= Thomas Brassey =

Thomas Brassey (7 November 1805 ? 8 December 1870) was an English civil engineering contractor and manufacturer of building materials who was responsible for building much of the world 's railways in the 19th century . By 1847 , he had built about one @-@ third of the railways in Britain , and by time of his death in 1870 he had built one in every twenty miles of railway in the world . This included three @-@ quarters of the lines in France , major lines in many other European countries and in Canada , Australia , South America and India . He also built the structures associated with those railways , including docks , bridges , viaducts , stations , tunnels and drainage works .

As well as railway engineering , Brassey was active in the development of steamships , mines , locomotive factories , marine telegraphy , and water supply and sewage systems . He built part of the London sewerage system , still in operation today , and was a major shareholder in Brunel 's The Great Eastern , the only ship large enough at the time to lay the first transatlantic telegraph cable across the North Atlantic , in 1864 .

= = Background = =

The Brassey family traced themselves back to a Norman ancestor from the town of Brécey in Lower Normandy who crossed to England with William the Conqueror in 1066 . Initially their home was at Bulkeley , near Malpas in Cheshire , where they lived for nearly 600 years . At some time , and certainly by 1663 , the family moved to Manor Farm in Buerton , a small settlement in the parish of Aldford , 6 miles (10 km) south of Chester . Thomas Brassey was the eldest son of John Brassey , a prosperous farmer , and his wife Elizabeth .

= = Early years = =

Thomas Brassey was educated at home until the age of 12 , when he was sent to The King 's School in Chester . Aged 16 , he became an articled apprentice to a land surveyor and agent , William Lawton . Lawton was the agent of Francis Richard Price of Overton , Flintshire . During the time Brassey was an apprentice he helped to survey the new Shrewsbury to Holyhead road (this is now the A5) , assisting the surveyor of the road . While he was engaged in this work he met the engineer for the road , Thomas Telford . When his apprenticeship ended at the age of 21 , Brassey was taken into partnership by Lawton , forming the firm of " Lawton and Brassey " . Brassey moved to Birkenhead where their business was established . Birkenhead at that time was a very small place ; in 1818 it consisted of only four houses . The business flourished and grew , extending into areas beyond land surveying . At the Birkenhead site a brickworks and lime kilns were built . The business either owned or managed sand and stone quarries in Wirral . Amongst other ventures , the firm supplied the bricks for building the custom house for the port which was developing in the town . Many of the bricks needed for the growing city of Liverpool were supplied by the brickworks and Brassey devised new methods of transporting his materials , including a system similar to the modern method of palletting , and using a gravity train to take materials from the quarry to the port . When Lawton died , Brassey became sole manager of the company and sole agent and representative for Francis Price . It was during these years that he gained the basic experience for his future career .

= = Early contracts in Britain = =

Brassey 's first experiences of civil engineering were the construction of 4 miles (6 km) of the New Chester Road at Bromborough , and the building of a bridge at Saughall Massie , on the Wirral . During that time he met George Stephenson , who needed stone to build the Sankey Viaduct on the Liverpool and Manchester Railway . Stephenson and Brassey visited a quarry in Storeton , a village near Birkenhead , following which Stephenson advised Brassey to become involved in building

railways . Brassey 's first venture into railways was to submit a tender for building the Dutton Viaduct on the Grand Junction Railway , but he lost the contract to William Mackenzie , who had submitted a lower bid . In 1835 Brassey submitted a tender for building the Penkridge Viaduct , further south on the same railway , between Stafford and Wolverhampton , together with 10 miles (16 km) of track . The tender was accepted , the work was successfully completed , and the viaduct opened in 1837 . Initially the engineer for the line was George Stephenson , but he was replaced by Joseph Locke , Stephenson 's pupil and assistant . During this time Brassey moved to Stafford . Penkridge viaduct still stands and carries trains on the West Coast Main Line .

On completion of the Grand Junction Railway , Locke moved on to design part of the London and Southampton Railway and encouraged Brassey to submit a tender , which was accepted . Brassey undertook work on the section of the railway between Basingstoke and Winchester , and on other parts of the line . The following year Brassey won contracts to build the Chester and Crewe Railway with Robert Stephenson as engineer and , with Locke as the engineer , the Glasgow , Paisley and Greenock Railway and the Sheffield and Manchester Railway .

= = Early contracts in France = =

Following the success of the early railways in Britain , the French were encouraged to develop a railway network , in the first place to link with the railway system in Britain . To this end the Paris and Rouen Railway Company was established , and Locke was appointed as its engineer . He considered that the tenders submitted by French contractors were too expensive , and suggested that British contractors should be invited to tender . In the event only two British contractors took the offer seriously , Brassey and William Mackenzie . Instead of trying to outbid each other they tendered jointly , and their tender was accepted in 1841 . This set a pattern for Brassey , who from then on worked in partnership with other contractors in most of his ventures . Between 1841 and 1844 Brassey and Mackenzie won contracts to build four French railways , with a total mileage of 437 miles (703 km) , the longest of which was the 294 @-@ mile (473 km) Orléans and Bordeaux Railway . Following the French revolution of 1848 there was a financial crisis in the country and investment in the railways almost ceased . This meant that Brassey had to seek foreign contracts elsewhere .

= = = The collapse of the Barentin viaduct = = =

In January 1846 , during the building of the 58 @-@ mile (93 km) long Rouen and Le Havre line , one of the few major structural disasters of Brassey 's career occurred , the collapse of the Barentin Viaduct . The viaduct was built of brick at a cost of about £ 50 @,@ 000 and was 100 feet (30 m) high . The reason for the collapse was never established , but a possible cause was the nature of the lime used to make the mortar . The contract stipulated that this had to be obtained locally , and the collapse occurred after a few days of heavy rain . Brassey rebuilt the viaduct at his own expense , this time using lime of his own choice . The rebuilt viaduct still stands and is in use today .

= = " Railway mania " = =

During the time Brassey was building the early French railways , Britain was experiencing what was known as the " railway mania " , when there was massive investment in the railways . Large numbers of lines were being built , but not all of them were built to Brassey 's high standards . Brassey was involved in this expansion but was careful to choose his contracts and investors so that he could maintain his standards . During the one year of 1845 he agreed no less than nine contracts in England , Scotland and Wales , with a mileage totalling over 340 miles (547 km) . In 1844 Brassey and Locke began building the Lancaster and Carlisle Railway of 70 miles (113 km) , which was considered to be one of their greatest lines . It passed through the Lune Valley and then over Shap Fell . Its summit was 916 feet (279 m) high and the line had steep gradients , the maximum being 1 in 75 . To the south the line linked by way of the Preston ? Lancaster line to the Grand

Junction Railway . Two important contracts undertaken in 1845 were the Trent Valley Railway of 50 miles (80 km) and the Chester and Holyhead line of 84 miles (135 km) . The former line joined the London and Birmingham Railway at Rugby to the Grand Junction Railway south of Stafford providing a line from London to Scotland which bypassed Birmingham . The latter line provided a link between London and the ferries sailing from Holyhead to Ireland and included Robert Stephenson 's tubular Britannia Bridge over the Menai Strait . Also in 1845 Brassey received contracts for the Caledonian Railway which linked the railway at Carlisle with Glasgow and Edinburgh , covering a total distance of 125 miles (201 km) and passing over Beattock Summit . His engineer on this project was George Heald . That same year he also began contracts for other railways in Scotland , and in 1846 he started building parts of the Lancashire and Yorkshire Railway between Hull and Liverpool , across the Pennines .

A contract for the Great Northern Railway was agreed in 1847 , with William Cubitt as engineer @-@ in @-@ chief , although much of the work was done by William 's son Joseph , who was the resident engineer . Brassey was the sole contractor for the line of 75 @.@ 5 miles (122 km) . A particular problem was met in the marshy country of The Fens in providing a firm foundation for the railway and associated structures . Brassey was assisted in solving the problem by one of his agents , Stephen Ballard . Rafts or platforms were made of layers of faggot @-@ wood and peat sods . As these sank , they dispersed the water and so a firm foundation was made . This line is still in use and forms part of the East Coast Main Line . Also in 1847 Brassey began to build the North Staffordshire Railway . By this time the " railway mania " was coming to an end and contracts in Britain were becoming increasingly more difficult to find . By the end of the " railway mania " , Brassey had built one @-@ third of all the railways in Britain .

= = Expansion in Europe = =

Following the end of the " railway mania " and the drying up of contracts in France , Brassey could have retired as a rich man . Instead he decided to expand his interests , initially in other European countries . His first venture in Spain was the Barcelona and Mataró Railway of 18 miles (29 km) in 1848 . In 1850 he undertook his first contract in the Italian States , a short railway of 10 miles (16 km) , the Prato and Pistoia Railway . This was to lead to bigger contracts in Italy , the next being the Turin ? Novara line of 60 miles (97 km) in 1853 , followed by the Central Italian Railway of 52 miles (84 km) . In Norway , with Sir Morton Peto and Edward Betts , Brassey built the Oslo to Bergen Railway of 56 miles (90 km) which passes through inhospitable terrain and rises to nearly 6 @,@ 000 feet (1 @,@ 829 m) . In 1852 he resumed work in France with the Mantes and Caen Railway of 133 miles (214 km) and , in 1854 , the Caen and Cherbourg Railway of 94 miles (151 km) . The Dutch were relatively slow to start building railways but in 1852 with Locke as engineer , Brassey built the Dutch Rhenish Railway of 43 miles (69 km) . Meanwhile , he continued to build lines in England , including the Shrewsbury and Hereford Railway of 51 miles (82 km) , the Hereford , Ross and Gloucester Railway of 50 miles (80 km) , the London , Tilbury and Southend Railway of 50 miles (80 km) and the North Devon Railway from Minehead to Barnstaple of 47 miles (76 km) .

= = The Grand Trunk Railway of Canada = =

In 1852 Brassey took out the largest contract of his career , which was to build the Grand Trunk Railway of Canada . This line passed from Quebec , along the valley of the Saint Lawrence River , and then to the north of Lake Ontario to Toronto . The line totalled 539 miles (867 km) in length . The consulting engineer for the project was Robert Stephenson and the company 's engineer for the whole undertaking was Alexander Ross . Brassey worked in partnership with Peto , Betts and Sir William Jackson . The line crossed the river at Montreal by the Victoria Bridge . This was a tubular bridge designed by Robert Stephenson and was the longest bridge in the world at the time , measuring some 1 @.@ 75 miles (3 km) . The bridge opened in 1859 and the formal opening ceremony was carried out the following year by the Prince of Wales . The construction of the line caused considerable problems . The main problem was the raising of the necessary finance and at

one stage Brassey travelled to Canada to appeal personally for assistance . Other difficulties arose from the severity of the Canadian winter , the waterways being frozen for around six months each year , and resistance from Canadian businessmen . The line was an engineering success but a financial failure , with the contractors losing £ 1 million .

= = = The Canada Works = = =

The contract for the Grand Trunk Railway included all the materials required for building the bridge and the railway , including the rolling stock . To manufacture the metallic components , Brassey built a new factory in Birkenhead which he called The Canada Works . A suitable site was found by George Harrison , Brassey 's brother @-@ in @-@ law , and the factory was built with a quay alongside to take ocean @-@ going ships . The works was managed by George Harrison with a Mr. Alexander and William Heap as assistants . The machine shop was 900 feet (274 m) in length and included a blacksmiths ' shop with 40 furnaces , anvils and steam hammers , a coppersmiths ' shop , and fabrication , woodwork and pattern shops . There was also a well @-@ stocked library and a reading room for all the workforce .

The fitting shop was designed to manufacture 40 locomotives a year and a total of 300 were produced in the next eight years . The first locomotive , given its trial in May 1854 , was named Lady Elgin , after the wife of the Governor General of Canada of the time , the Earl of Elgin . For the bridge hundreds of thousands of components were required and all were manufactured in Birkenhead or in other English factories to Brassey 's specifications . These were all stamped and coded , loaded into ships to be taken to Quebec and then by rail to the site of the bridge for assembly . The central tube of the bridge contained over 10 @,@ 000 pieces of iron , perforated by holes for half a million rivets , and when it was assembled every piece and hole was true .

= = The Grand Crimean Central Railway = =

Brassey played a part in helping the English forces to success in the Crimean War . The Black Sea port of Sevastopol was held by the Russians . The British government , in alliance with the French and the Turks , sent an army of 30 @,@ 000 to Balaclava , another port in a neighbouring bay of the Black Sea , from which to attack Sevastopol . Sevastopol was besieged in September 1854 by the British and allied forces . It was hoped that the siege would be short but with the coming of winter the conditions were appalling and it was proving difficult to transport clothing , food , medical supplies and weaponry from Balaclava to the front . When news of the problem arrived in Britain , Brassey joined with Peto and Betts in offering to build a railway at cost to transport these necessary supplies . They shipped out the equipment and materials for building the railway , which had been intended for other undertakings , together with an army of navvies to carry out the work . Within seven weeks , in severe winter conditions , the railway from Balaclava to the troops besieging Sevastopol was completed . It then became possible to move supplies easily to the front and Sevastopol was finally taken in September 1855 .

= = Worldwide expansion = =

In addition to building more railways in Britain and in other European countries , Brassey undertook contracts in other continents . In South America his railways totalled 250 miles (402 km) , in Australia 132 miles (212 km) , and in India and Nepal 506 miles (814 km) .

In 1866 there was a great economic slump , caused by the collapse of the bank of Overend , Gurney and Company , and many of Brassey 's colleagues and competitors became insolvent . However , despite setbacks , Brassey survived the crisis and drove ahead with the projects he already had in hand . These included the Lemberg and Czernowicz Railway in Austria which continued to be constructed despite the Austro @-@ Prussian War which was taking place in the locality .

From 1867 Brassey 's health was beginning to decline , but he continued to negotiate further

contracts , including the Czernowicz and Suczawa Railway in the Austrian Empire . In 1868 he suffered a mild stroke but he continued to work and in April 1869 he embarked on an extensive tour of over 5 @,@ 000 miles (8 @,@ 000 km) in Eastern Europe . By the time of his death he had built one mile in every twenty miles of railway in the world .

= = Non @-@ railway contracts = =

Brassey 's works were not limited to railways and associated structures . In addition to his factories in Birkenhead , he built an engineering works in France to supply materials for his contracts there . He built a number of drainage systems , and a waterworks at Calcutta . Brassey built docks at Greenock , Birkenhead , Barrow @-@ in @-@ Furness and London . His London docks were the Victoria Docks which had a water area of over 100 acres (40 ha) . The contract for this was agreed in 1852 in partnership with Peto and Betts and the docks were opened in 1857 . Also included in the contract were warehouses and wine vaults totalling an area of about 25 acres (10 ha) . The dockside machinery was worked by hydraulic power supplied by William Armstrong . The dock had links to Brassey 's London , Tilbury and Southend Railway and thereby to the entire British rail system .

In 1861 Brassey built part of the London sewerage system for Joseph Bazalgette . This was a stretch of the Metropolitan Mid Level Sewer of 12 miles (19 km) which started at Kensal Green , passed under Bayswater Road , Oxford Street and Clerkenwell to the River Lea . It was one of the earliest ventures to use steam cranes . The undertaking was considered to have been one of Brassey 's most difficult . The sewer is still in operation today . He also worked with Bazalgette to build the Victoria Embankment on the north bank of the River Thames from Westminster Bridge to Blackfriars Bridge .

Brassey gave financial help to Brunel to build his ship The Leviathan , which was later called The Great Eastern and which in 1854 was six times larger than any other vessel in the world . Brassey was a major shareholder in the ship and after Brunel 's death , he , together with Gooch and Barber , bought the ship for the purpose of laying the first Transatlantic telegraph cable across the North Atlantic in 1864 .

Brassey had other ideas which were ahead of his time . He tried to interest the governments of the United Kingdom and Europe in the idea of a tunnel under the English Channel but this came to nothing . He also wanted to build a canal through the Isthmus of Darién (now the Isthmus of Panama) but this idea similarly had no success .

= = Working methods = =

In most of Brassey 's contracts he worked in partnership with other contractors , in particular with Peto and Betts . The planning of the details of the projects was done by the engineers . Sometimes there would be a consulting engineer and below him another engineer who was in charge of the day @-@ to @-@ day activities . During his career Brassey worked with many engineers , the most illustrious being Robert Stephenson , Joseph Locke and Isambard Kingdom Brunel . The day @-@ to @-@ day work was overseen by agents , who managed and controlled the activities of the subcontractors .

The actual work was done by labourers , in those days known as navvies , supervised by gangers (or foremen) . In the early days the navvies were mainly English and many of them had formerly worked on building the canals . They were later joined by men from Scotland , Wales and Ireland . The number of Irish workers particularly increased following the potato famine . Brassey paid his navvies and gangers a wage and provided food , clothing , shelter and , in some projects , a lending library . On overseas contracts local labour would be used if it were available , but the work was often done or supplemented by British workers . The agent on the site had overall responsibility for a project . He had to be a man of great capability , working for a fee plus a percentage of the profits , with penalties for late finishing and inducements to complete the work early .

Brassey had considerable skill in choosing good men to work in this way and in delegating the work

. Having taken on a contract at an agreed price he would make a suitable sum of money available to the agent to meet the costs . If the agent were able to fulfil the work at a lower cost he could keep the remainder of the money . If unforeseen problems arose and these were reasonable , Brassey would cover these additional costs . He used hundreds of such agents . At the peak of his career , for well over 20 years , Brassey was employing on average some 80 @,@ 000 people in many countries in four continents .

Despite this he had neither an office nor office staff , dealing with all the correspondence himself . Much of the detail of his works were held in his memory . He travelled with a personal valet and later had a cashier . But all his letters were written by him ; it is recorded that on one occasion after the rest of his party had gone to bed , 31 letters had been written by Brassey overnight . Although he won a large number of contracts , his bids were not always successful . It has been calculated that for every contract awarded , around six others had been unsuccessful .

Brassey was given a number of honours to celebrate his achievements , including the French Légion d 'honneur , the Italian Order of Saints Maurice and Lazarus and the Austrian Iron Crown (the first time this had been awarded to a foreigner) .

= = Marriage & progeny = =

In 1831 he married Maria Harrison , the second daughter of Joseph Harrison , a forwarding and shipping agent with whom he had come into contact during his early days in Birkenhead . Maria gave Thomas considerable support and encouragement throughout his career . She encouraged him to bid for the contract for Dutton Viaduct and , when that was unsuccessful , to apply for the next available contract . Thomas ' work led to frequent moves of home in their early years ; from Birkenhead to Stafford , Kingston upon Thames , Winchester and then Fareham . On each occasion Maria supervised the packing of their possessions and the removal . The Harrison children had been taught to speak French , while Thomas himself was unable to do so . Therefore , when the opportunity arose to apply for the French contracts , Maria was willing to act as interpreter and encouraged Thomas to bid for them . This resulted in moves to Vernon in Normandy , then to Rouen , on to Paris and back again to Rouen . Thomas refused to learn French and Maria acted as interpreter for all his French undertakings . Maria organised the education of their three sons . In time the family established a more @-@ or @-@ less permanent base in Lowndes Square , Belgravia , London . They had three sons , who all gained distinction in their own right :

Thomas Brassey , 1st Earl Brassey (b . 1836) became a Liberal MP , Governor of Victoria and was created Earl Brassey in 1911 .

Henry Brassey (b . 1840) was Liberal MP for Hastings . His son was Henry Brassey , 1st Baron Brassey of Apethorpe , a Conservative politician , who was elevated to the House of Lords in 1938 .

Albert Brassey (b . 1844) was Conservative MP for Banbury .

a fourth son died in infancy .

= = Later years = =

In 1870 Brassey was told that he had cancer but he continued to visit his working sites . One of his last visits was to the Wolverhampton and Walsall Railway , only a few miles from his first railway contract at Penkridge . In the late summer of 1870 he took to his bed at his home in St Leonards @-@ on @-@ Sea . There he was visited by members of his work force , not only his engineers and agents , but also his navvies , many of whom had walked for days to come and pay their respects .

When Brassey 's business friend , Edward Betts , became insolvent in 1867 , Brassey bought Betts ' estate at Preston Hall , Aylesford in Kent on behalf of his second son , Henry .

In 1870 Brassey purchased Heythrop Park , a baroque house situated in an estate of 450 acres (1 @.@ 8 km2) 15 miles (24 km) northeast of Oxford as a wedding present for his third son , Albert .

On 8 December 1870 Thomas Brassey died from a brain haemorrhage in Victoria Hotel , St Leonards and was buried in the churchyard at Catsfield , Sussex where a memorial stone has been erected . His estate was valued at £ 5 @,@ 200 @,@ 000 which consisted of " under £ 3 @,@ 200

@,@ 000 in UK " and " over £ 2 @,@ 000 @,@ 000 " in a trust fund . The Oxford Dictionary of National Biography describes him as " one of the wealthiest of the self @-@ made Victorians " .

= = Thomas Brassey , the man = =

It is not easy to be objective about the nature of Thomas Brassey 's character because the earliest biography by Helps was commissioned by the Brassey family and the latest , rather short , biography was written by his great @-@ great @-@ grandson , Tom Stacey . There is virtually no remaining material of value to a biographer available today . There is no private correspondence , there are no diaries and none of his personal reminiscences .

Judging by his achievements alone , he must have been a remarkable man . He had enormous drive , an ability to remain calm despite enormous pressures , and extreme skill in organisation . He was a man of honour who always kept his word and his promise . He had no interest in public honours and refused invitations to stand for Parliament . Although he accepted honours from France and Austria , he mislaid the medals and had to request duplicates to please his wife . His great @-@ great @-@ grandson considers that he was successful because he inspired people rather than drove them .

Walker , in his 1969 biography , tried to make an accurate assessment of Brassey using Helps and other sources . He found it difficult to discover anyone who had a bad word to say about him , either during his life or since . Brassey expected a high standard of work from his employees ; Cooke states that his " standards of quality were fastidious in the extreme " . There can be no doubt about some of his qualities . He was exceptionally hardworking , and had an excellent memory and ability to perform mental arithmetic . He was a good judge of men , which enabled him to select the best people to be his agents . He was scrupulously fair with his subcontractors and kind to his navvies , supporting them financially at their times of need . He would at times undertake contracts of little benefit to himself to provide work for his navvies . The only faults which his eldest son could identify were a tendency to praise traits and actions of other people he would condemn in his own family , and an inability to refuse a request . No criticism of him could be found from the engineers with whom he worked , his business associates , his agents or his navvies . He paid his men fairly and generously .

The Oxford Dictionary of National Biography states " His greatest achievement was to raise the status of the civil engineering contractor to the eminence already attained in the mid @-@ nineteenth century by the engineer " . Walker regards him as " one of the giants of the nineteenth century " .

= = Commemorations = =

None of his three sons became involved in their father 's work and the business was wound up by administrators . The sons created a memorial to their parents in St Erasmus ' Chapel in Chester cathedral . This consists of a backcloth to the altar inscribed to their parents ' memory , and a bust of their father to the north of the altar . The memorial is by Sir Arthur Blomfield and the bust by M. Wagmiller . There is also a bust of Thomas in Chester 's Grosvenor Museum and plaques to his memory in Chester station . Streets named after him in Chester are Brassey Street and Thomas Brassey Close (which is off Lightfoot Street) .

In November 2005 , Penkridge celebrated the bicentenary of Brassey 's birth and a special commemorative train was run from Chester to Holyhead . In January 2007 , children from Overchurch Junior School in Upton , Wirral celebrated the life of Brassey . In April 2007 a plaque was placed on Brassey 's first bridge at Saughall Massie . In the village of Bulkeley , near Malpas , Cheshire , is a tree called the ' Brassey Oak ' on land once owned by the Brassey family . This was planted to celebrate Thomas ' 40th birthday in 1845 . It was surrounded by four inscribed sandstone pillars tied together by iron rails but due to the growth of the tree these burst and the stones fell . They were recovered and in 2007 were replaced in a more accessible place with an information board .

= = Further bibliography = =