The Genesis of SGB4 (the four speed revolution!)

It came about in the following way.

In trying to make my Scott racer more than usually competitive, I kept breaking cranks. I decided to develop the engine to breathe better and enhance the crank assembly to withstand higher revs. This progression brought the dilemma that if I wanted more power, I could achieve this by a narrowing of the power bank and pushing up peak output. This solution brought the problem that the spacing in the three speed box would be too wide for the more narrow power band.

I had heard of the Scott four speed box, but had never seen one. Enter Fate!

A friend phoned and told me that the Scott GP machine with two four speed gearboxes, owned for many years by that gentleman Scott expert Nick Sloan, was in his care. He told me that Nick had sold the bike and it had passed into the ownership of a gentleman who was having it rebuilt and that it was intended that the best components from the two gearboxes would be used to make one serviceable unit. I was asked, if I wished to have a brief loan the rejected set of

gearbox components, for the purpose of making drawings of them. This would make it possible to make a faithful copy at a future date, rather than the easier but non-standard route of modifying a three speed box. The latter option being in contravention of the eligibility regulations for Vintage Racing.

My friend said that several of the gears were marked 30TT and that this would be evidence that this design was produced in pre production form at that date. This was important as the cut off date for the “Vintage” class in racing was, at that time, Dec 31st 1930. If the box was produced after that date, then the bike would be put into the next age class “Post Vintage”. I like riding and rode the Scott in the Vintage events and a 39 T100 Triumph in the Post Vintage class. This enabled me to get four rides per meeting instead of just two.

I have a most talented friend named Tony Pacey of Melton Mowbray, who in his early years had been an engineer’s pattern maker. Although, at his place of work, he had progressed to technical management, he still enjoyed the challenge and fulfilment that came from producing an interesting pattern privately. I visited Tony and discussed the project. He assured me that he would be able to make patterns that would produce an exact replica of the Scott gearbox castings even down to the location of casting split lines. While Tony made each pattern, the original castings were measured and full engineering drawings produced. On completion, the patterns were sent to the Leicester foundry of R C Harrison Ltd, who were acknowledged experts, for the castings to be produced in heat treated LM 14, which is the old “Y” alloy piston alloy.

When correctly processed, this grade, machines very well and results in a tough casting with strong threads, without resorting to none standard “Helicoil” thread inserts. The drawings having been produced for both castings and rotating parts, the next step was to review the design. It was evident that as the normal Scott gearbox was short in body to accommodate the inside primary chain line, so it had been a challenge to incorporate a further ratio into this limited space.

The gearchange mechanism had been located above the gears and was a most elaborate design. It used a face cam to push either forward or reverse plungers which were each equipped with a swing out pawl, rather like a small version of a kick starter pawl. This pawl engaged a small ratchet wheel secured to the top face of a plate cam, which in turn moved the selector forks. I looked for the positive stop features in the design, and found nothing effective. True, the operating plungers had their stroke limited, but once the plate cam was spinning, there were only small spring-loaded balls in the selector forks to engage in small grooves in the guide rods to arrest the momentum. This design fully earned the reputation of the box with four gears and sixteen neutrals! It was found that the face cam profile could be altered slightly to solve this problem. The modification meant that whilst one plunger / pawl assembly was being pushed to rotate the plate cam in one direction, then near the end of its travel, the second plunger would be advanced a little, so as to block the plate cam from continuing to spin past its target. A detent plunger was also incorporated to work on the periphery of the plate cam, instead of the spring- loaded balls in the selector forks. The Scott casing had extra metal to allow for this feature, but it had not been used.

The finished gearbox is a trifle slow to shift but is otherwise a great success. The only problem has been one particular gear that has shed teeth, due to the side face having dog pockets machined into it leaving too little metal under the teeth for good support. It must be accepted that at about 37BHP now, the loading is perhaps a little higher than originally envisaged.

I have sought the advice of Messers Hewland, the long established maker of gearboxes for racing cars, as regards the best metal spec. currently available and am at April 2001 engaged in the manufacture of replacement gears to a modified design.

Nick Sloan was kind enough to send me a copy of an arrangement drawing for the original Scott design. To my infinite mortification, my Airedale dog Rex ate the packet before I got to it. I did not have the heart to ask for another at the time, but if you read this Nick, you know what I want for next Christmas!

To be fair to Scott, it was not so easy to get the extra ratio’s into the same space as that of a three speed box and the design thus ran to complexity and expense. I am convinced that they could have solved the selection problems but the extra production cost of the four speed box over that of the three speed unit, would have been more than the market would stand.

The production of a facsimile Scott four speed gearbox with minimal internal

refinements, is perhaps the single most extreme commitment of an overall project to develop the Vintage Scott, whilst staying true to it’s overall design parameters. I have had a lifelong love affair with engineering for its honesty and purity in a world of deceit and dishonesty. The development of this bike has been my tribute to Alfred Angus Scott for his inspired concept of simplicity and clarity.