

The Atkinson Differential engine: “Mini A” design.

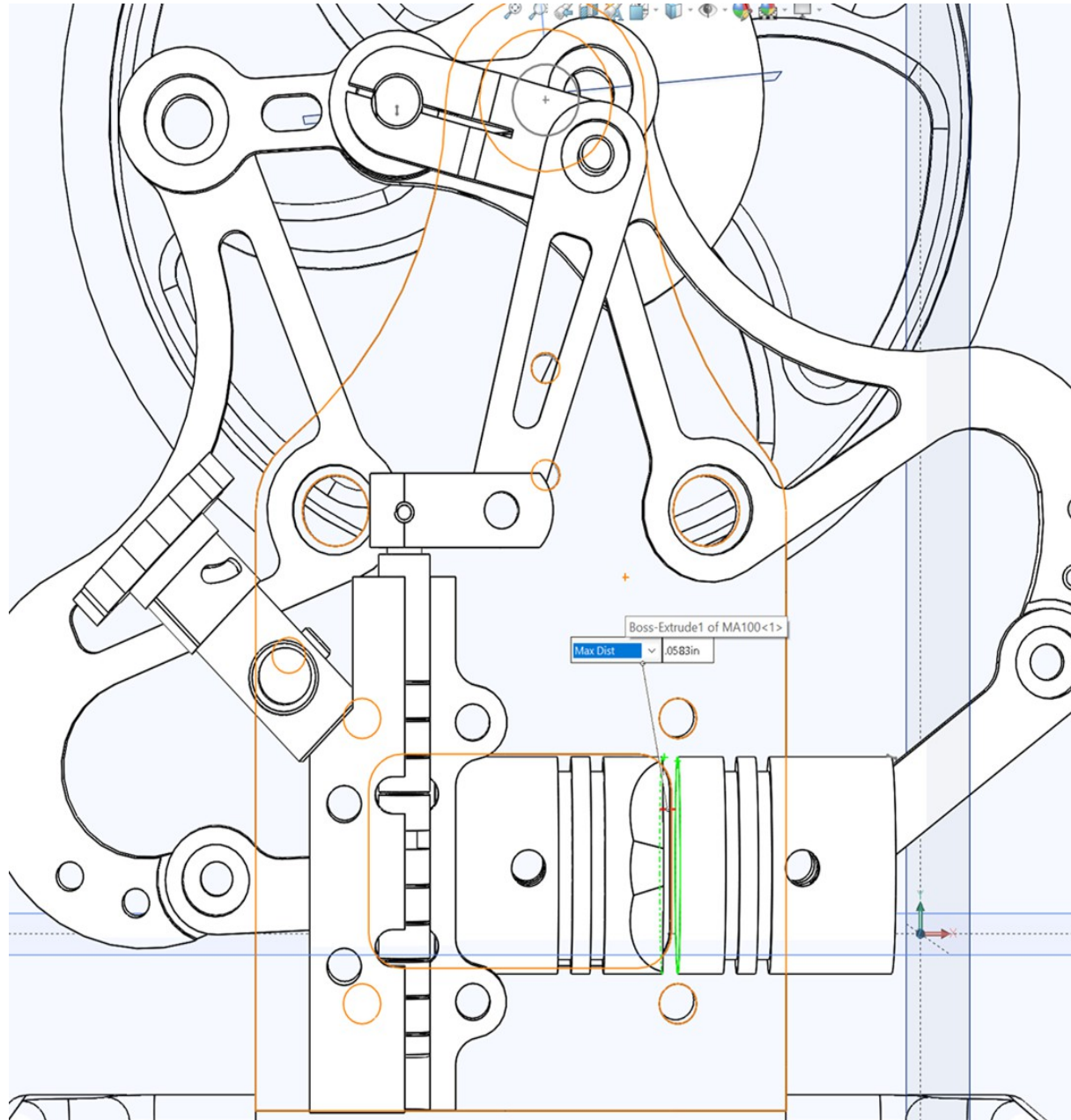
Pressure versus volume study

Following various discussions on a Home Model Engine Machinists forum, it was decided to produce a P-V diagram (Equivalent to the well known Otto diagram) in order to better study the valve timing, pressure in the combustion chamber, etc. to aid an understanding of how it runs.

Thanks to:

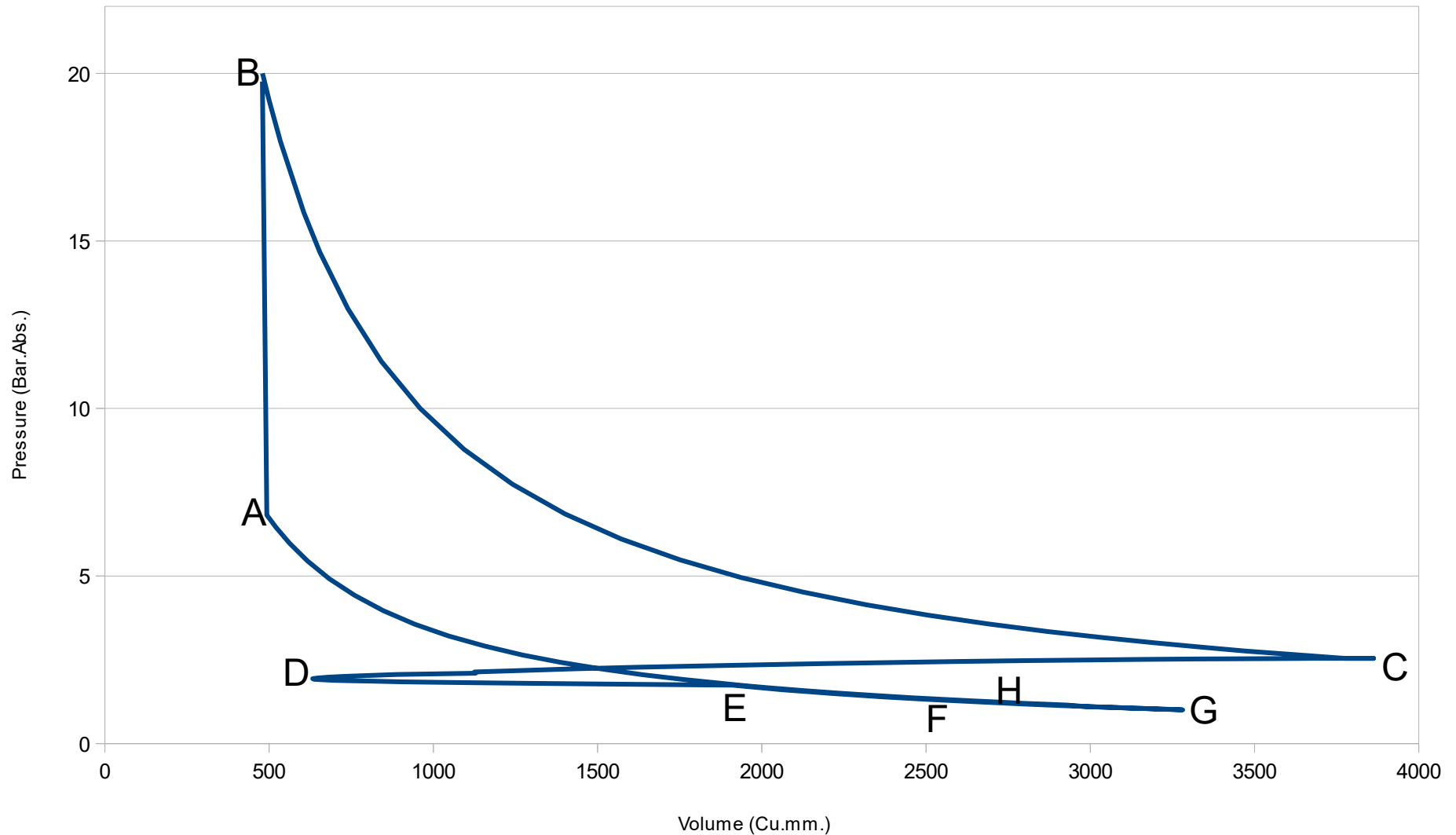
Dave Peurault – Mini A designer,
Ken Brunskill – model builder and
Jaime Quevedo – model builder.

The engine:



The Atkinson differential engine

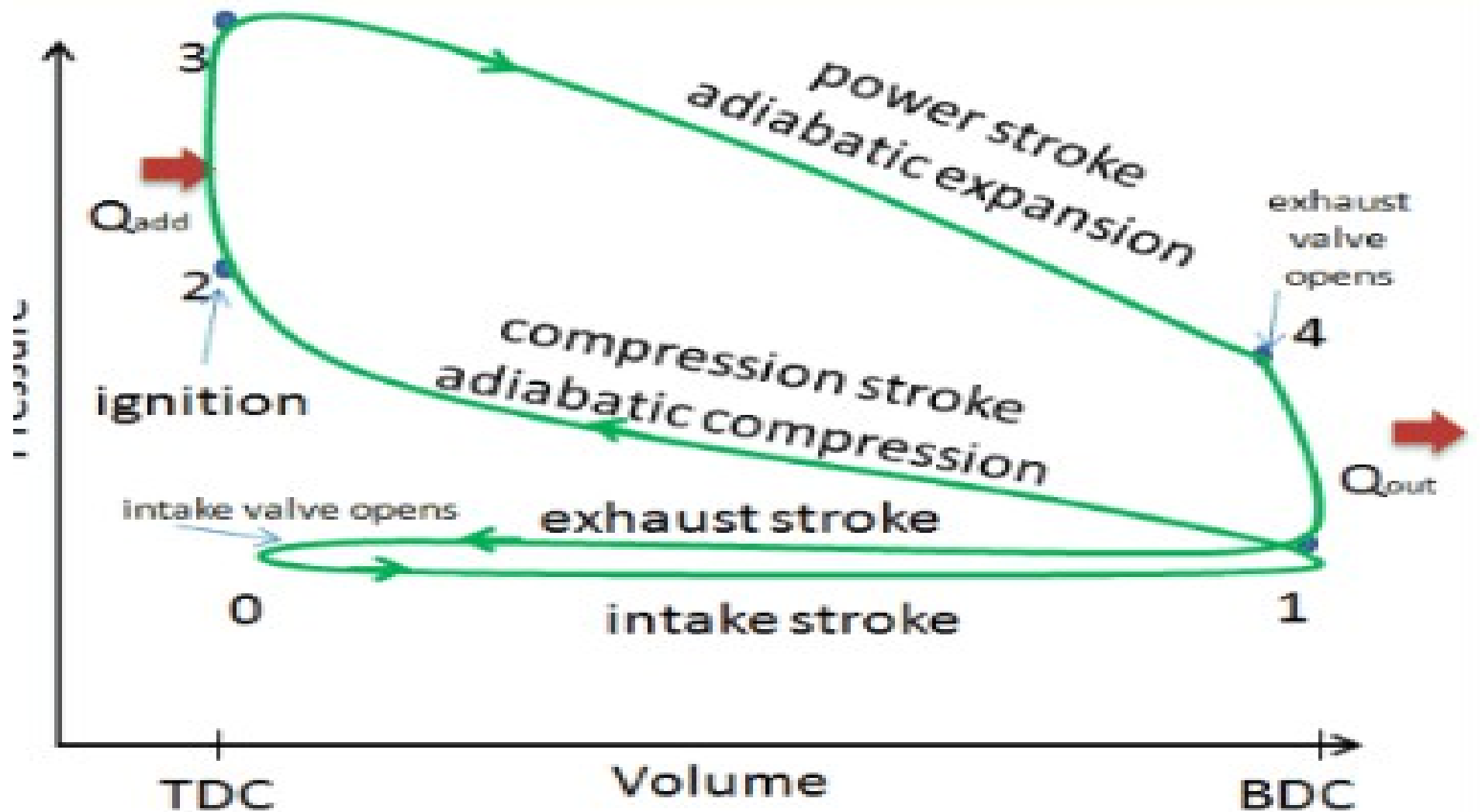
P – V diagram



The P – V diagram - explanation

- A-B: IGNITION – of compressed fuel air mixture.
- B-C: EXPANSION (adiabatic) of Hot combustion gas.
- C-D: Chamber volume reducing to minimum – EXHAUSTING burnt gases.
- D-E: Chamber volume expanding, exhaust closing.
- E-F: Chamber expanding – developing vacuum.
- F-G: Inlet valve opens, INTAKE of fresh Fuel & Air mixture
- G = Max intake volume.
- G-H: Intake valve closing, volume decreasing.
- H-A: Volume decreasing – valves closed – COMPRESSION.

An Otto Cycle P-V diagram



Differences between the Otto cycle and the Atkinson differential cycle engines.

- The Otto-cycle engine is basically a 4-stroke spark ignition cycle: I.E. 2 revolutions (4 piston strokes) make a single cycle.
- The Atkinson Differential engine cycle engine is in essence a 2-stroke cycle, in that there is 1 complete cycle in 1 revolution of the crankshaft = 2 strokes of the power piston. This engine completes the Intake and exhaust cycles around the end of the power stroke, and before the compression stroke, actuated by a secondary (valve) piston.

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- Timing of exhaust of the Atkinson differential cycle allows for more expansion and increased efficiency of the cycle, compared to the Otto cycle.