CORRECTIONS & ADDITIONS: Part 2

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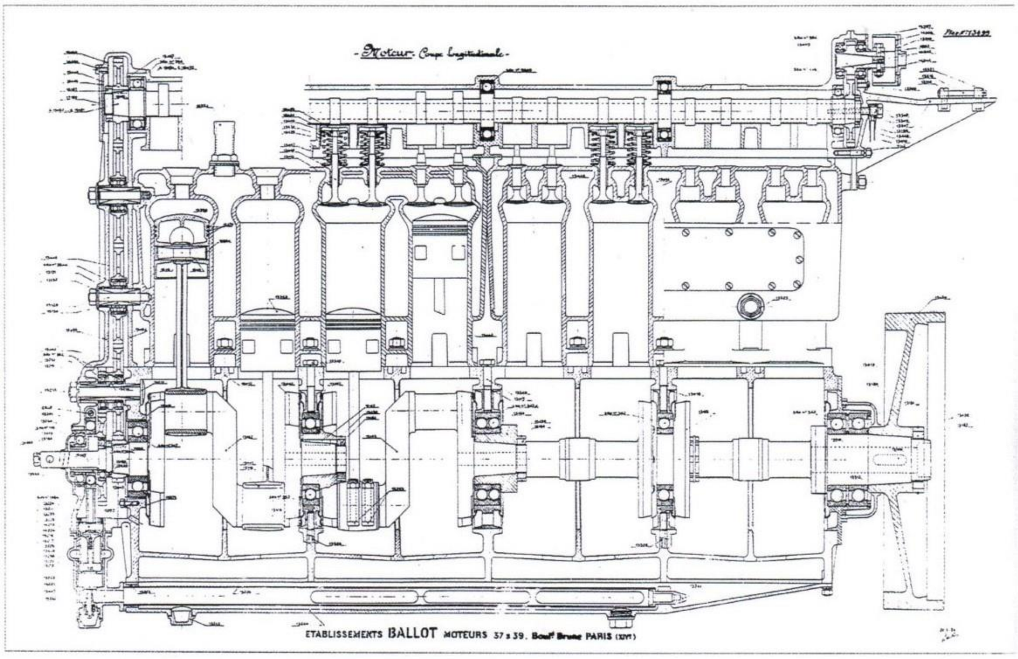
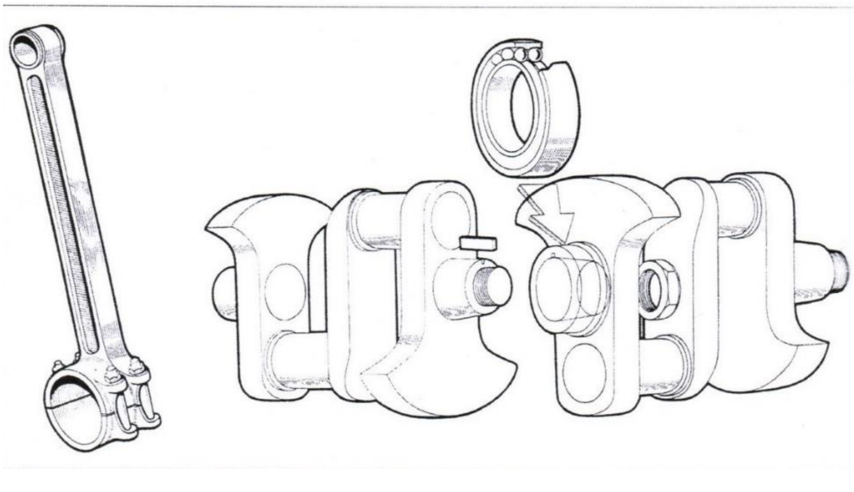
CORRECTIONS & ADDITIONS: PART 2

6 September 2019

Significant Other: SO6: 1920 Ballot 3L

DASO 1224 (see ref. below) has a longitudinal section of the 1920 Ballot 3L 8-cylinder engine which is sharper than that provided in SO6 and also gives an "exploded" illustration of how the 4-piece crank was built-up to allow un-split crankshaft ball-bearings to be used. These drawings are reproduced below. [It is hoped that there will not be objections to their use here in a not-for-profit website which is intended purely for study.]





The crank-pins were 42 mm diameter and the ball-bearings were Hoffman.

Reference

DASO 1224 BALLOT D. Cabart & G. Sen Dalton Watson 2019.
Advised by courtesy of Bernard Heurteux. E-mail 31 August 2019.

CORRECTIONS & ADDITIONS

17 September 2019

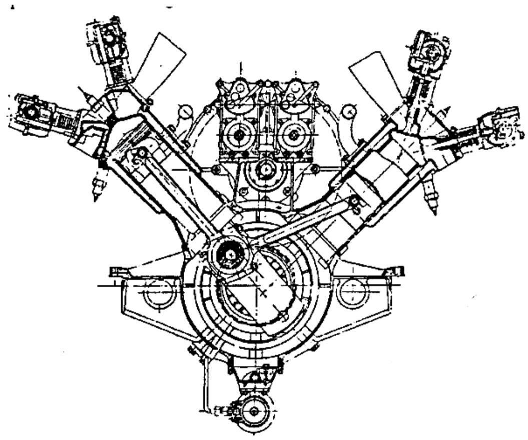
ADDITION

Appendix 8 Illustrations

A former colleague, Bernard Heurteux, has brought back to the author's attention an omission from this collection of piston aero engines of the 1914 V8 Peugeot, built for the French government. This unit is of particular interest in a website aimed principally at racing engines, because it was based by Ernest Henri on his successful 1913 Grand Prix engine. Two of the 100 mm x 180 mm cast-iron DOHC 4 valves-per-cylinder blocks, modified only to insert additional sparking-plugs to conform to standard aero practice, were mounted at 90^0 . The bottom-end was also to Henri's 1913 re-design pattern, the 4-throw balanced crank rotating in 3 large-diameter ball-bearings. The centre bearing being un-split required a 2-piece crank, with a bolted-up taper joint (the design is illustrated, as used by Henri in the 1920 3L Ballot, at C & A Part 2 on P.1). Steel pistons were carried by fork-and-blade con. rods.

The engine section is shown below.

1914 Peugeot
DASO 371 (see Refs. below)
90V8 100 mm/180 = 0.555 11,310 cc
Rated at 210 HP @ 2,000 RPM
1:2 crank-speed spur gear reduction
Weight 395 kg



DASO 1053

The engine was not a success. It found a belated home in only the Voisin type 8 night bomber, but gave "little satisfaction" and was superseded in the type 10 by a new Renault engine (ref. Bomber Aircraft Pocketbook R. Cross Batsford 1964). This was partly because its Weight/Power ratio of 395/210 = 1.88 kg/HP was poor – for comparison the novel aluminium-alloy block Hispano-Suiza V8 of Marc Birkigt was developed in 1917 to 240/220 = 1.09 when also fitted with a propeller-speed reduction gear (these engines were reserved for SPAD fighters). Henri left Peugeot in February 1915 so it cannot be known how he might have developed his aero engine. There were other factors against the unit as a practical military engine. The Mean Piston Speed (MPS) of 12 m/s, compared to the 8.5 m/s of the Hispano was too high, bearing in mind that reciprocating stress varies as MPS^2 (x2). The 32 valves needing frequent clearance adjustment and grinding-in at overhaul plus 4 camshafts to be re-timed then, were too labour-intensive.

In the UK Louis Coatalen of Sunbeam used pirated Henri racing technology to build many types of aero engine during WW1, but these also were not judged successful (evidence of George Bulman and W.O. Bentley given in DASO 1097 at Note 16).

It is noteworthy that the two best aero engines used by the Allies in WW1 were the designs of Hispano-Suiza and Rolls-Royce, who had learnt pre War to build long-life, quiet luxury car engines, not the units produced from a racing engine base.

References

DASO 371 Test records of some Petrol Engines A. Berriman IAE 1919.
DASO 1053 AEROSPHERE G. Angle Aircraft Publications 1939.
DASO 1097 EAGLE–HENRY ROYCE'S FIRST AERO ENGINE D.S.Taulbut R-R Heritage Trust 2011.

CORRECTIONS & ADDITIONS: PART 2

13 November 2019

ADDITION

The Unique Cosworth Story

A 1978 power curve for the Cosworth DFV has been provided by DASO 1225 (see refs. below) by courtesy of correspondent Stephen Cansick. This has enabled an update to the power of this engine at various stages of its development given in chart form on CORRECTIONS & ADDITIONSt P. 40. The tabulated 1978 data is given on P. 5. A power of 483 HP@ 10,750 RPM lies between the “Typical” 475 and “Best” 495 given for the DFV in Eg. 58 of The Unique Cosworth Story
The updated comparison curves are shown on Figs. 1 and 2 below

Fig. 1

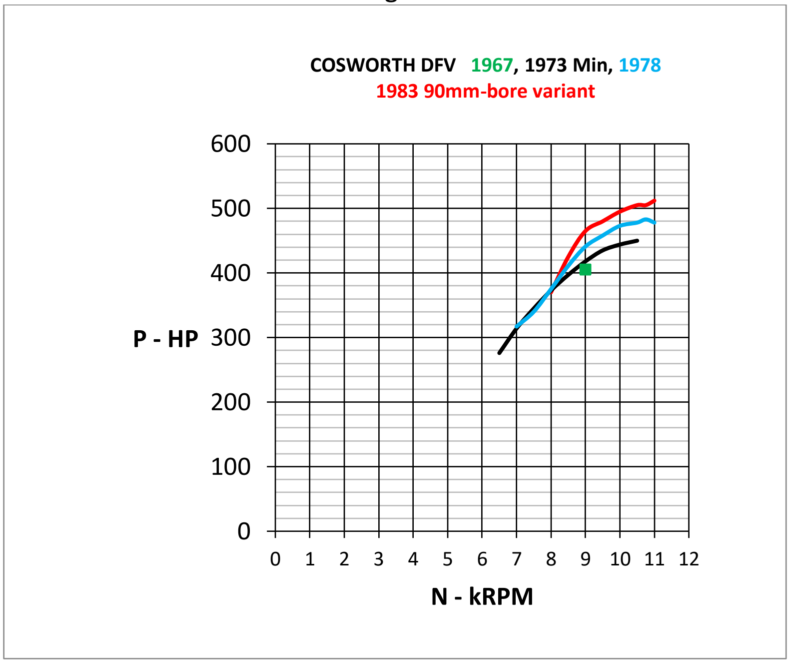
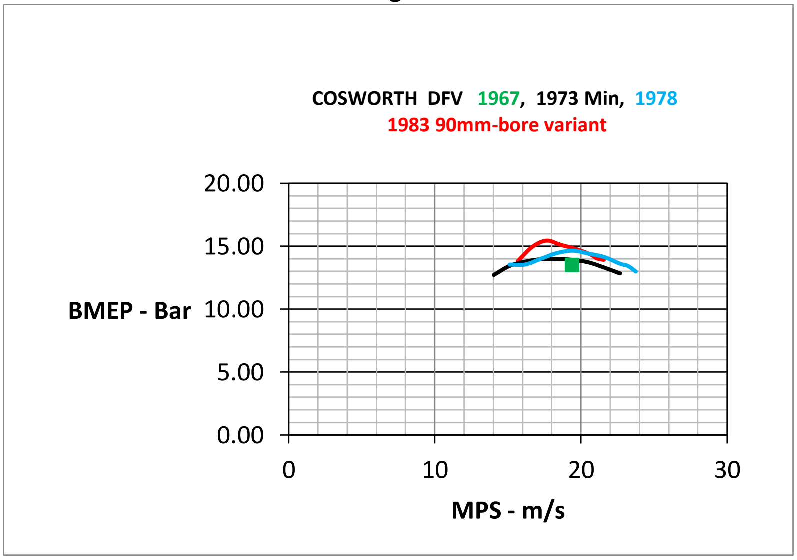


Fig. 2



Comparison with Ferrari 312B(T3)

DASO 1225 also provided a contemporary power curve for the 11-year rival unit , the Ferrari 180V12 (F12) 312Bin its 1978 T3 chassis specification (see P. 5). The two engines are compared on Figs. 3 and 4 on P. 4.

Fig. 3

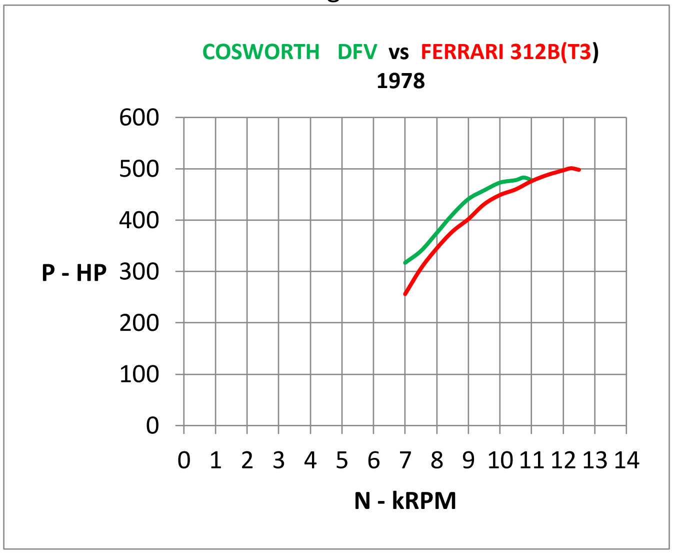
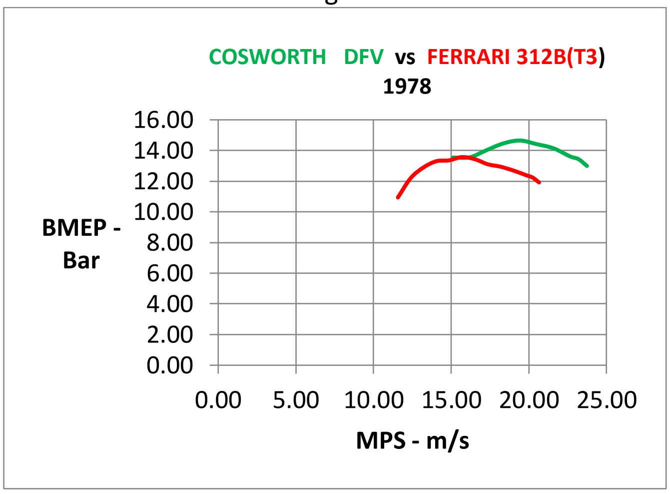


Fig. 4



<u>The 1978 winner</u>

In 1978 the Drivers' and Constructors' Championships were won, respectively, by Mario Andretti (6 wins) and the Lotus "Ground-hugging" designs L78 (first 2 races) and L79 (6 races), total 8 wins (2 by Ronnie Peterson). With 1 DFV-powered Tyrrell win by Patrick Depailler, the DFV total was 9 wins to the Ferrari's 5 (1 by the T2 specn.).

As recorded in The Unique Cosworth Story, Andretti was sometimes able to win while restricting his DFV to a max. 10,250 RPM, providing 476 HP, or a little more in a Cosworth development engine, as supplied to favoured customers. The rival Ferrari had a peak of over 500 HP. This illustrates the advantage of the Lotus' ground-effect, even though the Ferrari that season was on the new Michelin radial-ply tyres (versus cross-ply Goodyears).

<u>1979</u>

However, Ferrari won the last 4 races of 1978. This foreshadowed their return of Championship-winning form in 1979, with the T4 specn.. This was the year that Colin Chapman over-reached himself in ground-effect with the L80 and the new ground-effect Williams FW07 did not peak in form until past mid-season.

In turn, the 1980 Ferrari 312B(T5) was a flop! For comments on the Lotus over 1978-1979 and the Ferrari over 1979-1980 see the piece on "Spectacular Loss of Performance between seasons".

<u>Reference</u>

DASO 1225 *Motor* 5 April 1980 advised by courtesy of Stephen Cansick, E-mail 31 October 2019.

POWER CURVES

Eg.	58
DASO	1225
YEAR	1978
Make	Cosworth
Model	DFV
Vcc	2993.1
Ind. System	NA
Confign.	90V8
Bmm	85.6742
Smm	64.77

The source is believed to be Metric Horsepower and has been reduced by 1.4% to give BHP.

N kRPM	P HP	MPS m/s	BMEP Bar
7	317	15.11	13.54
7.5	340	16.19	13.55
8	375	17.27	14.01
8.5	411	18.35	14.46
9	441	19.43	14.65
9.5	458	20.51	14.41
10	473	21.59	14.14
10.5	478	22.67	13.61
10.75	483	23.21	13.43
11	478	23.75	12.99

POWER CURVES

PEP	
DASO	1225
YEAR	1978
Make	Ferrari
Model	312B(T3))
Vcc	2992
Ind. System	NA
Confign.	180V12
Bmm	80
Smm	49.6

N kRPM	P HP	MPS m/s	BMEP Bar
7	256	11.57	10.94
7.5	306	12.40	12.20
8	345	13.23	12.90
8.5	378	14.05	13.30
9	402	14.88	13.36
9.5	431	15.71	13.57
10	449	16.53	13.43
10.5	460	17.36	13.10
11	476	18.19	12.94
11.5	488	19.01	12.69
12	497	19.84	12.39
12.25	501	20.25	12.23
12.5	498	20.67	11.92

Powers as published were Italian CV and have been divided by 1.014 to convert to HP

CORRECTIONS & ADDITIONS: PART 2

19 November 2019

ADDITION

1st Pressure-Charged Era (1PC)

Egs. 12,14,15,16, & 17 Bugatti

DASO 1226 (see refs. below), advised by courtesy of correspondent Stephen Cansick, provides a power curve for the Bugatti type 35B*. This is charted below in Figs 1 and 2. Added to this are spot points for all Bugattis which were Grand Prix Cars-of-the-Year (CoY):-

1926 T39A; 1928 T35C; 1929 T35B; 1930 T35C and 1931 T51.

POWER CURVES

PEP		N	P	MPS	BMEP
DASO	1226	kRPM	HP	m/s	Bar
YEAR	1929				
Make	Bugatti				
Model	T35B	2.5	82	8.33	12.98
		3	102	10.00	13.45
Vcc	2262	3.5	118	11.67	13.34
Ind. System	PC	4	132	13.33	13.06
Confign.	IL8	4.5	142	15.00	12.48
Bmm	60	5	149	16.67	11.79
Smm	100				

Fig.1

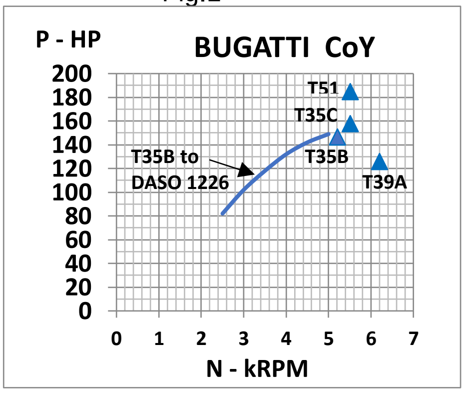
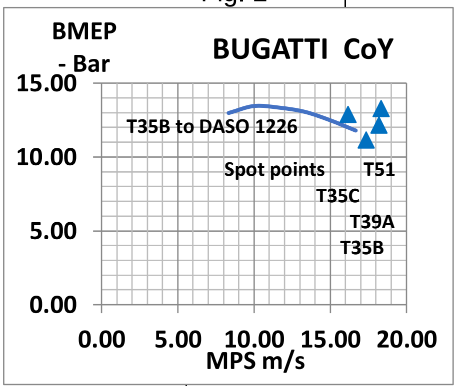
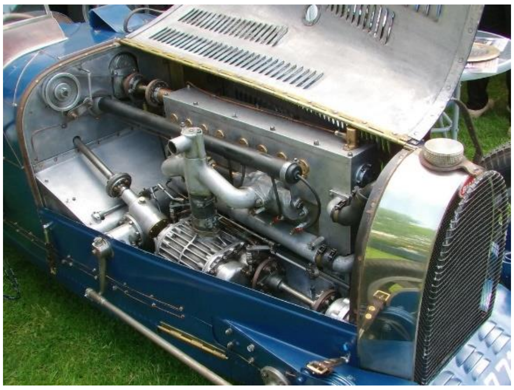


Fig. 2



* Tested at Monaco Engineering by A. Maclachlan on fuel 60% Methanol+20% Benzole+20% Petrol. The works Bugattis ran on Elcosine:- 44% Ethanol+53% Benzole+2% Ether+1% Castor oil.

T35B



hiveminer.com

Contd. on P.7

Bugatti T59

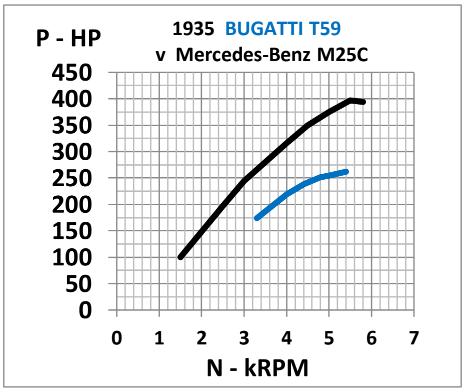
Although far from being CoY, the Bugatti T59 is interesting as a survivor from the "Old School" of Grand Prix cars overlapping – with the Alfa Romeo P3B – the start of the "Teutonic Era" in 1934-1935. It was PC IL8 72 mm/100 = 0.72, 3,257 cc with the DOHC introduced on the T50 production and T51 GP car which was CoY in 1931. The chassis remained as before with beam axles and leaf springs.

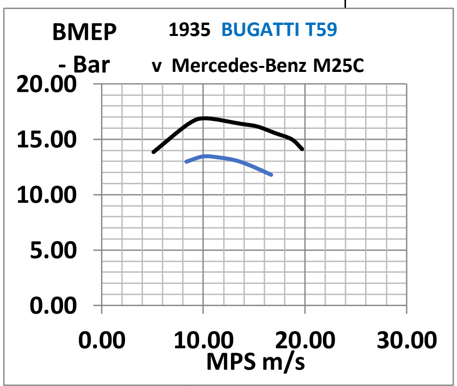
DASO 1227, also provided by Stephen Cansick, is his analysis of Bugatti T59 test records, specifically for its final development prepared for the 1935 Belgian GP. The year previously a T59 driven by René Dreyfus had won that event, the last classic GP victory for Bugatti – admittedly in the absence of the German teams and after two leading P3Bs had run into trouble.

In 1935 at Spa Mercedes-Benz were there in full force, the W25s now fitted with M25C 4,309 cc engines. The Mercedes gained 1st and 2nd places ahead of 2 Alfas and Robert Benoist could only finish 5th, 3 laps in arrears. Figs. 3 and 4 show how hopeless the T59 power was compared with the M25C.

POWER CURVES

PEP		N	P	MPS	BMEP
DASO	1227	kRPM	HP	m/s	Bar
YEAR	1935				
Make	Bugatti				
Model	T59	3.3	174	11.00	14.49
		4	219	13.33	15.04
Vcc	3257	4.4	238	14.67	14.86
Ind. System	PC	4.8	251	16.00	14.37
Confign.	IL8	5	255	16.67	14.01
Bmm	72	5.4	262	18.00	13.33
Smm	100				





The specific effect on performance is given in DASO 1228 in figures for the fastest race laps:-

Car	Power HP	Fastest lap KPH
Mercedes-Benz W25/M25C	397	165.7
Bugatti T59	262	155.1
Ratio Mercedes/Bugatti	1.515	1.068

Remembering Laurence Pomeroy's empirical correlation for pre-War cars (in eg. DASO 32 p.264) that:-

Lap Speed varied as the 6th root of (Power/Frontal Area),

noting that the Frontal Area of the T59 was rather more than the W25 but that the two cars were equal in Weight by rule, it is found that $(1.515)^{1/6}$ = 1.072.

T59 "Rated Power"

The T59 output was "Rated" at that obtained at 5,500 RPM because of crank vibration. Possibly, if shorter duration inlet valve timing had been used, the slightly higher true power peak could have been brought into the working range, with a fatter torque curve.

T59

bonhams

References

DASO 32 DESIGN & BEHAVIOUR OF THE RACING CAR S. Moss & L. Pomeroy Kimber 1963.
DASO 1226 *Autocar* 12 March 1983 Advised by courtesy of S. Cansick E-mail 31 October 2019/9.08.
DASO 1227 E-mail S. Cansick 31 October 2019/9.17.
DASO 1228 www.kolumbus.f1/leif.snellman.

CORRECTIONS & ADDITIONS: PART 2

27 November 2019

ADDITION

Appendix 5 and Illustrations for Appendix 5: **Maserati 4CLT/48**

This is to give some background to the 1948 Maserati 4CLT/48, a contender in the post-WW2 Grand Prix arena after this adopted for supercharged engines the pre-war 1.5 L Voiturette capacity. Maserati had built for sale over 1932 -1939 three types of engines in that racing class and the 3rd design (4CL) was the basis for the post-war car. The 4CL, designed by Ernesto Maserati, showed an awareness of the link between "Bottom-end" and "Top-end" architecture through choice of Bore/Stroke ratio and Valve Operating Systems. This is the reason for this piece, whose main source. is DASO 27 (see refs. below)..

4C-1500

In 1932 the Maserati voiturette offering was the 4C-1500, an IL4 DOHC 2v/c 69 mm/100 = 0.69 1,496 cc enlargement of a parallel 4C-1100 65 mm/82 = 0.79 1,088 cc engine which is illustrated below.

Maserati 4C-1100

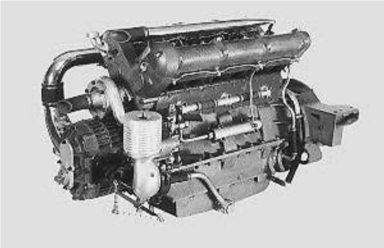
maserati-alfieri.co.uk

The 1.5 L unit was claimed to give 130 HP @ 5,500 RPM (BMPP = 14.1 Bar @ MPSP = 18.3 m/s).

6CM

Over 1934-1935 the 4C-1500 Maserati was defeated by the new ERAs, A and B types. Therefore in 1936 the firm produced the 6CM, IL6 DOHC 2v/c 65 mm/75 = 0.87 1,493 cc, which had a claimed 155 HP @ 6,200 RPM (15.0 Bar @ 15.5 m/s). DASO 27 suggests that this was optimistic, which remark probably also applies to a later figure of 175 HP @ 6,700 RPM (15.7 Bar @ 16.8 m/s)

Maserati 6CM



maserati-alfieri.co.uk

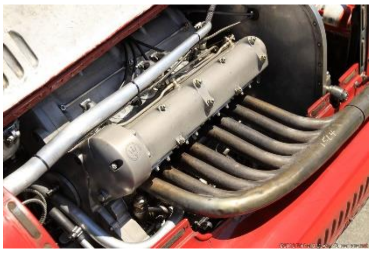
During 1936 -1938 the 6CM "Held the fort" for Maserati. In 1936 Felice Trossi beat Dick Seaman's Ramponi-rejuvenated 1927 Delage 15-S-8 in the Voiturette races Eifelrennen and Coppa Ciano but, after losing to that combination in the Coppa Acerbo withdrew from meeting it at Berne. By 1938 the C type ERAs, with Porsche IFS and high-pressure Zoller superchargers, had the legs of the 6CM. Furthermore, the Alfa Romeo 158 appeared in August. It was IL8 DOHC 2v/c 58 mm/70 = 0.83 1,480 cc and as 1st raced claimed 195 HP @ 7,000 RPM (16.8 Bar @ 16.3 m/s). This won its first race (Coppa Ciano), lost the 2nd, won the 3rd but lost its 4th. With the writing on the wall for the 158's return better-developed in 1939, coupled with the Italian racing authority's decision in September 1938 that future races on Italian soil would be 1.5 L, Ernesto Maserati decided that a new engine was needed.

4CL

Maserati chose to return to the IL4 configuration. From a consistently-competitive point of view over the years this turned out to be a bad decision, but the company had to make affordable and easily-maintainable cars for private owners. To get the best out of IL4 a "Square" Bore/Stroke ratio, 78 mm/78 1,491 cc, was adopted, something not used in automobile racing since well before WW1. However, Ernesto Maserati would have been well aware of the Italian motor-cycle firm of Moto Guzzi using B/S = 1 since 1926* for their successful 1-cylinder 250cc and, since 1933, for a 120^0 V2 which had won the "Blue Riband" Senior TT in 1935 with Stanley Woods aboard (DASO 1190). The Guzzi engines had SOHC and 2v/c, but Ernesto took no chance of the valve gear restricting his RPM by using DOHC and, for the first time, <u>4v/c</u>.

Maserati 4CL

velocetoday.com



supercars.net

With 1-stage Roots-type supercharging as before, power claimed was 220 HP @ 6,600 RPM (20.0 Bar @ 17.2 m/s).

The 1939 Tripoli race

The first works race for the new 4CL was in the Italian Libyan colony at Tripoli on 7 May 1939. Having reduced this race to 1.5 L the organisers fully expected a "home" victory. Alas for them, their Axis "partners"in the form of Mercedes-Benz had used their enormous resources and vast experience to build in secret in only 8 months and then enter two rival 1.5 L cars! These were

W165/M165 90V8 DOHC 4v/c 64 mm/58 = 1.10 1,493 cc (see Significant Other SO13). With 2-stage supercharging reserved for later development (Mercedes expected the Grand Prix formula to become 1.5 L in 1941), the 1-stage Tripoli engines gave 243 HP @ 7,500 RPM (19.4 Bar @ 14.5 m/s).

By this date the Alfa Romeo 158 was producing 225 HP @ 7,500 RPM (18.1 Bar @ 17.5 m/s) (DASO 31).

The main works contenders therefore had:-

	Power HP	Mean Piston Speed (MPS) m/s	$(MPS)^2$	$(m/s)^2$
W165	243	14.5	210	Datum
158	225	17.5	306	+46%
4CL	220	17.2	296	+41%

Bearing in mind that “Bottom-end” stresses vary as $(MPS)^2$, the Italian cars were likely to be in trouble compared to their Teutonic rivals.

However, Maserati had a secret weapon! This was a fully streamlined body on Luigi Villoresi’s car (see below).

!939 Maserati 4CL
Tripoli Streamliner
(1/43rd scale model)
The rear wheels were left without fairings to permit fast tyre changes.

racingdioramics.us

Villoresi took Pole at 132.1 MPH (212.6 kph)** (DASO 1228), but Hermann Lang was only 0.24% slower with the open-wheeled W165.

On the very hot race day, the race was a triumph for Mercedes and Lang and an utter disaster for Maserati and Alfa Romeo. Villoresi’s gearbox broke at the start and the other two works 4CLs broke pistons on the first lap! Of 6 type 158s entered, 5 retired before half-distance from overheating and the last was 3rd, 4 minutes behind Rudolf Carraciola who was 2nd on the other Stuttgart car, Emilio Villoresi having kept his revs right down. The designers in Swabia had obviously prepared their engines better for the Libyan conditions than Gioachino Colombo 400 miles further South in Emilia, although the Italian blamed the Alfa team manager for lowering the cooling pressure in practice. The fact remains that the 158 cooling system was redesigned after the race. A year later in Tripoli, when the Germans had given themselves other things to do but Benito Mussolini was still waiting to join the war, Giuseppe Farina, after a practice lap 2% higher than Lang’s, won with a 158 at a 4% higher race speed than the W165’s. So an Italian *bella figura* was achieved!

Post-war, when both Italian cars (with development) contested Grands Prix, the perhaps unavoidable decision of Ernesto Maserati to make the 1939 engine IL4 meant that whenever it met the Alfa Romeo IL8 it was defeated. In 4CLT/48 2-stage supercharged tubular chassis form it *did* beat the new 1.5 L Ferrari and the new 4.5 L un-supercharged Lago-Talbot *once* in 1949 (British GP), but that was the year that Alfa did not enter while developing their 1900 production car.

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*Carlo Guzzi had actually built his first motorcycle in 1919 as an aircooled single-cylinder with B/S of 88 mm/82 = 1.073 499 cc, and had shown his awareness of appropriate cylinder architecture by fitting SOHC with 4v/c (DASO 1190). As developed in 1924 it powered the winners of the German and European GPs.

**The body was built in Bologna after consultation with the coachwork specialist Stabilimenti Farina of Turin. Clearly it was stable at very high speed, unlike the two Auto Union streamliners taken to Reims in 1938 for the French Grand Prix, which both crashed in practice and were withdrawn from the race. The difference *may* have lain in being front-engined instead of mid-engined.

References
DASO 27 MASERATI a history A Pritchard Arco 1976
DASO 31 Profile No. 30 D. Hodges ca 1965
DASO 1190 ITALIAN RACING MOTORCYCLES M. Walker Redline 1998
DASO 1228 www.kolumbusf1/leif.snellman

CORRECTIONS & ADDITIONS: PART 2

21 December 2019

ADDITION

1st Pressure-Charged Era (1PC)

.Eg. 18 Alfa Romeo Type B (P3)

(1).Central camshaft drive

In this Eg. it was noted that Vittorio Jano's inspiration for the central camshaft drive for the 1931 8C-2300 and the subsequent Type B was from Emile Petit's 1927 IL8 Salmson. Recently a section drawing of this latter engine was discovered on the internet and it is reproduced below

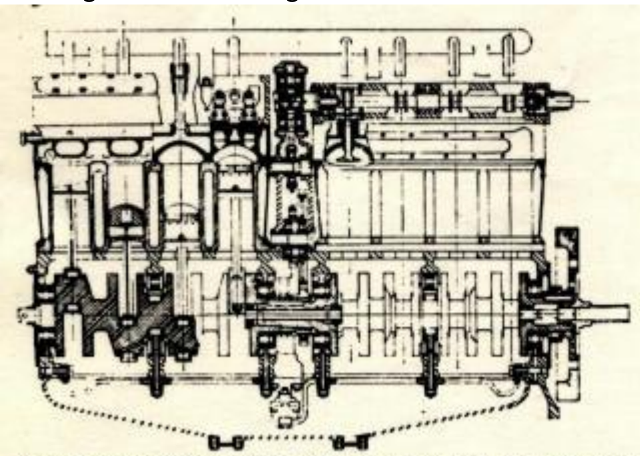


Fig 7 Longitudinal section of the Salmson eight-cylinder twin-cam racing engine

desmodromology

1927 Salmson
IL8 49.9 mm/70 = 0.713 1,095 cc
100 HP @ 5,800 RPM

It is not a clear enough drawing to show how the crankshaft halves were joined.

This engine was not very successful. Salmson closed their racing department in 1929.

(2).Magnesium-alloy crankcase

Considering other un-successful attempts to use magnesium-alloy in racing engines, its application by Jano in the P3 (and later Alfa engines) was not sufficiently emphasised by the author. The obvious advantage of a Specific Gravity only 2/3rd of aluminium-alloy is partially offset by its lower stress capability needing thicker sections, but Jano found it worthwhile. The alloy used was almost certainly the proprietary Elektron and probably the original 1908 German composition of 90% Mg + 9% Al + 1% other.

Regarding the problem of using Mg-alloy, in 1927 Roy Fedden had included a forged Mg-alloy crankcase in his revised *Mercury* aircooled radial engine for the Short-Bristow *Crusader* seaplane entry for that year's Schneider Trophy. On the bench the large forging proved to be weaker than small test pieces had indicated (studs pulled loose) and it had to be replaced with an Al-alloy part (part DASO 225). [The author cannot now find the reference, but has read somewhere that a Mg-alloy case *was* fitted later and, after the aircraft sank at Venice and was salvaged a week later, the sea-water had dissolved most of it!].

When Gioachino Colombo, Jano's long-time assistant, designed the Alfa Romeo type 158 in 1937, he used cast Elektron for the crankcase, which showed that it had not given problems in earlier Alfas (it may have been a later specification, as the suppliers continued to improve the alloy). As this engine was developed to 2-stage supercharging after WW2, some cracking around the bearing housings was experienced. Tie rods were fitted to take the extra loads and saw the engine through the increase to well over 2 x times its original power by 1951 (DASO 31).

The success of Mg-alloy in Alfa engines is high-lighted by the fact that Cosworth found it unsuitable for the DFV block in 1977 (see "The Unique Cosworth Story" at P. 18).

CORRECTIONS & ADDITIONS: PART 2

23 December 2019

ADDITION

1st Pressure-Charged Era (1PC) Part 1

Alfa Romeo Power Curves 1923 – 1935

Having recently obtained power curves for the 1934 and 1935 derivatives of the Alfa Romeo type B (P3) (DASO 1230, see ref. below) the opportunity has been taken to provide comparative charts of all the Grand Prix Alfas from 1924 to 1935 on P.13.

Brief specs. are as follows (more details are given in Appendix 1):-

All PC, DOHC, 2 v/c

Date	1924	1924	1932	1934	1935	1935
Source DASO	938	1133,25	1133,25	1230,25	1230,25	25
Type	**P1**	**P2**	**B (P3)**	**P3B**	**P3B**	**8C-35**
		CoY Eg. 10	CoY Eg. 18	CoY Eg. 20		
Configuration	IL6	IL8	IL8	IL8	IL8	IL8
B/S mm	65/100	61/85	65/100	68/100	71/100	78/100
= B/S	0.65	0.718	0.65	0.65	0.71	0.78
V cc	1991	1987	2655v	2905	3167	3823
PP—HP*	116**	143	212	251.5	261***	325
@ RPM	5000	5500	5600	5400	5400	5400
BMPP Bar	10.4	11.7	12.8	14.3	13.7	14.1
@MPSP m/s	16.7	15.6	18.7	18	18	18
Principal						
GP victory		French	French	French	German	Magyar '36

*Powers as published were Italian CV and have been divided by 1.014 to convert to HP.
**The original P1 of 1923 was NA with 94 HP @ 5,000 RPM (8.4 Bar @ 16.7 m/s). See P.13.
***The 9% volume enlargement from 1934 yielded only just under 4% more power, probably because the inlet valves were not enlarged. In contrast, the 32% enlargement of the revised 8C-35 gave 29% more power.

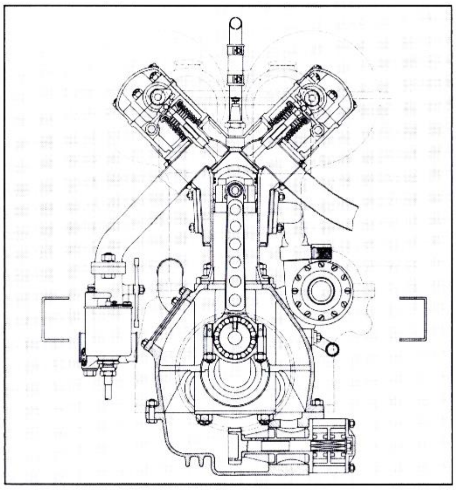
P1

The P1, designed by Giuseppe Merosi, never raced. The 1923 original crashed in practice for the Italian GP, killing Ugo Sivocci.

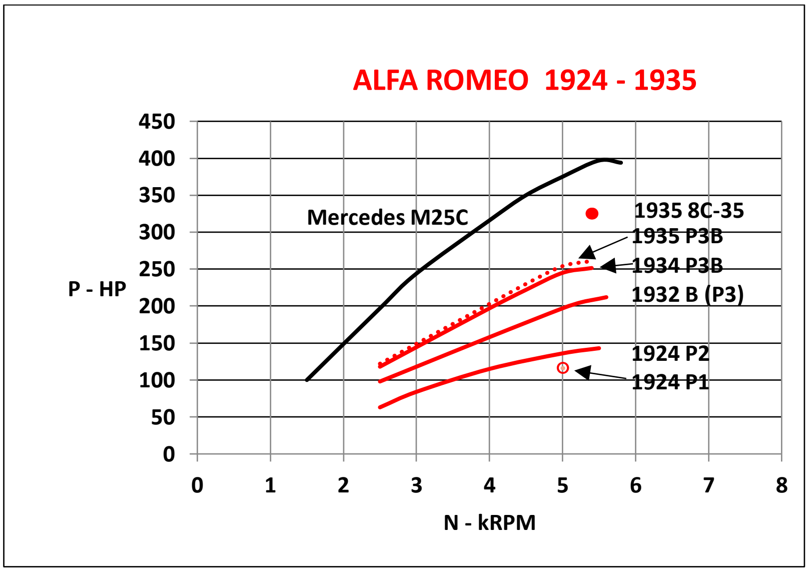
1932 -1935

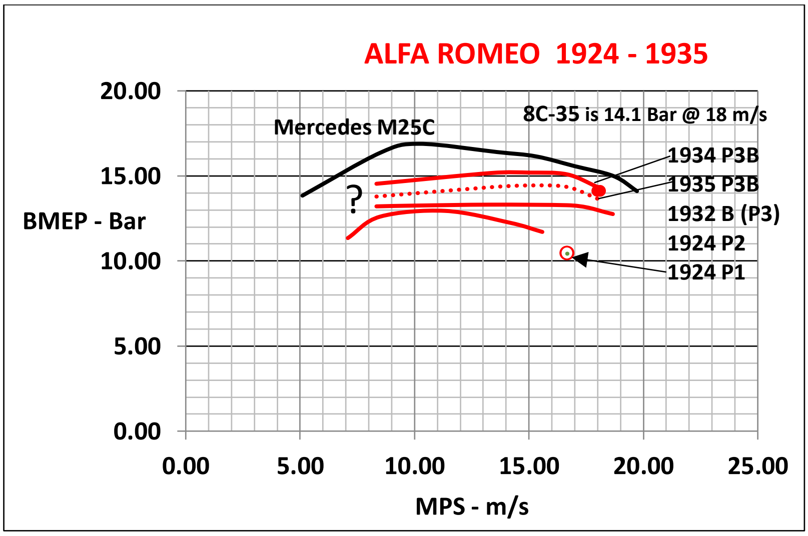
All the other cars tabled were designed by Vittorio Jano, who joined Alfa Romeo from FIAT in 1923

1923 Alfa Romeo P1



DASO 25





The lower speed BMEP curves for the 1932 -1935 engines are suspect.

The most famous Grand Prix victory of the 1934 P3B in the hands of Louis Chiron was its defeat of the full teams of Mercedes-Benz and Auto Union at Montlhery in the French classic.

This was surpassed by Tazio Nuvolari's winning of the 1935 German Grand Prix at the Nurburgring with the up-dated P3B, in a battle with both home teams. His car had the 9% enlarged engine of 3.2 L (often stated in reputable sources to be 3.8 L, but www.kolumbus has shown that engine, being developed for the 8C-35, was too long to be fitted in the P3). The suspension had been revised to Dubonnet single leading-link IFS and reversed ¼-elliptic rear (see plan below), which one would have thought gave an understeering characteristic, hardly ideal for the Nurburgring. At any rate, after a wet track dried by Lap 8 (of 22) Nuvolari was in the lead at ½ distance but lost much time at his re-fuelling stop because the handle broke on the pump. He recovered to be on the tail of von Brauchitsch's Mercedes W25B (M25C engine, power curve shown) on the last lap. That driver, with his usual tail-sliding style (see Note 114), then had his left rear tyre burst and the little maestro passed him to win – and provided his own record of the Italian national anthem!.

1935 revised Alfa Romeo P3B

Dubonnet single leading-link independent front suspension (IFS), replacing beam axle mounted on semi-elliptical leaf springs.

Rear suspension by reversed ¼-elliptic leaf springs, replacing semi-elliptical leaf springs.

Probably converting an oversteering characteristic into understeering. A significant advantage would be the elimination of front wheel-flap by gyroscopic precession on one-wheel-bump.

cyclekartclub.com

8C-35

This was developed to replace the P3 series and first raced to 2nd place in the 1935 Italian Grand Prix at Monza late in the year. The engine followed the P3 pattern. Suspension was revised again, with Porsche-type double-trailing-link IFS (giving positive control of brake reaction, unlike the Dubonnet) and rear swing axles. A fascinating comparison of the two 1935 suspension systems in action post-War is shown in the illustration below.

conceptcarz.com

The pursuing P3B is identified as a 1935 revision by the beam across the front.

Reference

DASO 1230 E-mail 25 November 2019, courtesy of Stephen Cansick (basic data from DASO 1133).

CORRECTIONS & ADDITIONS: PART 2

20 March 2020

Minor corrections

- Appendix 3 at foot of P.2:- For 240 cc read 300 cc.
- Illustrations for Appendix 6:- Figure 7 on P.3; The Alfa Romeo 8C-2300 did *not* win the 1935 Mille Miglia.
- Note 2 Footnote:- Should read

Power proportional to 1/√(Absolute ambient Temperature).

CORRECTIONS & ADDITIONS: PART2

20 March 2020

ADDITION

Corrections & Additions at P.49 re Daimler-Benz DB601 & DB605.

Con.-rod Bearings

The DB601 had roller *split-race* bearings in its master con.-rods on its 1-piece crank (which had 7 plain lead-bronze bearings). There were 3 rows of 24 rollers on each rod. The forked slave rods rotated in 2 plain lead-bronze bearings on the outside of the master's bearing housing.

When the 33.9 Litres DB601 was enlarged from 150 mm bore to 154 mm (same 160 mm stroke) to give 35.7 Litres, among the changes was the conversion to plain master con.-rod bearings. This was done probably to reduce production time, as well as to save weight. The DB605 entered service in the Bf109 in February 1942. It was well before the attacks by the USAAF on the main roller bearing factories of Schweinfurt in August and October 1943, intended to cripple German engines. The Germans *may* have foreseen that possibility.

However, the bearing change is reported to have caused unreliability, even causing fires, partly due to poorer quality lubricant as the war progressed. The problems were not resolved by the end of the war (source Wikipedia).

DB601
showing the forked slave con.-rod
and twin plain bearings.

Flight