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File

Report of Tests on Damper Settings for Armstrong Dampers for Leading Link Forks on the Crusader Super Sports Model

1. These leading link forks were developed some three years ago from the Armstrong fork which had links 7" long with the spring and damper units acting half-way along the links. These were not only ugly, shce to obtain a normal trail the fork main tubes had to be at a steeper angle than the steering head, but also needed very strong springs and very heavy damper settings on account of the 2 : 1 leverage ratio imposed by the links. It was not realised at the time that this 2: 1 leverage not only doubles the load on the springs but also halves their movement (for a given movement of the wheel spindle) so that, to give results equal to those obtained from a spring acting directly on the wheel spindle, the spring rating must be four times as great, not twice as might appear at first sight. In consequence spring rates of the order 130/140 lbs./in. were necessary and the static load on each spring was of the order of 200 lbs. - which caused some trouble with the rubber bushes used for connecting the lower ends of the spring /damper units to the links. Nevertheless the handling of the machine was very good, particularly at high speeds over roughish roads and, owing to the very efficient oil seals on the Armstrong dampers, there was no trouble due to oil leaks.

2. In consequence the forks were redesigned with 6" links having the point of attachment of the spring/damper unit about 1½" from the wheel spindle

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and 4½" from the pivot   This not only improved the appearance of the fork but reduced the spring rate required to about 60 lbs./in. and the static load on each spring to 140 lbs. - at the expense of greater angular movement on the pivot bearings and also on the rubber bushes connecting the damper units to the links.

The first of the new type links were made of Malleable Iron castings and in consequence testing was confined to main roads where the performance was considered good. Later some steel links were made by hand from EN.8, in a toughened condition, and these were tried on the Pavé circuit at M.I.R.A. where the report was that the forks bottomed continually at speeds over 15 - 20 m.p.h.

3. Messrs. Armstrong were, therefore, called in to try to arrive at a damper setting to prevent excessive bottoming without spoiling the ride on good roads. The first modification tried was to reduce the size of the small orifice in the side wall of the damper tube. This increases the damping on both bump and rebound by about 30%. This appreciably stiffened the ride on main roads but not to a serious extent.

The machine was then tried on the new "Ride and Handling Course" at M.I.R.A. which contains steeply cambered sections, bends with reverse camber, long pitch waves, rippled concrete both on the straight and on a bend, single bumps, a railway crossing, raised and sunken manhole lids, etc. It is nothing like ~~as~~ severe as the Pavé and is not intended to break the machine, but, as its name implies, to test its suspension and handling characteristics. Although primarily intended for cars it is quite useful for testing motor-cycles provided care is taken that the line followed does not miss some of the test features.

A similar machine fitted with a standard Crusader telescopic fork (which had been run far enough to ensure freedom of operation) was run on the same course for comparison, both machines being ridden by the writer and by CLN. Rogers. Both riders agreed that there was very little to choose between them though Rogers thought that he felt the rippled concrete more severely on the leading link fork.

The writer tried both machines on the first leg of the Pavé. The leading link fork bottomed at least 12 - 15 times in the half mile at 20 - 25 m.p.h. in spite of the heavier damping. The telescopic fork did not bottom at all.

4. The next change was to restore the original size of orifice in the damper tubes, thus restoring the original rebound setting, at the same time the bump damping was increased by fitting restricting orifices in the damper pistons. This did not appear to affect the performa nce on the "Ride and

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Handling Course" but prevented bottoming on the Pavé except very mildly on two occasions - this being usually considered to be about the ideal to aim at.

5. Finally, the restricting orifices were removed from the pistons, thus restoring the dampers to their original condition. Rogers thought this gave 'as good a ride as any' on the "Ride and Handling Course" but the writer found the "Chøpping" on ţhe rippled concrete worse with this setting than with the others and also worse than withh the telescopic forks.

6. During these tests it was noticed that the leading link fork was inclined to look 'down on its knees'. Measurement showed that 1¾" of the total 4½" wheel spindle movement was accounted for by static load when Rogers was on the machine and 2¼" when the writer was on it. Since the only fault of the fork is "bottoming" on big bumps and it has shown no sign of "topping" on the rebound some fork springs have been ordered ¼" and ⅜" longer than those now fitted. These will be tried with standard damping and also if necessary with increased damping on the bump. They will lift the front of the machine by about ⅛" and 3/16" respectively.

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