the fun continued, for pulling it through into second on the hand lever gave access to a second band of surge and into top gave a third thrill of torque. That was it though, for just when it appeared to be getting into its stride it seemed to run into an invisible barrier. Sending frantic messages to the engine room for more urge produced nothing more. No more power and not one single revolution extra. That was it. Ideal as a family sidecar tug, but not quite the thing for solo racing.

Reverting to a more conventional set of pipes found all the missing top-end power but also quietened the initial surge. In the years since this outing I have read several other opinions about front chamber characteristics, some totally contradictory, so it is time to check it out for myself once more.

On the Super Little Racer a Howarth style rear silencer has been added in on the offside to avoid an anti-social level of noise, and it has been possible to tuck the tailpipe in tightly under the gearbox as there is no frame rail there on this machine. Enthusiastic cornering should still be possible.

So what was intended as a quick wipe over with an oily rag has turned into a pretty comprehensive re-fit. If it works as well as I hope it may be time to consider the cosmetics, but there must surely be many reasons in the workshop that need doing before that is possible. That's my story, anyway.

And the first couple of trial runs about the locality show that some more work is needed but that we are on the right lines. The carburation is a bit rich just off the pilot jet but it then pulls very well to the extent of seeming under-geared in top. At the moment it reminds me of the well sorted '29 two-speeder that introduced me to Scotting in the first place. Similar in physical size as well as performance, but I feel sure that the performance can be improved beyond that territory with a little care — and without resorting to exotic gaseous assistance once more.

So some more work is needed on the 'manners' and performance, and some more attention to the general presentability. Excellent, what more could you ask for with the forecast onset of tinker ing weather. You will be able to judge for yourself at a later date in part two.

Colin Heath.

SCOTT CRANK FAILURES

Yes, this same mishap happened to my father's new Brum Scott around 1957 in the middle of the ACU National Rally. He got the Scott up to Derby on the train and he and Tom Ward worked through the night, replaced the crank and finished the rally.

This eventually led to me working for Tom, and I became the sorcerer's apprentice. Tom was a brilliant Victorian engineer, originally worked in the toolroom at Bradford Jowett. He helped build the first batch of six Scotts, which were made by Jowett.

Early in the second world war Tom was drafted to Derby to develop the Merlin superchargers which meant leaving his successful Scott business and his beloved Bradford. His special tools, Scott knowledge, but above all his love for the two-speeder, is legendary.

A regular teatime visitor to Wilfred St. was John Hartshorne and we spent many hours discussing the weaknesses of the Scott (as well

as the finer points), especially the cranks, and the adapted lathe oiler the Pilgrim oil pump.

John was into sprinting, and the offer of a Swift engine, via our mutual friend Brian Woolley, from Matt Holder sort of led me into mechanic for John. Needless to say I too got the bug. Endless plotting hours going to and from sprints and hill climbs ended up with a three-speed Super, much modified in the crank and oil pump department. The bike was very light and very fast.

We soon learned how fast. On our first trip out with it at a special sprint on some reunion day at Brooklands I went up against the fancied Douggie — this bike was quick. The Scott flew past it and a picture appeared in *MCN* that week; some start. Shortly after this I caught the racing bug, egged on by Ivan Rhodes, and heavily influenced by the exploits of Chris Williams on Clive Waye's dope burner, which had just seen off the modern bikes at Brands and the temptation was too much, we went racing.

Clive was at this time branching out with his Drag Waye and a 500cc new engine, which left Chris without a ride. I was never going to make a brilliant rider, too busy listening for the bumps and bangs. The really good guys are more concerned how far they could slide it out on the back end, or do you knock it off a bit on the Gooseneck — me, I wasn't even in that gear! So Chris took over and we had quite a few successes racing and hill climbing. He did the riding, I prepared the bike. Except for one day at Darley Moor, after a lot of ribbing by my modern pals how fast their Suzukis and Yamahas were, the Scott recorded 104.2 with me on it, and as Ivan had suffered a rare Velo malfunction, he took the Scott out and recorded 102.2 (he was a bigger bloke), the modern 250s 99.5.

The point of all this background is that my racing Scott had unburstable cranks, Best and Lloyd oil pump, special lighter pistons, crankcase stuffers and gas flow. (The latter with help from my then next door neighbour Dave Midgelow, RR turbine engineer.)

Cranks: There would, after all, be no point in squeezing more out of the orange if you can't transmit it. In those days we didn't have Solid Works 3D modelling we've got today. Good engineering common sense can tell you quite a lot. An overhung load will put a bending moment on a crank and it's purely a matter of time how long before it breaks (try it with a piece of wire). Several problems compounded the issue, like the Scott pistons are 14 ounces, con-rods heavy, even with our light pistons/rods the rev ceiling is around 5,000 before vibrational hell breaks loose. Heavier flywheels, caged rollers, all help, but the engine is a long-stroke (72mm) and the heavy piston/con-rod provide the rev limiter. Actually the overall surface speed of any engine is 4,000 ft/min. So the modern trend is shorter stroke to get higher revs.

What to do about the Scott crank. The standard crank disc is heavily recessed to allow the main bearing cup to overhang into this recess. Hoping that the oil flowing through the mains will spin out into the recess/groove and through the oil hole into the big-end. Oh no it doesn't! During the development of the Silk engine (Rob Sewell and I) tested this hope. In a lathe with a white paper backing we ran the cranks at 3,000 r.p.m.: 98% of the oil went out the back, 2% through the big-end feed. We went home to sleep on it. In the morning Rob came in: got it, it's a trough! If you tip a trough up at one end etc. So we machined the groove .30" out of centre. The re-test

showed 98% through the big-end hole, 2% out of the back, so now we had a pumping crank. You could easily apply this feature to a Scott crank.

Web thickness is also a big issue. The recess to accommodate the cup, coupled with the case hardening, result in a very thin core (the tough bit); this is the reason they break. During the afore-mentioned period at Tom's, with John Hartshorne another regular visitor was Roger Moss. He also did something with cranks, and in those days was closer to the original, but much beefed up, and were, I believe, case hardened.

I saw no point in case hardening, but opted for the toughest steel I could lay my mitts on, KE805 (originally made for the steam turbine generating shafts). The modern equivalent is EN24T. We cold rolled the root radius, reduced the thread size of the big-end bolt, fitted Hoffman caged rollers, reduced the recess. As far as I am aware none of these gave any trouble, including our Scott, which finished the Manx (although the Velo gearbox lose second and third).

The real answer to breaking and vibes is to simply support the crank. I believe Roger has done this on Scotts and we certainly took the opportunity with the Silk engine to do that. (Although we did have the big-end cages give trouble on early Mk1s, they were all replaced with silver-plated cages).

So good luck, Richard. Roger and I have spent the last 40 years grappling with this problem, and I'm sure we don't have all the answers. I will be very interested in you findings though.

George Silk.

FURTHER NOTES ON PHASED TRANSFER AND A GENERAL PROGRESS REPORT

Phase Transfer

I would like to take this opportunity to discuss some further point not mentioned in the articles on phased transfer of December '08 and February '09 respectively.

This is that it may be possible to run the engine *without* any inlet valves at all!

If so, it will as far as I know, be the only internal combustion engine to do so! The reasoning behind this is as follows:

Refer to graph over page.

The inlet phase of the pump piston is unaffected and as it starts to move down from TDC, and before any substantial pressure can be generated, the transfer ports of the adjacent cylinder start to open. Now, at this point the gas has two options: it can either flow into the ever-increasing aperture of the transfer ports *or* back flow past the carburettor slide.

At low r.p.m. when starting, both effects will most likely occur, i.e. mixture will go both ways, but enough, it is felt, will go into the transfers to enable the engine to fire. Once this occurs, a depression should form in the working cylinder due to the rapid exit of exhaust gases, thus further inducing charges from the pump chamber, i.e. crankcases. Initially there will undoubtably be a spray of mixture from the carburettors until the revs rise far enough for stable running to commence.