Dear Lianne

“We are focusing on Sir William's innovations in engineering & construction techniques (such as building bridge sections on land and rolling them out over the water)  as the focus of this year's week is innovation & discovery. Your idea of writing on pushing the boundaries of engineering design would be spot on!

So a 5oo word distillation of the main Text to deal with that might be as follows. However you can cut paste edit improve as you wish.

Sir William Arrol 1839 - 1913– Innovations in Engineering + Construction Technique

A well grounded + practical man from a poor family in Industrial Paisley, started his career at 9 as a Bobbin maker and at 14 as a Blacksmith. Arrol was immersed in the clank + clammer of the busiest period in the Industrial revolution when he founded in 1871, his Iron works in Baltic street, Dalmarnock in Glasgow’s East end.

This existing complex of red brick buildings which typify Glasgow’s transfer to heavy engineering tell a story of ever strengthening Iron and the development of lighter and stronger still, steel.

Major infrastructural improvements were being suggested by requirements for a detailed network of rail + canal routes. Despite the early work of Brunel in the south, major rivers and estuaries of the Northern capitol and territories of empire, were not yet able to sustain mechanised and ever heavier rolling machinery.

The Tay Rail Bridge had collapsed in December 1879 when the Dalmarnock Iron works was busy completing ground breaking modular bridges in Glasgow. A H Barlow stepped in to design the new one. “ Having proved the companies reputation on a number of smaller Iron bridges Sir William Arrol + Co made and supplied the bridge sections spanning the masonry piers in Wrought Iron between 1882 – 1886.’ - J Hume

From his drawing office overlooking a working yard, he monitors both the production of plate and fixings. He develops maintains and utilizes the lifting and forming machinery. He has then the ability to full scale mock up and test. As John Hume’s wonderful book “ Workshop of the British Empire” illustrates he is not working in isolation but cross referencing and exchanging goods services and ideas with the best of fabricators such as the Paisley firm of Fullerton, Hodgart + Barclay. - Fabricators and makers who were ahead of the world on the fabrication and use of Hydraulic Machinery.

That very machinery would allow entire Bridge sections to be manufactured on land and be railed into place. Embracing such technology meant that these early bridges are composed of previously unfeasibly large components. Pioneering efficiencies in process are being investigated.

As manufacturers Arrol + Co had quality control at close quarters …in their yard. They also had the benefits of improving transport to role large sections out by barge and rail. Dalmarnock offered canal and rail options.

However the option to yard build was not always possible. For the Forth Bridge Arrol needed to premanufacture huge pieces of the bridge at ground level as opposed to at height perched out over the water.

The sections were not transportable by Rail, so he set up a yard in south Queensferry and premanufactured and rolled pre-manufactured steel sections into place from there on rails.

The process of manufacture and placement being a honed and commodious strategy developed from the projects before.

Ever forward on that principal they went, until 51 000 Tons of contemporary steel was rivoted or welded in place….and the most difficult Engineering feet known to mankind in 1890 was complete.

The bridge progress then being metaphoric for advancement of empire.

Its clear from the extant work that Arrol is a man of weights and measures and that the eye of the firm is on every detail, every process.

The chronology of development of detail and components is linear and one bridge seems to leap developmentally to the next over 34 years, based on the last experience.

As an Architect what I most enjoy is how Arrol seems to have calculated how to use the optimum material of the time in an innovative way. He pushes that technology as far as he can and by the time your eye reaches the end of a cantilever …there is just what’s needed to hold the span bridge in place.

Nothing more, nothing less.

Not even one rivot or even one bobbin … was wasted.

Image

July 1889

A bridge section ( central Girder ) being manufactured on land at south Queens Ferry awaiting rolling out on the drill road (rail for sliding components into place.)

From – Workshop of the British Empire by John Hume.

