2-STROKE ENGINE

MAINTENANCE LOG BOOK

W. & S. Ltd.

BPLB/2

2-STROKE ENGINE MAINTENANCE LOG BOOK

Name .....

Address .....

.....

'Phone .....

Club or Association .....

.....

'Phone .....

Insurance Co.....

.....

'Phone .....

Policy No.....

Certificate No. .....

Renewal date .....

Service station or garage.....

.....

'Phone .....

Driving licence No. .....

Expiry date .....

PARTICULARS OF 2-STROKE

Make .....

Model .....

Registration No. .....

Engine No.....

Frame No.....

Petrol Tank capacity .....

Gearbox capacity .....

Grade of oil.....

Battery type and voltage .....

Spark plug gap .....

Contact breaker points gap .....

Ask your dealer to fill in these particulars

HOW THE ENGINE WORKS

Of all internal-combustion engines, the three-port two-stroke type is by far the simplest. There are only three moving parts—the piston, the connecting-rod and the crankshaft. Sometimes people find that the very simplicity of the engine makes it difficult to understand.

Let us start with the first principles. Imagine that you are pedalling a bicycle. As you thrust down on the right-hand pedal the chainwheel is caused to revolve, carrying with it the chain which, in turn, makes the back wheel rotate. The crankshaft of our two-stroke engine can be likened to that chainwheel and crank; your leg is the connecting-rod of the engine and the pressure developed at your knee is the force of the explosion in the cylinder. Push down on top of the piston, which is what the pressure in the cylinder does, and the crankpin at the lower or " big-end " of the connecting rod moves round, carrying with it the wheel—the flywheel—and the chain that passes the drive to the back wheel.

Fig. 1 shows the cylinder, piston, connecting-rod, crankshaft and crankcase of a two-stroke engine in a diagrammatic form. The parts are lettered to show which is which. No difficulty will be experienced in grasping how pressure in the combustion chamber—the space between the crown of the piston and the cylinder head—causes the crankshaft to rotate. The cylinder is ribbed on its head and all the way up in order that it may be kept at a safe,

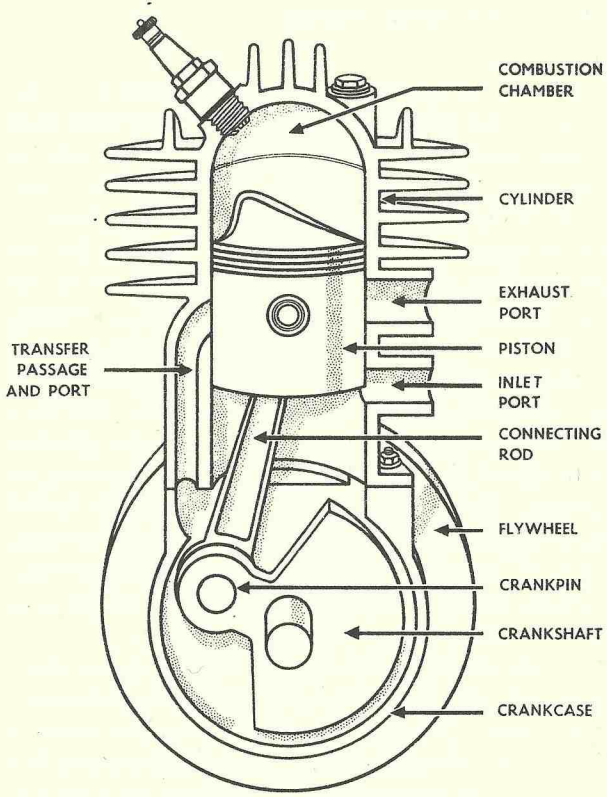


Fig. 1

as opposed to a too high, working temperature, the fins passing heat to the air, dissipating it by conduction, radiation and convection. In other words, the engine is air-cooled.

It will be noticed that the piston crown has a hump. This deflects the fresh petroil-air gas upward and away from the gas which has already been burnt. Not all two-strokes have deflector type pistons, though all have some arrangement for deflecting the incoming gas and thus preventing its leaving the engine via the exhaust without being used. The crankcase is an aluminium box, closed at its upper end, or " mouth ", by the cylinder. In the cylinder is a series of ports and one or more transfer passages. The former is the means of entry and exit for the inlet and exhaust gases and the latter transfers gases from the crankcase to the cylinder.

Next look at Fig. 2. The piston in this diagram is shown moving upwards. As it does so, the bottom of the piston uncovers the inlet port. The rising piston causes a partial vacuum in the crankcase—a vacuum into which, as the port is uncovered, petroil-air mixture from the carburettor rushes. In other words, the crankcase is being used as a pumping chamber and the rising piston as a suction pump. Already in the combustion chamber above the piston there is a charge of petroil-air mixture from the previous cycle of operations. The piston moving upwards, compresses this charge. When the piston reaches the top of its stroke, an electric spark,

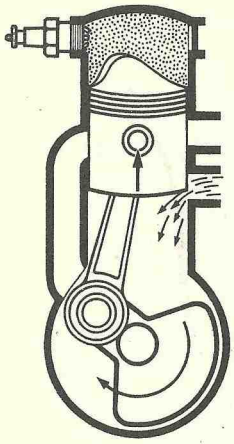


Fig. 2

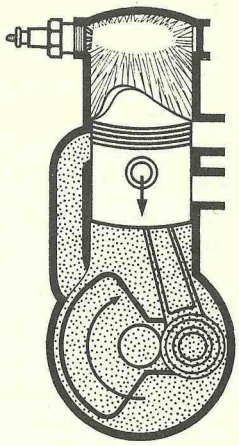


Fig. 3

automatically provided by the magneto, ignites the compressed charge. Down goes the piston (Fig. 3). As it travels downwards, it uncovers, first, the exhaust port (Fig. 4), thus letting out the burnt gas which passes to the silencer. At the same time it covers the inlet port and starts to compress the petroil-air mixture waiting in the crankcase. Before the exhaust port has been fully uncovered the piston starts to uncover the transfer port, whereupon the compressed mixture in the crankcase rushes upwards into the combustion chamber. The

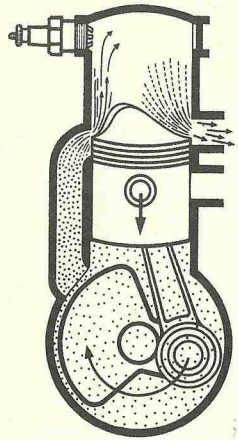


Fig. 4

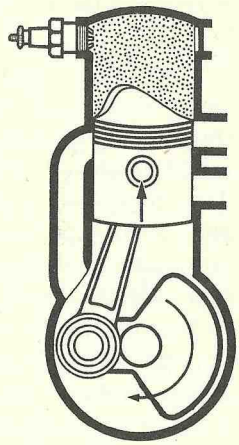


Fig. 5

deflector on the piston forces this fresh mixture upwards and away from the exhaust. Now the transfer of the mixture completed, the piston rises again (Fig. 5) and, just as soon as the inlet port is uncovered, a fresh cycle of operations will start. It is all delightfully simple. All standard two-stroke engines function in this manner. They are called three-port two-strokes, the three ports being the inlet, the exhaust and the transfer. Many engines have twin exhaust ports and two or more transfer ports, but they are still termed " three-port ".

RUNNING-IN YOUR NEW MACHINE

The aim in running-in is to give the various bearing surfaces—those of the piston, cylinder, big-end, little end, etc.—their opportunity of bedding in and taking on a high degree of polish thus minimising friction loss. This they will do automatically if there is correct lubrication, a proper mixture of petroil and air via the carburettor and thoughtful handling of the controls, expecially the throttle control.

As is emphasized in the chapter on lubrication, it is most important that the correct grade of oil is used in the precise quantity that the makers of the engine recommend and that the oil and petrol are properly mixed. An incorrect grade of oil, the wrong quantity or incomplete mixing, will affect the running of the engine ; it may also result in excessive carbon and port blocking that can lead to a certain amount of bother.

The rule over running-in is that the initial mileage is covered with the engine working lightly and that, as the distance increases, the engine is given progressively more to do until, at the end of the stipulated mileage, it is operating up to the full, desired capacity. Therefore, at first, keep to about a third, or at the most, half-throttle. With a cyclemotor, aid the engine with the pedals so that it does not have to labour. If, during the course of a run, the engine seems to run unduly hot and sluggishly, disconnect the drive and give the engine a minute or two

to cool down. The chances are that nothing of the sort will occur, but it is as well to be clear on the point that the engine should, at first, have a really easy time.

Makers differ in their views on the distance that should be covered before the engine is driven at full capacity. For example, four hundred miles is mentioned in the instructions issued by one well-known manufacturer. With a 98 c.c. autocycle, 500 miles is the figure usually quoted. Your particular instruction book probably stipulates a distance; if not, these figures will act as a useful guide.

During the running-in period, many parts of a machine tend to bed down. Hence it is wise to check the tightness of nuts and the correctness of adjustments. A clutch, if fitted, is almost certain to bed down to some extent in the first few hundred miles. If with a machine that has a clutch it is found that when the throttle is opened the engine starts to buzz hard yet the machine travels no faster, or very little faster, the reason is merely that the clutch is slipping. Provided that it is not a case of the rider grasping the clutch without realizing the fact, one simple alteration to the setting of the clutch-control adjuster is all that is needed.

There must be a slight amount of free movement of the cable that operates the clutch—about $\frac{1}{8}$ in. movement of the wire before the clutch lever on the engine unit starts to free the clutch. The probability is that when this buzzing occurs there is no free movement at all.

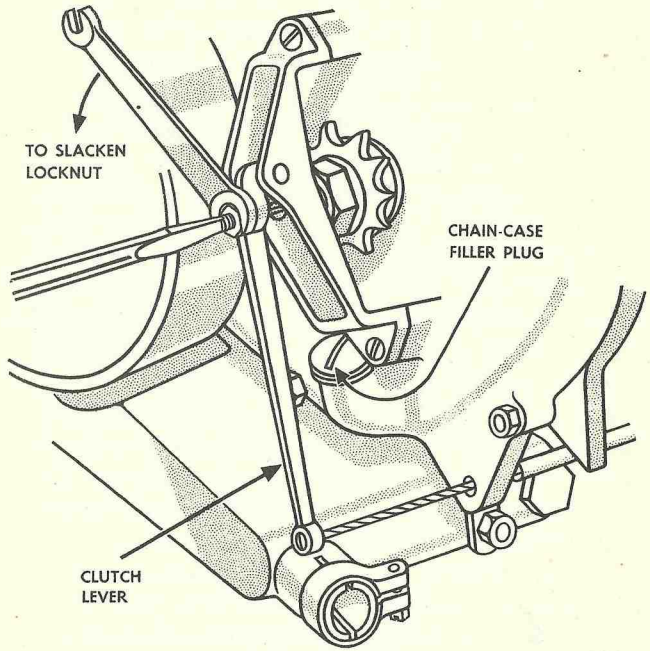


Fig. 6

Where, as shown in Fig. 6, there is an external lever on the engine unit, it is a matter of a moment to check there is free movement in the cable, and no more than a couple of minutes is required to slacken the locknut, rotate the screw anti-clockwise to the required extent and re-tighten the nut. It is as well to keep a fairly close watch on this adjustment during the first hundred miles or so. If all the slack is allowed to disappear, and the clutch therefore slips, the wear both on the clutch-operating mechanism and in the clutch itself will inevitably be rapid.

When a machine is new there is always more likelihood of dirt reaching the carburettor than at any other time. The makers of many of the units have guarded against this by fitting special filters. In the case of the engine the filter, wisely, is of such design that not only does it prevent any choking of the carburettor but also it is not likely itself to become choked. This filter is at the carburettor end of the fuel pipe—in the banjo union that will be found at the end of the petroil pipe (Fig. 7). Clean this filter, or at least check that it is clean, following the first hundred miles. After that there is little chance of trouble, though obviously whenever the engine is dismantled, as, for example, when it is being decarbonized, the rider will automatically make sure that it is clean.

Another thing which is much more likely to happen in early stages of ownership than at any other time is that

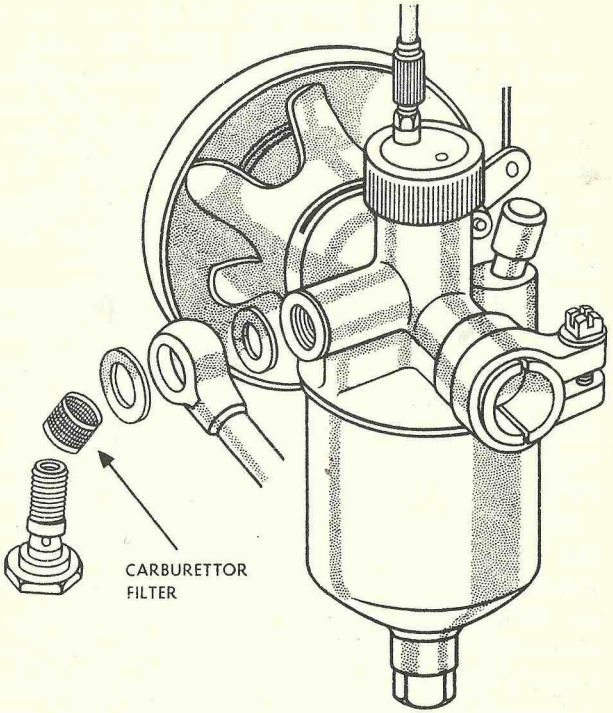


Fig. 7

the rider will inadvertently make the petroil-air mixture so rich that the engine will not fire. This can result from flooding the carburettor and/or using the strangler when the engine is hot, excessive flooding at any time or the machine being left leaning over with the petroil tap on—leaning so that neat petroil can flow into the engine. Wheeling the machine a few yards with the throttle wide open and the drive engaged may ventilate the engine sufficiently.

Should the engine by any chance still be unwilling to fire, the drain plug near the bottom of the crankcase should be removed and the machine pushed a few yards in the manner just described. Then screw the plug home tightly, taking care that the washer is replaced, and all should be well. The only other possible cause of trouble is that the points of the sparking plug have become soused with wet petroil owing to the excessive flooding. Thus it may be necessary to unscrew the plug, blow out any petroil with the tyre pump and wipe the points with a piece of rag.

Such tasks are very unlikely to be required and will not be required if the owner remembers to turn off the fuel tap when he leaves the machine and, secondly, always avoids overflooding.

There is, however, one well worth-while hint for petroil-lubricated machines, namely, that when the machine is to be left for more than a minute or two, the petroil tap should be turned off some three hundred

yards before the end of the run. The reason for this is simply that otherwise heat from the engine will cause petrol in the float chamber to evaporate, leaving behind an excess of oil. This heat drives off the lighter and more volatile fractions in the petrol—the easy starting fractions. By leaving the float chamber more or less empty, we only have to turn on the tap to have petroil of the correct proportion—petroil which ensures the easiest possible start. Four final points: Running the engine for long periods with the machine stationary is undesirable. In such circumstances there is no cooling draught other than that of any breeze. Secondly, if at any time a new piston is fitted, treat the engine as if it were new. Thirdly, carburettor jets have very small holes and, if there is not an efficient filter and the petrol or oil comes from a dirty can or measure, they may become choked. Fourthly, when descending long hills, when the engine is being used as a brake to check road speed, it is wise to open the throttle at intervals, so that the petroil mixture can lubricate the engine when running idle.

LUBRICATION

Because of its extraordinary simplicity, the lubrication of a two-stroke engine with some owners brings trouble in its train. No lubrication system could be more simple, provided an oil approved by the manufacturer is used, in the correct proportion and thoroughly mixed with the petrol. The engine sees to the rest, inducing its quota of oil with every charge of petrol and air and passing it, in the form of " petroil " mist, to every bearing surface—the cylinder walls, the little end, the big-end and the main bearings.

If the machine is ridden down a long hill with the throttle closed the engine receives no lubricant and has to rely on whatever quantity clings to the respective bearing surfaces. This last point need not be an objection, because the rider, realizing that oil only reaches the engine when the throttle is open, will appreciate the desirability, in such circumstances, of opening the throttle occasionally.

One of the main objections to the two-stroke lubrication system was the difficulty and messiness involved in the pre-mixing of oil and petrol, and subsequent doubt in the owner's mind as to whether he was getting the right amount and correct grade of oil to petrol. This has now been overcome with the introduction of the Shell and BP Two-Stroke Petroil Service, employing the new Avery-Hardoll Petroiler.

2-STROKE PETROIL SERVICE

GENERAL DESCRIPTION

The Petroiler is a self-contained unit which dispenses accurately mixed petrol and lubricating oil.

The main dial indicates the quantity of petrol/oil mixture delivered, whilst subsidiary openings in the dial indicate the number of the mixture selected for delivery. Above the dial is a combined sight glass panel showing that the oil and petrol systems are full. The homogeneous mixing of the petrol and oil can be seen taking place in a visible chamber between the sight glasses and the delivery outlet.

SALIENT FEATURES

Accuracy of measure: The equipment is extremely accurate, measuring down to half-pints.

Delivery takes place only during the downward stroke of the pump handle and therefore accurate measure is independent of the length of the stroke.

The Petroiler and either one or the other of the two mixtures it dispenses are approved by leading manufacturers of two-stroke engined machines.

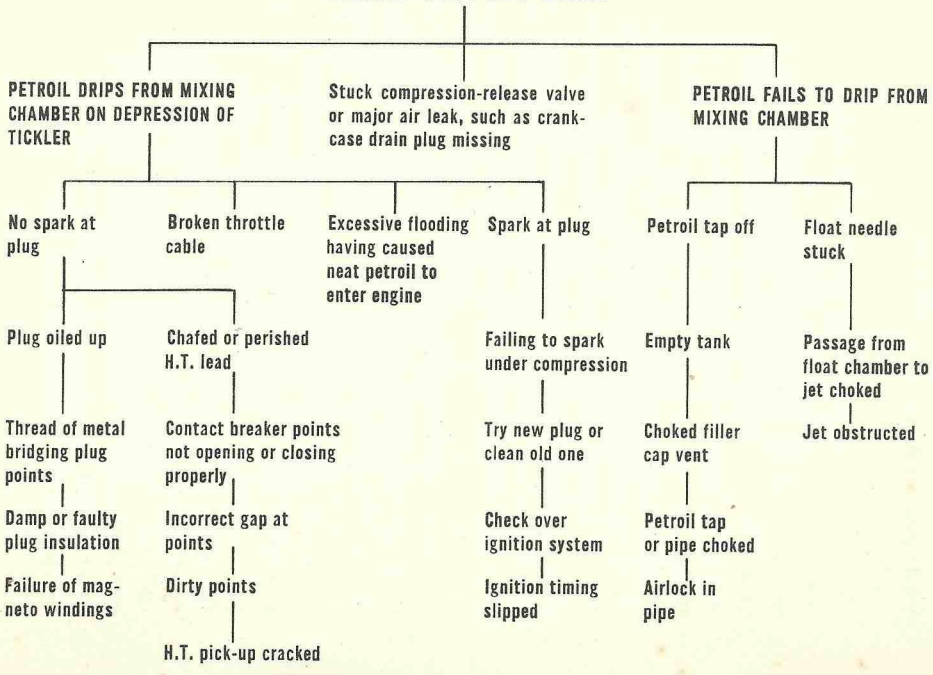
TRACING TROUBLES

The great secret in tracing any little trouble is to be methodical, thinking and acting along definite lines instead of darting here and there. This is so irrespective of whether the engine suddenly ceases to fire, whether it will not start from cold or hot or whether it runs badly, perhaps misfiring. On the following pages will be found two " Tracing Troubles " charts specially designed by the technical staff of *The Motor Cycle* to help the user of a two-stroke engine. As will be seen, they are based on the theme of logical sequence.

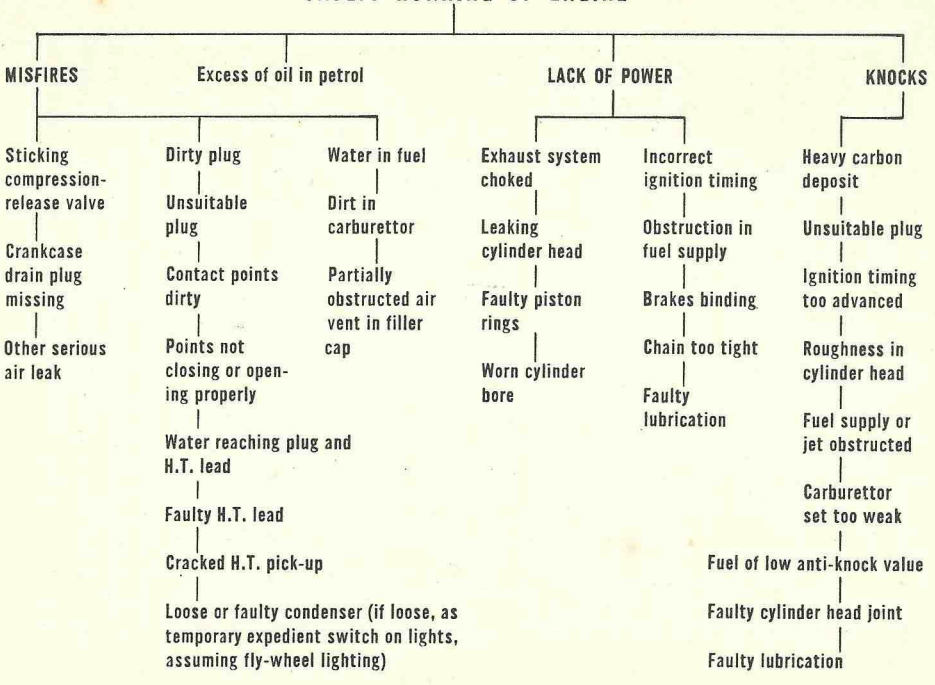
One of the charts is for use when the engine fails to start, or when it stops. The other chart covers faulty running.

With a two-stroke engine one is, of course, dealing with a power unit so simple that there is little which can go wrong. But this very simplicity seems at times to make elucidation more abstruse. And there is the fact that a two-stroke has such a marked ability for continuing to run even though off-colour that eventually, when trouble does occur, it may arise not from one fault, but several. A case can be quoted of a lightweight owner whose machine failed completely after many months of daily use; before the engine would again run properly it was necessary to replace a perished high tension cable, to fit a new sparking plug, a new carburettor jet needle and to clean up the contact breaker points—this was an

ENGINE WILL NOT START



FAULTY RUNNING OF ENGINE



exceptional case of an engine which, following years of use, has suddenly died on its owner, but it does constitute a rather telling example of how, when there is more than one fault, it may be necessary to attend to a series of points. As will be seen, the " Tracing Troubles" charts will help irrespective of whether the trouble is a singleton or a combination.

Where the filler-cap vent is partially choked one may have the puzzling fact that the machine will run for half a mile or a mile, stop, and after a minute or two, during which some petroil will have reached the carburettor, start up and run for, say, another half a mile. Puzzling, yet so simple !

A perished high-tension cable has been mentioned. These cables, if they are allowed to touch the hot cylinder, can become burnt through; they can also become chafed. The puzzle that arises here is that, when the plug is removed and laid on the cylinder for checking whether there is a spark, the high-tension cable is clear of the cylinder or cylinder head—in other words, the current is no longer being short-circuited. From this it will be gathered that it is wise always to arrange the high-tension cable so that it remains clear of the cylinder or cylinder head. This can be done by screwing up the plug terminal hard with the cable so placed that it is out of harm's way. If the terminal is not of the screw type, but has a clip, it may be necessary to twist the cable half a turn or a complete turn before attaching it to the plug; twist the

terminal end clockwise and not anti-clockwise, which might cause the high-tension pick-up to unscrew.

Now a more detailed explanation of how to check whether there is a spark at the appointed place—the plug points. All we have to do is to remove the plug and place it on top of the cylinder so that only the body of the plug touches the cylinder, and the terminal, to which the high-tension cable is attached, is well clear of the cylinder or any other metal part. Now rotate the engine either by pushing the machine with the drive engaged or, preferably, by use of the pedals or kick-starter with the machine on its stand. A regular spark should occur at the plug points. Bear in mind that the fact that a spark occurs at the points in the open air is not absolute proof that a spark occurs under compression. Owing to oil and carbon the spark may, under compression, occur inside the plug instead of at the points.

If a plug fails to spark, look very closely at the gap between the central electrode and the side point or points. Sometimes a very fine whisker of metal will be found bridging the gap and preventing a spark occurring. Removal is merely a matter of running a penknife blade, or even a pin, between the points, thus knocking it off. If this trouble occurs frequently, it is probable that a weak carburettor mixture, a choked exhaust system or retarded ignition timing, are resulting in the engine's operating at a higher-than-normal temperature. Therefore the frequency of the plug-point bridging may be reduced by

(a) setting the carburettor to give a slightly richer mixture, (b) cleaning out the entire exhaust system, (c) ensuring that the contact-breaker gap and ignition timing are correct and (d) increasing the gap between the plug points as much as possible consistent with easy starting and good running.

Remember that, when an engine is comparatively new, there is the possibility of the fibre heel on the contact-breaker bedding down a little—perhaps to the extent that the contact-breaker points do not separate, as they must do if the circuit is to be broken and a spark occur.

If at any time the engine stops suddenly and locks the back wheel until the clutch lever is raised, there are two possibilities. One is that the sparking plug is of the wrong type and incapable of withstanding the heat. Or perhaps there is some obstruction in the fuel system which is causing a weak mixture; lean mixtures can result in this pre-ignition even with a plug which is of the correct type. Another possible cause of this locking up is partial seizure of the piston. This is very unlikely but can occur with a new piston or if the owner has failed to mix the proper quantity of suitable oil with the petrol. A weak petroil-air mixture can also be at the root of the trouble. Where the trouble is pre-ignition the plug points will have that hard, whitish appearance. Also, the engine will rotate freely once the throttle is closed. In the case of partial piston seizure—drying-up it is often called—it will be a moment or two before the engine is free.

This guide to good ownership is coming to an end; may one bit of rather obvious advice be given ? It is just this: it pays to adopt the old adage " a stitch in time ". While it is foolish to disturb the cylinder and piston when the engine is running well, it is even greater folly not to attend to any lubricators, adjust the final driving chain when it needs it, occasionally see that the plug and contact-breaker gaps are approximately correct—indeed, attend to any of the little maintenance tasks; there are not many.

We are indebted to " The Motor Cycle " for their co-operation in producing this booklet, and, in conclusion, an excellent publication called *Autocycles and Cyclemotors* by the staff of " The Motor Cycle " and published by the Iliffe Press will be quite a big asset to the owner's bookshelf.

PETROILER RECOMMENDATION CHART

MIX No. 1 is approved by the manufacturers for

AMBASSADOR
A.C. PETITE
ALLARD CLIPPER
BOND MINICAR
BRITISH ANZANI
BROCKHOUSE SPRYT
B.S.A. BANTAM
B.S.A. BANTAM MAJOR
B.S.A. WINGED WHEEL
CORGI
COTTON
CYC-AUTO
DAYTON ALBATROSS
D.K.W. (Sonderklasse car)
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D.K.W. (Hobby motor scooter)
D.M.W. (two-strokes only)
D.O.T. (standard untuned engines only)
DOUGLAS VESPA
EXCELSIOR
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GORDON (car)
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HARPER SCOOTOMOBILE
JAMES
J.A.P. (125 c.c.)
KIEFT (moped and scooter)
LAMBRETTA
MOSQUITO
NEW HUDSON
NORMAN
NSU-QUICKLY
NSU (Fox and Lux two-strokes)
O.E.C.
PANTHER (two-strokes only)
PASHLEY
RAMBLER
RIVA SPORT
ROYAL ENFIELD (R.E. and Ensign)
SCOTT (98 c.c.)
STARLETT
SUN
TANDON
VERNON INVALID CAR
ZUNDAPP-BELLA

MIX No. 2 is approved by the manufacturers for

CYCLEMASTER
CYCLEMATE
CYCLAID
ITOM
J.A.P. (34 c.c.)
MINI-MOTOR
MOBYLETTE
PHILLIPS
POWER PAK
TEAGLE
VINCENT FIREFLY

PETROIL CONSUMPTION REGISTER

DATE	SPEEDOMETER READING	PINTS	£	s.	d.
TOTAL C/F					

PETROIL CONSUMPTION REGISTER

DATE	SPEEDOMETER READING	PINTS	£	s.	d.
TOTAL B/F					
TOTAL C/F					

PETROIL CONSUMPTION REGISTER

DATE	SPEEDOMETER READING	PINTS	£	s.	d.
TOTAL B/F					
TOTAL C/F					

PETROIL CONSUMPTION REGISTER

DATE	SPEEDOMETER READING	PINTS	£	s.	d.
TOTAL B/F					
TOTAL C/F					

PETROIL CONSUMPTION REGISTER

DATE	SPEEDOMETER READING	PINTS	£	s.	d.
TOTAL B/F					
TOTAL					

GEARBOX LUBRICATION REGISTER

DATE	SPEEDOMETER READING	QTY.	GRADE OF OIL	£	s.	d.
TOTAL						

FINAL DRIVE LUBRICATION AND ADJUSTMENT RECORD

DATE	SPEEDOMETER READING	SERVICING PERFORMED

BRAKES MAINTENANCE RECORD

DATE	SPEEDOMETER READING	ADJUSTED/RE-LINE	£	s.	d.
TOTAL					

BATTERY—
TOPPING-UP, CHARGING AND REPLACEMENTS

DATE	DETAILS	£	s.	d.
TOTAL				

WHEEL HUBS, STEERING, SUSPENSION
LUBRICATION AND ADJUSTMENT RECORD

DATE	SPEEDOMETER READING	SERVICE PERFORMED

SPARKING PLUG MAINTENANCE REGISTER

DATE	SPEEDOMETER READING	CLEANED, RE-SET OR RENEWED	£	s.	d.
TOTAL					

CONTACT BREAKER ADJUSTMENT AND LUBRICATION

DATE	SPEEDOMETER READING	REPLACEMENT	£	s.	d.
TOTAL					

TYRE RECORD

DATE FITTED	SPEEDOMETER READING	DATE REMOVED	DETAILS OF REPAIRS	£	s.	d.
TOTAL						

DECARBONISING, REPAIRS, REPLACEMENTS (not recorded under other headings)

DATE	SPEEDOMETER READING	DETAILS	£	s.	d.
TOTAL					

SUMMARY OF COSTS

(Enter total from previous pages)

PETROIL .....£

Total of running supplies.....£

TYRES .....£

REPAIRS .....£

BATTERY WORK .....£

Total of running costs .....£

GARAGE .....£

LICENCE .....£

INSURANCE .....£

SUNDRIES .....£

Total standing costs .....£

Add depreciation £

_____

TOTAL COST _____

MILEAGE: Subtract first from last speedometer reading.

Last speedometer reading—

First speedometer reading— _____

TOTAL MILES COVERED
(Divide into total cost) = _____ **PENCE PER MILE**

SUGGESTED RAPID CHECK

before starting out on a long journey at short notice

TYRES

Pressures. Examine for cuts and remove stones and flints. Test inflator.

CONTROLS

Examine all controls for smooth operation and security, particular attention to exposed ends of Bowden cables, clutch and brake adjustment.

FINAL DRIVE

Adjustment, lubrication, and attention to spring connecting link.

SECURITY OF MAIN COMPONENTS

Quick check on security of wheels, petrol tank, footrests, silencer(s), mudguards.

FRONT FORKS

Check for freedom of movement, security of locking nuts on girder type.

PETROIL

Check level, topping up if necessary. Turn on and check for leaks or flooding carburettor.

LIGHTS

Whilst dynamo is running check lights and dynamo.

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