BACK TO THE FUTURE

In today's world of electronics and computers, the auto industry has been quick to take advantage of this new found high technology. Now in the 1990's where we see cars priced well beyond peoples ability to pay for them we wonder now whether we are any better off than we were in the 50's and 60's. John Bennett looks at some popular "Flatheads of the Past" and opens the debate on the future!

Today's motor vehicle manufacturing development strategies are pursuing complexity to maintain or gain market shares, in fact the designs of current engines reflect Formula One technology of 20 years ago. The repair industry is now requiring a major thrust on education to maintain and mend these complex motors and support systems.

The lack of perceived value in modern cars is drawing the average motorist towards rebuilding older models to be used as transport or recreational vehicles, or doing with less.

We have never seen a hint of Government incentive to re-utilise engines/trans **or** fuel economy guarantees to reduce mobility costs, which **are** a cost to the country. Is it now up to the oil companies, while developing their medium and longterm production strategies, to know the future by *their* budgets creating **it**?

Australia, in reality—the world would surely benefit if a joint venture of research and development to investigate appropriate technology was to occur.

Actual power unit production is a minor part of total vehicle manufacture, so maybe it should revert to specialist manufacturers, so that accountability for engines SFC/power are part of the commercial negotiation. Something like the 20's when many makes used the same engines, eg. Continental Lycoming Hercules, etc. This would reduce costs of motor cars as all manufacturers currently persue independent engine developments as a major factor in marketing strategies.

Since piston aero engine development of W.W. 2 no break-throughs in specific fuel consumption (SFC) have evolved from post-war car manufacturing. **Political will has not or cannot legislate for vehicle efficiency improvements.**

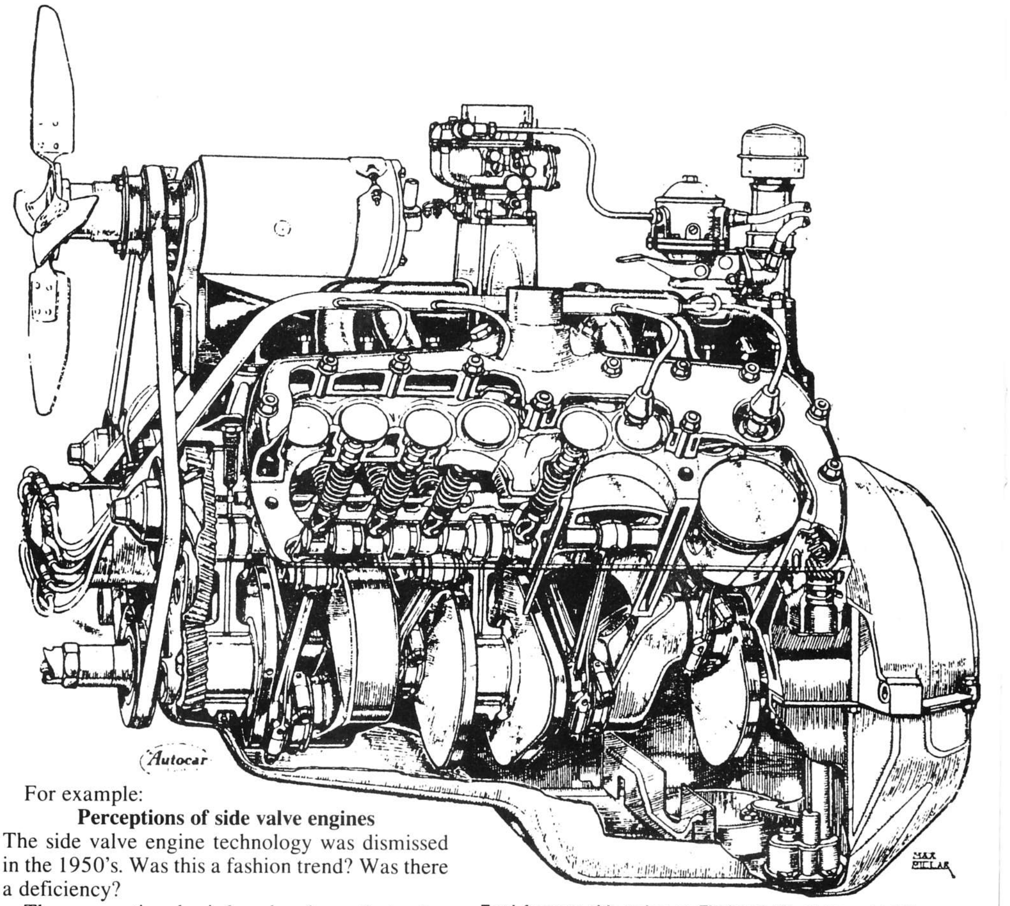
E.P.A. regulations mean little if miles/gallon (litres/100 km) are any indication.

Our first world "culture of contentment" requires wise redirection towards a global survival strategy (engines included).

It is a disgrace that the 1990's still show no sign of change towards appropriate technology. Current 3rd world aspirations are to emulate the 1st world, especially motor vehicles!

Henry Ford did a lot of things right and plenty has been learnt from development since, but not much applied!

If "what we learn from history is that we *don't* learn from history" then we should reconsider some of the basic changes and evaluate.



Ford famous side valve or Flathead V8 of the mid 30's. Ford turned the motoring world on its ear offering a V8 in a low price car in 1932 but they weren't without their problems. Over heating has also been a big problem with these Flatheads, but new technology could have solved this.

For example:

Perceptions of side valve engines

The side valve engine technology was dismissed in the 1950's. Was this a fashion trend? Was there a deficiency?

The conventional wisdom has been that valve grinding and decarbonising maintenance of pre-war cars *was difficult*, so OHV the solution. More power came along with more valve area as used in OHV heads. (Modern metallurgy and lubricants would make pre-war SV motors absolutely reliable with possibly minor attention to coolant circulation routing to utilise modern fuels!)

Overhead valve designs are much more complex and have proved no more economical.

Back in 1951 in the Mobilgas Economy Run, Les "Featherfoot" Viland achieved 28¼ MPG (imperial) driving his 337 cid side valve Lincoln V8, 6.5 comp ratio. Clever driver and efficient motor. Bearing in mind early post-war fuels were very low octane and almost without lead. **And** all mobil economy test cars were absolutely stock and loaded with **750 lb** of passengers.

Consider also the 1932 Model B 200 cubic inch motor if it was treated to 1990's remanufacturing to benchmark parameters to optimise breathing with camshaft timing. This could be a state of the art fuel efficient motor. Let's-do-it!

To expand on perceptions of side valve engines, I have selected a variety of successful designs to investigate the dimensions and proportions of the main engine parts. In addition to benchmarking their breathing and turbulence factors within the block, we will test manifold distribution and intake mixture residence factors.

A 1923 Chrysler SV six—218.6 cu. in.
B 1932 B Ford SV four—200.5 cu. in.
C 1936 Cadillac V8—346 cu. in.
+ references to OHV 1930 V12 & V16 units
+ references to 1938 SV V16 431 cu. in.
D 1949 Lincoln SV V8—336.7 cu. in.
E 1941 Nash 600 SV six—172.6 cu. in.
F 1949 Studebaker six—245 cu. in.
G 1951 Hudson Hornet six—308 cu. in.
+ reference 1953 jet—202 cu. in.

Some of the above design concepts and their vehicle efficiencies were sensational, by any standard, but towards the end of the side valve era these production sedans were perceived as sluggish and many drivers of 1950's motor vehicles wanted "improved" features and aspired to emulate the sophisticated luxury car features or at least keep up with the Jones's.

By the 1950's Hudson's technology was exceeding 40 HP/litre and 50 ft lb/litre, Studebaker consistently exceeded 60 ton/MPG (imperial gallon), but this did little to overcome advertising pressures for more power and new "anything".

Both these companies knew supercharging was an option, but companies like Cadillac had already flaunted their 331 cu. in.—160 HP lightweight OHV V8 by 1949. So the 1930's Flatheads didn't inspire.

The potential lower cost of producing blocks with ports incorporated, plus the already refined combustion technology and compact nature of a wide-vee 12 cylinder (following 1938 Cadillac V16 @ 431. Example) . . . it was all there . . . what if the Hudson Stepdown concept was sucessfully uprated and remained competitive through the 60's?

30 years later we will now track the technology and establish some benchmarks, and possibly make some break-throughs. To revive interest and respect for the side valve technology and the mechanics and machinists of past eras.

All the 1970's mainstream manufacturers endeavored to introduce features as "racing improved the breed". Production techniques reduced cost, cars received disc brakes, fancy heads, OHC, multi speed gearbox, multi carbs and fuel injection.

Althouth highway speeds rose during the 60's and 70's this has gradually receeded due to policing, fuel costs and improved highways. Reasonable trip times are now achieved without excessive speed or severe acceleration.

Current production cars seem less than appropriate technology when cruise speed is at 2000-2500 RPM and peak torque often well above 4000 RPM. Hence the multi speed gearboxes to avoid holes in the response range. During this post-war period the highway fuel consumption of a loaded 4-5 passenger vehicle has changed little.

In Australia, Holden grey and red motors (including 186 cu. in.) were often good examples of fuel economy, especially when local garages adjusted a main jet or power valve to optimise individual cars. With hindsight, benefits from more efficient manifolds and thermostatic control of coolant inlet could have made a just 30 MPG goal into 40 MPG plus achievements.

The same applies to the all-iron high turbulence side valve. Although conservative designs, they regularly won the mountain climbing Mobil Economy Runs. The 1954 winning Studebaker champion achieved 68.4 ton/MPG (Imperial gallon). Studebaker was also runner-up in a smaller class (169.6 cu. in. and 8.3:1).

These Mobil Economy Runs moved over 7000 feet plus mountain ranges (snow, chains, etc) covering 1335 miles at over 42 MPH average. Not withstanding special driving skills the ton/MPG achieved by these side valve "relics of pre-war era" are still fantastic.

In the late 50's the Mobil Economy Run organisers in their wisdom forbade overdrive transmissions. The resulting lack of publicity for overdrives and their benefits for side valve motors would have contributed to both technologies being phased out—this was obviously a political move and required the side valve engine manufacturer to counter with more appropriate gearing in 4 speed transmissions. Without the flatheads the American guzzler was thus sanctioned by economy run successes and marketing hype.

Some modern categories for inter car club economy/touring trials should be instigated for petrol, diesel and LPG. For all types of registered vehicles. Publishing authentic results would promote competition and expand expertise and skill for efficient motoring, and vehicle preparation.

Exhibit A 1923 Chrysler six cylinder

3⅛" ϕ x 4¾" ST. = 218.6 cu. in. (3.580 l)

68 HP @ 3200 RPM on 4.7:1 c/r. A truly sophisticated engineering specification with combustion chamber development by the great Harry Ricado of England. Claims of 20 MPG (US Gallon) at cruising speeds. A 1929 example in original running order is due to be faithfully rejuvinated and dyno tested to optimise compression for modern fuel. Full report on torque and specific fuel consumption before and after will be published.

Exhibit B 1932 Model B four cylinder

3⅞" ϕ x 4¼" ST. = 200.5 cu. in. (3.284 l)

50 HP @ 2800 RPM on 4.6:1 c/r. End of the Ford 4 cylinder era? Not yet! This unit was and still is raced and developed due to availability of motors. Custom Rodder in due course will, step by step establish the HP potential of this little beauty.

Exhibit C 1936 Cadillac V8

3½" ϕ x 4½" ST. = 346 cu. in. (5.677 l)

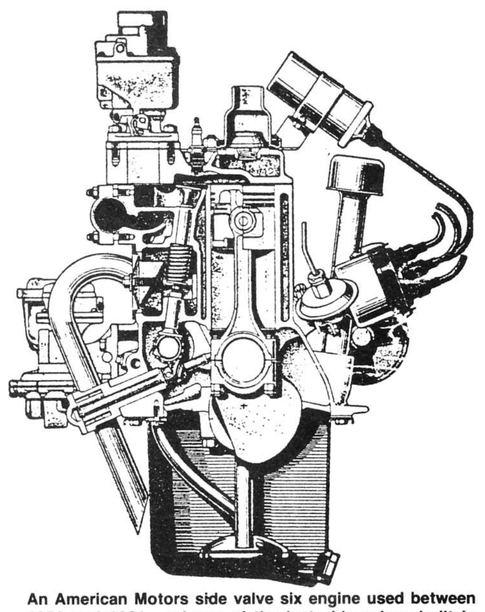
This 135 HP monoblock V8 with high efficiency and silent running would remain in production until 1948.

A military specification of the 346 unit with hydraulic lifters and rated at 150 HP was fitted (in pairs) into tanks by the thousands.

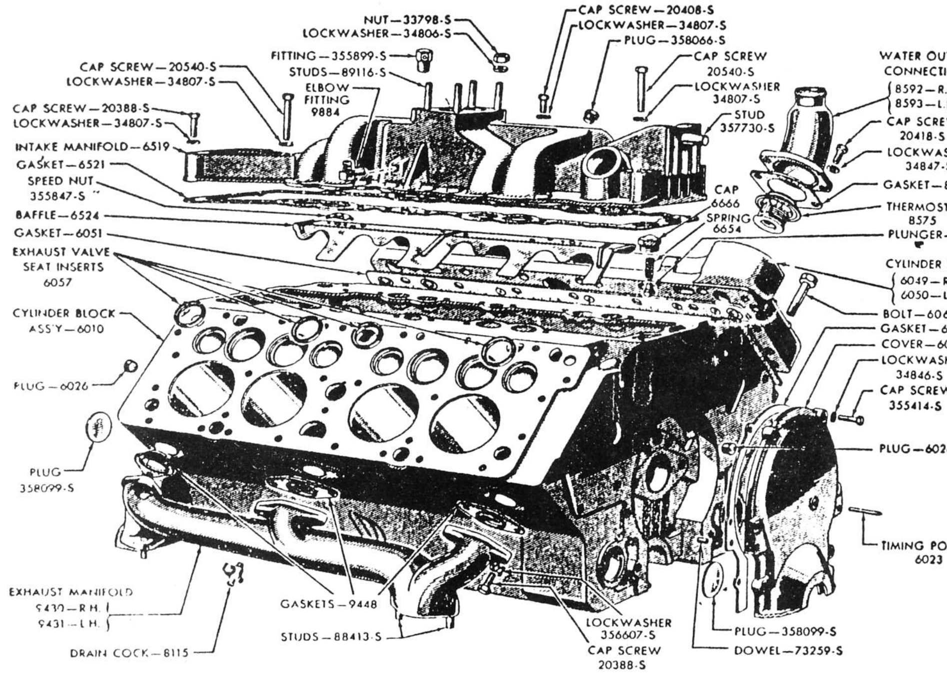
In 1930 Cadillac introduced an OHV V12 with 3" ϕ x 4" ST. giving 339.1 cu. in. A V16 of 452.1 cu. in. soon followed. These mammoth OHV motors were bringing good sales in the early 30's, but could not be sustained. Performance of the V12 in very heavy chassis was marginal, heavy on fuel and not exactly silent compared with other Marques. The sheer expense of manufacture and a depression didn't help!

A replacement power unit for the "big" cars arrived in 1938. Monoblock 135° vee sixteen. 3¼" ϕ x 3¼" ST. 431 cu. in. on 6.67:1. This side valve power unit was truly significant for its short stroke and compactness. The composite construction V16 it replaced, was over 250 lb heavier, 1 foot higher and 6" longer.

The HP potential from this short stroke design can only be imagined. If a side valve design ever invited serious development this would be it! Imagine 7-8 litres, aluminium block and heads, 6000 RPM, light turbo-charging and even LPG! Back to reality the depressed economy changed many things, imminent war ceased production in 1940.



An American Motors side valve six engine used between 1956 and 1961, and one of the last side valves built in the USA. Note the carb bolted to the head which was popular with vehicles over the years.



The "big block" Flathead from Lincoln used between 1949 and '51 in Lincolns and "big" Ford trucks. It was close to 337 cubic inches and developed 154 HP. In the Mobil Economy Run 1951, it did well for a 2½ ton car achieving over 28 mpg on an Imperial gallon.

Exhibit D 1949 Lincoln (last SV V8 Production Motor)

3½" ϕ x 4.37" ST. = 336.7 cu. in. (5.515 l)

152 HP @ 3600 RPM on 7.0:1 c/r. 265 ft lbs @ 2000. 27.5 HP/litre is disappointing. This motor is 40% scaled up version of pre-war Ford V8 and it continued into the 50's using the same build specification as Ford Trucks! 1951 power was up . . . to 154 HP.

Ford 90 HP V8 motor had a siamesed exhaust port central on each bank. The exhaust reflux problem plagued the pre-war smaller engine with low speed fuel inefficiency. Even factory "Service Bulletins" (1937) show wide open throttle (WOT) torque and Specific Fuel Consumption (SFC) curves where ⅓ more fuel is consumed for each horsepower at 500 RPM, than at 2800 RPM where the friction and parasitic losses are much, much higher.

Sadly, the pre-war 90 HP side valve Ford V8 was notorious for overheating as well as poor cruise economy. Part of the problem was that a V8 firing order necessitates the central cylinders on both banks to fire 180° apart. The duration of the exhaust event is at least 230°. So Ford's design unfortunately promoted reflux across the open siamesed central exhaust port. The high pressure of initial exhaust discharge delivers exhaust back into the overlap phase of the adjacent cylinders cycle, thus contaminating the combustion chamber and sometimes up the inlet port. It has been observed on dyno test that the deleterious effects are slightly less at higher loads and speeds. Installing an iron deflector into the port and locating firmly by trapping it under a conveniently placed head stud is a solution.

With these fitted increasing valve duration dramatically increased HP, without sacrifice of any low speed torque. The other unfortunate aspect of pre-war Fords was insufficient coolant migration to the rear cylinders. A welsh plug installed in the central coolant outlet snout with approximately ½" ϕ hole and provision to take coolant flow from top corners of the heads (½" ϕ) and outlet to radiator, is bliss.

Initial inspection of our 336 cid Lincoln test motor parts discovers a cast-in deflector within the siamesed ex-port. The cooling system will be investigated and developed in due course. A fresh multi carb manifold design is proposed and it is intended to match 40 HP/l. Benchmark and install in a '49 and challenge "Featherfoot's" 1949 Mobil Economy Run record.

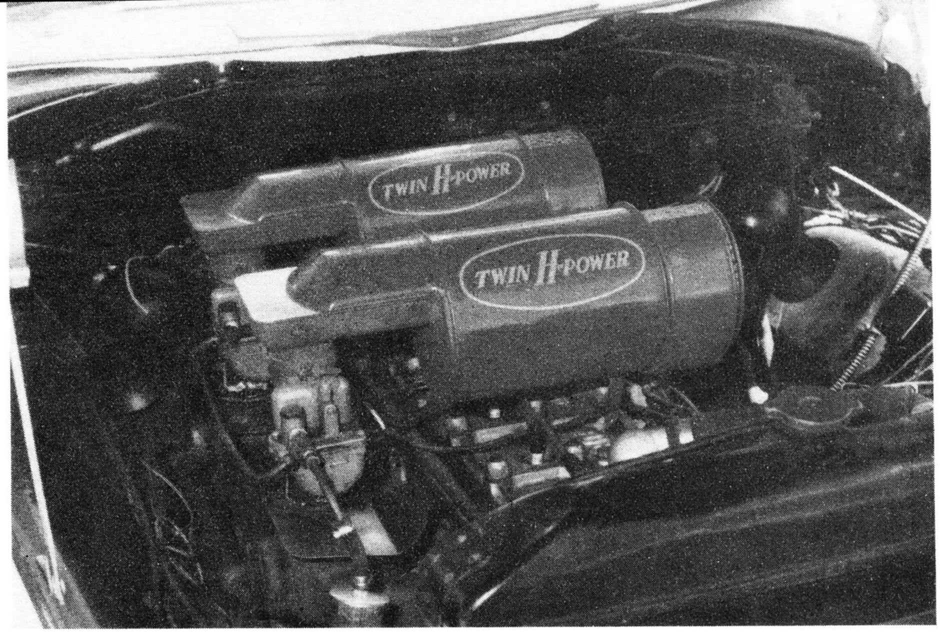
Exhibit E 1941 Nash "600" six
3⅛" φ x 3¾" ST. = 172.6 cu. in. (2.827 l)
82 HP @ 3800 RPM on 6.87:1 c/r. 136 ft lbs at 1200 RPM.
1950 → 4" stroke = 184 cu. in.
85 HP @ 3800 RPM (automatic)
1954 → 4¼" stroke = 196 cu. in.
90 HP @ 3800 RPM (for 2 door and long wheel base cars.)

This baby claimed 600 miles from its 20 gallon (US) tank. In production for 21 years and many Economy Run records to its credit, it warrants close inspection and benchmarking. Modest dyno development and SFC analysis should represent the pre-war state of the art technology and power to weight factor.

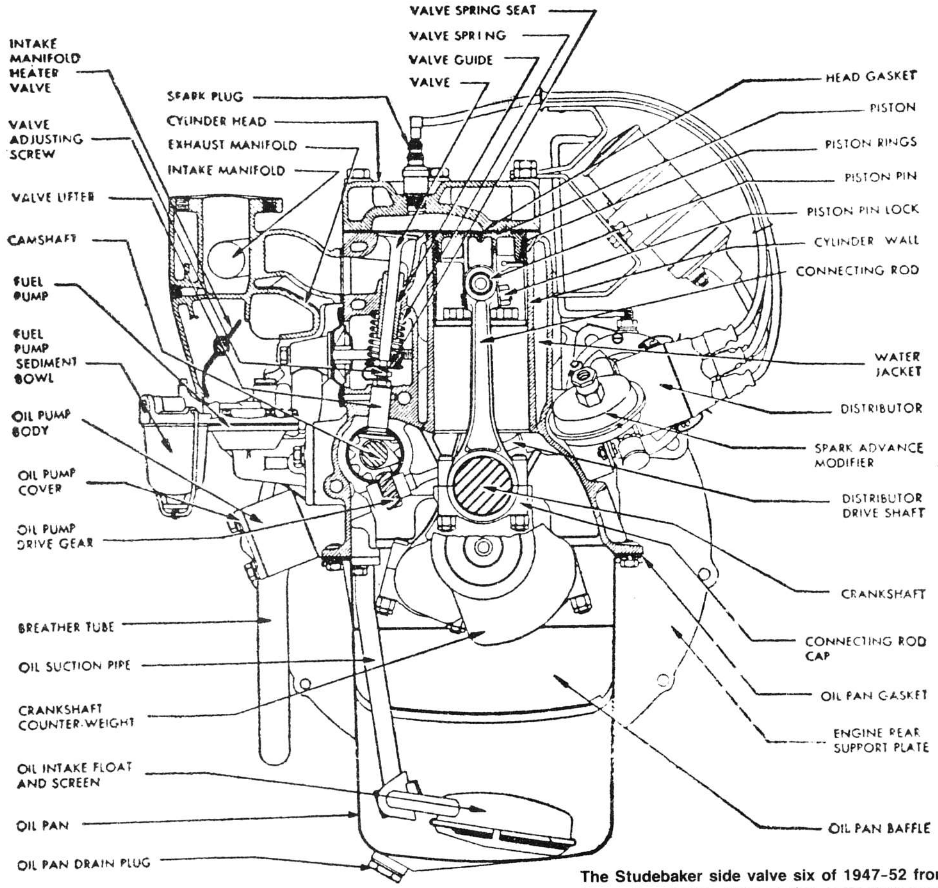
Exhibit F Studebaker Commander six 1932-1960
1932 — 3⅛" φ x 4⅛" ST. = 189.8 cu. in.
66 HP at 3200 RPM
1934 — 3⅛" φ x 4⅛" ST. = 205.3 cu. in.
1936 — 3¼" φ x 4¼" ST. = 217.8 cu. in.
1938 — $3\frac{5}{16}$" φ x 4¼" ST. = 226.2 cu. in.
1949 — $3\frac{5}{16}$" φ x 4¾" ST. = 245 cu. in. (4.013 l)

This real slugger delivered 204 ft lbs or torque @ 1400 RPM (50.8 ft lbs/litre!) 118 HP @ 3400 RPM (only 29.4 HP/l).

Any motor that prevails 28 years deserves respect. Late model Holden Commodores would love a grunty six! Mild tune job and look out Bathurst XU1's Toranas.



The famous 308 cid Hudson Hornet side valve six of 160 HP. Up to 1954 they dominated the NASCAR racing, beating OHV V8's from Oldsmobile, Cadillac, etc. and the Mobilgas Economy Run it turned a creditable 25 mpg on the Imperial gallon.



The Studebaker side valve six of 1947-52 from the small Champion Series. This engine gave very good economy for cars of a medium size.

Many brand new Studebaker sixes are still available from Newman and Altman at the South Bend Indiana Plant—Engineering Department, real pieces of history!

The baby Studebaker Lark six 3" φ x 4" ST. = 169.6 cu. in. 90 HP @ 4000 RPM on 8.3:1 c/r (32.4 HP/litre). 145 ft lbs @ 2000 (52.1 ft lbs/litre!)

Curb weight of 58 Lark was 2750 lbs, so 90 HP was a bit sluggish but popular science tests of the day with overdrive model at steady speed.
30 MPH → 38.1 MPG (imperial)
60 MPH → 28.9 MPG (imperial)

Not a bad standard for the passing out of side valve technology from the US market.

Exhibit G 1951 Hudson Hornet six 308 win
1951 308 Hornet $3\frac{13}{16}$" φ x 4½" ST. = 145 HP @ 3800 RPM; 275 ft lbs @ 1800 RPM.

Dominant in NASCAR stock car racing and completely reliable while revving above 5000 RPM on track.

1953 — 308 7 x model — 170 HP.

Factory supplied and dealer fitted "severe usage parts" were reputed to deliver 210 HP.

This must surely be the world's best side valve production motor development. High lift cams, over size valves, #232 cu. in. head hand reworked for compression and airflow, studded block and the twin carbs and dual exhaust.

Mid 50's saw serious competition from bigger V8's on the ovals and Hudson's "skunkworks" had no alternative technology to boost HP so the advanced step down Hudson dated with its motor's lagging competition output.

Hudson introduced the "all new 202 Jet" in 1953. This represents the **last** side valve production motor. 3" φ x 4¾" ST. = 114 HP @ 4000 RPM on 8.0:1 c/r.

1956 model with twin cabs rated 130 HP (39.4 HP/l)

The 308 motor lives and so do the memorable cars. The time warp mentioned earlier is a logical project.

Remanifold the 308 for turbo-charging and benchmark the side valve at 80 ft lbs/l. (I suggest the waste gate control be mounted in the glovebox—for authenticity of course).

Roll on the future.

J.B.