

# Benelli's baby



**A**lthough Honda produced a series of technically brilliant 125 and 250cc multis when they dominated GP racing in the sixties, they were not the only factory to make small four-strokes of that type during the period. Indeed, when the original Honda four was raced in 1960, it did so 20 years after similar machines had first been campaigned in the class. The originators of lightweight multis were the Benelli and Gilera firms, each of which designed 250cc fours in 1940. But these bikes appeared too late to race before the outbreak of hostilities, and were rendered obsolete after the war by the FIM's ban on supercharging in 1946. Though Gilera managed to make their blown 500 four reasonably competitive bereft of its supercharger, their 250 was too heavy to make a similar exercise worthwhile, while the water-cooled Benelli was bulkier still. But new ground had been broken, and though Gilera's retirement from racing at the end of 1957 meant they never again trod the path of small-capacity multis, the 1960s

saw the little Benelli factory at Pesaro field a range of 250, 350 and 500cc four-cylinder machines which seriously threatened Honda and Yamaha in the smaller classes, and MV Agusta in the larger.

I'm not alone in believing that Benelli have never really had the recognition they deserve for their racing efforts in the 1960s: they've always been regarded as the makers of the 'other' Italian four, much as Alfa Romeo have played second fiddle to Ferrari in the car world during the past 20 years. Yet given that their GP involvement was financed by the failing profits from their road machines, the fact that they produced a series of technical *tours de force* culminating in a 250cc V8 and won a world championship in 1969, thanks to Aussie Kel Carruthers, merits considerable applause.

MV's racing efforts, on the other hand, were backed by the resources of one of Europe's leading aeronautical concerns. And to carry the MV analogy further, the reason that Benelli's

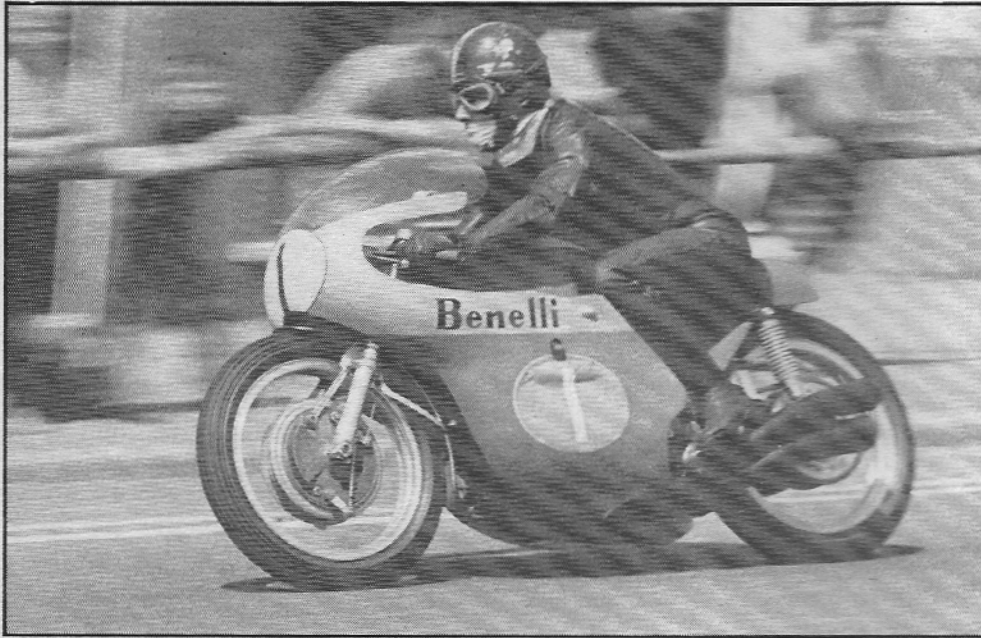
**Tarquinio Provini, the rider who played a crucial role in the development of the Benelli four, takes the 250 round the Isle of Man in 1964.**

feats have gone largely unrecognised is due mainly to the low-key, unostentatious atmosphere which pervaded their racing team. Instead of a bombastic, larger than life personality like Count Domenico Agusta, the retiring Benelli family ran a close-knit squad of designers, mechanics and usually just one or two riders at a time. Headed by a Benelli cousin, Count Nardi Dei, the team attracted riders of the calibre of Tarquinio Provini, Renzo Pasolini, Phil Read, Mike Hailwood and Jarno Saarinen, who were happy to ride for smaller fees than MV and Honda could pay.

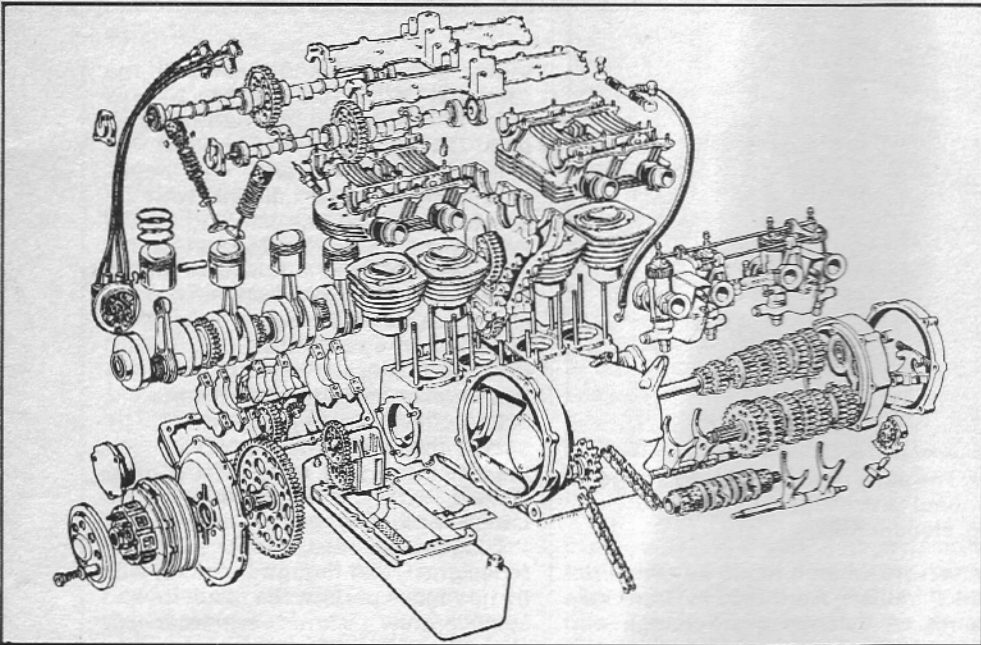
When the racing department was closed in the wake of the company's takeover by Alessandro de Tomaso in 1971, Benelli's legacy to the racing world was already manifest. Ex-mechanic Eugenio Lazzarini was a future world champion, and staff from

# four

Alan Cathcart traces the development history of the 250cc version of Italy's 'other' four-cylinder racers and, on page 20, track-tests a 1966 model.



Kel Carruthers, the man who gave the Pesaro fours their only world title, compresses the 250's suspension at the bottom of Bray Hill in the 1969 TT.



A two-valves-per-cylinder version of the 250cc Benelli engine. The camshafts are driven by a train of gears carried between the centre cylinders.

the old team were behind the successes gained by Morbidelli, MBA, Sanvenero, Bimota, Ringhini, Piovaticci and all the other Pesaro-based companies whose existence in this hotbed of European road racing derived directly or indirectly from Benelli's efforts.

Benelli are one of the oldest surviv-

ing motorcycle manufacturers, dating from 1911 when the six Benelli brothers were set up in business to repair mechanical objects of any nature by their despairing but wealthy mother. In 1921 they made their first complete motorcycle and later expanded into competition, spurred on by the youngest brother Tonino, a

useful rider. In the 1930s Benelli began their bitter struggles against Moto Guzzi in the 250cc class which led to a world championship for the Pesaro firm in 1950, thanks to rider Dario Ambrosini. The machine employed was a development of their pre-war dohc single, but after Ambrosini was killed the following year in France it was a mark of the close relationship between the Benelli family and their riders that they lost interest in racing for many years. They returned at the end of the decade with a modernised version of the single which scored some successes, notably in the hands of Geoff Duke at the Locarno GP in 1959.

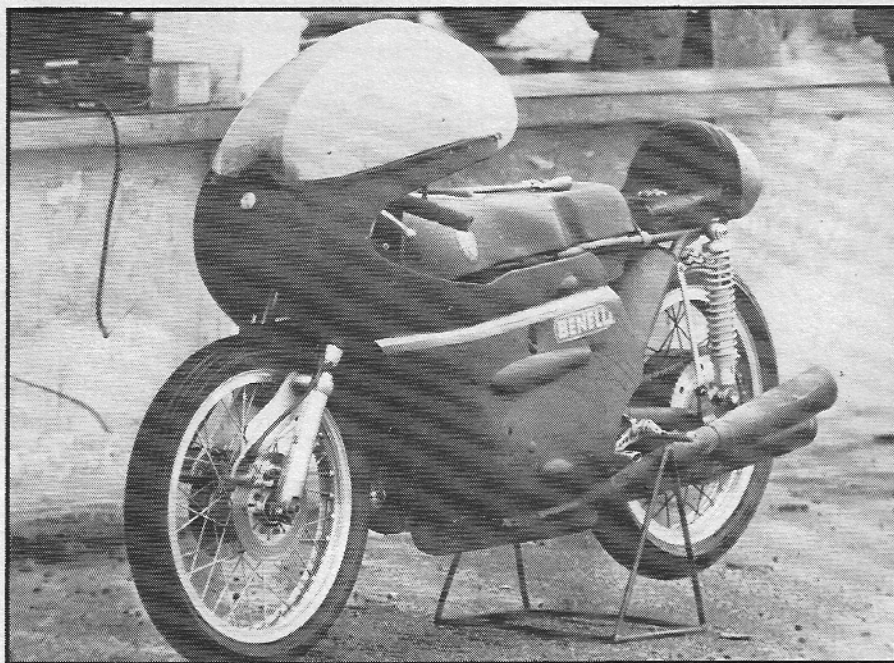
That same year the first 250cc four to appear in competition had made a dramatic appearance in the Asami Volcano races in Japan, clinching five out of the first six places on its debut: this was the bevel-driven dohc Honda. But that machine, essentially a doubled-up version of the 125cc twins Honda had entered in the 1959 TT, was scrapped in favour of a new design, with gear-driven dohc valve-gear, with which the Japanese firm contested their first full GP season in 1960. Though they ended the season only as runners-up to the MV twins, Honda did enough to scare MV out of trying to defend their title the following year, leaving the field clear for the Japanese firm to win the first of a hat-trick of 250cc titles in 1960.

Thus it was left not to MV, who concentrated henceforth on the 350 and 500cc classes, to produce the European answer to the Honda four, but to an unexpected source: Benelli. In the summer of 1960 they astonished the racing world by unveiling the prototype of the magnificent range of in-line 250cc four-cylinder machines which would be an integral part of the GP scene for the next decade. The machine had been designed jointly by the number two brother, Giovanni Benelli, and the firm's racing technician, Ing Savelli, and owed nothing to the pre-war blown engine, being a small-scale version of what had come to be a typically Italian multi-cylinder unit.

Bore and stroke measured 44 x 40.6mm for a capacity of 246.8cc, dimensions which were to be retained up to Carruthers' world title-winner. The cylinders were positioned vertically, and twin overhead camshafts actuated the two valves per cylinder. The engine was a dry-sump design with a rather bulky oil tank under the seat, but the chassis sat ill at ease with this thoroughly modern power unit, being rather heavy-looking and over-engineered in true fifties' style. Wheel rims, on the other hand, were skinny, a 2.50 x 18 front tyre matching a 2.75 section rear. A dry weight of only 122kg (268lb) was claimed, though in



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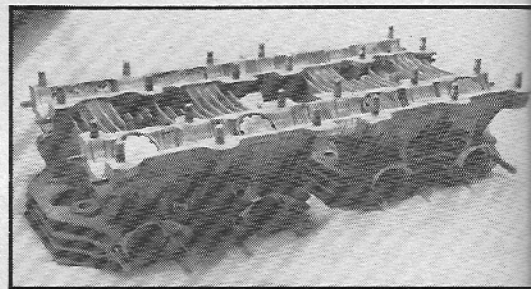
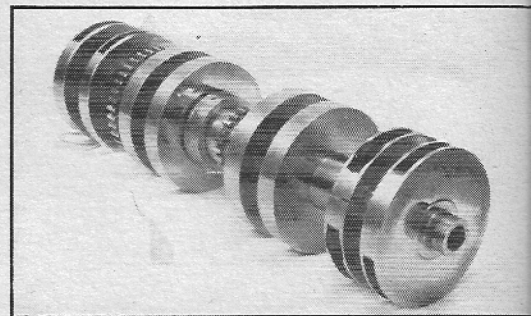
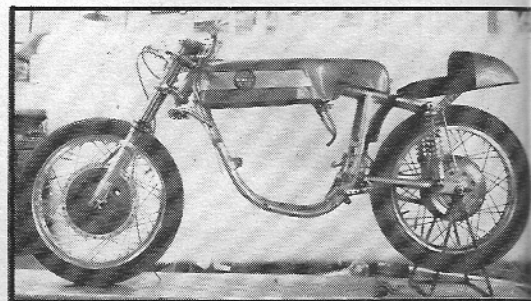
Compare these two versions of the 250 four. The early model, pictured at Imola in 1962, has a drum front brake and conventional tank shape, but the 1965 machine uses twin discs and has a very long, slender tank.

retrospect it seems certain that it was considerably more, in spite of much expensive use of electron in the engine castings. Forty bhp was claimed at 13,000rpm, which compared well with the 42-43bhp quoted for the contemporary Honda. But work had started on the machine only at the end of the previous year, so it was almost completely untried; works rider Silvio Grassetti had to rely on an updated version of the dohc single until the opening of the 1962 season.

Two years of development had evidently been well spent, for the speed of the Benelli four startled

observers when it made its racing debut at Imola in April 1962 in Grassetti's hands. A missed gear change and pinged valves robbed him of victory first time out, leaving Provini on the remarkable Morini single to romp home in the lead. But at the next race at Cesenatico it was Grassetti all the way, and Benelli's 250 four won at only its second attempt.

Many changes had been implemented in the machine since its first appearance, the most critical being the removal of the oil tank under the seat in favour of a large-capacity bolt-on sump with two-way oil pump

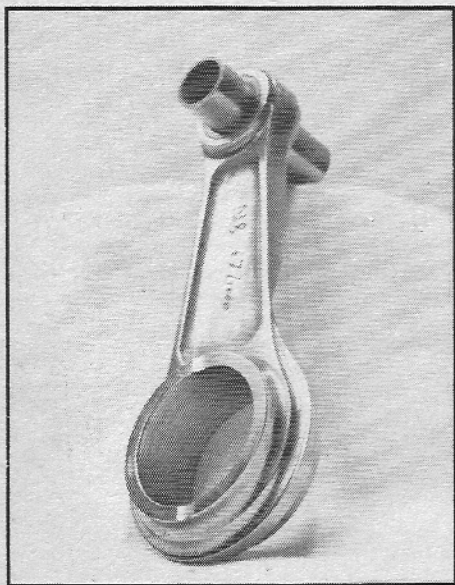


mounted above it, and running off the camshaft drive pinion which was placed between the middle two cylinders. On the prototype, ignition had been by battery and four coils mounted under the fuel tank, with the points driven off the left end of the inlet camshaft. But for Cesenatico this was replaced by a Lucas magneto mounted on the right front side of the crankcase, bevel-driven off the camshaft pinion again. It had been found that the points of the four-lobe contact-breaker floated open at high revs, acting effectively as a rev-limiter. The use of the British magneto also had the desirable side effect of reducing weight, with the elimination of the battery and coils.

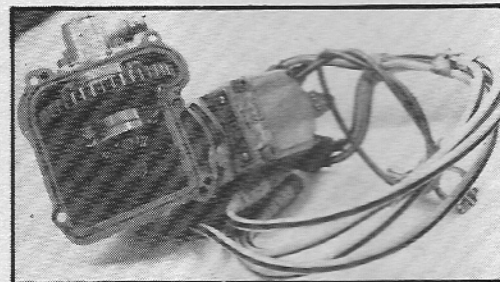
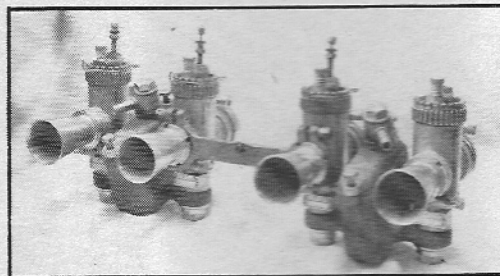
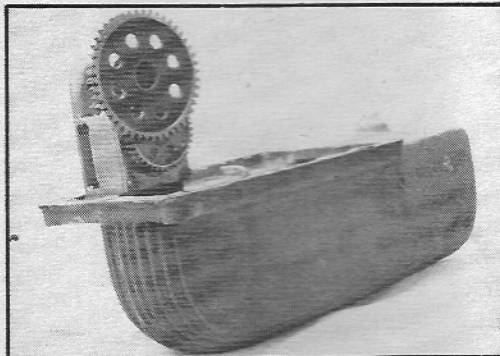
The chassis also had been partly redesigned, and though handling was by no means perfect, the result looked considerably more workmanlike: slightly wider section tyres were now fitted. But Grassetti, for all his bravery and aggression, was no development rider, and for the rest of that season and throughout 1963 the Benelli four's progress was stymied because of this, in spite of successful testbed work on the engine, which was now giving 45bhp at 14,000rpm.

By 1963 Honda had advanced to the top of the GP tree, so that yesterday's neophytes had become today's team to beat. And beaten they almost were





Detail shots of the 1962 machine show the duplex cradle frame, crankshaft with central gear take-off for the camshaft drive, light-alloy cylinder heads, robust conrod with caged-roller big-end, finned sump containing oil pump gears, Dell'Orto 20mm carburettors with twin float chambers, and the magneto with its driving gears.



that year by a most unlikely threat in the shape of Provini and the incredible Morini single. 'Old Elbows' and his supposedly obsolete 12,000rpm thumper came within a whisker of rubbing Honda's nose in the dust, only losing the world title to Jim Redman's four at the last round in Japan, after each had won four GPs. But Morini's resources were even smaller than Benelli's, and Provini knew that '63 had been their best shot. Accordingly, he changed camps for the 1964 season, and Benelli could now enjoy the services of one of the greatest riders Italy has ever produced, and twice a world champion to prove it.

Under Provini's influence the Benelli was completely redeveloped. A smaller, lighter frame featuring a long, thin, carefully-shaped fuel tank to enable the rider to squeeze low under the screen took shape, while careful attention to weight-saving brought the scales down to 112kg (264lb) dry (this time without a thumb under them!) Revised camshafts narrowed the powerband but raised the rev-limit, so that 48bhp was now available at 14,500rpm, still with two-valve combustion chambers and single-plug ignition. The six-speed gearbox was replaced by a seven-speed unit to compensate for the narrower rev range. The separate pairs of 20mm Dell'Orto carburettors each shared a

flat-sided float bowl positioned between them.

The Benelli had now assumed the basic format which would eventually result in Carruthers' world title. But first it was Provini who reaped the benefits of his own development talents by easily winning the 1964 Italian 250cc title after being victorious in every race. More to the point, though, was his magnificent defeat of the Honda, Suzuki and Yamaha works teams in the opening European GP of the season round the tight Montjuich Park circuit in Barcelona. A fourth and two fifth placings were the best he could manage during the rest of the season, but Benelli were at last on the move.

For 1965 more alterations were made, with the inlet and exhaust ports modified for better breathing, while new camshafts offered greater lift and dwell. Useable power came in at 8,500rpm and lasted to 14,500 revs, at which point output was up to 52bhp, and the engine was safe to 15,000rpm on the overrun. Combustion chambers and piston crowns had been modified to give more squish, and larger 24mm carburettors were fitted, with specially-tuned intake stubs which were found to produce an increase of nearly 2bhp. But the most important mechanical development was the substitution of the Lucas magneto by one from a Mercury four-

cylinder two-stroke outboard engine, modified for four-stroke use. The Lucas, designed originally for the lower-revving Gilera and MV 350 and 500cc fours of the 1950s, had proved unreliable at engine speeds over 12,000rpm, but the new US-made unit cured the problem and was retained to the end of the model's development in spite of some experiments with an early form of electronic ignition.

The chassis was also modified for 1965, being lowered and shortened even more, and equipped for the start of the season with American made Airheart disc brakes. Benelli were among the first teams to employ this now commonplace feature, and possibly were the first to do so on the GP scene. However, two small 7in discs originally designed for go-kart use proved insufficient to stop a 250lb motorcycle travelling at the 143mph of which the Benelli was now capable, and a lack of pad choice was also a problem in those early days. By season's end the team had reverted to drum brakes all round, particularly after wet-weather braking problems experienced during that year's Italian GP at Monza, which was run in driving rain and won so convincingly by Provini and the Pesaro four that he lapped every other finisher.

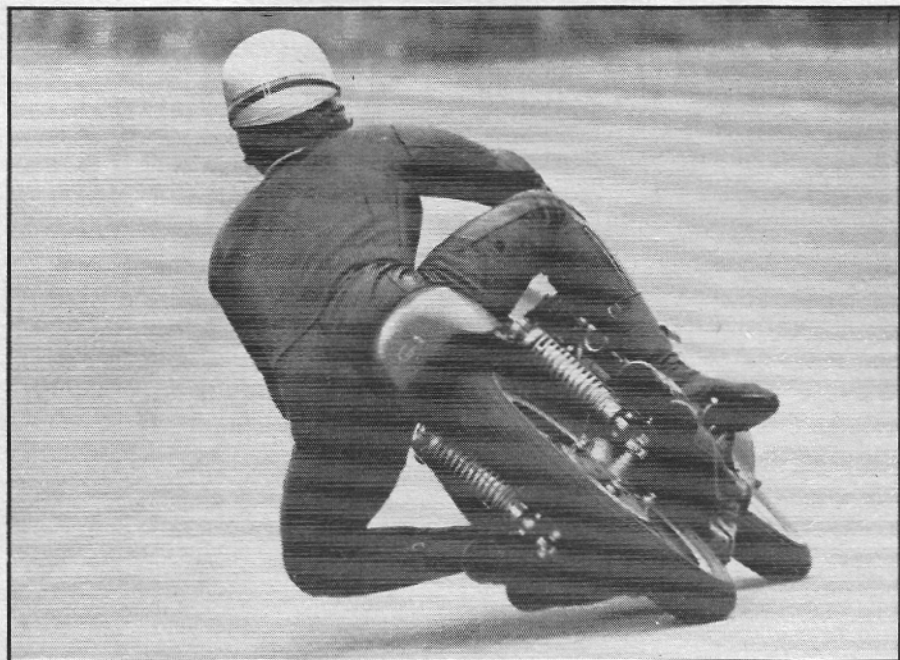
Another Italian championship was attained, compensating for a disappointing year in the GPs, apart from the Monza victory and a fourth place in the Lightweight TT. More power was needed, especially as the bitter struggle being waged between Honda and Yamaha in the 250cc class had the effect of accelerating development. The Honda six was now producing nearly 60bhp while weighing only about 18lb more than the Benelli, and in '66 Mike Hailwood's talents would see the six at last begin to handle properly. Something had to be done if Benelli were not to be also-rans on the world stage.

The answer was twofold: first the 250 four was scaled up into a 322cc version with 50 x 40.6mm bore and stroke, eventually yielding 53bhp at 14,700rpm, still with seven speeds and two-valve heads. Provini splashed his way to third place in the 350 event at Monza on the bike's debut in 1965 in the Italian GP, and bettered this by finishing second to Mike Hailwood's 297cc six in the '66 season opener in Germany. Encouraged by this, Benelli bored the engine out to the maximum permissible 52mm, or 354cc, in which form it eventually produced 64bhp at 14,500rpm with four valves per cylinder, and finished runner-up to Ago's MV in the 1968 world championship in the hands of Renzo Pasolini.

Benelli's attentions in the winter of 1965-66 were, however, more closely directed to the 250, and an interim version was constructed with three valves per cylinder, two inlet and one



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Four pipes on display — a classic sight in the sixties. Renzo Pasolini rides the 350 Benelli to third place in the 1967 Dutch TT.

exhaust. This increased bottom-end torque but not absolute power, so finally Savesi took a leaf out of Honda's book and produced the first four-valve Benelli engine in the spring of 1966. This increased safe revs to 16,000 and bumped the power up to 55bhp, still with an acceptable, though inevitably narrower, power band. On this machine, now painted slate-grey in place of the colourful Benelli green and white livery which would be revived in time for Carruthers' world title, Provini won his third consecutive Italian title but failed to make any impression on the Japanese bikes in the GPs. Then he was seriously injured in late August when blinded by the sun while practising for the Isle of Man TT (the races were held later that year because of a seamen's strike), and suffered such severe back injuries that he was never able to race again.

This was a tragic blow to Benelli, but they decided to continue and enlisted Aermacchi rider Renzo Pasolini for 1967. They also produced a new four for the 500 class, a 491cc machine based on the 350 (and thus on the 250) which produced 75bhp at 12,800rpm and won first time out at Vallelunga in late '66. But 'Paso' took longer to find his feet on the little multi, especially after the quite different experience of a pushrod single. It was not until 1968 that he began to shine on it, winning both 250 and 350cc Italian titles (beating the MVs in the latter class), and finishing second in the TT in both classes. The long years of painstaking development by the small Benelli rac-

ing department were now beginning to bear fruit, and though their task had been eased by Honda's retirement at the end of '67 (and would be further by Yamaha's at the end of 1968), there's no doubt that the 'other' Italian fours were now highly competitive.

Pasolini proved as much at the start of 1969, winning all seven races in the keenly contested Italian season-opener on tracks such as Imola, Riccione and Rimini, and defeating Agostini's MV comprehensively on six out of seven occasions in the 350 class. Both rider and team were in seventh heaven, riding on the crest of a wave of success that seemed to repay all the long years of labour. But sadly for Pasolini, by general consent an odds-on certainty for that year's 250cc world championship, he fell in practice for the first GP at Hockenheim, and was sufficiently badly injured to miss the first three GPs, the third of which was the crucial TT.

With Santiago Herrero's amazing Ossa single well in the lead of the championship, Benelli team manager Nardi Dei had to act decisively. He drafted in reigning world champion Phil Read, backed by Aussie privateer Kel Carruthers. Read retired in the TT but Carruthers swept to victory more than three minutes ahead of Frank Perris' Suzuki twin. He was rewarded with a regular place in the team for the rest of the season even after Pasolini returned to win the next GP in Holland, and as Herrero's challenge faded it was left to the two Benelli riders to battle out the title. But the little Ita-

lian's exuberance got the better of him again, and he hurt himself when he fell in Finland, putting himself out for the rest of the season.

Benelli then moved Carruthers up to team leader, gave him an eight-speed four-valve engine (he had been using the less powerful two-valver) and kept their fingers crossed. The Aussie won two out of the last three GPs and finished second in the other, to clinch his first world title and Benelli's second. Pasolini was fourth in the world championship, but easily won the Italian 250 and 350cc crowns.

That was to prove the Benelli 250 four's swansong, and indeed it won the world title at its last chance. The following season the pernicious FIM rule limiting 250cc machines to a maximum of two cylinders and six gears was introduced, denying the 250 V8 Benelli that had been built in the summer of 1968 the chance to appear in public, as well as strangling future small capacity four-stroke engine development on the race track. After 1969, it was many years before a 250 Benelli four appeared on the circuit again, though there are various machines in differing states of repair dotted all round the world, none of which appear to be runners. Similarly, 'Old Elbows' Provini had absented himself from the growing historic racing scene. Provini preferred to concentrate on building up his successful Protar plastic scale model business, as well as supporting his two sons' motocross efforts.

But at the Italian historic meeting this year as Misano, only a stone's throw from the Benelli factory, the long awaited reappearance of man and machine took place, in front of an ecstatic crowd as related in the Summer '83 edition of *Classic Racer*. Mounted on a 1966 Benelli four-cylinder 250 owned by the factory and specially prepared for the meeting, Provini showed that he had lost none of his old verve. Scorning the opportunity simply to complete a handful of parade laps, he took part in the 350 race, and despite slides occasioned by elderly Dunlop triangular tyres, held fourth place behind a pair of fleet 350 Aermacchis and Franta Stastny, another old adversary from the past, on his 350 Jawa twin. The wonderful exhaust note of the four-cylinder bike had spectators entranced, and Provini confided to me, 'If I'd known these old-bike events were so much fun I'd have started doing them years ago'.

Better late than never.

**Benelli's 250cc four in 1969, its world championship year. Eight- and 16-valve versions were produced, and seven- and eight-speed gearboxes were tried.**