NEW CRANKCASE ASSEMBLY FOR SUPER-TUNED VILLIERS

Alpha Bearings break new ground with racing two-stroke bottom-half conversion

FOR some years there have been special racing top-half conversion kits for the Villiers 197 c.c. 9E and later 250 c.c. 34A. First in the field was the Hermann Meier-designed Vale Onslow cast-iron cylinder assembly (which produced a quite amazing improvement in power output although it was not exceptionally reliable) and this was followed by linered light-alloy cylinders from the Colchester firms of Cromwell Motors and Parkinson and, of course, the Greeves conversion.

The trouble was that while all this development was going on to increase power output the bottom half of the engine remained basically the same as when the 9E was introduced in 1957 as a touring model—for country parsons, and the like, as Chris Lavery said last month.

The 9E crank assembly is not man enough to cope with power outputs in the region of 20 b.h.p. (some *claim* even more for their conversions) and as a result two troubles occur.

First, the cranks " spread "—they part at the crankpin until the webs touch the sides of the crankcase ; and secondly, the cranks flex so that in time (quite a short time, very often) the mains work loose in their housings, with the result that a new crankcase is necessary.

Villiers' answer

Villiers—to their credit—are the first to admit that the 9E assembly is not up to coping with such power. It is not a racing design and never was. Their answer is the new Starmaker which, I am sure, will eventually prove absolutely first-class.

In the meantime, however, there are hundreds—possibly thousands— of scrambles and grass-track enthusiasts who have already got 250 c.c. Villiers-powered competition machines of one make or another and are seeking more power and more reliability.

It is to help these people that Alpha Bearings have come into the picture. Reconditioning hundreds of two-fifty Villiers competition engine big-ends, etc, and hearing almost daily of spread cranks and worn cases, soon convinced them that there was room for improvement.

First step was to introduce the Alpha full flywheel assembly which, as well as increasing crankcase compression ratio, had a larger-diameter crankpin and so stayed together better. But even this, they soon realized, was not the real answer. Flexing was still occurring, even the Alpha cranks would part and mains still worked loose. One reason for this, they thought, was the twisting effect imparted by acceleration and deceleration of the Villiers outside flywheel.

What was wanted was a conversion bottom half—a complete bottom half—to cope with the power of the super-tuned conversion top halfs.

As a result of these observations, Alpha managing director Frank Cutler together with his co-directors Norman Cutler and Harry Nightingale got together and designed a complete new crank and crankcase assembly—an assembly to take Villiers or Villiers conversion barrels but one which is far stronger and intended mainly for racing.

The main way in which the Alpha assembly differs from the Villiers is that there is no outside flywheel. Instead wide, full-crank discs are employed which have a total weight equal to that of the Villiers

WHO ARE ALPHA BEARINGS ?

IN 1946 the brothers Frank and Norman Cutler were working as toolmakers in Birmingham and in their evenings did a few jobs in their own private workshop in Norman's back garden.

It was to Norman that scrambles and racing enthusiasts Len Vale Onslow came with a problem. He wanted a big-end but could not buy one anywhere. Could Norman help ?

Norman could and did. In that little garden shed the necessary parts were machined and after hardening the resultant bearing worked perfectly. Len Vale Onslow came again for more big-end bearings and soon other people came. In a few months it was obvious to the two skilled brothers that there was enough work to keep them both going full time.

Next step was to move to a shed in a builder's yard—a shed shared with a deafening metal-spinning machine—but after a year or so even this was not big enough.

It was then that Harry Nightingale came into the picture. A schoolmaster teaching maths at Oldbury, he was getting a little tired of his job and realized anyway that, in his own words, " the highest I can get to is headmaster."

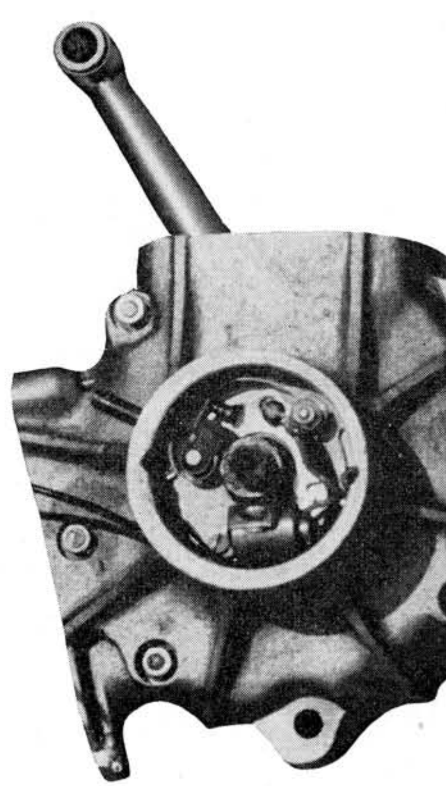
Harry had some land and a building in Oldbury. He would let the Cutler brothers have it in return for a share in the business.

With Harry looking after the business side of things and the Cutlers freer to get down to technical problems, Alpha Bearings, as they had decided to call the firm, really began to get on the move.

Extra staff were recruited to man the lathes, grinders and milling machines but still the demand for Alpha big-ends increased and soon these premises were not large enough.

In 1955, therefore a move was again made—to the present works in Netherton. There Alphas occupy 12,500 square feet of floor space and make 2,500 big-ends per week including original equipment bearings for some of the most famous British manufacturers.

On the payroll now are some 75 workers—most of them skilled machine-tool operators—but Mr Frank and Mr Norman, as they are called, are still setting the pace. Both are—as I noticed when I went over the works last month—still essentially practical men who are right on top of the technical part of the job. Frank Cutler, 52, calls himself production manager and looks after the day to day running of the works and resultant problems. Younger brother Norman, 48, is concerned primarily with the design of the machines to make the bearings and has invented—among many other ingenious devices—a tool to produce big-end cages in three minutes where other methods took half-an-hour.



Dispensing with the Villiers outside flywheel means no flywheel magneto, of course. Alpha design has contact breaker with cam on the end of the mainshaft and is used with battery and coil

Prototypes going out to factories and selected riders . . . extended development before marketing

bob weights plus the flywheel. Additionally, the case is stiffer and the main bearings are wider.

Let's take a look at the details.

The stroke, of course, is just the same as on the Villiers and so are the crankcase mouth, the attachment lugs and the gear box mounting flange.

Of streamlined oval section, the connecting rod is similar to that employed for the old Alpha crank conversion but width of the big-end eye has been increased still further—to 0.7in as opposed to the original 0.5in of the Villiers—while crankpin diameter has been stepped up to a full inch, as opposed to the original $\frac{5}{8}$in.

So that the gap between the flywheels will not be too large—and thus adversely effect crankcase compression—the big-end runs in machined recesses in the discs. Overall width of the flywheels is $2\frac{7}{16}$in and because of the so much increased diameter it was felt unnecessary to use expander plugs for the crankpin. This has a 0.0035in interference fit while the discs are machined from E.N. 34 forgings which are afterwards hardened, quenched in oil and then ground. Reason for hardening is to prevent the crankpin swaging the metal away when it is pressed in and also to provide an improved side bearing surface.

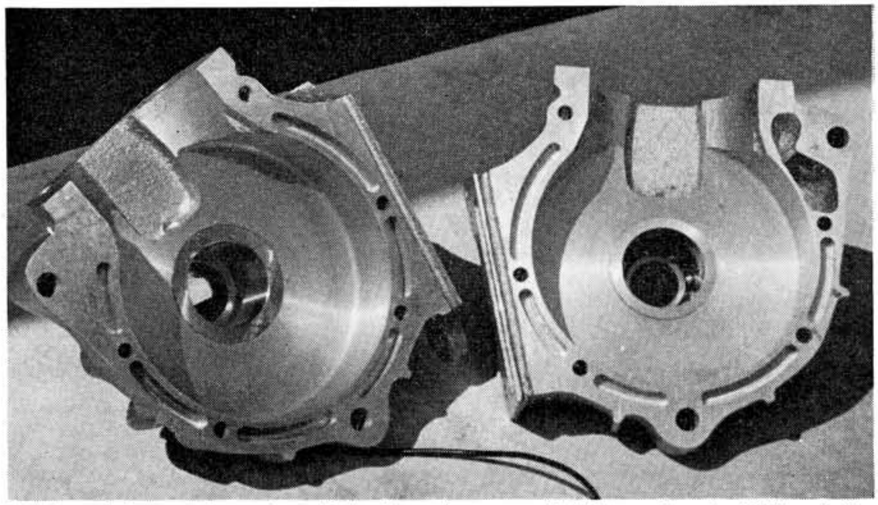
As with the crankpin, so mainshaft diameter has been increased. Both are $1\frac{1}{16}$in o.d. where they pass through the main bearings and, as in the speedway J.A.P., the main bearing rollers run direct on the Alpha shafts.

Main bearings

The reason for this type of main bearing? It is possible to have far thicker and longer outer tracks which can be well and truly shrunk into their housings in the case and are not likely ever to work loose. On the timing side the shaft runs in two rows of $\frac{3}{16}$in o.d. $\times$ $\frac{3}{8}$in long rollers in a single two-track cage while on the drive side there is a single deep row ball race to control end float and a single row of $\frac{9}{16} \times \frac{3}{16}$in rollers running in a liner of $\frac{1}{8}$in wall thickness.

On the first batch of experimental cranks the shafts are pressed into the webs but production assemblies may well be one-piece forgings.

After experiments with an engine in a Greeves frame a balance factor of 63 per cent was settled for as providing best results between 4,000 and 7,000 r.p.m. but using a Cross barrel an Alpha assembly has been taken up to 9,000 r.p.m. without undue vibration. To obtain the required balance the wheels are drilled and then plugged with light-alloy caps.



Crankcase halves are in sand-cast light alloy, of greater wall thickness than the Villiers design and with strengthening external ribs. Transfer cutaways are deep cut for maximum oil drainage to main bearings

Of sand-cast light-alloy, the crankcase halves are made for Alpha by Vowles foundry at West Bromwich. Wall thickness is greater than that of the Villiers, and horizontal external ribs increase stiffness.

Why, I asked, have the transfer cutaways been left so deep? The reason, I learned, was to obtain maximum oil drainage to the mains. Many tuners believed in building up and streamlining the transfer cutaways in order to increase crankcase compression and improve gas flow but this, Alphas felt, would almost certainly spell loss of oil to the bearings, and that was more important.

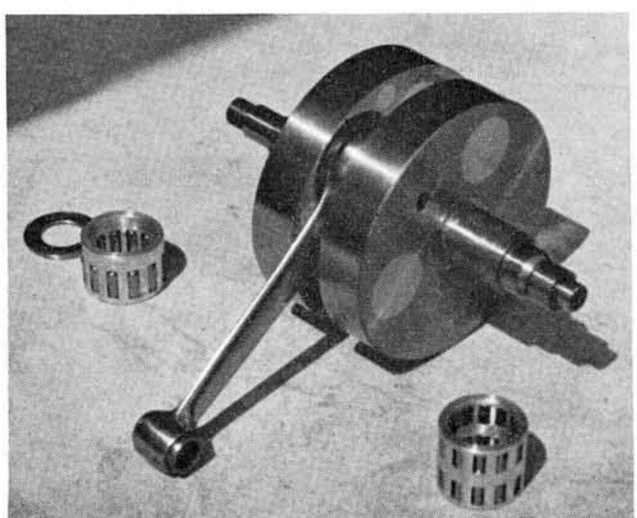
Spring-loaded rubber oil seals are located outboard of both bearings—that on the timing-side running on the shaft and that on the drive-side on the sprocket boss. Five through studs hold the crankcase halves together on prototype assemblies but production engines will have the number increased to six by the addition of an extra stud just behind that at the top rear.

Dispensing with the outside flywheel has meant, of course, dispensing with the flywheel magneto. Instead the Alpha design has a contact breaker with cam on the end of the mainshaft and is intended for use with battery and coil. The contact points are in fact a standard Lucas assembly—from a Standard Vanguard car—but mounted on an Alpha back plate. One advantage of coil ignition is that the timing can be varied without affecting internal timing and, in consequence, spark intensity.

It is intended to experiment with a Lambretta-size battery in rubber mountings. Range of timing adjustment is from the piston at top dead centre to a full inch before t.d.c.

Price of the new Alpha assembly has not been settled yet—and hold on a moment before you rush off to write and place an order! Unlike some manufacturers, Alpha do not intend to let any of their new units get into the hands of the public until they are sure all the bugs have been ironed out.

The initial batch of prototypes are going out to factories using the Villiers unit and to some selected riders, and extended development tests will be carried out before the units reach the market. R.T.M.



Alpha crank conversion has streamlined, oval-section connecting rod. Crankpin diameter is 1in and mainshaft diameter $1\frac{1}{16}$in at the the main bearings. Full-disc flywheels are balanced by drilling and inserting light-alloy caps