

Q-Car Extraordinaire

The V8 engined 403

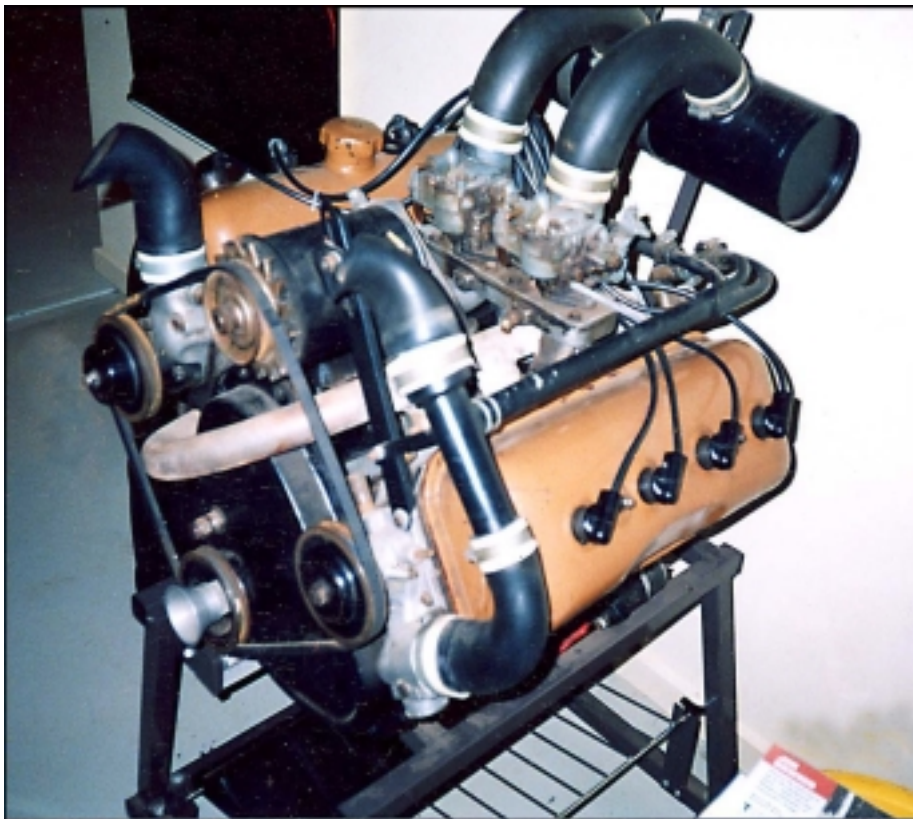
If you come up against a cream-colored Peugeot 403 bearing the Victorian number JMD-558, you need not be surprised if it whistles off into the distance a trifle faster than you expected. Nor need you imagine your own engine has gone temporarily off song. What you have encountered is not—as the type name implies—a 1500 cc four-cylinder car, but what is certainly the only eight-cylinder Peugeot in Australia and very probably the whole world.

Moreover, it is not just another example of shoe-horning a big American V8 into a chassis of inadequate size. Apart from a few specially constructed components, the car is entirely Peugeot, and one of the most workmanlike conversions you could possibly wish to see.

Even after intensive scrutiny it is hard to believe that the engine was not built and installed at the factory instead of being dreamt up and constructed in Melbourne by owner Jim Hawker.

Jim, who is Foundry Superintendent to the Russell Manufacturing Co. (the Repco division which makes pistons), has been knee-deep in engines all his life. In addition to much experience with racing cars, he was closely associated with building the original Chamberlain tractor and before that, the legendary Chamberlain supercharged two-stroke f.w.d. Beetle. The idea of building the Peugeot V8 came when the first Repco V8 (for which Jim produced a great number of small aluminum components) was in its gestation period at Russells.

One thing which influenced the decision was that the existing steel crankshaft had such wide big-end journals, it appeared quite feasible to run two narrow rods side-by-side on each pin. Also it had bolted-on balance weights which could easily be varied.



Theoretically, a single-plane or “flat” crankshaft attached to eight pistons results in an engine with a secondary vibration acting transversely at twice crankshaft speed, but in practice this seemed to be almost unnoticeable on the racing engine.

So there was reason to think it would not be troublesome on a touring engine which was precisely what the new version was intended to be—just a well-mannered touring device. In fact, as is well-known, the Peugeot is designed as quite a slow-revving engine and the scheme was to retain this feature and get the increased performance just by increase in capacity.

The original 403 engine is of 1500 cc, but it was decided to use a pair of 203 blocks, which are smaller in the bore. The final dimensions are 75 mm bore by 73 mm stroke, giving a total of 2580 cc. Based on the manufacturers’ data (for there has been no opportunity to put the unit on a brake) power output is about 90 bhp at 4500 rpm, with maximum torque of 112 lb. ft. occurring quite low at around 2400

rpm. The performance of the car confirms that these figures must be pretty close to the mark.

Block

The normal block is a cast-iron component with inserted wet liners and a fairly high camshaft. Two of these were modified, if that is the word, by chopping off the entire crankcase portion just below the bottom deck of the water jacket and the remnants were attached at 90 deg. to a cast-aluminum crankcase of about the same external size and proportions as those of a kennel intended to accommodate a small Dachshund.

One trifling snag is that the position of the camshaft is such that it is not possible to obtain a completely flat face on the cylinder blocks, as the camshaft housing projects a little way below the main joint face.

On the port side block this does not matter, as the camshaft housing is also on the port side and merely overhangs the side of the crankcase, but the starboard side camshaft lies in the V between the cylinders and some snaky work was required to devise an oil-tight joint in two planes. However, once the blocks are in place, there will never be any need to detach them and the joint can be made permanently with the use of the correct sealant.

To attach the blocks, long shouldered studs are employed; these studs bear on the bottom water jacket flanges which are drilled at the same centres as the existing head-bolts (ten per block). In service, each jacket simply acts as a distance piece between head and crankcase and thus carries no working stresses.

Crankcase

The crankcase is a chunky component with a thick web to carry the centre main bearing. Incidentally, this and the sump were the only parts for which drawings were made and Jim not only made the patterns, but cast and machined the things with his own fair hands.

The steel main bearing caps, machined from solid bar, come flush with the sump joint face and a cross-bolt extends through each cap from side to side of the crankcase, thus ensuring that the latter cannot gape or flex under running stresses, but at the same time there is no possibility of pulling the bearing seats out of round. These bolts can be seen in place in the engine picture which also shows that there was a sticky problem with the oil pump, which is driven from the port camshaft.

Unfortunately, its position was such that the hole required to accommodate the pump spindle housing intersects the joint face at an angle, but this was overcome by machining the spigot register with case and sump bolted together—a rubber O-ring renders the joint oil tight.

Con-rods

The standard con rods are 1.25 inches wide at the big ends and these were narrowed down to fit side by side on the journals with only the outer sides of the bores chamfered in the usual manner.

No chamfers on rod or bearing shells are required on the abutting faces and by taking advantage of this and widening the journals a little it was possible to work in shells of .6 inch width as the diameter is 1.77 inches. The bearing area, though not excessive, is felt to be adequate for the conditions envisaged especially as the shells are the Repco tri-metal type used in FI racing units.

The crankpins are normally bored for lightness and closed by plugs to retain oil; this construction made the job of blocking up the central oil holes and cross-drilling additional holes to suit the new big-end positions quite simple.

The main journals, of 1.968 inches diameter, were considered to be quite adequate and were unchanged, but the four existing balance weights were replaced by others of considerably greater mass.

Some guesstimation had to be employed here, but the result has been satisfactory as far as smoothness is concerned. Actually, the main bearing loads due to piston inertia are less in the V8 than in the four-cylinder form, and consequently main-bearing life should be excellent.

Apart from moving a lot of weight off the existing rather heavy flywheel, this just about completes the work done on the bottom half.

Induction

Upstairs, use was made of another Peugeot feature to permit installation of two standard Solex down-draught carburetors side-by-side in the V. The 203 induction system is designed rather on the lines of a rabbit burrow, with a tunnel running through the head between the centre cylinders and joining up with a longitudinal gallery which has four off-takes leading to the valves.

The starboard head was left “as is”, but on the port side, the cross-hole was blocked up and a riser added to the gallery cover-plate to carry the carburetor on this side. The resulting installation is very neat and the linkage extremely simple.

From the carburetors, twin flexible intake pipes lead to an intake silencer mounted on the bulkhead, from whence a single duct runs to an oil-wetted cleaner just behind the radiator.

The valve gear remains completely standard as do the rocker covers and plug housings, but two new exhaust manifolds were fabricated by welding from steel tube. The port one runs forward and curls around the front of the starboard block, whereas the other manifold is of normal shape; both are aluminized to prevent rusting.

The drive to the camshafts is by the normal duplex roller chain, extended to embrace both camshaft sprockets. The standard manually-adjusted tensioner sprocket is retained but a rubber-faced damper pad is arranged to prevent flap of the long unsupported top run.

Naturally, the cover plate at the rear of the drive had to be extended and the chain case altered to suit. Water pumps in each head are driven by a single belt which also turns the central generator, this system ensuring equal cooling to both banks although an additional water outlet had to be added to the port head to eliminate any chance of steam pocketing due to its steep inclination.

Ignition

For ignition, the sparks are provided by a standard eight-cylinder distributor ex-Chevrolet, very accessibly mounted in the same location as the original and driven by the starboard camshaft.

The existing starter is retained, but unfortunately it had to be moved outwards to clear the port camshaft housing, which would have meant an impossibly large ring-gear. Instead the pinion shaft was mounted in its own bearings and connected to the starter by two sprockets and a short roller chain, an installation which works perfectly.

This just about covers the salient features of the engine and it will be noted that except for the narrower big-end shells, any running spares which may be required in the future are all stock items obtainable from any reputable dealer. Thus, long journeys can be undertaken without fear of being stranded miles away from home base.

Thanks largely to the allowable reduction of flywheel weight, the complete unit weighs only 27 lb. more than the original, so there was no necessity to alter the front suspension.

Being much wider than the four-cylinder unit, some difficulty was expected in installing the eight-cylinder unit to clear existing components and chassis members. The position was explored in a novel manner by making a three-ply cutout equivalent to the engine cross-section and sliding this along a bar threaded through the car along the crankshaft axis.

This simple expedient showed that all would be well if this motor was tipped over by 11 deg. to the left and although this is a fairly large angle there are no disadvantages attached to it

Naturally, the carburetor risers were arranged so that these instruments are truly vertical. the practice it is not easy to detect that the engine is inclined at all.

There was no room to accommodate a fan without extensive modifications to the radiator mounting; instead, a larger core was installed to cope with the extra heat to be dissipated. A small electrically-driven fan mounted ahead of the core, where there is

plenty of space behind the grille, looks after the cooling at low speeds; at high speeds, no fan is needed anyway. Rather than cut a new body about, Jim managed to obtain a semi-finished body shell, which was modified where necessary, including the addition of two diagonal stiffeners just below the bonnet line and finally finished by the factory. Hence there are none of the burnt patches or jobs of bronze welding which so frequently disfigure home-built specials.

Transmission

To cope with the double torque, a Peugeot 404 clutch was originally installed but even this was found to be inadequate until heavier springs were fitted; even so, the pedal pressure is acceptably low. From the clutch, the drive goes to the four-speed gearbox, which at first contained the set giving direct drive on top. This was found to provide unsuitable ratios in conjunction with the 4.12 final drive and was changed to the earlier pattern, with direct drive in third and a geared-up overdrive giving a step-up of 1.3 to 1, the overall ratio then being 3.17.

Most ordinary town running can be done in direct drive but when conditions permit, the overdrive furnishes a top speed of 115 mph with the power plant turning over at a leisurely 4500 rpm. The car will cruise happily in either overdrive or direct top at 80 mph, but above this speed, for which it was originally designed, wind roar begins to be somewhat obtrusive. Under open-road conditions, as for instance on a 5000-mile run to Cairns, and back, the excellent consumption figure of 28 mpg was recorded.

To facilitate gear shifting, the column change has been discarded in favor of a neat central lever located on the gearbox itself. An electric tachometer, sensibly placed almost at eye level on the fascia, tells the driver exactly when this gear-stick has to be manipulated.

To sum up, a most praiseworthy effort, reflecting great credit on its designer-builder not only for the original conception, but also for the meticulous attention to detail which has resulted in a workmanlike product.

Story by Phil Irving, Modern Motor, January 1968.