Villiers Engines Are

Entirely New 98 c.c. Autocycle Engine : 122 c.c. and Positive-stop Foot Change : Rectifiers for

ALL Villiers engines have been completely redesigned. A new layout of the ports has resulted in greatly increased power output; all engines have single-port exhaust systems; the famous autocycle engine of 98 c.c. has been recast and is now accommodated within the frame of the machine instead of beneath the bottom bracket as in the past; 122 c.c. and 197 c.c. engine-gear units have positive-stop foot-change and can be supplied with rectifiers to allow battery charging from the lighting coils in the flywheel magneto.

The new 98 c.c. (bore 47mm, stroke 57mm) power unit supersedes the Junior de-luxe engine. In external appearance the latest design has a likeness to the other engines in the range in that the centre line of the cylinder approaches the vertical; it will be recalled that all previous autocycle engines featured a horizontal cylinder layout.

A power output of 2 b.h.p. at 3,800 r.p.m. is achieved with the new engine, which is known as the Mark 2F. This power output is more than adequate for an autocycle, but experience has shown that in practice the peak r.p.m. can easily be exceeded under favourable conditions. To withstand the added loading of high r.p.m., the built-up crankshaft is supported on both sides by journal ball races; the Junior de-luxe engine had an overhung crank.

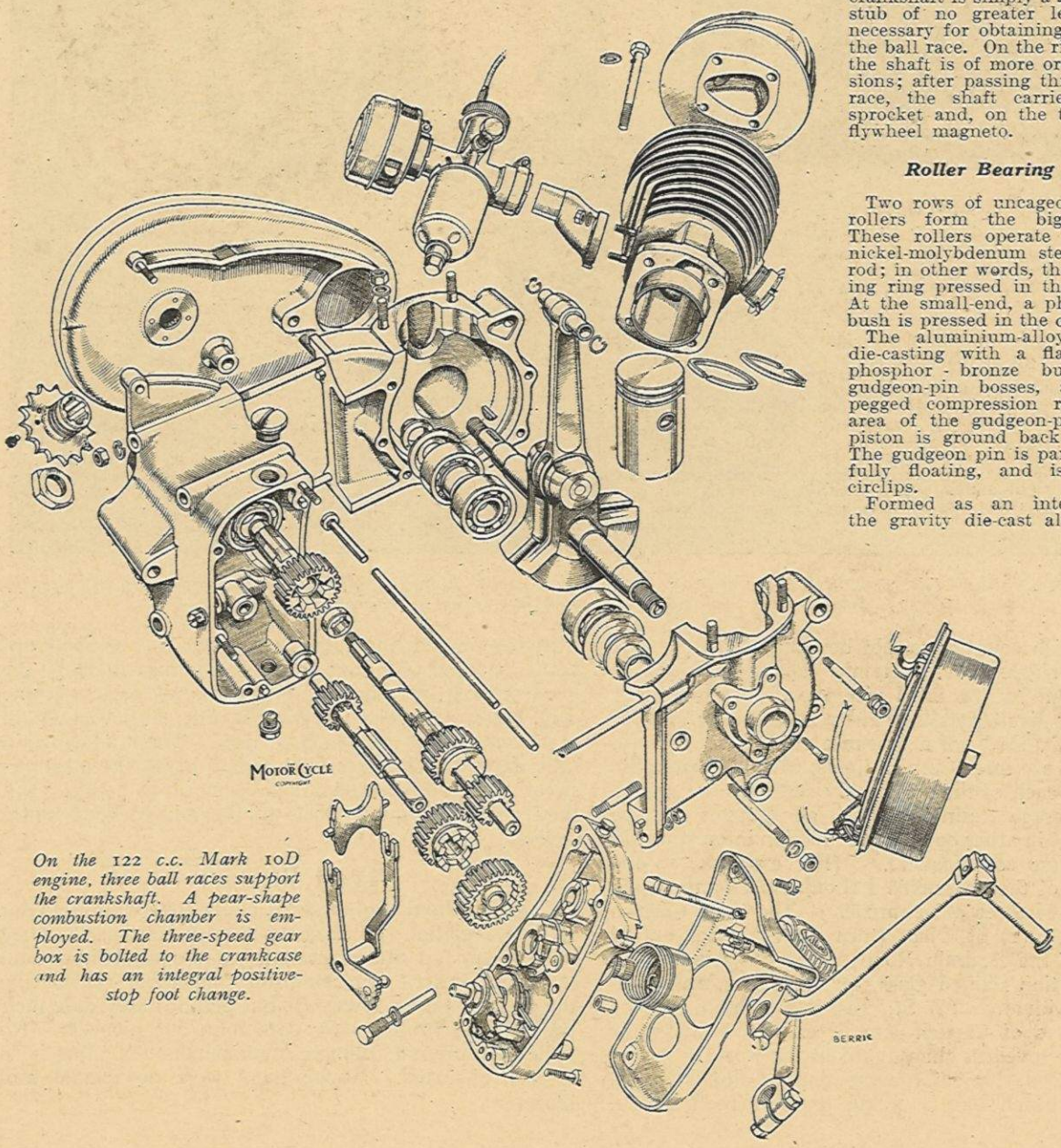
Each crank web with its shaft is a steel stamping. Joining the web is a solid carbon-steel crankpin of $\frac{5}{8}$in diameter throughout its length, which is an interference fit in the web bosses. On the left-hand side of the engine, the crankshaft is simply a 20mm-diameter stub of no greater length than is necessary for obtaining support from the ball race. On the right-hand side, the shaft is of more orthodox dimensions; after passing through the ball race, the shaft carries the engine sprocket and, on the taper end, the flywheel magneto.

Roller Bearing Big-end

Two rows of uncaged $\frac{3}{16} \times \frac{3}{16}$in steel rollers form the big-end bearing. These rollers operate direct on the nickel-molybdenum steel connecting-rod; in other words, there is no bearing ring pressed in the big-end eye. At the small-end, a phosphor-bronze bush is pressed in the connecting-rod.

The aluminium-alloy piston is a die-casting with a flat crown, has phosphor-bronze bushes in the gudgeon-pin bosses, and has two pegged compression rings. In the area of the gudgeon-pin bosses the piston is ground back some 0.002in. The gudgeon pin is parallel bored, is fully floating, and is retained by circlips.

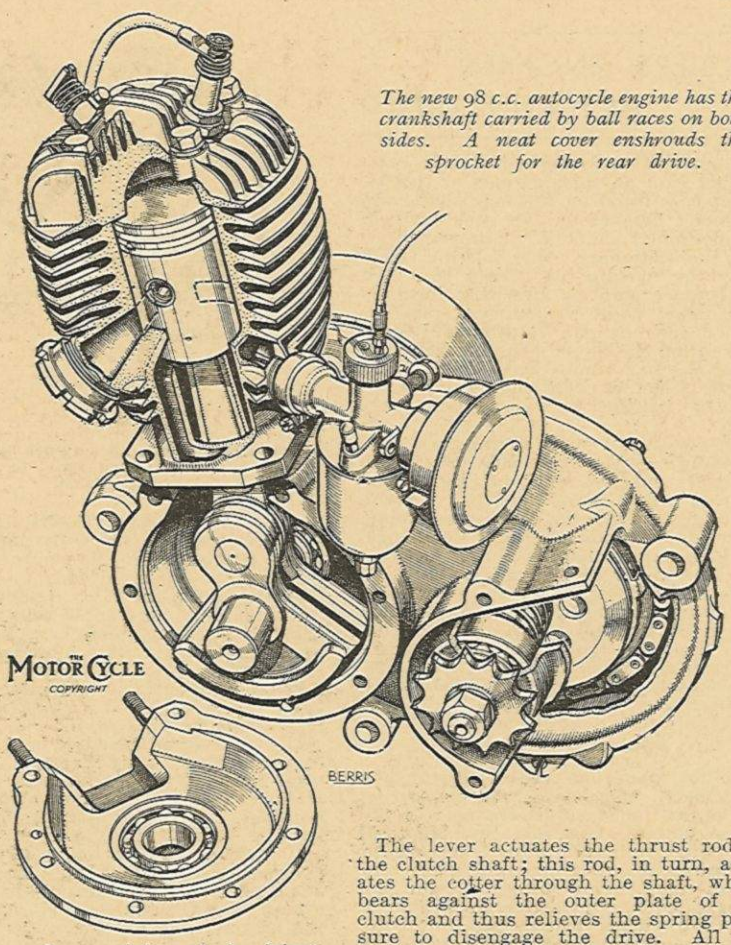
Formed as an integral part of the gravity die-cast aluminium-alloy



On the 122 c.c. Mark 10D engine, three ball races support the crankshaft. A pear-shape combustion chamber is employed. The three-speed gear box is bolted to the crankcase and has an integral positive-stop foot change.

Redesigned

197 c.c. Engine-Gear Units with Battery Charging



The new 98 c.c. autocycle engine has the crankshaft carried by ball races on both sides. A neat cover enshrouds the sprocket for the rear drive.

crankcase is the inner half of the primary chaincase and the boss for the clutch shaft bearing. On the left-hand side, the crankcase "half" is really a plate carrying the crankshaft ball race; the plate is retained by six countersunk screws and, at the bottom, a bolt, which is also a crankcase drain plug. A cover at the bearing boss seals the crankcase at this point and, in effect, forms a "blind" bearing.

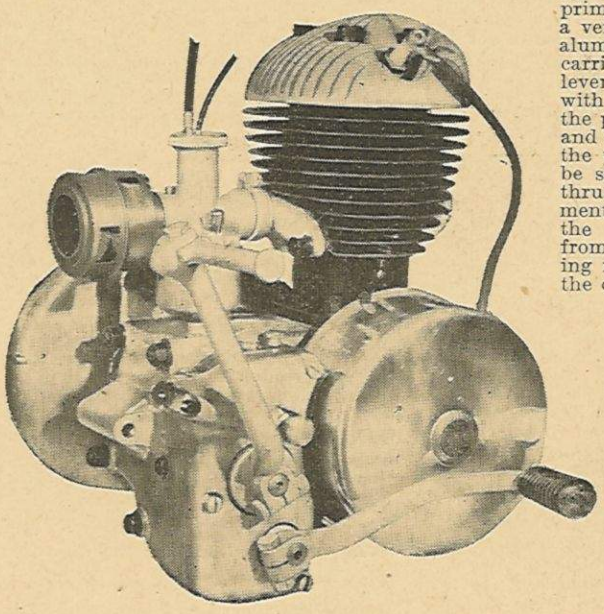
Four studs retain the cast-iron cylinder. The inlet port is the rear, the single exhaust port at the front, and the two transfer ports are placed one on each side. These transfer passages start as cutaways in the crankcase; the cylinder spigot forms the passages proper which then continue through the cylinder casting. The outlets of these passages give a rearward and upward swirl to the incoming charge, which is directed towards the cylinder head and ensures good scavenging.

Light-alloy Cylinder Head

The cylinder head is an aluminium-alloy casting, has a hemispherical combustion chamber, and is fitted with a 14mm sparking plug at the rear and a compression-release valve at the front. The joint between head and cylinder is direct (no gasket), and there are four high-tensile steel retaining bolts.

An endless ½in pitch chain is employed for the drive between engine and clutch sprockets; the reduction is 2.47 to 1. The clutch is of the two-plate cork-insert type, operating in oil. The sprocket itself forms one friction plate and the other friction plate has five peripherical tongues, set at right-angles, which locate in slots in the sprocket face. There are, obviously, three plain steel driven plates; these fit splines on the clutch shaft. A single coil spring is employed; this is wound from square-section wire.

Both ends of the clutch shaft are supported by ball races. The clutch operating mechanism is on the right-hand side. On the aluminium - alloy primary chaincase cover is a very neat casting, also in aluminium - alloy, which carries the clutch thrust lever. A single screw, fitted with a lock-nut, provides the pivot for the thrust lever and at the same time allows the position of the lever to be set to give the required thrust mechanism adjustment; the lever is located at the sides and prevented from canting over by operating in a channel formed in the casting.



Very similar in layout to the 122 c.c. engine, the 197 c.c. Mark 6E has a hemispherical combustion chamber; the sparking plug is situated on the right-hand side of the cylinder head, and on the other side is a compression release valve.

The lever actuates the thrust rod in the clutch shaft; this rod, in turn, actuates the cotter through the shaft, which bears against the outer plate of the clutch and thus relieves the spring pressure to disengage the drive. All the operating mechanism is fully enclosed, the clutch cable "disappearing" into the unit at a point near the base and to the rear of the primary chaincase.

At the other end of the clutch shaft—the left-hand side—the 11-tooth driving sprocket is fitted; the shaft is parallel and the sprocket is keyed in position and retained by a nut. Enshrouding the sprocket and preventing messiness from oil flung off the final drive chain is an aluminium-alloy cover retained by two countersunk screws.

Incidentally, three robust mounting lugs are provided on this new autocycle engine. One lug is at the front of the crankcase, one is at the base and the third is at the rear of the primary chaincase.

New Strangler cum Filler

A stub-fitting Villiers Junior single-lever carburettor is employed. This carburettor now has the new Villiers air filter of the wire-mesh type, the mesh being automatically oil-wetted. It is a very neat filter and incorporates the strangler for easy starting. The strangler takes the form of a shutter which, when brought into operation by the control rod, blanks off the rectangular ports in the filter body.

A new 6-pole flywheel magneto incorporating lighting coils is employed. Output for lighting is double what it was before; it is now more than 12 watts at 6 volts, and standard lighting equipment is head-lamp main bulb 6v 12w, parking bulb and tail lamp bulb, 4v 0.3amp.

The design of the flywheel follows the well-tried Villiers layout with revolving

VILLIERS ENGINES ARE REDESIGNED

magnets and stationary coils, the contact breaker cam an integral part of the flywheel boss fitted on the mainshaft, and a contact breaker on the back plate of the assembly. A detail improvement is that the stationary contact point is adjusted by moving the carrier to which the contact point is attached; formerly the contact point was screwed into the carrier and the gap setting held by a lock-nut on the screw. The new arrangement is much more accessible. Total weight of the Mark 2F engine unit without the lighting set is approximately 31 lb.

The two motor cycle engine-gear units are known as the Mark 10D (50×62mm, 122 c.c.) and the Mark 6E (59×72mm, 197 c.c.). Both have much in common in design; indeed, the gear box assembly, including the positive-stop foot-change, the kick-starter and the clutch mechanism are similar on both units.

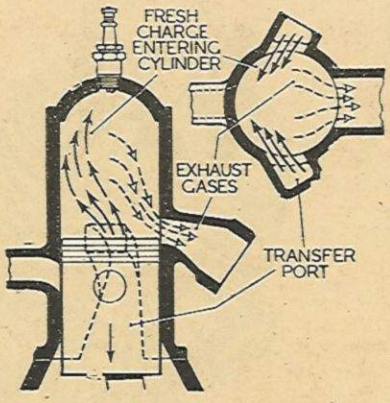
On the 122 c.c. unit the crankcase gravity die casting is in aluminium-alloy and is of straightforward orthodox design. Bolted to the rear of the crankcase is a separate gear box. It is a self-contained unit, but when assembled forms, in effect, a part of the engine.

Spaced Ball Races

Similar materials are used for the crankshafts, bob-weights and connecting rod as for the Mark 2F engine. In the larger engine, however, the left-hand crankshaft protrudes through two spaced ball races (20mm inside diameter) and carries the engine sprocket. On the other side there is a similar ball race, and on the taper towards the end of the shaft, the flywheel magneto is fitted.

The ⅜in-diameter crankpin is hollow; it is an interference fit in the bob-weight bosses, and hardened taper plugs are fitted in the ends of the pin to lock up the assembly. Two rows of uncaged ¼×¼in rollers form the big-end bearing, and at the small-end there is a phosphor-bronze bush. The hollow gudgeon pin is of the fully floating type and is retained by circlips in the piston-boss bushes. The piston has a flat crown.

Porting in the cast-iron cylinder is on the same principle as for the 98 c.c. engine. The cylinder head is in light alloy and has a combustion chamber shaped like a half of a pear. The 14mm plug is fitted towards the rear—the narrow end of the pear contour. No compression release valve is employed. An external difference from the 98 c.c. engine is that the inlet stub, instead of being formed with the iron cylinder, is a light-alloy casting retained on the cylinder by two studs.



New porting on all engines gives an upward and rearward swirl to the incoming gases

Primary drive is by ⅜in pitch endless chain. The clutch is a two-plate, cork-insert type running in oil.

The three-speed gear box is of straightforward robust design and of the constant-mesh type. Half-inch internal diameter phosphor-bronze bushes support the layshaft at both ends, and a similar bearing is employed for the mainshaft at the cover end. At the other end the mainshaft operates direct, without a bush, in the top-gear sleeve, a spiral groove in the mainshaft journal ensuring adequate lubrication. The top-gear sleeve bearing is a ball race of 25mm inside diameter. All gear pinions are case-hardened.

Both kick-starter and foot-change mechanisms are carried by the gear box inner end cover. The kick-starter is of the pawl type; when the pedal is depressed the pawl engages with ratchet teeth formed on the inside of the layshaft bottom-gear pinion. An enclosed wire coil spring returns the kick-starter crank, which is splined to its spindle; a spring-loaded folding pedal is fitted.

Simplicity is the keynote of the positive-stop foot-change mechanism. On the spindle mounted in the end cover is a floating operating plate prevented from turning by a stop in the cover. A pawl plate is splined to the spindle, and as the foot-change lever is moved, the pawl plate, which is spring-loaded from the back by a square-section coil spring, cants over. This brings the pawl plate into engagement with the operating lever, which in turn actuates the selector forks. The selector quadrant has a spring-loaded locating plunger of orthodox pattern.

A two friction-plate clutch with three springs is utilized. With this clutch the thrust rod operates throughout the length of the mainshaft and the thrust lever is carried in the outer end cover of the gear box. The pivot mechanism of the lever follows the general principle of that employed on the 98 c.c. engine, except that the pivot pin is fitted with a knurled adjuster for setting by hand; there are four small cutaways in the adjuster in which locates a flat spring to hold the setting required.

In the top of the gear box case is a large filler for lubricant, and at the top of the inner end cover is a readily accessible dip stick for checking the level.

Rectifier to Order

Gear box ratios are top, 1 to 1, second, 1.7 to 1, and bottom, 3.25 to 1. Engine to gear box reduction is 2.83 to 1.

The 6-pole flywheel magneto is fitted with lighting coils giving an output of over 30 watts at 6 volts. A Westinghouse rectifier can be supplied to order. With the rectifier a 24×24 watt headlamp main bulb is used; with direct lighting a 30×30 watt bulb is standard. An attractive aluminium cover enshrouds the flywheel.

A two-lever, Lightweight Villiers carburettor with air filter is fitted.

Differences between the 197 c.c. Mark 6E unit and the Mark 10D unit described are few. The bore and stroke are 59×72mm respectively, and the crankcase is larger to accommodate the greater throw of the crank. Engine bearings are similar.

A marked difference, however, is in the cylinder-head design. For the Mark 6E, the combustion chamber is hemispherical with the sparking plug situated on the right-hand side. On the left-hand side a compression release valve is fitted.

The primary chain has a ½in pitch and the reduction between engine and gear box is 2 to 1. Gear box ratios are the same for both units. The larger engine is fitted with the Villiers Middleweight carburettor.

Kidston Scramble

B. W. Hall (350 Matchless) on Top of His Form

CONDITIONS were delightful for the Kidston Open Scramble held at Builth Wells last Saturday. The numerous spectators basked in the sunshine, while open-necked shirts were the prevailing fashion among the riders, air cooling being regarded as more important than protective clothing.

B. W. Hall, on a 350 c.c. Matchless, with his Continental honours thick upon him, was at the top of his form and scored a decisive victory, gaining on every lap.

At the start, J. Cox (350 A.J.S.), No. 4, took full advantage of his inside berth. He was first into the bog. He charged through in great style, literally leapt out of it, and had a clear lead. Very shortly, however, a bad spill, which cut his face and bent the forks of his machine, put him out of the race, and at the end of Lap 1 Hall was leading, with E. Ogden (500 Norton) in close attendance, followed by S. B. Manns (500 Triumph) and G. E. Duke (500 Norton). Manns came off in the bog and was passed by Duke. The first four remained in the same order until Lap 6, when Duke dropped back to fifth, Manns regained third place, and R. Oakes (350 Matchless) became fourth.

While on the fast straight at the finish of Lap 9, Manns had a most spectacular spill. His front wheel met an obstruction and stopped, the machine stood on end and the rider seemed to be in the air for ages—all arms and legs. He landed with a terrific thump and then, to the amazement of everybody, remounted and was off—truly scramble riders are tough. Meantime, Duke had regained fourth position and this spill let him back into third place behind Hall and Ogden, which he retained to the finish. Manns was a very gallant fourth, Oakes fifth, W. Barugh (350 B.S.A.) sixth, and veteran Colin Edge, who had ridden throughout with a flat front tyre, seventh. A. W. Pearce (350 Matchless) completed the Builth "B" team, the only team to survive.

RESULTS

Kidston Cup: B. W. Hall (350 Matchless).
Hancock's Trophy: E. Ogden (500 Norton).
Price Bros. Cup (Best 250 c.c.): A. D. Parker (B.S.A.).
Popular Cup (Best 350 c.c.): R. Oakes (Matchless).
Frank Jones Cup (Best over 350 c.c.): G. E. Duke (500 Norton).
Team Prize: Builth "B" Team (A. Colcombe, A. W. Pearce and J. Price).
Phillips Cup (Best local rider): D. R. James (350 B.S.A.).

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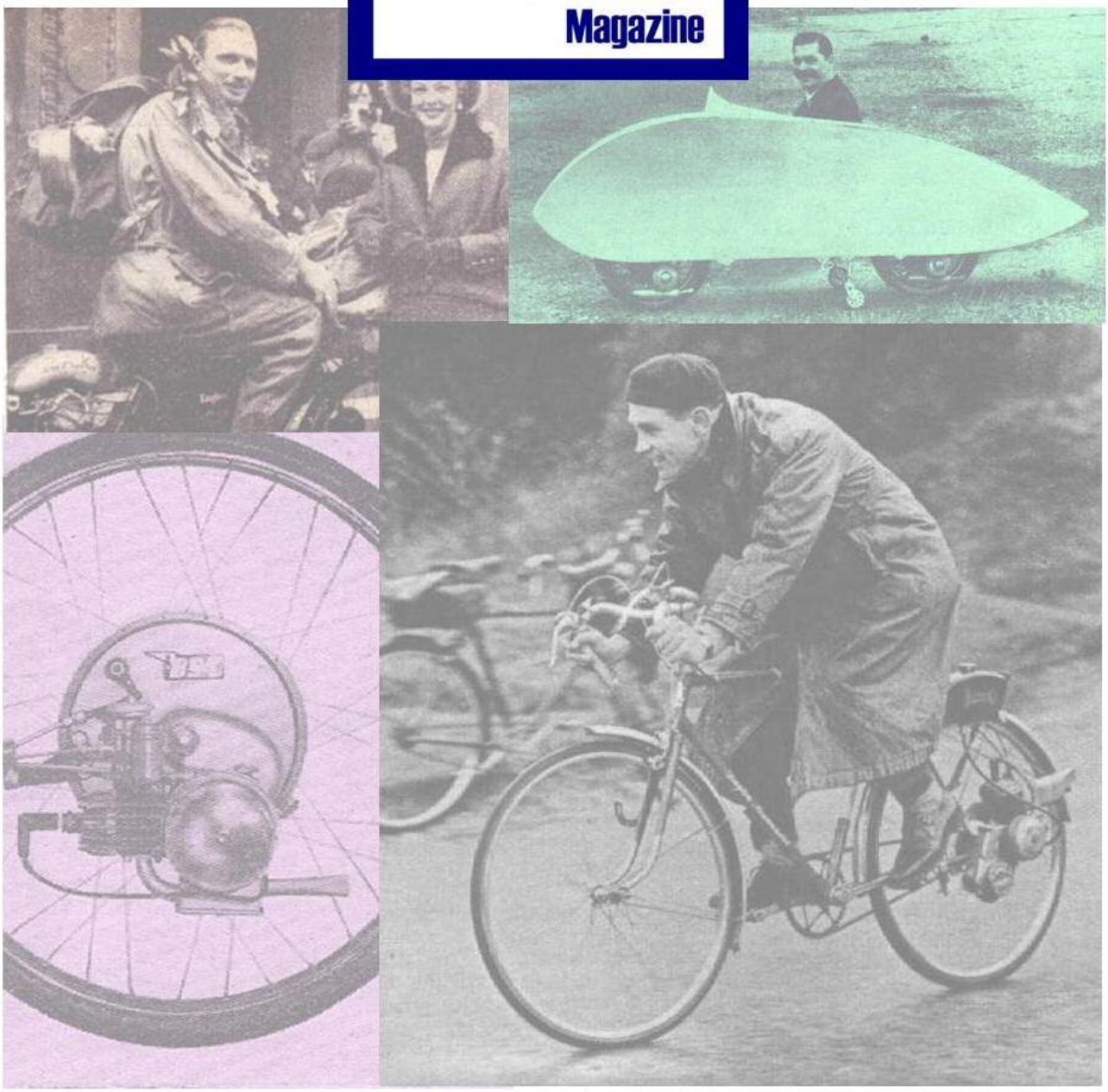

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