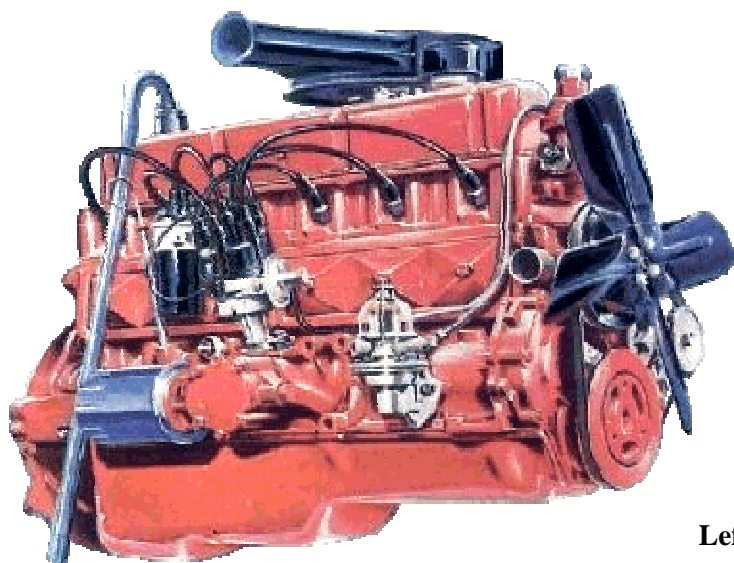


Stories Too Hot to Tell

DIESEL

Holden Red Motor



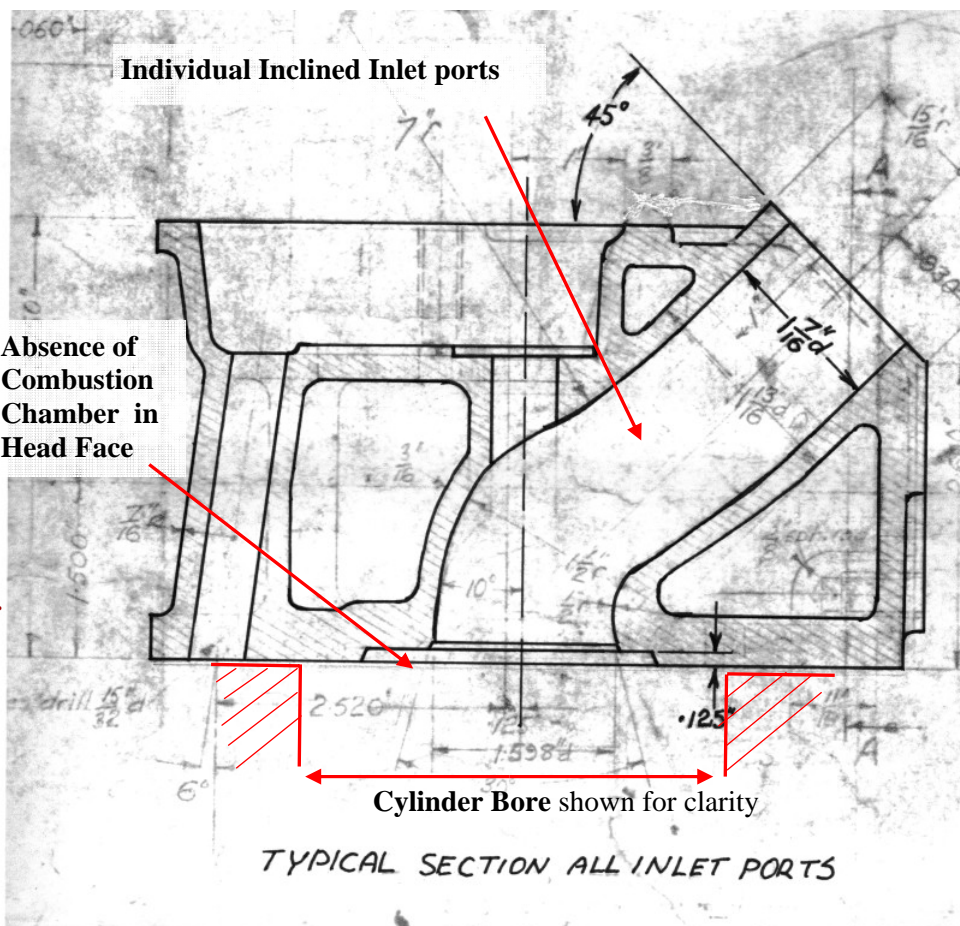
Left The standard petrol version of the 186 cubic inch 6 cylinder inline Holden Red Motor

Working in the highly competitive and secretive car industry there are stories that at the time are too hot to tell . With the passing of time things cool down and now, with the death of local production, information that was once secret can be pieced together to record a piece of history before it is forgotten . The conversion of a Holden Red Motor to Diesel by Repco is one such story. Warwick Bryce

SECRET OUT

I First heard about the conversion of a Holden 186 engine to Diesel operation during a visit to Bob Chamberlain’s Port Melbourne “Man Cave” in 1974 . The visit to, see their unique vintage racing cars , was arranged by Geoff Chamberlain at that time my supervisor at Holden Experimental Engineering . Discussion soon turned to cylinder head modifications to increase power and a project they had done, in conjunction with Phil Irving, to make a special head for the 186 Holden red motor. The drawings done by Phil were soon got out and the design discussed. The unique feature was the utilization of a Heron type combustion chamber in which the underside of head face was flat and the combustion chamber formed by a bowl in the top of the piston . I made the passing remark that it was not unlike a Diesel engine ! This prompted the bombshell that in fact a version of this head was the basis of an experimental conversion of a 186 Holden

Right A section through the inlet port taken from Warwick’s copy of Phil Irving’s cylinder head drawing .No C h 2 . Of note is the high flow inclined inlet port and absence of a combustion chamber in the underside surface allowing larger valves. Both these were done to increase the power of the engine but also were the features that later lent themselves to conversion to Diesel . Drawing obtained with permission of P. Irving and B. Chamberlain.



Very little more information was forthcoming about this secret project by Repco Research however over the years enough bits of this story, that was once “too hot” to talk about, have sneaked out and are pieced together below .

WHEN WAS IT DONE

Bill Chamberlain did not say but I can speculate that it was around 1970 based on :-

- The First Red motor (149 and 179 cub in) came out in 1963 and the upgrade to 186 cubic inches by increasing the cylinder bore was made in 1966 . This ran to 1971 before when the stroke was lengthened to make the 202 (actually 201 but marketing thought 202 sounded better) .
- The Head project had lapsed by my visit in 1974.
- Chamberlain / Irving head drawing is marked “issued 12/7/79 “ either a 5 or a 6 (unlikely to be 1959 as the red motor was not released for another 4 years)
- Ex Repco engineer Bevan Fenner has recently confirmed it would be 1969 and was a project of Repco Research at Dandenong .

WHY MAKE 186 INTO A DIESEL.

This is still a mystery but we know the engine did duty in the department’s test car, reportedly a Holden ute, and then on a generator.

- Industrial Engines the Holden 6 cylinder engines were widely used for such applications as compressors and concrete agitator trucks and were marketed in power pack form by GMH Parts & Accessories
- Operating Costs Diesels were gaining popularity due to reduced operating costs through cheaper fuel and reduced consumption.
- Tractors Engines, after ending their involvement with Tractor manufacture in West Australia the Chamberlain’s had designed a

prototype tractor in the late 1950’s utilizing a Holden Grey motor so this sort of application may have been seen as an opportunity. (The prototype is at Science works).



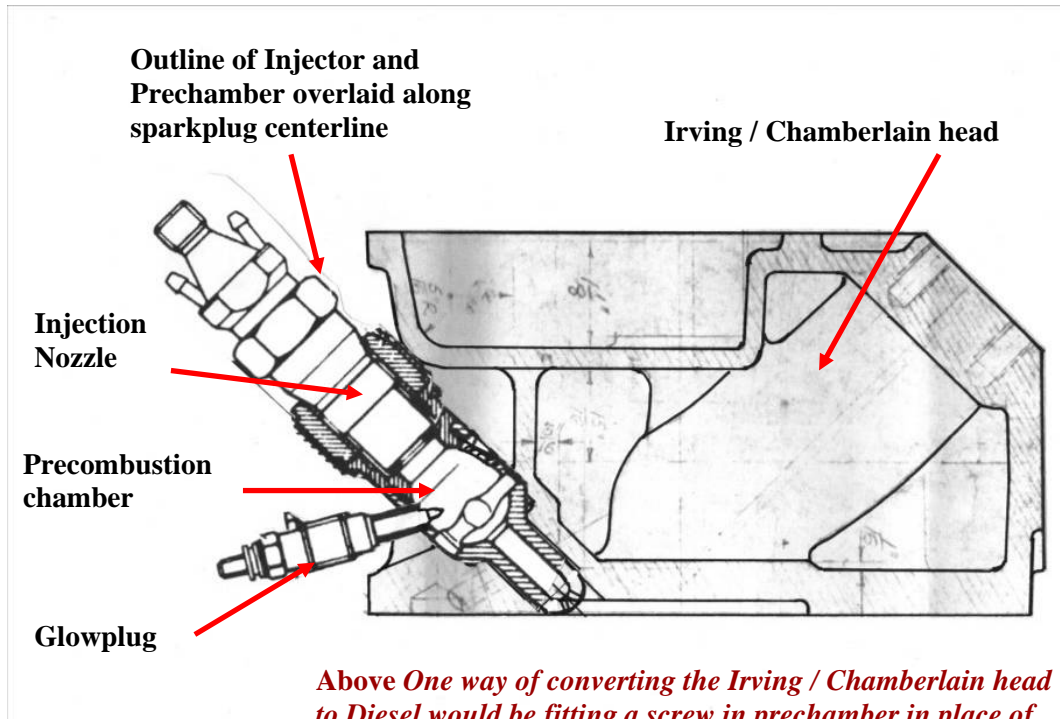
Above Prototype of the tractors designed to utilizes the industrial version of the Holden 132 “Grey Motor” . Acknowledgement Wiki.

I heard a whisper that it’s performance on the Werribee Tractor Test was disappointing because the engine oil temperature bogey was exceeded before full power was reached. The Red Motor would have dropped straight in .

- Repco had set up a Research facility at Dandenong after the winding down of the Repco Brabham activities so would have been looking for worthwhile projects .

DIESELIZATION OF PETROL ENGINES

Conversion of the 186 to an indirect diesel would be a relative simple process given Repco’s manufacturing capability at that time.



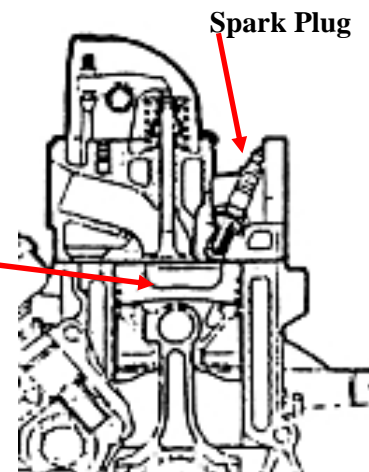
Above One way of converting the Irving / Chamberlain head to Diesel would be fitting a screw in prechamber in place of the sparkplug with appropriate water jacket modifications

- Combustion Chambers are the main difference between the engines . Bill Chamberlain mentioned that only minor changes were required to the head casting to fit a Precombustion Chamber in place of the sparkplug so this confirms it was an Indirect Injection design that was popular for automotive diesels at that time. This configuration of Diesel engine uses a flat face on the cylinder head and a flat-topped piston with the fuel injected into a separate combustion chamber connected by a narrow passage to the cylinder

- The Irving petrol Head being a Heron type has this flat underside ideally lending itself to Diesel conversion

Right Cross section of Petrol engine with a Heron head showing the Combustion Chamber in the Piston .

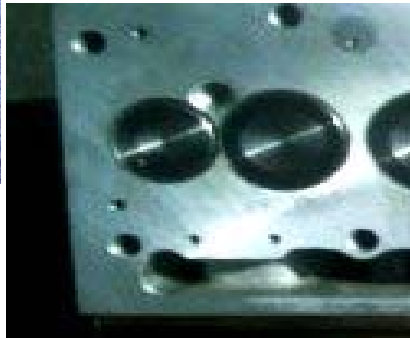
Chamberlain abandoned the concept due to excessive piston temperature . Subsequent heads successfully used normal bathtub chambers.





Above Bathtub chamber of standard Red motor head would not give high enough compression ratio for Diesel operation . Pic Warwick

Below Flat underside of the Heron type would give the required compression ratio of around 21:1 Pic internet



HOW DID IT GO ?

Power , I did not hear any figures for the conversion but would estimate it would be no more than 70 actual hp at 2700 rpm and 154 ftlb of torque @ 1600 .

This is based on adjusting the 186 advertised figures of 126 hp a@ 4200 rpm then applying Diesel factors.

- Diesel Factor These engines only use about 85% of the available combustion air since unlike a petrol engine fuel and air mixing takes place during combustion not before hand on it's way into the cylinder.

Consequently not all the air and fuel have time to find each other (as evidenced by the onset of smoke) and result in approximately a 15 % reduction in power and torque for a given rpm . Power is further reduced in the order of another 30% by the inability to rev because of the extra time taken for this mixing and the higher inertia forces of the heavier pistons and rods.

- Comparison of the 85 hp @ 2600 rpm from the 288 cubic inch displacement Perkins P6 Diesel engine which is of similar configuration to the 186 cub inch Holden Diesel supports it could be as low as 60 hp Oh for a Turbo !

On the road , I have no official information but there are a number of first hand reports that it did duty in one of the departments test cars though to be a Holden utility.

My experience leads me to think it would be Slow , Smokey, Noisy, and Hard to Start like it's contemporaries of the day with only a modest fuel consumption improvement .

Bevan Fenner recalls that it ran smoothly and was not excessively noisy for a Diesel.

Comments were made that a favourite prank was to ask a hapless apprentice to investigate the engine's condition as there had been reports of knocking . These days this would be considered bullying

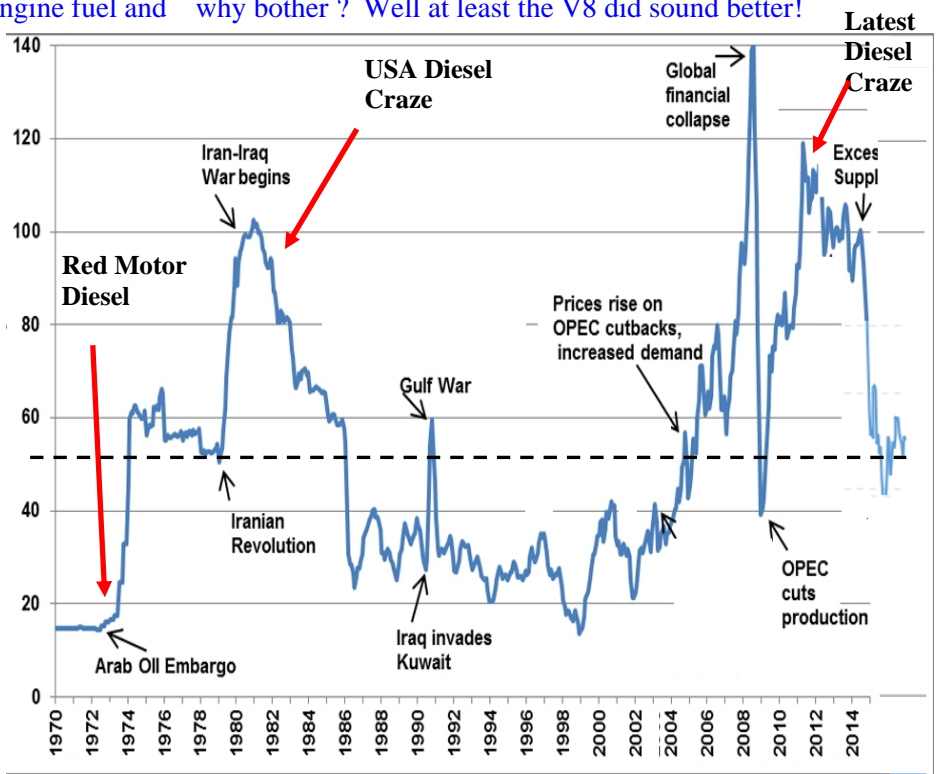
THE DIESEL CRAZE

Europe The rise of automotive Diesels seems to have been stimulated by VW with the introduction of the Diesel Golf in 1976 in response to the OPEC caused Fuel crisis of early 1970's . With petrol engines struggling with the newly introduced emission laws and the high price of fuel VW's answer was a dieselized version of their 1.5 l petrol engine. This was in contrast to the traditional approach of scaling

down of a heavy duty tractor type engine. Anyway it proved successful and caught the European public's imagination which did not escape USA car companies "spin doctors" notice

Detroit This prompted a rash of similar dieselization projects most notorious was the Oldsmobile 350 cub in V8 with only 120 hp in 1978 . Then in 1979 a second crisis hit with Iran / Iraq war and an overreaction saw widespread shortages and prices double. It seemed everyone had to have a diesel . There was even a highly secret project at the GM technical center in Detroit to make an experimental Diesel version of the Buick 3.8 l V6 (predecessor to the engine used by Holden) using Ricardo Comet Mk 5 combustion chamber. I can still hear the horrendous Diesel knock!.

GMH was not immune from the oil Crisis and the Detroit Spin with an Olds 350 engine imported and then fitted to a then current model *Statesman* for evaluation under real driving conditions on public roads. On a long country trip I concluded it had similar acceleration and economy to another test Statesman fitted with an Opel 4 cylinder 1.9 l engine so why bother ? Well at least the V8 did sound better!



Above Diesel activity historically follows sharp rises in oil price then slows down as prices moderate. Actually today at US \$50 /barrel crude is the same dollar number as 40 years ago but when adjusted for the intervening 450 % inflation they were paying the equivalent of \$275 in todays dollars .

At this time with the Diesel craze at it's peak enquiries were made to Repco about the *186 Diesel Red* motor but alas it was no more.

The best Holden could offer in 1981 was the 1.8 l *Diesel Gemini* from Japan (a proper Diesel not a petrol conversion) Off the record it sold like hot cakes until everyone who wanted one had one and the company was stuck with some leftovers. The remainder was put on the company lease car

scheme at a very discounted rate and soon were snapped up (me included) . These little cars became well regarded and commanded high prices on the used car market for years.



Above Ad for Diesel Gemini with 1.8 litre 65 hp and 5 speed overdrive gearbox (petrol was 1.6 litre 4 speed.) Along with the confidential marketing strategy of “ It is no good putting an expensive engine in a cheap car “ all cars were a attractive metallic green , had fancy wheels and top of the range trim. .

By 1986 oil had dropped to a 10 year low and lack of refinement , reliability and service issues of dieselized petrol engines with their indirect injection and lack of turbocharging put US consumers off Diesel cars for the next 25 years .

Right Typical Ricardo Comet combustion chamber .

This Indirect injection concept was used by virtually all diesel cars up until the 1990's .

The high turbulence speeded up combustion but the large surface area

and high velocities meant high heat loss to the walls making starting hard and only producing a modest fuel consumption reduction gain

Latest Diesel Craze

In the last 15 years electronics have transformed Diesel engines enabling extremely high pressure common rail systems with multiple injection events per cycle giving greatly improved and cleaner combustion. All engines are now specially designed as Diesels with Direct injection for maximum fuel efficiency. Turbochargers provide high boost so power can be produced without the need for excess revs while the introduction of multiple speed (up to 8) electronically controlled automatic transmissions means

superior performance is always available .

Between you and me I regard these engines as the ultimate development of the piston engine and despite the hype not just a passing fad as the Dieselization of the 186 Holden Red Motor was .

Fate of the 186 Diesel

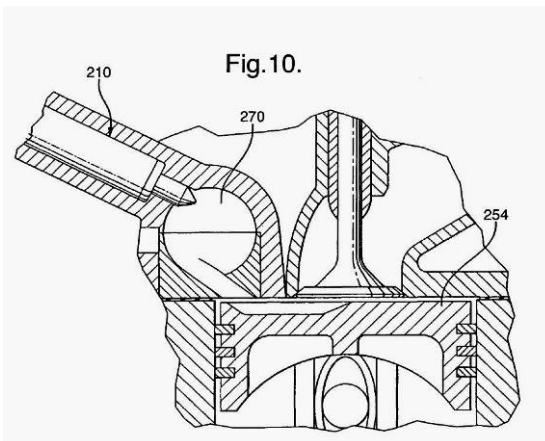
On a visit by Repco's Nigel Tait to GMH engine chief Fred James took the opportunity to inquire about the engine. Nigel confirmed it had existed but was destroyed in a fuel fire when being used to drive a standby generator during the SEC power strike era of the late 1970's.

Ps And the Irving /Chamberlain Head ?

The whisper around the traps was testing of the petrol version soon led to the abandonment of the Heron combustion chamber of the initial design . The extra surface area of the piston bowl absorbed more heat leading to softening of the aluminium pistons which usually results in ring groove failure.

Revisions were soon made to incorporate a conventional bathtub combustion chamber and cast the head in aluminium. In this form it went on to be made in small numbers by a number of concerns until very recent times.

Although the Diesel version did not go ahead all was not wasted though with the petrol version going on to become a legend with hot red motor fans.



Above A Red Motor fitted with the aluminium version of the Irving/ Yella Terra cylinder head. The Diesel 186 would look similar from this side. Internet pic

Warwick Bryce

Automotive Engineer 1973 to 2008

Acknowledgements:

Bevan Fenner , Repco 1953 to 1970

Nigel Tait , Repco 1966 / ACL Chief Eng till 2006

Geoff Chamberlain (Bill's son) , GMH 1970's to 2000's

Deceased:

Phil Irving , Designer of Vincent and Repco Brabham fame

Fred James , Vauxhall war years then GMH till late 1970's

Bob & Bill Chamberlain , many Engineering enterprises best known for their tractors.