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NEXT BRANCH MEETING

20th July 2004



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The Overhead Camshaft Norton – Part 1



Photo Barry Stickland

INTRODUCTION

The Norton Overhead Camshaft Engine is probably one of the most famous motorcycle engines ever made, spanning 5 decades. The engines came about from racing, something that Norton will always be famous for. In fact, a Norton has competed on the Isle of Man every year since the first TT race in 1907.

HOW IT ALL BEGAN

The engine was designed by Walter Moore during the winter of 1926/7 with its familiar dimensions of 79 x 100mm and was initially tried out by Stanley Woods in Germany in early 1927. It broke down. One part of the design, which never changed, was the use of bevels for the camshaft drive, but early on, tooth failure was a problem, a problem that was to reappear later.

The bottom half of the engine was based on the existing Model 18's but there the similarity ended. The camshaft was driven by two pairs of bevel gears and a hollow vertical shaft. The bottom gears were contained in a blister on the crankcase and the top pair were encased in an aluminium cam box with the magneto placed behind the engine.

Moore's creation boasted an entirely new cradle frame with three chainstays, a fine three-gallon saddle tank, and a six-pint oil tank. This together with Webb forks with adjustable side dampers, a new three speed footchange gearbox, and front and rear 8 inch brakes, gave this Norton the lusty look of a real thoroughbred. The new engine was soon to prove a winner and the 1927 Senior TT was to give this OHC engine the first of its many victories.

For 1928, the CS1 (or Camshaft Model One) was born, selling for £89.00 and aimed at the racing or sporting rider. During that years' TT the CJ (Camshaft Junior), a 71 x 88 mm 350 was tried out but proved to be too slow. Few changes were made in 1929, but problems arose that were all too familiar - engines fine at first and then starting to slow, probably caused by a re-designed combustion shape. This eventually resulted in Walter Moore leaving the Norton camp and going to N.S.U. It is generally understood that Walter Moore received a better financial offer from N.S.U., which he decided to accept. He personally owned the design of the OHC Engine, which he proceeded to make available to them, and they later produced a Norton look alike OHC engine. This prompted Norton to redesign their own engine.

THE FIRST RE-DESIGN

Arthur Carroll took over as Chief Designer, assisted by Edgar Franks and a Norton rider/development engineer, Joe Craig. Carroll, a draughtsman, together with Craig designed the now famous "Carroll" engine that first appeared at the North West 200 in the spring of 1930.

This engine incorporated extensive changes from the Moore design but still retained the original bore and stroke. Then for 1932, the International appeared in both 490 and 350cc classes, and a name which was to represent world-wide sporting success was established. During the 1930's the design changed little, although coil valve springs were replaced by hairpin springs on the Works bikes because of breakage (to be followed later on production models). Different materials such as magnesium and ally-bronze were used, helping to improve engine performance by reducing its overall weight and rolling resistance.

The touring CS1 continued into 1934 with its three-speed gearbox but with the option of a four-speed hand change. The road type mag-dyno was fitted, as Inters had a racing BTH magneto together with Norton forks, in place of the earlier Webb type. Later, the touring CS1 and CJ (which also used the "Carroll" engine) were given the four-speed gearbox as standard, but the positive stop mechanism remained an option.

Also in 1934, the oil supply was increased and the gearbox received a neater positive stop mechanism. The CS1 and CJ changed to the Norton forks and Inters were fitted with the familiar one-piece hub and drum front wheel used on the racing machines, with the narrower front fork to suit it.

For 1935 hairpin valve springs were specified and the petrol tank was increased to 4 gallons and the oil tank to 7 pints. The gearboxes were now of a new type built by Burman and virtually copied from the Sturmey-Archer design except for a fully enclosed positive stop mechanism. This cluster was to be used virtually the same in the Commandos during the 1970's.

During 1936 the works bikes used a plunger-type rear suspension but for all others solid rear ends were the norm. From late 1937, selected riders were given the new plunger type rear suspension but without all the lightening holes.

From 1938 the plunger rear suspension was available for an extra £15, and approximately one third of all Internationals were built to racing specification as standard. Works bikes (probably influenced by BMWs) now used undamped telescopic forks.

In 1939, the Norton Racing Internationals were at their best with plunger rear-suspension, large tanks, square type cylinder head and megaphone exhaust. This was the classic Garden-Gate Norton and probably the most sort-after Garden-Gate Manx today. The difference between racing and road machines was now more noticeable. The CJ and CS1 became less sporty whilst the International and International to racing specification were classed as the real thoroughbreds, and even a few 600's were built for sidecar racing. The works were always trying new ideas - an enclosed valve spring version of the 350 engine was tried (gaining 10th place in both the Junior and Senior TT of 1937) but sadly, never put into production due to the inaccessibility of the valve springs which might need to be quickly changed during a race. However, one idea, which reached production a decade after its fruition, was the Double Overhead Camshaft. It was tried in practice for the 1936 TT and then used in the 1937 TT and was to become standard equipment for production racers in 1949.

In January 1939, Joe Craig who had been involved in the development of the OHC engines since 1929, left Norton to join BSA and Norton eventually pulled out of the works entry racing.

A racing International with telescopic forks was catalogued for 1940 but never produced. The "over the counter" Model 30 (500cc) and the Model 40 (350cc) Internationals continued with steady sales and were more popular than the CS and CJ versions which were dropped from production after 1939.

After six years of war, during which the factory had been fully engaged in the war effort, production returned to normal. During July and August 1946, the first purpose built racing Inters (now catalogued as "Manx Norton") were produced with the first Inter following in September and receiving the new A 11 code. (The letter A represents the year 1946 with B for 1947 and so-on). Due to "pool" petrol only being available, compression ratios had to be drastically lowered.

By 1947, Joe Craig had rejoined the Company. Gilbert Smith, now Managing Director, was keen to build on Norton racing successes and the U.S.A was considered an important and popular export market. In the spring of 1948 Steve Lancefield was sent to Daytona to assist the Norton riders. The American Motorcycle Association (A.M.A) insisted on catalogue models, which had to be fitted with a kick-start, so Norton fitted the low-ratio International 1st gear pinions. As a result, one or two riders came to grief due to the retarding effect of the bottom gear, which was to prove too severe. This problem was later resolved when Burman developed a special higher ratio first gear pair with kick-start. This became known as the "Daytona" first gear and was well sought after by Road riders to close up the huge gap between 1st and 2nd gear.

The 1948 Norton's were basically still the pre-war models with increased finning on the square heads and barrels. The Internationals and Manx's remained little changed until late 1949 when the double overhead Camshaft became available for the first time other than on works engines and this was based on the 1937 works machines.

To be continued ...

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2004 Events

Thames Valley Branch NOC - Events Calendar			
Date	Event	Contact	Status
July			
Fri 16 th – Sun 20 th	NOC National Rally at Kirkby Lonsdale, Cumbria - see <i>Roadholder</i> for details		
Tues 20 th	Thames Valley NOC clubnight – Cricketers*	Ian Verrinder	Confirmed
August			
Tues 3 rd	Extra club night - Cricketers		
Sun 15 th	Norton Day at Fareham Hampshire - see <i>Roadholder</i> for details		
Tues 17 th	Thames Valley NOC clubnight – Cricketers*	Ian Verrinder	Confirmed
September			
Tues 7 th	Extra club night - Cricketers		
Tues 21 st	Thames Valley NOC clubnight – Cricketers*	Ian Verrinder	Confirmed
October			
Tues 19 th	Thames Valley NOC clubnight – Cricketers*	Ian Verrinder	Confirmed

* For the uninitiated The Cricketers is at Hayley Green, Near Bracknell