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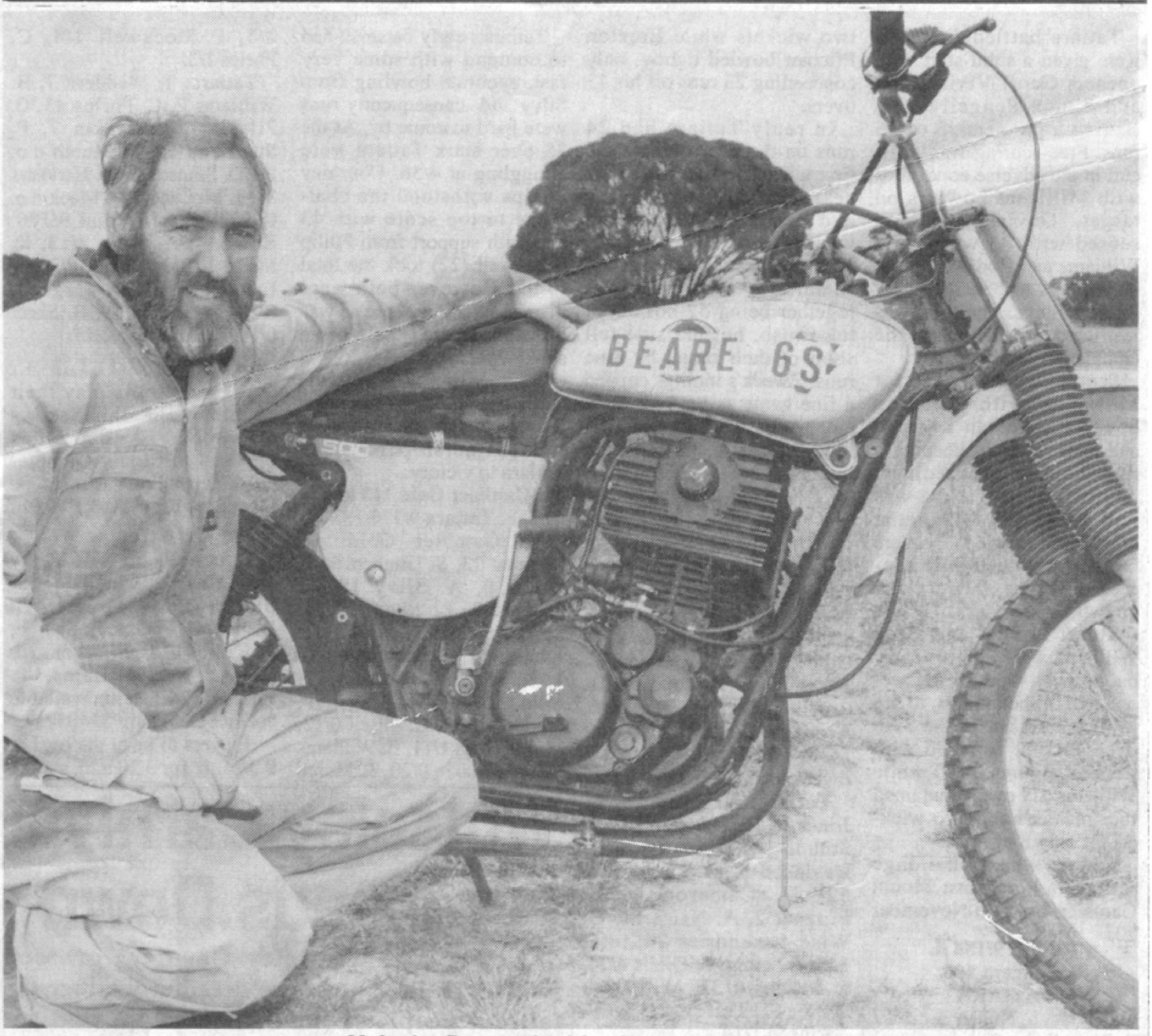

Malcolm Beare with his six-stroke engine.

After 16 years' work — the six-stroke engine

Bordertown engineer Malcolm Beare has invented a revolutionary six-stroke engine which appears to have huge potential.

The prototype has been installed in a 500cc motorcycle but the design can be adapted to any four-stroke, overhead camshaft engine and could eventually be used in trucks and passenger cars.

The unique design provides advantages in power, efficiency and quietness over current engines.

Mr Beare, a self-taught engineer, has been working on his design for 16 years, building three engines in his farm workshop and the fourth in his engineering premises.

He has now gone as far as he can go with it, and is looking for a manufacturer to take over its development.

He would like to see the engine fitted to racing motorcycles to get the name recognised.

Used to repairing badly-designed farm machinery and frequently redesigning it, Mr Beare started thinking about poppet valves and camshafts, and decided there had to be a better way. Rotary valves are quiet, compact and cheap to manufacture, but difficult to lubricate.

Mr Beare has borrowed the basic components of a rotary disc induction two-stroke and grafted it onto a four-stroke motor. In doing so he has taken combustion pressure off the rotary valve during the period when temperatures and pressures are highest.

A small upper piston forms the roof of the combustion chamber. It takes the brunt of the gas sealing and part of the valving, the opening of the exhaust port and the closing of the intake. The upper porting piston is connected to a small crank driven at half main crank speed.

The main crank does the normal four strokes, while the upper porting piston does two strokes, making six strokes for a complete cycle. During the power stroke approximately 12% of the power is transmitted through the upper piston. The main piston loses about three per cent, therefore there is a net gain of nine per cent, all things being equal.

The crown of the upper piston remains at a much more even temperature, unlike the roof of a conventional combustion chamber, where the exhaust poppet valve is the hottest area. Therefore a gain in thermodynamic efficiency is evident, because a significant increase in compression ratio can be achieved without the onset of detonation or preignition — lower octane or unleaded petrol is no problem. Mr Beare envisages a gain from approximately 9:1 to 10.5:1, or compression pressure of approximately 200-220 lbs/sq inch, from the standard of 150 lbs/sq inch.

He has found it to be beneficial to have the upper porting piston delayed in reaching its top dead centre, compared with the main piston. This achieves three beneficial effects.

From the combustion point of view it gives a substantially longer period of relatively constant volume, during which combustion can occur.

It also places peak cylinder pressure later in the expansion stroke, thereby taking advantage of more favourable crank angles for producing more torque.

The valve timing is also enhanced without having excessively tall ports. It allows later closing of the intake port, but the exhaust timing also occurs later in the cycle — closer to bottom dead centre before opening. This does not matter so much with this engine design as cylinder pressures are higher at this point anyway.

The nature of the valve opening is radically different from poppet valves. The period that the piston ports are open can match or better any poppet configuration.

It is the period around top dead centre, at the end of the exhaust stroke and the beginning of the intake stroke, that the better valving is evident.

The exhaust is cut off quickly by the rotary disc valve, and the intake is demand automatic. The reeds open whenever pressure differentials dictate.

These improvements in mechanical, thermodynamic and volumetric efficiency could make it a world beater.

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