Motorcycle Sport

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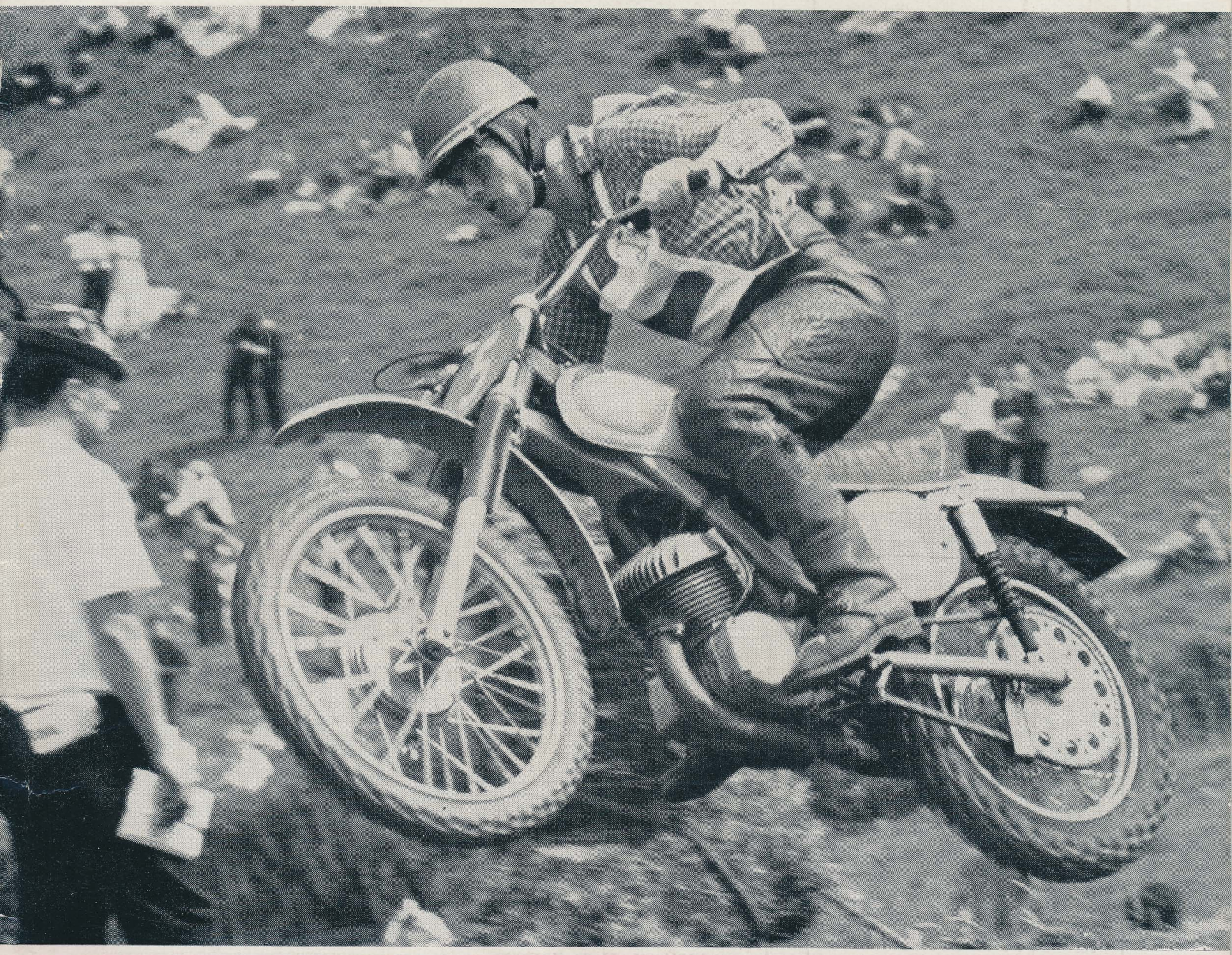

500-Mile Race ★ The Wooler Flat Four ★ AJS Impressions

Three Grands Prix ★ Moto-Cross ★ Two-Stroke or Four ?

Motorcycle Sport

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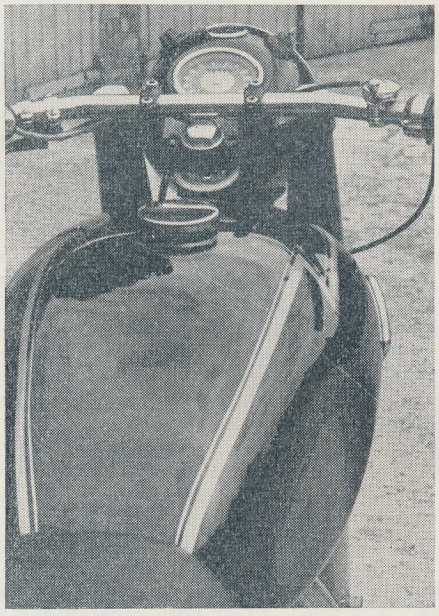
Contents

FRONT-COVER PICTURE shows the Czech moto-cross rider, Vlastimil Valek, riding the latest Jawa at the British 250 c.c. Moto-Cross Grand Prix at Glastonbury. He displayed plenty of style and speed but fell back to fifth place; and at the moment is ranked sixth in the world championship



Beauty by repute residing in the eye of the beholder, we should be cautious in condemning the zig-zag styling on the tanks of the latest A.M.C. singles. Nevertheless we must go on record as deploring it : and invite you to turn to page 345 for our impressions of the 1965 model 16

Another debt to the USA

HUMMING with activity, British factories are building bigger bangers for our American cousins as fast as they can while we have to wait for delivery. Frustrating for people with money burning holes in their pockets, but a good thing for the future of the industry and the country's economy. Without the export market there would soon be no big sports machines anyway; it would just not be economic to make them. Design would stagnate, factories wilt and fade away and in time the big machine would become as extinct as the Dodo. Which is what happened in America between the wars. They pioneered really big machines; in the early 20s the Harley, Indian and Henderson were technically superior to anything else in their class. In a land of vast distances and cheap petrol the motor car finally triumphed and the once-proud makes of motorcycles withered and died. You can blame the motor car but it could also be that the motorcycle became extinct in America for the same reason that the dinosaur became extinct . . . it just grew too big and clumsy. It is to be hoped that with the Americans calling the designer's tune in this country we shall not make the same mistake and produce dinosaurs on two wheels. The danger is real. Remember that the American motorcycle boom started when they discovered our speedy, agile three-fifties and five hundreds but with their " bigger and better " complex they soon talked us into six-fifties and now the seven-fifties.

Just why a country which has a two or three car per family economy should want motorcycles at all is a problem for psychologists. The motorcycle has perhaps become a symbol of virility. After you have made your pile and got two Pontiacs in the driveway you need something to demonstrate to yourself and others that you are still a young man at heart. . . .

British factory entries in road racing

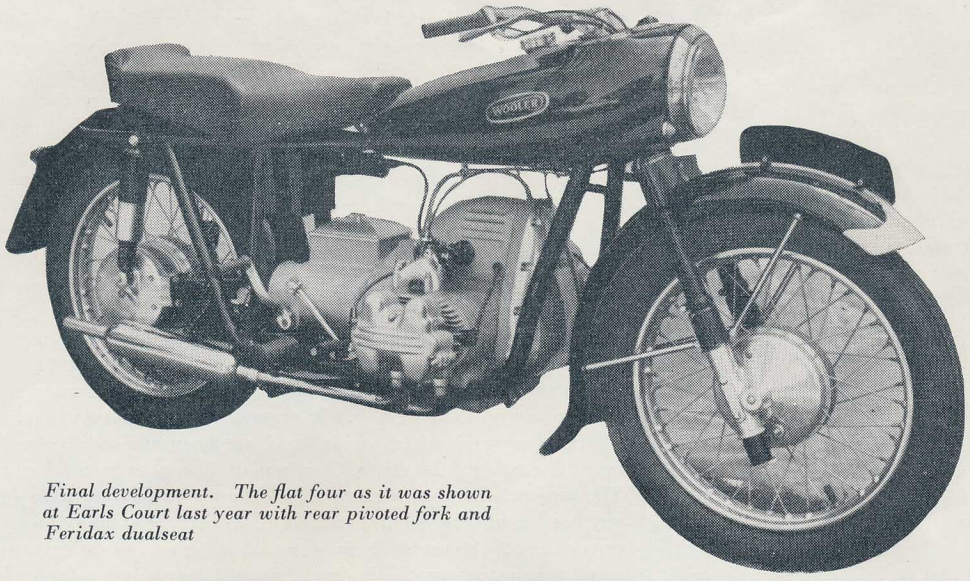
TWO, closely connected, factors were the most significant features of this year's 500 Miles Race at Castle Combe. For the first time British manufacturers officially entered the meeting . . . Cottons and Royal Enfields. Having put their head in the noose, so to speak, Cottons then provided the sensation of the meeting when Derek Minter and his co-rider, Peter Inchley, circulated at indecent speed to finish third overall, in the process winning the 250 c.c. class.

Enfields were not so impressive; their pair, Gordon Keith and John Rudge, finished fourth in their class, beaten by a 175 c.c. factory-entered Montesa and the privately owned and splendidly managed CB72 Honda of Brian Davis and Bill Scott. This can only make Enfields keener than ever to avenge defeat—and to salvage their slogan of " Britain's fastest 250."

Further factory support was evident in the very efficiently prepared Triumph Bonnevilles, one of which—entered by Syd Lawton—won outright. At least five, perhaps six, of these Bonnevilles were specially prepared by the factory in an all-out bid to win the event and then were entered through selected dealers. The same applies to a couple of B.S.A. Lightnings. Officially the B.S.A-Triumph group does not support racing but next year the position may alter. Certainly, these Bonnevilles were the fastest machines present and the steering problems of recent years were, mercifully, a relic of the past—thanks to intensive work by development engineer Doug Hele. It was he who was in charge of racing in the last years of Norton's participation in racing, and he has transferred something of Norton's legendary roadholding to Triumphs—not a bad thing, either ! The speed and reliability of the Bonnevilles were most impressive. The only one which failed through breakage was the other

Continued on page 333

Whatever happened to the Wooler four?



Final development. The flat four as it was shown at Earls Court last year with rear pivoted fork and Feridax dualseat

Told for the first time . . . the inside story of how near the Wooler Flat Four, sensation of the 1954 Earls Court Show, came to reaching the public

BECAUSE it is a long story, the life story of an inventive genius who despite early disillusionment with motorcycle manufacture could not resist having another go when his son inherited his enthusiasm, it will be best to start with a synopsis.

John Wooler marketed his first motorcycle in 1912—a 350 c.c. two-stroke. It was probably the first motorcycle in the world to be styled, as distinct from evolved from bits and pieces. Technically it was so far ahead of its time, a time when most two-strokes hardly functioned at all, that its basic features of forced induction without crankcase compression and throttle-controlled pressure oil feed to its bearings are still ahead of two-stroke design. For good measure, the machine was sprung front and rear at a time when not all machines had sprung forks.

The first world war stopped production when it was selling well.

The next Wooler was a flat twin with inlet over exhaust . . . it finished 34th in the Junior T.T. in 1921 and managed 311 m.p.g. in a petrol-economy test. It was followed by an overhead-camshaft model with all chain drive, and 500 c.c. editions were on the stocks when the post-war slump caught up with the Wooler concern and ruined it.

Between the wars John Wooler turned his back on motorcycles and worked as a freelance inventor on automatic transmissions, swash plate engines and the elusive dream of a diesel aero engine.

In 1943 he announced plans for a superimposed transverse four motorcycle operating on a novel beam principle. By 1945 a prototype was running, in 1947 it was demonstrated to the trade and Press and in 1948 it appeared at Earls Court. Development continued but it never went into production.

In 1952 a redesigned Wooler four was announced, a more conventional flat four designed by John Wooler and his son, Ron. Definite plans for production were announced. In 1954 it was at Earls Court . . . delivery was promised early in 1955. It was listed in buyers guides the following year but none reached the public.

Last year at Earls Court a modified version with pivoted fork rear suspension appeared on the *Daily Mail* stand. Its appearance set " ideal machine " enthusiasts wondering again. What did happen ?

Bugs in the beam

It should be explained that the Woolers, father and son, were only experimental engineers. They lived and worked in a small bungalow in a quiet side road at Ruislip. There they could design, and with their workshop facilities build prototypes, but production was beyond their resources physically and financially. They had spent over five years trying to get the bugs out of the beam engine which, by reason of its unorthodox principles, posed constant problems for which there was no text book answer . . . because, for instance, the rate of acceleration of the pistons was quite different from a conventional reciprocating engine, accepted theories of valve timing just did not work.

Convinced that it would take too long to get the beam engine fit for public consumption, Ron Wooler persuaded his father to switch to a conventional engine. It was a joint design project and by burning midnight oil it was on paper in record time. The prototype was actually built in four weeks of almost ceaseless toil. " Some of the castings were still warm when we machined them," Ron Wooler recalls.

The flat four behaved well from the start, Press reception was enthusiastic and financial backers were found. A second prototype was completed and road testing continued apace.

Ron Wooler demonstrated his model to the Spanish police . . . they wanted 500 if he could guarantee delivery. If the trade reception was rather cool or " Let's wait and see " (40 dealers were prepared to order at Earls Court), foreign buyers were more enthusiastic. Unable to import, the Argentine wanted to

manufacture under licence. Orders received altogether were worth, according to Ron Wooler, £¼ million.

With two prototypes built and running and financial backing arranged, the problem was how to get the Flat Four into production. Wooler senior would have liked to build a modern factory where the machines could have been assembled from parts manufactured by specialist sub-contractors but this ideal state of affairs proved to be unattainable. It was difficult enough in the industrial boom time of 1952 to find firms able and willing to produce the parts, the forgings, castings and special components. It was the search for a firm with resources available for the necessary machining capacity for the main castings which brought Wooler and Partners to Leicester and introduced them to the Electrical Equipment Company. This 50-year-old firm specialized in diesel and petrol electric generator sets and were prepared to undertake the machining. As Wooler and Partners still had no facilities for building the machines, they suggested that the Leicester firm might be interested in the assembly work. A price was negotiated and the project got under way. Orders had piled up for the machines as a result of the world wide and very glowing press reports, and a production target of 3,000 machines was envisaged. Many parts were ordered on this basis . . . it is unlikely that some of the suppliers would have been interested in smaller orders . . . and in other cases the orders were 1,000-off. The programme was to build a pilot batch of six machines as soon as possible for production-type testing and then go into something like flow production.

Early troubles

Work began in the winter of 1953 and in 1954 the first of the Leicester-built machines was running. There were many production difficulties before the wonderful moment arrived when the newborn four gave song, none of them helped by the fact that Ron Wooler lived 100 miles away from Leicester. He clocked a considerable mileage in the process of sorting out the snags. The Electrical Equipment Company was fortunate in having a really practical motorcyclist who was also a real craftsman—Bernard Fowler of Coalville, Leicestershire, whose hobby was rebuilding vintage Sunbeams. To him fell the task of assembling, tuning and road testing the production prototypes and sorting out the " bugs." Troubles there were, though no more than is normal with a new design and nothing like so many as one would expect with such a revolutionary one . . . revolutionary, at least, by British motorcycle standards.

It is well known that a prototype may behave beyond expectations and the mirror-image production machine develop no end of trouble. The Wooler maintained this tradition. First of all there was a mysterious knock when the engine had been running for a time. When the engines were stripped everything appeared perfect. The trouble was eventually tracked down, but not before the small staff had been driven almost to distraction. The cause was simple and easy to cure. There was insufficient interference fit between the cast-iron cylinder liners and the alloy barrels. When the engine heated up the liners moved : by the time it was stripped down they were tight again.

Lubrication troubles traced to porosity in the crankcase casting were tracked down and cured but it all took time. One engine developed a prank of its own. After a fair mileage, oil would build up in the rocker box until it brought things to a stop. Why just one engine ? Why should the oil build up there, when there was no pressure feed to the valve gear and a perfectly good drain path via the underslung push rod channels ? Ron Wooler was constantly summoned to Leicester to sort out problems like that. It turned out that the oil was sucked into the inlet rocker box by the induction depression acting through the inlet valve guide. It happened on this particular engine because the tolerances on the rear main bearing added up instead of cancelling out and affected the crankcase pressure.

Prototypes would do 100 mph but production versions managed only 80 . . .

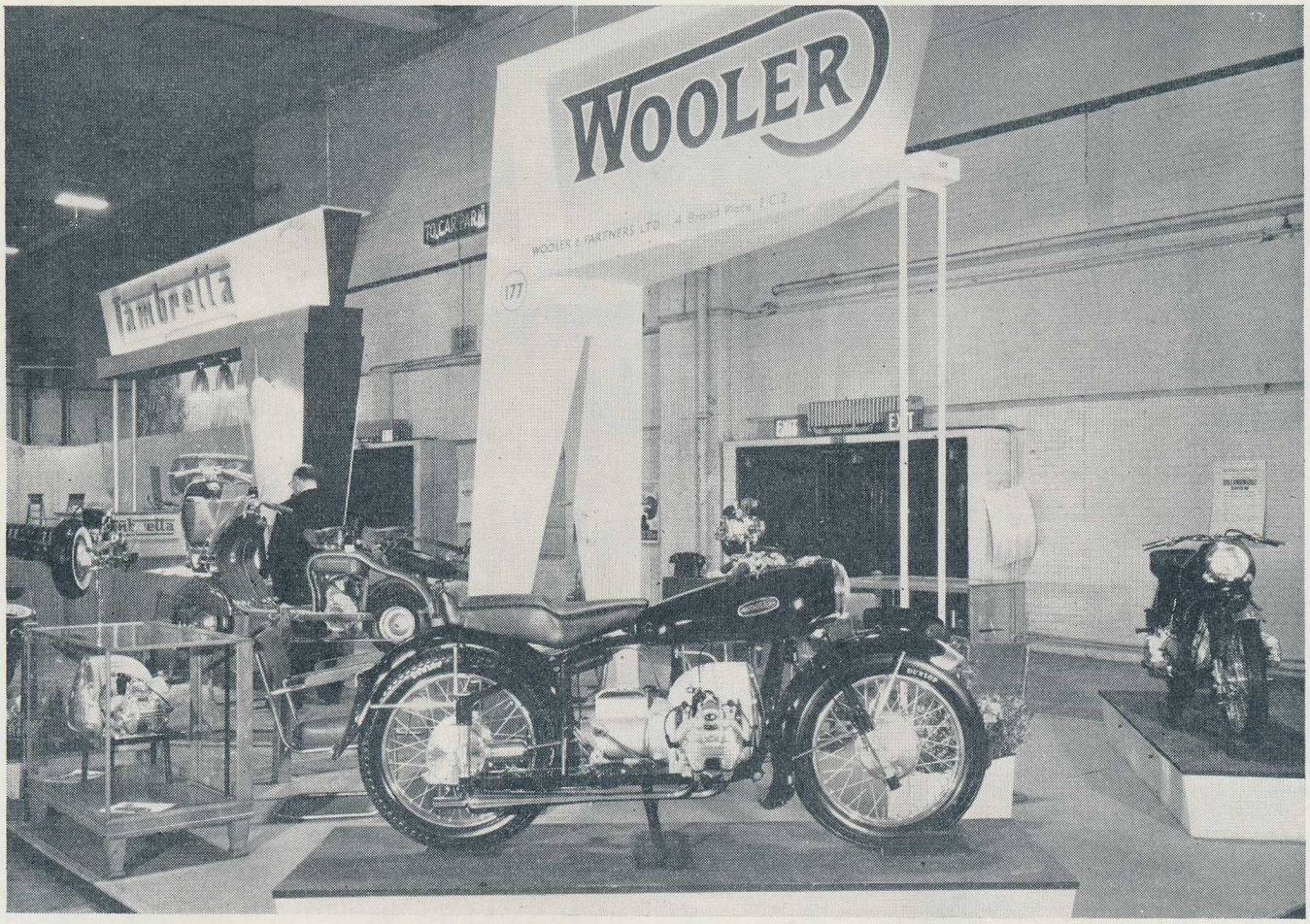
But the real difference between the production models and the Wooler built prototypes lay in the performance. Ron Wooler's much travelled prototype was quick . . . he told me that it often topped the 100 mark in favourable conditions and certainly, when Arnold Jones rode it in road going form at Silverstone in August 1954, it did not motor at all badly for a roadster with no pretensions to racing. The production machines were not very quick. Seventy-five to eighty was more their mark. Where the performance had gone to was never really established. Ron Wooler believes it was due to slight changes in port shape caused by the change from sand castings on the Wooler-built models to shell castings on the production models. There was also the change from Amal carburettors to the miniature car-type Solex instruments. The carburettor change was dictated by the determination to preserve the traditional standardization of spanner sizes. More spanner sizes were needed to dismantle an Amal carburettor than the whole of the machine.

The summer of 1954 sped by and the pilot machines were still not considered good enough. There was also the problem of cost. There were various items which had not been allowed for in the original costing. Electrical Equipment began to have doubts. The project was costing them a lot of money and they were still nowhere near the mass production which they hoped would repay them. A cost analysis was undertaken to see where they could save money on the design . . . by fitting ready made control levers, for instance, but this was unfruitful because the major cost lay in the engine unit and nothing could be saved there. It was decided to hang on until the Earls Court Show.

The prototypes were built with a " Show " finish . . . it was at this task that Bernard Fowler really excelled. Although the Show models had been on the road for some time, he refurbished them so expertly that they all appeared brand new. At this time Ron Wooler thought he had an ace up his sleeve which would save the precarious financial position. The Ministry of Supply was looking for a lightweight engine to power a revolutionary light aeroplane which was being developed for forces use . . . it had an inflatable wing. Ron Wooler bored out an engine to 600 c.c., fitted a reduction gear and got 46 b.h.p. out of it which won him a Government development contract.

The " pump it up plane " as the newspapers called it at the time was being developed by the M.L. Aviation Company at White Waltham airfield. It had detachable wings of a flexible material . . . rubberized canvas or a plastic on a wooden frame which could be folded into a small space—into the boot of a car, it was claimed. When inflated it had a wing span of 40ft. Two passengers and the engine with a pusher propeller were carried in a gondola slung under the wings. A speed of 45 m.p.h. and petrol consumption of 25 m.p.g. were claimed. The Ministry of Supply was interested in the project from a military point of view . . . seeing it as a kind of motorcycle of the air. The M.L. Company saw in it a civilian future as a flying runabout for the man in the street. The vital need was for a lightweight engine which would produce around 40 b.h.p. for take off and a cruising power of about 30 b.h.p. The Wooler engine looked just the job. It successfully passed its prototype tests and then started the next stage, the endurance testing.

But before there was a chance for it to win a valuable production contract, a Government economy axe fell and the " pump it up plane " project, and no doubt many others, was scrapped. This was really the death knell of the Wooler motorcycle as well. Electrical Equipment cancelled what orders they could, discharged their financial obligations to suppliers, and closed down the motorcycle department. Stacks of castings, crankshafts, pistons



Wooler magnificent. Two flat fours on the Wooler and Partners stand at Earls Court, 1954. This was the model listed for early 1955 delivery

and electrical equipment remained as a reminder of a bold venture which failed. Finally, a year or so ago, it was sold for scrap. Bernard Fowler bought enough to build himself one last final Wooler with enough spares for a lifetime. Some pieces were missing but with help from Ron Wooler the machine is beginning to take shape. When it is complete Fowler has promised us a road test and then it will probably be offered for sale to an enthusiast who wants something really different.

Why the project failed

Why did the project fail so dismally and so expensively after so much work had been put into it and hopes raised so high ? Simply, I suppose, because it was too ambitious a design for the facilities and finance available. Launched by a big manufacturer who could have weathered the delays and disappointments on the four by continuing production of bread and butter machines, it could have been a world beater. Mercifully, John Wooler died peacefully in his sleep before his dreams faded. It would have been kinder of fate if he had been spared to see the last Wooler, the cynosure of eyes at Earls Court, but if that pleasure was denied him so was the bitter denouement which was soon to follow. For Ron Wooler it was a grim lesson in the hard facts of economics. I do not think he will ever venture into motorcycle production again. " It's one thing to design a machine, build the prototype and develop it, but to go into production, that's a very different matter," he says with the finality of a man who has learned the hard way.

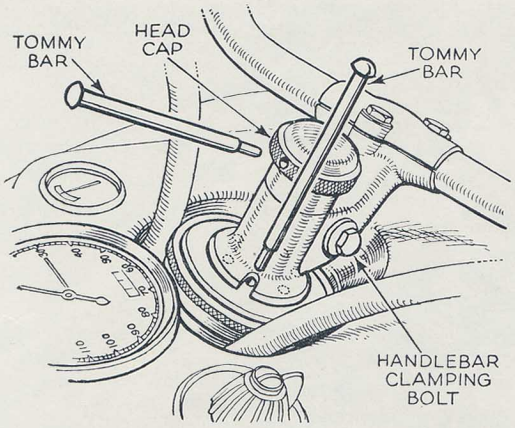
Could the Woolers have got a big motorcycle manufacturer to produce it ? The answer to that one is simple.

The motorcycle industry was not interested. Ron Wooler took the prototype around to one or two manufacturers but they were too busy pouring out basically pre-war designs for the sellers market. The head of one of the biggest firms put the attitude in a nutshell : " We can sell all we can make of our existing models. Why should we give ourselves headaches."

That is probably the short sighted viewpoint which led to the decline of the British motorcycle.

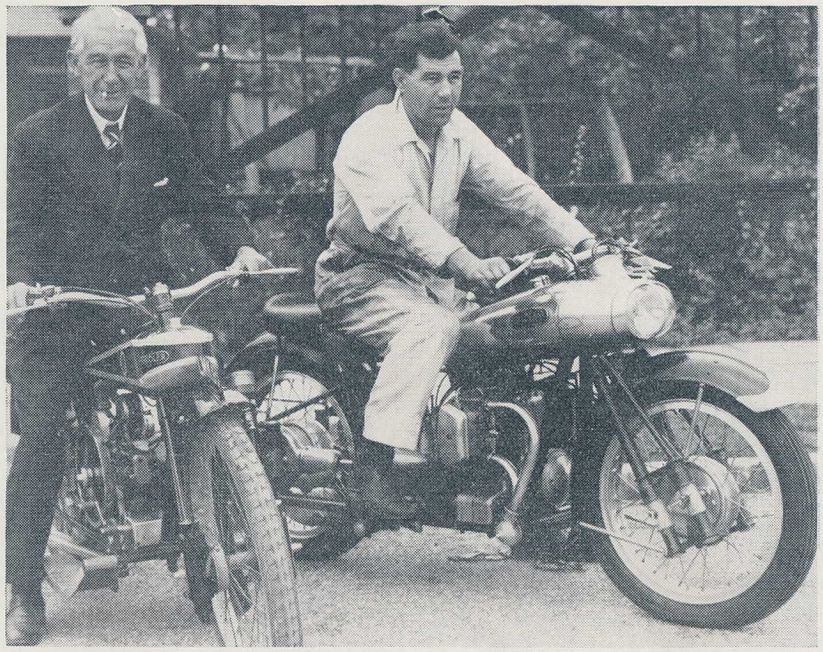
You may say of course that the Wooler would never have been a world beater or even popular with the " boys." Seen today it is of course decidedly " square." But at the time it was conceived there was a big market for the refined luxury touring machine. The Sunbeam twin was designed for the same market and was not unsuccessful. That the market for this type of machine would dwindle until only the B.M.W. remains in this class could not have been forseen. We can see now that the market was made up of a type of enthusiast starved of riding by the war years and therefore older than is normal today. Now the motorcycle age group is much lower and the period before the almost inevitable graduation to cars much shorter. But Ron Wooler was young enough to have felt the pulse of the market and it is conceivable that if his machine had become established it would have been brought up to date. Imagine it with four carburettors and four separate megaphoned exhausts, sprint guards and the tank nose enlarged to a racing type nose fairing merging into a huge tank with scallops for elbows and knees . . . it is not difficult to imagine a very " with it " road burner.

Just how much money the Electrical Equipment Company lost on the project will never be known. It is not the sort of thing they like to talk about. " In the thousands anyway," says A. M. " Jock " Gardner, now technical director of the reconstituted company, now known as Elequip, who was, in the Wooler days, in charge of the components.



" *Steering head adjustment was quite painless. After the handlebar stem clamp had been slackened, a tommy bar could be inserted in locating holes and the handlebar used as a lever to tighten the head races* "

Father and son. John Wooler on a 1922 *flat twin, Ron Wooler on the beam-engine four of the* '40*s*



Where are the Woolers now ? It is difficult to trace the individual machines because there was much swapping about of parts and cannibalisation. It appears that apart from the two prototypes which Ron Wooler built at Ruislip, two machines were completed at Leicester . . . these were the ones which were exhibited at Earls Court . . . and a third was unfinished, the one which Fowler is completing. Ron Wooler has one machine which he later converted to pivoted-fork suspension . . . this is the four which was on view at Earls Court last year. One machine went abroad for demonstration purposes and vanished. Ron Wooler thinks it finished up in Casablanca. The engines which were under test at the Aeronautical Research Establishment at Farnborough are probably still there if they have not been scrapped.

Although the Wooler was unconventional in appearance . . . seen against an Earls Court background of conventional singles and vertical twins . . . it was not really unconventional in general design. The flat four layout was a classic one for a vibrationless unit, the more especially because the designer chose the expensive but theoretically correct layout of forked and plain connecting rods to eliminate couples and at the same time keep the crankshaft short. Because each pair of cylinders was formed in a single block, the overall appearance of the unit was that of a chubby B.M.W. and the complete machine was also very reminiscent of plunger versions of that make—until one came to the petrol tank. The tank followed Wooler tradition which originated with the veteran and vintage Wooler " Flying Banana." It completely surrounded the steering head and was carried forward to form a nacelle for the headlamp unit. This design, seen again on the Douglas Dragonfly and in vestigial form on the Ariel Arrow, necessitates a front fork which ends at a lower crown, like a push bike . . . not the easiest fork to design on the telescopic principle because of the limitation of travel. Douglas opted for an Earles-type fork to dodge this problem. Ariel chose a trailing link, but the early 50s was the era of the telescopic fork and Woolers managed to obtain an acceptable range of movement and spread of bearing surfaces by extending the legs below the wheel spindle. Front suspension was by means of coaxial springs for load, one shorter than the other for overload conditions, and rebound was checked by an opposing spring. The whole assembly was packed with grease but there was no hydraulic damping, the designers claiming that none was necessary with their progressive springing system.

The plunger units at the rear operated on the same principle. The earlier beam engine four followed the vintage Wooler design of duplicated plungers at either side. Two aims which the Woolers followed through from the vintage days with unswerving devotion were accessibility and ease of maintenance. With one fell swoop they eliminated half the trouble with maintenance by so standardizing their nut sizes that three spanners would cope with every nut on the machine—a solution of such staggering simplicity that it has escaped every other motorcycle designer. Vintage models could be dismantled with but one spanner . . . the spanner which formed the basis of the Wooler motif with the word Accessibility embossed upon it. The tool kit consisted of three spanners, the tommy bar for the quickly detachable and interchangeable wheels, and a set of tyre levers. It fitted neatly into a lidded box formed in the top of the gearbox casting.

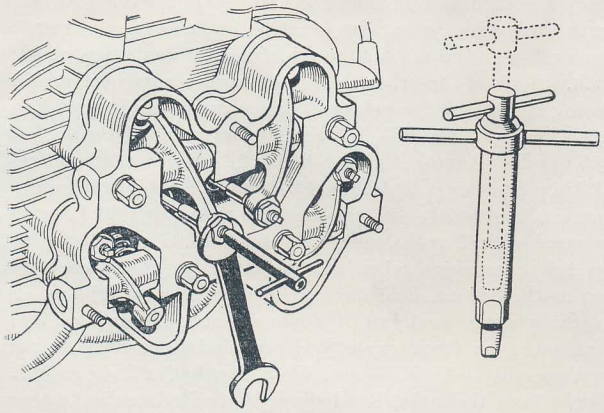
Every aspect of maintenance showed evidence of careful thought by practical motorcyclists used to doing their own dirty work. The overhead valve gear was, of course, inherently accessible but to simplify tappet adjustment a neat tool was available consisting of concentric tube spanners, one to hold the locknut, the other to turn the adjuster. The instruction book stressed that feeler guages were unnecessary. If the adjuster was screwed up until there was no clearance and then slacked back one flat, the clearance would be correct. The full flow Tecalemit oil filter was accessible on top of the engine under the detachable cowling which enclosed the coil ignition contact breaker and distributor. Clutch adjustment of the quick-thread operating screw and the clutch cable was plain to see at the rear of the gearbox. Kickstarter return spring tension was adjustable by rotating the spring housing. Steering head adjustment was quite painless. After the handlebar stem clamp had been slackened, a tommy bar could be inserted in locating holes and the handlebar used as a lever to tighten the head races.

Another practical feature obviously the result of experience was the centre stand arrangement. There was a prop stand on either side of the machine and the drill was to tilt the machine over, first one side and then the other, while the props were lowered. The stands were so positioned that the rear wheel was normally clear of the ground, but removal of the front-wheel spindle and the release of the weight of the front wheel would tip the machine on to the back wheel. At 335 lb the Wooler was light for a five-hundred and although it looked longer than normal the wheelbase was only 54in. Ground clearance was 8½in.

These were the outward features of this unique machine. Inside there was nothing unconventional. As has been mentioned, the cylinder blocks were in pairs with cast-iron liners pressed into RR 56 castings. Heads in the same alloy had inserted cast-iron seats. The bore was 50mm and the stroke 63.5mm . . . " over-square " engines were then out of fashion. Although the engine was set up for pool fuel, a compression ratio of 8 to 1 was permissible with the small dimensions and alloy heads, and the claimed output was 32 b.h.p. at 6,000 r.p.m., an output which was in line with contemporary vertical twin figures but by no means the limit for an engine of such potentialities. The valve timing was quite mild with 38 degrees of overlap. The forked and plain connection rods were forged in RR 56 light alloy and had shell bearing plain big ends. They ran on a counterbalanced two-throw crankshaft itself turning in similar shell bearings. The gudgeon pins ran direct in the connecting rods. Rocker gear was conventional . . . each monobloc pair of heads and barrels being reminiscent of normal vertical twin design. A typically Wooler detail touch was a spherically seated steel pad in the valve end of each light-alloy rocker to prevent side thrust on the valve stem. The duralumin push rods ran in tunnels below the cylinder barrels.

The camshafts were driven by a single chain which followed a somewhat tortuous path from the crankshaft pinion round the camshaft sprockets and up to the distributor sprocket on top of the timing case which was movable to provide chain tensioning.

Clutch and gearbox followed normal practice for a transverse, shaft-driven machine. As in the days of the beam four, there were tantalising references in the publicity announcements to an optional infinitely variable transmission which gave a step-less change of ratio from infinity to a direct drive. Nothing came of this for the two-man team had too much on their plate with the machine in normal form to spare time to develop the " box of tricks." However the gear itself was no myth for a prototype unit had been functioning in a small car for several years. It



Above : " To simplify tappet adjustment a neat tool was available consisting of concentric tube spanners, one to hold the locknut, the other to turn the adjuster "
Right : Front and rear suspension arrangements were similar, the wheels being interchangeable and quickly detachable

operated by means of a cluster of free wheels actuated by thrust rods from an eccentrically mounted shaft. It was aimed to provide full drive control from a single twistgrip control . . . no clutch would have been necessary because the ratios came down to nil movement and a bonus point was that the machine could not run backwards.

Lavish use of light alloy for engine and transmission and an all-welded light-gauge duplex frame resulted in an all up weight of 300 lb . . . lighter than any contemporary 500 c.c. machine. The life-long Wooler tradition of weight saving by design had been followed to its ultimate conclusion.

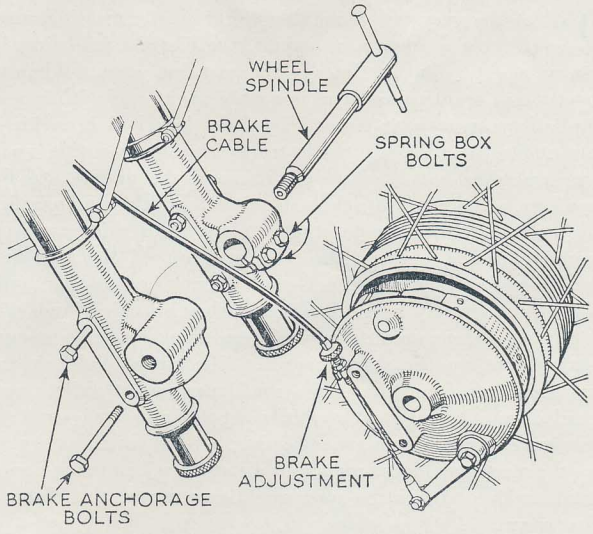
World-wide acclaim—and a guarded road test from the Civil Service

It was hardly surprising that such an advanced design received world wide press publicity. It was the answer to a technical press man's dream and the Woolers, father and son, were always enthusiastically helpful. " Exciting," " impressive," " exclusive," " breathtaking " were some of the adjectives used.

The *Trader* summed it up as, technically speaking, the most advanced motorcycle at the 1954 Earls Court Show. Wooler's own leaflet was by comparison quite restrained. " This superb 500 c.c. motor cycle with its four-cylinder engine and shaft drive sets a new standard in motorcycling of speed, comfort, flexibility and control. On inspection this new ' Wooler ' will show that it is not only unique in design but that it is completely designed down to the last nut, bolt and spring."

What was it like to ride ? How did the undampened plunger suspension work in practice and what was the performance like ? Few people had an opportunity to find out and it is so long ago that memories are dim. Bernard Fowler who covered more miles on one than anyone apart from Ron Wooler recalls " It was quite good in its day." It was a great improvement on the vintage machines he was used to. From a suspension and handling point of view it was not up to today's standards but was comparable with other plunger-suspended machines of its day. The low centre of gravity was a good point which impressed him.

Only one " rider's impression " based on a ride of any distance appeared in print as far as I can trace. Guy Belsey, a vice-president of the C.S.M.A., was favoured with the loan of one of the finalized machines, registration number BMV 217, and used it for A.C.U. duties at the 1954 I.S.D.T. at Llandrindod Wells. He appears to have been impressed. " The riding position was very much to my liking. I found that the footrest position which



best suited me made it impossible to kickstart with the instep but starting by using the ball of the foot was quite easy once mastered and a half kick would usually start the engine when it was warm. The clutch was smooth in action and the engine and drive quite smooth at the lowest speeds but use of the fairly close ratios of the three higher gears was amply repaid if a brisk getaway was required. Roadholding and steering were first class and the spring frame gave every satisfaction. The machine's maximum was not tested for on my run to Llandrindod Wells a westerly gale was blowing hard. During the trials week most of the time was spent away from main roads and on the return

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WHATEVER HAPPENED TO THE WOOLER FOUR?

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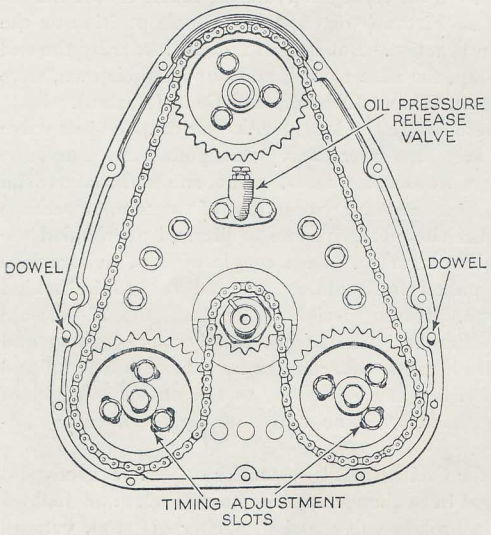
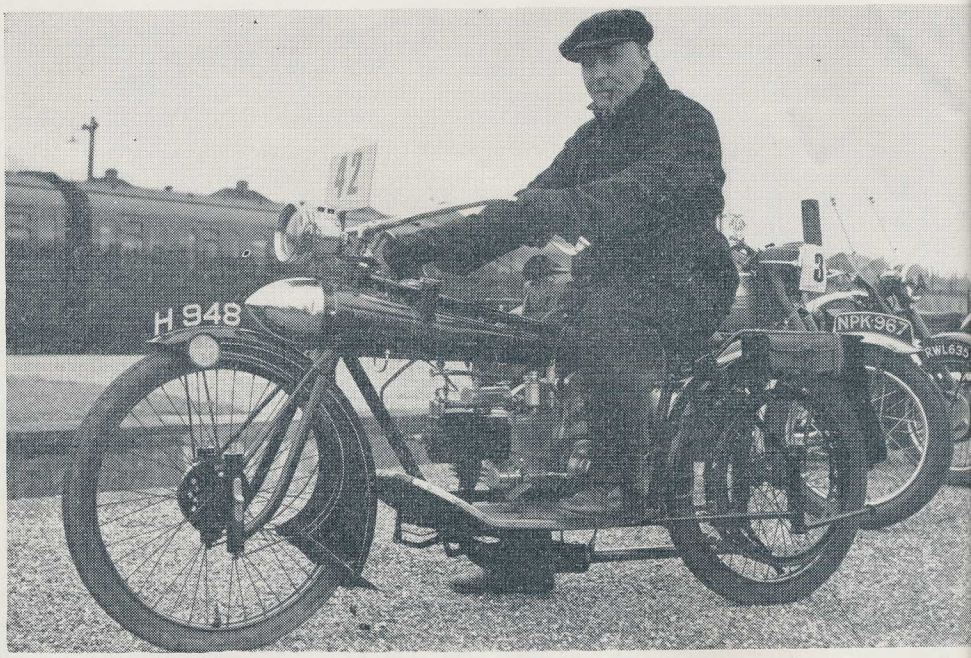




Camshafts were driven by a single chain which followed a tortuous path. . . . The first Wooler. Built in 1909, *it has a* 350 *c.c. two-stroke of very advanced design and set a new trend in styling. Seated is L. V. Fenton who regularly rides it in veteran events*

journey the speedometer ceased to function. The manufacturers, however, claim a maximum speed of 90-95 m.p.h. (32 b.h.p. at 6,000 r.p.m.).

" The machine was very stable on rough tracks when the surface was dry but a ribbed front tyre was not the best wear when the three ply going was not dry although on main roads I found myself quite heedless of wet surfaces. Petrol consumption worked out at about 55 m.p.g. Towards the end of the week I experienced a little trouble with oiling of plugs but this was almost certainly due to the fact that I had not remembered that the dipstick was incorrectly calibrated and inadvertently I had kept the sump considerably over filled. Braking was good under all conditions but I had no opportunity to test the lighting." Thus reported Mr. Belsey in the C.S.M.A. Gazette. We must congratulate him on reproducing so accurately the standardized " see no evil " journalese of the " weekly " road testers, but for our purposes we could wish he had adopted a more searching and detailed approach.

What I must emphasize is that this was a really serious plan to go into large-scale production and it could very well have succeeded. Not only were large quantities of illustrated leaflets produced but even an instruction book, a very lucid and informative little work, was printed. I have one in front of me as I write. The foreword sums up the machine pretty neatly. " The Wooler Flat Four is an unusual motorcycle in that it is built with more regard to specification than price. [The list price in 1954 was £292, approximately the price of an Ariel four.] Although it is of ultra modern design, it has a wealth of tradition behind it and is the direct descendant of a line of successful Wooler machines going back as far as 1909."

So having started with the end of the story we had better go back to the beginning, to 1902 in fact when John Wooler, after a spell at sea, was working at Napiers and like so many young men of his day became interested in powered transport. And like many others, he bought one of the popular do-it-yourself kits of miniature petrol engine castings and built himself a motorcycle . . . a motor-assisted pedal cycle would be nearer the mark. He progressed to bigger and better machines and an early picture shows him abroad a home-built forecar. By 1909 he had very firm and undoubtedly advanced ideas of what a motorcycle should be and produced the Wooler two-stroke which was both a trend setter and a technical marvel. To appreciate it properly, it should be studied alongside a contemporary direct belt drive two-stroke of the Levis type.

The Wooler had a torpedo-shaped tank finishing ahead of the steering column while other machines had a flat tank as shapely as a biscuit tin. The Wooler had a full cradle frame of straight tubing with built in footboard and plunger suspension of 1950 type front and rear, while many other machines had a bicycle-type frame, pedalling gear and not always sprung forks. The Wooler had expanding pulley, variable ratio transmission like a Rudge Multi or Zenith Gradua but coped with the changing belt tension much better because the drive pulley was driven through a reduction gear which could swing around the crankshaft gear to keep the tension constant. But the engine was the *piece de resistance.* Aware of the limitations of crankcase induction—this was some time before the discovery of resonances !—and the difficulty of lubrication without contamination of the charge, Wooler closed his horizontal cylinder at both ends and turned the other end into a charging pump. Transfer of the compressed charge was via a pipe above the cylinder and timing was controlled by automatic spring-loaded poppet valves. Depression opened the inlet valve and compression closed it and opened the transfer valve.

How, you may ask, was the piston connected to the crankshaft if the cylinder was closed at both ends? That was the Wooler touch. The gudgeon pin protruded through slots in the side of the barrel and there was a connecting rod each side. Oil was carried in a crankcase sump and force fed to the vital parts by a pump with a variable delivery linked to the throttle. It worked well and the one remaining example owned by the Woolers still works well and is a regular finisher in veteran events. John Wooler, incidentally, gave up his job at Napiers in favour of one at Du Cros, the London taxi pioneers . . . a night job so that he could develop the motorcycle by day. It was so good that the Wilkinson Sword Company which was experiencing a slump in the sword business agreed to manufacture the Wooler alongside the Deemster car in which they were also interested. A number of machines were made before they decided to concentrate on the car. Wooler set himself up in a small factory at Acton and carried on manufacture on his own and had made around 100 machines before the war came and he had perforce to switch to armament work.

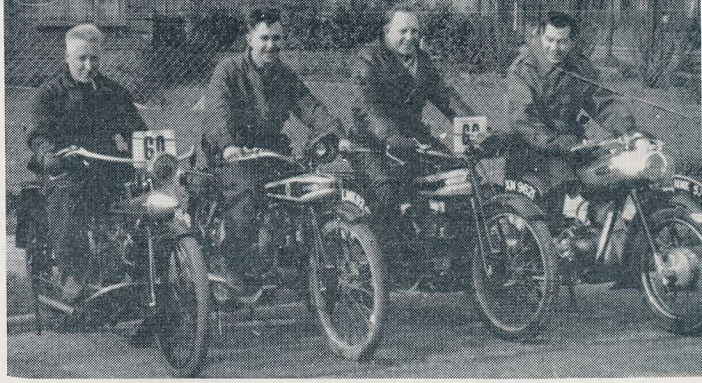
During the war years he designed and perfected his flat twin

four-stroke which followed the Wooler theme of accessibility, light weight plus styling . . . with neat touches such as enclosed cables and a rear-brake rod which was hidden in the lower frame tube. In 1919 he was ready to go with a newly registered company capitalized at £200,000. The works were in Ealing Road, Alperton, and things went well in the post-war boom time. An entry in the 1920 Junior T.T. ended in retirement for the rider, A. F. Houlberg, but the next year Frank Longman started a long and successful Isle of Man career by coming home 34th on a Wooler which was somewhat unkindly dubbed the " Flying Banana " by Graham Walker . . . the long cream and brown tank was not, I suppose, unlike a banana. It was a nickname which stuck as long as Woolers were made and even after.

The next development, in 1922, was optional all-chain transmission with a unit construction three-speed box and a spare chain in a built-in box underneath the sump. This had, quite by accident I am told, a completely foolproof clutch. No matter how suddenly the clutch lever was released the drive would be taken up smoothly. What happened was that when withdrawn, the cone clutch would fill up with oil which effectively damped the engagement. It was not long before Wooler was developing another unique engine, a flat twin with what can best be described as overhead-camshaft side valves. A skew-driven camshaft ran alongside the cylinders and had cams on the end. The valves were at right angles to the bore and the combustion chamber was a top hat extension of the cylinder. The 350 c.c. edition was reputed to produce 18 b.h.p. at 7,800 r.p.m., a pretty astronomic figure in those days. A 500 c.c. edition was under development too. But industrial troubles and strikes hit the Wooler concern, like many others, and the business was wound up. Wooler reorganized and got going again in Chatsworth Avenue, Wembley Hill, building P. and P. machines under contract to help out but in 1926 the vintage Wooler firm faded out for good.

As has already been mentioned, John Wooler turned his face against motorcycles and concentrated on the car world and might have stuck to his decision had not his son, Ron, grown up to be a keen motorcyclist riding a variety of popular machines, such as Velocettes, Douglases and Excelsiors in scrambles and on the grass. Contact with motorcycles, which to his idealistic mind left much to be desired, aroused the old enthusiasm. He would design a motorcycle fit for a Wooler to ride. The outcome was the Wooler Light Four . . . a 500 c.c. four to weigh around 200 lb. Modern machines were so infernally heavy! It was designed in spare time during the war and first announced in 1943. Starved of real news, the weeklies went into raptures about it and technically minded enthusiasts argued happily about the geometric implications of the novel engine.

The essence of the design was that one pair of cyclinders was mounted above the other . . . ideal for cooling of a transverse engine . . . and instead of two crankshafts as on the B***** S******* Dream the individual connecting rods rocked the arms of a centrally mounted T shaped beam. The leg of the T actuated a normal connecting rod and flywheel assembly mounted beneath the cylinders. The flywheel assembly came from a 150 c.c. New Imperial. The claimed advantages of this layout were light weight, following the elimination of two long crankshafts, reduced width of the opposed cylinders, there being no crank chamber between them, and reduced friction losses because there was virtually no side thrust on the pistons . . . maximum piston rod angularity was around 1½ degrees. These advantages were apparent. What was arguable was whether or not Wooler had achieved the near perfect balance he claimed. Practical demonstration of the engine running without being anchored down at all satisfied most doubts. Quite recently Phil Vincent summed up the design as having perfect balance in the transverse plain but out of balance forces in the vertical. From a practical point of view, the problem was to make the T beam light enough to reduce the inertia loading yet strong enough to withstand the bending moments. In the years they worked on the beam engine they broke a good many beam members trying various materials.



Top : Four Woolers—the two-stroke, the i.o.e. flat twin, the overhead-camshaft flat four and the flat four. Above : Early days. John Wooler seated on a home-built forecar, circa 1904

The whole machine was a remarkable amalgam of old and new Wooler novelty. The plunger front and rear suspension went right back to the 1909 two-stroke except that the plungers were duplicated each side. The frame was still made of straight tubes but the lower tubes were now used as exhaust pipes. The " banana " tank was still there but the forward extension now housed twin headlamps instead of a reserve petrol supply. Saddle springs were hidden in the seat stays. The legs of the central stand could be pivoted outwards and locked to form twin prop stands. It would fill a page to describe all the detail novelties.

It was not designed as a super sports machine, the valves were parallel in flat car-type combustion chambers and the designer contented himself with an estimated performance of 85 m.p.h. But he claimed that it would be possible to develop it to rev at 10,000 r.p.m. and had made provision for a built-in vane type supercharger. " A machine to set thoughts racing " was *The Motor Cycle* headline to a full description in 1945. It was.

If one may be permitted to criticize a dead design, I would say that the incorporation of so much vintage Wooler practice was a mistake which would have robbed it of a big commercial future. The traditional tank was permissible and tastefully modernized, but the twin plunger suspension looked clumsy and the complex exhaust system positively unsightly. Motorcyclists have always been extremely exhaust pipe conscious and " coffee pot " expansion chambers went out of fashion in the early 20s. Whether or not the power unit would have fulfilled the designer's claims if development had continued will never be known. What seems pretty certain is that it would not have topped the sales charts without being redesigned to look more conventional. C. E. A.