

The A, B — and D of

Lindsay Porter delves into the origins of Austin's — and BMC's

In the last days before the Second World War, Austin, under Leonard Lord, produced its first overhead-valve engine. It has been suggested, although vehemently denied by Austin management of the day, that the Austin 'standard truck engine' design, as it was called at Longbridge, was filched from the Bedford/Chevrolet 'stove bolt' truck engine that had proved so successful in the Thirties. The evidence we now have is purely circumstantial. The Austin and Chevrolet engines are certainly very similar indeed, except that the Austin unit was built with its camshaft in the left-hand side of the block which was established practice for Austin sidevalve engines, while the American engine's camshaft was on the other side. Moreover, the man ultimately in charge, Leonard Lord, was no stranger to plagiarism, having based the Morris 8 engine quite unashamedly on the Ford unit of the time when, with Nuffield, he had seen the need for a new, small engine in a great hurry . . .

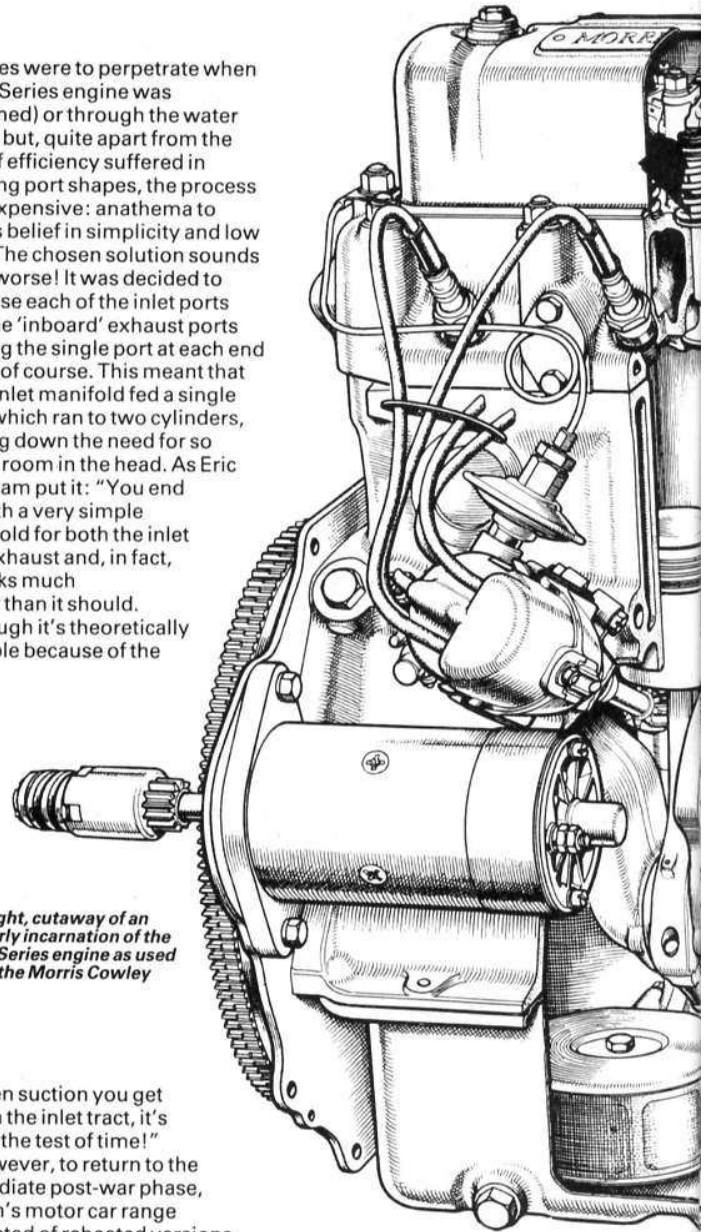
In the very first months of the war, Austin developed its engine into the 'high-speed engine', so called because it gave 87bhp from 4.0-litres compared with the 68bhp from the original engine's 3½-litres; and then to the '100hp' engine which, when fitted with a Stromberg carburettor in place of the Zenith one, gave 100bhp. Although this engine did not see civilian service until a couple of years after the war ended, it gave the Longbridge-based company an ideal platform on which to base its first ohv car engine. As early as 1944, Austin announced that the pre-war 12 would be fitted with a new 16hp, 2.2-litre ohv engine, designed by Johnny Rix with involvement by Eric Bareham as his last job before he temporarily left Austin. Stan Johnson, now head of experimental engineering at Longbridge, remembers being impressed by Bareham's layouts for the new engine but, typically, Bareham dismisses the engine, which was the keystone of Austin's entire post-war engine range as, "just a simple scaling-down job"! It was built much to the chagrin of Nuffield chief, Miles Thomas, who complained that, while the Nuffield factories had been throwing their all into the war effort, Austin had been messing around with new car engines. Of course his criticisms were born of little more than pique at the fact that Morris had

no similar engine development in the pipeline and in any case such criticisms were unfounded. Austin was allowed to work on the 2.2-litre engine because of its military application (it was later a candidate for use in the Army's Champ) while at Morris, wasn't there a chap called Issigonis beavering away throughout the latter stages of the war at a project called Mosquito, later to become the Minor?

The 2.2-litre engine shared the same stroke and general arrangement as the 'high speed' truck engine but was in effect a four-cylinder version of the truck engine with bore reduced from 3⁷/₁₆in to 3¹/₂in. It fulfilled a tremendous range of tasks for the company and, from its launch in 1944, powered the 25cwt Austin Van, the 16hp saloon and had a wide range of other applications ranging from its use in taxis, trucks, boats and many industrial roles. It went on to be restored to the truck engine's 3⁷/₁₆in bore which gave it 2662cc, exactly two-thirds of the 'high speed' truck engine's capacity in which form it was to power the Atlantic, the rare civilian Champ and, of course, the Healey 100 and 100M.

The general arrangement of this new generation of Austin ohv units, a hybrid of old practice, new constraints and, possibly, the political need to keep the camshaft on the opposite side to that of the Bedford, is interesting in itself. It had long been Austin's policy to position inlet and exhaust manifolds on the same side of the engine which had several advantages. It was possible to incorporate a hot-spot in the inlet manifold which aided rapid warming-up and encouraged better vaporisation of the mixture, and it meant that all the electrical components were kept away from the 'hot' side of the engine and away from the fuel input, too. This caused no problem with sidevalve engines, because only the head studs had to pass through the cylinder head, leaving plenty of room for ports and the water jacket. But with camshaft, inlet and exhaust ports all on the same side of an ohv engine it meant that an almost impossible demand was made on the available space because of the additional requirements of 12 or eight pushrods, depending upon the number of cylinders. One solution would have been to run tubes through the head, allowing the pushrods to pass through the ports (a horror which Morris

engines were to perpetrate when the C-Series engine was designed) or through the water jacket but, quite apart from the lack of efficiency suffered in spoiling port shapes, the process was expensive: anathema to Lord's belief in simplicity and low cost. The chosen solution sounds even worse! It was decided to siamese each of the inlet ports and the 'inboard' exhaust ports leaving the single port at each end alone of course. This meant that each inlet manifold fed a single tract which ran to two cylinders, cutting down the need for so much room in the head. As Eric Bareham put it: "You end up with a very simple manifold for both the inlet and exhaust and, in fact, it works much better than it should. Although it's theoretically horrible because of the



Right, cutaway of an early incarnation of the B-Series engine as used in the Morris Cowley

uneven suction you get within the inlet tract, it's stood the test of time!"

However, to return to the immediate post-war phase, Austin's motor car range consisted of reheated versions of the pre-war Eight, Ten and Twelve, the two smaller cars being fitted with different sized versions of the 10hp sidevalve engine, while the Twelve was fitted with a different design first introduced in 1932, the same year that the 10hp engine first saw the light of day.

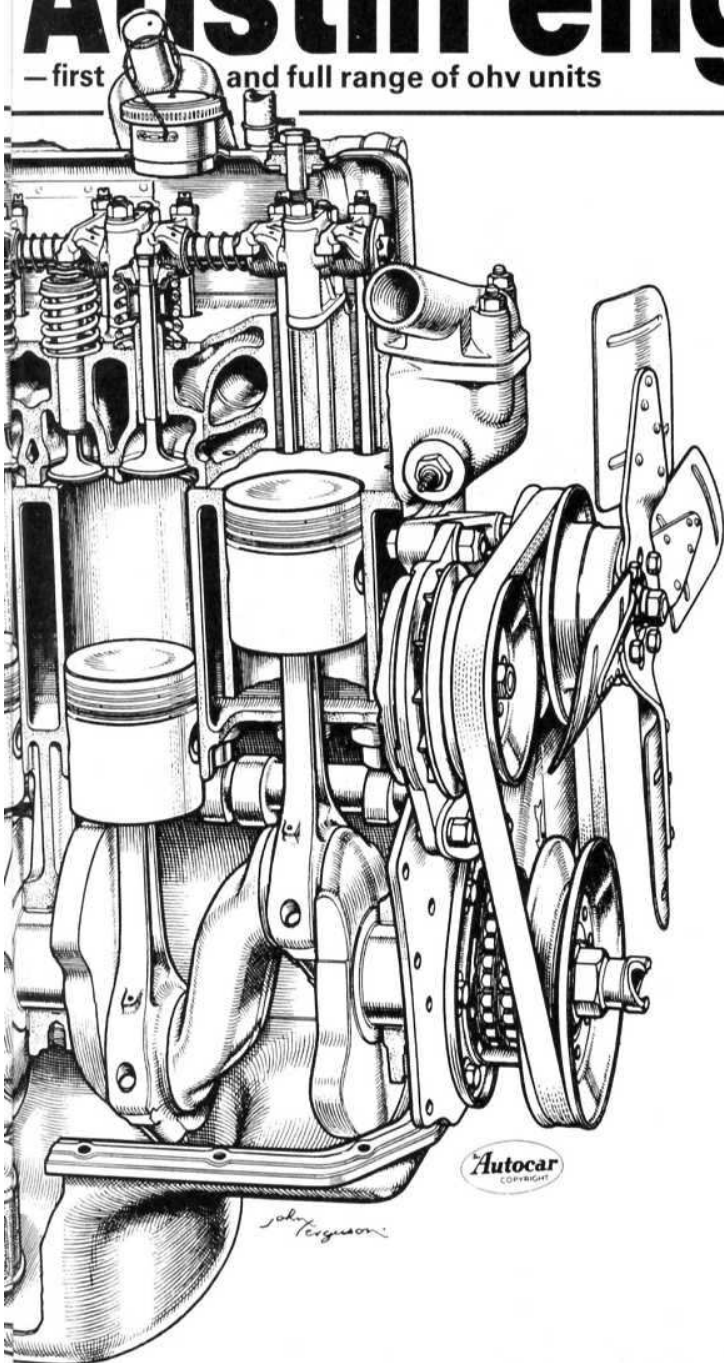
Austin's first all-new post-war car, the Devon/Dorset, was to replace all three of the smaller models in one fell swoop when it appeared in 1947. The car possessed an independent front suspension set-up that was to cost Austin a fortune in warranty payments as it broke up on the rough Continental roads and particularly on Belgian *pavé*, and was powered by a smaller version of the sturdy 'BS1' 2.2-litre ohv

Below, Eric Bareham wearing his Austin apprentice tie in 1953



Austin engines

— first and full range of ohv units



Below, the first post-war design upon which Eric Bareham worked was the 2.2-litre engine of the Austin 16



engine. Originally conceived as a 1.0-litre or 1.2-litre unit (Stan Johnson still calls it "the 1000/1200" today), the engine never saw the light of day in smaller guise. It was really a hybrid of the Austin Ten unit, retaining a similar-looking crank with the same external oil pipes, a bypass filtration system, and the same crank throw/stroke and the same crank-to-camshaft centres and even the same bore centres, although, of course, there was a tappet chest for the overhead valve pushrods where the sidevalves had once been. The top of the engine was essentially the truck engine and Bareham's BS1 layout but, of course, miniaturised. The question was, how much smaller could the layout go?

The answer came when Leonard Lord, rebuffed by Lord Nuffield in his bid to pull Austin and Morris into a single entity, decided to put pressure on Nuffield by bringing Austin's new AS3 model, or A30 as it was to become, on to the market. Work had already been started, led by the engineering skills of Eric Bareham, who had returned to the Austin fold in 1947 after a spell at Lagonda, and Johnny Rix. The first design notes were drafted out by Eric Bareham on May 24, 1949, which happens to be this writer's date of birth!

The original plans were for an 800cc four-cylinder engine, sidevalve, tilted at 20 degrees (amended to 15 degrees later) with an extraordinarily simple block design, no water pump and an aluminium cylinder head. The first engine was actually ohv and weighed in March 1950, and was known as the 7hp engine although by September 1949 designs for an overhead-valve 7hp were in hand and the first prototype was indeed an ohv. As the engine design developed, the oil pump driven from the end of the camshaft was retained from the original plans, but the distributor was restored to its conventional Austin location instead of being located on the other end of the camshaft. A water pump was fitted and the proposed aluminium head (for the sidevalve, following pre-war Austin 10 developments) was scrapped in favour of conventional cast iron. The 'slant' arrangement was also dropped in favour of the conventional upright stance.

In many ways it was a great pity that the BMC merger did not take

place before the A-Series was introduced. Designed for the lightweight AS3/A30, its 803cc capacity was too small for the Minor in which it had to be fitted in place of the antiquated Morris 8 engine that was still being used at the time of the merger. Paul Skilleter, in his book *Morris Minor, The World's Supreme Small Car*, asks the question as to why the Wolseley ohv 10hp was not fitted to the Minor, but not only was the Wolseley an ohv conversion of another piece of past history but the A-Series engine had introduced a leap of technology at Longbridge that could not be ignored. Not only had Eric Bareham and his immediate superior, Johnny Rix, designed a modern, efficient engine, but also the production facilities had become among the best in the world. Previously, engines had been manufactured a stage at a time at entirely separate work stations: now there were vast transfer lines, a kind of conveyor belt production line along which a block or a head would pass, starting at one end as a rough casting and coming out at the other as a machined and finished component. Leonard Lord had sunk a fortune of Austin's money into setting up these new production facilities and they were best utilised by making as many engines as possible. The A-Series had to go into the Minor!

One of Eric Bareham's next projects was the creation of BMC's keystone engine units, the B-Series. Bob Grice, once head of testing at BMC, says that Leonard Lord had told him: "What we want is a universal engine, one as reliable as the Heavy 12 and that can be used in lcv's (light commercial vehicles) and that can be developed as a Diesel." Whether that quotation is apocryphal or not, the 'universal' engine is just what Eric Bareham turned out. The B-Series engine, designed almost from the start to be used with either 1200 or 1500 capacity, was certainly an evolved A40 engine but it was most certainly not the same as A40's. For one thing, in order to allow for greater capacity, Eric Bareham had to lengthen the block. Then, to prevent the overall length from growing by too much, the water pump was heavily and cleverly recessed into the front of the block. The crank was redesigned as a stronger, longer component and it quickly became apparent that white metal would no longer

The A, B— and D of Austin engines

be adequate for the bearings and so lead-indium was substituted. The type of oil filtration used with white metal bearings had been of the bypass type which meant that just a little of the oil was filtered at a time, some unfiltered oil going through the bearings allowing any hard particles that got away to become embedded in the white metal. Lead-indium is very much harder and any particles that entered the bearings would have caused damage, so it became necessary to re-route the major oilways to ensure that all of the lubricant was directed through the filter. Superficially, the two engines look similar but there are very few components indeed that the B-Series engine has in common with the A40 unit. Apart from the fact that the earlier engine is sidevalve, there is almost as much in common between the 1200 A40 engine and the pre-war Austin 10 unit as there is between the B-Series and the A40 engines; Austin 10 and A40 engines share the same bore centres, crank throw, crank-to-camshaft centres and essentially the same production techniques. The B-Series took on new bore centres and production techniques but crank-to-camshaft centres were retained and so was the crank throw (or half the stroke, same thing). An interesting footnote is that, for reasons of high politics and low finance at BL, O-Series, R-Series and S-Series units are still encumbered with the same stroke as the 1932 Austin 10 engine!

The initial intention of the designers was to produce the B-Series engine as a 1400 — "The figure was plucked from the air by chief designer, John Rix," says Eric Bareham and then a number of alternative bore/stroke ratios and capacities were considered, including 1425cc and 1240cc. In the end, the existing crank throw and the machining facilities already in hand prevailed upon the two men to settle for 1200cc and 1500cc capacities. "We attempted a 1200 by utilising different bore/stroke sizes, but in the end, the A40 ratio was the one we stuck with," says Eric Bareham.

A feature of cars fitted with the new A-Series engine, which arrived in 1952, and the B-Series which was launched two years later, was that they were tested far more rigorously than any Austin cars or engines had ever been tested before: the management was determined that the costly mistakes which led to the use of inadequate front suspension on the Devon and Dorset would

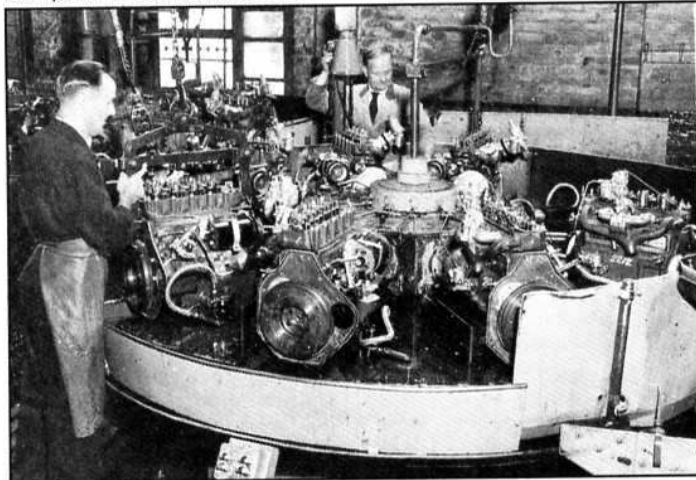
never be repeated. Head of testing at that time (and later to become vice-chairman of Jaguar) was Bob Grice who had been involved with the company since Herbert Austin's days. Grice's men would take their prototypes on a six to eight-week trip to the Continent travelling first from Longbridge to Dover, then Boulogne to Bordeaux, the French part of the run being non-stop except for petrol halts, which is not such an easy trip even today. After an overnight halt in Bordeaux, the convoy would enter Spain and drive through San Sebastian, Madrid, Seville and into the Rio Tinto area where extensive checks were made for dust entry into engines and passenger compartments. Then they were

off again, to Algeciras and Malaga where there were three days of endurance testing around Granada, including a climb up the Sierra Nevada mountains. (Bob Grice well remembers the time he drove to the top in an AS3/A30 in his shirt sleeves because of the heat at the start of his climb, only to find when he completed the climb that the high altitude had forced the ink out of his fountain pen, which he had thrust into his top pocket, ruining his best shirt!)

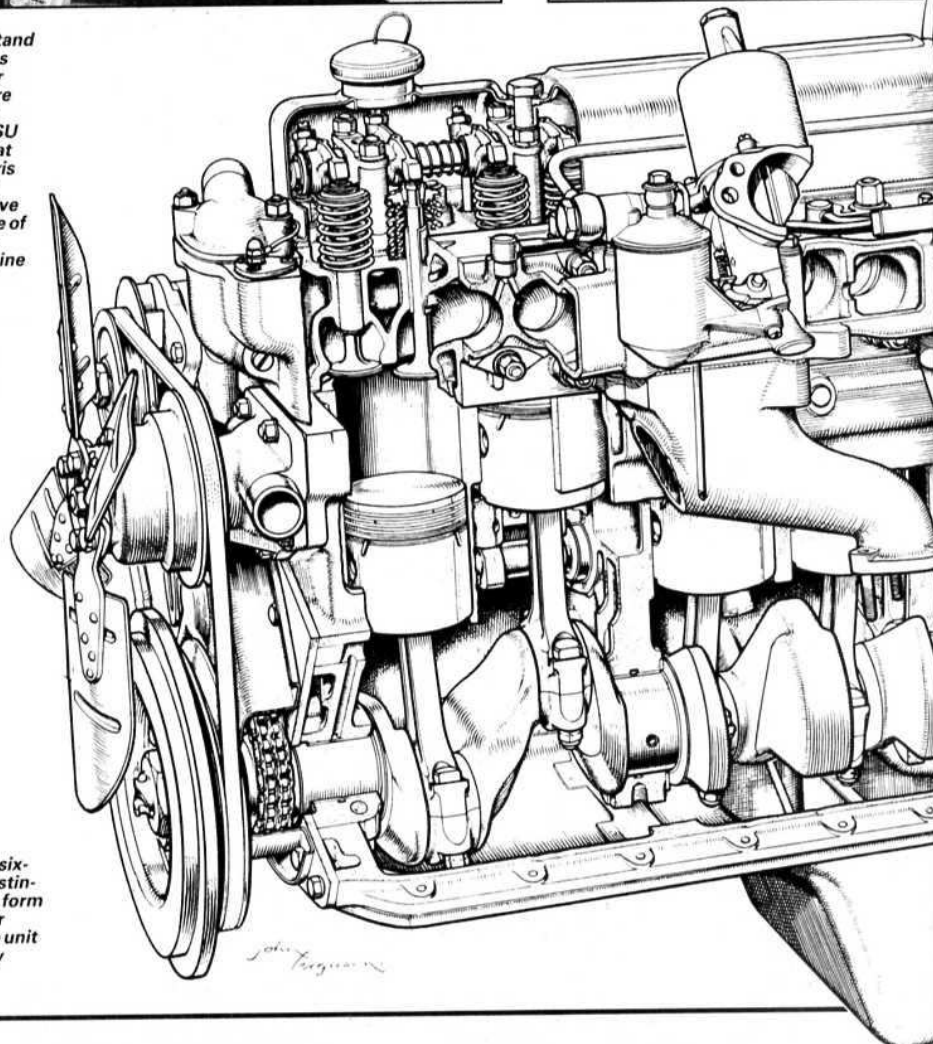
From there, the testers moved on to Valencia, through Barcelona then into France — Perpignan, Carcassonne and right back to Boulogne. Throughout the testing period, Bob Grice would fly backwards and forwards, to and from Toulouse, Gibraltar or

wherever there happened to be an airport near to the location of the convoy. This extremely rigorous testing programme must have had a strong bearing on the utter dependability for which the two engines were famed.

The reader may have noticed by now that, although this article is entitled *The A, B— and D of Austin engines*, no mention has been made so far of any 'D-Series' engine and indeed there was never officially any such engine. A- and B-Series nomenclature came about, according to Eric Bareham, when the engines were well under development and someone pointed out that the engines ought to be given identifying labels. "I suggested A-Series then B-Series seemed



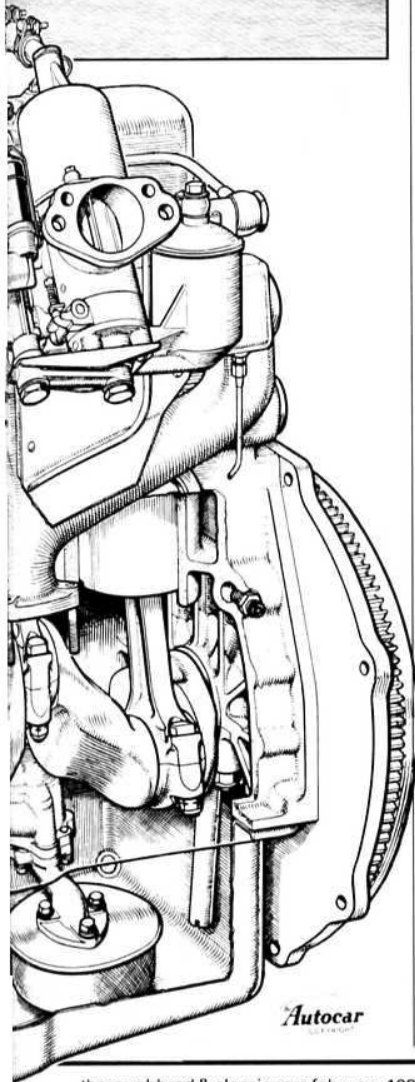
Above, a 'running-in' stand showing 803cc A-Series units being turned over electrically to make sure that they function. The mixture of Zenith and SU carburettors shows that units destined for Morris Minors and A30s were handled together. Above right, the MGC was one of the recipients of the C-Series six-cylinder engine



Right, cutaway of the six-cylinder engine, in Austin-Healey guise in which form it offered rather better performance than the unit originally designed by Morris

logical and the names just stuck," he has told me. But he also explained that there had been certain conventions at the Austin drawing office that dated back to before the war and that had a certain bearing on the matter. The 7hp engines had had an 'A' drawing number prefix, 4.0-litre engines had a 'D' drawing number prefix, but other engines (10hp — 'G'; 1200 A40 — 'H') went out of sequence.

The C-Series engine was designed by Morris Engines at Coventry (but was never liked at Longbridge because of its poor head design) and the 4.0-litre engine, as fitted to the Sheerline and Princess, was, and is, known apocryphally, but never 'officially', as the D-Series engine,



a label which is supported by its Austin drawing office number prefix.

So, by 1954 BMC possessed an engine range that was cohesive, logical — and dominated by Austin engineers' design excellence. Morris Motors had supplied the C-Series six-cylinder engine in time for the launch of the A90 Westminster in 1954, but Austin designed and built the new A-Series from 1952 for the A30 (it was also fitted to the Minor Series II at the same time) and the B-Series for a whole range of cars, starting with the MG Magnette in late 1953 and then the A40 and A50 Cambridge and Morris Oxford and Cowley in 1954, followed by the Wolseley 15/50 in '56, Wolseley 1500/Riley 1.5 in '57 and Riley 4/68 in 1959, not forgetting the MGA which was introduced in 1955 — a universal engine indeed! And all the while, the 4.0-litre 'D-Series', the first development of Austin's first ohv engine, the one that sparked off the whole Austin approach to ohv design, was still being produced throughout the Fifties for use in the Princess limousine.

It's strange to think that a cylinder head layout that was initiated in 1939 could still be in use — most successfully, too — in one of the more economical and efficient engines of the Eighties: the A-Series engines fitted to the Metro and Maestro! It's all quite a tribute to the far-sighted and aggressively successful policies of Leonard Lord, boss at Austin and BMC and to the high standards set by designers like Johnny Rix and Eric Bareham. 

Lindsay Porter has written *The BMC B-Series: Engine Data* book which details history, data and strip down information on these engines. Published by Osprey, it is scheduled for launch in Spring 1985

Engine evolution

The 1939 Truck Engine was Austin's first ohv engine. Eric Bareham says that he understands that it was "based on" the Bedford engine. Bore: 3.35in, stroke 4in, six cylinders. 3460cc. 68bhp.

Although the 'High Speed' and '100hp High Speed' 4.0-litre versions of the engine were developed for military use by 1940, they did not see civilian use until 1947 in the Sheerline and 1948 in civilian trucks.

'High Speed' engine — Bore: 3 7/16in, stroke: 4 3/8in, six-cylinders. 3995cc. Zenith carb. 87bhp. These engines known apocryphally as 'D-Series'. 'D' applied only to car versions, Sheerline, Princess, not trucks — these were 'K' all types.

'High Speed 100 hp' engine — as above, except: Stromberg carb. 100bhp. Used in Sheerline and Princess range of limousines. Alternatively with three SU carbs. 110bhp. Used in Jensen Six and Interceptor, and for marine use.

Austin stole a march on every other manufacturer by launching the 2.2-litre engine during the latter part of the War. Military use allowed Austin to put the engine into production: it was fitted in the

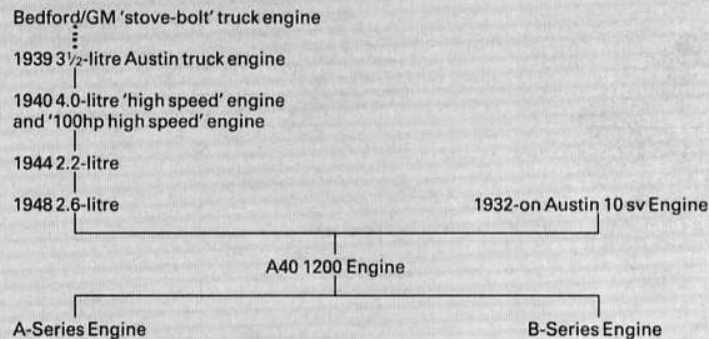
Austin 16. Bore: 3 1/8in, stroke: 4 3/8in, four cylinders, 2199cc. 52 to 69bhp. Used also in 25cwt van, taxi, hire car. Gipsy, 5200 truck.

The 2.6-litre engine was a four cylinder slice off the 'High Speed' 4.0-litre engine. Bore: 3in, stroke: 4in, four cylinder. 2662cc. 88bhp. Used in Austin Atlantic, civilian version of the Champ, Healey 100. The Austin 10/4 engine was launched in 1932 and powered the 10 until 1947 with modifications. Bore: 2 1/2in, stroke: 3 1/2in, four cylinders. 1125cc. Sidevalve. 30bhp.

The A40 engine was developed in 1000cc and 1200cc form but only used in the larger size. It was largely a new engine but was based strongly on the A10 engine but with 'D-Series'/2.2-litre ohv-type head. Bore: 2.578in, stroke: 3 1/2in, four cylinders. 1200cc. 40bhp.

A-Series and B-Series were developed separately but based on what went before. A-Series had oil pump at rear end of camshaft but otherwise used layout already developed. Bore: 2 1/4in, stroke: 3in, four cylinders. 803cc 28bhp. B-Series data: Bore: 2.578in, stroke: 3 1/2in, four cylinders. 1200cc. 42bhp. Larger engine, as shown except: Bore: 2 7/8in, 1489cc. 50bhp.

Austin A-Series and B-Series engines' family tree



Above, the Austin drawing office at Longbridge, circa 1948. It was here that the likes of Johnny Rix and Eric Bareham schemed their engine designs. According to Eric Bareham, the only differences between then and now are that in the Eighties first names are in, while jackets and white ties are out!