IMPROVING SMALL GAUGE STEAM LOCOMOTIVES – WILLIAM POWELL



- Small gauge: 5", 31/2", 21/2"
- Improving within the constraints of an existing miniature loco or the 'scale' out-line of a prototype
- 'Modern' steam miniature, built without constraints -'Porta-ised'

3¹/₂" CANTERBURY LAMB





$2^{1/2}$ " Gauge Ayesha LBSC Design Atlantic





3¹/₂" GAUGE LBSC DESIGN TICH





IMPROVING THE FRONT END

- Draughting
- Improving the steam circuit both in and out of the cylinders
- Improving the Steam flow through the ports, over or through the valves
- Refined Valve gear for better events

DRAUGHTING

- Alignment as near **PERFECTION** as possible.
- Pipe work to feed steam to the cylinders, but ducting to feed the used steam to the blast nozzle
- Always an element of compromise, exhaust has priority over steam
- JJG Koopmans Exhaust proportions
 Vs Porta's Lempor (3 nozzels)



IMPROVING THE STEAM CIRCUIT

- As large pipe work as possible, as large and smooth bends as possible
 - Using commercial available plumbing bends
- Radiant stainless superheater



• Regulator to reduce the wiredrawing effect

STEAM FLOW THROUGH THE PORTS

Piston valves outside admission

- Hollow pistons (maximise steam flow volume available at admission)
- Rings controlling the events
- Multi-ring
- Balance side valves
 - Exhaust straight out of the back/top
 - Reducing the load on valve and valve gear
 - More tolerance of fits and wear





PLASTICS FOR USE WITH STEAM

• PEEK (Polyether ether ketone)

- The Young's modulus is 3.6 GPa and its tensile strength 90 to 100 MPa. PEEK has a glass transition temperature of around 143 ℃ and melts around 343 ℃. Some grades have a useful operating temperature of up to 250 ℃.
- Some grades are available with carbon and graphite mixed in



ROSEBUD GRATES

- Air holes 10%-20% of total grate area
- Channelling/funnelling of primary air give a more complete combustion, grit/fine ash left in ash pan





• More development work required.

- Long narrow fire grates
- Square 'wide' grates
- Hole patterns/sizes
- Secondary air flow
- Additional Features
 - Stainless steel arch helps reduce particle carry over reduces the dependence on spark arresters





TESTING

Simple/cheap ways of testing

- Digital Manometer
- Digital Thermocouple



• The use of a continuous running track, the endurance of the driver is the limiting factor

CURRENT PROJECTS

- Chassis re-gauged from 21/2" to 31/2"
- Canterbury Lamb boiler
- Lempor Exhaust
- Balance slide valves
- Slip eccentric valve gear set for 45% cut off
- Water feed heater







- o 5" gauge Q1
- Outside admission valves
- Rosebud grate, stainless steel arch
- Twin Radiant Super heater
- JJG Koopmans revised Lemaître exhaust proportions (Lempor won't fill the chimney)

FUTURE PROJECTS

- 3¹/₂" gauge 5AT style 3 cylinder Smith type compound
- Re superheating between HP and LP
- Water feed heater, water delivery by pumps
- Double Lempor Exhaust
- Equalised springing



OTHER PEOPLE'S LOCOS

• Ben Paiver NER 0-8-0

- Balanced slide valves
- Vortex Exhaust





For the next generation:

