THE MODERN
ARIEL
MOTOR CYCLE

1931
OWNERS' GUIDE
Models VB.31 & VF.31

Price:
ONE SHILLING

ARIEL WORKS, LTD.
SELLY OAK, BIRMINGHAM

Grams:
ARIEL, SELLY OAK

Phone:
SELLY OAK
451

ARIEL WORKS LTD.

SELLY OAK, BIRMINGHAM

INTRODUCTION.

A careful study of this Guide will enable you to get the best results from your machine, with the minimum of trouble and expense.

Motor Cycling is one of the most fascinating of outdoor pastimes, for not only does it give one speedy access to the open country, and bring numerous places of interest within easy reach, but it offers ample opportunity for the display of skill, both in driving and management of the machine, in order to get the maximum amount of pleasure and utility at the lowest possible cost.

A certain amount of attention must be given to the machine to maintain its high standard of efficiency, otherwise much of the delight of Motor Cycling will be lost. Neglect to make the necessary adjustments, or only casual attention to the lubrication of important working parts, will soon neutralise the best efforts of those engineers who have devoted their skill and knowledge to the production of an ideal machine, and bring needless trouble and expense to its owner.

In the following pages of this publication we have given, in non-technical language, practical matter which has been compiled from carefully kept records extending over the past few years, and deals with every kind of query likely to arise.

We are, however, always pleased to give Ariel owners every assistance and advice on matters connected with their machines.

When sending in your enquiry, please always give the following information :—

Model, e.g. VB.31 (557 c.c. S.V.) or VF.31 (497 c.c. O.H.V.).

Year of Manufacture.

Engine number and letter (stamped on drive side of crankcase, just below cylinder flange).

Frame number and letter (stamped on right side of saddle lug).

It is quite useless to send the registration number of the motor cycle.

Enquiries of a technical nature should be addressed to the "Technical Information Dept."

Orders for spares should be sent to the Spares Department, and not included in a letter dealing with other matters, although the two can be enclosed in the same envelope. Compliance with this request will save at least one day's delay in the despatch of spare parts.

Taking over a New Machine.

First see that the seals on the tool bag and tyre pump are intact, and that any extras which may have been ordered are as specified. If necessary, unscrew the kick starter spindle and reverse, and fix foot-rests.

Fill up the petrol and oil tanks. For fuel, we recommend any of the well-known brands of No. 1 spirit for use in either of the standard engines. With a high compression piston fitted, however, the compression ratio becomes approximately 7.1 and a genuine 50/50 benzole-petrol mixture is required; plain petrol will cause excessive pinking. Aviation Spirit can be used instead of No. 1. Notes in connection with suitable oils, etc., are given on *page* 8, and see also "Oil Level in Tank," *page* 12.

Having satisfied yourself that everything is in order, it is essential to become familiar with the various controls, both as to position and direction of movement. The handlebar controls and gear lever are shown in Fig. 1 with notes. The gear lever quadrant is marked 1.N.2.3, the number 3 being nearest the rider. 1 signifies first or low gear, N. neutral or free engine position, 2 second or middle gear, and 3 third or top gear. The rear brake pedal is on the right-hand side, just by the footrest.

Instructions for Starting.

The engine will always start readily if the following instructions are followed :—

Set the ignition lever one-third advanced, slightly open the throttle—about one-eighth of the total movement of the lever—close the air lever and very slightly flood the carburetter by momentarily depressing the "tickler" in the lid of the float chamber. Depress the kick-starter until a big resistance is felt. Allow the kick-starter to return to the top of its travel. Hold up the

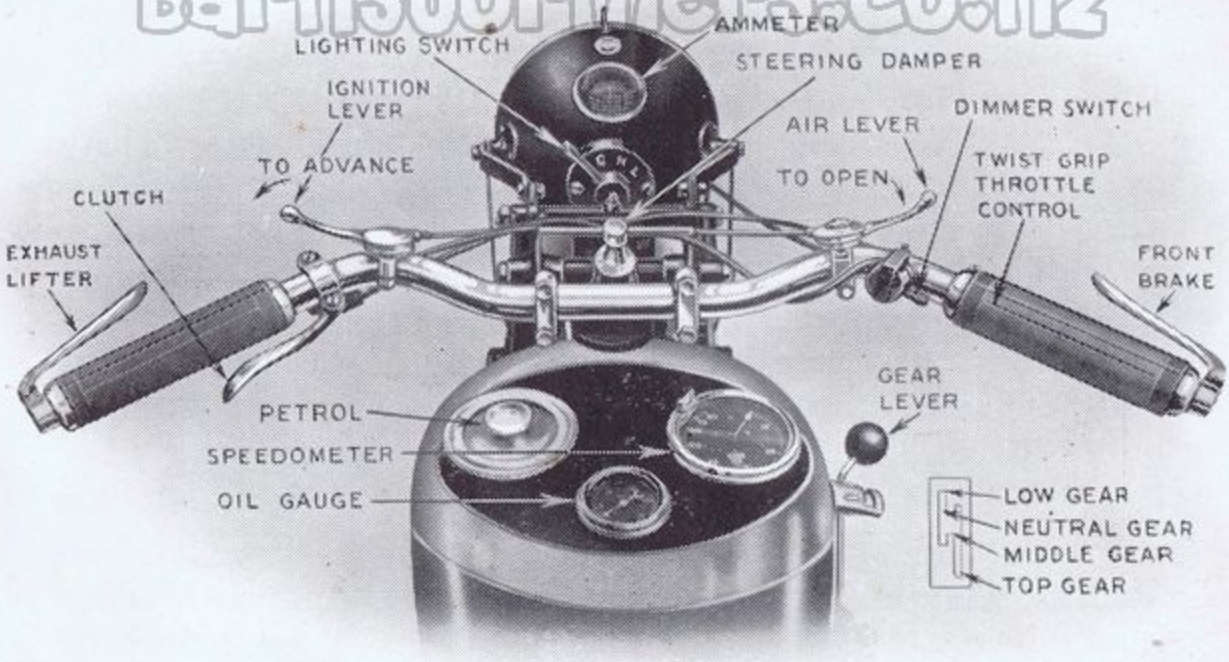


FIG. 1. THE CONTROLS.

exhaust valve lifter. Now depress the kick-starter sharply, dropping the valve lifter rather before the kick-starter crank is half-way down. If the engine has started, fully advance the ignition lever and open the air lever about half to three-quarters.

See that the oil gauge mounted in the tank is registering a pressure. Under normal running conditions this will be about 10-15 lbs.

The Ariel lubrication system is entirely automatic in action, and so long as the oil tank is kept replenished it is practically impossible for any trouble to occur. Hence occasionally verifying the supply by seeing that a pressure is maintained is all that is required.

As soon as the engine is warm—about half a minute—fully open the air.

If the engine has not started, have two or three more attempts, but do not flood the carburetter any more. Trouble in starting a new machine is more likely to be due to inexperience on the part of the rider than to there being any fault present.

If this is your first machine persevere for a few minutes before starting to locate the trouble.

Fault Finding.

If the engine still fails to start, it may be due to a dirty plug. Remove the sparking plug and see if the points are clean. They may be found covered with oil or carbon ; carefully clean this off, and, if possible dismantle the plug (see Sparking Plug) and clean the inside. Having re-assembled, connect the high tension wire to the plug terminal and place the plug on top of the cylinder or on top of the timing cover, being very careful that neither the terminal screw nor the metal connecting piece on the end of the H.T. wire—which has been connected to the plug terminal—are touching any part of the machine. Now operate the kick-starter and see if there is a spark at the points.

If there is now a good spark, and the points were previously dirty, the trouble has probably been cured, and so replace the plug and try again.

Should the engine still refuse to fire, undo the high tension wire from the plug, hold the metal end about $\frac{1}{8}$in. from the cylinder—take hold of the rubber, NOT the metal itself—and operate the kick-starter. A good spark shows that the plug is at fault and must be dismantled, and properly cleaned (see Sparking Plug) or a new one fitted. No spark at all signifies magneto trouble (see Magneto) or a faulty H.T. Cable. This latter is most improbable on a new machine, but if faulty a spark will probably be seen jumping from the cable to some part of the machine ; in this case it must be renewed. A temporary repair is to tie the cable so that the faulty part is held well away from any other part.

If a spark is obtained from the end of the high tension cable and also across the plug points, the trouble is probably due to carburation..

To Check Carburation.

1. Make sure that there is plenty of petrol in the tank and that the petrol tap is turned on. Also see that the vent hole in the filler cap is clear ; a stopped up vent hole causes an air lock, with ensuing petrol shortage, or possibly total stoppage.
2. Ascertain, by flooding, that petrol is reaching the carburetter. Petrol should flow out of the main jet and air intake. If not—stoppage, dismantle and clean. (See Carburation or Carburetter Booklet).

3. If petrol flows out as described it is probable that the pilot jet is obstructed by dirt or may have been tampered with. As this jet supplies the whole of the petrol for starting and slow running, it is essential that it should be correctly set and quite free of all obstruction. Try readjusting this, or take out and clean. (See Carburetter Booklet, also *page* 33).

   It is most important to remember that this pilot jet automatically goes out of action as the throttle is opened ; hence if the throttle is opened too far, this jet does not work at all, and starting becomes very difficult or impossible. Also, do not forget that the cable operating the throttle will probably stretch after a short time, so that although the lever on the handlebar may be opened correctly, it does not follow that the throttle valve in the carburetter has opened sufficiently. This can be remedied by adjusting the cable stop on top of the carburetter, so that there is only a little lost movement in the throttle lever.

   A further point is never to adjust the slow running jet when the engine is hot, as if this is done the mixture will probably be too weak when cold.

   If the engine starts all right and will run slowly, but stops when the throttle is opened, the main jet is probably choked with dirt and must be removed and cleaned.

   The only other reasonable causes of difficult starting are loss of compression or faulty timing, which are dealt with elsewhere.

A chart of possible troubles is given on *page* 58.

Driving.

Having started the engine and seen that the oiling system is working correctly, declutch, engage first gear, open the throttle very slightly, and let the clutch in gently. The machine will then move off. Fully advance the ignition lever.

To engage second gear, close the throttle, declutch, and move the gear lever into middle gear, making a slight pause in the neutral position between the gears. Release the clutch and open the throttle again.

Top gear is engaged in precisely the same manner as second, except that the gear lever is moved from the middle to the top gear position.

To change down from a high to a lower gear, slow the machine down, partly close the throttle, but not fully, so that the engine speeds up as soon as the clutch is disengaged ; declutch and move the gear lever to the next lower position ; then release the clutch.

Always declutch before changing gear either up or down.

Do not exceed about 30 m.p.h. in top gear until all bearings, etc., have thoroughly bedded down and are quite free. This will probably take 400 to 500 miles. Proportionate speeds in middle and bottom gears are approximately 20 and 10 m.p.h. respectively.

Front Brake.

The Front Brake is exceptionally powerful, yet perfectly smooth and safe in action. We advise riders to get thoroughly conversant with its action first, so that it can be correctly applied when occasion arises.

Ignition Control Lever.

It is advisable to keep the ignition lever advanced, retarding only when necessary, *i.e.*, for starting and occasionally for hill climbing (see Section 7 below), for it not only enables more power to be developed, but greatly helps the Magneto, since prolonged and unnecessary running in the retarded position causes burning and rapid wear at the contact breaker points. It also enables the engine to run much cooler and tends towards greater economy in petrol and oil consumption.

What Constitutes Bad Driving.

1. Racing the engine unnecessarily and letting the clutch in so quickly that the wheel skids or jerks the machine forward. *Take a pride in a neat "getaway."*

2. Jamming on the brakes at the last minute instead of slowing down steadily. *Brake early and drive on the throttle and not the brakes.*

3. Racing the engine or grinding the gears when changing gear. *A good driver is a neat driver.*

4. Applying the brakes when rounding corners instead of slowing down before reaching them. *Brake early and be neater, safer and faster.*

5. Remaining in top gear when the engine is obviously labouring instead of dropping down into a lower gear. *Never force an unwilling engine.*

6. Opening the throttle quickly when the machine is travelling slowly, thus causing the engine to " pink." *Change down for a quick " getaway."*

7. Running with the ignition too far retarded, causing overheating and loss of power. *Advance the ignition as far as the engine will stand.*

8. Using the exhaust lifter lever to slow down instead of shutting the throttle. *The exhaust lifter is for starting only.*

9. Holding the clutch " out " too long instead of dropping into neutral. *Excessive slipping soon heats up the clutch.*

10. Interfering with the silencing system to obtain a heavy bark. *Silence is golden, but noise brings a fine.*

11. Using the machine when out of adjustment. *Check everything over at frequent intervals.*

12. Taking unnecessary risks.

Obey the rules of the road scrupulously.

Silence.

As the result of careful tests and experiments, the manufacturers of the Ariel Motor Cycle have evolved a silencing system which is entirely satisfactory under all normal conditions of use. A rider who is driving his machine in a reasonable and normal manner, can be fully assured that the silencing system is many times more than adequate to reasonably quieten the exhaust note.

The observance of the following points will however, prevent any remote possibility of a charge of inefficient silencing :—

1. Don't keep your engine running unnecessarily in neutral. It is easily stopped and started.
2. Start off quietly in low gear, then change into middle and top. Close the throttle whilst actually making the change.
3. Avoid quick acceleration in any confined space. Narrow streets, high walls, etc., confine, or may even magnify, noise.
4. Recollect that the degree of silence of your machine is judged not by the actual noise it is making, but by the " background " of noises present. Thus in

a busy street your engine might be inaudible at ten yards, but in a quiet and narrow street, with high buildings, it might be heard for several hundred yards, although being driven in exactly the same manner.

5. Don't alter the standard silencing system, or you will probably have to pay the fine.

THE ENGINE.

Construction.

The 497c.c. O.H.V.Ariel engine has a bore of 81.8m.m. and a stroke of 95 m.m., whilst the 557 c.c. S.V. model has a bore of 86.4 m.m. and the same stroke as the O.H.V. model. These engines are built according to the best practice in motor cycle engine design, and incorporate fully enclosed valve gear on both side valve and overhead valve models, also dry sump lubrication.

Special Dry Sump Type Lubrication.

(**See diagram, pages 30 and 31**)

This is the latest type of lubrication system and combines great economy with the most efficient lubrication.

With this system the lubrication of the engine is entirely automatic and all the rider has to do is to keep the oil tank replenished and clean out the filters, etc., as required. An oil pressure gauge mounted in the petrol tank, indicates a pressure immediately the oil begins to circulate, and so long as the pressure is maintained, it shows that oil is circulating correctly. Should the gauge fail, or should the rider feel in any way dubious about the oil circulation, it is easily checked by removing the oil filler cap (with the engine running), and seeing that oil is being returned from the engine to the tank, *via* the oil pipe just beneath the filler cap.

To obtain the best results, only a suitable high-class lubricating oil should be used ; we strongly recommend Messrs. Wakefield's Castrol Oil.

Castrol X.L. for the S.V. models in cool weather.
Castrol X.X.L. for the S.V. models in hot weather, and for O.H.V. models at all times.
Castrol R. for very fast road work, racing and competition riding.

Do not mix Castrol R., which is a vegetable oil, with other oils, or mineral oils such as Castrol X.L. or X.X.L. If changing over, drain and swill out the oil tank, pipes and engine. Run carefully for 50 miles after changing over.

Owing to the importance of using only a suitable high-class oil, riders are advised to always specify the *make and grade*. For example, ask for " Castrol XXL " and not simply " XXL." " XXL " might refer to any brand of oil, and whilst the oil itself might be quite good, it would not necessarily be of a suitable composition for use in our engines.

The actual working of the oiling system is as follows :—

Bolted on to the outside of the timing case, but inside the magneto chain case, is the special Ariel pump. This has two plungers working side by side in the phosphor bronze pump body. These two plungers are caused to move up and down by means of an eccentric on the end of the cam spindle, movement being transmitted from the eccentric to the plungers through the medium of a sliding block.

These plungers are of two different diameters but both have the same stroke so that one pump can pass more oil than the other. The smaller plunger is the delivery pump ; it draws oil from the tank and passes it through a pipe which projects into the hollow mainshaft spindle on the timing side. The oil is then forced through the Oil Purifier in the flywheel, into the hollow crankpin, and so direct to the big-end bearing which is thus receiving a continuous stream of cool, clean oil. Escaping from the big end, the oil is thrown on to the cylinder walls and piston, lubricating and cooling these ; it then drains down into the crankcase, some of it being collected in oilways which take it to the large phosphor bronze bearing on the timing side of the mainshaft.

Oil spray from the crankcase is forced through specially placed vent holes into the timing case and magneto chain case, where it lubricates the timing gear and after reaching a pre-determined level—which is such that the timing pinion is running in an oil bath—it then drains back into the crankcase.

Below the timing gear, at the bottom of the crankcase, is a small sump in which the oil collects after passing through a large filter. It is then pumped back to the tank by the larger pump plunger already described.

With this system the oil is continuously being circulated, so that the engine is receiving a large supply of oil without, however, there being any waste or likelihood of the sparking plug being oil up.

When running at 25 m.p.h., on top gear, one pint of oil is circulated through the engine every ten minutes. The oil supply varies with the engine speed.

The Ariel Oil Purifier

(Patent applied for)

and Oil Filters.

The Centrifugal Oil Purifier, mentioned above as being in the flywheel, is an absolutely automatic and mechanical device for separating dust, grit, dirt, etc. from the oil. No matter how clean an oil is used, dirt and grit will get drawn into the engine via the carburetter, and unless this grit is removed immediately, it will help to wear away the bearings. The Ariel Oil Purifier removes this grit as soon as ever it gets into the circulating oil. The action of the oil purifier is as follows :—

The oil leaves the hollow timing side mainshaft and passes half way along the steel tube A. emerging at the hole B. This tube is solid at the end away from the centre of the flywheel. As the oil passes from the tube into the reservoir C, any dirt or grit, etc. is thrown by centrifugal force to the end of the reservoir nearest the cleaning plug D, whilst the purified oil travels back towards the centre of the flywheel and enters the crankpin via the passage E.

The dirt which has collected in the cupped plug D should be cleared away about every 5,000 to 8,000 miles under normal conditions of use. Where the motor cycle is used in particularly dusty conditions, so that there is a proportionately greater chance of grit being drawn in through the carburetter, the plug can be removed for cleaning at shorter intervals.

To get at the purifier, remove the crankcase sump by undoing the four set bolts, and drop the sump complete with filter. Rotate the engine until the plug D is immediately above the sump and then undo the plug ; this is locked in position by means of a tab washer. When the plug is removed, the dirt (if present in any quantity) will be found packed quite hard inside the

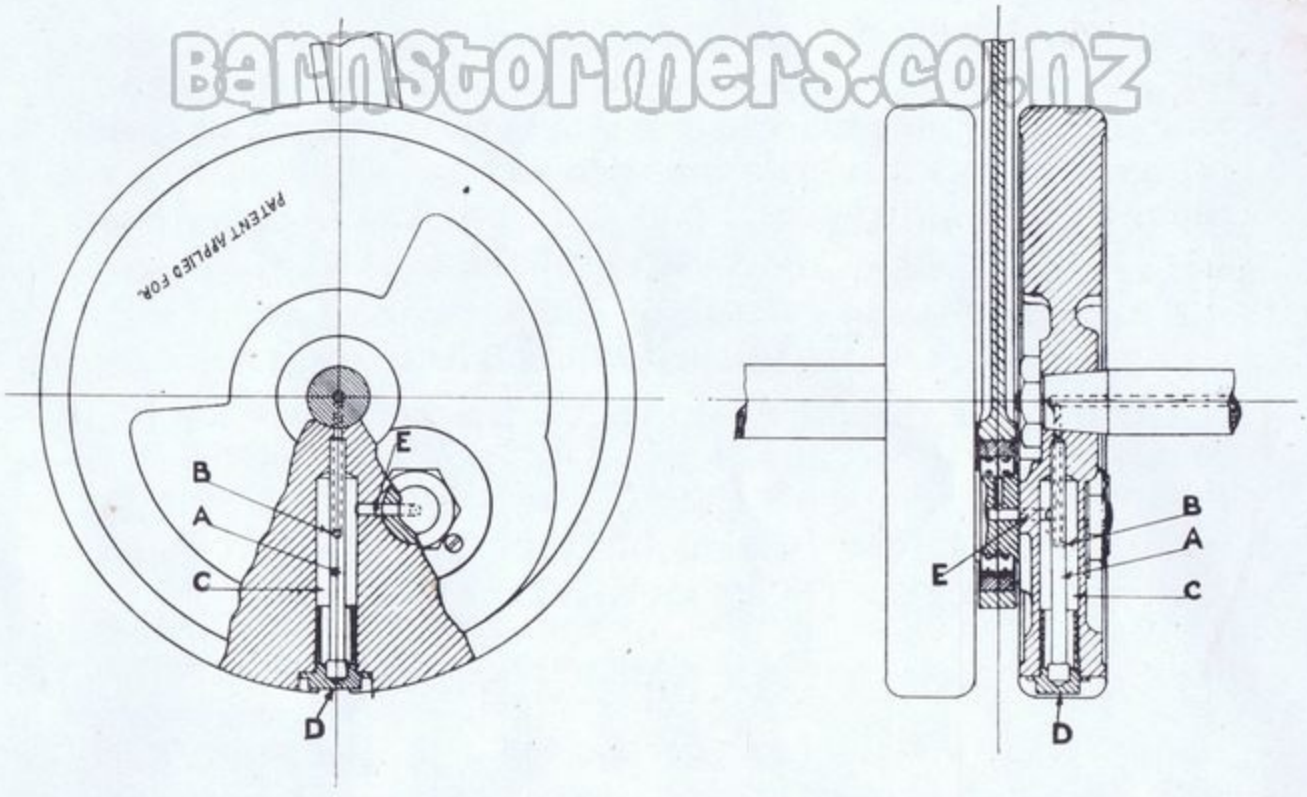


FIG. 2. "THE ARIEL OIL PURIFIER."

cup formed in the plug, and must be removed with the blade of a penknife. See that the tube A. is not damaged and if it drops out, replace with the large end in the plug. The plug locates the tube and keeps it in position.

When replacing the plug, see that it is screwed up dead tight *and do not forget the tab washer* ; one end must be turned up by the side of a flat on the plug. Use a new tab washer every second or third time the plug is removed, as repeated bending of the metal will cause the end tab to break off the washer.

The sump filter should, of course, be cleaned whilst detached. When replacing, see that the suction pipe is located in the hole in the top of the gauze and do not forget the joint washer. Wire up the set bolts to prevent loss.

Similar remarks as to cleaning also apply to the filter on the inner end of the plug which secures the oil pipe to the bottom of the oil tank. Unscrew the plug, clean in petrol, and replace ; screw up securely and see that there is a fibre washer on each side of the eye piece at the end of the oil pipe.

The lower pipe from the oil tank is the delivery or suction pipe and should be connected to the upper port on the timing cover. The pipe from the top of the tank is the return pipe and is connected to the lower port on the timing cover.

Although the Ariel Oil Purifier will remove all dirt, etc., from the oil, it cannot turn old oil into new, and it therefore becomes necessary to throw away the used oil as it loses its lubricating properties. This is recommended about every 2,500 miles. A suitable drain plug is provided at the bottom of the oil tank.

Oil Level in Tank.

Do not fill the oil tank above the level of one inch below the return pipe, and do not allow the level to drop below about two-thirds. This leaves a minimum quantity of 1 pint in circulation. The more oil there is in the tank, the cooler and cleaner it keeps.

Notes on the Oil Supply.

Pressure Gauge.

A pressure gauge is incorporated in the oiling system so that the rider can tell at a glance that the oil supply is correct. The gauge is mounted in the tank and is connected to the delivery side at a point immediately after the delivery pump. The pressure is created by pumping the oil past a spring-loaded ball valve, Fig. 3.

Although a means is provided for varying the oil pressure, it should be understood that a pressure registered on the oil gauge simply indicates that the lubrication system is functioning correctly. The quantity of oil passing to the engine is governed entirely by the efficiency of the pump and the actual engine speed. Increasing the oil pressure does not increase the efficiency of the lubrication system or the amount of oil passing to the engine, and a pressure regulator is used only to facilitate setting the gauge to give a normal reading of 10-15 lbs. per sq. inch

The path of the oil past the regulator is as follows : Oil is delivered from the pump along the hole A. and forces the spring loaded ball valve B. off its seat. It then passes through oilways C. drilled in the timing cover, to the point of delivery into the hollow mainshaft. The connection to the oil gauge is along the pipe D. It will, therefore, be seen that the pressure registered on the gauge is the pressure which is required to force the ball valve B. off its seat. If the locknut E. is slacked off, the spring pressure adjusting screw F. can be rotated so that the spring pressure on the ball valve can be

varied. Turning the screw clockwise increases the spring pressure and gives a higher reading on the oil gauge, whilst rotating the screw anti-clockwise has the reverse effect.

In order that the gauge may return to zero when the engine stops, or should the oil supply fail for any reason, the inner end of the regulator body is made slightly smaller than the hole into which it fits, so that a small leakage exists at the point G.

Hence, if the oil ceases to flow, the oil which is under pressure in the passage A. will leak away at the point G. so that the gauge shows no pressure.

The flow of oil can be tested by removing the plug H. when, with the engine running, oil will be pumped out at this point instead of passing along the oilways to the mainshaft and big end bearing.

The oil supply can also be checked by removing the oil filler cap on the tank and seeing that the oil is returned via the return pipe. The oil will come through in a continuous stream for a few seconds when the engine is first started, but the flow will rapidly decrease until the oil is returning in a series of bubbles. This is the normal condition of the returning oil.

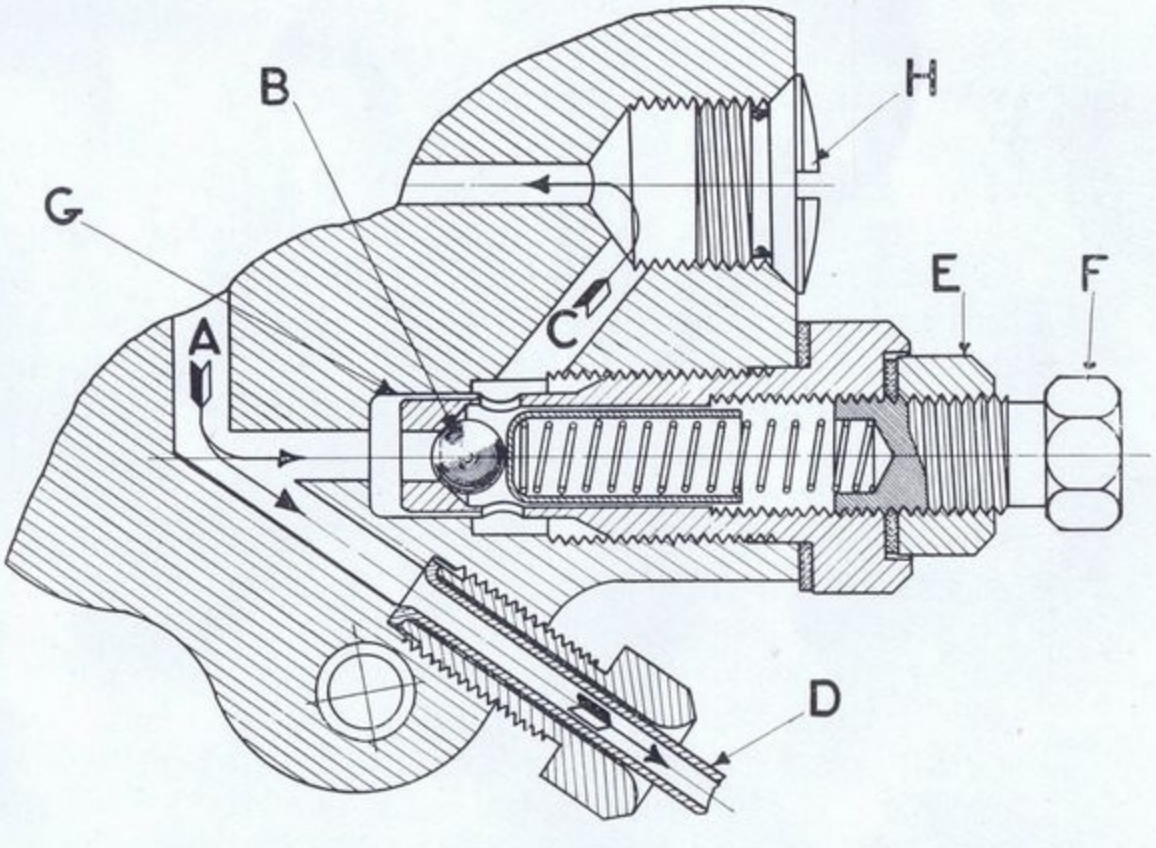


FIG. 3.
OIL PRESSURE REGULATOR.

It is practically impossible for the lubrication system to go wrong, but the following notes may be helpful in the event of any slight irregularity in the oil supply.

1. The greatest enemy of efficiency and good lubrication is dirt. Clean the filters as outlined and use only a clean high-class oil, such as Wakefield's Castrol X.L. or X.X.L. (see page 8). It is preferable to buy this in sealed tins. If the oil pipes are removed, wash them out with petrol or paraffin, and, before replacing, carefully clean each joint.

2. Failure of the oil supply will almost certainly be due to a bad joint, dirt, or a defective pump.

A bad joint causes the pump to suck air instead of oil.

Dirt will get on to the valves beneath the pump plungers and will cause the pumps to operate inefficiently. To clean :—

The following method will frequently prove effective in moving dirt from the delivery pump plunger valve.

See that there is plenty of oil in the tank. (Preferably full).

Screw down the oil filler cap securely, start the engine, and place the finger on the vent hole in the filler cap for 1 or 2 minutes. The pressure created in the tank by the return pump will cause the oil to flow and probably clear away the obstruction.

If this method is not effective, or if the dirt is under the return pump plunger, proceed as follows :—

Remove the magneto chain cover and unscrew the appropriate valve plug beneath the pump body ; the front plug is the return or scavenging pump, whilst the rear plug is the delivery pump. The ball valve and spring will then fall out. See that the ball, spring, and also interior of the plug, are clean, and squirt a little clean petrol or paraffin up into the pump body so as to clean the valve seat. Then kick over the engine several times with the plug removed. This should blow away any dirt or grit which may be on the valve seat.

To test the oil flow to the delivery pump rotate the engine until the pump plungers are up at the top of their stroke. Remove the plug, ball and spring below the left or rear plunger and oil should flow out. The flow is only by gravity from the tank and so will be only relatively slow.

If the pump itself is defective return it to our Service Dept.

Nothing is to be gained by removing the pump body from the timing case. See that the two securing screws are done up tightly and do not disturb unnecessarily.

See notes under Timing Gear and Oil Pump, pages 23, 24, and 25.

Decarbonisation.

The period for which an engine will run efficiently without being decarbonised, depends to a great extent upon driving conditions. To obtain the best results from our 500 c.c. and 550 c.c. models, decarbonisation should be carried out about every 2,000 to 3,000 miles. For the first time, decarbonisation can advantageously be carried out at **half** this distance. This is a perfectly simple operation, and is done as follows :—

Side Valve Model.

Remove the sparking plug, valve caps, carburetter, exhaust pipe, exhaust valve lifter wire.

Now remove the four nuts and spring washers, holding down the cylinder, and lift the cylinder up. As soon as it is clear of the securing studs, incline it forwards and lift up towards the front of the tank. Pull the piston down to the bottom of the stroke and the cylinder will come away.

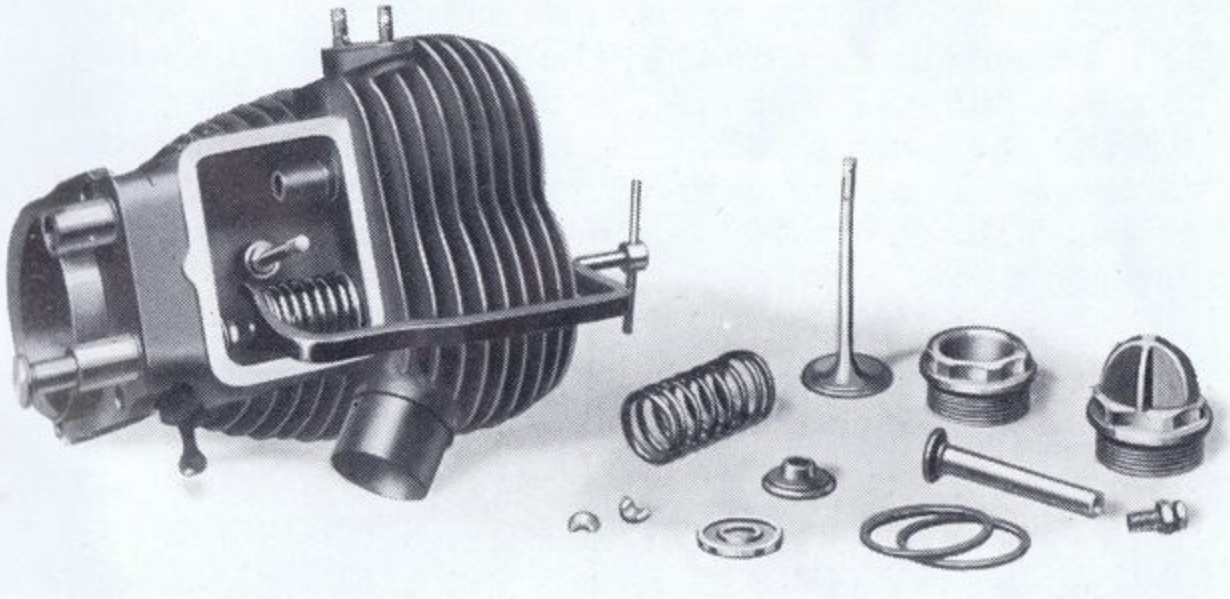


FIG. 4.

METHOD OF REMOVING VALVES. S.V. MODEL.

Place the cylinder on its side—valve spring chamber upwards—on a bench, and remove the valves, using the valve extractor obtainable from Ariel Stockists or the Ariel Service Dept. (price 3/10, including postage). The forked end is placed under the valve collar and the point of the screw in the small centre hole in the valve head. Screw up, compressing the spring and then remove the split cones. Unscrew the extractor and remove the valve, leaving the spring and collar in position resting on the tappet head. Both valves are dealt with in this manner.

Do not interchange the valves. The inlet valve is stamped " IN " or " 2,S,11." The exhaust valve is stamped " EX " or " J,H,3."

Now scrape all carbon deposit out of the cylinder head, valve pocket and ports ; an old screwdriver can be used for this.

The Piston.

The carbon on the piston head must also be scraped away. The piston is easily removed by pushing out the gudgeon pin, which is fully floating. Be careful to replace the piston and pin the same way round. To avoid mistakes a small mark may be made on, say, the timing side.

Gudgeon Pin.

The gudgeon pin is of the fully floating type, *i.e.*, free to rotate in the piston and connecting rod bush. It is important to note that the aluminium ends which prevent the gudgeon pin scoring the cylinder, are tight in the pin, smooth, and that the contour conforms to the shape of the cylinder. The engine must never be run with the pads loose or missing, as considerable damage may be done to the engine.

Owing to the difference in expansion between aluminium and steel, the gudgeon pin is fitted tight into the piston when new, and becomes an easy running fit when warm.

Piston Rings.

These should be bright all the way round where they rub upon the cylinder barrel. Brown marks, particularly near the ends of the rings, indicate that gas is blowing past, causing loss of compression, and the rings should

be replaced. The rings should also be perfectly free in their grooves, but without much up and down movement (.003in. when new), and the gap between the ends of the ring, when tried in the cylinder should be from .006in. to .008in.

Valve Grinding.

The valves should not be interchanged and should be lightly ground in with fine emery powder (or one of the special preparations obtainable) until they and their seatings have a smooth bright surface. There should be no trace of " pit " marks left. Only a minute or two of light grinding should be necessary.

Reassembly.

Before replacing see that all parts are perfectly clean with no trace of emery powder from valve grinding.

Put the valves back into position and compress the springs with the spring compressing tool. The split cotters can now be inserted ; if the recessed part of the valve stem is slightly greased, the cotters will be held in position while the spring is being released. If the tappets have been removed note that the locknut with the large collar goes on the exhaust tappet ; the collar comes above the nut.

Oil the inside of the cylinder and also the piston and rings. Set the gaps in the rings diagonally opposite one another and carefully replace the cylinder, easing the rings into the bore.

See that the cylinder base paper jointing washer is sound. If broken, fit a new one.

Replace the cylinder base nuts and spring washers and tighten down evenly and firmly.

Clean the valve caps, sparking plug, etc., and replace with the rest of the parts. A little graphite grease on the valve cap threads will help to prevent these sticking, and will facilitate removal next time.

Readjust the valve tappets if necessary.

Exhaust System.

Before replacing the exhaust system, detach the silencer from the exhaust pipe and clean the holes in the baffle tube at the end of the pipe. Also clean the inside of the fishtail. If these holes are allowed to become choked up with carbon and oil, considerable back pressure will be created and may cause overheating.

Decarbonisation.

Overhead Valve Model.

This is done on similar lines to the Side Valve Model, but due to differences in construction, the following additional notes will be helpful :—

Remove the sparking plug, carburetter and exhaust pipes. Set the engine so that both valves are closed.

Fix the two link plates to support the rocker arms ; these are the two plates with projecting pegs, supplied in the tool kit. The method of use, is to undo the two rocker spindle nuts on the sparking plug side, and slip the plates on to the spindles so that the pegs come immediately under the rocker arms. Replace and tighten up the spindle nuts, and the rocker arms are held in place against the tension of the return springs, when the rocker box is removed. This greatly facilitates the replacement of the box.

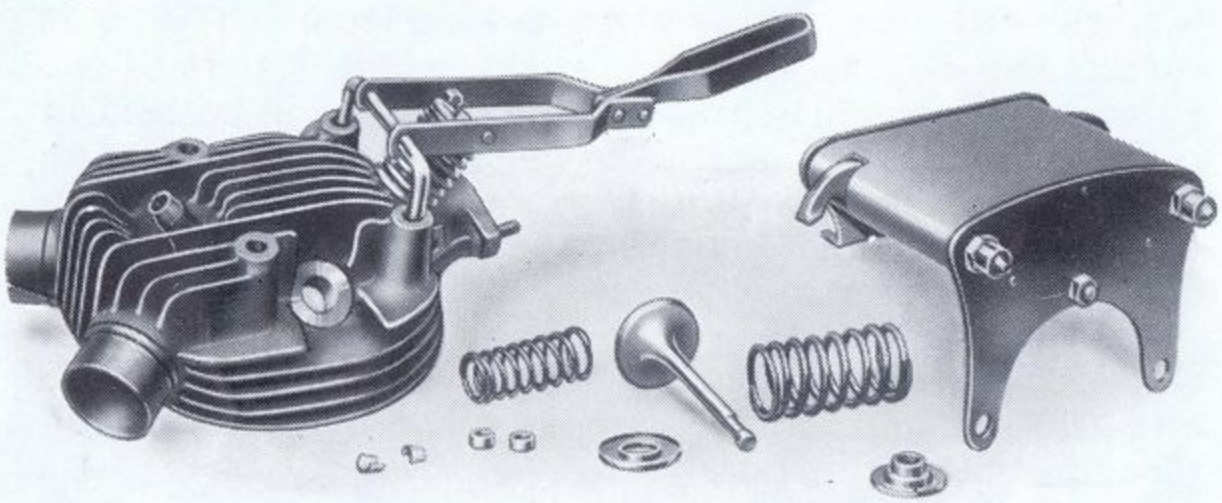


FIG. 5.

METHOD OF REMOVING VALVES. O.H.V. MODELS.

Undo and remove the two cylinder head bolts on the near side of the engine ; this also releases the rocker plate on this side. Next undo the two set bolts holding the off-side rocker plate to the head and lift up the rocker box complete so that it is clear of the push rods ; then draw it away towards the off-side of the engine. In some cases it may be found necessary to either loosen or remove the petrol tank before the rocker box can be removed. Now undo the two off-side head securing bolts and remove the head. If this tends to stick it can be prised up by inserting a screwdriver into the joint. Take care not to damage the joint face or break the fins.

Before lifting the head, undo the oil pipe to the inlet valve guide.

Now remove the valves, when the head and ports can be cleared of carbon and the valves ground in. Adopt the same procedure as for the side valve and *do not interchange the valves* ; these are stamped " IN " and " EX " on the inlet and exhaust respectively. In the event of the valves not being marked, they can be distinguished from one another by carefully noting the radius under the valve head, where it blends into the stem ; the exhaust valve is slightly thicker here.

Valve Removal.

The valves are held by taper cotters and collars as in the side valve model. The springs are easily removed by means of the special tool obtainable from Ariel Stockists or the Ariel Service Dept. (price 3/10 including postage).

This tool is used as follows :—Drop the square ⊓ shaped part through two of the head bolt holes and slip the wire through the small holes in the ends of the ⊓ so that it cannot be withdrawn. Place a small block of wood inside the head so that the valves rest on this, and then hold the head down firmly on the bench. With the two studs, which are inside the body of the tool, resting on the top spring collar, depress the handle so compressing the spring and withdraw the taper cotters. Note that the handle of the tool folds up if used the wrong way round. Having removed one valve, place the tool in the other two head bolt holes and remove the remaining valve in a similar manner.

O.H.V. Rocker Gear.

It is quite unnecessary to dismantle the rocker box when decarbonising, but the construction is as follows :—

The rockers are carried on two hardened steel spindles supported in side plates. The near side plate is held down by two of the head bolts and the off-side plate by two special set bolts. The rockers are completely enclosed (except for the ends of the rocker arms which operate the valves) by an aluminium box gripped between the side plates and located by pegs. Grease

leakage is prevented by the insertion of joint washers between each plate and the box. A tie bolt with distance tube between the plates, adds rigidity to the box.

To dismantle, undo the three nuts outside one of the plates, when the plate with box and rockers will come away.

When replacing the rocker spindles see that the end in which the grease hole is drilled comes to the off-side, so that the grease passages register correctly.

If desired the rocker gear can be inspected when the box is in position on the engine, by removing the off-side supporting plate only.

Lubrication.

Grease nipples are provided in the ends of the two hardened steel spindles. Grease is forced through the hollow spindles to a central recess and is also forced along a hole drilled through the rocker arm to the ball end, which bears in the cup at the top end of the push rod.

Lubricate with Castrolease Medium, or Castrolease G. (which has a graphite content) every 300-400 miles.

The Piston—O.H.V.

The piston head can be decarbonised without removing the cylinder barrel or push rods, and unless damaged piston rings are suspected it is better to leave the barrel in position. The barrel is secured in the same manner as the side valve cylinder.

Reassembly—O.H.V.

See that all parts are clean and free from grinding paste. Make sure that the joint faces of the head and barrel are clean, smooth, and have no carbon particles or old jointing compound on them, or a tight joint will not be obtained (no jointing washer is used). Smear the joint face on the barrel with a little of one of the special jointing compounds (goldsize may be used), place the head in position and screw down the two off-side head bolts finger tight. See that both push rods are down, *i.e.*, valves closed. Replace the rocker box seeing that the ball ends on the rocker arms are in the cups at the top ends of the push rods, and that the enclosing tubes

are located in the holes in the rocker box and in the holes on the top of the return spring chamber. Insert the two set bolts securing the off-side rocker plate and then the two near side head bolts. See that the four head retaining bolts are turned down finger tight until the head of each bolt is down on to the cylinder head. Now take a spanner and give one bolt a one-sixth turn, repeat this on the bolt diagonally opposite, and then on the two remaining ones ; keep going round in the same order giving each bolt a one-sixth turn at a time until all are tight. This method ensures that the cylinder head is pulled down evenly so that a good joint is made.

Remove the two link plates.

IMPORTANT.—Do not forget to replace the hardened steel end caps on the valve stems or considerable damage may be done.

Tappet Adjustment.

Both Models.

Remove the valve spring or tappet spring cover and set the engine with the piston somewhere near the top of the cylinder with both valves fully closed. To adjust the tappets, the tappet " C " (Fig. 6) should be held while the lock nut " B " is loosened. Then rotate " A," holding the tappet " C," until the desired clearance is obtained. Then secure the lock nut " B " and re-check the clearance several times whilst rotating the engine from the position where the inlet valve closes until the exhaust valve opens.

Correct clearance with engine cold.

	Inlet Valve.	*Exhaust Valve.*
Side Valve	.002in.	.004in.
O.H.V.	Nil.	Nil.

NOTE.—With the side valve engine the clearance is measured between the top of the tappet head and the end of the valve stem. Do not be confused by there being no clearance for a few degrees just after the inlet valve closes and just before the exhaust valve opens ; this is quite correct.

With the O.H.V. model the clearance must be checked between the end of the rocker arm and the hardened

steel cap on the end of the valve stem. The most practical way of checking the adjustment is to place a spanner on the tappet "C," just under the locknut, and let it rest on the edge of the tappet box. Light downward pressure on the outer end of the spanner causes the tappet and push rod to move upward against the tension of the tappet return spring if there is any clearance. After adjusting, test compression; if this is satisfactory it is clear that the valves are seating correctly. If there is no compression, either a valve is being held off its seat through too close adjustment or there is a serious leakage elsewhere. In either case the cause must be found and rectified.

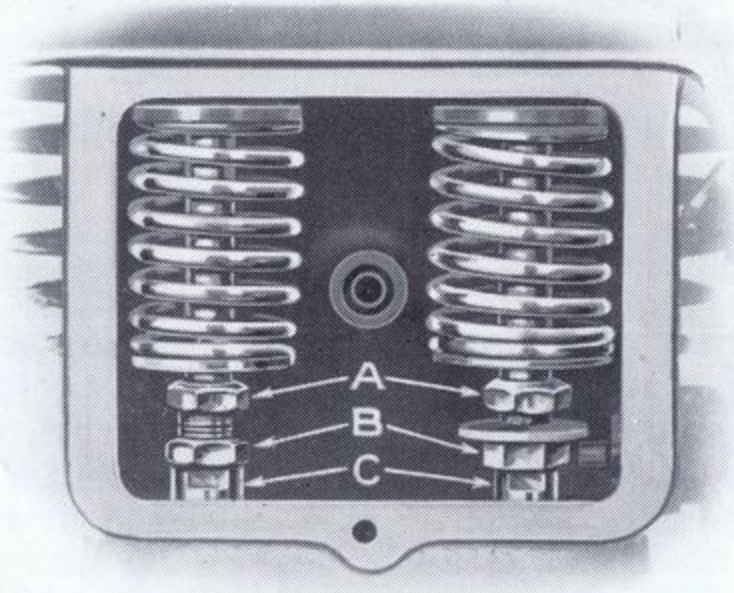


FIG. 6.

VALVE TAPPET ADJUSTMENT.

Exhaust Valve Lifter.

This may require adjusting occasionally, in which case it should be set, by means of the Bowden wire cable stop, so that there is a small amount of lost motion in the operating lever, before the lifter begins to move the tappet; this must be tested when the exhaust valve is fully closed.

To adjust, loosen the locknut and rotate the cable stop one or two turns. After adjusting re-tighten the locknut.

Always test the adjustment after re-setting the tappets.

A further means of adjustment is to alter the setting of the exhaust lifter arm on the eccentric spindle. This is only held by a nut and taper. To slack off the taper joint, undo the nut a couple of turns, and give the face of the nut a light sharp blow, so as to drive the eccentric spindle inwards. Set the arm as required and tighten up the nut securely.

Timing Gear and Oil Pump.

The timing gear consists of one cam wheel with two cams mounted upon the one spindle and driven at 2-1 reduction from the timing side spindle by a pinion. The two cam levers are carried on one centrally disposed pin. Each lever has one semi-circular face which bears on the cam profile and one which engages with the large " foot " on the lower end of the valve tappet.

The cam spindle extends through the timing cover and carries a sprocket for the magneto drive. On the extreme end of the spindle an eccentric is formed and drives the oil pump. A dust and oil-tight cover is fitted over the pump and magneto chain.

To Remove and Dismantle the Timing Gear.

Undo the seven set screws securing the chain cover and remove this. Remove the oil pump by taking out the two cheese-headed screws. Next undo the nuts holding the magneto driving sprockets and withdraw the sprockets with the extractor provided. Before removing the sprocket behind the oil pump, slip the small adaptor on to the eccentric on the end of the spindle. This prevents damage to this part. Undo the two oil pipes to the oil tank, the two to the chains, and the small one to the oil gauge. This latter is at the front of the case. Now slack off the set bolt holding the magneto platform and remove the five set screws securing the timing cover. Withdraw the gear cover, pressing on the end of the camshaft spindle to prevent this being pulled out and the timing upset.

If the cams are removed, the timing is perfectly easily reset. Rotate the engine until the piston is at top dead centre. The timing pinion and cam wheel will be seen to be centre-punched.

Take the cam wheel, lift the cam levers and insert the cam wheel so that the centre dot marked on this coincides with the centre dot on the pinion. (Sometimes the dot on the timing pinion is covered up by the nut—left-hand thread).

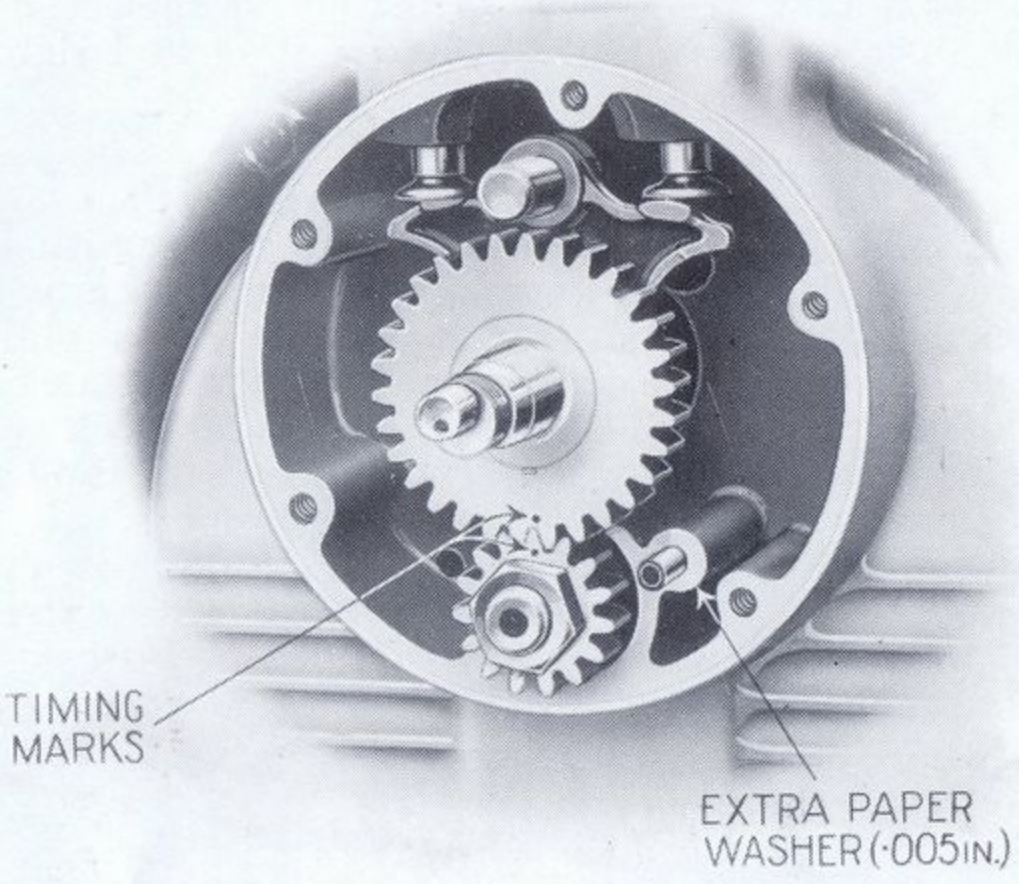


FIG. 7.
TIMING GEAR.

When fitting the cam levers, insert that for the inlet valve first, and then that for the exhaust valve. The small hole in the lever for lubricating the cam lever pin bearing, comes on top.

It is impossible to get the timing wrong if these instructions are carried out carefully. The timing pinion has one keyway and the main shaft is keyed to the flywheel.

Be careful to replace all joint washers, renewing these if damaged, and securely do up all nuts, screws, etc., or an oil leak may be experienced. It is most important to note, that when replacing the timing cover, the paper washer must be replaced in position and that there is an **additional paper washer** .005 in. thick at the joint connection to the sump. Do not forget the set bolt supporting the magneto platform.

Valve Timing.

We give below the correct valve timing of all models, so that the actual timing may be checked if necessary :—

Model.	Inlet opens.	Inlet closes.	Exh. opens.	Exh. closes.
VB.31	$\frac{1}{65}$ in. or 5° Before T.D.C.	$\frac{17}{32}$ in. or 50° After B.D.C.	$\frac{5}{8}$ in. or 55° Before B.D.C.	$\frac{5}{32}$ in. or 20° After T.D.C.
V.F.31	$\frac{1}{64}$ in. or 5° Before T.D.C.	$\frac{19}{32}$ in. or 55° After B.D.C.	$\frac{11}{16}$ in. or 60° Before B.D.C.	$\frac{5}{32}$ in. or 20° After T.D.C.
Quick-lift Cam (for Mod. VF only)	$\frac{3}{16}$ in. or 22° Before T.D.C.	1in. or 70° After B.D.C.	1in. or 70° Before B.D.C.	$\frac{1}{4}$ in. or 25° After T.D.C.

Dimensions represent the distance the piston has travelled from the top or bottom of its stroke.

Degrees represent Flywheel rotation.

T.D.C.—Top Dead Centre.

B.D.C.—Bottom Dead Centre.

Oil Pump (Patent No. 325226).

Do not remove this unless necessary.

The action of this is described under Lubrication.

When replacing, be careful to place the joint washer correctly in position and tighten up the set screws securely ; if the washer is damaged, fit a new one ; it is most important to obtain a good joint between the pump face and cover. Do not lose or damage the Duralumin block which operates the pump plungers.

It will be noticed that one edge of the hole in this block is chamfered off. This side of the block faces inwards.

Flywheel Assembly.

We strongly recommend only those with expert mechanical knowledge to dismantle the flywheels. We give, however, the following instructions to those competent to undertake the work themselves :—

The driving and timing side mainshafts, and also the crank pin, are secured by the usual taper fixing. The driving and timing shafts are also keyed, and the crankpin has a peg engaging with a keyway in the timing side flywheel. This ensures that the oilways between the timing side shaft and the flywheel and between the flywheel and the crankpin register correctly, and that the valve timing will also be correct if the camwheel is assembled to the instructions given.

Both crankpin nuts and driving spindle nuts are right-hand thread. Both timing spindle nuts are left-hand thread.

It is always advisable to check the register of the various oilways after re-assembly, by forcing oil down the hollow main shaft and seeing that it exudes round the big end bearing.

To dismantle the wheels :—

First undo the lock screw and crank-pin nut on the driving side, holding by the driving side flywheel only. Then hold the timing side flywheel only and give a sharp blow with a hammer on the driving side flywheel exactly opposite the crank-pin, near the edge, to separate the wheels.

The connecting rod has a double row roller bearing at the big end in which the hardened steel crank-pin forms the inner member, while the hardened steel outer member is a press fit into the rod and can be renewed in the event of excessive wear.

When re-assembling, it is important to ensure that the connecting rod bearing has from .006in. to .012in. side play, because after taking the wheels apart several times they sometimes pull together. To obtain the necessary side clearance, the sides of the race should be carefully ground away or in extreme cases an over-size crank-pin fitted.

When trueing up, it is more important to get the spindles to run dead true than the outside diameter and sides of the flywheels, although if correctly assembled both should run true.

When fitting the flywheels into the crankcase, carefully note that they have from .008in to .012in. end clearance. Hardened packing washers of various thicknesses can be supplied for adjustment within reasonable limits, but it must not be overdone, otherwise the flywheels will be out of centre with the crankcase.

These washers are inserted on the drive side mainshaft between the flywheel and ball bearing.

THE MAGNETO.

Contact Breaker.

Adjustment of the contact points should only be necessary at long intervals, but it is of the utmost importance to see that the points are kept clean and *free from oil.*

If an adjustment is necessary, it can easily be made without removing the contact breaker. Turn the engine round slowly by hand until the points are seen to be fully open, then using the magneto spanner, slacken the nut K (Fig. 8), and rotate the fixed contact screw by the hexagon head L until the gap M is set to the thickness of the gauge (.012in.) ; then screw up the nut K again until it is firmly locked.

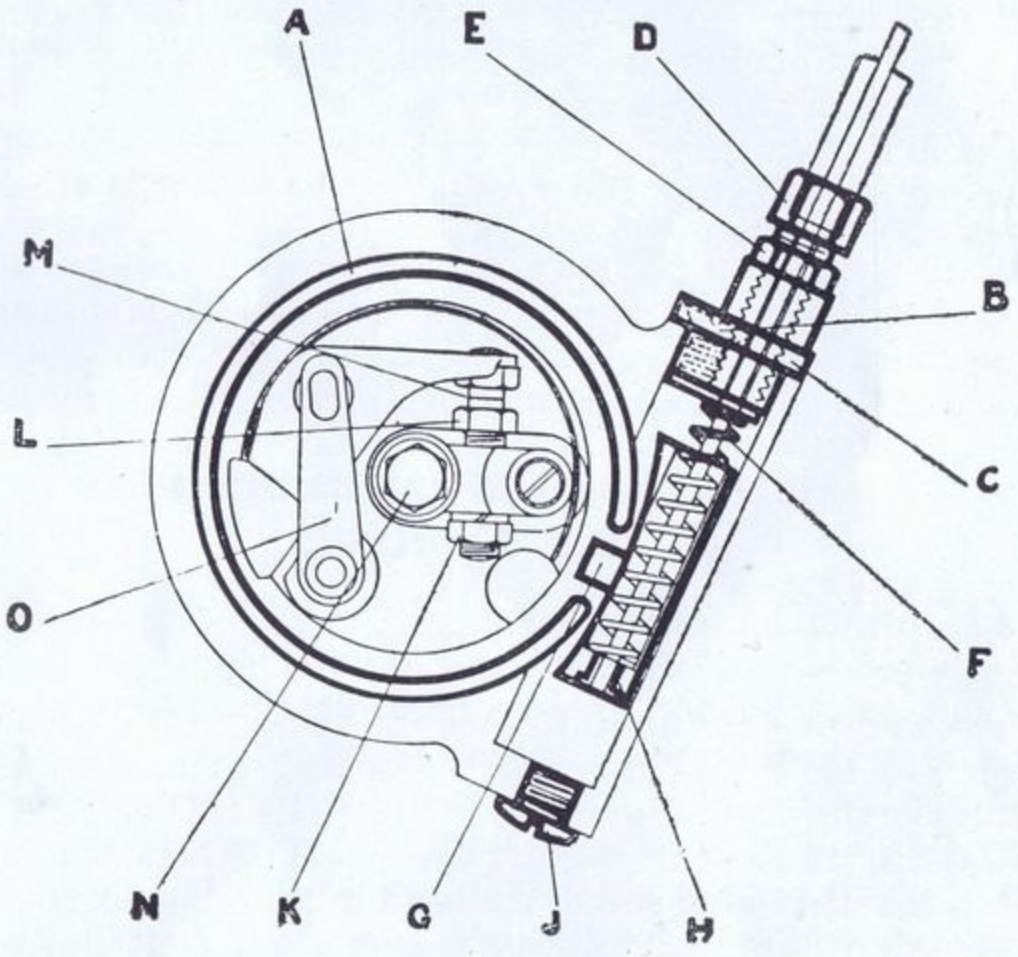


FIG. 8. MAGNETO CONTACT BREAKER.

Cleaning the Magneto.

Remove the pick-up occasionally by swinging aside the flat holding-on spring. The pick-up is then easily removed by gently pulling it away. Clean and polish it

with a fine dry cloth, see that the brush works freely in its holder, and clean it if necessary with a cloth moistened with a few drops of petrol.

The contact breaker should be kept spotlessly clean, and free from oil—particularly the contact points themselves. If, when the contact points are examined, it is found that they are burned or blackened (owing. probably, to the presence at some time or other of oil or dirt), they may be cleaned with a very fine emery cloth, and afterwards with a cloth moistened with petrol. Care must be taken that all particles of dirt and metal dust are wiped away.

To render the points accessible for cleaning, it is necessary to withdraw the contact breaker from its housing by unscrewing the hexagon-headed securing nut N by means of the magneto spanner. The whole contact breaker can then be pulled off the tapered shaft on which it fits. Now push aside the locating spring O and prise the rocker arm off its bearings, when it will be possible to begin cleaning the points.

When replacing the contact breaker, care should be taken to ensure that the projecting key on the tapered portion of the contact breaker base engages with the keyway cut in the armature spindle, or the whole timing of the magneto will be upset. The hexagon securing screw should be tightened up with care ; it must be neither too slack nor must undue force be used.

Instructions for Dismantling Spring Control.

Should it become necessary at any time to dismantle the spring control and Bowden cable, proceed as follows :—

First remove the metal cover of the contact breaker, which is held in position by a spring arm, and then withdraw the timing cage A. THIS IS IMPORTANT.

Next unscrew the fixing screw B, which is sunk flush with the surface of the end plate C. Then pull the Bowden cable and this will come out together with cable stop D (which screws into the end plate), locknut E, end plate C and plunger G (which engages with a slot in the timing cage A).

If it is necessary to further dismantle this latter portion, it will be found that the Bowden cable passes through the spring F, and terminates in a brass nipple H, into which the end is soldered.

These operations should, of course, be reversed when assembling.

Magneto Timing.

Remove the inlet valve cap (or sparking plug on O.H.V. models) and release the magneto sprocket from the taper on the armature shaft. Rotate the engine until the piston is at top dead centre and *both valves are closed*. Set the ignition control to " Fully Retard." Move the contact breaker in the direction of rotation until the points are just separating, and tighten up the chain sprocket, taking care that this operation does not alter the setting. It is advisable to check this setting because of its importance.

This setting gives approximately $\frac{7}{16}$in. advance before top dead centre.

Magneto Chain.

As this is entirely enclosed and lubricated from the engine, it will require very little attention. Inspect occasionally and adjust if necessary. To alter the chain tension slacken off the two set bolts holding the magneto on to its platform and then slide the magneto backwards or forwards until the chain has about $\frac{3}{8}$in. up and down movement in the middle, when at the tightest point. Carefully re-tighten the set bolts, and make certain that the magneto is held close up to the back of the chain cover, or the oil retaining washers may become displaced with ensuing oil leakage.

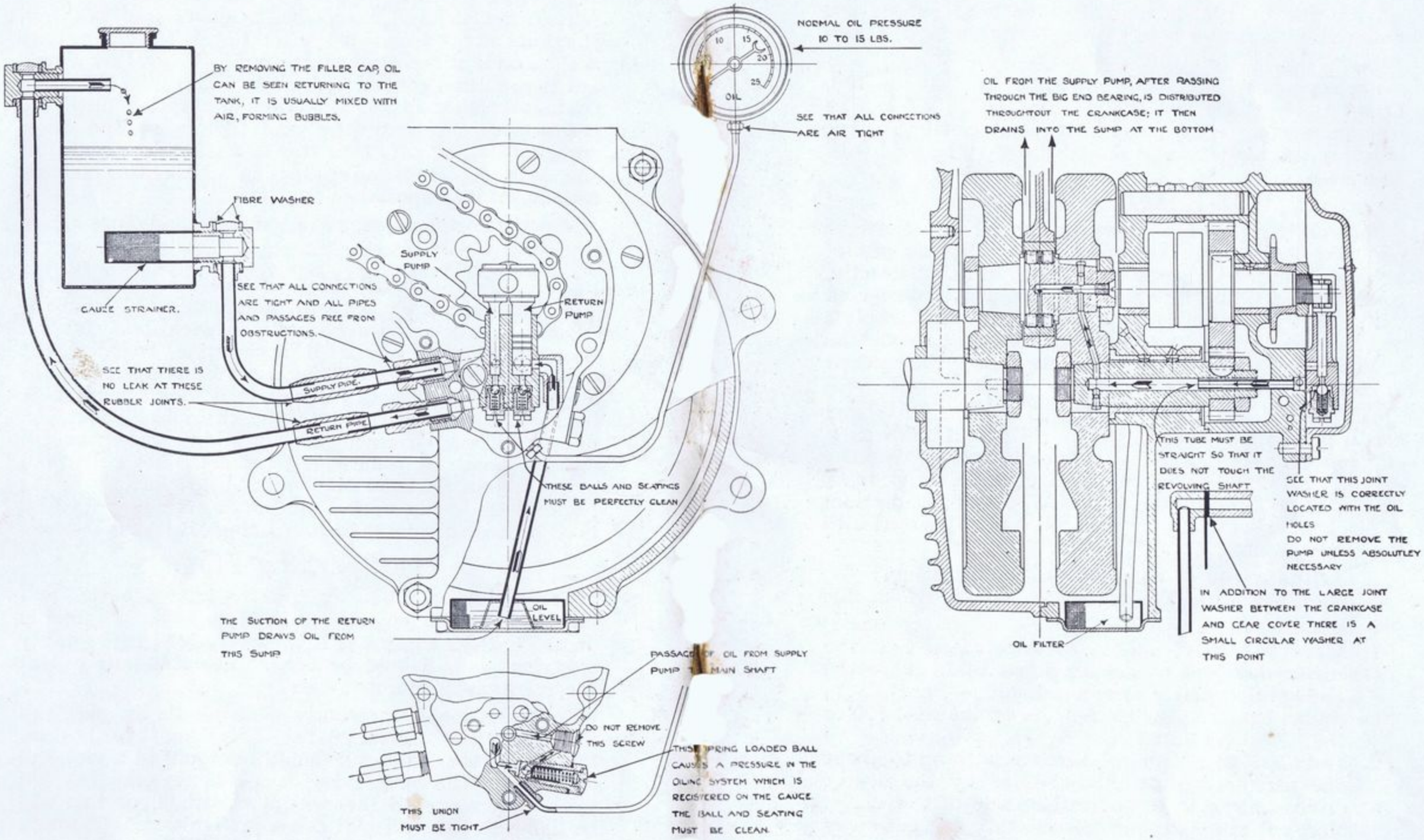
The Sparking Plug.

The sparking plug can greatly influence the performance of the engine for good or evil. Especially on the O.H.V. engines is it necessary that best quality sparking plugs should be used. The standard gap at the points is .020in. or .025in.

It is occasionally necessary to dismantle the plug and thoroughly cleanse the inside. This is most easily done by holding the gland nut (small hexagon) in a vice and unscrewing the plug body (large hexagon). Do not scrape the mica on the central electrode, or this will be liable to flake off and cause pre-ignition. Use only a clean rag moistened with petrol. Clean the carbon from the inside of the body with an old penknife. When re-assembling, do not forget the copper washer. Screw up tightly and reset the points to the correct gap.

FIG. 9.

ENGINE LUBRICATION DIAGRAM, Models V.B.31 & V.F.31.



This is a diagrammatic illustration of the engine lubrication system. It does not show the patented Ariel Flywheel Oil Purifier which is described and illustrated on pages 10 and 11. For full description of the working of the dry sump lubrication system, see pages 8-14.

For the Side Valve Models, we recommend the use of such well-known plugs as Lodge H.C.1 or H.1., K.L.G. H.S.1., and A.C. S.1., while for the O.H.V. we recommend Lodge H.1. or H.32, K.L.G. H.S.3. or 4, and A.C. 114Q.

With the O.H.V. if high average road speeds are maintained, a rather better plug should be used, otherwise overheating and pre-ignition may occur.

Such plugs as K.L.G. Type C.B. No. 246 or 180, Lodge H.45, B.R.4 and B.R.29, and A.C. 105T can be recommended. These plugs oil up more easily than the ordinary touring plug and should therefore be used with discretion.

CARBURATION.

The carburetter has three important functions to perform. Firstly, to maintain a constant supply of petrol in the float chamber, from the tank. Secondly, to divide the petrol into fine particles which are mixed with the air in the correct proportion for complete combustion in the engine. Thirdly, to control the engine power to a fine degree, by regulating the amount of mixture drawn into the engine.

The first condition is controlled by the float and needle ; keep the float chamber clean and the needle clip properly set. If the needle or its seating become excessively worn or damaged, the petrol level rises, leading to poor results and excessive petrol consumption. A displaced needle clip or punctured float gives rise to the same trouble.

Adjustment of the AMAL Carburetter.

Mixture Strength. There are five ways in which this can be adjusted.

1. *Main Jet.* This should be selected so that the engine develops maximum power at full throttle. The approximately correct sizes are :—For the S.V. engine No. 150 ; for the O.H.V. engine Nos. 170 or 180.
2. *Throttle Valve.* The mixture strength up to about one-quarter throttle is controlled by the degree of cut-away on the air intake side of the valve. More cut-away weakens the mixture, less cut-away richens it. Correct sizes are :—S.V. engine No. 4 ; O.H.V. engine No. 4.
3. *Taper Needle.* This controls mixture strength from just after the position where the slow running

jet goes out of action up to nearly full throttle. The standard setting is to have the needle secured in the middle notch of the five notches provided at the top of the needle. It may sometimes be beneficial to slightly alter this setting and therefore note that lowering the needle weakens the mixture and may lead to greater economy in petrol consumption, whilst raising the needle richens up the mixture and may give better acceleration but poorer consumption.

4. *Pilot Jet.* This only comes into action for starting and slow running or ticking over. The strength of this slow running mixture is regulated by the milled headed screw on the off-side of the carburetter. Turning this screw clockwise richens the mixture, whilst turning it anti-clockwise weakens it. The correct setting will usually be found between one-half and one full turn open (*i.e.*, turn anti-clockwise). Final tuning must be carried out with the engine running. Close down the throttle valve and adjust the jet. As the settings of the throttle and jet are interdependent, further slight adjustment of each may be necessary.
5. *Main Air Valve.* This is contained in the main mixing chamber with the throttled slide. All touring and normal running must be carried out with this valve full open. In very cold weather it may facilitate starting to partly or fully close the valve. Open fully as soon as the engine starts.
6. *Throttle Stop.* This is an adjustable stop designed to prevent the throttle valve closing fully when the throttle lever is in the shut position. The advantage is that, with the stop and the carburetter properly adjusted, there is no possibility of accidentally stopping the engine when endeavouring to get a slow "tick-over" in traffic. The "stop" is the screw which slopes upwards and inwards on the offside of the mixing chamber.

   To adjust :—Undo the locknut and screw the stop downwards until the throttle fully closes. Make sure that it is fully closed by starting the engine and then stopping it by shutting the throttle lever on the handle bar. If necessary, adjust the cable by means of the cable adjuster on top of the carburetter. Then screw the stop upwards until the throttle valve is about $\frac{1}{8}$in. open. Start up the

engine—keeping the throttle lever on the handle bar closed—and then regulate the engine speed by screwing down the stop until the desired tick over is obtained. The pilot jet may require adjustment at the same time. Tighten up the locknut on the stop screw. The engine will now continue to tick over when the throttle lever is closed. To stop the engine raise the exhaust valve lifter.

For full details of the construction of the carburetter, and further tuning hints, see the separate booklet issued by the manufacturers of the carburetter.

Amal Air Cleaner.

This may be fitted on to the carburetter intake of either model. The air passes through a silk filter fitted over a light spring carried inside a suitable protecting case. Due to road shocks, etc., this spring is continuously vibrating so that the filter is self-cleaning. If required the filter is easily dismantled by undoing the small screw on the end cover.

The fitting of an air cleaner will generally slightly restrict the air flow to the carburetter, so that a little power is lost at full throttle. To compensate for this restriction in the air supply, the main jet size can be slightly reduced ; for the S.V. engine, use a No. 130 jet, and for the O.H.V. a No. 140 jet.

THE TRANSMISSION.

The Gearbox.

It may be said in general terms that the amount of power developed by a motor cycle engine depends upon (1) The amount of gas burned at each power stroke ; (2) The number of power strokes obtained per minute. The first condition is controlled by the position of the throttle lever and the second by the speed at which the machine is being driven, and the gear ratio employed.

Always recollect that a motor cycle engine gives the best results in all ways when it is running easily. It should not be driven at low engine speeds on large throttle openings as this causes " snatch " and harshness in the transmission, leading to rapid tyre wear, worn bearings and unevenly worn chains. Ariel engines are designed to " rev." and the rider will give himself most pleasure and least expense by freely using the three-speeds provided. At the first sign of jerkiness when hill-climbing or running slowly on the level, change down

into a lower gear. Driving conditions vary so much that it is not possible to make hard and fast rules about when to change gear. The following suggestions may be regarded as useful and not binding :—

On the level, do not endeavour to run at less than 18-20 m.p.h. on top gear or 12-15 m.p.h. on middle gear.

On a hill, change down into middle gear if the speed drops below about 24-25 m.p.h., and into bottom gear if the speed drops below about 12-15 m.p.h.

Recollect, a gear box is provided for use.

STANDARD GEAR RATIOS.

Model.	Teeth. Engine Sprocket	3rd.	2nd.	1st.
V.B. Solo, Normal	21	4.9	7.8	14.4
V.B. Solo, Hilly Country	19	5.4	8.7	16.0
V.B. Sidecar	17	6.1	9.7	18.0
V.F. Solo, Normal	23	4.75	7.6	13.0
V.F. Solo Hilly Country	21	5.2	8.3	14.2
V.F. Sidecar	19	5.75	9.2	15.7
High ratio gearbox supplied to special order on Model VF only.				
Solo, Normal	23	4.75	6.9	9.4
Solo, Hilly Country	21	5.2	7.6	10.4
Sidecar	19	5.75	8.4	11.4

Lubrication of the Gearbox.

In the Burman gearbox (Model VF.31) use Wakefield's Castrolease Medium, and replenish every 1,000 miles, through the screw plug just behind the gear control arm. Grease can be obtained in suitable "squeeze up" tubes or can be injected with an ordinary grease gun. A large inspection cover is provided on top of the gearbox, but it will only be possible to remove this after the oil tank, accumulator, and their platform have been removed. Inspection is only necessary if damage inside the box is suspected.

In the Sturmey-Archer gearbox, fitted on the model VB.31 machine, use Wakefield's Castrolease Light or Speedwell Crimsangere Light.

Oil all outside joints such as the joints on the ends of the Control Rods, Gate Lever Centre Pin, Kick-starter Lever, centre ball, and bearing of clutch operating lever. Also occasionally put a spot of oil on each of the tongues of the Clutch Plates in the Clutch Case Slots, but note that if it is overdone, it may cause temporary clutch slip.

Construction.

The construction of the gearbox is briefly as follows :— The body consists of a one-piece aluminium casting secured to the frame by four bolts, and carrying a main and secondary shaft upon which are mounted three pairs of gear wheels giving the three speeds. The pairs of wheels are always in mesh, the drive being taken up by engaging sliding "dogs." These "dogs" are positioned by an internal locking device so that the gear quadrant only acts as a guide for easy changing. The clutch consists of three cork-faced sliding plates held in contact with the fixed plates by five or six springs, and controlled by the hand lever through the medium of a short lever on the gear box and a rod which passes through the hollow main-shaft. The shafts are of hardened and ground steel, while the gears are of specially heat-treated alloy steel and practically indestructible.

A shock absorber is incorporated in the clutch sprocket. Note that in the Burman box two of the rubber buffers are purposely omitted.

Taking the Gearbox Apart.

We recommend only those with expert mechanical knowledge to undertake this. It is far better if anything is wrong to send the complete box back to us.

If at any time it should be necessary to dismantle the box, complete instructions will be found in the booklets dealing with the respective boxes.

To Dismantle the Clutch.

Remove the clutch cover on the chain case—held by four set screws—and then undo the six (or five) spring retaining nuts projecting through the spring plate, when the clutch plates can be withdrawn. Care should be taken to reassemble them in the correct order. The first plate to be put in is the thick plain plate, then a cork-faced plate, and a plain plate alternately, finishing with a plain plate.

To Take off the Clutch Centre.

Unscrew the nut about one turn, and with a light hammer and a piece of brass or copper, give the end of the shaft a few sharp blows. This will release the centre from the taper, and the clutch case, chainwell and centre will come off together.

Clutch Adjustment (Burman).

Adjustment is rarely necessary, and all is correct as long as the spring nuts stand level with the face of the spring plate. After adjusting the clutch, see that the spring plate lifts equally ; if not, the nuts should be eased off on the low side and tightened on the high side until it does.

There should always be $\frac{1}{32}$ in. clearance between the ball C in the clutch operating lever E (see illustration and diagram) and the end of the operating rod D. The end of the operating lever E must be set by means of the cable adjuster F, so that its end is $2\frac{1}{2}$in. below the bottom face of the cable adjuster lug. Then adjust A and B to give the necessary clearance. This setting gives equal movement of the operating lever on each side of the centre line of its pivot with a minimum of wear on the Bowden cable.

Clutch Adjustment (Sturmey-Archer).

With this clutch, the six set screws securing the clutch springs, should be screwed up tight.

For the correct clutch wire adjustment it is only necessary to see that the clutch worm lever has $\frac{3}{16}$ in. idle movement when the clutch is fully engaged.

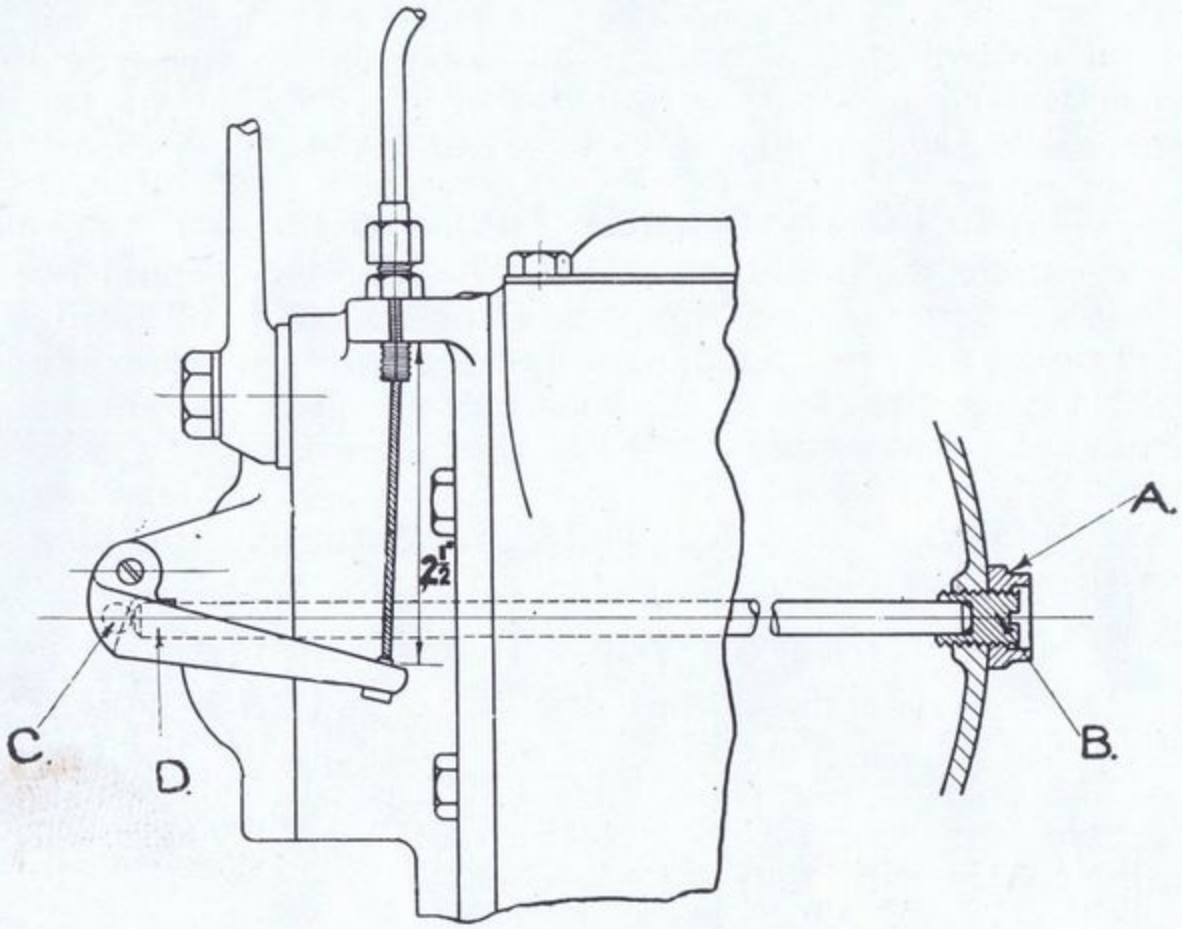


FIG. 10.

BURMAN CLUTCH WIRE ADJUSTMENT.

Gear Control Rod.

After an adjustment has been made to the primary chain, the position of the change speed lever in relation to the quadrant should be checked.

It is only necessary to see that there is an equal clearance on either side of the lever in the middle gear position, and that the lever is not hard against either end of the gate in top or bottom gear. The gears are positioned inside the box and do not depend on the quadrant for correct meshing.

The adjustment is effected by removing the pin which passes through the yoke on the end of the gear rod, and the gear arm projecting from the gearbox, slacking off the locknut, and rotating the yoke in the required direction.

After adjusting, replace the pin and split cotter and tighten up the locknut.

Engine Shaft Shock Absorber.

This should be lubricated, by means of the grease gun, every four or five hundred miles. A nipple is provided on the end of the engine shaft, and is quite accessible through the small hole in the chain cover.

Note that the shock absorber spring is not adjustable for tension. The correct value has been determined by careful experiment, and the spring is designed to give this tension when the locking nuts are screwed right up.

Engine Sprocket.

If this is removed at any time it is absolutely essential when replacing to see that both the nuts are screwed up *dead tight*. After screwing up the first nut, it is advisable to give the spanner several sharp blows with a hammer ; repeat this with the second nut.

Note carefully where the washers are placed. The one between the inner lock-nut and the sprocket is *hardened* ; never use a soft washer here. The tab washer is a special locking washer and goes between the two nuts. After locking up both nuts *dead tight*, turn over two of the tabs—one on to a flat on the inner nut, and one on to a flat on the outer nut.

Chains.

Lubrication.

Efficient protection and lubrication is of the utmost importance if long life is to be obtained from the chains. On the latest vertical engine Ariel motor cycles the primary chain runs in a dirt and mud excluding case, whilst the rear chain is protected by very efficient guards over the top and bottom runs. Release pipes from the magneto chain case are arranged to convey oil mist from the engine, and direct it on to the lower runs of the primary and rear chains. Due, however, to the high speed at which the primary chain runs it is not always possible to ensure that this oil mist will properly work its way inside the chain rollers, and so on the latest machines a small oil tank is mounted inside the primary chain case. This oil tank has a lead to the primary chain, and a screw down needle valve in the top of the tank, enables the rider to augment the automatic supply as required. In general, about 4 or 5 drops of oil per minute, will be found sufficient to keep

the chain well oiled. For very high speed work, it may be advantageous to slightly increase the supply, but it should be noted that the amount of oil mist from the engine also increases with the engine speed. A small door in the chain cover enables the rider to see and adjust the oil flow. Do not forget to turn off the valve when the machine is stationary, or oil will continue to drip and will go on to the ground.

Having found the correct position of the valve to give the required number of drops per minute, it will be unnecessary to inspect and adjust the flow each time the engine is started ; just turn on the valve to the position already noted as being correct. Check occasionally, to make certain that the valve has not become clogged with thick oil or dirt.

In the case of the rear chain the supply of oil mist from the breather pipe will probably be sufficient for all normal requirements. If, however, a little extra lubricant is occasionally required, this is easily given by means of an oil-can held so that the oil drops on the top of the bottom run of the chain. This allows the oil to work its way through the chain as the wheel rotates.

A very sound method of prolonging the life of the rear chain is to remove it from the machine every 1,000 miles, thoroughly wash in paraffin and immerse in a bath of hot grease, or one of the special chain preparations. Move about to enable the grease to work in thoroughly, then hang up and drain off surplus grease. Do not heat the grease more than is necessary to enable it to run freely.

The small breather valve which screws into the top of the timing case, is simply an air valve to increase the amount of oil vapour passing to the chains. On the up stroke of the piston, the disc valve automatically opens and air is drawn into the timing case. When the piston descends, the valve closes and the air, now laden with oil vapour, is blown through the release pipes and on to the chains.

Do not attempt to dismantle this valve. If it becomes inoperative, simply wash in clean petrol.

The life of the primary chain, if the machine is driven hard, is approximately 5,000 to 8,000 miles, and the rear from 10,000 to 15,000 miles.

The mileages mentioned should be easily attained if the chains are properly lubricated as directed.

Adjustment, Primary Chain.

Slack off the gearbox steady nut (top of rear engine plate) and loosen the four nuts A (Fig. 11), securing the gearbox (set spanner provided) just enough to allow the gear box to slide freely. Then by turning the draw-bolt at the front end of the gearbox platform, move the box along in the required direction. Do this a very little at a time, as a small movement of the box makes an appreciable difference in chain tension. There should be about $\frac{3}{8}$in. up and down movement of the chain at the middle; this should be checked in several positions by turning the engine after the securing nuts have been tightened. (See Gear Control Rod, page 38).

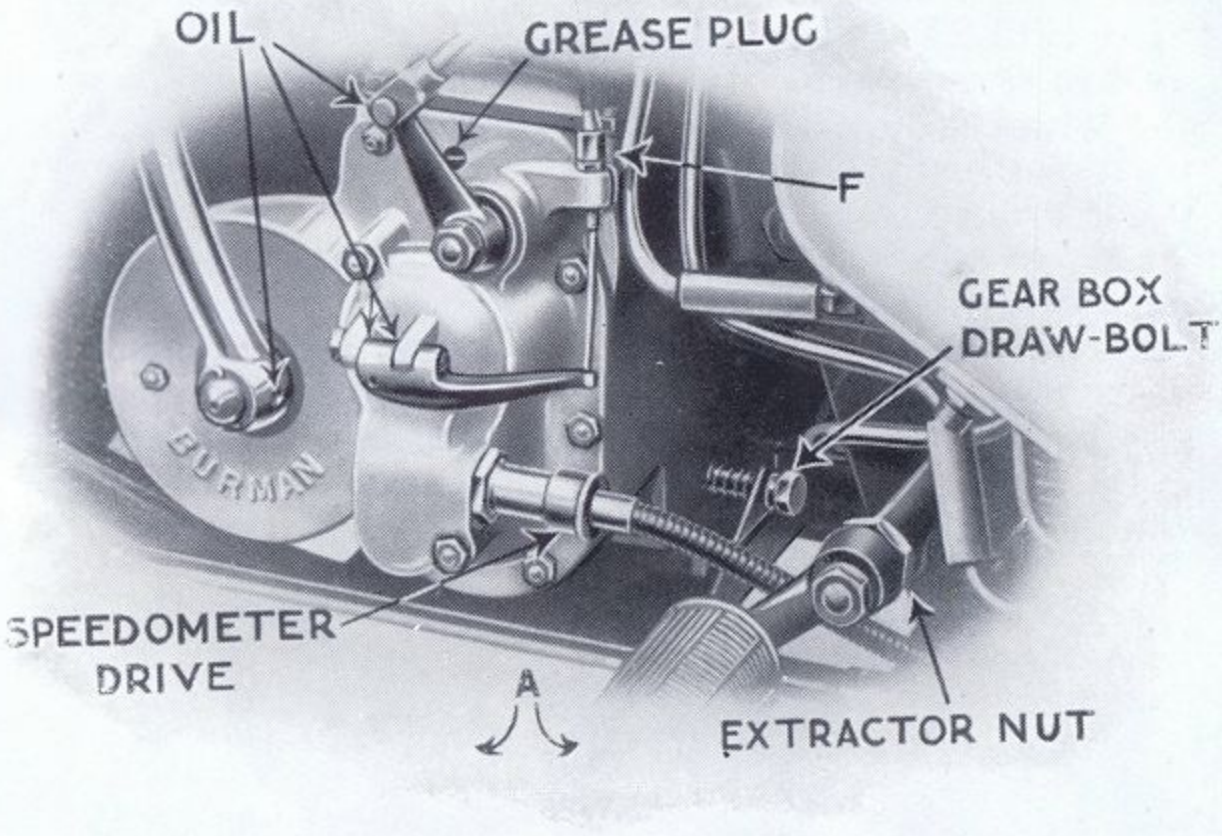


FIG. 11.
BURMAN GEAR BOX.

Adjustment, Rear Chain.

Loosen the two outside spindle nuts E (Fig. 12), and the two lock nuts F, securing the adjusting screws K. Turn each adjusting screw the same amount to maintain the alignment of the wheel and re-tighten all nuts. There should be about the same up and down movement of this chain as the primary chain. Adjust the rear brake control rod if necessary.

WHEELS AND BRAKES.

Front and Rear Wheel Bearings.

These are taper roller ; the outer race is pressed into the hub whilst the inner race is a light sliding fit upon the spindle.

The adjustment for the cone of the taper roller bearing is on the side opposite the brake drum. Loosen the outer spindle nut E (Fig. 12), then loosen the lock nut H. Adjust by turning the nut G clockwise to tighten and anti-clockwise to give more play. After making the adjustment, be careful to tighten the lock nuts together first, then the outer spindle nut. For correct adjustment THERE SHOULD BE THE SLIGHTEST " SLACK " MEASURED AT THE RIM. Test in several places by rotating the wheel, and be sure the wheel is quite free. It is advisable to remove the rear chain when adjusting the rear wheel bearings.

To remove bearings :—Remove wheel from frame. Take off brake plate (see under Brakes). Screw off nuts G and H, and tap wheel spindle out towards the brake drum side. Now prise off the dirt excluding disc and remove cork washer. The inner bearing with rollers and cage will then come out complete ; each side is the same. Do not attempt to remove the outer race —unless damaged—as this is pressed into the hub.

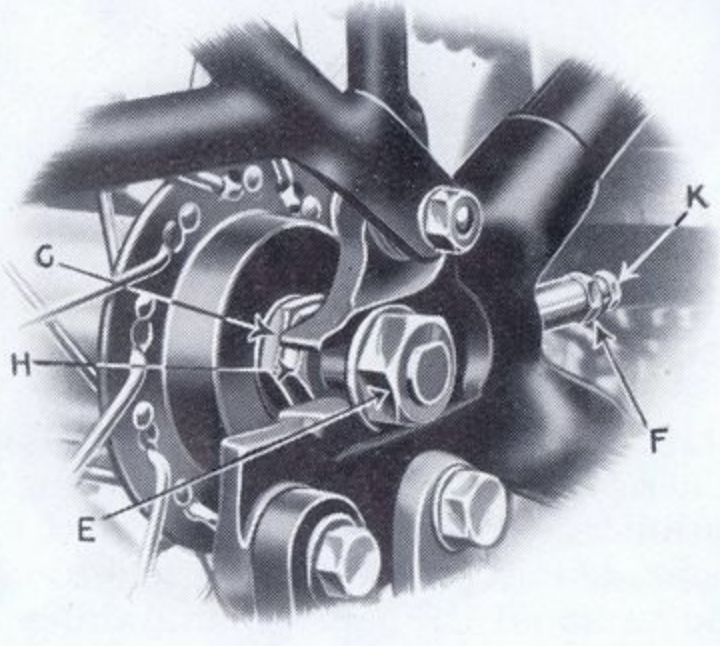


FIG. 12. REAR WHEEL AND BEARING ADJUSTMENT.

As the dirt excluding discs and washers will most probably be damaged in removal, new ones should be available for replacement.

Sidecar Wheel Bearing.

The sidecar wheel is carried on taper roller bearings. To adjust, remove the hub cap and the split pin through the castellated nut on the end of the hub spindle. Hold the inner nut, slack off the outer castellated nut and adjust by turning the inner nut. Hold the inner nut, securely tighten up the castellated nut and replace the split pin and hub cap. For correct adjustment THERE SHOULD BE THE SLIGHTEST "SLACK" MEASURED AT THE RIM.

Lubrication.

The hubs should be greased every 1,000 miles with the grease gun, using Wakefield's Castrolease Medium, (which may be used for all parts requiring the grease gun). As soon as grease begins to leak past the dirt excluding washer it indicates that the hub is full and no more grease should be inserted or it will be forced into the brake drum, where it will get on the brake linings with a serious reduction in efficiency.

Brakes.

To remove the brake plate complete with brake-shoes and fittings, remove the spindle nut on the brake drum side ; insert a thin spanner on to the hexagon between the fork end and brake plate and loosen this nut a half-turn. Disconnect the brake rod (and chain on rear wheel). Undo the other spindle nut and remove this, when the wheel can be slipped out. With the front wheel, also undo the anchor bar holding the brake plate ; this need be unfastened at the top end only. If the brake plate locking nut (previously slackened) is removed, the brake plate will slip straight off the spindle.

Lightly grease the brake cam and brake shoe fulcrum, also brake cam spindle and joints.

To reassemble, reverse the order given and see that :— Rear Wheel : the brake anchor pin is in engagement with the slot in the brake plate arm. Front Wheel : the anchor bar is securely replaced.

Adjustment.

A milled nut L (Fig. 13) is provided at the end of the brake rod for adjustment and merely requires one or two turns by hand to take up wear ; a similar nut is on the front end of the rear brake rod. After making any adjustment carefully re-tighten all locknuts and replace any split pins which may have been removed.

Brake Pedal.

The brake pedal is held on to the end of a splined shaft, which bears in a tube welded to the off side engine plate. The arm carrying the brake rod is similarly splined to the other end of the shaft. If it is required to remove the pedal or arm, undo the securing nut and drive the shaft into the tube ; take care not to damage the threads, or the primary chain case.

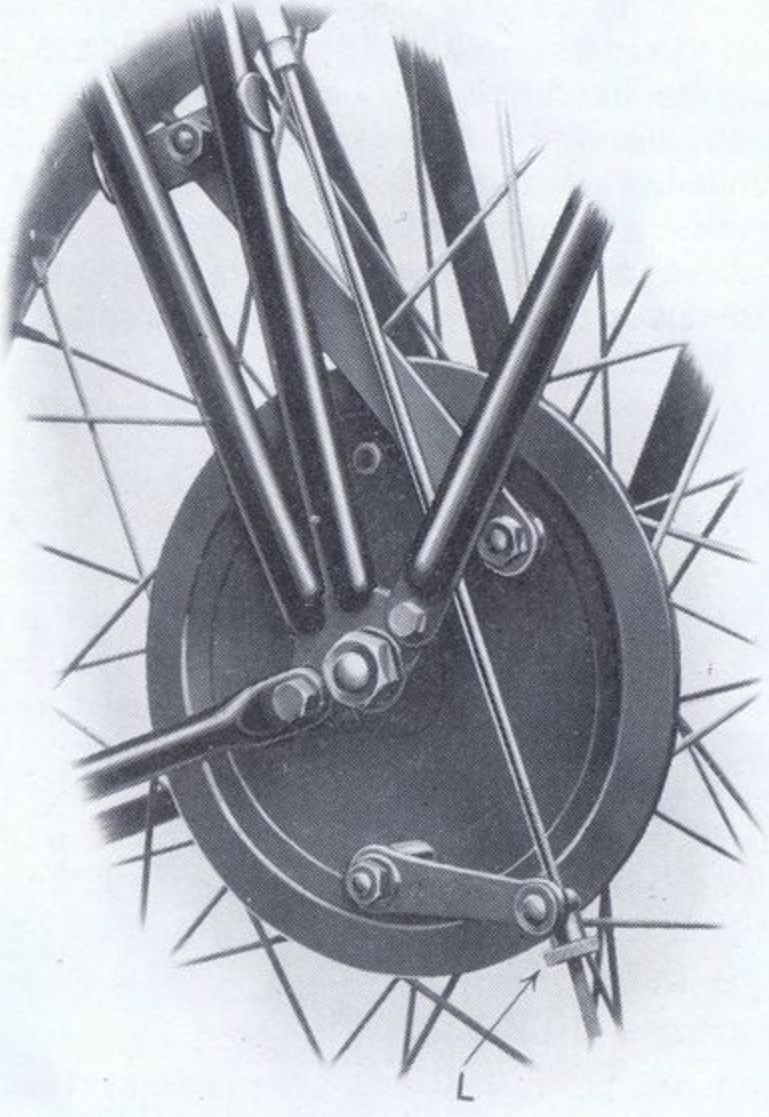


FIG. 13.
FRONT BRAKE.

FRAME PARTS.

Front Forks.

Adjustment and Lubrication.

The function of the two friction discs on the side of the front forks is to damp out oscillations when travelling over rough surfaces. Their action is controlled by the adjustment of the star-shaped spring washer. Correct adjustment has a marked effect on the ability of the machine to "hold the road," and also upon one's comfort. Too much tension on the spring has the effect of transmitting a large proportion of road shocks to the frame, which is particularly noticed on the handlebars. On the other hand, too little tension allows the fork to "dance."

To make an adjustment, loosen the locknut N and turn the bolt head over the star washer clockwise to increase the tension, and anti-clockwise to reduce it.

As the friction discs wear after say 5,000 to 10,000 miles, it may be necessary to replace the washer at P with a slightly thinner one (these may be obtained in different thicknesses). This is to enable the fork link faces to bear equally over the friction discs. To remove these washers it is only necessary to support the front wheel off the ground by means of a block under the engine, and remove the bolt R.

Grease the fork spindles every 500 miles. A grease gun is provided in the tool kit.

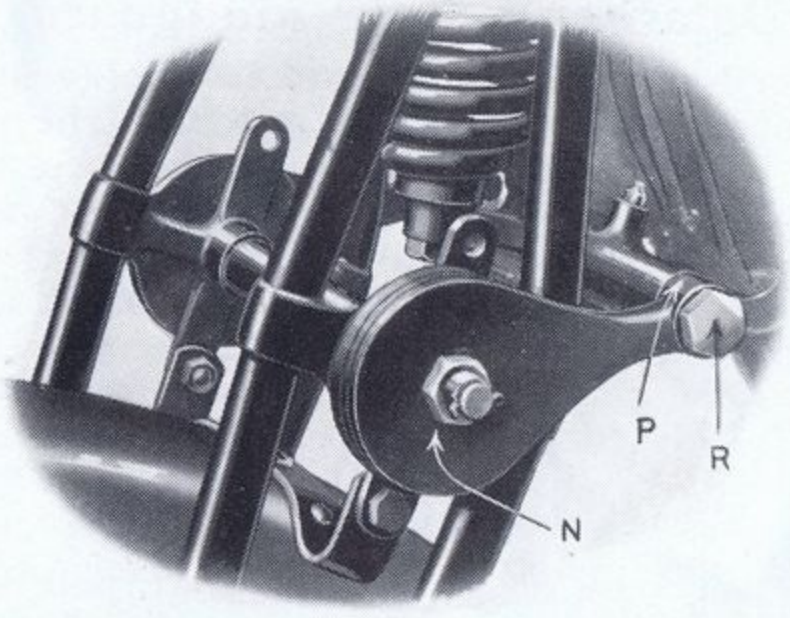


FIG. 14. FRONT FORK LINK ADJUSTMENT.

Steering Head Adjustment.

When adjusting the head bearings it is advisable to take the weight off the front wheel by putting a block under the crankcase ; also slacken the steering damper right out, and loosen the bolt through the ball head clip. Above the clip are two thin nuts. Slacken off the top one—a lock nut—and adjust by means of the lower one. The steering should be quite free, but there should be no shake in the handlebars. Carefully re-lock.

Lubrication.

Two grease gun nipples are provided for the two head bearings. Grease here every 1,000 miles.

Rear Stand.

This is of the spring-up type. To raise the rear wheel off the ground, put one foot on the stand, take hold of the carrier, or the handle provided, and lift the machine up and back.

When the machine is pushed forward the stand springs up into position.

Front Stand.

When it is required to support the front wheel off the ground, first put down the rear stand, then swing the front stand round until it is in a vertical position. Don't let it swing over and touch the brake spindle bush or the stand will bend. Never leave the machine supported by the front stand only.

Detachable Rear Mudguard.

The rear half of the mudguard is quickly detachable to facilitate wheel removal. To detach the rear half, undo the two set bolts at the junction of the two parts of the guard and slack off the nuts securing the guard-stays to the rear fork ends. If the guard is swung to the off side of the machine the cable to the tail lamp need not be disconnected. When replacing, see that the bolts are done up securely, particularly the two holding the stays, as one of these stays carries the lifting handle.

Petrol Tank.

The petrol tank is secured at four points by set-screws, each having two rubber washers and one plain steel washer and locked with a wire. The thick rubber

washer goes next to the tank. The set-screw should not be screwed up too tightly, otherwise the rubber will be so compressed as to lose its elasticity.

The petrol filler cap is of special leak and splash-proof design. Keep the jointing washer in position inside the filler cap, also the leather washer under the milled knob. Tighten up securely. Also see that the air vent does not become choked or the petrol flow will be restricted.

To remove filler cap :—Slacken centre screw, rotate filler cap a quarter turn anti-clockwise and lift up.

To replace cap :—Drop into position, turn cap clockwise as far as possible and tighten centre screw.

Reserve Petrol.

A two-level petrol tap is provided. Always run on the main supply, and then when this is exhausted the petrol tap can be turned to the reserve position and the tank replenished at the next opportunity. Find out just how far the machine will travel after turning the tap to reserve and you will then know for future use that petrol must be procured within this distance.

Do not forget to turn the tap from " reserve " to " main " after filling up.

Ewarts' 2-Level Cork-seated Petrol Tap.

To open main supply pull out knob " Pull on."

To open reserve supply pull out knob " Pull reserve."

The knob " Pull on " *must* also be left open.

To close tap push in both knobs.

Adjustment of corks. As the corks wear with use, adjustment can be effected as follows :—Undo the hexagon lock nut outside the knurled knob marked " Pull on " or " Pull reserve " as required. Then with a small screw-driver, give the adjusting spindle—projecting through the centre of the knob—a half or full turn in an anti-clockwise direction. Tighten up the knob and replace the locknut.

To renew the corks. Remove the hexagon lock nut. Undo the side screw—the small round-headed screw just behind the knob and underneath the tap body. Pull the knob, which will bring out the plunger complete ; remove the knob from the spindle. Fit new cork and replace the knob but do not squeeze up the cork in any way. Slide the plunger back into the barrel and screw up the knob until the adjusting spindle

projects sufficiently to enable the lock nut to be replaced. Screw home the side screw so that it engages with the slot in the knob extension. Adjust, if required, and tighten up the knob and lock nut.

Storage. If the machine is to be stored for any length of time, empty the petrol tank and leave both knobs " out or in the open position. If this precaution is not taken, the corks tend to creep up into the petrol passages through the tap, and then when the knob is pulled to the open position, the cork sticks in the hole and tears, giving rise to a leaky tap.

Speedometer Fitting.

If a Smith Speedometer is mounted in the tank, it can be removed as follows, if required at any time :—

Disconnect the driving cable at the gearbox end, by unscrewing the knurled ring holding the cable to the sleeve (Burman box) or to the driving box (Sturmey box) ; undo the cable clip by the front engine plates. Unscrew the nuts at the lower ends of the two speedometer securing rods ; these rods pass through a half round bridge piece underneath the tank and across the speedometer hole. Then drawn the speedometer, complete with driving cable, up from its location in the tank.

See that the securing nuts are kept tight ; also disconnect the driving cable about every 1,000 miles and grease.

Burman Box. If the sleeve which screws into the gearbox and which carries the driving worm, is removed at any time, be very careful when replacing. See that the worm gears are properly in mesh and screw in the sleeve *by hand for the full length of the thread, easing back slightly if the gears appear to bind at all.* Only use a spanner to finally lock up the sleeve after it has been screwed right home. Also see that the gearbox end cover, into which the sleeve screws, is kept screwed up really securely.

The speedometer spindle for the standard, or low ratio gearbox, has 13 teeth, whilst that for the high ratio box has 18 teeth.

These worm gears should receive ample lubrication from the gearbox but extra grease can be added if found desirable.

Sturmey-Archer Box. The driving box for the speedometer cable is held by two studs and nuts, on to the front of the gearbox. The drive is taken off the layshaft through ordinary straight pinions, and it is only necessary to see that the box is securely bolted up.

Knee Grips.

The rubber pads are carried on plates which have three securing holes giving a range of adjustment. A lip formed all the way round the back of each pad, folds over the back of the plate, and so holds the pad in position. To remove a pad, lift up the lip at some point, pull it in front of the plate and then carefully work round the pad pulling the lip to the front of the plate until the pad slips off.

Adjustable Footrests.

These consist of six parts. Two adjustable rests (with rubbers), two footrest supports, a footrest rod, passing through the engine plates, and a distance tube between the plates. The rests are held on to the supports by a taper, the supports being held in position by the rod, and prevented from turning by two pegs on the engine plates which engage with recesses in the supports.

To Remove or Adjust the Rests :—Slack off one nut on the end of the footrest rod until the spring washer is just free. Place a spanner on the extractor nut on the end of the footrest support and at the back of the adjustable rest. Turn this anti-clockwise until the rest is forced off the taper on the support. Repeat on the opposite footrest *and then screw the extractor nuts well back along the support until they do not touch the adjustable rest when it is pushed home on the taper.* Set the rests in the desired position and re-tighten the nut on the end of the footrest rod.

To prevent the extractor nuts rattling they can be lightly screwed up to the back of the adjustable rests.

It is unnecessary to slacken the other nut on the footrest rod and if the nut which is slackened is undone too far the support will disengage with the peg and rotate, so preventing the taper joint being broken.

Electric Lighting Set.

Riders are referred to the booklets issued by the manufacturers of the lighting set for advice concerning adjustments to the electrical parts. The following brief notes on the care of electrical equipment will, however, prove helpful.

The Lucas Magdyno gives *half charge* in the " charge " position, and full charge only when the lights are on.

The " cut out " is to prevent the battery discharging back through the dynamo, and is *not* an automatic means of controlling the state of the battery.

Keep all electrical connections tight and clean.

If the insulation of a cable becomes chafed through, wrap a little insulating tape round the damaged portion or a " short circuit " will be experienced.

Top up the battery with distilled water about every fortnight. Keep the acid level about $\frac{1}{4}''$ above the top of the plates.

The correct specific gravity of the acid when the battery is fully charged is from 1.285—1.300 at a temperature of about 60° F.

Never leave the battery in a discharged condition. Never run the engine with the battery disconnected or out of service, unless the switch is in the " OFF " position.

It is difficult to lay down rigid instructions on the question of how long a battery should be kept on charge, as the conditions of use vary so considerably, and obviously, the amount of charging which a battery will require, is directly dependent on the extent to which the lamps are used. The following suggestions will serve as a rough guide :—

The switch should be left in the " C " position for about one hour daily. This time should only be increased if the period of night running is considerable, or when the battery is found to be in a low state of charge (if the specific gravity of the acid solution is 1.210 or below).

Always disconnect the positive lead from the battery before undoing any other connections or before removing the cover over the cut-out.

If a *Lucas-Nife* steel plate battery is fitted, *never use acid*. A special alkaline solution is required for first filling up, and only pure distilled water should be used for replenishment purposes.

Removing Dynamo.

To remove the dynamo from the main part of the instrument, disconnect the two leads, loosen the clamping band over the dynamo body, and take out the cheese-headed screw at the apex of the inverted V-shaped cover over the driving gears. Pull the dynamo out endways.

To replace, slide the dynamo into position, seeing that the gear teeth go properly into mesh, screw home the cheese-headed screw and do up the clamping band.

Sidecar Connections.

The Ariel Sidecar Chassis is a completely new design. It is now of triangular construction with 3 point connection ; due to our special design a fourth point connection is entirely unnecessary. The front and rear connections are ball jointed and should be kept locked up quite tight, so that the ball has no freedom inside its housing. (Make quite certain that the locking ring is secure). This connection easily adjusts itself to slight movement and occasional greasing will prevent any tendency to squeak.

Wheel alignment is obtained by sliding the drop arm, from the rear ball joint, along the sidecar frame tube.

The third connection is to the saddle tube lug. The lower end of this connecting tube is attached to the sidecar chassis by means of a spring loaded ball joint. This permits of a small amount of flexibility over rough ground. The sliding members of this ball joint should be kept greased.

To obtain vertical alignment of the motor cycle, undo the lock nut just beneath the yoke-end—at the top of the tube to the saddle lug—remove the bolt passing through the yoke-end and eye-bolt, and then screw the yoke-end in or out of the connecting tube until the required alignment is obtained. Replace the bolt and securely do up the lock nut.

An alternative method is as follows :—Slack off the clamp lug on the sidecar chassis (*i.e.*, the lug at the bottom of the saddle connection) and move this back or forward as require : forward, to push the bike out ; backward, to pull it in. It is advisable to loosen the eyebolt through the saddle lug and the connecting bolt through the eybolt and connecting tube.

See that the ball-headed pinch bolt, *i.e.*, the one through the clamp lug—is at right angles to the connecting tube.

An incorrectly aligned sidecar can seriously affect tyre life. Hence, check over connections occasionally and test the wheels for alignment. Also see that the motor cycle is upright. (See wheel alignment, page 54).

Cleaning Chromium.

Do not use metal polishes or similar abrasives on chromium plated parts, or rusting is likely to take place. Clean with a wet sponge and polish with a soft cloth.

Affixing Transfers.

Carefully clean the part on which it is desired to place the transfer. Lift up from the stout paper backing, one corner of the thin paper on which the transfer itself is mounted. Apply a very thin and even coat of adhesive varnish to the face of the transfer. Allow the varnish to become tacky, carefully peel off the stiff paper backing, and then place the transfer, varnished side down, in the required position on the article. Press down evenly and drive out all air bubbles which may appear under the transfer ; a soft cloth rolled up into a ball is good for this purpose. Then get a damp sponge and press the transfer down again, taking care that it does not move. When the transfer is firmly pressed into contact with the article, thoroughly wet the thin paper mounting and when this is well soaked, peel off. Next, carefully sponge over the transfer with plenty of clean water so as to remove the composition. Surplus varnish can be removed with a sponge moistened in water to which a little paraffin has been added. Quickly remove traces of paraffin by sponging again with clean water.

If desired, the transfer can be varnished over, but this must not be done immediately ; preferably, leave till the next day.

TYRES AND THEIR USE.

Inflation.

Satisfactory tyre mileage depends fundamentally upon reasonable treatment being given. It will be apparent from the very nature of their service and their method of functioning that the influences governing the life of tyres are many and various, but almost invariably wholly or in part within the user's control.

The whole principle of the pneumatic tyre is the employment of compressed air to form a cushion between the vehicle and the road. The correct degree of inflation is determined by the load to be carried in relation to the section of the tyre used.

The tyre maker's recommendations should be rigidly adhered to if satisfactory service is to be obtained. Tyres should be tested at least weekly and any deficiency in pressure at once remedied.

Although in some cases additional comfort can be obtained by lowering the degree of inflation, this must inevitably be paid for in decreased tyre life, increased liability to tyre destruction and a higher percentage of troubles on the road.

In respect of motor-cycle tyres, special measures are necessary when the very common practice of carrying a pillion passenger is indulged in. It will be appreciated that when a passenger is carried in this position almost the whole of the additional load is imposed upon the tyre fitted to the rear wheel, which, even apart from the presence of an additional passenger, is being worked much harder than the tyres fitted to the front and sidecar wheels.

It follows then that if the rear tyre is inflated to that degree of pressure sufficient to deal with conditions when a pillion passenger is not carried, that when the pillion seat is occupied, *unless the inflation pressure is increased to meet the altered load conditions*, there is serious overloading, or, in other words, the tyre is under-inflated for the load carried.

A table of inflation pressures is given on page 54.

Rim Sizes and Oversize Tyres.

The rims used for the 26″ × 3.25″ wired-on tyres are size WM2-19 (2½″ × 19″). Suitable oversize tyres for this size rim, are 26″ × 3.50″ and 27″ × 4.0″. As regards

clearance, there will be ample for the 26″ × 3.50″ cover, but the 27″ × 4.0″ cover will run rather close to the rear chainguards; in general, this size cover can be fitted if the guards are given a slight set away from the wheel.

The 27″ × 3.25″ tyre is the correct oversize for the WM1-20 ($2\frac{1}{4}$″ × 20″) rim used for the 26″ × 3.0″ tyre.

Recommended Minimum Inflation Pressures for Dunlop Cord Tyres.

Wired Type.

MODEL V.B. & V.F.	26 × 3.25″ tyre. lbs. per sq. in.			26 × 3.50″ Balloon Tyre lbs. per sq. in.		
	Front	Rear	Sidecar	Front	Rear	Sidecar
Solo	16	20	—	16	16	—
Sidecar ..	19	25	16	16	22	16
Solo, with pillion passenger ..	16	28	—	16	24	—
Sidecar, with pillion passenger	19	36	16	16	30	16

Wheel Alignment.

Solo Machine.

Procure a plain board about 6 ft. long, 4 in. wide, and 1 in. thick. One edge must be planed perfectly straight and square. With the machine on the stand, place the straight edge of the board alongside the two wheels. By slightly turning the front wheel, if necessary, the board should touch each tyre, front and back, on both wheels. If it does not do so, adjust the alignment of the back wheel by means of the adjusters provided (Fig. 12, and see Rear Chain). If this alignment cannot be obtained the frame or forks are probably twisted.

Sidecar.

The combination must stand on a smooth level floor. Place a board alongside the wheels of the machine; these must be in line as described above.

Procure a second board similar to the first one and place this with its edge touching the sidecar tyre. Measure the distance "A" in the diagram, which should be taken as near to the back tyre as possible. Similarly measure the distance " B, taking this as close as possible to the front tyre. These two distances should be equal in running, but in practice it is permissible to have " B " about $\frac{3}{8}$in. shorter than " A " with the machine stationary. This ensures that the wheels are in correct alignment.

The next point is to see that the machine is standing perfectly upright. Without disturbing the boards, take a smaller one about 3ft. 6in. long, and rest one end on a given point towards the top of the front fork, the other end resting on the ground. Mark the ground where the board touches. Do this on the other side, placing the top end of the board in an exactly corresponding position, and again mark the ground. Then measure from each mark to the centre of the tyre where it touches the ground. These distances "C" should be equal. If necessary, the setting of the machine must be altered so that this is obtained.

Unless the combination is both upright and in correct alignment, rapid wear of one or all of the tyres is certain to ensue.

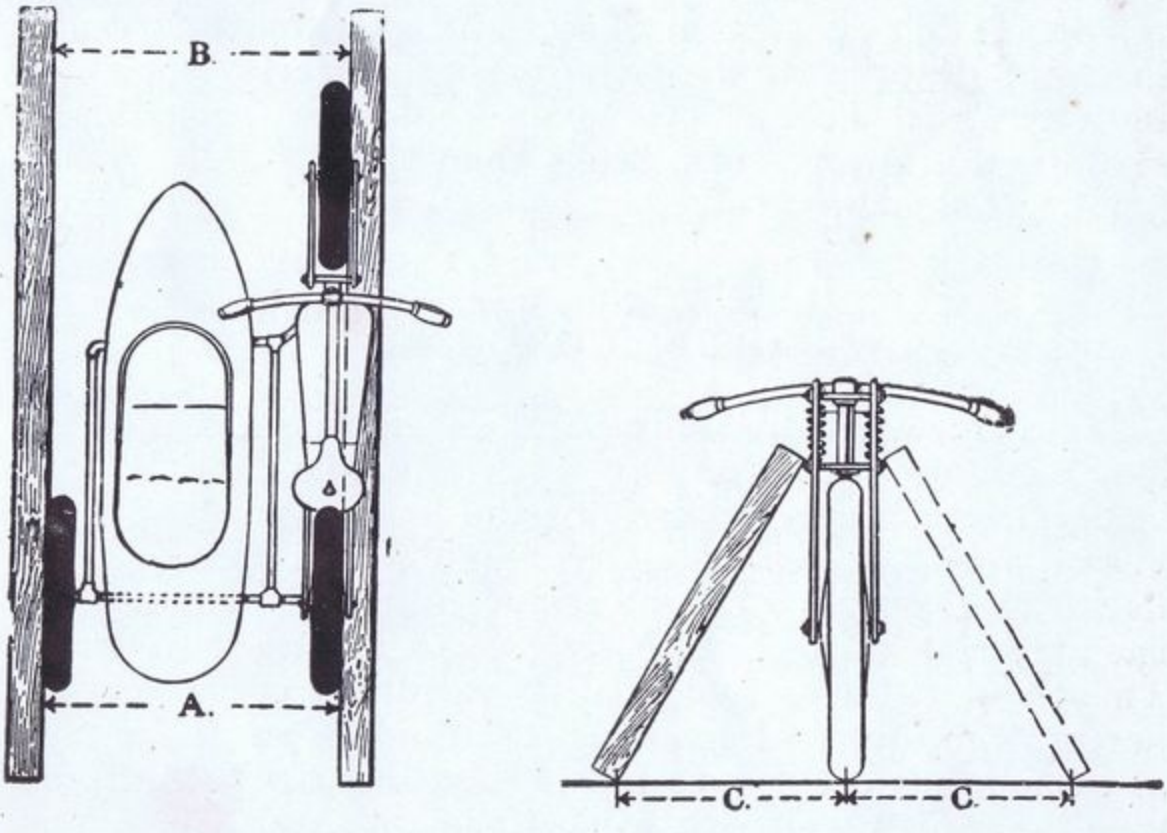


FIG. 15. DIAGRAM SHOWING WHEEL ALIGNMENT.

Misuse of Brake and Clutch.

With the highly efficient brakes and powerful engines used on Ariel machines the effect of any harsh braking or violent acceleration is likely to be seen in rapid tyre wear, and drivers who habitually indulge in these practices must expect to pay the price in more frequent tyre replacements than would be the case were they to exercise reasonable care.

It is important that there should be no irregularity of brake action causing intermittent and jerky retardation. If such conditions are present it is quite possible to completely grind off a portion of the tread, the extent of the damage depending of course upon the momentum of the vehicle in relation to the power of the brakes.

Cuts.

Any but superficial rubber cuts are a menace to the whole tyre structure. The tyre casing retains its strength only so long as the whole of its plies are unbroken. If two or three strands are severed the whole tyre casing is weakened and a large burst may result. The penetration of wet and road matter results in rapid deterioration of the casing material to which it may gain access. Covers should be periodically examined and any cuts, other than those purely superficial, efficiently repaired.

Concussion Bursts.

If a tyre, when travelling and bearing its share of the load, comes into contact with an obstruction, the impact, which is a product of the load carried and the velocity of the vehicle, may reach an extremely high figure and produce an excessive localised strain upon the material forming the casing and a resultant fracture. The tread rubber, owing to its nature, may not show perceptible signs of bruising or damage as the result of even the most severe blow. An incorrectly inflated tyre is more susceptible to damage resulting from such blows than one inflated to the maker's recommendations.

Special Tuning.

O.H.V. Models only.

For those riders who desire to do a little tuning up for competition or racing work we can supply a high compression piston, quick lift cam wheel and extra strong outer valve springs. We would however, like to point out that these parts are not recommended for ordinary touring work.

The high compression piston gives a compression ratio of 7 : 1 and it is desirable to use as fuel a mixture of 70 per cent. Benzole and 30 per cent. No. 1 Petrol or Aviation Spirit. A 50/50 mixture can be used. An alcohol fuel is not required on this compression ratio and will probably not give such good results.

After fitting the piston, run it in carefully for several hundred miles and then carefully examine for high spots. If any are apparent, remove with a dead smooth file and refit the piston and then run again, with further examination and attention if necessary.

The valve ports, both inlet and exhaust can be carefully ground out and polished, so that a dead smooth surface is obtained.

If desired, the connecting rod and flywheels can be polished, but as this gives very little advantage and entails parting the flywheels, it is not recommended. Also, little is to be gained by endeavouring to lighten the flywheels, and if attempted, the balance may be upset.

The peak engine revolutions will probably be about 5,200 R.P.M., and the ignition will take a little more advance. Try contact breaker points separating at $\frac{1}{2}$in. before T.D.C. on full advance.

The standard carburetter is entirely satisfactory, and with the large benzole content in the fuel the standard No. 170 or 180 main jet will probably suffice. Raising the taper needle on the throttle slide will improve acceleration, but at the expense of good fuel consumption.

A sparking plug with good heat-resisting properties is required, and some suitable plugs are listed on page 32.

Use a first-class lubricating oil such as Wakefield's Castrol R.

Pay special attention to the mechanical condition of all parts ; be scrupulously clean when fitting and tuning, and do not be satisfied with " good enough." See that it is RIGHT.

If the engine runs imperfectly or has lost considerable power, read the table below from left to right, eliminating possible causes.

Poor Compression.	Wrong Mixture.	Faulty Sparking Plug.	Engine in Bad Condition.	Insufficient Oil Supply.
Valves require grinding in.	Wrong jet size.	Plug runs too hot and damages insulation or too cool and oils up.	Valve springs weakened or broken.	Oil pipe connection loose.
Too much gap in piston rings or carboned up.	Taper needle wrongly set.	Insulation faulty.	Valves and guides badly worn.	Pump non-return valve not seating.
O.H.V. Head joint faulty.	Punctured carb. float.	Ignition too much retarded.	Engine badly carbonized.	Oil pipe or filters choked.
Cylinder badly scored.	Needle not seating correctly causing flooding.	Gap at points incorrect.	Cam Levers badly worn, giving incorrect timing.	Bad joint between pump face and timing case.
Badly worn valve guides.	Control slides not properly adjusted.	Insulation covered with oil or carbon.	Bearings badly worn or engine tightened up due to seizure.	Pump face joint washer fitted incorrectly.
Exhaust lifter holding valve off seat.				Delivery pipe into mainshaft broken off.
Tappet adjustment too close.				

Table showing relation between Engine Revolutions per minute and speed in miles per hour for different gear ratios with 26in. wheels.

Gear Ratios	MILES PER HOUR.														
	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
4.8		930	1240	1550	1860	2170	2480	2785	3110	3415	3725	4035	4350	4660	4970
5.2		1010	1345	1680	2015	2355	2680	3025	3365	3700	4035	4375	4710	5045	5380
5.8		1125	1500	1875	2250	2625	3005	3375	3755	4130	4510	4880	5255	5630	
6.9		1340	1785	2235	2680	3125	3570	4020	4470	4920	5370				
7.6	980	1470	1960	2450	2940	3430	3924	4420	4910	5400					
8.4	1090	1630	2170	2710	3260	3800	4340	4890	5440						
9.4	1220	1825	2425	3030	3645	4250	4850	5470							
10.4	1340	2020	2690	3360	4030	4710	5360								
11.4	1470	2205	2940	3675	4410	5145									
13.0	1675	2515	3350	4190	5030										
14.0	1805	2710	3610	4510	5420										
15.0	1935	2910	3885	4845											
16.0	2080	3100	4140	5180											
17.0	2200	3300	4400	5500											
18.0	2330	3500	4650												

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