THE MODERN

# ARIEL

## MOTOR CYCLE

1935

# OWNERS' GUIDE

## SINGLE CYLINDER MODELS.

*Price :*

*ONE SHILLING*

ARIEL MOTORS (J.S.), LTD.
SELLY OAK, BIRMINGHAM

Grams: ARIEL, SELLY OAK.
Phone: SELLY OAK 1381.

THE LION PRESS, (1931) LTD. WEST BROMWICH.

# INTRODUCTION.

This book is intended to enable the rider to keep his machine in first-class running order by carrying out running adjustments and minor repairs as required. If any point of difficulty arises, however, we are always pleased to advise. When sending in an enquiry or when writing about a machine at any time always state clearly :—

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

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

Model—*e.g.*, VA3 or VG, etc., and year of manufacture.

## Running-in.

Proper running-in of the new engine is of the utmost importance, as misuse during the first few hundred miles will lead to poor results and unnecessary expense. Definite running-in speeds cannot be given, as the safe limit of speed depends absolutely upon road conditions, etc. Keep the engine turning over easily on small throttle openings, letting it rev. rather than pull slowly on large throttle openings. All motor cycles leaving our factory are in first-class condition, but we have to leave the running-in to you. What your engine ultimately becomes depends upon *your* care during the first 500-1,000 miles. Give yourself lasting satisfaction by using restraint until the piston and cylinder have become seasoned by constant heating and cooling and have acquired first-class bearing surfaces and well-fitting rings.

## Fuel, Oil and Grease.

Good oil and petrol are always necessary, but are even more essential during the running-in period. We very strongly recommend the exclusive use of one of the following oils :—

Wakefield Castrol XXL.
Mobiloil D.
Aero Shell.

Any No. 1 spirit of reputable brand is entirely satisfactory for the standard models, but an anti-

pinking fuel should be used for the Hunters, if fitted with a high compression piston : this is standard on the 250 c.c. Hunter. A genuine 60/40 Petrol/Benzole mixture is recommended for the best results.

The following greases are recommended for general use :—

Castrolease Medium.
Mobilgrease No. 2
Shell Motor Grease Soft.

## Instructions for Starting.

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

Set the ignition one-third advanced, slightly open the throttle—about one-eighth of the total movement of the grip—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. Push forward the exhaust valve lifter trigger. Now depress

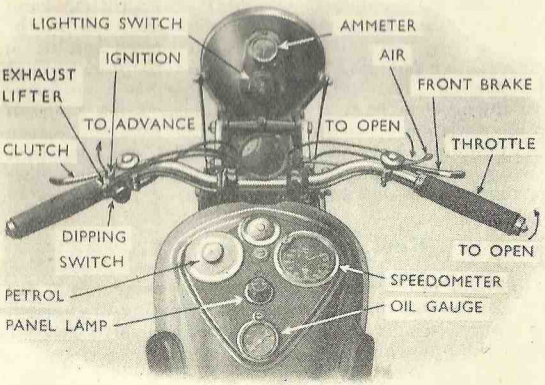


FIG. 1.
THE CONTROLS.

the kick-starter sharply, releasing the valve lifter rather before the kick-starter crank is halfway down. If the engine has started, fully advance the ignition and open the air lever about half to three-quarters. As soon as the engine is warm—about half a minute—fully open the air.

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.

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 look for faults. If, however, the engine still fails to start, check over the various items in the Fault Finding Table on p. 37, reading the table from left to right, and eliminating possible causes.

## Hints on Driving.

Always start in bottom gear, changing up one gear at a time as the engine gathers speed. Always declutch to change gear, either up or down.

Keep the ignition fully advanced for all normal running. Retard only for starting, and occasionally slightly retard for hill climbing.

Don't hang on to too high a gear. Change to the next lower gear immediately the engine shows signs of labouring or, if on the level, there is any snatch in the transmission.

Don't open the throttle suddenly when the engine is running slowly ; this causes pinking.

Don't stand in gear with the clutch held out, or the cork inserts will overheat and require replacement.

Make necessary adjustments periodically. Don't wait until they *must* be made.

# THE ENGINE

USEFUL NOTES.

| Model. | Bore. | Stroke. | Capacity | Compn. Ratio. |
|---|---|---|---|---|
| VA.VB ... | 86.4 m.m. | 95 m.m. | 557 c.c. | 4.8 |
| VF.VG ... | 86.4 ... | 85 ... | 497 ... | 5.8 |
| VH ... | 81.8 ... | 95 ... | 497 | 6.0 or 7.5 |
| NF ... | 72 ... | 85 ... | 348 ... | 6.0 |
| NH ... | 72 ... | 85 ... | 348 ... | 6.0 or 7.0 |
| LF ... | 61 ... | 85 ... | 249 ... | 6.0 |
| LH ... | 61 ... | 85 ... | 249 ... | 7.0 |

## Dry Sump Lubrication System.

In the dry sump system the oil is continuously circulating through the engine and oil tank, thereby ensuring that the engine always has an adequate supply of oil, but without waste occuring. It is only necessary for the rider 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 a steady pressure is maintained, it shows that oil is circulating correctly.

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 a crank on the end of the cam spindle, movement being transmitted from the crank to the plungers through the medium of sliding a 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.

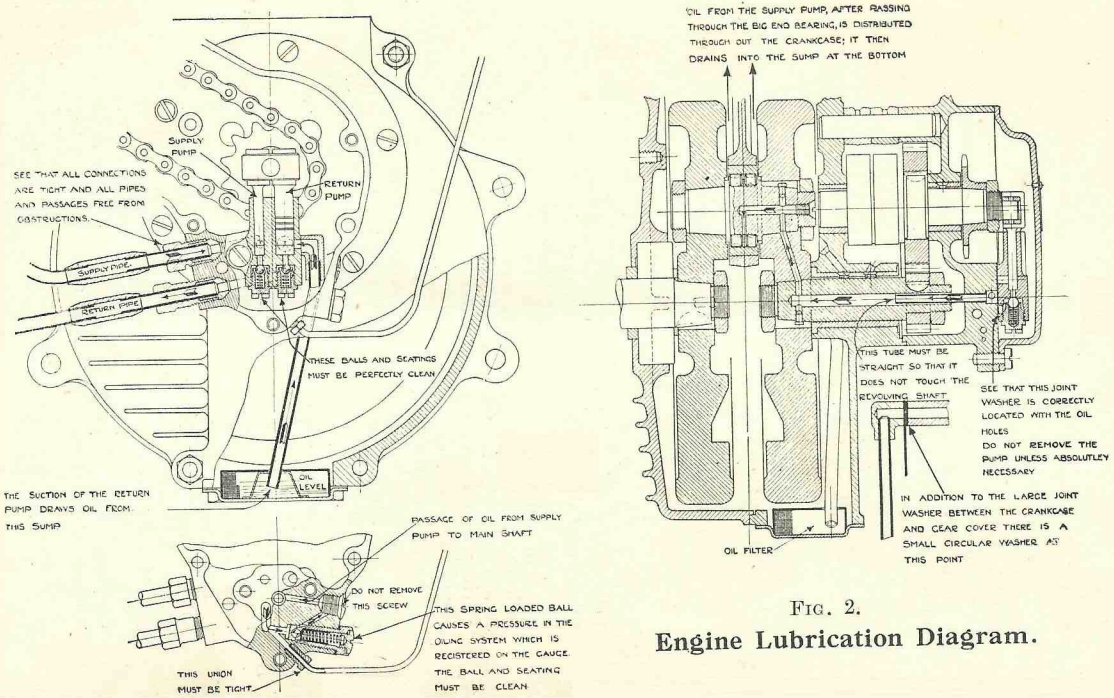


FIG. 2.

**Engine Lubrication Diagram.**

Oil spray from the crankcase is forced through vent holes into the timing case and magneto chain case, where it lubricates the timing gear and, after reaching a predetermined 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.

When running at 25 m.p.h., in 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 NO. 353565)
## and Oil Filters.

The Centrifugal Oil Purifier, already mentioned 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, briefly, is as follows :—

Oil enters the flywheel reservoir, about midway along its length, via a tube held in position by the cleaning plug in the flywheel periphery. Due to centrifugal action, grit, etc., is forced *outwards* into the cleaning plug, whilst the cleaned oil passes back through suitable oilways to the crankpin bearing.

The dirt which has collected in the cupped plug 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 should 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 is

immediately above the sump and then undo the plug. When the plug is removed, the dirt (if present in any quantity) will be found packed quite hard inside the cup formed in the plug, and must be removed with the blade of a penknife. See that the tube 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. It is locked into position by being slightly bell-mouthed so that it binds in the thread. No other locking device is used, and is not needed so long as the plug binds slightly and is screwed hard home.

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 in the oil tank. Unscrew the plug at the back of the tank, withdraw the filter and clean. When replacing, see that the internal oil pipe is located in the hole in the end of the filter gauze.

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 1,000 miles under normal conditions of operation. In places where excessive dust is encountered, the lubricating oil becomes contaminated with abrasive matter at a rapid rate, and the oil tank and the crank case should be drained every 500 miles. This is highly important to avoid undue wear of pistons, cylinder, etc. 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.

Clean the two filters every time the oil is changed.

## 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 is circulating. The gauge is connected to the delivery side at a point immediately following the pump, the pressure being created by a spring-loaded ball valve.

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. 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 pressure is adjusted by means of the hexagon-headed screw immediately above the oil gauge pipe where it joins the timing case. Turning the screw clockwise increases the pressure whilst rotating the screw anti-clockwise has the reverse effect.

The flow of oil can be tested by removing the plug above the regulator 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.

It is practically impossible for the lubrication system to go wrong, but in the event of any slight irregularity in oil pressure or supply, the trouble will almost certainly be traced to dirty oil. To remedy :—

1. Remove pressure regulator, clean in petrol and reassemble as follows : *a*, Steel ball ; *b*, ferrule, closed end next ball ; *c*, spring, fitting inside ferrule ; *d*, adjusting screw and locknut.

2. Clean oil filters and purifier and if the oil has been in use for some time, refill with clean oil.

3. Check points under " Insufficient Oil Supply " p. 37.

## 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, however, decarbonisation should be carried out about every 2,000 to 3,000 miles. This is a perfectly simple operation, and is done as follows :—

*Side Valve Model.*

Take out the sparking plug, undo the seven set bolts securing the cylinder head to the barrel, and lift off the head. Take care not to damage the copper-asbestos joint washer. Scrape all carbon from the piston top, from the inside of the head, and also from the edges of the joint washer.

## Valve Removal and Grinding—S.V.

To grind in the valves it is not essential to remove the cylinder, but its removal is effected as follows :—

Undo the carburetter, exhaust pipe, and exhaust valve lifter wire ; then undo the four cylinder base retaining nuts and lift the cylinder up and forwards. Push the piston down to the bottom of its stroke and the cylinder will come away.

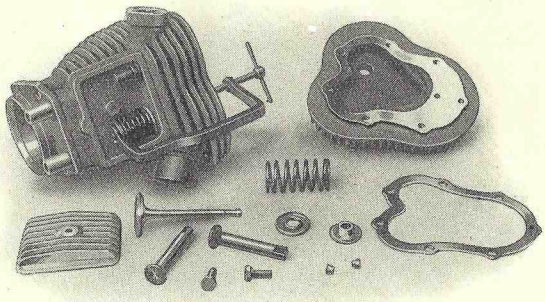

FIG. 3.

METHOD OF REMOVING VALVES. S.V. MODELS.

To take out the valves, place the cylinder on the bench with the valve spring chamber upwards, and then compress the valve springs by means of a valve extractor. A suitable type is 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, spring and collars, Both valves are dealt with in this manner. Now scrape all carbon deposit from the exhaust valve port; an old screwdriver can be used for this.

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. The inlet valve is stamped 1N or 2.S11. The exhaust valve is stamped EX, J.H.3, or G.2.

If the valves are ground in without removing the cylinder from the crankcase, exactly the same method of removal should be adopted. Before attempting to do any valve grinding, rotate the engine until the piston is towards the bottom of the cylinder and then stuff a large piece of clean rag into the cylinder bore so as to keep out all dirt, etc. Be careful not to get any grinding paste into the interior of the engine.

If this method of valve grinding is adopted, rotate the engine so that the valves are down on their seats and also slack off the tappets to ensure clearance.

## The Piston—S.V. and O.H.V.

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—S.V. and O.H.V.

The gudgeon pin is of the fully floating type, *i.e.*, free to rotate in the piston and connecting rod bush. The pin is held in position by means of two spring

circlips which fit into grooves machined at each outer end of the gudgeon pin hole through the piston. These circlips can easily be removed by inserting a pointed instrument (*e.g.*, a scriber) in the slot, under the clip, and prising out. Take care not to damage the clip, which should be round and lie flat when removed. To replace the clip, push it into the gudgeon pin hole in the piston, and see that it springs out into the locating groove. These clips should be quite firm when in position and should not shake about.

## Piston Rings—S.V. and O.H.V.

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.

## Reassembly—S.V.

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

Put the valves, springs and collars 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.

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

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

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

See that the head joint washer and the joint faces are perfectly clean and put the head and washer back into position. Insert the set bolts and screw these all down fingertight until the head of each bolt is down

on to the cylinder head. Take a spanner and give one bolt a one-eighth turn. Repeat this on the next but one bolt, and then on the bolt next but one to the last. Work round the head in this manner until every bolt is tight. This method of pulling down the bolts ensures an even pressure on the joint face so that there will be no possibility of leakage.

Re-adjust the valve tappets if necessary.

## Exhaust System.

Undue back pressure is a not unusual cause of overheating, heavy petrol consumption and general poor running. The silencing system should, as far as possible, be cleaned out periodically. Pay particular attention to the baffle tube on the end of the exhaust pipe where this projects into the silencer and see that the flat part of the fish tail is not choked up with thick oil and carbon.

## 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.

Remove the valve spring covers and undo the set bolt in the middle of the off-side rocker plate ; this bolt secures the oil-feed-to-valve-guide union to the rocker box. Undo the four set bolts holding the rocker box to the head and draw the box away upwards and outwards to the off-side. Take care not to lose the fibre and rubber washers at the top and bottom ends respectively of the push rod enclosing tubes.

Now unscrew the four head bolts and remove the cylinder head. If it 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.

Do not remove the oil feed pipes to the valve guides as these are driven into position in the head and unnecessary removal will only lead to looseness and oil leakage.

## Valve Removal and Grinding—O.H.V.

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). The method of use is exactly the same as for the S.V. model ; place the forked end on the valve spring collar, and the pointed end of the screw in the centre of the valve head. Then screw up until the spring is compressed sufficiently to enable the split cotters to be removed.

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.

## O.H.V. Rocker Gear.

As the complete rocker gear is carried in the cast aluminium box, it is quite unnecessary to disturb this in any way when decarbonising the engine. If it is required to dismantle the rockers at any time, the procedure is as follows :—

The box is made in two halves and is fixed to the head by means of side plates. The rocker spindles and nuts and oil-feed-union bolt, form the means of

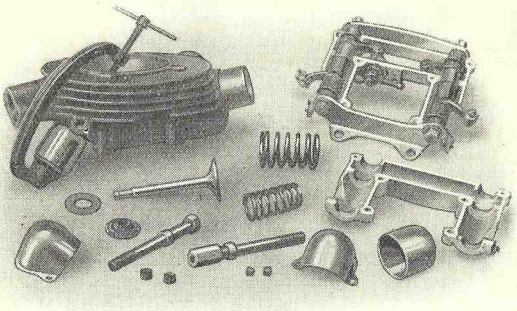

FIG. 4.
METHOD OF REMOVING VALVES, AND VIEW OF ROCKER GEAR. O.H.V. MODELS.

securing the plates to the box. To dismantle the rocker gear, hold the off-side plate in a vice and take out the six screws holding together the top and bottom halves of the box and lift up the top half ; the bottom part of the box will then drop away.

To further dismantle the rocker gear, undo the two spindle nuts securing the near-side plate and slide off the plate. The rockers, collars and return springs will then slide off the spindles. Note how the distance collars are fitted, so that they can be correctly replaced,

*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, Rings and Gudgeon Pin—O.H.V.

See previous notes for S.V. and O.H.V. models. The cylinder barrel is removed in the same manner as the S.V. cylinder.

## Re-assembly—O.H.V.

Rotate the engine until neither cam lever is on the lift, *i.e.*, valves closed. 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 (gold size may be used), place the head in position and screw up all the head bolts finger tight. Now give one bolt a one-eighth turn and repeat on the bolt diagonally opposite. Do the same on the two remaining bolts. Return to the first bolt, give it another one-eighth turn, repeat on the opposite bolt and then on the other two, and so on, working round the head from one bolt to another until all are perfectly tight. This will ensure a good gas-tight joint.

Insert the two push rods into their enclosing tubes, and see that the oil-retaining rubber washers are sound (if perished, fit new ones). Put the rods and covers into position, with the ball ends of the rods locating with the cups in the cam levers. Place the hardened steel caps on the valve stems. Take the rocker box, replace the exhaust lifter wire if this has been removed, and put the box into position, seeing that the ball ends on the rocker arms are in the cups at the top of the push rods, and that the enclosing tubes are correctly located at the base of the rocker box. Note that fibre washers are fitted at the tops of the enclosing tubes to prevent oil leakage. Keep the rocker box pressed down to overcome the resistance due to the compression of the rubber washers, run the two set bolts holding the near-side plate as far down the head bolt pillars as possible by hand, and insert and screw home the two off-side set bolts. Finally, tighten the near-side bolts and adjust the valve clearance.

Replace the carburetter, sparking plug, silencing system, etc.

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

## Tappet Adjustment.

*Side Valve Model.*

Remove the valve 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. 5) 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.

*O.H.V. Model.*

Set the engine with the piston near the top of the cylinder and with both valves fully closed. Remove the valve spring covers and slack off the lock nut on the adjusting screw which goes through the end of the rocker arm and bears on the valve stem end cap. Rotate this adjuster until there is just no clearance, then re-tighten the locknut. Note that the cover should not

be lifted higher than is necessary to free it from the pegs or the spring will be strained and will not hold the cover firmly in position.

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 due to the action of the cam taking up the clearance slowly before the valves themselves begin to open.

With the O.H.V. model, the clearance must be checked between the adjuster on 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 make sure that the clearance is practically nil by seeing that it is impossible to depress the end of the rocker arm, and then testing for 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.

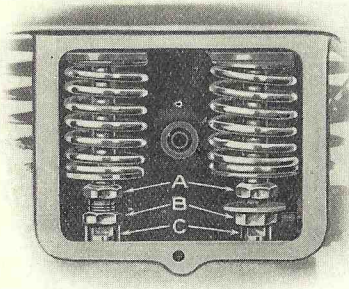


FIG. 5.
VALVE TAPPET ADJUSTMENT. S.V. MODELS.

## 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 (S.V.) or rocker (O.H.V.); this must be tested when the exhaust valve is fully closed. 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. 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 cams operate cam levers which are carried on a centrally disposed pin. Each lever has one semi-circular face which bears on the cam profile, and in the case of the S.V. models, a further curved face which bears against the tappet foot. In the O.H.V. models the curved face is replaced by a cup carrying the lower end of the ball ended push rod. The top end of the push rod is cupped and engages with the ball end of the rocker arm.

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

To dismantle the timing gear, first 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 cupped adaptor on to the crank on the end of the spindle, and so prevent damage. Undo the two oil pipes to the oil tank (disconnecting these at the connections so that the unions remain in the timing cover), one to the rear chain (non-oilbath models) 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 easily reset. Rotate the engine until the piston is at top dead centre. 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).

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.

| Model | Inlet opens | Inlet closes | Exh. opens | Exh. closes |
|---|---|---|---|---|
| S.V. | $\frac{1}{64}$ 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. |
| O.H.V. except Red Hunter | $\frac{1}{64}$ 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.C.D. | $\frac{5}{32}$ in. or 20° After T.D.C. |
| Red Hunter | $\frac{9}{64}$ in. or 22° Before T.D.C. | $\frac{15}{16}$ in. or 70° After B.D.C. | $\frac{15}{16}$ in. or 70° Before B.D.C. | $\frac{3}{32}$ 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.

## Oil Pump (Patent No. 325226).

**Do not remove this needlessly.**

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 forget the Duralumin block which operates the pump plungers and note that the chamfered edge of the hole 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 :—

Both mainshafts and crank pin are secured by the usual taper fixing. (Except 500 c.c. Red Hunter crankpin which is a parallel fit and not taper.) The mainshafts are also keyed, whilst the crankpin has a peg engaging with a keyway in the timing side flywheel. This ensures that the oil-ways 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.

To dismantle the wheels :—

*First undo the crank-pin nut* on the driving side, holding by the driving side flywheel only. Then support the drive side flywheel and press out the crank pin complete with timing side flywheel, etc.

*The connecting rod* has a double row roller bearing big end, the hardened steel crank-pin forming the inner member, while the hardened steel outer member is a press fit into the rod and can be renewed complete with crank pin when worn.

*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. These washers are inserted on either mainshaft as necessary to maintain the flywheel assembly central in the crankcase.

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

## THE MAGNETO OR MAGDYNO.

### Contact Breaker.

Keep the points clean and correctly adjusted. Attention should only be required every 2,500 miles or more. To adjust the points, remove the contact breaker cover and turn the engine round slowly until the points are seen to be fully open. Now, using the magneto spanner, slacken the locknut and rotate the fixed contact screw by the hexagon head until the gap is set to the thickness (.012″) of the gauge (rivetted to the spanner). Tighten the locknut, seeing that this operation does not move the fixed contact screw.

It is particularly important to keep the contact breaker free from oil and petrol or rapid burning of the points will occur. If they become blackened they may be cleaned with very fine emery cloth and afterwards with a cloth moistened with petrol ; clear away all traces of metal dust and let the petrol dry off before replacing the contact breaker.

To remove the contact breaker from its housing for cleaning, undo the central hexagonal headed screw and gently prise up the contact breaker ; it fits on a tapered and keyed shaft. The points are more easily cleaned if the contact arm is lifted up off its pivot after swinging aside the flat locating spring. When replacing the contact breaker make sure that the projecting key on the tapered boss is engaged properly with the keyway in the shaft. Also see that the securing screw is tight, but do not use undue force or the threads will be damaged.

Further information concerning the ignition and electric apparatus will be found in the Lucas instruction book.

## Magneto Timing.

The correct timing is as follows :—
Red Hunters, $\frac{5}{8}$" maximum advance.
All other O.H.V. models, $\frac{3}{8}$" maximum advance.
557 c.c. S.V. models, $\frac{5}{16}$" maximum advance.

To set the timing, remove the sparking plug and release the magneto sprocket from the taper on the armature shaft. Rotate the engine until the piston is the required amount before top dead centre on the compression stroke (both valves closed), and set the ignition control to full advance. (NOTE.—Be sure the contract breaker cam ring is responding to the movement of the lever). 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.

## 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. Especially on the O.H.V. engines is it necessary that best quality sparking plugs should be used.

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 re-set the points to the correct gap—.020in. to .025in.

We recommend the following plugs :—

S.V. models, Lodge H.1.

O.H.V. (except Red Hunter), Lodge H 1 for ordinary touring or Lodge H.32 or H.45 for hard driving.

Red Hunter, Lodge H.14 for running in and slow touring, and Lodge H.53 for harder driving. On the 250 c.c. Hunter model it is especially necessary to use a good heat-resisting plug such as the H.53, as this model is fitted with a high compression piston as standard. Similar remarks apply to the 350 c.c. and 500 c.c. Hunters when a H.C. piston is fitted.

## THE CARBURETTER.

Riders are strongly advised not to alter needlessly the carburetter setting : Keep the carburetter clean and periodically empty sediment and moisture from the float chamber. Note that the size of the main jet controls mixture strength from approximately three-quarter to full throttle, whilst the positioning of the taper needle which is attached to the throttle slide controls the mixture between approximately one-quarter and three-quarter throttle. As the taper needle and needle jet wear, the mixture is richened up over this range ; this can be compensated for by lowering the needle (*i.e.*, securing in a higher notch). When all adjustment has been taken up, both parts must be replaced.

For further details of carburetter tuning, see the booklet issued by Messrs. Amal.

### CORRECT SETTINGS FOR AMAL CARBURETTERS.

| MODEL. | JET SIZE. | THROTTLE SIZE. | TAPER NEEDLE POSITION (notches from top). |
|---|---|---|---|
| LF. ... | 85 | 4/3 | 3 |
| NF. ... | 110 | 5/4 | 3 |
| LH. ... | 110 | 5/3 | 3 |
| NH.... ... | 150 | 6/4 | 3 |
| VA. & VB.... | 160 | 6/5 | 3 |
| VF. & VG.... | 170 | 6/4 | 3 |
| VH. ... | 200 | 29/4 | 3 |

# 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. 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 gearbox is provided for use.**

*Lubrication* :—The gearbox should be topped up every 1,000 miles with 2-3 ozs. of one of the recommended greases. The filling plug is behind the kick-starter case.

Do not forget to lubricate all the joints and pivots in the gear-operating mechanism and, on the 4-speed boxes, grease the enclosed mechanism via the grease nipple on top of the cover.

Greasers are also provided, on the 4-speed boxes for the K.S. lever bearing, and for the spiral gears for the speedometer drive.

## Clutch Adjustment.

Adjustment to the clutch plates and springs 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.

Two methods of clutch withdrawal adjustment are in use. In the one type the adjustment is incorporated in the spring plate and for correct operation and withdrawal of the clutch there should always be 1/64 in. clearance between the ball C in the clutch operating lever E (see Fig. 6) and the end of the operating rod D.

The cable adjuster on the gearbox should be set to keep the operating lever E in such a position that the Bowden cable is subjected to the minimum of bending ; then adjust A and B to give the required $\frac{1}{64}$" clearance.

In the other type the adjustment is in the operating lever. Maintain 1/64thin. clearance between the two thrust points on the lever and the face of the plunger which slides through the gear box cover. To vary the clearance, push in the top end of the operating lever (thus withdrawing the clutch), and slip off the Bowden wire. Let the lever fall down and rotate the screw

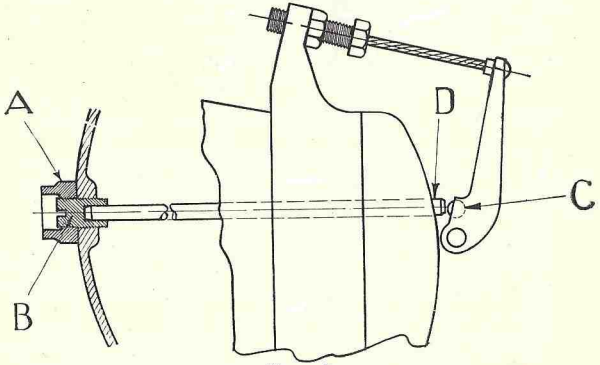


FIG. 6.
CLUTCH WIRE ADJUSTMENT.

through the plunger—clockwise to decrease clearance and vice-versa. Replace the cable and check the clearance. The adjustment cannot unscrew in operation as the head of the screw and flats formed on the plunger will only slide through, and not rotate in, the slotted operating lever. As for the other type of adjustment, the Bowden cable adjustment must be set to place the operating lever in such a position that the cable is subjected to the minimum of bending.

A clutch which sticks when the machine has been standing can be freed by depressing the kick-starter with the clutch held " out " before the engine is started.

## To Dismantle the Clutch.

Remove the chain case—outer half only, oil bath models—and then undo the four spring retaining nuts projecting through the spring plate, when the clutch plates can be withdrawn. Care should be taken to re-assemble them in the correct order. The first plate to be put in is the thick plain plate, then a fabric insert plate, and a plain plate alternately, finishing with a plain plate.

## To Dismantle the Clutch Centre.

Remove the clutch plates, undo the securing nut on the end of the mainshaft, and pull off the clutch centre, which is splined on the mainshaft. This leaves the clutch sprocket (carried on a roller bearing) and outer clutch housing in position on the shaft. Pull the sprocket endways off the shaft taking care not to lose the rollers as they fall out. The order of re-assembly is :—(i) Plain Washer, (ii) Inner roller race, rollers and sprocket, (iii) Plain Washer, (iv) Clutch centre, (v) Securing nut.

## Gear Control Rod.

Engage second gear and see that the gear lever is centrally placed in the second gear gate through the quadrant. If not central, adjust by removing the joint pin in the fork end at the lower end of the control rod and rotating the fork end. Slip the joint pin into position and check the gear lever in each of the other gears : in top and bottom it should not be hard against the end of the quadrant.

## Engine Shaft Shock Absorber.

The shock absorber spring is not adjustable, and the two lock nuts must be kept tight against the shoulder on the shaft. If they are removed, do not forget to replace the tab washer **between** them, turning one tab over on to each nut. Also, do not omit the **hardened** steel washer between the sprocket and inner lock nut.

On the 500 c.c. Red Hunter, the shock absorber assembly is fitted in exactly the reverse order to that employed on the other models, so that the splined collar comes at the outer end of the shaft. It is most important to see that the splines register with those on the shaft so that the collar is actually on the splined part of the shaft and not trapped between the hardened washer and shoulder on the shaft. On oilbath models the action is lubricated by the oil in the chain case. On chaincase models lubrication is by grease gun applied to the nipple in the end of the shaft.

## Primary Chain Adjustment.

Chain adjustment is effected by swinging the gearbox, which is pivot mounted, back or forward as required. Slack off the pivot bolt which is below the gearbox and which passes through the two lugs on the cradle tubes ; similarly, slack off the clamp bolt passing through the engine plates above the gearbox. At the top rear extremity of the offside engine plate, will be found the adjusting device. If this is of the eccentric and link pattern, loosen the large locknut and slightly rotate the hexagon ended centre : if of the draw bolt type, simply rotate the nut on the draw bolt ; this swings the box about the pivot bolt, varying the chain tension. Adjust until the primary chain has approximately $\frac{3}{8}$in. up and down movement midway between the sprockets, at the tightest point. Re-tighten (i) eccentric locknut, (ii) clamp bolt, (iii) pivot bolt. Check hand gear control adjustment.

## Rear Chain Adjustment.

Slack off the two rear wheel spindle nuts E (Fig. 7) and adjust by rotating the screw adjusters K ; turn each adjuster by an equal amount. The rear chain should have approximately $\frac{5}{8}$in. movement at the tightest point midway between sprockets.

## Chain Lubrication.

On oil-bath models the primary chain is lubricated by dipping into the oil in the case. Maintain the oil level up to the "Oil Level Plug," **but do not overfill or the oil will get into the clutch and cause drag.**

On chain-case models, primary chain lubrication is effected by taking a lead from the return oil pipe and directing the oil on to the lower run of the chain. Control is effected by a needle valve, the adjusting screw of which is situated inside the chain cover. Access is provided by a hole in the cover, just to the rear of the engine sprocket. Adjust the valve to pass 2-3 drops of oil per minute.

Rear chain lubrication is carried out on the chain-case models by oil mist conveyed via the breather pipe from the underside of the magneto chain cover. On the oil-bath models a needle valve in the primary chain-case, just behind the clutch dome, controls an overflow to the rear chain; this overflow only works when the engine is running. Obtain the correct setting by trial on the road; turn clockwise to decrease the supply and vice versa.

# WHEELS AND BRAKES.

(NON-DETACHABLE WHEEL).

## 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.

*To adjust*:—Slacken outer spindle nut E (Fig. 7) on side opposite brake drum; hold inner cone adjusting

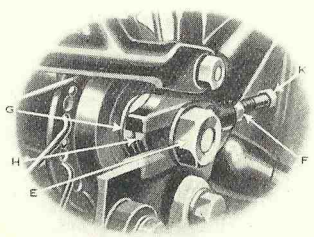


FIG. 7.
REAR WHEEL AND BEARING ADJUSTMENT.

nut G and loosen outer locknut H. Adjust inner nut, and then, still holding this inner nut, tighten the locknut and the outer spindle nut. When the bearing is correctly adjusted **there must be just the slightest slack as measured at the rim.**

*To remove bearings* :—Remove wheel from frame. Take off brake plate (see under Brakes). Screw off the two thin locknuts, and tap wheel spindle out towards the brake drum side. Now prise off the dirt excluding disc. 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.

*Lubrication* :—The hubs should be greased every 1,000 miles, using a medium bodied grease. 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, with a serious reduction in brake efficiency.

## Brakes.

To remove the brake plates 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 the wheel. 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 fulcrum adjustment device, also brake cam spindle and joints.

To re-assemble, 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.*

The rear brake is fitted with a fulcrum adjuster and all normal brake adjustment must be made by rotating the square-ended fulcrum spindle situated in the brake plate diametrically opposite the brake lever bearing. Turn clockwise to compensate for wear. The hand adjuster on the front end of the brake rod must be slacked off whilst the fulcrum adjustment is made.

When the fulcrum spindle will turn no further, retighten the hand adjusting nut until the brake pedal has only a trace of idle movement.

Adjust the front brake by means of the hand adjuster on the lower end of the brake rod.

## Detachable Wheel

*Removal* :—To remove the detachable wheel, simply put the machine on the rear stand, swing the hinged portion of the mudguard out of the way after slacking the stay nuts and take out the spindle bolt on the offside. Tap out the distance piece between the hollow wheel spindle and the fork end, if it has not already fallen out. Now pull the wheel to the offside, clear of the driving pegs, and withdraw. The wheel is replaced by reversing the procedure.

*Removal of Brake Drum and Sprocket* :—Take out the wheel as described, disconnect the brake rod and chain, undo the spindle nut and remove the assembly.

*Brake* :—The brake is the same as on the non-detachable wheel models. It will facilitate removal of the brake plate if the brake plate locknut is slacked before the spindle nut is undone.

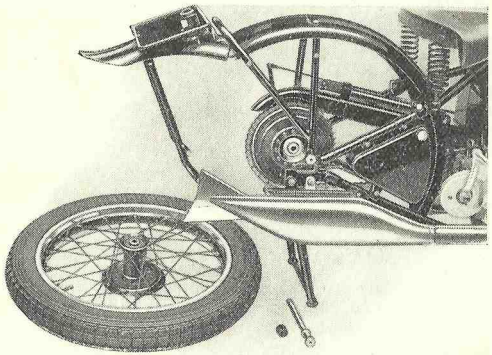

FIG. 8.

THE DETACHABLE WHEEL.

*Bearings* :—The wheel itself is carried on a hollow spindle by two journal ball bearings. The brake drum and sprocket is carried on a fixed spindle clamped in the nearside fork end, through the medium of a third journal ball bearing.

To remove the hub bearings, take out the round circlip and grease retainer in the hub at the flange end and undo the two bearing locknuts at the drive end. The outer nut locks the outer race to the hub whilst the inner nut locks the inner race to the hollow spindle : remove the outer nut first. Now drive out the hollow spindle (and with it the drive end bearing) from the flange end. Note that a collar is pressed on to the hollow spindle outside the flange end bearing ; therefore take care to drive on the spindle as the collar will be left behind. The flange end bearing can then be knocked out by means of a drift placed through the hub.

To remove the brake drum bearing, take out the circlip and grease retainer from the hub side. Remove the brake plate locknut, brake plate and distance collar and knock out the fixed spindle and bearing from the brake plate side.

## Brake Pedal.

On oil-bath chaincase models the pedal is carried on a plain spindle pressed in the case and is removed by undoing the retaining nut.

On steel chaincase models the pedal is secured to a tapered shaft carried in a bearing tube welded to the engine plate. To remove the pedal slack the retaining nut and drive the shaft inwards ; this will free the taper. Protect the greaser nut on the shaft by using a short distance piece, *e.g.*, the jaws of a set spanner.

# FRAME PARTS.

## Front Forks.

*Adjustment and Lubrication.*

To adjust the fork spindles, slacken the *two* hexagon locknuts—one at each end of the spindle—and rotate the spindle by means of a spanner placed on the squared end. Rotate anti-clockwise to tighten and clockwise to loosen.

*Note carefully* that re-tightening the locknut at the end of the spindle which is *not* squared, will tighten

up the adjustment. Therefore, adjust a little at a time, tighten locknut and test. When the final adjustment has been made, secure the locknut at the squared end.

The reason that tightening the locknut affects the adjustment is that the spindle at this end is stepped, the shoulder bearing up against a corresponding shoulder in the hole through the link. When the locknut is loosened, the link moves away from the shoulder on the spindle and *extra* clearance therefore develops.

For correct fork spindle adjustment, the knurled washers next the side links should just rotate easily.

The fork dampers are adjusted by means of the hand nut on the off-side lower front spindle only. Keep the spindle screwed right home in the near-side link and the locknut tight.

For the best results, the forks should have a free action, with just sufficient damping to prevent excessive fork bounce on bad roads.

Grease the fork spindles every 3-400 miles. A grease gun is provided in the tool kit.

## 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. Now loosen the bolt through the ball head clip. Above the clip are two thin nuts ; slacken off the top one—a locknut—and adjust by means of the lower one. The steering should be quite free, but there should be no shake in the handlebars. Carefully relock.

*Lubrication.*

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

## Resilient Handlebar Mounting.

The handlebar is carried in a bracket in which it is fixed through the medium of compressed rubber rings. The two large compression nuts must always be kept screwed up *hard* in order that the resilient mounting may work effectively.

## Steering Damper.

The action of the steering damper is to make the steering much stiffer. It is extremely useful for combination work and high speed solo work, particularly on rough roads. Do not tighten up the damper more than is necessary, and remember to slacken it off whilst reducing speed, as stiff steering at low speeds is very unpleasant and, on occasion, very dangerous. The damper is controlled by the rotation of the black hand knob projecting above the centre of the handlebars ; turning clockwise increases the damping.

To dismantle the damper, support the front wheel off the ground by means of a box under the engine. Unscrew the damper knob and remove the anchor plate bolt and star washer fixing nut. To take out the tie rod which passes through the column, remove the lower rear fork spindle.

When re-assembling, note that the nut securing the star washer screws up to a small shoulder, leaving the star washer free to rotate ; take care not to trap the washer.

The fixed anchor plate is in the centre of the assembly, the lipped plate, which rotates with the crown, coming next the star washer.

## Petrol Tank.

The petrol tank is secured by four 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-screws should not be screwed up too tightly.

If the tank has to be taken off, the cross pipe connecting the two sides must be removed, and the tank should therefore be emptied. *Note.*—As this pipe comes below the tank, it is liable to choke with sediment, etc. If, therefore, the petrol capacity of the tank appears to diminish take off this pipe and clean, so that there is a free petrol flow between the two sides of the tank.

*To remove filler cap* :—Slacken centre screw, rotate filler cap a quarter turn anti-clockise, 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, then, when this is exhausted, the tap can be turned to the reserve position and the tank replenished at the next opportunity. Find out 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 close the reserve tap after filling up.

A reserve tap is not fitted to the Red Hunter models which, instead, have large bore taps.

*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.

*To lock tap open* give a quarter turn to plunger after pulling out.

*Adjustment of corks.* As the corks wear with use, adjustment can be effected as follows :—Undo the small 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 and re-tighten the locknut.

*To renew the corks.* Take out the small grub screw at the side of the tap and pull out the plunger complete. Fit new cork, replace plunger and adjust. Put back grub screw.

## Speedometer Fitting.

The speedometer is fitted in the panel and can easily be removed after taking off the panel. To detach the lower end of the driving cable from the gearbox take out the grub screw in the face of the box and pull out the cable. *Note* :—On 3-speed machines also pull out the speedometer driving spindle or the spiral gears may be damaged if the layshaft is rotated.

## 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. With a heavy hammer or mallet give the inner end of the footrest a smart blow to release the taper ; the direction of the blow must be such as to rotate the rest about the support. Strike the other rest in the same manner.

It is unnecessary to slacken the other nut 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.

Set the rests in the position required and securely tighten up the nut. Note that if foot change is fitted the right hand footrest is non-adjustable.

## Rim Sizes and Oversize Tyres.

The rims used for the 3.25″×19″ wired-on tyres are size WM2-19 (2½″×19″). Suitable oversize tyres for this size rim are 3.50″×19″ and 4.00″×19″, but this latter is better mounted on WM3-19 (3″×19″) rim. As regards clearance, there will be ample for the 3.50″×19″ cover, but the 4.00″×19″ cover will run rather close to the rear chainguards ; in general, this size cover can only be fitted if the mudguard is of the unvalanced type, the lower chain guard is removed, and the top guard cut away near the tyre.

## Tyre Pressures.

The recommended minimum inflation pressures for Dunlop Cord Tyres in lbs. per sq. in. are as follows :—

| | Front | Rear |
|---|---|---|
| Model LF.—solos, 3.00—20 ... ... | 22 | 27 |
| Models LH. NF. NH. VA. VF.—solos, 3.25—19 ... ... ... ... | 16 | 21 |
| Models VB. VG. VH.—solo, 3.25—19 ... ... ... ... | 17 | 22 |
| All models—sidecar, 3.25—19 ... ... | 19 | 28 and 16 sidecar. |

For 3.00—20 front tyres, increase the above front wheel pressures by 6lbs. per sq. in. Solo and Sidecar respectively.

## 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 (see rear chain adjustment). If this alignment cannot be obtained the frame or forks are probably twisted.

*Note.*—This method will only apply with tyres of the same width.

*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 ¼in. shorter than "A" with the machine stationary. This ensures that the wheels are in correct alignment.

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.

## Sidecar Connections.

The Ariel Sidecar Chassis is a special design of triangular construction with 3 point connection ; due to the 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 apparent freedom inside its housing. (Make quite certain that the locking ring is secure). This connection easily adjusts itself to slight movement and occasional graphite greasing will prevent any tendency to squeak.

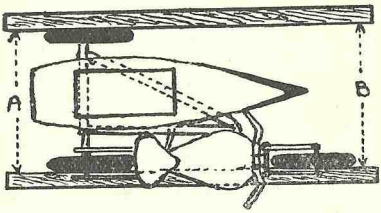


FIG. 9.

METHOD OF TESTING WHEEL ALIGNMENT.

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

Vertical alignment of the motor cycle is obtained by means of the screwed yoke end at the top of the seat pillar connection tube. Further adjustment is available by sliding the chassis clamp lug, to which the tube is attached, along the frame ; keep the ball headed pinch bolt at right angles to the connecting tube. Grease periodically the sliding joint at the bottom of this tube. The motor cycle should be perfectly upright or even leaning very slightly outwards ; on no account allow it to lean in towards the sidecar.

## Fault Finding Table—(see page 3).

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

## 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 | 85 | 90 |
| 4.8 | 620 | 930 | 1240 | 1550 | 1860 | 2170 | 2480 | 2785 | 3110 | 3415 | 3725 | 4035 | 4350 | 4660 | 4970 | 5265 | 5570 |
| 5.0 | 648 | 972 | 1295 | 1620 | 1943 | 2268 | 2590 | 2915 | 3240 | 3563 | 3885 | 4211 | 4536 | 4860 | 5180 | 5505 | 5829 |
| 5.2 | 672 | 1010 | 1345 | 1680 | 2015 | 2355 | 2680 | 3025 | 3365 | 3700 | 4035 | 4375 | 4710 | 5045 | 5380 | 5705 | 6050 |
| 5.5 | 714 | 1070 | 1426 | 1782 | 2140 | 2498 | 2850 | 3208 | 3568 | 3925 | 4280 | 4631 | 4988 | 5347 | 5700 | 6060 | |
| 5.8 | 750 | 1125 | 1500 | 1875 | 2250 | 2625 | 3005 | 3375 | 3755 | 4130 | 4510 | 4880 | 5255 | 5630 | 6010 | | |
| 6.0 | 778 | 1165 | 1555 | 1945 | 2330 | 2720 | 3110 | 3500 | 3885 | 4275 | 4660 | 5050 | 5440 | 5835 | 6220 | | |
| 7.5 | 973 | 1458 | 1945 | 2430 | 2915 | 3408 | 3890 | 4370 | 4860 | 5350 | 5830 | 6320 | | | | | |
| 8.2 | 1032 | 1595 | 2122 | 2655 | 3195 | 3715 | 4250 | 4780 | 5320 | 5850 | 6380 | | | | | | |
| 9 1 | 1176 | 1768 | 2355 | 2940 | 3540 | 4120 | 4720 | 5300 | 5890 | 6480 | | | | | | | |
| 9.4 | 1220 | 1825 | 2425 | 3030 | 3645 | 4250 | 4850 | 5470 | 6060 | | | | | | | | |
| 10.4 | 1350 | 2025 | 2700 | 3380 | 4050 | 4720 | 5400 | 6080 | | | | | | | | | |
| 11.3 | 1465 | 2190 | 2925 | 3660 | 4380 | 5120 | 5860 | 6580 | | | | | | | | | |
| 12.5 | 1620 | 2425 | 3240 | 4050 | 4855 | 5670 | 6480 | | | | | | | | | | |
| 13.8 | 1790 | 2670 | 3575 | 4480 | 5360 | 6260 | | | | | | | | | | | |
| 15.1 | 1960 | 2925 | 3910 | 4880 | 5860 | 6850 | | | | | | | | | | | |
| 16.8 | 2180 | 3270 | 4360 | 5440 | 6530 | | | | | | | | | | | | |