

THE BUTTERLEY COAL AND IRON WORKS 1792-1816

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Early history

THE development of the British iron industry in the 18th century was made possible by the work of Abraham Darby and Henry Cort. About 1709 Darby perfected the use of coke for smelting iron ore; and in 1783 Cort patented a combined puddling and rolling process, which allowed the large-scale production of wrought iron with coal fuel. Of great importance also was the introduction of James Watt's steam engine, which after 1769 meant that steam instead of water-power could be used at all stages of iron production. John Wilkinson, one of the pioneers of the modern iron industry, was the first to use steam for furnaces and forge-hammers, and for slitting and rolling iron. He developed coke-smelting in south Staffordshire and north Wales.¹

The Butterley Company was formed in Derbyshire in December 1792 by two civil engineers, Benjamin Outram and William Jessop, a banker and iron merchant named John Wright, and Francis Beresford, one of the many land-owners who invested money in the iron and coal industries. Each partner promised to contribute £6,000, and all agreed that the business should be done in the name of Benjamin Outram and Company. Britain's economic expansion provided the background to this undertaking; continuous population growth, improved communications, new techniques and larger units of production contributed to the development of the industrial revolution and its demands on all branches of the engineering industry.

The Butterley Company records for the period studied — the period of the Revolutionary and Napoleonic Wars — are interesting because they show the organization of a rural firm in the early stages of the modern coal and iron industries. The population of the area increased, but the nearby market-towns of Alfreton and Ripley never developed into large urban centres. The market for the firm's iron goods was chiefly provided by canal companies, collieries, foundries and water-works. Some coal was supplied to local industrialists. Little evidence is given in the firm's records of any care for the welfare of their workers. In fact there seems to have been a desire to keep the workers in their underprivileged state — as far as this could be reconciled

¹ For further information see the following works: A. H. Dodd, *The industrial revolution in North Wales*, 1933; A. H. John, *The industrial development of South Wales 1750-1850*, 1950, and *The Walker family, iron founders and lead manufacturers 1741-1803*, 1951; A. Raistrick, *A dynasty of ironfounders: the Darbys and Coalbrookdale*, 1953; and R. H. Campbell, *Carron Company*, 1961.

with the scarcity of labour. The minutes indicate clearly the labour difficulties: discipline, only partly solved by incentive and deterrent policies; the problem of supervising work, which, as in many 18th-century undertakings, was tackled by the contracting system, where a contractor was responsible for employing his men and working them as hard as he could; and, above all, the need to keep down costs, which meant that piece-rates were often paid.

Benjamin Outram and Francis Beresford had acquired the Butterley estate from Edmund Warren Horne.² The partners described themselves as traders in "getting and smelting Ironstone, Casting and Manufacturing Iron, getting and burning limestone and getting Coal and Slack".³ The indenture gave full liberty to dig mines in the grounds of Butterley and build furnaces, forges, lime-kilns, houses or other buildings necessary for the conducting of trade, provided that no building was erected within 200 yards of Butterley Hall.

The hall was three miles south of Alfreton and one mile north-east of Ripley, formerly a hamlet of Pentrich. In 1789 the chief forms of employment among the inhabitants of Pentrich were coal-mining and the manufacture of stockings.⁴ At this date Alfreton was a market town with about 450 houses in the whole parish.⁵ In 1811, however, Ripley was described as "a very considerable hamlet, which owing to the extensive coal and iron works carried on in the neighbourhood, has of late years experienced a very great increase of population. The iron works at Butterley, belonging to the Messrs. Jessop and Co. employ a great number of hands, while the different collieries find occupation for several more".⁶ By 1830, large-scale industry was in evidence: "At Butterley there are furnaces, a foundery and bar-iron works: at these places, together with the Ormonde, Portland and Heanor collieries; the ironstone mines connected therewith; the Crich limestone quarries and limeworks and the Codnor Park limeworks, there are at present nearly 1500 employed."⁷ This industrialization of the neglected stony, marshy land 10 miles north-east of Derby⁸ was, in the first place, due chiefly to the construction of the Cromford Canal, which made the Trent accessible to the iron works so that the firm was able to compete in a wide market.

Benjamin Outram and William Jessop were among the chief engineers employed on this canal,⁹ which was completed by 1793. It began in the Erewash Canal at Langley Mill and connected with the Nottingham Canal, ending at Cromford.¹⁰ The East Derwent ridge was penetrated by the Butterley tunnel, which was driven in the coal-measures about fifty-seven yards beneath the ridge. This tunnel was lined with bricks; it was nine feet wide at the water's edge, and the crown of the arch was eight feet above water-level.¹¹

² S. Glover, *The history and gazetteer of the county of Derby*, 1833, II, 169.

³ Partnership deed, 1792.

⁴ J. Pilkington, *A view of the present state of Derbyshire*, 1789, II, 240-1. Pentrich had 90 houses; Ripley about 140.

⁵ Pilkington, II, 319.

⁶ D. P. Davies, *A new historical and descriptive view of Derbyshire*, 1811, 329.

⁷ Glover, 1829, I, 231.

⁸ The manors of Ripley, Pentrich and Crich were among those owned by Darley abbey, before its dissolution in 1539.

⁹ J. Farey, *General view of the agriculture of Derbyshire*, 1815, III, 348.

¹⁰ Farey, III, 237.

¹¹ Farey, III, 343; G. G. Hopkinson, "The inland navigations of the Derbyshire and Nottinghamshire coalfield 1777-1856", *D.A.J.*, LXXIX (1959), 22-41.

The Butterley and Somercotes iron furnaces, foundries and works were on the banks of this canal. Two large shafts descended to a recess for boats, adjoining the canal tunnel, through which the boxes of coal, ironstone, limestone and fluor were drawn up for the use of the works, while pig-iron and cast-iron goods were lowered into boats to be sent off by the canal. A steam engine was used to draw up and lower goods.¹² The canal boom of the 18th century was a result, primarily, of the increasing demand for fuel,¹³ and railroads for the transport of coal and iron were laid from the mines to the canals. Iron rails for these tracks formed a large part of the production of the Benjamin Outram Company at the beginning of the 19th century, as did wagons, wheels, buckets and steam engines.

The Napoleonic Wars stimulated the company's output of cannons, but the casting of iron pipes, one of the specialities of the firm, and the production of pig iron were continued throughout the war. According to Farey's list of the iron furnaces in Derbyshire (1806),¹⁴ the Butterley Company produced 1,766 tons of pig iron annually, the highest output on the list. The Griffin Company at Chesterfield was the second largest producer with 1,700 tons. At this time, the Griffin Company had three furnaces while the Butterley Company had two.

The earliest extant record of the company is a cash book, which begins in June 1790. It gives the wages of workers in varied occupations; one of the earliest entries, dated 10 July, reads: "To R. Wainwright for 6 days sorting Ironstone from Pit Hill 15s. od." During 1791, the work included the filling and the sinking of pits, and on 8 November, Benjamin Outram was paid over £15 for "drawing 1,446 tons of coal out of the pits with his horses at 2½d. per ton".

John Wright of Lenton Hall, Nottingham, who provided business and trade experience, came from a family which had been concerned for several generations with the iron business. The family had set up a bank in Nottingham in 1771, but the back part of the banking premises was still used as a warehouse for iron, until there was a removal from Long Row to Pelham Street.¹⁵ As a partner, Wright must have been invaluable, not only for his understanding of the iron industry, but also for his sound financial backing. In 1798 the firm's capital was £32,000: ¹⁶ Beresford had paid £8,000, Outram and Jessop had each given £5,000. Wright, however, had contributed £14,000, and this sum contained two advances of £3,000 which he had made to Outram and Jessop. They were to repay him when they could, and after this had been achieved, they were to be considered equal partners with the others.¹⁷

Benjamin Outram (1764-1805) was well known as an engineer, and he

¹² Farey, III, 340.

¹³ T. S. Ashton, *An economic history of England: the 18th century*, 1955, 74.

¹⁴ "Derbyshire is the fourth English county in its produce of Pig Iron". Staffordshire with 25 furnaces had first place. Farey, II, 397.

¹⁵ T. Bailey, *History of the county of Nottingham*, 1852-5, III, 1256.

¹⁶ The private ledger of Messrs. Beresford, Outram, Jessop & Wright, 1796-1835.

¹⁷ There is no record that Outram ever repaid the loan to Wright; he died intestate, but the administration of his "Goods, chattels and credits" was granted to his widow Margaret. Jessop, on the other hand, repaid the debt in June 1805.

took over the management of the Butterley concern. His wife wrote of him, "My husband, like many other men of great talent and comprehensive and generous mind, was hasty in his temper, feeling his own superiority over others. Accustomed to command, he had little toleration for stupidity and slowness, and none for meanness or littleness of any kind."¹⁸ The letter book (1794-1801) gives convincing proof of his capacity for hard work and his impatient attitude to those whom he considered stupid or misguided. A letter to the Rev. Morewood of Alfreton Hall, 22 October 1796, shows Outram's forthright spirit. Morewood had given an order for a railway from Hermitage Colliery, but when the work was almost completed, a message from the vicar's wife was received which ordered that alterations to the road were to be made. Outram replied that the proposed changes would mean "a bungled piece of work neither profitable to Mrs. Morewood or creditable to us", adding that he would dispose of the almost completed rails and wagon wheels elsewhere rather than produce an "imperfect road".

Outram was educated as a civil engineer, and his fame lies in his use of iron railways for colliery traffic.¹⁹ He was a firm believer in the quality of the railways made at Butterley, as the statement from a letter of 1 May 1795 to J. Radford of Smalley shows: "I have seen the Railways near Coalbrookdale last week where they have every sort of Waggon Road that has yet been put in use and I am convinced ours is preferable to any of them." Outram's health was bad, and, in 1796, he handed over some of his responsibilities to his brother Joseph. The nature of his illness was disclosed when he wrote to the Rev. Wilmot of Morley on 26 September 1796: "I am yet so infirm of the Rheumatism that I dare not venture on a journey to Morley." Yet, in spite of illness, Outram continued to take an active part in the business, until his death at Butterley Hall in 1805.

William Jessop (1745-1814), the other engineer in the company, had a wide knowledge of the many uses to which iron could be put. He worked with Telford in the building of the Ellesmere Canal, and helped with the construction of the cast-iron aqueducts on that waterway.²⁰ He was also associated with Telford in the building of the Caledonian Canal. His practical talents stimulated the industry at Butterley.

Of the fourth partner, Francis Beresford, little is known. There is no evidence that he played an active rôle in the business; it was probably through his friendship with Benjamin Outram, and the marriage of his daughter Elizabeth to John Wright, in 1791, that he had become involved in the enterprise.

Labour

One of the company's most urgent needs was an adequate supply of skilled workers. This was a problem encountered by all the early industrialists whose factories were in country districts. Even when the workers had been hired,

¹⁸ M. F. Outram, *Margaret Outram 1778-1863*, 1932, 101.

¹⁹ *D.N.B.*

²⁰ S. Smiles, *Lives of the engineers*, 1862, II, 340-2.

there was always the danger of the "seduction of labour". The letter book contains several accounts of the unscrupulous methods used by employers to obtain skilled workmen from other firms. In 1798, Butterley wrote to the Raby Company at Dale Furnace, saying that Booth, a workman of Raby's, had tried very hard to persuade their moulders to enter Raby's service, and declaring that his "Temptations" had created dissatisfaction among their men. The letter concluded by stating that "William Matthews" had left them and was now employed by Raby's "in consequence of Booth's intreaties".

Occasionally, the partners had to answer charges that they were guilty of similar conduct, and a letter of 20 June 1801 to the Longdon Chambers Company was a denial of such behaviour. They claimed that their agent had orders "not to apply to any who were under engagement". They had employed a moulder from Sheffield only on the understanding that he was "out of employ", and no "undue influence by intoxication" had been exerted on him.

This competition for labour made it important for the workers to be under contract to their employers, and at Butterley these agreements were for varied terms: the maximum period was eight years (for some apprentices) and the minimum one year. The company's agreement book (1800-1816) gives some interesting examples of the conditions of employment which were laid down. The first agreement was that of a smith, Charles Southern of Butterley, who, in 1800, bound himself for five years, for the monthly sum of £4. In addition to his wages the company undertook to provide him with a shop for himself and his assistants, and to let him have a house and fuel, free of charge. The conditions for tenants of the company's houses were set out in a memorandum. The occupier was to keep the house, windows and garden in good repair, and in default of this money for the repairs was to be deducted out of earnings. The tenant was to be given one month's notice. If at the end of this time he refused to leave, he could be dispossessed or (at the firm's discretion) permitted to remain at a rent of 10s. per week. Some employees paid a nominal rent for these houses. Joseph Savage, a keeper of the furnaces from 1808-1813, was to be provided with a house at the weekly rent of 1s. 6d., and at a charge of 1s. he was to have "necessary fuel".

An agreement for one year was contracted by Samuel Roberts, a keeper of the furnaces, on 16 December 1802. In it, a clause was inserted, which said that Roberts engaged: "to keep himself sober and to be diligent and attentive to his duty or if ever found in liquor or asleep when he ought to be at work to forfeit five shillings and also one shilling for every charge that may be lost at the furnaces by his neglect". Heavy fines were a common method of maintaining discipline at this period, and forfeits were mentioned in several other agreements. Half of the money from these forfeits went to the Sick Club.

An example of the company's paternalistic attitude was the savings scheme sometimes imposed on the workers. J. Bailey, a moulder employed from 1806 to 1813, made the following promise: "And as a guarantee for the due per-

formance of this his agreement he engages to leave in the hands of the said B. Outram & Company the sum of 1s. per week till the expiration of this agreement at which time he shall be repaid with the addition of 6d. to every 1s. as reserved."

The agreement book contains occasional lists of general rules for the conduct of certain kinds of workers. There were those for the loam and dry sand moulders, and those for the men who worked at the lime-kilns; all of them suggest that the workers were being conditioned to accept their place in a disciplined, hardworking labour force. That the rules were broken seems clear from the forfeits which were imposed: 2d. per day was the fine for leaving a box or tool out of place; and "neglect of work" was punished by a levy of 1s. 11d. per hour on the master workman, and of 4d. per hour on his assistants. Some of the tools had to be provided by the men, but they were given an allowance of one shilling in the pound for this purpose. This sum was also to cover any repairs which became necessary.

The rules for working the lime-kilns at Amber Wharf (1803) stressed the company's desire for good business relations with customers: "The exact measure to be delivered to all buyers without partiality. Each customer to be served in turn and agreeable to promise. Engagements to be punctually kept." The daily duties of the lime-burners included the cleaning of the holes and yard; and they were responsible for the kilns, which were to be "well filled, regularly drawn and kept in the best possible order".

Many agreements were made with the "ironstone getters". On 23 June 1802, for example, two men agreed to work a "deep ironstone pit", called Furnsworth Rake in Codnor Park. Their task was to transport the "ironstone" for a distance of 120 yards, and to lay the necessary railways from the pit to the canal. All labour, tools and timber, required for this operation, were to be provided by the men.

The firm's apprentices were usually bound for seven years. George Frost's agreement was typical of many others. He was to be taught the "Art and Business as relates to Blacksmith work, Turning and Fitting up so far as generally practised from time to time in their respective Shops", and the company engaged to give him a maintenance allowance to cover his board and lodging.

Most of the workers came from nearby parishes like Codnor, Pentrich, Ripley, or Alfreton; but some came from Derby, Chesterfield, Sheffield, and even from Bridgnorth and Walsall, which shows that there must have been a fair amount of exchange of labour among these industrial centres. This mobility, however, was often hindered by the indebtedness of the workers to their employers, as several of the letters reveal. A letter of 11 April 1801 to Bradley and Warren of Goscoat Foundry, Walsall, shows how this obstacle to immigration was sometimes tackled by the Butterley Company. They wrote that one of their moulders had formerly been with this firm and that he claimed he could not "remove his family until some debts that he had contracted were paid". Butterley suggested that this worker should "deposit ten shillings per month out of his wages in our hands" until the "just

demands'' were paid. The company offered to guarantee this payment. This practice of having advances was of little advantage, in the long run, to either side.²¹ For the employer it involved a waste of time in keeping accounts for small sums, and for the worker it meant that he lost his independence.

Benjamin Outram, in common with other industrialists of his time, adopted a severe attitude to workers who were in debt. On 18 November 1800 he wrote to the ironfounders at Low Moor about a workman who had just come from there: "He has acted very imprudently in taking a Cart purposely for his goods and family — which might easily have come by a Stage Waggon. He has incurred 5 times the expense his goods are worth for I think their value would not exceed 30 shillings — his Stoppages on this Account will keep him poor, but it certainly is but justice he should pay his old Arrears first — I will thank you therefore for the particulars of what he owes you and I will stop it of him. I wish for the particulars — as on questioning him he (like all others who have left a place) says he owes nothing."

The usual number of hours worked per day, for six days a week, was twelve, but many of the keepers and fillers at the furnaces worked twelve-hour shifts, which meant that, in their turn, they had to work through the night, and that these men had a seven-day week.

Wages, in comparison with those paid to workers in cotton mills,²² were high. A filler, in 1802, earned an average wage of 14s. per seven-day week; and a bonus of "fourpence for every Ton of best Grey metal more than sixty Ton per week" was given to stimulate output. Colliers were paid piece-rates: in 1803, those of Codnor Park were to be given 3s. 6d. for every ton of 25 cwt. of coal, and 1s. 9d. for every 25 cwt. of slack. In the event of their producing less than 75 tons in any one week, they were to forfeit 3d. on every ton below this amount; but if more than 75 tons were produced, they were to receive a bonus of 3d. for each extra ton. In 1805 and 1806 an engine-tender keeper, William Worrall, received 17s. 6d. per week, and paid a rent of 2s. per week for a company house. The wage rates for coke burners were usually left to the discretion of the master workman, who was paid a sum large enough to cover the wages of his assistants. On 21 October 1800 Timothy Green engaged to find enough assistants to coke the coal that was needed for the Butterley furnaces. His monthly wage was to be nine guineas, and the contract was for five years. Apprentices' wages, in most cases, started at 6s. per week, but a rise of one shilling per week was given annually until the end of the apprenticeship.

A uniform standard of wages was generally adopted by neighbouring firms, and the competition for skilled labour prevented differences from developing. On 15 January 1797 Benjamin Outram wrote to the Smith Company, the Griffin Foundry, Chesterfield, as follows: "Shall take it as a favour if you'll say what are at this time your general prices to workmen for Loam Dry Sand and Green sand as we are informed you have advanced them lately and our

²¹ T. S. Ashton, *An eighteenth century industrialist, Peter Stubs of Warrington 1756-1806*, 1939, 36.

²² Many of these workers, of course, were women and children, and often only a small proportion of the wage was paid in cash, the remainder being in the form of rent and goods.

men talk of it." On the same date James Woodhouse replied for the Butterley Foundry to a Mr. Lister, whose address was not given, setting out for him the wages given to moulders and thanking him for finding suitable workmen: "Dry sand work" was to be paid at the rate of 18s. to 22s. 6d. per ton, "Elbow and Branch pipes" at 10d., "Most sort of loam work" at 2½ guineas per ton. There was to be "constant work" and wages were to be "One Guinea per week when not by bargain work". Only "good hands" were wanted, and each could have a "House, Garden and land to keep a Cow on easy rents" if they wished.

Not all wages, however, were paid in cash. The strain of the war between France and England, which had broken out in February 1793, had led to a crisis in the circulation of bills and a shortage of cash, and during this year, and the two following years, Benjamin Outram was sending out urgent demands for payment to other firms. In 1797 the suspension of cash payments by the Bank of England led to another crisis in industry, and the following letter shows the firm's great need of cash:

Butterley Foundry August 29, 1797.

"Sir,

I must earnestly request you'll favour us with a remittance of £300 on the Peak Forest Canal Co. Account on or before the 11 September. Please direct to Butterley Foundry near Alfreton. Demands are pressing and Cash very scarce. We hoped to have received a remittance your last pay day but now trust to it entirely."

Many industrialists overcame the difficulty of finding cash for the payment of wages by issuing token coins,²³ and many, including the Butterley Company, made use of tickets which could be cashed, at the firm's shops, in exchange for provisions. The ledger (1793-1801) contains the following account, headed "Tickets to Shops":

1799 Nov. 12	To Tickets issued this day	.	£40	0	0
1800 Jan. 6	To " "	.	£224	5	0
Dec. 9	To " "	.	£260	0	0
1801 Sept. 18	To " "	.	£227	10	0
Oct. 14	To " "	.	£297	10	0
Dec. 21	To " "	.	£475	0	0"

Markets

Many of the orders received by the Butterley concern came direct from iron foundries, forges, canal companies and iron, cotton or china manufacturers; but some of the firm's output was disposed of through merchants and factors.²⁴ Customers for Butterley's pig iron included Samuel Hopkins of Rugeley Forge, Staffordshire, Luke Abbot of Mansfield Foundry, Todd and Campbell of the iron foundry, Hull, and Wigger and Graham, of Thames Street, London.

The Butterley estate, in the beginning, provided most of the firm's ironstone and some of its coal. By 1800, the coal and ironstone mines of Codnor

²³ T. S. Ashton, *An eighteenth century industrialist*, 121.

²⁴ One iron merchant the firm dealt with was Mr. Raby, of Steel Yard, London.

Park, $2\frac{1}{2}$ miles to the south-east, were being worked by men employed by the company, but even in the early period (1792-1799) output was expanding fairly rapidly, as the following entries in the ledger show:

"By Mine Rent of 675 tons of Ironstone got up to April 1792	£33. 15s. od.
By Mine Rent of 1,303 tons of Ironstone got from April 1792-July 1793	£65. 3s. od.
By Mines Rents of 906 tons of Ironstone from July 7 1793--August 11 1794	£45. 6s. od.
By Mines Rent of 1,620 tons of Coals raised in the same period	£54. os. od.
By Mine Rent of 3,035 tons 11 Cwt. of Ironstone got in Butterley Estate from April 1 1797-April 1 1798	£151. 15s. 6d.
By Mine Rent of 8,620 tons 10 Cwt. of Coals raised in the same period at 8d.	£287. 7s. od."

Unlike the manufacturers on the South Wales coalfield, who specialized, at first, in the production of capital goods rather than in goods requiring craftsmanship,²⁵ the Butterley Company produced pipes, rollers, wheels, cylinders, shafts, steam engines and weighing machines, as well as cast-iron rails and wagons. The canal companies were responsible for a large part of the orders for rails and wagons, for almost all acts of Parliament authorizing the building of canals contained provisions for making railways to link nearby collieries with the waterways.

The act of Parliament (1793) for building and maintaining the Derby Canal from Swarkeston Bridge, through Derby to Little Eaton, with a branch joining the Erewash Canal near Sandiacre, contained provisions for making railways from the canal to several collieries in Denby, Horsley and Smalley. Benjamin Outram was the engineer for the railway from Little Eaton to Smithy Houses in Denby; but at first (1793) rails were supplied by Joseph Butler of Chesterfield.²⁶ Later, rails were sent from Butterley, and on 1 November 1799 20 road rails, of a total weight of 7 cwt. 1 qr. 22 lb., costing £4. 9s. 4d., were sent to the Derby Canal Company, probably for the purpose of repairing the railway.

Rails were also supplied to the Ashby de la Zouch Canal Company (1794). The principal object of this canal was the carrying of limestone from Ticknall and Cloud Hill, and coal from the Ashby coalfield.²⁷ The act authorizing the construction of the canal contained a clause, which gave discretion to convey traffic by "rollers, inclined planes or in any other manner than by water"; and, after some disagreement, the general assembly of the company approved Outram's report in which he advocated the substitution of tram-roads for the branch canals on 1 April 1799.

Outram recommended double-line railways on a gauge of 4 ft. 2 in., and

²⁵ A. H. John, *The industrial development of South Wales 1750-1850*, 1950, 98.

²⁶ M. Fryar, *Some chapters in the history of Denby*, 1934, 118.

²⁷ Farey, III, 297.

he suggested cast-iron rails in 3-ft. lengths, weighing 35 lb. (38 lb. at public road crossings) spiked to octagonal oak plugs centred in stone sleepers of not less than 150 lb. each. His estimate for complete construction was £29,500. In 1799, however, financial difficulties developed. The company's committee had agreed to Outram's estimate on 17 February 1800, but on 24 July a request was sent by Butterley for a remittance of £100 before 12 August. The reason for the low state of the canal company's finances was the failure of some of the proprietors to pay their deposits; and in a letter of 8 December 1800 Outram again asked for a remittance, pointing out that "otherwise the hardship falls upon us who are not to blame and have had no notice of such a stop". He ended the letter by making the following statement: "If in future we cannot have remittances regularly shall be glad if you will give us a month's notice thereof that we may be prepared."

The shortage of capital affected the progress of the tramroad construction, and when completed the work was found to be deficient: the most damning report was that of Christopher Stavely, dated 6 July 1803.²⁸ This report was especially critical of the poor drainage which had caused settling of embankments and slips in the cuttings, resulting in the distortion of the track.²⁹ The company refused to make further payments to Outram, and the matter was settled by lawsuit. Thereafter all rails required for the tramroads were obtained from Lord Moira's foundry at Moira.³⁰

An agreement similar to the one regulating the railways made for the Ashby Canal Company was entered into with the Trent and Mersey Navigation Company on 6 August 1802. The first clause of the contract was as follows: "The said Benjamin Outram and Company engage to make and provide for the said Company 16,000 Rails of cast iron to the pattern agreed upon. Each Rail to be 3 feet in length and to weigh on the average 34 lbs. of the stoutest metal."

Some of the earlier railways in Derbyshire, and the adjoining counties, were of wood, and in the use of these the flange was not on the rail, but on the wheel. The flanges of the iron railways, however, were at first cast on the bars, the wheels being left free, so that the wagons could be used on ordinary roads.³¹

The construction of an iron railway involved the following operations, which were laid down in the Butterley Company's specification for the proposed railway at Marple in Cheshire:

"To be formed 6 yards wide and effectually drained. To be covered with small broken stone for 4 yds. in breadth and 6 ins. thick.

The sleepers to be blocks of stone as on the Peak Forest Railway. The spaces between the Sleepers or Blocks to be filled with small stone or gravel to make with the first stones 12 ins. thick between the Iron Rails.

²⁸ Joseph Wilkis and Robert Charles Greaves (two members of the Canal Committee) inspected the work first as the result of a Committee minute of 11 November 1802 ordering "that the railways be inspected to see if they are completed".

²⁹ Christopher Stavely was a surveyor on the Leicester Navigation.

³⁰ John Warner and George Parramore produced another report as a result of a minute of 22 March 1803.

³¹ Fryar, 118.

The Rails to contain full $\frac{3}{4}$ of an hundred wt. of the stoutest cast Iron to each yard in length of Road to be capable of bearing Waggon loaded with 5 tons but to be commonly used with Loads from 30 to 45 cwt. each. The Plugs to be heart of Oak 6 inches by inch and half. The spikes to be of Tough beaten Iron equal in length and strength to those on the Peak Forest Railway.

The Gates already prepared to be hung across the road at the division — Fences where necessary."

The estimated cost of this work was £2,720. The object of the inner upright flange on the bar was to keep the flat wheels of the wagons on the track,³² but as the flange caused difficulty where a road was crossed, William Jessop reintroduced the flanged wheel which became universally adopted.³³ The wagons used on these railways consisted of an undercarriage with four wheels which carried the box containing the substance to be conveyed. The boxes were open at one end to make loading easier, and the contents were secured by chains tightened with a lever and link fastener.³⁴ The customers for wagons made by the Butterley Company included John Lees of Fairfield, near Manchester, and John Walker of Marston Park, near Ashbourne. J. Rennie, the engineer, of Blackfriars, London, also sent orders for wagons, and the type made by the firm was described by letter on 30 April 1801. Those they usually made were 4 ft. 2 in. wide; "the Beds for the axles" were "3 ft. assunder from Centre to Centre" and the length of the "Bodies or Boxes" 5 ft. 6 in.; 6 ft. if for transporting stone. If the wagons were for "a variety of materials", Rennie could not have "a better size than the above mentioned".

Rennie was one of Butterley's customers for cast-iron pipes, but a continuous demand for pipes came from the companies who owned collieries, water-works, foundries and canals. In 1795 the Nottingham Canal Company was supplied with pipes, as was the Cromford Canal Company in 1798. On 28 April 1798 the following order was sent to Jones and Company of Werneth Colliery, near Manchester:

	T.	C.	Q.	lbs.	£	s.	d.
"No. 12 Plain Pipes 7 $\frac{1}{2}$ Inch. diam.	3	1	0	23	44	7	5
1 Working Barrel 6 In. diam. bored	0	4	2	2	5	17	5
1 Clack door Pipe sent bored	0	5	1	12	4	16	6
1 Clack door to fit	0	2	0	13	1	9	7
1 Windbore Pipe 7 $\frac{1}{2}$ In. diam.	0	5	0	10	4	11	8"

And on 1 September 1798 Bedworth Colliery was supplied with a similar order. Pipes were sent to John Foulds of the London Bridge Water Works. A letter of 3 October 1799 set out the cost, and showed the company's eagerness to build up a trade connection in London. The pipes were to be delivered at the cost of £14. 10s. per ton. The other prices included £20 per ton for "pump barrels or cylinders of any diameter bored", and 6d.

³² Fryar, 118.

³³ Fryar, 120.

³⁴ Fryar, 118-9. In Outram's "Minutes to be observed in the construction of railways" (Appendix C, Outram, 352), he states that in underground works where only very small wagons could be used, very light rails were used, forming the so-called tram roads. These tramways were first laid down by John Curr, about 1774, for the duke of Norfolk's collieries at Sheffield.

per lb. for "wrought iron foundry pipes". They wrote that their situation afforded them "very good communication with the port of London", enabling them to offer as "good terms as from any other place in the kingdom". Foundries which ordered pipes from Butterley included Cossall Company and the Iron Foundry of Cort and Company at Leicester.

At an early period the company manufactured steam engines, and correspondence with Gorton and Thompson of Cuckney, near Ollerton, on 21 February 1799, showed that the terms of the steam-power age might still be unfamiliar to some of the customers. Their price for a four horse-power rotation engine "including House and all Materials" was £200. An eight horse-power rotation engine cost £520. "Horse-power", they explained, "is what 4 or 8 Horses would do night and day constantly".

Orders for weighing machines, for use at the toll-gates on turnpike roads, were received at Butterley, and on 26 November 1796 Robert Parker of Manchester was sent a description of the machines they were prepared to make. One, weighing from "5 tons downwards", they would deliver at Manchester along with a "person to fix and adjust it for Forty Guineas exclusive of the Masonry and Timber work".

Wheels were supplied to railway and canal companies. In March 1798 the Marple Railway in Cheshire was provided with a number of wheels and axles; and on 15 March 1802, 60 wheels and 60 axles were sent, from Butterley, to the London Dock Railway Company. In 1798 and 1799 the Derby Canal Company and the Cromford Canal Company were customers for wheels.

During the Napoleonic Wars the Butterley Company, unlike the pacifist Coalbrookdale Company, took part in the profitable trade of making cannon for the government and for merchant shipping.³⁵ The two kinds of cannon produced were described to Dickinson, Mallett and Shore, who were merchants of Birmingham. A letter of 1 April 1799, addressed to this firm, makes it clear that Butterley was in search of new trading connections, in the West Indies and elsewhere. They enquired which type of cannon the firm wanted: "Those used by Government are bored out of the solid and turned on the outside. Those for Merchant service are seldom finished in that stile, generally not turned and often cast with Cores, to reduce the expense of boring". Butterley said they were engaged on "some Cannon 14, 6 and 9 pounds for the Liverpool market". Hitherto, they added, they had been chiefly employed in the home trade, but they had extended their works, and were prepared to "make all Articles used in the Sugar Islands or any other Articles for the Export Trade". Their metal, they said, was of "very superior quality and strength". In the early 19th century the home trade continued to be of far greater importance than the export market. But by 1830 large quantities of steam engines, sugar mills and machinery were being exported to the West Indies and to Mauritius from the Butterley works.³⁶

³⁵ Most of the guns were disposed of through John Watson of the Iron Foundry, Liverpool.

³⁶ Glover, I, 231.

For the early period there is no evidence that the company issued printed price-lists of their products, but it is likely that they adjusted their prices to those fixed by other manufacturers. The inside cover of the day book (1798-1803) contains the printed price-list of "Cast Iron Goods at Thomas Fletcher's Old Foundry, Scotland Bridge, Manchester, 1 January 1801", so it is probable that this was used as a guide, although in the iron industry it was difficult to achieve a standardized product. As Benjamin Outram's brother wrote in a letter to Cort and Company on 6 May 1799, "the price of goods chiefly depends on the weight, size and workmanship of them". However, the list gave the prices, per hundredweight, of cylinders, barrels, pipes, wheels and boilers.

In the letter to Cort and Company, mentioned above, it was stated that a discount of 10 per cent, for money payment, was given to founders and wholesale dealers; but otherwise the discount was 5 per cent for ready money. Sometimes a 5 per cent discount was given if a draft at 6 weeks was remitted immediately to the company, and Joseph Bornes of Old Trafford was told in a letter of 5 September 1800, "Good Bills at two months delivery to be considered cash".

The bill of exchange was the commonest form of payment at this time. It had a wide circulation, as many traders made payments by bills which they had received themselves.³⁷ Some of the letters from Butterley indicate that a "Good Bill" was not always forthcoming. On 22 January 1796, for example, J. Outram wrote the following note to William Davenport of Mansfield Foundry:

"Sir,

Your favour of the 19th Inst. inclosing a draft on Rob. Wade value £42. 18s. od. was duly received. We will do our utmost endeavours to get its Value from the person upon whom it is drawn but as he is far from being a responsible person we dare not venture at present to give Mr. Abbot credit for the amount in his Actt."

The usual credit given by the Butterley Company was three months, from the time of delivery, and this was maintained fairly constantly, although some firms were allowed extra time for payment. A discount of 2½ per cent was given for a bill at two months, if it was sent on delivery of the goods, and this discount was given if the customer sent a money payment after two months' time. Benjamin Outram had often to remind customers that remittances on their bills were due, and on 13 July 1801 five letters were sent out similar to the one, which follows, to Kirby and Company:

"March 26 To 10 Tons best grey pig iron at £10 100 0 0

If remittance for above not sent, amount to be paid to Mr. Outram on Thurs. evening next, when he will be at the Bridgewater Arms, Manchester."

The Butterley Company were themselves customers of some firms. As already stated, they bought bar iron, shovels and spades from the Thorne-wills at Burton-on-Trent, but they also bought bars of iron from Lloyd and Company, Birmingham, from Lowe and Ward, Makeney Forge, and from

³⁷ Ashton, *An eighteenth century industrialist*, 105.

Wright and Gelsthorp, whose address was not given. An order for 3 cwt. of blister steel, and $\frac{1}{2}$ cwt. of "best cast steel" was sent to the firm of Benjamin Huntsman³⁸ in Sheffield on 21 August 1797, but no regular trade with them can be traced. An anvil-maker called Alsop, of Sheffield, supplied the firm with anvils and bellows in 1797, and James Fox, of Derby, made the axles for some of the wheels made at Butterley. This is indicated in a letter to Mrs. Morewood of Alfreton Hall, dated 24 October 1796: "We have several sorts of Waggon Wheels cast that will be suitable for your road and if you chuse I will order the man who bores them and makes the Axles for us (J. Fox of Derby) to make Axles and fit them up for you."

As well as being ironmasters, the Butterley partners had always been coalmasters, and although much of the coal produced was used in the company's foundries, forges and lime-kilns, a considerable sale of coal to manufacturers was developed.³⁹ Duesbury and Kean, manufacturers of china at Derby, were among Butterley's customers for coal, and on 15 January 1798 "a barge of Coals of different sorts by way of sample" was sent to them. It was hoped that a contract for 1,000 tons per year would follow when the samples had been examined. The different kinds of coal which were sent were as follows: "Berrys hard, 10s. per ton, Berrys Minge, 10s. per ton, Berrys Soft, 8s. 6d. per ton, and Berrys Good Slack, 7s. per ton." Coke was sold to the Collinghams of Sutton-on-Trent, near Newark, but a dispute over coke measures arose with this firm. J. Outram, however, wrote on 29 September 1798 and vindicated himself by stating, "I have examined all the Coke Measures at the different Collieries on the Erewash, Nottingham and Cromford Canals and find ours as large as any of them so am afraid if they have not measured out well some nefarious practice has been imposed". Davison and Hawksley, of Arnold Mill, bought coal from Butterley, and their coal account for May 1799 amounted to £90. 7s. od.

James of Nottingham made enquiries about the possibility of being supplied with coal from Butterley, but in his reply, written on 20 April 1801, Benjamin Outram said, "At times like the present 'tis unsatisfactory to attempt a contract. For coals I am convinced cannot be long afforded at the present price some are delivered for at Nottingham and you would not perhaps think well of us asking you what we know is a fair price". As a satisfactory solution, Outram offered to sell to James at the market price, provided that it was never lower than 9s. 6d. per ton, or to contract with him for two or three years at 10s. per ton. In both cases there would be an additional charge of 3d. per ton for carriage.

Coal from Hermitage Colliery, which belonged to the Morewoods of Alfreton, was taken by Butterley as payment for wagons and rails made for this colliery, but this arrangement came to an end in January 1797, as the result of a disagreement. Benjamin Outram ordered his boatmen to "take no more

³⁸ Benjamin Huntsman (1704-76) was responsible for the discovery of the crucible process of refining iron.

³⁹ Many ironmasters turned coalmasters, e.g. the Dowlais Company, and the Botfields in Shropshire. See *The development and organisation of the British iron industry 1815-67*, an unpublished thesis by Alan Birch, of Manchester University, 174.

Coals from Hermitage Wharf but to load where their custom [would] be acceptable", declaring at the same time that there was not "another Colliery in the Kingdom but would be glad to pay their Foundry Bills in Coals".

A letter of 30 April 1801 to Champman and Company, manufacturers of ropes in Newcastle upon Tyne, throws light upon the working of some of the pits at this period. They wrote that the usual depth of their pits was from 40 to 60 yards. The weight drawn by the ropes was "sometimes as much as 12 or 14 cwt.", although they tried to limit them to a maximum of 7 cwt. The ropes were generally about two inches thick, and a "Pair of Ropes turning on the average 30 tons per day" would last a year or longer. Butterley stated that they were chiefly working on a "thin bed of coal", from which not more than 5 cwt. was drawn. The ropes for this work were of "good hemp 1½ dia." and they turned an average of 20 tons a day. Their "corf" was very light, being "merely a frame to confine the coals upon". They turned with "the steam whimsey and the common horse gin".

In 1794-5 the output of coal from the Butterley estate was 7,785 tons, and from April to November 1797, 5,100 tons were produced. But in the statement book (1814) the Codnor Park Colliery, which in 1796-7 produced only 200 tons, had an output of 16,387 tons of "hard coals" which were sent to the cokehearth, whereas the Butterley Colliery sent only 59 tons to the cokehearth, 2,795 tons to the blast engine and 169 tons to burn ironstone.

Many of the company's workers had free fuel as part of their wages, and in 1814 the value of the coal used at the houses at Butterley was assessed at £42. 7s. 4d. Some people, however, preferred free rent to free coal, and "½ amount of Rent of Houses in lieu of Coals" amounted, in 1814, to £127. 1s. 7½d.

The Butterley Company also built up a trade in limestone and lime which they acquired from their quarries at Crich. Some of the limestone was used at Butterley furnaces as a flux which would increase the fluidity of the iron ore, but their other customers included merchants, farmers, and owners of foundries. Some of the farmers owned land, or were tenants of land, near the Nutbrook Canal, and on 16 September 1796, Benjamin Outram wrote to Harrison, a member of the Nutbrook Canal committee, to put forward a claim for reduced tonnage rates for lime. His argument was that the lime would improve the estates if it could be carried at a low tonnage in "full water time" or by "Boats that take Coals back". Farmers would then lay in their store in winter and "avoid expending the water in dry seasons". The present tonnage of 8d. per ton was "too high", there were "few Canal Acts" that did not hold out "indulgence to Lime and Manure".

On 26 September 1796, Benjamin Outram answered questions about limestone which were put to him by the Thornewills of Burton-on-Trent. In his reply Outram wrote that limestone could be laid down on the banks of the canal near Beardsallfield Bridge at 5s. 3d. per ton in winter. In summer it would be more expensive. The Crich limestone burnt in the Crich kilns lost about one-third of its weight in the "calcination". One ton of limestone would need about five cwt. of slack to burn it.

Contracts for the Crich limestone were given to individual entrepreneurs by the company. The agreement made with John Chilton included the condition that he was to get 100 tons per day "and as much more as should be wanted to keep a good set of hands at work by the day". The employment of these workers was Chilton's responsibility, although there were, in addition, "bargainmen" who had made separate agreements with the firm.⁴⁰ Chilton, however, did not prove an altogether satisfactory overseer, and on 22 April 1797 he received a letter from Benjamin Outram which declared, "you do nothing to encourage or assist the men altho' I have on our part given them Powder which neither they or you could at all expect. You employed no day men till my Bro. procured and set some to work and whilst they have been employed you have walked up in Gloves and White Stockings now and then to look at them. Can you expect they will do their duty with this management?" Such conduct evidently provoked Outram's temper, and the letter ended with a request for either a full compliance with the terms of the contract, or an ending of the agreement, "for our trade and Customers are not to be trifled with".

On 13 July 1801 an agreement was made between Joseph Wilkes and Benjamin Outram, which said that Wilkes should purchase and carry away from Amber Wharf (the property of the company) 6,000 tons of limestone annually for three years. He was to take away a boatload every day except when prevented by "stoppages on the canal". The Butterley Company undertook to provide the limestone for the price of 1s. 10d. per ton, allowing a discount, for ready money, of 10 per cent in winter, and of 5 per cent in summer.

All the limestone was transported by barge, and this was the usual form of carriage for all Butterley's products, which were, in general, too bulky or heavy to be sent by road.

Transport

The full opening of the Derby Canal (1796) meant that the company's boats were able to avoid going up the river Trent to Shardlow, the junction with the Trent and Mersey Canal, and this ensured an easier passage for the "narrow boats" which were on their way to Burton-on-Trent or Birmingham. Manchester was in touch with Butterley by the Derby and Grand Trunk Canals, and on 1 January 1798 rails sent to Manchester by water were expected to take seven or eight days to reach their destination. Goods intended for London were sent by the Grand Trunk Canal to Gainsborough, which was, in the 18th century, an important river port with access to the Humber and the sea.

Generally the cost of carriage was paid by the customer, and as it was sometimes included in the price of goods it is difficult to establish the precise rates. One or two examples of the rate, however, indicate that there could be wide variations in the price charged for freight over similar distances.

⁴⁰ The wages of two such limestone-getters in 1807 were "12 pence for every ton of 33 Cwt. of 120 lb. to the hundredweight of good limestone".

On 22 January 1798, for instance, Outram wrote to John Lees of Fairfield, near Manchester, to say that the wharfinger at Derby had agreed for the price of 25s. per ton for freight of cargo of gang rails from Derby to Manchester. But on 8 November 1798 Outram informed Dearmans and Frances of Birmingham that pig iron could be sent to them for a freightage of 14s. 6d. per ton.

Customers in London were given preferential treatment, as far as the cost of carriage was concerned, for they received their goods carriage paid.⁴¹ On 3 October 1799 Outram told John Foulds, of the London Bridge Water Works, that the prices they were charging for pipes were the same as those they charged "at home regularly when we are at no expense in conveying or freight". On 14 July 1801 Outram wrote to a wharfinger at Gainsborough, requesting him, with great urgency, to forward 100 tons of cast-iron rails for an unnamed company in London, as they had to be delivered within six weeks of the date of the letter. This indicates that, normally, the firm could not depend on their goods arriving in London in under six weeks' time.

Canal companies were not able to act as carriers, but, like the turnpike trustees, they charged tolls for the use of their canals. Disputes arose occasionally over these tolls, and the Cromford Canal Company, in particular, was often attacked by Butterley on account of its charges. The case for free transit of lime for agricultural purposes was put to one of the trustees of the Company in the following letter:

Butterley, April 26, 1797.

"Sir,

Some Lime Kilns have been erected on the Cromford Canal near Pye Bridge for the accommodation of that part of the Country and the Trade of those Kilns has been considerably impeded by demands of Toll made by the keepers of the Toll Gate near Pye Bridge. Lime for Manure is not liable to the payments of Toll on that Road as will fully appear by examining the clauses Fo. 13 and 14 in the Act passed in 1759 and Fo. 11-20 Geo. the 3rd. The latter clause is particularly full on the subject. Lime from these kilns passes much shorter lengths on the road than Crich Lime would to supply the same Farmers. The Trustees ought therefore to encourage these kilns rather than suffer any impediments to be thrown in the way of their trade."

Another plea for the encouragement of industry was made by Benjamin Outram on 10 December 1800, when he wrote to the Cromford Canal Company asking them to lower their charges on the Butterley coal trade, in view of the increase of tonnages which this trade brought the canal. Outram pointed out the difficulties his company had to face, writing:

"The Cromford Coal trade is hard upon us. We navigate 3 to 4 miles farther and pay 3d. to 5d. per ton more than the Pentridge and Ripley Collieries and adding the disadvantages of passing thro' the Tunnel we are about 1/- pr. ton heavier than they. This difference would have kept anybody but ourselves out of the Market, but we have born it without the least assistance from the Canal Company — except the indulgencies held out to every Trader — If we had floated our boats to other markets what would have been the case at Cromford at this Moment? Would not that trade have been as

⁴¹ See Ashton, *An eighteenth century industrialist*, 87.

unprofitable to the Cromford Company as it was before we began in Codnor Park — Nevertheless, we have encouraged the Cromford trade by ferrying with our own boats our coals unto that market and by refusing them to downgate boats whenever the Cromford market would receive them. By these means prices of coals have been kept down at Cromford."

The letter concluded with a request for the canal company to allow 22 cwt. to the ton, and to grant free weighing "for any trader who will pay £800 a year tonnages". Unfortunately, there is no record of whether this request was granted by the Cromford Company.

Transport by canal had many drawbacks: it was leisurely and uncertain, especially during periods of frosty weather in winter, or of drought in summer. Many letters contain references to goods being held up in warehouses until the canals were "open" again; but for the heavy goods which the Butterley Company produced, the canal was a convenient and comparatively cheap form of carriage. Moreover, the state of the roads near Butterley was such that carriage by road was not an attractive alternative. In a letter to the "Overseers of the Highway in Pentridge" Benjamin Outram wrote:

"Wishing much to have the Roads about us put in such state as that this Neighbourhood might have tolerable Communications with the rest of the world in winter I offered to my Neighbours in Ripley the Cinders from our furnace at half the value for their Repairs and Considering the situation of the Liberty of Pentridge with respect to the roads and very bad state of the Lanes from hence to Pentridge and Swanwick, I proposed last Summer to the late Overseer to give the Cinders gratis provided the inhabitants would lead them upon the road before winter and at the same time informed him that if they would not exert themselves to improve the lanes I would take the means pointed out by law to compel their repairs."

Despite this warning, no action was taken to repair the lanes, and Outram ended his letter by threatening that if immediate steps were not taken to make improvements he would withdraw his offer of cheap cinders and bring the law to bear on the overseer. The letter has no date, but it was probably written in 1800 or 1801, as it is near others of this date in the agreement book.

The later developments of the Butterley Company are related in a history of the firm published in 1950.⁴² The records that have been studied so far show only the early stages of a large-scale coal and iron concern organized in an area which had previously been predominantly rural. The policies of the original partners, however, had a decisive influence on the firm's history, for they had not only to meet the demands of the expanding market for coal and iron, but also to create a society in which men would be prepared to carry out heavy and arduous work, and in which they would accept the long, regular hours and severe discipline of an industrial community. The gulf between the employers and the workers was very wide, and the owners were always careful to keep the men in their place. Benjamin Outram wrote to Carr on 20 October 1796: "It is not any apprehension of Law but my

⁴² R. H. Mottram and C. Coote, *Through five generations. The history of the Butterley Company*, 1950.

Ideas of justice that have ever determined me never to employ a Workman that another has a claim to. Workmen are already too independent of their employers.”

An earlier draft of this article was read by Professor J. D. Chambers and Professor A. H. John; I would like to thank them for their advice. I have also to thank the Secretary of the Butterley Company for permitting me to visit the works and to examine the Company's early records.