MODEL HT — TRIALS

AND

MODEL HS —“SCRAMBLER”

MOTOR CYCLE

GENERAL MAINTENANCE

PUBLISHED 1956

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NOTES ON THE MAINTENANCE OF THE ARIEL MODEL HT TRIALS MOTOR CYCLE

GENERAL REMARKS

Fundamentally the Model HT is a single purpose machine designed and developed for the sporting Trials rider and first listed, after extensive testing in the major Trials of 1955, in the 1956 range. Although the HT as new could probably be ridden immediately in the severest of Trials, a certain amount of road work beforehand is advisable in order to bed down such things as chains, sprockets, wheel bearings, clutch plates, etc.

As is well known the life of a Competition machine for a given mileage is hard in comparison with that of a roadster, consequently after finishing a Trial the quicker the machine is washed down and the working surfaces re-oiled the better for both pocket and peace of mind.

The following notes refer to items of specification peculiar to this Model and ‘should be used in conjunction with the Model VH Instruction Book issued with this machine.

ENGINE

This is basically the same as the Model VH except that it is fitted with an aluminium cylinder barrel with a nickel-iron liner and a piston giving a compression ratio of 5.6 to 1. The same ramp type cam is used and the method of tappet adjustment is as set out in the VH Instruction Book. The liveliness of the “Red Hunter” engine due to the robust construction is inherent, but in time should any falling-off in power become apparent it will probably be due to the valve seats becoming pitted and valves failing to seat efficiently. Test the compression by standing on the kick-starter pedal; with perfect seating your weight should be held for an appreciable time, if not the valves will need regrinding. Bad compression and low compression are vastly different things, and poor compression can cause bad starting, a sluggish performance, high petrol consumption and, more important, can spoil the perfect carburation so necessary to the Competition rider.

Valve Timing:

Inlet Valve Opens	….	26° Before T.D.C.
Inlet Valve Closes	….	77° After T.D.C.
Exhaust Valve Opens	….	70° Before T.D.C.
Exhaust Valve Closes	….	33° After T.D.C.

Valve Tappet Clearances (with engine cold):

Inlet Vale	….	.006 in.
Exhaust Vale	….	.008 in.

MAGNETO

The racing magneto fitted is a "Wader" type, fully waterproofed. The control lever operates so that the cable is slack when the cam ring is sprung to full advance. There should be ⅛ in. backlash in the cable casing. To avoid condensation a breather tube is embodied in the contact breaker cover, and to be sure water does not enter at this point a length of rubber tube should be taken up under the saddle where the open end is high and dry. Remember when clipping this rubber tube to the frame it must not be too tight or it may become flattened. Should any variation be noticed to the normally easy cable operation it is advisable to remove the contact breaker and cam ring and check if the ring is dry and sticking. The ring must be clean and polished and reassembled with the slightest smear of light oil on the ring and felt wick. The magneto timing is ½ in. before T.D.C. on full advance.

CARBURETTER

This is the Amal Monobloc type 376/11T, with settings: .106T Needle Jet, No. 3 Throttle Valve, No. 200 Main Jet; Needle position —centre.

BREATHERS

The breather pipe from the back of the timing cover is fitted with a non-return ball valve. It is easily submerged, even in shallow splashes, but the valve has been found efficient and trouble-free. No valve is fitted to the breather pipe, which comes from the crankcase face on the nearside, and a rubber tube is fitted from the end of this pipe to a point under the saddle.

FRAME AND FORKS

The frame is a lugless design of large diameter straight tubes butted and arc welded, with the exception of the rear down stays which are curved and

bolted up. The steering head angle is set at 27° from vertical, and this, in conjunction with special fork brackets and a 21 in. front wheel, results in quick and positive action of the type necessary for competition work.

The swinging arm uses the same "'rubberbloc" bushes as standard models, but the bearing bolt is inserted from the offside and screws into the bearing housing on the nearside.

The head races each have twenty ¼ in. balls which are packed with heavy grease when new. Should slack develop, adjust as follows: Remove the domed nut from the top of the column which will reveal three grooves machined across the adjusting sleeve. Slacken off the pinch bolt in the top bracket, insert a suitable tool (flat strip alloy is good) and turn clockwise to take up slack.

The telescopic fork requires oil of the same grade as used in the standard fork (S.A.E. 30); the quantity is one third of a pint in each leg. The only parts of the frame requiring lubricant are at the brake pedal spindle and the saddle pivot bolt.

HYDRAULIC DAMPER UNITS

The type fitted is series number AT6/7/1110. The rubber bushes are pinched endways with ⅜ in. bolts.

Measured from the cnnbith of these bolts, the distances at various points are as follows:

Maximum length fully extended with wheel clear of ground—12 in. Minimum length fully compressed under highest load—8¾ in. Thirdly, there is an "'optimum" point where the centres of the gearbox mainshaft, swinging arm pivot and rear wheel hub form a straight line and the rear chain is at its tightest point—10 in.

GEARBOX

The gearbox is a special version of the GB47 type. The shell casting has slight alterations to allow clearances and adjustment in the closepacked short frame. The gears have intermediate ratios of 1.57, 2.44 and 3.2. The final driving sprocket is 19-tooth and the rear wheel 47-tooth. The clutch sprocket is the normal 44-tooth and, as the engine sprocket for the standard HT is 18-tooth, it will be seen that the final ratios are 6.04, 9.48, 14.7 and 19.32. A further range of sprockets between 17-tooth and 24-tooth are available from

the Service Department and a table gives the final ratios for any selected size of sprocket:

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

Two plates with “Klingerite” inserts are fitted, three plain plates and extra strong springs completing the assembly. Over-tensioning of the clutch springs is unnecessary and can be a factor leading to drag. So long as the end of the spring box centre stud slightly protrudes through the sleeve nut, and the top of the sleeve nut is flush with the edge of the spring box, all is correct.

The clutch withdrawal mechanism is enclosed inside the gearbox end cover and the filler-inspection cap must first be removed to see the clutch cable end.

The withdrawal operation is carried out with a double-faced cam plate with a spring-loaded centre bearing, each plate being separated by three steel balls floating in depressions at points equidistant from the pivot. The rear cam is splined to the inner cover and can move endways to depress the clutch push rod. The outer cam plate cannot move endways, but forms a lever to take the cable nipple and is free to turn on its pivot. This turning action causes the balls to climb the depressions in the cam, which in turn gives thrust to the push rod.

It is imperative that the adjustment of the clutch operating cable is carried out precisely as follows and in proper sequence:

(1) Remove clutch dome and gearbox inspection cap.

(2) Remove clutch cable nipple from cam lever with a small screwdriver and a wire hook.

(3) Slacken the ½ in. locknut on the adjusting screw in the centre of the aluminium clutch end plate. See that the threads on the adjusting screw and in the locknut are clean and easy.

(4) Place a screwdriver in the slot of the adjusting screw, turn first in an anticlockwise direction to make sure it is free, and then clockwise until the end is felt to butt against the end of the push rod.

(5) Note the position of the screwdriver slot in the adjusting screw; then run up the locknut until it is finger tight against the aluminium end plate.

(6) Hold the locknut steady; turn the adjusting screw one third of a turn in an anticlockwise direction and lock it tightly in that position.

Note. As the locknut is hexagon, one third of a turn is equal to either two flats or two points on the outer periphery of the nut.

Before refitting clutch nipple check as follows:

Place a finger down the inspection cover hole and on to the cam lever. It should be possible to move the cam lever anticlockwise against the pressure of a light spring for ⅛ in. before coming up hard against the stop.

Refit the clutch cable nipple in the cam lever; the cable should then be adjusted at the gearbox end to give one sixteenth of an inch backlash when the cable is pulled.

The use of a screwdriver to lift the cam lever against the pressure of the clutch is likely to cause damage to the soft aluminium threads in which the inspection cap screws. Protection is easily given if the screwdriver shank is covered with a short length of rubber tubing, or it can be bound with insulation or medical tape.

GEARBOX LUBRICATION

Although ordinary S.A.E. 50 engine oil is satisfactory, it is strongly recommended that for strenuous work an oil of the type used for highly stressed hypoid gears is used. This oil, S.A.E. 90, has been fully tested by our Works riders with excellent results. A drain plug is situated at the bottom of the box and a small plug on the outer cover behind the kickstarter spindle forms the level plug. Capacity to this level is nine tenths of a pint from dry.

Between the gearbox final driving sprocket and the oil bath chain case are two felt discs which prevent the ingress of water and mud to the primary drive. The revolving face is greased when new, but an occasional soaking with an oilcan whilst still in situ will keep them soft, supple and full bodied.

OIL TANK

Capacity of the tank when filled to half the depth of the filter gauze is 3} pints. This is ample and allows plenty of cool oil for circulation, yet has the additional merit of allowing the rider to make frequent complete flushings without undue expense.

It is advisable to flush out the entire lubrication system after each serious Trial and refill with one of the recommended grades listed in the "Owner's Guide".

Note also in the "Guide" the description and location of the Ariel Flywheel Oil Purifier, together with general instructions for changing the oil and cleansing filters.

AIR CLEANER

Just as there are no hard and fast rules for oil changing, neither can there be for air filter cleaning. The filter is a straightforward and simple article and the rider should immediately become familiar with its construction. The element is designed to run wet, i.e. the gauze is covered with oil, so that dust from the atmosphere passing through will cling to the oil. When the element is fully loaded so that it can collect no more dust, anything further will be fed into the engine to the detriment of the working parts. The conditions met with in Trials are varied; should the going be very dusty the element might need recharging even after a single Trial. Use engine oil S.A.E. 30 for the gauze element.

PETROL TANK

The light alloy tank has a capacity of just under two gallons from dry to brim. The filler cap opens by pressing on the built-in catch and is closed by pressure with the palm of the hand.

The petrol tap is a positive action straight through type with no reserve, thereby ensuring that non-stop sections are taken non-stop. A small filter tube is mounted on the end inside the tank, and can be withdrawn complete with the tap. The tap is of large bore and the flow is quick—if any variation is noticed the filter should be examined immediately as foreign bodies or water can impede the flow. Restriction is apparent by the petrol flowing out in a "flutter" on one side instead of in a round-bored stream.

The "tricycle" tank mountings are of a special soft rubber and when the fixing nuts are fully tightened the tank is thoroughly insulated from all vibration and can be rocked by hand to a small extent. There are no threads to screw into the alloy, instead, the two front rubbers are pushed into

welded-in tubes and the action of compressing the ends causes the diameter of the rubbers to increase and grip tightly in the tubes. The single rear fixing nut is on a stud which screws into the frame, and on removing the nuts and petrol pipe the tank can be lifted straight up and off. When tightening, the three Simmonds nuts should all be flush with the bolt heads.

FOOTRESTS

The footrests on the HT are made from spring steel, and on no account should any attempt be made to re-shape them by brute force, or by applying heat which will either crack them or draw their temper.

CHAINS

The primary drive is exactly the same as the standard VH. The rear chain, however, is exposed, and even if well oiled at the start of a Trial will most certainly look dry at the finish. The noise of a chain that has dried off is not everything to go by, for each link has a bearing which may still be floating in grease or oil, the noise being due to the hammering of dry rollers on dry sprockets. Many first class riders carry a nozzled tin of cycle oil to apply at such times, and a few minutes effort can often work wonders. Information is given separately regarding the periodical soakings in warm grease, but the periods should be much shorter with the Trials machine.

CONTROLS AND CABLES

The controls are best dealt with by the application of thin cycle oil directly on such parts as pivots and rollers and the exposed ends of wires, and this should be done before every Trial. Any chafing of cable covering so that the steel casing is exposed will lead to the ingress of water at that point and the inner wire will soon rust and seize. If noticed in time such points can be oiled, wiped and bound with insulation tape, but if left too late a new cable will be needed. The custom at one time of taping spare cables to operating cables for a quick change is not now considered worth while. Left idle they deteriorate through exposure, and when needed are often found useless. If spare cables must be carried, put them in a waterproof bag in the toolbox.

The flexible drive to the speedometer is taken from the rear hub. Whenever the wheels are out and the cable disconnected, a grease gun should be applied to the gear at the nipple provided, until excess is seen at the screwed end. The inner driving shaft should be drawn out of the casing and, if it needs it, greased as it slides back into the casing. A turn of the shaft under pressure will mate up the squared end into the speedometer head. Do not

grease the drive and cable whilst connected—excess can be pumped into the speedometer head and render it useless.

BRAKES

With so many Brake Tests in Trials you will find in the HT everything you could wish for so long as they are kept in correct working condition. The front brake lever on the handlebar and the foot pedal both return instantly after operation. Should either fail to return with the customary snap, then is the time to find out why.

Rear. Remove wheel, nearside nut and collars and take off the brake plate complete. The shoes may be muddy, but before removing see that one shoe is marked, also one side of the fulcrum post, with a punch mark so that they can be replaced exactly as they came off. If the fabric is wet remove and dry off. Remove lever and spring and draw out the cam spindle. This may be dry and partially seized, if so it will need polishing with emery cloth and greasing before refitting. Check that the adjuster and plungers are clean and greased, and that there is no excess of grease exuding from the wheel bearings. The brake shoes when dry should be cleaned with a stiff wire brush, lightly greased at each end, and refitted exactly as they came out.

Do not use the centre nipple for greasing the hub—instead, pack each race separately with high melting point grease.

Refit wheel without forgetting to apply a spot of oil to the brake rod roller and threads.

Front. Should the operation become stiff, remove the wheel and take off the brake plate. The full width front hub is provided with a grease nipple for lubricating the cam spindle, consequently, if you have given it an occasional pump with the gun it is unlikely to cause trouble. All friction points should be cleaned and working parts greased, whilst both bearings should be packed with H.M.P. grease. Before refitting front wheel see that the spindle is clean and lightly greased. A wedge should be tapped into the fork end slot on the nearside to help the spindle to slide in easily. After spindle is in, draw it right home with the nut. Allow the eye of the nearside fork lug to find its proper position on the spindle, tap out the wedge and tighten the clamping bolt. Pull the spindle nut up tight last of all.

TYRES

For long it has been the policy of manufacturers of motor cycles to issue with their machines a booklet dealing with the care and maintenance of the tyres. The “Old Hand” probably knows it all—on the other hand there are

many with but a vague idea why motor cycles sold purely for competitive purposes are invariably fitted with security bolts. Briefly, for racing purposes (and many Special Tests in Trials come into that category) the abnormal stresses due to acceleration and braking can cause the tyre to creep on the rim, taking with it the _ inner tube. The tyre valve, being a fixture in the rim, cannot go with it and is pulled out bodily to the annoyance, and maybe peril, of the rider. The bolt in the front wheel of the HT is there purely to take braking strains, while the two in the rear not only take braking, but also have to cope with the much higher strains due to driving torque. If a tyre with a white spot is fitted to the HT front wheel the spot must come by the bolt; when fitted to the rear the spot must come midway between the two bolts.

It is well known that to find maximum traction in trials very low pressures are customary, and in most Open events you will find the “maestro” using a degree of under-inflation which can only be described as chronic. Whether you can afford to follow this line is entirely a matter for you to decide—if you cannot, then some definite policy should be adhered to in order to get the maximum effective life from the covers. ;

The continual scrubbing action of the tyres on normal metalled roads can quickly wear the sharp edges from the studs if under-inflated. Therefore, should long distances be travelled to the start, or from the finish, of a Trial, the pressures should be as those of a normal roadster.

In rocky country pressures should be appreciably higher than over courses renowned for mud. It is always easier to let a pound or two out than to put it back. Should rocks be taken fast enough to leave a mark in the rim, check up as soon as possible, for there may be a concussion burst inside which can quickly chafe through the tube.

The value of the milled ring on the tyre valve is problematical. Should the threads become burred or clogged it can become an adjectival nuisance. To discard it and replace with a full length rubber sleeve not only does a better job, but, additionally, any creep taking place in the tyre will immediately be indicated by tilting of the valve.

THE COMPLETE MACHINE

For your guidance, should it be necessary to dismantle the complete machine, the methods used are quite different from those of the standard VH. The engine, gearbox and primary drive are all built into the rear engine plates as a complete unit.

The frame is then put over the unit and additional fitments are then connected up.

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.