutt, 54 Commercial Road
,,	Alec. Bennett, Broadway Garage, Portswood
Southport*	R. Bamber & Co., Ltd., 2 Eastbank Street
,,	W. S. Life, Bold Street
Southsea*	P. Kiln, 30 Elm Grove
South Shields	Hobley & Co.
Spennymoor	C. & F. Cator, Motor Dealer
Stanford-le-Hope	F. G. Stacey, Southend Road Garage
Spalding	E. Blackburn & Sons, Station Garage
Spilsby, Lincs	L. S. Dodds, Ltd., Market Place
St. Albans, Herts*	Clarke's Garage, 98 London Road
St. Austell	A. Assheton-Salton, White Hart Garage
St. Helens, Lancs	A. Rudd, 49 Duke Street
,,	Burrill's Garage, Greenfield Road
St. Ives	Parker & Sons
St. Neots, Hunts	Ireland Bros., Motor Engineers
Stafford*	Attwood's Garage
Stamford, Lincs	J. Fancourt, 36 St. Paul's Street
Stanton, near Chippenham	R. Smith & Sons, Motor Engineers
Starbeck	G. E. Threefall, High Street
Steyning	C. F. Wood, High Street

Town	Agent
Stockport	F. Ingle, 191 Wellington Road
Stockton-on-Tees	Hickson Motor Agencies, Dovecot Street
,,	W. & F. Croft, Harland Place, Norton
Stoke-on-Trent	Broadway Motors, 34 Liverpool Road
Stourbridge	North Worcestershire Garage
,,	H. S. Gardner, The Premier Garage
Stowmarket, Suffolk	Stannard & Co.
Stratford-on-Avon	Messrs. Young & Somers, 21 Wood Street
Street, Som.	N. Locke & Sons, Motor Engineers
Stretford	1073 Chester Street
Stroud, Glos	H. E. Steel, Ltd., Russell Street
Sudbury, Suffolk	S. N. Segers, East Street
Sunderland*	Dunn & Jameson, Hylton Road
Sutton-in-Ashfield*	Wilfred Henstock, Forest Street
Sutton	W. J. Robins, Carshalton Road
Swadlincote	F. Staley & Sons, Wide Shaft Garage
Swindon	Swindon Motor Co., 34 Wood Street
Taplow, Bucks	H. E. West, Bath Road
Taunton*	W. P. Edwards, East Street
Tavistock	Carr's Garage, Drake Road
Teignmouth	H. Williams & Co., 16 Bitton Street
Thetford	W. & G. Lambert, Ltd., Castle Street
Thorne	W. Eddell, Motor Agent
Tittensor	W. Abbatts, Car and Motor Cycle Dealer
Tiverton	Batten & Thorne, Motor Engineers
Tonbridge	Chas. Baker & Co., 150 High Street
Torquay	J. Harris, 111 Union Street
Totnes	H. Jordan, 94 High Street
Towcester	A. Edwards, High Street
Triangle, nr. Halifax	W. Whitely
Tring, Herts	Robbins & Marriott, High Street
Truro	S. Hicks & Son, 10 River Street
Tunbridge Wells*	R. Carey, 16 Crescent Road
Tuxford, Notts	G. H. Clark, North Road
Twickenham	Palmer's Motor and Cycle Mart, 53 York Street
Tyldesley, Lancs	R. Parr & Son, Castle Street
Uttoxeter	J. T. Shaw, 14 Holly Road
Wakefield*	T. F. Manby, Kirkgate
Wallingford	F. H. Jenkins, 7 Market Place
Walsall	Colmore Depot, 250 Stafford Street
Wantage	Wantage Motor Co., Mill Street
Warminster	A. J. Dale, 7 Silver Street
Warrington*	F. A. Crabtree, Bridge Foot Garage
Warsop, Notts	E. Poynton, Market Place
Warwick	B. Warner, Market Place
Wealdstone	Harrow & Wealdstone Motor and Engineering Co., Station Bridge
Wednesbury	Taylor's Garage
Wellingborough	W. H. Mason, Midland Road
Wellington, Salop	S. J. Ferriday, Park Street Garage
Wem, Salop	Moss Bros., High Street
West Bromwich	The Speedaway Garage, 19-27 Bull Street
Westcliff-on-Sea	J. Costin & Sons, 237 London Road

Town	Agent
West Hartlepool	Gales Motor & Eng. Co., York Road
West Oxted	G. Rice, Ltd., Station Road
Weston-super-Mare	J. Pruen, Oxford Street
West Stanley	Dunn & Jameson, Station Road
Wetherby	H. Riley
Weybridge	E. Rogers & Sons, 57 High Street
Weymouth	Dan Guy, The Esplanade
Whitby	C. Jackson & Co
Whitchurch, Salop	A. J. Taylor, High Street
Wigan	H. H. Timberlake, Ltd., King Street
Wigton	H. I. Moore, 18 New Street
Winchcomb	W. H. Harding, Cross Garage
Winchester	Martin & Smith, High Street
Windermere	R. Smith, The Garage
Windsor	Surplice, 37 Sheet St.
Wingate	J. R. Howe, Front Street, Station Town
Winterton	G. W. Waterlow & Son, Motor Engineers
Wisbech	Palmer Bros., The Cannon Garage
Witham	J. E. Glover
Wolverhampton	Cyril Williams, Cleveland Street
,,	J. Devey & Co., 50 Darlington Street
,,	Scott's Garages and Filling Station, Birmingham Road
Woodbridge, Suffolk	J. W. Whisstock, The Thoroughfare
Wooler	E. Scott, Market Place
Worcester	Eric Williams Ltd., Lowesmoore
Worksop	A. Tarr, 28-30 Gateford Road
Worthing	Bridge Cycle and Motor Mart, 114 Chapel Road
Yeovil*	J. Moffatt, Town Hall, Garage
York*	C. S. Russell, Clifford Street
Ystalyfera, Glam.	T. P. Lewis, Motor Agent

SCOTLAND

Aberdeen*	G. Cheyne, Ltd., 174 Holburn Street
Aberhirder	John Davidson, Cycle Agent
Airdrie	William Hutchinson, 27 Chapel Street
Alness	J. Munro, Averon Garage
Alyth	Great & Adam, Motor Agents, 55 Airlie Street
Arbroath	G. Law, Motor Engineer, Commerce Road
Auchterarder	Mallis Bros., High Street
Ayr*	J. B. Niel, 22 New Road
Banff	A. Morrisson, 23 Bridge Street
Barrhead	G. McDiamid, 17 Cross Arthurlie Street
Bathgate	A. R. Broom, South Bridge Street
Bellshill	J. Potts & Co., Station Garage
Blairgowrie	J. Small, Motor Agent
Brechin	W. S. Leslie, Motor Agent
Buckie	G. Webster, Garage
Campbelltown	Craig Bros., 97 Longrow
Catrine	W. Fisher, The Square
Coatbridge	Bell Bros., 12 Bank Street

Town	Agent
Crieff	Barrington's Garage
Cupar, Fife	J. Leith, 53 Bonnygate
Darvel	Murray & Scade, Motor Dealers
Dingwall	J. M'Rae & Sons
Dreghorn	D. Rollo & Sons, Motor Agents
Dumfries	E. C. Grierson, 36 Church Crescent
Dundee*	Mann & Scott, The Esplanade
"	Johnston Bros., 73 Nethergate
Dunfermline	Campbell & Semple, 56 Pettencrieff Street
Duns, Berwicks	D. Cochrane, Castle Street
Edinburgh*	Rossleigh, Ltd., 32 Shandwick Place
"	A. Downie Ltd., Haymarket Terrace
Elgin	G. Anderson, 31 High Street
Falkirk	David Morrison, West End Garage, Camelon
Fettercairn	F. Walker, The Garage
Fort William	The Lochaber Motor Co.
Forfar	B. Ballingall, 118-120 East High Street
Fraserburgh	A. Park, 65 Broad Street
Friockheim	E. Suttie, Motor Agent
Galashiels	A. Purvis & Son, Market Street
Galston, Ayrshire	Young Bros., The Garage
Girvan	A. J. Ross & Sons, Park End Garage
Glasgow*	Bell Bros., 223 St. George's Road
Hamilton	Union Motor Cycle Co., 69 Townhead Street
Hawick, Co. Roxburgh	A. & J. Guthrie, 61 High Street
Helmsdale	G. B. Palmer, Southerland Street
Inverness*	A. Munro, Falcon Square
Keith	H. Walker, Central Garage
Kelso	R. Swan, 9 Bridge Street
Kilmarnock	Dick Bros.
Kinross	Henderson Bros.
Kirkcaldy	Neilson Bros., 16 High Street
Kirriemuir	J. Fearn, 40 Roods
Ladybank, Fife	J. B. Dall, Motor Dealer
Lanark	Hugh McCinnies, 24 St. Leonards Street
Linlithgow	P. & W. A. Donaldson, High Street
Lochee, Dundee	D. B. Wooler, 147 High Street
Lochwinnock	W. Struthers & Sons, Motor Agents
Lockerbie	Baird & Sons
Maybole	H. & T. McQuiston, Motor Agents
Moffat	Hunter & Gardiner, Motor Agents
Montrose	Duthie & Son, 51 High Street
Munlochy	C. Fraser, The Garage
Nairn	Knowles and Cumming, 9-11 Bridge Street
Newton Stewart	J. Kevan, 42 Albert Street
Oban	Anderson Bros., Combie Street

Town	Agent
Paisley	Messrs. Hamilton Bros., 26 Causeyside Street
Peebles	Kidd & Veitch, 3 Old Town
Perth*	Valentine's Motor Depot, City Hall Square, King Edward Street
Pitlochry	A. Beedie, Main Street
Prestwick*	Allen & Sons, St. Cuthbert Garage, Main Street
Rogart	W. A. Rose, Motor Dealer
Sanquhar	John Donaldson, Motor Dealer
Selkirk	Paterson Bros., Victoria Works
St. Andrews	Christie Bros., Bridge Street
Strandaer	A. Sloss, 24 Queen Street
Strathaven	J. & T. Prentice, Motor Agents, 10 Barn Street
Strathyre	Ferguson & Gibson, Motor Engineers
Stirling	Rossleigh, Ltd., 44 King Street
Tain	Fox & McLean, Knockbreck Road
Tongland	J. T. Aitkin & Co.
Turriff	Wm. Dickie, 10 Balmelli Street
Wick	R. S. Waters & Son, 15 Bridge Street
Whithan	E. Martin, 48 George Street

IRELAND

Armagh	J. J. Millar, Thomas Street
Ballymena*	W. Cameron, Ballymoney Street
Belfast*	W. J. Chambers, 106 Donegall Pass
Enniskillen	J. Jeffers, 36 East Bridge Street
Londonderry	S. Taggart, John Street
Magerafelt	Wilson Bros., Queens Street
Newry	S. Lockhart & Co., 96 Hill Street
Omagh	S. Steele, Bridge Street
Portadown	Irish Road Transport, Ltd., Cecil Street
Strabane	P. M. McGrath, Bridge Street

WALES

Aberdare	Parker Bros., 10 Cardiff Street
Abergavenny	T. Powell, Brecon Road
Abermule	J. E. Corfield, Motor Dealer
Abersychan	Oliver & Harris, Motor Agents
Aberystwyth	C. Evans, 15 Northgate Street
Ammanford	A. J. Waldron, The Arcade
Bangor	R. E. Grice, 305 High Street
Beaufort	J. Elson & Co.
Berriew	W. R. Davies

Town	Agent
Blackwood, Mon	A. Chaston, Pentwyn Road
Brecon	Brooks Bros., Bulwark
Bridgend	J. Board & Co., Nolton Street
Brynmawr, Brecon	N. Carter, Motor Dealer
Builth Wells	A. Colcombe, West End Garage
Buckley	W. G. Richardson & Sons, Central Garage
Cardiff*	R. Bevan, 31 Castle Street
Cardigan	The Bridgend Foundry Co.
Carmarthen*	W. Edwards & Sons, Towy Garage
Chwilog	O. A. Griffiths, Fourcrosses
Colwyn Bay	The Colwyn Bay Eng. Co., Ltd., Prince's Garage
Cowbridge	A. T. Mills, High Street
Crymmych Arms	J. W. Edwards, Motor Engineer
Denbigh	W. Edwards, The Garage
Dolgelly	J. R. Thomas
Glasbury-on-Wye	R. Jones & Son, The Garage
Gresford	H. Pinnington, Pinnington's Garage
Haverfordwest	Greens Motors Ltd.
Hirwan	J. John, 69A Brecon Road
Holywell, N. Wales	T. Tudor Griffiths, Canton Garage, Whitford St.
Lampeter	F. W. Atkins & Son, Central Garage
Llanbrymair	J. Davies, Dolgoch Garage
Llandilo	Central Garage (Llandilo) Ltd.
Llanelly	Holloway Bros.
Llanfair*	W. Jones, Motor Mart, Bryn Salem
Llangefni, Anglesey	T. R. Jones, 28 High Street
Llangollen	Jones Bros. (Llangollen) Ltd., The Garage
Llantrisant	Llantrisant Motor Co., Talbot Garage
Llanybyther	J. M. Jones & Co., Tryal Garage, Cribyn
Machynlleth	W. Evans, Dovey Motor and Cycle Depot
Merthyr Tydfil	J. Lewis, 46 Morlais Buildings
Monmouth	Love & Son, Monnow Street
Montgomery	R. H. Bunner
Neath*	J. Thomas, Queen Street
Newtown	Groom Bros., Pool Road
Pembroke & Pembroke Dock	W. L. Silcox & Sons, Water Street, Pembroke Dock
Pontardulais	T. Griffiths, Forest Garage
Pontypridd	Pontypridd Auto. Co., Station Square
Pwll, nr. Llanelly	William Thomas, Motor Dealer
Pwllheli	R. J. Jones, Efailnewydd
Resolven	E. J. Rosser & Sons, Motor Dealers
Rhayder	Andrews Garage, East Street
Rhyl*	H. G. Nelson, 39 Queen Street
Ruthin	R. Beech & Sons, Market Place
Swansea*	I. L. Roberts, 223 Oxford Street

Town	Agent
Tenby	George Ace, Ltd.
Trawsfyndd	David Jones
Tredegar	A. Morgan, 49 Commercial Street
Welshpool	J. H. Thomas
Wrexham	Hammer Bros., Regent Street
ISLE OF MAN	
Douglas	J. H. Cubbon, Finch Road
CHANNEL ISLANDS	
Jersey	F. P. & W. Le Sueur, 26 Halkett Place
Guernsey	W. Green, Progressive Motor and Cycle Works, Smith Street
ISLE OF WIGHT	
Ryde	M. J. Rumsey, 160 High Street

INDEX

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376

1930 SUPPLEMENT

For the present season the A.J.S. Company have placed on the market seven new models, four of which have inclined engines. They have also reverted to the old colour scheme of black with gold lines, which greatly adds to the appearance of the machine. Saddle tanks and separate oil tanks are now standard on all models.

The 2·48 h.p. De Luxe O.H.V. Two-port Model, R12. Fig. 1 is

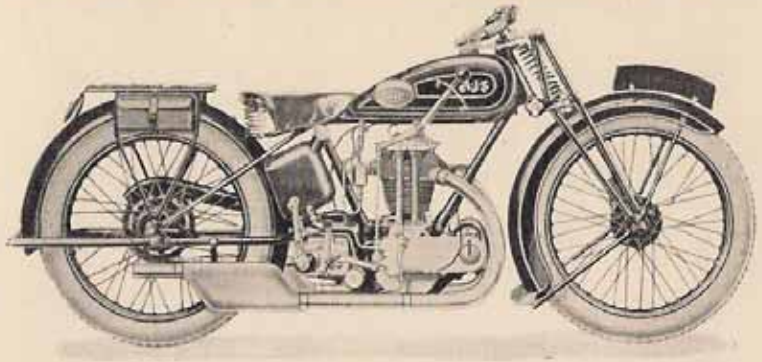

Fig. 1. The 2·48 h.p. De Luxe O.H.V. Two-port Model R12

from a photograph of the above model, a handsome machine which should prove to be very popular. Though one of the smallest in the range (bore and stroke 65 × 75 m.m., 248 c.c. capacity), it lacks none of the refinements of the larger models. It employs ry sump lubrication with auxiliary feed to cylinder walls, and has roller bearings fitted to the big end of the connecting rod, and ball bearings to main shafts. Detachable cylinder heads are standard on all models with the exception of R5, in which the cylinder head and barrel is cast in one.

Improved design of front forks, adjustable handlebars with steering damper and adjustable foot-rests, give added comfort. Stands are fitted on both front and back wheels, and, with wired Avon, heavy, non-skid tyres (25 × 3·00), make this machine very attractive.

Adjustable Lycett "Aero" saddle, Hans Renold all chain transmission, and Lucas magneto complete the specification.

The 3·49 h.p. De Luxe Side Valve Model, R.4. This machine, and

also the 4·98 h.p. Model R.9, has an inclined engine and side by side valves, and a brief specification is given below. The two models are identical except in respect of engine capacity. The engines, which have dry sump lubrication, aluminium pistons,

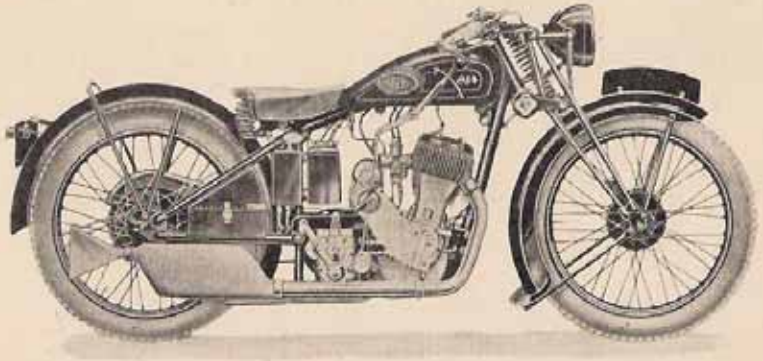

Fig. 2. The 3·49 h.p. De Luxe Side Valve Model R4

enclosed valve gear, and roller bearing big ends, are 74 × 81 mm. (349 c.c. capacity) and 84 × 90 m.m. (498 c.c. capacity), bore and stroke respectively. Amal carburettors with twist grip control are

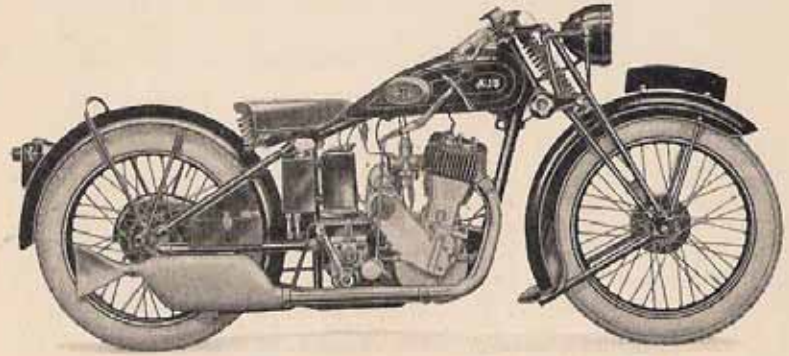

Fig. 3. The 4·98 h.p. De Luxe Side Valve Model R9

fitted, and magnetos are mounted behind the engine, and driven by chain from the inlet cam wheel. These models are shown by Figs. 2 and 3.

The 3·49 h.p. O.H.V. Two-port Model R.6. This model, and also the 4·98 model R.8 (Figs. 4 and 5), show exceptionally clean lines, and will be judged by some to be the best of the very attractive range of machines which the A.J.S. Company is marketing.

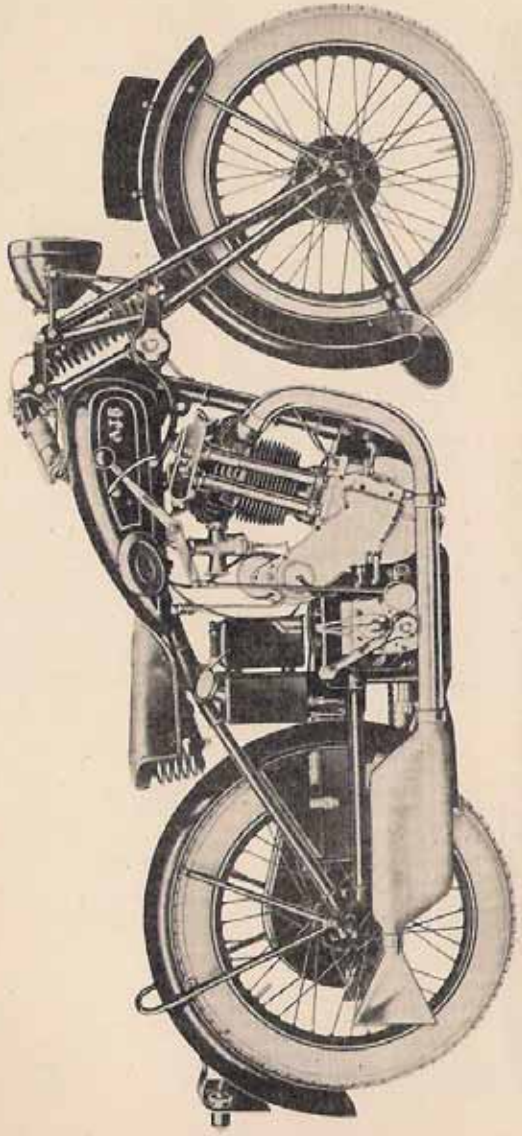

Fig. 4. The 4·98 h.p. De Luxe O.H.V. Two-port Model R8

The bore and stroke are 84 × 90 (349 c.c. capacity) and 74 × 81 mm. (498 c.c. capacity) respectively, this being the chief

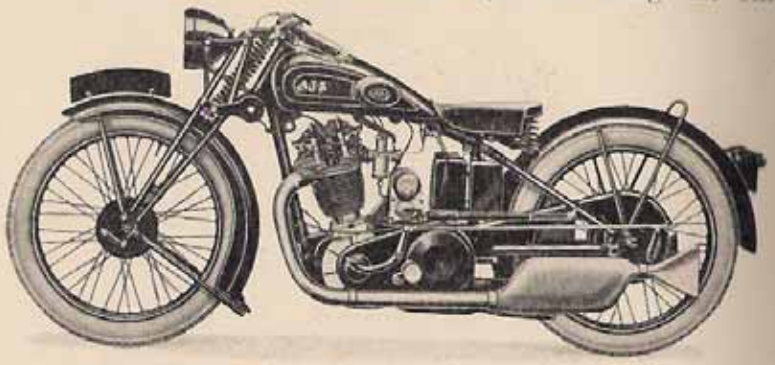

Fig. 5. The 3·49 h.p. O.H.V. Two-port Model R6

material difference between the two. The frames are of the semi-cradle type, with Duplex chain stays, and these are fitted to all the models which have inclined engines.

All of these models are of the usual very high standard of workmanship which one has come to associate with the A.J.S. Company.

1931 SUPPLEMENT

TO THE BOOK OF THE A.J.S.

Four new models have just been added to the range of machines, three of which (namely, SA 5, SB 6 and SA 12) come within the 30s. taxation limit, and these, together with the new motoring laws, will be described in the following pages. It may be as well to state here that the following items are standard on models S 4, S 6, S 8 and S 9. The rear mudguard is now hinged, and the carrier is quickly detachable, whilst low lift central stands are provided, and the saddle is adjustable for position longitudinally. "Clean" handlebars are fitted throughout the range, and provision has been made for easy adjustment of the magneto. Finger adjustment is provided for the clutch, brake, and exhaust valve lifter controls.

The 3·49 h.p. O.H.V. Model (SB 6). This model (Fig. 1) is perhaps the most outstanding of the new models. The engine is a single cylinder overhead valve type, and has a bore and stroke of 74 by 81 mm. respectively, the rated horse-power being 3·50. The cylinder head, which of course is detachable, has the famous A.J.S. big exhaust port, and the valve gear and rockers are entirely enclosed. An improved system of mechanical lubrication is employed on this and the other three new models. Roller bearings are fitted to the big end of the connecting rod, while the mainshaft runs in ball bearings. A three-speed countershaft gear-box is fitted, and the kick-starter mechanism is enclosed within the box. The ratios are 5·30, 8·20, and 14·59 to 1. When a four-speed box is fitted the weight brings the machine above the 30s. tax. The handlebars have the controls brazed on, and the carburettor, which is a Bowden, has the throttle operated by a twist-grip. Taper roller bearings are used in the hubs, which are fitted with internal expanding front and rear brakes, each brake being quickly adjustable.

The primary chain is enclosed, while the rear one is protected by an efficient metal guard. A transmission shock absorber is fitted on the engine shaft.

The 4·98 h.p. O.H.V. Model (SB 8). The specification for this model (Fig. 3) is practically the same as that for the SB 6, except for the following. The engine is mounted in a semi-cradle frame which has torque stays passing from the rear wheel beneath the gear-box and to the rear of the engine. The bore and stroke are 84 by 90 mm. respectively, giving a total capacity of 498 c.c. The rear brake is 7⅜ in. in diameter, and the front one 7 in.:

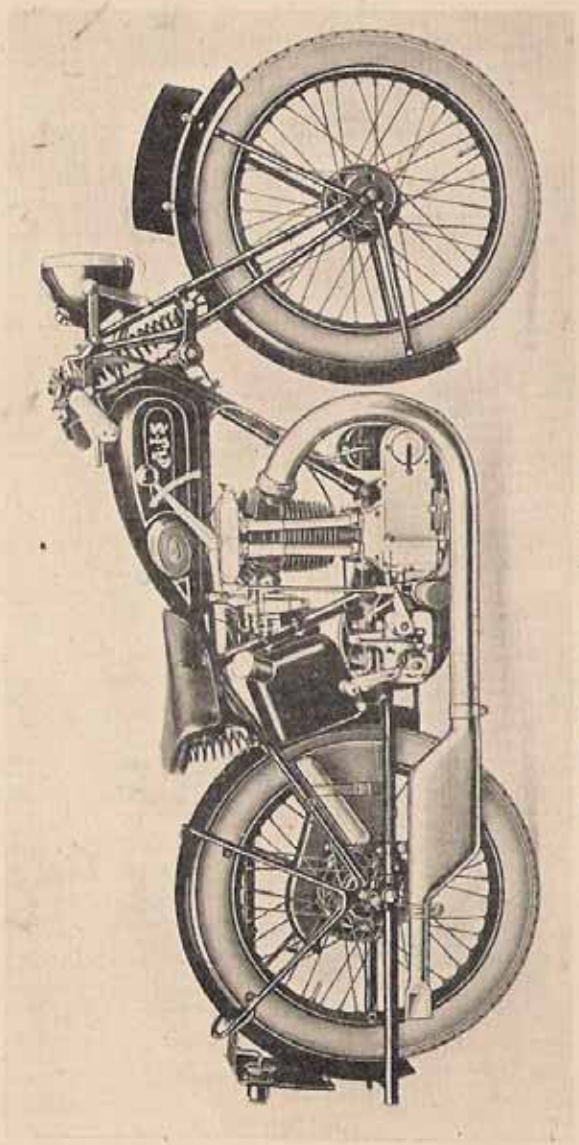

FIG. 1. THE 3·49 H.P. O.H.V. MODEL (SB6)

both are quickly adjustable. The Lucas magneto or magdyno is mounted behind the engine and is consequently protected from any foreign matter thrown up by the front wheel.

The 3·49 h.p. S.V. Model (SA 5). This model (Fig. 2) is identical with the SB 6 except for the following. Side-by-side valves are employed, and the valves are enclosed in a neat cover. An Amal carburettor is fitted, and this has twist-grip control. The handlebars are of a new type in which a steering damper is incorporated.

The 2·48 h.p. O.H.V. Model (SA 12). Although this model

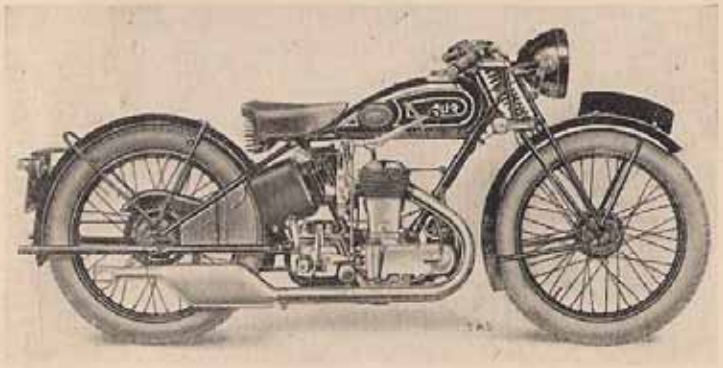

FIG. 2. THE 3·49 H.P. S.V. MODEL (SA5)

(Fig. 4) is the smallest in the range, its specification is very similar to that already given for the SB 6, therefore only the differing points are mentioned.

This machine has an overhead-valve engine, carrying a two-port head, the bore and stroke being 65 by 75 mm. respectively. As on the SA 5, an Amal carburettor with twist grip control is fitted, and the gear-box has ratios similar to those of the SA 5. No carrier is fitted on this model, but a lifting handle is provided.

NEW MOTOR LAWS

In order to bring this book right up to date, considerable data has been extracted from the Road Traffic Act, 1930, and it is hoped that this information will be of value to readers of this book.

Accidents (What to do). Stop immediately. Give name and address, and registration number of vehicle, if requested. Failing this, the accident must be reported within 24 hours at a police station or to a police constable.

The Ministry of Transport may direct an inquiry to be made into the cause of any accident involving a motor vehicle. A person authorized by the Minister may inspect the vehicle, and at a reasonable time enter premises where vehicle is situated. Obstruction of that person is an offence. The report of an inquiry shall

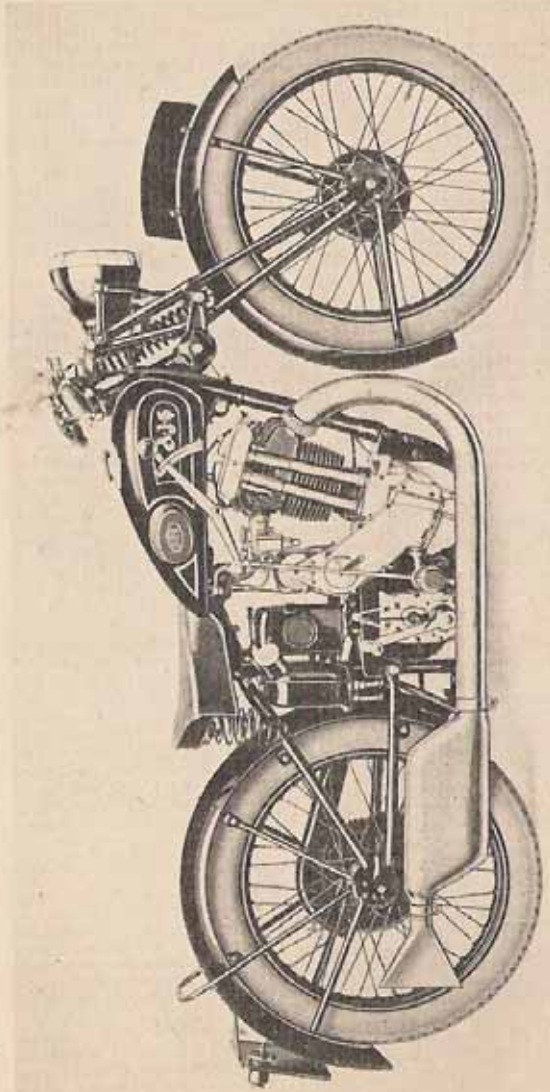

FIG. 3. THE 4·98 H.P. O.H.V. MODEL (SB8)

not be used in legal proceedings instituted in consequence of the accident.

Address. If a motorist is alleged to have driven recklessly, dangerously, or carelessly, he must give his name and address to any person having reasonable ground for requiring the information. If he refuses, or gives a false name and address, he is guilty of an offence.

Careless Driving. A person shall not drive without due care and attention or without reasonable consideration for other road

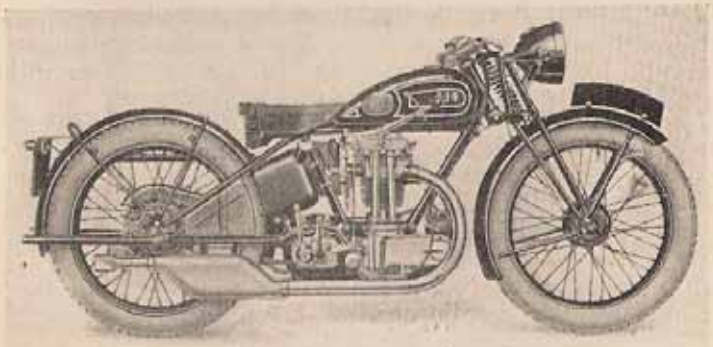

FIG. 4. THE 2·48 H.P. O.H.V. MODEL (SA12)

users. A first or second conviction for this offence does not entail disqualification from holding or obtaining a licence.

Dangerous Driving. A person shall not drive recklessly, or at a speed or in a manner dangerous to the public.

Penalties—

Not exceeding £50, or up to four months' imprisonment, for the first offence.

Not exceeding £100, or up to four months' imprisonment, or to both such fine and imprisonment, for the second or subsequent offence.

Six months' imprisonment or a fine (amount unlimited), or to both such imprisonment and fine, on conviction on indictment.

All convictions to be endorsed on the driving licence, with power to disqualify from holding or obtaining a licence.

Drivers' Licence. Seventeen is the minimum age for a licence to drive a motor-car, and sixteen for a motor-cycle. No person shall allow another to drive who is not properly licensed.

A declaration of physical fitness must be made at the time of application. The applicant must also declare that he is not disqualified by age or otherwise from obtaining a licence.

On the request of a police officer, the driver shall produce his licence for examination, to enable the officer to ascertain the name

and address of the holder of the licence, the date of issue, and the Authority by which it was issued. If unable immediately to produce the licence, he cannot be convicted of an offence if, within five days of the request for production, he produces the licence in person at any police station he may specify.

Drunkenness. Any person convicted of driving, or attempting to drive, or in charge of a motor vehicle on a road or other public place, when under the influence of drink or drugs to such an extent as to be incapable of having proper control of the vehicle, shall be liable—

(*a*) On summary conviction, to a fine not exceeding £50 or imprisonment up to four months. For a second or subsequent conviction, to a fine not exceeding £100 or up to four months' imprisonment, or to both such fine and imprisonment.

(*b*) On conviction on indictment, to imprisonment up to six months, or to a fine (unlimited) or to both imprisonment and fine.

A police constable may arrest, without warrant, any person committing this offence.

Unless, for special reasons, the Court thinks otherwise, disqualification for a period of twelve months shall follow a conviction. Particulars of conviction and disqualification shall be endorsed on the driving licence.

Eyesight Test. Are you able to read at a distance of 25 yd. in good daylight (with glasses, if worn) a motor-car number plate containing six letters and figures? Applicants who answer "No" to this question are debarred from obtaining a licence.

Highway Code. The Minister is required to prepare a code comprising directions for the guidance of all road users. This code, when prepared, has to receive the approval of both Houses of Parliament, after which it will be printed and issued to the public at one penny per copy.

Failure to observe any provision of the code is not by itself a ground for criminal proceedings of any kind. Nevertheless, it may be relied upon as tending to establish or negative liability in connection with any proceedings, whether civil or criminal.

Horn. A motor vehicle must be fitted with a suitable instrument for giving audible warning of approach where necessary. When a vehicle is stationary on the highway, no person shall use or permit the horn to be used except when such use is necessary on the grounds of safety.

Penalties—

First offence, fine up to £20. Subsequent offences, fine not exceeding £50 or imprisonment up to three months.

Insurance. A person may not use or permit any other person to use a motor vehicle on the road unless such use is covered by insurance against third party claims. This does not require the owner to cover a person in his employ against death or bodily

injury arising out of and in the course of his employment—a liability which is covered by other statutes.

Where compensation is paid under the provision of compulsory insurance, and where to the knowledge of the insurer a third party has received hospital treatment, the insurer shall also pay to the hospital a sum not exceeding £25 for each person so treated. This obligation does not apply where a charge has already been made by the hospital.

In addition to the usual policy, or cover note, the insurance company shall hand to the owner a "certificate of insurance" in

Fig. 5. Number Plate Dimensions

the prescribed form, and when applying for his motor-cycle licence, the applicant must—by production of the insurance certificate or otherwise—satisfy the Licensing Authority that the necessary cover against third party risks will be in force at the time the motor-cycle licence becomes operative.

The driver of a motor vehicle shall, when requested by a police constable, give his name and address, and produce the insurance certificate. If he cannot produce it immediately, he must produce it in person within five days at any police station he may specify.

Where an accident occurs involving personal injury to another person, if the driver is unable to produce his certificate at the time, he shall report the accident to a police station as soon as possible, *and in any case within 24 hours of the accident*, and shall there produce his certificate. If the certificate is not available for immediate production, the driver may produce it in person within five days at any police station he may specify.

Proceedings for offences may be brought (*a*) within six months of the commission of the alleged offence; or (*b*) within a period which does not exceed three months from the date on which the

offence came to the knowledge of the prosecutor, or one year from the date of the commission of the alleged offence, whichever period is the longer.

Penalties—

Up to £50 or imprisonment up to three months, or both such fine and imprisonment. A person convicted under this section is automatically disqualified from holding or obtaining a driving licence for twelve months, but without prejudice to the power of the Court where there are special reasons to order otherwise.

Lights. Motor-cycles with side-cars attached must show two white lights forward (indicating total width), and a red light showing to the rear.

Solo machines must carry one white light in front and a red light at the rear, together with proper illumination of the rear number plate (Fig. 5).

Number Plates. The dimensions for the front number plate are unaltered, but those for the rear number plate are as follows—

(*a*) All letters and figures must be 2½ in. high; every part of every letter and figure must be ⅜ in. broad; and the total width of the space taken by every letter or figure, except in the case of figure "2," must be 2¾ in.

(*b*) The space between adjoining letters and between adjoining figures must be ½ in., and there must be a margin of at least ½ in. between the nearest part of any letter or figure and the top, bottom, and sides of the black surface upon which the identification mark is inscribed.

Physical Fitness. A declaration as to physical disabilities must be made by every applicant for a driving licence. This declaration must be in the form prescribed by the Authorities, and it must state whether or not the applicant is suffering from any particular disease or physical disability specified in the form, or from any other disease or disability which would be likely to render it dangerous to drive. If the declaration shows the applicant to be suffering from any such disease or disability, the Licensing Authority can refuse to grant the licence.

Pillion Riding. No more than one person, in addition to the driver, may be carried on a solo motor-cycle, and such person must sit astride the cycle, and on a proper seat securely fitted behind the driver's seat.

Penalties—

First offence up to £5. Subsequent offences up to £10.

Speed Limit. The speed limit is now abolished except in the case of public parks, and local speed limits. The latter will be reviewed in 1932, and may then be suspended if the Minister of Transport considers it necessary.

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