Founded by Hugh G. Conway, C.B.E. in 1987

For the advancement of education through the study of works of Ettore Bugatti

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Bunny Phillips

Chairman's Report

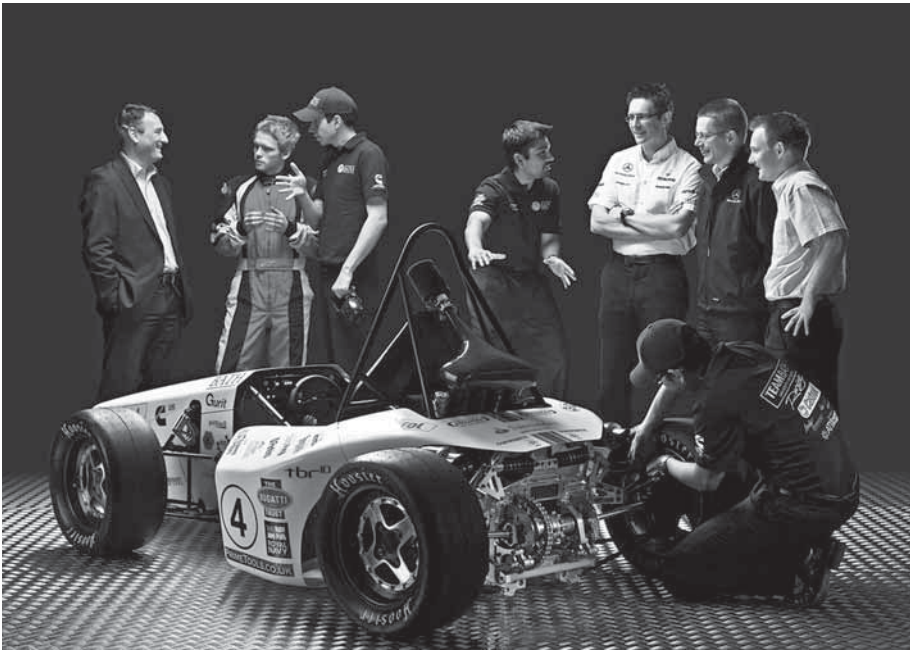
From time to time we are asked why is the Bugatti Trust a separate body from the Bugatti Owners' Club particularly as it is centred in its land. The reasons are straightforward but are worth repeating. The Trust has always valued its relationship with the club but it has to be noted that if it is to benefit from being a registered charity there are a number of conditions it must abide by under terms set out by Act of Parliament. It has for instance to demonstrate a benefit to the community. To this end the Trust provides educational and research facilities and active support to a number of schools and colleges. The club's objectives are of course quite different and are based around its renowned hill climb circuit. However they are complementary and we trust that each appreciates the benefits that the other brings.

The Bugatti Trust building, which we prefer to call a Study Centre is of course the centre of our activities. We endeavour to maintain the interest of visitors by making regular changes to what is on display. A frequent reaction by those who visit for the first time is surprise in discovering Ettore Bugatti's range of achievements and how much can be learnt from his innovative approach to engineering design. It is a message we hope to get across to the schools and colleges with whom we have close contact.

It is arguable that government, in this country at least, has failed to take on board the need for a strong manufacturing base with people designing and making things. Only time will tell whether the recent economic crisis has changed attitudes and something is done about it. The two thousand students from 107 teams from 23 countries taking part in the Formula Student competition at Silverstone in July will have provided a strong response to that question.

This takes us back conveniently to the relationship between the hill climb activities and the Bugatti Trust. Trish Davis, who all hill climbers will know, has invited a number of Formula Student teams to the meeting on 5/6 September to put their cars on display and demonstrate on the hill. If you can spare a few minutes to talk to them and study what they have achieved you will be impressed by the level of sophistication and engineering input into their cars.

Bath University which has been supported by the Trust for several years will be there but all teams will be equally welcome. Bath was top UK team in 2009. Whilst it was pipped by Hertford this year it still produced a highly creditable performance. Bath's third year students in the design competition were the design winners and achieved second place overall in the class so should do well next year when they participate in the main event.



Bath University Formula Student team

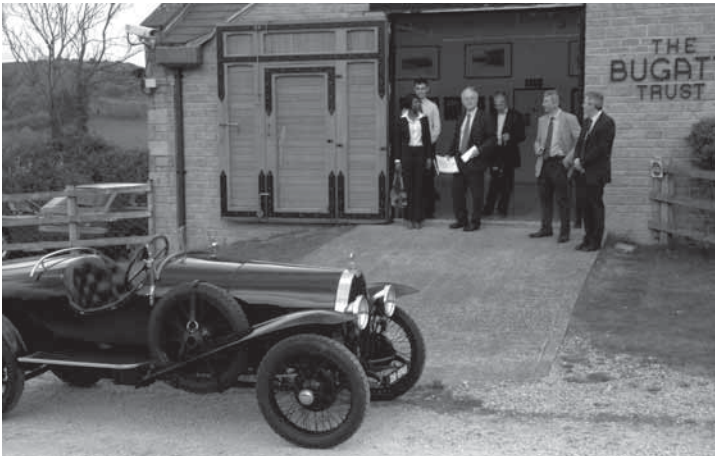
Photography by Mike Caldwell, www.mikecaldwell.co.uk, art direction by Bootes-Johns Design 01993 878110, with thanks to MERCEDES GP PETRONAS Formula One Team, Mercedes-Benz High Performance Engines and the University of Bath

During the early part of the year we presented Tiphaine Kamga, a student from Coventry University with the Trust's engineering prize for outstanding performance. She achieved top marks in her year. Her letter of appreciation is reproduced elsewhere in this newsletter.

Tiphaine Kamga, Coventry University winner of the Bugatti Trust's engineering prize

In June we attended Coventry University's degree design show and presented awards to a number of graduate students for their designs. This year we decided to make three awards, each under a different engineering design category. Younger students have not been forgotten and the help we give to Tewkesbury, Winchcombe and Cleeve schools is much appreciated by the schools themselves. The design challenge day at the Trust in early July proved extremely popular.

Finals day. Year 9 pupils from Tewkesbury School prepare their clockwork boats on the grass outside the Bugattii Trust



Coventry University prize giving day at the Bugatti Trust in April

Bugatti Type 29

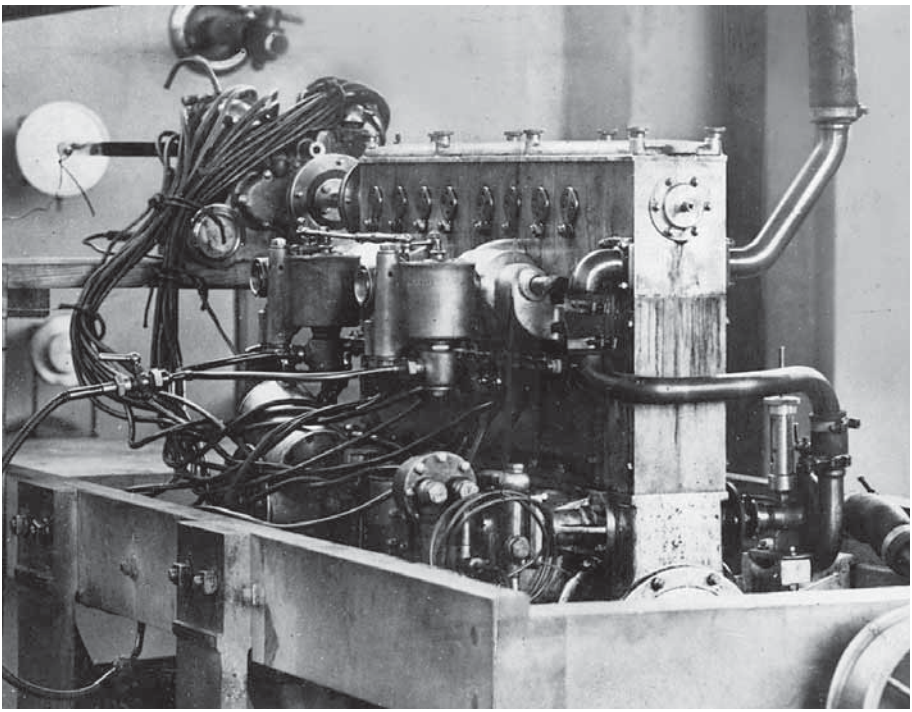
Richard Day

The first straight eight production cars were not 'Type 30' they were Type 22s with Type 29 engines.

When Bugatti set up his factory at Molsheim again after the First World War the four cylinder sixteen valve Voiturettes, Types 13, 22 and 23 pre-war designs, were quickly put back into production. The first new major project was the Type 28 – an eight cylinder, 3079cc luxury car – which was never intended for competition. Norbert Steinhauser has called it Ettore's embryo of the "Royale" concept.

A new high performance chassis in 1921

To supplement this luxury car Bugatti proposed to add a higher performance chassis to the range. This could be used for competition, sports or racing, and would, hopefully, maintain his position as "a significant racing manufacturer" (Venables) which had been created by the Type 13 win at Le Mans in 1920. By 1921 Bugatti must have realised that his four cylinder, two wheel braked Type 13 could not be expected to remain competitive for too much longer against, for example, the Talbot Darracqs which



The Type 29 engine on test in 1921. The oil pump assembly is on the inlet side and the cambox lid has a rounded shape. These features pre-date Type 30

is probably why he withdrew his team at the last minute from the Le Mans event on 18 September 1921. The new car was to be the Type 29.

Design work had started in early 1921 and the first component drawings were produced during March and April 1921. These drawings show the main parts of the engine which later went on to be developed, via Type 30, into the Type 35 and would serve Bugatti so well for the next ten years. The basic layout, 8 in line at 65mm centres, with its two narrow (only 95mm) rectangular blocks in tandem surmounted by the aluminium cambox, did not change throughout the whole period.

At this initial stage the bore diameter was 55mm giving 10mm of iron on the centreline between cylinders. They were twin plug blocks with all the plugs on the inlet side.

The crank stroke was initially drawn as 85mm giving an engine capacity of 1.6 litres but there are notes on the drawing to indicate that different possible capacities from 1.5 to 2.0 litres were envisaged. These are all 'Type 29' drawings.

As the international Grand Prix formula at this date allowed three litre engines it seems that this Type 29 design might have been conceived as a direct replacement of the four cylinder Brescia engine for the Voiturette class (1.5 litres).

The Type 29 crankshaft and lubrication

Together, the crankshaft and crankcase drawings tell us what was envisaged for the main bearings and bottom end lubrication system. The one piece crankcase incorporated nine large bronze rings, cast-in. The crankshaft had circular webs 139.9mm diameter designed to run inside the bronze rings with a 0.05mm clearance. There were deep grooves in the periphery of the crank webs and the idea was to inject enough oil through holes in the bronze rings to fill the grooves from where diagonal drillings would pass oil to lubricate the plain big-end bearings. There were three large ball races in addition – front, rear and centre – making a total of nine main bearings, if you can call the six intermediate bronze rings main bearings.

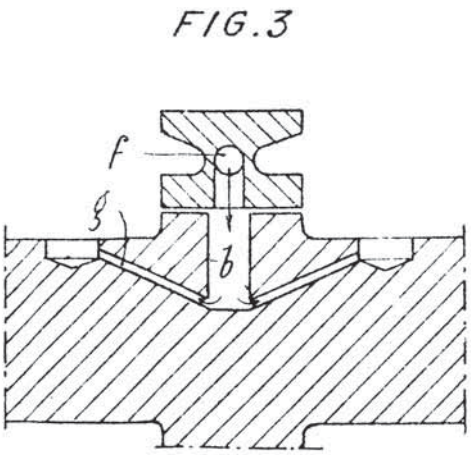
The Bugatti French Patent for this arrangement is numbered 565.087, sought on 13.04.1923, entitled *"System de graissage"*

Lubrication problems

We have been told by Uwe Hucke that during testing in 1921 Bugatti struggled to achieve success with this bottom end lubrication system. A large volume of oil at low pressure would be needed to fill the deep annular grooves in the crank webs against centrifugal force. Hucke thought that double oil pumps had been tried but the total theoretical clearance of 22mm^2 for the oil to leak out of the system before any would get to the big ends was too much. Bugatti's solution to this problem was his invention to inject the oil deep into the crank grooves with cross drilled jets which became the well known standard Bugatti arrangement applied to all Types from 1923.

The prototype engine

There are four Bugatti factory photographs of the Type 29 engine. The first two are of the engine mounted in a modified Type 22 frame with a Type 22/23 clutch and gearbox and Type 28 steering box and cradles for starter

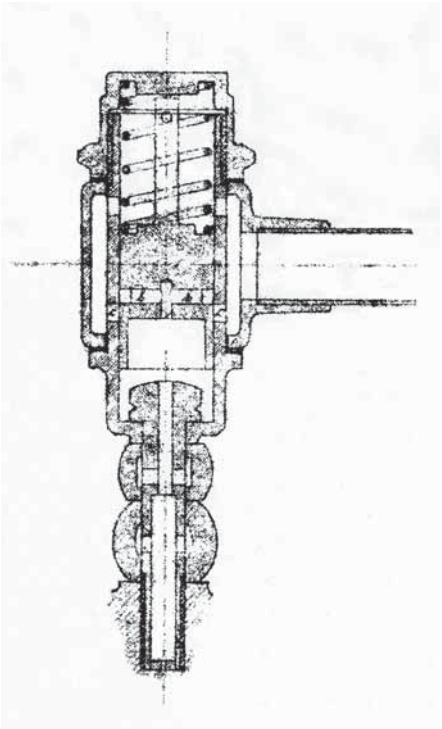


From Bugatti's French Patent No 565.087 showing the method of big end lubrication via the circular webs of the Type 29 crankshaft

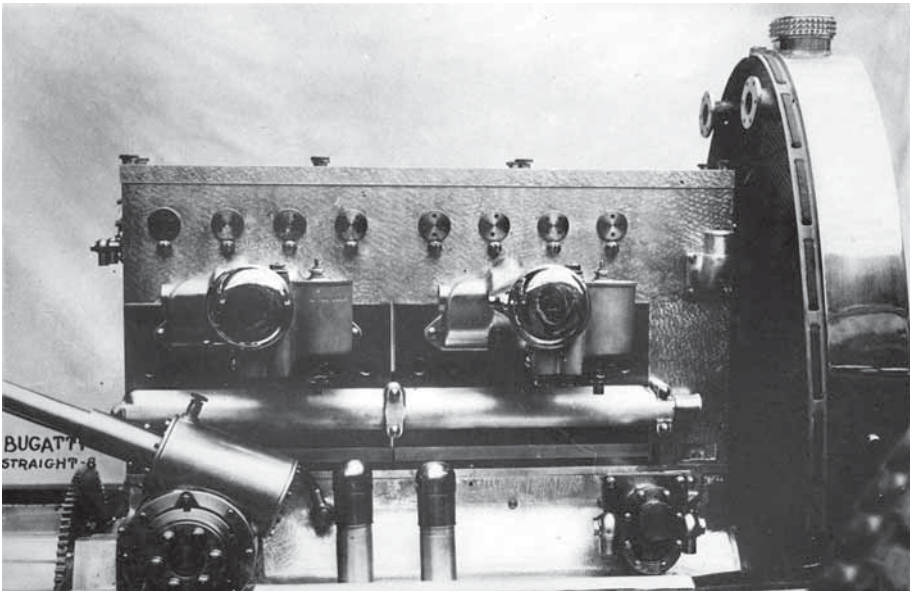
motor and dynamo can be seen. The assembly looks as if it is being prepared for exhibition and the engine is not quite complete. In the second pair of pictures a cast bulkhead has been fitted, the cradles have been removed and starter and dynamo are mounted in the bulkhead. (See pictures on pages 8 and 9.)

There is a small water pump driven by a cross shaft at the front of the engine on the left side and an oil pump on the right. The crankcase differs slightly from that shown in the previously mentioned drawing dated March 1921 and we believe this chassis/engine assembly was built in June/July 1921. The sump now has nine large cooling tubes whereas the earlier drawing shows none.

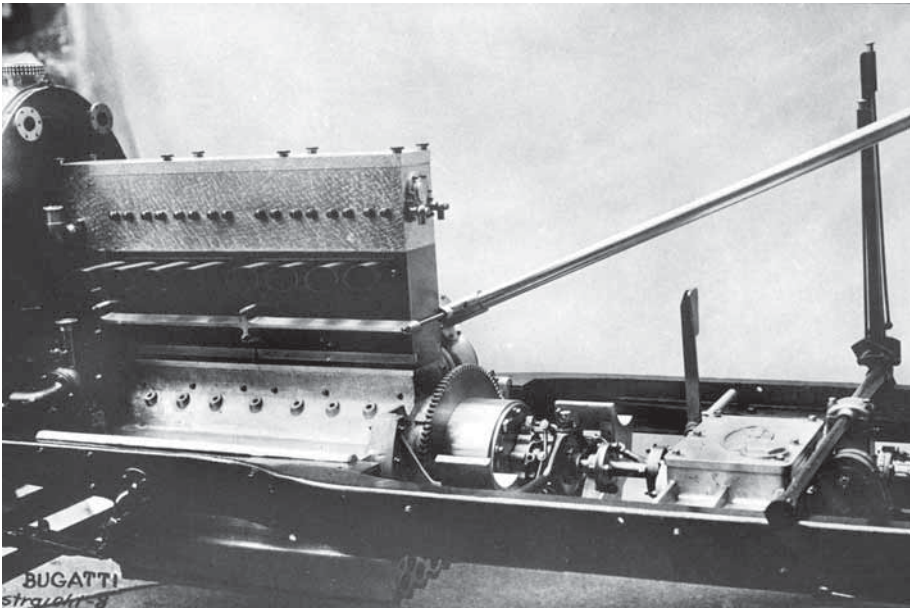
There was another series of Type 29 engine drawings produced in December 1921. These drawings still had the nine 'main bearing' bronze rings cast-in and there is a drawing for an ingenious oil pressure control valve for the Type 29. It is a relief valve which opens in order to reduce pressure at intermediate engine speeds but closes again at higher revs.

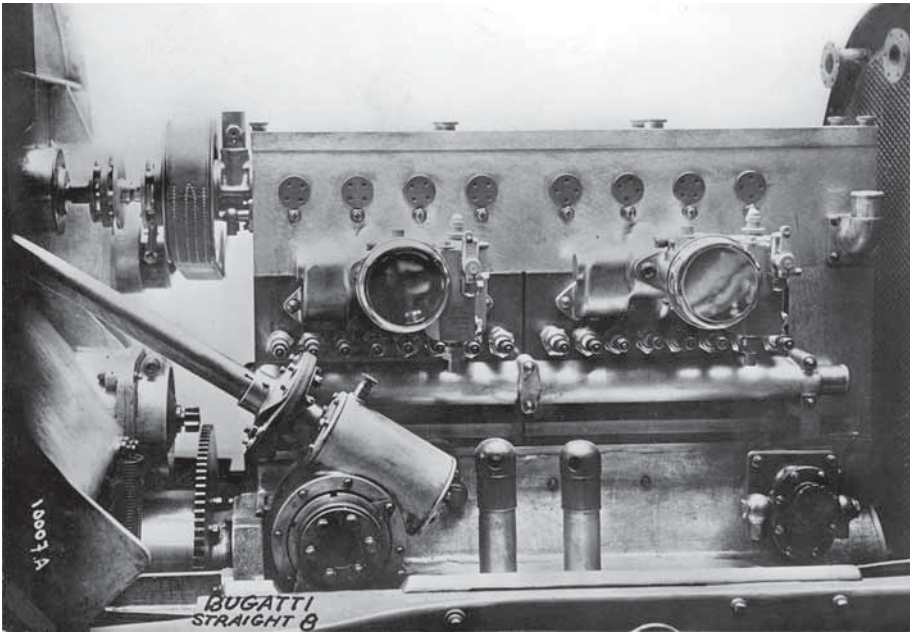


Oil pressure control valve shown at the higher speed shut-off point

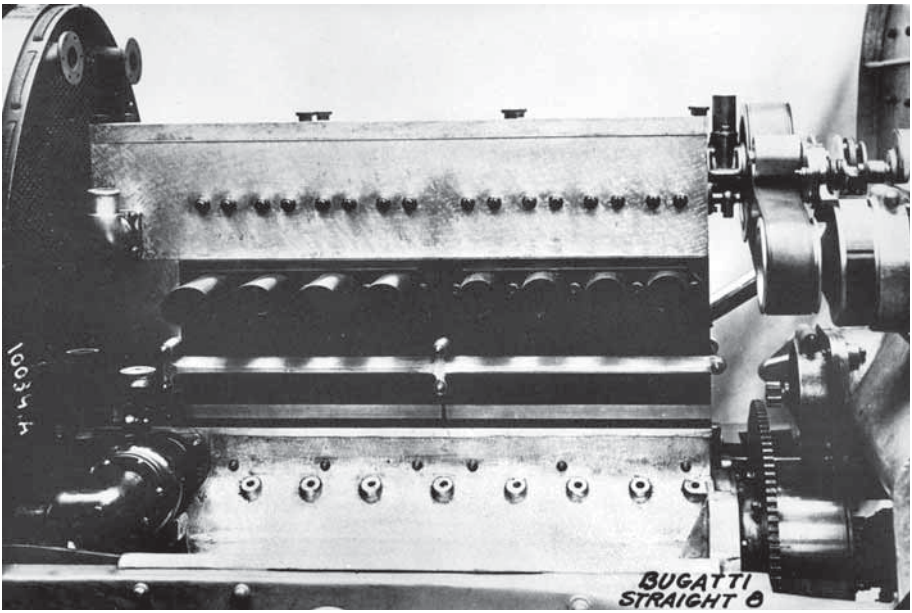


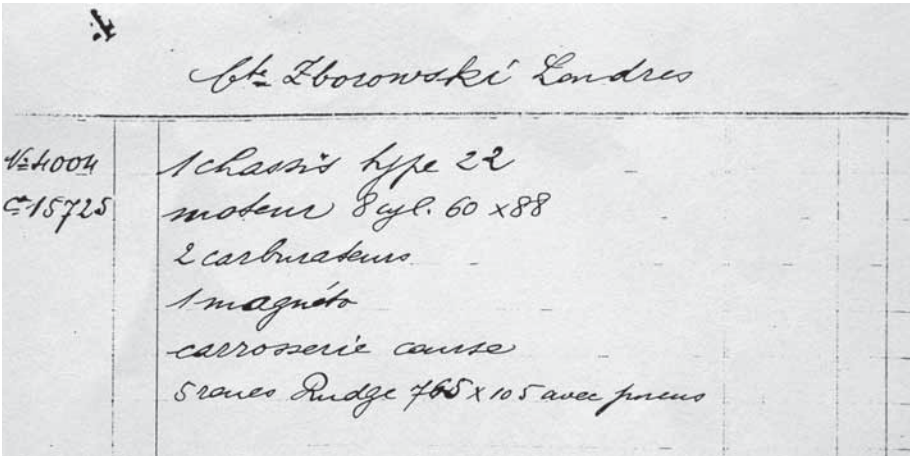
The incomplete Type 29 engine in a Type 22 chassis frame





The same chassis and engine, now with a bulkhead and different dynamo and starter mountings. The Type 29 engine had twin plug ignition like the Brescia




Mr Zborowski Londres

V=4004
C=15725

1 chassis type 22
moteur 8 cyl. 60 x 88
2 carburateurs
1 magnéto
carrosserie course
5 roues Rudge 765 x 105 avec pneus

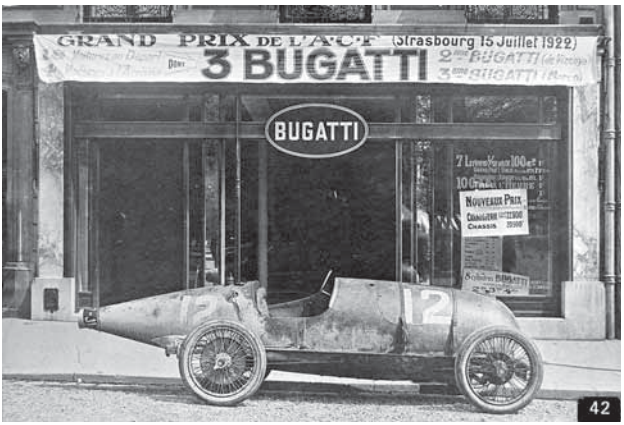
Factory build sheet for car, chassis number 4004, one of the 1922 Strasboug, French Grand Prix cars

Perhaps this device was expected to overcome the problems with the lubrication system.

Production

The new Type 30 chassis frame was not designed until August 1922. Before that date the first few 8 cylinder production cars were Type 22s fitted with Type 29 engines. By this stage the bore and stroke had been established as 60 and 88mm. The factory records describe these cars as "Type 22, Moteur 8 cyl. 60 x 88".

'Type 30', as a complete car, came later. At first it was the new Type 30 chassis with a Type 29 engine. Then, even the engine drawings (such as the production crankcase dated September 1922) were titled "29/30". Eventually the whole project became known, simply, as Type 30.



The 8 cylinder Type 22 at the Paris showroom having finished second in the French Grand Prix of 1922.

Bugatti French Patent No 565087

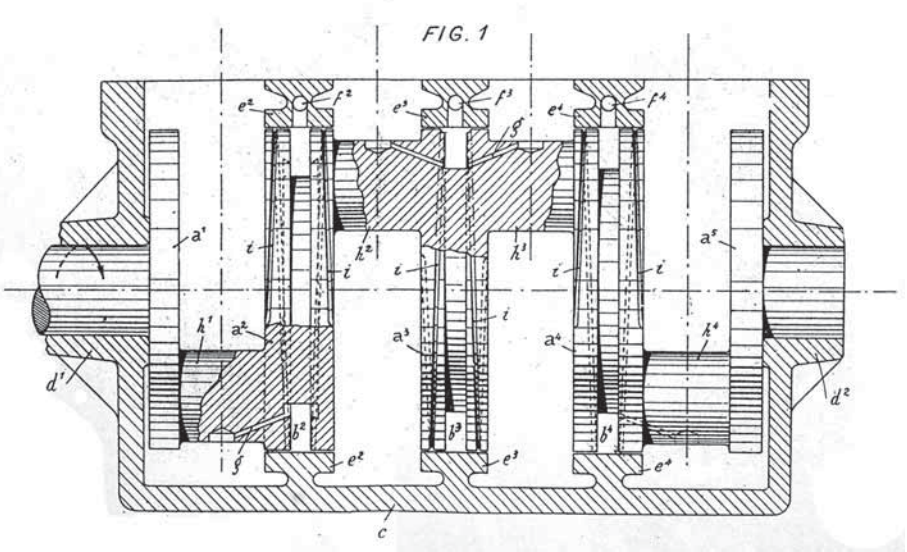
System for Lubricating Crankshaft Big-end Bearings Sought on 13 April 1923 (This patent is relevant to the Type 29 article in this Newsletter on page 5)

This is an invention for a method of crankshaft big-end lubrication which Bugatti tried out on the Type 29 engine. In this original form it was unsuccessful but the idea was developed with the use of oil jets and happily used on the later Brescias and all subsequent Types until the full pressure system was introduced for the Type 37 in July 1928.

The text of this patent firstly explains Bugatti's view of the limitations of a normal high pressure lubrication system. He did not like the idea of the oil for a big-end being supplied second-hand from a main bearing where it would already have been heated and might have picked up detritus. With this patented system, fresh cooled oil is supplied separately to each bearing.

The text then explains how this patented idea is supposed to work by reference to 'FIG 1.'

A long section of a crankshaft (for a four cylinder engine) is shown in a crankcase with conventional front and rear main bearings. The one piece shaft has five circular webs, 'a^1, a^2, a^3, a^4 and a^5. The intermediate webs, 'a^2, ^{3} & ^{4},' run closely within fixed rings, 'e^2, e^3 & e^4,' which are part of the crankcase. There are deep grooves in the periphery of each of the intermediate webs. Radial holes, 'f^2, f^3 & f^4,' supply oil from the pump. This squirts into the crank-web grooves, enough to completely fill them with oil. There is an angled drilling, 'g', so that oil from the base of each groove is thrown out to lubricate each crank pin/



big-end bearing. To prevent too much oil escaping between the circular webs and the fixed rings there are oil scrolls, 'i,' cut into the outside diameter of the webs.

Interestingly, this patent is dated April 1923 which is after the time Bugatti had experienced problems with this system for the Type 29. Too much oil escaped and what remained was thrown out, away from the inner diameter of the grooves, so that the angled drillings, 'g', were starved. The text of this patent reveals that Bugatti was already aware of the problem for it contains this passage which almost amounts to an admission of defeat! "If , for some reason, the oil does not completely fill the grooves, all lubrication is not lost but is just momentarily diminished." It goes on to explain that at least once every revolution the drilling 'g' will be in line with a stream of oil coming out of the radial hole 'f' and therefore some oil will always find its way to the crank pin.

The later stage of development, of course, was to use cross drilled jets to project the oil directly into undercut channels machined into the front and rear face of each of the torroidal grooves and abandon the idea of trying to pump in enough oil to completely fill them.

This patent gives us an insight into Ettore's thinking at one stage of his design development of the engines which were so successful for the following ten years.

On a Continental Track

George Eyston

In the last Newsletter we included a chapter from 'Flat Out' written by George Eyston and published in 1933. This is another instalment – the story of his formula libre race of the ACF at Montlhéry on 2nd July 1927.

I had a fast 2.3 litre supercharged Bugatti, the very first car of its series. Monsieur Bugatti had written to me saying that on test at Molsheim this car had beaten a French Army Spad fighter in a friendly affair for a wager down the main road leading to Strasbourg. When I got it I was aching to race against some of the well-known competitors abroad. I took it to the Montlhéry Track in Paris, and entered it in the "Formule Libre," a race for cars of unlimited size and engine capacity, which was organised on the day before the French Grand Prix, 1927.

The road circuit at Montlhéry is built in a park on top of a hill with charming surrounding country. It is wonderfully constructed, sweeping away from the track and returning behind the trees on the far side, the corners being concreted and slightly banked, while the tarmac straightaways give ample scope for the highest speed. It appears to be a dangerous course because of the speed at which the curves can be taken, but nevertheless its wide surface and its good design are sufficient to outweigh

these defects, and a large number of big races have been held there with success.

Those who visit Montlhéry for the first time, are particularly struck by its lovely surroundings. The run round this circuit is full of interest, but in wet weather the cement corners can be intensely slippery, and so it proved in the "Formule Libre."

On the day of the race it blew and rained in torrents. The track was covered in running water like a river. I expected to have to start in this, because in my experience of continental racing postponement is very rare, and was not even to be expected in this case; so as the hour approached I ordered my car up to the track.

I stood about in the howling wind and watched the large rain clouds loom up and vanish. All the cars were now being brought up and put in their starting positions. I managed to keep dry by putting on my crash hat with a couple of visors and a large oilskin.

The rumour went round that the start would be delayed for two hours, and this proved true. So we all made our way back to the garages in the slush and for the time hid the cars from the elements. I had trouble with water in the magneto, and we were glad of some extra time to dismantle and clean it.

The two hours went by and the weather improved. Evidently they had postponed the race on some good advice from the *Metrologique* in Paris. The rain now only came down in squalls. So up to the line we all came and again took up our allotted positions. I found myself between two 4-litre supercharged Sunbeams, one of which was afterwards the famous "Tiger" Sunbeam car which Kaye Don drove so successfully at Brooklands and in world's records. This car actually held the lap record at Montlhéry in the hands of Divo at a speed of 143 m.p.h., and subsequently the same car also obtained the lap record at Brooklands on two occasions in the hands of Kaye Don. So these were two formidable opponents to have ranged on either side, and I was tingling with excitement as to how I should fare between them. As for the rest of the field, there was the little Talbot of latest design in front driven by the redoubtable Divo, also Chiron on a 2.3-litre supercharged Bugatti like mine, but with a low axle ratio. These engines had a long stroke, and I was told not to exceed 5,400 r.p.m. on mine. It was evident that Chiron was going to take a chance.

Behind me were ranged the 3-litre Guyot Special cars, driven by Guyot and De Courcelles. Guyot was the driver of one of the Duesenberg cars that did so well in the French Grand Prix at Le Mans which had given me such a thrill in 1921, and he had driven with conspicuous success in the Targa Florio and at Indianapolis. De Courcelles had just won the 24-hours race at Le Mans on a Lorraine car.

The 4-litre Sunbeams were driven by the veteran Wagner, famous for his driving in pre-war Grand prix races, and Williams, who was a particularly fast driver.

The flag fell and off we all shot. The rain had ceased temporarily, so mercifully there was clear vision ahead. I started in the second row between the two twelve-cylinder sunbeams, and we had an exciting struggle for the first few yards. The one driven by Wagner got away first, and shooting ahead jumped into

the lead. I followed it and got bunched up with the cars which had started in the first row. It was a terrific sprint for the bottleneck which was, so to speak, the "pass" into the main track. Then came about half a mile up a slight incline, followed by a blind bend to the right. A really sporting piece of country for the opening spurt.

I was in a field of famous racers, men who had achieved fame by their infinite daring and prowess. The great Wagner, as I say, was first away. He shot out from the cars for the bottleneck, and was through while we scrambled for a place in the vanguard.

His striking red helmet, atop the twelve-cylinder double-blower engine, flashed away. Divo was in hot pursuit, and Chiron was on his heels – or should I say wheels? I was up among them too, and was already keyed up to the fight with these masters. Williams was nowhere to be seen. I had apparently beaten him to it.

I got to the blind bend to the right, which is called "Les Quatre Bornes," and went wide to take this flat out. Just as I was pulling out for the corner Williams shot by on the left, nearly plunging into the ditch in his efforts to screw round to pass me on the bend and yet keep on the road. I was immensely surprised to find that what seemed to me an almost impossible corner at the speed we were travelling could be taken two abreast in this way. I was certainly learning!

I had now the two large Sunbeams in front of me. Soon we came off the tarmac, which was not slippery, on to concreted wriggles, and afterwards down a little hill with a sharp turn to the left. Naturally, the concrete was just running with water, and I found it as slippery as ice. And so did the others, for no sooner had I completed my turn at the bottom of the little hill than I was confronted with Chiron's Bugatti broadside on in the middle of the track and at a standstill. On the slippery surface it was suicidal to attempt any quick turns, particularly at the speed I was going, so all I could do was to shuffle the car into such a position that I could shoot between his radiator and the edge of the concrete. Once over the edge of this concrete, particularly on the bends, I should have immediately encountered sticky clay, from which it would be impossible to extract oneself single-handed. Therefore, the edge of the concrete was a distinct danger point beyond which it was inadvisable to go.

How I managed to get by I don't know, but something had to be done about it very quickly, and fortunately all went well. What was going to happen to Chiron right in the fairway I did not like to think, for there were other cars howling down, and I guessed he had stopped his engine.

I had plenty of other things to think about, however, as the course rose immediately to a pimple, over which I skated, and then tumbled down a steep descent on the other side, where I had far too much speed for my liking. A sharp left-hand turn was followed a little while later by an acute hairpin to the right, which they call the "Epingle de Bruyères."

Here I found Wagner's Sunbeam just coming to a halt on the hairpin, and he threw his arms up in a gesture of despair. Something had evidently gone in the transmission, as he did not seem to be able to get out of the way. I scraped past

him luckily and pushed on for all I was worth. The little Talbot piloted by Divo was vanishing in the distance, Williams also in hot pursuit. I was certain that Williams on the larger car would soon gain the lead, and I should be third.

But just as I was making the best speed I could along a straight stretch a few miles farther on, up came Chiron! He must have been able to swing into the right direction and get going much sooner than I had anticipated. Evidently the low-gear ratio fitted to his car seemed the thing, but would his engine stand up to the higher revs? I kept as close to him as possible. Down came the rain again in torrents. Together we made the semi-circle of the "piste de vitesse," or portion of the steeply banked concrete track proper, which flattens out as it sweeps by the grandstand. We met the full force of the 45-m.p.h. wind, which I dare say reached 60 m.p.h. in gusts – partly ahead and partly oblique. On the rough ascent into the trees at full speed it was most terrifying. The only thing was to point the car in the right direction, let it swing about, and hope for the best. In spite of the wind, our speed must have been at least 125 m.p.h.

So the race went on. Where was Williams? I could see no sign of him. Chiron was disappearing in front. I could not now see the little Talbot. Round the steep banking we came once again all out, which sheets of water thrown up behind each car. It transpired that on this memorable day the crowds in the grandstand stood up and yelled as each car flew into view with the clouds of spray which followed it. It must have been a real thrill. Lap after lap was done. Sometimes we were battling with the stinging rain, and all the time striving with might and main to hold the car on a straight course.

Then suddenly, up the road circuit just at the spot which was always taken at maximum speed, I saw flags being waved frantically in the middle of the road. What on earth was the matter? I had, of course, to slow down, and I looked for some debacle.

There it was! Up against a tree, part of the tail of a car was distinguishable. The rest was just a pile of tangled metal. But what a tiny pile! Surely this could not be the remains of a whole car? I could not take it all in at a glance, but there was the race to get on with, and my slowing down was sufficient to clear the knot of people who were flag wagging. So again I put my foot down hard and tore on.

On the next lap I fell in with Chiron. He had evidently been held up far longer than I had by this smash.

And now there was an ambulance coming in the opposite direction. Was it Divo or Williams? I had no idea of my position, and I had not seen anything of the Guyot cars up to the present. It afterwards transpired that Chiron had met the ambulance coming through the bottle neck leading to the road circuit, just as he was about to rush through at full speed. There was no room for both. What could he do? He had to make a decision in a flash. He swung his car right-handed and took the full circle of the "piste de vitesse," or tract proper. He had just completed the turn when I joined in with him. It was the smartest piece of quick thinking that could possibly be imagined. The track was saturated with rain. Any application of brakes would have meant disaster as it did when on one occasion Cornelli braked at the finish of a race under similar conditions on Montlhéry track and went "for six," breaking his leg.

Chiron chose the only course, to encircle the banked racing track, keeping up his speed.

He told me afterwards that he was actually within two hundred metres of Divo, the leader, when this ambulance appeared, and as he had been close behind him on the previous lap he was pretty certain of drawing level had he not been baulked. And I expect he was not far wrong, because he had a much larger engine than Divo, and in a final burst might easily have caught him.

As it was, the race was flagged with Divo first, Chiron second, and myself third. Williams had fallen out at the pits with mechanical trouble.

Unfortunately there was the one fatal accident. This was to poor De Courcelles, whose car went off the road in the teeth of the gale, crashing against a tree with such force as to reduce chassis and body to absolute pulp. The small bundle of wreckage I had seen represented the remains of the whole car! As for the engine, it had been flung out of the frame forwards for distance of about 50 yards.

Ed. Note: Gerard de Courcelles died of his multiple injuries from this crash on the way to hospital. We do not know whether there is any connection with Henri de Courcelles who was involved with the Bugatti Paris showroom.

George Eyston

Some Notes on the Type 41 Prototype (Part 2)

Greg Morgan

In newsletter 33 I wrote an article outlining how a universally accepted belief that the prototype Bugatti Royale was even larger than its progeny was, after consulting the factory drawings, proven to be incorrect. Having now spent some considerable time studying these drawings, I would like to present a more in depth analysis.

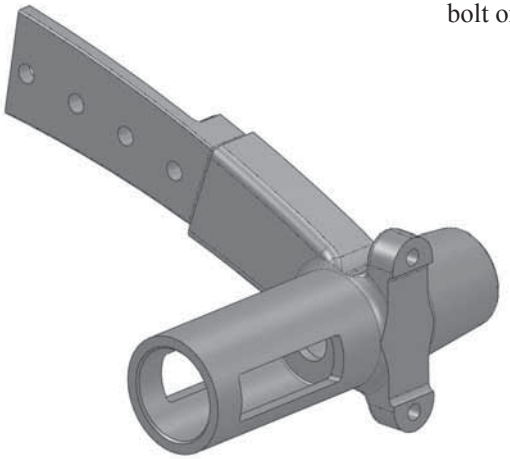
It would seem that the Type 41 probably had the most protracted development of any Bugatti car. Design work began in the summer of 1925 with a running prototype appearing about two years later. From dated drawings we can see that the car underwent a continuous development programme that carried on for at least three years after the final car left the factory, in 1933 (for example we find a design study from July 1937 for a proposed hydraulic clutch mechanism).

The Prototype had almost every mechanical part of its anatomy altered or replaced during its short life, which ended abruptly in the spring of 1931, when Bugatti had his famous crash. In the following paragraphs I try set out the principle changes.

Chassis

Perhaps the most serious problem Bugatti had with the initial design for the basic chassis was with the front springs, which we can surmise were not long enough forward of the axle to soften the ride. Numerous drawings exist for the front spring mount to be the fixed pivoting end rather than the sliding end seen on the production cars. This may have been to try to alleviate this problem.

As I wrote in the previous article, the 4300 mm wheelbase was fixed from the outset and so the only solution, short of scrapping the first frame and starting again, was to extend the front spring pivots by some 80 mm. This modification was incorporated into the bolt on dumb iron ends (see illustration).



Special front spring mounts fitted to the prototype chassis to enable 80 mm longer front springs to be fitted

To keep the ride height the same meant that the front spring pivot point had to move forward horizontally but not vertically in space and so the curvature of the chassis frame also had to be slightly altered. We find the drawing for this modification, dated 20th November 1928. A close examination of the Coupé Napoléon car, said to carry the same chassis number of 100 (previously always referred to as 41100 but actually stamped on its plate as just "100", shows no sign of this make shift alteration because it uses a later production chassis frame, conclusively proving that the prototype and the Coupé Napoléon frame were not one and the same as has often been written.

Four different bodies were fitted to this prototype chassis, the first a seven passenger phaeton was taken from a 143 inch wheelbase Packard. This took to the road in the spring of 1927.

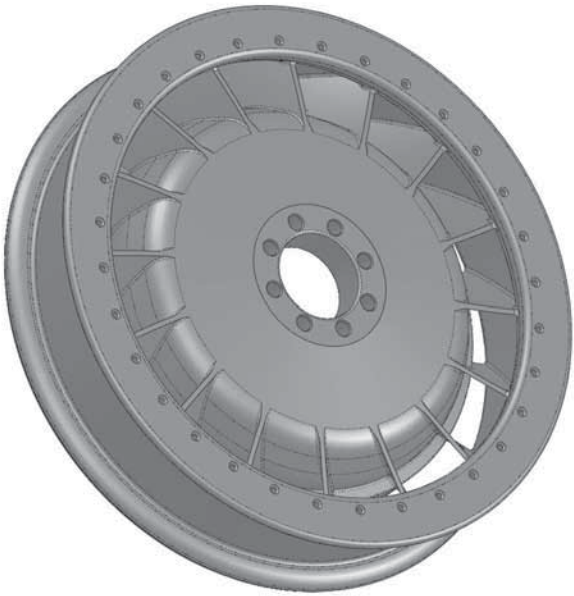
By October 1928 the body was removed (but the wings always retained) and replaced with a bizarre two door "fiacre" of Bugatti design, briefly seen and photographed outside the Paris Salon. This in turn was very quickly replaced with an equally short lived and unhappy four door version on the same theme.

By 1929, Bugatti finally got it just right by employing the services of C T Weymann to build a very handsome two door coach, entirely befitting the chassis.

Wheels

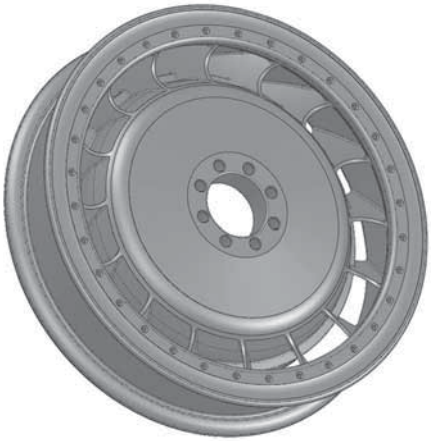
Bugatti used two distinct designs for the Type 41 wheel, his first aluminium road wheel intended for non Grand Prix applications.

The shape of the Royale wheel can be defined as an integral brake drum connected to the rim by sixteen, five millimetre thick webs set like the blades of a turbine, to draw air over the ribbed brake drum. The prototype wheel had these inclined at forty five degrees. This necessitated the use of a left and right handed version to work effectively on both sides of the car. Close inspection of every known photograph has shown that for the prototype wheel, only a "right hand" version was ever produced.



The first design. This perspective has been generated from the original drawing dated 25 May 1925

The second version introduced a scalloped profile machined into the fins and a more decorative moulding shape to the detachable rim.



The wheel design as first seen on the prototype car

The shrunk in and rivited brake drum was originally 450 x 55mm but this was quite substantially increased to 491 x 80mm for the later "Grand Freins" version for no doubt obvious reasons.

This large brake production wheel drawing is dated 23rd May 1927 and on a signed photograph dated 28th February 1928 of the Packard bodied car taken with Jean at the wheel and Ettore alongside on horseback shows these later wheels fitted. Also we notice that the detachable outer rim is secured by 16 instead of the usual 32 machine screws.

The usual aluminium detachable rim has been replaced by a forged steel version to maintain the strength otherwise lost. This experimental steel rim stayed with the car when the body was replaced with the two door and subsequent four door Fiacre.

By the time the Weymann body was fitted, Bugatti had reverted back to the original 32 bolt aluminium version.

The production wheel

Brakes

As previously mentioned brake dimensions began as 450 mm x 55 mm and were enlarged to 491 mm x 80 mm, increasing surface area of the drum by 58%, although the brake lining on the shoes of the prototype covered 260 degrees, whilst the production brake lining only covered 220 degrees.

When the wheel and brake design was modified, the rear brake back plates were also adapted to carry a pair of built in oil reservoirs to lubricate the rear spring pivots - a feature not used initially on the prototype.

In 1929 Bugatti experimented with self adjusting brake levers but these were

not fitted on the production cars (with the possible exception of the Berline de Voyage, a car that is an enigma in many ways).

Transaxle

The fundamental design of the unit, a development from the experimental Type 28, seemed fixed from the outset, but on closer inspection, nearly every original drawing has been "struck through" and replaced. Changes included the cross section of the primary gear shaft which was initially square sectioned, then going to four toothed and eventually becoming a six toothed spline. The gear module of the differential was also enlarged from 4 to 4.5. The first drawing for the axle case (dated 08.05.25) gives an internal diameter for the pinion area as 316 mm, whereas the drawing for the production case (dated 29.06.27) quotes 344mm, indicating changes to the final drive ratio. A search through the drawings confirms this, with at least twenty different proposals using 16:53, 12:43, 14:43 and 18:53 axle ratios and every possible tooth module, finally settling for a 12:43 ratio with a 7.5 module.

Gearbox ratios however were never altered.

To be continued in subsequent Newsletters

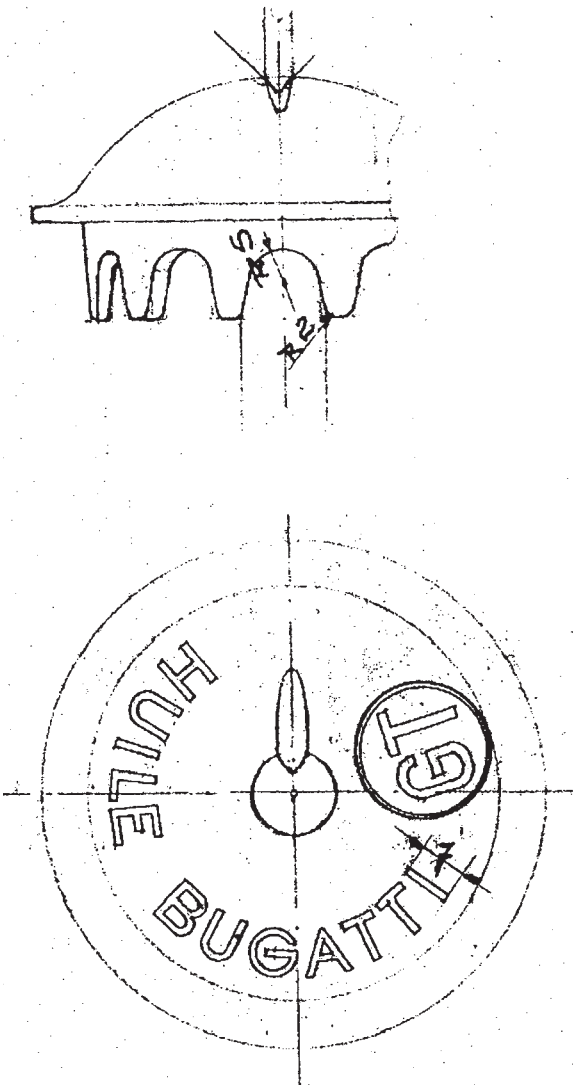
Bugatti Oil

Richard Day

Bob Jones has kindly lent a Bugatti oil can for us to display at the Bugatti Trust

The dark blue oil can is well known but this one is quite different. Bugatti supplied a range of oils which were coded T for "Tourisme" and CS for "Corse et Sport". The late Type 57 oil filler cover called for "Huile Bugatti GT".

CS was a vegetable oil. The CS can has some promotional text including "BUGATTI – CHAMPION DU MONDE – 1926 – 5000 VICTOIRES DANS LE MONDE ENTIER" which helpfully dates it to late 1926 or early 1927. It is one litre capacity and carries the Strasboug agent's name: *Kampmann*. The main body colour is the 1927 version of Bugatti blue: perhaps a useful colour reference.



From the Molsheim drawing for the matt chrome brass oil filler cap for the late Type 57

Dormer House Science & Engineering Week

Friday 12th to Friday 19th March 2010

Angela Hucke

Pupils enjoyed a full and varied programme of science experiments, visitors and visiting creatures. Younger children had talks on the skeleton, the life of a zoo keeper from Bob Joiner of Cotswold Wildlife Park and were able to handle snakes and chinchillas which were brought to the School by animal handler Rachel Bishop. Older pupils examined the effect of raising agents on cookery at local tearoom the Cacao Bean with Chef Silke Bruening, and swiftly ate their results! Other pupils examined water fleas, designed their own apps for mobile phones and visited labs in local secondary schools.

The week started with a supercharged Bugatti type 43 being driven into the Lower Courtyard much to the amazement of the children. Each year group with ages ranging from 3 to 11 learned about Ettore Bugatti, motoring in the 30s, the Bugatti Trust and above all, 'where does the petrol go in' and 'how fast is it' which seemed to be the recurrent questions. All 8 year groups were also invited in turns to do a countdown for the type 43's engine to be started up and the car happily obliged each time. A six year old was overheard telling her friends that when she grows up she wants to drive a Bugatti!

A great day out and a whole new generation shared the enthusiasm for vintage motoring and Bugatti in particular.

Dormer House School is an independent day school in Gloucestershire founded in 1875 and currently one of four PNEU schools in the UK which work autonomously but are bound by the ethos of excellence laid down by the Victorian founder of the PNEU - Charlotte Mason.

Bugattis in India

Elizabeth Junek's Type 44 roadster on route to India via Ceylon in 1930

In July 1964 Mr R Kahn wrote from Bombay to Godfrey Eaton to contradict his opinion that there were no Bugattis in India: there were in fact several. We are of course aware of the cars imported by Mme Junek of which there is photographic evidence and the 35A owned by J R D Tata. It is believed that most were eventually scrapped.

However Saleem Ahmadullah has written to say that not all have been lost.

Dear Hugh,

Thanks very much for the letter. The late Roni Khan was quite a good friend of mine, but sadly he neglected himself in a big way and about four or five years ago sadly he passed away. His son, Dorab, who is quite a car enthusiast, lives in London and I could introduce you to each other. Roni had several cars all of which got dispersed and, as far as I know, all that the family now has is a 1960 2 litre Lancia Flaminia Zagato coupe and on 8 litre Bentley which has been McKenzie modified.

The Adenwalla Bugatti ended up with Roni Khan! For many years now it is the car that belongs to Vijay Malliya. It has been partially restored but I don't think is yet in running condition.

One heard of a Bugatti that was sold in Poona in the sixties, the story goes that it ended up with the butcher and changed hands for about Rs. 60! At that time that was probably the equivalent of five pounds sterling!

There was a man called Chattriwalla who claimed that that he had a dismantled Bugatti in packing cases, in storage but nothing could ever be substantiated. I do know that the Bhiwandiwalla Bugatti did exist but he died many years ago. I do know his son vaguely so, I think may be I can get hold of a picture of it, if he has one.

Other vague stories surfaced from time to time but nothing ever came up which amounted to anything when followed up.

A Postscript

Hugh Conway

Now that the Bugatti - King aero-engine is complete and on display it may be of interest to state how the Trust came to acquire the parts and to provide some interesting historical background for the record.

In about 1993 my wife and I visited Bunny Phillips at his home in California and during a tour of his workshop he pointed to a large pile of aero-engine parts and said that I could have them for the Trust. After his death a year or two later I contacted his lawyer who advised me that he had decided they were of no use and it was his intention to scrap them. However if I was willing to pay for their shipment I could have them. A month or two later and $1000 poorer, thanks to the generous efforts of Mike Cleary, two pallet loads of parts were shipped over: about a tonne of spares, including five cylinder blocks, crankshaft, cambox, propshaft and numerous valves, bearings, pistons, etc.

Bunny Phillips, who was born in 1908, was instrumental in founding the American Bugatti Club in 1960. His interest in Bugatti started when the father of a young friend, bought a Brescia at the 1926 Paris Salon and brought it back to California. Bunny's family was well-to-do as many were in Southern California in the mid 1920s. Over dinner I remember him telling me that his mother's income was $100,000 a week from a single oil well at that time.

Later he bought a Grand Prix Bugatti of his own and this was used in a film with the extraordinary title of *Hip, Hips, Hurray*. Bunny ghost drove the car and wind scenes were provided by a Bugatti engine. Copies of the film are apparently available as a download from the internet but not much of the Bugatti is seen. He used his Bugatti, 4748, in many races and later fitted with a Miller engine it finished 13th in the 1941 Indianapolis 500 race.

These were the days of prohibition and a notorious bootlegger named Tony Cornero acquired a boat that was equipped with two Bugatti engines. Bunny had two spares ready for replacement.

He said that this was the fastest boat on the Pacific and could make 50 mph fully laden with booze. He told the story that one night, in 1930-31, the Coast Guard had learned that it was returning from Mexico with a full load, about a thousand cases of whisky and was waiting with two fully armed boats to head the smugglers off. They beached the boat and headed for the hills. The Coast Guard towed the boat out to sea and sank it with cannon fire.

He said the round trip from Los Angeles Harbour to the pick-up point off Mexico was about 350 miles and in the three to four years they operated there was never a serious engine failure. They travelled to Mexico by night. Usually they ran at about half throttle, but when they suspected they were to be intercepted by the Coast Guard or be high-jacked they gave it full throttle and no boat could catch them.

The Bugatti aero-engine wind machine was also used in many pictures to simulate hurricanes and also to blow the flames away from oil well fires so that

dynamite could be placed near enough to the well head to blast out the fire. According to Bunny when used in the films they required very little service although sometimes left to idle for long periods the plugs would oil up but otherwise they were totally reliable.

In the mid 1960s he sold two spare engines to Fritz Schlumpf. We may dream that at least some of what was left and is now on display saw service down the coast of California.

Correspondence

Radiators

10th April 2010 Netherlands

I have a picture of an abnormal Bugatti radiator (belonging to car 49451; if you want it I can send it to you) I am researching the origin of this unusual Bugatti radiator - type. From contacts with a previous Dutch owner of this car I know that - on a Molsheim visit with this car (ca. 1962), a factory mechanic has confirmed it as an original but did not give more details.

Meanwhile I found another similar if not identical radiator on a (to me) unidentified car in Conway's Bugatti, Le Pur sang des Automobiles, 1st edition page 208 below (registration A38337).

Also I have heard of - but not seen proof yet - of another specimen.

I see some similarities with the later slatted radiator type used on some T57 models - could this be a sort of prototype or styling evaluation.

Do you know any details for this type of radiator?

- why is it different?
- does it have improved thermal efficiency?
- are there more?
- why was it discontinued/why were cars sold with this different radiator?
- do you have factory records and/or drawings that confirm the originality of this abnormal shaped radiator?

I hope to hear from you - even if you can not help me with my research. If I find more data and/or evidence I will share it with you later.

Bart Oosterling

Reply from the Bugatti Trust:

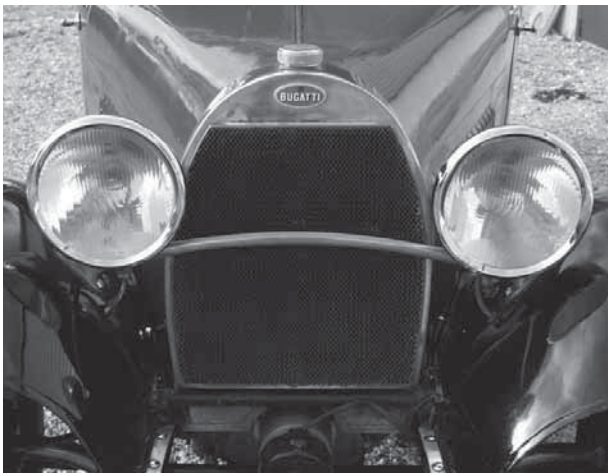
Thank you for your enquiry about the unusual Bugatti radiator.

The lower picture on page 208 of Conway's Bugatti book shows the Type 49, chassis # 49255. We believe this car was fitted with a square mesh radiator stone guard with a tubular frame. These, or similar types of guard were not uncommon - see page 181 of the same book. I can not find any Molsheim drawings of this type of fitting which perhaps indicates that it was not a Bugatti factory product.

Perhaps with more research, we could pin it down to one particular agent or coach builder.

Please let me know what you find.

4th May 2010



Thank you very much for your answer, but I think you misunderstood my question or maybe I did not describe my question clear enough.

Let me clarify:

It seems in the picture in the book that behind the mesh radiator guard of 49255 there is a radiator of the same type as 49451 has. Attached is a picture of 49451's radiator. Instead of having the Bugatti logo attached to the honeycomb structure of the radiator is now on a large chromed (or nickeled) base plate - which to me is unusual and as far as I know never has been documented in Bugatti literature.

49451 (1932) was bodied by Ruckstuhl - 49255 (1929) was originally bodied by Gangloff - according to my data they were built 2-3 years apart.

So I hope you can tell me more or maybe direct me to some other experts who may know more.

Another one found with a similar different radiator now a T40: 40696 built in 1929.

Thank you again for your time and response.

Bart Oosterling

Reply:

Now I understand your question. The Bugatti factory drawings for radiators (which we have here at the Bugatti Trust) were prepared in order to give enough information to the radiator manufacturers. None of the drawings shows the blank plate covering the header tank as shown in your picture. Some of the drawings such as 33 CH 2, which is the radiator for Types 38 and 43, clearly show a false honeycomb in front of the header tank. It is drawn and noted "Faux Nid d'Arbeilles - aussi court que possible".

The drawing for the Type 49 (49 CH 1) is less explicit. It does not show any honeycomb – the area within the normal edge band is simply left blank. Perhaps one of the radiator manufacturers chose to misunderstand this drawing and produced a batch of radiators with the blank front plate to the header tank.

5th May 2010

To me it seems very strange that Bugatti left details open to interpretation of supplying manufacturers (in this case radiator manufacturers), because Bugatti was very strict about design, form and function.

An essential part of their brand-image and design, the horse-shoe radiator, left open to the interpretation of a supplying manufacturer - I cannot imagine that. Also I cannot imagine that when such a radiator would arrive at the factory, it was accepted from the supplier and paid for. As far as I know there were no cash flow problems in 1929-1931 that might have caused the forced acceptance of these different radiators. Only a delivery deadline might be an explanation.

It might be interesting if we could trace the manufacturer(s) of these three abnormal radiators we now found. Are these from one and the same or from two of more different manufacturers?

Bart Oosterling

We would welcome comments on this subject from Trust members.

Bugatti Trust Engineering prize winner

The prize giving at the Trust was a splendid event. Tiphaine Kamga was given a ride in Charles Trevelyan's Type 23 and she wrote to give us some personal details. See a picture of her on page 3.

29th April 2010 Coventry

I was born in Cameroon, a country located in Central Africa. I came to England in 2007 to pursue my studies in Engineering. My home town is Edéa which is not far from the largest city and the commercial capital of the country (Douala). Edéa has a population of 120,000 and it accommodates aluminium, steel and timber processing facilities.

I have always been interested in Engineering and I could not do Mechanical Engineering in Cameroon because the subject is not supported at this level in my country. I always want to do things better, to improve, to be more effective and efficient and to learn and practice.

I enjoy trying to solve complex problems, working with my hands as well as applying fundamentals of science and mathematics to create practical and useful solutions.

I was not aware of Bugatti back home but winning this prize and the visit to the Bugatti Trust has shown me that it has a unique place in automotive history. I was particularly impressed with Bugatti's emphasis of innovative solutions to the engineering problems of the design of high performance cars and his use of art as an integral part of engineering design. I was delighted to be invited to ride in a classic Bugatti car, which I thoroughly enjoyed. Hugh, Richard and Charles (the owner of the car) were really kind and made me feel very welcome.

I feel honoured to have received the prize and I hope that I can progress in my career and demonstrate similar values as those represented by the Bugatti name. The fantastic museum of the Bugatti Trust is an inspiration and it was great to see pictures and thoughts behind the design. I believe that Bugatti's holistic approach to engineering is a lesson to future generations to solve future technical challenges.

Tiphaine Kamga

Bugatti Aero-engine

21 April 2010 Kingston Buci
Sussex

I was very pleased to note that the Bugatti-King aero-engine has now been put on display at the Trust HQ and that the centre-spread in the Journal does, indeed, do it justice. However, I would wish to make some observations about these engines as there seems to be an amount of conflicting evidence concerning them.

Apart from previous articles in the Journal, the entry in the 3rd Edition of 'Bugatti' by H G Conway appears to have been the most reliable account of the history of these engines. In "From Milan to Molsheim" on Page 184 it states that "none of these engines became airborn" but this is patently untrue; in Steinhauser on Page 128 (English translation) it says that the Lusac 21 flew in August 1919 from the Wright field – it was the McCook field then.

From my research I have deduced the following – 30 examples of the Lusac 11 (La Père US Army Combat) were supplied from the Packard Motor Car Co of Detroit, Mich., of which one was converted to be the Lusac 21, Serial No. SC 40023. This aircraft was fitted with a Bugatti-King 420 hp power plant and it was delivered by the Engineering Division of the US Bureau of Aircraft Production to McCook Field in the last week of January 1919. Now, the two remaining engines extant in America, Serial Nos. J46 and J50 were, presumably part of the last batch to have been manufactured. These two units are dated consecutively as the 14th and 15th January 1919 with the latter engine having the Engineering division No 40701. Reports in the US aeronautical press state that only 40 units were actually built so – is this statement incorrect or were there gaps in the register? Again, Steinhauser says that the Lusac 21 first flew in August 1919 – so what was it doing for seven months? US reports seem to intimate that it flew for the first time in February 1919. I think that either J46 or J50 powered the Lusac 21, probably the latter; there was enough time to complete a 50-hour running-in process before February. We know that the J-numbers were consecutive for J4 has been reported as having failed on test in 1918. Another query raises its head – J50 is now at the Wright-Patterson Air Base – has it always been there? The writer G Borgeson is reputed to have been the owner at one time – did he ever take it home? I believe that Lt. de Marmier, the French test pilot flew the Lusac 21 originally and that Dr Espanet took over in later months. Again, another query – how many flights were actually accomplished?

I believe that five units remain in preservation, the two in America, a French prototype, probably No 1 at Mulhouse and a Bugatti-King also at Mulhouse together with the example held at the Trust.

I attempted to obtain the works number of the engine at Mulhouse but unfortunately, the French Museum did not have the courtesy to reply to me; also I do not know the number of the unit held at the Trust.

So there we have it – several questions but little real evidence concerning the actual flights of the Bugatti-King engined Lusac 21. The maximum speed of the Lusac 21, (presumably at

sea level) has been quoted at 120 mph which is 13 mph lower than the Lusac 11 fitted with the 400 hp Liberty engine; however, to be fair the latter aircraft was some 400 kg lighter and about 2 feet shorter in length. The Lusac 11 went on to establish some height records during the 1920s and its overall performance was equal to the best World War 1 Scout, the Insilco SVA. Again another question arises – did politics play any part? The Bureau of aircraft Production placed orders with the Packard Motor Co for a total of 3495 aircraft of the Lusac 11 type and for 2000 Bugatti-King engines, but for no Lusac 21 machines whatsoever. One wonders if Colonel Jesse Vincent had any motive to promote the Liberty engine over the Bugatti for, after all, he was one of the co-designers of the Liberty and he was the Chief Engineer of the Packard firm. Also it was probably a fact that he knew Commander Renal C Bolling quite well, and, therefore might have been able to facilitate procurement of the material for the Packard organisation. In the event the Armistice precluded any further activity on the Lusac/Bugatti-King front as all of the wartime orders were cancelled.

Perhaps some of the membership of the Bugatti Trust may have the answers to these queries, I have been studying the Bugatti-King aero engine for years now and I do not have any answers!

Maurice A Kelly

24th April 2010 Villars, France

I read with great interest your article concerning the display Aero Engine. With this involvement you are probably in a position to help me clarify 2 questions concerning the machining and assembly of this engine which I have never been able to understand.

1) How is it possible to grind the main and con rod journals on the undercut crankshaft, I assume they had to be ground and not just turned and/or polished?

2) How do you position and tighten the inner row of nuts securing the 2nd cylinder block to the crankcase?

Erik Koux

Reply from the Bugatti Trust

Fitting the crankshaft is tedious. You can't thread the bearing caps onto their studs without turning the shaft. We only have one crankshaft - it must have been even more troublesome with two.

I do not know the answer to your question one. I think there are only two possibilities - either the journals were hand lapped or they used a special little grinding wheel at right angles to the crankshaft axis.

Question 2: there is enough space between the banks of cylinders to operate a spanner. It is also possible to fit the exhaust stubs with the cylinders in position.

The Schlumpf Brothers' Museum

19th June 2010 Weston, USA

I am hoping one of your experts can confirm the inspirational source of the candelabra lamps illuminating the Schlumpf museum in Mulhouse. I have read they were inspired by Venetian Grand Canale lamps (Schlumpf Obsession) and also the Pont Alexandre bridge in Paris. Which is correct?

Don Sherman

Reply from the Bugatti Trust

The book Die Automobile der Gebrüder Schlumpf; by Halwart Schrader has: "cinq cents Réverbères environ, semblables à ceux du Pont Alexandre III sur la Seine à Paris ..."

The Schlumpf Obsession by Jenkinson and Verstappen has "800 iron pillars ... (each with) reproduction candelabra modelled after those found on Venice's Grand Canal."

I believe that Schrader was correct and Jenkinson was not.

The Alexandre III bridge of Paris

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Grand Prix Bugatti, 3rd Edition by H G Conway	**£45 plus post and packing**	
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A few back issues of the Bugatti Trust Newsletters are still available - at £20 each plus post and packing.

Any of the above can be obtained direct from the Bugatti Trust by telephoning +44 (0)1242 677201 during office hours, or by emailing to info@bugatti-trust.co.uk please also refer to our web site for other information on items for sale: www.bugatti-trust.co.uk

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