ARIEL

THE MODERN
MOTOR CYCLE

OWNER'S GUIDE
1951

(PROVISIONAL FOR 1952)

TWIN
CYLINDER MODELS

ARIEL MOTORS LIMITED
SELLY OAK - - BIRMINGHAM 29
Grams: ARIEL, SELLY OAK Phone: SELLY OAK 1381

Price One Shilling and Sixpence

1951 MID SEASON MODIFICATION TO THE REAR SPRING FRAME ATTACHMENT

The main slider tube BOLT marked "K" in the owner's guide is not drilled or fitted with a grease nipple, but full lubrication of the sliding mechanism is provided by way of the grease nipple fitted to the slider boss marked "B". Lubricate freely in order to ensure efficient operation of the attachment.

ARIEL MOTORS LTD.

The 1951 500cc **ARIEL** Models **'KG'** and **'KH'**

(TWIN CYLINDER)

INDEX

INTRODUCTION

The information given in this book has been collected and compiled for your guidance by members of our Technical Staff who are practical motor cyclists of many years' standing and careful study of its contents will enable the owner to keep his machine in first-class running order by carrying out adjustments and repairs when necessary in a correct manner. Should any difficulty arise, however, our Technicians are always pleased to advise on any matter.

The following interesting literature is also supplied with every new "Ariel" Motor Cycle:

"Lucas Lighting and Ignition".
"Chains and the Motor-cyclist".
"Tyres by Dunlop".
"Amal Hints and Tips".

When sending an enquiry, always state the Engine and Frame Numbers so that we can identify the exact specification of the machine. The Engine Number and Letter is stamped on the drive side crankcase immediately below the cylinder flange, and the Frame Number is stamped on the right hand side of the saddle lug. We advise owners to make themselves conversant with all aspects of their machine by reading carefully the literature supplied.

Running in

Careful running in of a new machine is of the utmost importance, because it allows the pistons and cylinders to become seasoned by frequent heating and cooling and all bearings to acquire first-class surfaces, resulting in a prolonged life and high efficiency. Misuse during the first few hundred miles will lead to unnecessary trouble and dissatisfaction to the owner.

Running-in road speeds cannot be given exactly, as so much depends upon road conditions, but providing the engine is running freely on small throttle openings speeds in top gear up to 35 m.p.h. will be safe for the first 500 miles, increasing to 40 m.p.h. for the next 250 miles. Do not open out to full power under 1,000 miles, and then for short distances only until approximately 1,500 miles have been covered.

Check all bolts, nuts and screws for tightness during the running-in period in case any have slackened off. A number

of proprietary brands of running-in compound containing colloidal graphite are on sale and can be used generally according to the maker's instructions.

Fuel, Oil and Grease

Good quality oil and grease should always be used, especially during the running-in period. The various brands of lubricants shown on page 69 are the ones used exclusively in our works for all engine bench and road testing, and we strongly recommend the use of one or the other of them according to individual preference. Castor oil is not recommended for these machines.

Oil consumption depends to some extent on driving speed, but should average 2,000 m.p.g. over a long period. The only fuel available in this country at present is about 72 octane, but if 80 octane becomes available (or our overseas customers can obtain it) it can be used without alteration to the carburetter setting and will give improved all-round performance.

Fuel consumption under normal touring conditions should average solo 75/80 m.p.g., sidecar 60/65 m.p.g. These figures do not apply to new machines whilst "running in".

Instructions for Starting

Easy starting is usually an indication that the engine is in good condition; if, therefore, difficulty is experienced something is out of adjustment and the trouble should be remedied without delay. For starting when the engine is cold the carburetter should be flooded slightly, the twist grip throttle set just off the shut position, and the kickstarter used in the ordinary way. When the engine has started, allow the kickstarter to return to its normal position immediately; also see that the oil gauge is indicating the correct pressure (see notes on page 13). Ignition timing is automatically set in the retarded position for starting. In very cold weather the air control should be closed by depressing the knob on the control slide and giving it a part turn to lock it in the closed position. Release as soon as the engine starts. The carburetter throttle stop is set at the factory to give a steady tick-over of the engine when warmed up with the twist grip in the shut position. To stop the engine, press the button switch on the magneto contact breaker cover.

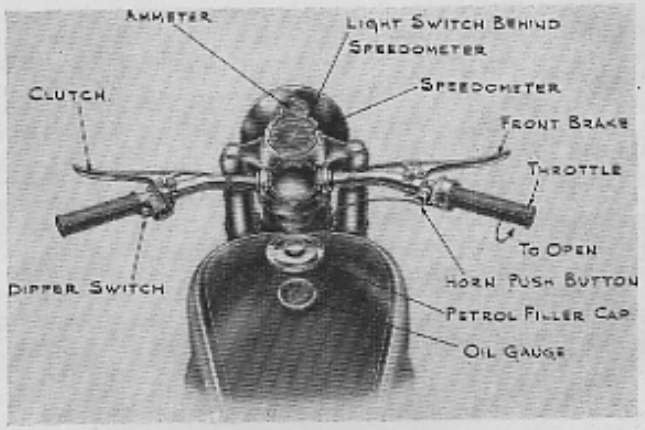


Fig. 1 Showing Controls and Equipment

Tracing Minor Troubles

If the engine does not start easily, check as follows:

1. Make sure fuel is getting to the carburetter. If the level in the fuel tank is low PULL on the reserve taps.

2. See that the carburetter fixing nuts are tight and that there is no air leak at the joint between carburetter and cylinder head.

3. Make sure the throttle valve moves in response to the twist grip movement—the wire may be faulty. See that the slow running adjustment is correctly set.

4. See that there is no fault with the H.T. leads from the magneto to sparking plugs and that the leads have not been changed round to the wrong sparking plug. Damp, soiled or perished rubber leads will cause difficult starting as well as moist sparking plug insulation.

5. Test the spark by disconnecting the H.T. lead from one of the sparking plugs, i.e., hold it about $\frac{1}{8}$ in. away from the plug electrode and turn the engine with the kickstarter. If a good spark occurs the ignition system is in order.

6. If a good spark does not occur as above, examine the magneto contact breaker points, which should always be clean and open and close as the engine is rotated. (See Lucas booklet or B.T.H. notes).

7. Examine the sparking plugs, clean the insulation thoroughly, and set the points to .020 in.

8. If a choked main jet is suspected, this can be readily inspected by unscrewing the nut at the bottom of the carburetter body. (See Amal leaflet).

9. Test the compression by depressing the kickstarter pedal. The valve rocker adjustment may be set too close, preventing the valves from seating properly.

Erratic Running

If the engine starts but runs erratically, check the following after the engine has warmed up:

1. Judge by the exhaust note which cylinder is giving trouble.

2. Check over all points mentioned under heading "Tracing Minor Troubles", especially No. 7.

3. Check valve rocker clearance and adjust to instructions on page 21. See that all valves are opening and closing properly when the engine is rotated.

4. Make sure the magneto cut-out switch has not been deranged to cause a short circuit.

5. A shortage of fuel in the carburetter can be traced by operating the tickler. See that the vent hole in the fuel tank filler cap is not stopped up.

6. See that the air control slide is in the open position.

Driving Hints

1. It is usual to start away by engaging the lowest gear, changing to the higher gears as the engine gathers speed. The gear change pedal movement is down for the next higher gear and up for a lower gear. Neutral can be found by changing through the gears to the lowest, then moving the pedal half

a stroke downwards. A dragging clutch due to incorrect adjustment makes neutral finding difficult. The pointer on the gearbox indicates neutral. (See "Gearbox" Notes).

2. To engage low gear without noise after the machine has been standing some time, it is advisable to free the clutch-plates, before the engine is started, by depressing the kick-starter once or twice, while the clutch is held out of engagement by the handlebar lever.

3. A silent gear change can be made if, when changing from a lower to a higher gear, the throttle is eased off and a slight pause is made in neutral position, half-way between the gears. The length of pause will depend on the engine revs., but a little experience will soon indicate the length of pause required.

4. When changing from a higher to a lower gear, leave the throttle partly open, so that the engine speeds up as soon as the clutch is released, then move the gear quickly, allowing the clutch to slip during the change.

5. Do not let the engine labour in a high gear, especially when a sidecar is fitted, but change down and get improved engine flexibility. The engine is designed to give its best all-round performance at fairly high revs. (see road speeds, page 71). If you are used to a single cylinder engine, do not mis-judge engine revs. of the twin by the exhaust note, which, of course, has twice the frequency of a single cylinder unit.

6. Do not open throttle suddenly at any time and do not "blip" the throttle when waiting in the traffic or starting away. The engine will continue to tick over if the throttle stop is set correctly. (See Amal leaflet).

7. Do not remain "in gear" long with the machine stationary and the clutch withdrawn, but change into neutral and release clutch.

8. Study the "Highway Code".

Description of Engine

(See Centre Page Illustration)

The four-stroke engine has two vertical cylinders in a monobloc iron casting 63 mm. bore, 80 mm. stroke, giving a total cubic capacity of 498 c.c. (2.48 in. bore, 3.15 in. stroke, 30.4 cubic inches).

Both pistons rise and fall together, giving one power stroke for each crankshaft revolution and even spacing of the induction and exhaust strokes. The remarkable absence of engine vibration is obtained by balancing the pistons and connecting rods by counterweight integral with the forged two-throw crankshafts and similar weights cast integral with

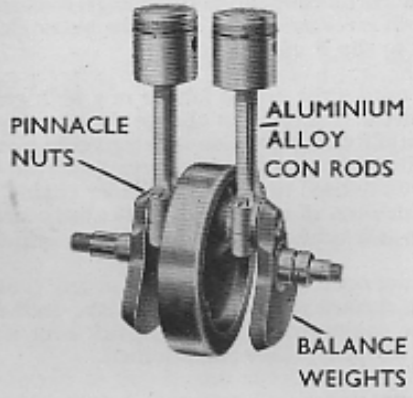


Fig. 2

the permanently mounted central flywheel. (See Fig. 2). The crankshaft is carried on a large roller bearing on the drive side and a white metal lined journal bearing on the timing chain side, which is also provided with large thrust faces for locating the crankshaft endways. Adjustment for wear can be made by removing one of the shims situated behind the thrust washer which is secured by the timing sprocket nut.

Forged aluminium alloy pistons are carried on forged light alloy connecting rods by full-floating gudgeon pins, the small ends of the rods are bushed and the large ends split and fitted with replaceable white metal half bushes or liners. (See Fig. 2). The connecting rod cap is secured to the rod by two bolts and nuts—the nuts tighten against the rod and are accessible from above after the cylinder block has been removed, so that, if ever necessary, a connecting rod bearing can be renewed without further dismantling of the engine.

Twin camshafts within the crankcase are driven from the crankshaft by duplex roller chain and wear is automatically adjusted by means of a spring-loaded blade which bears against the underside of the chain. An adjustable stop piece makes contact with the movable end of the blade to prevent reverse movement. The stop piece can be moved into contact when chain wear makes this necessary. Allow .010 in. clearance between the stop piece and blade end on a cold engine and readjust when the clearance due to chain wear exceeds $\frac{1}{32}$ in.

The 6-volt dynamo is driven from the front camshaft by gearing at one and a quarter times engine speed. The impregnated fabric driving gear is mounted on and driven by the camshaft sprocket through a slip clutch which relieves the gearing of shock when the engine is rapidly accelerated. The clutch requires no attention and is non-adjustable.

The flange-mounted magneto, with its automatic ignition timing control, is gear driven from the rear camshaft through an impregnated fabric gear, which in this case is riveted to the camshaft sprocket. The twin cylinder magneto, either B.T.H. or Lucas, runs at half engine speed. The gear, complete with ignition control unit, can be withdrawn from the magneto spindle by unscrewing the central hexagon sleeve nut extractor. (See Fig. 3).

A double-gear-type oil pump, situated at the base of the crankcase, is driven from the rear camshaft by spiral gears and a long vertical shaft terminating in a tongue coupling to the pump. Thrust of the pump shaft spiral gear is taken by a spring-loaded ball fitted into a plug at the top of the crankcase in which is also incorporated a crankcase pressure release system.

Twin camshafts, hardened and ground throughout, are carried on phosphor bronze bushes, those of the sprocket end having larger thrust faces for positioning the shaft endways. Adjustment for wear can be made by fitting a thinner shim behind the sprocket.

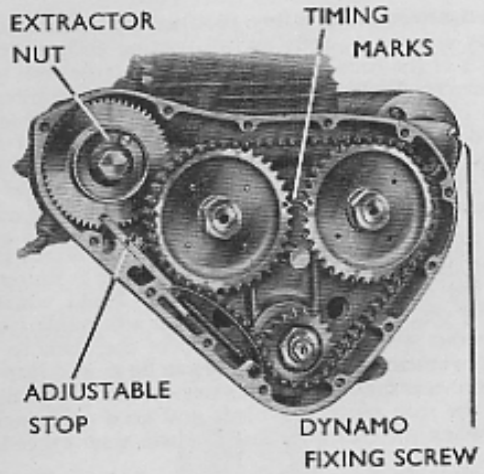


Fig. 3 (See page 18)

The spherical combustion chambers of the cast iron cylinder heads have inlet and exhaust valves at 80° to each other, operated by spring-loaded overhead rockers, each mounted on a hollow spindle supported by extensions of the head casting and supplied with oil under pressure from the main system. (See Fig. 4). The rockers are operated from the twin camshafts by ball-ended push rods and flat-based tappets having hollow stems containing small compression springs which prevent noise occuring at the contacting points of the valve operating gear.

The cast iron cylinder block is secured to the crankcase by a flange and eight accessible studs and nuts. A joint washer is used between the cylinder block and crankcase face. The flat-base tappets are supported by cast iron guides, a press fit in the block and retained by a spring steel circlip. A copper and asbestos washer is fitted between the cylinder block and cylinder heads, eight studs and nuts ensure a pressure-tight joint. (See Figs. 5 and 6).

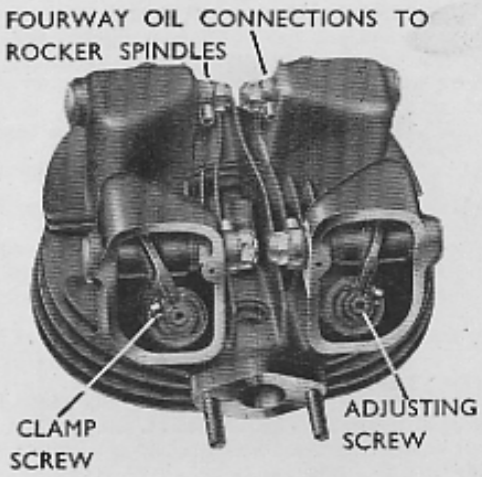


Fig. 4

Engine Lubrication Explained

The double oil pump consists of two independent pumps—for supply and return—built into a common body and surrounded by an efficient gauze filter which can be dismantled for periodical cleaning by unscrewing four nuts and removing the cover plate and retaining spring at the bottom —rear—of the crankcase.

Oil is drawn from the bottom of the oil tank by the supply pump and forced under pressure to the crankshaft bearing and thence through the hollow crankshaft to each connecting rod bearing; a secondary supply is taken to the overhead rockers with a further extension to the pressure gauge in the fuel tank panel. Constant pressure is maintained throughout the system by a release valve in the end of the crankshaft. Lubrication of all other internal parts of the engine is by splash, with suitable channels and holes for directing it to each particular bearing. After passing through the bearings, the oil drains into the sump and is pumped back into a second oil filter inside the oil tank. This filter can be detached for cleaning after removing the filler cap.

JOINT FACE AND STUD HOLES

TAPPETS AND GUIDES

Fig. 5

Oil tank and filters. The oil tank holds three-quarters of a gallon and should be kept full. Do not allow the level to fall below the "minimum level mark" on the tank, or there will not be sufficient oil for complete circulation. The oil tank and engine sump should be drained after the first 500 miles and the tank and filters thoroughly cleaned in petrol. The operation should be repeated every 2,000/3,000 miles. Our overseas customers riding in dusty or sandy conditions should clean out the tank and sump more frequently. Always remember to refill the oil tank.

How to Trace Lubrication Faults

The normal oil pressure (gauge reading) is 25 lbs. per square inch. The pressure may rise above this figure when the engine is started from cold, but will fall to normal as the engine warms up. The pressure is controlled by a non-adjustable relief valve situated in the end of the crankshaft, and the gauge pressure may be slightly above or below the normal without causing alarm, providing it is constant, because the capacity of the oil pump is such that it can supply more than four times the amount which the bearings can take, irrespective of the pressure, so that a large quantity of oil is always being by-passed into the sump and back to the oil tank. The important point is that the pressure gauge gives a

clear indication that oil is being fed into the engine and by unscrewing the oil tank filler cap the complete circulation can be observed as oil returns to the tank. On no account ride the machine unless the oil is circulating properly. By process of elimination, lubrication faults can be quickly discovered as follows:

If the gauge does not record a pressure—

1. Examine oil level in tank. It may be below normal.

2. Examine oil pipe connections from tank to engine at four points for leakage. On the supply side (the pipe nearest the centre of the machine) it may be sucking in air.

3. Examine oil pipe connections to pressure gauge and rocker spindles at eight points for oil leakage.

4. Loosen the nut at the side of the crankcase, near oil pump, half a turn. If oil exudes freely from this connection when the engine is running there is some fault in the passage-way to the gauge or in the gauge itself. It may be that the gauge hand has stuck and a slight tap will release it.

5. If the oil pipe to the pressure gauge is blocked it can be cleared by passing a wire through it or with air pressure.

6. If there is no fault with the pressure gauge or connections but still records little or no pressure and oil returns to the tank in the usual quantity when the engine is running, it is probable that although oil is circulating freely, a pressure cannot be built up to operate the gauge because of a leakage in the system, most likely at the relief valve.

Undo the screws and remove the timing cover. Unscrew the hexagon-headed valve in the end of the crankshaft and examine. (See sketch, centre pages).

If dirty, wash in petrol and also clean out any foreign matter which may have collected in the crankshaft hole before replacing the valve.

7. A fault in the oil pump is most unlikely, but it can be checked if the fault persists. Remove the sump cover, spring and gauze by unscrewing four securing bolts. Next undo four screws securing the oil pump to the crankcase, when the pump complete can be pulled away. Examine the pump but do not dismantle unless necessary. When replacing the pump make sure that the joint washer is correctly positioned, and take care to engage the slot on the driving shaft with the tongue on the oil pump spindle.

How and When to Decarbonise

The mileage at which an engine will run efficiently without being decarbonised depends to a large extent on how carefully it has been driven and maintained.

A new engine, carefully run in, should be decarbonised for the first time at approximately 2,000 miles, as more excess oil and carbon is deposited in the combustion chambers during the above period than will be the case when pistons and rings have taken on good bearing surfaces.

Broadly speaking, the harder the machine is driven, the more frequently should it be decarbonised, which of course includes grinding in valves.

Indications that this work should be undertaken are:

1. Engine "pinking" at, say, half throttle.
2. Lowering of general performance.
3. Poor compression, indicating bad valve seats.

Under average conditions the engine should be decarbonised every 8,000/10,000 miles, but if the general road performance has not deteriorated appreciably, the period can be extended.

To remove the cylinder head, follow these instructions carefully:

1. Raise the petrol tank, remove exhaust pipes, carburetter, petrol pipes, rocker box covers, sparking plugs and oil pipes from crankcase to central joint near rocker spindles and oil gauge pipe, but not the four-way connection to the rocker spindles. (See sketch, centre pages).

2. Unscrew the eight cylinder head securing nuts, situated between the second and third fins of the cylinder block, about $\frac{1}{2}$ in. or four complete turns. The cylinder head can then be raised off the cylinder block enough to pass two thin spanners or other packing between the two. (One piece on each side of the cylinder.) Do not force the packing in or the joint washer will be damaged. (See Fig. 6).

Next unscrew all the nuts from the studs and lift off the head complete, leaving the eight nuts resting on the cylinder fins, which can be removed later. As the head is lifted the four push rods must be lifted also and held up until quite clear of the cylinder; then the head can be drawn away to one side. Mark the push rods so that they are replaced in their original position. It is not necessary to remove the cylinder block

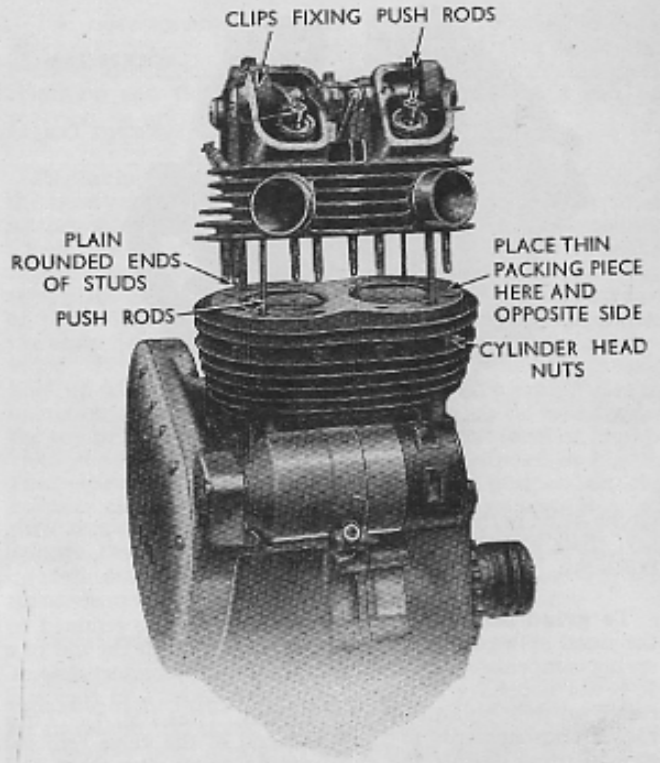


Fig. 6

unless some fault with the piston or rings is suspected. The piston tops can be scraped clean "in position" if the engine is turned to bring them to the top of the stroke.

If it is necessary to remove the cylinder block, first turn the engine until the pistons are at the bottom of the stroke, then unscrew the eight fixing nuts at the base and lift the block carefully so that the pistons slide out of the cylinder freely, taking care that the four tappets do not catch in the holes in the crankcase in which they operate. It is wise to leave the tappets in position, but they can be removed by giving each a pull to overcome the resistance of a small steel

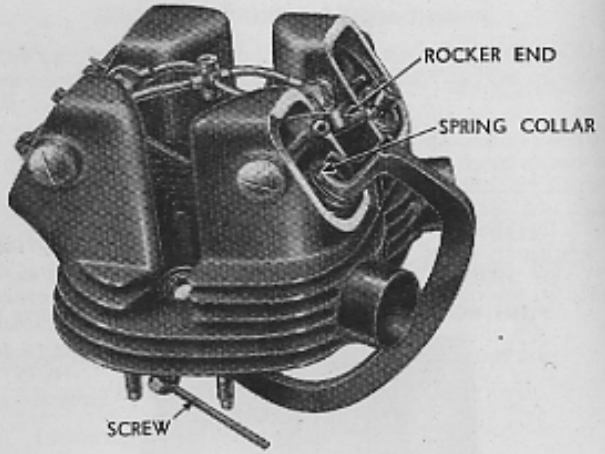


Fig. 7

circlip fitted in the tappet stem recess. Mark each tappet with, say, chalk and be sure to reassemble them in their original positions.

To grind the valves. The valve springs are retained by the usual split cotters and can be removed with the aid of a spring compressor tool obtainable from most accessory dealers. It is not necessary to disturb the valve rockers, as they will rotate on their spindles out of the way. (See Fig. 7). Turn rocker ends upwards to allow one end of the valve removal tool to press against the valve spring collar, the other end (with screw thread) to engage the centre of the head of the valve. Turn the compressor screw until the valve spring is compressed enough to release the split cotters fitted round the valve stem.

Keep the valves, springs and cotters to their respective ports. Scrape all carbon from the cylinder head, ports, valve heads, and grind the valves in the usual manner with fine grinding paste.

Wash all parts thoroughly in paraffin and assemble in the reverse manner to dismantling, but note the following:

If the cylinder has been removed take care not to damage the pistons or rings when assembling them in the bores.

The easiest method is to use ring clips (obtainable from accessory dealers) to hold the rings compressed while the cylinder is being replaced. See that the base washer is in good condition and that the cylinder is reassembled (it can be reversed) as originally fitted.

Replacing the cylinder head. See that the joint faces of the head and cylinder block are perfectly clean and the joint washer in good condition. Do not use jointing compound. Check the eight cylinder head nuts on the studs to make sure the threads have not been damaged during handling, then place each of the nuts between the second and third fins of the cylinder block and accurately locate them opposite the eight holes in the block by means of the tommy bar provided. Replace the push rods into the cylinder head and hold up while the head is being replaced. To enable ease of operation, the push rods and rocker levers can be held against the top of the rocker housing by using some form of improvised clip, and such an arrangement is illustrated in Fig. 6. Place the spanners or packing pieces in position on the cylinder block to support the head while the nuts are engaged with the threads on the studs. Note that the studs have spherical ends to "pick up" the nuts as the head is lowered on to the cylinder block. Screw the nuts three or four complete turns, remove the packing and finally tighten all nuts.

Adjust valve clearances as described on page 21.

When replacing the carburetter see that the joint washers each side of the insulating block are in good condition, because an air leak at this point will cause erratic running. Retighten the cylinder head nuts after the first 50 miles or so, because the head washer settles a little with the heat. This is particularly important if a new head washer has been fitted or on a new machine and should be repeated several times during the first 1,000 miles. Do not forget to check the valve clearances because it will be reduced as a result of any settling down of the head washer.

Piston and cylinder wear. The pistons are in forged wear-resisting aluminium alloy and under normal conditions should have a life of at least 20,000 miles.

The cylinder block is made of close-grained cast iron, also very wear-resisting. When ultimately wear has taken place to cause piston rattle and excessive oil consumption, the cylinder block can be rebored .020 and .040 in. over-size

(in two stages) and over-size pistons and rings fitted. The two compression rings have a side clearance of .002 in. in the piston grooves when new, and a gap between the ends of the rings when measured in the cylinder bore of .008/.012 in.

Rings should be replaced when, due to wear, the gap exceeds .040 in., but if the cylinder bore has worn excessively a rebore is advised. The scraper ring has similar clearances when new and should be replaced when, due to wear, the gap exceeds .070 in. Gudgeon pins are retained in the pistons by spring rings which should be removed carefully with a sharp pointed tool. They must snap tightly into the groove in the piston when refitted.

Dismantling the whole engine. Owners are not advised to undertake this work unless they have considerable mechanical ability. Removing the cylinder block and head has already been described.

Camshaft driving chain. Before removing the camshaft chain and sprockets, note the punch marking on the sprockets as this will be of assistance when reassembling and setting the valve timing.. Rotate the crankshaft until the dot on the crankshaft sprocket is on top and a dot on one camshaft sprocket is *almost* opposite a dot on the other. Note then the position of the second dot on each camshaft sprocket which should be at the lowest bottom position and *almost* directly under each camshaft centre.

Do not regard the dots as **exact** timing markings as these merely indicate and assist the operator to set the sprockets roughly before finally fixing them in exact position after checking and setting the valve timing to the chart on page 22.

First remove the tensioner blade and spring and the three nuts securing the sprockets to their respective shafts.

Three special extractors are desirable (it can be done with one) to withdraw the sprockets with chain in position from their shafts. Screw the extractors home and rotate each central screw of the extractor equally and in turn so that all three sprockets are drawn off together. (See Fig. 3).

To remove the magneto. Unscrew the central fixing nut, which also acts as an extractor, and the gear, complete with control unit, will come away. The control unit should not be dismantled but replaced as a whole if faulty. The magneto body is secured by a flange and three nuts to the back face of the timing gear chest.

To remove the dynamo. This can be done if necessary without dismantling any other part of the engine. Loosen the fixing strap, undo the securing nut near the timing cover and slide the dynamo out, complete with gear wheel. On the earlier models three screws secured the dynamo, two of them passing through the timing cover.

To remove the crankcase from the frame it is necessary to take off the outer primary chain case, primary chain, and dismantle the clutch and engine shock absorber. (See notes "Clutch and Gearbox").

Next the inner chain case, engine plate bolts, then the whole crankcase can be lifted out of the frame.

By separating the two halves of the crankcase the crankshaft and two camshafts can be withdrawn.

Do not overlook the two pinch bolts below the top face (cylinder face) of the crankcase.

Replacing crankshaft bearings. If it is necessary to replace the crankshaft roller bearing, the outer ring can be removed by heating the half crankcase in boiling water and knocking the joint face on a wooden bench or similar, when the ring will drop out under the shock. The inner race must be driven off the shaft with a punch. Note when fitting a new race that the inner member must be a tight fit on the shaft and the outer ring pressed into the housing with the lip side in first. The timing side bush should be removed if renewal is necessary by means of a mandrel press.

Replacement timing side bearings can be supplied either prefinished to size or .010 in. small for boring out to suit the shaft diameter. The diametral clearance when new, between crankshaft and bush, is .001 in., and the bush should be renewed when the clearance has increased to .003 in.

Crankshaft location. The crankshaft is located from the timing side bush faces only, there being a clearance of $\frac{1}{32}$ in. between the rollers and lip of the driving side bearing. The end clearance of .002/.004 in. between the crankshaft face, thrust washer and bush faces can be restored by means of shims of varying thicknesses. To check the end clearance, insert the crankshaft into the timing side bush only, tighten the thrust washer and shims against the shoulder on the shaft by means of a temporary sleeve and nut, and test with thickness gauges.

Camshaft location. The camshafts are both located in a similar manner to the crankshaft, by the thrust faces on the timing side bush. Adjustment for end clearance can be made with varying thicknesses of shims and the allowable end clearance is .001/.002 in.

Renewing connecting rod bearings. As previously mentioned, the connecting rods can be removed from above after taking off the cylinder block. Unscrew the pinnacle nuts securing the cap and gently pull the top part of the rod away, at the same time placing a piece of bent strip material underneath the cap to prevent it falling into the crankcase. When the rod is away the cap can be revolved round the journal and lifted off, together with the half bearing. If new half bearings are to be fitted, make sure that the crankshaft journal has not been scored or discoloured from heat. On no account file the face of the connecting rod or cap to take up bearing clearance, but fit new half bearings, which are supplied finished to size. Note when assembling that the key on each half bearing engages with the slot in the rod and cap and that the cap is fitted the right way round (see marking). The pinnacle nuts are self-locking.

In the case of a complete overhaul, before fitting new bearings, it is advisable to clean out the oilways in the crankshaft by unscrewing two large plugs and the relief valve and thoroughly washing in paraffin.

The maximum safe diametral clearance due to wear in the connecting rod bearings is .003 in., after which new bearings should be fitted, but if the crankshaft has worn oval it can be re-ground .010 in. smaller and under-size bushes fitted.

The diametral clearance when new is .0005/.001 in., and the end clearance about $\frac{1}{32}$ in.

Assembling the engine. Assembling the crankshaft and two camshafts into the crankcase calls for no special comment. When assembling the camshaft driving chain care must be taken to obtain the correct valve timing. Set the crankshaft so that the pistons are at the top of the stroke and the crankshaft key on top. Then roughly set the two camshafts so that their keys are approximately 45° outwards from the top vertical. Remember that the sprocket with the large gear attached fits on the rear or inlet camshaft. Place the thrust washer and shims on the crankshaft, fit the chain over the three sprockets with the marking as previously noted, and slide the sprockets on to the shafts, engaging the keys in the operation.

Gently knock the sprockets in turn on to the shafts until the nuts can be started on the threads, then force the sprockets home. Fit the chain tensioner and adjust the sliding block to within .010 in. of the tensioner blade and tighten nut and lock.

Magneto timing. This can be done more easily on the complete engine, so that the position of the valve openings can be noted. If the timing is right for one cylinder, the other will be correct.

Rotate the engine until both valves of one cylinder are closed and the piston is at the top of the stroke—T.D.C. Then further rotate the engine very gently until the piston is set at four to eight degrees (equivalent to $\frac{1}{32}$ in.) **after Top Dead Centre.** Next turn the magneto armature until the segment is opposite the H.T. pick-up for the cylinder being timed and the contact breaker points are just on the point of opening. Tighten the spindle nut in this position taking care not to alter the setting whilst doing so. This gives the **fully retarded** ignition point. Next check the **fully advanced** ignition point by turning the armature with the fingers by means of the automatic control mechanism. With the control thus held in the fully advanced position the piston should be thirty degrees (equivalent to $\frac{1}{4}$ in.) **before Top Dead Centre** with contact breaker points just breaking.

If there should be any variation in the range of advance and retard always adhere to the $\frac{1}{4}$ in. advanced position when setting the timimg.

Valve tappet clearance. The engine should be cold and all cylinder and cylinder head nuts finally tightened before the tappets or rocker adjusters are finally set.

Two types of rocker adjusting screws have been fitted to different series of engines, the early season pattern being adjustable by using the special socket key from the tool kit after loosening the clamp screw in the split end of the rocker. The later type adjusting screw incorporates a square end for adjustment purposes and a small flat spanner is supplied. The screw is secured with a locknut. Always ensure that either the clamp screw or locknut is finally tightened. Valve end caps are not fitted.

Valve Timing. The most suitable valve timing for this engine has been determined experimentally at the factory, and no improvement in performance can be obtained by altering the setting.

With .002 in. clearance:

The inlet valves open 15° or $\frac{1}{16}$ in. before T.D.C.
The inlet valves close 55° or $\frac{5}{16}$ in. after B.D.C.
The exhaust valves open 46° or $\frac{13}{32}$ in. before B.D.C.
The exhaust valves close 20° or $\frac{1}{8}$ in. after T.D.C.

Sparking plugs. The sparking plug can influence the performance of the engine very considerably, and the type fitted to the unit at the time of manufacture will have been one that was found most satisfactory for general use after very extensive tests. Plug manufacturers introduce at times what are known as "alternatives" and it is therefore difficult to lay down hard and fast rules regarding the different types. At present the Lodge "CN" is recommended for general use with good alternatives in the Lodge "C14" or "HN". The plug insulation and points should be kept clean and free from carbon and the gaps adjusted to .018/.020 in. Clean and check every 2,000/3,000 miles.

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, and petrol consumption will increase. This can be compensated for by lowering the needle (i.e., securing in a higher notch); make the adjustment one notch at a time until all adjustment has been taken up, after which both parts must be replaced.

Pilot air screw. This screw regulates the strength of the mixture for "slow running" and for the initial opening of the throttle. The screw controls the suction on the pilot fuel jet by metering the amount of air that mixes for the fuel. With the engine warm and the twist grip turned to the shut position adjust the throttle stop screw in conjunction with the pilot air screw to get good slow running.

The following are standard carburetter settings:

Model	Jet size	Throttle size	Needle position, notches from top
K.G. ...	140	... 6/3	... 3rd
K.H. ...	150	... 6/3	... 3rd

For altitudes above 5,000 feet or for use with alcohol or similar fuels special jet sizes should be ordered.

Air filter. Air filters can be supplied to order, and we strongly advise their use in countries where dusty conditions are prevalent. The filter can be readily dismantled for cleaning, which should be done frequently to avoid clogging. If kept clean no alteration is necessary to the standard carburetter setting when an air filter is fitted, but if it is allowed to become partly clogged the fuel consumption will increase and engine performance will deteriorate.

For further details of carburetter tuning see the "Amal" hints and tips leaflet.

Engine Shaft Shock Absorber

(See Centre Page Sketch)

The shock absorber assembly is not adjustable, and providing the outer locking sleeve is securely tightened no trouble will be experienced except perhaps after lengthy service the spring may weaken or fracture.

The correct order of assembly for the shock absorber is as follows:

(*a*) Splined Driving Sleeve with Oil Seal next Bearing.
(*b*) Engine Sprocket.
(*c*) Sliding Member.
(*d*) Spring.
(*e*) Spring Retaining Plate.
(*f*) Sleeve Locking Nut.

The Magneto (B.T.H.)

The following information has been extracted from the B.T.H. comprehensive Instruction Book, and is relative to the TWIN CYLINDER Magneto, Type K.C.2, Form W4, L.H.

The magneto is fitted with special cobalt steel magnets and to prevent damage to the armature in the event of the external high tension circuit being interrupted, the unit is provided with safety spark gaps, the earth electrodes of which are two screws, one on the top and one on the underside of the main housing.

These two screws must never be removed except when dismantling, and then it will be necessary in order to withdraw the armature from the housing.

Automatic Timing Device

This device is incorporated with the magneto driving gear and does not require any attention or adjustment.

It automatically provides the required magneto timing, in relation to the engine, for all conditions of running, and so considerably improves the performance of the motor-cycle.

When stationary, and at idling speeds, the device automatically returns to the retarded position, advancing as the speed of the engine increases.

Should, it be necessary for any reason to remove the magneto, the magneto gear and timing device can be removed by undoing the self-extracting nut on the end of the magneto armature spindle. After the nut loosens, it will almost immediately tighten again, and it is then that it commences to withdraw the gear and timing device from the tapered magneto spindle.

DO NOT, IN ANY CIRCUMSTANCES, TAKE THE AUTOMATIC TIMING DEVICE TO PIECES OR ATTEMPT TO REMOVE IT FROM THE GEAR WHEEL.

For details of magneto timing refer to page 21.

Attention in Service

Lubrication

The magneto armature runs on ball bearings, which are packed with grease before the magneto leaves the Works. This lubricant should not require renewal for a considerable period.

Contact Breaker

It is of the utmost importance that the points on the contact breaker should be kept absolutely free from oil, because any oil on the contacts will become oxydised and prevent good electrical contact between the points when closed. Failure to observe this may result in a considerable reduction in the current from the magneto.

The magneto is intended to operate with a gap of approximately .012 in. between the contact points. This gap should be checked occasionally by means of the feeler gauge attached to the small spanner provided with each machine. Do not unnecessarily readjust the contact gap. Great care should be taken to keep the contacts absolutely clean. The points are made slightly convex, and when necessary may be cleaned with a very fine emery cloth, but under no circumstances should they be filed.

The contact breaker may be removed for cleaning by unscrewing the central hexagon-headed screw and withdrawing the breaker. The contact lever may then be lifted

from its bearing bush by first raising and then moving to one side the check spring which is located in the end of the bearing bush. Care should be taken not to distort the contact lever control spring in any way. When replacing the contact lever it is advisable to smear the bearing bush lightly with thin lubricating oil, taking the utmost care to wipe off any surplus oil for the reasons already stated.

Collector Brush

The collector brush moulding should be periodically removed and the surface wiped clean with a cloth moistened with petrol. Before replacing this moulding, insert a corner of a clean cloth in the aperture in the housing so that it bears against the slip-ring track and the flanges, and at the same time turn the engine slowly. This will remove any oil or carbon deposit likely to cause leakage over the slip-ring flanges. On no account must any implement be used to exert undue pressure with the cloth on the slip-ring flanges, as this may cause them to be broken.

See that the cleaned parts are dry and that the petrol vapour is expelled before restoring the magneto to service.

Dismantling the Magneto

Total dismantling of the magneto should be rarely necessary, but in case this should be required instructions are given below, and the following procedure should be closely followed:

1. The contact breaker cover should be removed after rotating the securing spring on its pillar.
2. The hexagon-headed screw in the centre of the contact breaker should then be unscrewed, allowing the contact breaker to be withdrawn bodily.
3. The collector moulding should next be removed, and also the two safety spark gap screws.

It is important to note that the collector moulding and also the safety spark gap screws must be removed before any attempt is made to withdraw the armature from the housing. Failure to observe this will result in damage to the collector moulding and slip-ring.

4. The contact end plate may now be removed by unscrewing the fixing screws and the contact breaker cover spring pillar.
5. The armature may then be withdrawn from the housing.

Note. If the armature is actually withdrawn from the housing it will be necessary to re-magnetize the magnet after replacing the armature.

When reassembling the magneto, great care should be taken to ensure that the key on the contact breaker base engages with the slot in the armature end plate.

Location of Faults

If the engine is firing irregularly, due to faulty ignition, the investigator should first of all satisfy himself that the fault does not lie in the plug, the sparking gap of which should be set at .018 in.

Faulty ignition may result if the high tension cable becomes detached, loose, broken, or earthed, so that a careful examination of the connections and cable should be made. If sparking persistently occurs at the safety gap, it is an indication that there is a break in the external high tension circuit.

Irregular firing may result from defective operation of the contact breaker. To determine whether this is the case, remove the contact breaker cover and make sure that the contact breaker fixing screw is securely tightened. Attention should also be given to the contacts; the adjustable one should be securely locked in position. The gap should be checked and, if necessary, adjusted to the thickness of the feeler gauge attached to the spanner supplied with the machine.

If at any time trouble occurs which users are unable to overcome, they are urged to communicate with The British Thomson-Houston Company Ltd., Coventry, or with any B.T.H. Magneto Service Station, when advice and the necessary information to overcome the trouble will be gladly given. When returning a magneto for overhaul, care should be taken to detach and retain any sprockets or couplings.

The Magneto—Lucas

Certain series of engines are fitted with a LUCAS MAGNETO, TYPE A.C.53, MODEL K.2F, TWIN ANTI-CLOCKWISE ROTATION—and general instructions relative to this unit will be found in the LUCAS handbook issued with each motor-cycle.

The MAGNETO is fitted with the LUCAS own AUTOMATIC CONTROL.

The Dynamo—Lucas

The dynamo is a LUCAS TYPE E.3H, 6 volt separate unit, and a short maintenance treatise will also be found in the maker's handbook.

THE CLUTCH ASSEMBLY

1. Clutch Adjustment (Fig. C/A/1)

Adjustment to the clutch plates and springs is rarely necessary, and the spring plate tension is correct when the ends of the springs are just visible when looking across the face of the spring plate. This gives ample pressure to ensure efficient clutch grip. If the screws are tightened more it makes clutch withdrawal unnecessarily heavy. After adjusting the clutch, see that the spring plate lifts equally; if not, the nuts should be eased off on the low side or tightened on the high side until it does.

The cable adjuster on the gearbox should be set to keep the operating lever in such a position that the control cable is subjected to the minimum of bending; then adjust the plunger screw through the operating lever to give 1/64 in. clearance between the two thrust points on the lever and the face of the plunger which slides through the gearbox cover. To vary the clearance, push in the top end of the operating lever (thus withdrawing the clutch), and slip off the control inner wire. Let the lever fall down and rotate the screw 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.

To remove the rubber protecting cover, pull the top end down along the operating lever, after which the lever can be pushed in and the cable freed.

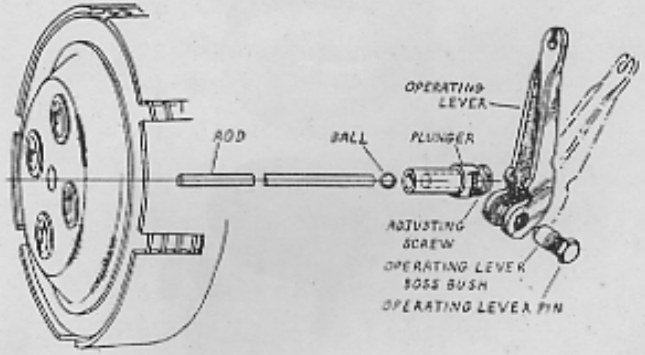


Fig. C/A/1 Clutch Cable and Rod Adjustment

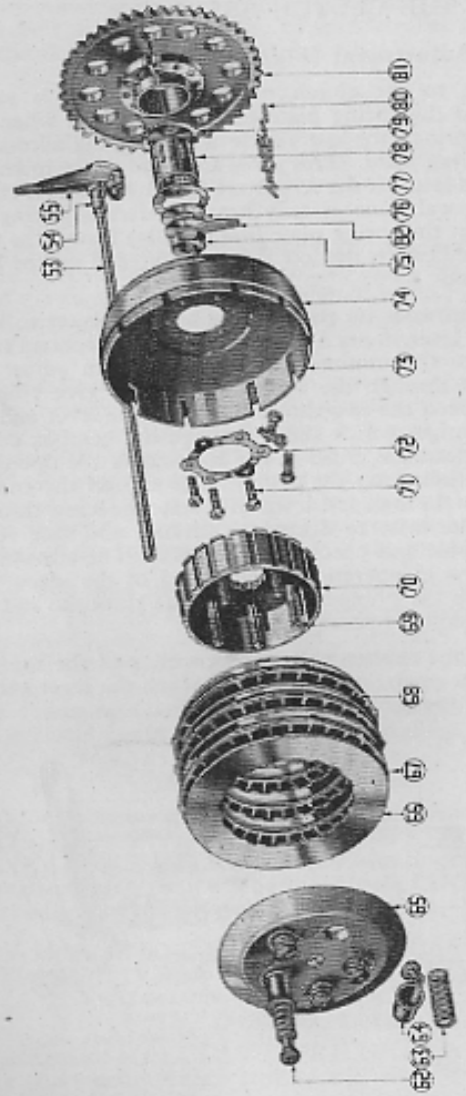


Fig. Ex/1 Exploded View of Clutch Assembly

CLUTCH ASSEMBLY

Description of Parts (see Fig. Ex/1)

53. Clutch Operating Rod.
54. Clutch Operating Plunger.
55. Clutch Operating Lever.
62. Clutch Spring Adjusting Nut.
63. Clutch Spring.
64. Clutch Spring Cup.
65. Clutch Spring Plate.
66. Clutch Plain Plate.
67. Clutch Plate fitted Cork Inserts.
68. Cork Insert.
69. Clutch Spring Stud.
70. Clutch Centre.
71. Chain Wheel Centre Bolt.
72. Chain Wheel Centre Tab Washer.
73. Clutch Case.
74. Clutch Case Band.
75. Mainshaft Nut—Clutch End.
76. Mainshaft Nut Plain Washer.
77. Thrust Washer—Keyed.
78. Needle Roller Cage.
79. Thrust Washer—Plain.
80. Needle Rollers.
81. Clutch Chain Wheel.
82. Mainshaft Nut Lockwasher.

If the plunger is pulled out, take care not to lose the ball which comes between the ends of the clutch rod and the adjusting screw.

2. Clutch Plates—Removal and Reassembly

Remove the clutch dome held by four screws, and then undo the 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 a plain plate, then a cork insert plate and a plain plate alternately, finishing with a plain plate. The heads of the spring retaining nuts should stand slightly proud of the spring plate (see adjustment, page 27).

3. Removal of the Clutch Body and Sprocket (See Fig. Ex/1)

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 and outer clutch housing (carried on a needle roller bearing) in position on the shaft. To remove these parts, knock back the edges of the ring tab washer locking the six set bolts in the centre of the housing and take out the bolts; the outer housing is now free. To remove the sprocket, take off the outer half of the oilbath case, when the sprocket, sleeve and needle roller bearing can be slipped off the shaft. Note that the rollers are not held in the cage and can therefore drop out when the sleeve is pulled off the shaft. When refitting these parts stick the rollers into the cage with a little grease. A plain washer fits *behind* the roller race and a tongued washer *outside* the race, next the clutch sprocket. Sometimes a tab washer is also fitted *behind* the outer clutch housing. This is used simply as a packing washer to increase the clearance between the clutch housing and the chain case.

When reassembling be absolutely sure that the six set bolts are screwed right home and that they are locked in position by the circular tab washer. Also do up the mainshaft nut, securing the clutch centre, dead tight, and do not forget to refit the special lockwasher behind the nut.

THE GEARBOX

1. Removing Gearbox from Frame

Remove nearside footrest, brake pedal and rod.

Remove clutch dome, dismantle clutch and remove clutch centre and clutch case.

Take off outer half of primary chain case. Note the small round paper joint washer between the two halves of the case, at the footrest boss.

Disconnect primary chain and draw clutch sprocket off mainshaft, taking care not to lose rollers out of bronze cage.

Disconnect clutch cable and push out clutch operating rod with plunger and adjuster towards the offside, in order to prevent loss or damage.

Remove gearbox clamp bolt (top—$\frac{1}{2}$ in. dia.) towards the offside and loosen gearbox adjuster. Slacken the tie bolts through the rear engine plates and seat tube lugs and also through the plates and crankcase lugs to give the gearbox clamping lug some play between the plates.

Remove gearbox pivot bolt at bottom and take out box towards the offside.

2. Dismantling the Box (see Fig. Ex/2)

First remove the clutch and clutch sprocket assembly, as already described. Next undo the nuts holding the gearbox outer cover and pull away the cover complete with the foot control operating mechanism and kickstart lever. Now unscrew the nut on the end of the mainshaft and pull off the ratchet pinion and sleeve. Undo the nuts holding the inner case and pull this away from the main gearbox casing, taking care not to lose the 12 rollers forming the roller race on the gear operating camshaft. Now unscrew the pawl spring plug at the bottom of the gearbox and take out the pawl spring, after which the entire gear assembly, together with camshaft and operating forks, can be removed from the gearbox en bloc. It may be found easier if the mainshaft is first pulled out from the clutch end.

The driving gear, ball bearing and rear sprocket are now left in the gearbox case. To remove these, hold the sprocket so that it cannot rotate and undo the large nut securing the sprocket to the driving gear sleeve. Note the special lock-washer fitted behind the nut. The driving gear will push through into the gearbox case whilst the ball bearing can be taken out after removing the bearing gland or oil seal, gland washers, etc. (See Fig. Ex/2 for order of assembly).

A good workshop method of holding the sprocket is as follows: Procure a scrap mainshaft and grind two flats on the part which carries the clutch roller race. Hold the main-shaft upright, clutch end at the bottom, and grip the two flats in a vice. Next take the sliding gear (mainshaft) and place this on to the shaft with the larger end (second gear pinion) uppermost. If the gearbox shell or case complete

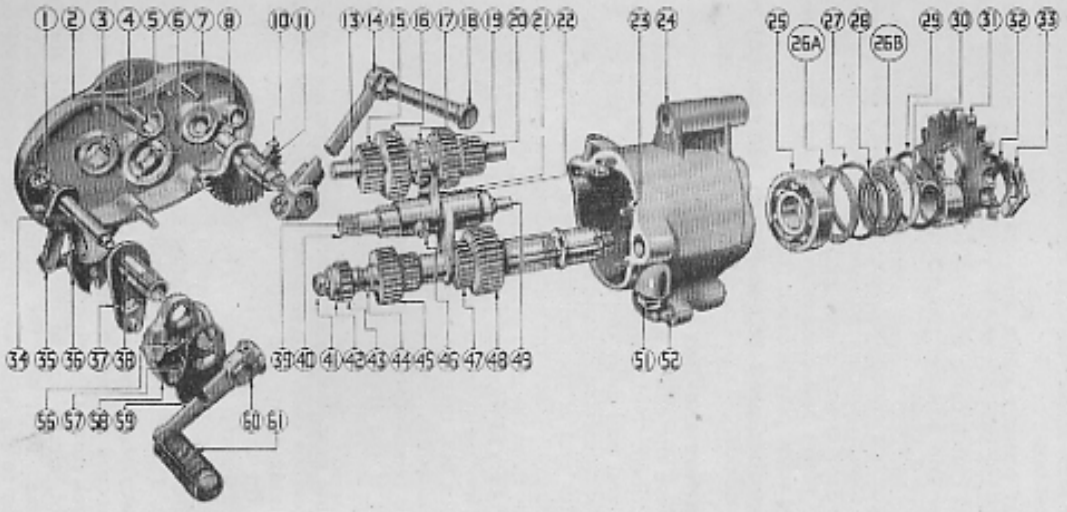


Fig. Ex/2 Exploded View of Gearbox Assembly

Note. In order to show all parts clearly the complete assembly has been turned upside down, i.e., the layshaft is shown above the mainshaft instead of in its normal position below the mainshaft, etc.

GEARBOX ASSEMBLY

Description of Parts

(See Fig. Ex/2)

1. Sector Spindle Bush.
2. K.S. Case—Gearbox Cover (Inner).
3. Camshaft Bush—K.S. Case.
4. Gearbox Cover Stud.
5. Layshaft Spindle Bush.
6. Mainshaft Ball Bearing.
7. K.S. Spindle Bush (Inner).
8. K.S. Stop Peg Rubber.
10. K.S. Quadrant.
11. K.S. Spindle.
13. Layshaft Spindle.
14. K.S. Lever.
15. Third Gear—Layshaft.
16. First Gear—Layshaft.
17. Layshaft Clutch.
18. K.S. Lever Pedal.
19. Second Gear—Layshaft.
20. Layshaft Small Gear.
21. Operating Fork (Layshaft).
22. Operating Fork (Mainshaft).
23. Gearbox Stud.
24. Gearbox Shell.
25. Driving Gear Ball Bearing.
26a. Gland Washer (Flat).
26b. Ditto.
27. Locating Ring (Split).
28. Bearing Oil and Grease Seal.
29. Gland Washer (Split).
30. Sprocket Spacing Collar.
31. Driving Sprocket.
32. Lockwasher.
33. Driving Gear Nut.
34. Footchange Sector Spindle.
35. Gear Sector, Quadrant and Ratchet Assembly.
36. Pawl.
37. Control Quadrant.
38. Ratchet Sleeve.
39. Camshaft Rollers.
40. Selector Pinion or Camshaft.
41. K.S. Ratchet Nut.
42. K.S. Driving Ratchet.
43. K.S. Ratchet Pinion.
44. K.S. Ratchet Spring.
45. Third Gear Mainshaft.
46. Operating Peg (Camshaft).
47. Mainshaft Sliding Gear.
48. Driving Gear.
49. Camshaft.
51. Filler Plug.
52. Gearbox Adjustment Peg.
56. Main Spring (Footchange)
57. Pawl Spring ,,
58. Spring Box ,,
59. Cover Plate ,,
60. Foot Control Lever.
61. Lever Rubber.

with the driving gear still in position is now placed over the shaft, the dogs on the second gear pinion of the sliding gear will engage with the dogs on the driving gear, thus securely holding the gear and gearbox driving sprocket whilst the nut is unscrewed.

An alternative method is to hold the sprocket with a length of rear driving chain, but this is not so rigid or convenient as the method described.

If the operating forks are removed from the camshaft, note that the two forks are different, the longer one operating the gear clutch on the layshaft.

3. Reassembling the Box (see Fig. Ex/2)

Reassembly is straightforward, but it will be found easiest to make a complete sub-assembly of the layshaft with gears, mainshaft gears (except driving gear which is already in the box) and camshaft and fork assembly, after which the whole assembly can be fed together into the gearbox shell. The mainshaft is then inserted through the driving gear. The rollers for the cam spindle should be held in place with thick grease whilst the kickstarter case is fitted.

When assembling the toothed ratchet of the gear control mechanism with the gear on the end of the camshaft, see that the marked teeth on the two members are assembled together, otherwise the gears will not be in correct register. Whilst it is quite possible to reassemble the foot control mechanism in one complete unit with the end cover, it will probably generally be found simpler to reassemble first the pawl, ratchet operating plate and spring box, after which the outer case and foot control lever can be put back into position.

4. Foot Gear Change Mechanism

This mechanism is very simple and easily operated although at first sight it may appear somewhat complex. The control positions of the foot-operated lever are clearly indicated in Fig. F/C/1, and each respective gear when once engaged is locked in a positive position and does not require to be held by the foot pressing on the pedal when the machine is in motion.

The action of the internal mechanism (Fig. F/C/2) is as follows: The footchange lever bush (F.C.L. Bush) is fitted with the rectangular extension inside the gearbox outer cover and is secured by the footchange lever bush bolt (F.C.L.B. Bolt) the plain end of which projects into the spring box between the

two main springs. The spring box and control quadrant are carried on the ratchet sleeve; the box, however, is free, whilst the quadrant is fixed on splines. The footchange lever fits on the fine splines at the outer end of the sleeve. The sector and ratchet assembly (riveted together) with toothed quadrant, is positively fixed to the sector spindle which passes through the ratchet sleeve and carries the movable indicator or pointer on the outer end. The peg "A", firmly fixed in the

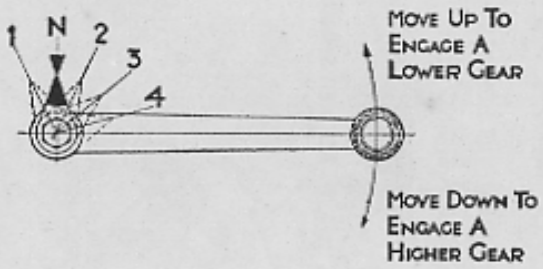
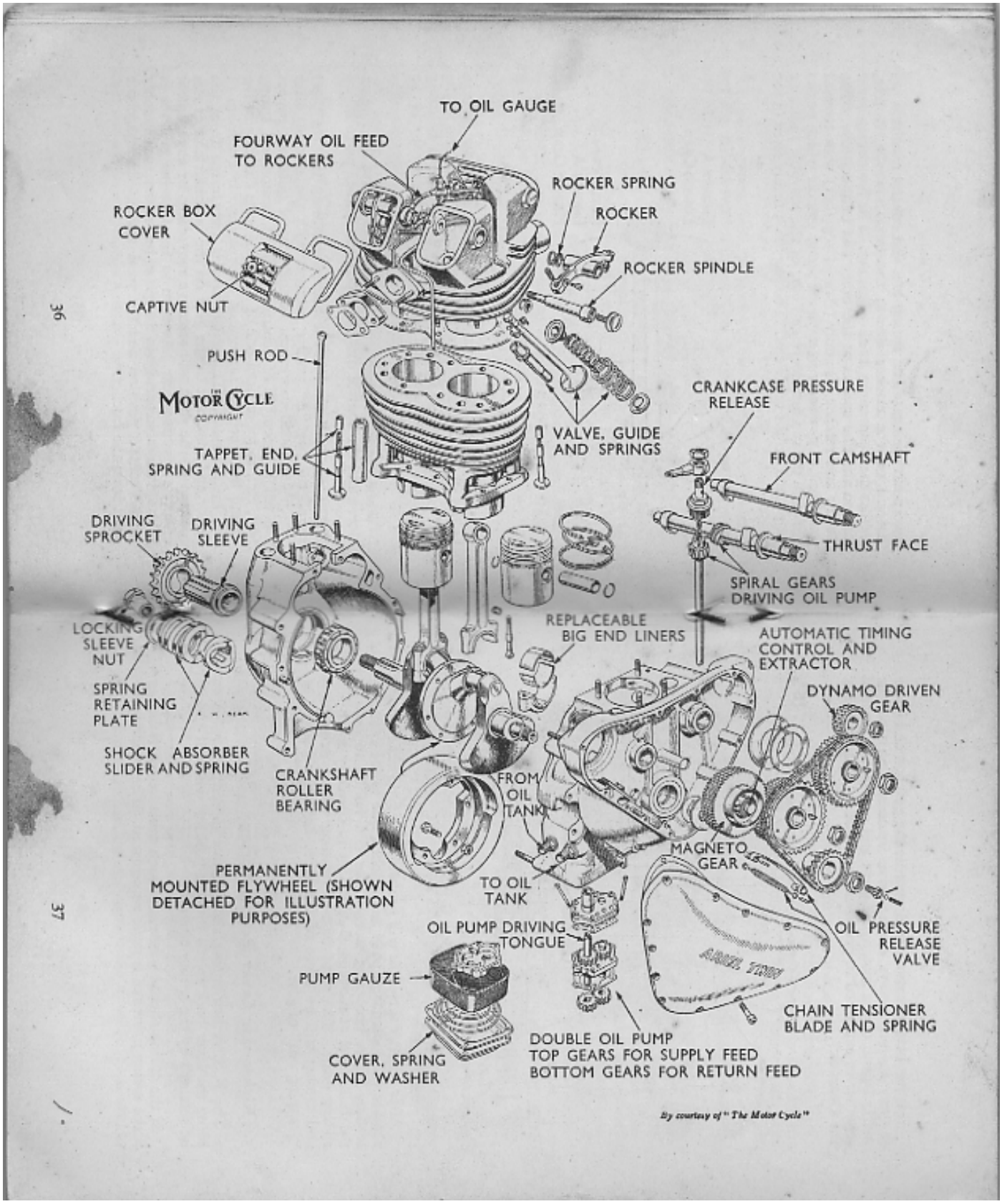


Fig. F/C/1

control quadrant, has one end located between the pawl springs in the spring box and the other end located in the slot in the pawl. The pawl is pivoted on the peg "B" which is firmly fixed in the spring box and which passes through a slot in the control quadrant.

When the footchange lever is moved it rotates the ratchet sleeve and the control quadrant which is splined on to it.

The peg "A" fixed in the control quadrant tips the pawl round the peg "B" until it engages with the ratchet, after which continued movement of the control quadrant causes the whole assembly of control quadrant, sector and spring box, etc., to move until one of the flanges on the side of the spring box becomes up against the rectangular extension of the F.C.L. bush. This movement is transferred from the sector and quadrant to the gear on the camshaft and causes rotation of the shaft and selective movement or engagement of any respective gear. As soon as the footchange lever is released the main springs in the spring box return the assembly to the central position and the pawl springs disengage the pawl from the ratchet.



By courtesy of "The Motor Cycle"

If it has been necessary to dismantle the gearbox end cover for any reason, always ensure when reassembling that the marked teeth of the footchange pawl and ratchet are meshed together as explained in previous notes under "Reassembling the Gearbox".

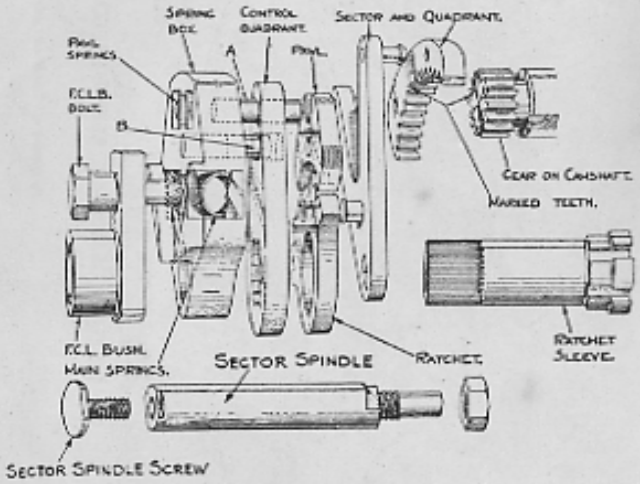


Fig. F/C/2

After lengthy service it will probably be found necessary to replace the footchange pawl and ratchet, due to the engaging leading edges becoming worn down and failing to operate the full travel of movement necessary to correctly mesh the sliding gears. The symptoms of running with a worn pawl and ratchet will be those of failure to engage a gear or of "jumping out" of gear.

5. Kickstarter Lever Return Spring

The K.S. return spring should have sufficient tension to bring the lever back to the upright position where it should be retained by the spring pressure.

If the spring should weaken, tension must be increased, or if the spring is broken it must be replaced. The general procedure is the same in either case.

1. Disconnect clutch cable at gearbox end and loosen offside footrest.
2. Remove footchange lever and pinch-bolt through K.S. lever.
3. Remove nuts securing gearbox outer cover.
4. Hold K.S. lever and pull off outer cover complete with kickstarter and footchange mechanism still in position in the cover. Withdraw clutch operating plunger and take care not to lose the steel ball between adjusting screw and clutch operating rod.
5. If the return spring is only insufficiently tensioned proceed as detailed in item 6.

   If the spring is broken or has to be replaced pull the kickstarter lever off the splined shaft and push the shaft and starter quadrant out of the cover. Remove the old spring. Take the new spring and remove the binding wire. Hold the quadrant and shaft assembly with the splined end of the shaft towards you and the quadrant hanging downwards. Slip the spring on to the shaft so that the inner end engages with the lowest of the slots next to the quadrant, i.e., slot at 6 o'clock position.

   Ensure that the spring is the correct way round. The coils should run clockwise from the centre to the outside of the spring. Push the shaft or K.S. axle through the bush in the outer cover and place the looped outer end of the spring over the peg in the outer cover. Place the K.S. lever on the spindle and wind up for one and a half to two turns. The actual amount may vary with different springs. Finish up so that the quadrant is in the normal "out of action" position, i.e., below the shaft as at the commencement of fitting the new spring, with the cover held in the normal horizontal position.

   Next give a further half turn equivalent to depressing the K.S. lever to start the engine. The spring must not close solid but must exert enough tension to return the lever smartly to the normal vertical position.
6. If the spring coils close up solid, unwind the spring, place the inner end one or two slots to the left (clockwise) and refit as described in paragraph 5. If the spring has insufficient tension move the inner end one or two slots to the right (anti-clockwise) and refit.
7. Refit the gear control mechanism into the inner end cover and replace outer cover and bolt up securely. See previous notes "Reassembling the Gearbox".
8. Fit footchange lever, tighten K.S. lever pinch-bolt and reassemble clutch withdrawal.

6. Lubrication—Gearbox

The gearbox incorporates a special lubricant seal next to the driving gear bearing and the main case should be filled with an oil and grease mixture made up on a 50/50 basis, using half good quality engine oil mixed with other half of gear grease.

This gearbox requires "topping up" approximately every 1,000 miles or so with the pressure gun containing the same mixture.

If spare parts for a gearbox are required always quote the series number to enable the Works Service Department to identify the correct model.

STANDARD GEAR RATIOS—MODELS "KG" AND "KH"
Fitted with Burman BA type gearbox
Specification and Gear Ratios

	Engine Sprocket	Top	Third	Second	First
SOLO ...	21T	5.20	6.65	9.15	13.85
SIDECAR ...	19T	5.75	7.40	10.15	15.40
CLUTCH CHAIN WHEEL ...		...	...	...	44T
GEARBOX DRIVING SPROCKET ...		...	...	...	19T
REAR WHEEL CHAIN SPROCKET ...		...	...	...	47T

1. Primary Chain (½ in. × .305 in. × 80 or 81 pitches)

Chain adjustment is made 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 draw bolt adjuster; rotating the nut on the draw bolt swings the box about the pivot bolt, varying the chain tension. Adjust until the primary chain has approximately ⅜ in. up and down movement midway between the sprockets at the tightest point. Retighten clamp bolt and pivot bolt.

If the drawbolt nut does not turn easily, do not force it or the lug on the gearbox may be broken. Ascertain why the box is not moving; probably the bolts are not properly free or the chain may already be too tight.

2. Rear Chain (⅝ in. × ¾ in. × 95 pitches)

The spring clip is fitted on the inner side of the chain, in order to prevent it touching the back of the primary chain case and possibly becoming displaced. It is quite accessible

through the rear wheel spokes. The open end of the spring clip must always *follow* the closed end when the chain is running in the normal direction.

To adjust the chain when a rigid frame is fitted, slack off the two rear wheel spindle nuts "E" (Fig. RB/1) and loosen the nut securing the brake anchor bar to the brake plate; then adjust by rotating the screw adjusters "K"; turn each adjuster by an equal amount. The chain should have approximately ½ in. movement at the tightest point midway between the sprockets. After making the adjustment, tighten up the spindle nuts, the locknuts on the adjusting screws and the brake anchor bar nut. Adjust the rear brake if necessary; see brake adjustment, page 45. See also page 46 for adjustment with spring frame.

3. Chain Lubrication

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 may be thrown out of the case where the gearbox mainshaft enters. The oil level is *not* maintained by the engine lubrication system. No drain plug is fitted and if it is desired to drain off the oil, the outer half of the chaincase must be removed.

Rear chain lubrication is carried out by means of a needle valve in the primary chaincase (just behind the clutch dome) which 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.

Periodically the exposed rear driving chain should be removed and thoroughly cleaned with paraffin and then dipped in a grease and graphite mixture well warmed. After cooling the excess mixture should be wiped off and the sprockets cleaned before replacing. All spring clip fasteners must be fitted with the closed end facing forward when the chains are running in the correct direction.

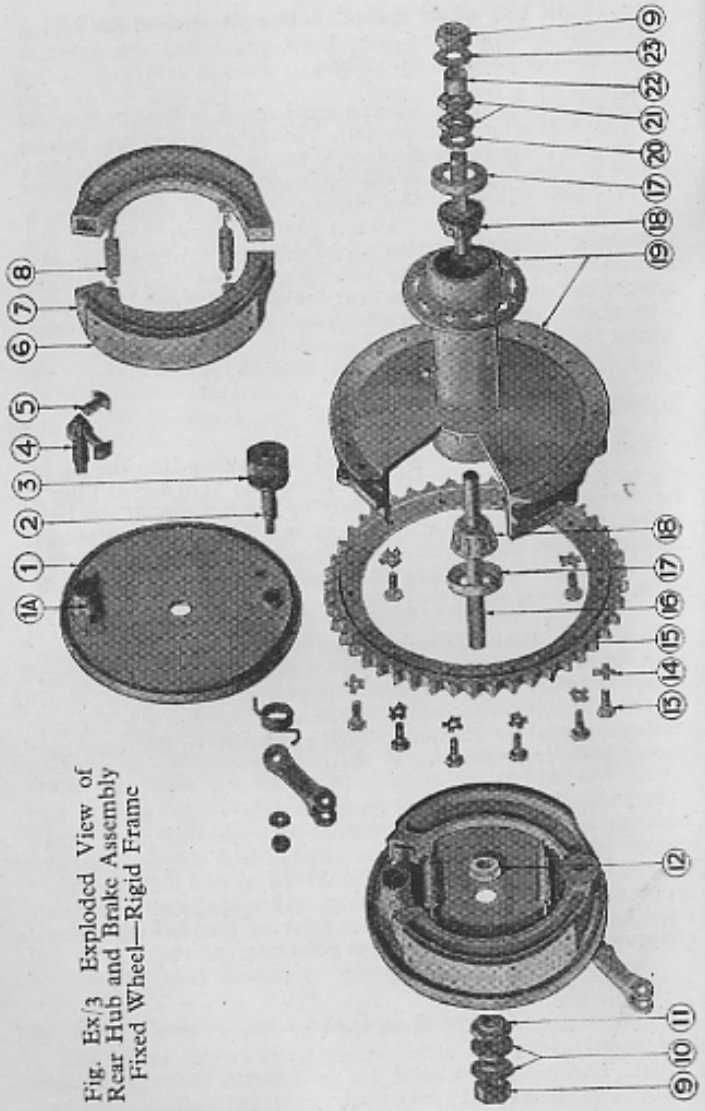


Fig. Ex/3 Exploded View of Rear Hub and Brake Assembly Fixed Wheel—Rigid Frame

REAR HUB AND BRAKE ASSEMBLY

Description of Parts (see Fig. Ex/3)

1a. Brake Adjusting Wedge Holder.
1. Brake Plate with Fixed Fittings.
2. Brake Cam.
3. Brake Cam Washer.
4. Brake Fulcrum Adjusting Wedge.
5. Brake Fulcrum Adjusting Spindle.
6. Brake Lining.
7. Brake Shoe Half with Lining.
8. Brake Shoe Return Spring.
9. Wheel Spindle Nut.
10. Fork End Spindle Bush.
11. Brake Plate Locknut.
12. Abutment Nut for Bearing.
13. Chain Sprocket Bolt.
14. Chain Sprocket Bolt Tab Washer.
15. Chain Sprocket.
16. Wheel Spindle.
17. Grease Retainer.
18. Taper Roller Bearing.
19. Hub, Brake Drum and Spoke Flange.
20. Lockwasher for Spindle.
21. Bearing Adjusting and Locking Nuts.
22. Spindle Distance Piece.
23. Wheel Spindle Nut Washer.

FIXED REAR WHEEL AND BRAKE
(Rigid Frame)

1. Removal of Wheel

Support machine on rear stand.
Remove wing nut on brake rod.
Disconnect chain.
Uncouple front end of brake anchor bar.
Slacken spindle nuts.
Release the domed nuts securing the forked ends of the mudguard stays and slacken by one or two turns the pins securing the mudguard front bridge or brackets.
The complete rear guard can then be pivoted upwards.

2. Removal of Brake (See Fig. Ex/3)

After removing wheel undo brake plate locknut and remove brake plate complete with shoes. Pull off shoes. Lightly grease:
Brake cam spindle,
Fulcrum adjustment wedge and spindles.
Examine the brake linings for wear and, if necessary, fit new linings or replacement shoes and linings. If new linings are fitted see that they are riveted down so that they lie in close contact with the shoe. Also see that the rivet heads are countersunk in the lining and that the foot of the rivet is carefully punched over.

3. Removal of Bearings (See Fig. Ex/3)

First take out the wheel and remove the brake plate as described in items 1 and 2.
Screw off the two thin adjusting and locking nuts ("G" and "H", Fig. RB/1) and tap out the spindle towards the brake drum side. Prise off the two dirt excluding covers; these will probably be damaged and therefore require replacement. The inner races, rollers and cages of the taper roller bearings will drop out complete.
The outer races are pressed into the hub and should not be removed needlessly. Each race bears against an abutment washer in the hub tube. Remove the race by driving out with a drift placed through the hub and bearing up against the back of the abutment washer.
Examine the track of the outer race. The inner race track cannot easily be seen as it is masked by the rollers and roller cage; however, wash in petrol, examine as well as possible, and also examine the taper rollers and the cage. If any parts are seriously worn or damaged replace the whole bearing assembly, i.e., outer race, together with inner race, rollers and cage.

4. Wheel Bearing Adjustment (See Fig. RB/2)

When the wheel has been refitted to the frame, slacken the outer spindle nut "E" on side opposite brake drum; hold inner cone adjusting 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.**

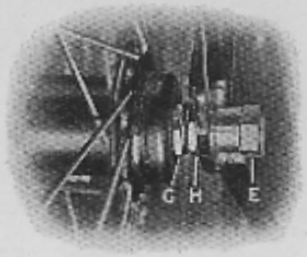


Fig. RB/2 Rear Wheel Bearing Adjustment

5. Brake Adjustment (See Fig. RB/1)

All normal brake adjustment must be made by rotating the square-ended fulcrum screw situated in the brake plate diametrically opposite the brake lever bearing. Turn clockwise to compensate for wear. The hand adjuster on the rear 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. **Always adjust the rear brake by means of the fulcrum adjuster. The thumb screw on the brake rod must only be used to compensate for rear chain adjustment. This is important if good braking and even wear on the brake linings is to be obtained.**

6. Bearing Lubrication

The hub should be packed with grease during assembly or grease may be pumped in via the grease nipple after the bearings have been assembled, but before the brake plate is fitted. Spin the wheel a few times, holding by the spindle, and wipe off any surplus which works out past the bearings.

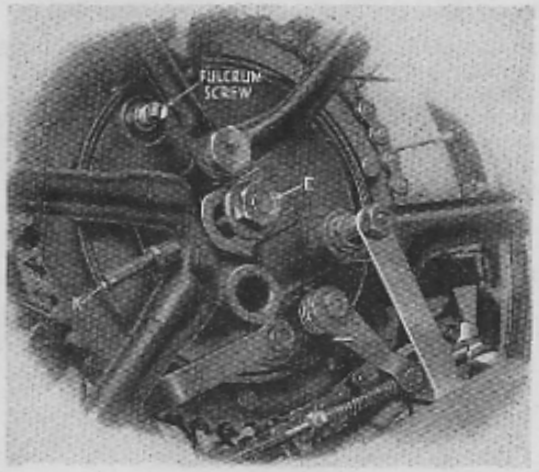


Fig. RB/1 Rear Brake Fulcrum and Chain Adjustment (Fixed Rear Wheel)

Fixed Rear Wheel and Chain Adjustment (**Spring Frame**) See page 61

Front Wheel

(See Figs. A, B and C, Telescopic Fork Assembly)

1. Removing Front Wheel

With the machine on front and rear stands, proceed in the following order:

Wipe all dirt off the piece of exposed spindle "A" between the wheel and the fork tube lug on the side opposite the brake. Unscrew the spindle nut "B" on the brake side and the bolt "C" securing the brake plate to the fork. Slightly rotate the brake plate so that the cable nipple "D" can be readily disconnected from the brake lever. Then loosen the pinch-bolt "E" on the other fork tube, and using a tommy bar in the hole in the wheel spindle "F" pull the spindle straight out, giving it a slight twist in either direction. The wheel is then free. Do not let dirt get into the spindle holes—plug them with small pieces of clean rag.

Fig. A Removing Front Wheel

2. Removing Brake

After removing wheel the brake plate can be taken off complete with operating cam, brake shoes and springs in position. If the brake shoes are removed for re-lining, lightly re-grease the brake cam and fulcrum adjustment before refitting the brake plate, and refer to para. 5 re notes on front brake adjustment.

3. Removing Hub Ball Bearings and Replacing

The front hub spindle is carried on two single journal ball bearings pressed into the hub centre. If it is necessary at any time to remove the bearings, proceed as follows: First unscrew the brass locking ring (right hand thread) using the special plug spanner from the tool kit, and carefully take out the grease retaining rubber washer which covers the bearing. This refers to the left hand side of the hub. Next turn to the right hand or brake side and take off with the point of a screwdriver the metal dust cover, then the brass locking ring and grease retaining rubber washer. Next remove the thick bearing abutment steel washer and both ball bearings can be punched out from opposing sides using a suitable drift or punch through the hub centre. Note the steel distance bush fitted to the brake side bearing only.

4. Replacing Wheel

Proceeding in the following order: Wipe the spindle absolutely clean and start it in the end from which it came out, then lift the wheel into position and slide the spindle right through. Twist the brake plate round so that the lug "G" will receive the anchor bolt "C". Connect the cable nipple "D" with the brake lever and screw the anchor bolt "C" home but not quite tight. Next screw on the wheel spindle nut "B" and tighten, then finally tighten the anchor bolt "C". The last operation is to tighten the pinch-bolt "E" on the other fork tube, but before doing this, work the fork up and down once or twice by pressing on the handlebars to allow the end lug to find its natural position along the spindle as shown at "H". Tighten the pinch-bolt "E" in this position, taking care not to move the lug along the spindle while doing so.

5. Front Brake Adjustment

Adjustment of the cable stop "J" is only for taking up initial cable stretch. Adjustment for brake lining wear is made by turning the square-ended cam "K" attached to the brake plate—similar to the rear brake. Turn one or more clicks in a clockwise direction. Occasionally oil the brake cable, nipple and cam spindle.

6. Front Hub Bearing Lubrication

Once or twice a year add about a teaspoonful of thin grease to the hub bearings. This can be done by pushing it through

the spindle hole—either side—with the finger. A grease nipple is not fitted. The job is most conveniently done when the wheel has to be removed for some other purpose. The bearings do not require adjustment.

WHEEL ALIGNMENT

Procure a plain board about 6 ft. long, 3 in. wide and ¾ in. thick; see that one edge is perfectly straight. With the machine on the stand, place the straight edge of the board alongside the two wheels so that it touches each wheel. Turn the handlebars if necessary so that the front wheel touches the edge of the board at two points. If the wheels are in perfect alignment the board will also touch the rear wheel at two points. If it does not touch in this manner, slack off the rear wheel spindle nuts and turn the chain adjusters (see Fig. RB/1) until the wheel touches the board at two points. The handlebars may require turning very slightly to adjust the position of the front wheel to correspond with the new position of the rear wheel.

When the two wheels are in proper alignment the straight edge of the board will touch each wheel at two points.

ARIEL TELESCOPIC FORK WITH HYDRAULIC CONTROL

To get the best results and greatest satisfaction from this fork, we strongly recommend all owners to carefully read these notes on maintenance, because they describe exactly what should be done and how to do it properly. The more difficult work will naturally be done by one of our Dealers who is fully conversant with the repair aspect of the job, but ordinary maintenance can easily be done by the owner himself.

As explained in our sales literature, the fork requires no lubrication or adjustment, so please do not tamper with it. Just see that the nuts are kept tight and front brake properly adjusted as it wears.

Oil Recommendation for Hydraulic Fork.

The forks are filled with oil before leaving the factory to a level of 17 to 18 inches below the top face of the top bracket, measured when the motor cycle is standing unloaded in an upright position. They do not require "topping up".

Wakefield's	Castrol XL
Anglo	Essolube 30
Price's	Motorine M
Shell...	Double Shell
Mobiloil	Mobiloil A

Export

In countries where extremely cold conditions prevail Mobiloil Arctic, etc., will be used instead of the heavier oils.

Passenger or Commercial Sidecar

When the machine is ordered for use with a sidecar, stronger fork springs will be fitted. Do not fit a sidecar to a machine not fitted with these strong springs and do not use a machine fitted with strong springs for solo work or the maximum comfort will not be obtained.

Completely Dismantling the Fork

It may be necessary to dismantle the fork as the result of an accident or other cause, in which case proceed as follows:

Support the front of the machine on a box under the engine so that the wheel is clear of the ground. Remove the front stand, mudguard and cable clip, but not the headlamp. Remove front wheel as previously described. Unscrew the hexagon plug "P" at the top of the fork, then loosen the pinch screw "Q" in the crown with the special hexagon spanner provided and each fork tube complete can be pulled out from below. See Figs. B, C and D. If it is too tight to slide, wedge a screwdriver in the split of the crown "R". Replace hexagon plug "P" to prevent oil escaping. To continue dismantling take off the spring, Fig. E, and unscrew the sleeve "S" carrying the oil seal with a special spanner supplied to ARIEL Dealers, Fig. F. Next remove the circlip "T" retaining the top bush "U" and whilst holding the main fork tube in a soft jaw vice, knock gently with a mallet on the end of the sliding tube "V" so that the bottom bush "W" will force the top bush "U" out. The main tube can be withdrawn complete with bottom bush, Fig. G. The latter is secured with a sleeve nut. The bottom cover can be removed by undoing three screws "X" with a long screwdriver and the top cover by loosening the one nut "Y" below the steering damper knob. Figs. B and C.

To Reassemble

If the covers have been removed replace these first, but do not *finally* tighten the top nut "Y" below the steering damper knob. Pass the oil seal and housing "S" over the main tube and also the top bush "U", then insert the bottom bush "W" in the sliding tube "V". Hold the main tube in a soft jaw vice and place a split sleeve supplied to ARIEL Dealers over the tube so that it touches the end of the vice jaws on the side and the top bush "U" on the other. Knock gently on the end of the sliding tube "V" until the bush is forced home.

Fit the circlip "T" and screw sleeve "S" home.

Assemble the main tube into the crown and top bracket, lightly tighten the top hexagon plugs "P" and finally tighten the nut "Y" below the steering damper knob. Finally tighten the two hexagon plugs "P" and *lastly* the two pinch-bolts in the crown. Assemble mudguard, etc., in the ordinary way.

Steering Head

Self-adjusting Head Races

Between the two steering column locknuts "L" and "M" and the ballrace dust cover is a diaphragm spring "N" which automatically adjusts the head races for wear within certain limits. After one or two years running, clearance may develop in these races and readjustment is necessary. The front of the machine should be supported on a box under the engine and the front wheel clear of the ground. Loosen the top locknut "L" and gently screw the bottom nut "M" down until all clearance in the races has just disappeared and there is no sign of tightness in the steering. Then further tighten this nut "M" 1/6th of a turn, that is, turn the nut from one pair of flats on the hexagon to the next flats and no more. Hold this bottom nut "M" with the spanner to prevent it moving and securely tighten the top locknut "L".

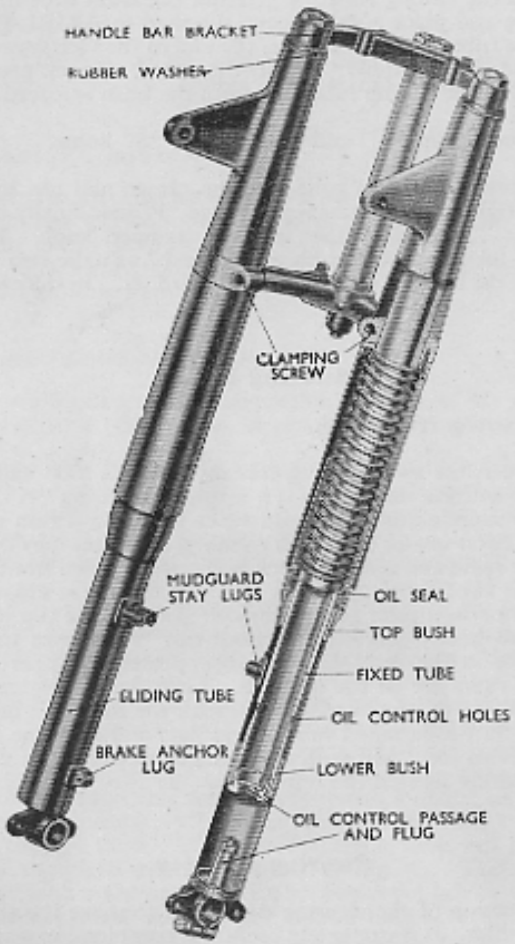
Steering Damper

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

TELESCOPIC FORK

with Hydraulic Control

Speedometer mounting not shown



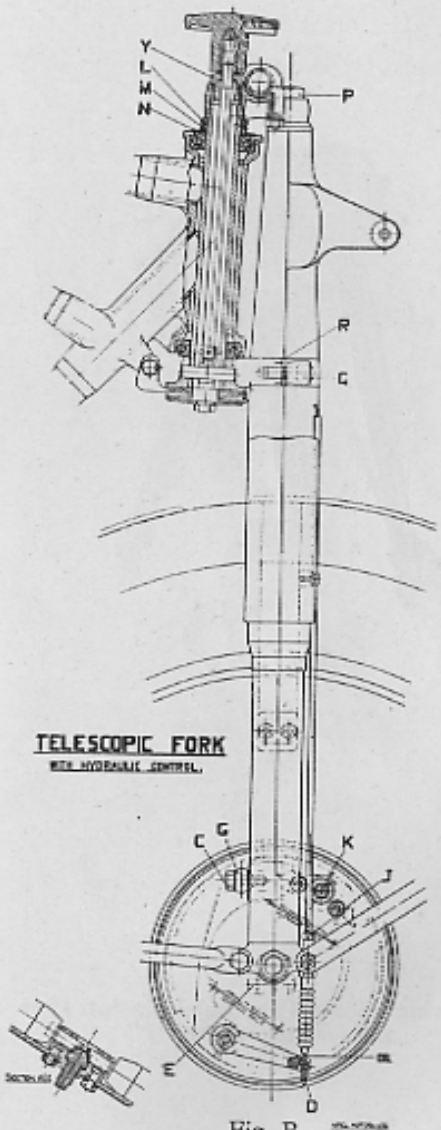


Fig. B

Fig. D

Removing Sliding Tube and Mainshaft after unscrewing top plug "P"

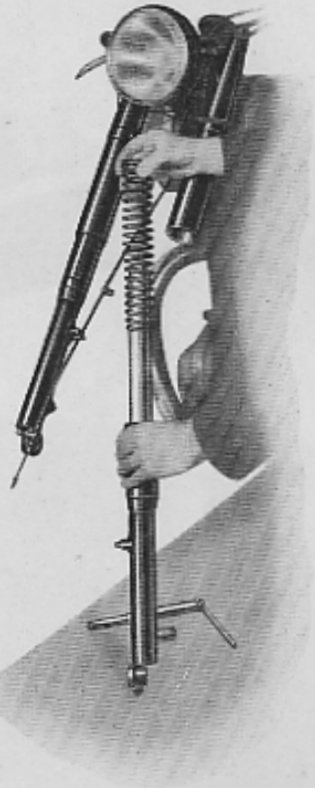


Fig. E

Taking off Coil Spring

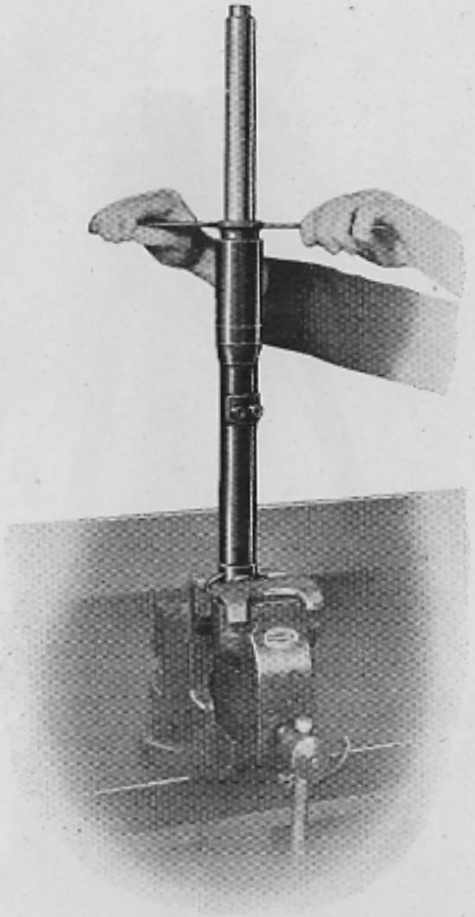


Fig. F

Removing Sleeve carrying Oil Seal
with Special Service Tool

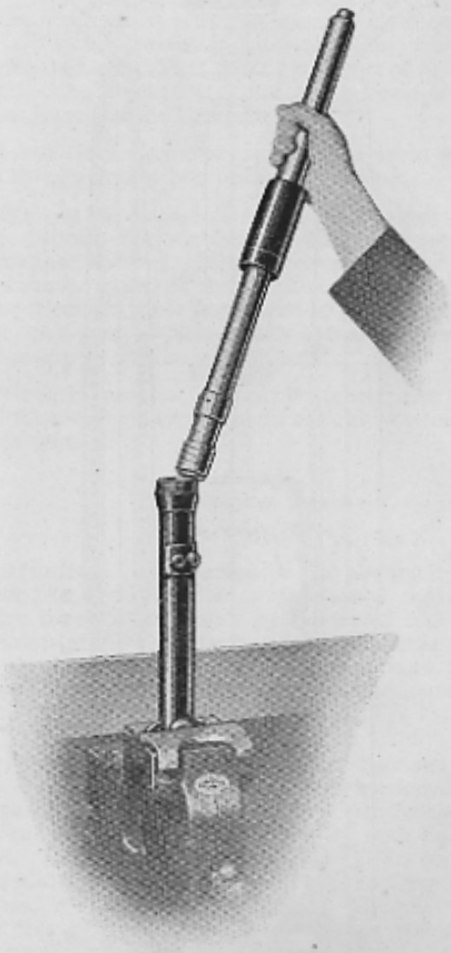


Fig. G

Withdrawing Main Shaft

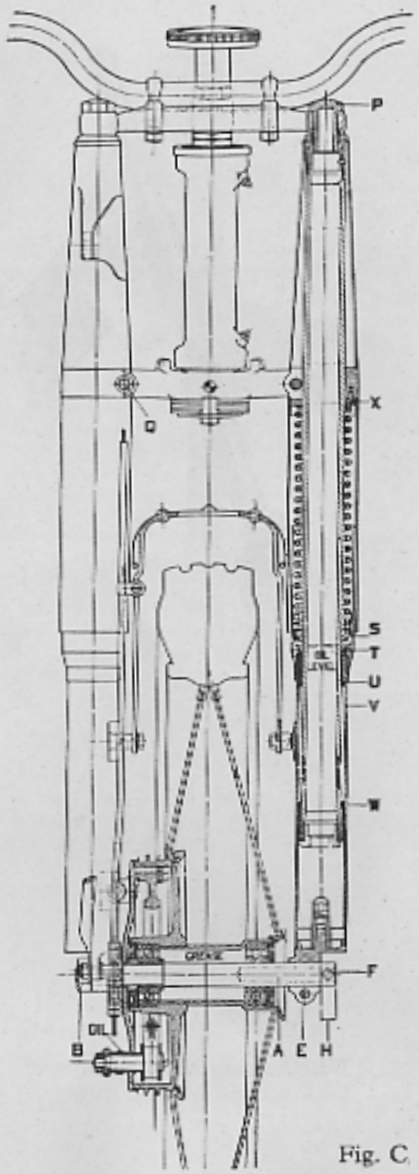


Fig. C

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 occasions, 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.

To take out the centre tie rod which passes through the steering column, remove damper knob and punch out the short steel parallel peg which is driven into and through the crown at the base of the column. The peg also passes through the brass trunnion piece connected to the end of the tie rod. Remove small damper plate anchor bolt and nut and the whole damper assembly can be withdrawn.

After lengthy service the friction fabric disc may require renewal otherwise no replacement should be necessary except in case of damage.

The Spring Frame
(See Fig. SF/1)

Construction. The design of the sprung rear wheel is such that rear chain tension is maintained constant and the brake can be operated direct by the usual rod without the interposition of any link mechanism or flexible cable. This perfect geometric pivoting of the wheel about the gearbox main shaft ensures maximum chain life and smooth braking.

The actual construction is as follows:

Each rear fork lug has cylindrical extensions at the top and bottom. Fitted through the centre is a hardened guide tube "A" which is clamped to the lug by a substantial bolt "K". On this tube is mounted the slider "B" with bushes "C" at each end. The spring abutment collar "D" is forged integral with the slider and extended rearwards to form a horizontal pivot boss "E" fitted with bush "F". The pin "G" passing through this pivot supports each side of the stirrup "H" which surrounds the fork leg. The closed end of the stirrup is anchored to the chain stays by short links "I", and one arm is extended to carry the wheel spindle. Renewable bushes are fitted to all bearings and the slider mechanism is completely enclosed against mud and dust by tubes "L" and "M". Grease nipples are fitted at the top of the slider tube bolt which is drilled down its centre to carry grease direct to the two slider

bushes "C", and the slider boss for lubrication of the bush "F". The link bearings are fitted with oil impregnated bushes which require no further lubrication.

This combination of the straight line movement given by the slider "B", and the small radius arc obtained by pivoting the stirrup just forward of the fork lug, gives a flat arc with centre at the gearbox driving sprocket, thus ensuring constant chain tension.

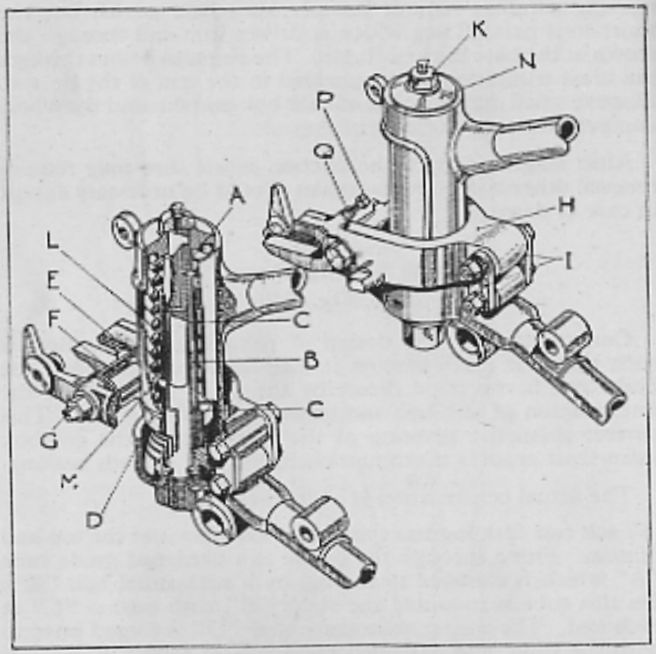


Fig. SF/1

Section of Rear Spring Wheel Arrangement

Assembly. The dust excluding tube "L" is fitted into the cylindrical fork lug from the top, the cut away part facing backwards. Next drop in the thick packing washer and the short recoil spring. Place the slider "B" in position (short extension below collar "D" at bottom) and above the collar

fit the dust tube "M" and the compression spring. Thread the aluminium collar "N" on to the bolt "K" and follow with the guide tube "A". Now run this assembly down through the slider and thick packing washer until the end of the bolt projects through the bottom of the fork lug; screw on the domed nut and lock up solid. Check this nut periodically for tightness.

The fitting of the stirrup is quite straightforward. Note that the pivot pin "G" is fitted from the wheel side of the stirrup and screws into the short arm. Tighten the pin until the stirrup has no side float, then do up the locknut. The squared end of the pin facilitates subsequent adjustments when the head is masked by other fittings. Fit the two links and bolts from the closed end of the stirrup to the frame lug.

Lubrication. Apply the grease gun to the nipples on the head of the clamp bolt "K" and the pivot pin boss "E" every 250 miles.

Chain Adjustment. The rear wheel fits into the forked ends of the stirrup arm "H" and adjustment is carried out by means of adjuster "P" (see Fig. SF/1). Always check wheel alignment and adjust chain to allow ½ in. movement at midway position between the sprockets.

Fixed Rear Wheel Removal. This is carried out in exactly the same manner as on the rigid frame models.

Brake. The actual brake construction and adjustment is again the same as on the standard models. **Adjust the brake by means of the fulcrum adjustment.** The brake plate, however, is not secured to the spindle by means of a locknut. It is located endways by collars inside and outside the plate and is gripped and held securely when the wheel spindle nuts are tightened. The plate is prevented from rotating when the brake is applied by a protruding lug on the stirrup engaging with a slot in the brake plate. When refitting the wheel, be sure that the lug and slot are in engagement.

Bearings. On the fixed wheel with spring frame the bearings are non-adjustable, being ordinary ball journal bearings. To remove or inspect the bearings, take out the wheel and remove the spindle nuts, collars and brake plate, etc., being careful to lay these down in correct order so that no mistake shall be made in reassembly. Prise off the dust cover at the

brake end of the hub and unscrew the bearing locating ring in the other end of the hub. The wheel spindle has two shoulders forming abutments for each inner race. If the spindle is now driven or pressed out it will carry with it one bearing; the other bearing can then be removed by utilising the spindle again after taking off the bearing already removed.

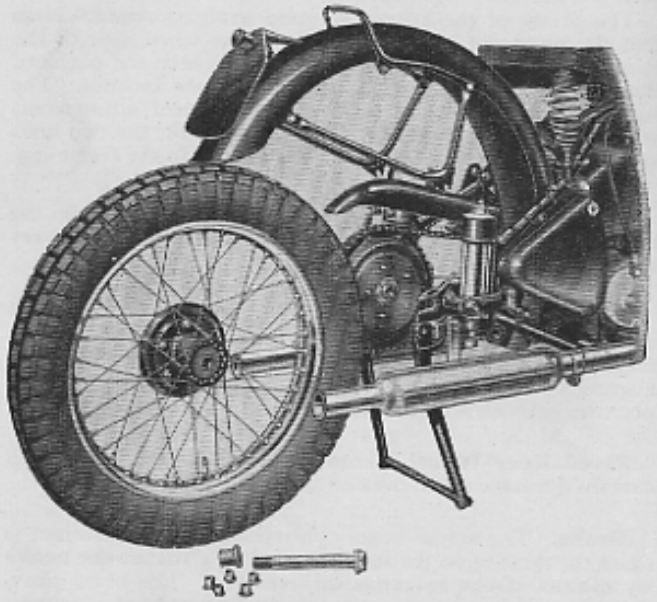


Fig. QDW/1 Detachable Rear Wheel shown with Spring Frame

Detachable Rear Wheel (Rigid Frame)

Removal

To remove the detachable wheel, support the machine on the rear stand and pivot the complete rear mudguard upwards after releasing the dome nuts securing the rear stay. See also page 44.

Next remove the five wheel nuts securing the hub to the brake drum (a special spanner will be found in the tool kit), and then unscrew and withdraw the large centre spindle bolt. Note the position of the loose distance collar between the hub hollow spindle and the right hand fork end and tap this away. Pull the wheel to the side clear of the five driving studs, leaving the complete brake drum with sprocket and rear chain in position (see Fig. QWD/1). The wheel is replaced by reversing the procedure and care should be taken to ensure that the centre spindle and the five nuts are securely tightened.

Brake

The brake drum and chain sprocket are carried on a fixed spindle clamped in the nearside or left hand rear fork end of the frame, and operates through the medium of a single journal ball bearing.

To remove the brake drum assembly it is generally most convenient to first take out the detachable wheel, but the wheel with drum assembly can be removed as a complete unit if desired.

Before attempting to remove the brake drum assembly it will be necessary to disconnect the brake rod, brake anchor bar and driving chain. Undo the spindle nut, and the brake plate complete with shoes can now be withdrawn from the drum. Take note of the position of the two plain distance collars, one on either side of the fork end, and also the plain flat washer next to the large securing nut. Note also the two flats on the short spindle which register with the corresponding flats on the fork end.

Lightly grease the brake cam and fulcrum adjustment device; also brake cam spindle and joints.

When reassembling always see that spindle nuts are dead tight, brake anchor bar securely fixed, brake rod connected and adjusted and chain correctly fitted and aligned. (See Fig. RB/1) for fulcrum adjuster position and always use this method for normal brake adjustment. A special spanner is provided in the tool kit for ease of operation. The adjuster thumb screw on the end of the brake rod should only be used to compensate for rear chain adjustment.

Bearings

One journal ball bearing (¾ in. bore) is fitted to the detachable wheel hub and one similar (1 in. bore) to the brake drum assembly.

To remove the wheel ball bearing, unscrew the right hand side brass locking ring, bearing collar and rubber grease retainer, and the bearing can then be driven out with a soft punch or drift from the left hand or inner side of the hub. Reverse the procedure for refitting and well pack the bearing with grease.

To remove the ball bearing from the brake drum assembly, first take out the brake plate (see previous notes) and then lift out the cork washer on the hub side. Next remove the large flat spring steel circlip and steel pressing and the short centre spindle can then be driven out from the brake side complete with ball bearing. Note how the bearing is held in position on the spindle by a wire circlip which must be removed before finally driving off the bearing. When replacing the bearing in the housing always well pack with grease.

Detachable Rear Wheel (Spring Frame)

The complete detachable wheel for the spring frame is precisely the same as that for the rigid frame with the exception of the arrangement of distance pieces for fork end fixing, and the brake drum assembly brake plate. On the brake side a grooved distance collar is fitted between the brake plate and frame fork end and one thick washer outside the fork end next to the short spindle nut. On the right hand or hub side a butted type slip collar is fitted between the hub and the fork end and one thick washer outside the fork end next to the head of the main spindle.

No rear brake plate anchor bar is fitted for spring frame models and the plate is prevented from rotating by a machined lug on the stirrup arm "H" engaging with a slot in the brake plate.

Wheel alignment and chain adjustment is carried out in the same manner as with the fixed wheel.

Petrol Tank

The petrol tank is secured by four set bolts, each having two rubber packing washers and one plain steel washer and secured with wire. The thick rubber washer goes next to the tank. The set bolts should not be screwed up too tightly, otherwise the base of the tank may be damaged and leakage occur.

Two separate two-level taps are fitted and both main supply plungers should be "pulled on" when running, especially if a low level of petrol or gasolene is carried. When the main supply is exhausted pull on the Reserve Plungers, but take care to still leave "on" the main plungers.

Ascertain how far the machine will travel after pulling on the reserve taps and you will then know for future use that fuel must be procured within this distance.

Always close the reserve taps after refilling the tank.

To simplify the above:

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

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

To close tap push in both knobs.

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

To renew the corks. Take out the small grub screw at the side of the tap and pull out the plunger complete. The cork end of the plunger rod can be held with pliers or grips and unscrewed. Fix new cork, replace plunger and adjust. Put back grub screw.

Use considerable care in handling the flexible petrol pipes as fitted to model K.H. These pipes have only a limited degree of flexibility and will soon leak if bent too sharply or otherwise strained.

Oil Gauge

The gauge is fitted into the top face of the petrol tank and secured by one nut and stud which passes through a short bracket welded to the tank. To remove the gauge, the top oil pipe union must be disconnected and the petrol tank removed from the frame in order to give access to the gauge fixing stud nut.

Speedometer

The Chronometric Type instrument is fork mounted and driven by a flexible cable attached to the gearbox. To remove the cable from the driving end it is necessary to take out the small fixing screw in the face of the gearbox just below where the cable enters and it can then be pulled out of the housing. When refitting the speedometer flex into the gearbox it will probably be necessary to rotate the rear wheel slowly so that the flat metal tongue on the end of the inner cable can engage with the corresponding slot on the short driving spindle in the gearbox.

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.

Front Stand

Never use the front stand by itself. Always first place the machine on the rear stand and then swing the front stand down under the wheel until the stand is vertical. Do not let it touch the brake cam bearing or damage may be done to either the stand or the brake.

Tyre Pressures

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

Model	Tyre Size	Pressure (lb. per sq. in.)
K.G. Solo	Front 3.25 × 19	20
	Rear 3.50 × 19	18
K.G. Sidecar ...	Front 3.25 × 19	24
	Rear 3.50 × 19	30
	S/car 3.25 × 19	17
K.H. Solo	Front 3.00 × 20	22
	Rear 3.50 × 19	18
K.H. Sidecar ...	Front 3.00 × 20	28
	Rear 3.50 × 19	26
	S/car 3.25 × 19	17

All models, both solo and combination, may be fitted with spring frame, in which case pressures in rear tyres should be increased by 2 lb. per square inch.

When a pillion passenger or additional load is carried the pressure in the rear tyre should be increased in accordance with the load and pressure schedule shown in the Dunlop booklet.

ARIEL MOTORS LIMITED

PROPRIETARY EQUIPMENT & ACCESSORIES

Although every effort is made to obtain the most suitable and highest quality fittings of a proprietary nature for incorporating into our Motor Cycles, our guarantee does not cover such parts.

In the event of trouble being experienced with proprietary fittings, the part or parts should be returned to and claims made direct on the actual manufacturers who will deal with them on the terms of their respective guarantees. Date of purchase and mileage covered should always be clearly stated when submitting a claim.

Magneto (B.T.H.)

The British Thomson-Houston Co. Ltd., Coventry.

Carburetters

Amal Ltd., Perry Barr, Birmingham.

Chains

The Renold and Coventry Chain Co. Ltd., Didsbury, Manchester.

Magneto and Electrical Equipment

Messrs. Joseph Lucas Ltd. (Service Dept.), Great King St., Birmingham, 19 and Great Hampton St., Birmingham, 18

Horns—Electric

Messrs. Joseph Lucas Ltd. (Service Dept.), Great King St., Birmingham, 19 and Great Hampton St., Birmingham, 18.

Clear Hooters Ltd., 33 Hampton St., Birmingham, 18.

Saddles

Messrs. Lycetts and Motor Accessories Co. Ltd., Ludgate Hill Passage, Birmingham, 3.

Messrs. Herbert Terry and Sons Ltd., Redditch.

Speedometers

Messrs. S. Smith (MA) Ltd., Cricklewood, London.

Tyres

The Dunlop Rubber Co. Ltd., Fort Dunlop, Birmingham.

Sparking Plugs

Lodge Plugs Ltd., Rugby.

Gearboxes

Messrs. Burman and Sons Ltd., Wychall Lane, Kings Norton, Birmingham, 30.

LUBRICATION RECOMMENDATIONS

	Wakefield	Esso	Price's	Shell	Vacuum
Engine Summer	Castrol XXL	Essolube 50	Energol S.A.E. 40	Triple Shell	Mobiloil BB
Winter	Castrol XL	Essolube 40	Energol S.A.E. 30	Double Shell	Mobiloil A
Gearbox	Castrolease Medium	Esso Grease	Belmoline D	Shell Retinax CD	Mobilgrease No. 2
Oil Bath, Chain-Case and Rear Chain	Engine Oil	Engine Oil	Engine Oil	Engine Oil	Engine Oil
Wheel Hubs	Castrolease Heavy	Esso Grease	Belmoline C	Shell Retinax RB	Mobil Hub Grease
General Greasing	Castrolease CL	Esso Grease	Belmoline C	Shell Retinax CD	Mobilgrease No. 2
Telescopic Forks Normal conditions	Castrol XL	Essolube 30	Energol S.A.E. 30	Double Shell	Mobiloil A
Arctic conditions	Castrolite	Essolube 20	Energol S.A.E. 20	Single Shell	Mobiloil Arctic

TECHNICAL DATA

Description	Model K.G.	Model K.H.
Wheelbase—inches	56	56
Overall length—inches	86	86
Handlebar width—inches ...	27	27
Ground clearance—inches ...	5	5
*Weight fully equipped—lb. ...	384	384
Oil consumption—m.p.g. ...	2,000	2,000
Petrol tank capacity—gallons ...	4	4
Solo Gear Ratio—Top	5.20	5.20
,, ,, ,, —Third	6.65	6.65
,, ,, ,, —Second ...	9.15	9.15
,, ,, ,, —Low	13.85	13.85
Sidecar Gear Ratio—Top ...	5.75	5.75
,, ,, ,, —Third ...	7.40	7.40
,, ,, ,, —Second ...	10.15	10.15
,, ,, ,, —Low ...	15.40	15.40
Engine Sprocket—Solo	21T	21T
,, ,, —Sidecar ...	19T	19T
Chain, front, ½ in. pitch No. of links	81	81
Chain, Rear, ⅜ in. pitch No. of links	95	95
Cylinder bore	63 mm.	63 mm.
Engine stroke	80 mm.	80 mm.
Engine b.h.p. at	24.0	26.0
,, r.p.m.	6,000	6,500
Cubic capacity—actual	498 c.c.	498 c.c.
Compression ratio	L.C. 6.8	L.C. 6.8—7.5 H.C.

* Spring Frame Models 22 lb. plus.

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

GEAR RATIOS	MILES PER HOUR																				
	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90				
4.7	607	912	1215	1520	1825	2130	2430	2730	3035	3345	3650	3955	4260	4555	4865	5160	5475				
5.0	646	970	1295	1615	1945	2270	2590	2915	3230	3560	3895	4215	4540	4850	5180	5495	5830				
5.7	735	1107	1470	1845	2215	2580	2940	3315	3690	4060	4430	4790	5160	5530	5900	6250					
6.0	778	1165	1555	1945	2330	2720	3110	3500	3885	4275	4660	5050	5440	5835	6220						
6.4	830	1240	1655	2065	2485	2895	3310	3720	4130	4550	4970	5380	5790	6200							
6.5	843	1260	1680	2095	2525	2940	3360	3775	4200	4620	5040	5465	5880								
7.2	930	1395	1860	2330	2790	3260	3720	4185	4660	5120	5580	6050									
7.3	943	1415	1885	2360	2830	3305	3775	4245	4725	5190	5670										
7.7	955	1490	1990	2490	2985	3485	3980	4470	4980	5470	5970										
8.0	1036	1557	2072	2590	3115	3620	4145	4660	5180	5695	6230										
8.8	1140	1705	2275	2845	3420	3980	4560	5125	5695	6260											
9.2	1190	1780	2380	2975	3575	4165	4770	5360	5950												
9.7	1260	1880	2505	3135	3770	4380	5030	5650	6270												
10.1	1330	1995	2655	3330	3995	4660	5340	5990	6530												
10.6	1395	2095	2785	3500	4200	4890	5615														
11.7	1540	2310	3075	3860	4625	5400															
12.6	1630	2445	3266	4075	4885	5700															
13.3	1720	2585	3460	4300	5170	6020															
15.3	1985	2960	3960	4870	5945	6920															
16.1	2085	3130	4170	5220	6240																
19.4	2510	3755	5020	6300																	

WHEN AND WHERE TO LUBRICATE

Every 250 miles

OIL	Check level in Tank and top up if required.	
	Clutch-operating Lever Pivot ...	1 point
	Clutch-operating Plunger	1 „
	Thrust points between Lever and Plunger	2 points
GREASE	Spring Frame when fitted	4 „

Every 500 miles

OIL	Replenish Primary Chain Case to "Oil Level" Plug.	
	Check supply to Rear Chain	1 point
	All Handlebar Controls and Cables.	
	Front and Rear Brake Operation Pivots and Cable.	
	Outer End Brake Cam Bearings in each Wheel	2 points
GREASE	Rear Brake Pedal Pivot ...	1 point
	Foot Gear Change, if Nipple fitted	1 „
	Kickstart Crank, if Nipple fitted	1 „
	Speedometer Spindle, if Nipple fitted	1 „

Every 1,000 miles

GREASE	Steering Head Bearings	2 points
	Rear Wheel Bearings	1 point
OIL and GREASE MIXTURE	2-3 ozs. in Gearbox. Approx. 1 teacup	

Every 1,500 miles

Drain Oil Tank and Sump, flush out and refill.

Every 2,500 miles

OIL	Plain Dynamo Bearing Commutator...	1 point
GREASE	Withdraw Clutch Push Rod and grease lightly, including ball in Plunger ...	2 points
	Front Hub (remove spindle)	1 point