

Copies to:- Major P.W. Smith  
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Mr. J.J. Booker ✓  
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File

7th March, 1961.

Report of Development Work in Progress  
February, 1961.

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Paragraph Nos. refer to Minutes of the Development  
Meeting held on February 10th.

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1.- Silencing:-

In spite of the fitting of a tab washer behind the nut securing the silencer end trouble is still experienced with these coming loose causing loss of the end casting.

To some extent this is no doubt due to deformation and charring of the sealing ring between the front taper portion of the silencer and the cylindrical portion. Protection of the sealing ring by a thin steel washer does not prevent the charring.

Three enquiries have been put out for sealing rings to stand higher temperatures. Of these, one has so far produced only an acknowledgement, one an apology for inability to supply and one a sample ring of silicone rubber. This is too large in section and diameter, but has been adapted to fit in a silencer fitted to a Constellation machine to be used for high speed tests at M.I.R.A. This will enable the heat resisting properties of this material to be evaluated.

An enquiry has also been put out for a C & A washer at this point, but no samples or quotations have yet been received. A reminder has been sent.

Loss of the centre nut is not serious; loss of the end casting is. We have one silencer running in which rotation of the end casting is prevented by three self-tapping screws instead of by the standard dimple and slot arrangement. This end remains in place even when the centre nut is missing.

### Silencing (contd.)

A "Phillidas" self locking nut is also being tried (in conjunction with a tab washer) in an attempt to prevent loss of the nut.

The standard new type silencer fitted to the 350 cc Bullet model produced such a loud and unpleasant exhaust note that a modification was made by adopting the internal arrangement "E" described in my report on Silencer Tests dated 7th December last. This consists of moving the spiral baffle to the front end of the cylindrical portion of the silencer and following it by a perforated cylinder some  $2\frac{1}{2}$  in. diameter supported on special washers. The space between this and the silencer barrel is packed with glass wool which however, was accidentally omitted when this arrangement was tested for performance at M.I.R.A. on 1st December, when it showed a loss in mean maximum speed of 0.8 m.p.h. on a Crusader Sports, and of 3.9 m.p.h. on a Constellation as compared with the present standard silencer. The corresponding losses at the end of the acceleration test from 40 m.p.h. in top gear over half the length of the timing straight were 1.2 m.p.h. and 1.96 m.p.h. respectively.

When fitted to the 350 cc Bullet this silencer gives a much pleasanter note, probably of lower intensity, with no noticeable loss in performance. The silencer is, of course, more expensive than the present one since it contains two special perforated washers 3 in. in diameter, and the perforated gauze cylinder as well as the glass wool packing in addition to all the standard components.

Another silencer is being made up without the spiral baffle in the hope that this will give equally as good a note without so much loss of performance on the Constellation model. Making the perforated cylinder of stabbed material (with the spikes outwards) will also be tried in the hope that this will avoid the cost and trouble of the glass wool packing.

I have attended a meeting at the Ministry of Health of a sub-committee dealing with vehicle noise. From the discussion at this I formed the opinion that 85 dB (A) might be fixed as the maximum permissible noise level for motorcycles. Objections were raised to my suggestion of a concession for twin cylinder four strokes. Such a concession would not present any difficulty so far as type tests for new vehicles were concerned, but it was felt necessary to have only one noise level for motorcycles so as to facilitate prosecution of individual motor cyclists who had tampered with their silencers or allowed them to deteriorate.

## silencing (contd.)

If the permitted noise level is fixed at 85 dB (A) we shall have to make very considerable modifications to our Constellation to comply without having to suffer a very severe power loss.

In the present state of knowledge a much larger silencer, or possibly an auxiliary silencer across the front of the engine, will be necessary to bring the exhaust noise down to the required level. When this is done it may well be found that air intake noise is predominant, necessitating an intake silencer. It will probably also be necessary to modify the cam form both to help reduce exhaust noise and also to prevent mechanical noise becoming predominant which would certainly irritate the rider even if it did not itself exceed the permitted noise level.

The results of the M.I.R.A. Subjective Noise Test have not yet been received in the form of a report. I have however, had some preliminary figures from Mr. Mills. These indicate that the dividing line between "Acceptable" and "Noisy" averages 82.5 dB (A) for motorcycles, and that there is no significant difference in the figure for singles or twins, two-strokes or four-strokes.

I have written to Mr. H. Palin asking him to approach Dr. Fogg of M.I.R.A. officially on behalf of the Cycle and Motor Cycle Industries Association requesting that some fundamental research be carried out as it is felt that there is a lack of basic knowledge of this subject.

I have also written to Professor Richardson of Southampton University on this matter, but so far have received no reply.

### 2.- 250 cc Front Forks:-

The heavy gauge undamped fork has been built into a machine with the standard frame, which has already covered 500 miles on the Pave at M.I.R.A. A further 75 laps (112 miles) have now been covered using prototype springs intended for solo work. At the end of this period the springs had not changed in length. They have now been replaced by prototype springs intended for sidecar work with this fork (primarily on the Meteor Minor) which are more highly stressed. The test is continuing.

### 3.- Sidecar Forks:-

The Works box carrier outfit has now been restored to sidecar trail, the heavy gauge forks being still fitted. Apparently the prototype springs have a satisfactory load/deflection rating for this type of sidecar.



4.- New Fork Head Glin:-

There is nothing further to report on this.

5.- Lubrication on 700 cc Machines:-

The engine incorporating plates running from the oil well to the cylinder base has been rebuilt, and is at the time of writing again being tested at M.I.R.A.

Bench tests have shown that, at any rate in some engines, some oil is escaping from the rocker feed release valve all the time the engine is running. Tests have also shown that the secondary side of the scavenge pump (which is intended to keep the timing case clear) virtually ceases functioning shortly after the engine has been started up. It appears therefore that most of the oil from the rockers either escapes past the cylinder spigots, where these break into the cam tunnels, or, if it reaches the timing case, it finds its way into the main crank chamber, and is picked up by the primary side of the scavenge pump thus adding to the load on this.

A series of tests have been run on oil consumption and sump contents on a special crankcase with deeper wells in which to collect the oil.

This shows sump contents of 150 to 180 cc at speeds up to 5000 r.p.m., 175 to 190 cc at 6,000 r.p.m., and 180 to 275 cc at 6,500 r.p.m.

Recorded oil consumption figures are zero (or even negative in some instances when allowance is made for change in sump contents) up to 5,000 r.p.m. They range from zero to 600 m.p.g. at 6000 r.p.m. with an average over three runs of 1,980 m.p.g. from zero to 455 m.p.g. averaging 1,330 m.p.g. over four runs <sup>at</sup> 6,500 r.p.m. allowing for change in sump contents. If additional oil in the sump is counted as lost the recorded consumption figures at 6,500 r.p.m. range from zero to 375 m.p.g. (average 705 m.p.g.)

This modification is undoubtedly an improvement. Even the worst recorded figure at 6,500 r.p.m. is not very serious when it is borne in mind that this speed represents 114 m.p.h. in top gear on a Constellation at which speed a five minute test run represents a distance of 9½ miles.

7.- Light Alloy Cylinder Barrels and Pistons for use in same:-

(a) The hyper eutectic piston is ready for fitting to an engine. Even if this proves successful where are we going to get

Light Alloy Cylinder Barrels (contd.)

these pistons ?

(b) The third piston plated by the Ionic Plating Co. has been checked by Messrs. Hepworth and Grandage Ltd. who report that the plate varies between .00071 and .00083 in thickness over most of the skirt except at the extreme top where it builds up to .00164 in. Their report has been passed on to Ionic whose attention has also been drawn to some acid attack on the gudgeon pin.

Messrs. Sheepbridge Engineering, Monochrome and Ionic have been asked to quote for chrome plating and finishing a cylinder bore of the size of our "Crusader". The only price so far received is a tentative one from British Van Der Horst Ltd. (a subsidiary of Sheepbridge Engineering) who quote tentatively a figure of 28/- to 30/- each. This seems reasonable compared with Hepworth's figure of 40/- to 45/- especially as the Van Der Horst figure is for porous chrome whereas Hepworth's was for hard chrome.

A pair of Cross pistons weighing the same as our standard Constellation pistons have been fitted in place of the heavier Cross pistons which have been on test.

8.- Clutches for Constellation and Super Meteor machines:-

Mr. J.J. Booker has been given a modified print showing a suggested way of slotting the interleaving steel plates in these clutches.

9.- Oil Filter on 250 cc Machines:-

The filter housings have been ordered as hot brass pressings.

Mr. Thomas has approached several suppliers for plastic filter elements. It seems that Messrs. Intermitt are the only ones who can supply.

10.- Cylinder Heads on 250 Clipper Machines:-

Mr. Freeman's investigation showed that by allocating a reasonable number of faced exhaust valves to Service stock it would be possible to change to aluminium alloy cylinder heads on the last 500 machines of the present sanction.

11.- New Cam Form for 250 Clipper and Crusader:-

No comment.

12.- Batch Tests:-

The promised Batch Tests on a Constellation and a Crusader were duly carried out and were reported on separately. The mean speeds obtained of 104.05 and 76.45 m.p.h. were considered satisfactory in view of the strong wind prevailing at the time of the tests.

13.- 250 Frame by Reynolds Tubes Ltd:-

We are still awaiting the third frame for test. Meanwhile a further 172 Pave miles have been put in on our standard frame bringing its total up to 672 miles.

14.- Nylon Roller Cage:-

The "final" samples have been received but unfortunately are .005 in. too wide. Messrs. Nylonic Engineering have been advised of this. The promised .020 in. radius at the bottom of each slot has not proved possible.

15.- Five Speed Gear Box:-

I have ridden this myself and found it rather too easy to miss 2nd from 1st, and also 3rd from top.

16.- The Scooter:-

The Scooter engine unit has presented many difficulties in adapting it to a test bench. These have been overcome, and tests have commenced. The maximum B.H.P. so far recorded is 7.8 at 5,000 r.p.m. which is promising, bearing in mind the fan and the fact that we are using a two-stage chain reduction and gear box is being driven so that in effect we are measuring the power at the rear wheel sprocket instead of at the engine sprocket as is usually the case. The air cleaner and/or its connecting pipe are, however, causing a considerable power loss.

17.- Bottom Link Front Forks:-

The hand made steel links are still being awaited.

18.- "350 Crusader" Engine:-

Mr. Thomas has completed the design of this, and the special parts are being made.



19.- Under 200 cc Engine:-

Mr. Thomas has prepared two alternative layouts of a 198 cc engine with alternative valve angles. He is now considering the design of the frame for this machine.

20.- Cross Cylinder Head Gaskets:-

There is considerable difficulty in adapting these to the Crusader as a production proposition. Since the standard copper gasket gives no trouble now that extra clamping bolts are provided, it is felt that the decision to change to the Cross gasket on this model should be reconsidered.

21.- Waterproof 7 in. Rear Brake:-

Cast Aluminium cover plates of the new design have been fitted to the 350 cc Bullet and to one of the Constellations in the Experimental Department. As there has been no rain since these were fitted there has been no opportunity in ordinary riding of assessing the water exclusion properties of the cover nor its ability to permit water in the brake to drain out.

The brake on the 350 cc Bullet has shown a tendency to chatter badly accompanied by severe vibration of the pedal on three or four occasions when applied fairly hard from about 40/45 m.p.h. Since there is no such complaint regarding the brake fitted to the Constellation, this is probably not connected with the design of the cover plate, but is the result of uneven bedding of the new linings. Examination of the linings showed a slight tendency to bear hard on the leading edges. These were filed back, which seemed temporarily to effect a cure. The trouble has, however, returned though to a less marked degree. The machine is being used to see whether this trouble disappears as the linings become bedded in.

*R.A. Wilson Jones*

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(R.A. Wilson Jones.)