Richard Roberts - Prolific Inventor

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By

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Richard Roberts was born in 1789 at Carreghofa in the parish of Llanymynech on the borders of England and Wales where he received only a rudimentary education. However, the local priest, the Rev. Griffith Howell, recognised Roberts' manual dexterity and encouraged the lad to use his lathe and other tools. Roberts made a spinning wheel for his mother and became proficient at wood turning. After labouring in the local quarry, at the age of 20, he found a job as a pattern maker at Bradley Ironworks. Further employment in the Midlands was terminated through being drawn for the Militia so that Roberts sought to avoid this by going first to Liverpool where he could find no work and then on to Manchester.

In Manchester, Roberts was given a job for a short time helping a cabinet maker which he followed by working at lathe and tool-making. But he heard that the Militia officers were still
r$ searching for him so that he walked with two friends to London where he was employed by the
famous engineers, Holtzapffel and Maudslay. He remained in London for a couple of years where he acquired much valuable practical knowledge in the use of the latest engineering tools. There is no doubt that his later development of machine tools was based on the experience he gained from Maudslay.

Roberts had returned to Manchester by l 816 after the ending of the Napoleonic wars when the threat of the Militia had disappeared. He set up his own workshop where one of his first tasks was to make himself a gear cutting machine and a sector to measure the gear blanks accurately. In 1821, he placed an advertisement in the first issue of the Manchester Guardian for an improved gear cutting machine, one of which is preserved in the collections of the Science Museum in London. These machines became a stock line of machine tools offered for sale later.

There are two other of Roberts' machine tools preserved in the Science Museum collections which he built in 1817. One is a centre lathe capable of turning articles six feet long and eighteen inches in diameter. It is fitted with back-gearing which is most likely to be the first of its type. While the saddle can be driven at various speeds through a lead-screw, the motion is too slow
for screw-cutting. Roberts later built special lathes for screw-cutting as well as centre lathes with
rack or screw traverse motions, the latter being capable of cutting screws. These again were
offered for sale in a range of sizes.

The other machine tool built in 1817 was a planing machine. Roberts always claimed that his was the first. While there are other contenders for this honour, he was probably correct and he certainly was the first to offer planing machines as a sales item to other engineers. He realised the potential of such machines for generating flat surfaces at angles in addition to the horizontal. He also adapted it to plane curves and spirals, so making it an extremely useful tool in the engineer's workshop.

The first commercial work of which we have knowledge was making letter copying presses. It was creating their flat surfaces which inspired the origin of the planing machine. Roberts'
ingenuity was stimulated when the Manchester Commissioners for Police asked him to develop a gas meter. He was successful but, through lack of finance, he could not patent it to that it was copied by Samuel Clegg in London. 1818 saw Roberts producing a breech-loading rifled canon for a Mr. Bradbury.

In 1821, Joshua Field, Maudslay's partner, visited Roberts and found him employing over a dozen men in a workshop with lathes, drilling and gear cutting machines as well as other tools. Roberts was building machines for manufacturing reeds for looms based on an American patent. T.J. Wilkinson and Thomas Sharp with two others had formed a partnership and were delighted with the excellence of the machines improved by Roberts. Only a few were made, since the partners decided to obtain their profits from selling the product, the reeds, rather then the machines.

Roberts next turned his attention to weaving and in 1822 patented a power loom. This was financed through a partnership with James Hill. It proved to be a sound design which they decided to produce in quantity themselves. Output may have reached 4,000 a year by 1825. Such a volume needed batch or semi-mass production techniques as well as special machine tools. By this time, Roberts had moved his works to Faulkner Street where he carried on until winding up the Globe Works there in 1852.

On his power looms, pulley and gear wheels had to be secured to their shafts by keys. To cut the slots for these, Roberts introduced his keyway grooving machine in 1824, which was later improved into the more versatile slotter. A blowing engine for furnaces in foundries, like an Archimedean screw, and the first of his punching and shearing machines followed soon afterwards.

In 1825, Roberts patented his first design of self acting spinning mule. Through a strike of skilled mule spinners, some mill owners asked Roberts to make the mule work automatically, but he at first refused. He relented and, but for a disastrous fire at the Globe Works in the summer
of 1825, would have had it running then. It did not prove as successful as hoped but Roberts

designed standard templates and gauges to secure accuracy in its manufacture. These became features in Roberts' later manufacture of other products such as railway locomotives and much more. This idea was quickly copied by others.

James Hill retired in 1826 when the famous partnership of Sharp, Roberts was founded. It was wound up in 1842 after the death of Thomas Sharp. 1830 saw a further patent for the spinning mule which included the intricate quadrant winding mechanism, at last bringing success. It was a brilliant solution to a complex problem which remained little altered and in production for over one hundred years. However it cost a lot to develop and brought little profit to Sharp, Roberts.

Although Roberts had carried out experiments on the friction of railway wagons in 1825, it was probably the opening of the Liverpool & Manchester Railway in 1830 which turned his attention to steam locomotion, on both road and rail. He constructed a steam road carriage capable of carrying 35 passengers. Trials along Oxford Road in the spring of 1834 terminated abruptly when the boiler exploded, injuring some men who had climbed onto the back of the machine.

Roberts' first venture into steam railway locomotives was a little more successful with his "Experiment", which was eventually purchased by the Liverpool & Manchester Railway but was quickly sold on. One fault was vertical cylinders which caused rough riding, something perpetuated on the next three locomotives for the Dublin & Kingstown Railway in Ireland. However, in 1835, more conventional locomotives were supplied to the Grand Junction Railway. These proved to be the first of a successful design of 2-2-2 tender locomotives ordered by many railway companies both in Britain and on the Continent.

Demand for railway locomotives became so great that it could not be met at the Globe Works. In 1839, the newly built Atlas-Works was opened on Oxford Street by the side of the Rochdale Canal. Roberts continued with his standardisation of as many parts as possible so that they could be manufactured on specially designed machine tools. As well as bolt and nut making machines, Roberts introduced shaping machines, plate rolling machines, improved punching and shearing machines. He was in advance of his time by designing tools with rotary cutters similar in principle to modem milling machines for producing his crankshafts, hexagon heads on bolts as well as the oil grooves in bearings. He also had a wide variety of drilling machines and is credited with inventing the radial arm drill. Through all these varieties of machine tools, he introduced much higher standards of engineering.

Up to the end of the Sharp, Roberts partnership, around 246 railway locomotives were produced. It is not clear why Roberts decided to continue on his own at the Globe Works, eventually with other partners. He continued with patenting improvements in the textile sphere for such as combing machines, looms and finishing machines. He invented a cigar rolling machine and presented a paper to the Manchester Literary & Philosophical Society about a design for a floating lightship.

His most famous invention at this period was the Jacquard punching machine ' on which the iron plates were prepared for fabricating one of the tubes of the railway bridge at Conwy. Meters for liquids, turbines, clock mechanisms, and many more inventions were featured in patents during this period. But it was the tubular bridge at Conwy which gave Roberts the idea which was to feature prominently in his business for the last years of his life. He realised that iron ships could be built on similar principles with tubes acting as strengthening girders. He secured a patent in 1852 for a very advanced design of liner to carry 500 passengers which, if it had been built, would have been the largest afloat. The patent contained claims for a wide range of novelties in both merchant and naval ship design. Twin screws capable of being worked independently for greater manoeuvrability were another feature which Roberts advocated.

Roberts became a member of the Manchester Literary & Philosophical Society in 1823. In 1824, he was one of the founders of the Manchester Mechanics' Institution, now the University of Manchester Institute of Science and Technology, and assisted it for many years afterwards. He was proud of his election to the Institution of Civil Engineers in 183 8. In the same year, he was elected to the city council for Oxford Ward in Manchester. In 1839, he was involved with founding the Royal Victoria Gallery for the Encouragement and Illustration of Practical Science which soon failed. He was on the Council of the Manchester Literary & Philosophical Society for many years, eventually being elected an Honorary Member in 1861 after he had moved to London.

Roberts thought he could pursue his nautical interests better in the Metropolis than in Manchester so he left the north sometime in the summer of 1861 and established an office in Adelphi Street. He became an Associate Member of the Institution of Naval Architects. Commander T.E. Symonds helped to promote his ideas. One ship at least, the S.S. Flora, was fitted with twin screws and showed greater manoeuvrability when employed as a blockade runner in the American Civil War.

Whatever wealth Roberts had earned while he was a partner in Sharp, Roberts, he expended it on developing and patenting his many inventions later. Those mentioned here are only a small sample. It was discovered that "poverty was knocking at his door" and his friends began to raise a subscription for him. A request for a civil list pension was rejected. He was looked after by his only. daughter of his second wife who had predeceased him. He had a fall down some stairs from which he failed to recover properly and died in his daughter's arms early in the morning of 11 March 1864.

Roberts has never had a full biography until that now written by Richard L. Hills. He deserves

to be better remembered for the important contributions he made in raising the standards of mechanical engineering through his invention of many machine tools as well as the standard
manufacturing techniques he introduced which were the forerunner of today's production engineering.