



OWNER'S GUIDE

MODEL F.H.

"THE HUNTMASER"

650 c.c.
TWIN
CYLINDER



ARIEL

THE MODERN MOTOR CYCLE

ADDENDUM FOR THE
1958-59
OWNER'S GUIDE

MODEL FH
650 c.c. "HUNTMAS^TER"
TWIN CYLINDER

Petrol Tank

Capacity 4½ gallons. Refer to page 52 re method of fixing and read as follows:—

The petrol tank is fitted to the top tube of the frame by one single bolt fixing, thus facilitating ease of removal for decarbonisation purposes.

To remove the tank, first take out the two small securing screws from the front end of the chromium plated strip across the top face of the tank and lift off this strip, taking note of the method of attachment at the rear end.

In the centre orifice of the tank will be observed the single fixing bolt nut ($\frac{3}{8}$ " \times 26 t.p.i.), which can be removed with an ordinary tube spanner and the tank can then be lifted clear of the frame. When removing take care not to misplace the steel flat washer and one spring washer located under the nut.

Note also the position of the steel distance tube and thick packing rubber through which the fixing bolt is located.

The method of locating the head of the self-aligning fixing bolt in the slotted bracket on the top frame tube will also be noted.

Take care when fitting the tank to ensure that the four buffer rubbers are located in the recesses provided in the base of the tank.

Detachable Rear Wheel. (Refer to page 38).

Note that it is not necessary to disconnect the rear chain when removing the rear wheel only, but it is essential to take off the chain when removing the rear sprocket from the left-hand rear fork end.



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650 c.c.

TWIN CYLINDER
MOTOR CYCLE

"THE HUNTMASTER"

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First Published January 1956
First Reprint November 1957
Second Reprint July 1958
Third Reprint November 1959
Fourth Reprint August 1963

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CW/TP

9000/56/59

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 each 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 with Prefix Letters 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 left-hand side of the steering head lug. We advise owners to make themselves conversant with all aspects of their machine by reading carefully the literature supplied.

ENGINE

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 upper cylinder lubricant 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 60 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.

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 air lever closed, the twist grip throttle set just off the shut position, and the kick-starter used in the ordinary way. When the engine has started, allow the kick-starter to return to its normal position immediately. Ignition timing is automatically set in the retarded position for starting. 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 closed position. To stop the engine, press the button switch on the handlebars.

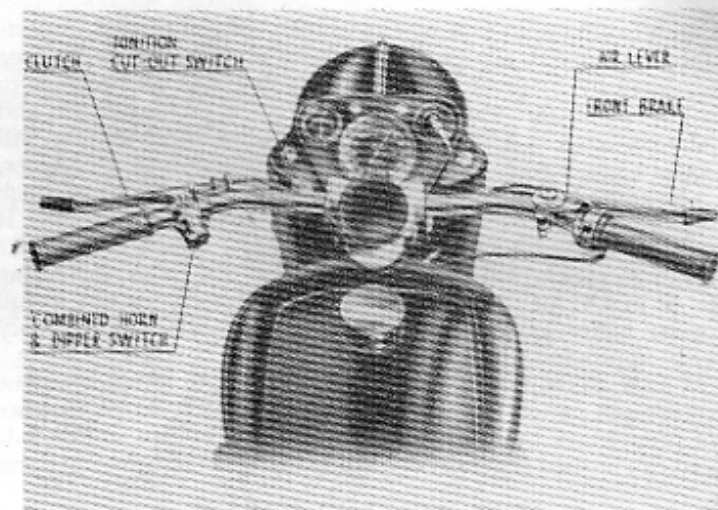


Fig. 1. Showing Controls and Equipment.

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 tap.
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 high-tension 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 high-tension lead from one of the sparking plugs, i.e. hold it about 1/16" away from the plug electrode and turn the engine with the kick-starter. 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 Magneto, page 29).
7. Examine the sparking plugs, clean the insulation thoroughly, and set the points to .015" .018".
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 Carburetter, page 26).
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 valve rocker clearance and adjust to instructions on page 21. See that all valves are opening and closing properly when the engine is rotated.
3. Make sure the magneto cut-out switch has not been deranged to cause a short circuit.
4. 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 quite clear.
5. 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 gearchange 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 in-correct adjustment, makes neutral finding difficult. See Fig. 2.

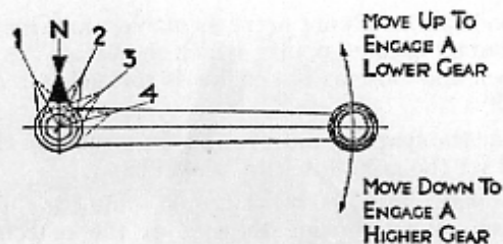


Fig. 2.

2. To engage low gear without noise after the machine has been standing for 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, halfway 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 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. If you are used to a single cylinder engine, do not misjudge 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

The four-stroke engine has two vertical cylinders in a monobloc iron casting, 70 mm. (2.755") BORE; 84 mm. (3.307") STROKE.

Actual cubic capacity, 646 c.c. (39.4 cubic inches).

The forged steel crankshaft, with counterweight and central flywheel, is mounted on a large roller bearing on the drive side and a plain white metal lined bearing on the timing side.

Alloy pistons are carried on sturdy but light alloy connecting rods by floating type gudgeon pins; the small ends of the rods are bushed and the large ends split and fitted with replaceable white metal half liners.

One single integral camshaft is installed and gear driven from the train of four timing pinions. The first pinion is situated on the end of the crankshaft, the next an intermediate or idler driving the camshaft pinion, and lastly the magneto pinion driving the flange mounted magneto with its automatic timing control at half engine speed.

A compensated voltage control type dynamo is chain driven, being coupled to the idler pinion shaft and dynamo sprocket.

A double-gear type oil pump situated within the timing case is driven by spiral gearing on the crankshaft.

The cylinder head has been specially designed to govern temperature control, and a free flow of cooling air over the main surfaces of the head is possible, due to the general layout of the finning arrangement.

The cylinder block is secured to the crankcase by a flange and accessible studs and nuts. A joint washer is used between the cylinder block and crankcase face, and a gasket is fitted between the cylinder and cylinder head to ensure a pressure-tight joint. The four tappets are positioned in the base of the cylinder block. See Fig. 3.

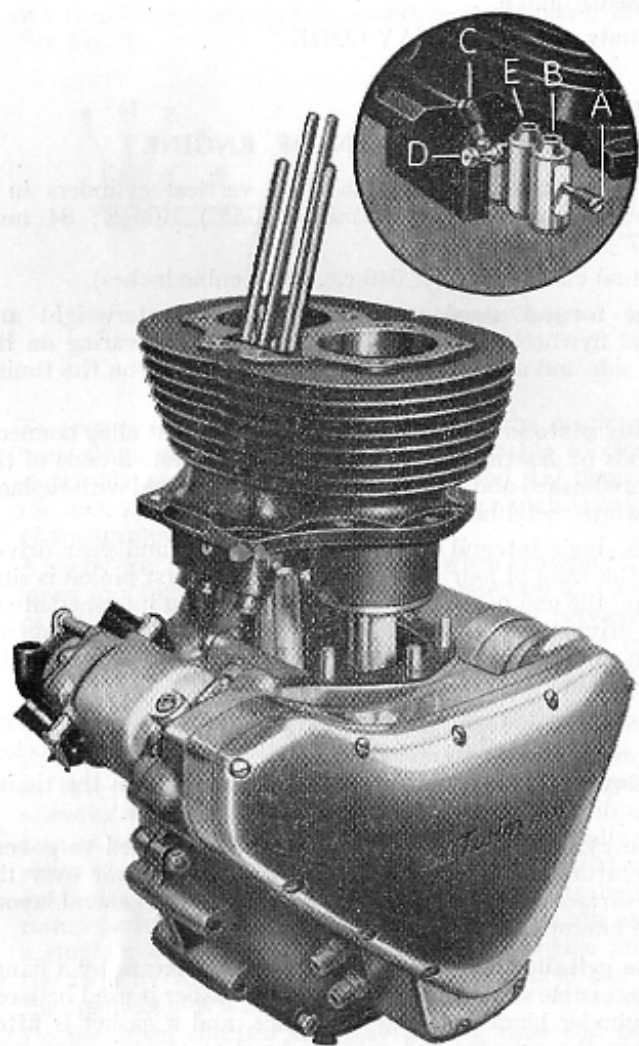


Fig. 3. Insert showing Tappet Assembly.

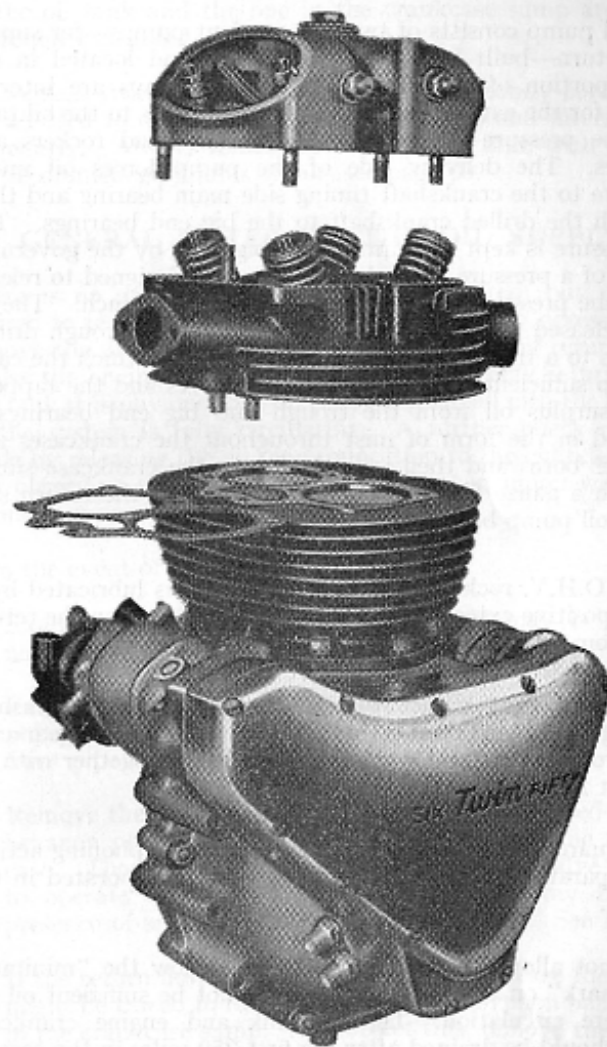


Fig. 4.
Cylinder, Cylinder Head and Rocker Box Assembly.

ENGINE LUBRICATION

The oil pump consists of two independent pumps—for supply and return—built into a common body and located in the lower portion of the timing case. All oilways are internal except for the external supply and return pipes to the oil tank and the pressure feed supply to the overhead rockers and spindles. The delivery side of the pump forces oil under pressure to the crankshaft timing side main bearing and then through the drilled crankshaft to the big end bearings. The oil pressure is kept constant at the big ends by the governing action of a pressure control valve which is designed to release when the pressure reaches 50/60 lb. per square inch. The oil thus released passes into the timing case and through drilled oilways to a trough below the camshaft, from which the cams pick up sufficient oil to lubricate themselves and the tappets.

All surplus oil from the trough and big end bearings is directed in the form of mist throughout the crankcases and cylinder bores and then is drained into the crankcase sump, through a gauze filter, and thence by way of the return side of the oil pump back to the oil tank.

The O.H.V. rocker and spindle assembly is lubricated by a direct positive external pipe line connected between the return pipe from the crankcases and the rocker boxes.

Operating automatically and driven from the camshaft gearing, a timed breather is located in the timing gear case and provides outlet for crankcase pressure together with an oil mist feed onto the driving chain.

To guard against any possible internal oil syphoning action, two separate anti-syphon ball valves are incorporated in the system.

Do not allow the level of oil 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 crankcase sump should be drained after the first 250 miles in the case of new or reconditioned engines, and again after 500 miles. The same procedure should be adopted then at every 1,500 miles. When draining the tank and sump always wash out with a

clean flushing oil and ensure that the gauze filter in the top of the oil tank and the one in the crankcase sump are both thoroughly cleansed.

Overseas Ariel owners riding in dusty or sandy conditions are advised to clean out the oil tanks, sump and filters more frequently. Always remember to refill the tank with one of the recommended grades of oil—see page 60.

GENERAL NOTES ON THE OIL SUPPLY

There is no gauge or pressure indicator fitted, but if it is desired to test the oil flow at any time it is only necessary to remove the oil tank filler cap and observe the oil return flow whilst the engine is running. If the oil is being returned to the tank it is obvious that oil is being pumped into the engine as the system is fully circulating. A further check can be made by releasing the oil pipe connection to the cylinder head and observing the flow of oil from the open union with the engine running.

In the event of a failure of the oil supply:

1. Examine the oil level in the tank. It may be below normal.
2. Examine oil pipe connections from tank to engine at four points for leakage. On the supply or delivery side (the front pipe) it may be drawing in air.
3. Remove the pressure control valve which is located in the hexagon plug in front of the lower portion of the timing case. Thoroughly clean and ensure that the valve is free to operate and is not obstructed in any way by the presence of small particles of foreign matter. See Fig. 5.
4. If the return flow of oil to the tank should cease the cause might be traced to the failure of the anti-syphon ball valve in the crankcase sump. To correct this, remove the cover plate and the ball valve will be seen located in the return oil pipe from the sump, and insert a stiff piece of wire into the valve orifice, thus lifting the ball off its seating to free it.

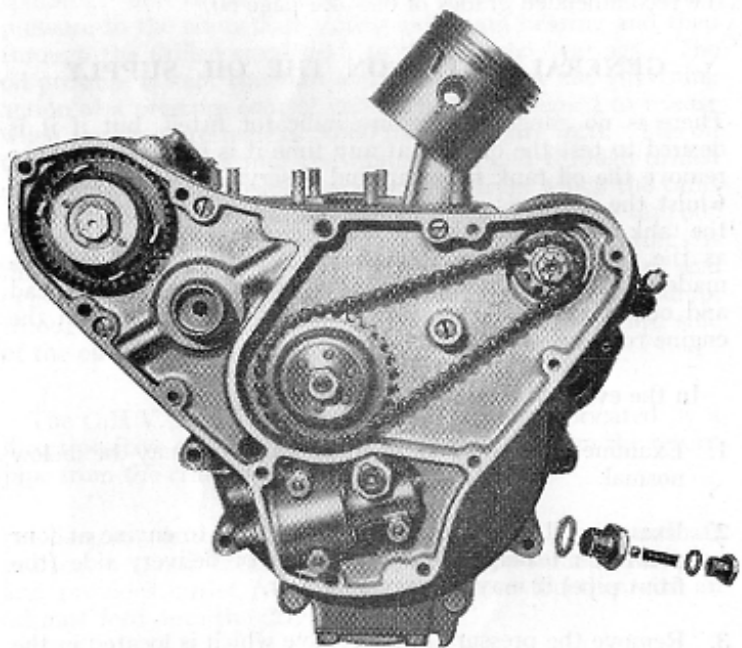


Fig. 5.
Showing Dynamo Drive, Oil Pump and Oil Pressure
Release Valve.

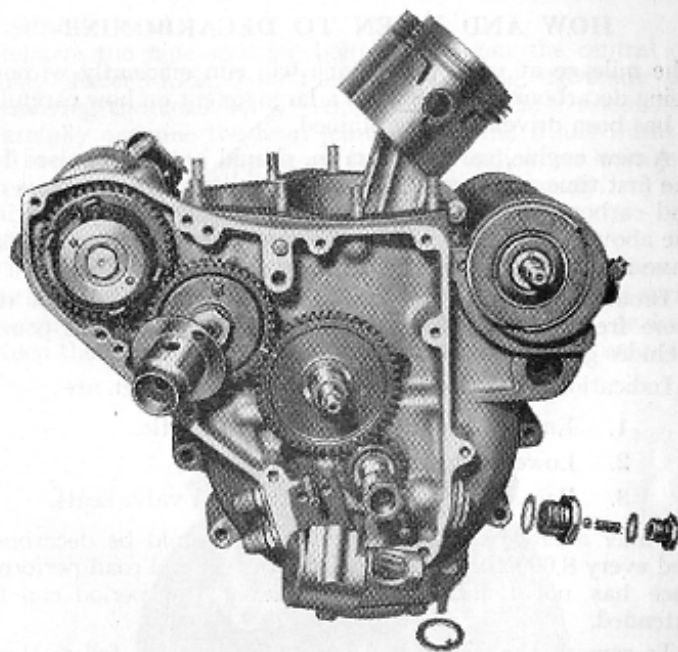


Fig. 6.
Showing Timing Gears, Oil Pump Drive and Timed
Mechanical Crankcase Breather.

5. The oil pump should be regarded as a complete assembly and not needlessly dismantled. The pump will rarely require any attention providing the lubrication system is kept clean. Therefore, only in the event of a total failure of the whole lubrication system or when the annual overhaul takes place should the pump be dismantled for examination and cleaning.

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 rocker box and cylinder head, follow these instructions carefully:

Raise the petrol tank, remove exhaust pipes, carburetter, petrol pipe, rocker covers, sparking plugs and oil pipe assembly from crankcase to rocker box. Remove the engine steady stays from the rocker box end only. Releasing the stay fixing from the frame end will allow the stays to be pivoted away from the engine.

Rocker box

Remove the four rocker box securing bolts and the four nuts from the studs under the rocker box and finally the nut from

the stud inside the rear cover aperture. Note that special "shakeproof" washers are fitted under the outside bolt heads as well as under the four stud nuts.

The rocker box can now be lifted off complete.

Push rods

These can now be lifted clear.

Cylinder head

Remove the nine securing bolts, taking out the central one first. Refer to Fig. 7 for the order of fitting, tightening and removing the head bolts. After removing the cylinder head carefully examine the head joint gasket, and if any burnt or oil stained patches appear on the faces, indicating leakage, a new gasket should be prepared ready for reassembly.

Valves

The valve springs are retained by common type split cones or cotters and can be very easily removed with the aid of a spring compressor tool (obtainable from most accessory dealers). Keep the valves, springs and cotters to their respective ports.

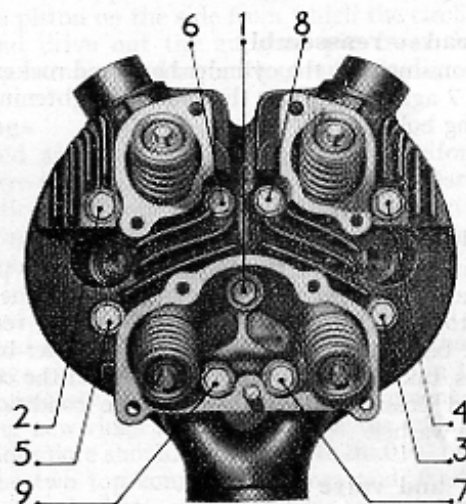


Fig. 7.

Cylinder Head showing order of tightening fixing bolts.

Valve grinding

Note the condition of each valve angular face before attempting to regrind, and if any deep pitting is present these valves should be properly refaced by a competent Service Depot or returned to the Ariel factory.

Do not attempt to grind excessively any pitted valves or seatings as this will cause widening and pocketing with an adverse effect on engine efficiency and performance.

Remove by scraping all carbon from the cylinder head, ports, valve heads, etc., and grind the valves in the now usual well-known manner using a good quality fine grinding paste. After all valves and seatings have been restored to show a uniform finish all parts should be thoroughly washed in paraffin and wiped clean before reassembly. It is advisable always to smear the valve stems with engine oil before insertion into the valve guides.

Valve springs

When decarbonising it is advisable to examine the valve springs and compare them for length. If due to lengthy service any spring is found to be compressed unduly it should be replaced.

Cylinder head — reassembly

After decarbonising refit the cylinder head and rocker box and refer to Fig. 7 again regarding the order of tightening the full set of securing bolts.

TOP OVERHAUL

Cylinder block and pistons

After removing the cylinder head and rocker box as previously described under "Decarbonising," rotate the engine to bring the pistons to the lowest position of the stroke, remove the nine cylinder base nuts and gently lift the cylinder block clear of the pistons, taking care to support these and the connecting rods to avoid possible damage. Note the condition of the cylinder base washer.

Rocker box and valve rockers

If it is considered necessary to remove the rockers from the rocker box, first take off the two dome spindle nuts from the right hand side and lightly drive out the rocker spindles by

applying a soft metal punch to the exposed thread ends. Note the exact position of the inlet and exhaust rockers and the various flat and spring distance washers, which must be reassembled in the correct order.

Pistons

Before removal from the connecting rods make an identification mark on each as they must be reassembled in the original order.

Gudgeon pin circlips

One spring clip is fitted at each end of a gudgeon pin but it is only necessary to take out one to enable the pin to be extracted. A circlip can be removed by inserting a sharp pointed instrument such as a scriber tool or a thin screwdriver ground to suit under the clip and prising out. Do not refit circlips more than two or three times—replace by new ones.

Gudgeon pins

These are a tight fit in the pistons and to remove it may be necessary to heat the piston slightly by covering with a cloth which has been dipped in boiling water and squeezed dry. Support the piston on the side from which the circlip has been removed and drive out the gudgeon pin from the opposite side, using a hammer and a punch of suitable diameter.

Piston rings

These should appear bright and present a uniform bearing surface where they rub on the cylinder bore. Dark or burnt marks, particularly near the ends of the rings, indicate that gas is blowing past causing loss of compression, and that the rings should be replaced. To check the piston ring gaps insert each piston into its bore without rings and then place each ring independently in the cylinder bore hard up against the lower end or skirt of the piston. Measure the gaps with a feeler gauge. Rings should be perfectly free in the grooves with approximately .003" up and down movement when new. When fitting new rings the gap between the ends when tried in the cylinder bore should not be less than .010" or more than .015" for the two top compression rings and .009" and .013" respectively for the bottom slotted type scraper rings.

Note that the TOP compression ring is of chrome type and cannot be interchanged with the lower ones.

Valve tappet assembly

The tappet assembly, which is positioned in the base of the cylinder block, does not normally require attention, but if it is desired to dismantle and examine for any reason, proceed as follows. Remove the two setscrews 'A' (see Fig. 3) and take out the two inlet tappets 'B.' Next remove the centre setscrew 'C,' taking note of the 3/16" diameter steel ball beneath it, and then push out the grooved tappet retaining pin 'D' from the inside of the barrel and remove the exhaust tappets 'E.'

The inlet and exhaust tappets are not interchangeable.

REASSEMBLY AFTER TOP OVERHAUL

Joint washers and gaskets

Before assembly is commenced have in readiness a set of new washers and gaskets and fit these where considered necessary.

Pistons

When refitting the pistons lightly heat as previously described and place them on the same connecting rods from which they were removed.

Gudgeon pins and circlips

Smear these with clean engine oil and tap into position while the pistons are heated, taking care to support the piston from the opposite side. Ensure that each circlip is carefully replaced otherwise extensive damage can be caused to the cylinder bores should a gudgeon pin become displaced.

Cylinder base joint washer

To ensure a perfect leakproof base always lightly smear both sides of the washer with a good quality jointing liquid.

Cylinder block

When refitting the cylinder it is essential to hold the pistons as securely as possible in a vertical position in order to allow the block to be lowered and the piston rings to be eased into

the bores. First smear the bores and pistons with engine oil of the same grade as used in the supply tank. Rotate the piston rings until the gaps appear on opposite sides and not on the front or rear bearing faces of the pistons. Procure two 8" lengths of 3/4" square section hardwood and place across the top of the crankcase front and rear, turning the engine until the pistons rest squarely on the strips, and lower the cylinder into position. Piston ring compression clips can be obtained from most accessory dealers, and the use of these does enable the cylinder block to be fitted single handed. Finally, tighten all cylinder base nuts.

Cylinder head

Refit with new gasket as described under "Decarbonisation."

The push rods

The rods are refitted by insertion through the apertures in the cylinder head and locating them into their respective tappet cups. The two inlet rods are the short right and left hand ones and the two exhaust long rods are the centre ones.

The rocker box

When refitting the rocker box take care to ensure that the push rods are correctly located in their respective valve rocker ends and carefully tighten the rocker box securing bolts and nuts. Note the position of the two front engine steady stays.

Valve tappet clearance and adjustment

Valve clearances and adjustments should always be carried out when the engine is cold. The correct clearances for all inlet and exhaust valves should be .010" (.254 mm.).

The rocker or tappet adjustment screws have squared ends for adjustment purposes and a suitable spanner is provided in the tool kit. The screws are secured by locknuts. Always ensure that the locknuts are securely tightened. Valve end caps are not fitted, all valve stems being specially treated to prevent wear.

When adjusting tappet clearances it is essential to adopt the following procedure.

1. Rotate the engine until one INLET valve is fully open and then adjust and check the clearance of the other INLET valve, which should now be fully closed with a clearance of .010". Use the .010" feeler gauge for accuracy when checking.
2. Adopt similar action for adjustment of the opposite INLET valve by rotating the engine again until the valve which has been adjusted is wide open.
3. Repeat exactly the same procedure for adjustment of the two EXHAUST valves.

Suitable spanners are provided in the tool kit.

DISMANTLING THE DYNAMO, MAGNETO AND TIMING GEARS

Remove the outer timing gear cover. Note the position of the twelve fixing screws, which are of varying lengths.

Detach the dynamo securing strap and rotate the dynamo in its housing in order to release the tension on the dynamo driving chain.

Remove the large dynamo driving sprocket which has a taper fixing and is secured by a lockwasher and nut. After loosening the nut an ordinary small workshop sprocket extractor can be used, but failing this the sprocket can be removed by giving a few light hammer and soft punch blows to the side of the centre taper boss. Withdraw the sprocket complete with chain. Take out the four deeply recessed fixing screws securing the inner timing cover and withdraw this from the crankcase face. The timed crankcase breather sleeve can remain in the cover, leaving the $\frac{1}{8}$ " thick cork washer attached to the camshaft gear.

The automatic ignition timing device, which is incorporated with the magneto driving gear, can be removed by unscrewing anti-clockwise 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 take the timing device to pieces or attempt to remove it from the gear wheel. Remove the cork washer from the face of the camshaft gear and next take off the nut and lockwasher, and the gear can then be withdrawn from the keyed end of the camshaft in a similar manner to the dynamo driving sprocket.

The idler gear, complete with shaft, can next be pulled away from the bushed crankcase. See Figs. 5 and 6.

The oil pump

The pump is held in position by three nuts and washers which are removed before taking off the locknut (left hand thread) and washers from the end of the crankshaft. As the oil pump is being withdrawn release the hexagon-headed worm gear which also has a left hand thread. The small timing pinion which is keyed to the crankshaft can be extracted using an ordinary workshop claw type extractor tool.

REASSEMBLY OF TIMING GEAR AND OIL PUMP

The timing pinion can be refitted by lightly driving it on to the keyed crankshaft with the concave side facing the crankcase. Follow with the plain steel washer.

The oil pump is next refitted, taking care to replace the joint washer, and ensuring that the holes correspond. Fit the pump and the driving worm on together, taking note that the worm is left hand threaded and therefore care must be taken to prevent damage to the corresponding spiral gear on the oil pump drive. The driving spiral worm is finally secured with the keyed washer and locknut.

The camshaft pinion can be easily refitted onto the keyed camshaft by adopting the following procedure. Insert a long screwdriver or similar instrument into the top of the crankcase and hold it against one of the cams and the top case lug to prevent the camshaft from moving inwardly and possibly displacing the key when fitting the camshaft gear pinion on the shaft. The pinion is fitted with the breather driving stud outwards and finally secured by the special locking washer and nut.

The idler pinion is next fitted after rotating the engine to bring the timing dot on the small crankcase pinion at the top to mesh with the corresponding dot on the idler pinion and

also so that the line or dash timing mark on the camshaft pinion meshes with the corresponding line or dash mark on the idler pinion. See Fig. 6.

The magneto is secured by two short bolts above and one long extension bolt below, with a thin paper joint washer fitted between the magneto and crankcase.

The magneto driving gear pinion, complete with automatic ignition advance device, should be placed in position on the armature spindle, but the centre locking nut can at this stage be left loosely attached until the timing is completed.

Ignition timing

See also *Technical Data*, page 56, for *Export Models*.

The standard ignition timing when the 6.5—1 compression pistons are fitted is $11/32$ " before T.D.C. with the automatic control held in the fully advanced position by turning the central bridge plate in an anti-clockwise (left hand) direction. Before tightening the automatic control and magneto pinion centre nut set the right hand side piston at top dead centre of the compression stroke and with both valves closed. Slowly rotate the engine backwards and forwards to check exactly T.D.C. This can be done by engaging the top gear and turning the rear wheel by hand and by inserting a metal rod into the sparking plug hole to enable the piston to be "felt." Next rotate the engine again very slowly backwards until the piston has moved down the cylinder bore $11/32$ ", which is the position required before T.D.C. Next rotate by hand the magneto contact breaker (turning it in its normal direction of rotation, i.e., clockwise or right hand) until the contact points are just on the point of opening and the armature segment is opposite the H.T. pick-up for the cylinder which is being timed. Now lightly drive the magneto gear and control unit on to the armature taper and tighten the central securing nut. Always check the ignition timing again before finally tightening the nut, as it is most important for the timing to be set accurately in order to obtain efficient engine performance.

The crankcase breather

Refit the mechanical breather on the camshaft gear pinion, taking care to ensure that the cork washer is located correctly between the pinion and breather. Next smear the breather

with engine oil. Place the paper joint washer in position on the inner face of the inner timing gear cover after covering the joint surface with jointing compound, and now place the inner gear cover in position and secure tightly with the fixing screws.

Dynamo drive

To refit the dynamo drive, first place the chain on the driven sprocket of the dynamo and then place the driving sprocket between the chain run (concave side of the sprocket facing inwards) with the cork washer positioned between the sprocket and the timing gear cover. Fit the driving sprocket on to the protruding shaft of the idler pinion and securely tighten in position with the lockwasher and nut. Next adjust the dynamo chain by rotating the dynamo in its cradle to give approximately $\frac{1}{8}$ "— $\frac{3}{16}$ " up and down play on the chain, but not sufficient to allow the chain to foul the screw boss in the centre of the cover near which the chain runs. Secure the dynamo by means of the strap fixing.

Dynamo chain lubrication

Before fitting the outer timing gear cover and joint washer, which should be prepared with jointing compound on the faces, insert approximately 4 oz. of a light grade grease in the chain housing. The chain is not otherwise automatically lubricated.

DISMANTLING THE COMPLETE ENGINE

Owners are not advised to undertake this work unless they have considerable mechanical ability.

The removal of the cylinder head, cylinder block and complete timing gear has already been described.

REMOVING THE CRANKCASE FROM THE FRAME

First take off the clutch and outer primary chaincase (see notes "Clutch and Gearbox"). Next the engine shock absorber assembly and primary chain, then the inner half primary chaincase.

Remove the various engine fixing bolts and plates, also oil pipes, etc., and the crankcase assembly, or the complete engine if so desired, can be taken out of the frame.

By separating the two halves of the crankcase the crankshaft assembly and the integral camshaft can be withdrawn.

Owners should not attempt to remove crankshaft bearings or bushes, this being an operation to be undertaken by Official Service Agents only, or alternatively, the engine should be returned to the factory if a major overhaul is considered to be necessary.

Big end bearings

To replace the connecting rod big end liners, remove the connecting rods from the crankshaft assembly after taking off the castellated nuts. Note the position of the lipped liners, which must be fitted in the correct manner, and also note the markings on the respective connecting rod caps, which must not be interchanged. New liners must not be scraped. When refitting the big end bolts and nuts do not on any account attempt to slacken back the slotted nuts in order to allow the insertion of the split cotter pins. If any nut slot does not line up with a hole in the bolt when the nut is **fully tightened**, file a flat on the face of the nut until the hole in the bolt and the nut correctly line up.

Crankcase reassembly

When reassembling the crankcase smear the joint faces with jointing compound to ensure an oiltight assembly and take care to refit all crankcase bolts, nuts and lockwashers securely.

Engine shaft shock absorber

After fitting the engine unit into the frame and before reassembling the primary chain outer case and clutch, take note of the order of assembly of the shock absorber parts as follows:

- | | |
|----------------------------|----------------------|
| 1. Splined driving sleeve. | 4. Spring. |
| 2. Engine sprocket. | 5. Locking ring nut. |
| 3. Sliding member. | 6. Split cotter. |

THE CARBURETTER

Riders are strongly advised not to alter needlessly the carburetter setting. Keep the carburetter clean and periodically empty sediment and moisture from the float chamber. Note

that the size of the main jet controls mixture strength from approximately three-quarters 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 enriched 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 jet by metering the amount of air required for a correct mixture. 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.

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

Normal carburetter settings

- Amal "Monobloc" type 376/12.
- Main jet size No. 240.
- Throttle valve size No. 3½".
- Needle position: notches from top, 3.

For further details of carburetter tuning see the "AMAL Hints and Tips" leaflet issued with other literature supplied with each new motor cycle.

THE AIR FILTER

The air filter is a standard fitting and is connected to the carburetter by a rubber sleeve. The filter can be readily dismantled for cleaning which should be done frequently to prevent clogging. If kept clean no alteration is necessary to the standard carburetter setting, but if the internal gauze element is allowed to become even partly clogged the fuel consumption will increase and engine performance will deteriorate.

It is recommended that the cleaner be serviced frequently when operating under severe conditions and approximately every 1,000 miles under normal conditions.

To service

The air cleaner is fitted with an oil impregnated gauze element and requires to be periodically serviced. At intervals of 1,000 to 1,500 miles, according to local climate and road conditions, the gauze element should be removed and washed in a solvent such as petrol or paraffin and allowed to drain and dry. Then re-oil the element by immersing in engine oil and allow the surplus to drain off before replacing.

Recommended grades of oil for air cleaner

Below 10° F.	S.A.E. 10
10 — 32° F.	S.A.E. 20
32 — 90° F.	S.A.E. 30
Over 90° F.	S.A.E. 40

SPARKING PLUGS

It is very important always to fit the correct type sparking plug in order to obtain full engine efficiency.

After extensive tests the official factory recommendation for the most satisfactory plug is the Champion type No. L10S, or L7 Lodge type H.N.

It is advisable after every 1,000 miles (1,500 km.) to remove and clean the plugs and to check and adjust the points to give a gap of .015"-.018" (.38—.45 mm.).

THE DYNAMO

Output control

The dynamo is of the compensated voltage control type and is arranged to work in conjunction with a regulator unit which is fitted alongside the cut-out. The regulator causes the dynamo to give an output which varies according to the load on the battery and its state of charge. The dynamo also gives an increase of output to balance the current taken by the lamps whenever they are switched on. It will be noted that during daytime running, when the battery is in good condition,

the dynamo gives only a trickle charge, so that ammeter readings will seldom be more than one or two amperes. A discharge reading may be observed immediately after switching on the headlamp, but after a short time the battery voltage will fall and the regulator will respond, causing the dynamo output to balance the lamp load.

Maintenance

About every 10,000 miles take off the cover band and check the brushes and commutator. See that the brushes move freely in their holders by holding back the brush springs and pulling gently on the flexible connectors. If a brush is inclined to stick, remove it from its holder and clean its sides with a petrol moistened cloth. Be careful to replace brushes in their original positions in order to retain bedding.

The commutator should be clean, free from oil or dirt, and should have a polished appearance. If it is dirty, clean with a dry duster while the engine is slowly turned over. If the commutator is very dirty, moisten the cloth with petrol.

Lubrication

No lubrication is required to the dynamo as ball bearings are fitted to both the commutator and driving end bracket. These bearings are packed with grease during assembly and will last until the machine is in need of a complete overhaul.

THE MAGNETO

Cleaning and adjustment

About every 3,000 miles remove the contact breaker cover and examine the contact breaker. If the contacts are burned or blackened, clean them with fine carborundum stone or fine emery cloth and afterwards wipe away dust or dirt with a petrol moistened cloth. Check the contact breaker setting after cleaning.

To check the contact breaker setting turn the engine until the contacts are fully opened and insert the gauge provided on the ignition spanner. If the setting is correct the gauge should be a sliding fit. If, however, the gap varies appreciably from the gauge, slacken the locknut on the fixed contact and turn the contact screw until the gap is set to the gauge. Finally, tighten the locknut.

Next examine the pick-ups, which can be removed when the fixing arms are moved aside. See that the brush in each pick-up moves freely, and while the pick-ups are removed clean the slip ring track and flanges with a soft dry cloth.

Lubrication

About every 3,000 miles take off the contact breaker cover. Turn the engine over until the small hole in the cam can be seen. This hole is fitted with a wick which enables the oil to reach the pad and cam face.

Renewing high tension cable

A high tension cable showing signs of cracking or perishing must be replaced by 7 mm. rubber covered ignition cable. To make the connection to the pick-up terminal thread the moulded terminal nut over the cable, bare the end of the cable for about $\frac{1}{2}$ ", thread the wire through the washer removed from the original cable and bend back the wire strands. Screw the nut into its terminal.

THE BATTERY

About once a month take off the battery lid, remove the filler plugs from each of the cells and examine the level of the electrolyte in each cell. If necessary add sufficient distilled water to bring the electrolyte level with the top of the separators. Do not use tap water and do not use a naked light when examining the condition of the cells.

The condition of the battery should occasionally be checked by taking hydrometer readings of the specific gravity of the electrolyte. Readings should be taken after the motor cycle has been out for a run, when the electrolyte is thoroughly mixed. The specific gravity readings and their indications are as follows:

1.280 — 1.300	Battery fully charged.
About 1.210	Battery about half discharged.
Below 1.150	Battery fully discharged.

The readings for each of the three cells should be approximately the same. If one cell gives a reading very different from the others it may be that electrolyte has been spilt or

has leaked from this particular cell or there may be a short circuit between the plates. In this case the battery must be examined by a Lucas Service Depot or Agent.

Finally, never leave the battery in a discharged condition for any length of time; wipe away all moisture and dirt from the top of the battery and keep the terminals clean and smeared with petroleum jelly to prevent corrosion.

Special Note—The Positive terminal of the battery is earthed.

TRANSMISSION

THE "GB44" TYPE GEARBOX AND CLUTCH ASSEMBLY

The exploded view of the complete gearbox and clutch in this booklet clearly indicates the general arrangement of the internal gear, kick-starter and foot-change assemblies. Reference to the part numbers given in the list will provide a full description of each separate component part.

Location of the gearbox main case in the motor cycle frame is by the same method as adopted on previous models, i.e., being held between the right and left hand rear engine plates. The top fixing lug of the gearbox case is slotted and allows the box to be moved on the lower swivel lug to provide driving chain adjustment.

Lubrication

Ordinary engine oil is recommended for lubrication of the complete box, and a filler cap and an oil level plug are provided on the kick-starter end casing.

Oil code number or grade S.A.E. 50 to 60 of any reputable brand is suitable. See page 60.

The oil level should be checked every 1,000 miles and "topped up" as necessary.

Clutch adjustment

Clutch cable adjustment is by way of a common adjuster and cable stop on top of the gearbox end cover. The internal clutch operating arm or lever is located within the enclosed kick-starter end of the gearbox and adjustment provided by the inclusion of a simple sleeve nut arrangement located in a small cover plate on the outer face of the end cover.

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 viewed across the face of the spring plate. This setting provides ample pressure to ensure efficient clutch grip. If the clutch adjustment screws are tightened more it makes clutch withdrawal unnecessarily heavy. After adjustment see that the spring plate lifts equally; if not, the adjusting screws should be eased off on the low side or tightened on the high side until the plate is equally lifted.

The clutch operating lever within the kick-starter cover should be set to give up to 3/16" clearance or free movement, which can be felt by testing after removing the oil filler plug and exposing the lever.

To set the operating lever, loosen the small cover plate held by two screws on the face of the end cover and adjust the sleeve nut, which can be turned complete with the plate, until the correct position is found to give the necessary clearance. Finally, take up all unnecessary slack in the control cable by means of the external adjuster, but take care not to interfere with the free movement or clearance already given to the internal operating lever. Reference to the fully descriptive exploded view of the gearbox will readily assist operators to identify and adjust the clutch withdrawal assembly.

DISMANTLING THE CLUTCH ASSEMBLY

Clutch plates

Remove the clutch dome cover, held by four screws, and then undo the five spring retaining nuts projecting through the end spring plate. The complete set of clutch plates can now be withdrawn from the housing. If clutch slip has taken place, carefully examine the condition of the cork or fabric inserts

and replace with factory exchange plates if necessary. Care should be taken when reassembling to fit the plates in the correct order. The first plate to put in is a plain one, then alternately a cork or fabric insert plate and a plain plate, finishing with a plain one. See also "Clutch Adjustment," page 32.

Clutch body and sprocket

After removing 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 sleeve. This leaves the clutch sprocket and outer clutch housing (carried on a needle roller bearing) in position on the shaft. To remove these parts, turn 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, bearing cage and needle rollers can be slipped off the shaft. Note that the rollers are not held in the cage and can therefore drop out when the cage and sprocket are pulled off the shaft. When refitting these parts secure the needle rollers in the cage with a little grease. A plain washer fits **behind** the roller race and a tongued washer **outside** the race next to the clutch sprocket.

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 ensure that the mainshaft nut securing the clutch centre is tightened fully and the special lockwasher is placed behind the nut.

DISMANTLING THE KICK-STARTER CASE END COVER

Removing the kick-starter case end cover enables examination to be made of the internal clutch operating lever and plunger and also exposes the complete kick-starter and foot-change mechanism as well as the speedometer spiral gear drive.

Before removing the end cover take out the oil drain plug and allow all oil to drain off.

Release the clutch cable adjuster sufficiently to allow the inner wire and nipple to be detached from the inner operating lever.

Next take off the nut securing the gear indicator cap and small coil spring enclosed on the end of the foot-change cam barrel spindle. Then unscrew the six cheese-headed screws which secure the outer kick-starter cover to the inner kick-starter case, noting carefully the position of the three different lengths of screws used.

Next draw the cover forward approximately $\frac{1}{4}$ " taking care to hold securely the kick-starter crank and pedal in the vertical position.

Tie the kick-starter crank to the foot-change lever in order to prevent the kick-starter spring from unwinding.

The kick-starter end cover can now be fully removed complete with kick-starter quadrant and spring and also part of the foot-change operating assembly.

Note the position of the main RETURN SPRING for the foot-change control quadrant. This is the large "U" shaped flat steel spring working together with the cam cylinder.

After fitting any necessary replacement parts and cleansing, the end cover can be replaced by reversing the procedure, taking care to replace the paper joint washer and tightening all screws before refilling the case with oil. Be sure to replace correctly the small coil spring and gear indicator cap and nut.

DISMANTLING THE KICK-STARTER CASE OR BACK PLATE

After removing the kick-starter outer end cover, take off the mainshaft end nut, kick-starter driving ratchet and pinion, and the small coil spring and sleeve.

Next dismantle the gear selector spindle split pins and take out the foot-change cam cylinder, together with the spring plunger which, it will be noticed, makes contact with the various indentions on the face of the cylinder. Take out the clutch operating plunger and rod, noting the method of

engagement between the plunger and the operating lever, which will still be attached to the kick-starter case outer cover. Also note the position of the small steel ball between clutch rod and plunger.

Remove the four cheese-headed screws securing the inner kick-starter case to the main gearbox shell, noting the position of the two different lengths of screws, and withdraw the case, leaving the internal gear assembly, etc., in position in the main housing or shell.

It is possible to remove the kick-starter rear half case, complete with the internal gear assembly, selector forks, etc., all left in position, by taking off the complete clutch as previously described but also removing the splined driving sleeve fitted to the clutch end of the mainshaft.

Without dismantling the kick-starter ratchet pinion assembly the four securing screws are taken out and the rear half case can be pulled away with gear assembly attached. This method is the most satisfactory way of making a close examination of the gear assembly.

Reference to the exploded view should be made when dismantling and reassembling, and the correct order of gear assembly, part numbers and titles, carefully noted. When refitting the foot-change cam assembly place in position the ball ended plunger and small coil spring so that the ball end plunger engages with any one of the indentations on the rear face of the cam cylinder. Make quite certain that the paper joint washer is replaced between the kick-starter case and the main shell, and that the four securing screws are well tightened.

After dismantling the kick-starter cover and case with the gear assembly attached as previously described, it will be noticed that the main driving gear ball bearing, rear sprocket and oil seal will be left in position in the gearbox shell or main case. To remove these secure the sprocket to prevent rotation and unscrew the large nut locking the sprocket to the driving gear sleeve. Note the special lockwasher fitted behind the nut and also the order of assembly of the ball bearing, oil seal and retaining washers.

The driving gear will now push through into the gearbox case and the ball bearing, which is a press fit in the shell housing, can be driven out after removing the gland, oil seal, etc.

Reference should be made to the exploded view again when reassembling.

GEAR RATIOS

<i>Engine Driving Sprocket</i>	<i>First Gear</i>	<i>Second Gear</i>	<i>Third Gear</i>	<i>Fourth Gear (Top)</i>
24 T. Solo	12.01	7.71	5.93	4.53
21 T. Sidecar	13.74	8.81	6.78	5.18
Clutch chain wheel	...	...	44 teeth.	
Gearbox sprocket	...	...	19 teeth.	
Rear wheel sprocket	...	...	47 teeth.	

Clutch, gearbox and wheel sprockets are standard and cannot be altered.

PRIMARY CHAIN

$\frac{1}{8}$ " \times .305"—73 or 74 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 nut on the draw bolt swings the box about the pivot bolt, varying the chain tension. Adjust until the primary chain has approximately $\frac{3}{8}$ " up and down movement midway between the sprockets at the tightest point. Retighten clamp bolt and pivot bolt.

If the draw bolt 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.

REAR CHAIN

$\frac{1}{8}$ " \times $\frac{3}{8}$ "—100 pitches

For accessibility the spring clip fastener is fitted on the outer side of the chain and it is important always to ensure that the CLOSED end of the clip points in the direction of the drive.

Note also "Chains" booklet, issued with other literature for new machines.

Adjustments

The rear chain should be adjusted so that when the machine is on the centre stand and the damper units fully extended the chain will have an up and down movement of between $1\frac{1}{4}$ " and $1\frac{1}{2}$ ".

The chain will then have the normal adjustment of $\frac{5}{8}$ " up and down movement when the rear wheel is on the ground and the rider seated. See Fig. 8 for chain case inspection hole.

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. A drain plug is fitted, and if it is desired to drain off the oil the outer half of the chaincase need not be removed.

Rear chain lubrication is carried out by means of a feed pipe taken from the return supply of oil in the tank direct to the enclosed rear chain case or chain guard and chain. The pipe is fed with warm oil through a felt wick immediately below the tank filler cap and is, therefore a drip feed to the rear chain only when the engine is running.

When a rear chain open type guard only is fitted the exposed rear driving chain should be periodically 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. Primary and rear chain spring clip fasteners must be fitted with the closed end facing forward when the chains are running in the correct direction.

REAR WHEEL AND BRAKE

REMOVING REAR WHEEL AND BRAKE

Support the machine on centre stand. Remove the brake cable from the operating lever and adjuster on the brake plate after turning the latter and the locknut until the "split" allows the inner wire to be withdrawn. Disconnect the rear chain and remove the securing bolt from the front end of the brake anchor bar.

Remove the rubber plug ('A,' Fig. 8) from the enclosed rear chain case, when fitted, and rotate the rear wheel to expose each of the four wheel securing nuts, which can be removed by inserting the spanner provided through the plug 'A' hole. Next release the main hub spindle bolt (Fig. 9).

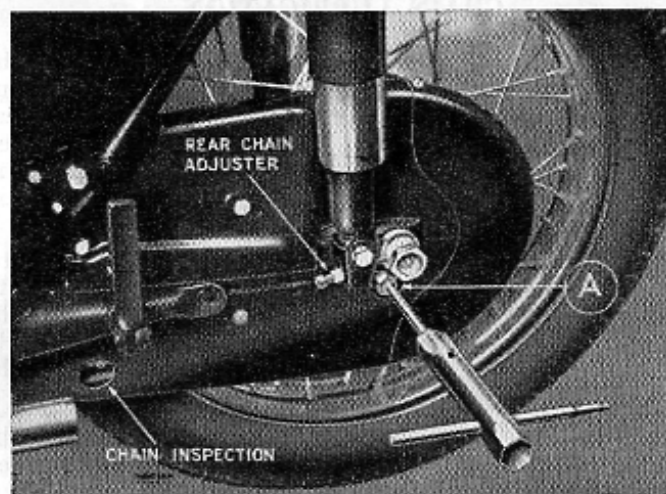


Fig. 8.

Remove the two bolts securing the dual seat stays and the four bolts securing the rear end of the mudguard.

Detach the two rear lamp "snap" cable connectors inside the rear guard, and the rear end of the mudguard can be removed, thus facilitating easy removal of the complete wheel, but leaving the chain sprocket and short fixed spindle in position (Fig. 9).

REMOVAL OF BRAKE PLATE AND ATTACHMENTS

After removing the rear wheel, the brake plate, with attachments, can be withdrawn, thus exposing the brake shoes, etc. To remove the brake shoes first release the tension on the two adjusting wedges by unscrewing fully the fulcrum adjuster on the brake plate, when the shoes can be pulled off. See Fig. 10.

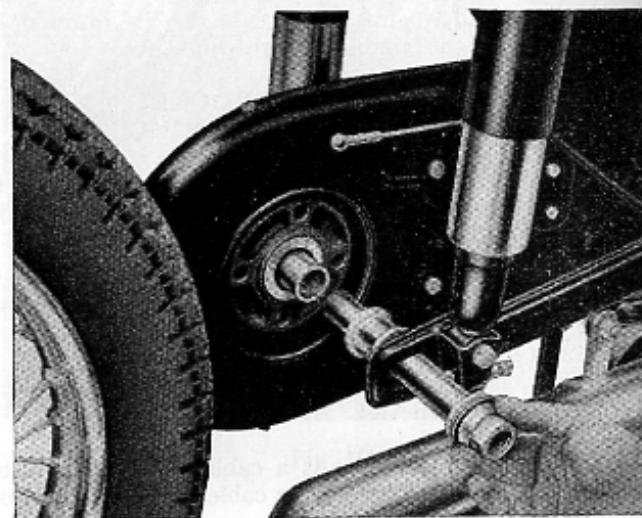


Fig. 9.

Note the location and action of the two brake shoes and one cam return spring.

Also note, when reassembling, to lightly grease the cam and fulcrum bearing faces, and inject grease into the cam spindle bearing by way of the nipple provided.

REMOVAL OF HUB BALL BEARING

After taking off the brake plate, with attachments, the screwed bearing locking ring can be unscrewed (right hand thread) but note the one indentation on the outer metal cover, which must be removed before unscrewing the ring.

The single row ball journal bearing can be tapped or pressed out from the right hand side, noting the location of the circlip, which need not be disturbed.

REAR HUB BEARING LUBRICATION

The ball bearing should be packed with grease before assembly and afterwards during service at approximately every 3,000 miles, when a small quantity of grease can be inserted by hand through the right hand side of the hub tube.

REMOVAL OF CHAIN SPROCKET AND LUBRICATION OF BEARING

The rear chain sprocket, with spindle and ball bearing, can be removed from the left hand fork end after releasing the securing nut and distance piece(s).

Next remove the spindle and take off the dust cover or plate, which will then expose the ball journal bearing, which can be tapped or pressed out from the opposite side. Note the location of the felt grease retaining washer.

REAR BRAKE ADJUSTMENT

Fitted to the rear brake plate is a cable stop and adjuster which can be used for adjusting the cable tension and taking up the initial cable stretch.

Adjustment for brake lining wear is made by turning the square-ended cam or fulcrum screw with one of the spanners provided in the tool kit.

The cable should first be slackened off as far as possible and then the brake shoes adjusted by turning the fulcrum screw clockwise until the brake linings just touch the bearing surface of the drum. Release the fulcrum screw two or three notches until the wheel revolves freely and then re-tension the brake cable with the adjuster, leaving just a trace of idle movement.

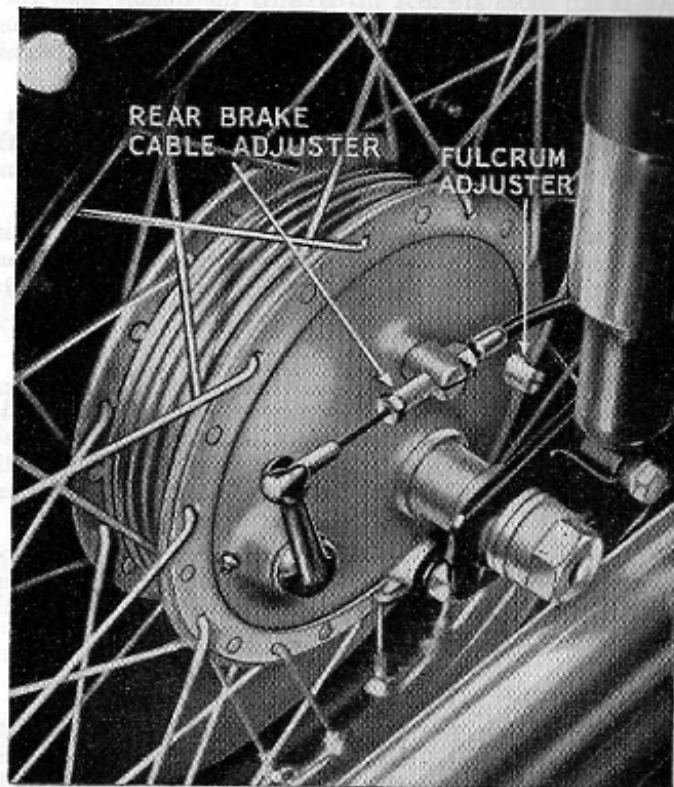


Fig. 10.

REAR BRAKE LININGS

The type of linings fitted to the full width alloy hubs are of a special wear-resisting material and thus guaranteed to give very long service under all conditions of running.

After lengthy service when it may be necessary to replace the linings, this should only be carried out by fitting a pair of complete brake shoes with linings attached as supplied direct from the factory.

All brake shoes are first fitted with the linings, and then turned or ground on the bearing surface to conform to a gauge corresponding to the size of the internal diameter of the brake drum, which is 6.970"—6.980".

One of the original brake shoes will be found to have a colour code mark corresponding to a similar mark on the brake plate, and the shoes should be refitted in the original order if for any reason dismantling has taken place.

Always insist that the local Ariel Dealer supplies genuine works replacement brake shoes complete with linings, and never attempt to reline the shoes unless facilities are available for turning or grinding linings after fitting.

REPLACING THE REAR WHEEL

When replacing the spindle it is easier to engage the thread if the nearside nut is slackened about one turn. If the brake anchor bar is taken off, notice that it is not perfectly flat, the large end pointing very slightly inwards and the smaller end outwards.

Be very careful when reassembling to refit in this position, also be careful when greasing the wheel bearings not to use too much grease or some of the surplus may escape on to the brake linings.

WHEEL ALIGNMENT

Whenever adjustment has been carried out to the rear chain it is advisable to check the road wheel alignment, because if this is incorrect the steering will be unsatisfactory and undue wear will occur with the sprockets and chains.

FRONT WHEEL AND BRAKE

REMOVING THE FRONT WHEEL

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

Release the front brake cable from the stop lug. Release the right hand front mudguard stay and brake plate anchor bar. See Fig. 11.

Loosen the pinch bolt on the lower end of the fork tube (Fig. 12), and also remove the large hub spindle nut on the brake plate side.

Insert a tommy bar in the hole on the end of the hub spindle, and by turning this in either direction it can be pulled out leaving the wheel free for removal.

REMOVAL OF FRONT BRAKE PLATE AND ATTACHMENTS

After removing the wheel the brake plate, with attachments, can be withdrawn thus exposing the brake shoes, etc.

To remove the brake shoes, release the tension on the two adjusting wedges by fully unscrewing the fulcrum adjuster on the brake plate, when the shoes can be pulled off.

REMOVAL OF THE TWO FRONT HUB BALL BEARINGS

After taking off the brake plate, with attachments, the screwed bearing locking ring can be removed (right hand thread), and also the same type screwed locking ring from the opposite side, noting the positions of the felt grease retainers.

Both single row ball journal bearings can be tapped or pressed out from each respective opposite side, noting the location of the two circlips which need not be disturbed.

FRONT HUB BEARING LUBRICATION

The two ball bearings should be packed with grease before assembly and afterwards during service at approximately every 3,000 miles, when a small quantity of grease can be inserted by hand direct into each bearing after removal of the hub spindle.

FRONT BRAKE LININGS

The type of linings fitted to the full width alloy hubs are of a special wear resisting material, and thus guaranteed to give very long service under all conditions of running.

After lengthy service, when it may be necessary to replace the linings, this should be carried out by fitting a pair of complete brake shoes with linings attached, supplied direct from the factory.

All brake shoes are first fitted with the linings, and then turned or ground on the bearing surface to conform to a gauge corresponding to the size of the internal diameter of the brake drum, which is 6.970"—6.980".

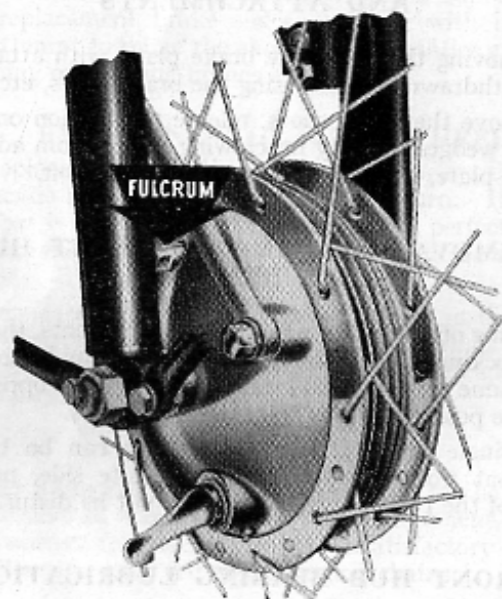


Fig. 11.

One of the original brake shoes will be found to have a colour code mark corresponding to a similar mark on the brake plate, and the shoes should be refitted in the original order if for any reason dismantling has taken place.

Always insist that the local Ariel Dealer supplies genuine works replacement brake shoes complete with linings, and never attempt to reline the shoes unless facilities are available for turning or grinding the linings after fitting.

FRONT BRAKE ADJUSTMENT

Fitted to the handlebar against the brake lever is a knurled screw-ring, which can be used for adjusting the cable tension and taking up the initial cable stretch.

Adjustment for brake lining wear is made by turning the square-ended cam or fulcrum screw (Fig. 11) with one of the spanners provided in the tool kit.

The cable should be first slackened off as far as possible, and then the brake shoes adjusted by turning the fulcrum screw clockwise until the linings just touch the bearing surface of the drum. Next, release the fulcrum screw two or three notches until the wheel revolves freely, and then re-tension the brake cable with the knurled screw on the handlebar, leaving just a trace of idle movement.

FRONT FORK ASSEMBLY

Lubrication recommendations

The forks are filled with oil before leaving the factory, the correct amount being approximately one third of a pint, or nearest equivalent 7 fluid ounces, for each respective leg. Under normal conditions of use the forks should not require "topping up" and provided leakage has not occurred, very lengthy service should be obtained before the forks need draining and refilling.

If the forks appear to have lost the original effective hydraulic damping action after lengthy service, each leg should be drained and refilled with approximately 6½ fluid ounces of one of the following grades of oils:

MOBIL OIL	...	...	Mobil oil A.
WAKEFIELDS	...	...	Castrol XL.
ESSO	...	...	Essolube 30.
B.P. ENERGOL	...	...	Energol 30.
SHELL	...	...	Shell X100-30.

Export

In countries where extremely cold conditions prevail it is recommended to use Mobil oil Arctic or an equivalent.

A heavier grade of oil can also be used especially if the motor cycle is adapted for heavy sidecar duty.

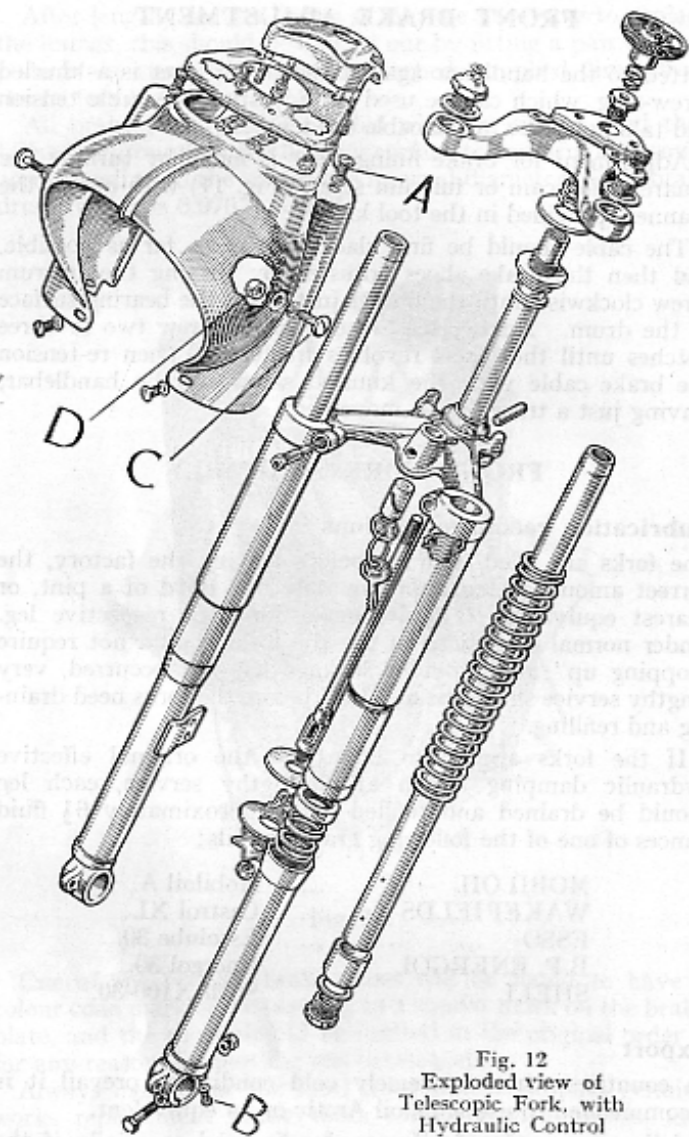


Fig. 12
Exploded view of
Telescopic Fork, with
Hydraulic Control

Draining the fork legs. See Fig. 12.

1. Remove the chromium plated screw plug 'A' from the top of each fork leg.
2. Remove the drain plug 'B' at the bottom of each fork tube and drain off all the oil into a suitable vessel, preferably a graduated half pint (10 ozs.) measure. To ensure that all the oil is fully drained work the forks up and down sharply. Note the amount of oil removed.
3. Refill each leg by way of the top screw hole 'A' with approximately one third of a pint, or the nearest equivalent 7 fluid ounces (198 c.c.), of any of the above recommended grades of oil.
4. Replace the plugs 'A,' and tighten securely.

Important. Do not overfill the fork tubes or the hydraulic action will be retarded.

Main coil springs

If the machine was ordered for use with a sidecar, stronger coil springs would have been fitted at the factory, but the Ariel Dealer will advise upon this matter if consulted.

It is not advisable to attach a sidecar to a machine not fitted with the stronger or heavy duty springs, and also it is not advisable to use a solo machine fitted with the strong springs if the maximum efficiency and comfort is desired.

Consult the Ariel Dealer from whom the machine was purchased if in doubt regarding the specification of the fork assembly, etc., if it is intended to use a sidecar.

Owners of Ariel machines are advised not to needlessly dismantle the fork assembly as this calls for a certain amount of mechanical knowledge and, therefore, such work should be placed in the hands of a competent mechanic or any Ariel Dealer.

STEERING HEAD ADJUSTMENT

The head bearings are of the cup and cone ball type, and should be adjusted after the first few hundred miles running, after which they will require only infrequent attention. 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 and gently screw the bottom nut 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 one-sixteenth 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 with the spanner to prevent it moving and securely tighten the top locknut.

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

STEERING DAMPER

The action of the steering damper is to make the steering much stiffer. It is extremely useful for combination work and high-speed solo work, particularly on rough roads. Do not tighten up the damper more than is necessary, and remember to slacken it off whilst reducing speed, as stiff steering at low speeds is very unpleasant and, on 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.

STEERING LOCK

The lock is a press fit in the base of the steering head lug, and secured by a small grub screw.

Two keys are provided, both bearing the code number of the lock. The number is stamped upon the barrel of the lock, but this is not visible until the lock is withdrawn from the head lug. First remove the grub screw, and the lock can be prised downwards. Spare keys can be obtained from Ariel Dealers, after quoting the code number of the lock.

Do not attempt to lubricate the steering lock internally, the mechanism is already packed with a special lubricant. If after being exposed to adverse weather conditions however, a few drops of very thin machine oil may be applied to the outer edge of the moving cylinder.

FRAME WITH PIVOTED REAR SUSPENSION

The "swinging arm" frame, with front duplex down tubes, gives the necessary rigidity for perfect steering, combined with load distribution between the extended cradle tubes, seat tubes and engine-gearbox mountings.

The "swinging arm", or pivoted rear assembly, is mounted to the main frame section by means of a fixed pivot spindle passing through two robust rubber bushings pressed into a welded cross tube. Upon this structure depends the rigidity of the rear wheel when subjected to side loads which occur especially when a sidecar is fitted, and the design of the complete frame has been based on this important point.

The rear suspension damper units incorporate flexible coil springs to carry the weight of the rider and pillion passenger, and the hydraulic damping device caters for all additional loading due to road shocks.

Built-in lugs are provided on the frame for sidecar attachment at five points.

The damper units are detachable and are supplied in two graded types for solo or sidecar use.

The respective code markings are engraved on the damper top cover as follows:

Solo Damper Unit ...	No. AT.6/7-1086.
Sidecar Damper Unit	No. AT.6/7-1086/1.

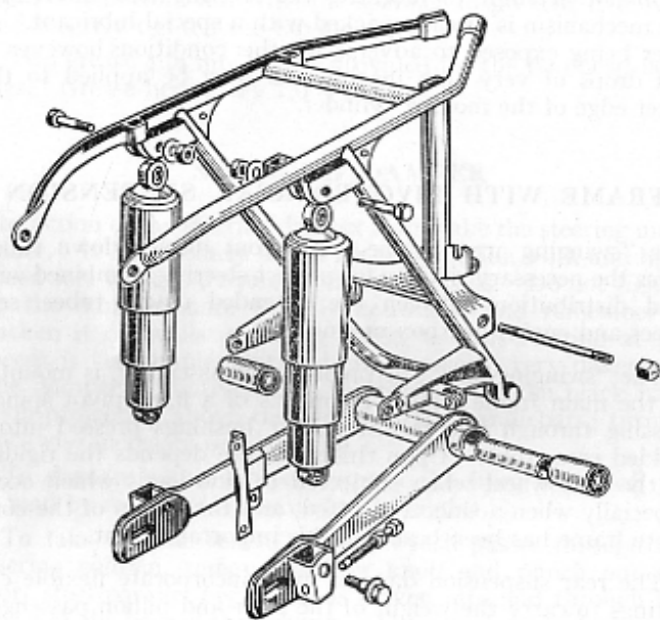


Fig. 13.
Pivoted rear suspension of frame ("swinging arm")
showing damper units, chain adjuster and
rubber bushing.

The damper units are sealed and do not require "topping up." After lengthy service the rubber mounting bushes may require renewal, these being easily removed by the ordinary workshop press method.

LAMPS

Headlamp

This is of the sealed beam type incorporating the main and pilot beams.

The lamp, being positioned within the covering hood or cowl, must be withdrawn forward if it is necessary to exchange a bulb.

To withdraw the lamp first unscrew the two securing pins 'C' (Fig. 12), taking note of the two inside distance pieces 'D,' which will fall away, and the complete lamp can then be withdrawn by placing one hand underneath the body and pulling forward out of the cowl or hood.

To gain access to both bulbs first remove the headlamp front after partially releasing the fixing screws at the base of the rim.

The pilot bulb is positioned in the beam or reflector unit by a sprung holder which can be simply pulled out. The main prefocus bulb is held in position by a bayonet fixing cap and cannot be wrongly refitted.

When placing the complete lamp back within the fork cowl or hood make certain to first position the two distance pieces 'D' before inserting the screws 'C.'

Stop and rear lamp

To gain access to the twin filament bulb it is only necessary to remove the two visible retaining screws and withdraw the red plastic portion of the lamp, the centre panel of which is the essential REFLECTOR.

Replacement bulbs

Headlamp (main):

Lucas pre-focus, 6 volt, 30/24 watts.

Stop tail lamp:

Lucas, 6 volt, 18/6 watts.

PETROL TANK

The petrol tank is secured by four set bolts, each having two rubber washers and one plain steel washer, and locked with a wire. The thick rubber washer goes next to the tank. The set bolts should not be screwed up too tightly.

To remove filler cap

Press downward, rotate filler cap a quarter of a turn anti-clockwise, and lift up.

To replace cap

Drop into position, press and turn cap clockwise as far as possible.

Reserve petrol

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

Do not forget to close the reserve tap after filling up.

To open the *main* supply: pull the plunger on fully.

To open the reserve supply: leave the plunger on fully and then turn clockwise (right hand) with a further slight pull to lock.

To remove the plunger complete with cork seating, take out the small grub screw at the side of the tap and pull out. In the event of petrol tap leakage after lengthy use the complete plunger should be renewed.

SPEEDOMETER

To detach the driving cable from the gearbox unscrew the union nut at the gearbox end and pull out the inner cable.

When refitting the speedometer flex into the gearbox it will probably be necessary to rotate the back wheel so that the metal tongue on the end of the inner cable can slip into mesh with the corresponding slot on the driving spindle.

ADJUSTABLE FOOTRESTS

The footrests are positioned to the frame on finely serrated tubes, and are therefore adjustable within certain limits governed by the layout of the footchange and brake pedal levers.

To remove a footrest for adjustment purposes it is only necessary to take off the securing nut and tap the rest along the spline or serrated tube. When refitting take care to tighten the securing nut thoroughly.

FRONT STAND

Never use the front stand by itself. Always first place the machine on the centre 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 tyres in lb. per sq. in. are as follows:

<i>Model</i>		<i>Tyre Size</i>	<i>Pressure</i> <i>(lb. per sq. in.)</i>
Solo	Front ...	3.25-19	18
	Rear ...	3.50-19	20
Sidecar	Front ...	3.25-19	20
	Rear ...	3.50-19	22
	Sidecar ...	3.25-19	18

These recommended inflation pressures are based on a rider's weight of 176 lb.

For riders exceeding 176 lb. increase tyre pressures as follows:

Front tyre Add 1 lb. per sq. in. for every 28 lb. increase in weight above 176 lb.

Rear tyre Add 1 lb. per sq. in. for every 14 lb. increase in weight above 176 lb.

If additional load is carried in the form of a pillion passenger or luggage the actual load bearing upon each tyre should be determined, and the pressure increased in accordance with the Load and Pressure Schedule shown in the Dunlop booklet.

CLEANING YOUR MOTOR CYCLE

To remove mud and dirt use a sponge and plenty of water, soaking the mud off. Oil and mud can be removed by soaking with paraffin. When all dirt has been removed dry off the machine with a chamios leather and then polish, if desired, with one of the proprietary polishes.

Chromium plating

Chromium plating must never be cleaned with ordinary metal polish or the surface deposit will be destroyed and rusting will take place. Clean with a wet sponge and polish with a soft cloth or use one of the special chrome cleaning compounds now available.

Riders living in industrial districts should remember that there is usually chemical matter on the roads. In wet weather these chemicals get splashed on to the chrome and cause corrosion. Similarly, where salt is used to clear snow the chrome may be attacked. Under these conditions chrome parts should be washed in clean water after the machine has been used.

Most accessory dealers can supply a tin of rust preventative compound recommended for use on all chromium plated parts during the winter months. Such a compound solution, when applied to the metal, leaves a transparent protective film which can, however, be easily removed with a little clean petrol or chromium plate special polish.

Tins of specially prepared spirit graphite or thread anti-seize solution for use on sparking plug and other threads can be supplied by Ariel stockists at price 2/-.

ARIEL MOTORS LIMITED PROPRIETARY EQUIPMENT AND ACCESSORIES

Although every effort is made to obtain the most suitable and highest quality fittings of a proprietary nature for incorporating in 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.

WHEN AND WHERE TO LUBRICATE

EVERY 250 MILES

OIL. Check level in tank and top up if required.
OIL. All exposed control cables.

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.
GREASE. Rear brake pedal pivot ... 1 point.
Front and rear brake cam spindles ... 2 points.

EVERY 1,000 MILES

GREASE. Steering head bearings ... 2 points.
OIL. Top up level—"GB" gearbox.

EVERY 1,500 MILES

Drain oil tank and sump, flush out and refill.

EVERY 3,000 MILES

GREASE. Front hub (bearings) ... 2 points.
Rear hub and brake drum bearings 2 points.

EVERY 3,000 MILES

GREASE. Check dynamo chain drive.
OIL. Magneto cam pad ... 1 point.

TECHNICAL DATA

MODEL "THE HUNTMASER"	FH
TYPE 650 c.c. TWIN CYLINDER	O.H.V.
Number of cylinders	2
Bore and stroke	70 × 84
Cylinder capacity (actual)	646
Compression ratio	6.5 or 7.5

IGNITION TIMING

Export models

Home	$\frac{3}{4}^{\circ}$ (9.5 mm.) B.T.D.C. max. advance.
Home	$\frac{1}{2}^{\circ}$ (8.7 mm.) B.T.D.C. max. advance.

VALVE TIMING

Export models

Inlet opens	42° Before T.D.C.
Inlet closes	62° After B.D.C.
Exhaust opens	67° Before B.D.C.
Exhaust closes	37° After T.D.C.

Home

Inlet opens	30° Before T.D.C.
Inlet closes	70° After B.D.C.
Exhaust opens	65° Before B.D.C.
Exhaust closes	25° After T.D.C.

Solo gear ratio with 24T. engine sprocket—Top	4.53
—Third	5.93
—Second	7.71
—First	12.01

Sidecar gear ratio with 21T. engine sprocket—Top	5.18
—Third	6.78
—Second	8.81
—First	13.74

Wheelbase (inches)	56
Overall length (inches)	86
Handlebar width (inches)	27
Dualseat height (inches)	31
Ground clearance (inches)	5 $\frac{1}{2}$
Weight fully equipped (lb.)	410
Petrol tank capacity (gallons)	4
Oil tank capacity (pints)	6

'GB' GEARBOX AND CLUTCH ASSEMBLY PARTS (See exploded view at rear of book)

Part No.		No. per set
3600-52	Gearbox shell only	1
3602-52	Gearbox joint washer	1
3610-52	Kick-starter case	1
3611-52	Kick-starter case joint washer	1
3620-52	Kick-starter case cover	1
3623-52	Kick-starter case cover locating piece	1
3626-52	Mainshaft nut (kick-starter end)	1
3176-33	Mainshaft bearing	1
3628-52	Bearing retaining ring for mainshaft bearing	1
3630-56	Mainshaft	1
3631-52	Driving sprocket, $\frac{5}{8}^{\circ} \times \frac{3}{8}^{\circ}$, 19T.	1
3632-52	Sprocket spacing collar	1
3095-33	Driving gear bearing	1
3634-52	Bearing retaining ring (split)	1
3635-52	Driving gear oil seal	1
3636-52	Driving gear oil seal housing	1
3089-33	Driving gear nut	1
3091-33	Driving gear nut lockwasher	1
3637-52	Driving gear bush	set of 2
3638-52	Driving gear with bush, 28T.	1
3641-52	First gear mainshaft, 17T.	1
3642-52	Second gear mainshaft, 22T.	1
3643-52	Third gear mainshaft, 25T.	1
3644-52	Third gear mainshaft bush	1
3648-52	First gear layshaft, 29T.	1
3649-52	Second gear layshaft, 24T.	1
3650-52	Second gear layshaft bush	1
3652-52	Third gear layshaft, 21T.	1
3653-52	First gear layshaft bush	1
3656-52	Layshaft pinion, 18T.	1
3657-52	Layshaft	1
3658-52	Layshaft bush (clutch end)	1
3659-52	Layshaft bush (kick-starter end)	1
3660-52	Layshaft bush dowel	2
3661-52	Layshaft cover washer	1
3663-52	Speedometer spindle	1
3664-52	Speedometer spindle bush	1
3665-52	Speedometer thrust washer	1
3160-31	Speedometer location button	1

3666-52	Speedometer spindle bush oil seal	1
3164-31	Speedometer spindle bush grub screw	1
3342-31	Gearbox filler plug	1
3670-52	Gearbox drain plug washer	1
3669-52	Gearbox drain plug	1
3671-52	Gearbox and kick-starter case dowel	1
3676-52	Screw, kick-starter cover to kick-starter case	2
3677-52	Screw, kick-starter case to gearbox	2
3678-52	Screw, kick-starter case to gearbox and kick-starter cover to kick-starter case	4
3679-52	Screw, kick-starter cover to gearbox	2
3682-52	Gearbox adjuster pivot pin	1
3342-52	Oil level plug	1
3687-52	Oil level plug washer	1
3668-50	Mainshaft nut (clutch end)	1
3070-50	Mainshaft nut lockwasher (clutch end)	1
3675-52	Dowel, kick-starter case cover locating piece	2
3680-52	Driving ratchet	1
3191-33	Ratchet pinion	1
3196-33	Ratchet pinion spring	1
3683-52	Ratchet pinion bush	1
3325-31	Kick-starter quadrant	1
3686-52	Kick-starter quadrant spindle	1
3688-52	Kick-starter spindle bush (inner)	1
3689-52	Kick-starter spindle bush (outer)	1
3335-48	Kick-starter spring	1
3690-52	Kick-starter spring pin	1
3696-52	Kick-starter lever	1
3305-31	Kick-starter lever pedal	1
3310-37	Kick-starter lever pinch bolt	1
3698-52	Kick-starter lever pinch bolt nut	1
3699-52	Kick-starter spindle oil seal	1
3701-52	Kick-starter lever bolt washer	1
3705-52	Cam assembly	1
3707-52	Cam plunger	1
3709-52	Cam plunger spring	1
3711-52	Cam spindle bush (inner)	1
3713-52	Cam spindle nut, retaining indicator	1
3716-52	Quadrant and drive peg for control spindle	1
3718-52	Quadrant spindle	1
3720-52	Quadrant spindle bush (inner)	1
3723-52	Quadrant spindle bush (outer)	1
3725-52	Quadrant spindle cover washer	1
3728-52	Main return spring for control quadrant	1
3733-52	Selector fork	2

3736-52	Selector fork spindle	2
3738-52	Selector spindle cover washer	2
3739-52	Selector spindle peg	4
3741-52	Selector spindle cotter pin	4
3743-52	Selector spindle oil seal	1
3746-52	Return spring (secondary) (coil)	1
3750-52	Foot-change lever	1
3514-33	Foot-change lever bolt	1
3516-33	Foot-change lever bolt nut	1
3752-52	Foot-change lever bolt nut washer	1
3508-33	Foot-change lever rubber	1
3754-52	Foot-change lever rubber fixing pin	1
3756-52	Foot-change indicator	1
3758-52	Foot-change indicator oil seal	1
3760-52	Cam spindle bush (outer)	1
3763-52	Indicator oil seal spring	1
3766-52	Mainshaft sleeve	1
3770-52C	Clutch operating lever	1
3783-52	Clutch operating lever adjusting sleeve	1
3785-52	Adjusting sleeve cap	1
3788-52	Adjusting sleeve cap screw	2
3790-52	Clutch operating plunger	1
3794-52	Clutch operating plunger ball, 5/16"	1
Clutch Parts		
3350-57	Clutch case C/W segments (1957-59 model)	1
3350-36	Clutch case (three-plate) (1956 model)	1
3355-48	Clutch centre (three-plate) (1956 model)	1
3355-57	Clutch centre (three-plate) (1957-59 model)	1
3360-54	Clutch plate fitted inserts	3
3365-54	Clutch inserts (fabric) ... ..	...
3370-36	Clutch plain plate	4
3380-36	Chainwheel ($\frac{1}{2}$ " x .305" x 44T.)	1
3388-41	Chainwheel set pin lockwasher	1
3391-36	Chainwheel set pin	6
3394-36	Thrust washer (inner)	1
3397-36	Thrust washer (outer)	1
3400-41	Clutch spring plate	1
3402-52	Clutch spring plate thrust cup	1
3405-54	Clutch spring	5
3410-31	Clutch spring cup	5
3413-31	Clutch spring adjusting nut	5
3417-54	Clutch spring stud (three-plate)	5
3420-37	Roller cage	1
3423-36	Needle rollers	set of 12
3430-52	Clutch operating rod	1

LUBRICATION RECOMMENDATIONS FOR 650 c.c. 'HUNTMASTER'

	Vacuum	Shell	Wakefield	B.P.	Esso
Engine Summer	Mobiloil BB	Shell X-100 Motor Oil 40	Castrol XXL	Energol S.A.E. 40	Essolube 40
Winter	Mobiloil A	Shell X-100 Motor Oil 30	Castrol XL	Energol S.A.E. 30	Essolube 30
Gearbox GB 44 ...	Mobiloil BB	Shell X-100 Motor Oil 40	Castrol XXL	Energol S.A.E. 40	Essolube 50
Oil bath, chaincase and rear chain ...	Engine Oil	Engine Oil	Engine Oil	Engine Oil	Engine Oil
Wheel hubs ...	Lithium Base Grease	Shell Retinax A or RB	Castrolase Heavy	Engrease C3	Esso Grease
General Greasing	Lithium Base Grease	Shell Retinax A or CD	Castrolase CL	Engrease AO	Esso Grease
Telescopic Forks Normal conditions	Mobiloil A	Shell X-100 ³⁰ Motor Oil	Castrol XL	Energol S.A.E. 30	Essolube 30
Arctic conditions	Mobiloil Arctic	Shell X-100 Motor Oil 20/20 W	Castrolite	Energol S.A.E. 20	Essolube 20

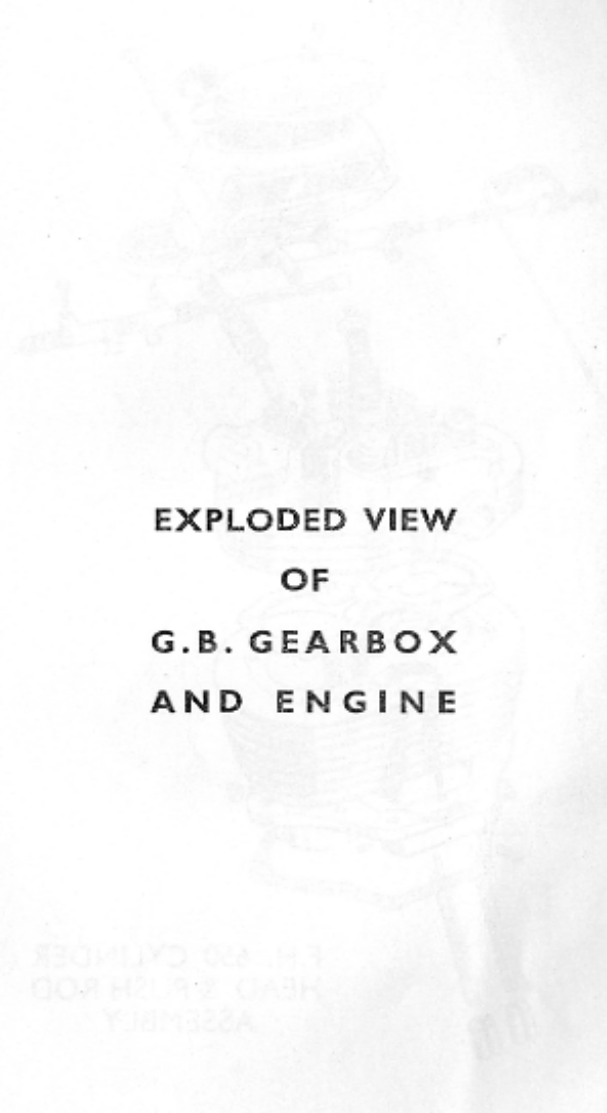
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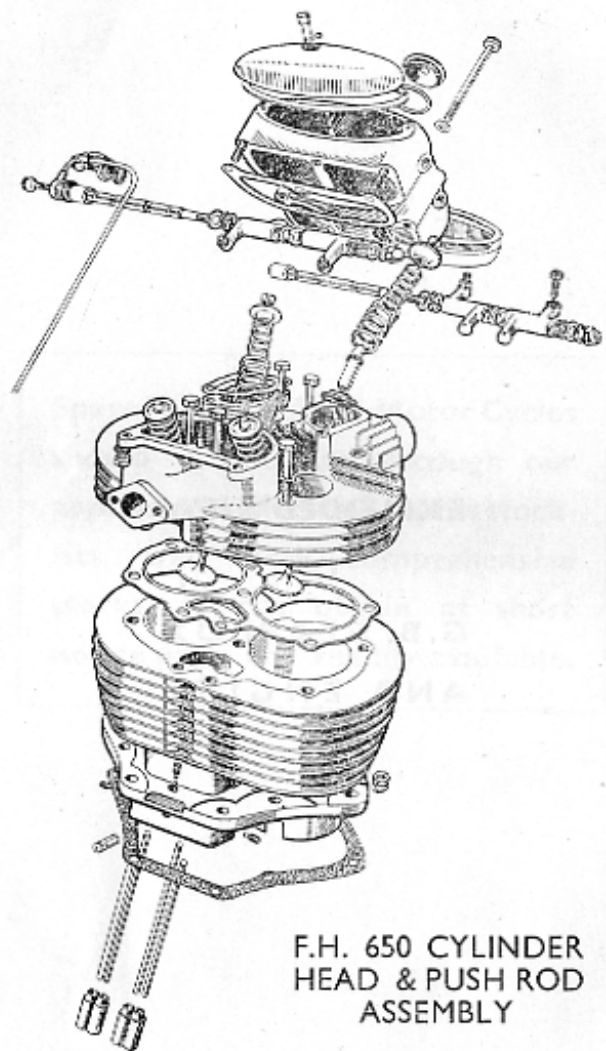
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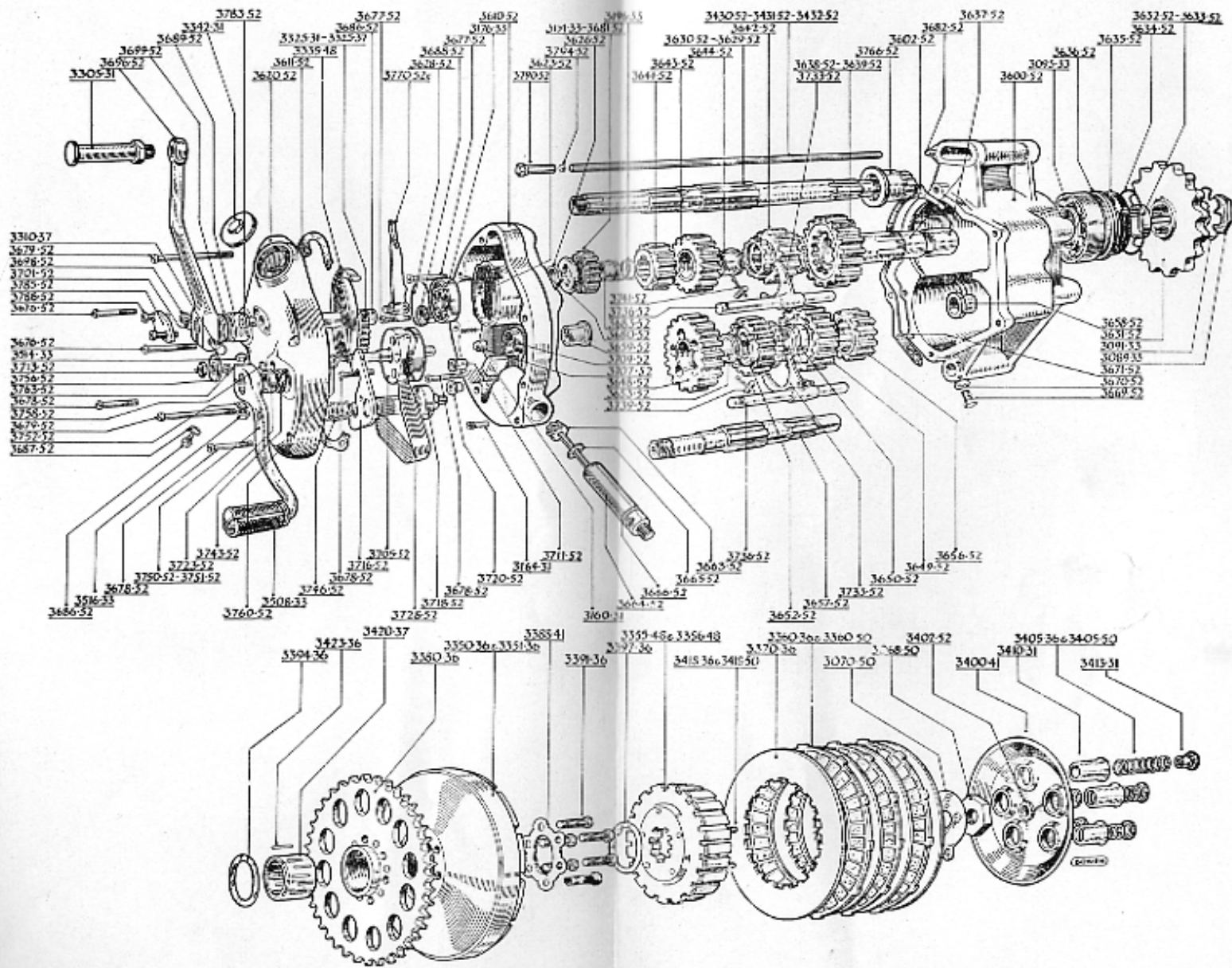
Spare Parts for Ariel Motor Cycles should be obtained through our appointed dealers and spares stockists, who carry comprehensive stocks, or can obtain at short notice parts not readily available.

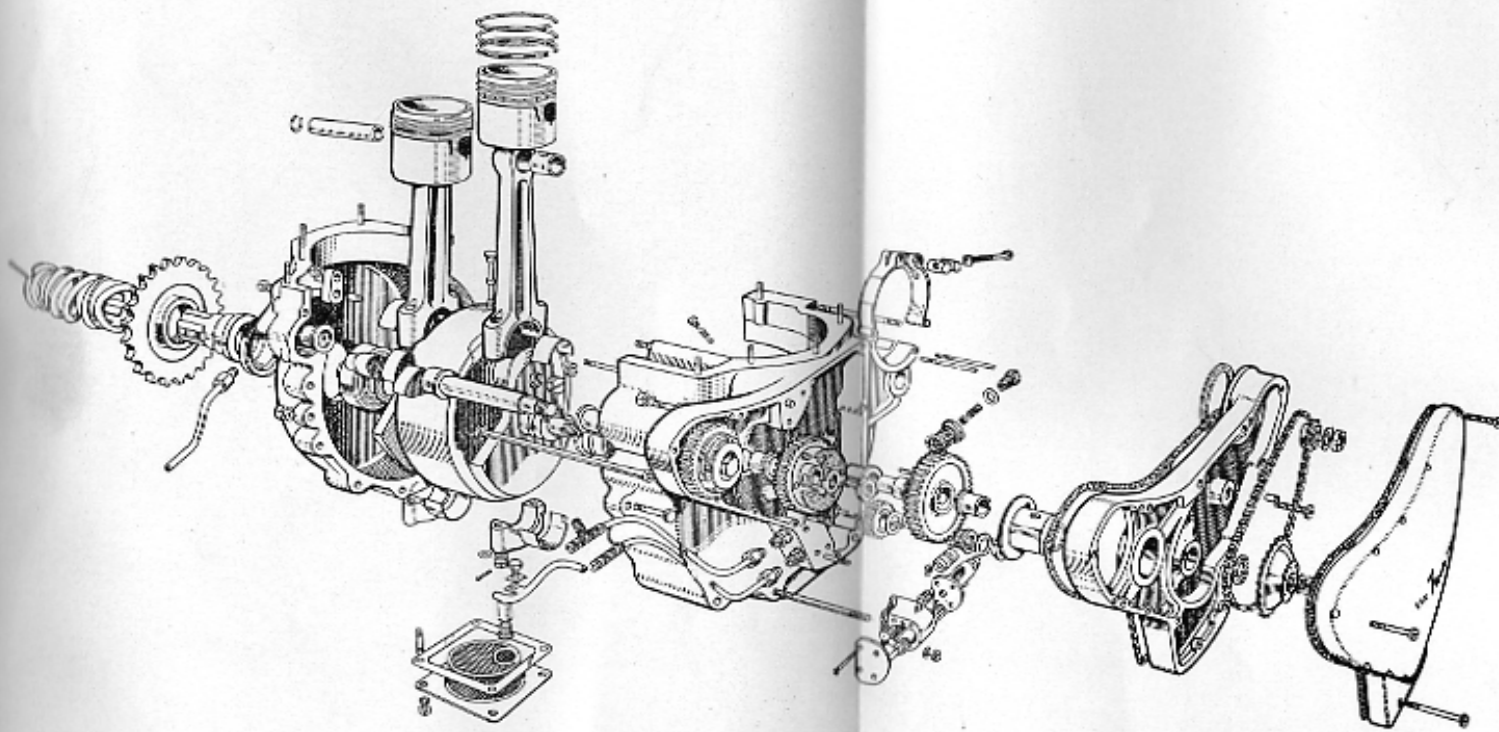
EXPLODED VIEW
OF
G.B. GEARBOX
AND ENGINE





F.H. 650 CYLINDER
HEAD & PUSH ROD
ASSEMBLY





F.H. 650 CRANKCASE & PISTON ASSEMBLY