

James Watt's BLOOMFIELD ENGINE

by Keith Hodgkins.



2019 marks the 200th anniversary of the death of the engineer James Watt (1736-1819), one of the most important figures of the Industrial Revolution.

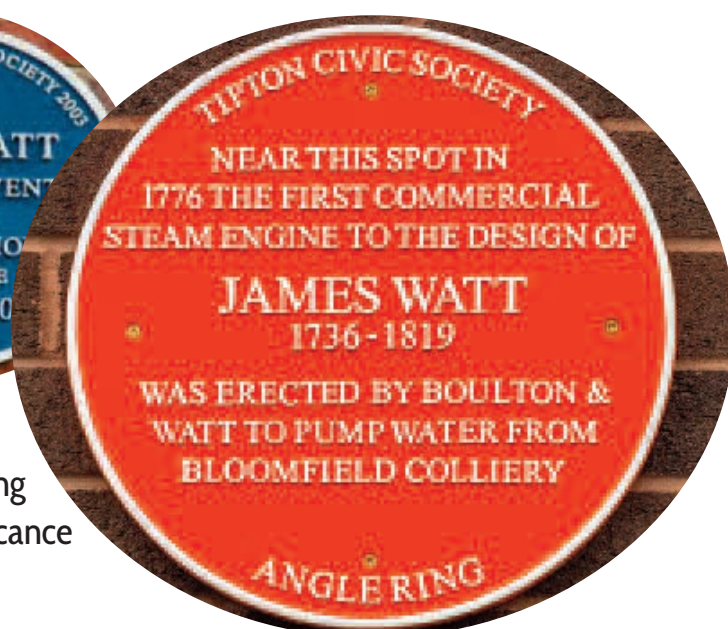
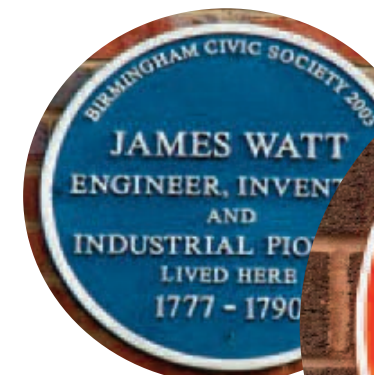
Throughout the year a series of celebratory events (see <jameswatt2019.org>) has been organised up and down the country to honour Watt's achievements, one of which was the unveiling of a commemorative plaque by the Tipton Civic Society on the site of Watt's first commercial engine at Bloomfield in Tipton.

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This took place on 13th March at the Angle Ring Company in Bloomfield Road, which now occupies the engine site and which generously sponsored the event.

The plaque was the 23th in Tipton erected by the Civic Society and was finished not in the usual blue colour, but in orange, to reflect the corporate identity of the Angle Ring.

It was unveiled by Dr Jim Andrew, a chartered engineer and leading authority on early Watt engines who was responsible for the refurbishment of Watt's 1779 Smethwick engine at the old Birmingham Museum of Science and Industry. Now the world's oldest working steam engine, it can now be seen at the Thinktank at Millennium Point in Birmingham.



Prior to the unveiling of the orange plaque Dr Andrew delivered the following address on the development and significance of the Bloomfield engine:-

This year is an important and busy one for historians of steam power because 250 years ago James Watt patented his significant improvement in the design of steam engines. The design initially gave twice the power and three times the efficiency of Newcomen engines. In August we will be commemorating the 200th anniversary of Watt's death in 1819. More significant for today we are standing close to the site of the first commercial engine built to Watt's patent, which started working 243 years ago last Friday. The Bloomfield engine was to drain a coal mine on this site. One trusts that the mineshaft was suitably capped when it ceased to produce coal. The reason for the seven-year delay between Watt's 1769 patent and the building of this first engine was that it took six years for a steam cylinder to be produced which was bored accurately enough to work with Watt's idea. Earlier engines managed with very poorly machined cylinders while Watt's initial tests had been carried out on small scale model engines.

The fact that steam could be useful and that condensing steam could produce a vacuum had been known for some time. In the 1690s Thomas Savery marketed a form of engine which condensed steam in a closed vessel to lift water up and then, with suitable valves, steam under pressure forced the water to a higher level. Available boilers seriously limited the height that the water could be pushed up. Anyone owning a vacuum coffee maker such as a Cona machine, will have seen a very similar useful device.

But the break-through for useful steam engines came after 1700 when Thomas Newcomen, whose business supplied equipment for mines, developed a beam engine where a piston, in a cylinder, was drawn up as the cylinder filled with steam from a boiler. Water was then sprayed into the cylinder, the steam condensed and atmospheric pressure forced the piston down. This raised the other end of the beam which raised the pump rods in the mine shaft, thus lifting the water from the mine. Valves controlled the alternate admission of steam and cold water into the cylinder, together with the draining of the condensate. Because the pump piston could be much smaller in diameter than the one in the steam cylinder, the engine could raise water out of a mine shaft without needing high pressure steam, which was much too dangerous at the time.

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It wasn't long before those working with the Newcomen engines realised just how inefficient they were, but there was nothing better available. Various ideas were tried and the famous engineer John Smeaton did manage to double the engine's efficiency, although his customers seemed incapable of maintaining that performance. We now know that the reason for the inefficiency was that the engine could not cool the steam in the cylinder enough to give greater performance. It was to take a brilliant thought in 1764 by the Glasgow instrument maker James Watt, to separate the steam in the hot cylinder from a cold vessel where it was condensed. The result was that the steam could be rapidly condensed to give a better vacuum and significantly better power and efficiency.

Initially, Watt's developments in Scotland produced results from his model tests to justify a patent in 1769. Watt soon found serious limitations in scaling up his small models to full size engines because the cylinders could not be made accurately enough for his system to work. The funding of the development was taken over by Matthew Boulton, the Birmingham businessman, who brought Watt to Birmingham with the promise that he knew suppliers who could provide suitable components.

The most significant supplier was John Wilkinson, who was already supplying the Royal Navy with canon bored to a greater accuracy than anyone else. Wilkinson could fit Watt's 18inch diameter prototype cylinder into his large canon boring machine and by 1775 Boulton and Watt had the engine running nicely and returning the expected improvements.

Watt wanted to proceed slowly to develop larger and more powerful engines but Boulton, always in a rush, wanted real progress. So, in June 1775 they contracted with Messrs Bentley, Banner, Wallin and Westley, the proprietors of Bloomfield Colliery, to design and facilitate a pumping engine of at least a dozen times the power of the prototype. Mr Watt was just a little unhappy.

Things were better when they heard that John Wilkinson had already redesigned part of his boring machine to machine cylinders up to 64inch diameter to the same accuracy. Bloomfield had already contracted with a steam engineer, Isaac Perrins, to install a large Newcomen engine at the colliery but he agreed to change the project to Boulton and Watt's design. The new cylinder was delivered in August 1775 and work proceeded on the many other components such as the pump to go down the shaft, the separate condenser, valves, pipework and the engine house structure.

Finally, on 8th March 1776 the engine was set to work in public in the presence of a number of scientific gentlemen and representatives of the local newspaper, Aris's Birmingham Gazette. Their report was published on 11th March, stating that the engine had been named 'The Parliament Engine' and including lots of information about the engine design. So we meet here today to unveil a plaque close to the engine's site and to remember the eight significant men who pressed on with this project: Watt, Boulton, Wilkinson and Perris for the engine, plus Messrs Bentley, Banner, Wallin and Westley, who took a real gamble with such untested technology.

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The plaque was then unveiled from beneath a Black Country flag, adorned with the Tipton coat of arms in the centre, to cheering and applause from the assembled crowd of about 35 Tipton Civic Society members and friends, including Irene de Boo, the Project Co-ordinator for the James Watt Bicentenary events.

The reason that the Bloomfield engine was given the name Parliament Engine was due to Watt's petitioning of Parliament to extend the length of his 1769 patent for his invention of the separate condenser, described as 'a method of lessening the consumption of steam and fuel in fire engines.

This was to last for 14 years until 1783, but when Watt went into partnership with Matthew Boulton six years of the patent had already expired. Boulton, being the shrewd businessman, could foresee that the time left would be insufficient to recoup the financial outlay on the development of the engine and so he persuaded Watt to apply for an Act of Parliament to extend the patent for a further 25 years, up to 1800. Despite some opposition the Bill was passed and received Royal Assent on 22nd May 1775.

Therefore, the Bloomfield engine, as the first commercial engine to be sold by Boulton and Watt, was also the first to enjoy the newly extended patent protection granted by Parliament.

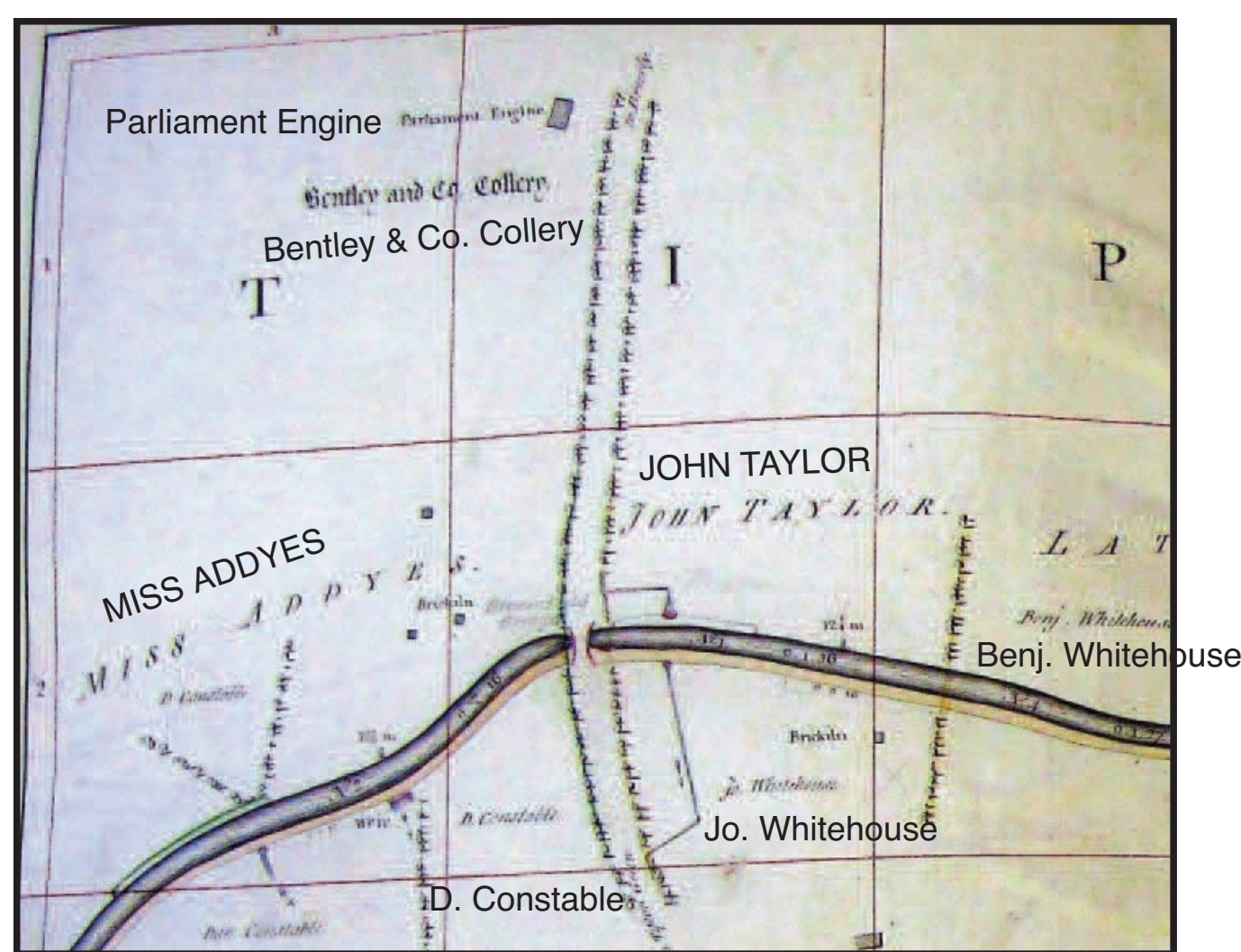
The Tipton Civic Society event marked the third occasion that the Bloomfield engine has been commemorated over the years. On 27th May 1959 a Newcomen Society plaque was unveiled by their President, Lord Northesk, on the site of the British Rolling Mills Limited (the Brymill) in Bloomfield Road, opposite the Angle Ring premises.

The occasion coincided with the opening of new laboratories for the firm and was attended by the Mayor of Tipton, Councillor J W Walters. The Brymill was very conscious of its industrial heritage. Not only was it near to the location of Watt's Bloomfield engine, it also occupied the site of the old Bloomfield Ironworks, where another important but lesser known figure of the Industrial Revolution, Joseph Hall, invented the wet puddling process of making wrought iron in the 1830s. When the Brymill closed in 2005 the Newcomen Society plaque was rescued by the Tipton Civic Society who then persuaded the developer to fix it to one of the new houses built on the site, 2, William Barrows Way, where it can now be seen almost facing the new orange plaque.



Keith Hodgkins (Left), members of the Black Country Society, employees of The Angle Ring Company and James Watt enthusiasts applaud the unveiling of the Plaque for James Watt by Dr Andrew.

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A further point of interest regarding this Newcomen Society visit in 1959 is that Lord Northesk later in the day travelled over to Stourbridge where he unveiled another plaque on Foster and Rastrick's foundry, to commemorate the two famous steam locomotives, the Stourbridge Lion and the Ageron, built there in 1828 and 1829. The foundry was successfully converted to the Lion Medical Centre in 2014 but it seems that the plaque has not survived.

The next commemoration of the Bloomfield engine took place in 1976 when the Black Country Society issued a medallion to mark its 200th anniversary. Two thousand numbered medallions were struck, 1,660 in bronze, 400 in silver and 40 in gold.

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The illustration above indicates the site of the Parliament Engine. Annotation has been added to aid legibility.

An article by Richard Newnham in the autumn 1976 edition of the Black Country Society magazine, the Blackcountryman. The article gave a detailed history of the development of the engine together with the full transcript of the Aris's Birmingham Gazette newspaper report of 11th March 1776.

But it was only about ten years ago that the exact site of the engine was established, thanks to John Hemmingway, the Dudley Borough Archaeologist, who discovered a set of maps of the Birmingham canal dated 1777, in the archives of British Waterways.

The section of the map (opposite left) covering Bloomfield clearly shows Parliament Engine and Bentley and Co Colliery on the west side of Bloomfield Road about 300 yards north of the road bridge over the canal, thus placing the engine firmly on the site of what is now the Angle Ring Company. How gratifying it is to see that modern-day engineering is still being carried on in Tipton on the site of one of the greatest technological achievements of the Industrial Revolution.



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2 William Barrows Way, Tipton is located opposite The Angle Ring Co. The plaque below erected in 1959 in celebration of the location of the First Commercial Beam Engine has been relocated above the front door.



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