
# MODEL HS —“SCRAMBLER”

## MOTOR CYCLE

**GENERAL MAINTENANCE**

**PUBLISHED 1956**

**ARIEL MOTORS LTD., SELLY OAK, BIRMINGHAM 29**

# HINTS ON THE MAINTENANCE OF THE ARIEL "SCRAMBLER" MODELS MK. I and MK. III MOTOR CYCLES

## GENERAL REMARKS

Not only in Great Britain, but internationally, the sport of Motor Cycle "Scrambling" is governed by official Rules and Regulations, the pattern of which may greatly differ. Hence the Ariel HS "Scrambler" is offered in two different forms which are designated Mk. I and Mk. III.

Both of these types possess all the qualities of sound and solid construction that thorough and conscientious development can give, but whereas the Mk. III is a super sports machine, fully equipped and capable of being efficiently silenced for use on the public roads, the Mk. I is a racing engine in a Scramble machine, with an exhaust system of a type which must be regarded as a functional part of the engine, and, in consequence, cannot conform with the legal requirements for use on the roads of Great Britain.

Apart from the power output of the engines the Mk. I and Mk. III machines are identical, with the exception of the air cleaner, oil tank footrests and exhaust pipe.

The Mk. III also has the additional equipment fitted as standard: dynamo, a.v.c., lamps and wiring (quickly detachable), horn, battery and speedometer. The exhaust system is down-swept and fitted with a standard silencer.

Obviously, with engines of such different character, the driving methods of the rider must vary accordingly. In a general way the power output of the Mk. III begins fairly low down and mounts steadily to its peak at 5,600 r.p.m. It is good, solid power, and can be geared, without taking it too literally, to pull. The engine sprocket fitted as standard is 21-teeth.

The -Mk. I needs quite a different driving technique, as the movement of the gases comes under the influence of exhaust pipe extraction at about 3,500 r.p.m., and the revolutions then surge immediately upwards to the maximum safe limit of 6,250 r.p.m. If allowed, it can go very much higher, but a real danger then exists of valve float. The engine sprocket fitted as standard is 18-teeth.

As may be realised, the Mk. I engine is only in its element at “full noise”; a missed gear change, a rear wheel which remains airborne overlong, or a gear ratio too low for the prevailing conditions, all demand that instant closure of the throttle which can definitely become a full-time job for the rider.

In successful Scrambling a perfect liaison must exist between rider and his mechanic, for the final results rest on the performance in a comparative way, and the onlooker can often build an independent aspect of great value.

An engine cannot be expected to give of its best under the handicap of tight chains, binding brakes, or a brake pedal so badly positioned that it becomes partly applied when the rider takes his normal riding stance. As soon as possible after a meeting the machine should be hosed down and freed from every trace of mud, grass, etc., and the essential working parts re-oiled.

The following notes and advice refer entirely to this machine with a view to keeping it at its best for Scrambling. Any information not given below must be regarded as similar to the requirements of the standard Model VH and given in the current Instruction Book issued with the machine.

## ENGINE

The crankcase assembly is the tuned “Red Hunter” with polished steel flywheels, connecting rod and cam levers. The timing case is modified to flood the working surfaces of the cam gear. The cams and cam levers form a complete assembly, the Mk. III being known as the “Sports” assembly, the Mk. I the “Super Sports”, and both assemblies are quite different from the standard VH.

The cylinder barrel is aluminium alloy with nickel-iron liner. The pistons of the two engines also differ, the Mk. III giving a compression ratio of 8.2, whilst the Mk. I is 9.0 to 1.

The alloy cylinder head with cast-in valve seats has ports ground and polished to blend with the 14 in. diameter carburetter bore and the exhaust pipe.

Rocker boxes each have a removable plug set in the side to facilitate tappet adjustment. With both Mk. I and Mk. III the tappets are adjusted from cold with the piston at top dead centre on firing point. The clearance is an easy .010 in.

After assembly the engines are “‘run in” on the bench and afterwards tested on the dynamometer, and no engine is passed unless it has reached or

exceeded the standard set on the Certificate of Performance. The Champion NA-8 or Lodge H-LN sparking plug is "'soft" and merely for warming-up purposes. It is not designed to stand up to racing conditions. The "hard" Champion NA-12 or Lodge RI-49 supplied as a spare should be fitted for the actual race. Do not use the "'hard" plug until the engine is thoroughly warm, or there is a possibility of the electrodes becoming fouled by oil.

Under racing conditions a close eye should be kept on the compression of the engine as a guide to whether the engine revolutions have been allowed to accidentally overrun the safe limit; on carburation, to ensure that there is no starvation of fuel either by partial blockage in the feed or in the jet or passages. In the latter case, suspicion should first fall on the tiny vent hole of the filler cap. Each of these conditions could lead to a serious weakening of the mixture, with subsequent overheating.

The clearance at the tappets can often give a clear indication of what has been happening elsewhere. An excessive gap, for instance, with a total lack of compression, can often point to a valve that has "tapped" and, in consequence, not fully seating. Also, a rider knowingly completing a race with a mixture obviously weak should immediately check up, for a valve stretched through overheating will have no gap.

The colour of the plug is also worth watching. The ideal colour is a brownish black which will not come off when touched. Black soot which comes off on the finger is over-rich. The whiter a plug runs the hotter are the conditions in which it performs, and with a racing type plug generally point to a weak mixture which can be dangerous. When using a "soft" plug these signs can be ignored, as the plug is not designed to dissipate excessive heat and, even with the correct mixture, will run hot and white.

## Valve Timing—Mk. I:

| | | |
|---|---|---|
| Inlet Valve Opens | ..... | 50° Before T.D.C. |
| Inlet Valve Closes | ..... | 72° After T.D.C. |
| Exhaust Valve Opens | ..... | 67° Before T.D.C. |
| Exhaust Valve Closes | ..... | 47° After T.D.C. |

## Valve Tappet Clearance—Mk. I:

| | | |
|---|---|---|
| Inlet and Exhaust | ..... | .010 in. |

## Ignition Timing—Mk. I:

½ in. Before T.D.C. Maximum Advance.

### Valve Timing—Mk. III:

| | | |
|---|---|---|
| Inlet Valve Opens | ..... | 37° Before T.D.C. |
| Inlet Valve Closes | ..... | 70° After T.D.C. |
| Exhaust Valve Opens | ..... | 62° Before T.D.C. |
| Exhaust Valve Closes | ..... | 45° After T.D.C. |

### Valve Tappet Clearance—Mk. I:

| | | |
|---|---|---|
| Inlet and Exhaust | ..... | .010 in. |

### Ignition Timing—Mk. I:

½ in. Before T.D.C. Maximum Advance.

## CAM ASSEMBLY

1956 Model HS "Scrambler" Mk. I. Part No. 1751-56.

The Mk. I HS Cam Spindle is produced from a special hard-wearing material, giving very long life for the cam formation. Owing to the nature of the metal, however, great care must be taken when assembling the magneto chain driving sprocket on the cam spindle and any tendency to over-tighten the sprocket securing nut can result in damage to the respective tapers of the spindle and sprocket. The sprocket securing nut must be fully hand tightened only, and if a torque wrench is used it should be preset at 175 inch pounds, for if used at higher pressure the sprocket will be distorted with resultant incorrect chain alignment.

## CARBURETTER

The Amal Monobloc type 389 is the standard fitting with the following settings: 1+ in. Bore, Throttle Valve No. 34, Main Jet No. 380. General tuning hints and tips are given with the Amal Leaflet No. 502/3 issued with other literature with a new motor cycle.

## GEARS AND GEARING

The gearbox fitted is type GB45. It is a close ratio pattern and the internal reductions are 1.31, 1.7 and 2.65. The importance of finding the most suitable gearing for a given course cannot be over-emphasised. An alteration of even a tooth to the engine sprocket can often increase the functional character of a "Scrambler" to a remarkable degree, and the rider capable of making the correct decision on this matter will soon find his knowledge at a

premium. Where reasonable grip can be obtained, under-gearing can lead to a lightening of the front wheel which can become airborne, especially on upgrades, under slight provocation. Over-gearing, however, prevents the full power of the engine being employed over its most effective range. With the Mk. I, when assessing the note and feel of the engine as it reaches the crucial 6,250 r.p.m., it might be of help to the rider to know what the equivalent terms in miles per hour would be on the road. With the standard 18-tooth engine sprocket, 6,250 r.p.m. equals 31 m.p.h. in bottom gear, 48 m.p.h. in second, 62 m.p.h. in third and 81 m.p.h. in top. With the 4.0019 Sports tyre as fitted, similar terms in m.p.h. at 6,250 r.p.m. can be quickly obtained by dividing the factor 491 by the gear ratio in use, but wheel spin can lower these figures appreciably. A range of engine sprockets between 17 and 24-tooth are available from the Service Department and below is a table giving the final ratios of the different sprockets:

| Engine Sprocket | Top Gear | Third Gear | Second Gear | Bottom Gear |
|---|---|---|---|---|
| 17 | 6.40 | 10.05 | 15.62 | 20.47 |
| 18 | 6.04 | 9.48 | 14.73 | 19.32 |
| 19 | 5.73 | 8.99 | 13.98 | 18.33 |
| 20 | 5.44 | 8.54 | 13.27 | 17.00 |
| 21 | 5.18 | 8.13 | 12.64 | 16.58 |
| 22 | 4.94 | 7.76 | 12.05 | 15.81 |
| 23 | 4.73 | 7.43 | 11.54 | 15.14 |
| 24 | 4.53 | 7.11 | 11.05 | 14.50 |

## CLUTCH

A three-insert plate clutch is fitted, with extra strong springs. Ihe inserts are ““Klingerite”’. Nothing is to be gained by over-tensioning the springs—the sleeve nuts should lie flush with the edge of the spring box. It is of great importance to see that the clutch end plate, when operated, withdraws in a straight plane, for any tilting can lead to drag, which, in turn, gives a heavy and overloaded operating mechanism. Should drag occur through slackening of a sleeve nut, the nut, spring cup and ends of the spring should be examined to see that the ends of the spring are being correctly spragged in the recesses to prevent the sleeve nut loosening.

## GEARBOX LUBRICATION

The stresses imposed in the gearbox under scrambling conditions are truly enormous. After extensive testing under actual conditions it is recommended that the oil used is of a type specially designed for use in hypoid gears, S.A.E. 90. The working capacity for the box is nine tenths of a pint; the drain plug is underneath, and the hexagon plug behind the kick-starter spindle is for checking the correct oil level.

## MAGNETO

The Lucas "Wading" type as fitted is fully waterproofed. The advance and retard lever pulls the spring-loaded cam ring to full retard and is slack at full advance. There should be } in. backlash in the cable at full advance. Should any stiffness or sticking become apparent in the cable the milled end cover should be unscrewed and the contact breaker and cam ring checked.

The cam ring must be clean and free to turn and the working surfaces covered with a trace of light oil. The felt wick in the cam ring housing should be wetted, and also the contact breaker pivot pin needs its microscopic quota.

On refitting the milled end cover it is advised that a length of small bore tubing be led from the cover to a point under the saddle to ensure that casual mud does not block the vent hole. A similar length of tubing should be taken from the end of the breather pipe on the nearside crankcase face.

Magneto timing is ½ in. before T.D.C. at full advance on both Mk. I and Mk. III engines.

## OIL TANK

Mechanically, the lubricating systems of both the Mk. I and Mk. III are identical, but the machines have oil tanks of different sizes and use oil of quite a different base.

The Mk. III tank is fitted to the offside of the machine and has a capacity of 6 pints; beneath the filler cap is a removable filter which should always be in place when the tank is being filled. The oil used is S.A.E. 50, which is, of course, a mineral. See "Owner's Guide" recommendation.

The Mk. I tank is fitted to the nearside of the machine and has a capacity of 4 pints. The filter is screwed into the tank through a large "banjo" oil pipe

union. The oil used is Castrol “R”, which is castor oil, and of a vegetable origin.

It should be clearly understood that mineral and vegetable oils will not mix and the type in use must be strictly adhered to when refilling.

To change the basic type of oil is a major operation which means partially dismantling the engine to wash out every crevice. The mechanical life of a ‘‘ Scrambler ” engine depends to a large extent on the scrupulous cleanliness of the oil in use. The reason for using a vegetable oil in the Mk. I is due to the high rate of revolutions it normally attains, the oil having outstanding qualities under these conditions.

It is difficult to assess in facts and figures any set times for oil changing. Dirty oil is an abrasive and must be ruthlessly scrapped. Any dirt present can easily be seen when the oil is run over the palm of the hand, or on clean, absorbent rag or paper. Test with a dipstick immediately after a race, when the oil is thoroughly in circulation, for if the machine is left standing for any length of time the dirt can settle to the bottom of the tank and give a false reading when the top is dipped.

With the Mk. III tank the oil can be run off from the bottom of the tank. The Mk. I tank is easily removed complete with pipes; the oil can then be tipped straight out. Do not forget to remove and wash out the filter. While the tank is draining remove the filter plate from the crankcase sump, wash out and refit. After the oil tank has been replaced the feed pipe should be connected up (top pipe), but the return pipe left disconnected. After the tank has been refilled with fresh oil the engine should be started up and run as slowly as practical, until the clean oil is seen to flow from the return union, the return pipe then being connected up.

## AIR CLEANER

The box type Burgess air cleaner fitted to the Mk. III is in standard form and the Instruction Book gives the information regarding its maintenance.

The Mk. I cleaner is a drum type of much larger surface area and is mounted on the offside of the machine. To remove the element the induction sleeve should first be slackened off at one end, the three bolts removed, and the cleaner taken off en bloc. The three flynuts at the back of the cleaner should each be turned over 90 degrees against a spring load, when the element can be lifted out. The © element must be washed in clean petrol and recharged

with oil periodically, the frequency of these operations depending on the type of course on which the machine has been used. To be fully effective the element must be wet; dust can quickly dry its cleansing properties and so render it ineffective. On “Scramble’’ machines air cleaners are very necessary fitments, and until the rider is fully conversant with its capabilities, caution should be the keynote, and the condition of the element checked after each event.

## CHAINS

Adjustment and maintenance of the primary drive is already dealt with in the official Instruction Book.

The “Scrambler” rear chain is open, whilst at the gearbox end two thick felt washers prevent ingress of mud and water to the primary chain case. The occasional external use of an oilcan will prevent these washers from going dry and hard.

Lubrication of the rear chain is best carried out as described in the booklet issued on the subject, by soaking in molten grease. An excessive amount of grease should not be applied externally if it is known that a scramble course is of a sandy nature. Perhaps the best method is to use thin oil from an oilcan directly on to the chain immediately before an event and subsequently if it appears dry. Individual rollers tightening up make chain tensioning hazardous and usually point to a breakdown in the cushioning grease with which the internal bushes of the chain are periodically charged. A chain cannot be any stronger than its weakest link, so remember to keep your eye on that spring link.

## CHAIN TENSIONING

This should only be carried out when the chain is in a clean and oiled condition. The rear damper units are fully extended when, measured from the centres of the ‘‘ rubberbloc ”’ bushes, the length is 12 in. Conversely, they are fully compressed at 84 in. At 103 in. the gearbox centre, swinging arm pivot and the rear wheel hub centres are all in a straight line and the chain at its tightest point.

## CONTROLS AND CYCLE PARTS

Whilst very little attention is needed to keep the control mechanism in first class condition, it is essential that this attention is regularly given. The chief

enemy is rust, and the antidote oil. The protective cable casing must not be allowed to chafe through, as water will enter through the casing and quickly seize the inner wire. Points where chafing are likely to occur should be bound with tape, or a protective rubber sleeve slipped over. A thorough wash in clean petrol before re-oiling can often sweeten a harsh cable operation.

The brake pedal spindle and the rear brake cable need the application of a grease gun until the grease is seen to exude. The brake operating arms are better greased when the brake plate is off, so any excess can be immediately wiped off—greasing in situ calls for a restraining hand. The addition of a simple cycle oilcan to the "Scrambler's" tool kit will pay great dividends.

## BRAKES

The square-headed adjuster at the fulcrum point of the full width brakes is there for the purpose of balancing the wear of the brake linings. Should brake operation become stiff or heavy the shoes should be examined to see if the working faces are rusted or jammed with casual mud. Wash out with clean petrol, but first see that they are marked so that they can be replaced exactly as they came out. Lightly grease all contact faces before assembly. Any mud on the actual linings can easily be removed, when dry, with a stiff wire brush. Whilst the brake plates are off, check to see if any excess of grease is coming from the bearings, if so, wipe away all trace and repack each bearing individually with H.M.P. grease.

## PETROL TANK

This is all-steel with "tricycle" type mountings. The rear mounting is a long stud, and the Simmonds nut should be pulled down until the stud end slightly protrudes. The two front fixing bolts should be pulled down so that the full length of the thread goes into the tank carriers and is reasonably tightened. Lock the bolt heads with wire.

## FUEL

Most of the "Premium" types of petrol sold in Great Britain are of 80 octane rating. Both Mk. I and Mk. III engines perform satisfactorily on this grade, but, if obtainable, a slightly higher (85) rating should be used with the Mk. I.

## TYRES

The sole object of the Sports tyres as fitted is to give the maximum grip possible for both driving and braking. The risk of concussion bursts and dented rims in high speed scrambling is common, but is always aggravated by under-inflation.

The aim of the rider should be to maintain the air pressures to the highest possible limits consistent with tyre adhesion. Tyres inflated to a high pressure will always give the wheel, as a whole, greater strength, whilst low pressures allow impacts to become local, which, as far as possible, should be guarded against.

A rim which has become dented during a race points to the possibility of a concussion burst in the tyre wall and should be examined at the first opportunity.

The milled nut on the tyre valve is better discarded and replaced with a length of rubber sleeve so that tyre creep can immediately be seen by the valve tilting.

Balanced tyres when fitted should always have the marking spot, which is diagonally opposite the weight, alongside the security bolt on the front wheel, and midway between the two security bolts of the rear wheel.

## WHEELS, HUBS, FRONT FORK ASSEMBLY & FRAME Mk. I and Mk. III

All general information relative to the maintenance of these parts is given in the “Owner’s Guide”’ or extracts, the fittings being identical to the standard Model VH, etc.