

THE DEVELOPMENT OF LEAD MINING AND OF THE COAL AND IRON
INDUSTRIES IN NORTH DERBYSHIRE AND SOUTH YORKSHIRE.
1700 - 1850.

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Ph.D. Thesis.



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SUMMARY.

During the century and a half between 1700 and 1850, communications in North Derbyshire and South Yorkshire were greatly improved. During the first half of the 18th century, the Don was made navigable as far as Tinsley; the Seven Years War saw a great number of roads turnpiked; the canal linking Chesterfield with the Trent was made in the 'seventies and the Canal Mania of 1793 saw Acts passed to build canals through parts of the coalfield previously unexploited. Forty seven years later, the North Midland Railway was opened, crossing the area from north to south. During the Railway Mania, a number of Acts were passed, authorising the building of new lines both to open up the South Yorkshire and North Derbyshire Coalfield and to connect it with areas to the east and south where its coal might win new markets.

Industrially, lead, iron and coal dominated the district during these 150 years. During the first half of the 18th. century, a charcoal iron industry was built upon the iron ore, timber and water power of the region, but this was threatened with extinction by 1750 by a shortage of fuel. During the next half century, the lead ores of Ashover were exploited, on what was for 18th. century Derbyshire, a large scale. With their exhaustion early in the next century, the mines closed down and with them, the adjacent smelting works and red lead mills. Most important in the long term industrial development of the region was the exploitation of its coal. In 1700, this was of little more than local importance. By 1850, it was a factor to be reckoned with in most markets south of the Humber. This growth in output was accompanied by changes in the size of the average firm in the industry, by methods of mining technique and management.

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ERRATA.

- P. 20. Barnby Dun should read Barnby Moor.
 P. 156. High Peak should read Low Peak.

ROAD DEVELOPMENT IN SOUTH YORKSHIRE AND NORTH DERBYSHIRE
1700 - 1850.

THE PARISH ROADS 1700 - 60.

In the early eighteenth century, there were only four places of any size in South Yorkshire and North Derbyshire - Sheffield, Chesterfield, Rotherham and Barnsley. Each of these towns owed something of its importance to the fact that it stood at a point where a main road connecting the North with the Midlands and with London crossed one or more of the routes traversing the district from east to west. Each of these two road systems had its own particular importance. In general, although this generalisation must not be pressed too far, it may be said that the trunk routes were important primarily for passenger traffic and the cross country routes for the transport of goods. From the purely economic standpoint, the latter system was much more vital to the life of the region than the former, as it not only tied together the different geological formations in this area with their variety of products, but also connected the area with the increasingly valuable markets of South Lancashire and with navigable water at Nottingham on the Trent, at Bawtry on the Idle and with Doncaster - and after the river was improved to that point, with Rotherham - on the Don.

The most important trunk route crossing the district during the reign of George the First was that linking Nottingham with the woollen towns of the West Riding. This entered Derbyshire at Pleasley. It then crossed the magnesian

limestone ridge with its well drained soils and easy gradients to within a few miles of Rotherham, where it bridged the Don. The road then climbed out of the valley to Barnsley, before crossing the moors to Huddersfield.¹ The southern portion of this road carried a certain amount of packhorse and waggon traffic conveying Sheffield goods southwards.² Much more important, however, was the passenger traffic between the West Riding and North Derbyshire and such towns as Nottingham, Leicester, Northampton and London. The correspondence of the Spencer family of Cannon Hall, Cawthorne, near Barnsley shows that, when they travelled south, they invariably rode along this road to Nottingham, where they hired a coach to their destination. In addition, their letters and diaries make clear to what extent this route was used in the second quarter of the century - by London merchants travelling to the West Riding on business; by Yorkshire ironmasters visiting the capital in search of orders; by partners in the Derbyshire lead mines journeying to London for conferences with capitalists financially interested in the soughs which drained the Peak; by local lawyers and their witnesses en route for Westminster and by the gentry of the region on pleasure bent to London. It is probable that this road was at the height of its importance during the early decades of this century, as it was soon to lose much of its passenger traffic to turnpikes giving more direct access to the south.

1. H. Moll. A Set of 50 New and Correct Maps of England and Wales. 1724. Plates 30, 40 and 41.

2. Journals of the House of Commons. XXIII, 302.

The second road linking north and south was that from Leeds, through Wakefield, Barnsley, Sheffield, Chesterfield and Duffield to Derby.^I Compared with the route further to the east, it was a bad road, clinging to the ridges wherever possible and characterised by gradients of remarkable steepness where it was compelled to descend to the valleys. Goods traffic between the Barnsley district and the river port of Wakefield was heavy. English timber brought by river from the Yorkshire plain; charcoal and Cumberland ore for Barnby Furnace; Knottingley lime for the thin, poor soils of the grits and the coalfield; groceries and luxury goods from London, all were carried along this road. Store cattle and sheep, bought at the fairs at Ripley and Stagshawe Bank in the North, were driven in considerable numbers along this road, to be fattened before sale to the butchers in the towns. South of Barnsley, traffic does not seem to have been so heavy, as other sections of this road had independent connections with other river ports, nearer to them than Wakefield. Traffic on this part of the road seems, in the main, to have been short distance - farmers attending markets at Chesterfield, Sheffield and Barnsley and merchants travelling to the Fairs there.

At Barnsley, where these two trunk roads met, they were crossed by the most northerly of the longitudinal roads traversing the district. This entered Yorkshire from Manchester at Saltersbrook. It then crossed six miles of open moorland to Penistone. After passing through Barnsley, it headed for navigable water at Doncaster. Another road diverged

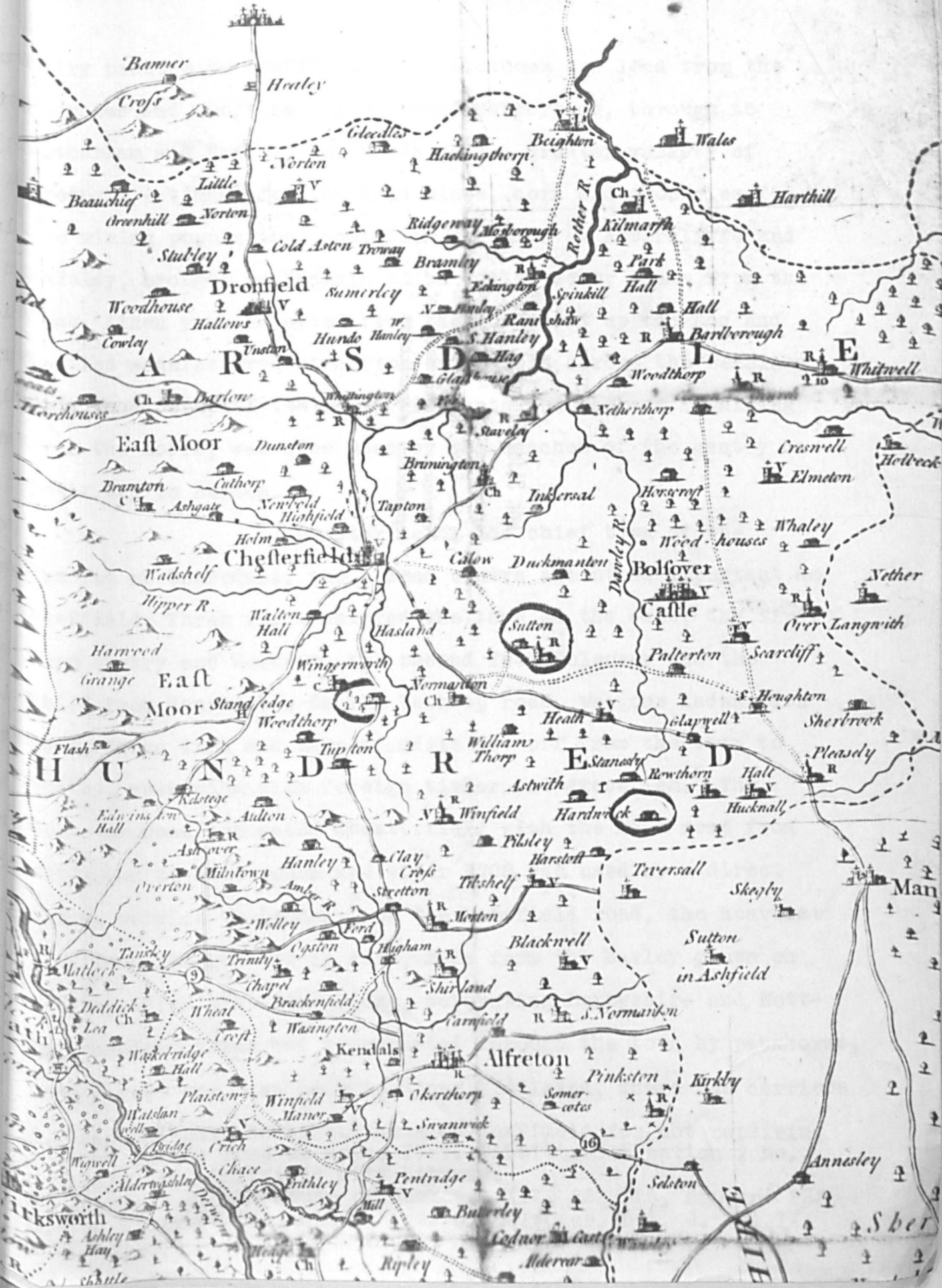
I. The northern section of this road is shown on Dickinson's "New and Current Map of the South Part of the County of York." 1750.

from this route at Hartcliffe Hill in Penistone, continued past the two forges at Wortley and ran through the heart of the nailing country to Rotherham, the head of navigation on the Don from 1733 to 1751. Both roads carried a considerable volume of coal traffic. In addition, they carried cheese, salt and Manchester goods eastwards. The waggons and packhorses which brought these returned laden with hemp, flax and linen yarn imported from the Baltic for the Lancashire weaver as well as with Yorkshire forge iron and rod for the lockmakers and nailers of Ashton, West Leigh and Warrington.^I

The most important road centre in the region was Sheffield. On the north eastern side of the town, three roads converged on Lady's Bridge; the first, through Attercliffe from Worksop; the second, from the inland port of Bawtry on the Idle and the third from Rotherham and Doncaster. Along the Worksop road, building stone and English timber entered Sheffield. From Bawtry, Rotherham and Doncaster came German steel, wainscoting from the Baltic, Dutch linens and groceries from London. The packhorses and waggons which brought these commodities to Sheffield returned with the products of its industry - forge iron, nails, tools and cutlery on their way to markets as distant as St. Petersburg and Jamaica. On the west, Sheffield was linked with Lancashire by a road which climbed up to Crookes, ran over the moors to Redmires and Stanage, dropped down into the Derwent valley near Hathersage and continued through Chapel and Stockport to Manchester. Eastwards, this road carried Manchester goods and Derbyshire

I. Journals of the House of Commons. XXIII, 613.

Sheffield



dairy produce to Sheffield and millstones and lead from the quarries and smelting mills around Hathersage, through to Rotherham and Bawtry. Westwards went a greater variety of products - timber for the lead mines, corn and groceries for the mining population, coal from the pits at Attercliffe and Wadsley, brought to Lydgate to be collected by teams from the Peak, linen yarn imported from the Continent up the Don and scythes manufactured at Norton to be sold across the Pennines. This road, despite its heavy gradients and lack of metalling over the moors, was also used by the coaches of the gentry on their way to Buxton.^I

Chesterfield, the chief town of the Hundred of Scarsdale, was a road centre almost as important as Sheffield. Three roads entered the town on the east; the first from Bawtry and Worksop, the second from Bolsover and the third from Mansfield. On the Worksop road, waggons laden with lead, forge iron and bags of nails set off from the town to Bawtry, returning with foreign timber and groceries.² The Bolsover road connected Chesterfield with the main road from Rotherham to Nottingham and after 1708 was used by a direct waggon service to London.³ On the Mansfield road, the heaviest traffic westwards was in malt, made from the barley grown on the magnesian limestone ridge, separating Derbyshire and Nottinghamshire, which was transported through the town by packhorse, then across the East Moor to Stony Middleton, where the carriers

1. Case against the Inhabitants of Sheffield for not repairing part of the road to Hope. 1777. Tibbitts Collection ? No. 413/9 -10. Sheffield City Library.
2. Journals of the House of Commons. XIX, 222, 226, 230 and 233.
3. The Diary of Benjamin Granger of Bolsover. D.A. J. Vol. IX. P.67.

were met by packhorses from Manchester to take the malt into Lancashire and Cheshire. Eastwards the most important traffic was coal mined from the pits lying at the foot of the magnesian limestone ridge, to Nottinghamshire and Lincolnshire. On the west, Chesterfield was connected with the bridges over the Derwent at Matlock, Rowsley and Darley by tracks across the moors. Lead ore from the mines at Winster and Wensley were carried along these to be smelted in Ashover. Sheep and cattle were driven along these three routes over the East Moor to feed in summer on the limestone pastures of the Peak, returning in autumn to be fattened near the towns, before sale to the butcher.

The most southerly of the cross country routes climbed out of the Derwent valley near Matlock up to the East Moor, before descending to Oakerthorpe, where at Kendall's Inn, it crossed the main road from Chesterfield to Derby. At this point, it was joined by another road, running through the lead mining districts around Crich and Wirksworth, to Ashbourne. From Oakerthorpe, this road headed for navigable water at Nottingham, through Alfreton, up the steep hill out of the Erewash valley and onwards to the Trent through Watnall and Nutall. The familiar traffic pattern of lead moving eastwards and coal and malt westwards was repeated on this road. ^I

In addition to the long distance traffic through the district, there was a heavy volume of internal traffic, particularly connected with the iron industry. Iron ore and charcoal were carried in large quantities to the blast

furnaces at Rockley, Chapeltown and Barnby in Yorkshire and at Wingerworth, Staveley, Foxbrooke and Whaley in Derbyshire. Pig iron from these was distributed to the forges at Attercliffe, Sheffield, Wadsley, Roche, Staveley and Carburton. From these, forge iron was sold to the many edge tool out workers in the area as well as to the slitting mills at Rotherham, Renishaw and Wortley. These latter supplied bunches of rod to warehouses at Eckington, Ecclesfield, Hoyland, Howbrooke and Chapeltown, from which they were distributed to nailers in the vicinity. After the bags of nails had been collected, they were then transported with pig and forge iron, to Bawtry or Rotherham, to be forwarded down river to Hull. If the figure of 20,000 outworkers employed in the Hallamshire trades in 1725 be accepted, the number of pack animals and waggons employed in distributing their raw materials and collected the manufactured articles must have been large indeed.^I

Topographically, the district with its rapid alternation of ridge and valley was a difficult one for road construction. Geologically, neither the Coal Measures nor the Magnesian Limestone formation provided good road materials for maintenance. Blast furnace slag, favoured by many Village Surveyors of the Highways, although cheap and easily available, broke up quickly under the stress of heavy traffic.

Again the whole area, apart from the four towns, was thinly populated. This fact, combined with a small rateable value and long mileage of road in many parishes, especially

I. A Case in relation to the improving and completing the Navigation of the River Dun. Trans. Hunter Society. Vol.5. P.248.

on the East Moor, made it inevitable that, so long as each parish remained responsible for the roads within its own boundaries under the Act of 1555, long sections of the cross country routes should be nothing better than mere tracks.

These difficulties were often accentuated by a narrow localism, which could not see beyond the immediate interest of one township. In Derbyshire, the Minutes of Quarter Sessions at the end of the seventeenth century record a number of cases in which townships protested against performing Statute Labour in any but their own particular part of the parish. Across the Yorkshire border, this same spirit can be seen at work in Ecclesfield. ^I In this parish, admittedly a large one - it stretched from Howbrooke Dyke to Blackburn Bridge, a distance of seven miles and from White Lane to Malin Bridge, a distance of six miles - there were no fewer than sixteen different highway authorities and although only one warrant was issued by the West Riding Quarter Sessions for the appointment of a Surveyor, there were, in fact, twenty to thirty officials acting under this one warrant. In 1751, the inhabitants of this parish expressed their opinion that this was the most suitable system as the parish was too large to be administered as a single unit. They defended this extreme subdivision on the grounds that the Surveyors " may attend the repairs of them (the roads) without neglecting their own private concerns" - a sentiment as to the duties of parish officers which would certainly have won universal approbation throughout the whole

I. Case against the Inhabitants of Ecclesfield for not repairing Nether Lane. 1752. Tibbitts Collection. No. 413/3. Sheffield City Library.

area. Supervision by the Justices, with such excessive decentralisation, seems to have been extremely lax, as it was admitted that " Officers always kept the assessments themselves and either lost or destroyed them afterwards." Again, when Nether Lane, the old main road from Sheffield to Chapelton was indicted in 1752, the parish of Ecclesfield repudiated all responsibility for its condition, thrusting it back on the township, which in turn excused itself for its failure to keep the road in good condition on the grounds that the road was but little used by its inhabitants but " was perpetually torn up by Heavy Carriages with Coals for the use of the other parts of the Parish."

This narrow localism also expressed itself in a reluctance to spend money on the roads, a fact made very obvious by the few Surveyors' accounts remaining for this period, which contain little beyond a list of names of persons liable for Statute Duty with crosses opposite these to represent the number of days worked. Apart from Chesterfield and its neighbouring townships - Newbold, Tapton and Hasland - no North Derbyshire parish consistently levied highway rates over any number of years during this period.

Road presentments before the Derbyshire and West Riding Quarter Sessions show that many of these main roads were presented as in bad condition during these years. The township of Brightside Bierlow was indicted in 1700, 1729, 1734 and 1736 for its failure to keep the road between Doncaster and Sheffield in repair; in 1726, Nether Hallam was prosecuted for the bad condition of the Sheffield to Halifax road in that

district; nine years later, the town of Rotherham was indicted for its failure to repair its roads.^I In Derbyshire, Somercotes was presented in 1738 and in 1746 on account of the road from Nottingham to Alfretton being "ruinous." The township of Palterton was prosecuted in 1741 for its failure to keep the road between Chesterfield and Mansfield in good condition. Three years later, Dore was fined for the poor state of the road linking Sheffield with Manchester. In 1746, the main road from Chesterfield to Derby, outside Clay Cross was covered with some hundreds of tons of spoil excavated from a nearby colliery. The parish of Brampton was presented in 1749 as the main road over the East Moor to Bakewell was badly maintained.² The general practice was for Quarter Sessions to levy a fine on the parish to be remitted when a certificate was furnished by a Justice to the effect that the road had been repaired to his satisfaction.

Petitions to Parliament, initiating turnpike Bills are, unfortunately, only too often couched in the stilted jargon of the lawyer and convey little information as to road conditions. Nevertheless, the persistent references to the difficulty of vehicles passing each other on the roads of the district and of using the roads in winter, probably convey a general truth. It is, indeed, likely that with the exception of such winters as those of 1739/40 and of 1747, when the roads were frozen as hard as iron, so that they were as good as im

I. Highway Index. West Riding County Council Offices, Wakefield.
2. Portfolio K (I and 2). Presentments of Highways 1720-69. Derbyshire County Council Offices, Derby.

summer - the phrase is that used by the South Yorkshire iron-master, William Spencer ^I - there was comparatively little goods traffic on the roads in winter. The account books of coalmasters show that coal was heavily stocked during the winter months and that it only began to move freely in May. The same conclusion may be arrived at from a study of the correspondence of various business men during this period. Richard Dalton, a Sheffield timber merchant, wrote in the third week of August 1735 to the Hull importers with whom he did business, asking them to forward the deals he had ordered " before ye roads grow bad." At the same time, he was in communication with an Amsterdam firm from which he purchased wainscotting, informing them that as it had been shipped to Bawtry on the Idle, it would probably have to be brought to Sheffield in bad weather " wch will be a great Inconvenience to me as well as more charge as I told you before wee have part Land Carriage and Carters will have more wages when Roads are bad." In November, he wrote to Hull, complaining about a shipment of Russian and Swedish iron and Stockholm deals which had arrived at Aldwark on the Don) " I am afraid they must remain there till Spring." Simultaneously, he wrote to Amsterdam that some of the boards had arrived in Sheffield but " I don't expect any more this Winter the roads are grown so bad." Later letters show him refusing offers to supply deals in October 1738 and in the same month two years later " for they will come up heavily now as we have near five miles land carriage

I. Letter Book of William Spencer No.3. Letter dated 18 Jan. 1740. Spencer of Cannon Hall Correspondence. Sheffield City Library.

most of them as bad as any in England." ¹ As late in this period as 1758, Anthony Tissington, the manager of one of the most important collieries in Derbyshire, at Swanwick, could write to its owner that heavy rains in October had damaged the roads to such an extent that coal traffic had become impossible. ² Heavy summer rains could reduce the roads to a quagmire, as can be seen from a letter written by Thomas Simpson, a Doncaster merchant, to Mrs Copley of Spotborough Hall, alongside the Don, asking permission to hale boats through her estate on the grounds that " by reason of ye great rains yt have happened this summer ye roads have been and still are almost impossible for Carts and Carriages wch have occasioned a great Scarcity of Coals at and below Doncaster." ³

Bad road conditions naturally increased the cost of road transport to such an extent that it was out of all proportion to the freight charges on the inland navigations. An undated memorandum drawn up by William Spencer - probably in the '30's - shows that despite the difference in distance, the cost of sending bar iron from Wortley Forge to Rotherham and from there to Hull was approximately the same. ⁴ In winter, transport costs doubled, as carriers attempted to recoup themselves for the loss of time resulting from delays on the unmetalled roads of the period, badly broken by rain and heavy traffic.

1. Letter Books of Richard Dalton. Bagshawe Collection 5/4/I -3. John Rylands Library, Manchester.
2. Turner MSS. Flintham Hall, Notts. Letter dated 12 Oct. 1758.
3. Copley MSS. Yorkshire Archaeological Society, Leeds. Letter dated 10. Oct. 1724.
4. Winding up Wortley Forge Business. No. II. Spencer of Cannon Hall Correspondence. Sheffield City Library.

It is, therefore, apparent that the roads in this area, as maintained under the Act of 1555, severely handicapped its economic development. This system had failed to provide anything more than moorland tracks on vital lines of communication and nowhere had it resulted in roads which could be used by heavy wheeled traffic all the year round. The expansion in coal mining, the increase in the output of lead, the growth of the secondary metallurgical industries, the development of the manufacture of glass and pottery and the continuous increase in food production, all features of the economic development of the district at this period, were all placing a growing burden upon a method of road maintenance ill prepared to sustain it.

TURNPIKE LEGISLATION.

This situation was general throughout the country. The solution to the problem was everywhere the same - the adoption of the principle of making road users pay for road repairs through tolls paid to the Turnpike Trusts.

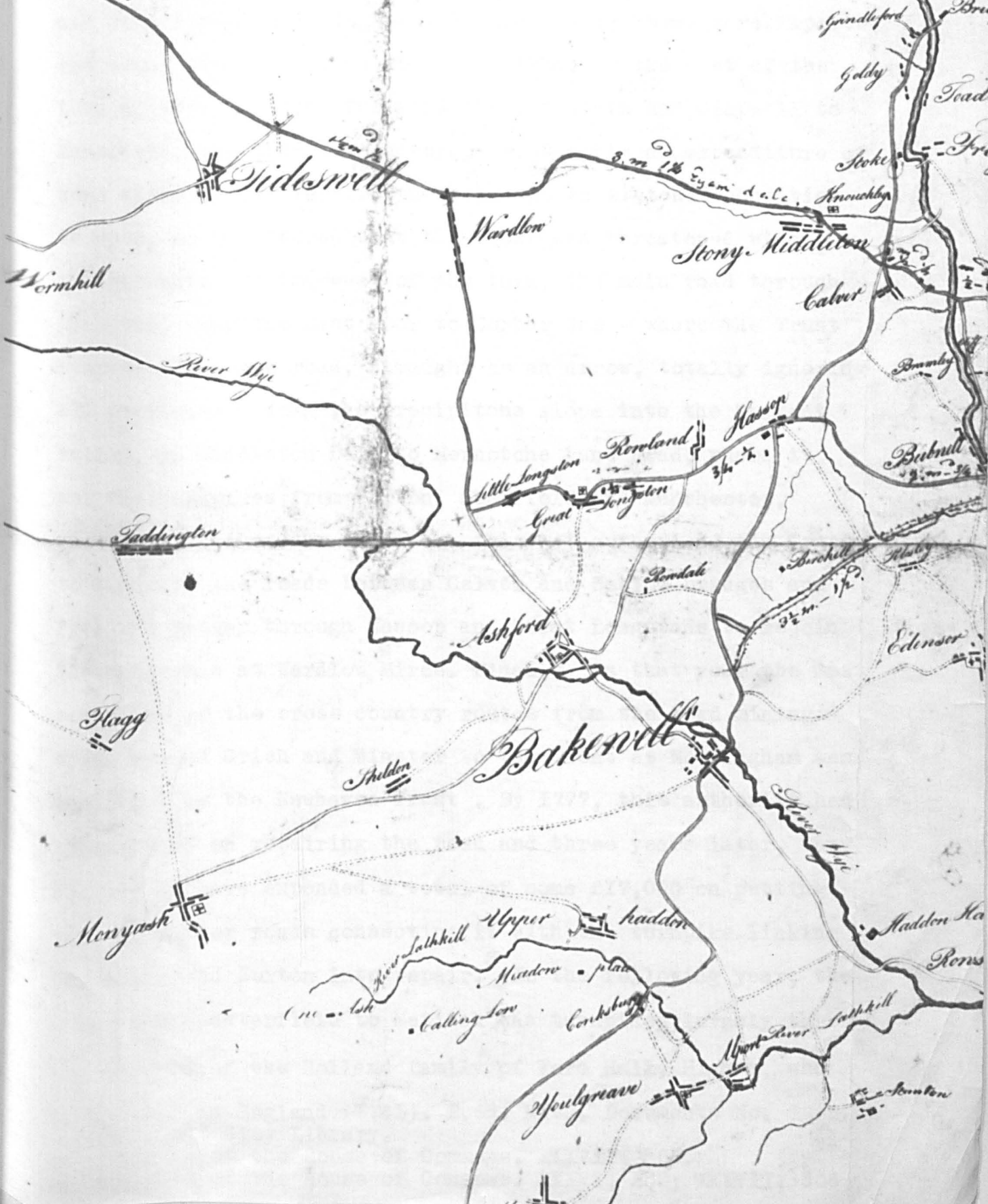
The first roads in the region to be turnpiked were the cross country roads carrying the heaviest volume of goods traffic. In 1739, an Act was obtained to turnpike the road from Bakewell, through Chesterfield to Worksop, primarily with the object of improving the route from the lead mining areas in the High Peak through to the river port of Bawtry on the Idle. However, little use was made of the Act and when it was renewed in 1758, no attempt had been made to turnpike the road from Bakewell to Chesterfield and despite an expenditure of £5225, only some six miles of the Worksop road had been repaired, the remainder being "founderous." I

The most northerly of the cross country routes, that from Doncaster, through Barnsley and Penistone, to the boundary of the West Riding at Saltersbrook, was made into a turnpike in 1740, thereby giving through communication with Manchester, as the road on the other side of the Pennines had been turnpiked in 1732. Although it had been no part of the original scheme, a clause had been added to the Bill at the Committee stage, whereby the Hartcliffe Hill road to Rotherham, then temporarily the head of navigation on the Don, was made into a turnpike, largely to facilitate the distribution of goods brought up river.

Between the beginning of the War of Austrian Succession and the opening of the Seven Years War there was a lull in turnpike development in the district. During the next eight years, there was a spate of Acts, by which almost all the cross country roads were turnpiked. In 1758, the road from Little Sheffield over the moors to Hathersage, through Castleton to Sparrow Pit on the Chapel en le Frith road was made into a turnpike. This Act also turnpiked another road which crossed the county boundary near Barbers Field Cupola, dropped down to Grindleford Bridge, climbed steeply up the Sir William Hill, continued past the important group of lead mines on Eyam Edge, clung to the narrow ridge overlooking the moors on every side towards Hucklow, dropped to Tideswell and continued forward through Fairfield before terminating at Buxton.^I Both these roads joined branches of the Sherbrooke Hill Trust's roads into Lancashire, turnpiked some years earlier. To contemporaries, they were "the finest roads imaginable"; made from small stones

I. F.B.I3.Pp 38-49. Fairbank Collection. Sheffield City Library.

West
Kernstone Lane Head
2 1/2 m. S



Kernhill

River Whi

Saddington

Flagg

Monyash

Shildon

Wardlow

Little Longston
Great Longston

Ashford

Bakenill

Upper Mudden
Mudden place
Callington
Conksburg

Moulgrave

Stony Middleton

3 m 1/2 Egan d. & c.

Rowland

Pordale

Hassop

Birchill

3 1/2 m. 1/2

Edensor

Madden Hall
Rens

Sathkill

2 1/2 m. 1/2

Grindford

Golby

Bria

Toad

Fre

Stoke

Knockby

Calver

Burnby

Burnby

covered with clay, sand and fine gravel, consolidated by frost and winter weather.¹ In the following year, three more important cross country routes were turnpiked. To the east of the town of Chesterfield, the road through Heath and Glapwell to Mansfield, was made into a turnpike. Despite an expenditure of some £4000 on its repair, the road was in wretched condition in 1780, so bad indeed that the Trust was threatened with presentment.² To the west of the town, the main road through Brampton, over the East Moor to Curbar Gap - where the Trust constructed a new road, straight as an arrow, totally ignoring all gradients - down the precipitous slope into the Derwent valley, up Middleton Dale to Hernstone Lane Head, where it met the turnpikes from Buxton, Sheffield and Manchester, was also turnpiked. In addition, this Act authorised the Trust to turnpike the roads between Calver and Baslow bridges and from the latter through Hassop and Great Longstone to rejoin the main road at Wardlow Mires. Finally, in that year the most southerly of the cross country routes from the lead mining areas around Crich and Winster to the Trent at Nottingham was turnpiked by the Newhaven Trust. By 1777, this authority had spent £8456 on repairing the road and three years later, they claimed to have expended a total of some £17,000 on putting this and other roads connecting it with the turnpike linking Ashbourne and Buxton into repair.³ In the following year, the road from Chesterfield to Matlock was turnpiked largely through the efforts of the Holland family of Ford Hall, Higham, who

1. Travels in England (1761). P.65. Misc. Documents No. 1769. Sheffield City Library.

2. Journals of the House of Commons. XXXVII, 566.

3. Journals of the House of Commons. XXXVI, 250: XXXVII, 566.

did much to raise an interest in the scheme and to solicit subscriptions for it from local landowners and lead merchants. This Act also turnpiked two branch roads across the East Moor, both constructed by the Trust with almost Roman directness, down to the bridges at Rowsley and Darley, thereby improving communications between the lead mining areas to the west of the Derwent and the smelting plants at Ashover. In South Yorkshire, the road linking the two river ports at Tinsley and Bawtry was turnpiked in that year. Four years later, another Act was passed turnpiking the road from Tinsley to Rotherham, then along the magnesian limestone ridge east of the Don, past Conisborough and its Norman castle, through Warmsworth into Doncaster. Arthur Young, with his customary forthright language, condemned the section from Tinsley to Rotherham as " execrably bad, very stony and excessively full of holes." ^I In the same year, the road from Attercliffe, through Handsworth and Anston to Worksop, was turnpiked. Turnpiking, however, cannot have improved this road very much as 22 years later, the first two miles out of Sheffield were denounced as " execrable " the next two as " so cut up and bad as hardly to be safe " and the remainder as " all rugged and jumbling." ² Finally, in that year, another Act set up the High Moors Trust, which turnpiked a series of secondary roads connecting the turnpikes running out of Chesterfield to Worksop, Sheffield, Hernstone Lane Head, Rowsley, Darley and Matlock. In less than a decade, the chief east to west roads out of Sheffield, Chesterfield and Alfreton had been turnpiked, so that the lead mining areas of the Peak,

1. Arthur Young " A Six Months Tour through the North of England " (1770). Vol. I. P.132.
2. Rev. T. Twining " A Country Clergyman of the Eighteenth Century." (1776). P. 47.

the coalfield, the agricultural districts of the magnesian limestone ridge and the river ports serving them were linked by a number of turnpikes, spaced at intervals of about twelve miles distance from one another. It is, however, obvious from the reports of travellers that turnpiking did not mean any automatic improvement in road conditions and that comparatively large sums of money might be expended on repairs with few results.

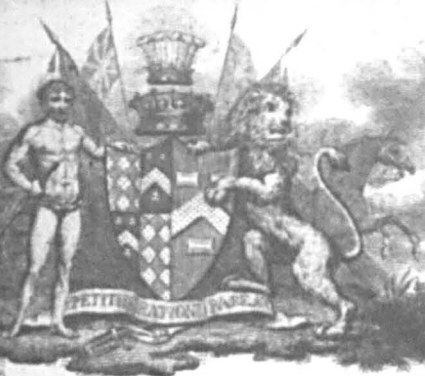
These years also saw the turnpiking of the main trunk routes running from north to south through the region. In 1756, the road from Derby, through Chesterfield, to Sheffield was made into a turnpike. In the following year, largely through the influence of Lord Strafford, the road from Sheffield to Wakefield was turnpiked. At first, the weight of tolls was resented by its users, but the Trustees defended their scale of charges by the assertion that even its critics " must own the vast amendment it is, from the uncommon badness and inconvenience of the Road before the Turnpike was established " and by an argument which had a ring of truth about it that many of the existing turnpikes were at that date in bad repair through failure to charge adequate tolls. These two roads not only opened up a new route to Bath, Bristol and the west of England but also to the capital, reducing the old trunk route through Mansfield and Rotherham, turnpiked in 1764, to the status of a mere country highway, of purely local importance by the end of the century.

By 1764, the framework of the turnpike system

I. Sheffield and Wakefield Turnpike Trust. Tibbitts Collection
363/I6. Sheffield City Library.

in the region had been created. The Trusts had, however, in general only taken over the existing roads and repaired them. As wherever possible the parish roads had followed the ridges which dominate so much of this countryside, the turnpikes inherited the severe gradients where these roads descended into the valleys. Even where the Trusts had been compelled to build new lines of road to replace the tracks across the East Moor, these roads terminated in hills with exceptionally heavy slopes. These could be negotiated by packhorses but the expansion of wheeled traffic in the shape of mail coach and stage waggon demanded the easing of these gradients. As a result, the War of American Independence and the later wars against the French saw the passing of a number of Acts to construct new turnpikes or to improve old ones with this object in view.

Communication between Hallamshire, with its growing cutlery and edge tool industries and Liverpool, through which a considerable part of its produce was exported to America, was still, despite the turnpiking of the roads through Sparrow Pit and Tideswell, extremely difficult, as traffic had to negotiate such hills as the Sir William or the Winnats. In 1781, an Act constituting the Greenhill Moor Trust, authorised it to turnpike an easier route through Holmesfield, past Owlter Bar to Hathersage Booth, down the steep slope to Hazleford Bridge and on to Hathersage. Forward from Hathersage, the road remained a difficult one, as a Frenchman discovered riding along it one fine autumn day at the end of the century, when his experience prompted him to write that travelling along it was



To the Right Honourable
 William Wentworth Fitzwilliam
 Earl Fitzwilliam
 Viscount and Baron Milton &c.

**THIS MAP OF THE COUNTRY ROUND
 DONCASTER**

Is with his Lordship's Permission
 Humbly Dedicated
 By his obliged Servants,
 W^m FADEN & W^m SHEARDOWN.

Published Jan^r 2^d 1805, by W. Sheardown, Gazette Office,
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 LONDON.



as disagreeable and as tiring as riding along ordinary roads in the depth of winter. In 1809, the Sparrow Pit Trustees prepared estimates to expend some £9000 on improving their road on Dore Moor, near the Odin Mine at Castleton and at Mam Tor through to Chapel en le Frith. Two years later, they obtained the necessary powers to effect these improvements, whereby the long hauls up from Hazleford Bridge and through the Winnats were at last eliminated.

The main road from Duffield northward, through Chesterfield to Sheffield, climbed no fewer than eleven hills steeper than one in nine. The northern section of this road was largely rebuilt under an Act of 1795, which authorised the Trust to abandon long stretches of the road, notorious for their disrepair - they were immediately presented on their reversion to parish control - through Coal Aston and Old Whittington and to construct new roads in the valley of the Drone, thereby both decreasing the gradient. and straightening the course of this turnpike. South of Higham, a new road, running across less undulating country than the old Derby Turnpike, had been built under an Act of 1786, through Shirland and Alferton to Swanwick, from where in 1802, a new turnpike had been constructed past Butterley Works, through Ripley to Derby. Although this route from Sheffield to Derby was still very hilly, it was so much superior to the old road, turnpiked in 1756, that it rapidly superseded it as the main artery of north to south traffic.

North of Sheffield, the Wakefield Turnpike had had

I. B. Fauyas^{de}/Saint Fond. " Travels in England, Scotland and the Hebrides. " (1799). Vol. 2. P.309.



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ROTHERHAM

LAUGHTON COMMON

WORKSOP

BAWTHY

BLYTH

N

T

THORP SALVIN

WORKSOP

H I R E

BOLSOVER

Millingley Dr. S. Helms Well. Fir Ennair. Barnulough. Hartington Mill. Bolton upon Dearm. Dearn River. Spratthorpe. DONCASTER. POTTERICK. CANTLEY. Wadsworth. Kiverton Park. ROTHERHAM. LAUGHTON COMMON. WORKSOP. BLYTH. THORP SALVIN. BOLSOVER. Various other place names and landmarks throughout the map.

hills at Chapeltown, Tankersley and Hoyland. A somewhat easier road northwards was obtained by turnpiking the road to Penistone in 1777.^I In 1805, another Act authorised the turnpiking of the road from Wadsley to Langsett, part of which followed an easy route alongside the Don, thereby giving northbound traffic easier access to the woollen towns of the West Riding and traffic heading west into Lancashire an easier route to the Saltersbrook Turnpike.

By 1815, little remained to be done in the way of turnpiking. With one exception, the schemes carried out were small and of little consequence, revenue in all cases proving disappointing and almost all proved from the standpoint of their shareholders abortive investments. In 1818, an Act was obtained to turnpike the road from Brampton Brierley on the Tankersley to Rotherham Road with Hooton Roberts on the main road from Doncaster to Rotherham. Three years later, constructed across 23 miles of open moorland, with what contemporaries considered to be a remarkably easy rise and fall - one newspaper even went so far as to describe it as a "level road"² - a new turnpike was opened from Sheffield to Glossop to facilitate communication between Hallamshire and Lancashire. In 1826, the road from Barnby Dun on the Great North Road, through Blithe and on to Maltby on the turnpike from Sheffield to Bawtry was turnpiked. In the following year, another short road connecting two turnpikes out of Mansfield - those to Chesterfield and Ashover - was made into a turnpike from Temple Normanton to

1. A Map of the Wadsley Bridge Estate of Wm. Burton .1775. Wheat Collection No. 1533. Sheffield City Library. This map, redrawn in 1779, shows the improvements made in this road near Wadsley Bridge by the Trust.
2. Derby Mercury. 5 Sept. 1821. Col.II.

I
Tibshelf. A decade later, the construction of a new road from the obelisk on Birdwell Common to Ruggen House linked the Wakefield and Penistone turnpikes out of Sheffield, thereby giving traffic to the former town, the advantage of a road with much smaller gradients. Three years later, a series of lanes in the triangle between the Worksop and the Sheffield roads out of Chesterfield and the main road from Sheffield to Worksop,² was turnpiked. In 1841, the Tinsley and Doncaster Trust obtained an Act empowering them to build a new line of road from Swinton Station on the North Midland Railway to their own road at Conisborough. The object of this branch road was partly to replace an older one, down in the Don valley, always liable to floods; partly, to facilitate communication with this newly opened railway and partly to divert traffic from Swinton to Doncaster on to the Tinsley and Doncaster Turnpike, thereby increasing its revenue.³

The last Turnpike Trust to be created in this district was for the road from Sheffield to Tinsley, set up in 1849. Peculiarly enough, this same road was the subject of the first turnpike legislation in this area, as the Don Navigation Company in their Act of 1726 received powers to make a road from Lady's Bridge to Tinsley "either sett and pitched with boulders or trench'd and gravelled at least seven yards wide." In return, the Company was to levy a toll of a penny per ton for the use of the road. Although the need for

1. A Map of the Intended Turnpike Road from -Temple Normanton -- to the Mansfield and Tibshelf Road at Tibshelf Side Gate. 1825. Jackson Collection. No.1786. Sheffield City Library.
2. Greenhill Moor and Eckington Turnpike Road. C.P. 20 (128 -200). Fairbank Collection. Sheffield City Library.
3. Tinsley and Doncaster Branch Roads. Minute Book No.I. West Riding County Council Offices, Wakefield.

this road arose in 1751 when the river had been improved up as far as Tinsley, the Company proved most dilatory in building it and it was not until 1758 that the contract was awarded for its construction. The road soon proved a financial liability to the Navigation, costing £3,500 a year to maintain more than was received in tolls, as it was badly cut up by many narrow wheeled vehicles on their way to the wharfs at the terminus of the waterway. As a result, when in 1760, a Bill was introduced to turnpike the road from Tinsley to Bawtry, the Navigation eagerly seized the opportunity to petition Parliament that their road should become part of the responsibility of this new Trust. They, naturally, had no wish to bear this burden and successfully resisted this plan of the Company to shift part of their legal liabilities on to shoulders less able to bear it.^I

A second opportunity came for the Company to rid itself of the road when it was proposed to construct a canal from Tinsley to Sheffield in 1815. Using every opportunity to intimidate the Canal Company by threatening it with prolonged opposition in Committee, the Navigation was successful in its efforts to force the former to assume responsibility for the road. Its new owners soon found that it was costing them over £1,600 a year to maintain. Further, in 1828 the road was presented and the Canal Company compelled to tear up the boulders and macadamise it. With the threat of railway competition looming up before it with the promotion of the Sheffield and Rotherham Railway, the Canal Company attempted to divest

I. Journals of the House of Commons. XXVIII, 808, 828, 857, 860, 890, 900, 908 and 914.

itself of its responsibility for the upkeep of the road in 1836 by Act of Parliament. The Bill was, however, somewhat naturally thrown out by an unsympathetic House.¹ Once the line had been opened, the Canal Company resolved to do nothing as regards repairing the road beyond their bare legal obligations. In 1846, they set up edge stones along the road to mark out a space seven yards wide, thereby hindering all traffic along the Wicker. Later in the year, they failed even to repair that width of road which, it was alleged developed ruts so deep that a man might lie in them and not be seen.² Naturally, the road was presented and much to their surprise, the townships along the road - Brightside Bierlow, Attercliffe and Tinsley - found that, despite the various Acts of Parliament concerning it, they were legally still responsible for its repair. Faced by such a verdict, they sued the Canal Company, which by a turn of the wheel of fortune, had ironically enough once more become the property of the Don Navigation. As the latter was adamant in its determination to have finished with the road and the parishes equally obstinate in their belief that they had no responsibility for it, the ensuing litigation proved costly. Finally, the parties were persuaded to meet at Pontefract Sessions in April 1849 and in the following month, with Sheffield Town Council, the Doncaster to Tinsley Trust and Earl Fitzwilliam holding watching briefs - they were all equally interested in the provision of a good road with low tolls from Tinsley to Sheffield - it was agreed that a new Trust should be set up. The Don Company, however, had to pay £2000 towards

1. Journals of the House of Commons. XCI, 60, II 7, 145 and 256.

2. *Queen v Sheffield Canal Company*. Nisi Prius Court. York Assizes. Sheffield and Rotherham Independent. 17 July 1847.

putting the road into good repair and to give the townships compensation for their legal expences. Once the Bill had gone through Parliament, the Trust had to negotiate with the Midland Railway Company as to the siting of the toll bar at the Sheffield end of the turnpike, the Railway Company finally making an annual ex gratia payment of £100 to prevent it being positioned between their station and the town.^I

It is thus evident that the smooth passage of a Turnpike Bill through Parliament was dependent upon the success of the preliminary negotiations between the various parties interested in a particular road - local corporate bodies,, business interets concerned, other Trusts and above all, the local landowners. Particularly vital was the support of the aristocracy, whose capital, territorial power and political influence in Parliament were all essential at each stage in the promotion of a Bill.

In South Yorkshire, the most important of all families were the owners of the Wentworth property. Their influence can be discerned in a number of turnpike schemes. In 1764, a group of merchants and landowners in and around Sheffield planned to turnpike the road from Rotherham to Pleasley. In view of the importance of this road at this time and that the roads northward out of Barnsley had already been made into turnpikes, it was hoped that the intervening section from Barnsley to Rotherham, then in poor condition, might also be made a turnpike road. While the Bill was in the Committee stage, Fenton, the Marquis of Rockingham's able lawyer and agent, suggested that a clause might be added to it, turnpiking

I. Sheffield and Rotherham Independent. Feb 17, 1849; March 17, 1849; April 14, 1849; July 14, 1849 and Dec. 8, 1849.

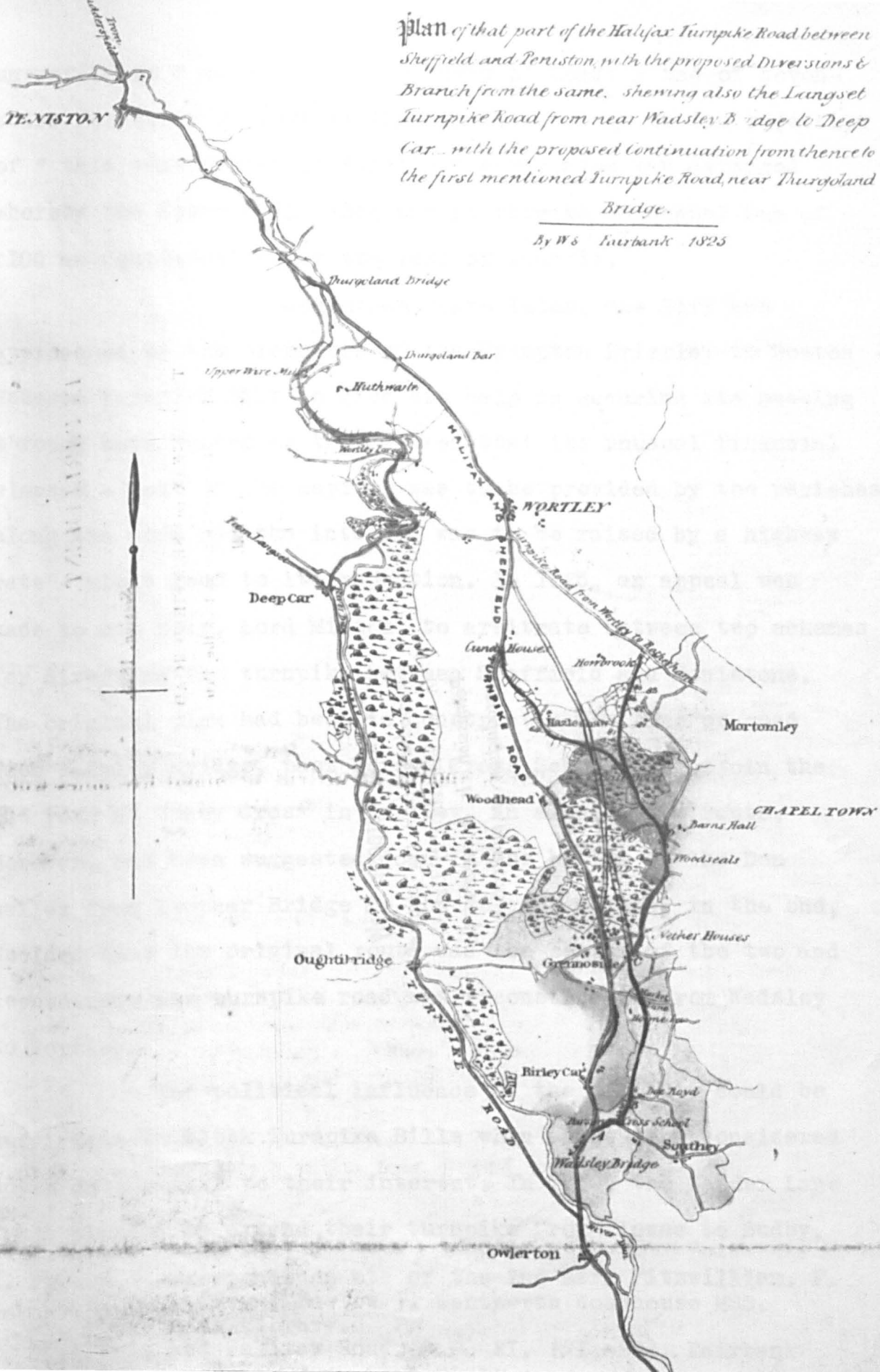
the road from Rotherham to Tankersley, on the main Wakefield to Sheffield road. As this road ran through the Wentworth estate, the value of that property might be expected to increase with the improvement of communications. This being a longer road than the more usual route between the two towns through Wombwell, Fenton attempted to quieten local opposition to his plan by calling in Metcalfe to survey the two roads to prove that the longer road would actually be cheaper to repair as part of it was "already a Road thrown up & Covered in the Manner of a Turnpike." Fenton also arranged to supply witnesses to give the required evidence and, despite local hostility to the scheme, a clause was tacked on to the Pleasley Bill, authorising the turnpiking of the road through to Tankersley.^I In the same year, another Bill was introduced to turnpike the Doncaster to Tinsley road, avoiding Hooton Roberts on the Wentworth estate. On Fenton pointing out the disadvantage of this to the Marquis, he intervened to persuade the promoters of the Bill to restore the road to its original line.

In 1801, when it was proposed to extend the Greenhill Moor turnpike through to Sheffield, thereby opening a route competitive with the Sparrow Pit road, the Trust sought the support of Earl Fitzwilliam, who had property along the new road in Ecclesall, assuring him that their new road would be "a much leveller as well as a more warmer road and with better materials than the present mountainous and exposed road over the High Moors." The older Trust, fearing that this new road would render a large section of its road "useless and

I. Miscellaneous Letters. Feb. to April 1764. R.5. Letters and Papers of the Second Marquis of Rockingham. Wentworth Woodhouse MSS. Sheffield City Library.

Plan of that part of the Halifax Turnpike Road between Sheffield and Peniston, with the proposed Diversions & Branch from the same, shewing also the Leangset Turnpike Road from near Wadsley Bridge to Deep Car, with the proposed Continuation from thence to the first mentioned Turnpike Road, near Thurgoland Bridge.

By W^s Fairbank 1825



unprofitable " appealed to the Dukes of Norfolk and of Devonshire for their support at the Committee stage in the rejection of " this idle project." Finally a compromise was arranged whereby the Sparrow Pit Road was to receive an annual sum of £100 as compensation for the loss of traffic.¹

Seventeen years later, the Earl was approached by the promoters of the Brampton Brierley to Hooton Roberts Turnpike Bill to give his help in securing its passing through both Houses as they feared that its unusual financial clauses - part of the capital was to be provided by the parishes along the road and the interest was to be raised by a highway rate - might lead to its rejection. In 1825, an appeal was made to his heir, Lord Milton, to arbitrate between two schemes for diverting the turnpike between Sheffield and Penistone. The original plan had been to construct a new line of road from Wadsley Bridge, past Parson Cross School, to rejoin the old road at Cundy Cross in Wortley. An alternative route, however, had been suggested down in the bottom of the Don valley from Deepcar Bridge to Thurgoland. Milton, in the end, decided that the original route was the better of the two and accordingly the turnpike road was reconstructed from Wadsley to Wortley.²

The political influence of the nobility could be sufficient to block Turnpike Bills when these were considered to be detrimental to their interest. In 1780, the Gander Lane Trust planned to extend their turnpike from Clowne to Budby,

1. Papers, Correspondence etc of the 2nd Earl Fitzwilliam. F. 106 G. Turnpikes (Baslow). Wentworth Woodhouse MSS. Sheffield City Library.
2. Sheffield and Halifax Road. C.P. 2I. (7I -92). Fairbank Collection. Sheffield City Library.

on the main road from Worksop to Kelham. In 1782, advertisements were inserted in the local papers declaring that it was intended to apply for an Act to turnpike the two roads linking the termini of the Trust's roads at Renishaw Bridge and Clowne with Budby and in addition, what was notoriously a bad road, that from Chesterfield to Bolsover. No application was, however, made to Parliament at this time. Eight years later, the plan was revived. The Trust asserted that the turnpiking of these roads would bring many benefits in its train.^I It would enable lime the more easily to be transported from the quarries on the magnesian limestone ridge to farms on the poor sandy soils around Cuckney; it would enable malt, made in Newark, for the Lancashire market to reach its destination more rapidly; it would improve transport between the newly established cotton and woollen mills at Cuckney and their suppliers and customers in Lincolnshire, Lancashire and Yorkshire and also improve communications, in general, between Lancashire, the Great North Road and Lincolnshire. Although the scheme won the support of the Duke of Kingston and of Earl Bathurst and the towns of Sheffield, Rotherham and Newark, it was opposed from the beginning the Duke of Portland. Unfortunately, the documentary material fails to disclose any reason for this attitude, although it may have been connected with the petition of the Mansfield to Rotherham Trust against the Bill, alleging that the proposed extension ran parallel to its own road for many miles, that its road was in good condition, that its tolls were moderate and that share-

I. Reasons for supporting the Bill for the intended turnpike road from Clowne -- to Budby. Barlborough Hall MSS. Derbyshire.

holders had invested their capital " on the implied Faith of Parliament, that no needless new Road should at any time be made to their Detriment." ^I The Bill was lost by a large majority as a result of " the formidable and united Exertions of the Portland, Devonshire and Bedford families " supported by such " auxiliary troops -- as Edmund Burke and Michael Angelo Taylor " who attended " not only to vote but to make Speeches." A second attempt made in 1811 was more successful, as although once again it proved necessary to sacrifice the turnpiking of some sections of the road in face of the opposition of the Duke of Portland, powers were obtained to turnpike the road from Clowne through Cuckney to Budby. ²

Second only to the interests of the nobility to be considered were those of the gentry. In 1758, the Sheffield promoters of the turnpike to Buxton, with their minds fixed on the through traffic to Manchester, naturally wished the road to be as straight as possible across Tideswell Moor. To achieve this, they planned to avoid the town and to route their road through Weston. This proposal alarmed both the people in Tideswell, as they had no wish to see the town left a rural backwater and Robert Freeman, the most important landowner in Wheston, who had to no desire to see his property severed by the construction of a new road. This opposition proved so strong that the Trust was forced to reroute the road through Tideswell and to avoid Wheston, with the result that the turnpike ran up and down Monksdale, with particularly

1. Journals of the House of Commons. XLVI, 167.

2. Journals of the House of Commons. LXV, 61; LXVI, 71.

atrocious gradients.¹ In the same year, when the Hernstone Lane Head Turnpike Trust was being set up, it was feared in Tideswell that it would result in tolls being imposed at the junction of the three turnpikes on the moors, on coal led from Cheshire. Pressure from the local gentry was sufficient to secure a promise that no such tolls would be exacted.² In the last decade of the century, the line of the Sheffield to Chesterfield Turnpike through Norton was laid out according to the wishes of the Shore family, who had no wish to have the road too near the Hall. In addition, pressure from the Bagshawes of the Oakes, acting on behalf of their tenants, alarmed at the prospect of further Statute Labour on the new road, led to the Trust making a promise to all the parishes along it that none would be levied if the new road paid a 5% dividend in the future.³

Nor could the interest of the business community be neglected. In 1740, Cavendish Neville of Chevet, a landowner with property south of Wakefield, wrote to William Spencer of Cannon Hall, asking him for his support for the proposed Saltersbrook Turnpike over the moors into Lancashire. Spencer replied that his backing was assured as the advantages it would bring would more than outweigh the sole disadvantage he could foresee - that improved communication would enable wheat grown on the Yorkshire Plain to be sold around Barnsley, thereby lowering farm rents in that district.⁴ The influence of the Cutlers'

1. Turnpike Road Papers. Nos. 362 and 404. Tibbitts Collection. Sheffield City Library.
2. I3/3/296. Bagshawe Collection. John Rylands Library, Manchester.
3. Correspondence between John Bagshawe Esq -- and Joseph Outram of Alfreton. I79I-I80I. 8/4/2776-2923. Bagshawe Collection. John Rylands Library, Manchester.
4. Letter Book of William Spencer No. 4. Letter dated 12 Dec. I740. Spencer of Cannon Hall MSS. Sheffield City Library.

Company, with an eye to better roads linking Hallamshire with Lancashire and the desire of the Wortley family to improve the roads through their property, were responsible for the inclusion of a clause in this Bill whereby the road from Hartcliffe Hill in Penistone, past the forges at Wortley, was to be turnpiked.¹ Nevertheless, despite these preliminary negotiations, a fierce wrangle rose in Committee between Wortley and the Earl of Effingham as to where the toll gates were to be placed on the Hartcliffe Hill road, Effingham naturally wishing them to be so sited as to cause the minimum interference with coal traffic.²

The Act turnpiking the road from Newhaven House to Nottingham, passed in 1759, contained clauses giving concessionary tolls to coal and lead. The lowered tolls on coal were probably the result of a letter from Anthony Tissington, the manager of Swanwick Colliery, much of the output of which was sold in Winster for use of the pumping engines at the lead mines there, to Thomas Thoroton M.P., the owner of the Swanwick estate, asking him to press for this in the House. The concession given to lead resulted from correspondence between Nicholas Twigg, the most important lead merchant in the Peak at this time and Isaac Bonne, agent to Robert Banks Hodgkinson of Overton Hall, Ashover. Twigg, who had shares in both the Winster mines and in the smelting plant at Kelstedge, wrote to Bonne to appeal to Hodgkinson, then living in London, to use his influence with Members to secure the incorporation of a

1. Doncaster to Saltersbrook Turnpike. 1747. Wharnccliffe MSS. No. III. Sheffield City Library.
2. Letters from Wm. Marsden. Letter dated 26 Feb. 1740. Spencer of Cannon Hall MSS. No. 10. Sheffield City Library.

clause in the Act, lowering tolls on lead ore carried over Darley Bridge, in order to prevent an increase in the price of pig lead, marketed from this particular cupola.

TURNPIKE FINANCE.

Shareholders in the various Trusts in the area, so far as can be ascertained from the somewhat scanty number of lists of subscribers available, were almost exclusively local landowners, coalmasters and merchants, all of whom might expect to benefit financially by the improvement of communications around Sheffield.

Complete lists of shareholders exist for four Trusts controlling roads to the east of the town.^I The chief subscribers to the Rotherham and Pleasley Trust were the Dukes of Portland and of Leeds; the Earl of Holderness; Gilbert Rhodes of Barlborough Hall; E. Sacheverall Pole of Park Hall, Barlborough and John Hewett of Shireoaks. The Earl of Holderness, Rhodes and Hewett were also shareholders in the Attercliffe and Worksop Trust. Other subscribers were the Duke of Norfolk, William Mellish of Blythe Hall, Henry Athorpe of Dinnington Hall, Noble Champion of Worksop and the Rev. John Stacey of Ballifield. The Duke of Leeds, the Earl of Surrey and Rhodes were amongst the principal shareholders in the Gander Lane Trust. Others were the Duke of Devonshire, Francis Sitwell of Renishaw Hall and John Parker of Woodthorpe. Three other shareholders in this Trust were John Inkersall, one of the leading edge tool manufacturers in the district; George Townshend, the lessee of the Norfolk collieries and Samuel Peach, a Sheffield coach proprietor. The Sitwell, Rhodes and Parker families were shareholders. Barlborough Hall MSS.

holders in the Clowne and Budby Turnpike. Other subscribers included the Duke of Portland, Earl Manvers, the Bowdens of Southgate House and Appelby, Walker and Company of Renishaw Ironworks.

The chief shareholders in the Sheffield to Penistone Trust were the Duke of Norfolk, the Earl of Bute, the Town of Sheffield and the Company of Cutlers. Other subscribers were Thomas Steade of Onesacre, Thomas Rawson of Wardsend, the leading tanner in the district; J. and G. Kenyon, edge tool and steel manufacturers and Thomas Broadbent, the lessee of a number of grinding wheels on the Norfolk property in Sheffield.^I When the road was improved in 1825, over half the additional capital was provided by the Wortley family and the Thorncliffe coal and ironmasters, Newton, Chambers and Company. Capital for the parallel road to Sheffield from Wakefield was largely provided by the Duke of Norfolk, the Earl of Strafford, the Marquis of Rockingham and Sir Thomas Wentworth.² Another South Yorkshire Trust, set up in 1809 to improve the road from the north end of Rotherham to Pottery Lane in Swinton was largely financed by Earl Fitzwilliam and his heir Lord Milton. The remainder of the shares were taken up by such local families as the Walkers of Masborough, the Kents and the Bingleys, all interested in one way or another in heavy industry and coalmining.

On the west of Sheffield, the Dukes of Norfolk and Devonshire were the most important shareholders in the

- I. Papers relating to the estate of Thomas Steade. Beauchief Muniments No. 198. Sheffield City Library.
2. A.W. Goodfellow. "Sheffield Turnpikes in the Eighteenth Century." Trans. Hunter Society. Vol. V. P.78.

Sparrow Pit Trust. Other subscribers were Vincent Eyre, the agent of the Duke of Norfolk and the Reverend William Bagshawe, a member of a family owning estates at both ends of the road.^I When in 1812, the Trust was empowered to build a new road from Fox House to Banner Cross, the Duke of Devonshire loaned £6000 for this purpose. He and the Duke of Norfolk were chiefly responsible for making it possible to raise the capital necessary for the construction of the new road between Sheffield and Glossop, for when it improved impossible to raise sufficient money from other landowners in the area, the two Dukes gave their personal security that interest due would be met - a step which induced a number of people with trust funds at their disposal to lend these to the Trustees.²

Two roads joined Ashover, with its lead mines and smelting plants, with the coalfield. Most of the capital for these Trusts was provided by local landowners, partners in the lead mines and in the lead smelting cupolas. Prominent amongst these were the Duke of Devonshire, Godfrey Clarke of Somersall Hall, John Woodyeare of Walton Hall and R.B. Hodgkinson, all of whom had property adjacent to these roads. Amongst the shareholders in nearby mines and smelting plants were Peter Nightingale of Lea, Richard Wilkinson of Chesterfield and William Milnes of Ashover and members of the Bourne, Towndrow, Allen and Willamot families, the latter group all connected with the most famous of eighteenth-century Derbyshire lead mines, the Gregory Mine at Ashover.³

1. Papers relating to Turnpike Roads. Beauchief Muniments No.85. Sheffield City Library.
2. Sheffield and Glossop Turnpike. Minute Book. C.P.G. I. Fairbank Collection. Sheffield City Library.
3. Twigg MSS (uncatalogued). Chesterfield Borough Library.

Information as to shareholders in other roads is fragmentary. The Duke of Devonshire, as befitted his position as the largest landowner in North Derbyshire, subscribed liberally to the Trusts controlling the roads from Sheffield to Duffield, from Nottingham to Newhaven and from Chesterfield to Hernstone Lane Head.¹ When, in 1795, it was decided to build a new turnpike road from Whittington Moor to Unstone Green to avoid the steep hills on both sides of Old Whittington, the Duke not only advanced £500 towards its cost but also gave a large part of the land required.² When, in 1812, the Hernstone Lane Head Trust constructed a new road from Chesterfield to Baslow, planned to eliminate the worst of the gradients over the East Moor, the capital for this was provided by the Duke.

Few owners of Turnpike securities can have congratulated themselves upon their choice of investment. The exceptions were shares in Trusts controlling long stretches of road, such as the 58 miles long Hernstone Lane Head Trust, the 31 miles long Nottingham to Newhaven Road, the Sheffield to Wakefield Trust with its 22 miles of main road or the Tinsley to Doncaster Trust with its 13 miles of trunk road, all of which paid regular dividends of about 5% until the Early Railway Age.³ These bodies could meet the heavy administrative and legal expenses inevitable in running such organisations, which could easily bankrupt a short Road with a small revenue from tolls - for example, the Tinsley to Doncaster Trust spent well

1. Hardwick Hall MSS. (uncatalogued.)

2. Correspondence between John Bagshawe Esq -- and Joseph Outram of Alfreton. 1791-1801. Letter dated 1 March 1795. John Rylands Library, Manchester.

3. Turnpike Accounts at Derbyshire and West Riding County Council Offices returned under 1 Geo. IV. cap. 95.

over £1100 in obtaining powers to turnpike the four and a half miles of road between Swinton and Conisborough. Inadequate income caused by control of too short a length of road must be considered the fundamental factor in such situations as that of the four mile long Temple Normanton to Tibshelf road, which turnpiked in 1827, converted £1261 of unpaid interest into capital in 1835, or that of the Swinton to Rotherham Trust, set up in 1809 to turnpike three miles of road, which twelve years later similiarly converted £1733.

Indeed, in too many cases, shareholders must have re- echoed the words of a Sheffield lawyer, Bernard Wake, that money invested in Turnpikes, was " in innumerable instances, after lapse of time -- considered as lost to the original lenders and their families for ever or is treated as a Property of little value." ^I This accusation was levelled specifically at the Attercliffe to Worksop Trust, controlling some sixteen miles of road, which had a deplorable financial record. After borrowing £4000 in 1767, it raised another £3000 in loans over the next three years. In 1817, with arrears of interest, the debt of this Trust amounted to £12,500. This position was not the result of controlling too short a road, nor of corruption, malpractice or incompetence on the part of the Trustees. When the Trust was set up initially, an agreement was made with the Company of Cutlers that no toll bar was to operate nearer to Attercliffe than Blackburn's Smithy. The consequence was that a large volume of traffic used a part of the road without payment. In 1782, the Trustees realising the danger of this to

I. Observations Intended to Show that the Mortgagees of the Tolls of Turnpike Roads have a right to clear payment of their interest. By a Mortgagee. 1817.

their finances, decided to introduce a Bill to put up another Bar nearer Attercliffe. This provoked the Master Cutler to attend a meeting of the Trustees to remind them of the previous agreement. Two years later, the Trust once again reconsidered this step, but the idea was abandoned when it was ^arelised that the financial position was so desperate that they could not afford the luxury of opposition from the Company when their Bill came up for renewal. In 1786, another attempt was made, supported by Vincent Eyre. Once more the Master Cutler intervened, vigorously denouncing the proposal at a meeting at which it was alleged that any such step would increase the price of coal from the pits at Attercliffe, that other pits would follow suit and that in all, a new toll bar would cost the Sheffield cutlery trade another £500 annually in fuel. Hence, the continued failure of the Trust to meet its obligations and the revolt of its shareholders against the diversion - or so they considered it - of tolls from the payment of interest to the repair of the road. Their protest was, in fact, successful, as an agreement was made between them and the Trustees whereby, when the tolls amounted to over £1000 a year, 5% was to be paid as current dividend and another 5% to wipe out arrears.
I

Another road with a similiar financial history was the Gander Lane Trust, controlling 13 miles of road from Sheffield to Killamarsh. In 1831, it was paying interest due in 1820; by 1840, it had converted £2543 of unpaid interest into capital. Once more the same reason - traffic which paid
I. Minute Book. Attercliffe to Worksop Turnpike Trust. West Riding County Council Offices, Wakefield.

no tolls - was the cause of this unhappy plight. When the Trust was formed, it took over the road from Intake through the Park into Sheffield, which formerly had been a private road owned by the Duke of Norfolk. In return, the Trust agreed that no tolls should be collected nearer to Sheffield than the entrance to the Park and that coal mined on the Norfolk estate at Gleadless and Woodthorpe should be exempt from dues. In 1821, the Trustees decided to introduce a Bill to place a new toll bar between the Deep Pits and the town. The lessees of the Norfolk collieries immediately petitioned the Duke against the Bill on the grounds that the new toll bar would increase the price of their coal in Sheffield at a time when they were beginning to feel the competition of coal mined in the Dearne valley, brought in by the newly opened Tinsley Canal.^I The influence of the Duke was such that the Act contained a clause explicitly confirming the complete exemption of coal mined on the Norfolk estate from payment of toll.

Economic decay was yet another factor in the financial plight of a number of Trusts. Most of the turnpikes around Ashover had been made either to facilitate the transport of coal to that place or of lead away from it. While the Gregory Mine there was prosperous, the Mansfield Turnpike paid an annual dividend of 5% from the time it was formed to 1780. With the decline in lead production its traffic slackened and by 1823 the Trust was twelve years behind in the payment of interest. The record of the Chesterfield to Matlock Trust was even worse. It had encountered difficulties even when lead output was high

I. Deed Box 25. Norfolk Estate Office, Sheffield.

as its Act gave exemptions and concessions to various articles transported on the road. As lead output decreased, revenue fell so seriously that interest due in 1804 was only being paid in 1828. By 1833, its debt was £24,128 and its revenue £428.^I The High Moors Trust, which crossed the various arms of the Matlock and Hernstone Lane Head Turnpikes was another body which suffered not only from the decay of the lead industry in Ash-over, but also from the general depression in the industry which set in during the thirties as a result of the competition of the much cheaper Spanish metal. As the demand for coal for smelting and pumping declined, its tolls fell off so much that by 1843, the Trust owed £4,500 in unpaid interest.

Some Trusts owed their precarious financial position to competition from other roads. The Hartcliffe Hill road, already financially embarrassed as a result of coal traffic evading badly sited gates, was finally ruined when the Don was improved as far as Tinsley, so that through traffic into Lancashire no longer found its way over Woodhead but over Stanage and up the Winnats. By 1762, its tolls were insufficient to keep the road in repair, much of it, indeed, having relapsed into the hands of the parishes through which it ran.² The Sparrow Pit Road, in its turn, lost much of its Lancashire traffic when through communication was established between it and the West Riding by water. Heavy local traffic in coal and lead kept the Trust solvent until the opening of the French Revolutionary Wars. The collapse of lead mining in Eyam, comp-

I. Second Report of the Select Committee of the House of Lords appointed to examine the Turnpike Returns. 1833. P. 20.

2. Journals of the House of Commons. XXIX, 159.

etition first from the Greenhill Moor Turnpike and later from the Glossop Road, however, placed the Trust in such a difficult financial position that by 1840 it owed its shareholders £4476 in back interest.

The abolition of Statute Labour, with the loss of income derived from its composition, drove some of the Trusts nearer bankruptcy. Then came the competition of the railways, which in a decade reduced the income of the Tinsley to Doncaster Trust to a sixth of what it had been in 1840; caused the Treasurer of the Sheffield to Wakefield Trust to suspend payment of interest the day the North Midland Railway was opened; led to such a diversion of traffic from the Worksop to Attercliffe Turnpike to the Chesterfield Canal between Worksop and Eckington, where goods could be transferred to the North Midland line, that it proved impossible to let the toll bars by auction; almost ruined the section of the turnpike controlled by the Sheffield to Duffield Trust which ran parallel to the railway from Chesterfield to Derby and plunged the Glossop Trust so deep in the morass of bankruptcy that, by 1849, the two Dukes in fulfillment of their guarantee, had been forced to advance £10,700 to pay off the arrears of interest. The Trust was so badly hit by the competition of the Sheffield, Ashton-under-Lyne and Manchester Railway that at a time when it cost £2900 annually to repair the road, its income had dropped to between £300 and £500 a year. Indeed, Sir George Grey of the Road Office proposed that in view of " the hopeless financial position " of the Trust in the middle of the century, the road should revert to the public - a suggestion which naturally found

no favour with the shareholders, so that the Trust dragged on another twenty five years before it was abolished.^I

THE CONDITION OF THE TURNPIKE ROADS 1800-50.

To appraise the condition of the turnpike roads in this district during the first half of the nineteenth century with any degree of accuracy is an impossibility. Too many records have vanished, particularly the Minute Books of many Trusts, for a historian to be able to feel the pulse of the system and to assess its vitality. Standards change - what has been to one generation a perfectly satisfactory system of transport becomes to the next an anachronism. Travellers through the area fail to record their appreciation of good roads whereas others are bitter in their condemnation of the bad. To strike the balance correctly today is an impossibility.

The main trunk road through from Derby to Wakefield seems to have been considered unsatisfactory at many times during the half century. In 1829, a Surveyor's report on the section from Wakefield to Sheffield, referring to the appalling gradients at Mount Vernon and Chapelton, declared that only a small mileage on this turnpike was "compatible with the present rapid method of travelling in this country."² In the same year, the Post Office threatened to present the road from Alfreton to Derby, alleging that coaches on it, threaded their way, like ships amongst shoals, through the stones. Another well travelled witness, writing in the same year, asserted that the stage between Sheffield and Barnsley was regarded by

1. Sheffield to Glossop Trust. C.P.G. 12/16. Parliamentary Business. Fairbank Collection. Sheffield City Library.
2. Printed Report by James Mills on the Sheffield and Barnsley Turnpike Road. 1829.

postillions and coachmen as " the worst stage for horses in the Kingdom."¹ In 1836, The Post Office threatened to present the turnpike road from Sheffield to Chesterfield as it was in dis-repair.² On the eve of the Railway Age, another author declared that the whole route from Derby to Wakefield was " reckoned one of the worst roads in England by travellers and coachmen."³ In the middle of the Mania, in evidence before a Select Committee, The Surveyor of the Sheffield to Derby turnpike road, was forced to admit that this road from Sheffield to Chesterfield was in bad condition.⁴ Altogether, the total of this evidence suggests that the main trunk route through South Yorkshire and North Derbyshire was in an unsatisfactory condition during these years.

Information about other turnpike roads is sparse. Farey -probably the most reliable observer amongst the visitors to Derbyshire during this period - considered that its roads were, on the average, superior to those in other counties. Nevertheless, he had a number of criticisms to make about certain turn-pikes. The Mansfield to Chesterfield Road was badly mended with friable magnesian limestone at Glapwell; that from Ashover into Chesterfield was covered with large lumps of crowstone; at In-take, the Gander Lane Turnpike was repaired with such big pieces of ganister that even heavy coal carts were jolted about and the High Moors turnpike road was patched with refuse from

1. Sir Richard Philips " A Picture of England." (1829).P.326.

2. Derby Mercury. Aug.10.1836. P.3.

3. A Few General Observations on the Principal Railways in the Midland Counties -- with the Author's Opinion on them as Investments. 1838. P.II.

4. Thomas Fall, Surveyor of the Sheffield to Derby Turnpike Trust in evidence before the S.C. on Manchester, Sheffield and Midland Junction Bill 1845.

the local potteries.¹ In 1825, this last named road was in much the same condition as a writer to a local newspaper alleged that it was neglected to such an extent that it was obstructed by "dunghills, ditch scourings, high hedges and water filtering down the road."² Fifteen years later, part of the turnpike from Swinton to Rotherham, the section of the Worksop turnpike near Tapton Bridge and the western half of the Saltersbrook road³ were all under indictment.

In addition to financial difficulties, the organisation of the Trusts was not conducive to the construction of good roads. Too often, the Clerk, a lawyer such as John Charge of Chesterfield or Bernard Wake of Sheffield, seems to have been the dominating personality on many Trusts, who inevitably looked at matters through legal glasses, being ignorant of the engineering problems at issue. There seems, too, to have been a dearth of men trained as civil engineers. The Glossop Trust employed the younger J.L. McAdam for a period but soon dispensed with his services as an economy measure. Men like Thomas Fall, a brickyard owner and Thomas Ellison, connected with the Norfolk Estate in Sheffield were probably representative of the general run of Turnpike engineers at this time.⁴

Turnpike Trusts, too, found it difficult to retain the loyalty of their Trustees. The long - and with each successive Act everlengthening - list of Trustees was a confession

1. Farey J. "Agriculture and Minerals of Derbyshire." Vol.3. (1817). Pp. 206-79.

2. Daily Independent 22 Jan 1825.

3. Appendix to the Report on the State of the Roads 1840.

4. Fall was Surveyor both to the Sheffield and Derby Trust and to the Greenhill Moor and Eckington Trust. Thomas Ellison was made Surveyor to the Sheffield and Glossop Trust after the dismissal of J.L. McAdam.

of their inability to attract disinterested service from them. Often it was difficult to obtain a quorum to hold the statutory meetings. Men such as John Gorell Barnes of Ashgate, chairman of the Mansfield Trust; W.A. Ashby, the agent at Chatsworth of the Duke of Devonshire, who served on the Glossop Trust and G.B Strutt, the Belper cotton manufacturer, chairman of the Sheffield to Derby Trust were rare exceptions, but even they, however interested they might be in this work, could not supply the place of the professional engineer.

Many Trusts, also, found it difficult to make arrangements to maintain their roads. As an example, the Attercliffe to Worksop Trust, between 1798 and 1810 let contracts for repairing its roads to three different contractors, each of which left the road in worse condition than he found it, so that finally it was threatened with presentment. Some of the Trusts, trembling on the edge of bankruptcy, solved this problem and eased their financial position by handing over a portion of their tolls to the village Surveyors of the Highways along the Turnpike, who then assumed responsibility for its repair.

Nevertheless, despite these admitted defects, a century of turnpiking left its mark on the economic life of Hallamshire and Scarsdale. Enclosure came rapidly on the heels of turnpiking, as the huge wastes of the Peak and the extensive Commons on the coalfield were crossed by these roads. Enclosure, too, paid its debt to the turnpikes, as many Enclosure Acts made provision for straightening the course of turnpikes and for a system of secondary roads serving them. The great decade of turn

piking during the Seven Years War was accompanied by the inauguration of a large number of new fairs and markets for both beasts and cereals, as farming responded to the impetus given to it by better communications.

The output of minerals was especially stimulated by turnpiking. Production of lime, so badly needed by the farmer on the coalfield, increased as the Peak and the magnesian limestone ridge were linked by turnpike with the consuming area. In return, the carts took back with them coal, particularly from the collieries situated on the eastern and western edges of the coalfield. Turnpiking also led to an increased output of iron ore in certain localities as some of the largest iron works, such as the Griffin Foundry at Brampton and the Adelphi Works at Duckmanton, were wholly dependent on roads for the assembly of their raw materials.

Business, too, must have been facilitated by the coach services linking Sheffield with London, Birmingham, Selby, Leeds and Manchester and the intermediate towns.

Whatever may have been the defects of the turnpike system, a comparison of the district in 1740 and a century later, shows such a difference in the scale of economic development in every field as to justify, from the national standpoint, what capital was invested in the Trusts. No doubt, too, many a landowner in the area, contemplating his rent books and his royalty accounts, felt that after all, his turnpike shares, however far behind they were in the payment of interest, were one of the soundest long term investments he had ever made.

II.

THE DEVELOPMENT OF INLAND NAVIGATION IN SOUTH YORKSHIRE AND NORTH DERBYSHIRE 1697-1830.

In the half century after the Glorious Revolution of 1688, the location of industry in the Hundred of Scarsdale and in the Liberty of Hallamshire was largely influenced by the availability of water power on what was for the times a large scale. The streams rushing down rapid and waterfall on their way to join the Don or the Derwent had been dammed up at many points on their courses to provide power - power to drive bellows, to lift hammers or to drive grindstones. Near their sources, in lonely places on the East Moor or in Loxley Chace, where their poisonous fumes could do no harm, stood the lead smelting mills, drawing their ore from what was, at that time, one of the richest lead mining areas in Europe, the Peak of Derbyshire. Lower down stood the blast furnaces, supplied with iron ore mined from the easily accessible supplies on the edge of the Coal Measures and with charcoal made in the woods standing on slopes too steep or on soils too poor for cultivation. Near them stood the forges, slitting mills and grinding wheels. From these and their associated domestic industries came a supply of pig and forge iron, edge tools, cutlery, nails, pig lead and red and white lead, the greater part of which was marketed outside the region, through the port of Hull.

These rapid, swift flowing streams, on which the industrial strength of the area in part depended before the age of steam were, however, in the early eighteenth

century, its greatest weakness from the standpoint of communications. Its rivers were too shallow, too much impeded by weirs and their run off too rapid for navigation. Not until its products reached Holmestile on the Don, Bawtry on the Idle or Nottingham on the Trent could they be carried by the cheapest, safest and most rapid form of transport at this time - the inland navigation.

THE BIRTH OF THE DUN NAVIGATION 1697-1751.

Any attempt to improve the course of the River Don had to face considerable natural and man made difficulties. The river fell 119 feet between Sheffield and Barmby Dun, the biggest gradient being at the Sheffield end. Communication between Sheffield and Doncaster was rendered impossible by a series of weirs and ~~dams~~ near the Wicker, at Attercliffe, Rotherham, Thrybergh, Kilnhurst, Conisborough and Spotborough. Below Doncaster, navigation as far as Fishlake was hindered by sand and gravel beds, so that in summer navigation between these two points was confined to small boats.¹ At Fishlake, since the old course of the Don had been stopped up, keels had to use the Dutch River on their journey to the Humber, a route rendered unnecessarily hazardous by the dangerous placing of the bridges at Rawcliffe and Goole.²

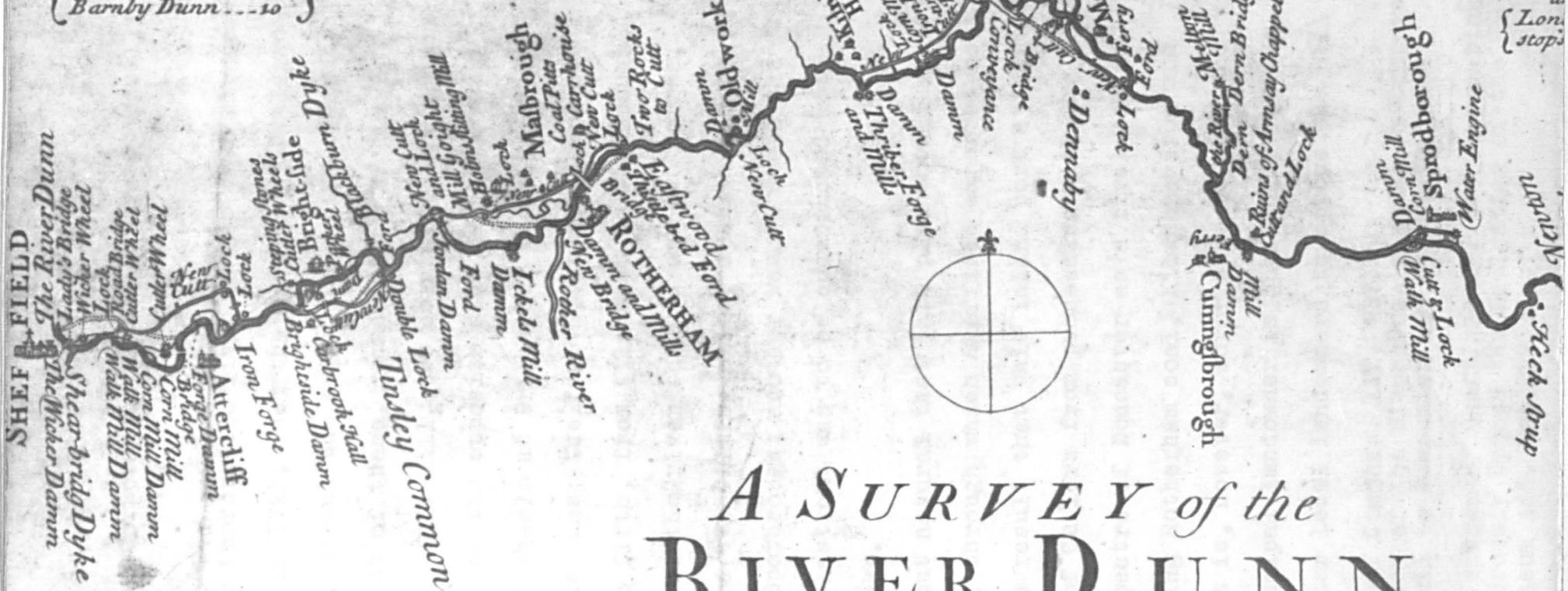
The first attempt to secure powers to make the Don navigable as far as Sheffield was made in 1697, when Sir Godfrey Copley, the chief landowner in Spotborough, alongside the river, introduced a Bill - unsuccessfully - into the Commons for this purpose.³ Seven years later, a similar

C.H. A Case in Relation to Making the River Dun Navigable. n.d.
Journals of the House of Commons. XXI, 626.
Journals of the House of Commons. XII, 79.

The height of the Banks of y^e River

| | | | | |
|----|-------------|-------|----|--------|
| at | Holms Sile | ----- | 16 | } Foot |
| | Wheatley | ----- | 13 | |
| | Long Sandil | ----- | 11 | |
| | Barnby Dunn | ----- | 10 | |

The Tides
at
Gool
Fishlo
Barnby
at
{ Long
stop



*A SURVEY of the
RIVER DUNN
in order to improve the Navigation
from Hull to Doncaster and to
continue up to Sheffield
By Will. Palmer & Partnerstaken*

Anno Dom: 1722. Eman: Bowen Sculp^r

Explanation

- Cutt or New River -----
- Old Drains or Goights -----
- Where New Cutts may be made -----
- Hedges or Fences -----
- Standing Waters -----
- Mills Iron Works Cutler Wheels &c. -----
- Places where Mills may be built -----
- The Darts shew y^e Course of y^e Water -----

attempt on the part of the Corporation of Doncaster was equally unsuccessful.¹

The plan to improve the river as far down stream as Sheffield was revived in 1722, when the Company of Cutlers supported a scheme to circumvent the weirs across the river by a series of cuts. The first of these, commencing near the Wicker, was to by pass the Walk Mill, two corn mills and Attercliffe Forge; the second, on the opposite side of the river, was to avoid the cutlers' wheels at Brighside; the third was to avoid Jordan and Ickles Dams; the fourth, at Aldwark, was to cut off a meander; the fifth, from Kilnhurst to Mexborough, was to by pass a section of the river which drove two forges, a series of corn mills and two tilting mills; a sixth was to cut off another bend at Spotbrough; another was to avoid the mills at Doncaster and a last cut was to be constructed not far from Thorne at Fishlake.²

It was but natural that this plan should arouse the antagonism of Bawtry, through which Sheffield exported most of its products, with the result that this inland port attempted to dissuade the Company of Cutlers from proceeding with the project by raising the spectre of Doncaster as a rival centre of the cutlery trade, using Rotherham coal, Kilnhurst iron and Thrybergh grindstones.³ It is, however, surprising to find the Duke of Norfolk, the principal landowner in Sheffield, threatening to combine with other local landowners to oppose the Bill

1. Journals of the House of Commons. XIV, 437.
2. William Palmer. A Survey of the River Dun in order to improve the Navigation from Hull to Doncaster and to continue up to Sheffield. 1722.
3. Several Reasons why the Town of Sheffield and the Corporation of Cutlers should Rigorously Oppose the Navigation of the River Dun. British Museum Add. Mss. 27538.

The Falls of the RIVER DUNN.

taken from the still Water above the Damns Shoals & to the still Water below & same From Sheffield to Barnbydun taken at a very low Water by I. Mitchel & W. Palmer.

| | |
|----------------------------------------------------|--------------|
| Wicker Dam at Ladies Bridge at Sheffield | 5.7. |
| Walk Mill Dam | 8.8. |
| Corn Mill Dam | 15.0. |
| Attercliff Forge Dam | 9.9. |
| Brightside Dam | 6.10. |
| Parker Wheel Dam | 1.6. |
| Shoals to Tinsley Common p ^r estimation | 19.3. |
| Stolms Siting Mill | 6.2. |
| Rotherham Mill Dam | 2.9. |
| Total | 65.9. |

| | |
|---------------------------------------------------------------------------|--------------|
| From below Rotherham Dam to about as far below Rotherham Bridge | 2.8. |
| Fall at Thistlebed Fords | 2.5. |
| Rockie Shoal above Oldwork | 0.6. |
| Oldwork Mill Dam | 5.1. |
| Thriver Dam | 5.4. |
| Kilnhurst Works Dam | 7.10. |
| Shoals from Kilnhurst Works to below Mexborough p ^r estimation | 4.6. |
| Cuningborough Mill Dam | 3.11. |
| Sprodborough | 5.11. |
| Total | 38.9. |

| | |
|-----------------------------------------------|--------------|
| Doncaster Mill Dam | 4.1. |
| From above & Water Engine to Frire bridge | 3.0. |
| From thence to Mill goight-mouth | 2.0. |
| to Stolms Sile | 0.6. |
| Mill thorn Shoal | 0.4. |
| Copleys Scaup p ^r estimation | 0.3. |
| Heatley Grove | 0.3. |
| Heatley Townside p ^r estimation | 0.3. |
| Heatley Bridge Ford p ^r estimation | 0.2. |
| Copley Close | 1.0. |
| our Mile Oak p ^r estimation | 0.3. |
| andil Ford | 1.0. |
| andil Townside | 0.4. |
| Heat Ford p ^r estimation | 0.3. |
| Barnbydun Ford | 2.0. |
| Total | 15.7. |

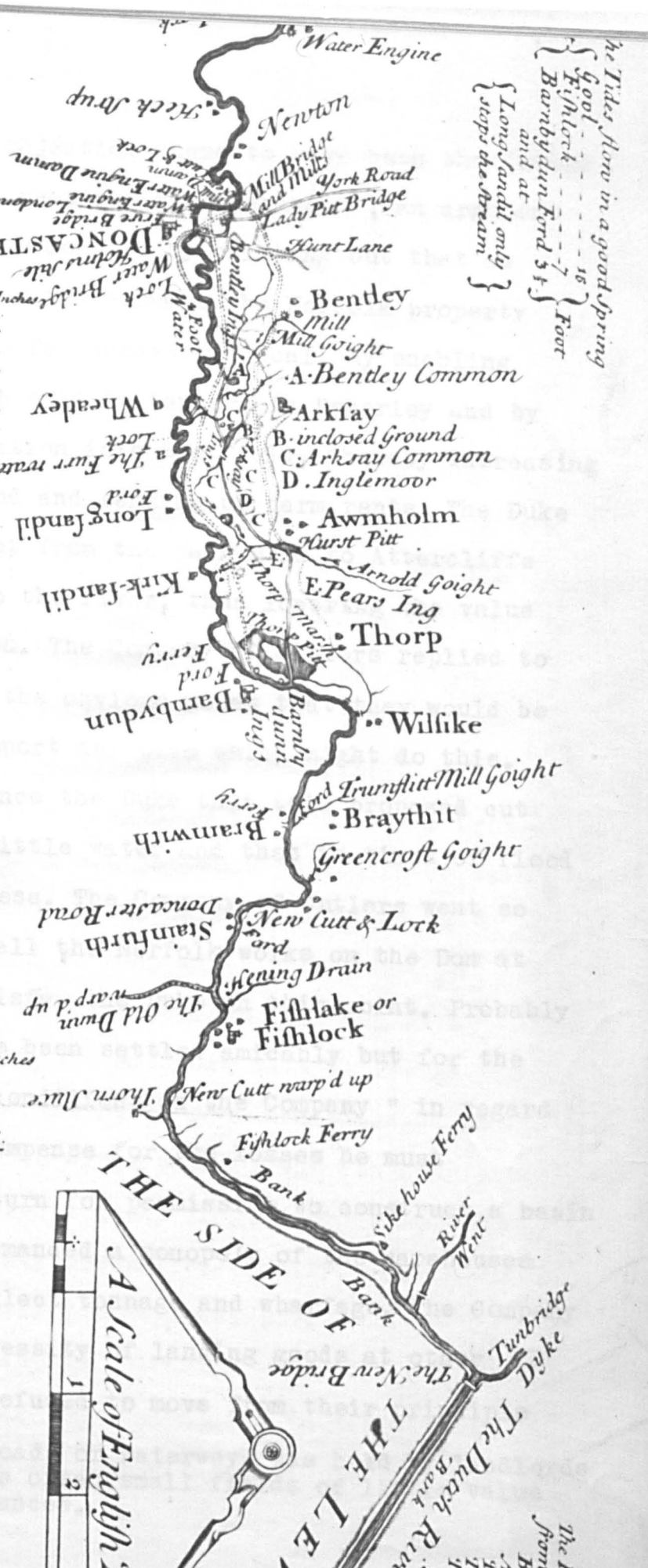
A Collection of the Totals

| | |
|-----------------------------|---------------|
| From Sheffield to Rotherham | 55.9 |
| Rotherham to Doncaster | 28.1 |
| Doncaster to Barnbydun | 15.7 |
| The Grand Total | 119.6. |

Note that there is some little Fall in the still parts of the River which is not here expres^d.

The Distance of several parts of the River Dunn from Sheffield p^r I. Atkinson.

| | Miles |
|-------------------------|--------|
| Bridge at Attercliff | 1 |
| Attercliff Forge | 2 |
| Brightside Dam | 3 |
| Parker Dam | 4 |
| Jordan Dam | 5 1/2 |
| Locks Dam | 6 1/2 |
| Rotherham Dam | 6 3/4 |
| Oldwork Dam | 10 |
| Thriver Forge Dam | 12 1/2 |
| Kilnhurst Dam | 13 |
| below Mexborough Shoals | 16 |
| Cuningborough Dam | 18 1/2 |
| Sprodborough Dam | 19 |
| Doncaster Engine Dam | 25 |



The Tides flow in a good spring
 Foot 15
 Fishlock 7
 Barnbydun Ford 5 1/2
 and at
 Longlandil only
 stops the stream

THE SIDE OF THE LEV
 THE DUNE RIVER
 THE DYKE
 The Fa
 from 0
 Bir
 Ar
 the
 the

in Parliament. His main objection seems to have been the damage likely to be done to his property by severances^I, an argument which the Company tried to counter by pointing out that an improvement of the river would benefit the Norfolk property by opening up new markets for Handsworth coal, by enabling bark from the woods to be sold to tanners in Beverley and by bringing a greater population into Sheffield, thereby increasing the price of building land and sending up farm rents. The Duke also declared that the cut from the Walk Mill to Attercliffe would draw off water from the river, thus lowering the value of the works along the Don. The Company of Cutlers replied to this objection by making the obvious point that they would be the very last body to support any plan which might do this. They also sought to convince the Duke that this proposed cut would use comparatively little water and that in times of flood it would draw off the excess. The Company of Cutlers went so far as to offer to lease all the Norfolk works on the Don at the existing rents to satisfy the Duke on this point. Probably these questions might have been settled amicably but for the Duke's attempt to impose conditions on the Company " in regard to his Royalty and in recompense for the losses he must inevitably suffer." In return for permission to construct a basin at the Wicker, the Duke demanded a monopoly of the warehouses there and the right to collect tonnage and wharfage. The Company pointed to the obvious necessity of landing goods at other points near the town and refused to move from their principle

I. Severing farm land by roads or waterways was held by landlords to decrease its value as often small fields of little value were left by such severances.

that " Warfes and Warehouses goe together."^I Whether it was this particular difficulty or the engineering problems of a river which fell 55 feet in the three miles below Sheffield, which caused the Company to abandon the idea of making the river navigable as far as Sheffield is uncertain, but Tinsley, outside the Norfolk lordship, was finally chosen as the terminus.

Supported in the Commons by a number of petitions from various towns, the result of vigorous propoganda by many leading Sheffield merchants, and steered through the Lords by the Duke of Devonshire, the Bill became law in 1726.² The Company was not to erect any dam any dam, to raise or lower the level of the water or to pull down any ironworks on the river; it was to give security to Lord Frederick Howard against any injury to Rotherham Mills; it was prohibited from making a cut between Jordan Dam and Eastwood except in certain specified places; special precautions were to be taken in placing the lock at Jordan Dam so that water should not be diverted from Holmes Goyt, feeding Rotherham Slitting Mill; at Aldwark, the cut connecting the mill dam with Thrybergh was to be on the opposite side of the river from the village; at Spotborough, the Company had to agree to keep the cut supplying the water engine on the Copley property in good order and to lease the corn mills for twenty one years. Finally, no cut was to be made out of the corn mill dam at Doncaster.

In the following year, the Corporation

1. The Navigation of the River Dumn considered in Respect to my Lord Duke of Norfolk. British Museum. Add. Mss.27538.
2. Letters between John Smith and his wife whilst he was on a mission to London on business connected with the River Dun Navigation Bill. 1725 -6. Leader Collection. No 70. Sheffield City Library.

of Doncaster again sought powers to improve the river from Holmestile to Wilsick House. The resulting Act also transferred to the Corporation control over the three wooden bridges over the Dutch River, empowering it to fit the bridges with draw leaves, so that boats could sail through them, without the necessity of unshipping their masts.

By 1729, the Company of Cutlers had made the Don navigable from Holmestile to Mexborough, a distance of six miles. At this juncture, the venture proved too costly for them to continue out of their own resources, so that additional capital had to be raised in Sheffield to complete the project. The agreement between the Company of Cutlers and the new body of undertakers provided for the election of a Committee of seven to supervise the improvement of the river. The first Committee consisted of William Steer of Ecclesfield; Samuel Shore, a Sheffield factor; Thomas Buck of Sheffield, grocer; James Crawshaw, the Town Collector, representing the Burgery of Sheffield; John Smith of Belhouse, a former Master Cutler, who had seen the Act of 1726 through Parliament; Samuel Staniforth of Darnall, a local landowner and Thomas Heaton, a Sheffield wiredrawer and ironmonger. Heaton was also nominated the First Treasurer of the Company.

By 1730, the Sheffield undertakers had spent £8692 and the Corporation of Doncaster another £3774 on the improvement of the Don. Two authorities on one river were, however, plainly excessive, so in September of that year, the two were amalgamated. Their agreement was afterwards incorporated in the Act of 1732, passed to regularise the position and

to regulate the powers of the new company.

For the next twenty years, this Company was busy implementing the powers given it by this Act. Active direction of its affairs lay in the hands of the Committee, headed by an annually elected Treasurer and Chairman. Among the men who served in either or both of these capacities during the early years of the Company's history were many of high standing in the business world of Hallamshire. They included John Fell, the Bridgehouses' ironmaster, who controlled the Duke of Norfolk's ironworks in South Yorkshire; Gamaliel Milner, one of Fell's relatives and a fellow ironmaster; Samuel Shore, a Sheffield factor and a partner in Kilnhurst forge; Joseph Broadbent, a Quaker merchant; Francis Sitwell of Bridgehouses, a leading Sheffield lawyer; Joseph Steer, a Sheffield mercer; John Travers Young, merchant and his father in law, Samuel Staniforth of Darnall and William Steer of Darnall, cutler and his eldest son, the Reverend William Steer of Ecclesfield. Day to day control of the affairs of the Navigation were in the hands of Thomas Radford, the book keeper and John Smith, the engineer - originally a Brightside carpenter - whose duty it was to purchase materials, to see that " Stone and Woodwork be done in a Substantial Manner " - and to settle accounts. A shareholders' meeting was held annually, either in Doncaster or Sheffield, but the control exercised by this over the direction of affairs was purely nominal.

In March 1731, the Committee began work by ordering stone and timber at Hooton and Dalton for the construction of a lock and bridge at Aldwark, which was to be

temporarily the head of navigation. In September, instructions were given to Smith to clear out the river below Thistlebed Ford, near Eastwood. In October, the Committee authorised the building of locks at Denaby and between Eastwood and Rotherham High Mill. In the February of the next year, Smith was ordered to pull all the roots of trees out of Thrybergh and Aldwark. dams " and Everywhere Else that is necessary." Below Doncaster, Goole Bridge was repaired, Sandall Weir rebuilt, a lock put in at Redcliffe and a new cut made at Barmby. By 1733, the first stage of the programme was completed by the building of warehouses at Swinton and Aldwark. The Committee then proceeded to frame a schedule of tolls for the river. The majority of commodities - iron, steel, cutlery, horns, boxwood, cheese, salt, groceries, tallow and wine - were to pay a toll of three shillings a ton. Dues on certain goods were, however, lower. The tariffs on Derbyshire lead and on English timber were fixed at eighteen pence a fodder and a shilling a ton respectively with the intention of diverting this traffic from the Idle. Coal also was to pay a toll of eighteen pence a ton, so that coal mined around Park Gate could compete in the Humber and Trent valleys with coal brought down the Aire and Calder Navigation.

The Company paid its first dividend of 5% in March 1734. The Annual General Meeting, however, passed a resolution that " this Navigation be let by ye Committee for any term not exceeding seven years provided that they can have a good tenant that will give six pounds for all the moneys expended." It was not, however, until Lady Day, 1738 that the Navigation was leased to Henry Broadhead, Francis Cripps and

Thomas Ellison, all of whom had interests in the Doncaster - Thorne section of the River, for the next seven years at a rent of £1200. The lessees also contracted to lease the river for a second term of seven years at an " improved " rent of £1500.

With its financial position assured, the Committee was able both to plan the completion of the Navigation from Aldwark up to Tinsley and to set on foot improvements below Doncaster. In April, 1738 they notified landowners as to what property would be compulsorily purchased for cuts above Aldwark; in August, preparations were begun to carry the Navigation into Rotherham High Dam; two years later, wood and stone were ordered for Ickles Lock and work on a lock at Bromley Sands was begun in 1742. By 1751, the Navigation was open through to Tinsley, where a wharf and warehouse were built. Below Doncaster, the Committee deepened the channel below Stainforth and Fishlock Ferry, made a lock and cut on the south side of the river to by pass the ford and shallows at Stainforth and Bramwith and built a dam above the Twenty Acre Drain near Bramwith Upper Ford to deepen the course of the Don to Wilsick House. It is obvious from the Minute Book that the Company was profoundly dissatisfied with the slow progress made in improving the river during these years, but it is impossible to state whether their allegation that this was caused by the dilatory payments of the lessees, injuring the Company's credit, had in foundation in fact.

How far the Don replaced the Idle, before the middle of the eighteenth century, as the main line of communication between Sheffield and the sea, is uncertain. The business

correspondence of Richard Dalton, a Sheffield merchant, who imported Baltic timber and iron both from the United Provinces and from Scandinavia, shows these commodities reaching him through both Bawtry and Aldwark. These letters also show that the Don was closed to traffic at various times during the summers of 1740, 1743, 1745 and 1747 on account of water shortage, a problem which continued to plague the Navigation throughout its whole history.^I

THE NAVIGATION AT WORK 1751-75.

In 1751, when the lease of the river expired, it was transferred to Joseph Broadbent, Thomas Smith and Joseph Atkinson for a period of seven years at a rent of £3,500. When this lease terminated in 1758, the Annual General Meeting after " a very tedious and loquacious " three day assembly decided to administer the Navigation directly and not to lease it again, a decision which proved to be extremely profitable.² The Committee was fortunate enough to secure the services of two men - John Hill of Thorne and William Martin of Tinsley - who had managed the Navigation for the previous lessees and who in return for a salary of £590 a year, undertook " the whole management of the River in forwarding and expediting the Carriage and Delivery of Goods and Merchandises the charging of Tolls and Duties thereon, the superintending the Locks and Wharfs and keeping a proper number of agents, Lock Keepers, Wharfingers and Porters --- and keeping and making regular and fair accounts." When

1. The Letters of Mr Richard Dalton. Bagshawe Collection. B. 5/4/I-3. John Rylands Library, Manchester. Letters dated 9 July 1740, 2 July 1743, 3 August 1745 and 1 August 1747.
2. Letter dated 12 August 1751. Letters from William Rhodes 1735-55. Correspondence of William Spencer. No.6. Spencer of Cannon Hall Correspondence. Sheffield City Library.

Martin resigned in 1765, he was replaced by William Stanley of Chesterfield " a person well recommended to the Committee for his Ability Industry Care Sobriety and Integrity" who served the Company as its Secretary until his death in 1793. Much of the success of the Company during these years must be ascribed to the honesty and diligence of these men and to the administrative routine introduced by them into its affairs.

Naturally, with the completion of the Navigation, there ensued a period of quiescence in the history of the Company. Little new capital expenditure was authorised during the next thirty years and the greater part of the work carried out was in the nature of routine repairs or minor improvements. In 1754, Sandall Weir was rebuilt; in the next year, the dam at Deadman's Hole was improved; in 1759, the channel below Barmby Dun Lock was constricted to give a better flow of water; in 1760, Brindley, after viewing the three bridges across the Dutch River, designed the leaves, authorised in the Act of 1727 to enable boats to pass through the bridges without unshipping their masts; in 1765, as trade on the Don was so good, new warehouses were built at Rotherham and Swinton; the river was dredged at the Long Cut at Kilnhurst and at Aldwark and Thrybergh; and in 1768 the bridges at Denaby, Bramwith and Stainforth were rebuilt, so that vessels could pass under them when the river was in flood. In addition, the Company began at the end of this period, when it leased Doncaster Corn Mills and the mill at Aldwark, its policy of acquiring water rights at as many points along the river as possible - a line of action it was to pursue consistently in the future.

Probably the basis of this quarrel was the lesson learned from a bitter and humiliating quarrel with the Walkers of Masborough, who had leased the water rights at the Holmes in Rotherham from the Earl of Effingham. Here, they built a furnace and rolling and grinding mills on a site previously occupied by an old slitting mill.^I During the years in which the Navigation had been leased to Broadbent, the Walkers had enjoyed preferential tolls. These were abolished when the Company resumed control of the river. Naturally, the Walkers took this ill. They also complained that, since all boats passing through Doncaster up river paid the same dues whatever their destination, they were overcharged by sixpence a ton by the Company. The latter, on its side had a grievance in that the new works with their four water wheels took three times as much water out of the river as the old slitting mill had done, thus diminishing the supply of water available for navigation at the Ickles. In 1761, members of the Committee met the Earl of Effingham and offered, without success, to compensate him for any losses which he might suffer, if he would agree to a diminution of the amount of water taken by the Walkers' works. In 1762, the Company introduced a Bill into the Commons to protect their rights, but the influence of the Earl was sufficient to secure its rejection. At this stage, the Company consulted Brindley, who suggested that a channel three feet deep should be dredged at Ickles Dam and that a new cut should be made from there to Jordan Dam. A successful law suit

I. Journals of the House of Commons. XXIX, 159, 192, 225 and 228.

against the Walkers, however, made it unnecessary to put this plan into operation.

On their defeat, the ironmasters attempted to reach an agreement with the Company, offering in return for preferential tolls along the river, complete exemptions from dues between the Holmes and Masborough and an annual payment of £60 to divert sufficient water from their new cut at the Holmes to keep the river at the Ickles full of water.^I In addition, in return for an annual payment of £25 to help maintain the river works at Thrybergh, where they leased the water rights, they offered to stop their works whenever necessary to fill the cut. Whatever their rights in law, the Company might have been well advised to close with this proposal. It was, however, rejected contemptuously. The Minutes contain no further reference to the matter until 1770, when on August 23, the Walkers completely paralysed the Navigation by grounding a number of vessels in the Long Cut at Thrybergh. These were only released when the ironmasters condescended to fill the Long Cut on payment. Stanley went to Thrybergh to attempt to smooth matters over and on meeting Samuel Walker remarked that he hoped that " the little animosities" between them were over. Walker's reply was uncompromising and showed the depths of bitterness which this quarrel had engendered. He answered that " Things remained just as they were when they were aggrieved by the Company and till these Grievances were removed he should take every opportunity to impede the Navigation and he hoped

I. The cuts in the vicinity of the Holmes in 1760 are shown on plan ROT 66S in the Fairbank Collection, Sheffield City Library.

his Children would do it after him. " He was as good as his word. On Saturday, 15 September he set the new rolling mill at Thrybergh at work at a time when the river was several inches below the level of the weir, completely closing the Long Cut to navigation. On the Sunday, as the mill was not at work, Stanley organised a convoy of boats to steal through the Long Cut. As soon as they were seen, the Walkers set the wheels at work, so preventing any more water flowing through the cut. Altogether, they succeeded in grounding between 70 and 80 boats for a week and these were only released at the end of that time by flood water. On 7 October, there were two more boats aground in the Long Cut and on the following Sunday, the rolling mill was once more at work, grounding another convoy of 30 boats. Stanley admitted defeat when he declared to the Committee " I left them there till they should be relieved by rain or till it should be Mr Walkers Pleasure to set them at Liberty." Reluctantly, the Company agreed to pay the ironmasters £90 a year and to allow their claim for freedom from tolls between the Holmes and Rotherham, in return for which the Walkers promised to keep the Navigation supplied with water.

THE CONSTRUCTION OF THE CANALS 1770-1820.

The income of the Company from lock dues in the decade 1759 to 1769 averaged £7000 annually, over half of which arose from the transport of Park Gate coal down river in to the Humber estuary and the Trent valley. It was estimated in 1769 that 30,000 tons of coal was sold along the Trent between Gainsborough, Lincoln and Newark, the greater part of which was

supplied from around Rotherham.^I By 1770, however, many of the more accessible seams within easy reach of the Don had been worked out, a situation which resulted in a spate of canal projects, designed to bring the Trent valley into communication by water with coalfields as yet comparatively undeveloped.

The first of these canals to be planned from the Trent was one into the North Derbyshire coalfield, terminating at Chesterfield. It was expected that coal mined here could undersell Yorkshire coal in the Trent valley by as much as two shillings a ton, as barges using this canal could make two journeys between the Derbyshire coalfield and the Trent in the time that a vessel could travel from Rotherham to Lincoln, thus cutting freights substantially. The scheme also promised other advantages. Chesterfield was already manufacturing a coarse brown earthenware, which, it was thought, would find a ready market in Lincolnshire. The canal would pass, in its central section, through the magnesian limestone formation, where large amounts of barley were grown. A canal would facilitate its transport to the coalfield for malting. This formation, around Kiveton and Shireoaks, also produced large quantities of lime. This could be cheaply carried by canal and used to enrich the thin, poor soils of the coalfield. Finally, there already existed a considerable through trade between Derbyshire and Bawtry on the Idle, particularly eastwards in lead and in groceries in the opposite direction, which could be trusted to desert land transport should communication by water be established.²

1. Seasonable Hints Relating to the Intended Canal from Chesterfield to the River Trent. 1769.
2. A pamphlet addressed to "The Most Noble Henry Duke of Newcastle and Lord George Cavendish and Godfrey Bagnall Clarke." 1769.

Three committees - at Chesterfield, Gainsborough and East Retford - were set up to decide upon the most suitable route. Brindley, who had been engaged as engineer, presented two schemes to members of these committees at a meeting held in Worksop in late August 1769. The first of these was for a canal from Chesterfield, through Worksop and Drakehole Hill, estimated to cost £95,000. The second scheme, estimated at £105,000, was for a canal from Chesterfield to Gainsborough via Capell's Hill. Both plans, Brindley declared, would yield a 5% dividend after all repairs and bad debts had been met. A third scheme was submitted by another engineer, John Grundy, on behalf of John Lister, Esq, the owner of the Idle Navigation. Grundy suggested that the Idle should be improved by dredging and that a canal should be constructed from its terminus at Bawtry, through Serlby and Shireoaks to Chesterfield. It was argued that this scheme would cost much less than either of Brindley's plans. The committees, however, decided to adopt the first scheme put forward by Brindley. The necessary Parliamentary powers were easily obtained, the only opposition being that of the Don Company, which feared that there might be a decreased flow of water into it from its tributary, the Rother, which was to act as a feeder to the new canal.²

Unlike the share list of the Don Company, from which the names of the great South Yorkshire landowners are conspicuously absent, that of the Stockwith Canal shows

1. The Report of John Grundy Engineer Respecting the Proposed Navigation from Chesterfield to the River Trent. Spalding. 1770.
2. Journals of the House of Commons. XXXII, 676; XXXIII, 82 and 223.

that the majority of the aristocratic families owning land near it, subscribed to its capital. Amongst these were the Dukes of Leeds, Devonshire and Newcastle. After the nobility, the most important shareholders were the lead merchants, smelters and miners, who had much to gain by the development of cheap transport to Hull. Amongst these were William Milnes and John Twigg, both connected with the famous Gregory Mine at Ashover; Nicholas Twigg of Holme, Bakewell, the most important lead merchant in the Peak; Joseph Storrs of Chesterfield, a Quaker lead merchant; Alexander Barker of Edensor, lead smelter and Lindley Simpson of Babworth, a member of a Nottinghamshire family with shares in almost every large lead mine in Derbyshire. The joint Treasurer of the Canal was Allwood Wilkinson of Chesterfield, a descendent^a of two of the best known Derbyshire lead mining^k after whom he was named.

Two committees were set up - one in Chesterfield, the other in East Retford - to supervise the building of the Canal. Brindley was appointed engineer at a salary of £300 a year and his pupil, John Varley, who had made the original survey of the route, was made Clerk of the Works. Brindley met the Proprietors in June 1772 at an inn at Harthill to outline his plans. The first operation was to complete the tunnel through the magnesian limestone ridge at Norwood in two years and then to construct the section of the canal through to the Trent from the east of the tunnel. Finally, the section from the western end to Cheserfield would be completed.

Tunnelling began at Norwood immediately. A number of shafts were sunk through the ridge so that work could

be carried on at a number of faces simultaneously. In the February of the next year, the Committee ordered Varley to stake out the line of the canal from Norwood to Worksop and in the following May to continue it as far as East Retford. Trouble was, however, brewing for the Committee as a result of its failure to appoint a successor to Brindley after his death, until March 1774 when his brother in law, Hugh Henshall, was appointed to this post. During this interval, Varley had been using his opportunities to provide his relatives with lucrative contracts and to pass work of inferior quality. These practices were discovered by Henshall and Varley was lucky to escape without any penalty other than being compelled to enter into a bond for the correct performance of his duties in the future. His relatives were dismissed on the spot.

Simultaneously, the Proprietors had run into financial difficulties, finding it impossible to raise sufficient money from calls made on shares to keep the whole of their constructional staff at work. However, Wilkinson was able to borrow sufficient money on his personal security and with this construction was resumed. Next the line of the canal was staked out across Misterton open fields, then in process of enclosure, and shortly afterwards to Retford. In August 1774, contracts were given out for cuttings from West Retford to Bishop Gate Cross Roads and for new bridges near Babworth. In May 1775, Varley was ordered to complete this section of the canal through to Stockwith on the Trent. This was not a difficult task, as the only major work was a tunnel through Drakehole Hill. By the following April, the Committee was able to advertise that the

canal was open from Killamarsh to Stockwith.

The Norwood Tunnel, 2850 yards long, had, in the meantime been opened on 9 May 1774, when three boats full of people " with a band of music " had passed through the tunnel. Immediately after this, work began on the that section of the canal from the west end of the tunnel, following the Rother valley into Chesterfield. There were no engineering difficulties on this stretch and, with the experience already gained, work proceeded rapidly. However, financial difficulties still continued to plague the Committee. In August 1776, it announced that another £12,000 was needed to complete the undertaking. An appeal was made to shareholders to subscribe the additional capital in proportion to their original holdings. As shares were at this time changing hands at 30% below par, it is obvious that shareholders took no rosy view of the Canal's immediate future. This appeal, therefore, proved fruitless and as banking was but little developed in the district, the Committee was compelled to borrow from bankers in Nottingham and York. In all, they borrowed £53,000 to complete the canal. With this sum they built wharfs at Retford, Norbriggs and Killamarsh, warehouses at Stockwith and Chesterfield and a dwelling house and offices at the latter terminus for their Superintendent and Bookkeeper. Next, the committee announced their tolls at a meeting in Chesterfield, together with the fees for wharfage and crantage, extending over a great variety of articles, including casks of nails, crates of glass, packs of wool, bobbins of flax, ladders of lead and hogsheads of pots, all typical products of the Chesterfield area. Early in June 1777, the canal was open

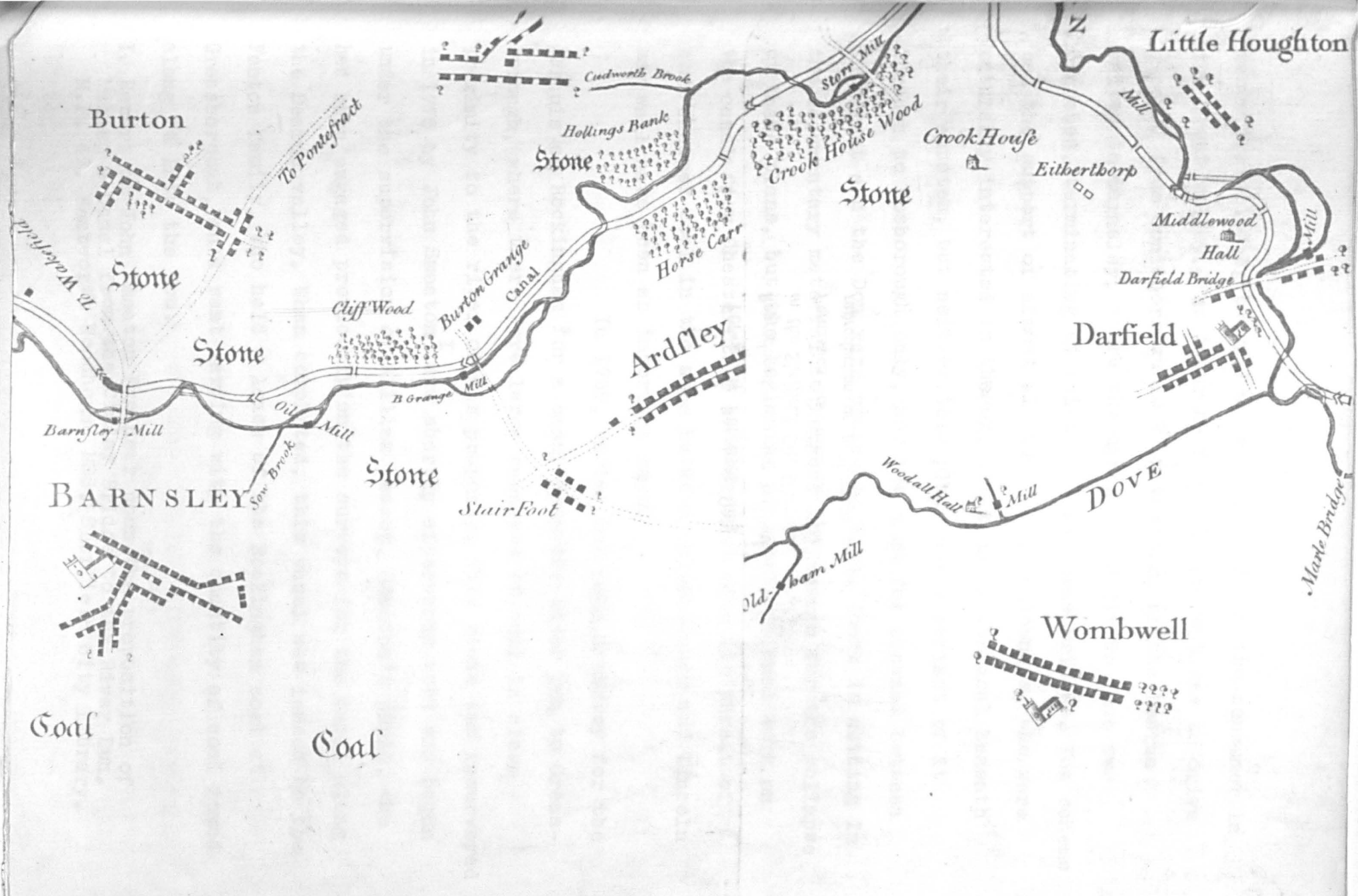
from end to end and a contemporary newspaper account declares that this event " so long wished for, so interesting and so advantageous -- was celebrated by the Proprietors in the Town and the Inhabitants in general with all those Demonstrations of Satisfaction and Joy which they must feel upon such an occasion." ^I The first barge arriving in Chesterfield was welcomed by a large crowd of shareholders and the inevitable band, after which " the goods were unloaded and put into waggons, which were drawn to the town by the Navigators preceeded by the Gentlemen of the Committee and the Proprietors, who walked in procession with the Music playing before them." ^I

The decline in coal shipments from Park Gate to the Trent valley had also stirred coalmining interests in South Yorkshire to project new canals. As early as 1763, Brindley had been engaged by the Don Navigation to survey the Thorne district and to provide an estimate of the cost of a canal between the Don and the Trent. Any plans that may have been made were, however, pigeonholed until 1772, when the Company's engineer, John Thompson - appointed in 1766, to assist the ageing John Smith - was instructed to make another survey of the route. He drew up a plan for a canal at an estimated cost of £14,600 to carry forty ton barges between Stainforth Cut on the Don through Crowle Common to Althorpe on the Trent. ²

This scheme was part of a larger plan, designed both to open up the virtually untouched coal resources on the Bute, Fitzwilliam and Strafford estates and to shorten the dis-

1. Derby Mercury. 13 June 1777.

2. A Report on the Practicability of Making a Navigable Cut to the River Trent at Althorpe from levels taken by Mr John Thompson. 1772.



SCALE, one Mile = 2 Inches.

tance travelled by barge between pit head and the consumer in the Trent valley. The other half of the project was to drive a canal from Conisborough Lock on the Don, up the Dearne valley to Barnsley, where the canal would divide into two branches, terminating at Haigh and Cawthorne Bridges. The scheme had the support of almost all the local landowners, who were naturally interested in the exploitation of the coal beneath their estates, but neither this plan, nor a variant of it through to Wosborough only, nor the plan for a canal between the Trent and the Don were proceeded with. There is nothing in the documentary material to suggest any reason for the collapse of these plans, but the beginning of constructional work on the canal from Chesterfield to Stockwith with its threat of much cheaper coal in the area between Gainsborough and Lincoln may well have been an important fact.

In 1769, Varley had made a survey for the Marquis of Rockingham for a canal from the River Don to Greasborough, where there were large reserves of coal in close proximity to the river on his property. This route was resurveyed in 1775 by John Smeaton^I and shortly afterwards work was begun under the supervision of William Jessop, Smeaton's pupil, who had been engaged previously on the surveys for the canal along the Dearne valley. When completed, this canal was leased to the Fenton family, who held a lease of the Rockingham coal at Greasborough, on a rent varying with the quantity of coal moved along it into the Don.

I. Report of John Smeaton Engineer upon the proposition of Making a Canal from the Cinder Bridge to the River Dun. M.P. 47. Wentworth Woodhouse MSS. Sheffield City Library.

The success of this canal in enabling the coal on this property to be developed was such that Earl Fitzwilliam had estimates prepared for another canal, planned to connect the Don with collieries already at work at Law Wood and Elsecar on his estate, which were to be expanded so that 60,000 tons of coal could be carried along this projected canal to be sold in the Don valley. Nothing, however, came of this plan, probably because it was merged in a much more ambitious project, sponsored jointly by the Don Company and the Aire and Calder Navigation to open up direct communication by water from the Calder to the Don and from the Don to the Trent, thus enabling the rich coalfield around Barnsley to be developed and its coal to be transported cheaply into the valleys of the Calder, Don and Trent and along the Humber estuary.

A coal shortage had, in fact, again appeared in the Trent valley in the early nineties as a result of the continued reduction in output around Rotherham and of the diversion of coal mined in North Derbyshire from the trade along the Stockwith Canal to the newly erected ironworks in the area.^I Such a situation naturally turned attention to "that valuable tract of country abounding in coal of the best quality" between the Calder and the Don and to a renewed interest in the canal projects of 1772. It was, obviously, to the advantage of the Don Company to support these plans to the fullest extent, as the coal traffic which would pass along the river from the coalfield into the Trent would yield

valuable tolls. The Company, therefore, offered to subscribe half the necessary capital for the canal connecting the two rivers and three fifths for that into the coalfield. In addition, it set up a special Committee to handle the many problems inherent in these schemes; arranged meetings at Thorne and Barnsley to canvass the support of local land-owners; negotiated with the Aire and Calder Navigation, which was to build the section of the canal north of Barnsley; made arrangements for Thompson and the Sheffield surveyor Fairbank, to survey the country from Stainforth on the Don to Keadby on the Trent^I; for Mylne, a London civil engineer to survey the district from Swinton to Barnsley and for either Whitworth or Jessop to support the Bill at the Committee stage. The Act of 1793 authorised the raising of £60,000 for the construction of a canal from Swinton on the Don to Barnsley, with cuts to Elsecar and Wosborough. Tolls were to be at the rate of a penny per ton for lime and coal, but concessionary rates were granted where barges brought lime to the coalfield and returned with at least 30 tons of coal. The Stainforth and Keadby Act provided for the building of a canal between these two places, at a cost of £24,200. With rising prices, the original estimates were exceeded and it became necessary to secure additional powers in 1798 for the Stainforth and Keadby Canal and in 1800 for the Dearne Canal to raise more capital.

The opening of these two canals, linked together by the Don, made it essential for the Don Company to improve

I. F.B. 72. Pp. 62-5; F.B. 73. 74-8 and 88; F.B. 233. Pp. I
- end. Fairbank Collection. Sheffield City Library.

the river from Stainforth to Swinton, to take the larger craft for which the canals had been designed. The Company, therefore, in 1795, engaged Benjamin Outram of Butterley, to make a survey of the whole river and to suggest points at which improvements were necessary. Outram reported that the lock at Stainforth Cut could only be used at high spring tides; that the river from Bramwith to Barmby Dun was winding; that, at the latter place and Wheatly Ford, there was insufficient depth of water for navigation and that the channel through Doncaster was crooked and shallow. Above Rotherham, navigation was hindered by shoals at Aldwark, Eastwood, Ickles and Tinsley Wharf. To remedy these defects, he proposed that a new cut should be excavated from Bramwith to Kirk Sandall; that another cut should be made 500 yards long at Doncaster, leaving the old winding course of the river for use as wharfs; that a third cut should be made at Eastwood; that the ford at Wheatly should be replaced by a bridge; that the shoals above Rotherham should be dredged and that nine bridges should be reconstructed to widen the waterway and to provide towing paths. Outram estimated that, at a cost of £13,737 " The Navigation will be a very complete one, liable to as few impediments and having as great advantages as any Inland Navigation in the Kingdom." The Company, however delayed action until 1800 and then only sought powers to improve the river from Swinton to Stainforth by the construction of new cuts at Cadeby, Kirk Sandall and Stainforth. This Bill was, however, withdrawn.

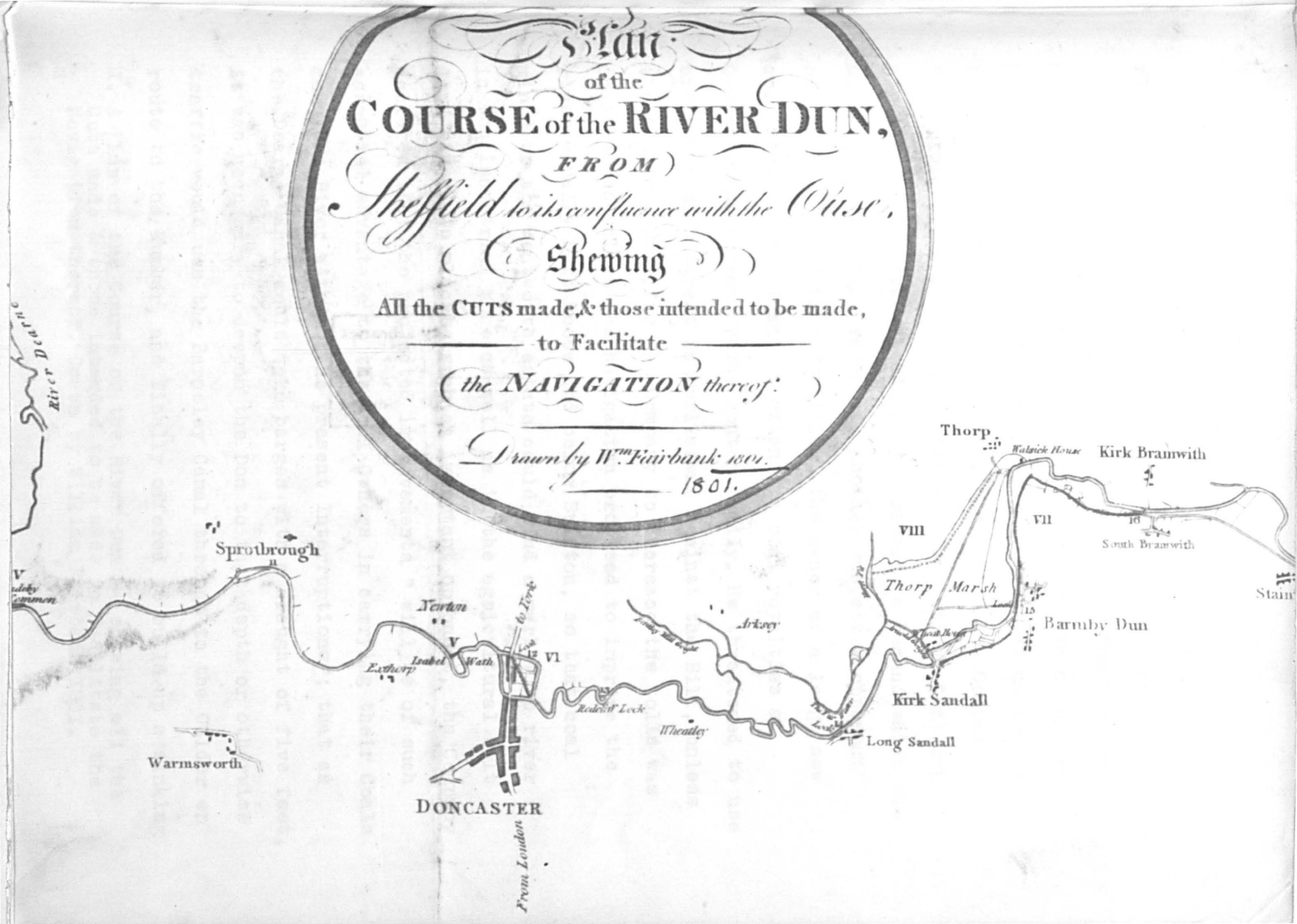
Plan
of the
COURSE of the RIVER DUN,

FROM
Sheffield to its confluence with the Ouse,
(Shewing)

All the CUTS made, & those intended to be made,
to Facilitate

(the NAVIGATION thereof:)

Drawn by W.^m Fairbank 1801.
1801.



River Don

V
valley common

Sprotbrough

Warmsworth

DONCASTER

From London

Newton

Easthorp

Isabel

Wath

to Lock

VII

Rodwell Lock

Wheatley

Long Hill bridge

Arksey

Kirk Sandall

Long Sandall

VIII

Thorp Marsh

Thorp

Walrick House

Kirk Bramwith

VII

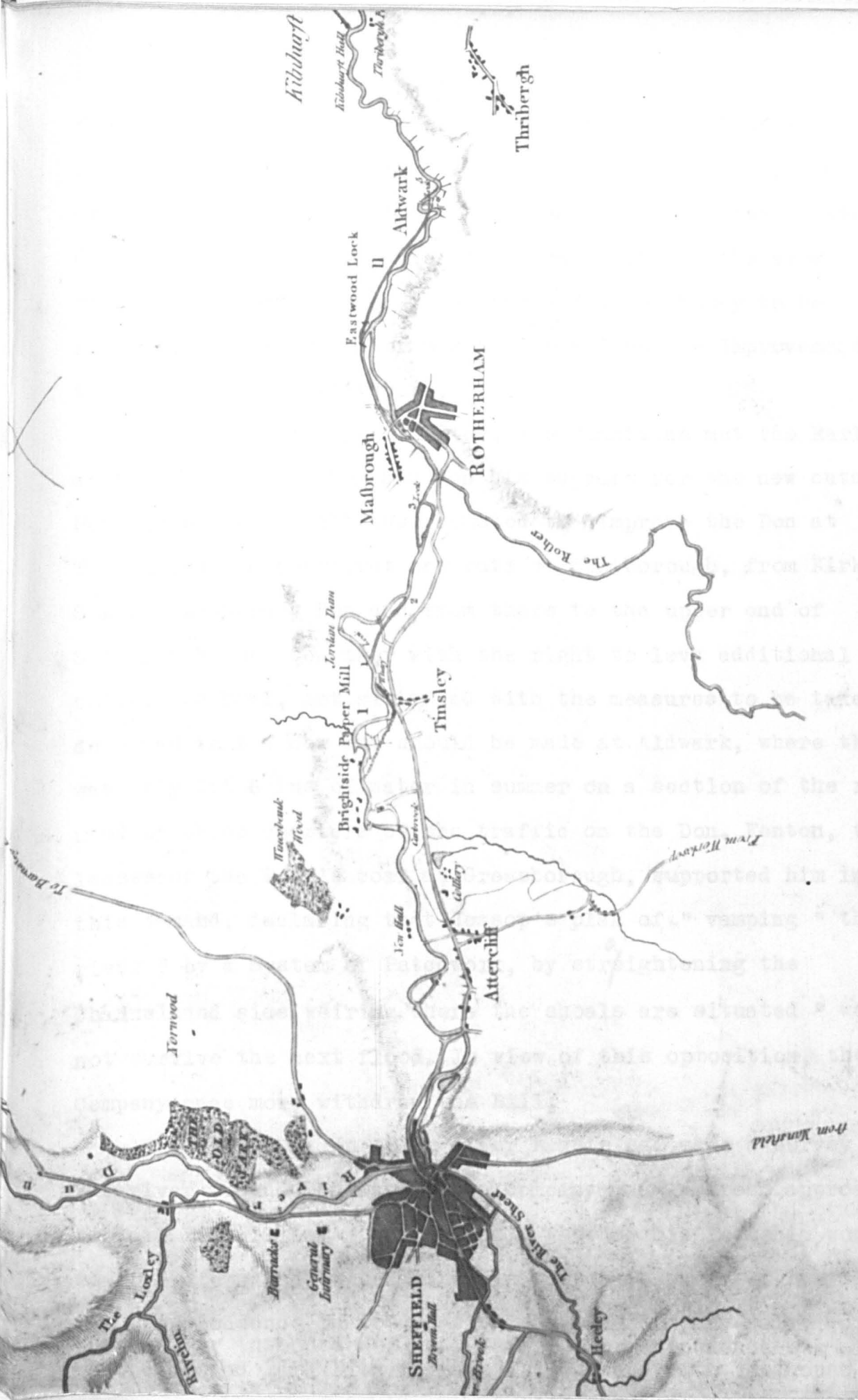
South Bramwith

Barnby Dun

Stain

In 1801, Jessop was engaged to report upon the river, but his only new suggestion was that it should be constricted at Eastwood to scour out the bed. The Company again decided to promote a Bill to give them the necessary powers to make these improvements.^I The Bill met unexpected resistance from local landowners, who wanted the Company " to protect the Country from all the Inundations that may possibly happen from floods on the river", a demand which the Navigation naturally rejected. Another unexpected opponent of the Bill was Earl Fitzwilliam, the owner of a large new colliery at Elsecar and of extensive coal royalties at Greasborough worked by the Fenton family. He threatened to use his powerful interest in Parliament against the Bill, unless the clause empowering the Company to increase the tolls was omitted and unless the Navigation promised to improve the river equally both above and below Swinton, so that coal mined on the Wentworth estate could find a market up river in the industrial zone as well as in the agricultural belt down river. To placate such an important opponent, the Company declared that the projected improvements " will be of such essential advantage to the Coal Owners in carrying their Coals down the River without the present Interruptions"; that as the Dearne Canal could take barges with a draught of five feet, it was necessary to deepen the Don to that depth or otherwise traffic would use the Barnsley Canal through to the Calder en route to the Humber, and finally offered to build up a sinking

I. A Plan of the Course of the River Don -- shewing all the Cuts made & those intended to be made to facilitate the Navigation thereof. Drawn by William Fairbank 1801.



The Cuts and Alterations intended to be made to facilitate and
 improve the Navigation are marked with Red
 The feeder or Drain at Tinsley with Yellow.
 The Drain on Sheep Marsh with Green.

fund from the additional dues to pay off the cost of the new cuts, after which the extra tolls would be abolished. These arguments failed to move the Earl and so the Minutes of the Company record as there was no "probability of the very reasonable dues intended to be taken for the Money to be expended in making the proposed Alterations and Improvements", the Bill would be withdrawn.

Three years later, the Committee met the Earl and believed that they had won his support for the new cuts. Hence, in 1807 a Bill was promoted to improve the Don at Tinsley and to construct new cuts at Spotborough, from Kirk Sandall to Bamby Dun and from there to the upper end of Stainforth Cut, together with the right to levy additional tolls. The Earl, not satisfied with the measures to be taken, demanded that a new cut should be made at Aldwark, where there was only 3ft 6 ins of water in summer on a section of the river used by three quarters of the traffic on the Don. Fenton, the lessee of the Earl's coal at Greasborough, supported him in this demand, declaring that Jessop's plan of "vamping" the river "by a System of Patchwork, by straightening the Channel and side weiring where the shoals are situated" would not survive the next flood. In view of this opposition, the Company once more withdrew the Bill.

In 1815, after Rennie had made a survey of the river around Doncaster, the Company made a fresh approach to Earl Fitzwilliam "to ascertain whether his Lordship would co-operate with the Committee in the Improvement of the River

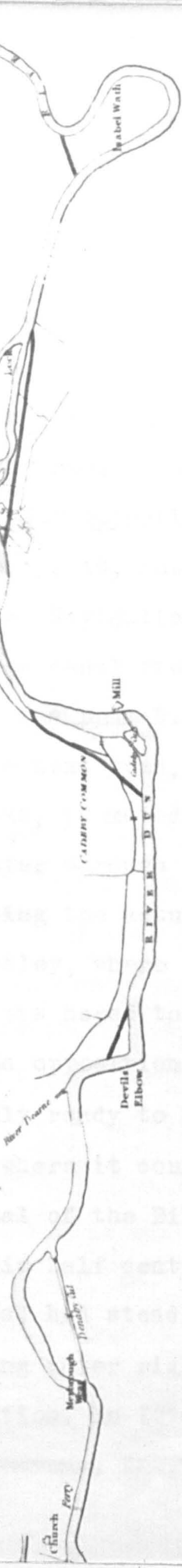
I. Correspondence in 1808/9 with the Dunn Company relative to their intended New Act. Papers, Correspondence etc of the Second Earl Fitzwilliam. F.68e. Wentworth Woodhouse MSS.



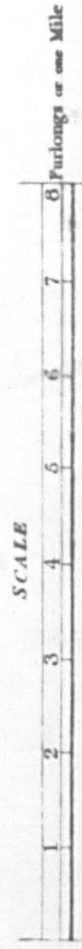

of the
State
 Alterations & Improvements
intended to be made
 in the NAVIGATION of the
River Don.
By E. J. Foxbank, Surveyor's Shop

SPROT BROUGH

ABROUGH



*N.B. The Intended Improvements are coloured Red.
 The present Cuts and Rivers.....Blue*



Dun and would consent to a reasonable Composition for Money to be expended thereon." Although on this occasion, the Earl gave his consent, the Company once again withdrew the Bill, judging that in the economic circumstances of the day, £70,000 was too great a sum to invest.

Four years later, proposals were made to construct a canal from Knottingley on the Aire, through Womersley, to Holmestile on the Don. As this canal would have rendered new cuts below Doncaster superfluous, the scheme was supported by the Don Company. It, however, aroused the hostility of the Aire and Calder Navigation which was itself promoting a Bill to construct a canal from Goole to Knottingley, with the result that the Aire and Dunn Bill was thrown out at the second reading. ^I In the next year, the Don Company at the suggestion of Lord Hawke, promoted another Bill to construct a canal from Doncaster through Wilsick House to Wentmouth, thus short circuiting the actual course of the river, with a branch to Womersley, where there were large limestone deposits, which it was hoped to develop for agricultural purposes. Once again, the opposition of the landowners around Doncaster, who were only ready to support a canal on the south side of the river, where it could be used for drainage, led to the withdrawal of the Bill.

Throughout this half century, the Company amidst all these large schemes, had steadily pursued its policy of leasing or purchasing water rights along the river which might hamper its navigation. In 1776, the mills at

Spotborough were leased; in 1780, Rotherham Mills were purchased and when they were leased to the Walker family for a forge in 1791, a clause was inserted that the Navigation should receive a full supply of water at all times; in 1815, a lease of Aldwark Mill was obtained and three years later, Thrybergh Mill was bought.

The history of the numerous schemes projected during this period to link Tinsley and Sheffield by canal is almost as depressing as that of contemporary attempts to improve the Don Navigation. In 1778, the Company of Cutlers held a meeting to support the scheme; in 1782, William Fairbank drew a plan for a canal from the Wicker to Tinsley and apparently the idea was still in the air three years later when Jessop was surveying the Rivelin valley for sites for reservoirs, as one reason given in support of this plan was that these could be used to supply the projected canal with water. Once again, it appears that the hostility of the Duke of Norfolk - or more probably that of his Sheffield agent - was the main reason for the failure of this project. Some of the arguments instanced against the canal were short sighted, narrow minded and took but little account of the views of the representative business interests in the town. It was alleged that the proposed waterway could be of no value to the Norfolk property as all the timber and farm produce grown on it were marketed locally and "As for Coals no Body but Madmen would think of Exporting them from Sheffield." Others, indeed, were more cogent and were fully justified by

I. Course of the Proposed Canal from the Wicker to Tinsley.
1782. Eca 31 L. Fairbank Collection. Sheffield City Library.

the course of future events. It was argued that in this particular case, transport by water could be no cheaper than land transport, on account of the great number of locks in a comparatively short distance. It was also argued that as the thirty water wheels at the Wicker, the Walk Mill, at Brightside and Attercliffe Forges and at the paper mill at the last named place were short of water in summer, it was obvious that the amount of water in the region was insufficient to supply a canal in addition to the needs of industry. It was further argued that to divert water from the Don into a canal would be to deny industry along that stretch of the river opportunity for expansion.^I

The plan was revived in 1792, when a coal shortage in Sheffield prompted the Don Company to consider the construction of a canal from Rotherham to Sheffield with a branch to Renishaw in Derbyshire with the object of supplying the town with an additional 40,000 tons of coal a year.² Even before Outram had completed his survey, the Company was hesitant about undertaking the Renishaw branch "in consequence of the strong probability that a cheap and competent supply of coal will be furnished to the town of Sheffield by means of the Intended Dearne and Dove." However, the Committee decided to continue with this part of the project when their engineer pointed out the value of this branch as a feeder to the main line of the canal. At the end of 1792,

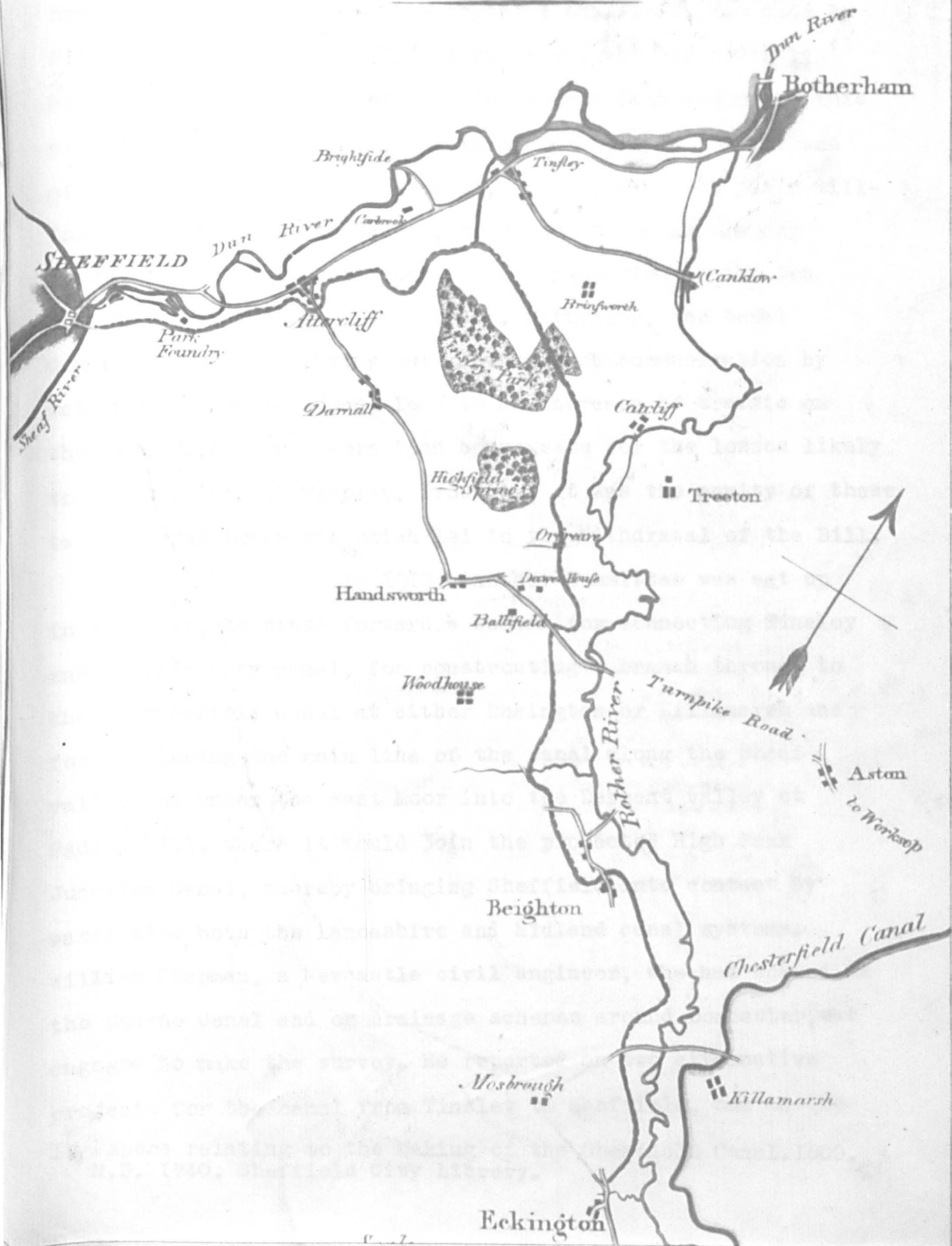
1. Objections to the River Don being made navigable from Tinsley to Sheffield. n.d. British Museum Add. Mss. 27538.
2. Report of Benj. Outram Engineer on the Proposed Sheffield Canal. 1793.

the Committee met the Duke of Norfolk, who agreed to lease land near the Shrewsbury Hospital in Sheffield for a wharf and a basin. When Outram submitted the detailed estimate, the Committee, alarmed at a total cost of £46,292 on top of all their other commitments in the Dearne and Dove and the Stainforth and Keadby Canals, decided to abandon the whole project. A favourable report by Mylne, however, led the Committee to submit the scheme to the decision of a General meeting of shareholders, at which it was decided that the Don Company should construct a canal from Rotherham to Sheffield, but that a separate Company should be formed to make the Renishaw branch, to which the Don Navigation should contribute a quarter of the capital. When it proved impossible to interest local landowners in the Renishaw branch, the Committee decided not to proceed with this part of the plan. This decision aroused strong feelings in Sheffield, where a meeting of manufacturers passed a resolution that " a communication betwixt this place and the Coal Country towards Eckington is -- of high importance to the commercial interests of this manufacturing town." Despite this resolution, the Company not only continued to withhold support from the Renishaw branch, but for some ^a reason not obvious in the Minutes, also decided not to proceed with the main line of the canal from Sheffield to Rotherham.

Ten years later, an application was made to Parliament by the Company of Cutlers for powers to make a canal from the terminus of the Don Navigation at Tinsley to Sheffield. ^I The survey for this canal, which also included a

PROPOSED CANAL from Sheffield to Eckington.

W & J. Fairbank 1873.

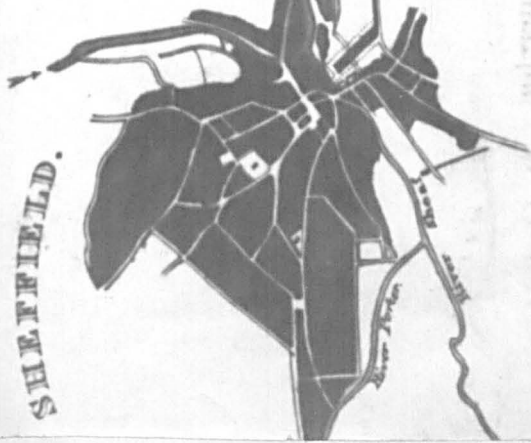


branch through to the North Derbyshire coalfield, was made by William Dunn, a Sheffield civil engineer, who had recently been employed on canal construction near Melton Mowbray.^I This project aroused the hostility both of the Duke of Norfolk and of the Don Navigation. The latter, indeed, declared their willingness to support the scheme, provided the Canal Company bought the Tinsley wharfs and paid compensation to the Don Company for the loss of dues there. Naturally, the Canal Company refused, pointing out that through communication by water with Sheffield must lead to an increase of traffic on the Don, which would more than compensate for the losses likely to be sustained at Tinsley. Probably, it was the enmity of these two powerful interests which led to the withdrawal of the Bill.

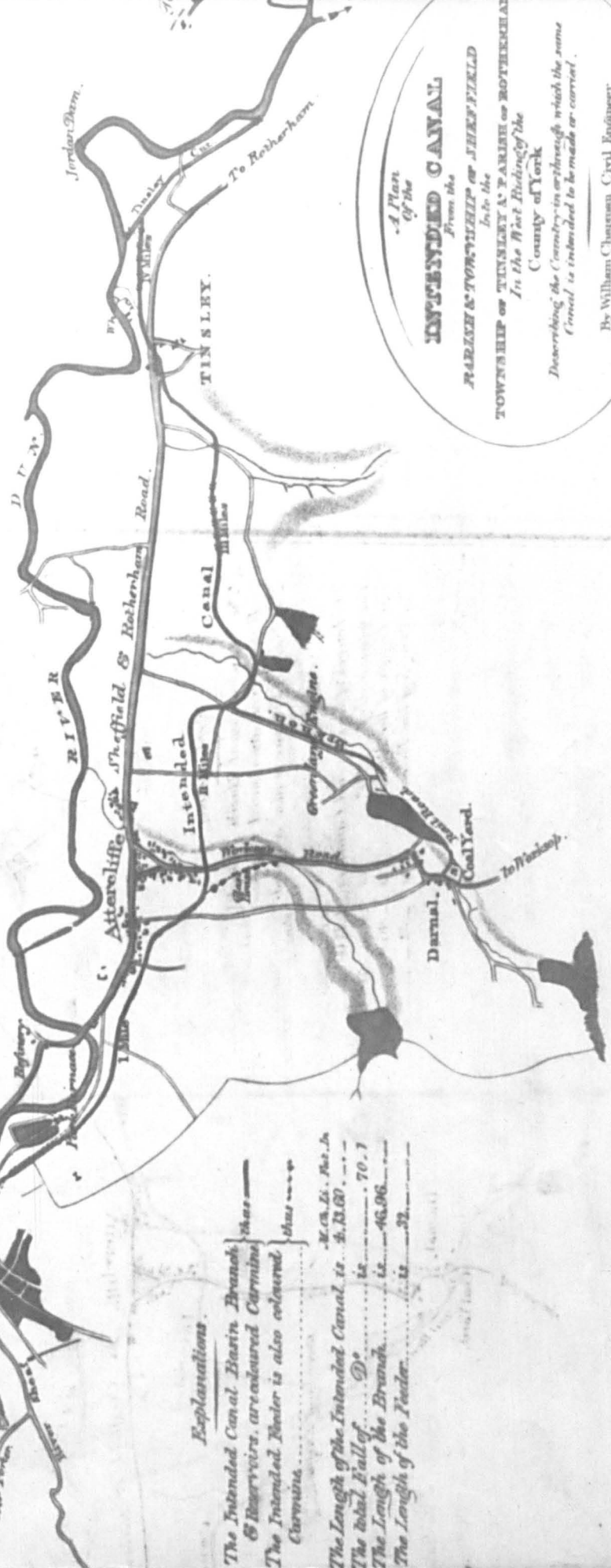
In 1813, another Committee was set up in the town, to press forward a scheme for connecting Tinsley and Sheffield by canal, for constructing a branch through to the Chesterfield Canal at either Eckington or Killamarsh and for continuing the main line of the canal along the Sheaf valley and under the East Moor into the Derwent valley at Padley Mill, where it would join the projected High Peak Junction Canal, thereby bringing Sheffield into contact by water with both the Lancashire and Midland canal systems. William Chapman, a Newcastle civil engineer, who had worked on the Dearne Canal and on drainage schemes around Doncaster, was engaged to make the survey. He reported on two alternative projects for the canal from Tinsley to Sheffield, one on the

I. Papers relating to the Making of the Sheffield Canal. 1800. M.D. 1740. Sheffield City Library.

SHEFFIELD.



Brightside.



Explanations.

The Intended Canal Basin Branch & Reservoirs, are coloured Carmine
 The Intended Toler is also coloured Carmine

The Length of the Intended Canal is 4.13.00
 The total Fall of ... is 70.7
 The Length of the Branch is 46.96
 The Length of the Toler is 13.32

INTENDED CANAL

A Plan of the
PARISH & TOWNSHIP OF SHEFFIELD
In the
TOWNSHIP OF TINSLEY A PARISH OF ROTTERHAM
In the West Riding of the
County of York
Describing the Course in which the same
Canal is intended to be made or carried.

By William Chapman Civil Engineer
 Surveyed by W. & J. Fairbank,
 1819.
 ENGRAVED BY T. HARRIS, SHEFFIELD.



S.C.A.L.E.

north side and the other on the south side of the River Don.^I Of the two, Chapman recommended the former, on the grounds that the engineering difficulties would be less. He advised against the construction of the two other canals, suggesting that railways be built instead, on account of the geographical difficulties involved. Engineering problems were, however, amongst the least important factors affecting the fate of these projects. The Ashton Canal abandoned the High Peak Junction project and with it, of necessity vanished the canal from Sheffield to Padley Mill; Earl Manvers, the most important landowner along the branch through to the Chesterfield Canal showed himself only lukewarm in support of this section of the project and indeed advised that the Committee should concentrate all its efforts on constructing the main line of the canal and Earl Fitzwilliam, who owned valuable coal bearing land at Tinsley, showed comparatively little interest in the plan.² The Duke of Norfolk, on the contrary, displayed an active interest in the route of the canal, offering his powerful support in Parliament, provided that the canal ran on the southern side of the Don, presumably - it is nowhere stated explicitly - so that a branch could be made through to the coalmines on the Norfolk property. The Canal Committee felt itself constrained to accept the southern route in face of the advice of its engineer or see their Bill once more rejected in Parliament. They offered the Don Navigation the option of

1. Report of Wm. Chapman Civil Engineer on the Various Projected Lines of Navigation from Sheffield. 1813.
2. Sheffield Canal Papers 1813- 14. Papers, Correspondence etc of the Second Earl Fitzwilliam. F.68a. Wentworth Woodhouse Mss. Sheffield City Library.

constructing the canal but the Company rejected the proposal, declaring that making it on this side of the river would be so costly as to involve the Navigation in an annual loss of £1400. The Company itself, moving with the times, suggested that the most satisfactory system of transport between these two points would be a double track iron railway. The Canal Committee, however, went ahead with its plans and after buying off the opposition of the Don Company by paying £11,000 for its Tinsley property, was able in 1815 to secure an Act to construct a canal from Tinsley to Sheffield with a branch to Greenland Engine " towards the valuable collieries and Beds of Coal and Ironstone which abound in that direction;" with reservoirs on the Darnall Brook and Acres Hill Dyke and with power to take water from the Sheaf and from the coal pits at Greenland Engine and at Crookes Croft. Four years later, on 22 February, after costing £104,719, the canal was ceremoniously opened by the " Industry " of Thorne leading six other vessels into the basin at Sheffield. Almost a century after the plan to make the Don navigable through to Sheffield had been envisaged, it was now possible to sail a keel direct from tide water to within a few yards of the site of Sheffield Castle.

In the meantime, three canals had been built to link the southern portion of the Yorkshire, Derbyshire and Nottinghamshire coalfield with the Trent valley. In the same year as the Chesterfield Canal had been opened, an Act was passed to authorise the construction of the Erewash Canal from the River Trent to Langley Mill, with the

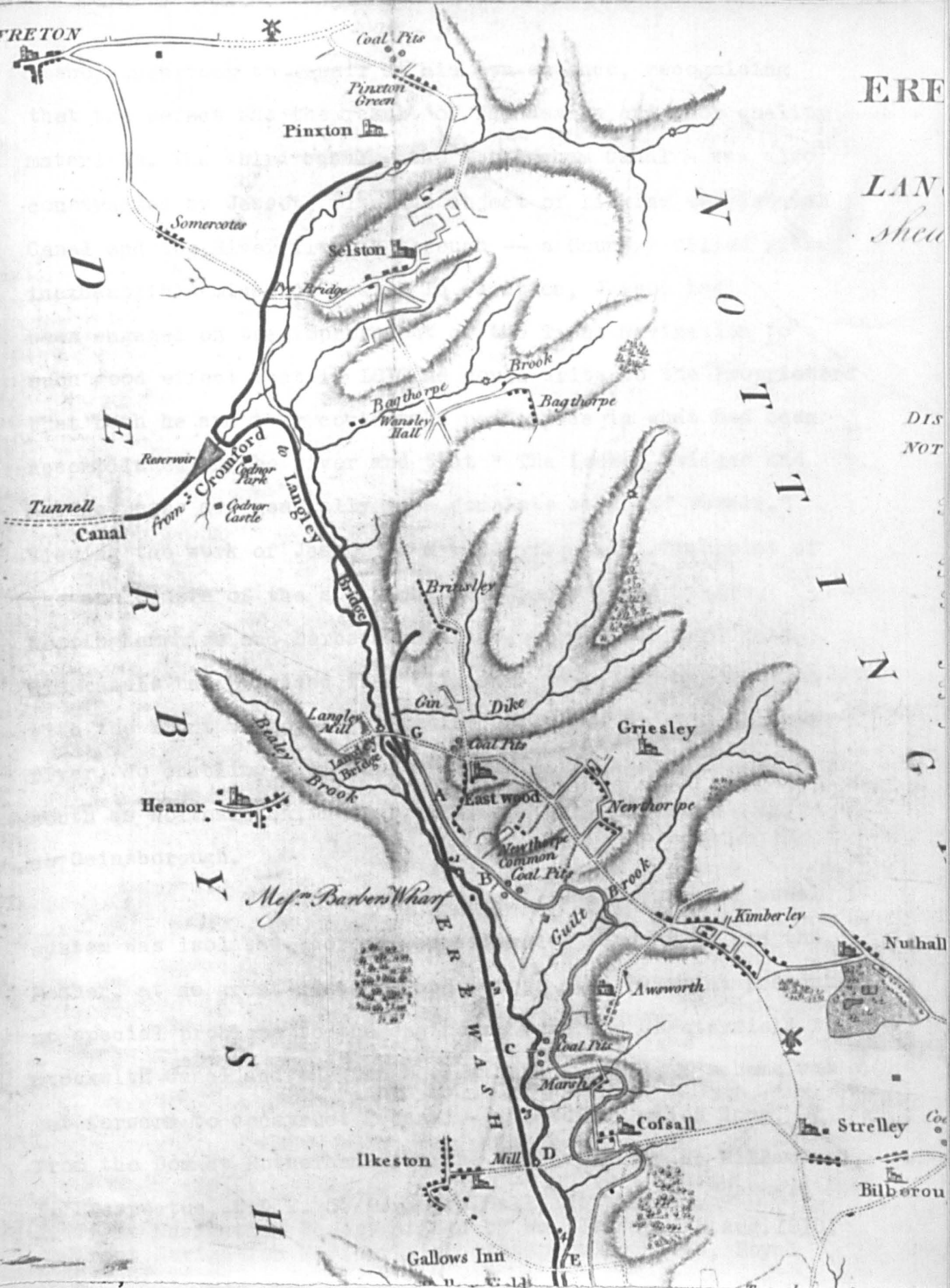
object of facilitating the transport of Derbyshire coal up the River Soar into Leicestershire and Rutland. In 1789, another Act was passed to continue this canal six miles further up the Erewash valley, to open up another six miles of coal, then unworked for lack of communications. A branch almost at right angles to the main line of the canal, skirting the boundary of the Hundred of Scarsdale, ran from Pye Bridge to the Arkwright cotton mills at Cromford in the Derwent valley. The greater part of the capital for this waterway was provided either by Nottingham business men or by West Derbyshire landowners. The only important North Derbyshire shareholders were the Cokes of Pinxton and the Morewoods of Alfreton. Both these families had been long settled in the region and both were landowners and coal masters, the value of whose land and mines might be expected to increase with improved means of communication. This canal, like the Erewash, was built by William Jessop, with Benjamin Outram as his assistant. As in the case of the other canals built at this period in the region, the cost of construction proved to be much greater than had been expected, partly as a result of a 20% rise in the cost of materials and wage rates between 1789 and 1793 and partly as a consequence of the contractors absconding with a considerable amount of money. In addition to raising £46,000 as capital, the Proprietors found it necessary to raise a loan of £20,000 to complete the canal. Engineering difficulties encountered were slight, with the single exception of the threatened collapse of the Derwent aqueduct, which

ALFRETON

ERE

LAN
shea

DIS
NOT



Messrs. Barber's Wharf

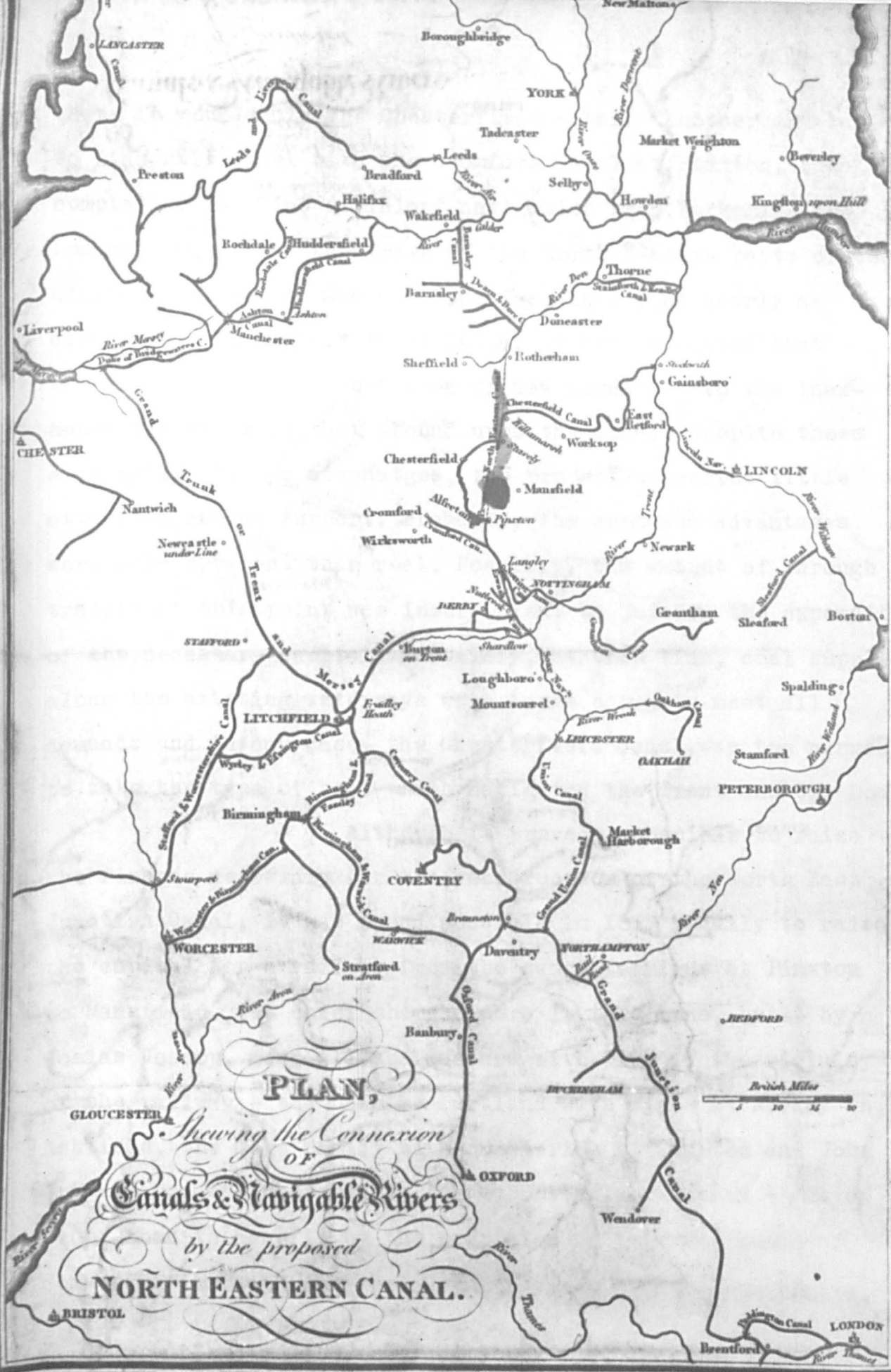
Gallows Inn

Jessop undertook to repair at his own expence, recognising that the defect was the result of bad design and poor quality materials. The third canal - the Nottingham Canal - was also constructed by Jessop, with the object of linking the Erewash Canal and the River Trent " through -- a Country filled with inexhaustible mines of coal." In addition, Jessop had^I been engaged on the improvement of the Trent Navigation to such good effect that in 1810 he could write to the Proprietors that both he and they could take real pride in what had been accomplished on the river and that " The Locks, Bridges and haling paths are generally in a complete state of repair."² Viewing the work of Jessop as a whole from the standpoint of the coalowners of the southern portion of the Yorkshire, Nottinghamshire and Derbsyhire field, we may conclude that his canals had provided them with the means of communication with the Trent valley and with the waterways hinging on that river, so enabling them to find markets for their coal as far south as Northampton, as far east as Boston and as far north as Gainsborough.

To the north, however, this particular canal system was isolated. Across the watershed between it and the Rother, at no great distance and across country which presented no special problems to the engineer, were the Chesterfield to Stockwith Canal and the Don Navigation. In 1811, a scheme was put forward to construct a canal, some thirty miles long, from the Don at Rotherham down the Rother valley to Killamarsh,

1. Prospectus. D.D.E. 35/2. Shire Hall, Nottingham.

2. Trent Navigation Report signed by Wm. Jessop. 18 Aug. 1810. Trent Navigation MSS. British Transport Archives, Royal Oak, London.



PLAN,
Showing the Connexion
OF
Canals & Navigable Rivers
by the proposed
NORTH EASTERN CANAL.

where it would join the Chesterfield Canal. Another arm was to link this canal with the Cromford Canal at Pinxton, thus completing the line of inland navigation from Yorkshire to London, bringing " the Trade of the North Eastern parts of the Kingdom through the Midland Counties, in a line nearly as direct as a Turnpike." In addition, it was suggested that the projected canal would open up new markets " to the inexhaustible minerals that abound upon the line." Despite these apparently obvious advantages, the project attracted little attention and no support. Probably, the supposed advantages were more apparent than real. Possibly, the amount of through traffic at this point was insufficient to justify the expenditure of the necessary capital. Certainly, at this time, coal supplies along the existing waterways were large enough to meet all demands and in any case, the Chesterfield Canal was too narrow to take the type of boat which navigated the Trent and the Don.

Although it proved impossible to raise the finance necessary for the construction of the North East Junction Canal, it was found possible in 1817 locally to raise the capital for a railway from the canal terminus at Pinxton to Mansfield. The chief shareholders in this line, built by Josias Jessop, were all coalmasters with pits in the vicinity of the railway - the Duke of Portland with mines at Kirkby in Ashfield, the Coke family with collieries at Pinxton and John Wright, one of the partners in the Butterley Company - all of whom stood to benefit by the provision of improved means of communication with the agricultural areas of Nottinghamshire.

I. Observations on the Intended North East Junction Canal. 1811.

THE LAST DECADE 1820-30.

The half century ending in 1820 had been a great age of canal building in South Yorkshire and North Derbyshire. Its end saw most of the valleys provided with navigable waterways. Any future extension of the system would, however, necessitate heavy expenditure on flights of locks along the narrow valleys climbing up to the moors and on tunnels under the watersheds. In addition, there was a growing volume of opinion that the iron railway and not the canal was the more economic solution to the transport problems of the region. Thus, although it was apparent to business men that the construction of canals to link Sheffield with the Lancashire and Midland systems of inland waterways would be extremely advantageous, attempts to accomplish this failed, largely as a consequence of these facts.

The first of these attempts, planned in 1824 by Telford, was for a canal from Kelham Wheel, outside Sheffield, along the Don valley to Wortley, ascending to Penistone by a chain of 60 locks, tunnelling under the moors at Woodhead and then descending by the valley of the Etherow to Tint-whistle and Mottram, to Hyde on the Ashton Canal by another 66 locks. The engineering difficulties of the route, with what would have been the highest summit level of any canal in the country, the high cost - estimated at half a million - together with the fact that little traffic could be expected from the sparsely populated country between Sheffield and Mottram, were all factors which led to its promoters never seeking Parliamentary powers, once estimates of expenditure and traffic had been prepared.

COMMERCIAL CANAL

Scale $\frac{1}{2}$ an Inch
to a Mile

SHEPPIELD

HATHERSAGE

DRONFIELD

CHESTERFIELD

M O R N
H I G H
T H E

Canal at
Black Land Hollow

Woodthorp near
Clay Cross

200
Chester Canal at
Duckland Hollow

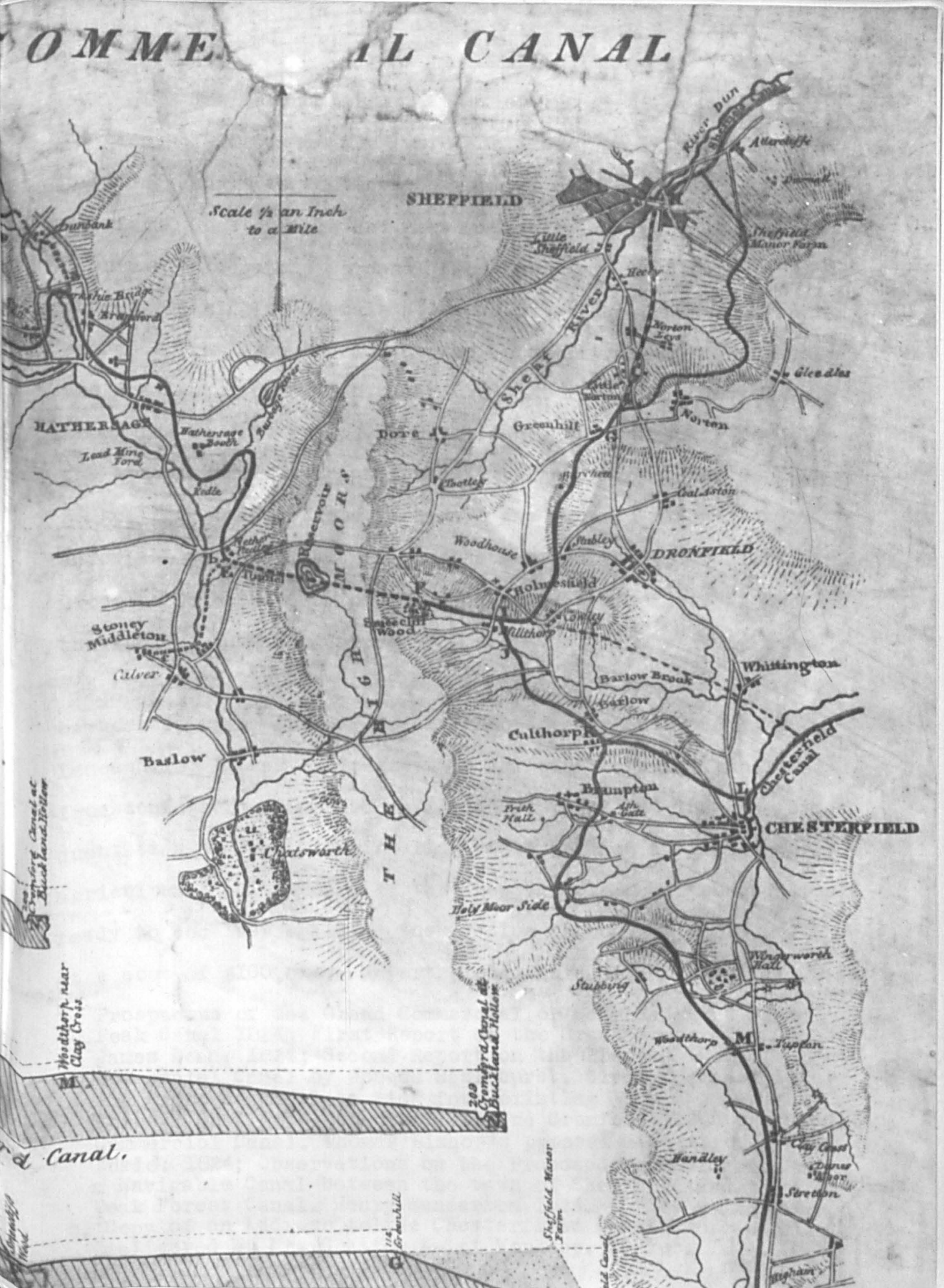
115
Greenhill

Sheffield Manor
Farm

Old Canal

Canal.

Canal



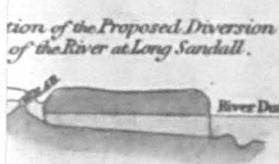
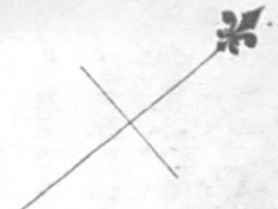
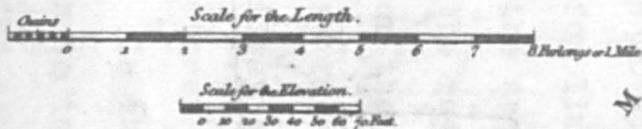
The second attempt, part of the great speculative movement of 1825, was much more ambitious, as it aimed at building canals to connect the termini of the Sheffield, Cromford, Chesterfield and Ashton Canals. In general, the plan was to construct a canal from Sheffield to Chesterfield, thereby linking the canals at these two places, with a branch swinging from side to side up the Cordwell valley to decrease the gradient, tunnelling under the East Moor to Padley Mill, along the Derwent valley to Hathersage, through Edale to join the Ashton Canal at Bugsworth by a tunnel through the Cowburn Ridge. From Chesterfield, a branch was planned with a tunnel under the watershed between the Rother and the Amber at Clay Cross to join the Cromford Canal at Buckland Hollow. Altogether, the whole scheme would involve the construction of 120 locks and cost £365,769. Apart from the advantages of enabling barges to travel from Sheffield into the Midlands and into Lancashire, it was envisaged that large resources of coal and ironstone would be opened up for development and that large quantities of Peak District lime would be made available for agriculture.¹ The Board of the Chesterfield Canal showed itself ready to consider building the section through to Padley Mill at a cost of £100,000.² Nevertheless, this Grand Commercial

- I. Prospectus of the Grand Commercial or Scarsdale and High Peak Canal 1824; First Report on the Grand Commercial Canal. James Dean. 1824; Second Report on the Proposed Grand Commercial Canal by Joseph Haslehurst. Civil Engineer. 1824; The Proposed Canal to link four existing canals at Peak Forest, Sheffield, Chesterfield and Cromford 1824; the Grand Commercial Canal. Thomas Bishop's proposed line through Edale. 1824; Observations on the Proposed Communication by a Navigable Canal between the town of Sheffield and the Peak Forest Canal. Henry Sanderson. 1826.
2. Copy of an Address to the Chesterfield Canal Proprietors delivered by Mr. Gratton -- at Worksop. 26 Feb. 1824.

A MAP
of the
ALTERATIONS & IMPROVEMENTS

Intended to be made in the
NAVIGATION OF THE RIVER DUN.

BY W. & J. FAIRBANK.
1820.



Explanations.

The Present Course of the River Dun is colored Blue.....thus

The Proposed Cuts and Diversions are colored in the Plan thus
in the Sections thus

The Length of the Proposed Cuts at the 1st West Reach... marked A. is... 8. 4. 1/2.
from Long Sandall to Stainforth Cut B. is... 3. 2. 3/4.



(B.)

Section of the Proposed Diversions from Long Sandall to Stainforth Cut at South Bramwith.



Canal, as it was so grandiloquently named, never got beyond the stage of contradictory pamphlets and pious resolutions " that a canal to effect an Union by Water, in one bottom, Between the Eastern, Western and Southern parts of the Kingdom, through the Midland Coal and Lime Districts -- is the great Desideratum wanted by all the Commercial Men in the United Kingdom." The times were not propitious for large scale capital investment. Heavy industry throughout the area had been depressed since the end of the Napoleonic Wars. Landowners and farmers, dispirited by the depression in agriculture, were no longer enclosing common and waste, so that the market for lime was stagnant. The trade recession, with the end of the speculative boom of 1825, caused many bankruptcies in the region. Although meetings were held to enlist support for the Grand Commercial scheme until 1827, after that date it faded into oblivion, once the Cromford and High Peak Railway had provided a route alternative to the turnpikes, between the Lancashire and Derbyshire canals.

In the meantime, the Don Company had obtained two Acts to improve that river. These had been necessitated by the completion of the canal from Tinsley to Sheffield, with a depth of six feet, theoretically capable of taking 70 ton Humber " Billy Boys ;" which would be unable to reach Sheffield without further deepening of the Don. In 1821, the Company held meetings with landowners around Doncaster to secure their support for a Bill empowering it to make new cuts near that town. As a consequence of these negotiations, Parliamentary proceedings initiated by Lord Milton, heir to

Earl Fitzwilliam, ran smoothly and the Company obtained an Act to make new cuts at Arksey, Arksey Ings and Barmby Dun. Once these had been completed, an application was made in 1826 for another Act to authorise the Company to make further cuts above Doncaster. There was, however, general opposition to this Bill by the Dearne and Dove and by the Stainforth and Keadby Canals as well as by industrialists in the Don valley. William Newman, solicitor to Earl Fitzwilliam expressed what was common opinion about this Bill, when he wrote to the Earl: " Altho' they are a very opulent body, they never make any Improvement (altho' the Public have reason to complain of the defective State of the Navigation) without charging additional dues more than sufficient to remunerate them." Because of the powerful interest of the Earl in Parliament, compromise was advisable and although the Company was able to secure its point that it should be allowed to abandon the old line of the river from Mexborough to the entrance of the Dearne Canal, it had to agree to halving its original demand for additional tolls and to collecting them at two points, so that boats only using a part of the cuts would not be compelled to pay all the new tolls. ^I With the opposition conciliated, the Company was able to secure another Act, empowering it to deepen and extend the cuts from Rotherham to Mexborough; to improve the river at Eastwood, Aldwark and Kilnhurst; to make new cuts around Denaby; to cut

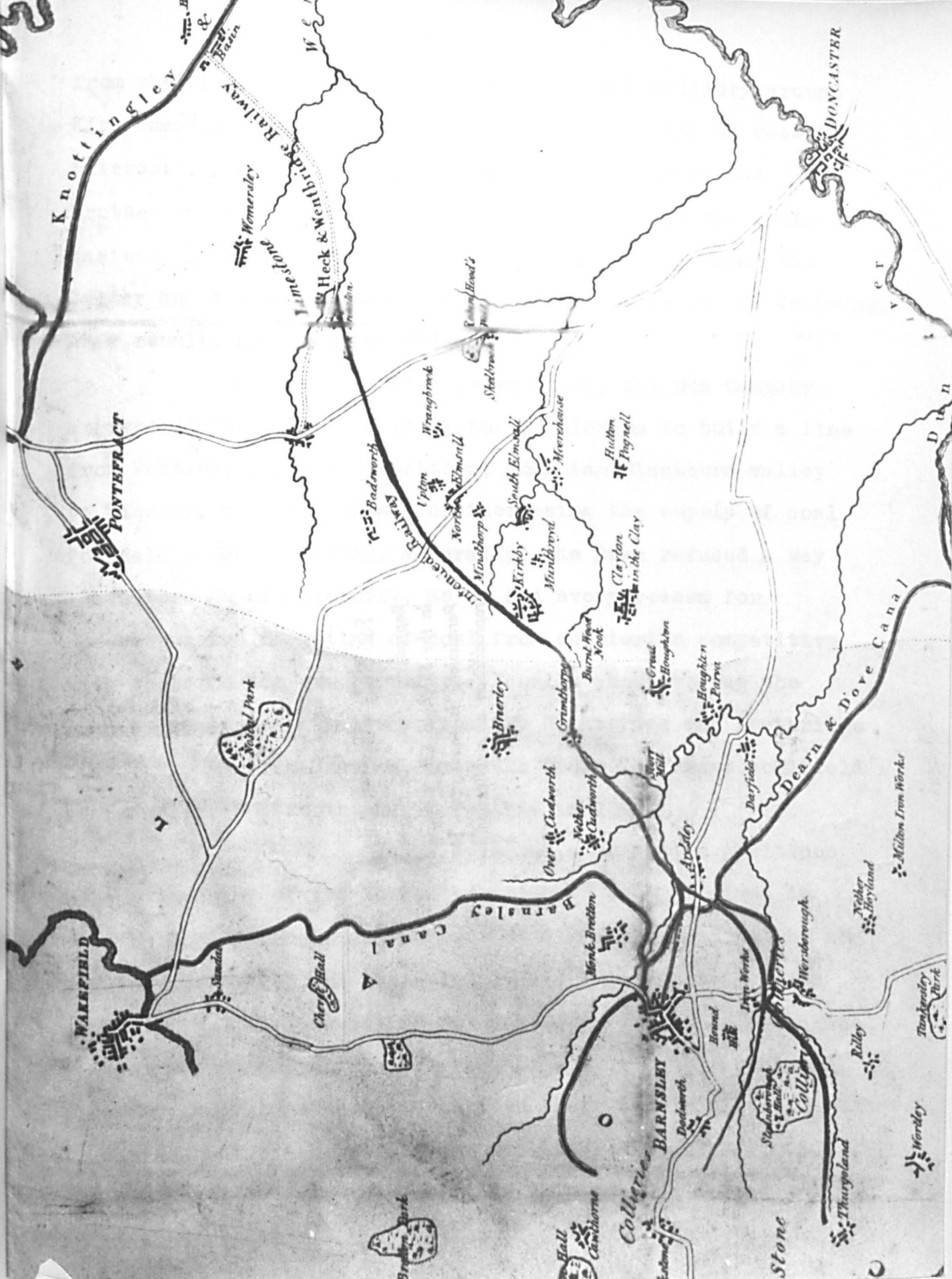
- I. Correspondence from Wm. Newman, Earl Fitzwilliam's Solicitor. 1826 -57. Letters dated 22 Feb. and 31 March 1826. Correspondence of the 3rd Earl Fitzwilliam. No. 49. Wentworth Woodhouse MSS. Sheffield City Library.

off the Devil's Elbow further down stream; to make another cut at Conisborough and another lock at Spotborough.

In addition to these improvements, the Company was able to make considerable purchases of property along the Don, in continuance of its policy of buying up water rights wherever possible. In 1821, Rotherham Mills were purchased from the Walkers and when the lease came up for renewal in 1824, restrictions were placed on the tenants using water from the river, so that the depth of the channel was increased from four to five feet. Three years later, the Company bought ^kIcles Mill for £8000 and when these were _kleased in 1829, a clause was incorporated in the deed whereby the Navigation was able to regulate the flow of water through the shuttles in a dry season.

The growing conviction during this decade that the iron railway was the cheapest means of transport in the hilly country between the valleys led to a number of projects to build these to act as feeders to the canals. In 1820, it was proposed to construct a line from Trumfleet on the Don, through Askern and Norton to the limestone quarries at Womersley and Kirk Smeaton. In the following year, another proposal was made to build another line from the end of the Dearne cut at Wosborough, through Dodworth, Stainborough, Thurgoland and Oxspring, terminating at Tomroyd Colliery. The two projects were, in a sense, complementary as the railway from Wosborough was intended to carry Womersley lime to enrich the newly enclosed moorland near Penistone and that

I. To the Proprietors of Shares in the Dearne and Dove Canal. 1821. Wm. Bingley.



from the Don to distribute coal from Tomroyd Colliery around Kirk Smeaton. Both projects excited the hostility of vested interests. Limeburners at Spotborough, Knottingley and Brotherton were hostile to the Womersley railway and coal-masters along the Dearne and Barnsley Canals and along the Calder and the Don opposed the line from Wosborough to Oxspring. As a result, both schemes failed.^I

Five years later, the Don Company approached the Duke of Norfolk for permission to build a line from Wortley, through Chapeltown, down the Blackburn valley to Tinsley, with the object of increasing the supply of coal for sale along the river. Naturally, the Duke refused a way leave through his property, as he had every reason for preventing the marketing of coal from collieries competitive with those on his own property.² Equally abortive was the plan to construct a railway from the Heckbridge and Wentbridge line, through Kirk Smeaton, into the South Yorkshire coalfield at Barnsley, Dodsworth and Thurgoland in 1829.³

In Derbyshire, a much more ambitious scheme than any of the Yorkshire projects was conceived in 1824 by Josiah Jessop and a group of landowners, headed by the Duke of Devonshire and including such families as the Gells of Hopton and the Arkwrights of Willersey. This was for a line, linking the Cromford and High Peak Canals, to carry coal and lime and general merchandise between their terminini. With such

I. Journals of the House of Commons. LXXVI, 56; LXXVII, 53.

2. John Watson, Law Clerk of the Don Company, in evidence before the S.C. on the Sheffield to Rotherham Railway Bill. 1835. P.284.

3. Plan of an Intended Railway from the Silkstone Collieries to communicate with the Goole Canal. n.d.

support, the capital for its construction was easily raised.^I
Much less fortunate was the plan to build a line from the
coalpits at Staveley, Dronfield and Chesterfield to the lime
quarries at Stony Middleton up the Cordwell to Holmesfield
and over the East Moor, which never seems to have got beyond
the advertisement stage.²

TRAFFIC AND DIVIDENDS.

The Don Navigation, with the largest population of any of the navigations in this region on its banks, with a heavy traffic down stream in coal and in manufactured goods and up stream in Swedish iron, timber and agricultural produce, was financially the most successful of these inland waterways. During the period 1770 -90, the Company made an annual average profit of about £6000; during the next twenty years this rose to £8000; during the next decade it was £12,000 and from 1820 to 1830, it was again increased to a sum of £16,000. As the original share capital of the Navigation seems to have been some £48,600, in the thirties it was distributing a dividend of about 33%.

The most successful financially of the canals was the Cromford, which carried a heavy traffic in coal, lime, iron, corn and general merchandise, much of it the whole length of the canal, through to other waterways or railways. It paid no dividend until 1796, as previous profits had gone to the repayment of loans, borrowed to complete the canal. After that date, dividends averaged about 16%. Traffic on

1. Proceedings of the Projectors of the Proposed Railway from the Cromford Canal to the Peak Forest Canal. June 1824 to March 1825. B.T.C. Archives, Royal Oak, London.
2. Derby Mercury. 18 October 1826.

the Dearne and Dove and on the Chesterfield Canals was of a similiar type to that on the Cromford but their dividends were lower. The Chesterfield Canal, in particular, had been a bitter disappointment to its shareholders. Traffic had failed to develop as had been expected. The original estimates had been based upon a revenue of £15,225 but five years after the opening of the Canal, its income was only £4,811.^I In 1782, the Committee offered to lease the navigation " for any term not exceeding eleven years "² but it proved impossible to find any person to lease it. Traffic, however, with the building of Newcastle railways to pits at Inkersall, Spinkhill, Glasshouse Common and Norbriggs³ grew steadily and although the expected revenue was not reached until after 1820, the shareholders after 1800 received a dividend averaging some 6%. Even less fortunate were the shareholders in the Sheffield Canal, who received their first dividend of 2½% six years after the Canal had been opened and who had to be content with a miserable 3% until 1830. It may be added that canals had no monopoly of low dividends as the Mansfield to Pinxton railway never paid more than 4% during these years.

CRITICISM OF THE NAVIGATIONS 1830-50.

In the years between 1830 and 1850, the inland waterways of North Derbyshire and South Yorkshire found themselves pilloried by their critics before the various Select Committees set up to investigate the Railway Bills relating to this area.

1. Statistics of the Traffic on the Chesterfield to Stockwith Canal. 1774-89. Jackson Collection No. 1255. Sheffield City Library.
2. Derby Mercury 26 Sept. 1782.
3. B. Baxter " Early Railways in Derbyshire." Trans. Newcomen Society. Vol. XXVI. Pp. 185-97.

Whereas little is known of what the users of the navigations thought of their efficiency in the period prior to the Railway Age, these Reports throw a flood of light on the attitude of the merchant and the industrialist towards the inland waterways in this district during these twenty years. The evidence offered by these witnesses was not, of course, unbiassed as obviously the best method by which the requisite Act could be obtained was to condemn the existing means of communication as harshly as possible. On too many occasions, also, the case of the waterways went by default, as when a canal had sold itself to a Railway Company, it had no interest in defending its past record. Nevertheless, much can be learned from these Reports about the weaknesses of the navigations at this time.

The first and most obvious criticism was that the inland waterways in this region were in no sense a real system, allowing traffic to circulate freely through it. The failure to carry through the Grand Commercial project left the waterways of South Yorkshire separated from those of North Derbyshire. There is ample evidence to show that these gaps were a considerable hindrance to business. Goods had to break bulk, with a consequent loss of time, in addition to being diverted to the slower and more expensive stage waggon. Large quantities of corn and general merchandise were, for example, unloaded at Buckland Hollow on the Cromford Canal, where there was a large carriers' establishment, to carry these forward, on what was one of the most difficult turnpike routes in the country, to Chesterfield and Sheffield. In addition,

some 2000 tons of Stourbridge clay, essential for making crucibles for Huntsman steel, were unloaded here for Sheffield. Large quantities of steel and manufactured goods were sent by road from Sheffield to Derby for loading on to barges on the navigable Derwent, to be forwarded through to Birmingham, Gloucester or the West of England. In the other direction, Staffordshire pig iron was sent to Sheffield down the Trent to Gainsborough and then along the Stainforth and Keadby Canal and the Don to its destination, a circuitous and expensive journey of a month.^I

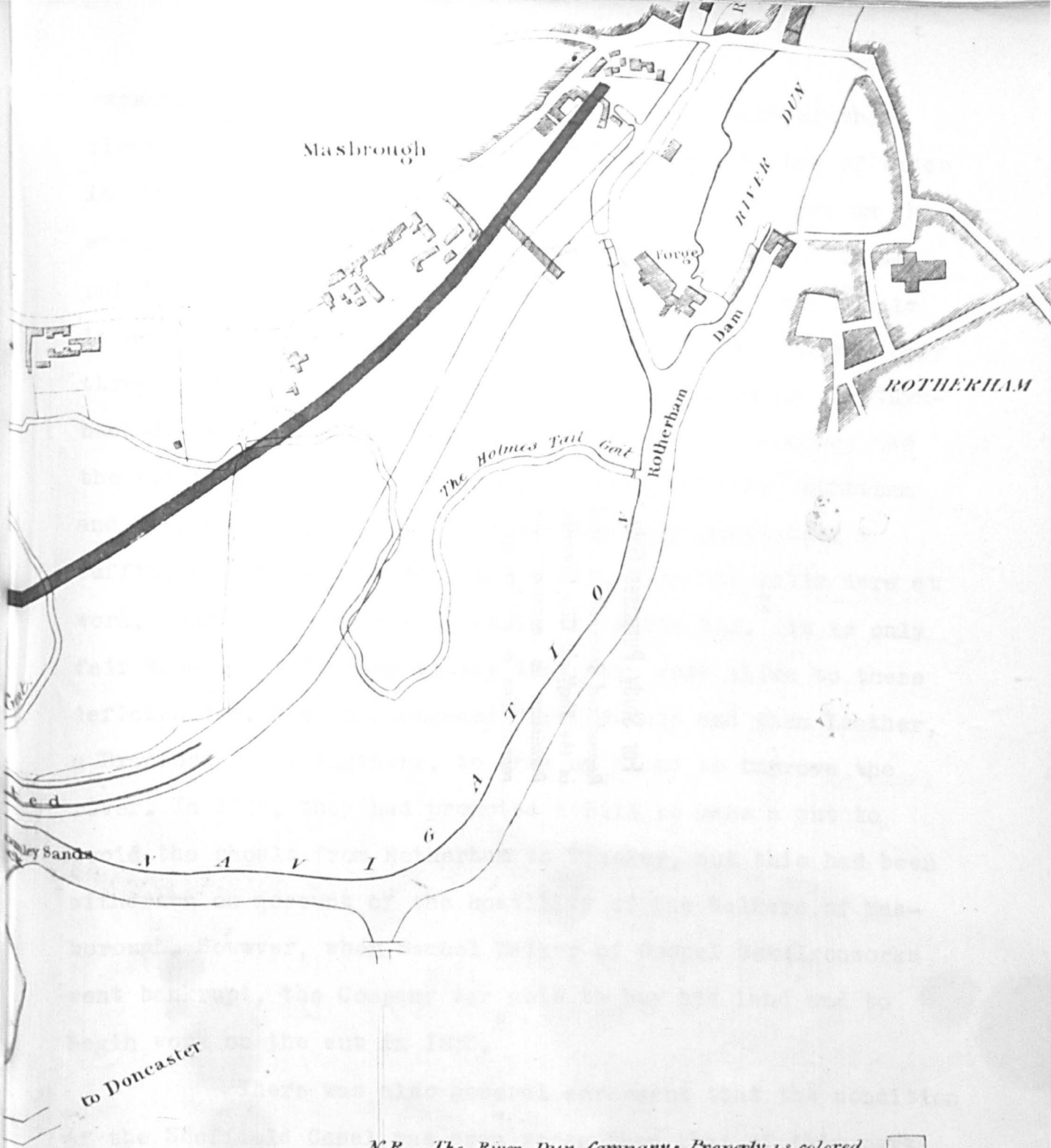
Failure to carry out the Grand Commercial scheme had also left the South Yorkshire and North Derbyshire canals isolated from those of Lancashire, except by a devious route through Wakefield, Rochdale and Manchester. The South Derbyshire canals were connected by the Cromford and High Peak Railway with those in South Lancashire. Neither route was, however, considered satisfactory by the business men who used them. The principal traffic westward was in malt, made in East Retford, Worksop, Mansfield and Newark for sale in South Lancashire. From the first two towns, malt was sent eastwards by the Chesterfield Canal to the Trent, then along the Stainforth and Keadby into the Don and the by means of the Dearne and Barnsley Canals into the Calder and then through into Lancashire.² From Mansfield, malt was taken first by

- I. Thomas Cox of Derby, general merchant; Francis Saunders of Derby, corn factor; John Marshall of Walsall, iron merchant and Henry Pauling of Sheffield, shipping agent in evidence before S.C. on North Midland Railway Bill. 1836.
2. John Hickson of Worksop, malster in evidence before S.C. on Sheffield and Lincolnshire Junction Railway Bill. 1846.

railway to Pinxton, then along the canal to Cromford, where it was transferred to the High Peak Railway and after transport on this, to reach its final destination in Lancashire by canal. ^I Malt from Newark was sent by barge along the Trent and the Nottingham Canal as far as Langley Mill, where it was unloaded into a narrow boat for transport on the Cromford Canal to follow the same route into Lancashire as that from Mansfield. ² There was general agreement that all ^e these routes were slow and that the malt deteriorated in quality as a result. Eastbound traffic from Liverpool Docks was similiarly slow. Sugar, for example, took ten days to ^e reach Sheffield from the Mersey. _L

A second and more serious complaint was the irregularity of traffic on the inland waterways. The two narrow boat canals - the Chesterfield and the Cromford - were periodically frozen up. Despite the usully heavy rainfall of this area, most of the navigations were seriously hampered in summer by water shortage. Although there was a general consensus of opinion that the condition of the Don between Stainforth and Rotherham was " very fair " or " middling ", it was agreed that above Rotherham, the river was in a bad condition for navigation. Many of the larger vessels, known as " Billy Boys, " were unloaded at Doncaster or Rotherham and their cargoes brought to Sheffield by road. Others were partially unloaded into lighters, so that with their smaller draught, they could navigate this section of the Don more safely. Despite heavy

- I. Henry Morris of Mansfield, malster in evidence before S.C. on Newark and Sheffield Railway Bill. 1845.
2. John Thorpe of Newark, miller in evidence before S.C. on Newark and Sheffield Railway Bill. 1845.



The Parliamentary Line of Railway is col^d ~~RED~~
 and it would destroy and render useless $\frac{3}{4}$ ths of a
 mile of the New Cut made by the River Dun Co
 for the improvement of their Navigation

expenditure by the Don Company on cuts, this part of the river with its dams and water wheels, its rapid flow of water in times of flood and its shallowness in drought, was on the eve of the Railway Age, seriously defective from the standpoint of navigation. Near Rotherham, there were four shoals in half a mile; the depth of water in the Holmes Cut was only three feet and there were two shoals - one known as the Turn-back-in the Ickles Cut. Again, although the Don Company had the power to regulate the supply of water at both Rotherham and Ickles Mills, in actual fact, they only guaranteed a sufficient supply of water once a day. When the mills were at work, long shoals were exposed in the river bed.^I It is only fair to the Don Company to say that they were alive to these deficiencies. They had engaged first Rennie and then Leather, a Bradford civil engineer, to draw up plans to improve the river. In 1827, they had promoted a Bill to make a cut to avoid the shoals from Rotherham to Tinsley, but this had been withdrawn on account of the hostility of the Walkers of Masborough. However, when Samuel Walker of Gospel Oak Ironworks went bankrupt, the Company was able to buy his land and to begin work on the cut in 1835.²

There was also general agreement that the condition of the Sheffield Canal was even worse than that of this part of the Don. Originally, the canal had been constructed to take

1. John Palmer, haulier; John Woodall Senior, boat captain and George Ogden Browne, late agent of the Don Company in evidence before S.C. on Sheffield and Rotherham Railway Bill. 1835.
2. John Watson, law clerk of the Don Company in evidence before S.C. on the Sheffield and Rotherham Railway Bill. 1835.

vessels sixty feet long with a beam of sixteen feet and a cargo capacity of seventy tons. The Company failed to build the reservoirs authorised by its Act and as the owners of works along the Don refused to allow it to take water from the river, it was compelled to buy water from the collieries in the Park to compensate for the loss of water through lockage into the Don. As this was heavily loaded with silt, the canal became steadily shallower. No doubt, Samuel Jackson, a partner in Spear and Jackson, one of the chief Sheffield exporting firms, was guilty of exaggeration when he declared that a boat might take days on the canal but all the evidence offered in support of the Sheffield to Rotherham Railway Bill shows that the waterway was badly hampered by shoals.^I Another supporter of this Bill, William Ibbetson of the Globe Works on Manchester Road, placed the responsibility for the defects of this canal on the shoulders of the original directors, who to appease the Duke of Norfolk, rejected Chapman's advice and constructed it on the south side of the river.² His condemnation " instead of its being level with an abundance of water, without cost, they took it uphill, where there was no water but was pumped out of the coalpits, which was not only a scanty and precarious supply, but a very expensive one. Instead of it being straight, to render it as short as possible, they took it a round about course and added perhaps a mile to its length; and by such means, instead of it costing £60,000, as it was at first expected, it cost near £130,000 and instead of it being nearly

- I. Thomas Smith of Rotherham, boat owner; Charles Bartholemew, engineer and Henry Paulin of Sheffield, shipping agent, in evidence before S.C. on Sheffield and Rotherham Rly Bill.
2. A Letter on the Rejection of the Sheffield and Rotherham Railway Bill 1835.

without locks and requiring very little water which could probably have been procured without charge, it has 12 locks to get a distance of three miles " was undoubtedly justified and fully supported by facts.

Further south, navigation on the Chesterfield Canal was equally hampered by water shortages. The failure to provide adequate water storage near the summit tunnel led to allegations that hardly a day went by without boats being stopped by shoals on the western section of the canal and that in summer barges lay on the canal bed with cattle grazing round them.^I Even the agent of the Canal Company had to admit that " It was most liable to obstructions."² When the Company turned itself into a Railway Company during the Mania, the prospectus of the Manchester and Lincoln Union Railway Company, as it called itself, delicately admitted that a water shortage existed on the canal, when it was asserted that it had been necessary to turn business away on this account, so that the Railway Company ought to be able to earn more than 9%, the then current Canal dividend.

The Cromford Canal was handled as roughly in Committee as the Chesterfield by its critics. When its original Bill went through the Commons, it was opposed by mill owners on the Derwent who feared diversion of water from their works and to placate them, the canal was only allowed to take water from the river on Sundays and then only to the extent of a twenty eighth of its flow. Initially, the Canal

- I. Francis Appeleby of Renishaw Ironworks and John Dickson, canal carrier in evidence before S.C. on the Sheffield and Lincolnshire Junction Railway Bill. 1846.
2. W.A. Cartwright, canal agent, in evidence before S.C. on the Manchester and Lincoln Union Railway Bill. 1846.

obtained its water from three sources. Two of these were colliery soughs. One at Ripley supplied three quarters of a ton a minute; the other at Hartsay supplied double that amount. The principal supply was from Cromford Sough, draining the lead mines in that district, which supplied 75 tons of water a minute. In 1796, a further supply was obtained from a colliery, owned by Outram and Company at Codnor Park. The Cromford Canal lost large amounts of water by lockage into the Nottingham Canal which, to compensate for this, had built a reservoir at Butterley to feed both waterways. This proved defective and had to be reconstructed in 1800. It also proved inadequate in storage capacity and had to be enlarged in 1813. Thirty years later, a serious crisis in water supply hit the canal when the leadmines began to work below the level of Cromford Sough and their water was diverted into another sough. At one stroke the canal lost three quarters of its supply and a pumping engine had to be hurriedly installed on the River Derwent to secure an alternative source of water. As this canal was the principal artery of a highly industrialised zone, this shortage was bitterly criticised by its users, who were convinced that the Cromford Canal had all the failings inherent in canals in general and many others peculiar to itself.

Both the Chesterfield and Cromford Canals had long tunnels. Both were a source of complaint to canal users. The Norwood Tunnel on the first named canal was worked on a one

I. Wm. Jessop, manager of Butterley Iron Works and R.C. Coke, mining engineer in evidence before S.C. on Erewash Valley Railway Bill. 1845.

way traffic system which often led to considerable delay. The Butterley Tunnel on the latter canal was often under repair as a result of mining subsidence, again holding up traffic.

Other criticisms proffered were relatively unimportant. Dues, with the exception of those on the Sheffield Canal, were not generally regarded as too high.^I Pilfering was common, especially of malt and coal on the Cromford Canal, to make beer. These complaints were, however, insignificant compared with those previously enumerated.

It is only too obvious that by this time vitality had gone out of the Canals. Since their initial construction, their shareholders had been content to be mere receivers of dividends. Parochial in their outlook, the proprietors of each canal in this district conceived it as something complete in itself and nowhere was there vision and energy sufficient to drive through the schemes which would have welded the inland waterways into a system enabling barges to circulate freely throughout the region and to travel into the Midlands and into Lancashire. Experience proved that the capital needed to remove the bottlenecks in the canals by the provision of more reservoirs and of second tunnels at Norwood and Butterley was not forthcoming. The Canal Companies were undoubtedly moribund. The Don Company, on the other hand, although so much older than any of the Canal Companies, was still full of life and during this period was ploughing back

I. Thomas Smith of Rotherham, boat owner in evidence before S.C. on the Sheffield and Rotherham Railway Bill. 1835.

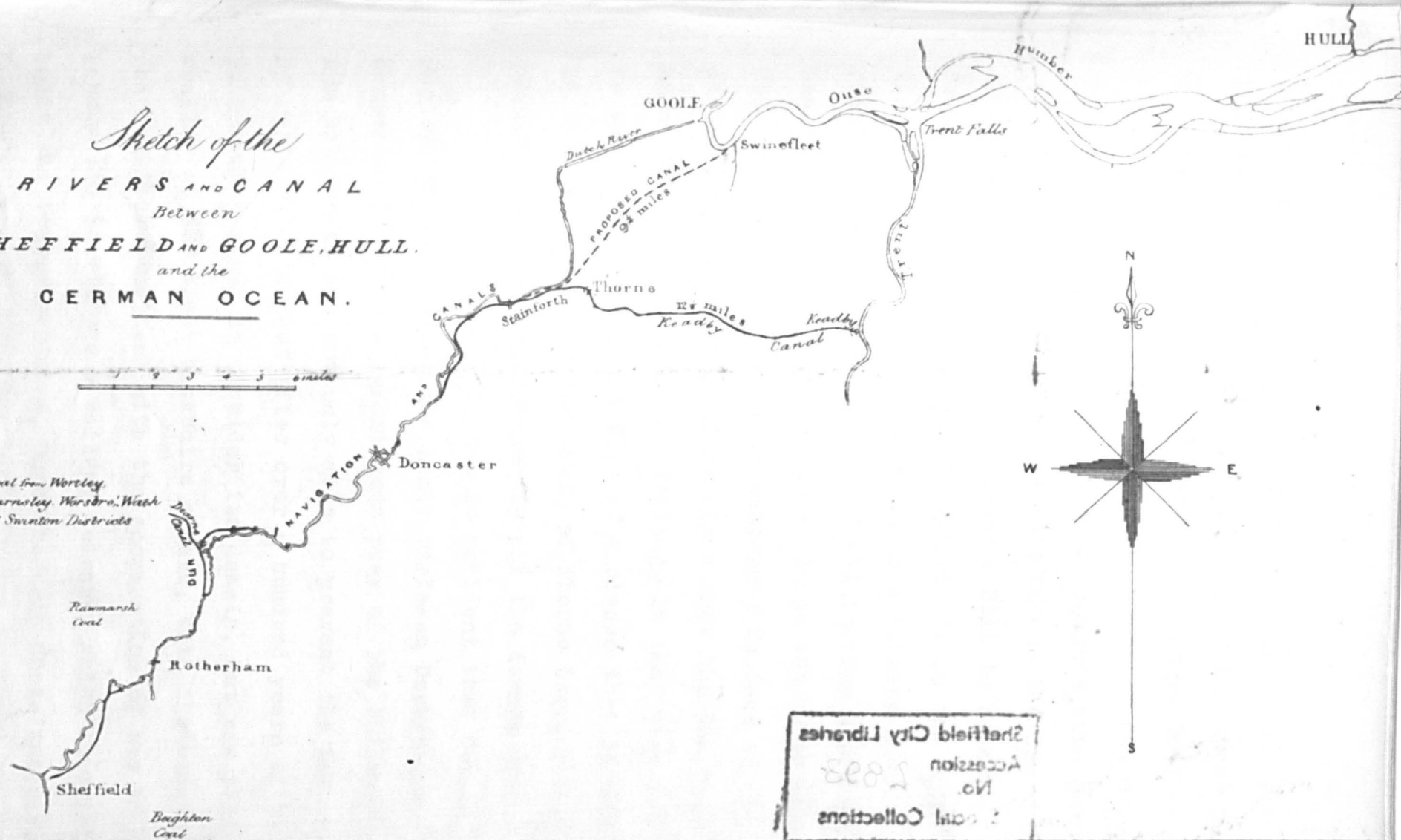
Sketch of the
RIVERS AND CANAL
Between
SHEFFIELD AND GOOLE, HULL.
and the
GERMAN OCEAN.

0 1 2 3 4 5 miles

Coal from Wortley,
 Barnsley, Worsboro', Wess
 & Swinton Districts

Rawmarsh
 Coal

Baughton
 Coal



Sheffield City Libraries
 Accession
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 2nd Collection

profits to improve the river, experimenting with new rates of dues to secure the maximum traffic and the highest possible income, introducing facilities for passenger traffic by building fly boats and planning new, shorter and more efficient routes so as to be the more able to compete with the railways which its Directors saw would soon invade the Don valley.

In 1836, for example, it promoted a Bill to construct a canal from Stainforth on the Don to Swinefleet on the Ouse, with the object of shortening the distance between these two points by water transport and of eliminating those two bug-bears of all river navigations - floods and water shortages. The Bill, however, had to be withdrawn in face of the demands of the landowners in Hatfield Chase that the Don Company should make itself responsible for drainage in that area and agree to the insertion in the Bill of a clause that in the event of floods to the east and south of Thorne barrier bank, it should compensate landowners for all the damage done.^I

It was no accident that during the Railway Mania, whereas the panic stricken Derbyshire Canal Companies became the ignominious prey of the Railways, the Don Navigation was not only able to prevent the intrusion of railways into what after over a hundred years of business it had some right to consider its domain, but was able to swallow up the South Yorkshire canals, with the exception of the Barnsley Canal and with the cooperation of the local landowners to finance a Railway Company, which successfully built the South Yorkshire, Doncaster and Goole Railway.

I. Hatfield Chase MSS. No. 6322. Papers re River Dun Banks 1809-49. Nottingham University Library; Letters to and from John Read and others about the Don Navigation. Letter dated 30 June 1836. Leader Collection. No.84. Sheffield City Library.

III.

RAILWAY PROJECTION AND CONSTRUCTION IN SOUTH YORKSHIRE AND NORTH DERBYSHIRE 1830 - 50.

John Parker M.P., Chairman of the Sheffield, Ashton-under-Lyne and Manchester Railway, addressing the half yearly meeting of shareholders, held in the Cutlers Hall in Sheffield at the beginning of April 1846, put forward a view of the relationship between the State and the railway companies, which must have sounded heretical to his audience of Lancashire and West Riding business men, bred in the beliefs of free trade and laissez faire. Looking back on the months of the Railway Mania and the many ill-starred bills pushed forward prematurely by his own Company, and on the costly campaigns waged to prevent other railways intruding into what he and his fellow directors considered to be the area in which they had some inherent right to a monopoly of railway operation, Parker declared that he wished that he had never seen a railway committee nor a railway lawyer. He, then proceeded to denounce the English system of railway development by private bill legislation, contrasting it, to its disadvantage with the French and Belgian method of granting a concession in a given district - what later English railwaymen were to call "districting."^I With most of its bills rejected and with heavy legal costs on its hands, the Chairman of this Company was understandably in favour of any process which might have made the railway world an easier place for the weaker companies such as his own. Parker had possibly

forgotten that one minister, Gladstone, and his Department, the Board of Trade, had attempted to guide railway development into some overall plan in consonance with the national interest and that it was the pressure group of railway directors in the House, headed by George Hudson, which was responsible for the failure of this attempt to introduce some degree of planning into what was a world of blind, unco-ordinated growth.

In the previous year, the Railway Department of the Board of Trade had issued a report to guide the many Select Committees considering the Railway Bills in both Houses, in which it examined - amongst other matters - the various projects for building railways in the West Riding and the North Midlands.^I Its criteria in judging these schemes were how far each line might link economically complementary districts; how far it would carry coal south and east; how far it would dovetail into the single railway system through Lincoln and Cambridge, which was all it could envisage between London and York, and how far its potential earning capacity could justify the capital to be invested in it. With these points in mind, the Five Kings, as Dalhousie and his associates were known by their enemies, supported the plan to construct a railway from the coalfield at Wakefield, through Pontefract to the developing port of Goole. Further south, they commended the project to build a railway from the Midland main line at Swinton, through Doncaster to Gainsborough, on what was envisaged to be the trunk route from London to York.

I. Report of the Board of Trade for extending Railway Communication between London and York. 1845. XXIX, 261.

Westwards they approved the scheme to construct the Barnsley Junction Railway linking the Midland with the Sheffield, Ashton-under-Lyne Railway, thereby giving direct communication between the best farmed districts in Eastern England and the most important textile centres in Lancashire. In addition, the Barnsley Junction Railway would give the section of the Yorkshire coalfield through which it was proposed to build this line, then completely dependent upon canals, cheaper and more rapid transport to its markets. Further south still, the Railway Department supported a scheme to build a railway from Newark, then an important malting and corn milling centre, to Chesterfield, where it would join the existing Midland line. From there, this railway would climb along the Drome valley and descend that of the Sheaf into Sheffield. These lines would enable reserves of coal in Derbyshire, hitherto comparatively undeveloped for lack of transport facilities, to be exploited and transported cheaply into markets hungry for coal. Finally, the Railway Department wished to see the railways constructed from the Durham Coalfield into the Vale of York continued southwards in order to facilitate competition between Durham and South Yorkshire coal and in addition, it supported a project of the Midland to build a railway from Syston to Peterborough, so that Derbyshire coal could be sold in the district east of the latter town, in competition with sea-borne coal from the North Eastern Coalfield.

Looked at from the standpoint of the bureaucrat in the capital, the plan was a logical one. However, it totally ignored the vested interests involved in railway

promotion in its concentration upon developing a railway network, which, while promoting competition between the various coalfields and farming districts, would at the same time give each Railway Company a semi-monopoly in the region it served. The Report took no note of the economic interests of such great landlords as the Dukes of Norfolk and of Devonshire, of Earl Fitzwilliam and Lord Wharnccliffe and of the lessees who worked their coal and iron, whose mines and furnaces were totally ignored by this scheme. It ignored the fate of towns such as Worksop and East Retford, hitherto dependent upon their trade in malt and upon coaching traffic, left high and dry, miles from any railroad, to moulder into decay. It failed to consider the legitimate ambitions of the inland navigations, threatened with ruin by railways running direct from the pit head to the consuming areas, to ward off total disaster by the promotion of their own railway schemes. The territorial aristocracy, the business world and the shareholders in the waterways, all linked together by the ties of a common economic interest, were by lobbying in private and by evidence in public before the Select Committees on Railway Bills, to induce them to ignore the recommendations of the Five Kings in favour of lines planned to meet their own particular needs, thus producing a railway network, radically different both in ownership and layout, from that advocated in the Report.

A DECADE OF RAILWAY PROMOTION 1830 - 40.

Topographically, North Derbyshire and South Yorkshire offered many opportunities to the railway engineer. Equally, the district presented him with many

formidable problems. The Don valley offered an easy line of communication from Goole to Sheffield. North west of the latter town, the upper course of that river appeared to provide a practicable route through to Lancashire, although expensive tunnelling would be necessary near its source around Woodhead, before the line could penetrate into the Etherow valley and descend into Lancashire. Again, the Sheaf valley seemed to offer an alternative route through to Lancashire in conjunction with the upper part of the Derwent valley, although once more the engineer would be faced with great problems in tunnelling through the watersheds.

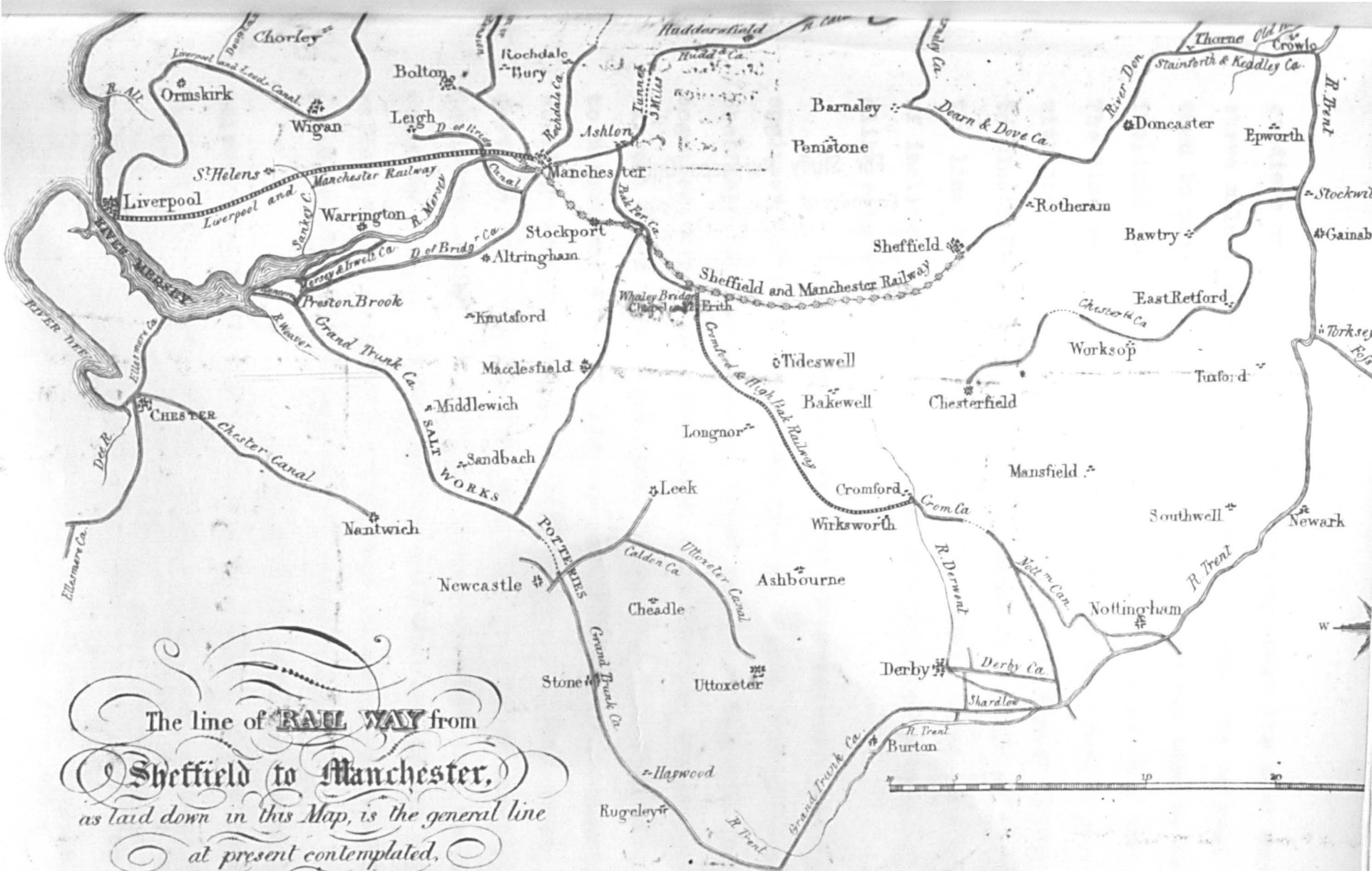
Railway building from north to south, too, was facilitated by the well marked line of valleys - the Dearne, the middle Don, the Rother, the Amber and the Derwent - broken only by one low watershed at Stretton. With engineers rightly afraid that the low-powered locomotives of this period could not tackle heavy gradients and with Directors apprehensive of the heavy capital and operating costs of routes needing extensive earthworks and tunnels, it was inevitable that all the railway projects of this decade should be confined to building railways along these valley routes.

The post-Waterloo depression, the collapse of the short lived boom of 1825 and the inherent engineering difficulties of the project had all combined to lead to the failure of the plan to construct the Grand Commercial Canal, linking South Yorkshire with Lancashire and the Midlands. Traffic between Sheffield and Liverpool in 1830 still found its way by a long, roundabout route by river and canal, at a

time when increasing European competition in the American market for edge tools and cutlery, made cheap transport between the two towns increasingly important. Eastwards, Sheffield was linked with the other navigations in the Humber basin by river and canal. The Sheffield Canal was regarded with nothing but contempt; one critic described it as "the wonder of all strangers who looked at it, for in the space of 2½ miles it contained no fewer than 9 locks."^I There was general agreement amongst its customers that this canal was most inefficient. The Don Navigation, on the contrary, was known to be both cheap and efficient. Public opinion, however, held it to be monopolistic and strongly suspected it, on the evidence of the few shares which appeared for sale on the market, of paying indecently high dividends. There was, therefore, every reason, topographical and commercial, for the many attempts made during these years, to promote schemes to construct a railway, linking the Mersey and Humber ports, through Sheffield.

The success of the Rocket in the Rainhill competition led to a renewal of interest in the plans to build a railway from Manchester to Sheffield, previously sponsored by William Chapman and Thomas Bishop.² George Stephenson was invited to become the engineer. He planned a line, starting at the Canal Wharf in Sheffield, which was to ascend the Sheaf valley by an inclined plane with a

- I. Sheffield and Rotherham Independent. 9 March 1844. P.2.
2. Report of Wm. Chapman Civil Engineer on the Various Projected Lines of Navigation from Sheffield 1813; Thomas Bishop's Proposed Railroad to unite the Sheffield and Peak Forest Canals. 1830.



The line of **RAIL WAY** from
Sheffield to Manchester,
 as laid down in this Map, is the general line
 at present contemplated,
 subject to be altered when the Surveys and Levels
 shall be completed.

gradient of 1 in 32, before burrowing under the East Moor for three miles, to emerge at Hathersage Booth. The railway was then to pass through Hope, climbing to Rushup Edge by two inclined planes, the second of which was to be in a tunnel. The line was then to follow the Goyt valley, form a junction with the Cromford and High Peak Railway at Whaley Bridge and terminate at Salford. Later the plans were modified to take the line through Edale, whereby the summit level, the number of inclined planes and the cost of construction were all alike reduced.^I

Stephenson was also simultaneously engaged as engineer for a railway along the Don valley from Goole to Sheffield. The promoters of these two lines believed that together they would offer great advantages to the district through which they would pass. Travelling time from Sheffield to Manchester would be greatly reduced; Sheffield manufactures would be carried cheaply to Liverpool; Manchester goods, destined for the Continent, would be transported cheaply to Goole for export. In addition, it was expected that there would be a large traffic in lime from the Peak to the Don valley, with its infertile soils and of coal from Greasborough and Rawmarsh to the towns of the Humber basin.²

Despite these apparent advantages, neither line was built. The plan to build a railway from

1. Sheffield and Manchester Railway Bill. Case in support of the Bill. 1830; Description of the Intended Line of the Sheffield and Manchester Railway. Henry Sanderson of Sheffield; Report of the Provisional Committee of the Sheffield and Manchester Railway Company. 1831.
2. Prospectus. Sheffield and Goole Railway. 1830; Remarks on the Projected Railway between Sheffield and Goole. 1830; Subscription List to the intended Sheffield to Goole Railway. Bramley Collection. Nos. 3II-3. Sheffield City Library.

Goole to Sheffield, although it provoked a temporary panic amongst shareholders in the Don Company in February 1831, was abandoned in the following year, without any attempt being made to promote a Bill. That to construct a railway from Sheffield to Manchester was dropped in the following year, after an Act had been obtained. Detailed examination of both projects had shown that the cost of construction had been underestimated and potential traffic overestimated, so that the margin of profit likely was not so great as had been originally thought. In addition, a trade depression made it a bad time for floating companies requiring large amounts of capital. A contributory factor in the failure of the Goole line was the hostility of the Don Company to a railway running, for most of its route, parallel to its waterway. With its powerful local interest, it was able to persuade such leading local landowners as Earl Fitzwilliam and Sir William Cooke to declare that this projected line was prejudicial to the interests of the landowners along its route. Shortly afterwards, the Board of the railway company declared it was "inexpedient to continue with their Bill."

The failure in 1811 to construct the projected North East Junction Canal, followed by that in 1825 to make the Grand Commercial Canal, had left the waterways of North Derbyshire isolated from those of South Yorkshire and both linked with the Midland Canal system only by long and circuitous routes along the Trent. George Stephenson, on his journeys by road through this part of the country, had observed the succession of river valleys running from

north to south, which offered an ideal route for a railway linking Derby, Chesterfield, Rotherham and Leeds with branches to Sheffield, Barnsley and Wakefield.¹ Surveys made by his assistant engineer, Frederick Swanwick, confirmed their suitability.² The whole route, too, was rich in coal and iron, much of it as yet unexploited, as it was remote from any inland waterway. Stephenson had, in addition, noted that coal and limestone were immediately adjacent at Crich and were not, as is customary, separated by millstone grit. The site with its low assembly costs for fuel and raw material was ideal for lime burning on a big scale. The market was almost on the doorstep, amongst the farmers on the coalfield, where an infertile soil required a large tonnage of lime to be annually applied to keep it in good heart.³ Adequate transport facilities only were lacking. A heavy traffic in minerals, therefore seemed guaranteed. Backed by Lancashire capital - South Yorkshire was aggrieved by the small quota allocated to it - the North Midland Company was promoted in 1835.

The town of Sheffield soon discovered that its interests and that of the North Midland diverged. The line had been planned by Stephenson to ensure the minimum possible gradients to facilitate heavy mineral traffic. After surveying "every creek in the county" Stephenson came to the conclusion that it was impossible to use the route along the valleys of the Drone and the Sheaf into Sheffield,

1. George Stephenson in evidence before the S.C. on the North Midland Railway Bill. 1836.
2. Frederick Swanwick in evidence before the S.C. on the North Midland Railway Bill. 1836. For his career see "Frederick Swanwick. A Sketch." (1888). J.F. Smith.
3. Thomas Pearson of Herringthorpe, Rotherham, farmer in evidence before S.C. on the North Midland Railway Bill. 1836.

on account of the heavy earthworks and tunnelling involved. The Midland estimated that to construct a railway along this route would cost £685,000 more than a line further to the east along the Rother valley, avoiding Sheffield. To placate the town, the railway company employed Leather, the engineer of the Aire and Calder Navigation, to make new surveys and to suggest alternative routes. It was, however, all to no purpose; Stephenson remained convinced that if he spent another twenty years surveying the district, he could not find a better line of country for a railway than the one he had selected.

By February 1838, work was going on along sixty miles of railway. At this time, some 6000 men were employed by the contractors. Many were Irish; the majority were, according to a local paper "the lowest rank of society, untaught and uncultured"^I; most were addicted to prize fighting and drink, a natural reaction from the fever infested, squalid sod houses and overcrowded cottages in which they lodged. Nevertheless, the rate of construction attained by these navvies astonished contemporaries. Indeed, it became necessary to step up the calls made from shareholders to pay for the works. Observers noted with amazement the speed with which Clay Cross Tunnel was excavated, despite difficulties with water; the rapidity with which a 32 arch viaduct was built at the Ickles; and Chesterfield Station, with its "mixture of Elisabethan and Gothic" architecture, erected. A spell of bad weather, however, threw work behind schedule and it was not until six

I. Derby Mercury. 2 May 1838.

weeks after the date planned, the First of April, 1840, that the first train ran between Rotherham and Derby. The remainder of the railway through to Leeds was completed a few weeks later and soon the North Midland was at work throughout its whole length, carrying minerals and passengers and in the process, transforming the economic geography of Hallamshire and Scarsdale.

The business world of Sheffield was somewhat solaced by its failure to induce the North Midland Railway Company to put Sheffield on its main line by the opening of the five mile long Sheffield and Rotherham Railway in late October 1838, planned to join the North Midland at Masborough. This was accompanied by all the junketing then usual at the opening of any railway - bells pealing all day in Rotherham, pieces of cannon firing, a yeomanry band playing in Sheffield Station, Earl Fitzwilliam travelling in the first train and George Stephenson presiding over a ceremony designed to honour his friend, Frederick Swanwick, whose work it was. I
Although in its short independent existence - it was soon to be amalgamated with the Midland - its dividends came chiefly from passenger traffic, it had been designed originally as a mineral line, planned to connect Sheffield with the Fitzwilliam collieries at Greasborough. The object of its construction had been to break the monopoly enjoyed in Sheffield by the Duke of Norfolk's lessess, the Sheffield Coal Company, which it was alleged had failed to provide local industry with fuel in sufficient quantities and a low enough price, at a
I. Doncaster, Nottingham and Lincoln Gazette. 3. Nov. 1838.

time when foreign competition in hardware in the export market was becoming acute.¹ Naturally, the scheme aroused the hostility of both the Duke of Norfolk and of the Sheffield Coal Company. Equally naturally, it earned the enmity of the Sheffield Canal and of the Don Company, the more so, in the case of the latter, as it was then engaged in heavy expenditure on improving the river from Rotherham to Tinsley, as authorised by a recent Act.² Although the Bill passed the Commons easily, it was thrown out in the Lords at the Committee stage, so it was declared, by the votes of two members of that House, who had never attended a single sitting of the Select Committee, before it was time to vote. A second attempt was more successful, probably as a result of negotiations behind the scenes between the Duke, the Don Navigation and the Railway Company.³ When constructed, the line was too short to be economic to work with its own motive power and rolling stock. As a result, it was worked by the North Midland and from that to complete absorption was but a small step.

In the meantime, another attempt had been made to promote a company to build a railway from the Humber to the Mersey. With the return of favourable trade conditions in 1836, a Bill was promoted to construct a railway from Sheffield, down the Don valley to Doncaster, where it would cross the projected Great Northern and then continue to Hull, crossing the Humber at Goole. Like the previous attempt it

1. Samuel Jackson of Sheffield, manufacturer in evidence before S.C. on the Sheffield and Rotherham Railway Bill. 1835.
2. Charles Bartholemew, engineer in evidence before S.C. on the Sheffield and Rotherham Railway Bill. 1835.
3. Letters to and from John Read and others about the River Don Navigation. Leader Collection 84/4. Sheffield City Library.

failed. It proved impossible to raise the necessary capital. Sheffield business men, as always in the history of railway promotion at this period, either could not or would not invest in railways. Hull merchants refused to subscribe to a line which might build up their hated rival, the port of Goole. Manchester men, usually reliable investors in any sound railway scheme - so the Secretary of this Company alleged in extenuation of his failure to interest them in this project - had so heavily invested elsewhere, as to have no surplus capital left.^I

The return of favourable economic conditions had also led to the promotion of a bill to construct a railway between Manchester and Sheffield. Supported by the Duke of Norfolk, who had property both in Sheffield and in Glossop and by Lord Wharnccliffe, who had an estate overlooking the Don valley around Wortley, the Sheffield, Ashton-under-Lyne and Manchester Railway Company secured its Act in 1837. Wisely, it was decided to abandon the route selected by Stephenson through the Derwent valley and to use that along the Don and the Etherow, marked out by Telford as the best line of communication between the two towns.² Superficially, despite the criticisms offered as to the engineering difficulties likely to be encountered, this route seemed to offer definite advantages. It would link two densely populated areas; traffic on competitive canal and

1. Sheffield and Humber Railway. S.P.C. I/29. Fairbank Collection. British Transport Archives, York.
2. Map and Section of the proposed Sheffield, Ashton-under-Lyne Railway. Book of plans and sections. Charles Vignoles Engineer. 1836. Sheffield City Library. The reports made on this line by Charles Vignoles and Joseph Locke are printed in The Railway Magazine Vol. 2. Pp.13-23.

road routes was slow and it was hoped that the remarkable industrial expansion of Lancashire would ensure a market there for South Yorkshire coal.

The history of this railway was, however, beset with difficulties.^I Its first issue of shares was heavily oversubscribed. Unfortunately, many of these were taken up by speculators, who bought in the expectation of being able to sell at a profit. When this hope was not realised, they did their best to bring about a dissolution of the Company, in order to prevent calls being made upon them to pay the full value of the shares which they held. Labour problems on the windswept, desolate moors were severe. Engineering problems of unprecedented magnitude were met with in the construction of the Woodhead Tunnel. In August, 1840 Lord Wharnccliffe retired from the position of Chairman, after differing from the other Directors on a matter of policy. Vignoles, the original engineer, quarrelled with the Company. Bad trade made it difficult for many shareholders to meet their calls, so that many shares were forfeited, to be hawked to any buyer at half price. With such a history of difficulties behind them, the Directors naturally jumped at an offer made by George Hudson, Chairman of the Midland, then busy seeking a route into Lancashire, to lease the line for the next thirty years at a guaranteed dividend of 5%, only to see the proposal rejected at a special meeting of shareholders, who, remembering the glib talk of 17% dividends in 1838, felt

I. Sheffield, Ashton-under-Lyne and Manchester Railway. Circulars to Proprietors. S.P.C.13/1/34. British Transport Archives, York; The Life of C.B. Vignoles - a reminiscence of early railway history. O.J. Vignoles (1889). ch. XVI.

the offer of the Railway King was not worth their consideration. By the middle of July 1845, a double track line had been built from Sheffield to Dunford Bridge. Misfortune, however, continued to dog the Company as, when it was due to be inspected by the Board of Trade prior to the official opening, all the stations except that at Sheffield were incomplete, the eastern entrance to Woodhead Tunnel was choked by a mass of rubble six feet high and the ballasting had been so badly done that trains had to be run at slow speed. The line was finally opened to the public throughout between Manchester and Sheffield a few days before Christmas 1845. Conceived during the first period of railway promotion in 1837, its gestation had been so long that it was born into the second and more prolific age of railway speculation - the Railway Mania of 1845 and 1846.

THE RAILWAY MANIA 1844-6.

On the eve of the Railway Mania, there were only two lines open in South Yorkshire and North Derbyshire - the Midland and its offshoot, the Sheffield and Rotherham Railway and one line from Sheffield to Manchester under construction. Obviously, these railways served only a comparatively small part of the highly industrialised region around Sheffield. The district had, as yet, no direct communication with its chief port on the east coast, Hull, through which it imported large quantities of Scandinavian timber and iron. No railway linked the Sheffield, Ashton-under-Lyne and Manchester Railway, where it turned west towards Woodhead, with

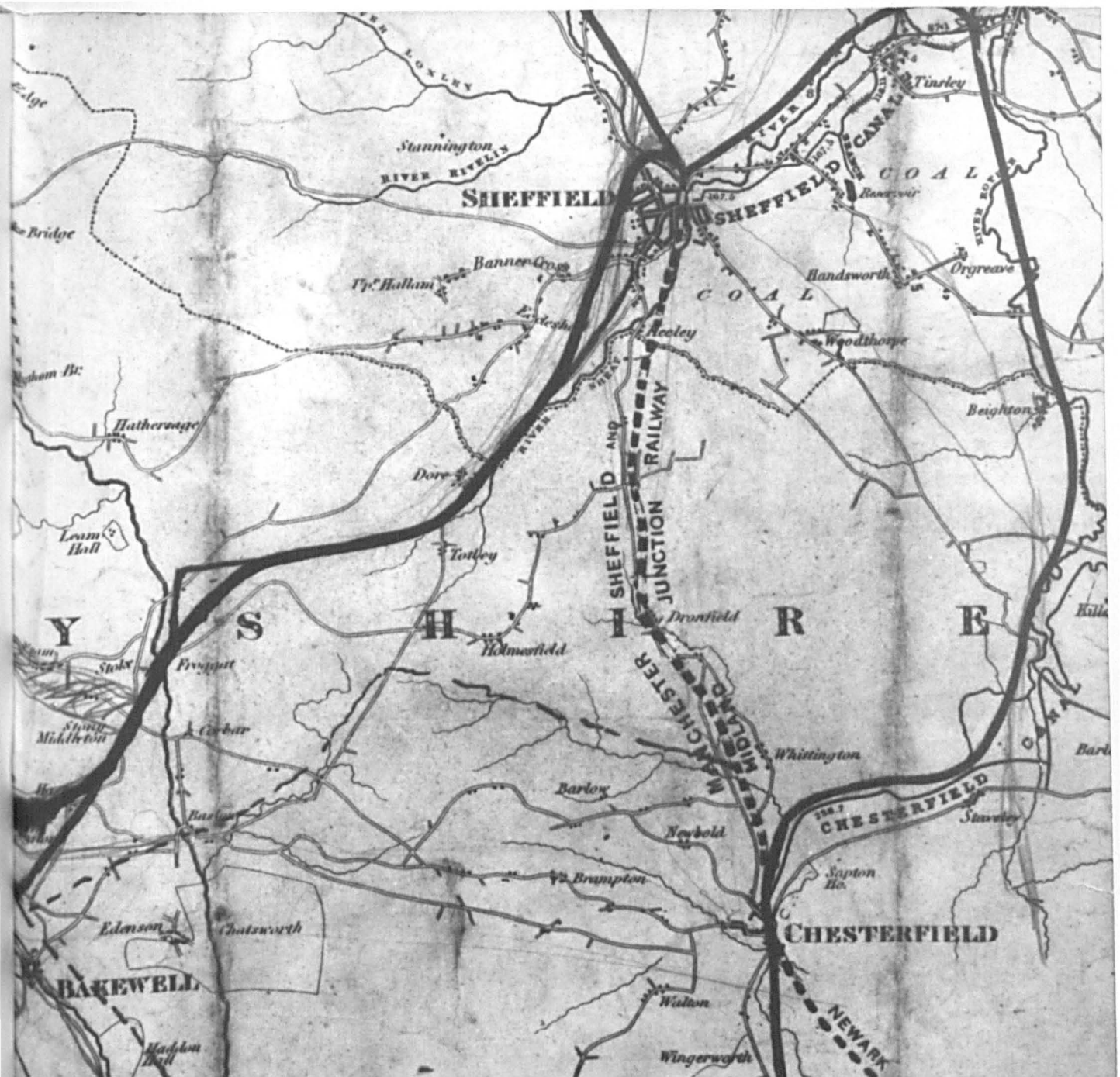
the Midland, skirting the eastern edge of the Barnsley coal-field, although they were only nine miles apart and the country between them contained many large collieries and iron-works. No railway as yet penetrated the Peak District with its immense reserves of limestone. Communication with Lincolnshire and Nottinghamshire, from which the industrial zone drew a large proportion of its food supplies, was still dependent upon the slow moving canal barge and expensive stage waggon. Naturally, both the Midland and the Sheffield, Ashton-under-Lyne and Manchester Railways were eager to fill these gaps. Companies with their trunk lines outside the district, such as the London and York and the Manchester and Leeds, were ambitious to build lines into the area, to feed its traffic on to their main lines. Inland waterways which served the region saw, in railway promotion, their only salvation. Landowners, coalmasters and ironmasters were all equally ready to take hand in the game of railway promotion to further their own interests. Hence, the great number of bills - and the still greater number of schemes - to build lines through the district during the Railway Mania.

East of the highly industrialised districts in the Don, Rother and Erewash valleys lay the farming areas of Lincolnshire and Nottinghamshire. Mansfield and Worksop malted the barley grown on the magnesian limestone ridge nearby; East Retford and Newark malted that grown further east. All four towns sold most of their malt to the West Riding and to Lancashire. All had seen this trade decline in recent years in face of competition from the East Riding which had direct

railway connection with these densely populated textile regions.¹ The pastoral area, lying between these two barley growing districts, sold some 100,000 sheep and 5000 head of cattle annually at Rotherham market, mainly to butchers from Wakefield and Manchester. All these animals were driven by road, losing weight on this long journey.² Some hundreds of thousands of tons of coal were distributed by road, river and canal in the zone between the eastern edge of the coal-field and the valley of the Trent. Much of this traffic, it was reasonably expected, would be attracted to the railways by their speed and cheapness. Traffic, too, could be confidently expected to increase as population grew. Hence, the many plans to build railways linking Lancashire, the Don valley and Lincolnshire at this time.

The first of these schemes appeared in October, 1843 when plans were put forward to construct a line from the Midland Railway at Chesterfield to the Manchester line at Sheffield. The primary object of this projected railway was to open direct communication between Chesterfield and Sheffield, thereby removing the exasperation felt by every Sheffield business man when he had a long wait for a connection at Masborough or, in the attempt to avoid delay at that station, a coach ride to or from Chesterfield. A secondary objective of this line was to divert part of the traffic in malt and flour normally routed by the Aire and Calder, the Trent and

1. Granville Vernon M.P. in evidence before S.C. on the Sheffield and Lincolnshire Junction Railway Bill. 1846.
2. P. Ripping, cattle jobber of Grantham, in evidence before S.C. on the London and York Railway Bill. 1845; Robert Nall, cattle dealer of Chesterfield, in evidence before S.C. on the Sheffield and Newark Railway Bill. 1845.



| DISTANCES | MILES | SAVING OF BY THE PROPOSED NEW LINES |
|-----------|-------|-------------------------------------|
|-----------|-------|-------------------------------------|

| | | |
|-----------------------------------------------------------------------------|-----|-----------|
| Sheffield to Derby via Sheffield and Ham & North Midland Railway | 45 | 9 Miles |
| Manchester Sheffield & Midland North Midland Railways | 36 | |
| Huddersfield to Derby via The Manchester & Leeds and North Midland Railways | 82½ | 20½ Miles |
| Huddersfield & Sheffield Sheffield & North Midland Railways | 61½ | |

TABLE OF DISTANCES

REFERENCES.

Manchester Sheffield & Midland Junction Railways existing or in course of construction

Mersey, the Cromford Canal and the High Peak Railway into Lancashire to the Chesterfield Canal and subsequently to this railway and to the Sheffield, Ashton-under-Lyne and Manchester Railway.

Sufficient capital was raised to comply with Standing Orders but the bill introduced in March 1844 was quickly withdrawn as the schedules of property to be purchased compulsorily were inaccurate. Before this could be done, however, the Sheffield and Chesterfield Junction Company, short of capital, had been merged into a larger scheme backed by the Manchester and Leeds, the Gainsborough, Sheffield and Chesterfield Railway.

This line was planned to link Gainsborough, then a river port of some importance, capable of taking 300 ton ships, through Bawtry and Maltby, with Sheffield.^I It would then follow the Sheaf and Drone valleys to Chesterfield. The claim was made on its behalf that it would be the shortest possible line between these three towns, would have the least extensive earthworks and the smallest gradients and would be assured of heavy traffic between the coalfield and the farming districts along the Trent. However, once again this project was to undergo change, as the Manchester and Leeds dropped out of the picture, with the London and York promoting a bill to construct a branch from its projected main line at Bawtry to Sheffield.² A new company was then set up, known as the Manchester, Sheffield and Midland Junction to build the section

- I. Map of the Gainsborough, Sheffield and Chesterfield Railway, showing -- its connection with other railways. 1844.
2. London to York Railway. Bawtry to Sheffield. Surveyed by W.F. Fairbank. Era 83L to Era 97L. Fairbank Collection. Sheffield City Library.

from Sheffield to Chesterfield. Its Board of Directors were men drawn mainly from the business world of Sheffield, primarily interested in opening railway communication with the then comparatively unexploited coalfield around Dronfield to break the monopoly of coal sales still enjoyed in Sheffield, despite the opening of the Sheffield and Rotherham Railway, by the Sheffield Coal Company.¹

This new Company was too weak to stand on its own feet and so it entered into an unofficial alliance with the Sheffield and Newark Railway, which had been formed to build a line from the Midland at Chesterfield, through Mansfield - which was to be its headquarters - through to the London and York at Newark.² Its Chairman was Captain Salmond, a coalmaster with a large new modern colliery at Wingerworth, on the Midland line outside Chesterfield, who obviously stood to benefit by the building of a line into Nottinghamshire. Its Vice Chairman was E.V. Pegge Burnell, an important landowner in Nottinghamshire, through whose property the railway would pass. The scheme also had the backing of the Arkwrights of Sutton Scarsdale in Derbyshire. This family owned some 5000 acres of coal-bearing land, remote from both canal and railway, which, if this line were constructed, could then be exploited on a large scale.³

The Sheffield and Newark Bill was introduced

1. Wm. Butcher of Sheffield, steel refiner; Benj. Fox of Sheffield, steel manufacturer and John Sykes, Chairman of the Sheffield Gas Company in evidence before S.C. on the Manchester, Sheffield and Midland Junction Railway Bill. 1845.
2. Newark and Sheffield Railway. A Plan of an intended railway Commencing near the town of Newark- and terminating at or near Chesterfield. From a Survey by George Sanderson. 1844. ERA 187R. Fairbank Collection. Sheffield City Library.
3. Captain James Salmond of Mansfield in evidence before S.C. on the Sheffield and Newark Railway Bill. 1845.

in February 1845, but was thrown out for failure to comply with Standing Orders. It was reintroduced in the next month, passed its second reading, but ran into rough water at the Committee stage, where it was opposed by the Duke of Devonshire, ostensibly because it would injure the amenities of Hardwick Hall, but more probably because it was not routed to serve the collieries on his Staveley property. The Midland, which had ambitions in this district, sent George Stephenson and Frederick Swanwick to oppose the Bill. The Sheffield and Lincolnshire Junction Railway, an opposing line, also sent its engineer to support the evidence given by Stephenson and Swanwick that the Sheffield and Newark railway could not be built for its estimated cost. Such a combination of expert evidence and ducal hostility more than outweighed the approval of the Railway Department of the Board of Trade, with the result that the Select Committee declared that the preamble of the Bill was not proved.

The Manchester, Sheffield and Midland Junction Railway Bill was equally unfortunate. It, too, encountered considerable opposition. Much to the anger of the business community in Sheffield, it was opposed by the Duke of Norfolk, whose agent alleged that the projected viaduct to carry the line over the town would damage the Norfolk property, including the Corn Exchange and the Cattle Market, to the extent of £40,000. The Sheffield Coal Company alleged that the coal around Dronfield was totally unsuitable for converting iron to steel and that the interest of the town would be better served by the Sheffield and Lincolnshire Junction Railway, planned to run through the Norfolk estate to the east of Sheffield, where there were large

reserves of this type of coal.^I The opposition, supported by the Midland Railway, which had no wish to see a competitive line opened to Sheffield, brought as witnesses Robert Stephenson, Joseph Locke and Frederick Swanwick to prove that the gradients on this line were "highly objectionable", that it would be impossible to work it with heavy mineral traffic and that even passenger trains arriving at Chesterfield from the south would have to be divided before being worked through Totley Tunnel. Despite the evidence offered by Vignoles that his fellow engineers had overestimated the difficulties of this route, the Select Committee, in face of the weight of evidence against the Bill, could do little else but reject it.

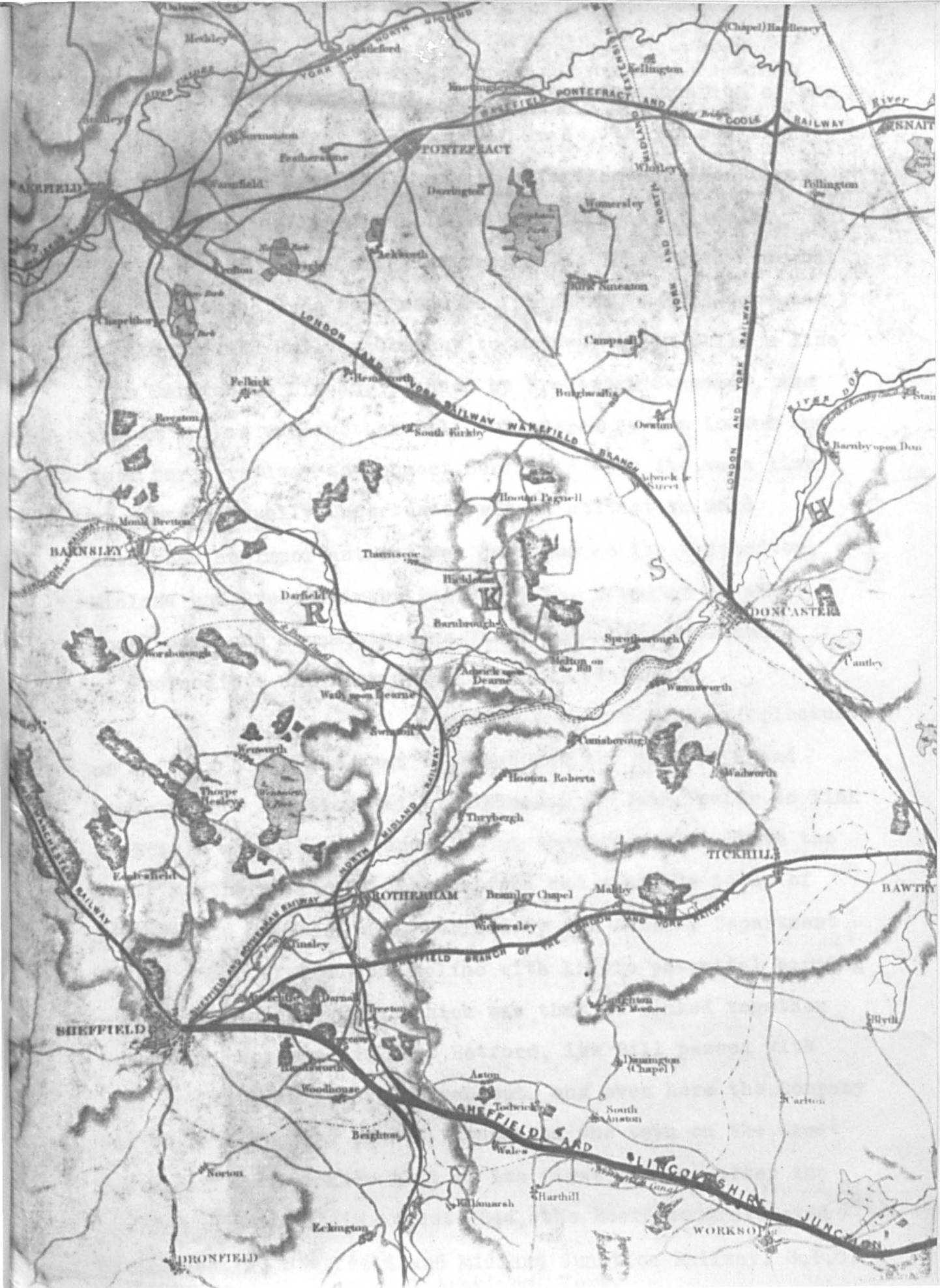
The promoters of these Companies were not, however, defeated. After a stormy meeting in the Cutlers Hall in Sheffield, at which the Duke of Norfolk was soundly trounced as the villain of the piece and reminded that the family fortune owed much to the hard work of Sheffield business men, a deputation was sent from the Board of the Manchester, Sheffield and Midland Junction Railway Company to meet him to attempt some compromise.² The Board of the Sheffield and Newark Railway Company agreed to accept an alternative route suggested by the Duke of Devonshire to avoid Hardwick Hall and to pass near the collieries at Staveley. In addition, both Companies attempted to strengthen their position by amalgamation with other projected lines. The Manchester, Sheffield and Midland Junction carried through an amalgamation with the

I. J.D. Jeffcock of Sheffield, coal viewer in evidence before S.C. on the Manchester, Sheffield and Midland Junction Railway Bill. 1845.

2. Derbyshire Courier. June 21, 1845.

North Derbyshire Union Railway, formed to build a line from Dronfield to Ashford in the Wye valley, where it would join the projected Manchester, Buxton and Ambergate line. The Sheffield and Newark Railway Company absorbed the Nottingham, Mansfield and Midland Junction Railway Company, set up to build a line from Clay Cross on the Midland to Mansfield, in the expectation that it would open up a section of the North Derbyshire coalfield, hitherto little developed for lack of transport facilities. In addition, it was planned to extend the line eastwards through Sleaford to Boston so that, it was hoped, coal from this district could be exported to the Continent. Finally, to strengthen its position in the coming struggle in Parliament, its Board persuaded the Sheffield, Ashton-under-Lyne and Manchester Railway Company to take up shares worth £87,500 and to agree to lease the line, if and when built, at an annual rent of 5%.

These amalgamations strengthened neither Company. In February 1846, the Boston, Newark and Sheffield Bill was thrown out for non-compliance with Standing Orders. Six weeks later, the Company was dissolved. This disheartened many of the Lancashire shareholders in the Manchester, Sheffield and Midland Junction who could see no future for what would now be, if it were ever built, nothing but a small isolated line. Indeed, a meeting at Liverpool agreed to bury the project. At a further meeting in Sheffield, however, shareholders from the town argued that the line was vital to its industrial future and managed to persuade other holders of stock to continue with the scheme. Although the preamble of



the Bill was proved, it was, despite the commendation of the Railway Department of the Board of Trade, thrown out when the Select Committee was examining its clauses. The Company accepted this as its final defeat and dissolved itself.^I

Other Companies projecting lines with somewhat similiar objectives were no more fortunate. A Bill promoted by the Midland Railway Company to empower it to build a line from Swinton to Lincoln, planned by Frederick Swanwick, was thrown out as was another Bill, sponsored by the London and York for a railway to connect Sheffield with its main line at Bawtry. Equally unfortunate was an attempt to make Rotherham an important railway junction as the Manchester, Midland and Great Grimsby Railway Bill, promoted by such local coal and ironmasters as Thomas and George Chambers of Thorncliffe and High Green, was rejected.

The sole survivor of this holocaust of railway bills was that to construct the Sheffield and Lincolnshire Junction Railway, planned by John Fowler to link Sheffield with the Midland line at Woodhouse Mill, with the Great Northern line at East Retford and with the towns of Lincoln and Gainsborough. Derided by the Railway Department of the Board of Trade as a line with little potential earning power, the only merit of which was that it linked together two towns, Worksop and East Retford, its Bill passed with only the Lincoln branch struck out, and even here the Company was to have running rights through to the town on the Great Northern. Small wonder that at its first meeting after the passing of the Act in August 1846, the Board congratulated

the shareholders with " no ordinary Feelings of Satisfaction " that so many " rival schemes " had been defeated and that so much " bitter and determined opposition " had been overcome.^I

Originally the driving elements in this project had been such Sheffield business men as the two brewers, Richard Truswell and Thomas Worrall and the two coalmasters, T.D. Jeffcock and Henry Sorby of Orgreave, together with a group of brewers and corn merchants in Worksop and East Retford. Behind them, they had the support of the local aristocracy, who had as much to gain from the construction of the line as any of the Board. The Duke of Norfolk used all his influence to block the passage of rival Bills and to forward that of this Company, as it was routed as to enable the coal under the eastern portion of his Sheffield property to be mined and railed either into Sheffield or into Lincolnshire or as it was then considered likely, up the Great Northern main line as far south as Grantham. The Bill, too, enjoyed the support of the Duke of Newcastle and of his son, the Earl of Lincoln, as the railway would pass through their Worksop Manor property. Finally, it was backed by Lord Yarborough, the owner of a large estate in Lincolnshire on an associated line, as the two railways would facilitate the transport of agricultural produce into the industrial areas. Again, this Company had the support of the Sheffield, Ashton-under-Lyne and Manchester Railway, the Directors of which felt, after their breach with Hudson, that their only hope of remaining

I. Minutes of the Proceedings of the Sheffield and Lincolnshire Junction Railway Company after the Act. British Transport Archives, Royal Oak, London.

independent was by a vigorous policy of expansion and that their guarantee of a 4% dividend to the Sheffield and Lincolnshire Junction Railway Company was, in the words of their Chairman, both "natural and legitimate."^I

The first attempt to obtain an Act came to grief as their solicitors had failed to lodge the necessary plans with the Bill Office, as rival companies had bribed the lithographers to give their plans priority.² A second attempt was more successful. The first sod was cut at the High Hazels, outside Sheffield on a wet afternoon in the middle of October 1846 with Michael Ellison, agent to the Norfolk Estate and Alderman Dunn of the Sheffield Coal Company present to give it their blessing. By July 1849, construction on this and the associated railways in Lincolnshire had been so far completed that the long planned through communication between the Humber and the Mersey through Sheffield was now a fact.

To forestall opposition in Committee from the Chesterfield Canal, the Board of the Sheffield and Lincolnshire Junction Railway Company had agreed to allow shareholders in that canal to exchange their shares for railway stock at par. The Board of this canal had anxiously watched this bout of railway promotion and to protect its interests had transformed itself into the Manchester and Lincoln Union Railway Company with the object of building a line from Chesterfield through Worksop to East Retford and on to Lincoln, with branches to Gainsborough and to the Midland at Beighton. Its

- I. John Parker speaking at the General Meeting in December 1845 reported in Bradshaw's Railway Gazette Vol.2. P.79I.
2. Sheffield and Lincolnshire Junction Railway. Minutes of the Provisional Committee 1844-5. British Transport Archives, Royal Oak, London.

Board included the Hon. G.H. Cavendish; members of the Barrow family, who at this time leased Staveley Iron Works from the Duke of Devonshire and Joseph Paxton, the future architect of the Crystal Palace, nominally gardner at Chatsworth, but a man with great personal interest with the then Duke and well versed in railway speculation.¹ The Manchester and Lincoln Union was obviously a rival project to the Sheffield and Lincolnshire Junction but the two competing Companies sensibly agreed to amalgamate after the former had secured an Act to construct a line from Staveley Works to Worksop.²

The Sheffield and Lincolnshire Junction Railway and the Sheffield, Ashton- under- Lyne and Manchester Railway, together with a number of other lines amalgamated in 1847 to form the Manchester, Sheffield and Lincolnshire Railway. The shareholders in the Chesterfield Canal must often have regretted the alacrity with which they had accepted the merger with the Sheffield and Lincolnshire Junction Railway Company. When they thought back to the decade immediately before the Railway Mania, when the Canal paid an annual average dividend of 9%, and compared it with, for example, the half yearly Report of August 1850, when the M.S. & L. could only pay six shillings in the pound on its preference stock and nothing on its ordinary shares, and when its credit had sunk so low that it could borrow only at 6%, they must have felt badly duped by their Directors. Indeed, these half- yearly meetings of the M.S. & L. in the late 'forties, when viewed in the light of the high hopes in which the constituent lines were

1. Violet Markham " Paxton and the Bachelor Duke." (1935).
2. Sheffield and Lincolnshire Junction and Manchester and Lincoln Union Railways. Minute Book. British Transport Archives, Royal Oak, London.

built, make sad reading, with their accounts of the wholesale resignation from the Board of the men who had planned and built the railway; with angry shareholders so far forgetting the dignity which should hedge a peer that one could tell the Chairman of the line, Lord Yarborough, that " if he came among commercial men, he must expect to submit to the inflexible rules of Cocker"^I; with Committees of Investigation set up to discover why such poor dividends were paid and which, to the anger of shareholders, made reports which " discovered nothing very striking as to the past " and worse still could promise " nothing very grand as to the future."² Shareholders had reason to complain. In 1849, ordinary shares of £100 paid up value were selling at £38. Then, the excuse put forward by the Board was that the trunk line between Manchester and Sheffield had been built on a scale sufficient to accomodate all the traffic which would develop when there was through communication to the East Coast and that once this had been achieved earnings on the whole system would be high enough to pay good dividends. Yet, thirteen months later, ordinary shares were down to £16, as when the line was opened into " that land of promise " as Lincolnshire was derisively dubbed by one shareholder, it was soon discovered that it failed to feed the section across the Pennines with anything like the traffic expected and that the whole system earned nothing like the revenue hoped for.

1. Sheffield and Rotherham Independent 3 March 1849. P.6.
2. The half- yearly and special meetings of the M.S.& L. are fully reported in the Sheffield and Rotherham Independent. 20 Feb. 1847 P.2; 21 Aug. 1847 P.2; 19 Feb. 1848 P.2; 12 Aug. 1848 P.3; 3 March 1849 P.6; 15 Dec. 1849 P.2; 2 March 1850 P.6 and 31 Aug. 1850 P.2.

THE COAL RAILWAYS.

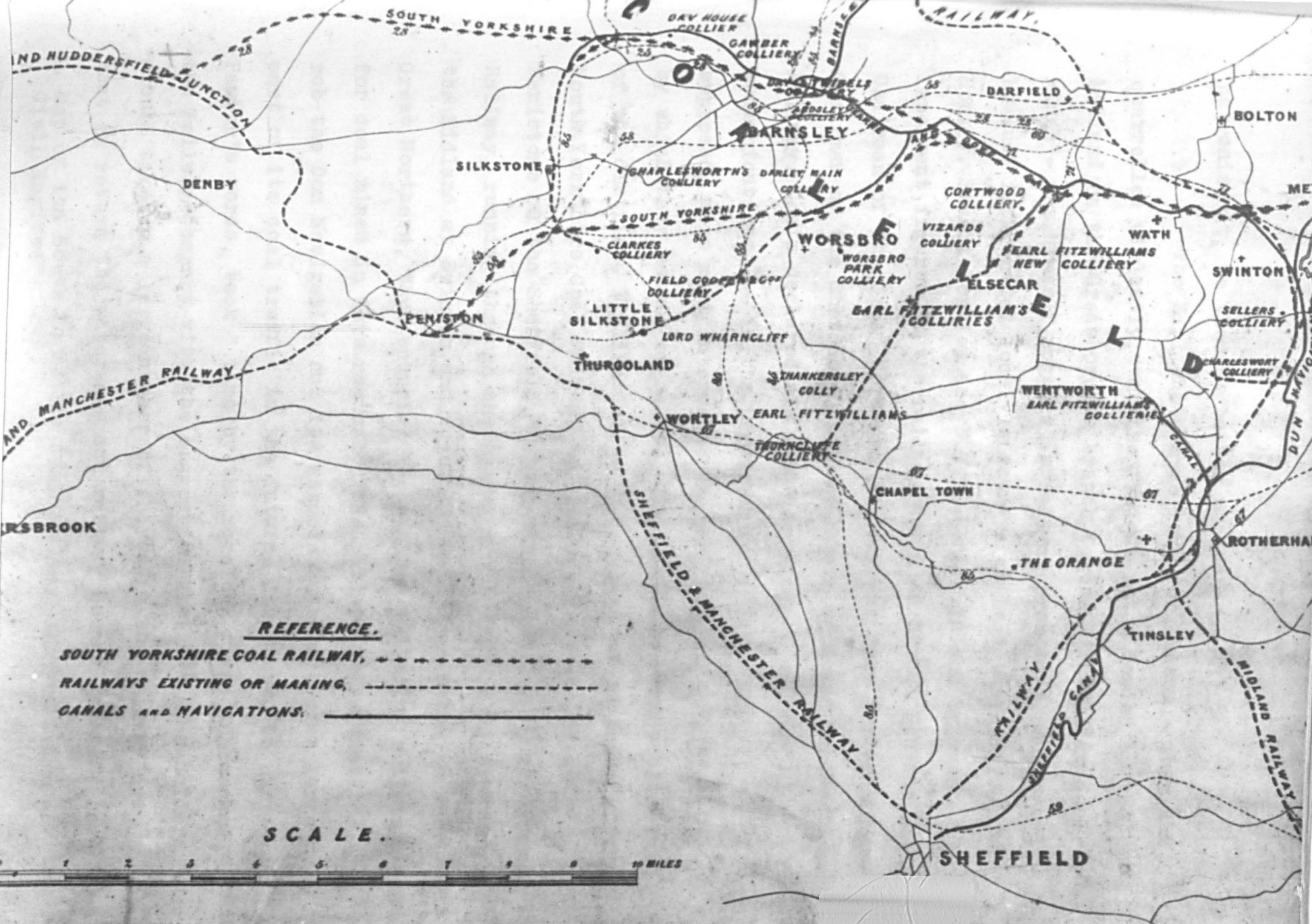
Another Board of Directors which had been anxiously watching the approaching storm of railway speculation was that of the Don Navigation. This Board of shrewd Yorkshire business men was foresighted enough to see that the Don valley with its mines, its factories, its heavy traffic to and from the Humber and the almost perfect route it offered to the engineer must inevitably attract the attention of the railway promoter. Hence, in 1841 the Board had lowered all dues on the river. A quiet period of railway promotion, however, lulled it into a false complacency, so that in 1843 the old rates were restored, except on vessels entering the Don from the Trent.

In the next year, the full fury of railway speculation beat on this district. The Midland, with Hudson at the helm, proposed to build railways from Swinton to Lincoln and from Rotherham to Doncaster. Both the projected London and York and the Direct Northern had plans to build feeder lines into the South Yorkshire coalfield. To meet this threat of railway competition, the Don Company bought the Dearne and Dove Canal, reducing dues to a halfpenny per ton, demanding in return for this concession that the "Coal Owners (both as Coal Owners and Landowners) will join in opposing any Railway Scheme which will be prejudicial to the Consolidated Canal and River Navigation."

Whatever they might promise, the South Yorkshire coalowners were in no position to fight a rearguard action on behalf of the inland waterways. Durham coal, brought by railway, was recapturing markets in the Humber basin, which

the North Eastern Coalfield had lost to South Yorkshire, when the Don was first made navigable to Aldwark in 1735. Durham coke, destined for Midland foundries was passing within sight of the Fitzwilliam collieries at Park Gate, by railway on its journey south. ^I Locke, the railway engineer, undoubtedly spoke for the coalmasters when he declared that " the only obstacle to the fuller working of the (South Yorkshire) field was the want of good railway communication." The railway companies, too, had much the same opinion for, as Parker declared at a half-yearly meeting of his Company " there is hardly a Company in Yorkshire that does not propose to go to Barnsley." His own line planned a branch from Penistone to Barnsley, where it was to join another railway to Howden on the Hull and Selby. The Bill, despite the support of the Railway Department of the Board of Trade - Ellison, another Director, ironically suggested because of that support - was thrown out. In addition, the Sheffield, Ashton-under-Lyne and Manchester Railway offered financial support to the Sheffield, Wortley, Silkstone and Wakefield Railway, planned to enable the coal on the Wharnccliffe property to be developed. ² Failure to raise the necessary capital led to the dissolution of the Company in March 1846. Hudson attempted to obtain powers for the Midland to construct branch lines from Darfield across the coalfield to Wosborough and Elsecar, but despite the approval of the Railway Department of the Board of Trade, he had to inform his shareholders that " as his Lordship (Earl Fitzwilliam) seemed indisposed to

1. John Woodhouse Day, coalmaster in evidence before S.C. on South Yorkshire Railway Bill. 1846.
2. Sheffield, Wortley and Silkstone Railway and a branch near Silkstone. F.P. Mackelcan. Map E4LB. Sheffield City Library.



SOUTH YORKSHIRE

AND HUDDERSFIELD JUNCTION

DENBY

SILKSTONE

BARNLEY

WORSBROUGH

WATH

SWINTON

ROTHERHAM

SHEFFIELD

BOLTON

MEXLEY

PENISTON

THURGO LAND

WORTLEY

CHAPEL TOWN

THE ORANGE

TINSLEY

WENTWORTH

ELSECAR

BARFIELD

DAY HOUSE COLLIER

GAMBER COLLIER

DRACOTT WELLS COLLIER

ADDSLEY COLLIER

CHARLESWORTH'S COLLIER

DARLEY MAIN COLLIER

CORTWOOD COLLIER

VIZARDS COLLIER

PEARL FITZWILLIAMS COLLIER

WORSBROUGH PARK COLLIER

EARL FITZWILLIAMS COLLIERIES

SELLERS COLLIER

CHARLESWORTH COLLIER

CLARKES COLLIER

FIELD COPPERHILL COLLIER

LORD WHARNGLIFF

THANKERSLEY COLLY

EARL FITZWILLIAMS

THORNCLIFF COLLIER

WENTWORTH EARL FITZWILLIAMS COLLIERIES

CHALK

RAILWAY

AND MANCHESTER RAILWAY

SHEFFIELD & MANCHESTER RAILWAY

SHARPLEY CANAL

DUN NAVIGATION

MIDLAND RAILWAY

REFERENCE.

- SOUTH YORKSHIRE COAL RAILWAY, - - - - -
- RAILWAYS EXISTING OR MAKING, - - - - -
- CANALS AND NAVIGATIONS, —————

SCALE.



patronise it, we thought better not to press it."

The Earl, who had no love for Hudson - they had quarrelled violently over the freight rates levied by the Midland on the Greasborough branch to the Fitzwilliam coal mines - was himself engaged in railway promotion, supported by such influential local landowners as Lord Wharnccliffe, the Hon. J. Stuart Wortley and F.W.T. Wentworth and by such important figures in the railway world as Edmund Denison M.P., Chairman of the Great Northern Railway and John Parker M.P., Chairman of the Sheffield, Ashton-under-Lyne and Manchester Railway. Their declared aim was "to place (railway) communications --- in the hands of the parties who, it is supposed, were most interested in keeping them in activity", by which they meant, of course, the landowners and coalmasters of the district. William Cubitt was engaged as engineer of the South Yorkshire Coal Railway to plan a line starting at Penistone on the Sheffield, Ashton-under-Lyne and Manchester Railway, running through the heart of the coalfield, crossing the Midland at Swinton and terminating at Rossington on the Great Northern, thus ensuring the maximum number of outlets for coal mined in this region.^I This railway threatened to rob the Don Navigation and its associated canals of a large part of its coal traffic in the future. Its Board, to use Parker's words, took "time by the forelock" and approached the Railway Company with the suggestion that its shareholders should take up a large number of shares in the railway and that in return the waterways and railway be amalgamated, Don

I. Map of the South Yorkshire Coal Railway. C. Bartholemew. Civil Engineer. 1846.

shareholders being guaranteed in the future, the current dividend of £120 on each £324 share.

The first attempt to obtain an Act failed, as the Chairman of the Select Committee dealing with Group XXXVII Railway Bills decided to eliminate, by a stroke of the pen, all those relating to the smaller lines, in order to expedite procedure. Wortley, in the House, went so far as to describe the rejection of the South Yorkshire Coal Railway Bill as " a most extraordinary proceeding " and a fellow Whig, Lord Morpeth, appalled at this treatment of a Fitzwilliam, even went so far as to introduce a motion that the Bill should be recommitted, but without success. Behind the scenes, its promoters were not idle. They clinched an agreement with the Don Company whereby that waterway and its associated canals were to be amalgamated with the railway. Again, they were in negotiation with another railway company, the Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole, which had secured an Act to build a line from the Manchester and Leeds Railway in the Calder valley, through Barnsley and Chapeltown, past the ironworks there on the Norfolk estate and at Thornecliffe on the Fitzwilliam property to join the Sheffield and Rotherham line in the Don valley.^I It was agreed between the two Companies that the South Yorkshire should take over the responsibility for the construction of the line south of Barnsley, the northern half being transferred

I. Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole Railway. Showing the existing and projected lines of railway affecting the Sheffield, Barnsley and Wakefield District. 1846. Metcalfe Collection. No. 656. Chesterfield Borough Library.

after its opening to the Manchester and Leeds Railway Company. Negotiations, too, were concluded with the Great Northern Railway whereby that Company was to subscribe half the capital of the South Yorkshire Coal Railway and was, in return, to receive running rights over it.¹ With the field cleared, the Company, now known as the South Yorkshire, Doncaster and Goole Railway, secured an Act to build a railway from Barnsley, through the heart of the coalfield to Mexborough, then along the Don valley through Conisborough to Doncaster on the Great Northern. A later Act, in 1850, led to some modifications in the route of the line around Doncaster and Dodworth and also an extension to Penistone, so that coal could be forwarded down the Sheffield and Huddersfield Junction Railway to the textile mills in the Colne valley.² The section through the Don valley was completed in 1850, but the remainder of the South Yorkshire system was not opened until after the turn of the century.

In the meantime, the Don Company - not yet officially part of the South Yorkshire Railway Company - had been carrying on a struggle with the Manchester, Sheffield and Lincolnshire Railway Company, which had purchased the Sheffield Canal, primarily with the object of securing its warehouse accommodation in Sheffield. The Don Company, suspecting that the railway company might attempt to close the canal by increasing dues to a prohibitive level, applied to Parliament for powers to construct another canal from Tinsley, past the

1. South Yorkshire Coal Railway. Minute Book. 1846. British Transport Archives, Royal Oak, London.

2. The South Yorkshire Railway. Maps 27 (Dodworth), 28 (Penistone) and 28b (Thurgoland). Vernon Wentworth MSS, Sheffield City Library.

forges at Brightside and Attercliffe to Blonk Street in Sheffield.^I At the same time, pressure was brought to bear on the Railway Company by the Town Council to sell the Sheffield Canal to the Don Company. Consequently, the Manchester, Sheffield and Lincolnshire Railway decided to transfer the Canal to the Don Company. After this success, the latter leased the Stainforth and Keadby Canal, guaranteeing its shareholders a dividend of 7% during the next seven years, thereby amalgamating all the inland waterways in South Yorkshire, with the exception of the Barnsley Canal, fast in the grip of the Aire and Calder Navigation. In 1850, the Railway Commissioners issued their official certificate that, as half its capital had been paid up, the South Yorkshire, Doncaster and Goole Railway Company could carry through its amalgamation with the waterways, whereupon each shareholder in the Don Company and in the Dearne and Dove Canal received scrip worth £3000 and £350 respectively for each share in those waterways. Significantly enough, about the same time, the Admiralty made a report on the Don, in which it was stated that the river was neglected between Thorne and Goole, with its banks washed away, and that the South Yorkshire Railway Company, taking advantage of the legal technicality that Humber keels were not always sea-going vessels, kept the bridges across the Don permanently closed, so that these boats had to unstep their large masts and rigging at Stainforth and come down river under jury masts, which they had to strike at all bridges.² Plainly, the day of

- I. Journals of the House of Commons. CIII. 176, 195, 239, 255, 301, 351 and 598.
2. Report of the Admiralty under II & 12 Vict. c.129. South Yorkshire, Doncaster and Goole Railway. 1850.

the inland navigation had gone.

Further south, in Derbyshire, competition from coal brought by railway into what they had come to regard as their traditional markets, had compelled another group of landowners and coalmasters in the Erewash valley, to become railway promoters. Since the completion of the Cromford Canal, collieries along it or connected to it by tramways had supplied, together with other coalmines along the Erewash Canal, much of the Midlands with fuel. The opening of the North Midland Railway in 1840 had been followed by the sinking of large collieries at Wingerworth and Clay Cross, which once they came into production had captured a large share of this Midland market for coal. In addition, the capacity of the collieries in the Erewash valley to compete with these new pits in the vicinity of Chesterfield was seriously reduced by a great shortage of water in the Cromford Canal, brought about by the failure of the Cromford Sough in 1844 to maintain a supply of water to the canal.^I By 1845, the exploitation of North Derbyshire coal was still in its infancy, but the memory of what had happened to their market in Leicestershire after the opening of the Leicester and Swannington Railway was burned deep into the minds of the coalmasters in the Erewash valley. Clearly, a railway from the pits in that area to the old Midland Counties line between Derby and Nottingham, which had rail connection with the Midlands was essential, if coal mined there was ever to

^I George Pickering, mining agent in evidence before the S.C. on the Erewash Railway Bill. 1845.

become competitive again in the markets of Central England.

Dominating this group of coalmasters were Francis Wright and William Jessop of the Butterley Company. This concern with its 2000 men employed at its six pits, its blast furnaces, its rolling mills, its forge and its engineering shops was the giant amongst Derbyshire companies in the Early Victorian Age.¹ Situated alongside the Cromford Canal, it was dependent upon it for the assembly of its raw materials and for the export of the steam engines and bridges on which it specialised. As a result of the failure of the Cromford Sough to keep it supplied with water after 1844, the Canal could take no more than 5½ ton cargoes in place of the normal 20 tons.² Fortunately, Rennie had surveyed the district when the Midland Counties line had been promoted in 1832 and it was a comparatively simple matter for Jessop to plan a line with few earthworks from Long Eaton on the old Midland Counties Railway - now incorporated in the Midland Railway - to the southern terminus of the Mansfield and Pinxton Railway. The Bill went through with little opposition, one reason being that the Company promoting it had arranged its amalgamation with the Midland Railway. That Company also purchased and reconstructed to the standard gauge the Mansfield and Pinxton line, so that the whole of the Erewash valley was, at last, accessible by rail and able to compete on level terms with the collieries around Chesterfield in the coal markets of the Midlands.

1. Wm. Jessop of Butterley Works, ironmaster in evidence before the S.C. on the Erewash Railway Bill. 1845.
2. Abraham Booth, agent to the Butterley Company, in evidence before the S.C. on the Erewash Railway Bill. 1845.

Thus, by the middle of the nineteenth century, North Derbyshire and South Yorkshire had been equipped with a railway network which, with a few additions, was to serve the area until today. The Midland Railway gave it a good system of communication from north to south. The M.S.&L. provided the district with transport into Lincolnshire, which supplied the coalfield with so much of its food, and with the Mersey, through which so many of its exports were forwarded. The South Yorkshire, Doncaster and Goole Railway together with the Erewash Valley branch of the Midland Railway enabled the richest parts of an extremely rich coalfield to be intensively exploited. Together, these railways were, during the next quarter of a century, to revolutionise the scale of industry and mining in Hallamshire and Scarsdale.

The network, however, bore little resemblance to that advocated by the Railway Department of the Board of Trade in 1845. Like the turnpikes and canals, the railways - with the exception of the Midland - had been fashioned in accordance with the desires of the landowners and business men of the district. Their routes had been dictated by the economic interests of these classes, modified in a few instances by the prejudices of the gentry who set their vistas and their coverts above the state of their bank balances. Probably, the result was a railway network more efficient than that planned by Dalhousie and his colleagues. Certainly, as far-sighted railwaymen such as John Parker saw, the price paid for this disregard of the advice of the Board of Trade, in money, in time, in energy and in the waste of human capacity was extremely high.

IV.

LEAD MINING AND SMELTING IN THE HUNDRED OF SCARSDALE AND THE LIBERTY OF HALLAMSHIRE 1700-1850.

The deep, thickly wooded gorge through which the River Derwent flows between Matlock and Ambergate separates the limestone dome of the Peak from the millstone grit of the East Moor. Near the southern end of the latter is a limestone inlier, drained by the little stream of the Amber, centred upon the village of Ashover. Like so many of the limestone districts in Derbyshire, this inlier contained rich veins of lead. From the standpoint of lead mining, this area was in many respects unique. It was the only deposit of this mineral in the Hundred of Scarsdale. Unlike the mining areas of the Peak, Ashover had no Barmaster to walk the Field, to collect the duties levied on ore or to perform the many other duties of this official. Nor had it any Barmote Court to try cases between miner and miner as to questions of title as was the custom in the mining Liberties in the Peak. The Common Law, which vested minerals in the owner, held here unlike the Mineral Custom of the High and Low Peak, which bestowed the right to mine lead in the finder of a vein. No miner in Ashover had, as had his contemporaries to the west of the River Derwent, the right of access to the nearest water to cleanse his ore or to the nearest road to take it to be smelted, without the consent of the ground landlord. ^I During the latter half of the eighteenth century, this parish was by far the most important producer of lead ore in Derbyshire. Its biggest mine, the Gregory Mine, was certainly the most profitable lead mining concern in the county during this period. Here, too, was the biggest

I. The literature of the Derbyshire lead mining laws is catalogued in "Derbyshire Lead and Lead Mining. A Bibliography" issued by Derby Borough Library. 1956.

concentration of atmospheric and steam engines at work at any one lead mine in Derbyshire at this time.

In all lead mining areas, the biggest problem was that of draining the limestone through which the lead veins run. In Ashover, the main deposits of this mineral were situated high up in the escarpment which flanks the western side of the Amber valley, so that a sough could easily be driven into it to lower the water table in the rock sufficiently to enable the ore to be mined. This sough was constructed under an agreement made in 1695. As was the customary practice, the capital for this sough was subscribed by a partnership of lead smelting and lead merchanting interests working in combination with local landowners engaged in the development of the mineral wealth of their estates or looking for an investment which offered the possibility of good dividends. The chief shareholders in this sough were William Hodgkinson, a Derby lead merchant, living at Overton Hall, not far from his Ashover lead smelting mill; Richard Biorbidge, a Mansfield apothecary, who, as is evident from various smelting mill accounts, dealt in lead; Arthur Woodis, an Ashover yeoman and Richard Taylor of Walden Wells, a Yorkshire gentleman. Again, as was the custom, the sough partnership was to receive a composition of a fifth of all the ore mined in areas drained by the sough as the reward for their expenditure. The deed also contained all the usual clauses safeguarding the interests of both miners and soughers. The sough partners were to keep it in repair and in their default, repairs could be done by the miners. The latter, on their part, undertook to work their mines and in the event of their failure, the sough partners were empowered to enter and

mine the lead. The sough drained what became known as the Gregory vein, as it lay beneath land owned by that family, who lived at Ravensnest, a house situated on a shelf high above the Amber valley. A partnership called the Nether Sough Company was formed to exploit this vein. This group operated from August 1734 to June 1737 and mined 936 loads of ore during these years. The mine was then abandoned in the belief that the vein was not worth working. Mining, however, continued in other parts of the parish, as the Chatsworth accounts record a payment in 1742 of £11.9.0 to the Duke of Devonshire as one of the Lords of the Manor, indicating that ore worth some £4,400 was mined that year.¹

Later, a branch sough was cut out of the main Gregory Sough to drain a new mine known as Overton Mine. From a letter book of Isaac Bonne, an Ashover grocer, who acted as paymaster to this particular partnership, it is possible to gain an insight into the development of this mine.² Before mining began, manager and miners made a bargain as to the rate of pay for the extraction of the ore and as Bonne wrote to his correspondent, Robert Banks Hodgkinson, who had inherited the Overton Hall estate " when the works are worse the Miner has so much more per ton for getting." The letter dated 23rd October 1756 describes the process: " George Allen (the manager) has let sundry works on copes as follows the Gardenside Vein at £3.18s per ton to the Miner for getting drawing and making it ready to weigh, the other vein where most of the ore has been raised for two years past (but almost cut out) is let at 60s per ton. Four or five other places which has stood for bad some time past is let at £5 and

1. Alexander Barker's Accounts for Chatsworth. No. 497. Bagshawe Collection. Sheffield City Library.

2. In the possession of Mrs Derbyshire, formerly of Amber House, Ashover, now of Cheltenham.

and £5.4s a ton." This mine proved a fairly profitable venture until December 1757 when the Overton section of the sough became blocked, and the process of cleaning it out proved to be an expensive one, as it was impossible to discover the exact point at which it was blocked except by drilling shafts from above. It was not until July 1758 that the water began to flow again and it was December before the workings were finally drained. In the meantime, the partners had suffered another disappointment as output had dropped when two veins hitherto considered separate joined together.

Despite their frequent protests about the unhappy state of lead mining, both Hodgkinson and Bonne were eager to extend their mining operations. Their next venture, Brimstone Dyke Mine, down the hill, nearer the Amber, was unsuccessful. This mine only produced 430 loads of ore before the vein ran out. Financially, it was a failure, losing £116 in a year. ^I They next turned their attention to the old Gregory Mine, forming a new partnership to reopen its workings. As was customary in lead mining, this partnership consisted of lead smelting firms, investing in lead mining to ensure supplies of ore for their cupolas; local landowners, desirous of encouraging the exploitation of the minerals underneath their property and local business men ready to speculate in a type of enterprise which by a fortunate strike of ore could pay big dividends on the capital which they had invested. The largest shareholder was Isaac Wilkinson of Chesterfield, lead smelter and merchant, who held a quarter of the total capital. Hodgkinson and his relatives, the Banks family of Revesby

Land

The Mine was recovered by the structure - it
to the south of the Mine

the bringing
ribber

Gear Shaft
Sunk in 1768

| | |
|-----------------------|----|
| Old Fire Engine Shaft | |
| Shale | 40 |
| Limestone | 30 |
| Total depth | 70 |

Old Fire Engine Shaft
Sunk in 1769

Climbing Shaft Old Water Shaft.

Old Gear Shaft. These two shafts were sunk in
1703 & 1764 the water was drawn by hand pumping
and horses till January 1768 afterwards by Rimmis
and slide tools worked by the Fire Engine till the
Engine Shaft was sunk

Water & Gear Shaft
Gregory's Mine Company that was formed in 1758 began
with opening this shaft which had been filled by the
Ketcher Saugh Mine Company who had worked Gregory's
Mine from August 1734 till 24th June 1737 when they
gave up working Gregory's Mine and drove a shaft from
this shaft to Owen's Mines.

S H A L E

S H A L E

Limestone

N
E

Original Floor

25 Fm

23 Fm

66 Fm

45 Fm

41 Fm

26 Fm

Level of the Saugh at Ormsall

Level of the Saugh at Ormsall

Mr

John

Abbey, Lincolnshire held 12 out of the 44 shares into which the partnership was divided. Two shares each were held by the Haslam family, which had been connected with the Overton Mine in 1740; by the Bourne family, which provided the parish with its parsons for so long; by Samuel Kirk, who became mine manager and by Thornhill and Twigg, who were part owners in a nearby smelting plant at Kelstedge. Other shareholders were Isaac Bonne, who took up four shares; the Rev. Francis Gisborne of Staveley, with three shares; William Willamet, a mine overseer and John Gratton, a Quaker timber merchant of Wingerworth, both of whom held one share. As the original Gregory Mine shaft had been choked up, another had to be sunk. A new pumping engine was installed, but the last letter in Bonne's Letter Book referring to the mine, dated 30th June, 1759 declares that in view of the low price of ore, it had been decided not to incur the heavy expense of draining the mine.

Between 1758 and 1762, the new Gregory Mine partnership spent £429 in capital development before the mine produced any ore. In the latter year 214 tons were mined. In a memorandum written early in the nineteenth century by John Milnes of the Butts, Ashover and based on sources now lost, it is stated "About the year 1763 two shafts were sunk at a little distance from each other, one for a water shaft, the other for a Gear Shaft, these shafts were nearly opposite a House occupied by Stephen Thompson afterwards one of these shafts was made a climbing shaft, this shaft was used as a climbing road as long as the Mine was kept at work." Probably as the labour force was concentrated on shaft sinking, ore production was low in quantity,

1m
60
73
133 to the bringing floor
19
152 whole depth

| | |
|-----------------|----|
| Gritstone 7c | 43 |
| Shale | 73 |
| Limestone | 30 |
| Toadstone | 2 |
| 148 whole depth | |

Slide works by the New Engine to draw water out of the by a Shaft instead sinking

Bye Shaft
Forefield Shaft

House Water Level

G R I T S T O N E

Gritstone

60 Fm

S H A L E

Level of Derwent at Matlock Bridge

Forefield Slope in 1803 when the work was given up.

Forefield Linn

Sip of the Limestone in a yard
Wagon Gate

Limestone

Water Course to the new Fire Engine

Jumped +
Quicks
Turn a reel

This is how it is by Fairman late he is up in on the shore a pump
less usual

Sole pool
As by Fairman pool on Ore

Limestone

Toadstone

Forefield Shaft began to be sunk May 1790 finished sinking Sept 1791
Upon this shaft a small Fire Engine called a Whimsy Engine, was erected
in February 1796 to draw the gear from the bringing floor. This Engine also crew the
water (which was not much) from the bottom of the shaft 15 fathoms in Feb 1796
were turned over to be further drawn by the New Fire Engine

only amounting to 84 tons. As was the customary practice, this was sold to the two lead smelting concerns which were shareholders in the mine, at £8.10.0 per ton.

With the completion of this work, output at Gregory Mine rapidly increased. In 1765, it was 383 tons, 609 tons in the next year and in 1767 it topped the 1000 ton mark. In 1768, so the memorandum continues " the Gear or Drawing Shaft on the Hill Side was sunk. In the same year, the first Steam Engine, below the Hill was erected and lifted the water to the Sough in one of the shafts sunk in or about 1763 by means of slide rods, there was a great deal of ore got before the Engine was set to work by means of hand pumping and drawing water by Horses." Evidently the water problem had become serious as may be deduced from a comparison of the two following accounts:-

Oct. 1761. One horse drwg water 18d per shift.

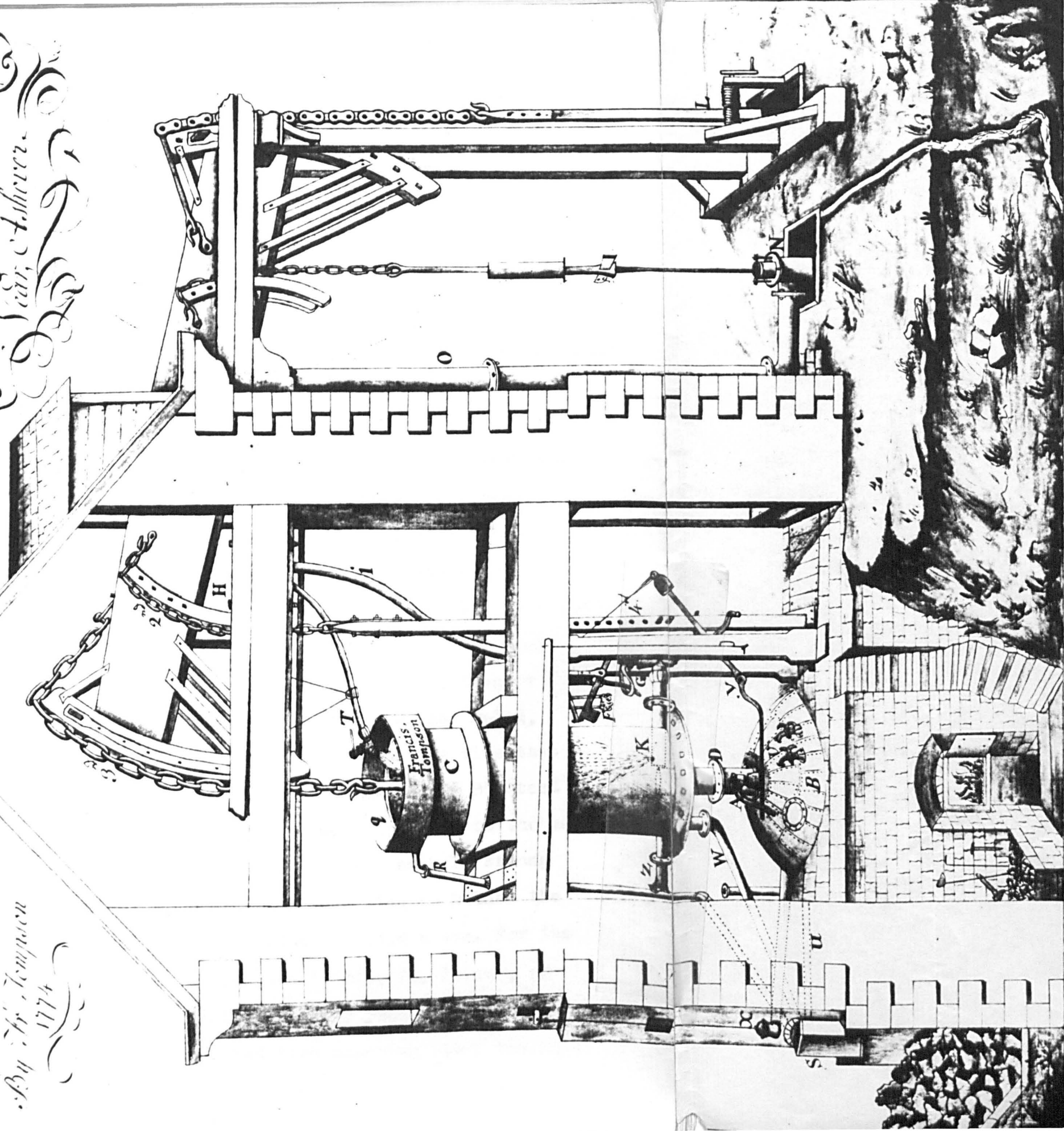
July 1765. 4 sets of Horses 3ea. set, drwg water 37/6 per Week ea. set.

To solve the problem, the partnership bought a Newcomen engine from Mill Close Mine, a few miles away across the East Moor. This engine had been built by Darby of Coalbrookdale in 1748 and was a 42 inch cylinder machine of approximately 47 H.P.^I It was erected at the Gregory Mine by Thomas Southern of Winster. The Gregory Mine plan, now in the possession of the Clay Cross Company, shows that it operated a pump of 12 diameter, the engine making a stroke of six feet, lifting the water 60 yards. Milnes declared in his memorandum that it used 26 tons of coal a week and that " 6 or 7 strokes a minute would draw the regular fading of the water." Whether this installation laid bare any richer ores, it is impossible

I. A. Raistrick. " Mill Close Mine. Derbyshire." Proceedings of the University of Durham Philosophical Society. Vol. X. Pp. 38-47.

A Draught of the
 Fire engine at
 Gregory's mine
 near Ashover.

Multon enl'aree
 By Fr. Tompson
 1774



A Description of the Engine for raising water by fire, whose Cylinder is 42ⁱⁿ and raises the water 61 yds a 1/2 hour. See to describe the engine. B is a large boiler whose water is converted into steam C is the Cylinder D a Pipe that joins C the Cylinder & B the Boiler together on the Lower orifices of which within the Boiler is a Broad Plate E by means of the regulator A which keeps in or lets out the steam according to the Steam to the Works to be a little. Through the air that enters the Cylinder C it may be a little more than a Ballance to the Pressure of the External air that keeps down the Piston F the Piston being By this means at Liberty, the Pump rod will by the Great weight of a bent 10 or 12 tons at one blow will descend at the opposite End to such a Stroke but as the Piston and Weight at the other end is not Exceed half that weight the End of the Lever at the Pump will always Proponderate and descend when the Piston is at Liberty. Then by Pulling back the Regulator Stops all Communication of Steam with the Cylinder then the Leases called the F must be dropped to turn the Injection Cock at G and that will Permit the water brought from the Cistern H by the Pipe I to Enter the Cylinder at K which is of Cold water being Driven above the Cylinder. Condenseth the Steam into water again by Reason of its Coldness and by this means its Bulk is become 14000 times Less than it was when Steam itself makes a Vacuum sufficient for the Pressure of the atmosphere.

to say, but 118 tons of ore mined in the Gregory Vein some distance from the drawing shaft on the hillside was extracted by Henry Ludlam and Company in August 1769 at a contract price of 13/4 a ton, a figure which Milnes stated " was the lowest cope ever given for getting Ore in Gregory Mine."

William Milnes kept an account book described as " Gregory Mine Reckoning Book with Accounts from April 1770 to ditto 1775." ¹ This gives the mine accounts for Lady Day and Michaelmas quarters during these years. According to a note inside the book, the Midsummer and Christmas quarters' accounts were kept by J. Twigg. These accounts are known to have been in existence in 1917 but it is highly probable that they have since been destroyed. ² However, the Milnes' set of accounts gives a wealth of information about lead mining in the Ashover area at this time. During these years the Gregory Mine attained its zenith. Probably the almost fabulous profits earned in relation to the capital employed were due to the junction of the Overton and Gregory veins. The quarter ending 4 April 1772 was, as Milnes noted, " the most profitable reckoning ever made during the time that Gregory Mine was kept in work." Production of ore was 875 tons and profit the huge amount of £5,592. A note appended to the map is to the effect that two companies of miners, each 19 strong got 711 tons of ore at a cope of 16/-. According to Milnes the ore was " of the best sort " and sold at £7.17.6 a ton. For the whole year 1772, total profit amounted to £15,024. Labour, of course, received no share of this fantastic profit, shift wages being 1/4 a day. Profits indeed had been mounting since the first

1. In the possession of R. Nodder Esq, Ashover.

2. W.T. Anderson. " Notes on an Old Colliery Pumping Engine." (1791). P.7. (1917).

quarter of 1770, when 220 tons were sold at a profit of £708. Even after profits had begun to decline, many quarters up to the first of 1775 showed profits of over £2000 and outputs of 450-600 tons of ore.

The actual mining of the ore was in the hands of four companies, generally making two contracts with the mine owners in each fourteen week period. Driving headings, too, was a contract job. It is obvious from a comparison of the names in the reckonings with the Poor Law Certificates now kept in the parish chest, that a large number of the miners were not natives of Ashover. Indeed, since 1700, there had been a continuous migration from the adjacent lead mining areas, particularly from Bonsall into Ashover, supplemented by migrants in smaller numbers from the parishes to the east - Brampton and Wingerworth. In 1758, the year the Gregory Mine was reopened, the settlement certificates record the arrival of eight newcomers to the parish and as the certificates in the parish chest almost entirely relate to married men with families, it is probable that there may have been in addition some unrecorded immigration of single men. In addition to the direct labour it afforded to miners, Gregory Mine employed indirectly a large number of persons - coopers, builders, carpenters and blacksmiths. Payments were made to ten men for carting coal; the amounts of coal purchased over a fourteen week period ending 28 September 1771 show the huge appetite of the Newcomen engine - 136 tons from Ainmoor, 105 tons from Swanwick, 19 tons from Tibshelf and 63 tons from Grassmoor. Purchases of timber, too, were heavy, for the stemples, fails and bunnings used in lead mining.

There is a gap in the series of Gregory Mine Account

Books from 1775 to 1782. However, a note as to the profits made during these years has been found amongst the Overton Estate records in the hands of the Clay Cross Company. This shows that the partnership made a profit of over £40,000 between 1775 and 1778. A levy of £600 had to be made on the partners in 1779 to cover a loss of £600 and another levy was made in the following year of £725 for the same reason. These losses were undoubtedly caused by a fall in lead prices during these two years of about fifteen shillings a fodder. In the first four months of 1781, the price of lead rose rapidly from £13.10.0 to £14.10.0 a fodder. By August, it was up another £1 and by the end of the year, the price was firm at £16.15.0. This increase in price once again put the mine on a profitable footing.

This gap in the history of the mine can be partly filled by material drawn from correspondence between the partners in the Gregory Mine and the firm of Boulton and Watt.^I On 3 May 1779, Robert Banks Hodgkinson wrote to Boulton and Watt to the effect that a friend, Sir Harbord Harbord, had described to him the new separate condenser engine recently developed by the firm and wished to be given particulars of it. The next letter came from the mine manager and engineer at Ashover:-

My William Milnes Ashover Derbyshire.
May 29, 1779. Left by Francis Thompson
at Scho.

Mr Watt.
Sir,

Please to send to Mr William Milnes at Ashover in Derbyshire your Proposals for building a fire Engine the depth of the mine is 304 Yards Deep and is to lift a pump of 13 inches 90 yards deep in the bottom and house water 50. They only desire your proposals for erecting.

I. Boulton and Watt Collection. Reference Library, Birmingham.

Weather you would send Men or Let their Engineer Build for you and also where the Castings is to Come from because their is a Dood foundry in Chesterfield and that is near to them for Carriage and how much money you think it Will Cost for they must have one this summer.

I am, Sir Your hble St
Frs Tompson.

In the meantime, Boulton and Watt had written to Thomas Southern to ask him to communicate with Hodgkinson as to the merits of their engine. Southern did as requested, pointing out to Hodgkinson that he had inspected a recent Watt engine on a canal at Birmingham, eulogising its high standard of workmanship and its power and making the point that its coal consumption, a quarter of that of the common engine, more than compensated for its much higher first cost. Evidently, there was a division of opinion amongst the directorate of the Gregory Mine as to whether they should buy a Watt or a Newcomen engine. Thompson was pressing hard for the adoption of the latter type, arguing that experience at Yatestoop, with which he was closely connected as engineer, showed its suitability for pumping purposes in lead mines. Southern obviously had no high opinion of Thompson's professional ability, finding him entirely ignorant of the principles on which the Watt engine operated. With his knowledge of the psychology of the Derbyshire lead miner, Southern warned Watt not to try to hasten matters, but to let events take their course as " I saw Tompson since -- who says they are at a stand at Gregory's engine and he expects some plan will be adopted quickly." There is little doubt that there was a serious water problem at Gregory Mine by this time as the old Newcomen engine was working a minimum of 17 or 18 hours a day, making 9 to 10 strokes a minute in summer and 12 in winter.

Hodgkinson, however, seems to have been the dominating

figure in the partnership and after he had visited Ashover in August, it was decided to order a Watt engine. On 11 September 1779, Soho placed its terms before Hodgkinson. Boulton and Watt proposed that they should supply " Plans, Drawings and Directions of all sorts for erecting and repairing and working" an engine with a 45 inch cylinder " capable of making an 8 feet stroke in ye cylinder " to be built at the expense of the Gregory Mine partners. The engine was to be guaranteed not to consume more than 255 lbs. of coal per hour working at the rate of 9 strokes per minute and to be able " to work a pump of 13 inches diameter and 90 yards high at the rate of 10 strokes of 6 Feet long each in one minute -- and shall be able to give the necessary motion to 214 yards of dry rods." As was their usual practice, Boulton and Watt were to be paid a premium quarterly for each 10,000 strokes, counted automatically by a meter on the engine.

Once the contract had been signed, Thompson was able to push on with his share of the work. The haystack boiler was constructed on a plan furnished by Watt; a great beam of oak 25 feet long averaging over 30 inches in thickness and width was purchased from the Duke of Portland and slabbed to size; a massive engine house, sunk down 13 feet in the ground to ensure solidity was constructed and work on the shaft 304 yards deep hastened on. Soho, on its part, was as usual lethargic in delivery of components, so that Milnes wrote in the July of the following year complaining that they were not " getting forward with setting up the Engine on Account of losing the benefit of this Summer Season, for the place where it stands is very cold and bleak. Men will scarcely abide to work at it in the winter

time." Probably as a result of this letter, Watt himself visited Ashover in August. However, by September the cylinder and bottom had been erected, but in the next month trouble arose over a missing piston rod which Watt had dispatched via Liverpool and the Grand Trunk Canal to Shardlow and which had not yet arrived at Ashover. The beam was put up in November and in the same month Thompson sent drawings of the steam pipe and board models for elbows and angles to the foundry in Chesterfield to be completed. In the following March the condenser was put in, two balance beams installed in the shaft and presumably soon afterwards the engine was started up, as a premium of £67.8.9 for I,348,750 strokes was paid in September. The new engine proved a great success, using in the first quarter 100 tons of coal as against the 350 of the atmospheric engine. Milnes wrote to Watt in November 1783 to say " The engine still continues to work well and the more we see of it the more we admire and esteem it." Indeed, for some time there was a proposal to convert the Newcomen engine to a separate condenser engine, but it was continually put off and the scheme was eventually dropped.

Although none of the account books of the Nether Sough Company have been found, it is possible to obtain from some of Milnes' papers details which supplement the information already obtained from Bonne's letters. In 1759 the mine produced 536 tons of ore. The next three years saw a continuous decline, probably connected with drainage difficulties, as Milnes records that up to 1758 " there was little, if any, hand pumping or Drawing Water by Horses before the Year 1758", whereas by 1762 the charge for horses drawing water was £6.8.0 a week. This problem increased

in seriousness over the next few years and in 1766, Milnes noted that 12 horses, 8 or 9 rag pumps and about 30 pumpers, some working double shifts were employed. However, output increased between 1764 and 1766, almost aggregating 2,000 tons. The water problem, however, was too much for the partnership, as Milnes declared " In Jan. 1767, pumping by hand and drawing Water by Horses was given up, the forefield slope in Overton Vein was then about the Rocky Part in Overton Part." Output consequently fell and less than 300 tons were mined from 1767 to 1772. An attempt was made between 1772 and 1775 unsuccessfully to work the Overton Vein from Gregory Mine, but all work here was shut down in 1777 as obviously the small amount of ore did not repay the cost of production.

After 1782, a new series of mine accounts is available for the Cockwell Mine. This partnership was again dominated by Robert Banks Hodgkinson and his relatives in Lincolnshire, who between them owned a third share. Twigg, Winchester and Company, the lead smelters, held a further seventeen shares out of a total of forty eight. Other odd shares were held by Ashover families, Bournes, Allens, Kirkes, Thompsons, Haslams and Gregories, with a few shares in the hands of outsiders such as Lawyer Manley, Gladwin of Stubbing Court and Gratton, the Wingerworth timber merchant. By 1778, production at Cockwell Mine had been only 146 tons and during these years it had lost its owners almost £2000. One reason for this heavy loss was the expense sustained in driving new levels in search of ore. Fortunately, the Chimney Vein was discovered in the process of cutting back the Gregory Vein to the New Engine Shaft of that mine and as it was on the north side of the Gregory Vein, it was allocated to the Cockwell

Mine. The low copes for ore for the quarter ending 27 September, when lead was mined at contract prices from £2.5.0 to £3.15.0 a ton show the comparative ease with which this new vein could be worked. The last two quarters of this year showed a profit of £1,344; the next year with an output of 907 tons made a profit of £3,497; 1785 saw production increased to 1,190 tons with a corresponding increase in profits to £5,387; 1786 witnessed both a fall in output and in profit to 538 tons and to £1,587; the next year saw a slight recovery to 619 tons and £2,571 profit. Probably profits over the next three years, approximately at the 1787 figure, might have been much larger if the attempts made at discovering new veins had not proved abortive.

Equally unfortunate was the Woodhead Mine, almost entirely owned by the Gregory family. The accounts for this mine are unfortunately fragmentary. In 1784, it produced 80 tons of ore. In the following year output fell to 71 tons. The next year was even worse, the mine only producing 34 tons. The accounts for 1787 and 1788 are missing, but those for 1789 show that only 16 tons were mined.

During these years, Gregory Mine had been declining both in output and profits, though the real depreciation had been somewhat masked by a rise in lead prices towards the end of the period. In 1783, output had been 1,249 tons. Five years later, it was down to 970 tons. Profits had dropped in a similar fashion from £4,192 to £2,472. Working costs had risen as the mine had penetrated further under the escarpment towards Holestonegate Road, the miners having to descend the climbing shaft and then walk over half a mile to the forefield. Similarly, ore had to

I. Gregory MSS. Ravensnest House, Ashover.

be brought back to the gear shaft, hauled to the surface and be dressed on a site nearby, water for which was provided by sinking a shaft above the gear shaft. Moreover, the profits of Gregory Mine had been inflated by an agreement made in 1785 with the owners of Cockwell Mine, whereby " in consideration of the Two Fire engines which belong to Gregory's Partnership -- it was agreed and thought reasonable to allow the Proprietors -- 7/- per ton as a composition for all ore that is got -- and drawn up Gregorys or Overton shaft." This contract brought in £238 in 1789.

In this year, Gregory Mine became from the standpoint of the partners in it, a liability. The first quarter of that year showed the usual profit, but a decline in production from 228 tons to 76 tons in the second quarter turned this profit of £811 into a loss of £158. It is apparent from the accounts that the vein had become much thinner and that heavy expenditure had been incurred in driving the level forward to find richer ore. To meet this situation, the lords' cope was lowered to an eighteenth, but even so the whole year's working showed a loss of £45, which by the following June had grown to £308. The partnership met the changed situation by a levy of £12.10.0 on each share, which brought in £550 to finance the mine. It was also decided to sink another shaft called the forefield shaft 258 yards west of the New Engine Shaft, with the object of cutting down underground haulage costs and of opening up new veins of ore, the majority of copes now being in the region of £6 a ton. The sinking of this shaft was for that period a difficult task, as 60 fathoms of gritstone, 73 of shale and 19 of limestone had to be penetrated,

so that it was not completed until 1795 at a cost of £5,000. These years were, however, for the shareholders, a period of unrelieved gloom, output continually falling and losses growing, together with frequent levies of additional capital. Of course, in the case of Hodgkinson and Bourne, these losses were somewhat mitigated by the payment to them of a large share of the lords' cope.

When the sinking of the forefield shaft at Gregory Mine had been completed, Francis Thompson erected a whimsey engine. The material for this was supplied by local firms - the boiler plates came from Charles Hurt's Morley Park plant, castings from Smith's Griffin Foundry at Brampton and other material from Butler's furnace at Wingerworth. Despite this introduction of steam haulage, the discovery of a new vein on the south side of the Gregory Mine and the working of the old hillocks for ore, Gregory Mine remained financially a failure. During the March quarter of 1798, Henry Ludlam and Company produced 52 tons of ore at a cope of only £3.10.0 but nevertheless the mine lost £127. Naturally an attempt was made to mend the situation by driving new levels, by opening the forefield and by deepening the whimsey shaft and then opening up new levels. As a result, despite an increase in the price of lead to £17 a ton, heavy losses were incurred and frequent levies had to be made on shareholders.

To deal with these problems, the partners held a number of meetings. They also called in mining engineers for advice, but nothing came of these steps. The end of Gregory Mine came about almost by accident in 1803 when the spring supplying the Watt engine failed, so stopping the engine, allowing the water in the mine to rise.

The Gregory Mine was not the only mining venture in Ashover to be in difficulties during this decade. According to an undated letter from John Twigg of Ashover to his uncle in Paisley which can, however, be dated by its reference to the impending war to the year 1793, Fallhill Mine "is overdone with water the mine has been drowned out for near two months" and "Cockwell Mine still keeps going the wrong way." This latter mine made its first loss in the September quarter of that year. Subsequent years were disastrous as a profit was only made in a single year (1799) - and that was but £9. Production fell slowly but surely from 182 tons to 37 between 1794 and 1800. Working was concentrated in the Chimney Vein east of Holestone Road but this vein became "divided by riders or flown into strings." A cross vein was discovered several fathoms below the top of the limestone and was followed in a rising direction until it disappeared on reaching the shale. After this disappointment it was decided to abandon Cockwell and to concentrate on Overton Mine. Although a profit was made in 1802-3, compared with former years it was miserable in amount - £213.

At Christmas 1803, a new partnership was set up to work both Gregory and Overton Mines. This included all the former shareholders, newcomers being Richard Arkwright, the cotton spinner and Bache Thornhill, the squire of Stanton in the Peak. Expenditure was concentrated at Overton where two new shafts were sunk, many new headings driven, many turns sunk and much driving across carried out. It was all to no purpose as no new veins of lead were discovered.

The Newcomen and Watt engines at the Gregory Mine were but little worked during this period of exploratory driving

at Overton. By 1805, the forefield of the vein had narrowed down to four or five feet in width and was, to quote Milnes, "chiefly filled with dog tooth spar with no regular carriage of ore." Output in that year was down to 46 tons and cope had risen to £12 a ton. Only one thing kept the mine at work - the fact that lead had risen at this time to the exceptionally high price of £40 a Hull fodder. The market, however, broke in 1807 and by September of that year, the price of the metal had slumped to £27 a Hull fodder. This collapse in the price of lead made both Gregory and Overton Mines uneconomic to work with the result that all the engines were dismantled and sold. So ended the great era of Ashover lead mining.

The collapse of lead mining in the parish could not occur without baneful economic results. Some indication of this may be studied in the Poor Law accounts. Between 1790 and 1808 the amount paid out by the Overseers doubled; before Waterloo it had doubled again. This increase continued until 1820 when no less than seven times the 1790 figure was expended. The financial burden became so serious that that a permanent overseer of the poor was appointed and a Select Vestry elected to supervise his activities. His accounts are full of payments to men and girls out of employment. The vicious Speenhamland system of making up wages was also adopted. Work on the roads was used as a method of dealing with the able bodied poor and the Vestry passed a resolution that "any person being out of work and wanting relief from the parish to be employed on the Highways as much as possible". An equally pernicious system, the Roundsman System, was also in use in Ashover. In 1817, the Vestry ordered that paupers should be taken off the roads and that they should be

employed by farmers, the parish paying them a wage of 3/- each, with an additional 1/9 for a wife and each child.

LEAD SMELTING IN THE HUNDRED OF SCARSDALE.

Ashover, the only parish in the Hundred of Scarsdale containing deposits of lead, is situated on a small limestone inlier, surrounded on every side by millstone grit formations. These underlie the East Moor, a long narrow ridge extending from the southernmost boundary of the Hundred to the county boundary with Yorkshire. At the end of the seventeenth century, this and the immediately adjacent areas, was the most important lead smelting district in Derbyshire. The reasons for this are clear enough. The streams running down its eastern and western slopes to the Don, Rother and Derwent provided the power necessary to drive the bellows of the lead smelting mills. The wooded slopes of the ridge, the spring woods of the Vale of Scarsdale and the thickly wooded Derwent valley provided the kiln dried wood used as fuel in these mills. In addition, another important locational element in the siting of these smelting plants was the fact that the thin, acid soils of the East Moor were incapable of even supporting a rough pasture, so that the poisonous fumes emitted by these works could here neither harm farm animals nor damage crops.

By 1700, the East Moor and the districts flanking it to the east and west had over a century of lead smelting behind them by the technique then in use. First introduced early in the reign of Queen Elizabeth at Beauchief on the River Sheaf, the use of the lead smelting mill spread rapidly during the late sixteenth and early seventeenth centuries, replacing "boiling" the lead ore in a bole, fanned by the wind as the standard method of

lead smelting. By the middle of the seventeenth century, there were eight smelting mills at work in each of the parishes of Ashover and Brampton, another eight in each of the townships of Walton and Dore and Totley and two more in the township of Holmesfield.¹ A century later, a rental of the Devonshire property at Dore shows that three mills alongside the River Sheaf were in the hands of Richard Milnes of Cowley, John Rotherham of Dronfield and John Nodder II.² Another mill nearby, the Upper Mill at Dore Town End, was worked by Robert Clay of Walkley, a Sheffield lead merchant, who willed it at his death in 1747 to his son, Joseph. Outram's End Smelting Mill at Totley was worked for a short time by a Sheffield timber merchant, Richard Dalton, then attempting to build up a return trade with the Hull merchants, through whom he imported Baltic pine. Information as to the ownership of the smelting mills in the other parishes and townships of the Hundred during this half century is, unfortunately, scanty. Thomas Shaw, a London merchant, leased Cathole Mill in Brampton parish during the War of Spanish Succession. Langside Mill, in the same parish was in the hands of Alexander Barker of Bakewell, in the early 'fifties. Francis Birds, a High Peak lead smelter, operated a smelting mill at Upper Town, in Ashover, early in the reign of George I.

At the beginning of the eighteenth century, the lead smelting mill had one fatal defect. It used kiln dried wood, an article in short supply, as fuel. So heavy had been the depredations of the ironmasters on the timber of the district during the

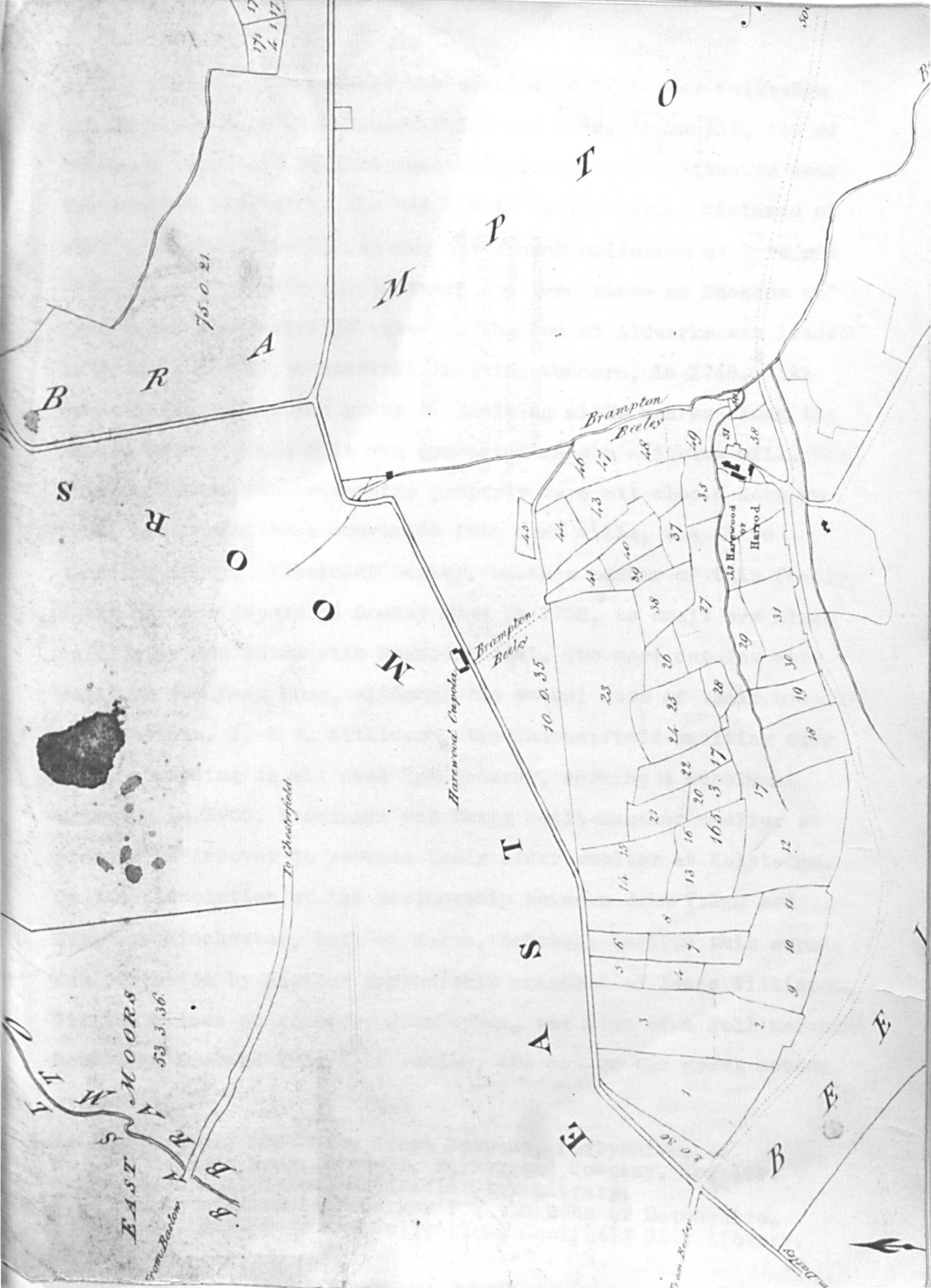
1. A Breviate of the Survey of the 31 Townships within the Hundred of Scarsdale. 1641-61. D.D.P. 59/21. Portland MSS. Shire Hall, Nottingham.
2. Alexander Barker's Accounts for Chatsworth. 1743. No.497. Bagshawe Collection. Sheffield City Library.

previous half century, that there was insufficient charcoal left for the furnaces and forges, some of which were closed down for lack of fuel. Fortunately for lead smelting in Derbyshire, the London Lead Company introduced the cupola with a reverberatory hearth, which used coal as a fuel, into the county in 1734.^I

The first example of this type of smelter was built by that concern on the site of Bower's Mill in Ashover and was worked by it until 1788 when the Company sold its Derbyshire lead mines.² Apart from the advantage that it used a fuel of which there was a boundless supply, the cupola enabled the smelter to smelt the belland, the powder like substance which was the last product of buddling the ore in water, a material so fine that it was blown out of the hearth of the smelting mill by the blast from the bellows. The locational requirements of the cupola were very similar to those of the older type of smelting plant. It demanded a situation amidst a large area of waste land, free alike from animals and crops. It needed to be sited in proximity to water power to drive the bellows of the slag hearth, used to resmelt the slag from the cupola. Naturally, it was essential to position it as near as possible to coal. All these conditions were met with on the edge of the East Moor, where the Alton Seam basseted out near the headwaters of brooks flowing rapidly down slopes covered with heather and gorse. As a result, the supplanting of the smelting mill by the cupola made little difference to the siting of the lead smelting plants in this part of Derbyshire.

What was probably the second cupola to be built in the

1. Rhys Jenkins. " The Reverberatory Furnace with Coal Fuel. 1612-1712."; A. Raistrick. " The London Lead Company. 1692-1905." Trans. Newcomen Society. Vol. XIV. Pp. 67-81 and 119-162.
2. A. Raistrick. " Two Centuries of Industrial Welfare. The London (Quaker) Lead Company. 1692-1905." Pp. 118-9; Derby Mercury. 9 July 1788.



in the Hundred of Scarsdale was erected in 1740 near Kelstedge Old Smelting Mill by Nicholas Twigg and Henry Thornhill, two of the most important lead merchants in the county.¹ Situated near the Ashover lead mines, it was within easy striking distance of coal at Walton. Totley Cupola, sited near collieries at Dore and situated on the main road between the lead mines on Hucklow and Eyam Edges and navigable water on the Don at Aldwarke was leased by J. & G. Barker, a Bakewell smelting concern, in 1748.² Its competition killed the group of smelting mills nearby along the Sheaf. Outram's End Mill was converted into a slitting mill. The three mills on the Devonshire property were all closed down in 1756, two having been converted into corn mills, the third standing empty.³ Alexander Barker, another member of this family, built Harwood Cupola on Beeley Moor in 1752, to smelt ore mined in Winster and Elton with Brampton coal. Two more cupolas were built on the East Moor, although the actual date of their erection is uncertain. I. & J. Wilkinson, the Chesterfield smelting firm were, according to the Land Tax returns, working a cupola at Brampton in 1780. Thornhill and Twigg built another smelter at Stanage in Ashover to replace their older smelter at Kelstedge. On the dissolution of the partnership between John Twigg and Humphrey Winchester, both of Holme, Bakewell in 1790 this cupola was purchased by another partnership composed of Isaac Wilkinson; William Milnes of Ashover; John Sykes, the head of a Hull merchant house and Richard Arkwright Junior, the son of the great cotton spinner.

1. Overton Hall MSS. Clay Cross Company, Derbyshire.
2. Cash Account Book, 1743-51. Barker and Company. No. 484. Bagshawe Collection. Sheffield City Library.
3. Accounts of Alexander Barker for the Duke of Devonshire. 1756. No. 489. Bagshawe Collection. Sheffield City Library.

During the last decade of the eighteenth century, the three cupolas at Totley, Stanage and Harwood were worked by Isaac Wilkinson and George Barker in partnership. During these years, Stanage Cupola was mainly supplied with ore from the Gregory, Westedge and Cockwell Mines in Ashover; Harwood Cupola from Calver, Sheldon and Alport and Totley from Oden Mine in Castleton and from the mines along Eyam Edge. ^I When the output of lead ore at the mines controlled by this partnership declined early in the new century, Totley Cupola was closed down in 1802. With a further decline in ore production, Stanage Cupola was shut down in 1806. In the following year, Isaac Wilkinson withdrew from the partnership, leaving Barker and Company in possession of Harwood Cupola, which continued to smelt ore from Westedge Mine. When this Ashover mine closed, the bulk of the ore smelted at Harwood was drawn from as far afield as Bradwell and Peak Forest, a situation plainly involving heavy transport costs. As a result, Barker and Company stopped smelting at Harwood in 1814, concentrating their business upon their cupola in Middleton Dale, which was more centrally situated for the collection of ore mined in the High Peak.

With the closing down of Harwood Cupola, the East Moor lost its primacy as a lead smelting district to the area immediately adjacent to the terminus of the Cromford Canal, where the cupolas not only enjoyed good transport facilities into the Midlands and London along the canal system engineered by William Jessop but were easily supplied with coal by it to smelt the ore mined nearby in the High Peak. Sykes, Milnes and Company

1. Ore Accounts. 1807-56. Barker and Company. No. 478. Bagshawe Collection. Sheffield City Library.
2. Voyage Metallurgique en Angleterre. MM. Dufrenoy, Elie de Beaumont, Coste et Perdonnet. P.584. Paris. 1837.

kept Stannage Cupola at work after the end of the Napoleonic Wars, but the statistics of pig lead transported on the Stockwith Canal during the next decade show that production here could only have been a shadow of what it had been the 'nineties.

THE RED AND WHITE LEAD MILLS.

Part of the lead smelted at the mills and cupolas on the East Moor was retained within the region to be manufactured into red and white lead. The former was made by heating pig lead for four to five hours in a reverberatory furnace, fired by coal, a process which reduced the lead to powder, which was then washed to break up any remaining clots of lead, before being ground by water power. The powder was then dissolved in water to allow the heavier particles, which had to be resmelted, to separate out. The remainder was then heated in another furnace for 36 hours. After being cooled down and passed through a sieve, it was ready for sale.

To ensure the lowest possible cost of production, the red lead mills had to be sited in close proximity to the smelting plants, to coal and to water. Such conditions were again to be found on the eastern edge of the East Moor, where above Chesterfield were to be found the most important concentration of red lead mills in the county during the Later Stuart and Hanoverian periods. In 1693, Richard Lindsay, a London merchant, was working Cathole Mill in Brampton. In 1706, two Cromford lead merchants, Benjamin Haywood and his son, Joshua leased Walton red lead mill from Sir Paul Jenkinson. In 1717, John Bright of Chesterfield was in possession of another red lead mill on the Hunloke estate at

I. Gabriel Jars. "Voyages Metallurgiques". Vol. 2. P.569.
"Procédé des Anglais pour fair le minium." Lyons.
1774-81.

Wingerworth. Cathole Mill was operated by William Soresby in the 'thirties after Lindsay had gone bankrupt. In the 'fifties, the red lead mill at Walton had come into the possession of Thornhill and Twigg. In the same decade, other red lead mills were being worked on Brampton Moor and Holymoorside by Bernard Lucas of Hasland and by the Chesterfield partnership of Milnes and Wilkinson. During the period 1790-1807, all these red lead mills had come into the possession of Barker and Wilkinson who, thus, established a virtual monopoly of its production in this area. Production figures for these mills are, unfortunately, non-existent. They must, however, have been high as in 1804 their purchases of lead from the cupolas amounted to over £12,000^I. With the virtual ending of smelting on the East Moor after Waterloo, these red lead mills became uneconomic to work and were converted into corn or cotton mills.

White lead was made by first casting lead into thin sheets and exposing it to the action of vinegar for from six to eight weeks. The lead was then put through a bolter worked by a waterwheel. The smaller pieces were then ground to a fine powder which were then dissolved in water to allow the heavier particles to settle to the bottom of the receptical. The remainder of the material was then placed in barns to bleach for six months, when it was then ready for sale.²

The only white lead works in the region were at the Ponds in Sheffield. These were initially erected in 1759 by a partnership which included James de la Pryme; William Cooper, a Sheffield cheese factor; Samuel Turner, a local mercer and

- I. Waste Book. 1800-7. Barker and Wilkinson. No. 483. Bagshawe Collection. Sheffield City Library.
2. Gabriel Jars. "Voyages Metallurgiques." Vol. 2. P. 569. "Art de fabriquer la cerufe et le blanc de plomb." Lyons. 1774-81.

James Allott, brother in law of Joseph Clay, the Sheffield lead merchant. By 1767, Cooper and Turner had retired from the partnership, to be replaced by James Wheat, clerk to the Church Burgesses and the Town Trustees and by Thomas Rawson, a member of a family in business as tanners. Seven years later, the works were valued at £12,087. In 1775, the partnership was reconstituted as Allott, Gunning and Company in which James Allott II of Attercliffe and Thomas Gunning of Tinneys Court, Cold Ashton, Gloucestershire each held five shares. The latter's father in law, John Shirecliffe of Whitely Hall and William Bullock, a Manchester merchant each held four shares.^I No further information as to the fortunes of this concern is available until 1846 when its capital had grown to £20,000; its profits were £3,027 and its owners were the executors of the late John Barker, J.E. Barker and T.R. Barker, all descendants of the eighteenth century family of Bakewell lead merchants.²

THE LEAD MERCHANTS OF SHEFFIELD AND THE HUNDRED OF SCARSDALE.

During the first half of the eighteenth century, a large sector of the lead industry in Derbyshire was controlled by merchants living in the Hundred of Scarsdale and in Sheffield. During the War of the Spanish Succession, John Bright I, who had been clerk to Richard Youle, one of the leading lead merchants in Chesterfield and who had subsequently married his daughter, was one of the most important figures in the industry in the county. Other leading lead merchants in the town before the turn of the century were William Soresby, whose son, Adin, married Barbara, the daughter and co-heiress of John Bright II; the two Quakers,

1. Papers. White Lead Works, Sheffield. 1774-83. No. 1231.
Wheat Collection, Sheffield City Library; SHes 897 L.
Fairbank Collection, Sheffield City Library.
2. Barker Family Muniments. Bakewell, Derbyshire.

Joseph and William Storrs; Richard Milnes, who later went into partnership with Richard and John ^RWilkinson, the sons of a Bradford Dissenter, who had set up in business in Chesterfield and Henry Thornhill and Bernard Lucas of Hasland. Outside the town, John Rodgers of Cowley and John and Samuel Rotherham of Dronfield were important figures in the industry. In Sheffield, the leading lead merchants in the first half of the century were Richard Clay of Walkley and his son, Joseph; Richard Dalton and John Nodder I and his son of the same name.

The majority of the lead merchants had many other business interests. Robert Clay was a coalmaster, working the Norfolk coal in Sheffield Park during the War of Spanish Succession. His son, Joseph, was a member of the Spencer group of ironmasters which almost completely dominated the charcoal iron industry in South Yorkshire and North Derbyshire during this half century. Dalton was an importer of Swedish pig iron, German steel and Baltic timber. Richard Milnes, Bernard Lucas and the two Wilkinsons were grocers. William Storrs was a hosier. The Bright family speculated in tithes and in land. ^I John Rotherham was agent for the estates of the Oxford family around Dronfield, a coalmaster, the lessee of the grindstone quarries at Hathersage Booth and in the Rivelin valley and the proprietor of a transport business between the Peak and Bawtry. ² William Soresby, the son of a miller at Wigwell in the Low Peak, who had been a bailiff in the Chesterfield office of the legal firm of Calton, entered the industry by investing his savings in lead mines, a step which proved very profitable. In addition to his interests in the manufacture of red lead, he was agent to the Countess of Oxford and Receiver for

1. B.I3/I0/204 and B.I3/I0/218. Bagshawe Collection. John Rylands Library, Manchester.
2. Will dated 30 October 1720. Notebook. No. 29. Addy Collection. Sheffield City Library.

the Yorkshire and Derbyshire estates of Samuel Pierrepont Esq.^I Soresby seems to have had most of the virtues and vices of the self made man. Completely unscrupulous, he took advantage of his position as agent for the Oxford property to lease to himself the market and fair tolls in Chesterfield, the tithes of corn and hay in the High Peak and part of the Oxford property around Chesterfield. He proceeded to rack rent the latter until the tenants complained that they had been "Bond slaves to him near these Twenty Years last past" and that they had worked "like slaves and far'd hardlier than the Poor of our Parish." In addition, he took large fines from the tenants on the renewal of copyholds, cut down the greater part of the standing timber on the estate, allowed buildings to fall into disrepair and ploughed up ancient meadow and pasture.^I

Soresby, like the majority of his contemporaries in Chesterfield engaged in the lead industry, drew considerable wealth from it. At his death in 1749, in addition to his new "capital messuage" in the street named after him in the town, he left real estate in Dronfield, Wirksworth, Middleton, Ashford and Tideswell. His son, Adam, sold all this property after his marriage to Jane, daughter and heiress of Sir Fisher Tench of Low Leyton, Essex and their taking up residence in Hanover Square. John Bright I was, at the time of his death in 1732, "well known to be of great substance and fortune." His son, John Bright II, who died in 1748, owned freehold and leasehold land worth £1000 a year and had £10,960 out on loan to such local business men as William Spencer of Cannon Hall, the South Yorkshire ironmaster, and Henry Thornhill, the Chesterfield lead merchant. At his death,

I. Henrietta, Countess Dowager of Oxford v Wm. Soresby. In Chancery. 1741. Box. 1285. Jackson Collection. Sheffield City Library.

his fortune was willed to his daughter, Mary, who married the Sheffield merchant, Richard Dalton. Their daughter, in turn married Lord George Murray, younger son of the Duke of Atholl.^I John Rodgers of Cowley, in 1735, willed property which he had purchased at Muggington and Turnditch in Derbyshire to his daughter, Elisabeth. Twenty years later, John Rotherham II bought the Manor of Dronfield, thereby founding another family of gentry, which like so many others in the county, speedily forgot its origins in trade in the new found dignity of Sheriff and Lord Lieutenant.² Henry Thornhill, in partnership with three other lead merchants in the Peak, purchased all the Derbyshire estates of the Earl of Scarsdale in 1742 for £130,000, a speculation which brought them a profit of £20,000. With his share, Thornhill acquired the Manor of Pleasley in the following year.³

The foundation of these new families of landed gentry reduced the number of lead merchants in business in this area in the second half of the eighteenth century, the more so as the trade failed to recruit new members. The amount of capital required to start up in this business after the middle of this century was much greater than it had been previously as once the cupola had superseded the smelting mill, it was necessary to purchase larger quantities of ore for smelting and to finance the sale of greater amounts of pig lead. Participation in lead mining, an essential part of the lead merchant's business, too, demanded the possession of more capital during this period than hitherto as the initial investment in lead mining increased with the

1. Legal Affairs of the Bright Family. No. 474. Tibbitts Collection; Dalton v Heathcote. Box I285. Jackson Collection. Sheffield City Library.
2. Rotherham- Cecil MSS. Dronfield.
3. British Museum. ADD. MSS. 24,477. No.88; D.D.P. 97/I and II8/I6. Portland MSS. Shire Hall, Nottingham.

exhaustion of the upper veins. In addition, lead mining failed to attract outside capital during the reign of George III, as the industry became much more speculative during this period than previously as a consequence of the fact that the ore content of the deeper veins proved to be much less reliable than that of the deposits nearer the surface. As a result, the lead merchant had to shoulder a much larger burden in the development of mining in the second half of the eighteenth century.

Joseph Clay of Sheffield continued in business as a lead merchant until his death in 1797. Joseph Storrs, presumably, retired from business in 1803, when he sold his cupola in Middleton Dale to Barker and Wilkinson. This partnership was, unquestionably, the most important concern in the lead industry in the region after the Seven Years War. Originally formed by Richard and John Wilkinson of Chesterfield and Alexander Barker of Bakewell in the late 'fifties, it was continued by Richard's two sons, John and Isaac and by Barker's son, George until it was dissolved in 1807. The association of the Barker family with lead mining and smelting dated back to the late 'twenties when they were mining ore at Chapeldale in Flagg and at Wham Mine in Moniash and smelting it at Shacklow Mill in the Wye valley near Ashford. In the forties, they extended their mining activities to Leadnams and Cowclose Mine in Elton, from which ore worth £21,000 was extracted between 1740 and 1746. At the same period, they were partners in many mines along Eyam Edge, smelting the ore mined here and at Elton at Trolley Cupola. Almost the whole of their make of pig lead was marketed by Milnes and Wilkinson in the early 'fifties. A partnership between

I. Miscellaneous Lead Mine Accounts, 1736-50; Reckonings Whafe, Wham and Hubbadle Mines 1729-36. Nos. 490 and 584. Bagshawe Collection. Sheffield City Library.

Alexander Barker and the two Wilkinsons, the one engaged in mining and smelting and the two brothers engaged in selling lead was, therefore a natural one. The two families had other points of business contact. The Barker family acted as agents for the Duke of Devonshire and the Wilkinsons as his bankers. The former family, too, banked the land and window taxes which they collected in the Peak with the two Wilkinsons. Probably, the reason for the dissolution of the partnership was the fact that Isaac Wilkinson sustained an almost fatal accident about this time, which led to his spending much of the remainder of his life at various spas. Wilkinson's red lead mills were taken over by his clerk, James Croft and his shares in the various lead mines in which the partnership had been interested, together with the cupolas at Stanage and Harwood were bought by George Barker. Both men, however, suffered from a severe shortage of capital. Barker, indeed, was largely financed by Wilkinson and the Chesterfield bank of Jebb, Slater and Malkin.^I In addition, the Derbyshire lead industry was subjected to severe stresses when the European market for lead was closed by the Berlin and Milan Decrees. Again, as previously stated, the group of smelting and red lead plants on the eastern edge of the East Moor was, as a result of the exhaustion of the mines in Ashover, becoming uneconomic to work. A combination of these factors led to the closing down of Harwood Cupola in 1813, an event which, thus, not only marked the end of an era in smelting in the Hundred of Scarsdale but also the dominance so long exercised by Chesterfield lead merchants over a large sector of that industry.

The fortunes of the Derbyshire lead merchant and indeed those of the whole industry in the county were largely

I. Letters dated 22 January and 12 February 1811. General Correspondence of the Wyatts, 1800-58. No. 650. Bagshawe Collection. Sheffield City Library.

dependent upon the price of the metal set by the forces of supply and demand in London. In addition, the price of lead appears to have been profoundly affected by international politics, a natural enough event as large amounts of Derbyshire lead were exported to the United Provinces and the Baltic and Mediterranean countries during the eighteenth century. The East India Company, too, was a large buyer of Derbyshire lead. Superficially, war might have been expected to have led to an increase in the price of lead by the increased demand for the metal which conflict entailed. In fact, war, with the dislocation of trade which accompanied it usually brought lower prices for the metal and with it lessened activity in smelting and mining and created unemployment in both sections of the industry.

There is, unfortunately, no reliable series of lead prices before the opening of the War of Austrian Succession. In April 1741, lead was selling at £14 a fodder.^I During the next two years, as fighting increased on the Continent, it dropped in price to £10.15.0. Probably, like so many price movements in the metal markets, the fall was overdone as it caused a number of smelting mills in the county to close down, with the consequence that a shortage of lead ensued. As a result, as one smelter wrote in September 1743 "Lead (is) prodigiously advanced in Derbyshire,"² pig lead selling at £12 a fodder. During the remainder of the war, it remained within a few shillings of this price.

During the short-lived peace between the Treaty of Aix-la-Chapelle and the opening of the Seven Years War, lead prices again advanced. By September 1754, lead was selling

1. The weight of the fodder varied from 2,408 lbs at Stockwith, Thorne and Bawtry to 2,340 lbs at Hull and 2,180 lbs in London.
2. Letter dated 17 Sept. 1743. Letters of Mr. Richard Dalton. B.5/4/I-3. Bagshawe Collection. John Rylands Library. Manchester.

at £19.5.0. a fodder, a figure at which led mining within the county was highly profitable and which led to great activity within the industry. The shadow of the approaching war was felt as early as March 1754, when Derbyshire lead merchants were rushing lead to market when war was rumoured. When war did come, the price of lead fell £2.10.0. a fodder in its first year. By April 1758, the price of the metal was down to £14.12.0 a fodder and a year later it had slumped to £12.2.0. a fodder. Such a catastrophic fall in the price of lead brought with ^{it} a considerable volume of unemployment and acute misery among the mining population was only prevented by the employment afforded by a heavy programme of turnpike construction which happened to coincide with the depression in the lead industry. Unemployment, combined with high food prices resulting from a poor harvest, also led to rioting in the Peak.² Lead prices recovered after 1759 and when the war ended with the Treaty of Paris in 1763, the metal was selling at £17 a fodder.

Little statistical information as to the price of lead is available until the opening of the War of American Independence, when the metal was selling at £14 a fodder.³ The usual price fall set in during the war and during the years 1779 and 1780, lead fluctuated in price between £12.10.0 and £13.10.0. a fodder. As it was difficult to work many of the mines profitably at this figure, output declined sharply, lead traffic, for example on the Chesterfield Canal only being in 1780 a third of what it had been in 1778. Such a shortage, inevitably, led to a rise in the price of lead and by August 1783, it had risen to £17.10.0. a

1. Letter dated 4 March 1754. Correspondence of John Spencer. 2a. Letters from B. Dutton. 1752-68. Cannon Hall MSS. Sheffield City Library.
2. Derby Mercury. August 26 1756 and 2 May 1760.
3. Price of Lead at Sundry places. 1774-95. No. 49I. Bagshawe Collection. Sheffield City Library.

fodder.

The Treaty of Versailles was followed by the usual rise in the price of lead. Joseph Clay of Bridgehouses, with fifty years of experience in the trade, writing in 1787 when lead was being sold at £21.10.0. a fodder, could not remember the time when its price had been so high. During the next year, its price went even higher, to £23 a fodder. Political troubles on the Continent had their usual effect on the price of the metal and by 1794, the price of lead had fallen to £15 a fodder. During the next eight years, it crept up slowly and by the time of the Treaty of Amiens stood at £26 a fodder. Over the next three years, the price of lead was stabilised at £35 but between March and September 1807, presumably as a result of Napoleon's overrunning of Germany and his victory over the Czar of Russia, with all that those events meant to the efficient working of the Continental System, lead prices dropped to £26 a fodder and even at that figure it was almost impossible for the Derbyshire lead smelter to find a customer in London. In the following February, the price declined still further to £23.10.0 a fodder delivered in London and sold at six months credit. In May, " the present immense stocks of lead" dammed up in England by a " War with nearly all the world" caused the price to fall to £20 a fodder. During the following months, lead fluctuated violently in price, largely as a result of Hull merchants speculating in lead in the hope of an early peace. In September 1808 lead rose to £38 a fodder; fell during the same month to £33; shot up again to £38.10.0. in October and was at its peak at forty guineas in November. Such prices led to intense

I. Letter dated 29 April 1787. General Correspondence of Ben. Hall. No. 6. Wentworth Stewards's Correspondence and Papers. Wentworth Woodhouse MSS. Sheffield City Library.

activity in Derbyshire both in mining and smelting, ore being rushed to the cupolas to take advantage of this phenomenal price. As usual, after such an orgy of speculation, especially with the disappointment in the hopes of peace and the opening of foreign markets, the price cracked and by the middle of December 1808, the market was "at a stand or worse." By the following April, the price of lead had fallen to £30 a fodder delivered in London and in fact, only one firm, Walker, Maltby and Company were buying Derbyshire lead. Worse was to come. In August 1809, lead fell to £29 a fodder and even at that price little was sold. In the March of the next year, Thomas Preston, one of the biggest London lead merchants, went bankrupt, an event which only further served to throw more gloom on the Derbyshire lead industry. Even the freeing of the Continent from French rule failed to revive the demand for the metal, a natural enough fact when the lack of purchasing power in countries suffering from the ravages of war is considered. As a result, the last two years of the war were marked by both a great lack of demand for the metal and a fall in its price.^I

Even at the opening of the eighteenth century, the Derbyshire lead industry was largely integrated in structure. Lead mining, the soughs constructed to drain the limestone, smelting, the manufacture of red lead and the sale of that article and of pig lead were all in the hands of a comparatively small group of men. Generally, although not invariably, as befitted an industry which demanded a considerable outlay of capital and was highly speculative by nature, lead mines were worked by partnerships. It was customary for the majority of the partners to appoint an overseer to manage the actual working of the mines. His

I. This paragraph is largely based on John Barker's Letter Book. I765-1811. No. 494. Bagshawe Collection. Sheffield City Library.

duties included the negotiation of the rates at which the various veins were worked with the " copers" who headed the gangs of miners working them; purchasing materials such as timber and making up the quarterly reckonings of profit or loss.^I

During the first half of the eighteenth century, the lead merchants of the Hundred of Scarsdale and of Sheffield played a considerable part in the exploitation of the mineral deposits in the Peak. At the western end of Hucklow Edge Old Vein, John Bright II and Joseph Rodgers were two of the partners in Speed, Bank and Silence. In the Liberty of Eyam, Richard Clay was a partner in Little Pasture, Haycliffe, Miners Engine and Brookhead mines. John Nodder I was also a partner in Ladywash, Miners Engine and Magclough Mines. Some of these mines had outputs which must have ranked amongst the highest in the history of the industry. Miners Engine, for example, raised 1,272 loads of ore in the last quarter of 1734; in one week in 1743, 1,103 loads were raised and between March and September in that year 1,815 loads were extracted at a cope of $\frac{5}{6}$ a load. Haycliffe made a profit of £7,238 from 1736 to 1741.² Another rich deposit of ore in this vein was worked by William Soresby who installed a "fire engine " at Watergrove Mine in 1748 but as this was sold in 1756, it may be presumed, as so often happened at this mine, that in the end, the water beat the pumps.³ Samuel Rotherham was working Oden Mine at Castleton from 1726 to 1732 in partnership with the Duke of Devonshire. Henry Thornhill was a partner in Portaway Mine in Winster, one of the richest ever to be worked in the County. Re-opened in 1744, with a Newcomen engine to drain it, the mine

1. Memorandum taken for the Better Carrying of the Mines in Eyam and Fowlce. 1721. B.8/3/1. Bagshawe Collection. John Rylands Library, Manchester.

2. List of mines, profits etc. No. 587/70. Bagshawe Collection. Sheffield City Library.

3. Correspondence. No.530/4. Wheat Collection. Sheffield City Library.

produced 34,063 loads of ore between October 1746 and December 1753.^I

The mining interests of Barker and Wilkinson during the second half of the eighteenth century were much more extensive than those of any of the lead merchants in the preceding period. The most productive of the mines in which the partnership had interests in the sixties were Breachside Sough in Hassop, where 14,140 loads were raised from 1763 to 1769 with a total profit of £6,334; Cowclose Mine in Elton where 8,088 loads were mined in 1763/4; Placket at Winster, which produced 7,739 loads from 1763 to 1768, making a profit of £7,750; Gorseley Dale Mine in the same liberty, where 3,369 loads were extracted from 1763 to 1768, making £828 profit; Calver Mill Sough, where £2,050 was invested before the mine proved profitable, made a profit of £958 on the 2,732 loads raised in 1765/6; Winster Pitts, where 1,627 loads were mined from 1767 to 1769 with a profit of £305 and Waterhole, on the ridge above Rowland, where 1,343 loads were mined from 1766 to 1769 with a profit of £319. At the end of the decade, 28 years of driving a sough at a cost of £9,000 was rewarded with the discovery of an extremely rich pipe of ore at Hubbadale in Taddington Liberty, from which 12,556 loads of ore were mined in Nether Hubbadale Mine and 2,037 loads by the sough owners, who together made a profit of £14,633 from 1767 to 1769.² At the same time, however, many mines which had been highly productive at an earlier period were either exhausted or being worked so deep in the limestone as to have become waterlogged. No ore was mined at Crowshaw Rake, Butts Grove, Wills Founder in Winster, Maury Mine

1. H. M. Attorney General at the relation of William, Duke of Devonshire -- Plaintiff against John Wall etc. 1760. Hardwick Hall MSS, Derbyshire.

2. Letter dated 14 March 1767. John Barker's Letter Book. 1765-1811. No.494. Bagshawe Collection. Sheffield City Library.

in Priestcliffe, Wilds Old Grove in Eyam and Chapeldale in Flagg. Wharf was sold in 1763 as it was "heavily loaded with water and not likely to be of any use unless completely drained"; Blackden in Wardlow was so waterlogged that the mine was worthless and Writheing Lake in Hucklow was declared in 1765 to be "so overloaded with water it will never be of service."^I

During the 'seventies, Waterhole Mine and Breachside Sough continued to be highly productive. At the former, 12,995 loads were produced during the decade and at the latter 15,211 loads were raised from 1772 to 1780. In addition, Watergrove Mine had an output of 18,674 loads between 1771 and 1777 and Shining Stone Sough in Youlgreave produced 4,304 loads from 1771 to 1779. Production at many of the older mines, however, fell off badly. Cowclose only raised 1,765 loads during the decade; output at Plackett declined to 2,210 loads from 1772 to 1777 and Nether Hubbadale was regarded by 1775 as "of little value." In addition, it had become impossible to work a number of mines as they were badly affected by water. By 1771, heavy pumping costs had made Drake and Limekilns in Winster uneconomic to work; Saltersway was under water in the following year; the "fire engine" at Calver Mill Sough was sold in 1774 as the mine was considered to be of no value "unless a new sough be put in to drain it" and despite heavy expenditure at Oxclose Sough in Matlock, the mine had to be abandoned without ore being discovered, when the vein began to dip below the waterlevel in the limestone.²

There is, unfortunately, little statistical

1. Proprietors Reckoning Book. 1762-70. No. 431. Bagshawe Collection. Sheffield City Library.
2. Letters dated 31 July 1771; 21 December 1772; 26 December 1776 and 7 May 1778. John Barker's Letter Book. 1765-1811. No 494. Sheffield City Library.

information as to output at the mines controlled by Barker and Wilkinson in the next decade. Some indication of their position and prospects is, however, given in a valuation made in 1782.^I Breachside and Watergrove were still productive. Many mines had become waterlogged and measures were in train to drain some of them. At Yatestoop Mine in Winster, it was proposed to install a " fire engine " 95 fathoms below ground to drain a large body of ore. Shining Stone Sough, Broad Meadow, Guy Vein and Honey Spot were dependent upon Hill Carr Sough being driven from the Derwent under Stanton Moor to clear them of water and Limekiln and Cowclose were awaiting draining by Yatestoop Sough being extended to them.

The completion of some of these projects led to an expansion in output in the 'nineties at some of the mines associated with the partnership.² Blythe Sough produced ore worth £32,688 during the decade, on which a profit of £18,807 was made; Shining Stone Sough raised ore sold for £46,000, of which £15,962 was profit; Breachside Sough ore was sold for £17,531, making a profit of £1,387. Output at Watergrove continued to run high, ore worth £14,075 being mined during the decade. A loss of £4,500 was sustained at this mine, however, mainly attributable to the great quantity of water encountered. Three new water driven engines were installed underground during these years and when they proved incapable of keeping the mine clear of water, an atmospheric engine built by Booth of Sheffield, was erected in 1795. Output at Portaway, an old mine, increased to £14,075 during the period. The rising price of ore enabled some of the old high cost mines

1. Valuation of John Barker's shares in lead mines. 1782. No. 634. Bagshawe Collection. Sheffield City Library.
2. Barker and Wilkinson Mine Accounts. 1790-1802. No. 482. Bagshawe Collection. Sheffield City Library.

This Line Disch to where the Minson Engine now is in Brabant

This Line Disch to the place that John Minson Engine began from
Lille pasture ground and Stake down by Mr. Hodder's direction
when Lille pasture was struck through to Minson Engine

This Line Disch to the Lille pasture boundary in the old mine

This Line Disch to the parting of Lille pasture and Hay Cliff

This Line Disch to the Hay Cliff boundary

This Line Disch to the Stake parting the Hay Cliff ground & Ladyswash

Disch to the Ladyswash Trench

224

340-260

32-3-264

33-5-246

33-5-256

320-27-261

32-2-346

The Minson Engine now is in

Ground

95-0

320

The Hay Cliff now is in

such as Haycliffe, Old and New Bradshaws and Ladywash on Eyam Edge to be worked during the decade and although a loss of £1,400 was sustained, ore worth £31,500 was mined.

The last recorded figures of output at these mines during the Barker and Wilkinson partnership, for 1806, show production and profit at a few mines still running at a high level, with the exception of Breachside Sough where output had declined to £690. Shining Stone Sough mined ore worth £3,581 and made a profit of £1,606. Blythe Sough extracted ore valued at £2,350 and made £1,674 profit. Watergrove produced ore sold for £5,815, of which £2,725 was profit. Compared with the amounts of ore mined by the concern forty years before, it is apparent that the quantity had fallen appreciably by 1806.

The customary practice in lead mining was to divide the ore in proportion to the holdings of the various partners, who then proceeded to send it to their smelting plants. It was customary, too, for the lead merchants to lease the duties of lot and cope in the various liberties which, as they were paid in ore, gave them further supplies for their smelting plants and there was always, in addition, the possibility of making a profit on the transaction. John Rotherham of Dronfield, for example, leased these duties together with two thirds the tithe ore in Great Hucklow, Bradwell, Castleton, Peak Forest, Fairfield and Chapel from the Duke of Devonshire in 1710 for £240 for the first two years of the lease and £300 for the subsequent period. He, however, was unfortunate in his bargain and was soon petitioning the Duke for permission to surrender the lease on the grounds that in the whole of this area only one mine was at work in Great Hucklow, the remainder

being drowned out. Samuel Rotherham was still in possession of this lease in 1735, when he successfully petitioned the Duke for a rebate of £100 in the rent "in Regard to the badness of the Mines." ^I Richard Milnes and the two Wilkinsons purchased the unexpired portion of the lease of lot and cope in the King's Field for a period of 13 years in 1742 for £1000. The ore collected in this Liberty for these dues was smelted at Harwood Cupola. In the last decade of the eighteenth century, Barker and Wilkinson leased these duties in Calver Liberty from the Eyres of Hassop for £80 a year. During this period, they made a profit of over £900 on the transaction. The owners of some liberties preferred to collect these dues themselves and in these cases, it was the usual practice for the smelter to contract for the purchase of this ore. During the last years of their partnership, Barker and Wilkinson regularly bought the lot ore from the mines at Tideswell from the Archer family and that from Hucklow collected by the Bagshawes. Finally, it was always possible to purchase ore from the independent miner and from the men working over the "old hillocks" on the sites of abandoned mines or near the old smelting mills, digging out low grade ore discarded before the introduction of the cupola. Barker and Wilkinson, for example, bought ore worth £4,000 from these sources between 1801 and 1807 in the Liberties of Castleton and Bradwell. ²

Throughout the eighteenth century, the merchant controlled the smelting side of the industry. Apart from the smelting mills mentioned previously at work in the Hundred of Scarsdale in the early part of the century, merchants in this area and in Sheffield worked smelting mills in other parts of

1. Box I362. Jackson Collection. Sheffield City Library.
2. An Account of ore bought by William Wyatt for Messrs Barker and Wilkinson. No.506. Bagshawe Collection. Sheffield City Library.

Derbyshire. The Bright family smelted ore at Barbrook Mill on the East Moor above Baslow. Henry Thornhill worked Beeley Mill. Joseph Clay rented Padley Mill, near Grindleford from John Spencer of Cannon Hall in 1756. By far the greatest concentration of smelting plant in the county, however, was in the hands of Barker and Wilkinson who, in the sixties, were working four of the old type of smelting mill at Shacklow on the Wye, Stoke and Calver alongside the River Derwent and Barbrook in addition to their two cupolas at Harwood and Topley. Technically, the smelting mills were obsolescent by this time. They were, however, well sited as regards ore supplies, a fact which together with their proximity to the woods along the Derwent and the Wye valleys may account for their belated survival. Shacklow was near to Wheal Sough and Hubbadale and the other three mills were near to the mines in Calver and Eyam. Stoke closed down in 1769, Calver and Barbrook in the following year and Shacklow in 1775. After that date, the partnership relied exclusively on its cupolas for smelting.

In the first quarter of the eighteenth century, the pig lead manufactured at the various smelting mills on the East Moor was transported to Bawtry by road. It was then dispatched down the River Idle by keel to Stockwith and then down the Trent and Humber to Hull. With the improvements made in the River Don in the second quarter of the century and the building of Topley Cupola, a considerable amount of lead was transported first to Rotherham and then to Tinsley, once the river had been made navigable to that point. Unfortunately, there is little statistical information as to the volume of traffic in metal along these

rivers, except for the period immediately before the opening of the Stockwith Canal, when it was estimated that the Idle carried 802 fodd^Iers and the Don Navigation 3000 fodd^Iers. Once the Stockwith Canal was opened, the two river navigations seem to have lost the greater part of the traffic in lead. The quantities of lead carried by this canal reflect all the vicissitudes of fortune suffered by the industry between 1779 and 1815. In 1779, the first full year for which statistics of traffic are available, 3,429 fodd^Iers of lead were carried. During the War of American Independence traffic fell off, the worst year being 1780 when only 1,052 fodd^Iers were carried. With the termination of the war, traffic speedily recovered and in 1785 the quantity of lead freighted rose to 3,870 fodd^Iers. The renewal of war led to a rapid fall in the amount of lead transported on the canal between 1793 and 1802. At the opening of the French Revolutionary Wars, lead traffic was 2,714 fodd^Iers; by the Treaty of Amiens, it had declined to 607 fodd^Iers. The rapid increase in lead prices caused by speculation in the metal after the renewal of the war brought about a revival in the industry and in 1806 some 2000 fodd^Iers were carried on the canal. The imposition of the Continental System and the subsequent collapse in the price of lead, however, caused another fall in the quantity of metal sent by canal, which by 1812 had sunk to 643 fodd^Iers. Worse was still to come and in 1814 lead traffic had declined to 334 fodd^Iers in 1814.

The system of marketing the lead smelted on the East Moor changed greatly during the century. In its first half, lead was sold at Chesterfield Fair and at Bawtry, Stockwith and Thorne to such Hull merchants as James Mould, William Cookson

I. A. Raistrick. "Two Centuries of Industrial Welfare. P.85. (1938); M.D. 1740/18. Papers relating to the making of the Sheffield Canal. Sheffield City Library.

and Charlesworth and Edge, who arranged for its sale to merchant houses in London. ^I By the middle of the century, Alexander Barker was selling lead direct to London, cutting out the Hull intermediary. In the late 'sixties, it is obvious that Barker and Wilkinson were selling lead direct to the United Provinces, as the latter family settled their accounts with Barker in bills, many of which were drawn on merchants in that country. In the last twenty years of their partnership, the greater part of the lead handled by this concern, apart from small amounts marketed by Rodmell and Wilkinson, their branch establishment in Hull, was sold to London merchant houses, particularly to Yeat, Brown and Scott in St. Mary Hill, London. After the dissolution of the partnership, George Barker and Company sold most of the lead smelted at Harwood, except for small quantities purchased by Rodmell at Hull and Joseph Walker and Company in Derby to such London houses as Walker, Maltby and Company, Thomas Preston and John Ellil, until that plant closed down at the end of the Napoleonic Wars.

After Waterloo, little capital found its way from Sheffield and the Hundred of Scarsdale into the lead industry in the Peak. Falling prices made the industry an unattractive one for the investor. Thrown back on its own resources of capital, it lacked the equipment necessary to deal with the problems involved in deeper mining. The inevitable consequence of this during the next quarter of a century was a rapid fall in output, a considerable volume of unemployment and of migration from the Peak.

THE CHARCOAL IRON INDUSTRY IN THE SHEFFIELD REGION 1500 - 1750.

By Defoe's day, Sheffield had already acquired that blackness which was to become the characteristic colour of the English industrial town in the next century. More than any other place in the Liberty of Hallamshire and the Hundred of Scarsdale, the town owed its importance in the early eighteenth century to industry rather than to commerce. Its domestic workshops manufactured a great variety of products. They made files; knives for butchers and shoemakers; pen, spring and pruning knives; horse shears; scissors for barbers and tailors; frying pans; planes, chisels, awl blades and punches for joiners; table cutlery of every type and razors ornamented in every conceivable fashion, all famous for their quality throughout the world.^I

The countryside north and south of the town was, for its day, highly industrialised. The hilly, broken country in North Derbyshire, around Eckington and Norton, was full of the sound of grinding wheels sharpening saws, sickles and scythes. Villages nearby, such as Barlow and Bolsover contained many small holdings, where men plied the trade both of farmer and of smith, making nails or horse harness. North of Sheffield, there were again many small holders in the parish of Ecclesfield, who added to their income by making nails. In all, although the figure is undoubtedly inflated, the Company of Cutlers in 1726 estimated that there were some 20,000 men employed in Hallamshire in these secondary metallurgical industries. Behind this labour force,

I. Invoice of a case of hardware bot here on acct of Mr. Rd. Norcliffe -- in an adventure to Petersburg. Letters of Mr. Richard Dalton 1735-47. Bagshawe Collection. 5/4/I - 3. John Rylands Library, Manchester.

supplying it with the semi-manufactured material it required, were the forges and slitting mills in and around Sheffield. These ironworks and their associated blast furnaces were central to the economy of the whole district, the prosperity of which was largely dependent upon the capacity of these works to supply the local factors and nail chapmen with forge and rod iron at prices competitive with those of similiar materials manufactured in other parts of the country.

THE RAW MATERIALS.

Initially, the iron industry had been attracted to the area around Sheffield by its large ironstone reserves, by its ample water power and by its extensive woodlands.

The ironstone rakes, as they are known in the area, lie between the Silkstone and Barnsley seams of coal. They outcrop in a zone commencing to the west of Barnsley in Hugset Wood, continuing through Dodworth, Broom Royd, Friar Tale and West Woods and Tankersley Park to Greasborough and Rawmarsh. From there, they continue into Derbyshire through Eckington, Staveley, Chesterfield, Wingerworth and Stretton to Swanwick, on the southern boundary of the Hundred of Scarsdale. The ironstone is in the form of nodules, of which a quarter to a third is iron. In the eighteenth century, ore was mined at many points along the basset of the ironstone, particularly in the vicinity of the blast furnaces. The pits and soughs which drained the rakes were made at the expence of the ironmasters, who then contracted with the miners to pay them so much a dozen for the ore raised. To secure the maximum yield of iron from the stone, it was either washed or burned with slack before it was charged into the blast

furnace.

The broken topography of the Sheffield region, with its alternation of ridge and valley had led to the development of a large number of small, swift flowing streams running down to the Don and its chief tributary, the Rother. The Tudor period had seen the banks of many of these rivers occupied by ironworks. In 1500, Thomas Leake, Bailiff of the Hundred of Scarsdale was indicted for digging ironstone in the King's Ground and for diverting a stream at Newbold, near Chesterfield to drive his own iron smelting works; in 1545, Richard Curzon mortgaged to Nicholas Hunloke " the ironworks at Wingerworth and the woods and ironstone delph and water course"; in 1574, there was an ironworks on the Shrewsbury property at Stretton^I; in 1578, an ironsmithy is mentioned in a conveyance of the Barley estate at Barlow, outside Chesterfield;² in the same year, there were ironworks at Norton, along the river which then formed part of the county boundary; in 1578, there were smithies on the Shrewsbury property at Oxspring in the wild, upper part of the Don valley and twelve years later, there were ironstone mines at Tankersley, a furnace at Wadsley and fineries at Kimberworth on the same estate.³ At the end of the century, Elisabeth, Countess of Shrewsbury, as is shown by a wage book, now at Chatsworth, owned an ironworks in the upper part of the Rother valley at North Wingfield. Probably, the two bloomeries in the Loxley valley, two more at Walton near the source of the River Hipper in Derbyshire, that at Barnby and the bloomeries and iron mills

I. Note Book of William Dickinson, Bailiff of Hallamshire. M.D. 192. Sheffield City Library.

2. D.D.P. 3/I. Portland MSS. Shire Hall, Nottingham.

3. Notes from the Duke of Norfolk's Court Rolls and the Earl of Shrewsbury's Accounts. Leader Collection. Nos. II7 and II8. Sheffield City Library.

worked by the Wortley family at Silkstone and Wortley, all productive during the Early Stuart period, date from the previous century.

The first half of the seventeenth century saw a rapid expansion of the iron industry in the area. Near Chesterfield, a new furnace was put into blast on the Cavendish property at Barlow in 1605. From references in deeds, it is highly probable that a forge was also erected lower down the valley of the Barlow Brook.¹ Three years later, another forge and furnace were built alongside the Don at Kimberworth.² Probably about the same time - the date is uncertain - another furnace and forge were erected on the Frechville property near the junction of the Rother and the Handley Brook at Staveley. In South Yorkshire, another forge was built at Wortley in the 'thirties on the site of an old corn mill, if the evidence pleaded in a tithe suit a century later can be accepted.³ Chapeltown Furnace, at the head of the Blackburn valley, had been built before Harrison made his famous survey of Sheffield Manor in 1637. Probably as a result of the opinion expressed in "The Description of the Manor of Sheffield" that ironworks could be built in Sheffield Park using its abundant ironstone and "its great store of very stately timber" ironworks were built there at some time during the next few years, to be leased later by the great South Yorkshire ironmaster, Lionel Copley.⁴

1. Barlow Deeds 42/64 and 73/9. Portland MSS. Shire Hall, Nottingham.
2. H.R. Schubert "The Shrewsbury Letters. A Contribution to the History of Ironmaking." Journal of the Iron and Steel Institute. Vol. 155. P.524.
3. A Brief of the Accompts of Mr Bright for all ye rents -- belonging to the Right Hon. Thomas Earle of Arundel and Surrey. 1633-41. No.26. Papers of the Brights of Carbrooke and Badsworth. Wentworth Woodhouse MSS. Sheffield City Library.

George Sitwell, the most important Derbyshire ironmaster of this period, built Foxbrook Furnace in 1652 alongside a tiny tributary of the Rother and a slitting mill at Renishaw near the main stream. In the same year, Sir Francis Rockley built another blast furnace by the side of a small stream running down to the Dove near Wosborough.¹ Two years later, Sitwell undertook to build a forge at Carburton in Nottinghamshire on what before the Civil War had been land owned by the Earl of Newcastle.² In addition to these ironworks, there were during the Commonwealth, others at work at Whaley and Pleasley, both in the thickly wooded zone on the borders of Derbyshire and Nottinghamshire, their bellows and hammers driven by streams rising in the nearby magnesian limestone ridge.³

The Restoration saw the end of new construction in the iron industry in North Derbyshire and South Yorkshire. Expansion, however, continued in Nottinghamshire, the iron industry of which was to be integrated financially with that of the Sheffield region in the early part of the next century. A new furnace was put into blast at Kirkby c. 1673 by the Midlands ironmaster, Humphrey Jennens of Erdington Hall, Warwickshire, and John Wheeler of Woolaston Hall, Worcestershire, undertook in 1695 to build a new forge with two fineries and a chafery at Carburton on the site of that previously erected by George Sitwell in 1654.⁴ Both these ironworks were sited along streams flowing from the magnesian limestone ridge amidst a thickly wooded countryside.

1. An Abstract of the Case of Francis Rockley Esq. Nos. 765-8. Wosborough Muniments. Sheffield City Library.
2. Portland MSS. Shire Hall, Nottingham. (uncatalogued).
3. A Breviate of the Survey of the 21 Townships within the Hundred of Scarsdale. 1641-65. D.D.P. 59/21. Portland MSS. Shire Hall, Nottingham.
4. D.D.P. 15/1 and 5/76. Portland MSS. Shire Hall, Nottingham.

Much more important than either limestone or water power as a locational factor in the siting of the iron industry in the seventeenth and early eighteenth centuries was a supply of charcoal. At this time, as may be seen from an examination of the timber purchases in the Journals of the ironmasters, the area around Sheffield was well wooded.

On the eastern side of Derbyshire, many magnificent woods grew on the great ducal estates and on the properties of the gentry situated along that magnesian limestone ridge which forms such a prominent topographical feature in this part of the Hundred of Scarsdale. On the extreme southern tip of this formation, timber books now at Hardwick Hall, show that there were many small woods of deciduous timber in the vicinity of the house and nearby at Glapwell, Stainsby, Heath and Tibshelf. The Duke of Devonshire also owned other woods not far from the Hall at Houghton and Langwith. A few miles from the latter place, there were 387 acres of woodland on the property of Lord Bathurst in Scarcliffe Park. Further north, where the three counties meet near Shireoaks, there were large woods on the Portland estate around Whitwell; on the Worksop Park lands of the Duke of Norfolk; on the Hewett estate at Shireoaks and on that of the Rodes family at Gateford and Haggonfield.

Over the county boundary in Nottinghamshire, some of the finest timber in the Kingdom grew on the magnesian limestone plateau and on the otherwise infertile Bunter Sandstones. Although 2238 trees had been felled on the Harley property at Welbeck by the Spencer group of ironmasters between 1713 and 1723, an observer riding round the Park in the last mentioned year, noted some of



the finest timber he had ever seen with trees " some being 60, some 70 and some more feet clear in the shaft." ^I This same family also owned large woods at Mansfield, Blidworth and Harlow. The estates owned by Lord Galway at Serlby and by the Pierrepont family at Thoresby were also well wooded.

Further north, over the county boundary there were extensive woodlands on the Yorkshire estates of the Duke of Leeds around Harthill, Anston, Wales, Linderick, Todwick and Kiveton Park. In 1719, timber worth £15,000 was sold from these woods. The estates of the Aythorpe family around Dinnington and Gildingwells, too, carried a fair amount of timber. Near Roche Abbey Forge, the countryside around the Sandbeck property of Lord Scarborough carried magnificent woods at Maltby and Stainton. South of Doncaster, there were other extensively wooded areas on the Copley property at Sprotborough; on the Foljambe estate at Wadworth and on the lands of the Bright family at Edlington, where there were well over 400 acres of timber. The importance of this group of woods to the charcoal iron industry in South Yorkshire during the first half of the eighteenth century cannot be over estimated. Throughout the whole of this period, almost the whole of the charcoal required by Roche Abbey Forge was supplied from this district. In addition, there were many years when Chapeltown Furnace drew the larger part of its charcoal from this source. For example, in 1729 when some 1176 loads of charcoal were consumed at this furnace, 455 loads came from the woods at Wadworth. In the next year, when that furnace used 662 loads, almost the whole of this amount came from these woods. In 1732, 1737 and 1739 woods on the magnesian limestone

formation provided approximately half the fuel for this furnace.

The coalfield, too, was exceptionally well wooded. Much of this was not worth cultivating as the land in many areas was too broken or too steep for farming. In other districts, the soil composed of weathered outcrops of ironstone or coal was too infertile to be of much value for agriculture. In such circumstances, timber was the most profitable crop.

South of Chesterfield, there were over 500 acres of woodland on the ridges behind the furnace on the Humloke estate at Wingerworth. West of the town, on the edge of the East Moor, were large woods at Linacre and Smeekly, the latter one of the few properties owned by the Duke of Rutland in this part of Derbyshire. Near them, there were another 500 acres of timber in the wedge shaped mass of woods in Cobnar, Henpit Leyes, Rough Carr, Crabtree Spring, Monk Wood, Lounds Wood and Bull Close, growing on the hogsback between the River Drone and the Barlow Brook. Just after the Restoration, these woods around Barlow, then once more in the possession of the Earl of Newcastle were believed to contain 4000 cart loads of timber, 1600 of ash wood, 5000 of spring wood, 2000 of log wood and 40 cartloads of "grove" timber for the lead mines. ^I Between 1701 and 1709 some 5726 cord of timber were felled in these woods. Over the next ridge to the east, crowned by Ramshaw Wood overlooking the road from Sheffield to Chesterfield, there were over 200 acres of timber in Lightwood and High Bramley and in other coppices on the Crown Manor of Eckington. Surveys of the Cavendish Manor of Staveley and of the Pole family property at Park Hall show both to have been well wooded at this period. Nearby, Newman Woods at Spink Hill

provided 350 loads of charcoal in 1708 for the adjacent forges and furnaces. The broken country on the borders of Derbyshire and Yorkshire was densely wooded. Small properties here, such as those of the Staceys of Ballifield, the Fentons of Gleadless, the Bagshaws^w of the Oakes, the Offleys of Norton Hall, the Burtons at Birchett and the Mowers of Unstone Hall carried a large number of small coppices. Over the county boundary, in the valley of the Sheaf, there were 178 acres of timber at the end of the seventeenth century on the Beauchief Hall property of the Pegge family and another magnificent series of woods - Coppy, Smithy, Burton, Knockhouse and Brushwood - totalling 400 acres on the Bright estate in Ecclesall.

In the first half of the eighteenth century, the South Yorkshire coalfield was even more heavily timbered than the corresponding district in the Hundred of Scarsdale. In particular, the Norfolk estate was densely wooded. In 1719, there were more than 2500 acres of woodland on this property, capable of providing 1190 cord of timber annually. The largest single area of woodland on this estate was alongside the road linking Sheffield with Barnsley, where in Hesley Park and Smithy Wood there was a block of timber some 430 acres in extent. Near these were the 62 acres of Park Wood. A few miles to the west, poised on a ridge overlooking the Don and the moors beyond were the 310 acres of Grenna Wood. Near this were Upper and Lower Hall Woods covering 175 acres. Below Grenna, near Outibridge, was Beeley Wood covering 60 acres on the east bank of the Don. To the west of the Sheffield to Halifax road were another 90 acres of timber

in Wheata and Prior Royd Woods. Other large woods on the Norfolk estate near Sheffield were the 145 acres of Shirtcliffe Park and on the east of the town, Canklow Wood with its 247 acres of timber, another 68 acres in Treeton and a further 100 acres of woodland in Handsworth. In addition, there were another 27 copses each smaller than 50 acres scattered about the district.^I

Other aristocratic properties rich in timber were the estates centred upon Wortley Hall, Wentworth Woodhouse and Wentworth Castle. On the first named, there was the huge mass of woodland stretching for mile after mile through Wharnccliffe Chase, clothing the slopes towering above the Don. Further north, there were another 100 acres of timber on this estate around Pilley, most of it in coppices.² Timber covered over 1000 acres on the Rockingham property at Wentworth Woodhouse. The largest single wood owned by the Marquis was, however, to the south of his mansion, near Sheffield, at Tinsley Park, some 358 acres in extent. The remainder of his woods were chiefly in small copses. There were another 350 acres of timber in Wosborough and Stainborough on the Wentworth Castle property.³ In this area, as in the corresponding district in North Derbyshire, the estates of the minor country gentlemen such as those of the Bamforths in Owlerton, the Watts in Ecclesfield, the Staniforths in Darnall and the Edmunds in Wosborough carried a considerable amount of timber.

These woods were of two distinct types. Almost all the coppices and a few of the large woods were what were known to

1. Papers relating to the Sheffield estates of the Duke of Norfolk. British Museum. Add. Mss. 27538. f.320.
2. Pilley Survey.n.d. No.14. Wharnccliffe Mss. Sheffield City Library.
3. Wentworth Castle Maps. Nos. 19 and 20. Sheffield City Library.

lawyers as Sylva Caedua and to the ironmasters as spring woods. These were felled at intervals of twenty years to within a few inches of the ground, leaving the bowl of the stool as entire as possible so that it could send up new shoots, which after growth could be cut again. A number of what were variously known as wavers, standstills, referees or standards were left to grow to maturity to provide the shade beneath which the spring woods could grow once more, although some considered this to be bad forestry practice as the drip of rain from the larger trees on to the smaller was believed to be harmful - as Battie, the Sheffield lawyer writing about the woods on the Wortley estate in 1726 neatly put it " the larger those tree grow ye worse will be ye underwood." In the larger woods, trees were generally allowed to grow to maturity, being felled at intervals of from sixty to eighty years. In both cases, the purchaser paid an initial deposit, the remainder of the sum being paid in instalments during the period of felling. The method of valuation was, however, completely different as whereas spring woods were sold by the acre, each fully grown tree was sold separately.

The larger woods were divided into a number of falls so that the owner was able to market a certain amount of timber each year, an arrangement mutually advantageous to both grower and user. As an example, in 1693 one part of Grenna Wood was divided into three sections, each of 100 acres. At that time, the first of these was one year, the second contained trees of six years growth and the third trees seven years of age. ~~In the~~ In the same year, Hall Wood was divided into falls of 90 acres, I. Goodwin v Wortley over the Tithes of Tankersley. No. 99/57. Wharnccliffe Mss. Sheffield City Library.

three, four and five years old respectively. A much more detailed plan extending over the next twenty years and involving all the woods on his property was worked out by the Marquis of Rockingham in 1723.^I According to this scheme, the first wood to be felled on his estate was to be Tinsley Park, which was to come down in seven falls each of 50 acres and the timber of which was to be sold to Attercliffe Forge for conversion into charcoal. Westwood was then to be felled in four falls each of 39 acres between 1731 and 1735 and its cordwood sold to Chapelton Furnace for coling into charcoal. In the next year, Harley Spring and two other coppices were to come down. In 1737, six copses totalling 37 acres were to be cut and in the following year two more small woods were to be felled. Scholes Wood, 100 acres in extent, was to be felled between 1738 and 1740 and finally in 1741, four copses would be felled to complete the programme. In 1749, another scheme was worked out to include 400 acres of timber in Edlington and another 60 acres of woodland at Hoyland which had been acquired and to cover all fellings until 1770.

The timber accounts kept by the ironmasters enable their readers to visualise all the processes involved in the felling of these woods. First, the arrival of the woodward and the buyer's valuer to price each individual tree or in the case of spring woods a surveyor with his man "leading the chain" to determine the acreage; then the coming of the woodcutters to make their bargains for felling the woods, each receiving his earnest money when the contract had been concluded; next, the

I. A Scheme for bringing the Severall Spring Woods into a Regular Fall every Twenty Years. A General Rent Roll of Estates in England. 1723. Wentworth Woodhouse MSS. Sheffield City Library.

arrival of the tanners to bid for the bark and finally the construction of cabins for the men and the opening of roads through the woods before the actual felling commenced. Once felled, the tops and boughs of the trees were lopped off to provide cordwood for charcoal, the trunks being trailed down to the saw pits where they were roughly squared before being carted off elsewhere or sawn into planks, sleepers for Newcastle railways, tile lathes or anvil blocks for the forges. The bark in the meantime had been stacked, chopped and taken to be dried in kilns before sale to the tanners. Lastly, where it was decided not to make a spring wood, the tree roots were stubbed up and either converted into charcoal or sold to button makers. The ground was then ploughed up, young trees planted, fences put up to keep out cattle and apart from undergrowth being cleared periodically and trees thinned out every ten years, the timber was not cut again for at least sixty years.

There can be little doubt that there was less timber available for the iron industry in the early eighteenth century than had been a hundred years earlier. One reason for this was the diminution in the timber reserves of the area, brought about the extensive destruction of woodland and the enclosure of parkland which had occurred during the previous century. According to an account book, now at Chatsworth, a part of Langwith Park was enclosed in 1604. An early seventeenth century survey of the Manor of Bolsover, shows that the parkland below the castle had all been enclosed for farming by 1636. ^I A survey of the Manor of Staveley made in 1639 and now at Chatsworth

I. Wm Senior. Plan of Estates belonging to Wm. Cavendish. Earl of Newcastle. 1629-32. Welbeck Abbey MSS.

shows that a large part of the park had been enclosed and turned into farm land. According to the evidence offered in the tithe case previously referred to, the Old Park in Wharncliffe Chase had been disparked in the middle of the previous century and had since " been divided into Several Closes and farmed and lett to tenants who had since sowne the same with Corne." Other evidence in this case suggests the disappearance of 1100 acres of woodland in this district in the last three quarters of the seventeenth century. During the early part of the Restoration period, part of the Park at Worksop Manor was enclosed and converted into farm land.¹ Almost at the same time, the splendid timber in the Rivelin valley was felled by the great Yorkshire ironmaster/^{Lionel Copley} and as no replanting was done the district was turned into a desolation. Haw Park in Bradfield was felled about the same time and converted into pasture land. To the east of the town of Sheffield, much of the timber eulogised by Evelyn was cut down in 1690 and never replanted. Later, the devastation of timber on the Norfolk estate was completed by the disparking of Sheffield Park in 1706 and the cutting down of its timber. Three years before this, another section of Langwith Park on the Devonshire property had been enclosed, the timber cut down and the land turned into arable. In 1707,² part of Gateford Park had been stubbed up and made into farms.² Thirteen years later, another part of Staveley Park was ploughed up for farm land and the two parks around the great medieval manor house at South Wingfield were enclosed and ploughed up about the same time.³

1. Worksop Manor MSS. Norfolk Estate Office, Sheffield.
2. Sir John Rodes v Duke of Norfolk. Barlborough Hall MSS, Derbyshire.
3. Reynold's Derbyshire Notes. B. 12/2/17. Bagshawe Collection. John Ryland's Library, Manchester.

Against this loss of timber can be set the large number of trees planted according to the terms of farm leases in the hedgerows of newly enclosed fields. As early as 1730, the hedgerows around Edlington yielded 337 cord of timber to be made into charcoal for the furnaces and forges of South Yorkshire; trees on the estate of the Marquis of Rockingham, growing in the hedgerows at Wath provided a considerable amount of charcoal in 1746 for these ironworks and other ironworks' accounts in Derbyshire for the third quarter of the century show extensive felling of hedgerow timber. Nevertheless, in quantity there was no comparison between this gain and the amount lost by disparking and by the conversion of woodland to farm land.

Although the amount of timber available was less than had been the case during the early seventeenth century, the demands for wood during the next century were many and varied. The accounts of Ogston Carr, a small spring wood of some 30 acres in the south west corner of the Hundred of Scarsdale felled between 1736 and 1738 show the many uses to which this kind of woodland could be put. From this coppice, the ash trees were sold to make cart wheel spokes and spade and sickle handles; 13,000 hop poles were sent to Boughton in Nottinghamshire; 9060 lathes were made for roofing; 8400 palings were sold for fencing and other timber was sold for building spars and for " grove " timber for lead mines at Crich. Finally, the rammel was bought by a Derby soap boiler for fuel.

There were other markets for fully grown trees. One specially valuable market was the Peak of Derbyshire, where few trees grew except in the valleys of the Derwent and the Wye and

I. Turbutt MSS. Ogston Hall, Derbyshire.

in the deep cloughs which furrowed the sides of its hills. Here, the lead mines with their constant demands for timber for rails and corves, for engines and ladders and for buddles and bunnings provided a market for a considerable amount of timber grown in other parts of the county. Alexander Barker, for example, one of the most important lead mine owners in the Peak, was buying timber on a large scale around Dronfield in 1752.¹ Two years later, Barker and Company were engaged in felling woods owned by the Duke of Leeds at Anston and in conjunction with Joseph Briggs, the agent of Lady Oxford, at Barlow outside Chesterfield.² In 1761, Alexander Barker in conjunction with the two leading Chesterfield lead merchants, Richard and John Wilkinson; Joseph Whitfield, the agent of the London Lead Company and Nicholas Twigg, an important lead merchant in the Peak, was purchasing woods in North Wingfield, Walton and Brampton. Coal and ironstone mines, too, formed a small but steadily expanding market for pit props as they grew deeper and their headings longer.

Timber was also used on a growing scale for civil engineering. Around Sheffield, wood was used on a large scale for piling the banks of the River Don to protect them against erosion. The Norfolk Estate accounts for the years 1710 and 1711 show timber being felled in Burngreave Wood for repairing Woodhouse Mill weir and for strengthening the river banks at Neepsend and at Owlerton Bridge. The construction of coalways in Sheffield in 1722-3, at Kimberworth in 1742-5 and at Park Gate took a considerable amount of timber. Work on the Don Navigation used large

1. Wood Accounts for various mines. No.473. Bagshawe Collection. Sheffield City Library.
2. Alexander Barker and Company. Cash Account Book 1752-9. No.486. Bagshawe Collection. Sheffield City Library.

quantities of timber for temporary scaffolding and for such jobs as the construction of lock gates. Another waterway which required large amounts of wood for similiar purposes was the canal from Chesterfield to Stockwith, the Board of which took the precaution of buying five woods near its course in 1773 for these uses.

Timber also had many uses in mechanical engineering. Wood rather than iron was the material used by the millwright in the first half of the eighteenth century. When Carburton Forge was rebuilt in 1695, woods on the Welbeck estate provided timber not only for the actual building but also for the construction of much of the forge machinery. ^IThe Norfolk Estate accounts in the year 1711 show wooden cog wheels being made for Woodhouse Mill and bends for a water wheel at Rivelin Mill. Two years later, the Duke gave wood for the repair of Brightside and Kelham Wheels. In 1715, more timber was given for the repair of Parker Wheel and the mills at Bradfield and Ecclesfield Moor. The ironworks, with their many water wheels and wooden machinery required large amounts of timber for their maintenance. As an example, the 1719 Journal of John Fell I shows John Vintaine, who was responsible for the millwright work at the Duke of Norfolk's Ironworks along the Don, working 120 days at Attercliffe Forge putting in a new forge hammer and hammer wheel made from timber felled at Kiveton and Wentworth and another 94 days putting in a new chafery frame and new finery wheel from timber felled in a spring wood at Wentworth. In addition, he put in new flood gates at Attercliffe Forge; new helves at Roche Abbey Forge and new bellow, hammer beam, chafery wheel and shuttles at Wadsley Forge.

I. Day Book Timber Deliveries. 1695-6. D.D.P. 7/12. Portland MSS. Shire Hall, Nottingham.

In addition to the timber used within the district, a considerable quantity was exported from the area. John Spencer of Cannon Hall, the great South Yorkshire ironmaster, was selling timber from woods at Wheatley Hill in 1725 to Newcastle for rails. Three years later, his accounts show further sales of this commodity from Hugset Wood through Knottingley to the North East Coalfield. The improvement of the River Don up river, first as far as Rotherham by 1733 and then to Tinsley in 1751, led to a great expansion of the timber trade along this navigation. The Journals of John Fell II show large sales of Newcastle rails down river in the 'thirties and 'forties of this century. In 1730, Newcastle rails worth £1711 were forwarded by road from West Wood and Tinsley Park to Doncaster for shipment. Five years later, large amounts were sent from Tinsley Park to Thorne to be forwarded by coach. In the next year, more rails were shipped from Thistlebed Ford from the woods at Basingthorpe. In 1736, rails worth £277 were sold from Derbyshire woods felled by Denis Heyford, one of Fell's business associates. In 1738, William Spencer was selling both rails and wagon wheels to Newcastle. In the same year, John Fell II shipped 143 tons of rails from Swinton and Aldwark down river. The last year of this decade saw another 128 tons of Newcastle rails shipped by the Fell group. The Journals for the next ten years show shipments down river to Newcastle on a similar scale from woods in the vicinity of the River Don.

This diminution in the amount of charcoal available to the ironmasters resulted in the shutting down of various ironworks. Probably, the first of these to be closed was Barlow Forge,

which by the time of the Commonwealth had been converted into a mill.^I Entries in the Journal of John Fell II suggest that Norton Forge was shut down c.1690. Barlow Furnace was probably blown out for the last time at the end of the century and that at North Wingfield seems to have closed down about this time. Sheffield Forge was converted into a sickle wheel in 1700. Wingerworth Forge, listed in the Commonwealth survey of the Hundred of Scarsdale previously mentioned, had been shut down before 1717, as it does not appear amongst the property of the Catholic Hunloke family, registered with the Derbyshire Quarter Sessions in that year. The furnace there, according to this document had "not been employed for several years last past."² Wadsley Forge was temporarily closed from 1727 to 1731 on a account of a lack of charcoal. Foxbrook Furnace, described in a lease of 1749 as "now ruinous and in Great Decay" was converted into a sickle wheel in the following year. The Nottinghamshire and Derbyshire Journals of John Fell II show that Kirkby Furnace and Clipstone Forge were completely closed down from 1750 to 1765 and that Whaley Furnace was only in blast twice during those years. In the north of the region, a meeting of the Yorkshire ironmasters in 1769 decided that Barnby and Bank should be put in blast alternately and five years later both furnaces were shut down as there was only sufficient charcoal in that district to keep the furnace at Bretton in blast.³ Whaley Furnace had, in the meantime, made its last blast in 1770.⁴

1. Barlow Leases. 42/64. Portland MSS. Shire Hall, Nottingham.
2. Register of Estates of Papists 1716-29. Portfolio L. No.8. Derbyshire County Council Offices, Derby.
3. Diaries of John Spencer. 2 Jan 1769 and 23. Aug. 1774. Cannon Hall MSS. Sheffield City Library.
4. J. Farey "Agriculture and Minerals of Derbyshire." (1815). Vol.I. P.395.

The decrease in the supply of charcoal is also reflected in the allocations of charcoal specified in the leases relating to the different ironworks. When Copley established his ironworks in Sheffield, he paid £2000 in rent and in the purchase of timber, a sum of money which was subsequently never equalled for these purposes. In 1652, he was allocated 7000 cord of timber from the Norfolk properties for these ironworks. After the Restoration, when Copley and Richard Marriott leased the ironworks, the amount of cordwood allocated had been reduced to 1500 cords a year. In 1727, when John Fell II took over these works, the lease only called for a supply of 800 cords annually from the Norfolk woods. A similar decline, although not on so spectacular a scale, took place in the quantity of cordwood allocated to Wortley Forge from Wharnccliffe Chase. In 1683, when William Simpson leased the forge, the contract guaranteed him 800 cords a year. In 1706, when the forge was leased to John Spencer, this amount had been halved. At Carburton Forge, the quantity of cordwood contracted for by lease, too, steadily diminished. In 1703, 4200 cords were allocated from the Welbeck property. In 1734, the amount had sunk to 1500 cords a year and nineteen years later, when John Fell II and Joseph Clay took over the lease, the quantity had slumped to 600 cords annually.

This situation was not, of course, peculiar to the Sheffield region. The shortage of charcoal was felt as acutely in other iron making areas. The solution to the problem, that of substituting coke for charcoal as the fuel in the blast furnace was worked out in the early eighteenth century at Coalbrookdale by the Quaker ironmaster, Abraham Darby. No attempt

seems to have been made to introduce this technique into South Yorkshire until 1759 when John Fell II sent his blast furnace manager to Coalbrookdale " to learn how to blow with Ground Coals." Experiments were made with coke as a fuel at Chapeltown Furnace during the blast of 1761-2 but the attempt was a miserable failure as not only was the consumption of ore per ton of metal made the highest recorded but also the furnace had to be stopped on three occasions during its 23 weeks blast and at its end had to be rebuilt at a cost of £220. Three years later, another attempt was made to use coke as a fuel, this time at Staveley Furnace. Here, too, ore consumption was distinctly above the average per ton of pig iron made and charcoal consumption - neglecting the coke - little better than in the years when charcoal was used alone. It is impossible without further knowledge of the seam of coal used for the manufacture of the coke employed in these trials and of the design of the two furnaces to assign full reasons for the failure of this process at Chapeltown and Staveley. Certainly, one contributory factor was that limestone was not used as a flux. It is obvious from the Journals that these experiments were so discouraging in their results that no more were made.

Similar experiments were made with coke as a fuel at the various forges in South Yorkshire and North Derbyshire. Trials were made at Wadsley Forge in 1755 and again in 1759 and 1760; at Rochdale in 1757 and at Attercliffe in 1760. Here, too, the experiments were again a failure and the Ledgers make no further reference to the use of coke. Trials at Staveley proved, on the contrary, completely successful and this forge became a large scale user of coke after 1750.

THE PARTNERSHIPS.

The iron industry demanded large scale investment in the construction of furnaces, forges and slitting mills. In addition, a large amount of capital was tied up in stocks of ironstone and charcoal. Long term credit had to be given to customers. Consequently, the partnership was the normal form of business organisation in this industry in the Sheffield region in the eighteenth century.

A common feature of these partnerships was that they were vertically integrated organisations, controlling all the processes from the mining of the ore to the sale of the finished article. Each of these partnerships leased ironstone mines, bought and felled wood and made charcoal, rented forges to work up the pig iron, had shares in slitting mills and was actively engaged in the manufacture and sale of nails. There was, in addition, a strong tendency to horizontal combination in the industry, to amalgamate partnership with partnership with the object of gaining control over raw materials and markets, so that by 1727 almost the whole of the charcoal iron industry within the region was in the hands of a very small group of men. In this process towards greater integration in the industry, the descendants of the men who had built it up after the Restoration, most of them country gentlemen by the second quarter of the eighteenth century, were bought out by what might be termed the managerial element, who were, in the last phase of the history of this industry, in complete financial control.

In South Yorkshire, the most important ironworks were Chapelton Furnace and the forges at Attercliffe and Wadsley. Collectively, they were known as the Duke of Norfolk's Ironworks.

On the death of Lionel Copley, these had come into the hands of William Simpson, who it was alleged had used his position as executor to cheat the legal heir out of these works.^I In 1700, the partnership controlling these works included Simpson's son, John; Thomas Barlow of Middlethorpe, York who was a collateral descendant of Thomas Barlow of Sheffield, who had been William Simpson's partner and Denis Heyford, a descendant of the steward of Sir Francis Rockley, a Puritan, who had used his influence with the Parliamentary Committee for Compounding, to secure the outlawry of his master and the ironworks at Rockley for himself.

In addition, this partnership had come into possession of Sheffield Forge in 1692 on the bankruptcy of its lessee, John Eyre.² Two members of the partnership, Heyford and Simpson, each held a half share in the forges at Roche and at Laughton on the Sandbeck estate. Together, they owned a half share in the slitting mill at Masborough on the Don. Further north, the partnership held the derelict Stainborough Smithies on the Wentworth Castle property, Rockley Furnace near Wosborough and Bank Furnace, between Barnsley and Wakefield, the latter in partnership with William Cotton of Haigh Hall, who managed that furnace. Bank was worked in association with Knottingley Forge, in which Cotton, Simpson and Heyford each held a third share. Finally, this group was connected with the Company in the North, a steel making business in Newcastle. At the opening of the seventeenth century, the stock invested in these various concerns was £28,775, of which the Company in the North represented some £7000.

The retirement of the Sitwell family from active

1. Copley MSS. Yorkshire Archaeological Society, Leeds.
2. Tibbitts Collection. Deed No. 146. Sheffield City Library.

participation in the Derbyshire iron industry led to Staveley Furnace being taken over by John Jennens. However, at the beginning of the eighteenth century, this furnace and that at Foxbrook together with the forges at Staveley and Carburton and the slitting mill at Renishaw came into the hands of a partnership in which Barlow and Heyford each held a quarter share, John and William Simpson an eighth each and the remainder was held by John Fell I, who acted as Clerk at the Duke of Norfolk's Ironworks. Initially, the capital invested in this Nottinghamshire and Derbyshire Company was £3885 but by 1717 its assets had increased to £6780.

The partnership in the Duke of Norfolk's Ironworks underwent complete reconstruction in 1727, possibly as a result of the deaths of John Fell I and of some others of the original partners. Millington Heyford, the son and heir of Denis Heyford, took an eighth share as did Gervase Simpson. This new partnership was, however, dominated by John Fell II and by Arthur Speight, as each held a quarter share. These two men were also to act as clerks to the partnership. Gamaliel Milner, one of Fell's relations, a member of a family closely connected with Knottingley Forge in the early part of the century and who was to be in charge of timber purchases and sales, bought a sixteenth share in the ironworks. Newcomers to the partnership were a group of ironmasters in other parts of the West Riding. Chief amongst them was William Spencer of Cannon Hall, Cawthorne, the lessee of Barnby Furnace who took up five shares out of the thirty two into which the partnership was divided. James Oates of Dodworth, Francis Watts of Bretton Furnace and Colnebridge

Forge and John Watts of Kirkstall Forge each bought two shares. The total assets of the Duke of Norfolk's Ironworks at this time were valued at £15,000.

Before his death, Fell was able to increase his holding in the partnership. In 1734, he bought another sixteenth share from James Oates. In 1744, Millington Heyford's widow sold out her husband's original stock in the partnership in addition to the eighth which he had acquired from Gervase Simpson in 1737 and the half of John Simpson's stock which he had bought four years later, to Fell and Milner with the result that Fell then owned two shares and Milner eight in the concern. Fell had also increased his holding in the Nottingham and Derbyshire partnership as in 1750 he held three out of its eight shares. In 1759, he bought another eighth share from the Hortons of Chadderton, into whose hands it had come by marriage with the Watts family.

Fell's death and that of William Spencer again led to a complete reconstruction of the partnership in 1765. Fell died childless and the nominee of his widow, Walter Osborne of Ravenfield, a Sheffield merchant, as her representative in the partnership, found it impossible to work with the other members. Spencer had been succeeded at Cannon Hall by his son, John, a man of very different stamp from his father. Educated at Winchester and University College, Oxford he lacked the training essential to carrying on a great business. Like so many of his contemporaries, his interests were in his pack of hounds, in his stud and in his cellar. In October 1765, he informed his partners that he did not " propose being any longer interested " in the Duke of Norfolk's Ironworks. As a result the assets of this partnership were bought

by John Cockshutt of Wortley Forge; John Travers Younge, a Sheffield merchant; Richard Swallow, who had acted as clerk after Fell's death and Joseph Clay, who had married Speight's daughter, Elisabeth. The assets of the Nottinghamshire and Derbyshire Company, worth £7,944 were bought by Clay, Younge and Swallow, the former taking on the position of Clerk. This group worked Staveley Furnace, Carburton and Staveley Forges and the slitting mill at Renshaw until 1783 when, as is shown by a memorandum in the Hardwick Estate Office in Chesterfield, the Duke of Devonshire refused to renew the Staveley lease.

Situated alongside the Don in the upper part of its valley in Thurgoland were a wire and slitting mill. Associated with these were the two forges at Wortley lower down the river. These latter were leased by William Simpson in 1683 for seven years. In 1695, Thomas Dickin of Kirkstall Forge took over the lease and worked the forges until his death in 1700. Probably, the ironworks may then have come into the hands of John Simpson, Thomas Barlow and Denis Heyford as a note in the 1708 Journal of John Fell mentions a second lease of Wortley Forge by this partnership. In 1706, the forges were leased by John Spencer of Cannon Hall. After his death in 1729, they were managed by a relative, Matthew Wilson, who was a partner with Spencer's two sons, William and Edward, in the Thurgoland wire and slitting mills, together with James Oates of Dodworth and William Murgatroyd, who managed the business. Wilson, Oates and Murgatroyd were also partners in another wire and slitting mill at Derby and in Seamor Forge in Yorkshire. The total assets of this partnership

I. C.R. Andrews. The Story of Wortley Ironworks. (1956).

was computed to be worth £32,197^I in 1738. The finances of these works in the Don valley became most entangled as Oates and Wilson had run up heavy debts on account of the mills at Thurgoland for Wortley iron. Probably, this was to offset Wilson's claim to a half share in the iron making interests of the late John Spencer, which he had inherited by the will of Spencer's younger son, Edward, who so it was alleged had been on extremely bad terms with the elder brother, William. The latter refused to recognise the will, declaring that his brother " had been teased and importuned to death by Mr. Cockshutt" whose son, John, was the heir to his uncle Matthew Wilson. William Spencer leased Wortley Forge after Wilson's death, but on these matters being submitted to arbitration, he was compelled to surrender the forge to Cockshutt.² The latter then took over the lease of Bank Furnace to supply Wortley Forge with pig iron. To find the necessary capital for working these plants, Cockshutt went into partnership with a Sheffield merchant, Joseph Broadbent, who had extensive interests in the nailing industry, aided by a loan from Wortley, the owner of these ironworks, of £10,000 in 1743.

THE CLERK.

The key man in the charcoal iron industry was the clerk. Generally, like the two Fells, father and son - although the former only obtained a share in the Duke of Norfolk's Ironworks in 1716, when he bought half of Barlow's stock for £667 - Arthur Speight, Joseph Clay and Richard Swallow, the clerk was a partner in the business. Under him was a wood salesman, responsible for making arrangements to sell and cole timber. At each furnace and

1. Winding up Wortley Forge Business. Letter dated 17 Dec. 1738. William Spencer's Correspondence. No. II. Spencer of Cannon Hall MSS. Sheffield City Library.
2. Wilson and Cockshutt v Spencer. Spencer of Cannon Hall MSS. Sheffield City Library.

forge there were stocktakers to check in the raw materials and at each of the former, a founder paid by the quantity of pig iron made at each blast. William Spencer, as is obvious from his correspondence, acted as his own clerk, although he employed Bernard Dutton to manage Barnby Furnace and Thomas Cope, who had formerly worked for Cotton at one of his forges in the Midlands, as clerk at Wortley Forge.

The responsibilities of the clerk are best illustrated from the expence accounts of John Fell I listed in the Journals which he kept for the partnership in the Duke of Norfolk's Ironworks from the time he took over this position from his father, William in 1690 to the time of his death in 1724. It is obvious from the sparse references to the partners that, apart from Denis Heyford who collected debts due to the concern in Cheshire, they had little to do with the management of the business, which was left almost entirely in Fell's hands. His first responsibility lay in the supply of raw materials to the furnaces. He negotiated with landowners owning ironstone deposits as to their exploitation and made contracts with the men who mined the ore. He watched for timber coming on the market, contacted the owners for its sale and arranged with the timber salesman to get it felled and coled. Again, when the pig had been made, it was Fell's duty to see that it was transported to the forges. Subsequently, he saw to the transport of forge iron either to customers or to the slitting mills leased by the partnership. Finally, it was his responsibility to arrange for the carriage of rod to the nail chapmen outside Sheffield. Some of this transport was provided by the "leaders" whose payments occupy such a large space in the Journals and some

by the teams of packhorses controlled by the clerk. To provide fodder for these, Fell ran two medium-sized farms on the Norfolk estate at Attercliffe and Wadsley.

Fell, too, was responsible for the sales side of the organisation. He received an entertainment allowance to cater for the agents of the London merchants who visited Sheffield. He was assiduous in his attendance of the local fairs at Sheffield, Chesterfield, Barnsley, Rotherham and Doncaster, where he met many of his local customers. Occasionally, he attended Boroughbridge Fair, at which many of the Sheffield factors and nail chapmen sold a large part of their stock. On a few occasions, he crossed the Pennines to maintain contact with merchants in Liverpool, Warrington, Manchester and Stockport. Sometimes, he toured Yorkshire, meeting the firm's customers in such towns as Knaresborough, Hull and York. Once, at least, he went to East Anglia and London.

Lastly, he kept the partners' Journals and Ledgers. He cashed the bills with which he was paid with such persons as the Duke of Norfolk's agent, who had plenty of ready cash and needed bills with which to remit his rents to London. Annually, he balanced the outstanding accounts between the various partnerships, remitting the dividends due to each partner in the various works.

AGREEMENTS BETWEEN THE IRONMASTERS.

The customers of the ironworks - the filesmiths and the nail chapmen - were well organised by the early part of the eighteenth century. ^I To protect their own interests, the iron masters held frequent meetings to discuss such matters as the price to be paid for raw materials, the selling price of their

I. R. Butterworth. "The Ecclesfield Nailers' Agreement." Trans. Hunter Society. Vol. 2. P.114 and "Filesmiths' Declaration." Trans. Hunter Society. Vol. 7. P.265.

products and the attitude to be adopted towards tariffs on imported iron.

The shortage of cordwood in the early eighteenth century threatened to force up its price to a point at which the iron industry might become unremunerative. To prevent this, the ironmasters entered into agreements regulating the maximum price which they were to pay for timber and charcoal. In addition, to ^e prevent competitive bidding for woods, they combined together to buy them when they came on to the market, felling the timber and making it into charcoal, which they then proceeded to share out between themselves. As John Fell's Journal for the year 1702 mentions financial losses arising from the purchase and sale of Silkstone Fall " which was bought when there was not a very good understanding among the Iron Mastery" it may be assumed that there was some kind of working agreement as regards timber purchases between the various partnerships at the opening of the century. In 1713, John Spencer and the partners in the Duke of Norfolk's Ironworks jointly bought woods in Cawthorne Park, Dodworth, Newhall and Hoyland in the vicinity of Barnby and Bank Furnaces and Trowles, Parkin, Kings and Harley Woods near Chapel-town Furnace. Eleven years later, they were jointly sharing the charcoal made in woods at Ackworth, Thurnscoe and Darfield.

The fact that the furnace at Chapeltown was drawing charcoal from woods at such a distance was a sign of the fuel famine which had hit the South Yorkshire iron industry at the end of the first quarter of this century. Between 1722 and 1726, purchases of cordwood by the Duke of Norfolk's Ironworks dropped from 4096 cord to 2079 cord. Over the same period, charcoal prices

increased from roughly £1 a load to between £1.8.0 and £1.18.0 according to the locality in which it was made. Such an increase in price led to the Duke of Norfolk's Ironworks being involved in an annual trading loss from 1723 to 1727. The Nottinghamshire and Derbyshire Company was also losing money at this period and the Spencer furnaces at Bank and Barnby were compelled to raise the price of pig iron by thirty shillings a ton in 1724. To meet a potentially disastrous situation, the ironmasters met to remedy "Some of the Inconveniencies which have for severall Years last past Ruined the Trade of making Iron in the West Riding." At this meeting, it was agreed that woods should only be bought in the future by the partnerships which had been accustomed to purchase them in the past, that not more than eight shillings a cord should be paid where woods were small and that a maximum of nine shillings a cord should be paid where timber was near an ironworks. Whether it was due to this agreement or to other causes it is difficult to say, but charcoal prices soon began to fall and the Duke of Norfolk's Ironworks once again began to earn substantial profits.

The business correspondence of William Spencer shows the working of these agreements at a later date. In 1739, he came to an agreement with William Westby Cotton of Haigh Hall, the lessee of Bretton Furnace, whereby the cordwood in the area between Bank, Bretton and Barnby Furnaces was to be divided equally between the two ironmasters, who also agreed not to give more than five shillings a cord for wood bought within three miles of a furnace and six pence less if the wood lay at a greater distance. In addition, it was agreed that Spencer was not to buy any timber on

I. Proposal for more economical allotment of woods to various furnaces. 29b. Correspondence of John Spencer. Spencer of Cannon Hall MSS. Sheffield City Library.

the estate of Sir George Saville and Cotton nor on that of Wentworth of Woolley. In the following year, although Cotton refused to accept a proposal made by Spencer that Wortley Forge should be given a monopoly of all cordwood south of Silkstone, the latter's clerk, Thomas Cope, was able to write back to his master " We are able to have a very good understanding amongst us on all accts & lay our heads together to make easy all sides & the Country not to have ye pleasure of a Quarrel betwixt him and you." ^I In 1741, however, this agreement was terminated and the two ironmasters began to buy woods in competition with one another. Inevitably, the rivalry between the two increased timber prices. As a result, in the next year, when they were riding back from Sheffield to their homes, Cotton agreed that he would not bid against Spencer for timber on the Strafford estate. Shortly afterwards, another agreement was made whereby Spencer was allocated all the cordwood growing around Rockley, Cawthorne and Stainborough. In 1743, Cotton and Spencer were felling Silkstone Fall jointly and dividing the charcoal between them. The friendship between the two ironmasters came to an abrupt end when Spencer discovered that Cotton had been buying charcoal at Burton Land and Silkstone, areas traditionally reserved for Barnby Furnace and paying as much as 23/- a load for it. When Spencer reminded Cotton of their agreements, the latter retorted that he would buy all the cordwood he needed in Lund Wood- previously reserved for Barnby- even if he had to pay £1 a cord for it.

Such hostility between two leading ironmasters could only play into the hands of the landowners. As a result, cordwood prices

I. William Spencer's Correspondence. Letters from Thomas Cope. 1739-44. Letter dated 25 April 1740. No. 12. Spencer of Cannon Hall Correspondence. Sheffield City Library.

rose during the next few years. Business interests, however, prevailed over personal animosity and led to a reconciliation between Spencer and Cotton. Broadbent of Wortley Forge was also drawn into the negotiations and after a meeting between these three ironmasters, Spencer visited Sheffield to discuss this topic with John Fell II. The result was that all the South Yorkshire ironmasters met in Sheffield in the middle of March 1748 to hammer out some agreement between them on this vital matter of charcoal allocation. Spencer attended with his lawyer, William Rhodes of Wakefield and with his furnace manager, Bernard Dutton; the two Cottons, father and son came with their clerk, Callisthnes Thomas; Broadbent was there to represent Wortley Forge; Joseph Clay and John Fell II attended to represent the Duke of Norfolk's Ironworks and Brook, Crook and Watts came to safeguard the interests of the forges at Kirkstall and Colnebridge. At this conference it was agreed that all the timber around Thurgoland was to be allocated in the same proportions as before, certain woods were to be reserved to Spencer for Barnby Furnace but that all the remainder of the charcoal for the iron industry was to be bought centrally by one agent nominated by Cotton. It was also agreed that the maximum price to be paid for cordwood was to be eight shillings. Despite all the preparations made to ensure an agreement at this conference, its life was short as Fell accused Spencer of buying timber on his own account, whereupon Cotton refused to supply the Barnby ironmaster with any of the cordwood which he had bought on account of the ironworks represented at the meeting in Sheffield. Spencer then refrained from attending the ironmasters' meeting held at Barnsley in March 1749 and continued to buy woods independently, a step which broke the " ring " at auctions and angered the others

bitterly, Joseph Clay for example, declaring that he had been compelled to pay £40 more for a wood " than was necessary if all had been friends." The quarrel raged for more than a year but on the death of the elder Cotton and the succession of his son, Thomas, to his ironworks in 1749, harmony was restored and in 1751, Spencer was discussing " proposals as to Woods, Cordwood etc " at Sheffield with the other ironmasters. After a great deal of argument as to whether centralised charcoal buying should be continued, it was decided to drop the idea, leaving Spencer free to buy 400 cords for his furnace where he wished. ^I How far these agreements continued after 1751, it is impossible to say. The fact that the Journal of John Fell II records an agreement to pay 3/6 a cord more for timber in the year 1760-1 with the express intention of keeping the Walkers of Masborough, then attempting to break into the charcoal iron business, from leasing the woods and ironstone on the Wentworth property, suggests that the ironmasters had still a common policy on timber prices.

In addition to meeting to discuss charcoal prices, the ironmasters met to consider the price at which rod iron should be sold. The South Yorkshire nail trade was badly hit at the end of the thirties by competition from nails made in Worcestershire and Staffordshire, where labour - at least in this trade - was cheaper. In an effort to retain their trade, the nail chapmen supplied from the slitting mills at Rotherham and Wortley applied to the ironmasters for a reduction in the price of rod. The South Yorkshire ironmasters met in February 1738 to consider the question. Fell, Cotton and Watts were delegated to meet the leading nail

I. Diaries of William Spencer. 6 and 16 March 1739; 1 May 1741; 3 and 24 March 1742; 2 Dec. 1743; 3, 12 and 30 March 1744; 8 Feb. and 22 Oct. 1745; 8 Jan. and 4 Feb. 1751. Cannon Hall MSS. Sheffield City Library.

chapmen - the three Booths, the two Jenkinsons, the two Shaws, Daniel Bower and Joseph Smith - at Chapeltown to discuss the matter. There is, unfortunately, no record of the result of this conference. However, in January 1740, five of the leading nail chapmen approached Spencer and the other ironmasters with a proposal that if rod iron were to be reduced by £1 or £1.10.0 a ton, they in their turn would reduce the amount to be paid to their men for making nails. ^I Again, there is no record of the ironmasters' reply to this suggestion, but evidently the nail chapmen continued to press for a reduction in the price of rod, as Cotton and Spencer were discussing the matter in the middle of June 1741, declining to lower them and again in the following September when, he, Fell and Heyford discussed together the problems of the nail trade. In the February of the next year, however, at a meeting at Cannon Hall, rod iron was dropped a maximum of 10/- a ton for cash. As trade continued to be poor, the nail chapmen asked for a further reduction in rod prices, but when Fell, Watts and Milner met at Sheffield, it was decided not to make any alteration in the price of rod until the nail chapmen had done something on their side to reduce the price of South Yorkshire nails. As Spencer decided to abandon the manufacture of nails at this time, his diaries and correspondence contain no further information as to this aspect of co-operation amongst the South Yorkshire and North Derbyshire ironmasters.

In 1736, 1750 and 1757 attempts were made to persuade Parliament to allow the importation of American pig and bar iron into England, first through London and then through other ports.

The majority of the ironmasters in the Sheffield region were naturally hostile to any such proposals and united to oppose them in Parliament. In 1736, Wilson of Wortley Forge met Fell, Cotton and Watts to discuss this matter, which they regarded as a serious one from their standpoint as the American Cold Short Iron could be made into nails as good as those made in South Yorkshire and at a much lower price.^I Thinking that attack was much better than defence they petitioned Parliament to introduce legislation whereby the New England forges might be pulled down on the grounds that Sheffield had lost much of its trade in recent years in edge tools and in nails with the American colonies as a result of the building of forges and slitting mills in this part of the Empire.

In 1750, the Company of Cutlers petitioned Parliament in favour of allowing American iron to be imported through London, putting forward as their reason that without an adequate supply of iron from this source, European suppliers could charge a monopoly price.² As consumers, they were naturally interested in cheap iron. The ironmasters, on the other hand, naturally petitioned against the Bill, declaring that they had invested a large amount of capital in the ironworks around Sheffield and that the Bill could only lead to a big expansion in the output of American bar iron, with dire consequences to the blast furnaces and forges near the town. Behind the scenes, the ironmasters were not as united as they seemed. Broadbent of Wortley Forge, who had come into the iron industry from the distributing end and whose primary interests were those of a factor, advocated the importation of American iron duty free on the grounds that this would enable

1. Letter dated 16 Feb. 1736. Winding up Wortley Forge Business. No. II. Spencer of Cannon Hall Correspondence. Sheffield City Library.
2. Journals of the House of Commons. XXV, 1096.

the furnaces to be converted into forges, which could then use the available charcoal to convert American pig iron into forge iron, with the result that the output of the latter could be doubled. In defence of this proposition, Broadbent asserted that its adoption would not lead to any decreased demand for charcoal or labour by the iron industry. In addition, he supported it on public grounds, declaring that it would enable the colonies to pay for their imports from England and at the same time, reduce the large adverse balance of trade with Sweden. His partner at Wortley, John Cockshutt, an ironmaster with a much longer connection with the industry, whose interests were primarily in production rather than distribution, took a different view. He condemned the proposals, pointing out the importance of the home industry in war-time. He asserted that if protection for the English iron industry were taken off, it would perish with the result that the coppices would be stubbed up, that this would both harm the tanning industry and cause rents to fall and finally that the closing down of the furnaces would result in unemployment with a consequent increase in the Poor Rate. Evidently, he was able to persuade his partner to change his mind as soon afterwards Broadbent was travelling around the district organising the tanners to petition against the Bill. ^I William Spencer was probably at this time drawing up a memorandum on this subject. As a blast furnace owner and a landed proprietor his interests were against the Bill. His memorandum makes the point made previously by Broadbent that American pig was of the same quality as English Cold Short iron and that with cheaper charcoal supplies and cheaper labour costs it could always undersell English pig, so that if the Bill became law the English

iron industry would be threatened with extinction. Spencer then proceeded to forecast the same consequences as those envisaged by Cockshutt - the ruin of the tanning trade, the destruction of the coppices and their replacement by arable and pasture land, a process which could only cause a fall in rentals and a loss to the landowning class of large sums of money, derived from royalties on ironstone and payments for cordwood.^I The consumers, however, were able to make good their case and American iron was allowed to be imported into England.

In 1757, proposals were put forward to allow American pig iron through any English port. Once more the Bill was supported by the Company of Cutlers which asserted that the price of bar iron had risen. It is, in fact, very likely that with the completion of the Don Navigation to Tinsley, the consumption of forge iron had increased recently, as there is adequate evidence in many rentals of the construction of new cutlery wheels and the extension of old ones and the building of new tilts for slitting iron and steel. The ironmasters naturally protested against the Bill as did the local tanners, but all their protests were in vain, as the Bill passed, as John Spencer declared it would, by a majority of two to one.²

THE SUPPLY OF PIG IRON.

Technically, the manufacture of pig iron in the Sheffield region underwent little change during the period covered by the Journals recording the activities of the Duke of Norfolk's Ironworks and those belonging to the associated Nottinghamshire and

1. Forge and Furnace Papers. 29b. Mss Notes on the Iron Trade. Cannon Hall MSS. Sheffield City Library.
2. Letter dated 24 March 1757. Correspondence Book of John Spencer. Diary of John Spencer. 30 March and 1 April 1757. Cannon Hall MSS. Sheffield City Library.

Derbyshire Company. A description based on the accounts in the Journals of I690-I is, therefore, completely representative of blast furnace practice in this district until the end of the third quarter of the eighteenth century. During the summer and early autumn of I690, the furnaces at Chapeltown and Rockley were made ready for the winter's blast. At the former, the dam was mended, a new hearthstone put in, the bellows mended and charcoal and ironstone baskets made. At the latter, the tunnel was repaired and moulds made for casting stove backs. At the same time, miners were busy sinking pits and getting ironstone in Friar Tale, Price Royd and West Woods for Rockley Furnace and at Hollin Delph and Thorncliffe for Chapeltown Furnace. Woodcutters were at work in various woods belonging to the Duke of Norfolk at Grenna, Treeton, Sheffield Park and Oakern Greave felling timber and making it into charcoal for Chapeltown Furnace and simultaneously, timber at Burton Land, Swallow Wood and Lady Wood were being coled for Rockley. Sand for the pig beds was brought to both furnaces from Wombwell Woods. Chapeltown was put into blast on 3 November I690 and continued in blast until 20 May I69I, during which time it produced 308 tons of pig, 22 tons of uses - anvils, forge hammers and tuiroons - and 46 tons of iron pots, stoves and alum plates. The Journals fail to give the length of blast at Rockley, but during this winter the furnace made 289 tons of pig, I2 tons of alum plates, 2I forge hammers and six anvils.

With adequate supplies of charcoal to work two furnaces, with pig available from Bank Furnace in which the partnership had an interest and from Cotton's furnace at Barnby, the partnership in the Duke of Norfolk's Ironworks had a large enough

supply of pig iron to market part of its production before 1700. In 1692, 66 tons of pig was sold from Chapeltown Furnace together with 31 tons of iron bullets from Rockley, both to Fincher, a London merchant. In the following year, Chapeltown Furnace sold 71 tons of pig and until the end of the century, iron weights, stoves, backhoods, fire backs and malt tickets were being made at this furnace. A decline in the quantity of charcoal available together with the loss of the output of Rockley Furnace after 1705, however, completely changed the situation with the result that the partnership became largely dependent in the 'twenties and 'thirties upon Bank and Barnby for much of their pig supply - as an example, in 1731 the group bought 115 tons from these two furnaces. Occasional purchases of pig were also made from Wingerworth Furnace in Derbyshire, at that time in the hands of the Heyford family and from Cotton's furnace at Bretton - in 1736, for example, the partners bought 147 tons from Cotton and pig worth £440 from Millington Heyford. Outside purchases largely ceased during the 'forties as a result of a depression in the cutlery and nailing industries, which led to a decline in the demand for pig iron. The letter books of Richard Dalton, a Sheffield merchant and of William Spencer both show that these trades were badly depressed during the War of Austrian Succession. Just before Christmas 1740, the former was complaining to one of his suppliers in Hull that business in Sheffield was very bad; in the next April he was blaming the " troubles abroad " for " our trade being so bad in the cutlery way"; in October 1743, he wrote to Walter Edge, a leading Hull merchant that there was no possibility of selling iron to John Fell as he had " a Prodigious Large Quantity now by

him produced from Works of his own in this Neighbourhood Where he can be Supplied with greater Quantitys than he can consume"; in the same year, Millington Heyford confessed that it was almost an impossibility to sell iron at any price; Dalton's letters in 1745 and 1746 show that the Jacobite rebellion damaged trade considerably by the injury which it did to credit; in 1748, William Spencer decided to leave the nail trade as he could see little prospect of further profit in this industry when competing against other districts where cheaper imported iron was used.^I The end of the war, however, led to a period of better trade and the Duke of Norfolk's Ironworks once again^I to buy pig iron from Barnby, a practice which continued until the Journals close in 1765.

The partnerships controlling the Nottinghamshire and Derbyshire Company and the Duke of Norfolk's Ironworks were also large scale buyers of scrap metal and pig iron from abroad. Carburton Forge, within easy distance of navigable water on the Idle took some 870 tons of different types of scrap - old guns, bombs and bushel metal - in the six years after the Treaty of Utrecht.² When John Fell's Journals begin for this Company in 1750, they show the London firm of Sitwell and Company selling it 214 tons of pig iron between 1750 and 1756. This trade was interrupted by the Seven Years War, but it was resumed in 1768, when John Cockshutt sold Baltimore and Maryland iron worth £280 to the concern. In the following year, a scrap furnace was built at Staveley and during the next two years, scrap costing £1650

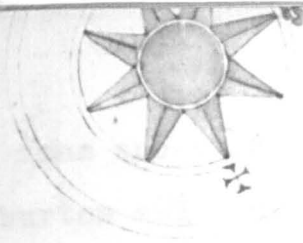
1. Letters of Mr. Richard Dalton. Letters dated 3 Dec. 1740; 26 April 1741; 8 Oct. 1743; 25 Sept 1745 and 7 Feb. 1746. Bagshawe Collection. 5/4/I-3. John Rylands Library, Manchester.
2. Carburton Forge Accounts 1701 - 20. No. 15. Cannon Hall MSS. Sheffield City Library.

was purchased from Nedermeyer and Vooy'd. Pig imports for the South Yorkshire ironworks did not commence until much later - not in fact until the completion of the Don Navigation to Tinsley facilitated this traffic. Between 1751 and 1753, 143 tons of pig iron were imported from London; in the next two years, iron worth £2500 was purchased from one firm alone, Jukes and Company of Southwark and the majority of the later Journals contain further references to large scale buying of iron from London.

THE SUPPLY OF FORGE IRON.

In the last decade of the seventeenth century there were five forges at work in South Yorkshire. These were located at Attercliffe, Wadsley, Sheffield, Wortley and Roche. In 1690, output at the first three of these forges totalled 353 tons. The earliest figure for Wortley shows production there to have been 148 tons in 1695/6 and that for Roche shows an output of 60 tons in 1702. Across the county border, Staveley Forge produced 98 tons in 1700 and Carburton Forge 129 tons two years later. All these forges continued in production throughout the period, with the exception of that in Sheffield which, despite the fact that it was centrally situated for supplying the cutlery trade was closed down in 1700, possibly because it was an uneconomic unit to work on account of its low fuel efficiency. In general, output increased at all these forges during the first half of the eighteenth century as, with the single exception of Roche, charcoal was diverted to them from the blast furnaces. Output at Attercliffe averaged about 200 tons a year, at Wadsley about

I. John Fell's Ledger for 1690 shows that 5½ loads of charcoal were used at Sheffield Forge to make a ton of forge iron. At Attercliffe, only four loads were used for this purpose.



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Clo

COMMON

The Paddock

THE SHARP-FORE MEADOW

Little Croft

RDEN'S

The Upper Forge

Spark Hill

The Rail Piece

THE MEADOW

Sand

N



coal

Forge

W.L.

G.A.

Fold

176

177

178

175

172

150 tons and at Roche about 60 tons. In the 'fifties, both Carburton and Staveley each made about 200 tons of forge iron annually.

The markets for the forge iron made at these works contracted sharply between 1690 and 1775. Before the opening of the eighteenth century, it was marketed in many ports along the East Coast and in many towns in Lancashire as well as in the capital. By the 'sixties, a great part of this trade had gone. As output was limited by the available supply of charcoal, it had probably been found that, as the cutlery and nailing trades expanded in the locality, stimulated by the extension of water transport up river to Tinsley, it was more profitable to sell forge iron within the immediate vicinity of the ironworks than in more competitive markets outside Derbyshire and Yorkshire.

At the end of the seventeenth century, London with its important ship building activities was a large buyer of forge iron. Here, at this period, William Cooper was the best customer for iron made at Carburton, Attercliffe and Wadsley. After his bankruptcy, which involved all these works in heavy losses, Thomas Helme and Law Victorin bought considerable amounts of iron from these forges. After 1720, sales of forge iron from the South Yorkshire ironworks to London practically ceased. Carburton, however, continued to find a market for its products in the capital. In 1753, for example, Jukes and Company bought iron worth £1614 from this Nottinghamshire forge. This trade, too, slowly dwindled and sales of forge iron to London from the Nottinghamshire and Derbyshire Company ceased completely after 1766.

In the last decade of the seventeenth century, Henry Lisle of Whitby; James Cook and John Wells of Stockton; John Davison, George Wingfield, Nicholas Ridley, James Mancaster, Ralph Read and Thomas Wilkinson, all of Newcastle, were good customers of these forges. By the end of the War of Spanish Succession, this trade had also gone. In the early part of the eighteenth century, such Hull merchant houses as those of Daniel Hoare, William Fenwick and James and William Mould bought large amounts of short broads, clout bars, salt pan plates and plough shares from the two partnerships. This trade had also vanished by the early 'twenties. The forges also did good business in these articles with Robert Aubon of Lynn and with John Yallop, Thomas Thrower, John Salter and George and Sarah Vertue, all of Norwich and with Samuel Tolver of Yarmouth in the first decade of the eighteenth century. Here, too, the South Yorkshire forges lost this market during the next decade. Staveley and Carburton, however, continued to sell iron in East Anglia until well into the 'seventies, although on a greatly reduced scale.

Before the end of the seventeenth century, the South Yorkshire forges sold considerable amounts of iron across the Pennines to Miles Winstanley, John Sandiford and Francis Cartwright - the last named, a relative of Denis Heyford - in Manchester and to John Kelsall in Stockport. This trade, too, had vanished by the 'twenties, possibly as a result of competition from the Furness iron industry.

With the loss of these markets for forge iron in the early part of the eighteenth century, local customers became increasingly important. The first Ledger (I690-2) of the Duke

of Norfolk's Ironworks shows few large buyers for this product in Sheffield except Thomas Diston, Robert Boughton and Thomas Parkin. The latter rapidly outdistanced the other two as a buyer of iron, purchasing iron worth £920 in 1702. During the next decade, Samuel Shore and Field Sylvester, two Sheffield factors, emerged as Fell's best customers. Over the next thirty years, the best customers for forge iron were the two Broadbents, Nicholas and Joseph, although their position was challenged in the 'forties by John Roebuck, who in 1748 bought iron worth £2000 from John Fell II. Other important customers were Thomas Haslehurst and William Taylor, both edge tool makers at Hackenthorpe in Derbyshire; Thomas Heaton, a Sheffield wiredrawer and ironmonger; William Binks of Darnall, a Sheffield steel merchant; Thomas Gothard, a scythesmith of Cliff Field; Richard Thompson, the lessee of Forge Wheel; Thomas Webster and his successor in business, Joseph Wilson; John Wofendale, a cutler who leased a tilt at Mill Green and a group of Sheffield factors which included William Dickson, Robert Dent and Jonathon Cutt. In the early 'fifties, John Greaves and Joseph Wilson were each buying iron products from Fell at a rate of well over £1000 a year. In the latter part of this decade, almost every one of these big accounts was either closed or greatly reduced and the conclusion seems irresistible - although entirely undocumented - that much of this business had gone to new concern of Samuel, Aaron and Jonathon Walker at its new works at Masborough. Until the ledgers end in 1765, most of the forge iron sold in Sheffield was bought by an increasing number of customers, each taking smaller amounts.

The partners in the Duke of Norfolk's Ironworks

retained a small quantity of forge iron to be manufactured into frying pans and dripping tins. This trade remained almost static in value, averaging about £400 annually from 1690 to 1765. Customers for these articles were almost entirely - apart from the trade with the capital - in towns on navigable rivers easily accessible from the Don, such as Wakefield, Leeds, York, Hull, Stockwith and Bawtry.

The Ledgers for the Nottinghamshire and Derbyshire Company, unfortunately, only cover the period from 1750 to 1771. These show that the greater part of the forge iron made by this partnership was sold locally to edge tool makers. In the 'sixties, the best customers of Carburton and Staveley Forges were Messrs Inkersall of Hackenthorpe and John Hill and Thomas Biggin, both of Norton, all of whom were buying iron costing about £1000 a year during this decade. Indeed, almost all the edge tool makers in the villages and hamlets situated alongside the streams flowing down from the long T shaped ridge separating the valleys of the Don, the Rother and the Sheaf were customers of these forges. It is evident from these Ledgers that during the period which they cover, the edge tool trade was developing rapidly and that the increasing demand from this industry was adequate compensation for any loss of markets for forge iron in other parts of the country.

THE SLITTING MILLS.

Finally, all the partnerships retained a large part of the forge iron which they produced for transport to the slitting mills, where, after heating by coal fired furnaces, the iron was rolled into rod and cut into nail lengths by water power. Wortley Forge, for example, in 1695/6 sent 92 tons of its output of 148

tons to Rotherham Slitting Mill; the Carburton accounts for the year 1719 show that about a third of its output was slit at that mill; Attercliffe Forge forwarded 157 tons of its total production of 247 tons to the adjacent slitting mill in 1749.

At the end of the seventeenth century there were two slitting mills in operation in the immediate vicinity of Sheffield. One, worked in conjunction with the Duke of Norfolk's Ironworks was at Masborough on the Don: the other, a part of the Nottinghamshire and Derbyshire Company was at Renishaw on the Rother. Both were situated where coal was easily obtainable for the furnaces; both were within easy reach of the forges; both were near areas where large numbers of men were employed in the nailing industry and both were not far from navigable water. Output at Renishaw was always relatively small - in 1702 it was only 69 tons and the Ledgers for the 'fifties and 'sixties show that production in many years was even lower than that amount. Production at Rotherham was much higher. In 1691, the mill slit 104 tons of rod; 152 tons in 1704 and 309 in 1744. The slitting capacity of the Duke of Norfolk's Ironworks was increased by the building of a new mill at Attercliffe in 1747/8 at a cost of £800 with a productive capacity of about 200 tons of rod a year. Further plant was installed in 1756 which doubled the output of rod, a fortunate move for the partnership as two years later it was compelled to give up its lease of the slitting mill at Masborough to the Walker brothers, where they built the blast furnaces, rolling and slitting mills, the products of which seem to have stolen so much trade from the Duke of Norfolk's Ironworks. This expansion of slitting mill capacity, coinciding

as it did with a greater local demand for forge iron after the completion of the Don Navigation in 1751 led to a serious lack of balance in the South Yorkshire ironworks controlled by John Fell II. A grave shortage of forge iron occurred, which was only overcome by importing iron for the slitting mills on an unprecedented scale. As an example, the partnership bought 63 tons of Tula and Brinskey iron, both low grade Russian irons suitable for nail making, from Sykes of Hull in 1760. Later entries in the Journals show large purchases of Russian bar iron for the slitting mills, chiefly from Jukes and Company in Southwark.

Rod iron produced by the partnerships in the Duke of Norfolk's Ironworks and in the Nottinghamshire and Derbyshire Company, unlike the forge iron manufactured by these groups, was not widely marketed outside South Yorkshire and North Derbyshire in the eighteenth century. In the last decade of the previous century, indeed, the Yorkshire Ledgers indicate that large quantities of rod were sold to Francis Cartwright in Manchester - as much as £1300 worth in 1691 - but as was the case with most other iron products, this trade came to an end with his death early in the eighteenth century. After 1700, the most important markets for rod were the Barnsley wire drawers; the dealers in spurs and bits in Bolsover and the nail chapmen in the parishes of Ecclesfield, Eckington and Barlow, near Sheffield and in Horsley and Belper in central Derbyshire. During the War of Spanish Succession, the best customers of Rotherham Mill were Daniel Bower and Samuel Allen in Chapeltown and of Renishaw Mill, the Cozens and Lings family in Barlow and Bolsover. During the next ten years, the number of customers north of Sheffield

increased. New names such as Widow Butterworth of Harley, Thomas Wigfull of Hoyland, Thomas Wilkinson of Mortemley Lane End and John Wilkinson of Barnes Hall appear in the Ledgers. In the 'thirties and forties, much of the rod made at Masborough Mill was sold to Sheffield factors. After 1744, by far the most important customer of this slitting mill was the London firm of William Sitwell and Company, with nailers in Rotherham, Ecclesfield and Eckington, which bought £8200 worth of rod between 1744 and 1750. During the next five years, this concern bought rod costing £6000 from Rotherham and Renishaw, but the onset of the Seven Years War brought this trade to an end. During and after the War, Joseph Hague, who had been employed by Fell to make nails at Rotherham, purchased rod on a heavy scale from both Masborough and Renishaw for manufacture into nails at Chapeltown.

Rod iron, rolled and slit for William Spencer, at Masborough or at Cockshutt's mill in the Don valley, was sold to another circle of customers, mainly in the parish of Ecclesfield. The most important of these in the 'forties was Matthew Booth, then rapidly increasing the volume of his business; John Bower, then endeavouring to drive out all his competitors in that area in nail making by the expedient of making contracts with all the outworkers in the parish; Joseph Parker of Anston, a nail chapman, whose name appears as a buyer from the other slitting mills around Sheffield; Daniel Bower, Thomas Senior and John Gibson.^I

THE NAIL TRADE.

The various partnerships controlling the South Yorkshire and North Derbyshire slitting mills retained a considerable

I. Letters dated 14 Feb. 1741; 15 Dec. 1741 and 26 Nov. 1742. Letters from Thomas Cope relating to business of Wortley Forge. 1739-44. No. 12. Correspondence of William Spencer. Cannon Hall MSS. Sheffield City Library.

amount of the rod produced there to be worked up into nails on their own account. In 1722, John Fell I sent rod worth £204 to nailers employed by him in Derbyshire; during the next three years, these nailers took 139 tons of rod and in the last year of the Old Partnership they were supplied with rod valued at £851. During the period 1724-38, Murgatroyd took rod costing £7626 from Wortley Slitting Mill.^I William Spencer asserted in 1742, after he had leased Wortley Forge, that he retained two thirds of the iron made there and slit for him by Fell and Cockshutt for nail making. Finally, the Nottinghamshire and Derbyshire Company sent 100 tons of rod from Renishaw to their nailers between 1767 and 1770.

Nailing was a seasonal industry. According to Murgatroyd, the men worked from March to August on making clasp nails for London. During the harvest, nailing stopped as the men were engaged in the fields getting in the corn.² After this had been gathered in, flat points for Virginia were made until Martinmas and then sharp points for the Leeward Isles and Jamaica.³ William Spencer's correspondence shows him meeting all the troubles encountered in the domestic industries with his 120 nailers. They broke their contracts with him, working for Cockshutt and Breadbent, when they offered better rates of pay; embezzled material and turned out nails not only without points or heads but without both.⁴

1. Memorandum in William Spencer's Correspondence with William Murgatroyd. 1727-42. No. 13. Spencer of Cannon Hall Correspondence. Sheffield City Library.
2. Letter dated 11 August 1741. Correspondence from B. Dutton and family. No. 17. Spencer of Cannon Hall Correspondence. Sheffield City Library.
3. Letter dated 10 May 1739. Correspondence with William Murgatroyd. 1727-42. No. 13. Spencer of Cannon Hall Correspondence.
4. Letters dated 24 April and 11 July 1742. Letter Book of Wm. Spencer No. 3. Cannon Hall Mss. Sheffield City Library.

Many of the nail chapmen in the area north of Sheffield sold their wares at Boroughbridge Fair. Ironmasters such as John Fell I, William Murgatroyd and William Spencer, however, found the capital their best market. The first Ledger of the Duke of Norfolk's Ironworks has no mention of nail making, but subsequent Ledgers show both the rapid growth and the equally rapid decline of this part of the concern's activities from 1695 to 1716. In the former year, the nail trade only amounted to £536. Over the next five years, when the partnership employed a dozen nailers centred upon a warehouse in Rotherham, sales were made totalling £4300. During the next decade, most of the nails were sold either directly to Philip Fincher in London or through him to other customers at a commission of 3%. At the end of this decade, William Grace became the chief customer in London. From 1709 to 1716 he took nails worth £13,500. After that date, Ledger entries cease but it is highly probable that Journal entries showing transport of rod to ^unamed nailers in Derbyshire reflect the fact that some of the partners were still carrying on this trade.

Although Murgatroyd, the managing partner in the wire and slitting mills in the Don valley sold part of the nails made for him around Holbrook in Birmingham, York, Gainsborough, Hull and Stamford, his main market was in London. Here, he maintained a warehouse, which, at the time of his bankruptcy in 1738 had stock unsold and debts valued at £10,000. His chief customers were William Sitwell and Company and Samuel Fossick of Crooked Lane.

I.
I. Memoranda dated 1727 and August 1738. William Spencer's Correspondence with William Murgatroyd. 1727-42. No. 13. Cannon Hall MSS. Sheffield City Library.

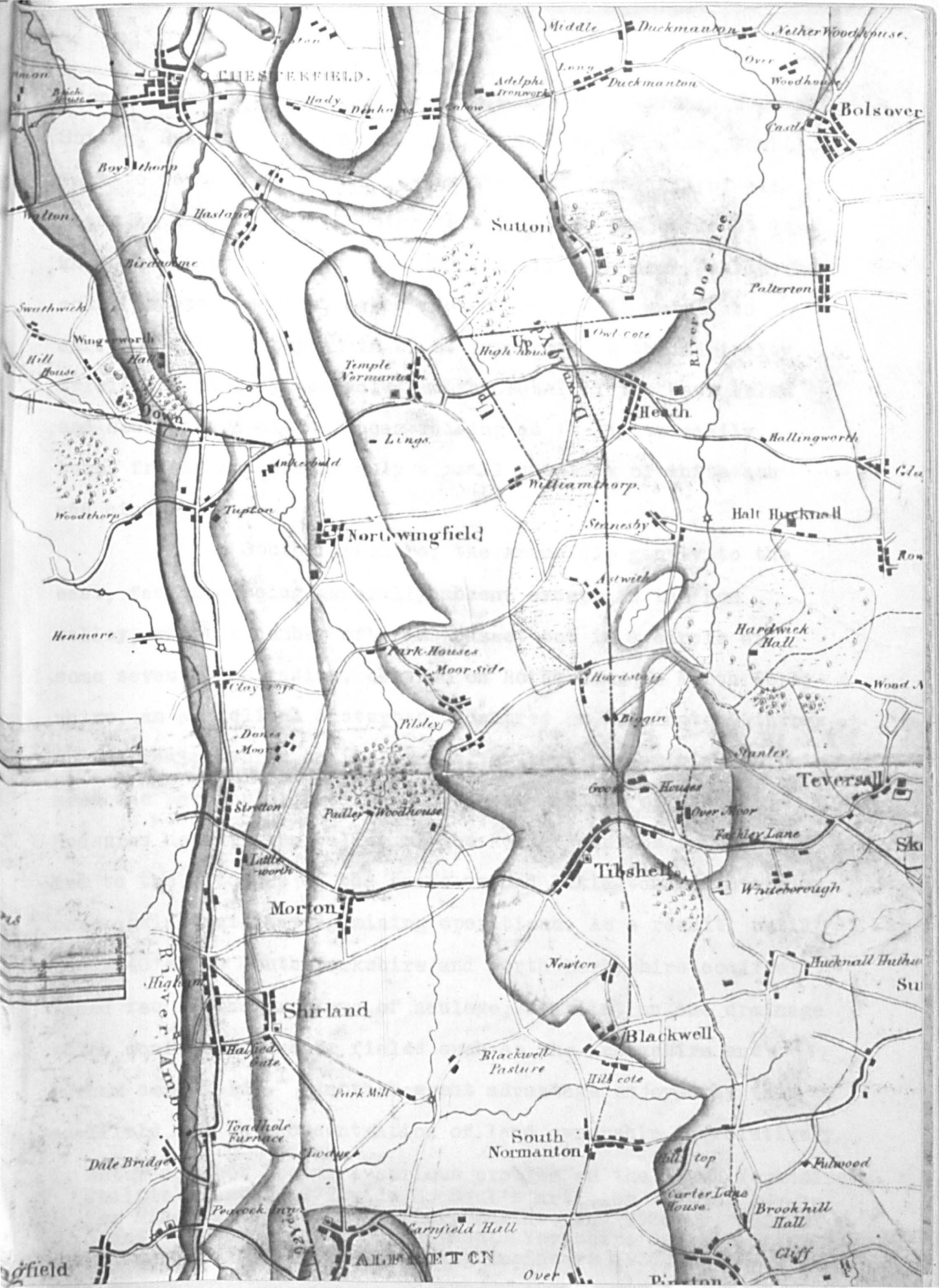
Between 1742 and 1747, William Spencer sent some 4,456 bags of nails to Hull, to be forwarded from there by his agent, Cookson to William Sitwell and Company, Samuel Fossick and Harrison, Bannister and Hallett, the latter in Thames Street, London. Spencer's correspondence deals, unfortunately, not with a period of normality in the nail trade but with one in which the industry was facing abnormal difficulties in the 'forties, when the South Yorkshire trade was having to readjust itself to competition from nails made from cheaper American and Russian iron. In addition, his position within the trade was weakened in that he was not able to supply an article of good quality as not only was his supervision of the outworkers employed by him inadequate but the quality of the rod supplied to them was poor, as a result of the bad workmanship of the hammermen at Wortley Forge. Finally, he was dependent on Cotton, Cockshutt and Fell for making his Wortley forge iron into rod and slitting it with the consequence that transport charges made his margin of profit lower than his rivals with forge and slitting mill in close proximity. Throughout the 'forties, his correspondence is full of moans as to his inability to secure orders for nails in the capital and at the end of the decade, he totally severed his connection with this trade. Whether his experience was typical of all the nail chapmen in the district, it is impossible to say. It is, however, significant that during this decade the Sitwell family were expanding their nailing activities in Derbyshire and that nail chapmen from outside the region were entering South Yorkshire in search of labour.

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I. Letter dated 21 Nov. 1742. Letters from Thomas Cope relating to business of Wortley Forge. I739-44. No. 12. William Spencer's Correspondence. Cannon Hall MSS. Sheffield City Library.

THE DEVELOPMENT OF COAL MINING IN NORTH DERBYSHIRE AND SOUTH YORKSHIRE.

The Yorkshire, Nottinghamshire and Derbyshire coalfield covers an area roughly oval in shape, with its longest diameter extending along the Trent between the Humber and the City of Nottingham. A bold escarpment separates the coalfield into two distinct regions - an eastern "concealed" coalfield and a western "visible" coalfield. In the latter area, bounded on the west by the moorlands covering the millstone grit and on the east by the fertile farmlands of the magnesian limestone, three important seams of coal outcrop between Barnsley on the north and Alfreton on the south, roughly parallel to one another and to the line of the gritstone.^I Furthest to the west, the thinnest and poorest of the seams, known in Yorkshire on account of its association with deposits of fire clay as the Ganister Coal and in Derbyshire as the Alton Seam by reason of its outcrop near the village of that name, bassets out from Wessington, through Ogston, Alton, Owlter Bar, Millhouses, Stannington, Crookes and Loxley to Bullhouse near Penistone. Further east, basseting out through South Wingfield, Clay Cross, Chesterfield, Brampton, Staveley, Sheffield, Thorncliffe, Mortemley, Pilley and Silkstone is a five feet seam, called after the last named place and famous as producing a good a good house, gas and coking coal. Nearest to the magnesian lime-

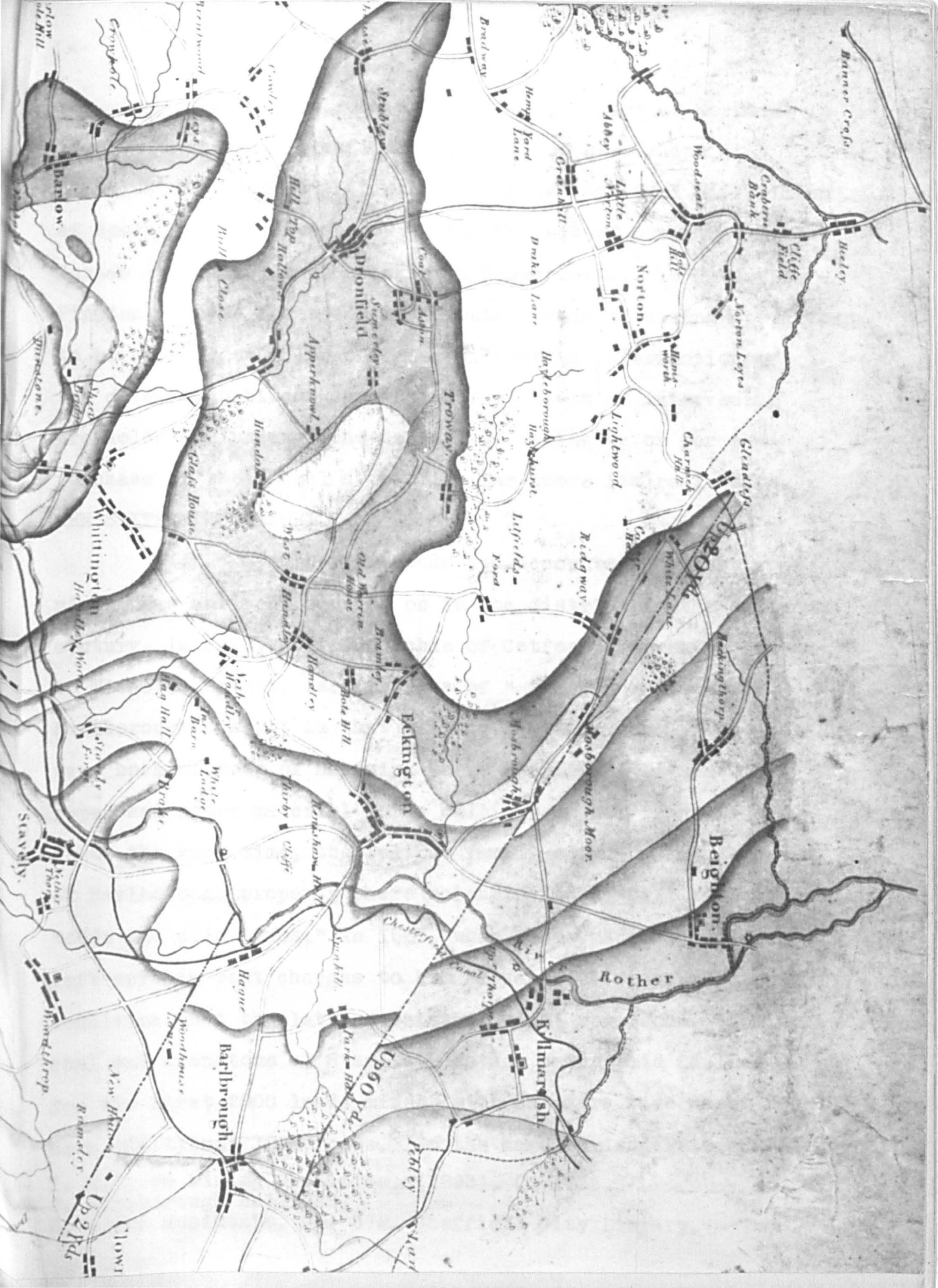
I. The two best pre-1850 maps of the coalfield are Thorpe's "Geological Diagram of the Yorkshire Coalfield" and Gratton's "Map and Section of the principal beds of Coal and Iron found in the Counties of Derby and Nottingham."



stone escarpment, outcropping from Blackwell, through Tibshelf, Sutton, Renishaw, Woodhouse Mill, Park Gate, Elsecar, Wosborough Park to Gawber, near Barnsley is the most important of all seams in the region, the nine feet Barnsley Bed or as it is known in Derbyshire, the Top Hard, yielding a coal, which when coked in open hearths, makes a hard coal, well suited to carrying a heavy burden in blast furnaces. In the Admiralty trials of 1849, it was adjudged the equal of the best Welsh and Newcastle coal for steam raising as it lights easily, burns freely and leaves only a small quantity of white ash and cinders.

In South Yorkshire, the seams dip gently to the east, faulting being generally absent except in the Don valley, where a number of seams basset out in a circle of some seven miles radius, centred on Rotherham. In North Derbyshire, an anticlinal disturbance centred on Brimington, throws up the coalmeasures on its flanks, so that coal mining in this area was particularly easy. Subsequent erosion of the Coal Measures here in the valley of the Rother and its tributaries led to the exposure of the seams around Eckington and Staveley, once again facilitating mining operations. As a result, until the 1840's the South Yorkshire and North Derbyshire coalfield, faced few of the problems of haulage, ventilation and drainage which confronted deeper fields such as the Lancashire and Durham coalfields.^I Another great advantage enjoyed by this coalfield was the concentration of land ownership in relatively

I. Water did not become a serious problem on the South Yorkshire Coalfield until 1877 vide H. Saul's articles "Water Levels for Mine Drainage" in Colliery Engineering 1936 Pp. 203-6 and "Outcrop Water on the South Yorkshire Coalfield" in Trans. Mid. Institute Mining Engineers 1937. Pp. 64 - 76.



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few hands, as estates such as those of the Duke of Norfolk in Sheffield and Ecclesfield, the Duke of Devonshire at Staveley, the Earl of Effingham at Rotherham, Earl Fitzwilliam at Wentworth and Greasborough, the Marquis of Ormonde around Sutton Scarsdale, the Hunlokes in Wingerworth, the Cokes in Pinxton and the Morewoods in Alfreton, enabled mining operations to be planned on a large scale, without the distraction of the often exorbitant demands of the owners of intervening freeholds for underground or surface wayleaves or for the purchase of their coal at a price far above its real value.¹

THE SIXTEENTH CENTURY.

A number of deeds and accounts show that coal mining was actively carried on in the district in the sixteenth century. In 1518, Ralf Constable of Catfoss, Yorkshire, leased to Nicholas Hewett, described as of " the Manor place of Barlborough " a pit in that village.² Sixty years later, the wage book of Bess of Hardwick shows her making payments for ropes and other material for a colliery on her property. About the same time, the Selioke family sold to Francis Rodes of Barlborough property there which included " all and singular woods and cole mynes." In 1587, when Rodes made his will, he left certain rent charges to his servant, Jeffrey Watson, on condition that the latter assisted Rodes' son, John, to mine coal and ironstone at Staveley, Watson being paid £6.13.4 for the first 2000 loads mined, with an extra five marks for each additional 1000 loads.³ In the same parish, Peter Barley

1. R.C. on Mining Royalties. (1893). Q. I436.

2. Barlborough Hall MSS.

3. Crewe Muniments. No. 372. Sheffield City Library.

of Barlow, in leasing certain property in 1578 reserved to himself the right to mine " sea cole " for his house.¹ In the same year, the Earl of Shrewsbury made an agreement with his tenants at Bolsover, whereby both parties to the contract were to have the right to mine coal on Shuttlewood Common, the tenants, however, undertaking not to mine within ten poles of a sough put in by the Earl for draining the seam.² According to the Shrewsbury accounts, this colliery made a profit of £83 in 1586. On the same estate, coal was being mined at this period in Handsworth, Gleadless, Sheffield, Bolsterstone and Dronfield.³ At the latter colliery at Stubley, the agent reported that the " colliers say they have for getting of coales in ye eye of ye pitt half of ye coales and my Lord ye other half and when they drive out of ye pye they have two parts and my Lord a third " declaring that the colliery would be worth to each of the two men employed there twenty pence a week. Further south in Derbyshire, Godfrey Foljambe in his will of 1595 left to his wife, Isabella, the right to mine ironstone and coal on his Walton property outside Chesterfield, on condition that she paid £4.3.4 annually to Dame Constance Foljambe for wood and coal.⁴ In the same parish, a lease of the Manor of Linacre, drawn up in 1544, specifically mentions the right to mine " sea cole." According to a customary of this manor, freeholders were entitled to mine coal on the common. Nearby, the right of mining coal on Beeley Moor was sold in

1. Portland MSS. 73/I. Shire Hall, Nottingham.

2. Portland MSS. Bolsover Leases No. 66. Shire Hall, Nottingham.

3. Note Book of William Dickenson Bailiff of Hallamshire.
M.D. 192. Sheffield City Library.

4. Star Chamber Proceedings Jas I. 139/20.

1560 for £1.2.3 a year.¹ In the southernmost parish of the Hundred of Scarsdale, Edward Holte of Stanton had sold the pits at Greenhill in Alfreton in 1593 to John Tenery of Stapleford. It is obvious enough that certain features of the industry which were to remain characteristic of coal mining throughout the period in question - sough drainage, piece work and the dominance of the landowning class - were already well established in the Tudor period.

THE SEVENTEENTH CENTURY.

For the next century, more evidence has survived in the form of deeds, rate assessments and mine accounts to show how widespread coal mining was in this area. Judged by rentals, a fair enough guide, the most important pits in South Yorkshire and North Derbyshire were those in Sheffield Park. In 1619, the coal under this property, then in the hands of the Earls of Arundel and Pembroke, was leased at £76 annually, an amount which had been increased to £200 on the eve of the Civil War.² After the Restoration, this colliery was leased by John Eyre, a Sheffield ironmaster, at a rent of £145. When Eyre became bankrupt, this colliery came into the hands of George Bamforth, one of the Lords of the Manor of Owlerton. In 1692, Richard Richmond, a London merchant leased the coal mines in the Great Lawns and the Nunneries in Sheffield Park for twenty one years at a rent of £140. He, however, sub-leased the mines to Richard Bagshawe of Castleton, one of the leading lead mine owners in the Peak, who worked the pits.

1. Collectanea Dakeynae. Vol. 10. P. 245. Derbyshire County Council Offices, Derby.

2. A Survey or an Estimate of the Rents values and profits of the Manors of Sheffield etc and Briefs of Rents and Profits of Hallamshire. B.24 and 202. Wentworth MSS.

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until 1700.

Outside the town, collieries were much smaller in size. To the west of Sheffield, on the outcrop of the Alton Seam at Crookes, the coal under the Norfolk property there was being mined at the end of the century by a partnership which included Henry Bromehead, yeoman of Fullwood and two lawyers, each at some time agent to the Duke, Thomas Chapell and Joseph Banks. This group paid £40 a year and a fifth of the profits as rent for this colliery.² On the other side of the town, Stephen Bright of Carbrooke, one of the leading lead merchants in Sheffield, leased a colliery from Lady Grace Cavendish at Handsworth in 1635 at an annual rent of £66. At the end of this century, this colliery was leased to Samuel Shepley, a small freeholder on this manor, for £30 a year. Two other men of much the same social class, William Fenton and John Savage, were working small pits in the same area in the reign of Charles II. Another small landowner, Randolph Ashenhurst, was selling coal in Sheffield from a colliery at Intake in the reign of William III. To the south of the town, the coal on the Bright property at Ecclesall was rented during the Commonwealth at £5 a year, an amount which had only increased at the end of the century to £6 a year, when it was worked by Henry Bromehead, mentioned previously as a partner in the pits on Crookes Moor.³

North east of Sheffield, the largest pits

1. Deed Box 25. Norfolk Estate Office, Sheffield.
2. Wentworth Woodhouse Deeds. No. 381. Sheffield City Library.
3. Wentworth Woodhouse Deeds. Nos. 375 and 379. Sheffield City Library.

were in the Don valley at Kimberworth and Whiston on the Effingham estate . During the Commonwealth, these were in the hands of Lionel Copley, the most important ironmaster in South Yorkshire at this time, who rented them at £100 and £55 respectively. Another colliery at Kimberworth was worked at this time by the Hurt family of Ickles. The pits near Barnsley - known, according to the topographer Blome as " black" Barnsley on account of its connection with coal mining - were also in the hands of ironmasters after the Restoration. The coal under Barnsley Moor was leased by William Simpson who had acquired the ironworks in South Yorkshire formerly owned by the Copley family. Simpson, however, subleased the coal to Gamaliel Milner of Burton Grange, another South Yorkshire ironmaster. In 1676, the lease passed to the Hon, Sydney Wortley, who again subleased the coal to Valentine Hurt of Ecclesfield at a rent of £40 per annum. Twenty years later, Wortley acquired another lease of this Crown property and after buying out the other royalty owners on the Moor, leased the colliery to William and John Rooke and to Peter and John Shippem, members of two well known landowning families in the district.^I

Evidence for coal mining in North Derbyshire during this century is much more complete than that for South Yorkshire and it is apparent that although the documentary material is scattered chronologically there were collieries at work in almost every parish in the Hundred of Scarsdale during this period.

A rate assesement made during the Commonwealth shows that there were coalmines at work in Alfreton, Bolsover, Brimington, Eckington, Heath, Staveley, Walton, Dore, Sutton and Tibshelf. ^I Other material amplifies this information. A lease drawn up in 1649 for a farm at Shireoaks, included as a part of the rent, the obligation on the part of the tenant " to fetch one waine load of cole -- from Barlborough pitts to Gateford Hall." The mines at Barlborough were then being worked by the Rodes family, the Lords of the Manor, as may be seen by a letter written in 1677 by Dame Martha Rodes, then hard at work trying to pay off the heavy debts incurred by her late husband, to Andrew Clayton of Romeley, a rich ironmaster and lead miner, appealing for a loan, as the letter expressly states that " This money is for Manageing of ye Coal Delph for Colliers must be paid or els their is no enduring." A Chancery petition of much the same date, made by her creditors states that Dame Martha " hath for several years last past sold great quantitys of Cole -- amounting to the sune of £500." Evidence in a case as to the ownership of certain commons near Eckington shows that coal was mined there during the Cromwellianⁿ era, as one witness testified that " Major Bolton had about twenty five years ago purchased the King's right in the Manor of Eckington from the then Commonwealth and he directed Mr Godfrey Bright to sink a cole pitt--- which he did and went forward until they were driven out by water."² A Parliamentary survey of this particular manor, made in 1650, shows that there were pits on Bramley

I. A Breviate of the Survey of the 31 Townships within the Hundred of Scarsdale 1641-61. Portland MSS. Shire Hall, Nottingham.

2. Barlborough Hall MSS.

Moor, leased by Francis Stephenson, a landowner in Unstone and on Mosborough Moor and at the Marsh, worked by Richard Taylor of Durrant Hall, a Chesterfield lead merchant.¹ To the north of Barlborough, John Ogilby's map " Illumination of the Kingdom of England " marks in a " Moore with a great many cole Pitts." On the Yorkshire border, a rate assesement for Beighton, made in 1697, shows William Newbold and Robert Haslehurst, two farmers, mining coal in that parish.

To the west, another assesement for Dronfield, dated 1667, includes amongst the property rated, collieries at Dore, Coal Aston, Unstone and Sommerwood Common. In the same parish, a petition from a number of farmers on the Newcastle estate in the reign of Charles I, shows that Godfrey Outrem and George Calton, both members of the class of minor gentry, had opened an open cast working at Hill Top, fifty yards broad and ten deep, from which they carried away a hundred loads of coal.² A survey of the Eyre property in the same district, made for the Parliamentary Committee for Compounding, includes a colliery rented at £5 a year.³ In the adjoining chapelry of Barlow, the accounts of the headborough for 16~~7~~⁴3 - 4 show him buying coal in that village for the Royalist garrisons at Wingfield Manor and Bolsover Castle. His disbursements for the next year include payments for coal bought at Dunston for the Puritan troops billeted in Chesterfield. In the same parish, John Frechville leased the coal under the common and enclosed grounds at Eastwood in Staveley to John

1. T. Walter Hall " Wosborough, Sheffield and Eckington". P. 71.
2. Portland MSS. 70/50. Shire Hall, Nottingham.
3. Rental of Horsley Gate, Hallowes and Barlow. Bagshawe Collection. No. 361. Sheffield City Library.

Hewett of Beightonfield in 1659 on a forty one year lease for £46 annually. During the reign of James II, German Pole of Park Hall - like Hewett, one of the few Catholic gentry in this part of Derbyshire - leased the coal in Staveley Westwood for seven years from Lord Conyers at an annual rent of £30. The Court Baron records of this manor, now at Chatsworth, contain many entries ordering miners to fill up coal pits near the highways through Staveley West Wood. When in 1647 the Parliamentary Committee for Compounding sold the property of the greatest supporter of the King in the north of England, Cosse Manor and the right to mine coal on Shuttlewood Common, were sold to William Newton, a later Mayor of Chesterfield.¹ In the same area, a trust deed devising property on his daughters by William Woolhouse, Lord of the Manor of Glapwell, shows that family mining coal there and another deed forty years later - in 1695 - shows them leasing coal from other landowners in the vicinity.² Within a few miles of Glapwell, the Cavendish family were mining coal on their Hardwick property continuously through this century.

On the western side of the coalfield, the Earl of Newcastle had leased the coal in the Manor of Newbold to Anthony Eyre of Rampton in 1637. Eyre, however, subleased the coal to Gabriel Wayne, one of the Lords of the Manor of Whittington. Wayne put in four soughs down to the River Rother and by 1688 almost all the coal under Newbold Great Moor had

1. Calendar of Committee for Compounding. P. 1735.

2. Glapwell MSS. Derbyshire County Council Offices, Derby.

I
been extracted. On the east of Chesterfield, at Spital, where the Rother had exposed the Coal Measures, the Jenkinsons of Walton Hall, were mining coal after the Restoration. Another Brampton family mining coal on the moors beyond Chesterfield were the Clarks.² In the same district, Plot records an explosion in a colliery at Wingerworth, which not only badly burned the miners but also "going forth of the mouth of the pit like a Clap of Thunder" blew out the windlass at the top of the shaft.³

South Of Chesterfield, the existence of coal mines at Tibshelf, Blackwell, Pinxton and Normanton is shown in a letter written by John Twentyman, Vicar of Tibshelf, in 1673, appealing for a reduction in the assesement on his pit.⁴ The coal under the Coke property in the last two places was leased to Godfrey Haslehurst of Teversall, described by the Herald's in 1687 as "A great dealer in Coles, thought to be worth £10,000."⁵ Another parson with an interest in coal mining was William Sleigh of Shirland, who was accused by his successor, John Towne, in a suit over delapidations, of having impoverished the glebe by getting the coal under it. The Coroners' Inquests for the Hundred of Scarsdale include one for two colliers killed at Stretton in 1694, when they fell off pickshafts inserted in the haulage ropes, while descending the shaft. Two estate surveys give further information as to coal mining in this locality. One, now at Chatsworth, mentions:

1. Newbold Case for Arbitration. 1688. No. 1701. Derby Borough Library.
2. Wm. Senior. Plans of the Estates belonging to Wm. Cavendish. Earl of Newcastle. 1629-32. Welbeck Abbey MSS.
3. Natural History of Staffordshire. Pp. 135-6.
4. D.A.J. Vol. XXXI. Pp. 221-3.
5. D.A.J. Vol. XXXII. P. 69.

coalmines on the Cavendish property at Hardstoft and Pentrich in 1610. The other, of the Duke of Norfolk's Derbyshire estates, made in 1684, includes amongst the Wingfield property, a coal delph at Ufton Fields. Further south still, the Turner family, having bought all the minerals in Alfreton from the Crown and from the Zouches of Codnor Castle, were mining coal continuously in that parish throughout the century.^I

It is obvious that both in South Yorkshire and North Derbyshire, coal mining was largely in the hands of the landowning class. A new feature in the industry during this century is the appearance of the lead merchant and the ironmaster as coalmasters. Capital from at least one other source flowed into the industry; the Turners of Alfreton, who were probably the most important family of coalowners in the Hundred of Scarsdale during this century, were originally mercers.

The typical coal lease of this century contained both a fixed annual rent and restrictive covenants drawn up in the interest of the landowner to prevent more than the customary output of coal. For example, when the Earl of Newcastle leased a colliery at Hen Pit Leyes in Barlow in 1632, the lessees were restricted for nine months of the year to working one pit at a time, employing a maximum of four hewers, two drawers and a barrowman. For the other three months of the year, when the roads were dry enough to bear heavy traffic, they were allowed to work two pits with double the number of men.² The lease previously referred to between Hewett and Frechville, drawn

1. D.A.J. Vol. LXXIII. Pp. 114-21.

2. Barlow Leases No. 34. Portland MSS. Shire Hall, Nottingham.

up in 1659, limited the former to the working of two pits with full companies from the end of September to the beginning of February, but allowed four pits to be worked for the rest of the year. The same type of restriction may be seen in the lease of the Sheffield Park coal by Richmond in 1692, whereby he was not to get coal at more than two pits at a time nor to employ more than ten hewers. In addition, the lessee contracted to carry on work on the deep of the seam equally with the basset and to leave two pits in working order at the expiration of the lease.

Mining technique throughout the area seems to have varied little from colliery to colliery. In South Yorkshire, mining methods can best be studied at the Handsworth pits, worked by Sir John Bright.^I Bright took over this colliery, valued at £1800, in 1651 at a rent of £30 a year, from the Countess Dowager of Arundel. To drain the coal, a sough was dug at a cost of £265 " beside our labour." In February, the colliers began to sink three pits which were completed a year later. Ventilation was provided at this stage by " trunks" or wooden pipes through which air was forced by bellows. One pit was on the outcrop of the coal and the other on the deep so that the intervening seam could be extracted by driving benches into the coal and then mining the seam between each pair of shafts. Such an arrangement provided natural ventilation. As the life of each pit was short, a third was usually being sunk while coal was extracted from the other two. The coal

I. Sir John Bright's Papers Concerning Handsworth. Wentworth Woodhouse MSS. Br. 52/6. Sheffield City Library.

was hauled along the workings in baskets placed on sledges. During the first year, when construction work was at its heaviest, 32 men were employed. Later, payments were made to six getters, so that it may be assumed that together with the manager, Thomas Stacey, and a banksman, the total regular labour force was about fifteen. Annual output during the third quarter of the century averaged about 1000 loads a year.

Further information as to the technique of mining can be gained from a study of the accounts of Heath and Beightonfield collieries, the former worked by the Duke of Devonshire and the latter by Henry Bowden, who had inherited the Hewett estate. The Heath coal book for 1697, when the pit produced 259 horse loads, contains an inventory of the colliery equipment. This included a wheel barrow, five new mandrills, three new hammers and twenty four wedges, three new spades and one new mattock and most interesting of all, a new fire pan showing that artificially induced ventilation was in use in North Derbyshire at the end of this century. The Bowden accounts show that at Beightonfield almost all mining operations were done on piece work, as may be seen from the following agreement, typical of others drawn up between the coalmaster and his men.

2 Oct 1699. Bargained with Henry Ryall to gett coales till Feb ye 2nd and was to give him 10d 2 qrs a 3 Quart he allowing me one att ten to make good ye stack; for any bye work or if it run in he is to bear his share. I am to allow 8d a score for punches getting and 12 d a yard for heading.

These accounts, incidentally, are almost unique amongst those so far discovered in that they contain details of profits; the

coalmaster made £25 in 1698 and £33 in the following year, in addition to clearing the whole cost of pit sinking and equipping the two new pits sunk.

Markets for the coal produced around Sheffield are indicated in a letter written by the banksman of the colliery in the Park in 1630, when he reported a diminished demand from cutlers, brewers and householders as one of the reasons for a fall in output. Further north, at the end of the century, coal was in use at Barnby Furnace, probably to give it a preliminary heat before the blast was turned on and the furnace put into full scale production. In Derbyshire, great houses such as Chatsworth and Hardwick consumed large amounts of coal; the latter, for example, was supplied in 1666 with 975 loads from a colliery on the estate at Hardstoft. It is probable that apart from its use for heating and cooking at Hardwick, coal was used for malting, as this part of the county was already well known for its production of barley.

Other markets taking increasing amounts of coal were brick making, the manufacture of pottery and lime burning. Brick only slowly replaced stone as the traditional building material of the region but houses such as Swanwick Hall, built by the Alfreton coalmaster, John Turner, on the occasion of his marriage to Elisabeth Thoroton, daughter of the famous historian of Nottinghamshire, in 1672^I and a house in St Mary's Gate in Chesterfield erected by the lead merchant, Richard Youle, show the trend of architectural fashion away from the old halls with their walls of native grit and sandstone. The

Welbeck estate accounts show building in brick there towards the end of the century.¹ In Yorkshire, an agreement of 1640 provides for the supply of both coal and wood to a brick yard in Ecclesfield.² The first brick house to be built in Sheffield was traditionally believed to have been erected in Pepper Alley in 1693.³ Another market for coal was in the manufacture of pots - the first big pothouse in the district seems to have been set up in Grich in 1698 by Thomas Morley, a Nottingham potter. Peak District rentals show an increasing amount of lime burning during this century and entries in estate accounts and occasional leases specifying the quantities of lime to be used on farms by tenants point to its increasing use in agriculture.

In addition to these internal markets coal was sent from the collieries on the eastern edge of the field into Nottinghamshire and from those on its southern perimeter into the counties of Leicester, Rutland, Northampton and Lincoln.⁴

THE PRE-CANAL AGE 1700-75.

Three rivers penetrate the Yorkshire, Derbyshire and Nottinghamshire coalfield - one, the Don in its central section and the other two, the Calder and the Trent, on its flanks. The two latter, were in the seventeenth century, unlike the Don, naturally navigable to points within the coalfield. As a result, the coal on the northern and southern edges of the coalfield, at places such as Sharlston, near Wakefield and at

1. Andrew Clayton v Duke of Newcastle concerning the administration of the Welbeck estate. D.D.2.P. 24/73. Shire Hall, Nottingham.
2. Br. 45. Wentworth Woodhouse MSS. Sheffield City Library.
3. John Bigland. History of the County of York. P. 817. (1811).
4. Richard Blome "Brittania" section on Derbyshire (1673) and Journals of the House of Commons. XI, 414-5 and 493.

Strelley and Wollaton, outside Nottingham was more extensively exploited than it was in the central part of the field, many miles from a navigable river.¹ Improvements on the Don, initially as far as Aldwark in 1733 and subsequently as far as Tinsley in 1751 placed the South Yorkshire coalfield on an equality with its competitors as far as transport facilities were concerned, leading to a spectacular expansion of the industry in the Don valley, as it responded to the stimulus offered by the demands of an expanding market. By 1732, South Yorkshire coal was effectively competing with Durham coal in the Humber estuary and in the valleys of the Trent and Ouse.² During the 'sixties, coal mined around Rotherham, penetrated the Trent valley as far south as Newark and along the Fosse Dyke to Lincoln, from which the adjacent parts of the county were supplied, as a result of the temporary exhaustion of the collieries around Nottingham and in the inability of the pits in South Derbyshire at Heanor, Shipley and Langley to compete in this market as the roads between them and the Trent were in such poor condition.³ It is probable that the introduction of the atmospheric engine into the Nottinghamshire coalfield and the turnpiking of the Bramcote Road between the Trent and the coalfield in the Erewash valley led to the capture of the market for coal in the lower Trent valley by the southern portion of the coalfield once again, but a traveller in Lincoln

- I. Sharlston Colliery was leased by Thomas Stringer in 1664 for a period of seven years at a rent of £1000 annually. Westmoreland (Sharlston Collection) MSS. Northamptonshire Record Office; Strelley Colliery made a profit of over £10,000 from 1654 to 1667. Edge MSS. Shire Hall, Nottingham; the importance of mining at Wollaton is shown in H?M.C. Middleton MSS.
2. Journals of the House of Commons. XXII, 456, 458 and 467.
3. Journals of the House of Commons. XXIX, 712, 796, 915 and 971.

in 1772 noted that the supply of coal in this county was chiefly from Yorkshire collieries.¹ The South Yorkshire pits, however, had no monopoly of this market, as it was fiercely contested by coal brought by barge from the mines along the Calder near Wakefield.² Another extensive market for coal mined in South Yorkshire was along the Derwent Navigation to Malton in the East Riding, an inland waterway controlled by the Marquis of Rockingham and leased by the most important coalmasters on his estate, the Fenton family. Altogether, it was estimated that the total coal traffic down the Don in 1772 was some 40,000 waggons - probably between 80,000 and 90,000 tons.³

The extension of the Don Navigation to Tinsley, within a few miles of Sheffield, with which it was connected by a turnpike, led to a considerable expansion in the trade both of Rotherham and Sheffield. When Arthur Young visited the former town in 1769, he noted the foundries at Masborough making plough shares, boilers and pans and a pottery making earthenware and two collieries supplying these works with fuel. He also noted the great prosperity of Sheffield, where, during the previous twenty years, the number of forges had increased by seven, tilts by two, grinding wheels by eleven and the number of troughs by 262. As many operations in Sheffield industry consumed coal, this expansion in business activity necessarily led to an increase in the demand for coal. Increased industrial development and the growth of population brought an increased amount of building in their train, a consid-

1. A Short Tour of the Midland Counties of England performed in the Summer of 1772. Pp. 41-2.
2. List of the Common Carriers of Coal on the River Calder. Bretton Hall MSS. Yorkshire Archaeological Society, Leeds.
3. Memorandum in Diary of John Spencer 1773. Cannon Hall MSS. Sheffield City Library.

erable proportion of which was in brick. Both the Norfolk and Bright rentals show the construction of new brickyards in or around Sheffield. To meet the demand for glass, new glass houses were built at Bolsterstone and Catcliffe, at each of which, small collieries were worked by the owners, to provide the necessary fuel.^I An increase in the number of houses led to an expanding market for domestic fuel - visitors to the district were astonished at the cheapness of coal and the amount burned by householders.² The increase in population stimulated agricultural development and, led by such landowners as the Marquis of Rockingham and the Duke of Leeds, landlords began to enclose waste and common land on a considerable scale. Lime was a necessity to bring this under cultivation and to keep it in good heart. Young on his Northern Tour noted that farmers in Ecclesfield used four quarters of lime per acre. As the River Don cut consecutively through the magnesian limestone formation and the coal measures between Doncaster and Sheffield, it was easy to transport both along the river and to burn the stone down to lime. The Don Company established kilns at Conisborough in 1733; the Marquis of Rockingham worked kilns at Hooper, Wentworth and Kilnhurst in conjunction with collieries on his Wentworth property; Young noted lime kilns at Rotherham and other documentary evidence shows kilns at work at Sprotborough, Warmsworth and Tinsley during this period. Two other coal consuming industries which underwent considerable expansion in South Yorkshire at

- I. British Museum Add. Mss. 24438 f. 41. Collections for the History of Ecclesfield Parish; Wentworth Woodhouse Deeds No. 1728. Sheffield City Library.
2. Magna Britannia et Hibernia. Vol.6.P.448 (1730) and "Travels in England" Letter II (1761). M.D. 1769. Sheffield City Library.

this time were the manufacture of malt and cloth.

This combined internal demand and export trade led to a massive development of coal mining in the first three quarters of the century in that section of the Don valley where the river cut through the Coal Measures. The rentals stipulated in coal leases show a vastly increased scale of output. In 1723, John Hirst leased two collieries on the Rockingham estate at Swinton and Greasborough with a combined rent of about £200 a year.¹ Two years later, William Spencer of Bramley Grange, a Yorkshire landowner with considerable interests in the Derbyshire lead industry, leased a colliery at Kimberworth from the Earl of Malton at an annual rent of £245 and another at Greasborough for £63.² These latter pits were taken over by the Derbyshire coalmaster, John Bowden of Beightonfield in 1742 for the same rent, but output at Greasborough rose so rapidly that this was soon increased to £240 a year.³ The account books of this estate show Richard Bingley paying a rent of £124 at this time for a colliery at Brampton Linthwaite lower down the river. These rents are, however, dwarfed by that paid by Thomas and William Fenton, who leased the coal under the Wentworth estate at Basingthorpe in 1757 at a rent of £324 for the first two years of their lease and of £648 for the remaining nineteen years. By 1773, their sales down the Don were more than 20,000 waggons a year - about half the total amount of coal sold down river.

1. General Rent Roll of Estates in England and Wales compiled in 1723. Wentworth Woodhouse MSS. Sheffield City Library.
2. Wentworth Woodhouse Deeds. No. 1727. Sheffield City Library.
3. Wentworth Woodhouse Deeds. No. 1729. Sheffield City Library.

Coal mining naturally developed around the terminus of the Don Navigation at Tinsley, near the outcrop of the Barnsley Bed. At Darnall, a colliery was opened by a local landowner, Joseph Alsabrooke. At his death, this colliery came into the hands of his son-in-law, Joseph Swift, who in 1760 entered into a partnership with Walter Osborne, an iron merchant and with Joseph Clay of Bridgehouses, the most important of mid-eighteenth century lead merchants.^I By 1762, competition from this colliery had become sufficiently acute in Sheffield for the Duke of Norfolk to take legal advice whether, as Lord of the Manor of Attercliffe, he could prevent traffic crossing the Common from the colliery to the town.² Ten years later, Darnall was supplying half the house coal used in Sheffield, as it had the advantage of good road communication with Sheffield, whereas the Norfolk pits had to bear the cost of heavy repairs on what were then private roads through the Park. Coal from Darnall Colliery was also exported down the Don.

Despite competition from Darnall Colliery, mining in the Park in Sheffield expanded rapidly under the dual stimulus of increasing industrial and domestic demand. At the beginning of the century, after the expiration of Richmond's lease, the Sheffield lawyer, Banks, took over the colliery for a period of twenty one years. A rate assessment of 1716, however, shows this colliery then to have been in the hands of Robert Clay, a Walkley yeoman whose chief business interest lay in lead mining and smelting.³ After his death, the mine

1. Tibbitts Collection. No. 819. Sheffield City Library.

2. British Museum. Add. MSS. 27538. Papers relating to the Duke of Norfolk's Estates in Sheffield.

3. Jackson Collection. No. 1694. Sheffield City Library.

was leased by John Bowden of Beightonfield at a rent of £400 annually and a fifth of all sales in excess of £2000 a year.^I Payments in the Cash Books of the Norfolk estate show that Bowden in the last six years of his lease, which ended in 1758, paid £1377 in excess rents. No further records of mining in the Park have been discovered until 1774, when a twenty one years lease was granted to Townshend and Furniss, whereby they undertook to pay a minimum rent for Sheffield Colliery of £100 annually and in addition a royalty of £2.4.0 for every Tenn (44 loads) of coal mined in excess of 600 tons. This partnership also took over the Manor Colliery at a minimum rent of £50 with an additional royalty of eightpence per cart load on all coal mined over 4400 loads. This partnership invested £3200 in the colliery and with the advantages of shallow pits and adequate supplies of the hard coal demanded by the cutlery trade easily accessible, increased output here to the extent that it was paying at the end of this period over £1000 annually in rent and royalty to the Duke of Norfolk.

Although no navigable river penetrated North Derbyshire, improved road communication with the lead mining areas of the Peak and the agricultural districts of Nottinghamshire, widened the market for coal. There is ample evidence to show that during the first half of the century, the transport of coal was confined to a comparatively short season between hay making and the corn harvest and that after the end of October, the roads were almost useless for heavy traffic. The creation of a road system usable throughout the year must have been a big advantage to the collieries. A primary motive in

road improvement in this region was to facilitate coal traffic. The Turners of Swanwick rebuilt the road from their pits to Matlock at their own expence in the ' thirties.¹ The chief purpose of the turnpike road from Little Sheffield to Buxton via Grindleford Bridge and Hucklow and to Sparrow Pit via Hathersage, Hope and Castleton was to enable coal mined around Heeley to compete with coal mined in Cheshire, carried along the Sherbrooke Hill Trust's road from Chapel en le Frith toll free.² In the next year, when the road between Baslow and Calver bridges was turnpiked, one clause of the Act stipulated that coal brought from Baslow Colliery by the owners of the lime kilns at Calver or by the Duke of Rutland's tenants should only pay half toll. Another road turnpiked in 1759, that connecting Chesterfield with Mansfield, was improved with the object of facilitating the transport of coal from the pits at Heath, Barlborough and Staveley to Worksop and Mansfield and other parts of Lincolnshire and Nottinghamshire.³ A third road turnpiked in this year, largely through the influence of Anthony Tissington, the manager of Swanwick Colliery, was the Newhaven Turnpike connecting these pits with the Winster, Matlock and Ashbourne districts. Its Act gave waggons carrying coal a concession of one third of the toll. Another Act passed in the same year, turnpiking the road between Chesterfield and Matlock Bridge, exempted all coal traffic entering this road from a side gate from payment

1. British Museum. Add. Mss. 6692. F. 180.

2. " The Humble Petition of the Town of Sheffield ? Tibbitts Collection No.362. Sheffield City Library; " Petition respecting the Chesterfield Turnpike" Bagshawe Collection I3/3/296. John Rylands Library, Manchester.

3. Case on behalf of the Bill -- for Repairing the Road from Chesterfield in Derbyshire to the twon of Mansfield. n.d.

of toll. In 1764, when the road from Alfretton to Mansfield was made into a turnpike, the Bill contained a clause whereby coal from Blackwell Colliery was to pay only half toll. Two years later, when the High Moors Turnpike was constructed over the East Moor, concessions were once more given to coal traffic. In the same year, a cross country road from Ashover to Temple Normanton was made into a turnpike, largely through the efforts of the Quaker Lead Company, which wished to improve communications between its Bower's Mill lead smelting plant and the collieries along the Mansfield Turnpike.^I

There is no doubt that coal traffic between the North Derbyshire Coalfield and the lead mining areas in the Peak was heavy, even before these roads were turnpiked. One reason for this was the introduction of the Newcomen engine to clear the deeper mines of water. There were three of these at work at Winster in 1730.² Shortly after this time, according to Farey, usually a most accurate witness, there were ten of these engines working at lead mines in the Peak.³ As the efficiency of these machines was low, their high fuel consumption must have greatly stimulated coal production. Another technical innovation was the introduction of the cupola by the Quaker Lead Company in the early decades of this century to smelt lead. This, unlike the lead smelting mill used coal for fuel. The intensive development of the Alton Seam, on the eastern margin of the coalfield, must be largely ascribed to these new markets in the Peak.

1. A. Raistrick "Quakers in Science and Industry." Pp.184-5.
2. "Dr. Clegg, Physician and Minister." D.A.J. Vol. XXXV. P. 28.
3. J. Farey "Agriculture and Minerals of Derbyshire". Vol. I. P. 338. (1811).

Turnpike development and increasing population undoubtedly did much to stimulate the enclosure of common land in the Hudred of Scarsdale and of the wastes in the Peak. Lime was needed to bring both under cultivation. Arthur Young, on his Eastern Tour in 1771, noted that it was customary to use a hundred bushels of lime per acre around Chesterfield. On the infertile grits, twelve horse loads per acre were used for wheat growing to destroy the ling on the newly enclosed land between Chatsworth and Tideswell.^I As the coalfield was flanked on both east and west by limestone formations, it was easy to take fuel to the quarries and burn the stone down to lime. To the west there were kilns at Ashover, Hockley, Calver and Stony Middleton and to the east at Cleasby and Worksop. These kilns, in addition to supplying lime for farming, also sold it for building.

Brick yards also provided another market for coal. Blast furnaces and cupolas required fire brick for relining their tunnels. Brick, as may be seen from the advertisements in the Derby Mercury, was replacing stone as the chief building material in the district. Successful lead merchants, such as William Soresby, who built himself " a capital mansion house " in Saltergate in Chesterfield and Isaac Wilkinson, who built Tapton House, outside the town, both built in brick. Even smaller houses, such as the delightful little house erected for the use of a master at Dronfield Grammar School, were built in this material. The construction of the Chesterfield Canal, for which three million bricks were made at Harthill for lining

I. The Farmer's Tour through the East of England. Vol. I.
Pp. 213-4. (1771).

Norwood Tunnel, and another million made at Shireoaks for building locks, must have led to a considerable demand for coal in this area at the end of the period.

Brewing was another industry which expanded during this period. Mansfield had become an important malting centre, supplying markets in Cheshire and Lancashire. Alferton had become a noted town for the quality of its beer.^I A German professor, Ferber, who visited Derbyshire at the end of this period, described the process of making coke for malting. The coal was placed in piles about seven yards long and a foot high, with the lumps loosely packed so that air could circulate through them. The heap was then ignited by throwing coal down holes left for that purpose. The piles were then allowed to burn until it was considered that all the coal had been turned into coke, when the heap was broken up with iron bars and the fire extinguished.²

This expansion in demand was not met, as in South Yorkshire, by an enlargement of existing collieries, so much as by an increase in the number of mines at work. The pattern is similar to that of the previous century with pits at work in almost every parish. The majority of these, where production figures are available, seem to have had an output of from 1000 to 2000 tons a year. Whereas the construction of the Don Navigation tended to canalise mining along one narrow sector of the coalfield, the development of the turnpike system in Derbyshire, crossing and crisscrossing^S the coalfield, tended

I. The Universal Magazine for October 1848.

2. J.F.K. Ferber "Versuch einer Dryktographie von Derbyshire." (1776). P.43.

rather to open up new pits and to decentralise rather than to concentrate production.

The pattern of ownership during these seventy five years is clear. Coalmining was still dominated by the land owning class. The part played by the aristocracy was, however, a minor one compared with that of the gentry. Typical amongst this class was John Bowden, who apart from the collieries already mentioned on the Norfolk and Wentworth estates had other pits on the Portland property at Shuttlewood, on the Duke of Leeds' estates at Todwick and on the Devonshire property at Beightonfield, Hollingwood and Inkersall in Staveley. This Catholic, descended from two of the best families in the county - his mother was an Alleyne of Wheston Hall, near Tideswell - called himself yeoman and who registered himself with the Derbyshire Quarter Sessions in 1745 as owning land worth a mere six shillings, had considerable landed property in the hands of trustees bonded to him for rents.^I Altogether, he must have been a very rich man and his son, in more peaceable times for Catholics in the second half of the century, was able to acquire a large landed property in Clowne, where he built Southgate House, near the junction of the Worksop and Rotherham Turnpikes. Of equal importance as coalmasters with the Bowdens, although the major part of their coalmining interests were in the south of the county, were the Fletcher family. In the seventeenth century, this family can be traced as yeomen, living at Kilburn. In 1684, Robert Fletcher was offering Francis Stanhope, the owner of the important Zouch coal royalty at Heanor, £70 for the lease of a pit there. His two sons, John I. Bateman MSS. Chatsworth House, Derbyshire.

and Robert, had a lease of the coal there in 1715 for sixty three years and the family worked this colliery until 1766.^I During the next half century, the brothers extended their mining operations, working collieries at Hartsay, Denby, Smalley, Shipley, Langley, Ripley and Pentrich.² John, who lived at Stainsby Hall, had a grant of arms in 1731; Robert, of Heanor, married the daughter and heiress of William Richardson of Smalley, another South Derbyshire coalmaster. This family first became interested in coal mining in North Derbyshire in 1728, when they leased the coal under the Coke estate at Pinxton. Later, in 1758 they took a lease of the coal under this same property at South Normanton.

Other members of this same social class working collieries in North Derbyshire were the Rodes of Barlborough Hall with pits at Nitticar Hill and under the open fields of that village; the Hunlokes of Wingerworth, the leading Catholic family in the district, had a colliery alongside the Derby turnpike; the Wraggs of Stretton Hall were working coal on the Hunloke and Woodyeare estates near Clay Cross and Thomas Thoroton of Scriveton M.P. for Newark (according to Reynolds, the Derbyshire antiquary, writing in 1760) after having inherited the Turner property in Swanwick, received " a large income from the coalmines there." Three other landowning families who were mining coal at this time, all with their roots in lead mining in the previous century were the Brights of Chesterfield with a colliery at Eckington, the Gladwins of Stubbing Court with

1. Charlton of Chilwell MSS. Shire Hall, Nottingham.

2. John Fletcher v Francis Barber. Accounts for sale of coal 1713 -55. Parcel CXCIV. Bemrose Collection. Derby Borough Library.

pits at Boythorpe and the Milnes of Dunston with a colliery on their property there.^I

The same situation can be found across the county boundary in Yorkshire. In Handsworth, three families which had risen into the ranks of the gentry by wealth derived from either coal or lead mining - the Staceys, the Noddors and the Fentons - were all mining coal under their own land. The Fenton colliery on this property and another mine rented from the Duke of Norfolk came by marriage into the hands of John Rotherham of Dronfield, a member of a family which had risen to wealth and position in much the same way as had the Fenton family. In the upper part of the Don valley, a series of law suits between the Duke of Norfolk and the Hamforths of Owlerton show the latter family mining coal in the early part of the century at Loxley, on the common between Bradfield and Wadsley. In the middle section of the river, where it was navigable around Rotherham, John Hirst of Clough leased eighteen acres of coal in 1745 for a period of 42 years.² In 1774, some 15,000 waggons of coal were sold down stream from this colliery. In the north of the area, coal mines were worked near Barnsley in the first quarter of the century by such families of gentry as the Spencers of Cannon Hall, the Shippems, the Elmhirsts and the Archdales.

The class below the gentry, that of the small land owner and tenant farmer, too, provided much of the capital and initiative for developing coal mining. In 1700, Peter Browne, a Staveley yeoman, leased the pits, later held

I. Fairbank Collection. D.46; Crewe MSS. No. II39 and Beauchief MSS. No. 905. Sheffield City Library.
2. Tibbitts Collection. No. 804. Sheffield City Library.

by John Bowden at Westwood for £30 a year and another colliery at Eastwood for the first year of the lease and £70 annually for the remaining four years. Nine years later, as shown by another lease at Hardwick Hall, he took over the coal at Beightonfields on the deep of Mastin Moor for £100 a year. Another family of this class, the Allwoods, had collieries on the Devonshire estate at Heath and on that of the Earl of Scarsdale at North Wingfield. More important than any of these families in the long term development of the North Derbyshire coalfield were the Barnes family. Joseph Barnes of Linacre farm was mining coal on the Oxford estate at Barlow and Brampton in the first half of the century.^I A second member of the family, another farmer, was at the same time buying coal rights in Brampton. The real founder of the family fortunes, however, was John Barnes of Holme Hall, a man with a multitude of business interests in addition to coal mining. In the 'forties, he was mining coal at Barlow on the Oxford estate. In 1756, he bought 70 acres of land at Ashgate and another 30 at Newbold, under which to get coal; in 1763, he leased another pit at Barlow; in 1765, he leased from the Duke of Devonshire " that delph of coal lying within and under the North side of Chatsworth Park " and in the same year he leased another mine from the Duke at Heath. The deeds of the Coke family of Pinxton contain a number of coal leases to farmers on this property; John Stones, a tenant farmer on the Oxford property at Brampton rented a colliery on his farm; on the Wentworth property in Yorkshire, leases show William Beaumont, husbandman

I. Henrietta, Countess Dowager of Oxford v Wm. Soresby.
Jackson Collection. No. 1285. Sheffield City Library.

and Farham, a tenant farmer renting over 150 acres, in possession of pits at Tankersley and at Westwood respectively.

Compared with these classes, the output controlled by the aristocracy was small indeed. The Duke of Devonshire was working a colliery on the Hardwick estate during the first half of the century, which, when leased in 1749, was valued at £300. Over the Yorkshire border, the Duke of Leeds took over a colliery on his property at Woodall Moor from a local farmer who had gone bankrupt and found himself in York Gaol in consequence. Its output in 1740/1 was 2500 loads. At a later date, two more collieries worked by the Duke at Wales and Todwick Common had a total sale of coal in 1765 of £430.^I On the Wentworth estate, the policy during the first half of the century was to lease the coal, but in 1752, after a visit to the Duke of Bridgewater's colliery at Worsley, the Marquis of Rockingham took over a small colliery at Elsecar, largely for the purpose of burning the lime which was brought down the Don to Kilnhurst from the magnesian limestone scarp near Brotherton. Other limekilns at Hooper were supplied with coal from a number of shallow pits at Swinton Common and Braithwaite. In 1763, on the death of the lessee, the Marquis began to work a larger colliery at Law Wood. At this time, twenty two colliers were employed here and eight at Elsecar. Coal from Law Wood was also used to burn brick and pantiles for estate use. Of interest, if not of any real economic importance, were the efforts of the Marquis to supply his town house in Grosvenor Square and his estate at Higham in Northamptonshire with coal mined on his Wentworth property. The coal was first sent by I. Duke of Leeds MSS. Yorkshire Archaeological Society, Leeds.

barge to Thorne, where it was placed in larger keels for shipment to Hull. There, it was forwarded by collier to Lynn or London. These areas were normally supplied by the North Eastern Coalfield and as these shipments were from the cost standpoint uneconomic, they can be regarded as a relic of feudalism, the determination of a great nobleman to use the products of his own estate, rather than an attempt to break into new markets.^I

The colliery lease underwent considerable change during this period. In the early years of the century, the typical lease on the Devonshire, Portland, Norfolk, Kingston,² and Newcastle³ estates contained a fixed rent without any reference to the amount of coal mined. The interest of the landowner, however, continued to be protected by clauses stipulating the maximum number of hewers to be employed and the number of shafts to be worked at any one time. As an example, the lease between the Duke of Devonshire and Peter Browne, drawn up in 1700 for the colliery at Staveley Westwood may be quoted: Browne was restricted to working two shafts at any one time, limited to employing not more than the usual number of men and bound by a bond of £600 not to use any mining methods whereby " the said mines may be wrought out or rendered the less beneficial." With the expansion in coal output, brought about by the improvements in communications, landowners and their lawyers began to draft leases, whereby there was some definite relationship between output and the

1. Letters and Papers of the Second Marquis of Rockingham. Memoranda about collieries at Wentworth. R.I74/23. Wentworth Woodhouse MSS. Sheffield City Library.
2. William Soresby's Accounts. Manvers MSS. No.4338. The University Library, Nottingham.
3. British Museum. Add. Mss. 33I65. Newcastle Rental 1737-74.

royalty paid by the coalmaster. The normal practice on the Wentworth property in the second half of the century was a fixed payment for each hewer. This varied from colliery to colliery. The amount stipulated was probably arrived at by a consideration of all the factors which governed profitability - the thickness and number of the seams, the depth worked and the situation of the mine in relation to markets and communications. The royalty on each hewer at Fenton's Basingthope Colliery, situated alongside the Don, in 1762 was £40.10.0.¹ At Richard Bingley's colliery at Law Wood, where although there was a thick seam of good coal, the mine was a considerable distance from water transport, the payment per hewer in that year was seventeen guineas. At Parkin's Bolsterstone pit, working a thin seam in a sparsely populated district, the royalty was only £3.10.0.

The customary practice in Nottinghamshire and South Derbyshire was to levy the royalty on each stack of coal brought to the surface. This system was to be found on the southern boundary of the Hundred of Scarsdale on the Coke estate at South Normanton, where 15 acres of coal were leased in 1758 to Goodere Fletcher at a royalty of 1/6 a stack.²

The fairest system - and one which virtually replaced all others during the Early Railway Age - was that in which royalties were calculated on the acreage of coal extracted. In addition to the virtue of fairness between the two parties, it offered another advantage in that it was both cheap and simple to operate since the only operation needed

1. Account Book No. 238. Wentworth Woodhouse MSS. Sheffield City Library.

2. A stack was 74 in long, 46 in. high and 57 in. wide.

was an annual scaling by a surveyor. The first example so far discovered of this type of lease is one for coal under the Ogston estate, dated 1742, in which the lessees were to pay £42 for each acre of coal mined. This lease is also of particular interest in that it contains a clause whereby a minimum annual payment of £45 is stipulated, a practice which again became general during the Early Railway Age. Another example, twenty years later, between Anne Cartledge of Dronfield and Anthony Gallimore, whereby the former was to sink two shafts and make a sough at Dore, provided for a coal rent of £60 per acre.^I In 1765, John Barnes of Ashgate leased the Top Hard Seam on the Hardwick estate from the Duke of Devonshire and a poorer coal at Brampton from the Duke of Portland. In the first case, the royalty was £120 an acre and in the second £40 an acre. Despite its advantages, the acreage lease did not, however, completely replace the older type of lease, examples of which can be found at a much later date.

In a few cases, the landowner agreed to meet a part of the initial cost of mining development. On the Wentworth property, when Richard Bingley leased Elsecar Colliery in 1752, he was allowed to work the coal free of royalty for two years provided he cleaned out a sough, constructed by a previous tenant, as far as Elsecar Green and continued it as far as "the foot of the coal now lying -- in a certain close - situate in Hoyland -- called the great arm royd." In the same year, another collier submitted a proposal to the Marquis of Rockingham to make a boring at Hooton Roberts, in which it was suggested that if coal were found there that he should not pay I. Deed No. 37/2. Brookhill Hall, Pinxton, Derbyshire.

any rent during the first two years when the colliery was at work. On the same estate, £50 was paid in 1761 to the tenant of Elsecar Colliery towards the cost of extending a sough. In the lease of 1765 mentioned above between Barnes and the Duke of Devonshire, the latter was to pay the cost of the sough for draining the Hardwick coal. In his other lease drawn up in the same year, Barnes was allowed to mine six acres of coal without payment as an allowance towards the cost of driving a sough from the bottom of Brampton Moor. In the same year, when proposals were being put forward for mining coal at Ainmoor in the parish of North Wingfield, the prospective lessees demanded that no royalty should be paid during the first year of the lease.^I

Information as to the amount of capital engaged in coal mining is unfortunately sparse. It is conspicuously absent for the more important owners such as the Fentons. What exists relates almost entirely to the smaller collieries. In 1716, Thomas Wentworth leased to John Green of Swinton, yeoman, the coal on the west side of Wath Common at a rent of £15 for the first year, when only one pit employing three men and three boys was to be at work and of £30 for the remaining six years of the lease, when two pits would be in operation. Green subleased the pits to working miners but the lease had to be surrendered when the sough became stopped up. An inventory made at this time shows the meagre equipment needed in the early decades of this century in coal mining - thirty pit props, four corves, three pairs of turnstakes, a fire pan, trunks and

I. Papers relating to the colliery with proposals from different people. Sneyd MSS. Hand Morgan Collection. William Salt Library, Stafford.

a pair of bellows for ventilation, a hurrying hook, planks and footboards - the whole valued at about £9.¹ An inventory of Woodall Moor Colliery, made in 1740, at the time of its transfer to the Duke of Leeds, shows the amount of capital invested in a colliery capable of producing well over 2500 loads a year - corfs, sledges, hammers, mandrels, dressers, axes, saws, wedges, a fire pan and bank hooks were valued at £85, pumping machinery at £63 - a total with other items of about £200. In 1754, a colliery on the Wentworth estate at Braithwaite was sold for £115. Three years later, when the coal on the north side of Swanwick Hall was worked out, Anthony Tissington estimated the cost of sinking a new pit on the south side of the house at £700 with an additional £1100 for a Newcomen engine.² In 1765, £100 was suggested as the cost of sinking a new colliery at Ainmoor. In 1767, another colliery working the Alton Seam at Barbers Fields, outside Sheffield, was sold for £57.³ John Barnes spent £130 on sinking pits and making a sough at Heath Colliery before it came into production. It is obvious that the capital needed to begin coal mining during this period was not large, a fact which largely explains why this industry was so much in the hands of individuals, whereas contemporary lead mining and iron smelting, which demanded much larger initial investment, was almost entirely in the hands of partnerships.

Information as to the profits made during this period, again, mostly relates to the smaller concerns.

1. Court Rolls and Papers. C.2/272. Wath Wood Colliery. Wentworth Woodhouse MSS. Sheffield City Library.
2. Turner MSS. Flintham Hall, Nottinghamshire.
3. Tibbitts Collection. No.830. Sheffield City Library.

One owned by the Duke of Leeds at Kiveton, selling coke as well as coal, made a profit of £125 between September 1718 and February 1719. A much larger colliery, that in the Park in Sheffield, was according to the Duke of Norfolk, selling coal in 1725 to the value of £1200 and £400 of this was profit. In 1730, when the colliery was worked by the Duke, almost exactly the same amount of coal was sold, but the profit realised was only £276.^I The Bowden account book for Todwick Colliery shows that sales averaged from £400 to £500 annually from 1720 to 1734 and that the pits made about £80 a year profit. A colliery worked on the Kingston estate at Beighton cleared about £150 profit from 1734 to 1736.² In 1747, when D' Ewes Coke, the owner of a large estate at Pinxton was heavily in debt, he drew up a balance sheet of his assets, in which he included the value of his colliery, which he estimated at that time to bring in £400 a year. As part of his plan to free himself from his encumbrances and to settle the property on his son, George, he proposed to lease the colliery to Goodere Fletcher, who was to expand production to 4000 loads a year, which it was estimated would bring in a profit of £1000 annually. Nearby at Swanwick, Anthony Tissington, when planning his new colliery there in 1757, considered that it would make an annual profit of £600. On the Wentworth estate, Law Wood Colliery cleared £140 in 1753 in selling 558 pit loads - about 2800 tons; in 1756, Elsecar sold 2200 dozen of coal - about 4500 tons - and made a profit of £160; a colliery on Swinton

1. William Ellis' Account for Sheffield Colliery 1730)- I.

Deed Box 25. Norfolk Estate Office, Sheffield.

2. Mr Green's Accounts. Beighton. 1733. Manvers MSS. No. 4368. The University Library, Nottingham.

Common made a profit of £200 on 1521 dozen in the first eight months of the next year and at the end of the Seven Years War, Law Wood and Elsecar realised £777 profit. At Heath, John Barnes, according to an account book now at Hardwick Hall, just cleared his expenses. His methods of accounting, however, hide a substantial profit in that he charged the colliery with a management fee of £20 drawn by himself as well as 5% interest on both the fixed and circulating capital employed in the business. There is, therefore, every reason to believe that coal mining could be a most profitable activity in this period.

Coalmasters such as the Barnes, the Fletchers and the Bowdens managed their own pits. The only example of a paid manager discovered during this period was Thomas Smith, employed on the Wentworth collieries at a salary of £20 in addition to the wages of an ordinary workman. Generally speaking, the mining problems encountered could be dealt with by men native to the coalfield. On two occasions at least, however, engineers had to be called in from outside, to solve problems too difficult for the Derbyshire or Yorkshire miner. In the early part of the century, the collieries worked by the Shippems and Archdales on Barnsley Moor ran into serious trouble with water. Wortley, the ground landlord, who had big mining interests on the North East Coalfield, called in two Durham viewers to advise on draining the pits.^I In 1771, the steward of the Townley collieries in Lancashire came to Sheffield to advise on the future development of the Duke of Norfolk's colliery at Handsworth, then leased by the Rev. Mr Stacey of Ballifield.

I. Barnsley Moor Collieries 1705-26. Wharncliffe Muniments.
NO.II. Sheffield City Library.

In general, the technique of coal mining shows little advance on the methods in use during the previous century, until the end of the period. There was, in fact, little necessity for any change as coal could be mined in large enough quantities to satisfy the demands of the market from shallow pits. The shafts at Whittington Moor Colliery were only six yards deep; those at Hardstoft were eight yards; at Barnes' Heath Colliery they were sixteen yards and at Beightonfield Colliery they were twenty yards deep. Across the Yorkshire border, in the third quarter of the eighteenth century the pits at Elsecar, Ecclesall and Basingthorpe were fifteen, fourteen and twenty five yards deep respectively. As a result, it was more economic to mine the coal by sinking a large number of new shafts than to drive long headings into the coal. A plan of Jonathon^a Swift's pit at Darnall, drawn at some date prior to 1750, shows five shafts; the same number are shown on a plan of Elsecar Colliery drawn in 1757;^I another of Westwood Colliery at Tankersley, made in the same year, shows the whole of the wood scored with the remains of old shafts; seven pits were sunk at Ecclesall Colliery in 1758; the accounts of the Duke of Leeds' collieries at Todwick and Wales show that nine pits were sunk there in 1765; a map of Sheffield Park, now in the Norfolk Estate Office, shows seven pits at work in 1765; a plan of a colliery at Rawmarsh four years later shows ten pits in use;² another plan of Fentons^v Basingthorpe Colliery drawn in 1765 shows four pits in operation and a later plan made in 1776, after a Newcomen engine had been installed to drain the coal to a depth of eighty yards,

1. F.B. 12. Pp. 58-65. Fairbank Collection. Sheffield City Library.

2. RAW 7L. Fairbank Collection. Sheffield City Library.

shows the whole area to be one mass of old pits which had been filled in, with coal then being mined from ten separate shafts.^I Evidence from Derbyshire tells a similiar story. Bowden, for example, sank seven pits at Beightonfield between 1703 and 1707; John Barnes, in evidence against William Soresby, who amongst his many business activities was agent to the Oxford property in Derbyshire and who was accused of having abused his position to grant himself advantageous leases, declared that he had sunk no fewer than eighty five pits at Barlow between 1726 and 1743;² six shafts were sunk at Heath Colliery between 1766 and 1770. It seems, indeed, to have been normal mining practice to begin to sink a new shaft immediately production began in its predecessor.

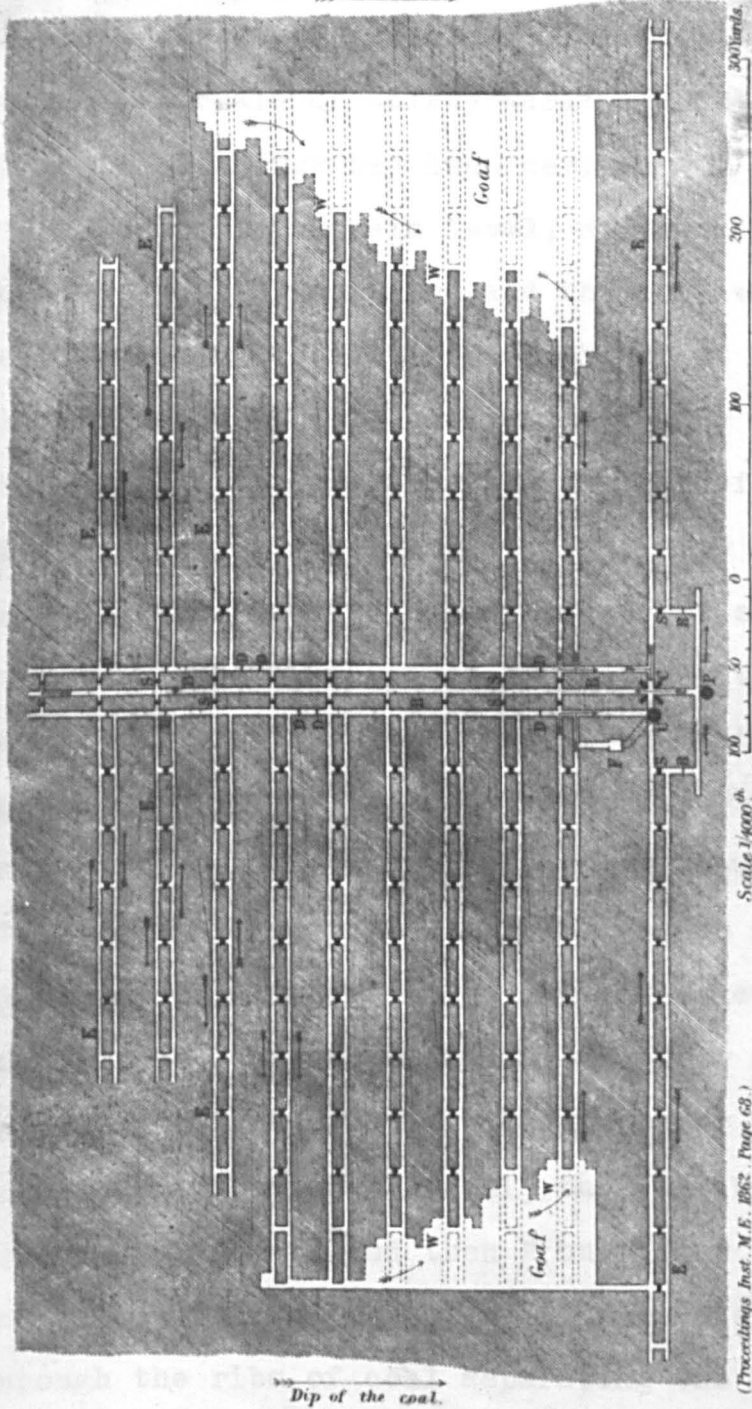
Leases and accounts of workings suggest that most collieries were worked by two shafts, one on the basset and the other on the deep of the coal. In the larger mines, two or more pits were worked simultaneously. Such a lay out made ventilation simple, especially where a fire lamp was employed. Where levels were longer, separate wind pits were sunk to the workings. As early as 1700 chimneys were in use at Beightonfield built on top of the air shaft to improve ventilation. Gas does not seem to have been a serious problem at this period as the Coroners' Inquests show comparatively few deaths from explosions or from asphyxiation during these years.³

Coal was extracted, as is shown by the numerous

1. F.B. Supp. 40. Pp. 2-7 and F.B. Supp.46. P.4. Fairbank Collection. Sheffield City Library.
2. Henrietta, Countess Dowager of Oxford v Wm. Soresby. Jackson Collection. No. 1285. Sheffield City Library.
3. Coroners Accounts. Hundred of Scarsdale. 1752-73. Box 12. No.31. Derbyshire County Council Offices, Derby.

SOUTH YORKSHIRE COAL MINING.

Fig. 5. Plan of Narrow Work, on the End of the coal.



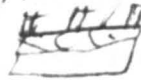
references to beks, endings and gobs in colliery accounts, by a method which was only to disappear in Victorian times, known as narrow work.¹ In this, a bord or level was cut traversley to the grain of the coal and from this endings or roads were cut at intervals of thirty yards against the end of the coal. When these endings had been carried the requisite distance on either side of the main level, a communication was established between their extremities and the coal worked by short faces, leaving behind a goaf. In Derbyshire, at least at the beginning of this century, some coal was mined by the board and pillar method as is evident from the remarks of Celia Fiennes when visiting the Chesterfield ditrict.² How wasteful this could be is shown from an account of land to be sold at Newbold Fields, outside the town, which declares that it was the normal Derbyshire practice to "leave about a third of the coal to support the roof." It seems, however, probable that most pits in the county were adopting the more economic narrow work at the end of the period. Explosives do not seem to have been widely used, although there are references to their purchase in the Bowden accounts in 1700 and they are included in an inventory of the Swanwick Hall property in 1744. After the hewer had extracted the coal, the coal baskets or corves were filled by his mate and then "hurried" to the bottom of the shaft - sometimes through post holes i.e. roads cut diagonally through the ribs of coal separating the banks - by a barrower. In a few of the Barnsley Bed collieries, where a nine feet seam was being worked, horses were used to drag the corves or

1. On Coal and Iron Mining in South Yorkshire. Parkin Jeffcock in Proceedings Institute of Mechanical Engineers. April 1862.
2. The Journeys of Celia Fiennes. ed. Morris. P.96.

Barnsley Colliery Oct



Barnsley Colliery
 &c



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 Mr Copley
 Mr Archdaile
 Mr Hackett

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| Coals Got Copley A R P 5 0 0 Coals dug out | |
| Coals Got Elmhurst A R P | |

Hackett's Lane

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sledges to the pit bottom. Gins, in most cases driven by horses, were used to haul the coal up the shaft. Sometimes, they were in the charge of girls, who seem to have been restricted to this work alone on the coalfield. Barnsley Colliery seems to have been unique in its use of water power for raising coal, if the "watergin, house and ropes" mentioned in an inventory of 1713 refers to a haulage engine.

Drainage throughout this period was mainly by sough. Little information is available as to their cost or extent. John Barnes, in the case previously referred to, declared that he had spent £500 on a sough at Barlow; proposals were put forward to construct a sough at Barnsley Moor in 1716, 900 yards long and costing £1000 but it is doubtful if anything came of the plan; Sheffield Colliery was drained in 1733 by a sough a mile and a half long, flowing into the Sheaf. Barnsley Colliery, again, seems to have been unique in its employment of a wind gin for pumping. This, however, was not sufficiently powerful to drain the pits on the Moor and Shippem suggested to Wortley that he should install a "Newcastle gin" for this purpose. There is no evidence that it was ever erected. Probably the first Newcomen engine to be erected in South Yorkshire was that which William Spencer of Bramley Grange contracted to build in 1735 "for the draining and recovery of the coals" at Carr House "as well as those lying within the Precincts of Kimberworth as those coals which lie within Greasborough Bierley" by raising water from the Thick Coal to a sough driven through to the Don. As the only "fire engine" shown on Dickinson's "New and Current Map of the South Part of the I. Wentworth Woodhouse Deeds. No. 1727. Sheffield City Library.

County of York", published in 1750, is at Carr House and as Bowden who took over Spencer's colliery in 1742, is included in a list of three Newcomen engine owners at Greasborough, printed in the Gentleman's Magazine in 1763 - the others were Hirst and Fenton - it may fairly be assumed that Spencer did fulfill the terms of his contract in this respect. It is probable that another Newcomen engine was installed at Darnall Colliery at this time.¹ By the end of the period there were other atmospheric engines in use at Barnborough in the Dearne valley and at Haugh near Rawmarsh.² Evidence as to the introduction of the Newcomen engine into the North Derbyshire section of the coalfield is, unfortunately, as indirect as that for Yorkshire, but it seems from a comparison of the first accurate map of Derbyshire to be printed - Burdett's Survey of Derbyshire 1762-7 - and Brindley's survey for the Chesterfield to Stockwith Canal made in 1769, that the first atmospheric engine was installed at Staveley at some time between those dates. Another Newcomen engine was at work at what a German visitor to the county, described as one of its largest collieries, at Alfreton in 1775.³

The miner himself remains during this period, a shadowy, indistinct figure. One thing, however, is certain, that in numbers, he was not, as he was to become during the Early Railway Age, the dominant social type in the region. The number of hewers at various collieries - two at Westwood, four at Cortwood and four at Bolsterstone in 1755 and twelve at Carrhouse, seven at Law

1. John Needham's Map of the Colliery on Darnall Common. Wheat Collection No. 1751. Sheffield City Library.
2. Thomas Jeffries. The County of York survey'd 1768 - 70. Plate XVIII.
3. Ferber. op. cit. P.40.

Wood and sixteen at Basingthorpe in 1759 and four at Eastfield in 1767 - shows that throughout the area, the miner was everywhere outnumbered by the agricultural population. Indeed, an examination of the land system of the coalfield and a comparison of it with that of the magnesian limestone district to the east, brings out the high proportion of very small holdings throughout the coalfield, suggesting that the collier, like the nailer and the edge tool worker, was probably a landholder himself. It is certain that the majority of the miners were natives of the area in which they worked, as the Poor Law certificates in such typical mining parishes as Attercliffe, Staveley, Brampton and Barlow, show only a thin trickle of movement into these parishes and in almost all cases, such migration was from a narrowly restricted region.

Almost everywhere the collier worked as a member of a group. The " butty " system whereby one man contracted with the coalmaster to drive headings at so much per yard or to get coal at so much per ton was strongly established. As an example, at the Duke of Leeds' Todwick Colliery in 1765, Allen and Company were paid three shillings for each three quarters of coal got, three pence a yard for filling pits and a penny each for recovering pit props. Wages were paid either fortnightly or monthly. Such a system renders it almost impossible to ascertain the collier's actual earnings or to compare them with those of other workers. In addition, the miner enjoyed many perquisites. The sinkers were given sod ale when a new shaft was started and pricking ale when it reached the coal; ale was given whenever a gin was moved; a colliers'

feast was an annual event at Elsecar; colliery accounts contain items for Christmas presents; many coalmasters provided flannel for pit clothes; free coal, coal at a reduced price or a money payment in lieu, were everywhere provided. Probably many coalmasters felt, like Bowden, that it was all an intolerable burden and that colliers, like other workmen should be satisfied with wages, but as he wrote in his account book, there was no evading it or "else they pretend their custom."

THE CANAL AGE 1775-1840.

The Canal Age in South Yorkshire and North Derbyshire may be said to have begun in 1775 when the first cargoes of coal began to move along the Chesterfield Canal from the pits at Killamarsh to the agricultural districts of North Nottinghamshire. It may be said to have ended with the opening of the North Midland Railway in 1840 across the coalfield from Ambergate to Cudworth through Chesterfield and Rotherham. The intervening period of sixty five years saw both the improvement of existing waterways and the making of new canals. Earl Fitzwilliam built the first of the South Yorkshire canals in 1780 from the River Don at Park Gate to collieries on his estate at Greasborough. The Canal Mania of 1793 led to the construction of the Dearne and Dove and the Barnsley Canals to open up the rich coalfield between the Calder and the Don and to the linking of the latter river at Stainforth with the Trent at Keadby to eliminate the long haul from Stainforth down river into the Humber and then up river to Keadby, a route not only long but hazardous with tides and badly placed bridges. The same year, too, saw the passing of another Act to make a canal from the terminus of the

Erewash Canal at Langley Mill to Pinxton, with a branch to Cromford, to facilitate communication between this part of the North Derbyshire Coalfield and the coal consuming districts in the Midlands. In 1819, the opening of the canal from Tinsley to Sheffield brought that town into communication by water with collieries on the Fitzwilliam property near the point where that navigation joined the Don. That river was itself improved between 1809 and 1835 at a cost of £157,000 by the excavation of new cuts so that by the latter date, Billy Boys of 70 tons could use the river up stream as far as Rotherham and smaller boats of 50 tons through to Sheffield.¹

Canal construction was necessarily restricted to the valleys. The construction of Newcastle railways, however, enabled coal to be transported from mines on the hillsides to the canals in the valleys below them. The Board of the Chesterfield Canal authorised in 1788 the building of a Newcastle railway from a side cut on the canal at Staveley to a colliery recently sunk at Norbriggs. Later, other railways of this type were built from this waterway to coal mines at Glasshouse Common, Inkersall and Spink Hill. By 1835, there were five tramways to coal mines on the Pinxton arm of the Cromford Canal and another thirteen on the branch to Cromford.² In South Yorkshire, construction of Newcastle railways to the Dearne and Dove and Barnsley Canals began before either was opened throughout its whole length.³ Another Newcastle railway was built from the end of the Wosborough

1. Evidence of John Watson and Charles Bartholemew, Law Clerk and Engineer respectively of the Don Navigation before S.C. on the Sheffield and Rotherham Railway Bill. 1835.
2. B. Baxter. "Early Railways in Derbyshire". Engineering. 17 June 1949. Pp. 573-6.
3. J. Aiken. "A Description of the Country from 30 to 40 miles round Manchester." (1795). P.582.

cut on the former canal to a group of collieries near Stainborough in the 'twenties. Earl Fitzwilliam reconstructed in 1831 an older Newcastle railway running down to his canal at Greasborough, giving it easier curves and gradients and at the same time extending it to a new colliery at Swallow Wood.

Dues on most of the inland waterways in this district were fixed with the object of stimulating coal traffic to the greatest possible extent. Tolls on both the Dearne and Dove and Barnsley Canals were fixed at a penny per ton mile with rebates for cargoes of lime and limestone, where barges returned laden with coal. The Board of the Stainforth and Keadby Canal asserted that it was "the cheapest Navigation in the Kingdom" as tolls on coal transported the whole length of the waterway were only ten shillings on a sloop carrying 45 tons. During the 'thirties, when the South Yorkshire coal trade was badly depressed, all the South Yorkshire navigations instituted a series of drawbacks on coal traffic with the object of enabling the collieries in that area to reduce their prices in districts where South Yorkshire and Durham coal came into competition in an attempt to keep these local pits in full production. In March 1833, the Dearne and Dove Canal lowered its dues from 3/9 a wagon to 2/- a wagon and the Don Navigation similiarly reduced its tolls from 2/10 to 2/- a wagon on coal shipped through to the Witham Navigation. In the following June, the latter Company decreased its dues by tenpence a wagon on coal forwarded to Hull for bunkering steamers. In the same month, the Stainforth and Keadby Canal and the Witham Navigation introduced a rebate on dues on South Yorkshire coal sold

in Boston and in the Fenland. The Canal Companies reduced all these drawbacks in the following year, alleging that the coal-masters had failed to use them to reduce the selling price of their coal in East Anglia and had merely pocketed the rebate as extra profit. The colliery owners protested bitterly that a drawback of $4\frac{1}{2}$ d a ton was quite insufficient to enable them to compete with Durham coal in coastal areas and at least one coalowner - Earl Fitzwilliam - was able in 1835 to persuade the Dearne and Dove Canal Company to give coal shipped from his pits at Elsecar a rebate of $1\frac{1}{3}$ a wagon. In the next year, a fresh scheme of rebates was drawn up whereby dues on coal were standardised at $1\frac{3}{4}$ d a ton mile on the Dearne and Dove Canal with a drawback of a thirddon coal sold along the coast, a quarter on coal supplied to steam vessels and a fifth on coal transported to Newark and Boston. These rebates were, however, withdrawn in 1836, probably because they had proved of little value, as even with these concessions, South Yorkshire coal had failed to find a footing in markets where coal exported from the North Eastern Coalfield had been so strongly entrenched for centuries. ^I

A similiar system of rebates was in use on the Derbyshire canals. The Cromford Canal gave a drawback of a shilling a ton between 1796 and 1813 on slack transported west of Buckland Hollow for lime burning. In 1800, preferential tolls were given to Outram and Company of Butterley on all coal shipped from their pits, provided that their account for freight amounted to more than £800 a year. Six years later, Hurt of Crich Chase Ironworks

I. This paragraph is based on Biram's General Correspondence 1832-9 and 1843. C.IV. Wentworth Stewards' Correspondence and Papers. 1771- 1805. Wentworth Woodhouse MSS. Sheffield City Library.

received a drawback on coal sent there, with the proviso, however, that a minimum of 1500 tons annually should be landed there. From 1831 to 1834, the Cromford Canal halved its dues on coal forwarded to the Grand Union Canal to enable Derbyshire coal to be sold in competition with Staffordshire and Warwickshire coal in the Midlands. Three years later, the Board of the Chesterfield Canal introduced a system of rebates over and above the normal drawback on coal transported the whole length of that canal, on coal mined on the Devonshire property at Staveley and transported along the canal to Stockwith for transshipment to London.^I

COAL TRAFFIC ALONG THE NAVIGATIONS.

The construction of the canals linking the North Derbyshire and South Yorkshire coalfield with the valley of the Trent greatly extended the market open to the coalmasters of that district. The mines along the Chesterfield Canal found new markets for their coal among the malsters of Worksop, East Retford and Newark and amongst householders in North Nottinghamshire and Lincolnshire. Brindley had based his financial estimates on the assumption that this waterway would carry 34,000 tons of coal annually. That figure was not, however, reached until 1787. Two years later, coal traffic soared to 50,000 tons. During the next decade the quantity of coal transported on the canal fell to an annual average of 40,000 tons as much the supply mined was diverted away from the canal to a number of newly-erected iron-works. Colliery development during the first decade of the nineteenth century enabled coal exports to recover and during this period, they averaged about 50,000 tons a year. After Waterloo,

I. Resolution of the Canal Company at a Meeting held II May 1837. Hardwick Estate Office MSS. Chesterfield.

the long years of agricultural depression led to a fall in the demand for coal in North Nottinghamshire and Lincolnshire and when the available statistics end in 1826, the quantity of coal carried on the canal in this year had sunk to 38,134^I tons.

After the opening of the Dearne and Dove and Stainforth and Keadby Canals, South Yorkshire coal began to compete successfully with North Derbyshire coal in the Trent basin. Unfortunately, the statistical evidence is incomplete as no tonnage figures are available for the latter navigation and those for the former end in 1820. Part of the Dearne and Dove Canal was opened in December 1798 and during that year 13,325 tons of coal were transported along it. Coal traffic had doubled by the time the waterway had been completed^e in 1804. During the next decade, the amount of coal forwarded along the waterway increased rapidly and by the end of the Napoleonic Wars, pits along this waterway exported 90,000 tons of coal. Three years later, coal traffic topped the 100,000 ton mark. By 1820, when the available statistical material ends, the quantity of coal carried on this canal had risen to over 120,000 tons in that year. The area supplied by collieries in South Yorkshire at this time covered the whole district between the Don valley and the sea coast between Hull and Boston, the Humber basin and the valley of the Yorkshire Derwent as far north as Boston.²

Coal from both South Yorkshire and North east Derbyshire penetrated the Trent valley as far south as Newark.

1. Statistics of the Traffic on the Chesterfield to Stockwith Canal. 1774-89. Jackson Collection. No.1255. Sheffield City Library and Chesterfield Canal Accounts. 1790-1826. L.M. 386.4. Chesterfield Borough Library.
2. Correspondence from Chas. Bownes abt. estate matters and collieries. F. 107 d. Papers, correspondence etc of the Second Earl Fitzwilliam. Wentworth Woodhouse MSS. Sheffield City Library.

Here, competition was encountered from coal mined around Pinxton and Alferton, transported along the Cromford and Nottingham Canals and the River Trent. The coalmasters in this southern part of the Hundred of Scarsdale, however, found it difficult to compete effectively in this district around the elbow of the Trent as freight rates along this meandering section of the river were extremely high. Nearer home, these pits supplied customers along the railway connecting Pinxton with Mansfield. In 1832, this line carried 27,000 tons of coal. Their chief customers, however, were in the towns and villages along the River Soar, the Grand Union and Grand Junction Canals with important subsidiary markets along the Wreak Navigation to Melton Mowbray and along the Oakham Canal into Rutland. In 1832, 180,969 tons were sent to Langley Mill, where the Cromford Canal joined the Erewash and Nottingham Canals, to be distributed in those districts. During the next eight years, the quantity of coal transported along the Cromford Canal fell by an annual average of 20,000 tons as a consequence of the opening of the Leicester to Swannington Railway in 1832, which brought coal into the Soar valley at freight rates less than half those charged by the canals from the mines on the southern borders of the Hundred of Scarsdale.^I

COASTAL, METROPOLITAN AND EXPORT MARKETS.

Many of the coal markets exploited in the East Midlands, in Lincolnshire and the East Riding by the North Derbyshire and South Yorkshire coalmasters, had once been the monopoly of the North Eastern Coalfield. Attempts by these coalmasters to break into other markets long dominated by the Durham and Northumberland Coalfield, however, proved a failure. In 1831,

I. Prospectus of the Midland Counties Railway. Sheffield Independent. 20 October 1832.

a seven weeks strike shut down the pits on this latter coalfield. In the following year, another more serious strike paralysed the district from March to August.¹ To Yorkshire coalmasters, this seemed a golden opportunity to find a footing in markets along the coast and in the capital, where profits of from 18/- to £1 a dozen could be earned and where payment was made in cash, in contrast to the much smaller profits usual in Yorkshire and the long terms of credit which had to be granted.² Many of the pits alongside the Don Navigation, the Dearne and Dove Canal, the Barnsley Canal and the Chesterfield Canal attempted to seize this opportunity of building up a trade in these districts, especially as their usual markets were depressed. Vigorous attempts were made, for example, to sell coal from Swallow Wood and New Park Gate collieries, both owned by Earl Fitzwilliam, along the East Coast and in London. The first attempt resulted in a serious financial loss, as in the endeavour to find an agent outside the ring of coal merchants, the distributors chosen proved to be little better than common swindlers. Once the Durham Coalfield had resumed production in 1832, experience soon showed that freight charges made it impossible to compete against coal from that county in the metropolitan market. By January 1833, Biram, the Earl's steward, had come to the conclusion that it would never be profitable to sell coal from these two pits in the capital. However, he continued his attempt to build up a market along the coast and even to penetrate into the Baltic markets in Scandinavia and North Germany. Usually, the initiative in these trades came from "fitters" in Keadby and Goole, who bought coal at the pit

1. P.M. Sweezy. "Monopoly and Competition in the English Coal Trade." Ch. IX. (1938).

2. Letter dated 28 May 1831. Micklethwaite MSS. John Rylands Library, Manchester.

head and hired boats to freight it abroad where they arranged for its sale. Biram, however, approached a Goole firm of "fitters", Birstalls, persuading them to contract for a definite period ahead for a specified amount of coal, paying them a commission based on total sales, very much above the average allowed to coal factors. With this inducement, Birstalls built up a good connection in East Anglia and as far afield as the Channel Islands and Scotland. In addition, the firm was able to sell the better grades of coal in the Baltic and even in the Mediterranean. The Marquis of Londonderry and Lord Durham responded to competition from these and other Yorkshire collieries by drastically cutting the pit head price of coal, with the result that the export trade in South Yorkshire coal collapsed, the best Silkstone being un-saleable at Keadby. Although the coalmasters on the North Eastern Coast could not maintain such low prices for long, they fought off Yorkshire competition, when prices were raised to a remunerative level, by every device known to the coal trade. They operated a two price system - a high price for their land-sale customers and a lower one for the markets along the East Coast; they gave overweight and evaded the export tax on coal to the best of their abilities. In the face of such tactics, the South Yorkshire coalmasters found it difficult to make headway in these markets.

One Derbyshire coalmaster, at least, continued the fight to sell coal in London in face of competition from the North Eastern Coalfield until the end of the decade. He was G.H. Barrow, the lessee of the coal on the Devonshire estate at Staveley. During the two strikes in Durham and Northumberland, the sale of Devonshire Wallsend Coal, mined at Handley Wood pit, had been established in the capital on a small scale and found

highly profitable. Barrow, therefore, determined to make a drive to build up sales in the Thames valley by selling direct to a London coal merchant, instead of through the London Coal Exchange, thus cutting the cost of coal to the consumer. A stock of 1000 tons of coal was built up at Stockwith, where the Chesterfield Canal joined the Trent, so that the eight Billy Boys employed in transporting coal should not be delayed in loading. By 1839, Barrow was selling 33,000 tons of coal in the capital, an amount sufficient to keep two of his smaller pits at work.^I

Nevertheless, the total amount of coal sold along the coast and in London from the Humber ports at this time compared with that exported from the Tyne, Tees and Wear was small. At the end of the decade, whereas Newcastle alone exported a million tons of coal, both Hull and Goole combined together exported less than a fifth of this quantity.² Apart from the fact that it cost more to transport coal by canal and river than by sea, other factors entered into the situation. There was a definite prejudice against Derbyshire and Yorkshire coal in these districts, as Thomas Chambers of Thorncliffe found when he was travelling in East Anglia in search of orders some years later - as he very neatly put it "the facts are what we call good coal they call bad and what we call bad they call good."³ Above all, the North Eastern Coalfield possessed an unrivalled fund of mining knowledge and commercial experience, which enabled it to mine coal a low price and to market it cheaply. Biram, the most important mining agent in South Yorkshire at this time

1. Staveley and London Coal. Hardwick Estate Office MSS. Chesterfield.

2. S.C. on Accidents in Coal Mines. 1854. Appendices 43 and 52.

3. Letter dated 8 November 1844. Chambers' letters 1836-46. Box 5. Newton, Chambers MSS. Thorncliffe Works, Chapeltown Works, Yorkshire.

came to the melancholy conclusion, while on a tour of the Newcastle area in 1833 that " the extent and number of the collieries with their great facilities for shipping coal has left me with very little hope that we shall be able to compete with the Newcastle people seaward ", a conclusion amply justified by the course of events.

THE RENAISSANCE OF THE IRON INDUSTRY.

The River Don in its passage to the sea through the undulating country east of the Pennines cuts a deep notch into the Coal Measures and the Magnesian Limestone Formation between Rotherham and Sprotborough. Along this comparatively short stretch of the river, coal and ironstone were available at no great depth around Rotherham and limestone was easily quarried at Sprotborough on the sides of the gorge through which the Don runs. Once the river had been made navigable between these two points it became easy to assemble these minerals for the production of pig iron. Water power, however, was necessary to drive the blast furnace bellows but fortunately with the increase in the gradient of the Don above Rotherham, this was in ample supply near to the outcrop of both coal and ironstone at the Holmes. Sheffield with its rapidly expanding hardware trade offered a local market for pig and forge iron and in addition, the Don Navigation made it possible to transport heavy iron castings and forgings to markets outside Yorkshire. The potentialities of the site were not, however, fully developed until it was leased by the Walker brothers, who, after 1759 built a blast furnace, rolling and slitting mills and a grinding wheel at the Holmes. Well managed by men who seized

I. Letter dated 20 June 1833. Wentworth Stewards' Correspondence and Papers 1771- 1905. No. 14. Letters from the Fifth Earl Earl Fitzwilliam to Benjamin Biram. Wentworth Woodhouse MSS. Sheffield City Library.

with both hands the opportunities created by the wars against the French and the Americans, Masborough speedily became the most important ironworks in the Sheffield region during the half century after its foundation. By 1802, Masborough with its blast furnaces, its moulding shops, its gun casting workings, its boring mill, its scrap melting furnaces, its cementation and crucible furnaces for the manufacture of steel, its reverberatory furnaces for the production of wrought iron, its rolling mills and tin plate works, its capacity to manufacture anything from " an iron bridge to a Dutch hoe " led the whole district in the technique of integration.^I

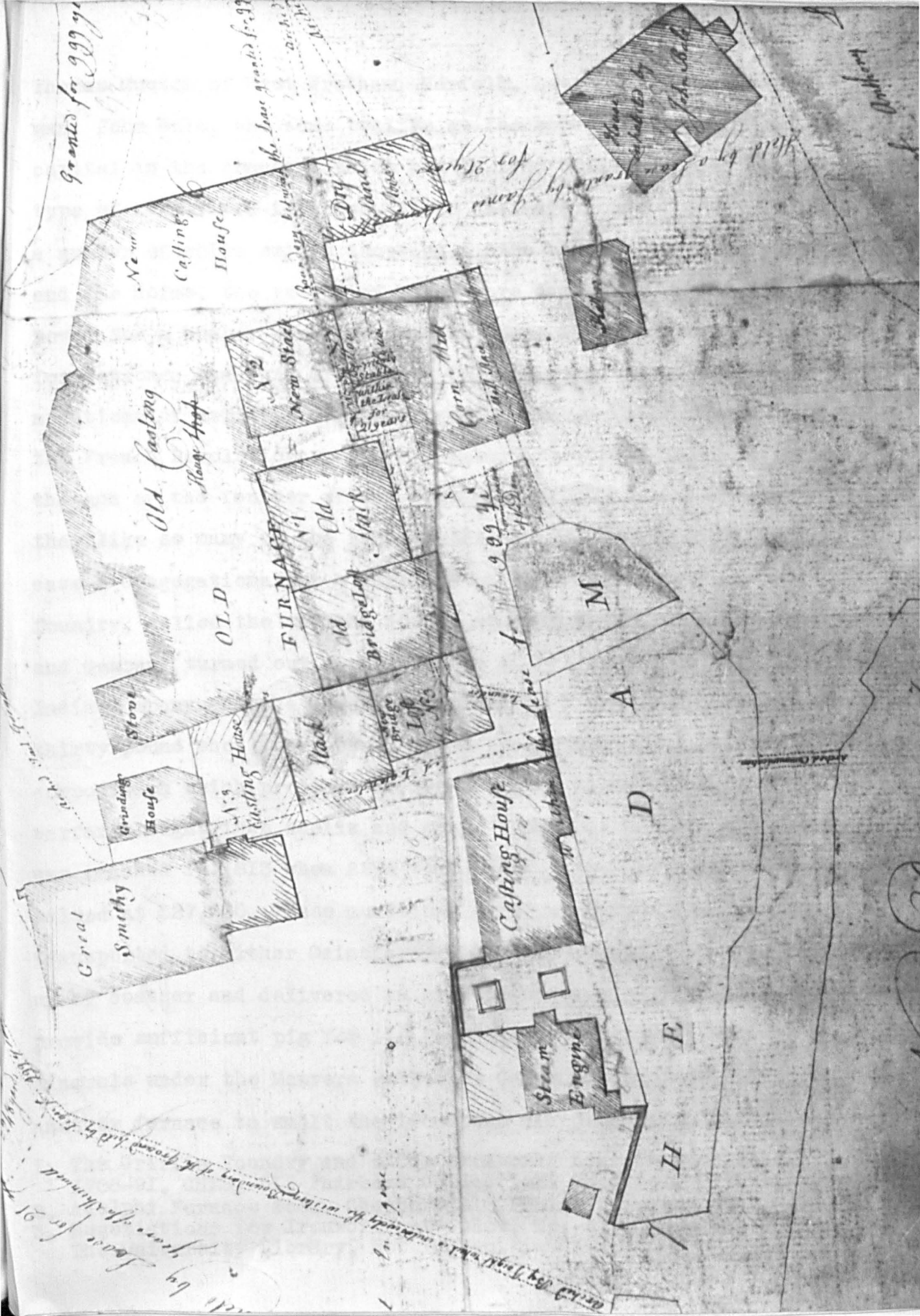
Despite the fact that the Walker family had been able to solve a problem which had defeated John Fell II at both Chapeltown and Staveley - that of using the local coal to make a coke suitable for use in the blast furnace - other ironmasters in the locality were slow to follow ~~in their~~ in their footsteps. A Sheffield ironmaster in the early nineteenth century, looking back on this failure, ascribed the tardiness of his predecessors to various causes - the prejudice of the consumer in favour of charcoal iron on account of its quality being superior to that of coke iron; the low price at which the latter had to be sold to gain a market; the great amount of capital required to build new ironworks and above all " the great hazard and risk of success from the uncertain proof of the minerals."² However, stimulated by the demand for iron brought about by wartime conditions and profiting by the construction of new canals which cut through the

- I. Rev. Richard Warner. " A Tour through the Northern Counties of England." Pp. 192-5. (1802). For the history of the firm see A.H. John. " The Walker Family. Iron Founders and Lead Merchants." (1951).
2. Observations on the Proposed Tax on Pig Iron. By an Ironmaster. (1806).

bassets of the ironstone rakes and the outcrop of the coal seams, local landlords and business men began once more to invest in the iron industry.

The first major canal to be made in the district, that from Chesterfield to Stockwith, like the Don, cut through formations of coal, iron and limestone. Here, too, it was easy to assemble these raw materials and as a consequence in the thirty years after the canal was opened in 1777 many new ironworks were built either along its banks or in close proximity to it. This increase in the production of iron in North east Derbyshire was reflected in the amount of traffic in this metal on the canal. In 1778, this was only 427 tons. Two years later, it had risen to 1732 tons and by 1782 to 2654 tons. With the coming of peace, iron traffic decreased on the canal but the declaration of war against the French in 1793 once again brought about a growth in the quantity of iron transported. At the opening of the new century, 2622 tons of iron products were exported down the canal; five years later, the amount had risen to 3994 tons and by the end of that decade to 5965 tons. After that date, traffic declined slowly and by Waterloo had sunk to 3458 tons.

Two months after the opening of the Chesterfield Canal, four men entered into an agreement to operate a furnace and foundry at Shimmels Mill at Walton in Brampton parish, about two miles from the terminus of the canal, on the basset of both ironstone and coal, by the banks of the River Hipper, at a point where water power was available. They were John Smith, a Sheffield cutler; Samuel Alsop of the same town; Thomas Biggin, one of the most important scythe makers of Little Norton, near Sheffield; Richard Clarke, a Norwich ironmonger and



Granted for 999 years

The lease granted for 99 years

Held by a lease granted by John Bull

Part of

New Casting House

Old Casting House

New Stack

Old Stack

Corn Mill

OLD

FURNACE

Old Bridge Loaf

999 years

M

A

D

Casting House

E

H

Steam Engine

Great Smithy

Grinding House

Stove

Casting House

Stack

Old Bridge

Loaf

Granted for 99 years by John Bull

Granted for 999 years

Thomas Munton of West Wretham, Norfolk. Later, another Norfolk man, John Bale, who came to live at the works, invested more capital in the concern, which had by 1788 built three of the new type of coke-fired furnaces, three castings houses, a forge and a number of white smiths shops on a site between the River Hipper and the Holme, the waters of which were dammed up to provide power for a number of water wheels. ^I Here were manufactured parts for Newcomen engines, iron beams for building cotton mills and munitions of war. The demand for the latter so increased during the French Revolutionary and Napoleonic Wars that Ebenezer Smith, the son of the founder of the firm - his name betrays the fact that like so many of the ironmasters, he was a Dissenter, in this case a Congregationalist - built two more furnaces and another foundry, called the Adelphi Works, at Duckmanton. Here, Smith and Company turned out a whole range of munitions for the East India Company and the Government, ranging from three pound to thirty pound shot; carcasses, a species of shell filled with a composition which produced a very powerful flame, used in siege warfare; eight inch shells and grape shot. The maximum production was reached in 1813 when 2274 tons of shot and shell were cast, valued at £27,000. These munitions were taken down the canal and transported to either Gainsborough or Hull, where they were picked up by coaster and delivered to either Woolwick^h or Blackwell^a.² To provide sufficient pig for its foundries, the firm leased the minerals under the Manvers estate at Calow in 1810 and built another furnace to smelt the ironstone mined at Hady.³

1. The Griffin Foundry and other ironworks near Chesterfield. 1788-91. CHES. 5L. Fairbank Collection. Sheffield City Library.
2. Adelphi Furnace Book. Chesterfield Public Library.
3. Negotiations for Ironworks at Calow. No. 4172. Manvers MSS. The University Library, Nottingham.

In 1780, two new concerns built ironworks near Chesterfield. Beyond the Brampton works of Smith, Clarke, Munton and Company, Joseph Butler erected a furnace on the Humloke estate at Wingerworth, which he worked in conjunction with a forge at Killamarsh. The other ironworks, known as the Wharf Furnace, was set up on the banks of the canal at Stonegravels, north of the town. The managing partner in this concern was David Barnes. Like his fellow townsman, Ebenezer Smith, Barnes was a Dissenter - in this case, a Sandemanian - who now added iron smelting to the other business activities which had in one generation raised his family from the ranks of the yeomanry to those of the gentry. His other partners were Richard Milnes, a member of a family previously connected with lead mining and smelting and Thomas Slater, a Liverpool merchant connected by marriage with Milnes. These ironworks produced castings on a scale large enough to necessitate extensive purchases of pig from other blast furnaces in the vicinity. The partnership came to an end in 1800, when Waller, a local lawyer who had inherited Milnes' share, bought out his partners.^I The works were later bought by the manager, Topp, who resold them to a Sheffield firm of ironmasters, Samuel and William Smith of the Wicker, who probably bought them to assure their Sheffield works of an adequate supply of Derbyshire pig iron.

In 1783, the Duke of Devonshire leased Staveley Furnace and Forge to Walter Mather, who replaced the old furnace there by one of the new type using coke. Unlike the majority of the men associated with other ironworks near the Chesterfield Canal, Mather came from a family of ironmasters. His father had

been the lessee of the furnace on the Hunloke estate at Wingerworth in 1757.¹ He himself, prior to his lease of Staveley, was the owner of forges at Bulwell in Nottinghamshire and at New Mills and at Makeney, both alongside the Derwent near Duffield and of a slitting mill at Ockbrook in the south of Derbyshire.² Mather expended £2,600 on building a new furnace with blowing apparatus, erecting a new casting house and on improving the supply of water to the various wheels which drove the machinery. The furnace accounts for the period 1784 to 1804 exhibit certain peculiarities. Use was made both of steam power and of a water wheel for blowing. Some blasts were made with charcoal, some with coke. Heavy use was made of Cumberland ore in addition to the local ironstone. The pig made at the furnace was sent either to the nearby forge at Staveley or to the other forges worked by Mather at Duffield. Some pig, however, was transported along the Chesterfield Canal to Renishaw Bridge, where it was unloaded and carted to Sheffield to be sold to engineers such as John Curr of Queens Foundry or to manufacturers such as Kenyon, Frith and Company. Staveley Forge sent most of its products, as it had done a century earlier, either to East Anglia or the capital. On Mather's death, the ironworks were devised to his two daughters and as a result their management fell into the hands of Edward Richard Lowe of Southwell, the husband of Elisabeth Mather. During his lifetime, the concern was mismanaged as large amounts of capital were spent unnecessarily, many bad debts run up and large sums of money withdrawn from the partnership. After Lowe's death, his widow married G.H. Barrow,

1. Estates of Papists. Roll X. M. 13. Derbyshire County Council Offices, Derby.

2. Mather MSS. No. 97. Stenton and Metcalf Collection. Shire Hall, Nottingham; Derby Mercury. 6 October 1780. Col. 16.

a member of another Southwell family, into whose hands the business fell when the husband of the other daughter sold out in 1811. Despite the fact that the iron trade had been booming during the war years, the firm was financially in low water at this time and when the Duke of Devonshire endeavoured to make the most of war-time prosperity by increasing the price of the coke and ironstone supplied to the works, Barrow shut down the plant until its lease expired in 1819.¹

Six years after Mather rebuilt Staveley Furnace, two Sheffield ironfounders, Thomas Appelby and Edward Scholefield, both of Gibraltar Foundry, erected two furnaces at Renishaw, by the side of the canal. Little is known of their activities, but it is obvious from contemporary colliery accounts that the firm manufactured corf wheels and tram rails on a large scale.² In 1801, another furnace was erected by John Brocksopp at Hasland, almost opposite Butler's furnace at Wingerworth on the other side of the Rother valley. This ironmaster came of a family which had no connection with the iron trade in previous generations. His grandfather was a butcher and tanner who at his death left considerable real property in Chesterfield and in the Peak. His father, too, was a butcher who married into a family of local gentry - the Wraggs of Stretton Hall - who had climbed the social ladder at much the same speed as the Brocksopps by farming and coal mining. The grandson inherited the Stretton Hall estate from his mother and land at Hasland from his father. The latter property was rich in coal and iron. After working the coal successfully, Brocksopp borrowed £2000 from the Chesterfield banker, Isaac Wilkinson and

1. Barrow MSS. No. 120. Stenton and Metcalf Collection. Shire Hall, Nottingham.

2. I am informed by Captain Stanier, former Managing Director at Renishaw Ironworks, that the Appelby MSS were pulped during the First World War.

in 1801 erected a furnace which between the time it came into blast and 1808 produced 4169 tons of pig iron. As this ironmaster had no foundry, the whole of his make of pig came on the market. A large part of his output was sold to such Sheffield foundries as those of Edward and John Scholefield; Phoenix Foundry owned first by Gregory, Longden and Barlow and later by Joshua Gregory and Company; Samuel and William Smith's Wicker foundry; Booth and Company's works in Brightside and to Harman and Company who had a foundry in Spring Gardens. Brocksopp also sold pig iron on a considerable scale outside the Sheffield region to such concerns as Todd and Campbell in Hull; Losh, Wilson and Bell of the Walker Foundry, near Newcastle; John Gurney Agg in Norwich; Fenton, Murray and Wood in Leeds and Richard and William Crawshay in London. The ironmaster died in 1812 and his executors, in accordance with his will, shut down the furnace to conserve the coal and ironstone on his land for his son, to be worked by him in the future.

Although the Dearne and Dove Canal cut through the outcrop of both coal and ironstone, enabling these minerals to be easily assembled for smelting, limestone had to be imported from the Don valley for fluxing. Despite this disadvantage, the amount of iron produced at works along its banks grew steadily during the war years. By 1805, its first full year of working, the canal carried 2802 tons of iron. By 1811, this quantity had doubled. At the end of the Napoleonic Wars, some 8,800 tons of iron products were carried from the ironworks in the vicinity of the canal.²

Near the terminus of the Elsecar Cut stood the Milton Ironworks, leased by the Walkers of Masborough. Despite difficulties

1. Brocksopp MSS. Barnes Collection. Chesterfield Public Library.
2. Dearne and Dove Canal. EMM/6. Elmhirst MSS, Houndhill, Barnaley.

encountered in mining a waterlogged ironstone rake in the Tankersley bed, the venture proved sufficiently successful for the Walkers to erect a second furnace there in 1809. Even at the end of the Napoleonic Wars, when other ironmasters were feeling the effects of the recession in trade, this firm was so busy on civil engineering contracts that they were negotiating with Earl Fitzwilliam for additional supplies of ironstone to feed two new furnaces which it proposed to build at Milton.

Near to the Milton Ironworks was another plant at Elsecar, worked by William and John Darwin. By the terms of their lease, they had contracted to work an acre of ironstone annually on the Fitzwilliam estate. Wartime demand enabled this partnership to exceed this quantity greatly. Between 1798 and 1800, the firm mined an extra five acres; from 1801 to 1810, four acres were mined each year and in 1812 a peak of six acres was reached. With trade so good, the concern built another furnace on the Wosborough Cut from the Dearne and Dove Canal, supplied with ironstone from Broomroyd Wood and the old park near Wentworth Castle.

In addition to the four ironworks near the South Yorkshire waterways, there were three others at work in that region during the last decade of the eighteenth century, located either near supplies of raw materials or close to centres of consumption. In 1784, John Booth of Brush House, Ecclesfield; George and William Binks of Hall Carr and John Hartop of Mill Green, Brightside Bierlow consolidated their holdings in a forge, a slitting mill, a rolling mill and six cutlers' wheels with the object of erecting a blast furnace in Sheffield Park. Four years later, the partnership leased land south of the River Don, below

Royds Mill weir from the Duke of Norfolk, on which to build a furnace and forge and to mine ironstone. By 1806, the Park Ironworks were producing 1905 tons of pig a year. In addition, like so many other ironworks in the district, they were making castings for steam engines.^I

Some miles to the west of the Dearne and Dove Canal, near the junction of the Fitzwilliam and Norfolk estates, both coal and ironstone basseted out near the steep climb out of Chapeltown on the Leeds Turnpike. The Furnace Coal, known locally as the Thin Coal, outcropped on the left hand side of the road a little beyond the village and the Park Gate seam, colloquially called the Thick Coal basseted out some seventy yards further up the hill. Associated with these seams were three rakes of ironstone, known as the black, white and Gallery Bottom ironstones, the latter rake being regarded as "much the best of the ironstone mines."² On this almost ideal site for an ironworks, Richard Swallow of Attercliffe Forge, a member of the partnership which had dominated the South Yorkshire charcoal iron industry for so long, built two coke-fired furnaces in 1788. After his death, this plant was inherited by his son, a man, so his enemies alleged "of notoriously low and depraved habits" addicted to "ill-judged and expensive speculations." It is impossible to say what truth there might be in this succinct character sketch, but Richard Swallow II went bankrupt in 1808, as a result of losing £50,000 in operating a new ironworks which he had built at Swallow Hill near the Barnsley Canal.³ The Chapeltown Works stood idle until 1811, when they were taken over by the two Darwins, the lessees of Elsecar Ironworks.

1. Diary of Robert Fourness. Engineer. 1793. No. 328. Bagshawe Collection. Sheffield City Library.
2. Report on the Chapeltown Coal and Ironstone Works. 1825. Deed Box 25. Norfolk Estate Office, Sheffield.
3. Wheat Collection. Nos. 337-41. Sheffield City Library.

During the next five years, this partnership mined 28 acres of ironstone on the Norfolk estate in the vicinity of the furnaces.

In 1793, Maskew, Newton and Chambers leased the Thick and Thin seams and their associated ironstone rakes under the Fitzwilliam estate at Thorncliffe, within sight of Swallow's ironworks at Chapeltown. George Newton had originally come to Sheffield in 1790, where he rented premises at the bottom of Queen's Foundry Yard. From here he travelled selling both his own products and those of other manufacturers in the town and " by the providence of God soon found ourselves in a comfortable way." With a growing business, Newton then built a forge and tilt at Nether Slack Wheel, Owlerton. Much of Newton's success in business was due to the financial accommodation given him by Maskew, a London merchant. In 1792, Newton was joined by Thomas Chambers, who, as a result of his experience with Smith, Stacey and Company at Queen's Foundry, strengthened the production side of the firm. The concern was evidently an ambitious one, as in that year, it was decided to build blast furnaces at Thorncliffe and the Phoenix Foundry in Sheffield, the two works with their associated ironstone mines and collieries, forming a vertically integrated company, controlling all processes from the mining of the raw materials to the sale of the stoves and ovens on which the Phoenix Foundry specialised.^I

The firm began production at Thorncliffe in 1793, casting 59 tons from pig purchased at Chapeltown and Renishaw. In the following year, a sough was dug to drain the minerals; ironstone pits and a colliery sunk and a blast furnace erected. During the next six years, a new casting^{house} and warehouses

I. Account of Mr. G. Newton's business life at Thorncliffe. Newton Chambers MSS. Thorncliffe Works, Chapeltown. Yorkshire.

were built; two new blast furnaces erected; a boring mill worked by water power installed; a new colliery sunk and a railroad constructed to link it with the furnaces, a total investment of £13,330. This additional plant enabled the firm to increase its make of pig to 932 tons in 1806 and the value of its castings in that year to £2409. During the next nine years, output further increased, reaching its maximum in 1814, when sales of pig and castings amounted to £44,755. The greater part of the pig disposed of was sold to John and James Mangles in London. The chief market for the light castings produced at Thorncliffe was in East Anglia. In 1805, the firm began to specialise on the production of water pipes and before Waterloo it had won contracts to supply the New River Company and the East London, the West Middlesex, the London Bridge and the York Buildings Waterworks with them. In 1810, the company began to manufacture gas works plant, again being awarded many contracts to supply works in London. Production of these articles proved to be very profitable. The partnership, however, pursued a most conservative dividend policy, only making an annual payment of 5%, the remainder of the profits being ploughed back into new plant. Chambers' capital, for example, grew from £219 in 1795 to £11,447^{in 1815} as a result of this practice.

This spectacular increase in the output of pig iron and of castings in South Yorkshire and North Derbyshire during the first forty years of the Canal Age created a wholly new demand for coal, required alike for calcining the ore before it was charged into the furnace, for the manufacture of coke for smelting the ironstone and for subsequent operations in the foundry. In 1806, the region produced about 23,000 tons of pig iron. As it was estimated that with the cold blast, four^{and} a quarter tons

of coal were needed to make one ton of pig iron, it is likely that the blast furnaces alone consumed about 100,000 tons of coal at that date.¹

If the period between 1775 and 1815 had been one of phenomenal growth in this industry, the next twenty five years were to be years of stagnation in the iron industry in this locality. If the first part of the Canal Age had seen this region becoming of increasing importance as an iron producer each year, the second saw it losing ~~losing~~ ground to other iron producing districts elsewhere in the British Isles. The whole economic atmosphere in the industry during the period, judged from accounts and correspondence, was unhealthy. The working of the trade cycle, with its alternation of boom and slump, made business planning difficult. Again, many firms were in that crucial third generation of management and there is adequate evidence to show that some firms were badly managed, staving off bankruptcy by too deep draughts of bank credit or by failure to undertake the expenditure necessary to modernise their plants, in particular, by the introduction of the much cheaper hot blast process. The whole district, too, had to face intense competition from Staffordshire and Welsh ironworks engaged in the light castings industry in its London market. At the end of the period, at a time when its assembly costs of raw materials were rising with the exhaustion of ironstone supplies in the immediate vicinity of the furnaces, it even had to face competition in Yorkshire and Derbyshire from the much cheaper Scotch pig.²

1. Memoire sur la Fabrication de la fonte et du fer en Angleterre. MM Coste et Perdonnet. Annales des Mines. Vol.5. (1829). P.495.
2. Letters dated 27 December 1833 and 5 May 1835 from William Jessop of Butterley Works, Derbyshire. Newton Chambers MSS. Thornacliffe, Yorkshire.

Three of the South Yorkshire ironworks ran into difficulties between the end of the war and the short lived boom of 1817 -18. In 1816, both Darwins and Walkers appealed to Earl Fitzwilliam for a reduction in their rents and royalties on the grounds that trade was depressed. In 1818, the proprietors of Thorncliffe asked for a similiar reduction, alleging that they had lost £2143 in the previous year. The Earl most unwisely rejected these requests. One consequence of this refusal was that Walkers surrendered their lease of Milton Ironworks, concentrating their business on the Gospel Oak estate which they had bought from Lord Dudley Ward. Milton was then leased by Sorby, Hartop and Littlewood, a partnership of interrelated Sheffield families. Despite the fact that the company was able to secure contracts for building two big suspension bridges for the Isle of Bourbon, it was unable to make the ironworks pay and so surrendered its lease in 1824.^I The plant was then taken over by a new partnership composed of Henry Hartop, a former shareholder in the previous company and William Graham, a member of a London merchant house of "First Rate Noteriety" as it was described by Newman, Earl Fitzwilliam's land agent. The new lessees were fortunate in the fact that they took over the works in the middle of the 1824/5 boom, when as Newman declared "Prices are beyond sober calculation." The price of No.1 pig had, in fact, shot up to £11.10.0. a ton and even at that figure was unobtainable.² Business activity in the Sheffield region was intense, every ironworks being employed to capacity. Thomas Butler of Kirkstall Forge, travelling through the district in May 1825, was informed by Chambers " they are

1. Sheffield Independent. 1 March and 5 April 1823.

2. Letters dated 15 August and 8 November 1825 to Messrs Cartmell of Doncaster. Copies of Outward Letters. Vol.I. Newton Chambers MSS. Thorncliffe. Yorkshire.

doing wonders " at Thorncliffe, producing 90 tons of pig a week from their three stacks. The Leeds ironmaster considered Chambers to be " a swaggering dog " for making such a claim, but, in fact, the works were producing at an unprecedented rate, sales of pig and castings that year amounting to £50,000.

Newman had made the forecast that the price of iron would fall " as soon as the Present Rail Road and other Schemes (prove) fallacious." His prophecy soon proved to be correct. The break in prices began in March 1826 when the Park Furnace in Sheffield lowered the price of its pig, a step which compelled all the other ironworks in the district to follow suit. The ironmasters at their meeting in Leeds accepted a general reduction of £1 a ton on pig, but this agreement was soon broken by the Bowling Ironworks which began to sell iron at £9 a ton on six months credit. The reduction in order books which accompanied the fall in the price of iron hit many of the South Yorkshire ironmasters badly. Thorncliffe, one of the strongest from a financial point of view, was hurt by a number of its customers going bankrupt and by the inability of others to raise sufficient money to meet their debts. The situation in the middle of 1826 is graphically described in the works correspondence - " Young and Athron have not paid anything further, neither could they promise anything until the beginning of June; Marsden said we might as well ask him for his teeth as ask him for Bills. Mr. George Shaw said they had £10,000 owing in Leeds, but could not obtain payments."^I In the following year, tenders were made at prices which did not even cover prime costs and a discount of 10% was offered for prompt payment. In the circumstances it is

I. Letter dated 13 June 1826. Copies of Outward Letters. Vol. I. Newton Chambers MSS. Thorncliffe, Yorkshire.

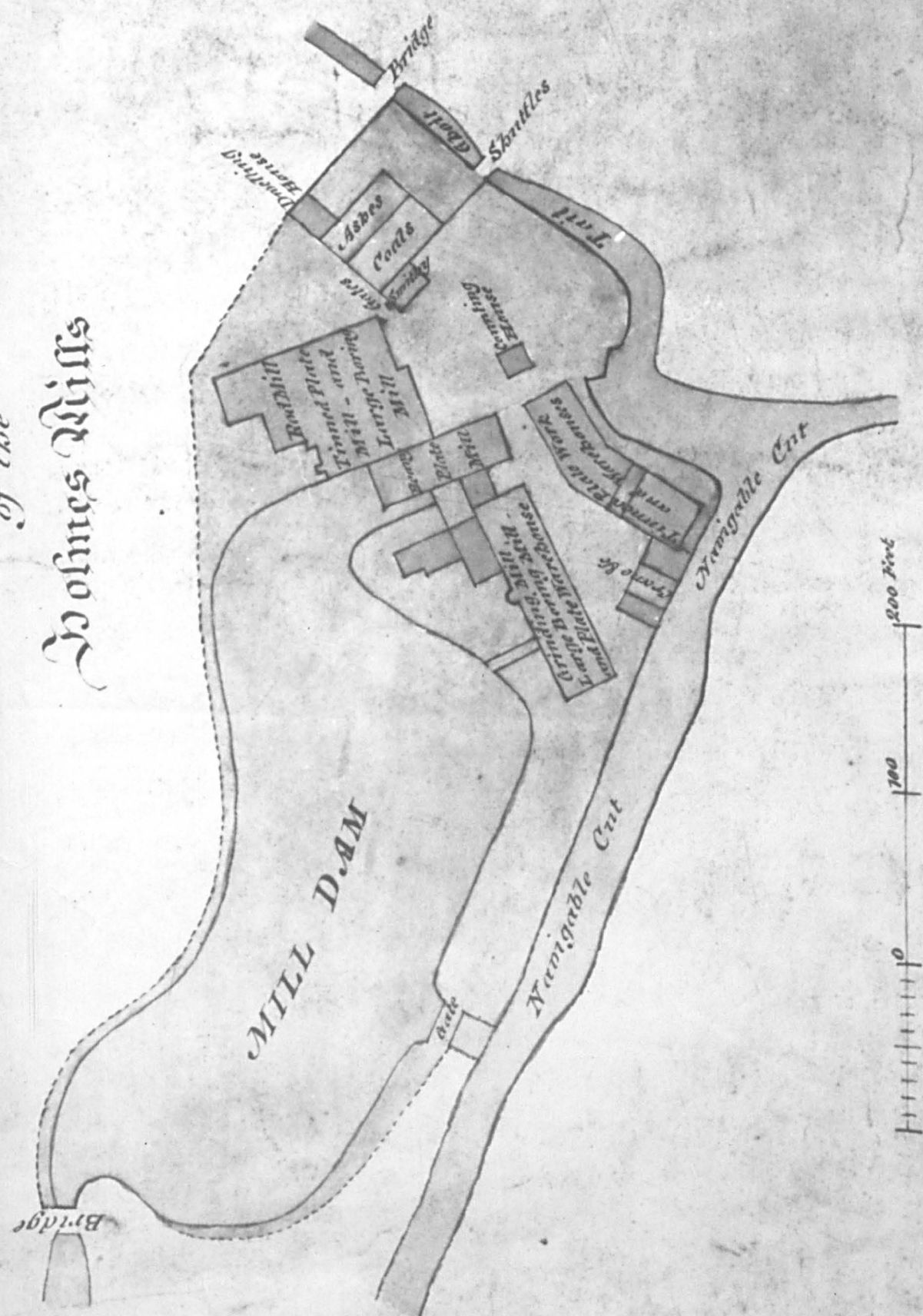
not surprising that sales in that year declined to £30,000. The firm was, however, fortunate enough to obtain accomodation^m from its bankers to tide it over its difficulties.

Newton, Scott, Chambers and Newton were not alone in their difficulties during this trade depression. Milton only weathered the storm by Earl Fitzwilliam guaranteeing a loan from the Bank of England to the lessees, by the Earl himself advancing the firm over £1000 with which to buy wages and by buying the plant from them for £27,000 and then leasing it to them at a rent of 6½%. In addition, the Earl was compelled to reduce the ironstone royalties at Tankersley and Swallow Wood from £375 to £170 and from £180 to £85 respectively. Another concern in financial difficulties in 1827 was Booth and Company, which after investing £11,000 in new works at Tinsley Park, had found itself short of trading capital, even during the boom of 1825. ^I Worst hit was the Darwin partnership, reputed in 1825 to be worth £20,000 with its ironworks at Chapeltown, Elsecar and Wosborough, which failed during the depression with liabilities so heavy that it could not pay even half a crown in the pound. The furnace at Wosborough was taken over by the Low Moor Company; Chapeltown Ironworks fell into the hands of the creditors, who held it until 1838, by which date, this ironworks had paid off the whole of Darwin's debts; Elsecar had to be taken "in hand" by Earl Fitzwilliam as it proved impossible to find any ironmaster willing to lease the plant.

During the next thirteen years, the South Yorkshire ironmasters danced to the tune piped by their competitors in Wales,

I. The Concerns of Messrs Booth and Company. Tinsley Park Ironworks. 1825. F.107 C. Papers, Correspondence etc of the Second Earl Fitzwilliam. Wentworth Woodhouse MSS. Sheffield City Library.

of the
Holmes Mills



the Black Country and Scotland, where newer and more efficient works were producing pig iron and iron castings at prices lower than was possible in the Sheffield region. One consequence of this competition was that the trade recovery of 1827/8 brought no comfort to the South Yorkshire ironmaster. At Thorncliffe, sales fell off in the latter year to £22,000. Joseph Butler, after visiting the Holmes Works at Rotherham, noted in his diary that "hardly the least hum of business arose." In the following year, with the general recession in trade, Thorncliffe was forced to reduce the price of its No. I pig to £5.10.0. a ton, in face of severe competition from South Wales and Staffordshire. Even with this reduction, it was impossible to secure sufficient business to keep all the furnaces in blast. This situation was general throughout South Yorkshire. As Chambers wrote "Blowing out seems to be -- the order of the day just now." ² Chapeltown and Elsecar each had one furnace out of blast and the Holmes Works were completely closed. Later in the year pig fell to £5 a ton, a price which Matthew Chambers described as "despicable." The trade recovery of 1830/1 was hardly felt in South Yorkshire. In 1830, the lessees of Milton Ironworks were so financially embarrassed that they appealed to Earl Fitzwilliam for a reduction in their ironstone rents. Sales declined at Thorncliffe during these two years. The worst had yet to come as in 1831, sales from this works fell off to £15, 623, a figure lower than any year since 1804.

The middle years of the decade saw a general improvement in trading conditions for the iron industry which, on this occasion, was felt in South Yorkshire. In February 1833, the Welsh

1. R. Butler. "The History of Kirkstall Forge 1200-1945". P.92. Second edition. (1945).
2. Letter dated 13 May 1829. Copies of Outward Letters. Vol.2. Newton Chambers MSS. Thorncliffe, Yorkshire.

ironmasters increased the price of pig iron by ten shillings a ton. The South Yorkshire ironmasters took advantage of this step to increase the list price of castings at the next meeting of their association in October. In December, when the demand for Scotch pig iron exceeded the supply and its price was raised by 10/- a ton, the South Yorkshire and North Derbyshire ironmasters seized the opportunity to increase their price by the same amount. Two years later, when the demand for iron all over the country was described as " good and improving ", keen competition was encountered from the South Staffordshire works, a situation which induced William Jessop of Butterley, the manager of the most important ironworks in the whole of Derbyshire, to write to Newton, Chambers and Company at Thorncliffe that " it was a great pity where there is so much activity in the trade that the parties interested cannot make it fairly profitable ",^I offering to attempt some accommodation between the South Yorkshire and Black Country ironmasters. His attempt met with evident success as in the following January he was writing to inform all the ironmasters in the West Riding as far north as Low Moor of the advances in the price of iron agreed on at the meeting of the South Staffordshire ironmasters. Iron continued to increase in price throughout the first six months of the year and as the Birmingham ironmasters were " all full of orders and no stock before hand ", most of the South Yorkshire furnaces were in blast. Statistical information as to output is, unfortunately, completely lacking for this period, but it is evident from the ironstone rents paid by Thorncliffe, Milton and Tinsley Park works to Earl Fitzwilliam and by Chapeltown to the Duke of Norfolk that it was

I. Letter dated 5 May 1835. Box 20. Newton Chambers MSS.
Thorncliffe, Yorkshire.

running at a high level.

The turn of the tide came early in 1837. Thomas Chambers, travelling in Lancashire, declared in February that "business appears to be almost at a standstill." Another Thorncliffe partner, Matthew Chambers, writing from London in March had much the same to report. ^I John Hartop, at this time managing Elsecar Ironworks for Earl Fitzwilliam, wrote about the same time that the bottom had dropped out of the market for iron. ² In the same year, Booth and Company of Tinsley Park Ironworks were so badly hit by the depression that the firm had to mortgage their coke ovens and workmen's houses to the Earl after they had failed to meet their mineral rents. It is plain from the ironstone royalties on both the Fitzwilliam and Norfolk estates that the end of the Canal Age was, in the Sheffield area, one of falling production in the iron industry.

The history of iron manufacture in North east Derbyshire during these years is almost as dispiriting as that in South Yorkshire. The immediate post war slump quickly eliminated the smaller firms. Butler's furnace at Wingerworth closed down at this time and soon afterwards his forge at Killamarsh was up for sale. The Wharf Furnace almost certainly shut down in 1822 when its ironstone reserves were acquired by Renishaw Ironworks. The Calow Iron Company was still in existence in 1824, but it is likely that this furnace was blown out permanently shortly afterwards. When Sir Richard Phillips visited Chesterfield in 1829, he found that although the Griffin Foundry had diversified

1. Letters dated 6 February and 20 March 1837. Box 5. Newton Chambers MSS. Thorncliffe, Yorkshire.
2. Miscellaneous Letters and Financial Statements about Elsecar Ironworks. G.44. Correspondence of Charles Wentworth Fitzwilliam. 3rd (and 5th), Earl Fitzwilliam. Wentworth Woodhouse MSS. Sheffield City Library.

Turnpike Road .

Pound.

LOWER DAM.

1598 Sq. yards.

WEAR.

BORING MILL.

Water Wheel.

Old Forge.

Old Race.

M.

Emure

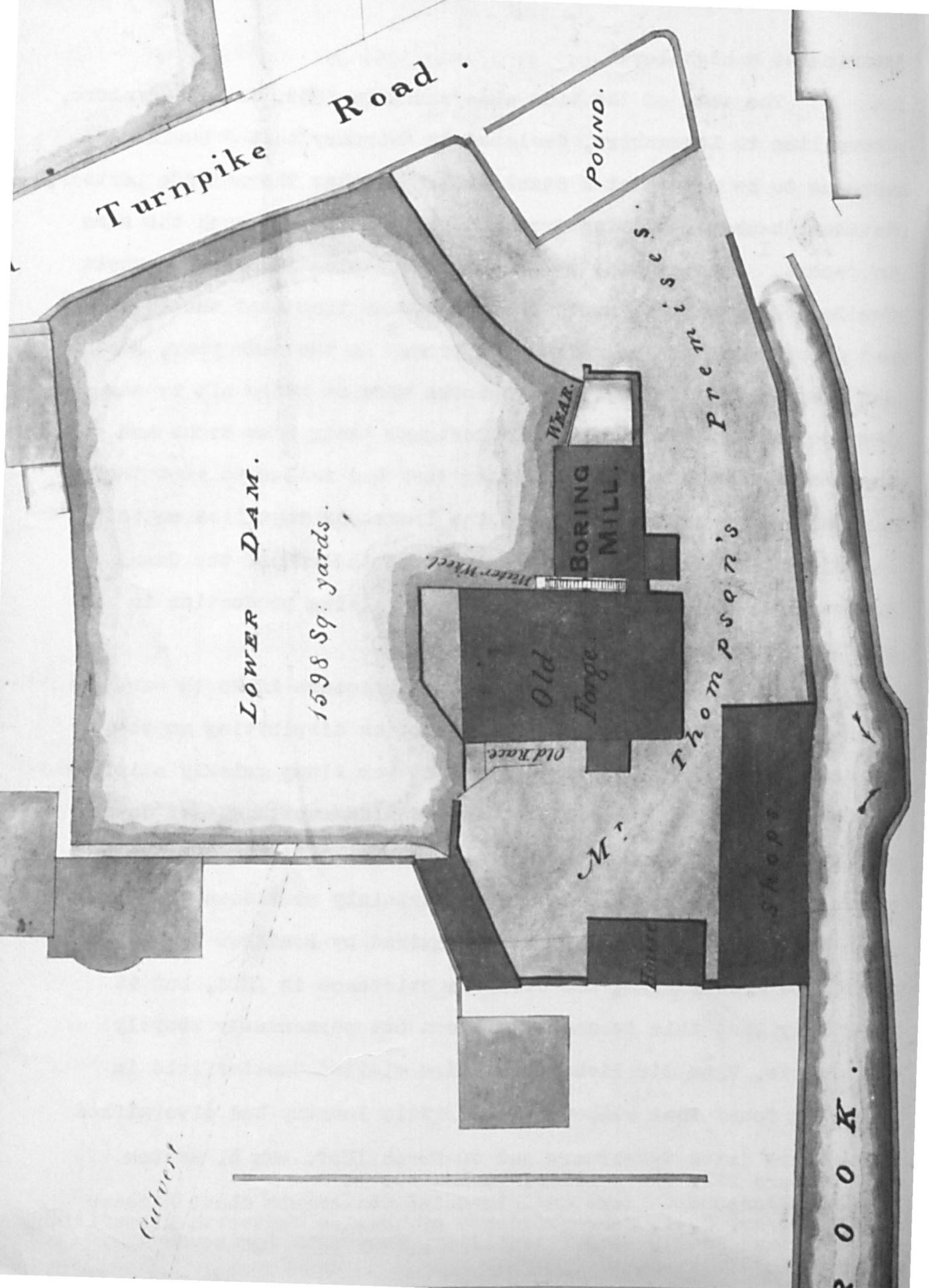
Thompson's

Shops

Premises.

Cutvert.

R O O K .



its production by manufacturing a wide range of light castings for steam engines and mills and had begun to make gas and water pipes, they had only three of their five furnaces at their Griffin and Adelphi Works in blast. By 1831, financially the concern was in a hopeless state, heavily in debt to local banks, which refused to extend their credits. The firm managed to stagger along for another five years but in 1836 the works were sold up piece-meal.²

With such a history, it is not surprising that there was little new construction of plant in the iron industry in the region during the twenty five years after Waterloo. During the boom of 1825, a second furnace was blown in at Staveley. Two years earlier, Sanderson and Watson had begun the building of a new ironworks at Park Gate, near Rotherham. Bad trade led to its closure ten years later. It was then purchased by the Birmingham Tin Plate Company, thus beginning a process which by the end of the next decade had brought more than half of the South Yorkshire ironworks under the control of Welsh or Black Country capital. Three years later, the whole plant with its one blast furnace, turning out 70 tons of pig weekly; its puddling furnaces making 100 tons of wrought iron a week; its two tin houses capable of manufacturing 500 boxes of tin plate each week and its casting shops were valued at £34,000.³

There are, unfortunately, no detailed statistics of iron output in the area for the year 1840. Scrivemor estimated that the productive capacity of its blast furnaces at this time was in the region of 62,500 tons a year. This figure, however,

1. Sir Richard Phillips. " A Personal Tour through the United Kingdom describing -- contemporaneous Interests." No.2.
2. Derby Mercury 25 April 1836.
3. N.B. 37.Pp. 225-7. Fairbank Collection. Sheffield City Library.

is no guide to actual production. As many of the furnaces had gone over to the hot blast and as much of the coke was now made in ovens, it is unlikely that this increase in blast furnace capacity implied any extra demand from this industry for coal in 1840 as compared with 1815.

THE MARKET FOR INDUSTRIAL FUEL DURING THE CANAL AGE.

Sheffield, with its industries and its growing population, was an important market for the coal mined in the surrounding area. That prosperity which Arthur Young had noted in 1770 continued with some breaks throughout the remaining years of that century. In the decade before the French Revolution, the number of men employed in the cutlery industry was considered to have increased by some 1750 and to serve them, three new tilts had been erected at Loxley, Little London and Beauchief Abbey; three new forges set up at the Ponds, Mousehole and Nova Scotia and two additional slitting mills built at the Wicker and the Ponds. As coal was used in so many operations in the cutlery and edge tool trades, these new works must have increased the demand for coal. The first trustworthy estimate of the amount of coal used in Sheffield is that of Benjamin Outram, who, when planning a canal from Sheffield to Eckington in 1793, estimated that coal consumption in the town was 120,000 tons per annum.² Despite the dislocation of trade which war brought to Sheffield, its industries continued to expand and when W. & J. Fairbank, the Sheffield firm of surveyors, was engaged on the same task twenty years later, it based its calculations on the estimate that 200,000 tons of

- I. Deeds and Papers of William Dunn of Sheffield. Engineer. M.B. 1747/9. Sheffield City Library.
2. Report of Benj. Outram, Engineer, on the proposed Sheffield Canal. Butterley 1793. C.P. (4).94. Fairbank Collection. Sheffield City Library.

coal were used annually in the town.

During the next two decades, despite the difficulties imposed by American tariffs, by the growth of American industry, by European competition in that market and by - so local manufacturers alleged - the hampering activities of trade unions, the town continued to grow rapidly. In 1830, its eleven major trades employed some 16,000 persons, half of whose products were exported.^I Three years later, one of the town's most prominent industrialists, Samuel Jackson, of the firm of Spear and Jackson, saw makers, asserted that Sheffield's increase in population and in the number of its industries was unparalleled in the United Kingdom, a statement which however incorrect it may have been in strict fact, shows what impression had been left on the minds of its citizens by its rapid development between Waterloo and the First Reform Act.² By 1835, coal consumption had so outrun production in the town, as a result of this expansion of industry, that it became necessary to look down the Don valley beyond Rotherham for additional supplies of fuel. To transport this, it was decided to build a railway between the two towns with a branch to the Fitzwilliam collieries at Greasborough. In the ensuing struggle over the Bill, its promoters asserted that coal consumption in Sheffield had risen to over half a million tons a year.³ General industry was declared to use 200,000 tons; another 184,000 tons were used for domestic fuel; steam engines used another 38,000 tons and conversion furnaces almost the whole of the remainder. One of the leading opponents of the Bill, Thomas Dunn Junior, who

1. S.C. on Manufacturers Employment. 1830.(590). X. Reprinted in the Sheffield Independent. 24 July 1830. P.2.

2. The Evidence of Samuel Jackson, Saw Manufacturer and Mr. John Milner before S.C. on Commerce, Manufactures and Shipping. Sheffield. 1833.

3. Evidence of William Vickers, merchant before S.C. (Lords) on the Sheffield to Rotherham Railway Bill. 1835.

appeared to give evidence on behalf of the Sheffield Coal Company, disputed these figures, setting coal consumption at the much lower figure of 350,000 tons a year.^I It is, of course, impossible at this distance of time to check the accuracy of these estimates, but a comparison of these figures with statistics of coal consumption in Sheffield prepared in the 'forties seems to indicate that Dunn's calculations may well have been the more accurate of the two.

It is unfortunate that there are no similar calculations for other towns in the district. There are, however, indications of new demands for coal during this period in each of the other towns. Steam power was in use in the woollen industry around Penistone before 1821; it was coming into use in the linen industry around Barnsley on a small scale in the middle 'thirties and on a much larger scale in the silk industry in Chesterfield at the end of the decade.

THE MARKET FOR COAL IN BRICKWORKS AND POTTERIES.

Associated with the coal seams were beds of ganister and clay. The former was mined at many places in both counties along the outcrop of the Alton or Ganister Seam and manufactured into fire bricks to line blast furnaces and lead smelting cupolas. The ordinary clay was extracted and burned into brick, particularly at the pits where there were ample supplies of slack to use as a fuel, which if they had not been used for this purpose would otherwise have been left underground. During this period, brick replaced stone as the conventional building material throughout the coalfield. Many examples of brick buildings still remain to show how extensive was the use of this material during the Canal Age.

I. Correspondence and Papers of Thomas Dunn Junior. M.D. 2197/15. Sheffield City Library.

Farm houses at Shirland and Grassmoor in Derbyshire, built after the enclosure of the commons there in 1777 and 1779 respectively, still stand exhibiting the grace and dignity characteristic of the minor domestic architecture of this age. High above the Rother valley, near Handley, there still remains a farm house, which the Devonshire estate records show was built in 1790 from a quarter of a million bricks made on the spot and roofed with tiles burned near the canal at Staveley Lowgrounds. Early nineteenth century building still exists on a large scale in Sheffield in the streets named after various persons associated with the Norfolk estate, built on the site of Alsop Fields on the slope to the east of the Ponds. Other contemporary brick building can be found on what was then the other side of the town, where it was then expanding along the Glossop Road around Carver Street Methodist Chapel, an ugly brick box devoid of architectural merit, erected in 1804. At a later date, better class residential districts were built in brick along streets such as Brunswick and Hanover Streets and Adelaide and Clarence Streets, their very names reminiscent of the date at which they were built. In addition, the town was expanding over Lady's Bridge down river and everywhere filling up nooks and corners with cottage property built in brick, three storeyed, consisting of cellar, day room, chamber and garret, built back to back for about £60 and let at half a crown a week. ^I Similiar houses were clustered around the Griffin Foundry in Chesterfield and around Park Gate Works near Rotherham to house their workmen. House building on a large scale was accompanied by a great demand for glass, partly met by production at

I. Described by the Sheffield architect, Flockton, in the Report of the Commissioners of Enquiry into the State of Large Towns and Populous Districts. 1845. XVIII. Pp. 347-50.

local glass houses at Whittington, Gawber and Wosborough Dale.^I

The presence of local clays also led to the development of a pottery and china industry. In South Yorkshire there were potteries at Rawmarsh, Mexborough and Swinton. Best documented of their histories is that of the Rockingham China factory in Swinton. First opened by Hartley, Green and Company in 1785 as a subsidiary of the Leeds Pottery, its lease was transferred in 1806 to a former manager, Brameld. During the war years, when farming was phenomenally prosperous, the concern sold £4000 of china annually in one county, Norfolk, alone. The post war slump in agriculture led to a decrease in sales of some £5000 to £6000 a year in the United Kingdom and an attempt to build up an export trade in china led to a loss of £22,000. The commercial crisis of 1825 led to the closing of the pottery, throwing its 250 employees out of work. The creditors appealed to Earl Fitzwilliam, the most important landowner in the district, to carry on the works, pointing out that if Brameld were made bankrupt the whole stock sold separately would not fetch half its true value and that if the concern had sufficient capital "the works would clear themselves and become a permanent source of emolument and advantage to the Neighbourhood." The Earl promised to guarantee their overdraft with the Doncaster Bank and in addition advanced the firm £18,000 as working capital. Apparently, the concern was badly managed and although Brameld had calculated that it should be able to make £3000 a year profit, it proved unable even to meet the interest on the money which it had borrowed. By 1840, the pottery had lost most of its trade, the works themselves were

I. E.A. Crompton. "A History of Whittington Parish." n.d. and W.R. Barker "Notes on some old Yorkshire Glasshouses". Journal of the Society of Glass Technology". Vol. IX. Pp. 322-7.

almost totally deserted and the only china sold was the forced sale of old stock.^I

Another earlier attempt to introduce the manufacture of china into the North Derbyshire Coalfield was equally unfortunate. This was made by Billingsley, the celebrated artist who had worked previously at the Crown Derby China factory and by D'Ewes Coke of Brookhill Hall, who provided a site at the Pinxton end of the Cromford Canal. Despite high expectations, the works were never a commercial success and by 1805 stood almost derelict.² Much more successful were the potteries near the Chesterfield Canal, making a coarse brown earthenware, largely for the Lancashire market. On the eve of the Railway Age, there were ten potteries around Chesterfield at Whittington Moor, Newbold Moor and Brampton Moor.

THE MARKET FOR COAL AT LIMEKILNS.

Three of the inland waterways crossed limestone formations. The Don breached the magnesian limestone between Conisborough and Sprotborough; the Chesterfield Canal cut through the same ridge at Shireoaks and the Cromford Canal skirted the sheer slopes of the carboniferous limestone almost at the point where it made a right angled turn into the Derwent valley. With coal to burn the limestone near at hand and cheaply transported by water, limelkilns were built by the side of the navigations at Sprotborough, Shireoaks and Buckland Hollow. In addition, another limeworks were erected at Tinsley in 1792 to supply Sheffield with lime for building purposes. Other lime kilns were built at Barnby Basin on the Barnsley Canal and at the end of the Wosborough

1. Papers relating to the Rockingham China Factory at Swinton. 1829. M.D. 182. Sheffield City Library; Brameld's Pottery Works. F.106 C. Papers, Correspondence etc of the 2nd Earl Fitzwilliam. Wentworth Woodhouse MSS. Sheffield City Library.
2. Coke Steel MSS. Trusley Hall, Derbyshire.

cut on the Dearne and Dove to burn limestone imported from quarries in the gorge of the Don or from Brotherton on the River Aire. Traffic in lime and limestone on these waterways was heavy. Of the four navigations, the Cromford Canal was the most important carrier of lime, supplying a large part of Nottinghamshire and Leicestershire with this commodity for agricultural purposes. In 1802/3, the only year for which the Canal Minute Book gives any figures of traffic during the period before Waterloo, the canal carried 29,727 tons. Lime traffic on the Dearne and Dove was lower than that on the Cromford Canal, which was only to be expected when it is considered that all the limestone burnt at the kilns along its banks had to be brought a distance. In its first full year of working (1805) it carried 6727 tons; three years later this quantity had been almost doubled; in 1812 the canal carried 18,287 tons and by Waterloo, the amount had risen to 22,479 tons. The only statistical information about limestone traffic on the Don Navigation is that 50 tons a day were brought up to Tinsley in 1802. Compared with these amounts, the quantity of lime and limestone carried on the Chesterfield Canal was small. Before Waterloo, the maximum traffic in these commodities was in 1802 when 6481 tons were transported.

The demand for lime for agricultural purposes in South Yorkshire and North Derbyshire during the first forty years of the Canal Age was heavy. The necessity to feed an increasing population during a period in which there were so many years of war led to the enclosure of the majority of the few scraps of open field which still existed, of the few remaining commons on the magnesian limestone and of the many areas of common and waste still to be found on the thin, cold soils of the Coal Measures

and on the even thinner, less fertile soils of the gritstone. During the American War of Independence, enclosure occurred on the Derbyshire section of the coalfield in the parishes of Shirland, Stretton, Morton, Tibshelf, Killamarsh, Hasland, Calow and Staveley and on that in South Yorkshire in Silkstone and Ecclesall. On the magnesian limestone, land at Bolsover and Dinnington was enclosed and considerable areas were also brought under cultivation at Lea in Derbyshire and in Loxley Chase in Yorkshire, on the edge of the moors.^I

The short lived interval of peace between the Treaty of Versailles and the outbreak of the war with France saw the enclosure of common land at South Wingfield, Sheffield and Brightside. The renewal of war, accompanied as it was by inflation and ever-rising food prices, led to another wave of enclosure in the district. Between 1793 and 1815, Acts were passed to enclose land at Barlborough, Eckington, Beighton, South Normanton, Norton, Walton, Pinxton and Alfreton on the Derbyshire section of the coalfield and at Hoyland, Kimberworth, Dalton, Handsworth, Darnall and Swinton on the South Yorkshire coalfield. On the edge of the East Moor in Derbyshire, commons were enclosed in Brampton and on the edge of the Pennines there were extensive enclosures at Upper and Nether Hallam, Fulwood, Stannington, Storrs, Dungworth, Ingbirchworth, Hunshelf, Langsett, Pensitone and Thurgoland.

Each of these enclosure acts brought more land under cultivation. Sometimes a glimpse of the process may be seen in the account books of the aristocracy and squirearchy. In 1778, after the enclosure of Dinnington, the books of the Aythorpe

I. W.E. Tate. "Enclosure Acts and Awards Relating to Derbyshire." D.A.J. LXV. Pp. 1-65; Return of Inclosure Acts. 1914. (Cd. 399.)

estate ~~estate~~ show the fencing of enclosed land to add to the acreage of an already existing farm, the house and buildings of which were being simultaneously extended.¹ Twenty one years later, when the work of enclosure had been completed at Beighton, one new farm had been created and ten more expanded in size from allotments on the common.² In 1790, a rental of the Bute estate shows allotments enclosed from Wharncliffe Moor added to already existing farms.³ The Cannon Hall rentals show new farms carved out of the commons and moors at Thurlstone in 1806, at Silkstone in the same year and at Dodworth and Gadding three years later. Land of such low fertility needed the application of large amounts of lime before it could be brought under cultivation. At the opening of the nineteenth century, the usual amount was a ton and a half per acre. Its effects, according to Farey, the land agent who surveyed Derbyshire for the Board of Agriculture during the Napoleonic Wars was "astounding."⁴

Traffic in lime declined on all the canals immediately after 1815. On the Chesterfield Canal, the tonnage of lime dropped by a quarter between that date and 1820 and when the available statistics end in 1826 the amount carried had sunk to 3549 tons. On the Dearne and Dove, freight in lime declined by a third from 1815 to 1821. On the Cromford Canal, the only figure available shows that traffic in lime had sunk by about a third between the tonnage previously quoted for 1802/3 and that of 1830/1. Such statistics reflect the depression in agriculture

1. Dinnington Enclosure 1778. No. IIII. Aythorpe MSS. Sheffield City Library.
2. Manor of Beighton. Book of Tenures corrected 1789 at the conclusion of the Enclosures. No. 9540. Derby Borough Library.
3. Wortley Rental and West Riding Estate Accounts. 1790. No. 424. Smith Collection. Sheffield City Library.
4. Farey J. Agriculture and Minerals of Derbyshire." Vol. 2. (1815). P.408.

which set in at the end of the wars and lasted well into the ' thirties, not only in South Yorkshire and North Derbyshire but also in the other farming areas which took lime and limestone from these two districts. There is ample evidence of local distress in farming. In 1816, the agent at Sprotborough wrote to Sir Joseph Copley to announce that his tenants were in arrears with rent to the extent of £980 and that the position of farmers lower down the Don valley was " most serious." Later, he described the harvest of that year as " the most deplorable we have had" with continuous rain and corn not gathered in until November. Little wonder that he declared he had fixed the next rent day " in considerable apprehension of the result." Few tenants did, in fact, turn up to pay their rent.¹ Four years later, the agent at Cannon Hall was reporting to its owner that his rents that year were " very deficient."² In the next two years, rents were reduced on the Portland, Fitzwilliam, Musters and Thornhill estates by some 10% to 15% to aid tenants struggling against the effects of the fall in the price of farm produce.³ In 1827, a meeting at Doncaster was attended by the majority of the big landowners in South Yorkshire or by their stewards to consider " the present alarming state of the agricultural interest." Six years later, William Simpson, a farmer at Loversall, near Doncaster painted an extremely gloomy picture of farming on the strong clay lands in the lower part of the Don valley. The yeomanry had nearly all gone, bankrupted by the fall in prices which had hit men hard who had bought their farms with borrowed money during the

1. Copley MSS. Yorkshire Archaeological Society, Leeds.

2. Letter dated 16 December 1820. Correspondence of John Howson with Walter Spencer Stanhope. Spencer Stanhope Correspondence. 2 A. Cannon Hall MSS. Sheffield City Library.

3. Sheffield Independent 12 May 1821, 9 February and 23 March 1822; Derby Mercury 12 June 1821.

wars with their high food prices. Despite a general reduction of rents of about 15%, many farms remained unlet in the district. Farm buildings were deteriorating as there was no money to spend on their repair and failure to keep drains clear had resulted in land going out of cultivation. Farm land was a drug on the market, the only purchasers being wealthy manufacturers from the West Riding. ^I Three years later, farmers in Lincolnshire and South Nottinghamshire asserted that farming was more depressed than it had been in 1833. ² Under such conditions, it could not be expected that the demand for lime could be kept at the height it had attained during the Napoleonic Wars.

Nevertheless, there were other factors at work during these twenty five years to encourage the use of lime. The actual work of reclamation from common and waste, as distinct from the legal processes of enclosure, went on long after Waterloo. For example, the East Moor in the parish of Brampton, the Act for the enclosure of which was passed in 1812, was only being brought under cultivation in 1827, as is shown by entries in the Devonshire estate accounts for making boundary fences on Brampton Moor. The few last stretches of open field, common land and waste, hitherto unenclosed by reason of the infertility of their soil, the height at which they were situated or the smallness of their area, at Holmesfield, Barlow, Whittington, Stainsby and Heath, Newbold, Totley, Unstone and Dronfield were enclosed by Act of Parliament during this period. Farm accounts relating to these years show that the small farms of the coalfield were not as badly hit by the depression as were the much larger farms

1. William Simpson of Loversall in evidence before the S.C. on Agriculture. 1833.
2. R.J. Atkinson and Richard Stephenson in evidence before the S.C. on Agriculture. 1836. VIII. Q. 5840 and Q. 13055.

on the magnesian limestone, although it must be admitted that this type of farm had no reputation to lose as improvers. Important landowners in North east Derbyshire, however, endeavoured to set an example to the small farmers on their estates by forming the Derbyshire Agricultural Society in 1819, which endeavoured to improve the standard of local farming by the time honoured devices of shows, lectures and premiums. Probably what did most to stimulate the use of lime during these years of gloom was the introduction by such landlords as the Dukes of Norfolk and of Devonshire, the Rodes of Barlborough Hall, the Bagshaws of the Oakes and the Spencer Stanhopes of Cannon Hall of various systems of tenant right whereby tenants received compensation for the application of lime to their fields if they left before its effects were exhausted.

THE MARKET FOR COAL IN THE PEAK DISTRICT DURING THE CANAL AGE.

To the west of the Derbyshire Coalfield lay the Peak District with its lime kilns, its Newcomen engines for pumping the lead mines clear of water and its lead smelting cupolas, all requiring coal. The most important lime kilns in the Peak were at Calver and Stoney Middleton. According to the Sheffield surveyor, Fairbank, the kilns at Calver had an output in 1813 of from 1300 to 1500 loads of lime a week. Large areas of waste land were enclosed in the Peak during the French Revolutionary and Napoleonic Wars and as an application of lime was essential both to destroy the ling and to enrich the soil, enclosure must have greatly stimulated the demand for this commodity. The process of enclosure and reclamation in this district at this time can be seen in the recollections of a Bakewell farmer some thirty

years after the enclosure of the moors at Great and Little Longstone - the division of the waste into ten acre fields by dry stone walling, the burning of the existing vegetation, the mixing of sixty loads of lime per acre with the ashes, the ploughing up of the soil, the sowing of turnps, the folding of sheep on the roots to manure the ground, followed by two crops of oats.^I Such treatment transformed land previously not worth a shilling an acre into good farm land worth a guinea an acre. Such enclosures must have stimulated the demand for coal, both for use in the lime kilns and by the higher standard of life brought about by the wages distributed during the work of reclamation.

While the market for coal was expanding as a result of enclosure, that for lead smelting was declining. Bishop Watson of Llandaff, who by reason of his correspondence with the lead smelting concern of Alexander and George Barker, had a first hand knowledge of Derbyshire lead mining, estimated that the county produced 10,000 tons of ore - about 7500 tons of pig lead in 1769.² Pilkington, writing seven years later, put the output then of Derbyshire lead at between 5000 and 6000 tons.³ The Lysons Brothers, who through their contacts with the lead smelting firm of Milnes in Ashover, had an accurate knowledge of production in the Peak, asserted in 1817 that lead output had fallen by half since 1789.⁴ This decline in output can be largely explained by the exhaustion of the shallower veins of lead ore and by the fact that the deeper veins brought into production proved to be comparatively poor in their content of ore.

1. William Greaves of Bakewell in evidence before S.C. on Commons Enclosure. 1844. (583). V. Q. 1850-86.

2. R. Watson. "Chemical Essays." Vol.3. P.231. (1782).

3. "A View of the Present State of Derbyshire." Vol.I. P.126. (1789).

4. D. & S. Lysons. "Magna Britannia." Vol.5. (Derbyshire). P.cxxiv.

During the next sixteen years, rising costs of production in Derbyshire lead mining coincided with falling prices, brought about on the one hand by competition in the Midlands from Welsh pig and sheet lead and on the other by competition from Spanish lead in foreign markets. In addition, demand for the metal was low during the many years of bad trade at this time.

At the height of the Napoleonic Wars, lead had sold at £40 a fodder. During the post war slump its price fell to £20. The boom years of 1824-5 naturally caused its price to rise - to £22 a fodder - but the Derbyshire merchants began to experience fierce competition from Welsh lead in their Midland markets at this time. The collapse of the boom caused lead to fall to £19 a fodder delivered in London. Even at that price Derbyshire merchants found it difficult to get rid of their stocks. The slump led to Welsh producers throwing their stocks on the market with the result that the price of lead fell to £18 a fodder in 1827. During the following year, its price declined another £2 a fodder. Worse still was to happen as pig and sheet lead were being offered in the Midlands by Welsh smelters at £13 in the winter of 1829 - well might Thomas Cox, one of the chief lead merchants in the county, write at the end of that year "The times are bad for farmers, worse for lead merchants." They were, in fact, to deteriorate further. In 1830, lead fell to £12.10.0. a fodder. It was impossible to mine and smelt Derbyshire ore at this price with the result that output during this year touched rock bottom, only 1000 tons of pig being smelted.^I Poverty among the mining population was unprecedented, many men not averaging more than three shillings a week during this year. Many miners

emigrated from the Wirksworth area to the Staffordshire coal mines. Those who remained were only kept alive by outside charity.^I Petitions to Parliament and to the Board of Trade for tariff protection against the importation of Spanish lead proved fruitless.² The situation remained poor until the middle of 1833, with pig lead selling at £13 a fodder, with the export trade dead and the demand in London flat. A steady recovery in general trade after the trough of the trade cycle had been passed in 1832, resulted in the price of the metal rising to £14 a fodder in August 1833, to £17.15.0 in the following September and to £20 in February 1836. Production that year was in the region of 4000 tons. With the decline in economic activity in 1838, the price of lead fell to £18 a fodder in the June of that year and after the peak of the next trade cycle had been passed in 1839, it dropped still further in December 1839 to £17.15.0. At the end of the year, Cox was writing gloomily " Never at any time since our Works were erected was the demand for manufactured goods so bad as it had been for several months last past " declaring that the existing demand for lead could be met from the smallest of their three works.³

These fluctuations in lead mining, apart from their effects on the demand for coal for smelting the ore, must also have affected the market for domestic fuel. Unfortunately, corroborative statistical evidence is almost entirely lacking. It was asserted in 1824 that coal traffic between Chesterfield and the Peak was in the region of 30,000 tons and that it had

1. Derby Mercury. 6 April 1831.

2. Sheffield Independent. 8 January and 5 February 1831.

3. This paragraph is based on The General Correspondence of the Wyatt family 1800-58 and Correspondence with Rev. William Bagshawe. Nos. 615 and 654. Bagshawe Collection. Sheffield City Library.

risen to 41,946 tons in 1837 and to 55,412 tons at the end of the decade. Both sets of figures fit into the general picture even if they do nothing to amplify it.

THE COALMASTERS DURING THE CANAL AGE.

The financial link between coal mining and the metallurgical industries of South Yorkshire and North Derbyshire dates back, at least, to the Tudor period. Bess of Hardwick and her fourth husband, the Earl of Shrewsbury, were both coalowners and ironmasters at the end of the reign of the first Elizabeth. In the middle of the next century, Lionel Copley of Sprotborough was the most important single producer of coal and charcoal iron in the Sheffield district. Field Sylvester, a Rotherham steel manufacturer, was mining coal at White Lane in Ecclesfield in the first decade of the eighteenth century. John Fell I of Attercliffe Forge was a partner in a colliery at Handsworth in the next decade. William Spencer, the central figure in the many partnerships controlling furnaces and forges in the West Riding and the Hundred of Scarsdale, was mining coal on his Cannon Hall estate in the late 'forties. Twenty years later, Joseph Clay of Bridgehouses, one of the small group of men which dominated the charcoal iron industry after the retirement of the Spencer family from active participation in it, had interests in a coal mine at Darnall. The link between the two industries was, however, purely financial as coal mining and the metallurgical industries were not technically integrated. This integration only came in the last quarter of the eighteenth century with the general adoption of the Darby process of smelting iron ore with coke at the existing furnaces in the district after successful experiments by the Walkers at

Masborough; with the building of many new ironworks on or near the banks of the Chesterfield, Dearne and Dove, Barnsley and Tinsley Canals and with the great increase in the number of foundries casting the soft melting pig made at a number of the blast furnaces. To ensure an adequate supply of fuel for these new ironworks, which the mines already sunk were in no position to provide, many of the ironmasters sank collieries themselves and so great was the quantity of coal produced by these pits that collectively this class was by far the most important producer of coal in the district from 1775 to 1840.

All the ironworks on or near the Chesterfield Canal, at some time or another controlled their own supplies of fuel. The first of these to be established, the Griffin Foundry at Brampton, acquired the Upper and Lower Ground Collieries on the Devonshire estate at Staveley, valued at £4,590 in 1804. Royalty figures now at Chatsworth, show that during the boom years of the Napoleonic Wars, these two mines produced about $8\frac{1}{2}$ acres of coal, probably about 34,000 tons, in 1806 and 1807. As a result of the stagnation which came upon the iron trade at the end of the war, the firm relinquished its lease of the Lower Ground Colliery in 1819. Output at the other mine remained at much the same level, some nine acres of coal being extracted from 1817 to 1821. A new pit, known as the Upper Ground New Colliery, was sunk in 1821. The lease of this pit was surrendered in 1831, some years before its legal termination, as by that date the concern was practically bankrupt. In the ten years of its working, some $24\frac{1}{2}$ acres of coal were mined - about 100,000 tons - a low annual figure explained by the fact that the Company had a number of its furnaces out of blast during the 'twenties. In addition, the

Griffin Foundry worked three other collieries during this period. In 1810, the firm leased the coal under the Manvers estate at Hady, on the steep hillside to the east of Chesterfield, to provide coke for Calow Furnace.¹ Near the Griffin Foundry, coal was mined on a small scale in the inferior Townend Seam. The greater part of the output of this pit was, however, sold to the local potteries.² The concern also mined coal on the Arkwright estate at Duckmanton to supply their Adelphi Ironworks with fuel but no output figures are available for this mine.

The next two ironworks to be erected in this area were at Wingerworth and Stone gravels. Joseph Butler, the lessee of the former, worked a colliery during the Napoleonic Wars on the Hunloke estate at Williamthorpe to supply his furnaces with fuel. In addition, he worked a landsale colliery at Tupton Woodthorpe and a watersale pit at Norbriggs, the latter originally sunk by the Proprietors of the Chesterfield Canal.³ The Wharf Furnace at Stonegravels was almost certainly supplied with coal from pits worked by one of the partners, John Barnes, on his land at Ashgate, outside Chesterfield. After the works were purchased by Topp and Company, their coal supplies were drawn from a mine worked by that firm at Stonegravels.

Staveley Furnace was initially supplied with coal and coke from the Duke of Devonshire's colliery at Hollingwood. In 1819, however, a new lease was negotiated between the Duke and George H. Barrow whereby the latter took over the ironworks for a period of fourteen years. In addition, he leased the Duke's Hollingwood pit, paying a royalty of five pence a ton and the

1. Negotiations for the Ironworks at Calow. No. 4172. Manvers MSS. University Library. Nottingham.
2. Notes on Collieries. n.d. Hardwick Estate Office, Chesterfield.
3. F. Sorby. "Coal Mining near Sheffield. 1737-1820." Trans. Institute of Mining Engineers. 1923. Pp. 90-9.

Lower Ground Colliery previously worked by the Griffin Foundry, where he contracted to pay a shilling a ton royalty on a minimum of 15,000 tons annually. Hollingwood was evidently near exhaustion as the quantity mined sank from 15,364 tons in 1820 to 245 tons four years later. During the next twenty-two years, the Lower Ground Colliery produced 150,000 tons of coal. In 1822, Barrow leased Norbriggs Old Colliery, formerly worked by Joseph Butler, from the Duke of Devonshire with the proviso that during the first five years of the lease, the ironmaster was to pay for a minimum of an acre a year and subsequently for not less than three acres annually. Output at this pit was much below this amount as during the next thirteen years only $9\frac{1}{2}$ acres of coal were extracted - about 38,000 tons. In the following year, Barrow leased Norbriggs New Colliery from the Duke at a royalty of tenpence a ton. This came into production in the next year and before the coal was exhausted in 1835, some 22 acres - about 88,000 tons - were mined. Barrow leased Staveley Upper Ground New Colliery in 1834 from the Duke and two years later brought Handley Wood Colliery into production. During the next four years, these two mines produced 42 acres of coal, an annual average of about 42,000 tons. In addition, the ironmaster sank Netherthorpe New Colliery in 1839. This, however, was only a small pit with a yearly output of about an acre. Altogether, at the peak of the trade cycle in 1839, Barrow's collieries were producing about 72,000 tons, an output which certainly made him the most important coalmaster in North eastern Derbyshire at the end of the Canal Age.

The last two ironworks to be built on or near the Chesterfield Canal during this period were at Renishaw and Hasland. The former concern had its own pits on the Rodes estate

at Spinkhill and Barlborough Common, where from 1799 to 1808, it mined 33 acres of coal. Later, the firm opened Cottam Colliery, extracting 28 acres of coal between 1831 and 1840.^I Hasland Furnace during the whole of its short life was supplied with coke made from coal mined by its owner, John Brocksop, on his own and surrounding property at Grassmoor. Brocksop was, in fact, a coal owner turned ironmaster as before he built the blast furnace, he had been in partnership with his mother mining coal on her late husband's estate at Grasshill. On the dissolution of this partnership in 1795, the son carried on the colliery himself, borrowing £1,300 from his mother, another £2,000 from his sisters and mortgaging his Stretton Hall property for £1,800 to another local landowner, Robert Newton of Norton to provide the necessary working capital. During the next four years, Brocksop sold coal worth £12,000, mainly to the ironworks at Wingerworth, Brampton and Stonegravels. After the erection of his own blast furnace, sales of coal from the Grasshill pits declined, despite the leasing of the coal under land belonging to the Duke of Devonshire at Grassmoor and to Lord Newark at Calow, amounting to less than £12,000 for the period 1801 to 1809.

The situation along the South Yorkshire waterways was very different as Milton, Elsecar and Park Gate Ironworks were all supplied with coal from mines worked by their ground landlord, Earl Fitzwilliam. Along the Don, however, the Walkers of Masborough mined coal for their ironworks on the Effingham estate on a large scale, as the account books of that property show the firm paying in 1782 a royalty on some fourteen acres of coal in excess of the minimum of $1\frac{1}{2}$ acres stipulated in their lease?

1. Barlborough Hall MSS, Derbyshire.

2. Effingham v Foljambe. M.D.3191. Sheffield City Library.

Two ironworks in the Barnsley area, in addition, mined their own coal. The Wosborough Ironworks, owned by Field, Cooper and Faulds, leased 400 acres of coal at Stainborough on the Wentworth Castle estate in 1822 at £130 an acre, undertaking to pay a minimum royalty of £1000 per year. ¹ Mining here was on a most extensive scale, as these pits not only supplied the ironworks, but also customers in the Trent and Humber valleys and along the East Coast. Altogether, 100 acres of coal - about 600,000 tons - ~~were~~ ^{mined} from 1831 to 1840. Further to the north, Hardy and Jarrett, partners in the Low Moor Company of Bradford, leased Barnby Furnace and the adjacent coal in 1797 for 31 years. These ironmasters contracted to pay £140 an acre and to mine a minimum of three acres annually. ² By March 1800, the firm had sunk a shaft to the Two Feet Coal, which when coked for the furnace proved "even far beyond their expectations." Three months later, the Low Moor Company began to mine the Silkstone Seam, declaring it for domestic purposes the equal of the best Newcastle coal and expressing the hope "that the ^a quality will carry them with preference upon the Aire, Calder or Dunn although we are the most distant."³ These expectations were not, however, realised and six years later, the Low Moor Company asserted that in the two previous years they had lost £13,000 at this mine, ascribing the cause to the high cost of transport along the Barnsley Canal. In the following year, after the concern had lost another £3569 "without reckoning one farthing for the Interest of our large

1. Bundle of notes of F.W.T. Wentworth relating to Collieries. No. 224. Vernon Wentworth MSS. Sheffield City Library.
2. 28 January 1797. Diary of Walter Spencer Stanhope. Cannon Hall MSS. Sheffield City Library.
3. Letter dated 21 August 1810. Letters from John Howson. Correspondence and Papers of Walter Spencer Stanhope. II C. (v). Cannon Hall MSS. Sheffield City Library.

Capital employed in it" the ironworks and pits were transferred to Walter, Thomas and Daniel Wilson. Although this group relinquished their lease of Barnby Furnace during the post war slump, it continued to mine the Silkstone Seam on an extensive scale, the peak of each trade cycle showing an increased output. In the boom year of 1825, some ten acres - about 60,000 tons - were mined. By 1828, output had risen to 13 acres. After the trough of the next trade cycle had passed, output once again increased to 24 acres in 1833/4. The eighteen months of improved trade after the trough of 1837, the last period for which output figures are available, show that some 36,000 acres of coal were mined, a quantity which may be estimated at 196,000 tons, an amount which must have made the Wilson family one of the largest coal producers in South Yorkshire and North Derbyshire at this time.

Away from the waterways, the South Yorkshire ironmasters, like those in North Derbyshire, mined their own coal. Richard Swallow I built two of the new type of coke fired furnaces at Chapeltown in 1788 and to supply these with fuel leased a pit from the Duke of Norfolk in Parkin Wood alongside the Leeds Turnpike in the next year. His son, Richard Swallow II leased another mine in 1804 from the Duke in Helsey Park. The ironmaster contracted to make a minimum payment of £250 a year royalty.^I Before Swallow's bankruptcy, production of coal at these two pits was heavy. Between 1804 and 1808, 12½ acres of the Thick Coal and 13 acres of the Thin - a tonnage of 130,000 - were mined. The ironworks then stood idle until 1811, when they were taken over by Darwin, Frith and Cookney. During the next

I. Coal Calculations. M.D. 1746/12. Deeds and Papers of Wm. Dunn and his son Thomas. Sheffield City Library.

five years, 18 acres of the Thick and 28 acres of the Thin Coal were extracted. No further information as to output is available except for the three years immediately before the bankruptcy of the lessees, when from 1825 to 1828, the firm mined $3\frac{3}{4}$ acres of the Thick, $1\frac{3}{4}$ acres of the Thin and $10\frac{5}{8}$ acres of the Bromley Coal. The ironworks and pits then fell into the hands of the creditors who were naturally reluctant to undertake capital expenditure on sinking a new colliery, despite the fact that the Thick Coal workings were exhausted. It was not until 1837 that Higgs New Winning came into production to mine this seam. This new mine enabled the next lessee, William Swann of Ferham, a Rotherham ironmaster, to step up output of the Thick Coal to nine acres in addition to six acres of the Thin and $9\frac{3}{4}$ acres of the Bromley Coal between the time of his taking over the plant and his bankruptcy in 1841.

Within sight of the glare of the Chapeltown Ironworks were the furnaces and foundries of Thorncliffe on the Fitzwilliam estate. Here, Chambers, Newton and Company leased in 1793 both the Thick and Thin Coal for 21 years to feed the ironworks which they intended to erect on this site. Before their first furnace was blown in, they had begun to mine coal at Thorncliffe Colliery. During the next eleven years, largely as a result of the great demand for water pipes on which they began to specialise in 1805, they mined 29 acres of the Thick and 52 acres of the Thin Coal, a total which may be estimated at 350,000 tons. After Waterloo, the amount of coal mined by the Company, like the output of every other integrated concern in the district was vitally affected by the fluctuations in trade which occurred during the next twentyfive years. The first year of the peace saw coal production halved

at Thorncliffe. Output declined still further during the next two years and it was not until the boom of 1824/5, that wonderful year for ironmasters throughout the country, when Newton, Scott, Chambers and Newton, with order books full, were turning down orders for several thousand tons of metal, that coal production fully recovered. In that year, both the Thick and Thin Seams each produced some $4\frac{1}{2}$ acres of coal - some 40,000 tons. Once the boom collapsed, output declined and in the worst years, when almost every letter from the works mentions the current slackness of trade and the fierce competition between the South Yorkshire and North Derbyshire ironmasters engaged in the production of light castings, coal production sank to a quarter of what it had been during the boom. During the next decade, output rose at the peak of each trade cycle and in 1839, the concern mined 46,500 tons of coal at its pits.

In 1789, Booth, Binks and Hartop leased a part of the minerals under the Norfolk estate in Sheffield to provide coal for a blast furnace and foundry which they had built in the Park. ^I The partnership was, however, compelled to close this pit shortly afterwards as the Duke refused to allow it to sell small coal in competition with Sorby, Littlewood and Company, the lessees of the other mines on the Norfolk estate, a step which made it uneconomic to work the colliery. At the end of the mineral lease, the ironstone was transferred to the Sheffield Coal Company, with the result that Booth and Company were left in the predicament of having a furnace on their hands with no coal or ironstone with which to feed it. Fortunately, the opening of the canal between Sheffield and Tinsley made it possible to transport these

I. Statement. The Park Furnace Company. Deed Box 25. Norfolk Estate Office, Sheffield.

minerals from the Fitzwilliam estate to the Park Furnace. Production of the Thin Coal began at Tinsley Park in 1820, followed by that of the Thick Coal in the next year and of the High Hazel Seam in 1823. During the boom year of 1825, when this concern, like all the other pipe making plants in the district, was fully occupied with orders, six acres of the Thin, three of the Thick and two of the High Hazels were mined, a total output of some 40,000 tons. Production during the remaining fifteen years of this period at Tinsley Park rose and fell with the dictates of the trade cycle, culminating in an output of some 66,000 tons in 1839/40.

As important, from the standpoint of coal output, as any of the ironmasters were the two partnerships which mined coal on the Norfolk estate from 1805 to 1840. In 1805, the Duke of Norfolk leased his Sheffield collieries to Thomas and Catherine Eyre at an annual rent of £750 for eighteen acres of coal "got or not got" with an additional £75 for every acre of coal mined in excess of this stipulated amount. The Eyre family then proceeded to sublease the newly completed Crookes Croft Colliery, together with pits at Handsworth and Woodthorpe, the whole valued at £13,250 to Messrs Nixon, Littlewood and Partners at an annual rent of £5000 with the right to mine an unlimited amount of coal. In the first year of their lease, this concern extracted twelve acres of coal at Sheffield, three at the Manor, eight at Attercliffe and another acre at two pits at Arborthorne, a total probably of about 150,000 tons. In 1812, Crookes Croft pit was closed down and the pillars of coal left in to support the roof robbed, with the result that the Sheaf entered the workings and drowned the mine. Another colliery was then sunk about half a mile away

on the Mansfield Turnpike where coal could be mined without the expense of pumping. Output remained at much the same level during the war, but after Waterloo production declined with the post-war slump to about 115,000 tons in 1817. By this time it was apparent that the lease granted in 1805 by Thomas and Catherine Eyre was, from the standpoint of the Duke of Norfolk "vague and unsatisfactory" as by that date, the lessees had mined almost all the coal workable at Sheffield and Woodthorpe Collieries without making any preparations for new sinkings. In addition, the waterlevels at Handsworth Colliery had been so neglected that it was impossible to mine coal after heavy rain. Consequently, when the lease expired in 1820 it was not renewed.

The new lessee was the Sheffield Coal Company. Like its predecessor, this firm was a partnership. The active members of this concern were Thomas Dunn and William Jeffcock. The latter was a member of a family of a type almost unique in the history of coal mining in the Sheffield district as in the course of some seventy years its head had risen from the position of collier to that of wealthy coalmaster. John Jeffcock, who according to Swift, the Sheffield genealogist "kept the house known by the sign of Adam and Eve at Hall Gates, Handsworth" appears to have been a "butty" at the pits in Sheffield Park before he was killed in 1777. His son, John, who died in 1814, had managed Dore House, Attercliffe and Handsworth Collieries, before becoming the mineral agent of the Duke of Norfolk.² The grandson, William, invested £9047 in the Sheffield Coal Company. Thomas Dunn, who was related to Jeffcock and who had managed a

I. Memorandum by William Stobart, mineral agent of the Duke of Norfolk. Deed Box 25. Norfolk Estate Office, Sheffield.
2. W.P. Jeffcock. Family Recollections. (1941).

colliery at Darnall before becoming a partner in the Coal Company, invested £1,788. The sleeping partners, two Sheffield merchants, T.B. Holy and J. Wilson each put £8,817 into the concern. The former was later bought out by Bartholemew Hounsfield, a member of a family whose wealth had been made in the tanning industry in the first half of the eighteenth century.^I By their lease, the partnership was required to spend £10,000 on sinking a new winning to the deep of Crookes Croft towards the Canal Basin. In actual fact, the new colliery which took two years to sink, cost £16,000. In addition, the lease stipulated that the concern should make a minimum annual royalty payment of £4,500. This provision proved to be a bad bargain for the Company, which entering business in a year characterised by the Board of the Sheffield Canal as one in which trade was "nearly at an expiring ebb" found the demand for coal in Sheffield declining at a time when the newly opened Tinsley Canal enabled coal mined along the Don and the Dearne and Dove navigations to compete with its products in the Sheffield market, resulting in a considerable fall in the price of coal. Despite the fact that output increased rapidly with the onset of the trade boom of 1824/5, the Coal Company failed during the first seven years of its existence to mine the minimum amount of coal stipulated in its lease. Nevertheless, by contemporary standards its output was high. From 1820 to 1827 it mined 56 acres at Sheffield Colliery, 32 acres in the Park and 25 acres at Handsworth. Over the next seven years, it extracted 39 acres at Sheffield, 31 at the Manor, 18 at Handsworth, 4 at Ballifield Green and 18 at Attercliffe Common. In addition, in 1826 the Coal Company leased the soft coal under the Manvers

estate at Birley Vale, outside the town, undertaking to mine the Upper Coal at £175 and the Lower at £100 an acre respectively and to make a minimum annual payment of £1000 in royalty.¹ Four years later, the Company brought another colliery at Sunderland Moor into production. By 1834, this pit was producing about 13,000 tons of coal, three fifths of which was the hard coal essential to the cutlery industry.² Altogether, the Sheffield Coal Company sold in 1834, the latest available statistics for this period, about 150,000 tons, an amount which must have placed it amongst the major producers of coal in South Yorkshire and North Derbyshire.³ This amount may well have been the maximum output attained by the partnership during this period, as the closing years of the decade saw the miners at its pits working short time and the firm heavily stocking coal for which it was unable to find a market.⁴

In comparison with the ironmasters and the two partnerships which mined the Norfolk coal in Sheffield, coal production by the landowning classes, with one important exception, was on a small scale. In Derbyshire, after two years of preliminary work, the Duke of Devonshire brought Hollingwood Colliery into production in November 1791. By 1805, it had an output of 9,000 tons. Records of coal sales, now at Chatsworth, indicate that this level of output was maintained throughout the Napoleonic Wars. The only later output figure before 1819, when it was leased to George H. Barrow, shows the pit to have produced 794 tons in 1818, a small enough amount attributable to the fact that

1. Deed No. 3233. Manvers MSS. The University Library, Nottingham.
2. F.B.229. Pp. 9-24. Fairbank Collection. Sheffield City Library.
3. The Sheffield and Rotherham Railroad. Correspondence and Papers of Thomas Dunn Junior. M.D. 2197. Sheffield City Library.
4. Letter signed by Thomas Dunn Junior in Sheffield and Rotherham Independent. 25 May 1844.

Staveley Ironworks was shut down at this time. Another aristocratic landowner, the first Earl Manvers, was working pits during the first decade of the nineteenth century at Heath, at High Lane near Eckington and at Birley. The first of these, set in the middle of a district notorious for its bad roads, was only a small land-sale colliery. The last named, sited in the heart of an important edge tool manufacturing district, had a productive capacity of 18,500/^{tons} in 1809, but unfortunately no output figures are available for any of these mines.^I

The policy of the Dukes of Norfolk was, in general, to lease the minerals under their South Yorkshire estates. There was, however, one period of twentyfive years, from 1780 to 1805, when the collieries on this property were worked by the Howard family, in conjunction with their agent, Vincent Eyre II. At the beginning of the Canal Age, the Sheffield and Manor pits were leased to Townshend and Furniss. During the next five years, these two mines grew steadily more unprofitable to work as the shafts grew deeper; as the proportion of hard coal, used by the cutlers and which fetched the highest price, diminished and as working costs increased when two bad faults were struck.² Probably for these reasons the lease was surrendered in 1780 when the two pits were taken "in hand." During the next four years, production of hard coal further decreased, "a circumstance" as the Duke's agent informed him "that can never be submitted to in quietness by the town."³ To increase output, the Duke's mineral agent, John Curr, suggested sinking two new pits at the

1. Colliery Accounts. Nos. 4737-4740. Manvers MSS. University Library, Nottingham.
2. Sheffield Park Colliery. John Curr. Deed Box 25. Norfolk Estate Office, Sheffield.
3. Report Relative to Sheffield Park Collieries. 28 January 1784. Deed Box 25. Norfolk Estate Office, Sheffield.

Ponds and at Attercliffe. The plans for these were submitted to John Buddle, one of the leading Durham mining engineers and after he had approved them, two new collieries were sunk at a total cost of £20,000. Unfortunately for all concerned, a series of occurrences rendered much of this capital expenditure useless. To the south and southwest of Attercliffe Colliery stood the workings of Fhipps, Clay and Deakin. At both of these pits large amounts of water were encountered. The owners of Darnall Colliery eventually came to the conclusion that pumping costs were too high and so shut down their engines, mining only the basset coal. In 1787, however, Darnall Colliery and another pit which its owners had sunk at High Hazels were bought by the Duke. In between the Norfolk and Fitzwilliam estates stood a small estate of sixteen acres owned by the Staniforth family. In working this coal, the barrier left at the boundary of the Norfolk estate was broken through with the result that all the water which had accumulated in the "old hollows" at Darnall Colliery flooded through into Attercliffe Colliery with the consequence that "the Duke's engines at Attercliffe were put to all they could do to keep the Works clear of Water." In fact, within a few days, the deep level had to be abandoned and with it thirty acres of coal. Although a wooden dam was inserted to block the hole in the barrier of coal, at the time of a suit brought by the Duke of Norfolk against Staniforth -1801- Attercliffe Colliery was closed down as the miners, conscious of the tremendous pressure of water behind it, refused to descend the pit.

Despite this setback, the new colliery in the Ponds successfully met the demand for coal in Sheffield until 1792,

I. Case respecting certain Trespasses committed by Mr. Staniforth. Deed Box " Legal Cases." Norfolk Estate Office. Sheffield.

when such was the shortage of fuel in the town that several furnaces and works had to close down.^I The situation induced several Sick Clubs " madly misapplying " their charitable funds, to quote John Curr, to invest their reserves in sinking Intake Colliery and a group of " ten or Twelve of the Principal Consumers of Coal in the Neighbourhood of Sheffield" to sink Dore House Colliery at a cost of £6,000. The consequence of these new sinkings, as so often happened in the history of coal mining in the district, was to turn a local shortage of coal into a surplus, with the result that the Ponds, Intake and Dore House Collieries engaged on a price war which ruined the Sick Clubs, lost the owners of Dore House pit £8,000 before the end of the century and the Duke of Norfolk three times as much. There were rumours in Sheffield that the Duke of Norfolk intended to sell his pits but instead he bought Dore House Colliery and with the elimination of this competition he was able to increase the price of coal with the result that in 1804 his group of mines made a profit of £18,000.

Much more important in the long run as coalmasters than the Dukes of Devonshire and Norfolk were the Earls Fitzwilliam, the owners of the Wentworth estates. Even before a canal had been constructed through this property, output at Law Wood and Elsecar pits was comparatively large. For example, the former produced 19,000 tons in 1789 and the latter seven years later some 10,000 tons. The opening of the Dearne and Dove and the Stainforth and Keadby Canals, however, revolutionised the scale of coal production on the Wentworth estate, partly by facilitating the transport of

I. Petition of the Owners of Intake Colliery against the Gander Lane Turnpike Bill. Deed Box 25. Norfolk Estate Office, Sheffield.

coal into Lincolnshire and East Anglia and partly by making it possible to assemble limestone, coal and iron ore at Milton and Elsecar and to transport the pig iron and castings manufactured there into the Humber and Trent valleys. The importance of these two ironworks, which by the terms of their leases, were compelled to buy coal and coke from the Earl's pits, as markets for coal may be seen in the fact that they consumed 100,000 tons from 1809 to 1812. To meet this demand and to supply the markets opened up by the construction of the two new canals, New Elsecar had been sunk in 1796. At the end of the wars, the three Fitzwilliam collieries had a combined output of 87,000 tons.

With a market dependent to such an extent on the activities of the iron works around Elsecar, it was natural that with the recession in the industry after the end of the war, coal production should slacken on the Fitzwilliam estate. With the recovery of trade which set in after 1819, output once more began to grow and by 1823 the quantity of coal mined on the estate amounted to over 120,000 tons. Part of this output came from two recently opened collieries. Swallow Wood, brought into production in 1822, was a comparatively small pit mining house coal. New Park Gate, sunk to mine the coal under the Chapter of Southwell property at Rawmarsh, which the Earl had leased in 1821 at a royalty of £160 an acre and which had cost £15,000 to sink before the first coal was raised in 1825 was, on the other hand, a very big pit which, when in full production in 1828 had an output of 52,000 tons. Unfortunately after this date, the statistical material is not comparable with earlier figures as none are available for Old Elsecar pit until the end of the period. The

I. Miscellaneous Papers about Collieries. F. 100. Papers, Correspondence etc of the Second Earl Fitzwilliam. Wentworth Woodhouse MSS. Sheffield City Library.

influence of general trade conditions is, however, fully reflected in the output figures of both New Park Gate and New Elsecar. Output fell off at both these pits during the depression of the early 'thirties and at each men were dismissed and wage cuts made in an effort to make them profitable. At the depth of the recession, output at New Park Gate fell to 27,000 tons in 1832 and in following year production at Elsecar dropped to 33,000 tons. Recovery of coal output as trade conditions improved during the next two years was rapid. In the early months of 1838, Milton Ironworks was using 100 tons of coal daily. The Fitzwilliam pits also enjoyed a considerable sale of coal in Sheffield at this time. Indeed, so brisk was the coal trade at Elsecar and New Park Gate that it was impossible to find sufficient labour to man the pits. At the end of the decade, the sixth Earl Fitzwilliam, with Old and New Elsecar, Swallow Wood and New Park Gate, with a total output of 200,000 tons could regard himself as the leading coalmaster in South Yorkshire and North Derbyshire.

The Fenton family continued to mine coal on the Fitzwilliam estate until 1824. During the first five years of the Canal Age, as the more accessible seams around Basingthorpe began to be exhausted, production at their pits fell off to 16,421 waggons in 1780 - some 40,000 tons. To enable new seams of coal to be exploited on the left bank of the Don, the Greasborough Canal was constructed in 1780. As a consequence of these developments, sales down river from the Fenton collieries averaged over 20,000 waggons annually during the next twenty years. Output fell off slowly during the war years, as the shallower seams were gradually worked out but it was the post war slump, in which the family sustained heavy financial losses, which led to a rapid

decline in production at these pits. The lease was extended in 1822 for a period of two years to enable sixteen acres of coal, which were only accessible through the shafts at Greasborough, to be worked. Once these reserves had been mined, the Fenton family severed their connection with coal mining in an area in which they had been the leading coalmasters for some seventy years. This step, however, did not mean that the family had completely withdrawn from the industry as they had, at this time, other pits in Leeds and in Leicestershire and later in the Canal Age they sank pits at Bagthorpe on the Nottinghamshire side of the Cromford Canal.

The smaller landowners, as a class, were of little significance as coal producers during the Canal Age. By the opening of the nineteenth century, the gentry had lost much of their previous importance as coalmasters. The Bowdens of Beightonfields, the foremost mining family in Derbyshire in the first threequarters of the eighteenth century surrendered their lease of the Portland coal at Shuttlewood in 1775 and sold their Staveley Colliery to the Griffin Foundry thirty years later. The Barnes family of Ashgate continued to mine coal throughout the Canal Age, but their relative importance as coal producers was lower during the first forty years of the new century than at any time in the history of the family between 1730 and nationalisation. David Barnes worked two pits at Brampton in partnership with John Wilcockson from 1789 to 1793. His son, John Gorell, who had inherited an income of £2000 a year, continued to mine coal on his Ashgate property, at first on his own account and then in partnership with his former manager, Matthew Wright until 1842, when the pits were closed. The fact that during their last seven years, sales totalled only

£3,615 show that it could only have been a small land sale colliery. Further south, near the Pinxton arm of the Cromford Canal, the Coke family of Brookhill Hall were producing some 35,000 tons of coal from their pits at Carnfield and Sleights in 1838.^I Nearby, in the parish of Alferton, the Morewood family, the biggest landowners in the district, were mining coal from 1780 to the end of this period.²

In South Yorkshire, the picture was very similiar. The Hirst family, so important as coalmasters in the second half of the eighteenth century, became extinct in the first decade of the next century, when its coal bearing land in Kimberworth and Greasborough was sold.³ In 1804, John Seaton Kent leased the Two Feet Seam at Rawmarsh from the Chapter of Southwell.⁴ He built up a very prosperous business selling foundry coke in Sheffield and house coal in almost every town on a navigation in the East Riding, Lincolnshire and in the northern part of East Anglia. His pits were, however, bought in 1819 by Earl Fitzwilliam. Altogether, compared with the activity displayed by this class in both counties during the early part of the eighteenth century, it is plain that their importance had declined greatly.

What, however, was new was that business men were acquiring land to mine the coal beneath it. At Intake, Newbould worked the colliery originally sunk by the Sheffield Sick Clubs in 1793. Although this colliery suffered^e from the disadvantage that coal mined there had to pay toll on the turnpike into the

1. Coke-Steel MSS. Trusley Hall, Derbyshire.
2. Land Tax Returns. 1780. Derbyshire County Offices, Derby; J. Farey "Agriculture and Minerals of Derbyshire". Vol. I. P. 182. (1815) and Childrens' Employment Commission. Mines. (1842). Appendix Part 2. P. 336.
3. Manor of Rotherham. 1779-1831.M.D. 3186. Sheffield City Library.
4. Deed No. 3969. Chapter of Southwell MSS. Shire Hall, Nottingham.

town, whereas that produced by its chief competitor, the Sheffield Coal Company was exempt, it was a highly profitable concern as these pits produced a high proportion of the hard coal so much valued by the cutlers. In 1828, when the colliery was valued at £7,240, it produced 23,900 tons.¹ Shortly after the opening of the Barnsley Canal, James Clarke purchased the Noblethorpe estate at Silkstone to mine that seam of coal. In 1826, his son, Robert took over a lease of the coal under Silkstone Common for twenty years at £210 an acre, undertaking to mine three acres annually.² In 1840, output at the three pits owned by the family, was well over 100,000 tons.³ In 1816, the Sorby family, at that time partners in the group working the Norfolk coal in Sheffield, purchased some 150 acres of land at Orgreave, outside the town, where they proceeded to mine the hard coal on a considerable scale during the remainder of the Canal Age. Finally, in 1828, the Charlesworth family of Rothwell, one of the largest mining concerns around Wakefield, bought property along the Barnsley Canal, near Barugh, with the intention of mining the Silkstone coal in that area.⁴

Once away from the waterways and their connecting tramways, the majority of pits had outputs little larger than the ordinary landsale mine at the opening of the eighteenth century. As the capital required to sink and work a colliery of this type was small, ownership of this type of pit was widespread amongst those

1. Intake Colliery. Details of Prices, Coal got etc. C.P. 38. (28-36). Fairbank Collection. Sheffield City Library.
2. Silkstone Coal Arbitration. 1824-6. Wentworth Stewards' Papers. 7 (V). Wentworth Woodhouse MSS. Sheffield City Library.
3. James Watson Brown, agent to Mrs Clarke, in evidence before S.C. on Sheffield, Ashton under Lyne and Manchester (Barnsley Branch) Bill. 1846.
4. Letter dated 27 October 1828. Thomas Pott's Letters. 1828-39. Correspondence and Papers of John Spencer Stanhope. Cannon Hall MSS. Sheffield City Library.



SECTION

A.B. Slater Esq.

W. D. M. Jones

Duke of Devonshire

Bank Face 1836

Bank Face 1838

Duke

D

53

52

Coal Road

Seep Level

3 Yards North East

51

43

44

45

46

ADIT LEVEL

Bank 10 Yards West and South

49

50

Silkstone's Coal

40

ADIT LEVEL

41

ROTHAM RIVER

Silcolne

From Chatterfield

W. D. M. Jones

54

55

Duke of

sections of the community with a little capital to invest. Land sale collieries were worked in the last quarter of the eighteenth century by innkeepers such as James Stephenson at Hady and by the Kendalls of the important coaching inn at Oakerthorpe on the Derby turnpike. Industrialists such as Joseph Clay, lead smelter and the Dixon family, glass manufacturers, were mining coal at Dronfield Woodhouse and Old Whittington respectively at this same period. During the later part of the Canal Age, James Webster, a Sheffield cutler was a partner in a colliery at Eckington Lees and the Lucas family, steel casters and spindle makers mined coal at Dronfield. Near Chesterfield, Knowles and Briddon and Oldfield and Company had pits in the 'thirties to supply their potteries with fuel. ^I Investment in small pits by farmers appears to have been common. Four Handsworth farmers each subscribed ten guineas in 1776 " for the purpose of buying and setting on work " a colliery under the glebe land of that village. Francis Glossop, a farmer at Upper Haddon, leased coal at Stonegravels in 1783. John Morton of Moor Top, Staveley was a partner together with Henry Longden of Sheffield, ironmonger and Abraham Hill of Whitely Wood, sawmaker in pits at Cortwood and Gawber in 1800. His son, Mark, was working coal at Bramley Moor, near Eckington, in the 'twenties. ² Another farmer, George Wells, took over a colliery at Marsh Lane, near Eckington in 1822. John Limb, another farmer, leased the coal under the Pegge Burnell estate at Tapton, outside Chesterfield, in 1825. Lime burners such as Forrest and Newton, both of whom owned small copyhold properties at Clowne, on which they quarried lime, worked

1. Hasland Poor Rate Book. 1837. No. 577/4. Bagshawe Collection. Sheffield City Library.
2. Correspondence. Bramley Moor Colliery. C.P.5. (9-54). Fairbank Collection. Sheffield City Library.

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the outcrop of the coal there to provide fuel for their kilns. The total output from the pits worked by the small coalmasters was, however, insignificant compared with production at the mines controlled by the ironmasters.

The fact that the bulk of the coal mined was raised at pits controlled by a relatively few coalmasters made it easy for them to combine in defence of their interests. The coalmasters in the Erewash valley had an association as early as 1824, which functioned throughout the Canal Age, to control the price of coal.² The West Riding coalmasters appear to have first begun to organise in June 1833 when a number of them met together in Wakefield to form an association to protect themselves against " Dictation on the part of the Workmen as to whom they shall employ." Soon, the majority of the concerns mining the Barnsley Seam along the Dearne and Dove Canal joined it. The association, however, rapidly turned its attention from the problems of trade unionism to that of regulating the price of coal. In June 1836, at a meeting at Barnsley, it was agreed to raise the price of hard coal, which was then in short supply and to maintain that of soft coal, of which there was a surplus. Two years later, in an attempt to compete with the North Eastern Coalfield, it was decided to adopt a discriminatory two price policy, in that while the price of coal at the pit head was to be raised, that of coal sold in Goole and along the coast was to remain unaltered. This association was in informal contact with the leading coalmaster in North East Derbyshire - George. H. Barrow-

I. Duke of Portland v Rev. Thomas Hill. In Chancery. 1864.
Evidence of John Wright and Joseph Shacklock. Olivier Settlement
Mss. Derbyshire County Council Offices, Derby.
2. Evidence of William Wilson, agent of the Morewood Estates,
Alfreton, Derbyshire before S.C. on the Erewash Valley Railway
Bill. 1847.

where there was no association of coalmasters, on the subject of prices. In September 1836, Barrow wrote to William Newman, land agent to Earl Fitzwilliam, after a visit to the Forest of Dean, the Warwickshire and the South Wales Coalfield, where he had noted that coal prices were rising:-

" Surely therefore it is high time that we participated in this advantage. Coals in my opinion have been sold much too low for many years and I feel quite confident that it only requires a general good understanding amongst the coalmasters to get them up a little.

I think of advancing mine 1/- a ton at first but I should like to have your opinion upon it. I will then name it to all the parties in this neighbourhood but I have no doubt of their adopting the suggestion, because their advantage would be self evident."¹

The West Riding association also dealt with another problem, that of giving overmeasure when a common price had been fixed by the coalmasters, to undercut rival concerns, without breaking the letter of the agreement. In 1833, for example, the Fitzwilliam pits were being undercut by as much as a shilling a waggon by mines at Barnsley and Gawber, practising this method of evasion. Biram, steward to Earl Fitzwilliam suggested that all coal in the future should be sold by weight and not by measure and when this proposal received statutory sanction, the association decided to take legal action against any coalmaster found breaking the law.

THE MINING LEASE DURING THE CANAL AGE.

During the early part of the Canal Age, old forms of the colliery lease still survived. For example, when Richard Swallow I leased Parkin Wood Colliery in 1779 his rent was to be twenty guineas for every pickman employed. Two years later, Hirst

I. Letter dated 24 September 1836. General Correspondence of Benjamin Biram. No. 15. Stewards Papers. Wentworth Woodhouse MSS. Sheffield City Library.

and Company were working the Carrhouse Thick Coal on the Effingham estate at exactly the same rent. Another pit at Hollinghouse on the Cannon Hall estate was leased in 1798 at a fixed rent of £70 per annum. Such archaic forms were, however, fast disappearing in favour of a royalty based on the acreage of coal mined, a method both simple and cheap to operate. It was, in addition, during a period when output fluctuated widely from year to year, more just to both coalmaster and landlord. This method of calculating mining royalties became standard during the early years of the nineteenth century on such aristocratic estates as those of the Dukes of Norfolk, Portland and Leeds, Earls Fitzwilliam and Manvers and the Marquis of Ormonde. It was, in addition, widely used on the Devonshire estate, except at some of the Barrow pits at Staveley, where the royalty was based on the tonnage raised. Acreage rents were also in general use on the properties of such local families of gentry as the Pegge Burnells at Tapton, the Barkers at Brampton,^I the Rodes at Barlborough, the Sitwells at Renishaw, the Spencer Stanhopes at Cannon Hall and the Murrays of Banner Cross.² The same system was employed on the Crown Manor of Eckington and the Chapter of Southwell estate at Rawmarsh.³ Practice differed from estate to estate as to whether any allowance should be made for pillars left in to support the roof, but with the more general use of the longwall system of mining during the period, such allowances became unnecessary. The practice became general of stipulating that a minimum acreage of coal must be mined annually. Any hardship that a coalmaster might endure by the working of such a clause in a period remarkable for rapid

1. Barker Family Muniments. Sheffield City Library. (uncatalogued).
2. Deed I3/I0/35. Bagshawe Collection. John Rylands Library. Manchester.
3. Decree Books. The Library. Southwell Minster, Notts.

variations of demand was, however, usually offset by the proviso that any deficiency of output in any one year could be set against an excess of production at any time during the duration of the lease.

Typical of the leases of the Canal Age, in its principles if not in the area of coal to be mined annually, was that between the Sheffield Coal Company and the Duke of Norfolk, signed in 1840. The former on its part contracted to make a minimum annual payment of £2,800 for seven acres of the Sheffield Bed; £1,200 for six acres of the Manor Bed and £500 for five acres of the Handsworth Bed. It was empowered to carry over any deficiency mined in one seam from one year to another in reckoning royalty payments, It contracted to leave a thirty yards barrier between the Norfolk coal and that under adjoining estates, a usual provision to prevent the minerals under neighbouring properties being drained by the soughs or engines installed by the coalmaster. As in all leases of this period, the Company was compelled to make land used for coal hillocks fit for agricultural purposes once ^a again when mining had finished in that particular area. The Duke, on his part, agreed not to lease any of his minerals to other coalmasters nor to give them wayleaves through his land, a clause which by this time had become customary in most mineral leases.

^H MINING TECHNIQUE DURING THE CANAL AGE.

The pattern of coal mining during the Canal Age is clear. In general, the most important centres of production were on the large landed estates either on the navigations or connected to them by Newcastle railways. The statistical material is too defective to arrange these mining areas in relative importance, but it is obvious that Silkstone on its tramway,

Wosborough and Elsecar on their cuts from the Dearne and Dove Canal, the Tinsley Park and New Park Gate district on the Don Navigation and Sheffield Park on the Tinsley Canal were the main mining centres in South Yorkshire. In Derbyshire, the most productive areas were between Staveley and Eckington on the Chesterfield Canal and between Pinxton and Riddings on the Cromford Canal.

Away from the great estates and the waterways and their associated tramways, collieries limited to a landsale market had a small output. This was particularly so on the western edge of the coalfield where the thin Alton or Ganister Seam was mined. In the extreme north of the district, at the end of the Canal Age, two pits on the Cannon Hall estate at Thurgoland were each mining half an acre a year - probably about 2000 tons. Further south at Wortley, a coal mine was leased by the Countess of Bute in 1790 for £10 annually. Another colliery on the Norfolk property on the edge of the moors at Ringinlow had an output of 700 loads in 1825. A lease dated 1806 for the coal under the Banner Cross estate only stipulated that a minimum of half an acre a year should be mined. Nearby, another pit on the Devonshire property at Dore was leased from 1792 to 1802 at £10 a year.^I Across the county boundary, some 19 acres of coal were extracted from a pit at Dronfield Woodhouse from 1798 to 1819. A Newbold rate valuation dated 1827 includes two pits each worked by only three men. The same situation could be found on the Silkstone Seam, in isolated areas, despite the fact that that this seam was much thicker and its quality much superior to the Ganister Bed. As an example, High Green Colliery worked by Newton, Chambers and Company, in the 'thirties had an output of about an acre a year. Even near

I. Dore Rental. 1792- 1802. No. 509. Bagshawe Collection. Sheffield City Library.

a canal where the property was small and seams broken by faults, output at individual pits could be small. On the Crown Manor of Eckington, situated close to the banks of the Chesterfield Canal, one coalmaster was proposing in 1821 to mine half an acre at High Lane; in 1824, another colliery was leased at Eckington Lees with a stipulated minimum of half an acre annually; in 1828, when the property was sold, it was asserted that half an acre of coal was mined each year at Mosborough Colliery.

Such pits as these involved no new problems for the mining engineer. The position was very different at the bigger collieries on the great aristocratic estates on the waterways, where much more extensive underground workings necessitated the solution of new problems of drainage and ventilation along the levels and up the shaft. The first mining engineer in the area to be confronted by these problems was John Curr who, as has been shown, had to plan a large expansion of coal production on the Norfolk estate in Sheffield in 1785, as a result of the simultaneous decline in the output of hard coal and a great increase in the demand for that article as a result of industrial expansion. His planning was complicated by the fact that an eleven yards dyke encountered in the workings had affected 130 acres of the basset coal "destroying the Texture and the Care and Quality of the Coal in so great a Degree that -- the Quantities gotten out of the same (will be) exceedingly bad, trifling and uncertain." It was, therefore, necessary to mine more deeply than usual to escape this fault and to design underground workings and shafts

I. Report of Inventions introduced by John Curr in Sheffield and Attercliffe Collieries. Deed Box 25. Norfolk Estate Office, Sheffield; John Curr. "The Coal Viewer and engine builders practical companion. Sheffield, 1797; Fred. Bland. "John Curr. Originator of Iron Tram Roads. "Trans. Newcomen Society. Vol. II. Pp. 120-30.

through which much larger amounts of coal could be conveyed or raised than had been the practice hitherto. In solving these problems, Curr showed a boldness of conception, an ability to weld a number of technical ideas into a harmonious whole, a capacity for large scale organisation and an executive ability which stamp him as by far the greatest mining engineer of his generation in the Sheffield region. In addition to Attercliffe Colliery, then being sunk, Curr proposed to develop three new pits in Sheffield, at the Ponds, the Park and Crookes Croft. Each of the last two named pits was to have an annual output of 50,000 tons. Production on a scale unprecedented in the district from a single shaft necessitated new methods of underground and shaft haulage. Curr suggested that the conventional method of raising coal by means of a gin worked by a horse, pulling a basket of coal up the shaft should be replaced by a carriage, loaded with two corves, sliding between wooden conductor rails and raised to the surface by his flat rope, wound by a water wheel. Curr asserted that by these methods five times as much coal could be wound as by the older techniques. Underground, he proposed to turn his levels into canals, seven feet wide and nine feet wide, which would both drain off surplus water and provide a navigation on which barges could transport coal. The scheme was submitted to Buddle, one of the leading mining engineers in the country, for his appreciation. He proved most enthusiastic about the haulage methods, as a result of which he saw large economies, although he was rather dubious about the development of mining in Crookes Croft on account of "the imminent danger to the underground Workings there, when carried on to a certain extent under the highly unfavourable circumstances of an enormous Weight of incumbent hill and the

great length of hurrying the Coal through a dangerous and precarious Space of Hollows and Waste." In actual fact, when the pits were sunk, Curr returned to the more conventional method of haulage, using the underground rails which he claimed to have invented in the late 'seventies. Haulage up the shaft was, however, as is shown by later colliery inventories^{which} included waterwheel, flat rope, carriage and conductor rails.^I

Unfortunately for Curr, to use his own words, his ideas were " buried in an unfortunate undertaking " when Attercliffe Colliery was drowned by water entering it from Staniforth's and High Hazels pits. This and the failure to secure compensation from Staniforth either by arbitration or by legal proceedings seem to have lost him the confidence of the Duke of Norfolk with the result that he was dismissed in 1801. However, by this time his new methods of haulage were beginning to find general acceptance around Sheffield. For example, when New Elsecar was sunk by Earl Fitzwilliam before the close of the century, it incorporated all the characteristic features which Curr had patented - flat ropes, conductors and underground tramways. After his dismissal, Curr continued to work as a consulting engineer, advising on colliery development in the area. In addition, he supplied many of the pits around Sheffield with equipment from his foundry and ropery. By the end of the Canal Age, the use of the flat rope for winding was almost universal in North Derbyshire and South Yorkshire. Conductors made of iron were by 1840 installed in almost every large colliery in the latter area. Their adoption in North Derbyshire where, in general, shafts were shallower seems, however, to

I. A Valuation of Materials and Stock at Handsworth, Sheffield and Manor Collieries -- the property of His Grace the Duke of Norfolk -- entered upon by Messrs, Nixon, Littlewood and Partners. 1805. Norfolk Estate Office, Sheffield.

to have been slow. Conductors were not introduced into the mines around Chesterfield until 1825.¹ It is obvious, too, that their use was unknown in the pits along the Cromford Canal during the Canal Age, as they were regarded as an innovation in that part of the county at the time of Ashley's investigation into mining conditions.²

During the early nineteenth century, the whimsey - an atmospheric or steam engine - replaced the horse gin as a means of winding coal. As shafts were comparatively shallow, these were of limited power. In 1805, what was described as a "small whimsey" was in use at Attercliffe. Coal was raised at High Hazels and at Crookes Croft at this date by Newcomen engines with cylinders of 18 and 27 inches respectively. On the Fitzwilliam estate, two winding engines were installed at Old and New Elsecar, one of 4 H.P. and the other of 12 H.P. At Intake Colliery in 1828 there were three winding engines. Two of these were Newcomen engines of 15 H.P. each and the third a Boulton and Watt engine of 17 H.P. In 1836, a steam engine of 20 H.P. was ordered from Milton Ironworks for New Park Gate Colliery and in the following year that establishment supplied another 10 H.P. engine for the Fitzwilliam pits. Coal was raised at the Deep Pit of the Sheffield Coal Company in 1837 by an engine of 25 H.P. In 1841, when the winding engines at Porter's Hill Stile Colliery in Barnsley were advertised for sale, they were described as being of 8 H.P. and 10 H.P.³

Larger underground workings confronted the mining engineer with new problems of ventilation and illumination. At the opening

1. Description des progrès de l'industrie houillère dans les comtés de Derby et de Nottingham. Par J.T. Woodhouse. P.225.
2. Children's Employment Commission. Mines. (1842). Appendix Part 2.
3. Sheffield and Rotherham Independent. 10 July 1841. P.4. (P.339.

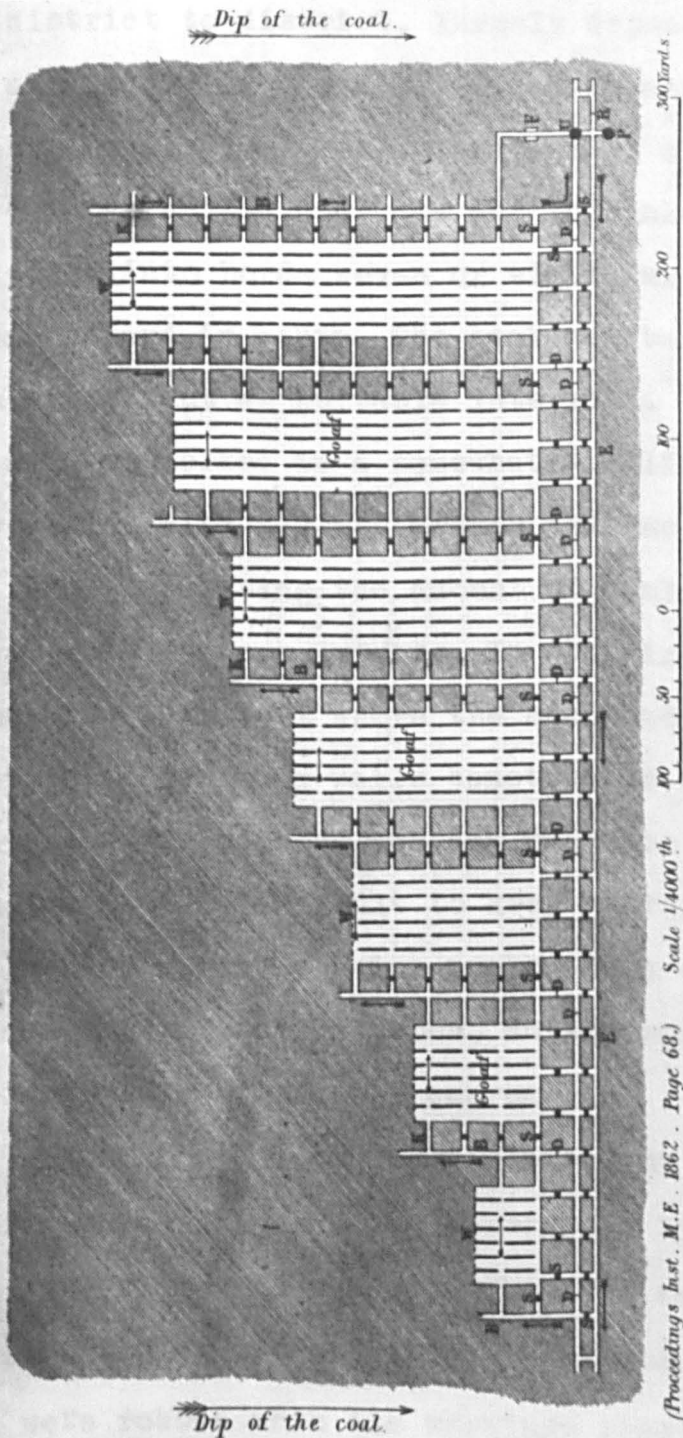
of the Canal Age many pits were ventilated by a chimney set on top of the drawing shaft, through which a more rapid flow of air was induced by a fire lamp. This method of ventilation was still in use at the end of the Canal Age, when it was generally condemned by the mining engineer as the shaft had to be divided by brattices, which often perished, making it difficult to maintain a current of air flowing down the shaft. In addition, when a fire lamp was in use the brattices were liable to catch fire, a great danger in a pit with only one shaft. At the end of the eighteenth century, the practice of splitting the air current to enable each section of the workings to be ventilated separately as opposed to the older method of one air stream ventilating the whole pit, came into use in the new collieries along the South Yorkshire canals. In the next decade, the dumb drift between the drawing and the upcast shafts was introduced into the Derbyshire pits, to give a more complete circulation of air through the workings. I
A further improvement in methods of ventilation was made when a furnace at the bottom of the dumb drift replaced the fire lamp in the upcast shaft, its greater heat drawing a much larger quantity of air through the pit. Despite these improvements, it is highly probable that the amount of air circulated through the collieries in this district was inadequate to ensure the optimum conditions underground for the collier. Nevertheless, as far as safety went, these methods were satisfactory as there were few explosions at collieries in this area during the Canal Age and the death roll from black damp and fire damp seems to have been much lower than that from roof falls and haulage accidents. 2

1. James Dugdale. "The New British Traveller." P.10. (1819).
2. Narratives of the Many Distressing Deaths which have Occurred at the Greasborough Colliery. 1762- 1823; Coroners' Accounts. Box 12. Nos. 33-6. Hundred of Scarsdale. Derbyshire County Council Offices, Derby.

SOUTH YORKSHIRE COAL MINING.

Plate 26.

Fig. 9. Plan of Wide Work.



(Proceedings Inst. M.E. 1862. Page 68.)

Scale 1/4000th

More extensive underground workings made it imperative to extract a greater proportion of coal than was possible by "narrow work". Methods of extraction, however, varied greatly from district to district, largely dependent upon the nature of roof and floor. On the Fitzwilliam estates, the greater part of the coal won during these years was by a system known as "wide work", in which the coal was got in banks sixty yards wide, each subdivided into bords seven or eight yards wide, separated by pillars a yard in width. The coal was barrowed from the face by cross gates, cut at suitable intervals. In North Derbyshire, the coal was worked in a somewhat similiar fashion in banks of sixty yards, with the difference that no intermediate ribs were used, thus increasing the amount of coal obtained. This technique, however, had serious defects. In the first place, the levels through the districts where the coal had been worked had to be supported by thick walls constructed from waste, difficult to maintain where there was any pressure from floor or roof. Secondly, it was difficult to keep ventilation up to the working faces while they were being pushed into the solid coal beyond the last pair of endings open, as the working face was out of the direct line of the air current.

Both these methods of extraction were, at the end of the Canal Age, being superseded by long wall working, in which either the whole face worked was extracted or where it was divided into lengths separated by pillars thirty yards wide, which were robbed when the workings reached their limit from the shaft bottom. Longwall had many advantages over both wide and

I. Plan of two sections of Elsecar Colliery 1793. Joshua Biram. M.P.55; Proposed Method of working the Colliery at Elsecar. F. 7I. Papers, Correspondence etc of the Second Earl Fitzwilliam. Wentworth Woodhouse MSS. Sheffield City Library.

and bank work. It was less expensive to drive a few long levels than many short ones. The proportion of slack and small coal was less. Ventilation was simplified in that there were no blind recesses into which the air could not penetrate. It did, however, demand both a good floor and a good roof but where such conditions obtained, as in the pits worked by the Sheffield Coal Company, as much as 90% of the coal could be extracted. Where, how and by what means, longwall working was introduced into the area is still unknown. When the Yorkshire mining engineer first became interested in the history of the practice of his profession in the Mid-Victorian era, all that he knew was the tradition that it had been introduced into that county from Derbyshire and that its origin must have been in the comparatively gas-free pits of the Midlands.^I

Larger underground workings, especially where it was essential to sink deeper shafts to tap thicker seams of coal, sometimes brought in their train problems of drainage. On the whole, there were few attempts during the Canal Age to drain large areas of coal by driving soughs, probably because once deep mining had commenced there were few areas topographically suitable for sough drainage. Richard Swallow had drained both the coal and ironstone in Parkin Wood and Hesley Park, by means of a sough draining into a small stream near his ironworks, at the end of the eighteenth century. At much the same time, Earl Fitzwilliam had a sough driven northward to Hoyland and southwest to Park Gate from Elsecar to drain some 4½ square miles of coal. Chambers,

I. The following papers in the Trans. Midland Institute of Mining Engineers discuss the advantages and disadvantages of the various methods of extraction and what was known of their history- J.E. Mammatt. " Various methods of working coal in Yorkshire." Vol.I. Pp.24-32; P. Cooper. " On different methods of working Coal. " Vol. I. Pp.44-54 and " Further Observations on different methods of working coal." Vol.2. Pp. 12-23.

Newton and Company were simultaneously driving a sough to drain both the coal and the ironstone at Thorncliffe. A few miles away, Field, Cooper and Faulds soughed Broomroyd Wood on the Wentworth Castle property to drain the coal in that area.^I Much the most important of these projects was only begun at the close of the period when in 1838, Newton, Chambers and Company concluded an agreement with Earl Fitzwilliam whereby both parties were to share the cost, estimated at £10,000, of driving a sough some 3000 yards long from Skiers Spring to drain the Park Gate and Silkstone seams of coal, in addition to valuable ironstone rakes. The work, making it possible to exploit these minerals, was completed in 1844.²

The engine, atmospheric at first and steam later, tended increasingly during the Canal Age to supersede all other means of mine drainage, except at the smallest pits. John Barnes installed a Newcomen engine in 1776 at what is still known as Engine Hollow in Barlow. In the following year, Francis Thompson, the Ashover mining engineer, was authorised by the Board of the Stockwith Canal to build an atmospheric engine at a cost of £1,200 to drain a colliery which had they sunk at Norbriggs. Pits at Cutthorpe and Walton drained by fire engines were advertised for sale in the Derby Mercury in 1778 and 1780 respectively. John Brocksopp's pits at Hasland were drained by two Newcomen engines at the end of the century. A valuation of the Upper and Lower Ground pits at Staveley at the time they were purchased by the Griffin Foundry in 1804 shows each to have been drained by an atmospheric engine. Thorncliffe Works built in the same year,

1. Notebook, No.228. Vernon Wentworth MSS. Sheffield City Library.
2. Correspondence about Contracts for a Colliery Sough at Skiers Spring, G.4I. Correspondence of Charles Wentworth Fitzwilliam. 3rd (and 5th) Earl Fitzwilliam. Wentworth Woodhouse MSS. Sheffield City Library.

as sub contractors for the Griffin Foundry of Brampton, many of the parts of a Newcomen engine for a colliery worked by Messrs J. Morton and Company at Eckington.^I

On the South Yorkshire Coalfield, the construction of the Dearne and Dove, Barnsley and Tinsley Canals was followed, as had been the case after the opening of the Stockwith Canal, by the installation of Newcomen engines to drain the seams along these navigations. In 1795, Earl Fitzwilliam commenced the erection of an atmospheric engine, still in existence, at New Elsecar to lift water from its workings into Law Wood Sough, from parts made at Park Furnace and at the two ironworks on the Wentworth estate, Thorncliffe and Elsecar.² Jarrett and Hardy set an engine at work at Barnby pit on 11 March 1799 as Walter Spencer Stanhope noted in his diary "with complete success." About the same time, Richard Swallow II put in a powerful engine at Chapelton to lift water up to the sough which drained the minerals there, once both coal and ironstone had to be mined below its level. In addition, he installed a smaller engine to drain the Thin Coal and the White Ironstone. In the same area, when a fault threw the coal and ironstone at Thorncliffe below the level of the sough driven by Chambers, Newton and Company, that firm installed an atmospheric pumping engine at their pit. In 1807, another 30 inch pumping engine was purchased from Fenton, Murray and Wood of Leeds at a cost of almost £1000 for Thorncliffe Colliery. Four years later, when Darwins leased the Chapelton minerals after Swallow's bankruptcy, they bought a powerful Newcomen engine to drain the Smithy Wood coal.

1. Day Book No. 6. Longden, Newton, Chambers and Scott. Newton, Chambers MSS. Thorncliffe, Yorkshire.
2. G.T. Newbould. "Notes on Newcomen Atmospheric Engines." Trans. Midland Institute of Mining Engineers. Vol. XXIV. Pp. 167-92.

Similarly, there was another concentration of Newcomen engines at Sheffield. At Attercliffe, John Curr had built a Newcomen engine to drain the pit when it was first sunk. By 1800, after the water had broken in from the old hollows at Darnall, there were five of these engines at work vainly trying to keep the pit clear of water. When the mines on the Norfolk estate were leased to Messrs Nixon, Littlewood and Partners in 1805 they were equipped with a magnificent pair of beam pumping engines, both with 50 inch cylinders, that at High Hazels of the Newcomen type and that at Crookes Croft converted into a condensing engine of the Watt type. Later, when their successors, the Sheffield Coal Company sank Soaphouse pit in 1821, an 80 H.P. engine was installed, a machine which must have been one of the most powerful of its type in the district at that date.

COLLIERY MANAGEMENT DURING THE CANAL AGE.

The profession of colliery manager developed almost inevitably out of the conditions in the mining industry during the Canal Age. Deeper pits with more extensive workings demanded the solution of new technical problems in haulage, ventilation and drainage far beyond the capacity of the men who had managed the small pits customary in the first three quarters of the eighteenth century. Collieries employing between 200 and 300 men, such as those of Earl Fitzwilliam, needed men at their head able to recruit, train, organise and above all discipline much larger bodies of labour than had been the rule hitherto. In addition, in general, colliery owners during the Canal Age, primarily ironmasters or landowners, understood little of the technical problems of coal mining, which had, therefore, of necessity to be handled by the expert.

Broadly speaking, this new profession was subdivided into two classes, that of the manager proper and that of the mining consultant. The former class included men like Joseph Hague, who managed Earl Fitzwilliam's Elsecar Colliery; George Dickens who was in charge of the Duke of Devonshire's Hollingwood Colliery; John Jeffcock, manager of Dore House Colliery and William Dunn, who managed Staniforth's pit at Attercliffe. The class of mining consultants included men such as John Curr, who after his dismissal from the position of mineral agent to the Duke of Norfolk, set up in business in this capacity. His successors as mineral agent, Nixon and Punshon in the first decade of the nineteenth century and William Locke and William Stobart in the second and third decades, exercised a general supervision over mining development on the Norfolk estate in Sheffield and Chapeltown. A similiar function was exercised by J.T. Woodhouse and Humphrey Goodwin on the Devonshire and Manvers estates respectively at the end of the Canal Age. Three, at least, of these men - Curr, Stobart and Locke - were trained on the Durham Coalfield. Woodhouse was a product of the Leicestershire Coalfield. It was, of course, natural that mining engineers already familiar with the problems raised by deeper mines and more extensive workings through practical experience on other coalfields should be called in to handle them once they were encountered in South Yorkshire and North Derbyshire.

The functions of the colliery manager at one of the most productive group of pits in South Yorkshire, at Elsecar, during the last twenty years of the Canal Age may be seen in a memorandum issued by Earl Fitzwilliam for the guidance of

I
the younger Biram, his Superintendent of Collieries. In the first place, his duties were financial. He was responsible for receiving from the book keepers at each pit the money received for selling coal, less what was expended normally; he had to examine all books fortnightly; to check the acreage of coal mined against the amount sold and to pay for all extraordinary expenditure himself. Secondly, he was responsible for selling coal although he was not allowed to make any alteration in its price without the consent of the Earl. Thirdly, he was responsible for the day to day running of the pits, but here too, the consent of the Earl was necessary before any major development, demanding the purchase of engines or tram rails, could be undertaken. Fourthly, Biram was responsible for all salaried staff with power "to hire and fire." It was his duty to pay colliers on piece work their wages without deduction fortnightly. In addition, he was charged with the duty "to promote The Comfort and Happiness of every Industrious Person employed at the several collieries but by every possible means to prevent Idleness, Extravagance, Dishonesty and Immorality"; an injunction carrying over the best paternalistic traditions of estate management into the harder, more commercially-minded atmosphere of the Industrial Revolution. Finally, Biram was ordered to inspect the collieries at irregular intervals "in order that any Neglect of Duty or Abuse may be discovered." Initially, his salary was £100 a year but on his protesting to the Earl that this sum was not as much as could be earned as a good jockey, it was increased to £120 a year in 1831. In 1837, he was given a bonus of £75 when the colliery profits exceeded £1000 a year and of £175 when they were more than £3000.

Biram had as his subordinates two book keepers, responsible for all ordinary expenditure and for keeping the cash books and ledgers and two ground stewards who were responsible for making contracts with hewers, measuring their stints and maintaining discipline. In 1836, the stewards were paid 32/- a week. At each pit, it was the duty of the banksman to keep an account of sales and in addition to be " careful in preserving motties sent up with each corf, in order that justice may be done to each Collier in the calculation of wages."

On the smaller properties, it was the normal practice to leave the management of collieries to butties or contractors. This method, the age-old system of the coalfield, had the advantage that it freed the coalmaster from any responsibility for recruiting and paying labour, for supervising the actual working of the pits and for organising the work of the colliers. This method was well described by James Wild, the machine man at Pinxton Colliery in Derbyshire, when he informed the Sub-Commissioner visiting the Hundred of Scarsdale as part of Ashley's great investigation into mining conditions that " when Mr Coke begins a new pit he sinks the shaft, prepares the headings etc. Mr Machon, Mr Coke's agent, fixes the price and offers it to the butties, who mostly take it. They then let it to the holers by stint and the hammerers, loaders and banksmen by the ton." However well this method of managing the pits may have suited the coalmaster and the butty, it was one condemned by every well-informed person on the coalfield at the time of this Select Commission. Ignorant, devoid of technical knowledge and only too often connected with a public house or " tommy shop"

where the collier was compelled to spend his pay on liquor or on goods of an inferior quality for their price, the butty was in too many cases the worst enemy of the mining population.

LABOUR CONDITIONS IN COAL MINING DURING THE CANAL AGE.

As a broad generalisation, the population of the parishes along the navigations in South Yorkshire and North Derbyshire may be said to have doubled during the last forty years of the Canal Age. The greatest increases were registered in the parishes of Barnsley and Wosborough, where the intensive development of mining the Barnsley Bed led to the quadrupling of the population during this period. Part of this increase throughout the area may be ascribed to the natural increase of population and part to the immigration of men seeking work at the collieries and ironworks in these parishes. In certain cases, it is possible to obtain some evidence of the place of origin of these immigrants. At Thorncliffe, it is traditional that lead miners from Eyam, where that industry was in a state of rapid decline, were responsible for opening both the coal and ironstone mines for Chambers, Newton and Company.¹ In Sheffield, farm labourers from parishes outside the town came to work in its pits. At Staveley, Poor Law examinations and certificates show an immigration into that parish of farm labourers and framework knitters' to become miners and of miners from pits within a radius of about twelve miles to work at George H. Barrow's collieries.²

In Derbyshire, the colliers' working hours were from 13 to 15 hours a day. In the Chesterfield area, however, hours

1. I am indebted to Mr. R.C. Burgin, former Secretary to Messrs. Newton, Chambers and Company for this information.
2. There are few or no Poor Law Certificates at the following parish churches; Alfretton, Brampton, Eckington, Handsworth, Pinxton, Rotherham, Sutton cum Duckmanton and Wosborough Dale.

were shorter, men working from 10 to 11 hours a day with an hour off for dinner. Much the same hours were worked in the Yorkshire Thick Coal pits, but a shorter day was usual in the Thin Coal Seams where work was harder. Generally, the colliers were paid fortnightly, a system which despite the hostility of the miner to it, lasted in the Sheffield area until well after that date.¹ The coalmasters defended this method of payment on the grounds that a weekly payment would mean too much accounting. Probably their real reason was that more regular wage payments would bring in its train increased absenteeism. As in the previous period, it is almost impossible to find details of wages within the industry. In the middle 'thirties, it was declared that a miner around Alfreton could earn 13/6 a week compared with the 10/- of the farm labourer and the 18/- to 25/- of the factory operative in Chesterfield.² Two years later, Biram at Elsecar, lamenting the Mondays spent on drinking after the Saturday pay, asserted that men could earn 30/- a week if they were prepared to work 11½ days in the fortnight. Some miners had other sources of income. In North Derbyshire, many colliers were small holders. In South Yorkshire, miners kept pigs and dug allotments. Some miners also received cheap housing, as on the Fitzwilliam estate where the collier was provided with a four-roomed house and a garden for 2/- a week.

Unfortunately for the collier, too many of his employers were only too eager to exploit him further. Truck was a feature of many mining communities. Originally, it may be conceded that in a newly developed mining area where there was a shortage of shops, it was natural for a colliery company to supply its men

1. Evidence of T.W. Jeffcock before S.C. on Mines, 1866, XIV.
2. Appendix to the First Report from the Commissioners of the Poor Law, P.390 A and Appendix B.

with groceries and textiles. Equally, it may be conceded that where the shop was owned by a firm such as Chambers, Newton and Scott at Thorncliffe, it was operated to the advantage of their workmen. On the whole, however, such shops were used to augment the profits of the coalmaster or the pay of the butty. In 1805, notices were circulated throughout the mining districts of mid Derbyshire offering a reward to informers where it could be proved that men were paid in tickets cashable only at certain shops. This system was still in force in that area at the beginning of the 'forties.^I There is ample evidence in that decade to prove that the truck system was rampant at the small collieries in the area between Chesterfield and Sheffield. At the northern end of the coalfield, truck was every whit as bad at this date. At Darley Main Colliery, the miners complained that men who did not spend a certain proportion of their wages at the "tommy shop" kept by the book keeper, were dismissed. Here, as usual, the groceries sold were poor in quality and high in price. As one collier asserted "They paid us in money, but we took it in one hand to deliver it with the other; we had never to bring it away; if we did we should not have any more work."²

The only area in North Derbyshire and South Yorkshire where women and girls were employed underground was around Barnsley, where they were employed in hurrying corves from the coal face to the bull stakes, where the pit tubs were taken over by horses. William Hopwood, agent at Barnsley New Colliery, was undoubtedly correct when he ascribed the employment of female labour underground in this district to the competition for male labour from the hand loom linen industry, leaving coal

1. Children's Employment Commission. Mines. (1842). Appendix. Part 2. P. 341.

2. S.C. on Payment of Wages. 1842. IX. Q. 3225.

mining with the rapidly growing demand for fuel undermanned. There may have been some truth in the assertion made by J.C. Sutcliffe, agent at Gawber, that pits in the Barnsley area were compelled to employ women as a cheap form of labour, as these collieries situated near the junction of the Dearne and Dove and Barnsley Canals, had the highest transport costs of any of the Barnsley Bed pits and so had to cut the pit head price of coal to meet the competition of mines, such as Elsecar, nearer the market. Every well informed person agreed that the work of females underground should be prohibited by law as it led to immorality, although some of the coalmasters excused themselves of any responsibility for the practice on the grounds either that the women were employed by the hewers or by the assertion that any refusal to employ them would merely lead to a migration of the married collier to pits where he could set his wife and daughters to work. Numerically, the problem was insignificant as there were probably only about 300 women working underground and their exclusion from the collieries in the area cannot have affected the industry in any significant fashion.

John Stuart Wortley, M.P., one of the largest landowners in the district overlooking the upper reaches of the Don, in the debates on Ashley's Bill was compelled to admit that this part of South Yorkshire " was one from which the Commissioners had drawn the accounts of some of the most striking and terrible features of their report." ^I The reason for this fact was simple. This part of South Yorkshire and the corresponding section of the North Derbyshire Coalfield was where the thin Ganister or Alton Seam was mined. In addition, in the former district the Thin Coal, a valuable furnace coal, was mined at Chapeltown, I. Hansard. Col. 1359. Vol. 63. 1842.

Thorncliffe and Tinsley. In each of these thin seams, where the gates were often less than a yard high, the only possible method of working them was, so their owners asserted, with children. As John Haigh, the underground steward at Tinsley, put it bluntly " The horses are not so handy as Christians and we could not do without them." In these pits, children began work at the age of five as it was considered the earlier they went down the pit, the easier it would be for them to learn the posture necessary for hurrying the corves along low gates. In Derbyshire, the pits around Brampton were notorious for the bad conditions in which children worked. The colliery owned by John Gorell Barnes in this parish was singled out by the Sub Commissioner for special condemnation. At these pits all the work was done by boys. Boys hewed the coal and boys barrowed it a distance of sixty yards some sixty times a day along headings two feet high, an inch or two thick in black mud, chained to sledges carrying a hundred weight of coal.

Relatively, children employed in the pits mining thicker seams, worked in better conditions. Usually, they began work at the age of eight, acting as trappers, " a dull dungeon-like life " in which children existed in damp, solitude and darkness. At ten, they began to drive horses, an easy task as the pit pony was well trained. Later, some boys became jimmy boys, detaching the horses from the corves and fastening the pit tubs to ropes pulling them along the main gates. At the age of 18, boys left these jobs to become hewers.

Such hard work unfitted the collier child for any day time education. His only resource was the Sunday School where he was often only too tired to benefit by this opportunity.

As a result, boys from mining parishes were regarded as duller than other children by all who were able to compare their educational attainments. As only too often, society was to pay for this neglect when this generation grew to manhood. The constant complaint of the Inspectorate of Mines during the 'fifties and 'sixties was the inability of the collier to read the Special Safety Regulations which it became statutory to introduce in the larger pits, making him a danger to himself and his fellows. In addition, the lack of any educational foundation on which to build a superstructure of specialised mining knowledge made it difficult to find men suited to be trained as deputies, to be made responsible for safety precautions in the collieries.

At the end of the Canal Age, certain impressions remain in the memory. Witnesses before Ashley's Commission give a vivid picture of the female labour around Silkstone and Barnsley - the girls at Hopwood's Colliery at the latter town " stark naked to the waist, their hair bound with a tight cap and trousers supported by their hips" working alongside men and boys; women at Silkstone standing outside their houses, stripped to the waist washing the pit grime from their bodies and the same girls swaggering about in all their finery in the evenings, unrecognisable as the same individuals who had worked in the pit all day. Other witnesses conjure up a picture of the collier child, as much the victim of his parents as of the butty or the coalmaster, often ill treated, always overworked and ignorant. The collier himself comes to life with his much higher standard of living than his neighbours on the farms in the same area, regarded by his social superiors as brutal and undisciplined and except where he came under the influence of Methodism, a bad

example to the remainder of the working class. That his work was harder than that of any other manual labourer was readily accepted and the picture of the colliers walking home from the pit " in their blanket coats and dirty faces, looking like (on) other human beings than themselves" has a ring of pathos about it which can probably only be appreciated by anyone who has seen miners tramping home across the countryside, with the pit dirt on their faces, towards the lights glimmering in their homes in the valley below. That their work in badly ventilated and badly drained pits was injurious to health was again readily accepted so that " after they are turned 40 or 50 they walk home from their work almost like cripples, stiffly stalking along, often leaning on sticks, bearing the visible evidences in their frame and gait of overstrained nerves and overtaxed strength." That the miners' conditions in collieries worked by Earl Fitzwilliam, the Sheffield Coal Company and G.H. Barrow were better than those in pits owned by less important coalmasters is evident enough.

Finally, most significant development of all, the end of the Canal Age saw the appearance of the mining engineer, on whose shoulders rested the responsibility for planning and operating collieries of a size unprecedented in South Yorkshire and North Derbyshire with all the new problems they entailed. Not as yet organised in any professional body, trained in a hard practical school, men such as the two Birams and J.T. Woodhouse, along with their fellow managers, carried the industry to a level of productivity hitherto unknown in the Sheffield region. Equally important, by their training of premium apprentices, they were preparing the ground for a further expansion in coal mining in the area, made possible in the Mid Victorian era by the completion of the railway network throughout the coalfield.

COAL MINING IN SOUTH YORKSHIRE AND NORTH DERBYSHIRE DURING THE EARLY RAILWAY AGE 1840-50.

The first decade of the Early Railway Age produced no revolution in coal mining in South Yorkshire and North Derbyshire, either in opening up new areas of the coalfield or in the introduction of new technical methods, comparable to that brought about by the construction of canals in that district during the French Revolutionary and Napoleonic Wars. The reasons for this are obvious enough. Many of the railways inevitably kept to the valleys, following the course of the navigations. The Sheffield and Rotherham Railway ran parallel to the Tinsley Canal and the Don Navigation through what was already a highly industrialised zone. The North Midland line followed the course of the Stockwith Canal between Chesterfield and Eckington. The Erewash branch of the Midland Railway ran along the Erewash valley near that canal and then followed the Pinxton arm of the Cromford Canal and its associated tramway to Mansfield. Many of the railways were opened too late in the decade to influence the pattern of mining on the coalfield. The Lincolnshire branch of the Manchester, Sheffield and Lincolnshire Railway, planned to enable that county to be supplied with coal from pits to be sunk on the eastern section of the Norfolk estate near Sheffield, was only opened in 1849. Negotiations between the Duke and Hounsfield, Wilson and Company for the exploitation of this coal was still in train in 1850. The railway connecting Penistone with Huddersfield, designed to supply the mills in the Colne valley with Silkstone coal, was opened in 1850. Although the South Yorkshire, Doncaster and Goole Railway built several branches to collieries around Wosborough in the last year of the decade, its main line along the Don valley

was not opened until the following year. In fact, the only railway both to cross comparatively undeveloped areas of the coalfield and to be opened early enough in the 'forties to affect the structure of coalmining in the region was the North Midland. Even in this case, its track from Masborough to Cudworth passed over seams of coal which, in general, it was considered too deep to mine. However, in North Derbyshire it crossed the basset of the coalfield between Chesterfield and Clay Cross and it was here that the most important developments in coal mining took place during the Early Railway Age.

THE MARKET FOR COAL DURING THE EARLY RAILWAY AGE.

Along this section of the North Midland Railway, George Stephenson and Company brought its first pit into production at Clay Cross in 1838, two years before the line was opened.^I The Wingerworth Coal Company began to raise coal at Wingerworth Colliery in 1844 and at Lings Colliery in the following year. George Stephenson was sinking Locofoord Colliery, planned to employ 400 to 500 men in 1845.² These collieries were designed to take advantage of the North Midland line to Derby where it joined the railway linking Derby with Birmingham and the Midland Counties Railway to Leicester and Rugby. Later, the Midland line from System to Peterborough, opened in 1847, gave coal mined around Chesterfield access to new markets in that part of the East Midlands.

Railway transport offered these North Derbyshire pits many advantages over the mines in the Erewash valley, which remained dependent upon canal transport until 1847. Freight rates were lower. Coal carried in colliery waggons on the Midland over

1. Clay Cross Company Centenary. P.14. (1937).
2. Sheffield and Rotherham Independent. 6 February 1841; Derbyshire Courier. 15 February 1845.

distances greater than fifty miles paid three farthings a ton mile. The railway was also a much more flexible means of transport as it was far easier to construct a siding to a pit than to excavate a branch from a canal. Again, the dealer could buy in waggon loads whereas by canal a barge load was the minimum order. Above all, the railway was a much more reliable means of transport than the canal which was often frozen up in winter, compelling dealers to build up a stock of coal in summer, at a heavy financial burden to themselves, with which to supply their customers in winter.

By 1840, coal from the Clay Cross pits was being sold in Nottingham, Leicester and Loughborough. In addition, a substantial sale of gas and steam coal had been built up in the Birmingham area. By 1842, Clay Cross coal was being sold as far west as Oxford and as far south as Reading. In 1849, a determined effort was made to sell coal in the capital on a large scale. A coal wharf was purchased between Camden Town and the West India Docks; a special concessionary rate of half penny a ton mile for 60,000 tons of coal a year was secured from both the Midland and the London and North Western Railway Companies and a meeting of the directors of the concern was held monthly in the capital "for the special regulation of the London trade." Similarly, the Wingerworth Coal Company established a number of agencies throughout the Midlands to promote the sale of their coal. However, this trade which had been so long a lure to the coalmasters of North Derbyshire proved to be unprofitable as the account books of both the Wingerworth Coal Company and of George Stephenson and Company show that the attempt to break into a market long supplied

I. James Allport, Manager of the Midland Railway, in evidence before S.C. on Canals. 1883. (XIII.I.) Q. 1538.

by other coalfields led to low profit margins, trade rebates and long term credits. In addition, as the Board of the Wingerworth Coal Company wrote to Sir Henry J. Hunloke in March 1851, the expansion in coal mining had been overdone throughout the country, resulting in a fall in prices which had upset all their calculations made at the time of the opening of the North Midland Railway, as coal which had sold in London in 1839 at 26/- a ton was then marketed at from 12/- to 14/- a ton " while the opening of the Erewash Valley, the Leicester and Swannington and other lines had brought in coal as good in quality and at a cost in transit of 1/- to 3/- less than that from Wingerworth."

On the whole coal sales from these new pits along the North Midland line did not eat into the trade formerly done by the collieries along the Cromford Canal. Probably, despite the fluctuations of trade during this decade, they did no more than meet the growing demands of the increasing population and the expanding trade of the East Midlands. In 1840/1, coal shipments from the Cromford ~~mine~~ into the Erewash and Nottingham Canals amounted to 158,251 tons. During the first year of real competition from the mines along the North Midland Railway, they increased to 168,371 tons. In 1844, coal traffic fell to 122,836 tons but this decline can be explained by the closure of the Oakham Canal that year by drought, by the fact that the carrying capacity of the Cromford Canal fell when two thirds of the water supplied by the Cromford Sough was lost and by the strike of that year which shut down almost all the pits along the canal. From 1847 to 1850, coal shipments along this section of the Cromford Canal climbed slowly back to 155,977 tons.

These quantities were, however, only maintained

by making heavy cuts in canal dues, made reluctantly under pressure from the coalmasters and generally too late to be effective. In 1840, the year in which the North Midland Railway was opened, the coalmasters asked for a reduction on the tolls levied on coal carried to Leicester. In the following year, they requested that dues on coal forwarded to London should be lowered. In both cases, these demands were refused. In May 1842, however, all the navigations - the Cromford, Erewash, Soar and Grand Union - along which coal passed into the South Midlands, lowered their dues. In 1843, the coalmasters applied for a reduction in the toll on coke carried to Leicestershire to enable it to compete with coke brought in by the Leicester and Swannington Railway. This request also was refused. In the following January, a meeting of the Boards of all the waterways was held to discuss the whole question of dues/^{on coal} carried from the Erewash valley into the Midlands, as a result of which these were again reduced. In all, during the decade 1836-46, tolls on coal from Langley Mill to London had been lowered by as much as 75% in the effort to keep coal mined in the Erewash valley competitive with railborne coal in the Midlands. ^I The only other decrease in dues carried out before 1850 was the introduction in 1847, in conjunction with the Nottingham Canal, of a drawback on the toll carried to Lincoln, in the attempt to meet competition from coal transported into the Trent valley on the railway linking Nottingham and Lincoln, opened in the previous year.

South Yorkshire remained almost wholly dependent upon water transport for the carriage of coal throughout this decade. Mineral traffic on the Sheffield and Rotherham Railway was small.

I. Sir. F.B. Head, Chairman of the Grand Junction Canal in evidence before S.C. on Railways and Canals Amalgamations. 1846, XIII. Q.334.

Coal traffic on the section of the Midland Railway between Masborough and Leeds only amounted to some 10% of the mineral traffic on the whole line.¹ It is unfortunate that statistical evidence as to the volume of coal traffic on the South Yorkshire waterways during this decade is minute. In 1841, when the Doncaster and North Midland Railway was projected, its prospectus asserted that coal and lime carried on the Don Navigation amounted to 544,000 tons. During the Railway Mania, it was declared that 800,000 and 1,000,000 tons of Silkstone coal was sold annually in the East and West Ridings between 1840 and 1843.² In 1848, 55,595 tons of coal passed along the Dearne and Dove Canal into the Don Navigation.³ One thing, however, is certain. Coal traffic on the South Yorkshire navigations was declining in the middle 'forties as a result of railway development linking York with the Durham coalfield. As Robert Stephenson pointed out, the Great North of England Railway with its easy gradients could offer especially low freights between Newcastle and York. In 1845, coal was being carried at a farthing per ton mile from Durham southwards. As a result, South Yorkshire coal was beaten out of markets which it had long monopolised along the River Ouse and the Derwent Navigation. In May 1845, Biram, mineral agent to Earl Fitzwilliam, reported that 2000 to 3000 tons of Durham coal was entering York station each month. South of York, coal carried on the Leeds and Selby line at three farthings a ton mile, was

1. John West, Mineral Manager of the Midland Railway, in evidence before S.C. on the Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole Railway Bill. 1846.
2. George Chambers, colliery owner, in evidence before S.C. on the Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole Railway Bill. 1846.
3. Letter dated 11 March 1848. Letters from Benjamin Biram. G.40. Correspondence of Charles Wentworth Fitzwilliam. 3rd (and 5th) Earl Fitzwilliam, Wentworth Woodhouse MSS. Sheffield City Library.

competing with the best South Yorkshire coal on the north bank of the Humber. Production at the pits along the Dearne and Dove and the Barnsley Canals dropped sharply as a result of this competition. Output at Elsecar Colliery in the winter of 1845 was only half of what it had been in the previous winter. At Stainborough, the mine owned by Field, Cooper and Fauld was on short time in 1846. Newton, Chambers and Company had not found it worth while, as a result of the decline in canal sales, to develop the coal drained by their new sough near Thorncliffe. The quantity of coal transported on the Silkstone tramway to the Barnsley Canal declined from 102,000 tons in 1840 to 54,736 tons in 1849.¹ Production at Clarke's Silkstone Colliery dropped by 37% between 1841 and 1846.² J.D. Charlesworth, partner in one of the largest colliery concerns in the West Riding, asserted in 1846 that production of Silkstone coal at their pits had declined heavily as "The North Country Coals beat us out."³ To meet this competition, the Don Navigation reduced its dues on coal to a half penny per ton mile in 1846. Three years later, when negotiations for its amalgamation with the South Yorkshire, Doncaster and Goole Railway were almost complete, its Board made a contract with Darley Main Colliery whereby the Navigation was to buy 80,000 tons of coal annually, which it was hoped to sell in the Humber basin, undercutting Durham coal by as much as a shilling a ton. Probably, this step was effective as three years later, the South Yorkshire and Durham coalowners were working

1. Correspondence of John Spencer Stanhope. VIII. (I). Canals. Cannon Hall Mss. Sheffield City Library.
2. James Watson Brown, agent of the Noblethorpe estate, in evidence before S.C. on the Sheffield, Ashton-under-Lyme and Manchester Railway (Barnsley Branch) Bill. 1846.
3. In evidence before S.C. on the Sheffield, Ashton-under-Lyme and Manchester Railway (Barnsley Branch) Bill. 1846.

harmoniously together to keep prices as high as possible in the district which had previously been their battle ground.^I

The North Midland Railway, between Stretton and Whittington, cuts across the basset of the Blackshale rake, the richest of the Derbyshire ironstone seams, which, at Hady on the hillside above Chesterfield station, ran to about 3,500 tons per acre. Underneath it was a thin seam of inferior coal, used to calcine the ironstone before it was charged into the furnace. Along the same line, there were plentiful supplies of excellent coking coal around Chesterfield and of limestone at Crich with which to smelt the ore. With low assembly costs of raw materials and with the market for iron rapidly expanding during the Early Railway Age it was natural that new ironworks should be established by the side of this railway during the 'forties. In 1844, Yates and Carrington, partners in the Effingham Works at Rotherham, built blast furnaces on the Humloke estate at Wingerworth to supply their foundries, producing grates and stoves, with pig iron. In the following year, another Rotherham firm, Scholefield and Company of Park Gate Works, erected a furnace at Newbold, about two miles from the Midland line, to help supply their works, then busy on railway contracts, with pig iron. In the same year, George Stephenson and Company built an ironworks by the side of their mines to supply railway equipment. Its two furnaces were 48 feet high, 12 feet wide at the boshes, with an internal capacity of 4,400 cubic feet, each designed to make 100 tons of pig iron weekly. These furnaces were blown by direct-action, non-condensing engines at a pressure of $2\frac{1}{2}$ pounds per square inch and

I. Memorandum dated 17 January 1853. Letters from Benjamin Biram. G.40. Correspondence of Charles Wentworth Fitzwilliam. 3rd (and 5th) Earl Fitzwilliam. Wentworth Woodhouse Mss. Sheffield City Library.

were heated by hot air stoves to a temperature of between 450^o and 500^o F.^I The whole of this plant and its associated ironstone workings were valued at £25,500 in 1847. Unfortunately for its owners, it only came into production when the tide of railway construction was ebbing and when the price of pig iron was falling to unprecedentedly low levels.

Staveley, the oldest ironworks in North Derbyshire, was given a new lease of life by the construction of the North Midland Railway, which not only linked it with the rich ironstone deposits at Hady but also gave it access to new markets. In 1840, these works came into the hands of Richard Barrow, who had begun his business life as a merchant trading with Spain and Portugal and later amassed a fortune in the China trade. By character, if his obituary can be trusted, Barrow was the typical Victorian capitalist "pre-eminently a great worker, a man who was never idle, but even in his relaxation was at work"; always planning new projects and seeking new markets for the products of Staveley. In 1843, he made a new lease with the Duke of Devonshire, taking over the minerals under the Manor of Staveley and contracting to expend £20,000 before January 1848 on extensions to the ironworks and collieries. In fact, this sum was spent on expanding the ironworks alone, which by the end of this period comprised in addition to the hot blast furnaces, cupolas, blacking mills and moulding shops for the production of pipes and saw mills, carpenters shops, smiths shops and fitting and erecting shops for railway waggons.

Another ironworks was built in 1848 at Unstone by Walter Rangeley, a local coalmaster. The blowing in of a new

I. William Howe, "The Original Construction and Subsequent Alterations to Clay Cross Blast Furnaces." Trans. Chesterfield and Derbyshire Institute of Engineers." Vol.I. Pp. 284-92.

blast furnace at the trough of a depression is a strange phenomenon, especially when it is considered that it was situated some four miles from a railway. However, in this case it may be explained by the fact that this coalmaster had built up a coke trade with the London and North Western Railway Company averaging about 150 tons a week, the contract for which had been cancelled, leaving him with pits and coke ovens unemployed. Possibly, it seemed to Rangleley that the easiest solution to his problem was to build a furnace to smelt the local ironstone with his own coke. In 1850, he further extended his works after buying the foundry patterns and hiring new hands from Milton Ironworks in South Yorkshire, which had closed down, to produce pipes and millwork. At this time, Rangleley had a labour force of 250 men employed at these works and at his collieries in Unstone.

The South Yorkshire iron industry underwent no such comparable expansion during this decade. On the contrary, many of these works suffered such heavy financial losses during the many years of bad trade during the 'forties that their owners either went bankrupt or so dispirited with the turn of events that they sold out to Welsh or Black Country firms, which by 1850 practically dominated the South Yorkshire iron industry.

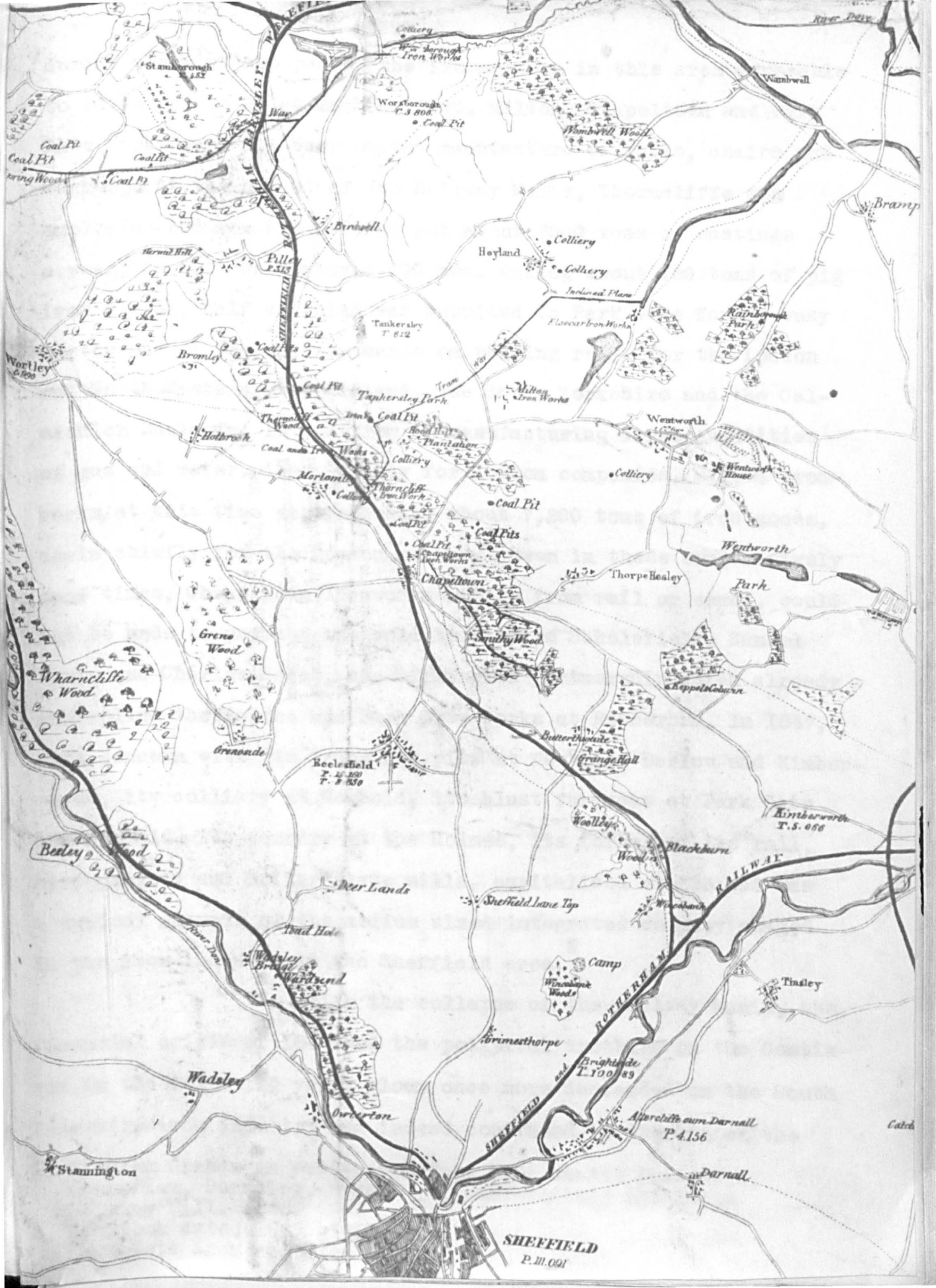
The first three years of this decade were years of exceptionally bad trade for the iron industry throughout the country, marked by falling production, low prices and intense competition. In November 1841, the South Yorkshire ironmasters decided to cut back pig production by 25%. During this year, William Swann of Chapeltown Works became bankrupt, the plant being taken over by John Oxley, a Rotherham steel manufacturer and Francis Wright Everett, who held a mortgage on the works.

I. Sheffield and Rotherham Independent. 5 August 1848, 16 March 1850.

The plant was then sublet to David Nisbett of Sheffield. The situation further deteriorated during the next year. John Chambers^I was bemoaning the state of the Thorncliffe order book; Welsh pig iron had practically driven the Elsecar product from the market; Milton had one furnace blown out and six puddling furnaces shut down and the firm was only kept solvent by a loan of £27,000 from Earl Fitzwilliam and another loan of £17,000 for which he stood security. Sayle and Booth only kept their heads above water at Tinsley Park by another loan of £17,792 from the Earl. Altogether, the fall in the price of pig iron involved the various works on the Fitzwilliam estate in losses on their stock amounting to £43,750. The depression in the iron trade continued throughout the greater part of 1843. The worst casualty of this year in the South Yorkshire iron industry was the firm of Sayle and Booth which went bankrupt after the failure of Parker, Shore and Company, the Sheffield banking concern. Apparently, the ironmasters had been insolvent for the last decade, having borrowed from that bank some £32,556 on which they had never paid interest, as their bankers realised that any attempt to exact this could only result in their failure. Altogether, it was reckoned that the creditors would be lucky to get 2/6 in the pound.² Eventually, their works were bought by a South Wales² firm, The Brymbo Mining and Engineering Company.

The situation began to mend in the autumn of that year. The Yorkshire and Derbyshire ironmasters met in October and for first time for three years were able to increase the price of pig iron. Subsequently, with the boom in railway construction

- I. Letter dated 16 July 1842. Chambers Letters I836-46. Box 5. Newton Chambers MSS. Thorncliffe. Yorkshire.
2. Sheffield and Rotherham Independent. 21 January 1843; 15 April 1843 and 3 February 1844.



Stamborough
P. 152

Colliery
Wainborough
Iron Works

Worborough
C. 3 806
Coal Pit

Wambwell

Coal Pit
Spring Wood
Coal Pit

Wambwell Wood

Bramp

Brimhall

Hoyland
Colliery
Colliery

Thornhill
Pillay
P. 315

Tankersley
T. 812

Inclosed Plains
Flaxcar Iron Works

Rainborough
Park

Worley
C. 1899

Bromley

Tapshereley Park
Coal Pit

Village
Iron Works

Wentworth

Holbrook
Coal and Iron Works
Colliery

Wentworth
House

Marlombury
Colliery

Colliery

Coal Pits
Coal Pits

Wentworth
Park

Wharncille
Wood

Greens
Wood

Smiddy Wood

Thorpe Healey

Wentworth
Park

Gronode

Beelsfield
T. 4. 180
T. 8 180

Butterthorpe
Grange Hall

Happels Colburn

Kimbarworth
T. 5. 066

Beeley Wood

Deer Lands

Sheffield Lane Top

Woolley
Wood

Blackburn
RAILWAY

Isad Hole

Wadsley
Bridle
Woodland

Camp
Wincobank
Wood

Tinsley

Wadsley

Owerton

Arimesthorpe

Brightside
T. 100 189

Alfreds cum Darnall
P. 4. 156

Catch

Stannington

Darnall

SHEFFIELD
P. III. 091

during the next two years, the ironmasters in this area were able to raise prices by as much as 300%. Milton, Chapeltown and Park Gate Works were all busy on the manufacture of rails, chairs and waggons. At the height of the Railway Mania, Thorncliffe was employing 600 men and turning out about 7000 tons of castings a year; Chapeltown employed 500 men, making about 120 tons of pig iron a week, half of which was supplied to Park Gate Works, busy at the end of the Railway Mania on rolling rails for the London and North Western, the Midland, the South Yorkshire and the Caledonian Railways, in addition to manufacturing large quantities of gas and water pipes, mainly for London companies. Milton Ironworks at this time was producing about 7,200 tons of iron goods, again chiefly for the London market.^I Even in these comparatively good times, Chapeltown Ironworks remote from rail or canal, could not be made to pay and was sold to William Scholefield, Samuel Beale and Charles Geach, the Birmingham partnership which already controlled the Holmes and Park Gate Works at Rotherham. In 1847, this concern with its ironstone pits at Newbold, Barlow and Kimberworth, its colliery at Newbold, its blast furnaces at Park Gate and Newbold, its foundry at the Holmes, its forge and its rail, merchant bar and boiler plate mills, capitalised at £33,856 was a typical example of the medium sized integrated company engaged in the iron industry in the Sheffield area.²

With the collapse of the Railway Mania, the financial crisis of 1847 and the political troubles on the Continent in the following year, gloom once more descended on the South Yorkshire iron industry and indeed continued to the end of the

1. William Graham in evidence before S.C. on the Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole Railway Bill. 1846.
2. Notebook dated 1847 giving Ledger Balances, prices etc. Park Gate Iron and Steel Company. Rotherham.

decade. The effects of the recession in this industry may be seen in the freight statistics of the private railway linking Thorncliffe, Milton, Elsecar and the Dearne and Dove Canal. On the Elsecar and Milton branch, traffic fell from 24,375 tons in 1844 to 22,934 tons in 1847; to 16,978 tons in the following year and to 2,308 tons in 1849. Milton Ironworks was probably closed down during the last two years of the period and were at the end of the decade leased with Elsecar and the ironstone reserves on the Fitzwilliam property to a Black Country ironmaster, W.H. Dawes. Thus, by 1850 all the South Yorkshire ironworks, with the single exception of Thorncliffe, were under the control of companies emanating from outside the region.

Despite the vicissitudes of fortune encountered by the iron industry in the area in the 'forties, it was always the most important customer for local coal. Even in a poor year for trade, Milton Ironworks used 40,143 tons of coal in 1842. The furnaces at Wingerworth in another year of falling trade consumed 22,187 tons of coal in 1848. In that year, the total pig production of the region was about 100,000 tons and as a hot blast furnace used from three to four tons of coal to make a ton of pig, it may be estimated that the blast furnaces alone in South Yorkshire and North Derbyshire consumed between 300,000 and 400,000 tons of coal in that year.

During the 'forties, industry in Sheffield was particularly affected by the working of the trade cycle. The first three years of the decade were a period of exceedingly bad trade. From 1840 to 1843, the Sheffield newspapers were full of the commercial distress of the times. During 1840, both the file

I. Elsecar and Thorncliffe Railway. 1845-9. G.97. Correspondence of Charles Wentworth Fitzwilliam. 3rd (and 5th) Earl Fitzwilliam. Wentworth Woodhouse MSS. Sheffield City Library.

and cutlery trades were badly depressed. In 1841, the town was badly hit by the competition of European industry in Continental markets and by the growth of American industry behind a tariff wall.¹ The following year was even worse. Half the crucible steel furnaces were shut down and by August there were 3,000 men out of work and 17,000 on short time in the town. The year closed without the gloom lifting as it was expected that there would be little sale for hardware in the United States during the next year as the merchant houses there were heavily stocked with British goods imported before the imposition of a new series of customs duties. The first half of 1843 was every whit as bad with heavy poor rates, little revival in the American market and the whole business structure of the area shaken by the failure of Parker, Shore and Company. In the second half of the year, business activity began to revive and during the next two years trade continued to be good in Sheffield. This trade revival led to railway promotion and to the collection of statistical information on coal consumption in the town, to buttress the argument for railways connecting Sheffield with collieries around Barnsley and Chesterfield. When the Sheffield to Chesterfield line was mooted in 1845, its promoters asserted that coal consumption in the town was in the region of 725,000 tons.² The chief consumers of coal, according to the supporters of this railway, were 134 steam engines which used 92,600 tons; the grinding wheels which consumed 72,600 tons of coke; 81 melting furnaces which used another 70,700 tons of coke and 83 converting furnaces which used

1. William Vickers, merchant and steel manufacturer, in evidence before S.C. on the Laws affecting the Export of Machinery. 1841. VII. (265). Q. 4210.
2. Correspondence and Papers of Thomas Dunn. Sheffield and Chesterfield Railway Bill. Minutes of Evidence. M.D. 2197/30. Sheffield City Library.

25,685 tons of coal. Their chief opponents in this scheme were the partners in the Sheffield Coal Company who, naturally, wished to prove that it was well within the capacity of their collieries to supply the needs of Sheffield industry. They, indeed, asserted that coal consumption in the town was about a half of what the supporters of this particular railway project represented -some 373,000 tons. This company declared that 25,000 houses took 150,000 tons of coal; converting furnaces 25,000 tons; melting furnaces 120,000 tons; steam engines 40,000 tons and rolling mills and forges 10,000 tons. In the following year, a similiar argument took place when the Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole Railway was promoted to bring coal into Sheffield from around Barnsley. Its supporters, alleging once more that the Sheffield Coal Company was unable to supply the demands of industry in the town, declared that coal consumption in Sheffield had risen to 802,000 tons.^I They asserted that there were 179 steam engines in the town, totalling 3,061 H.P., which consumed 80,000 tons of coal; 105 converting furnaces, making 3,276 tons of steel, which required ten times as much coal; 98 steel melting furnaces using 188,000 tons; iron foundries needing 4,274 tons of coke; 26,029 houses, each using 13 tons of coal a year and an industrial demand for soft coke of 26,000 tons. Some of the Sheffield works consumed as much coal as did a town the size of Doncaster. Jessop and Son, which claimed to be the biggest steel making concern in the world, employing 200 men and converting 2000 tons of iron annually, used 30,000 tons of coal a year. Andrew Vickers and Company, another firm making steel and employing some 400 men, some making files, used 20,000

I. Statistics of Trade, Manufactories and Inhabited Houses of Sheffield. 1846.

tons of coal a year. The Sheffield Coal Company, on its side, asserted that coal consumption in the town had never reached 450,000 tons a year. Thomas Dunn Junior, in support of this contention, set converting furnace consumption at 25,000 tons; steel smelting at 60,000 tons; steam engine consumption at 50,000 tons; domestic consumption at 175,000 tons; rolling mills and forges at 10,000 tons; gas works at the same quantity and smiths' soft coke at 12,000 tons. T.D. Jeffcock, a brother of one of the Directors of the Sheffield Coal Company, put coal consumption in the town at an even lower level - 400,000 tons in that year.^I It is likely that the estimates of the promoters of this railway exaggerated, as they had every reason to do, the amount of coal used in the town. The fact that the first official statistics of coal consumption in Sheffield show that 600,000 tons were used in 1854 seems to indicate that consumption in the middle 'forties was more in consonance with the figures propounded by the Coal Company than with those alleged by the promoters of these two railways.²

Other industries consuming coal continued to expand during this decade. Production of fire bricks increased^a, particularly at Stannington, to meet the needs of the iron and steel industries. The demand for ordinary brick was maintained at a high level with the rapid growth of Sheffield, with the expansion of Masborough and Rotherham after the opening of the North Midland Railway and with the growth of new mining communities such as Clay Cross with its 600 houses and the church, chapels and schools necessary for a population of 3000. The demand for steam coal was increased by the building of five large weaving factories in Barnsley during

- I. In evidence before S.C. on the Sheffield, Ashton-under-Lyme and Manchester (Barnsley Branch) Railway Bill, 1846.
2. Geological Survey. Mineral Statistics, 1854, P.61.

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this decade.

Lime burning continued to provide a considerable market for coal during the 'forties. Although/^{enclosure} had virtually come to an end, "high farming" demanded the use of lime to keep the land in good heart. The Yorkshire and North Derbyshire Agricultural Societies by their meetings and shows attempted to drive home the methods of good farming to the landlords of Hallamshire and Scarsdale. Farmers' clubs at Bolsover, Norton, Wingerworth, Roche Abbey, Ecclesfield and Whiston endeavoured to improve the standard of agriculture in those parishes. Big industrial concerns such as Newton, Chambers and Company at Thorncliffe and George Stephenson and Company at Clay Cross set an example of the best agricultural technique to farmers around their works.

The best cultivated area in the region was the magnesian limestone ridge running northward from Hardwick Hall to the Aire and Calder. With its well drained and easily cultivated soil, this was a mixed farming country, relying on bone manure, rape dust and the manure from the sheep folded on its turnip fields, rather than on lime to maintain the fertility of its soil.² The area immediately to the west, on the Coal Measures, where the soil was a retentive clay, was a much larger user of lime. The greater part of this supply for the farms of the North Derbyshire Coalfield was carted along the Hernstone Lane Head Turnpike from the kilns at Stony Middleton and Calver. In 1847, these were reputed to produce 10,000 tons of lime annually.³ In South York-

1. Thomas Lister. "A Sketch of Barnsley. Its Mineral and Manufacturing Products." Trans. West Riding Geological and Polytechnical Society. Vol. 3. Pp. 580-90.
2. Rev. Wm Thorpe. "On the Agriculture of the West Riding considered geologically." Trans. West Riding Geological and Polytechnical Society. Vol. I. Pp. 91-138.
3. Robert Higginbotham in evidence before S.C. on the Manchester, Buxton and Midland Junction Railway Bill. 1847.

shire, quarries at Warmsworth on the Don sent 36,740 tons of lime up river to Rotherham and Sheffield in 1845 in addition to 21,000 tons up river to Thorne, Goole and Hull. To the west of the Coal Measures lie the Millstone Grit formations, large areas of which had been enclosed from the moors twenty or thirty years earlier. William Bingley, a surveyor who had taken part in many of these enclosures, estimated in 1846 that there were 23,000 acres of old enclosures in the Penistone district alone which required the application of from two to three tons of lime per acre every six years. He asserted that some 15,000 to 18,000 tons of Knott-ingley lime were burned at Cawthorne, Barnby and Wosborough annually for use in these parishes and others on the edge of the moors. ^I Far more important than any of these limeworks along the navigations was that at Ambergate by the side of the North Midland Railway, established by George Stephenson and Company at a cost of £17,250 which by 1845 was producing 40,000 tons of lime a year, much of it sold as far south as Warwickshire. On a conservative estimate, some 65,000 tons of coal were consumed annually during this period in burning lime.

The tariff reduction on imported lead made by Peel in his 1842 Budget seemed to many to spell ruin to that industry in the Peak of Derbyshire. ² Despite this handicap, the middle years of the decade saw determined attempts to win ore at depths never previously attempted. The Magpie Mine on the moors near Sheldon was reopened in 1843/4, when some 845 tons of ore were mined. The pumping engine, however, proved capable of only draining the workings in dry weather and disputes between the

1. In evidence before S.C. on the Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole Railway Bill. 1846.
2. Letter dated 4 April 1842. Estate Correspondence of Rev. Wm. Bagshawe. B.10/2/947. Bagshawe MSS. John Rylands Library. Manchester.

partners as to the advisability of installing a 70 inch pumping engine or driving a sough to the River Wye led to the closing of the mine in 1846.¹ Watergrove Mine in Eyam, situated on the Hernstone Lane Head Turnpike, was reopened by George and Henry Greaves of Sheffield with a steam engine for pumping the old waterlogged workings. Much more powerful pumps were installed five years later and in 1847 Morewood Sough was purchased and a new branch sough excavated from it to an old engine shaft at Cliffe Stile to clear the veins. These steps enabled a large amount of ore to be won but the heavy financial losses sustained led to the mine being shut down in 1850.² The most important mining developments in the Peak during the 'forties were, however, at Alport. In 1841, Hill Carr Sough was cleaned out to drain the water from the numerous veins intersecting it; an hydraulic engine was installed in the Guy Vein shaft and iron pipes were placed in position from the River Lathkill through Alport to provide the necessary water power for another hydraulic engine to lift water from workings 21 fathoms below the Hill Carr Sough. These measures enabled 1487 tons of ore to be mined 1842/3. In 1844, the Stanton branch of the sough was cleared and another hydraulic engine installed to clear the water from a long run of good ore ground. During that and the following year 1812 tons of ore were extracted. In 1847, however, production fell as the veins decreased in ore content, water to work the hydraulic engines was short as a result of an inability to secure an adequate supply from the river and simultaneously water increased in the mines to a flow of from 2000 to 6000 gallons a minute, an amount

1. Magpie Mines. Miscellaneous Correspondence and Printed Reports. No. 587/20. Bagshawe Collection. Sheffield City Library.
2. Watergrove Minute Book 1836-51 and Watergrove Reckoning Book 1842-50. Nos. 518 and 526. Bagshawe Collection. Sheffield City Library.

which was believed to be " the largest upon record in the whole history of mining operations." Equally important was the fact that the market for lead broke during the depression of that year, causing its price to decline seriously. The political troubles on the Continent in 1848 forced large quantities of Spanish lead, which would otherwise have found a market in Europe, on to the English market. As a result, the price of ore fell below £9 a ton, the minimum at which the Alport mines could be profitably worked, with the result that their output fell to 664 tons in 1849.^I

The events at these mines are reflected in the amounts of lead smelted in Derbyshire. Lead production declined from a maximum of 6,000 tons in 1845 to 5,300 in the following year, to 4,250 in 1847 and reached its bottom at 3,370 in 1848.² It then began to climb slowly to 4,420 in 1849 and at the end of the decade stood at 5,149 tons. Although the demand for coal at the lead smelting cupolas was small - it took a ton of coal to smelt a ton of ore - that in most other markets for coal in the Peak was conditioned by the prosperity of lead mining. It is, therefore, safe to assume that the demand for coal in this area during the first decade of the Early Railway Age was higher than it had been during the last decade of the Canal Age. The only set of statistics available, those for coal traffic on the Bull Bridge arm of the Cromford Canal, certainly support this assumption as they show the quantity of coal transported along this branch to have been about 10,000 tons a year higher in the 'forties than in the previous decade.

1. Alport Mine Reports 1841-9. Wyatt Lead Mining Papers. No. 587/I. Bagshawe Collection. Sheffield City Library.
2. Memoirs of the Geological Survey. Vol. 2. Pt. 2. (1848).

In conclusion, the trends of coal consumption as they affected the collieries of North Derbyshire and South Yorkshire during the 'forties are clear. The mines of the first named area won a greater share of the Midland market than they had enjoyed hitherto and for the first time penetrated the London market with any degree of success. To offset this, the pits along the Barnsley and the Dearne and Dove Canals lost much of their market in the Yorkshire Plain and in the East Riding to the North Eastern Coal-Field. Coal consumption within the district itself increased with its progressive industrialisation, but varied greatly from year to year as trade within it fluctuated with the expansion and contraction of the national economy.

I
THE COALMASTERS OF THE EARLY RAILWAY AGE.

In a sense, it was only fitting that the creator of the Early Railway Age, George Stephenson, should have been the most important coalmaster in South Yorkshire and North Derbyshire during this period. His partners in the Clay Cross colliery included men of distinction in the railway world. Apart from his son, Robert they included "the Railway King"; George Hudson; George Carr Glyn^a, banker and director of the North Midland Railway; Mortimer Peto, the great railway contractor; Sir Joshua Walmsley, a Leicester corn dealer and coal merchant and Joseph Sanders, a Liverpool engineer, each of whom invested £15,000 in the business. In addition, the concern borrowed £10,000 from Carr Glyn^a and Company in 1841 and eight years later Peto supplied it with 100 coal waggons on credit at 3½%. Later when additional capital was required, Sir William Jackson who had acquired one fortune in the Africa trade out of Liverpool and another by land speculation

I. The coal royalty accounts for the Barlborough Hall, Cannon Hall and Portland estates covering this period are not, at the time of writing, available.

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in Birkenhead, was brought into the firm. In 1841, George Stephenson and Company leased 153 acres of coal under the Tupton Hall estate, contracting to mine a minimum of five acres annually. In the same year, it leased 174 acres of coal under the enclosures at Stretton Common, undertaking to mine a minimum of two acres a year. In 1843, further leases were made of 109 acres of coal under property owned by J. Lord Clay with the obligation to mine two acres annually and of 82 acres under the Hunloke estate at Woodthorpe, Clay Lane and Tupton for 38 years. In 1845, another 111 acres of coal were leased from Thomas Wilson at Coney Grey for 75 years. In general, all this coal was leased at £100 per acre. In addition, the coal under the intervening freeholds was bought at the same figure, way leaves were acquired to enable these areas of coal to be mined and transported to the shafts. Capital investment at these pits was on an exceptionally heavy scale. By 1842, £79,000 had been expended, the largest individual item of expenditure being £33,600 spent on the purchase of railway waggons. Four years later, the collieries themselves were valued at £63,466 and in June 1849 at £160,000. Sales of coal, apart from coal and coke used in ancillary undertakings, rose from £39,000 in 1844 to £64,000 in 1849.²

The Wingerworth Coal Company leased a large area of coal under the Hunloke estate on both sides the North Midland line in 1839. The original partners in the concern were John Chambers of Tibshelf and John Coke of Debdale Hall,

1. Life of Sir William Jackson Baronet. Reprinted from the Liverpool Mercury. (1876).
2. George Stephenson and Co. Account Book No.1; Minute Book No.2; Freehold and Leasehold Property belonging to George Stephenson and Co. 1849 in the possession of the present Clay Cross Company. I am informed by the Secretary that all other MSS were sent to salvage during the Second World War.

Mansfield both of whom were members of families with a long connection with coal mining in Derbyshire. Although by 1842, each partner had invested £8,660, this proved insufficient to finance the colliery development planned and new partners were brought in. These new shareholders were H. Cox, a Derby lead merchant and paint manufacturer; Joseph Machon, mineral agent to the Coke family of Brookhill Hall, Pinxton; T.B. Horsfall, a Liverpool merchant and A.C. Inman, brother to William, head of the Inman shipping line. As in the case of George Stephenson and Company, the Wingerworth Coal Company was partly financed by bank loans. Robinson and Broadhurst, a Chesterfield bank loaned them £4,000 and another £6,566 was borrowed from the Derby and Derbyshire Banking Company.

In 1839, the original partnership commenced operations by taking over a colliery already in production on the Hunloke estate. Before this was sold in 1852 to the newly formed Clay Cross Company, it had an annual output of about 16,000 tons. By the terms of their lease, the Company was to sink another pit two months after it had been signed and to commence work on another once coal had been proved. The first pit, sunk at Wingerworth, was comparatively small, with an output of about 12,000 tons a year. The second pit at Wingerworth which came into production in 1844 was much larger, its annual output from 1848 to 1851 being over 40,000 tons. The Company also sank another colliery at Lings to mine the Top Hard Bed at a depth of 150 yards. Lings came into production in 1845 and by 1850 was producing about 40,000 tons of coal a year. By this time, the Wingerworth Coal Company were producing about 100,000 tons of coal in the year.

The concern followed as consistent a policy

of ploughing back its profits as did George Stephenson and Company. By 1846, the partnership had spent on capital account £37,941. As at Clay Cross, the largest item of expenditure was formed by railway waggons, on which £16,000 was spent. Engines, pumps and gearing took another £7,239 and pit sinking cost £5,079. From 1839 to 1846, a profit of £2,500 was made, all of which was reinvested in new plant. During the next four years, the collieries earned annually about 5% on the capital invested but this too was ploughed back into further sinkings.^I

Of somewhat less importance were developments at Staveley. Here, when the North Midland Railway was projected in 1837, George H. Barrow planned a large expansion in coal production to take advantage of the new markets that line offered to the south. He decided to sink a new pit 190 yards deep on the south eastern boundary of the Devonshire estate to mine the Shuttlewood, Two Feet and Yard coals, with a daily output of from 400 to 500 tons.² In 1840, after Richard Barrow had taken over the minerals under this property, a new lease was drawn up whereby Barrow leased the coal for 42 years, paying a royalty of sixpence a ton on the Hard and three pence on the Soft Coal. By 1849, his ironworks were surrounded by a group of important collieries. On the south lay Speedwell, supposedly named after one of Barrow's ships, which produced 258,752 tons from January 1845 to December 1849. Handley Wood, an older pit, situated to the north of the works, had an output of 209,512 tons between 1843 and 1848. Hollingwood Colliery, sited in the ironworks, produced 49,215 tons from 1845 to 1849. At the end of the period,

- I. Minute and Account Books. Wingerworth Coal Company. Chambers MSS. Williamthorpe, near Chesterfield.
2. Report Relative to Winning a New Colliery Plant on the Upper Hard Coal Bed in the Manor of Staveley. 1837. Hardwick Estate Office, Chesterfield.

Victoria Colliery was then in process of sinking to enable the deeper seams west of the ironworks to be mined. The last available output figures, for the first six months of 1849, show that production was then running at the rate of 120,000 tons annually.

Little information is available about the collieries in South Yorkshire sunk along the North Midland Railway. John and Joseph Charlesworth, who had important mining interests at Silkstone and Rothwell in the West Riding, leased three seams of coal under the Chapter of Southwell estate at Rawmarsh in 1835 for 21 years.² In 1851, this pit had an output of 32,566 tons of coal. Further north, Mickletwaite and Company began to sink the deepest of the South Yorkshire mines, Ardsley Oaks in 1841, bringing it into production in 1843. In 1847, when it had been leased to Frith, Barber and Company, the colliery was reputed to have a daily output of 300 tons of coal.

Once away from the North Midland line, the pattern of colliery development was very similar to that of the last decade of the Canal Age, which is not surprising when it is considered that almost all these pits were limited to canal communication and restricted to much the same markets as they had built up forty years earlier. In South Yorkshire, Earl Fitzwilliam remained, as during the previous decade, the most important producer of coal. In 1850, he had £100,000 invested in his pits at Elsecar, New Park Gate, Kents Main, Strafford Main and Rainborough Park. In 1847, this group of collieries produced 190,000 tons of coal. Second to the Earl as a coal producer was the Sheffield concern of Hounsfield, Wilson and Company. In 1841,

1. Report to the Duke of Devonshire on Staveley by his Mineral Agents, 1849. Hardwick Estate Office, Chesterfield.
2. Deed No. 3994. Chapter of Southwell MSS. Shire Hall, Nottingham.

this firm brought Soaphouse Colliery into production, drained by two 80 H.P. engines and equipped with two 40 H.P. winding engines, a mine claimed by Thomas Dunn to be the biggest in South Yorkshire. In 1847, this pit had an output of 80,000 tons. The partnership also mined another 40,000 tons at their Manor Colliery, where 180 men were employed.

Other large scale producers of coal in South Yorkshire were Darley Main Colliery, owned by J.G. Jarrett of Doncaster, where some 150 colliers were employed and at which 24 acres of the Barnsley Bed were mined on the Wentworth Castle estate between 1846 and 1850;^I Day and Twibbel, who at their Mount Osborne Colliery, outside Barnsley were reputed to produce 250 tons of coal daily in 1846; Field, Cooper and Company who had a daily output of 200 tons at each of their pits at Silkstone and Wosborough Park; John Woodhouse Day, who leased a colliery on the Vizzard property at Hoyland, raised 200 tons a day and Samuel Thorpe whose collieries at Gawber had a potential daily output of 680 tons a day.² Other important coalmasters in this area were Newton, Chambers and Company who raised 36,000 tons of coal at Thorncliffe in 1847; the Sorby family, who produced 30,000 tons at Orgreave in 1845; France and Company who raised much the same quantity of coal at Ballifield in that year and Huntsman and Company, who leased the Tinsley Park pits from Earl Fitzwilliam at a minimum rent of £750 a year after the bankruptcy of Sayle and Booth, who mined 85,000 tons there in 1845, a large proportion of which was the hard converting coal, essential to Sheffield

- I. Miscellaneous Measurements of Coal etc. No.226. Vernon Wentworth MSS. Sheffield City Library.
2. List of Collieries in the South Yorkshire District which will be served by the proposed railway. S.C. on The South Yorkshire, Doncaster and Goole Railway. Bill. 1847.

industry.

THE MINING LEASE.

By 1850, the standard mining lease with a few odd exceptions was based on the acreage of coal actually mined. Typical of the majority of leases, in certain of its clauses, was that between the Wingerworth Coal Company and Sir Henry J. Hunloke. This gave the Company in addition to the power to mine coal, authority to quarry stone for roads, to dig clay and make bricks and to build workshops, offices and houses, powers essential for exploiting the minerals in a district relatively thinly populated, where coal mining had hitherto been on a small scale. Usual, too, were clauses compelling the Company to fill up shafts, to restore the surface of the land for agricultural purposes and to leave a barrier of coal thirty yards thick on the estate boundary to prevent the ingress of water from other pits. Its length of 42 years was a customary one for coal leases signed during the Early Railway Age in this district, a lengthening as compared with the Canal Age, brought about by the fact that a much larger amount of capital was involved in sinking the much more productive pits of this period. Usual, too, was the imposition of a minimum rent, in this case, of £600 for the first twelve years and of £1000 for the remainder of the lease.

Almost unique, however, was the method of calculating the royalty, which was based both on the thickness of the seam and the current selling price of coal. For example, the royalty on the Blackshale Seam was to be £18.15.0 per foot acre when it was sold at 7/- a ton at the pit head. Each increase in price was accompanied by an increase in the royalty until it stood at £37.10.0 per foot acre when the pit head price was 8/4

a ton. This type of lease, however, was regarded by coalmasters as too complicated to work and seems to have had no counterpart either during the Early Railway Age or in later periods in the region.

MINING PRACTICE DURING THE EARLY RAILWAY AGE.

A royalty based on the acreage extracted and not on the tonnage of coal raised made it imperative to mine the maximum amount of coal from the seam. In addition, the greatly increased capital cost of collieries with more extensive underground workings and more costly winding and pumping engines rendered it necessary to extract the largest possible amount of coal from each seam to offset the greater overhead cost of mining. Again, it was most difficult to find a market for small coal and it was, therefore, essential to avoid techniques of mining which produced any quantity of this almost unsaleable material. Such considerations led to the abandonment, wherever possible, of all forms of pillar working, as such methods not only inevitably left a large amount of coal underground, but also led to the production of considerable quantities of small coal, as the pillars were crushed during the process of working them by the weight of the strata above them. In Derbyshire, longwall working by which all the coal in the seam was mined, became the standard method of extraction during the Early Railway Age, except in the gassy Blackshale Seam. In Yorkshire, narrow work was almost completely abandoned during the 'forties and longwall working or some modification of it introduced, according to the nature of the seam, roof or floor. This technique of winning coal, so simple to work and to ventilate and so cheap to operate, however, left

I. Alfred Barnes in evidence before S.C. on Mining Royalties. 1893. XLI. Q. 2134.

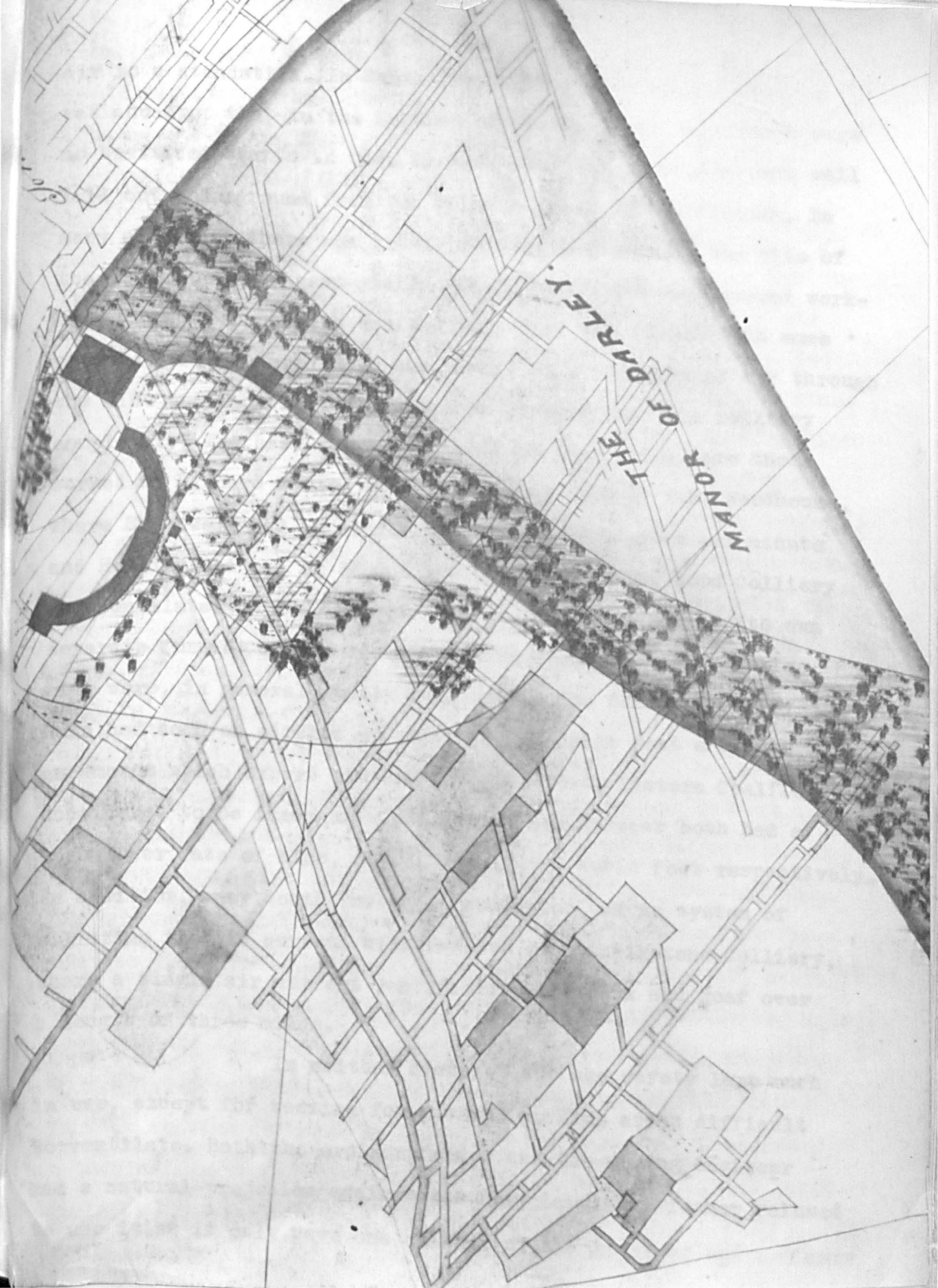
behind underground workings which, once the props were withdrawn, were allowed to fall in, except for the packed roads through them used as haulage ways. So long as these were sealed off and kept undiluted by air, the gas within them was, to use the words of Goodison, the viewer at Charlesworth's pits, "too damp to fire." ^I

The increased quantities of coal won daily in the bigger collieries placed a greater strain on the haulage system. All the new pits sunk during this period incorporated conductors in their shafts. Although the majority of pits clung to the flat hemp rope for winding, this decade saw the introduction of the wire rope into the district. Apparently, it was first introduced by George Stephenson and Company at Clay Cross and later adopted by Thomas Dunn at Sheffield and by Biram at Elsecar. ² George Stephenson and Company also pioneered the use of cages in this region.

Larger underground workings required much larger amounts of air to be circulated through the workings than had been customary in the past. In general, this fact was not recognised on this coalfield. In North Derbyshire, the majority of pits had no separate upcast and downcast shaft, but employed the winding and pumping shafts for the purpose of ventilation. Recognised by all mining engineers as a vicious practice, this method of ventilation necessitated the use of brattices in the shaft, always liable to perish and upset the flow of air. Dangerous enough in ordinary circumstances, this method was doubly dangerous in case of an accident blocking the shaft, so bringing the flow of

1. Rev. W. Thorpe. "On the Ventilation of Coal Mines." Trans. West Riding Geological and Polytechnical Society. Vol.2. Pp. 399-417.
2. Charles Morton. "On the use of wire ropes as a substitute for hempen rope on Railways and in Mining." Trans. West Riding Geological and Polytechnical Society. Vol. I. Pp. 390-408.

MANOR OF DARLEY.
THE



air to a standstill. In South Yorkshire, ventilation practice was ahead of that in the Hundred of Scarsdale in that there were no bratticed shafts in use. In Both counties, few pits were well laid out underground from the point of view of ventilation. In many collieries there was little correlation between the size of the upcast and downcast shafts and those of the underground workings. Much more serious was the fact that the furnaces in some pits was underpowered with the result that the flow of air through the mine was insufficient in amount to ventilate the colliery completely. The best ventilated pits in the region were those worked by Richard Barrow at Staveley, managed by T.B. Woodhouse, where Speedwell had an airflow of 40,000 cubic feet per minute and Hollingwood one of 35,000 cubic feet. Handley Wood Colliery was ventilated by a number of upcast shafts, each with its own separate furnace on the rise. The much larger South Yorkshire pits were, in general, badly ventilated. The Oaks and Darley Main had each an airflow of about 30,000 cubic feet a minute, an amount which expert viewers from the North Eastern Coalfield considered to be inadequate. Silkstone and Elsecar both had a much lower rate of flow, 18,931 and 10,708 cubic feet respectively. In addition, many South Yorkshire collieries had no system of splitting the air current with results as at Silkstone Colliery, where a single air current ventilated every bank and goaf over a length of three miles.

In neither district was the safety lamp much in use, except for testing for gas and working areas difficult to ventilate. Both the ordinary miner and the mining engineer had a natural prejudice against the Davy Lamp. The former refused to use it as it only gave one quarter of the light of the ordinary

candle and the latter took the view that every pit should be so well ventilated, both for the health of the men employed underground and to ensure a long length of life for the timbering, as to be capable of being worked with naked lights.^I

The coincidence of the use of candles, the dilution of labour by the introduction into the pits of men inexperienced in mining, the lack of an adequate supply of air together with the existence of "gobs" full of fire damp led to a potentially dangerous situation. Fortunately for the miner in North Derbyshire and in the Sheffield district, much of this fire damp was drained to the surface by the miles of workings excavated during the previous century. Such conditions, however, did not exist at two of the newer collieries working the Barnsley Bed, notorious for sudden and heavy outbursts of gas, with the result that 70 men were killed at the Oaks in March 1847 and another 75 colliers perished at Darley Main in January 1849. In both cases, explosions of unprecedented violence, compared by witnesses with an earthquake or with volcanic action, tore out the stoppings and at the Oaks, blew out the ground between the upcast and downcast shafts and choking the colliers with black damp, the aftermath of the explosion. Apart from the fact that the amount of ventilation at each pit was inadequate, the subsequent enquiries disclosed other failings. At the Oaks, a single current of air was coursed through the whole pit. At Darley Main, although the air current was split a number of times, the three miles it had to travel was too long a distance for the 10,000

I. This section is based on Report on the Gases and Explosions in Collieries. 1846. (529) XLIII; Report on the Gases and Explosions in Collieries by Sir H.T. de la Beche. 1847. (815) XVI; Report on the Ventilation of Mines by J. Kenyon Blackwell. 1850. (1214); Report on the Ventilation of Mines and Collieries by John Philips. 1850. (1222) XXIII and S.C. on Accidents in Coal Mines. 1852/3. XX.

cubic feet of air per minute, which was all that was passing through the workings at that time. Here, too, the workings were only capable of taking a half of the air passed down the down-cast shaft. This again was badly sited, being on higher ground than the upcast shaft. Although safety lamps were issued to the colliers at both pits, they either worked with candles or took off the tops of their lamps to obtain a better light. Both pits had extensive goafs, full of gas, not properly sealed off from the remainder of the workings. Both explosions were traced to gas coming into contact with naked lights, resulting in a loss of life unprecedented on this coalfield.^I

Fundamentally, the root cause of these disasters was a human one. The development of a single pit capable of turning 400 tons of coal a day had outstripped the capacity of all engaged in the industry in the region from top to bottom. J.T. Woodhouse, the most eminent mineral agent in the Midlands, asserted that on the whole the collieries in North Derbyshire and South Yorkshire were worked inefficiently from the standpoint of safety, setting this down to the fact that the managers were drawn from an inferior class of society, their subordinates defective in technical knowledge and the colliers undisciplined.² It is significant that when Ardsley Oaks came to be reconstructed after the explosion that Woodhouse, trained on the Leicestershire Coalfield, should be called in to supervise the installation of of new methods of ventilation, to push forward exploratory drifts

1. The events of these disasters and the subsequent enquiries are reported in the Sheffield and Rotherham Independent. 6, 13 and 20 March 1847 and 27 January, 3 and 10 February 1849. The official enquiries are printed in Reports on the Gases and Explosions in Collieries. 1847. XVI, Pp52-58 and Reports of Mr Seymour Tremenheere and Mr. W. Smyth on the Explosion at Darley Main Colliery. 1849. (1051). 101.
2. Second Report from the S.C. on Accidents in Coal Mines. 1854. XX. Q.1992.

to drain off the accumulations of gas and to introduce new standards of discipline amongst the colliers. It is equally significant that when George Stephenson and Company opened its Clay Cross pits, which had a splendid record both of production and safety during the Early Railway Age, the concern should choose Charles Binns, a colliery engineer from Newton-le-Willows in Lancashire, rather than a native of this district as manager. Obviously, the method of training colliery officials in this region by the premium apprentice system had failed to provide them in sufficient numbers to cope with the problems raised by the introduction of new techniques of mining during the Early Railway Age.

These disasters undoubtedly led to a change of attitude in the district to the question of the inspection of pits. In 1841, this had been opposed by the South Yorkshire coalmasters on the grounds that anything analagous to factory inspection would be " a violation of every Maxim of Civil and Commercial freedom." ^I Biram, one of the signatories of this protest, although he denounced inspection in 1849 as " a very pernicious interference with the working of collieries" was yet ready to accept the fact that there should be Government inspection of stoppings, ventilation and workings, provided that final responsibility was left in the hands of the colliery manager, a situation which was, in fact, very like that which emerged after the appointment of Inspectors of Mines.² William Newman, Earl Fitzwilliam's land agent, after the explosion at the Oaks

- I. Report of the Committee appointed at a Meeting of the Yorkshire Coal Owners to take into Consideration the Commission of Enquiry into the Employment of Children and Young Persons in Mines and Manufactures. 1841.
2. Instructions addressed to Coal Mines Inspectors. 1851.(464) XLIII, 401.

suggested that it was essential that men with a scientific and practical background should be appointed to inspect collieries.^I J.T. Woodhouse, too, agreed that inspection had become necessary, asserting that objection only came from the owners of small pits, whose mines were notoriously in the worst condition and who financially had the most to lose under any system of government inspection.

The historian of coal mining in South Yorkshire during the Early Railway Age is fortunate in having a description of one of the most important pits in this district, Sheffield Colliery, at the end of the Railway Age, from the pen of one of its leading mining engineers, Thomas Dunn Junior. At the bottom of the shaft was a horse way, five feet high, its roof supported by a foot of branch coal, to avoid the expence of arching or timbering. Running parallel to it and separated from it by a pillar of coal five yards thick was the main waterway, five feet high and three feet wide, two feet deep in water. During the process of driving the waterway, the coal was brought out into the horse gate by bolt holes, driven through the pillar at intervals of fifteen yards. When the coal had been extracted, the bolt holes were blocked by brick stoppings, which had to be regularly examined to prevent any leakage of air.

A centre post, eighteen yards thick separated the horse way from the main colliery workings. This was pierced at intervals by double board gates or double roads eight feet wide, entering board gates the same width, supported by pillars of coal twelve to fourteen yards thick. From these banks were driven, supported by a single or double row of pit props,

I. Letter dated 8 March 1847. Correspondence with William Newman. Earl Fitzwilliam's Solicitor. 1826 -57. No.49. Correspondence of the 3rd Earl. Wentworth Woodhouse MSS. Sheffield City Library.

according to the nature of the roof, a distance of sixty yards. Each pair of banks employed five colliers, two fillers and two boys, who were expected to turn sixty waggons of coal - about 200 tons - a week. The seam worked was six feet thick, with a dirt parting between the Top and Bottom Bright coals. This parting was holed by the collier on a face of from 15 to 30 yards, the Middle Coal falling with its own weight after being holed. The Upper Bright and the roof coal were then blown down with gunpowder. The collier then cleaned the gate while the filler wheeled the coal to the board gate, from where it was hauled along the horse way to the shaft bottom.

The colliery was ventilated by a furnace at the bottom of the shaft. It was part of the manager's duty to keep an eye on the barometer and in the event of any fall in pressure to inform the furnace man to increase the rate of firing, as any decrease in atmospheric pressure released fire damp from the Sheffield Seam and black damp from the Manor Bed. The main waterway acted also as the main airway, the air being coursed into the board gates through slits in the board gate posts. Driving these was the most dangerous operation in the pit as once the opening of the slit had been left " all the work in the Board Gate is out of the way of the air." Small amounts of gas in these gates were driven out by using the mens' jackets. Larger quantities were diluted by piping air straight to the face. Except when driving the board gates, where a safety lamp was used, the collier tested for gas with his candle, watching the top of the flame, the colour of which informed him of the presence of gas.

TRADE UNIONISM IN COAL MINING.

The Early Railway Age saw the first big struggle between Capital and Labour in coal mining in South Yorkshire and North Derbyshire. Trade Unionism had, however, been in existence at a much earlier date as there had been a strike at Thorpe's colliery in Barnsley in 1799 when " every man deserted by Combination."¹ The remainder of the wars against the French seem to have been free from labour trouble in coal mining. In 1825, a Coal Miners Union existed in Sheffield for " the purpose of Obtaining and Maintaining an equitable price for labour " by restricting employment in the industry to men who had worked down the pit since boyhood.² Probably it was this Union which had been responsible for a strike of miners at Darnall that year.³ There seems to have been no further labour trouble in the industry until June 1842 when the colliers at Travis and Horsfall's pit at Barnsley came out against a reduction in wages. In the following September, 80 men at the Clay Cross Blackshale pit went on strike but failed to bring out the men at the other mines owned by George Stephenson and Company.⁴

In the Spring of 1844, the Sheffield newspapers reported industrial unrest on the other English coalfields. Within a few weeks of these reports, the whole of the South Yorkshire and North Derbyshire Coalfield was aflame with strikes, fomented by the newly formed Miners Association. One competent witness of these events, declared that the fundamental cause of

1. Letter dated 29 May 1799. General Correspondence of Benjamin Hall. No. 6. Stewards' Correspondence and Papers. Wentworth Woodhouse MSS. Sheffield City Library.
2. Appendix No. 15. Report from S.C. on the Combination Laws. 1825.
3. Deeds and Papers of William Dunn of Sheffield, engineer and his son Thomas. M.D. 1743/20. Sheffield City Library.
4. Sheffield and Rotherham Independent. II June and 10 September 1842.

I
the strike was "want of sufficiency of employment." There is little doubt that the background of unemployment, short time working and low wages was one of the mainsprings of this strike. Competition from railborne Durham coal had caused a serious depression in mining along the Dearne and Dove and Barnsley Canals. There had been prolonged short time working at the pits worked by the Sheffield Coal Company since 1839, with the result that during the depths of the depression some colliers there had only earned 9/- a week. Shortage of water in the Cromford, Nottingham and Oakham Canals in summer had led to the practice of only working three days a week in that season around Alfreton.² When the strike occurred, however, trade was improving and the demand for coal brisk, the psychological moment, indeed, for strike action.

The aim of the strikers was simple. They demanded an eight hour day and a minimum of four shillings a day for hewers. In the words of a speaker at one of their meetings "The colliers had too long only dried bread. They now wanted beef on it." At some pits, however, their demands were more extensive. In Sheffield, the Union demanded a "closed shop" at the pits owned by the Coal Company and the right to approve the appointment of underground managers and stewards. In North Derbyshire, a delegate meeting at Brimington demanded the payment of wages weekly and the abolition of the truck system. At Pinxton, the men demanded that certain butties be dismissed and that they should be given a coal allowance. Behind the demand for an eight

- I. Charles Morton, agent to J & J. Charlesworth and Thomas Wilson in evidence before S.C. on the Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole Railway Bill. 1846.
2. R.C. Coke, mining engineer in evidence before S.C. on the Erewash Valley Railway Bill. 1847.

hour day, apart from the natural desire for more leisure, was the feeling that shortened hours would limit production to what the market would take, thus lessening competition between the various pits together with the wage cutting and speeding up which the miner had come to think were the inevitable concomitants of competition. Behind the demand for a minimum wage can be seen certain assumptions which were to become part of the mental furniture of the mining communities in this area until our own day - the belief that wages rather than royalty or profit should be the last to be affected by a recession or falling prices; that the best way to keep wages high was to restrict output; that all colliers should be paid the same wage rates irrespective of the conditions in which they worked and that competition between man and man and coalmaster and coalmaster was inherently immoral and should somehow be prevented.

The coalmasters with a long period of depression behind them were, at first, in no mood to listen to a demand for higher wages and shorter hours. In North Derbyshire, there was no organisation to organise opposition to the Union but as the largest producers of coal were also ironmasters, these at their March meeting agreed to discharge every unionist employed by them and to shut down all their furnaces and pits to break trade unionism in that district once and for all. ^I In South Yorkshire, the Coalowners' Association met at Barnsley with Lord Milton in the chair and after asserting that the demands of the Union were " an unjust and uncalled for interference with the Rights both of Masters and Men " called upon all its members to dismiss all unionists and any collier who failed to work

I. Letter dated 16 March 1844. Correspondence with Appelby, Walker and Company. Newton, Chambers MSS. Thorncliffe. Yorkshire.

hours or to turn out the customary amount of coal.

It was inevitable that with emotions aroused by the agitators of the Union, by the sight of their wives and children suffering from hunger and by the provocation offered by the coalmasters introducing a considerable number of lead miners from the Peak to break the strike that violence should break out. At Tinsley Park, the first South Yorkshire colliery to be affected by the strike, blacklegs were beaten up with railings. At Field, Cooper and Faulds' pits, blacklegs were assaulted and stripped naked. At Woodhouse Mill, the police who had been sent to make an arrest after an attempt to blow up a colliery engine were attacked by 200 men with bludgeons. At Orgreave, blacklegs were ambushed at Treeton and beaten up with clubs. In North Derbyshire, there were equally serious incidents at Staveley, Renishaw, Unstone and Dronfield.^I

Much more serious than any of these happenings were events in Sheffield, a town where trade unionism had been steeped in violence for a half century and where industrial disputes had often been marked by physical assault and damage to property. At the Soaphouse Colliery, owned by the Sheffield Coal Company, leadminers brought in as strike breakers, were showered with stones and assaulted with hammers and sticks. So ugly a situation developed that troops had to be called in to quell the disturbance.² Later, an attempt was made to blow up the engine at the Deep Pit but the attempt not only failed but also seriously injured the persons responsible.

The strike resolved itself into a number

- I. The account of the strike is drawn from the files of the Sheffield and Rotherham Independent, the Derbyshire Courier and the Derby Mercury for 1844.
2. A Letter on the Case of the Colliers tried at the last York Assizes to the Worshipful the Mayor. 1844.

of separate battles rather than into a single campaign. It was fought by separate battalions of strikers, accepting defeat or gaining victory, without any general direction from above. Strikers withdrew from the battlefield without any reference to how their fellow colliers were faring. Each coalmaster, too, considered his own separate interest, oblivious of the pledge to fight on a common front, made at their meetings held to consider their tactics before the strike. Improving trade with a rising demand for coal, marketable at higher prices made it possible for coalmasters to meet at least part of the Union's demands and to forget their ambition to destroy it in the natural desire to reopen their pits and to profit from the growing boom in industry. It is difficult to ascertain at what collieries the men won concessions but the Miners Association claimed that it had won better prices for its members at Field, Cooper and Faulds' pits at Wosborough and Stainborough; at Thorpe's and Sutcliffe's mines at Barnsley; at Appelby's at Renishaw and at various smaller pits at Rawmarsh, Pitsmoor, Melton, Mosborough and Eckington. The shortness of the strike along the Cromford Canal also seems to indicate a victory for the strikers.

At other pits, the strike was definitely a failure. Earl Fitzwilliam broke it at his mines by threatening his men with eviction from their homes. In Sheffield, the miners had to admit defeat at the hands of the Coal Company which had built up a large stock of coal during the depression, which it now found easy to sell in the town and once stocks dwindled, it brought in " knobsticks " to work its pits. Despite financial aid from other unions in the town, the miners employed by the Coal Company had to return to work on its terms, after a strike of five months' duration.

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Stretton, 17th and 18th Centuries

By G. C. Hopkinson, M.A.

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STRETTON IN THE 17th AND 18th CENTURIES.

By G. C. HOPKINSON, M.A.

AMONGST the Barnes Collection recently deposited in the Chesterfield Public Library are a number of manuscripts connected with Stretton. These manuscripts, mostly relating to the Wragg family, were evidently preserved by John Gorell Barnes of Ashgate House, Brampton, when he became executor of John Brocksopp, who died in 1812. Brocksopp was a coal and ironmaster, who lived at Grasshill, on the Hasland-North Wingfield road, where he had a number of collieries, and a blast furnace. In addition to his business activities, he farmed land at Stretton Hall and at Handley Lodge, on the slopes rising out of the valley now occupied by the old main line of the Midland Railway near Clay Cross up towards Littlemoor. Brocksopp had inherited Stretton Hall from his mother Mary, who had in turn inherited it from her brother William Wragg. The Wragg papers are of special interest to the economic and social historian of Derbyshire, as so little has yet been published on these topics, at least as regards that vital period of transition, the Industrial and Agrarian Revolutions.

The oldest manuscript bears on the outside wrapper the name and date — William Wragg 1732. It is in fact a survey of the Manor of Stretton compiled 1655-6 by Francis Allen for the lords of the manor, the Earls of Arundel and Shrewsbury and Sir George Savile. The information contained in this survey provides a picture of land ownership and land holding in the township. The largest farm was the Hall Farm, then held by Anthony Fox, 242 acres in extent and rented at £61 a year. There were five farms between 50 and 100 acres, thirteen

between 10 and 25, and thirteen small holdings below 10 acres in size. In addition, there were 15 cottages, to which were attached land varying between a rood and an acre in extent and rented generally at 1/- a year. There were also 10 freeholders, the size of whose farms unfortunately is not mentioned (the information of course was of no value to the lords of the manor), but where the names of the freeholders can be found in other documents, their farms are generally in the 25-50 acre block. The survey mentions two mills, the Hen Mill and the Baker Mill, both held by members of the Revel family and rented at £4 and £5. 7s. respectively. On the whole, the survey shows a village with a wide spread property range, an agricultural ladder with plenty of rungs to enable men to climb, together with a strong freeholding element.

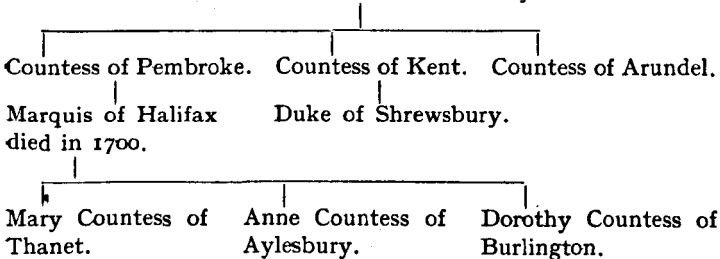
Towards the end of the 18th century, another survey was made in 1790 to regulate the land tax. It is fuller than that of 1655-6 in that it includes Woodthorpe and Egstow, but like the earlier survey it provides a picture of the social structure of the township after a century and a half of more rapid change than Derbyshire had yet seen. The largest farm in the village was still the Stretton Hall Farm, but now shrunk to 133 acres. This was owned and farmed by John Brocksopp, who was also shortly to purchase the Handley Lodge Farm of 69 acres. He also rented from William Webster, 93 acres of land at Henmoor for ironstone quarrying. There were four other farms over 100 acres, three of which were in Woodthorpe, where the whole of the land was owned by Sir Henry Hunloke, who lived in the adjacent Wingerworth Hall. In the 25-50 acre group there were 24 farms all rented; in the 10-25 acre group 13 farms were owner occupied, while in the 5-10 acre group 8 out of 14 farms were rented. There were about 50 properties in size less than 5 acres. It is plain from the assessment field record that the smallholder had received compensation in previous enclosure acts, as is shown by such records as:—

| | | | | | |
|--------------------------------------------|-------|---|----|-------|---------|
| Clay Lane. | | | | | |
| Hodgkinson R. Esq., Jas. Pendleton Tenant. | | | | | |
| Upper Carr. | 2 | 3 | 26 | 10 | £1 9 2 |
| Nether „ | 1 | 2 | 32 | 10 | 19 0 |
| Allotment on Hen Moor. | | | 18 | 19 | 1 0 |
| | <hr/> | | | | <hr/> |
| Total. | 4 | 2 | 36 | | £2 9 2 |
| | <hr/> | | | | <hr/> |
| Harding W. Abraham Gent Tenant. | | | | | |
| Common Allotment. | 2 | 2 | 15 | 10 | £1 5 10 |
| and | | | | | |
| North John. | | | | | |
| House, Yard, Barn, Garden & Croft. | 1 | 1 | 7 | | 2 10 0 |
| Over Croft. | 3 | 8 | 14 | | 11 2 |
| Sick. | 1 | 2 | 17 | 19 | 14 5 |
| Gilford Hole. | 2 | 2 | 19 | 11 | 1 8 9 |
| Common Allotment | | | 3 | 38 16 | 15 9 |
| | <hr/> | | | | <hr/> |
| Total. | 7 | 1 | 9 | | £6 0 1 |
| | <hr/> | | | | <hr/> |

It is, therefore, apparent that enclosure and the great changes in agricultural technique which so much affected the English countryside during this century had, so far as Stretton was concerned, not led to the disappearance either of the small landowner or the small landholder.

The situation as regards the lordship of the manor of Stretton was peculiarly complicated. Stretton had been one of the numerous Shrewsbury manors, but it had, in 1616, passed into the hands of co-heiresses, as shown by one of the manuscripts, apparently drawn up by Edward Brocksopp towards the end of the 18th century.

Gilbert, Earl of Shrewsbury.
died in 1616—owner of entirety.



The policy of the tenants through a century and a half was to buy out the lords of the manor. In 1660, they had subscribed £1,623. 17s. 8d. towards £3,040 necessary to extinguish the third share of the Countess of Arundel, the remainder being contributed by Mr. Gladwin of Tupton Hall. A list of the tenants taking part in this operation is to be found below:—

When the half of Howards Royalty being a sixth part of Stretton Manor yields 20 shillings profit.

| | s. | d. | mites. |
|-----------------------------------------------|--------|---------|--------|
| Mr. Clarke will have for his part of the 20/- | 01 | 00 | 11 |
| Mr. James Webster | ... 01 | 02 | 12 |
| John Clay | ... 00 | 06 | 13 |
| Robor Hall | ... 01 | 01 | 13 |
| James Hauksley | ... 02 | 02 | 09 |
| Mathew Hopkinson | ... 01 | 00 | 04 |
| Richard Millward | ... 01 | 10 | 01 |
| George Milward | ... 00 | 11 | 15 |
| John Beghton | ... 00 | 08 | 21 |
| Richard Holley | ... 00 | 10 | 08 |
| Thomas Brighton | ... 00 | 04 | 16 |
| Thomas Fauke | ... 00 | 09 | 19 |
| Samuel Wheatcroft | ... 00 | 07 | 20 |
| George Brunt | ... 00 | 03 | 17 |
| Richard Glow | ... 00 | 04 | 05 |
| Thomas Cowlshaw | ... 00 | 05 | 03 |
| George Smith | ... 00 | 09 | 19 |
| Robert Millward | ... 01 | 02 | 18 |
| Robert Alwood | ... 01 | 01 | 02 |
| John Osland | ... 00 | 03 | 23 |
| John Revell | ... 01 | 07 | 23 |
| Lawrence Bunting | ... 00 | 02 | 04 |
| Peter Ellat | ... 00 | 02 | 04 |
| | 19 | 11 2 f. | 4 |

Note that 6 mites make one farthing.

In 1708/9, the tenants negotiated successfully with the Duke of Shrewsbury to extinguish his third share.

Articles of Agreement indented made and outlined and agreed upon the fourth and twentieth day of September in the year of our Lord 1708 between John Arden and William Hill [stewards] of the most noble Charles Duke of Shrewsbury on the one part and William Wragg Humphrey Oldfield and James Hawxley of Stretton in the county of Derbyshire yeomen on the part and behalf of themselves and other tenants of the said Duke in Stretton . . . on the other part.

Imprimis the said John Arden and William Hill do hereby promise that the said Duke for and in consideration of the sum of £1958. 10. of lawful money of Great Britain to be paid to him . . . shall and will truly convey to the said William Wragg etc. . . . all that his third part of Messuages lands and tenements etc. in Stretton.

The tenants signed an agreement to contribute their shares of this sum.

20th January 1708/9.

We whose names are here unto subscribed being purchasers of his Grace the Duke of Shrewsbury's third part within the Manor of Stretton appointed to be sold by articles under the hands and seals of Mr. John Arden and Mr. William Hill appointed commissioners by his Grace bearing date 24th day of September 1708 do hereby promise and engage to bring in our proportion of the one half of our purchase money unto William Wragg James Hawxley and Humphrey Oldfield being appointed and nominated trustees for themselves and the other purchasers . . . Witness our hands the day and year aforesaid.

Israel Cantrell. John Towntrow. John Beighton (his mark). Jeremiah Higginbotham. Francis Oldham (his mark). Peter Rudgate. George Heald (his mark). Francis Low (his mark). Robert Barker (his mark). John Mottershaw. Sam Rowth (his mark). Peter Mottram. Ann Heald (her mark).

Signed in the presence of:—

John Holton. William Flint.

As may be seen, William Wragg was the leading spirit in these negotiations. He had become the tenant of Stretton Hall Farm in 1683, paying a fine of £8 and an annual rent of £13. os. 9d. to each of the two owners of the manorial rights. The Wragg family evidently became wealthy through farming and coal mining, as a later William Wragg who made his will in 1746 was able to leave land at Littlemoor, Stretton, Alton and Brampton, cottage property and a share in the Hen Mill, coal mines at Stretton Common, a sum of £520 and an annuity of £17 a year.

A petition by the tenants shows an endeavour to disentangle the ninth shares of the three countesses.

To the Rt. Hon. The Earl and Countess of Burlington and the Hon. Sackvil Tufton Esq. and Lady Mary his Wife and the Hon. Rupert Bruce Esq Coheirs of Wm. Late Lord Marquis of Halifax.

The Humble Petition of your several and respective Tenants holding your One third of the lands lying and being within the Manor of Stretton Com: Derby.

Shewith—

That as you have brought a bill in the high Court of Chancery for the setting out and dividing of the said lands into thirds your petitioners humbly crave leave to make here a State of the Case of their present Circumstances.

The Duke of Norfolk and Duke of Shrewsbury sold their two thirds of the premises unto your present Tenants and to some other Persons who together as near as we can be informed make a number above one Hundred proprietors and as their Interest being so small in quantity of land Your petitioners pray and beg the Liberty of assuring you the consequence of Such a Division as is proposed will be that the Law expenses will far exceed the value of their Property of the Estates they now enjoy of the aforesaid two thirds and further it will be attended with utter ruin of many of the owners and even greatly hurt the Most Ablest of them and in Order to prevent Such Miserys and Calamitys in the Country the petitioners Humble Submit themselves to your Lordships etc. and pray that you would Inquire of Mr. Wm. Abdy your agent into the truth and certainty of this their Petition Humbly Desiring that the Suite of Division may not be carried into further execution being your Petioners are ready and will Chearfully contribute their Two thirds of the Charges of a new Survey to be made of the Lands within the said Manor and as a Security for the same some of the most responsible of them have signed an Instrument Unto Mr. Abdy for that very purpose hoping thereby to be entitled Unto your Lordship and Favour either to obtain the Grant of Leases or to become Purchasers of your third as in your great Wisdom and Judgment Shall seem best.

And your Petitioners will as in
Duty bound ever pray etc.,

This Petition is addressed:—

For

Mr. William Ragg
Att Stretton Hall.

A note added to the genealogical chart quoted earlier explains the result.

“In January 1743 the thirds of these 3 ladies was allotted on a division of the late Marquis's estates to the Countess of Thanet alone.”

The Thanet family endeavoured apparently, as the following letter shows, to sell out their third.

Sir,

I am very sorry to trouble you with this letter about my affairs with Lord Thanet, but as the matter stands, cannot well avoid it. The case is this, Tho' I should be very glad and willing to take his Lordship's third part of my Farm If I could but soon take it so as to save myself, yet the present advanced rent is so high that I really cannot make it of the land. I am rather apprehensive some mistake must be made therin, as it is well known to be a wet, cold, clayey soil, moreso than most of the neighbourhood, and is valued at a considerable greater price than most of my Lord's Tenants Lands about it, which might perhaps be owing to the greatest part thereof being out of tillage and well manured and sown with seeds at the time when valued occasioned by a disagreement between our Rector and me about the tythes, or what other thing could occasion the mistake if this did not I cannot tell but certainly there must be one and whether a second (reevaluation) of lands might not be the best way to discover it or not I submit to you. I should be very glad to take it rather than give any more trouble either to his Lordship or yourself. If you'll but pleased to take it into consideration, and make such abatement as it really deserves or in proportion with the rest of his Lordship's Tenants in the Neighbourhood . . . I should be very glad to know whether you'd please to have me wait upon you in London upon this affair. If an abatement cannot be made and a Division must ensue I beg it may be done amicably, without the Expense of a Chancery Suit. I should be very glad to continue Tenant to his Lordship provided the rent can be fixed at such a rate as I can pay for it. I beg pardon for giving you this trouble and am

Your Most obedient and Humble servant,
W.W.

Stretton Hall.
24th April 1766.

However, a document of 1800 shows that the Thanet third and the sixth of Dr. Bourne, the heir of the Gladwins, still remained a bone of contention between the owners and the tenants.

The Wragg Papers contain one example of the working of a manorial court in the 18th century.

Stretton. } The verdict and presentment of the Jury at the
of } Court Leet and Great Court Baron held for the
Manor } said Mannor the twenty-seventh day of October
Anno Dom. 1724:—

before

M. Calton

Steward there.

The Names of the Jury

Viz:—John Towndrow Jur^rJeremiah Higginbotham } Jur^r

John Rooth

George Milnes

Richard Hawkesley

John Beighton

Isaac Williamson

Israel Cantrell

Ralph Wass

Arthur Wass

Thomas Millard Junr.

Philip Draycourt

Francis Barber

- | | | £ | s. | d. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|----|----|
| Impris. They Amerce every Gentelman and freeholder who owes suit and service to this Court and hath not appeared here this day or Essoyned each person to forfeit the sum of | ... | 0 | 1 | 0 |
| Item. Every Tenant, cottager and others to forfeit for the like, the sum of | ... | 0 | 0 | 4 |
| Item. They lay a pain upon all cottagers and other persons within this manor who shall keep any Dogs or Bitches to drive or disturb the sheep or other cattle upon the Common, that each person shall forfeit for every time such offence be committed by him or her to the Lady and Lords of this Manor | ... | 0 | 10 | 0 |
| Item. They lay a pain that all persons within this Manor who shall burn any Bracken upon the Commons before the 25th day of July in every year that each person so offending shall forfeit to the Lady and Lords of this Manor | ... | 0 | 10 | 0 |
| Item. They Lay a pain that if any person within this Manor shall put any cattle upon any of our Commons troubled with any infamous distemper each person shall forfeit for every such offence to the Lady and Lords of this Manor | ... | 1 | 0 | 0 |
| Item. They lay a pain upon all persons within the Manor who shall put any cattle upon any of the commons having no common Right within this Manor that each person so offending shall forfeit to the Lady and Lords of this Manor for beast for every Horse or Beast 12d. and every sheep 6d. | ... | 1 | 0 | 6 |

- Item. They Lay a Pain upon every person within this Manor that shall put more cattle upon any of the Commons in the Summer than the Lands they hold within this Manor will Maintain in the winter that every person so offending shall forfeit for each offence to the Lady and Lords of this Manor for every Horse or Beast 1/- and every sheep 6d. 1 0
for beast
0 6
... for sheep
- Item. They Amerce the several persons hereinafter named William Cutt Junr., John Linard Senr., John Linard Junr., Widow Milward, David Tatam, Mary Cowlshaw, Widow, James Norman, Wm. Hop, Wm. Mellors, Hannah White, Widow Keeton, Anthony Sneath, Ralph Slater, Mathew Cowlshaw, Eliz. Wass, Smal. Harrison, Widow Oldham, John Bunting, Thomas Fidler, Mathew Wass, Wm. Fidler, Joseph Hopkinson, Richard Hawkesley, Francis Goodale, Elizabeth Goodale wid., Susanna Goodale Widow, Geo. Millward, John Jackson, Michael Burkland, Samuel Wheatcroft, Richard Wilbourne, Wm. Hallowes, Geo. Wragg, Eliz. Cutt, John Turner, Richard Wood, John White, Mr. Holland for having not laid open their respective Jutarks or Jurroarthums upon the Commons or Wast Ground within this manor according to A pain laid at the last Court the sum of ... 2 10 0
- Item. They the said Jury present that the way to the Stoney Lands (being the Jutarks of Robert Hunloke Esq. and in the possession of his Tenant Savage — Shepherd lying within this mannour) is and of right ought to be from the — said Stoney Lands through A Close called the Pitt Hills and from thence thro' the Upper-John-Croft both in the possession of Joseph Barber, and out of — the said Upper-John-Croft into A Lane called John Lane and so to pass and repass that way to and from the said Close called Stoney Lands as well for driving of cattle as with all other carriages and for all other useful and necessary purposes, And we do further find that as well the said Mr. Hunloke and his said Tenant as also the said Joseph Barber being present in Court do justice to the right of way as before described and that in consideration of six shillings and six pence paid to the said Joseph Barber towards setting up A New Gate he shall forthwith put one up in the place in his own houre as now Directed and agreed upon, and shall for the future maintain it and — that Mr. Hunloke or his Tenant shall at all times repair for his own use that part of the said Way which is over the said Pitt Hills Close.

It is unfortunate that there is little material about farming. There is, however, a valuation of Stretton Hall Farm made when John Brocksopp and his mother dissolved partnership.

A VALUATION OF THE FOLLOWING GOODS AND CHATTLES AT STRETTON HALL BELONGING TO MRS. BROCKSOPP AND SON.

APRIL 1786.

| a. | r. | p. | | £ | s. | d. |
|----|----|----|-----------------------------------------------------------------------------|-----|-------|------|
| 16 | 0 | 0 | Summer Fallow Wheat 5 times ploughed and Harrowed at 7/6 per acre each time | 30 | 0 | 0 |
| | | | 33 Loads of Lime Leading & spreading included | ... | 14 | 0 6 |
| | | | Rent and Assessment for last year | ... | 16 | 0 0 |
| | | | Seed for do. 13. 1. at | ... | 11 | 3 0 |
| | | | | | <hr/> | |
| | | | | | 71 | 3 6 |
| 5 | 0 | 0 | Clover ley Wheat ploughing and harrowing | 2 | 10 | 0 |
| | | | Seed for do. 5 loads | ... | 4 | 0 0 |
| | | | Winter Herbage on do. | ... | | 12 6 |
| | | | | | <hr/> | |
| | | | | | 7 | 2 6 |
| 7 | 0 | 0 | Summer Fallows and Turnips 6 times ploughed & harrowed at 7/6 | ... | 15 | 15 0 |
| | | | 12 Loads of lime on do. | ... | 5 | 2 0 |
| | | | 75 Loads of Dung at 4/- per load & spreading incl. | ... | 16 | 17 6 |
| | | | 2 qrs. 6 sts. Seed at 26/- £3. 11. 6. 5 st. | ... | | |
| | | | Oats on do. 10/- | ... | 4 | 1 6 |
| | | | | | <hr/> | |
| | | | | | 41 | 16 0 |
| 16 | 2 | 0 | Thirty Loads of Dung to Grass Land | ... | 6 | 0 0 |
| | | | Oats, ploughing & harrowing at 8/- p. acre | ... | 6 | 12 0 |
| | | | 10 qrs. 2 sts. Seed for do. at 16/- £8. 4. 4 sts. Barley 13/- | ... | 8 | 17 0 |
| | | | | | <hr/> | |
| | | | | | 21 | 9 0 |
| | | | 80 lbs., Clover seed sown in 1785 at 8d. | 2 | 13 | 4 |
| | | | Dutch clover, trayfoil and Hayseed sown in 1785 | ... | 2 | 9 0 |
| | | | 100 load of Dung in the Folds at 3/- per load | ... | 15 | 0 0 |
| | | | Horses a 3 year old Colt £20. Two 7 yr. old mares £34 | ... | 54 | 0 0 |
| | | | A yearling colt and Filley £16. Galloway £8. 8. | ... | 24 | 8 0 |

| | |
|------------------------------------------------------------------|----------------------------------------|
| | Received of Rob. Nall on Acc. 286 11 6 |
| 1811 Jan. 11. do. | 60 5 0 |
| Jan. 18. do. | 61 2 0 |
| | 1 9 9 |
| | 409 8 3 |
| Keep of 6 Sheep from 17 Apl. 1810 to 13th Oct. | 12 1 11 |
| 1810 — 25 weeks 4 days — 3/- | 3 16 6 |
| Do. of 5 Sheep 13 Oct. to 26 Dec. 1810 10 weeks and 4 days — 2/6 | 1 6 3 |
| | 17 4 8 |

A certain amount of wool was sold off the farm as is evident by the following extract from John Brocksopp's pocket book.

Spencer & Ward Dr.

| | | £ | s. | d. |
|-----------|-------------------------------------------------------------|-----|----|------|
| 1793. | | | | |
| Dec. 12. | To 20 st. 10 lbs. Wool at 10/3 to be paid for 25 March 1794 | ... | 14 | 14 0 |
| 1794. | | | | |
| Mrch. 21. | Pr Contra..... Cr..... By a Bill | ... | 14 | 14 0 |

Information as to wages is sparse, but the following extracts relating to James Strutt, who rented land from Brocksopp and paid for it by working are typical.

| | | | | |
|-------|------------------------------------|-----|---|------|
| 1790. | Dec. 21. By 83 days labour at 10d. | ... | 3 | 9 2 |
| | to May 12. | | | |
| 1791. | Dec. 27. By 57 days labour | ... | 2 | 11 6 |

In the survey of 1655-6, coal mining had already begun on Stretton Common, as Thomas Wragg is noted as paying £10 rent for his mines. The earliest mention of a mining lease in the Wragg Papers is one of 1702 from the Duke of Shrewsbury and the Dowager Marchioness of Halifax to Humphrey Oldfield, Thomas Clay and William Wragg of two-thirds of a mine called Clay Cross Delfe situated upon the common adjoining to Clay Cross. The lease mentions a sough which had been dug to drain this mine — a sough that was to cause future owners of this pit much trouble. The partners agreed to complete this, and as their price were to work the mine one year rent free. However, in 1709 the lease was transferred to John Mottershaw, who transferred it to the

Gladwins of Tupton. Trouble arose when the Duke of Shrewsbury sold his third share in 1709, as Robert Barker who had bought a third share of the land he held, filled up the shaft by putting earth in it — a fact which shows, apart from the legal obligation in the lease to fill in the shafts when the coal was got — how shallow were the workings. What the result of this rather violent action was, the Wragg Papers do not mention, but a further complication arose in 1733, when the partners leased another mine on adjacent land belonging to Messrs. Woodyear and Turbutt and proposed to use part of this sough to drain the new mine. The other holders of shares in the manor protested that the sough belonged to all and not merely to some of the lords, and threatened to stop it up rather than allow the partners to use it without payment. They did so in fact, but in 1736 it was amicably settled that the partners should pay a rent for the use of this sough. In 1744, the seam was leased out to William Cupid and John White.

May the 13th 1744 MEMORANDUM let to William Cupid and John White Clay Cross pits of forty five pounds a year and to pay forty two pounds per acre and to let Humphrey Oldfield, William Wragg and Thomas Clay have what coke they have occasion to burn in their own houses and to let Doctor Burn have what coals he shall take at a Boon as usual, and twenty shilling a year to ballance the partners coals, to be paid to him by William Cupid and John White over and above the forty five pounds AND the said William Cupid and John White are to enter to the pits on the eight day of May and to two pits new sunk, seventy yards of level, forty yards of heading, three pits well timbered, three others timbered, one Thousand of punchons, Eight hammers, twenty seven picks, seven hooks, seven rakes, eleven spades, nine calves, twenty nine wedges, three bank rakes, one dresser, two old drags, one axe, one sharpening hammer, two mandrils, two clives, one sowwell froned, two trunks, one bank hook, one fire pan, three new ropes, two turn barrels, two foot hooks, two turn gears, four foot boards, three wiskets AND the said William Cupid and John White shall stand to the same Articles that John Mottershaw and George Barker did, in their last Bargain AS WITNESS OUR HANDS

TESTATORS.

Francis Barker.
William Wragg Junior.

His mark.
William X Cupid.
His mark.
John X White.

An indenture of 1746 with reference to this mine is of interest in casting some light on the condition of Derbyshire roads at this time.

KNOW ALL MEN that we Henry Bourne of Spittle in the parish of Chesterfield . . . William Wragg of Stretton Hall . . . Humphrey Oldfield of Holmgate in the parish of Northwingfield and Thomas Clay of Higham . . . are firmly bound to Thomas Holland of Ford, Gent, in the sum of Fifty pounds . . . WHEREAS the above bounden Henry Bourne etc have for several years last past been working . . . a certain coal mine within the hamlet of Stretton, and have carried and laid very great quantities amounting to more than One Thousand Loads of Deads, earth, dirt, slack and rubbish raised out of the said coal mine into the Common King's highway leading from Chesterfield towards Derby Whereby the same is becoming dangerous . . . they the said Henry Bourne etc have come to an agreement with the overseer of the Highway . . . that they shall at their own proper charges spread and level the said Deads etc, that the same may be even from the hedge or fence on the one side to the hedge or fence on the other and shall also in like manner lay a horse causway on the side of the road over the said slack already laid . . . and also the said Henry Bourne etc shall from time to time . . . during the term of eight years well and effectually repair the said highway . . . and also if the said Henry Bourne etc do not . . . lay any other Deads etc. within the said road whereby the same shall be raised higher than the sides thereof when levelled as aforesaid and not more than eighteen inches higher in the middle and further also if they the said Henry Bourne etc. shall pay unto the said Thomas Holland for the use of the Lords of the Manor of Stretton for all such quantities of coal as have been gotten by them within and under the said Highway being part of the waste of the said Manor after the rate of Forty two pounds per acre and accept the posts left for the support of the roof of the said work then and on performance of this present condition the above written obligation, to be void, but if default be made in the performance thereof or of any part thereof contrary to the true intent and meaning of these presents then the above written obligation to be and remain in full force strength and virtue.

Signed in the presence of:—
Geof. Heathcote.
John Elye.

Henry Bourne
William Wragg
Humphrey Oldfield
Thomas Clay.

Two more later leases refer to the other mining activities of the Wragg family. One is dated 1765, and is between William Wragg and his partner Thomas Clay

of Higham and John Woodyeare of Crookhill, Conisborough and William Turbutt Esq. of Doncaster, empowering the former to mine coal on certain farms in Stretton. It is known that the partners sank two pits and a water level and that the pit closed down c. 1800 leaving a considerable quantity of coal untapped. The other is unfortunately undated and is in draft form. It records an agreement between William Wragg and the Hunlokes, whereby the latter are to pay for the sinking of a new pit and for the driving of 60 yards of level and to transfer these and another pit to William Wragg. The Hunlokes also agree "to lay on the bank six cord of puncheons for every pit that shall be worked during the term" of the lease and are prohibited from working the Woodthorpe or Crosscliffe Collieries, except for coal for Wingerworth Hall. Evidently it was the custom of the royalty owner to provide a checkweighman, as a clause is included whereby the Hunlokes were to pay his wages "unless he will do the work of a banksman". Finally, a note to the draft lease shows that Wragg was to take over the engine at Woodthorpe or Tupton Collieries and chose the former.

Although the Wragg papers do not, unfortunately, enable us to build up a picture of the development of the family fortunes during this period, they do at least provide some material towards the history of a period and of an area too long neglected by historians of the county.

NOTE.—Charles, 12th Earl of Shrewsbury was created Duke of Shrewsbury and Marquis of Alton in 1694. At his death 1st Feb. 1717/8 the Dukedom became extinct, the Earldom reverting to his cousin.

GLOSSARY.

- Branderiff = Framework of a hayrick.
 Clive = A strong hook fixed to end of chain or rope and attached to rings of buckets for hauling them up the shaft of a mine.
 Deads = Unsaleable coal.
 Fleaks = Watted hurdle for drying and storing.
 Gablack = Iron Crowbar.
 Mandrill = Miner's pick.
 Puncheons = Pit props supporting roof in a coal mine.
 Sowwell = Stake.
 Wisket = Basket.

6.

Lead Mining in 18th Century Ashover

By G. G. Hopkinson, M.A.

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Lead Mining in 18th Century Ashover



by

G. G. HOPKINSON, M.A.

DURING the 18th century, Ashover was one of the most highly developed lead mining areas in Derbyshire. Its most famous mine, the Gregory Mine, proved to be after the turn of the century, one of the richest in the county and one of the most profitable. Fortunately, sufficient material has survived the hazards of time to enable the rise and decline of the industry to be depicted with unusual detail.

The first major mining operation in 18th-century Ashover was the construction at some date prior to 1706 of a drainage sough, almost a mile in length, extending from the base of the hills which limit the Ashover valley to the west at Cockwell to the River Amber at Woolley Moor. This was financed by Richard Taylor, Esq., Thos. White of Walden Wells, Richard Biorbidge of Mansfield, apothecary, Arthur Woodis of Ashover, yeoman, and William Hodgkinson of Overton, merchant. This sough unwatered what was known as the Gregory Vein, as it lay beneath land owned by the Gregory family,

who lived at Ravensnest, on a shelf of land high up above the valley. A company called the Nether Sough Company was formed to exploit this vein. This operated from August, 1734, to June, 1737, and mined 936 loads of ore during these years. When the extreme limit of the workings — termed by lead miners the forefield slope — was reached, it was approximately up to where Ravensnest House is situated. The mine was then abandoned until 1758, in the belief that the ore was not worth mining. A branch sough was then cut out of the main Gregory Sough to develop a new mine known as Overton Mine.

From a letter book of Isaac Bonne, who acted as treasurer to this mining syndicate in addition to his other activities as agent to the Overton Hall Estate at Ashover, secretary of two turnpike trusts and a grocer's business, it is possible to gain an insight into the development of this mine. Before mining actually began, manager and miners made a bargain as to the extraction of the ore, and as Bonne wrote to his correspondent, Robert Banks Hodgkinson, "when the works are worse the Miner has so much more per ton for getting". A letter — the third in the sequence — dated October 23rd, 1756, describes the process: "George Allen (the manager) has let sundry works on copes as follows the Gardenside Vein at £3. 18s. per ton to the Miner for getting drawing and making it ready to weigh, the other vein where most of the Ore has been raised for two years past (but almost cut out) is let at 6os. per ton. Four or five other places which has stood for bad some time past is let at £5 and £5. 4s. a ton."

The hazardous nature of lead mining from the standpoint of the owners is shown in these letters. In June, 1757, Bonne writes: "Since my last Sir two Miners from Matlock has discovered a good work at Overton; George (Allen) let 'em a place called Porto Bello pipe which has stood a many years — as these men — picked the ore left in the sides — there work mended opening like an Oven Mouth: — It was Garlanded all about with Ore and Spar. The Hearth was laid with Two Ribbs resembling Two Pavors." When the miners' time was up, the pipe was let at £3. 10s. per ton but the February, 1758,

letter notes that "it is not as good as it was." The next monthly letter brought news of yet another disappointment. For a considerable time, miners working what were thought to be two parallel veins had been able to hear each other's operations. Eventually the two headings met, proving there was but a single vein. Then too the usual troubles with drainage were encountered. The Overton section of the sough became blocked in December, 1757, and the process of cleaning it out proved an expensive one as it was impossible to discover the exact point at which it was blocked except by drilling shafts from above. It was not until July, 1758, that the water began to flow again and it was December before the workings were completely drained.

There is nothing in the letters referring to the dressing of the ore, beyond the fact that the process had been badly hindered by frost in February, 1757. The ore was then sold to Mr. Twigg of Holme, who leased a cupola furnace on Hodgkinson's land at Kelstedge, generally after long negotiations as to price, as Bonne's letters indicate that the lead trade was in a poor state, stock being high and prices consequently low. Little information has been discovered as to the smelting side of the industry in Ashover. The Overton Hall deeds, however, show that a smelting mill was in existence at Kelstedge in 1702. They also include an agreement whereby John Barber of Kelstedge undertook to sell its site to a group comprising the main lead mining interests in Ashover — Samuel Haslam, the manager in 1740, of the first Overton Mine; Joseph Banks of Revesby Abbey, Lincolnshire, a relative of the Hodgkinsons of Overton, Henry Thornhill and Nicholas Twigg, both of whom were well known lead merchants. The group had evidently been compelled to take this action as a result of a lawsuit in the Court of Common Pleas, in which the defendants had been accused of making "large fires and smelting great quantities of lead and thereby diverse poisonous stinking and unwholesome smells, Smoak and Vapours proceeded, whereby the petitioner and his family are greatly distressed his grass and corn spoiled". Every three months Bonne made a reckoning of output and profits and forwarded

Hodgkinson's share of the mine profits to his bankers, Snow and Denne near Temple Bar, London. This financial transaction was comparatively easy in Ashover, as Bonne was able to purchase bills drawn on the Quaker Lead Company of London and other merchant houses interested in the Derbyshire lead trade.

Despite their frequent protests about the unhappy state of the lead trade, Hodgkinson and Bonne were eager to extend their lead mining operations. Their next venture, Brimstone Dike Mine, down the hill, nearer the Amber, was unsuccessful, lead not being found at all. Next, they were compelled by force of circumstances to turn their attention to the Gregory Mine. The drainage rights from the Overton Mine to the sough constructed *c.* 1706 were only secure for the lifetime of Mr. Gregory senior, and his son openly admitted that he expected large financial concessions from Hodgkinson and Bonne if this privilege was to be continued after the death of his father. Bonne's reaction to this problem was a bold one — that of taking over the lease of the Gregory Mine, then in the hands of Mr. Hayes of Mansfield, who had a 65 years' lease of the mine dated 1720. As a result a new partnership was set up to finance the venture. The largest shareholder was Isaac Wilkinson of Chesterfield, lead smelter and merchant, who held a quarter of the total capital; the Banks-Hodgkinson family held twelve out of the forty - four shares; Isaac Bonne took up another four; two shares each were held by the Haslam family previously mentioned, by the Bourne family which provided the parish with its parsons for so long, by Samuel Kirk who was mine manager in 1769 and by the Twigge smelting concern of Kelstedge. Other shareholders were the Rev. Francis Gisborne of Staveley who took up three shares, Wm. Williamet, mine overseer, with one share and John Gratton, a Quaker timber merchant of Wingerworth, who also only held one share. As the original Gregory shaft was choked up, another had to be sunk. A new pumping engine was installed, but the last letter referring to the Gregory Mine, dated June 30th, 1759, declares that in view of the low price of ore, it had been decided not to incur the heavy expense of unwatering the mine.

Continuing, Bonne writes: "There is so little mining in Derbyshire at this time that if the turnpikes did not employ abundance of labour I cannot think which way they (the miners) could have got Subsistance for their Family." This note of poverty and unemployment is continuous throughout the whole series of letters. In November, 1756, Bonne complains of the high cost of food, pointing out that farmers were naturally holding on to their harvest in the hope of ever rising prices. In the following March, Bonne writes: "Corn continues very high and am afraid will till a good crop is at hand the last Years proving deficient more than what was expected till it was thrashed." Another cause of discontent, Bonne declares, was that the Duke of Devonshire was raising the rents of his tenants. The match which fired the explosion was the Militia Act. Writing to Hodgkinson on August 22nd, 1757, Bonne states: "We have a deal of uneasiness in this County about the Militia. All the Constables Sir are ordered to bring in a List of the inhabitants liable to serve as last Monday, but a great number of people got together and prevented 'em doing any business. On Wednesday they were at Bakewell raised a great clamour against the Duke of Devonshire and threatened Chatsworth but when they came there and met with great plenty of meat and drink their resentment dropt, then some of 'em said his Grace's liquor was not as good as they expected. On Thursday another Hundd was ordered to meet at Brassington instead of Ashborne thinking to be more quiet but all the Towns rose round about and Seized the Constables as they came in took all their papers and burned 'em. The Gentlemen hearing did not enter the town except Fitzherbert who came late. They did no other damage but said they were willing to Serve his Majesty but would be paid for it." In his next letter — undated, but probably August 29th — Bonne continues on this topic: "I have heard little of the Militia Sir Since my last so hope there will be no more disturbance; The Duke raising his Tenants at this unlucky Juncture has been the greatest cause of what has been; it begun at Chesterfield and Chiefly by his Tenants who seem'd very ripe for mischief. It happen'd Sir that that

Day Mr Heathcoat was letting one of the Dukes Farms by auction wh put the mob in a greater Hurry but Happily all ended in Words. Most people look upon auctioneering as a very bad precedent and many of the Dukes friends speak cooly of him." In a postscript to the same letter, however, he writes that a notice had been placed on the door of Ashover Church to the effect that the Lord Lieutenant was to be in Chesterfield on Militia business and that all the Ashover miners had gone there to protest against embodiment in the Militia. In his next letter dated September 5th, 1757, he gives the latest gossip on the subject of the Militia Act. "It is imagined from the following acct that the Duke of Devon: is not easy about it. Last Wednesday Sir as Wm Milnes was going to Eyam he overtook one F. Mason, an overseer at Eyam Edge Mines, who buys Candles of him and who said he was Just then come from the Duke that his Grace the day before ordered Mr Barker to send from 5 or 6 of the best kind of the Mob from Eyam that Mr Barker wrote to him (Mason) desiring he would — come down —. His Grace asked him many questions about the people rising, said himself was against the Militia Act That his Ancestors had always endeavoured to serve the Nation in General and Derbyshire in particular — That he was sorry they had conceived so ill an opinion of him who strove to tread in the Steps of his Forefathers as much as he could." Bonne then asserts that the Duke tried to probe into the deeper cause of the riots, but Mason refused to give further information on the ground that "their country was not Tenants to him" for which Mason "was heartily cursed by his Neighbours for his complaisance to the Duke". Finally the abandonment of the whole project and "the finest harvest this year that ever was known" with its effect on food prices led to the restoration of content.

Between 1758 and 1762 the new Gregory Mine syndicate spent £429 in capital development before the mine produced any ore. In the latter year 214 tons were mined. A memorandum written by Jno. Milnes of the Butts, Ashover, early in the 19th century and based upon sources now lost states " About the year 1763 two shafts

were sunk at a little distance from each other, one for a water shaft, the other for a Gear Shaft, these shafts were nearly opposite a House occupied by Stephen Thompson afterwards one of these shafts was made the climbing shaft, this shaft was used as the climbing road as long as the Mine was kept in work." Probably as the labour force was concentrated on shaft sinking actual production of ore was low in quantity — 84 tons, sold in equal quantities to Twigge and Company and to Messrs. Wilkinson and Company at £8. 10s. per ton. Incidentally, this became the future sales policy of the group, the twelfth formerly allocated to the Quaker Company who ran a smelting plant at Bowers Mill in Ashover no longer being sold to their agent, Joseph Whitfield.

With the completion of this work, output at Gregory Mine rapidly increased. In 1765 it was 383 tons, 609 tons in the next year and in 1767 it topped the 1,000 tons mark. In 1768, so the memorandum continues, "the Gear or Drawing Shaft on the Hill side was sunk. In the same year the first Steam Engine, called the Old Engine, below the Hill was erected and lifted the water to the sough in one of the shafts sunk in or about 1763 by means of Slide rods, there was a good deal of Ore got before the Engine was set to work by means of hand pumping and drawing water by Horses." Evidently the water problem had become serious as may be deduced from a comparison of the two following accounts:—

Oct. 1761. One horse drwg water 18d per shift.

July 1765. 4 Sets of Horses 3 ea. set, drawg water
37/6 per Week ea. Set.

To solve the problem the partnership bought a Newcomen engine from Mill Close Mine. This was erected at Gregory by Thomas Southern of Winster. This engine had been built by Darby of Coalbrookdale in 1748 and was a 42-inch cylinder engine of approximately 47-h.p.¹ The Gregory Mine plan, now in the possession of the Clay Cross Company, shows that it operated a pump of 12-inch diameter, the engine making a stroke of

¹ Mill Close Mine Derbyshire 1720-80 by A. Raistrick Vol.X. Proceedings of the University of Durham Philosophical Society. A drawing of this engine, formerly in the hands of the Gregory family, is now kept in the village school.

six feet, lifting the water sixty yards. Milnes declares that it burned 26 tons of coal a week and that "6 or 7 strokes a minute would draw the regular fading of water." Whether this installation laid bare any richer ores it is impossible, using the available evidence, to say, but 118 tons of ore mined in the Gregory vein some distance from the drawing shaft on the hillside was extracted in August, 1769, by Henry Ludlam and Co. at a cope of $13\frac{1}{4}$ a ton — "this was the lowest cope ever given for getting Ore in Gregory Mine" — and other quantities were mined at copes of 14/- and 16/- a ton.

An account book, described as "Gregory Mine Reckoning Book with Accounts from April 1770 to ditto 1775", was kept by William Milnes. This gives the mine account for Lady Day and Michaelmas quarters during those years. According to a note inside this book, the Midsummer and Christmas quarter accounts were kept by J. Twigg. These accounts are known to have been in existence in 1917,² but unfortunately they have not been located. However, the Milnes' set of accounts gives a wealth of information about lead mining in the Ashover area. During these years the Gregory Mine attained its zenith. Probably the almost fabulous profits in relation to the capital employed were due to the junction of the Overton and the Gregory veins. The quarter ending April 4th, 1772, was as Milnes noted, "the most profitable reckoning ever made during the time that Gregory Mine was kept in work." Production of ore was 875 tons and profit the huge amount of £5,592. A note appended to the map is to the effect that two companies of miners, each 19 strong got 711 tons of ore at a cope of 16/-. According to Milnes the ore was "of the best sort" and sold at £7. 17s. 6d. a ton. For the whole year 1772, total profit amounted to £15,024. Labour, of course, received no share of this fantastic profit, shift wages being $1\frac{1}{4}$ a day. Profits indeed had been mounting since the first quarter of 1770, when 220 tons were sold at a profit of £708. Even after the decline of profits had begun, many quarters up to the first of 1775 showed profits of over £2,000 and outputs of 450-600 tons of

² Notes on an old Colliery Pumping Engine (1791) p.7. by W. T. Anderson.

ore. One interesting fact about the payments of dividends is that several were paid direct to Wilkinson who evidently placed them to the credit of the shareholders in his Chesterfield bank.

The actual mining of the ore was in the hands of four companies, generally making two contracts with the mine owners in each 14-week period. Belland and pippin were each dressed by teams working on contract. Driving headings, too, was a contract job. Only one instance of female labour can be found in this set of accounts — Jane Hole carrying timber. It is obvious from a comparison of the names in the reckonings with the Poor Law certificates now kept in the parish chest, that a large number of the miners were not natives of Ashover. Indeed, since 1700 there had been a continuous migration from the adjacent lead mining areas, particularly from Bonsall into Ashover, supplemented by migrants in smaller numbers from the parishes to the east — Brampton and Wingerworth. In 1758, the year the Gregory Mine was reopened, the settlement certificates record the arrival of eight newcomers to the village and as the certificates in the parish chest almost entirely relate to married men with families, it is probable that there may have been in addition some unrecorded immigration of single men. In addition to the direct labour it afforded to miners, Gregory Mine employed indirectly a large number of persons — coopers, builders, carpenters and blacksmiths. Payments were made to ten men for carting coal; the amounts of coal purchased over a 14-week period ending September 28th, 1771, show the huge appetite of the Newcomen engine — 136 tons from Ainmore, 105 tons from Swanwick, 19 tons from Tibshelf, and 63 tons from Grassmoor. Purchases of timber too were heavy for the stemples, fails and bunnings essential in lead mining. It is also noteworthy that timber underground rails were in use for haulage.

There is a gap in the series of Gregory Mine Account Books 1775-82. However, a note as to the profits made during these years has been found amongst the Overton Estate records in the hands of the Clay Cross Company. This shows that between 1775 and 1778 the partnership

made a profit of over £40,000. A levy of £600 had to be made in 1779 and the next year showed a loss of £725. However, the mine in 1781 was once more profitable.

This gap in the history of the mine can be partly filled by material drawn from a series of letters in the Boulton and Watt Collection. On May 3rd, 1779, Robert Banks Hodgkinson wrote to Boulton and Watt at their Soho Works to the effect that a friend, Sir Harbord Harbord, had described to him the new separate condenser engine recently developed by the firm and wished to be given particulars of it. The next letter came from the mine manager and engineer at Ashover:—

Mr William Milnes Ashover Derbyshire.
May 29 1779. Left by Francis Thompson
at Soho.

Mr Watt.

Sir,

Please to send to Mr William Milnes at Ashover in Derbyshire Your Proposals for Building a fire Engine the Depth of the Mine is 304 Yards Deep and is to lift a pump of 13 Inches 90 Yards deep in the bottom, and house water 50. They only desire to know your proposals for erecting.

Weather you would send Men or Let their Engineer Build for you and also where the Castings is to Come from because their is a Good foundry in Chesterfield and that is near to them for Carriage and how much money you think it Will Cost for they must have one this summer.

I am, Sir Your hble St
Frs Tompson.

In the meantime, Boulton and Watt had written to Thomas Southern to ask him to communicate with Hodgkinson as to the merits of their engine. Southern did as requested, pointing out to Hodgkinson that he had inspected a recent Watt engine on the Navigation Canal at Birmingham, eulogising its high standard of workmanship and its power and making the point that its coal consumption, a quarter of that of the common engine, more than compensated for its much higher first cost. Evidently, there was a division of opinion amongst the directorate of the Gregory Mine as to whether they should buy a Watt or a Newcomen engine. Thompson was pressing hard for the adoption of the latter type, arguing

that experience at Yatestooop with which he was closely connected as engineer, showed its suitability for pumping purposes in lead mining. Southern obviously had no high opinion of Thompson's professional ability, finding him entirely ignorant of the principles on which the Watt engine operated, even after a visit to Soho — "and tho' another person accompanied him both came back nearly as Ignorant as when they Sett off". Southern, with his knowledge of the psychology of the Derbyshire lead miner, warned Watt not to try to hasten matters, but to let events take their course as "I saw Tompson since — who says they are at a stand at Gregory's engine and he expects some plan will be adopted quickly". There is little doubt that there was a serious water problem at Gregory Mine by this time as the Boulton and Watt Collection shows that the old Newcomen engine was working a minimum of 17 or 18 hours a day, making 9 to 10 strokes a minute in summer and 12 in winter. Hodgkinson, however, seems to have been the dominating figure in the partnership, and after he had visited Ashover in August, it was decided to order a Watt engine. On September 11th, 1779, Soho placed its terms before Hodgkinson. They proposed that they should supply "Plans, Drawings and Directions of all sorts for erecting and repairing and working" an engine with a 45-inch cylinder "capable of making an 8 feet stroke in ye cylinder" to be built at the expense of the Gregory Mine Partners. The engine was to be guaranteed not to consume more than 255 lbs. of coal per hour working at the rate of 9 strokes per minute and to be able "to work a pump of 13 inches Diameter and 90 yards high at the rate of 10 strokes of 6 Feet long each in one minute — and shall be able to give the necessary motion to 214 yards of dry rods." As was the usual Soho practice, Boulton and Watt were to be paid a premium quarterly for each 10,000 strokes, counted automatically by a meter on the engine. Boulton and Watt were to have power to remove enginemen who could not work the engine to their satisfaction.

Once the contract had been signed, Thompson was able to push on with his share of the work. The haystack boiler

was constructed on a plan furnished by Watt; a great beam of oak 25 feet long averaging over 30 inches in width and thickness was purchased from the Duke of Portland and slabbed to size; a massive engine house, sunk down 13 ft. in the ground to ensure solidity was constructed and work on the shaft 304 yards deep hastened on. Soho on its part was as usual lethargic in delivery of the components, so that Milnes wrote in July of the following year complaining that they were "not getting forward with setting up the Engine on Account of losing the benefit of this summer Season, for the place where it stands is very cold and bleak. Men will scarcely abide to work at it in the winter time". Probably as a result of this letter, Watt himself visited Ashover in August. However, by September the cylinder and bottom had been erected, but in the next month trouble arose over a missing piston rod which Watt had dispatched via Liverpool and the Grand Trunk Canal to Shardlow and which had not yet arrived at Ashover — a commentary on 18th-century methods of transport. The beam was put up in November, and in the same month Thompson sent drawings of the steam pipe and board models for elbows and angles to the foundry in Chesterfield to be completed. In the following March the condenser was put in, two balance beams installed in the shaft and presumably soon afterwards the engine was started up, as a premium of £67. 8s. 9d. for 1,348,750 strokes was paid — once again by a series of bills — in September. Incidentally, Watt supplied the engine man, John Stratford, a young man of 22, who had just completed his apprenticeship at Soho. The new engine proved a great success using in the first quarter 100 tons of coal as against the 350 of the atmospheric engine. Milnes wrote to Watt in November, 1783, to say "The engine still continues to work exceeding well and the more we see of it the more we admire and esteem it". Indeed for some time there was a proposal to convert the Newcomen engine to a separate condenser engine, but it was continually put off and the scheme was eventually dropped.

Although none of the account books of the Nether Sough Company has been found, it is possible to obtain

from some of Milnes' papers details which supplement the information already obtained from Bonne's letters. In 1759 the mine produced 536 tons of ore. The next three years saw a continuous decline, probably connected with drainage difficulties, as Milnes records that up to 1758 "there was little, if any, hand pumping or Drawing Water by Horses before the Year 1758", whereas by 1762 the charge for horses drawing water was £6. 8s. per week. This problem increased in seriousness over the next few years, and in 1766 Milnes notes that 12 horses, 8 or 9 rag pumps and about 30 pumpers, some working double shifts were employed. However, output 1764-6 improved, almost aggregating 2,000 tons, 95 per cent. of which was sold to be smelted by Twigg and Thornhill and 5 per cent. by Messrs. Wilkinson. The water problem, however, was too much for the syndicate, as Milnes declares "In Jan 1767, pumping by Hand and drawing Water by Horses was given up, the forefield Slope in Overton Vein was then about the Rocky Part in Overton Part". Output consequently fell and less than 300 tons of ore were mined 1767-72. An attempt was made 1772-5 unsuccessfully to work the Overton Vein from Gregory Mine, but all work here was shut down in 1777 as obviously the small amount of ore did not repay the cost of production.

After 1782 a new series of mine accounts is available for the Cockwell Mine. Milnes writes: "In the year 1772 a new partnership was formed and Cockwell Mine was again set to work." This new syndicate was again dominated by Banks and his uncle, R. B. Hodgkinson, who between them owned a third share, and by Twigg, Winchester and Co., the lead smelters, who held a further seventeen shares out of a total of forty-eight. Other odd shares were held by Ashover families, Bournes, Allens, Kirkes, Thompsons, Haslams and Gregories, with a few shares in the hands of outsiders such as Lawyer Manley, Gladwin of Stubbing Court and Gratton the timber merchant of Wingerworth. Barker and Wilkinson contracted to smelt a third of the ore, the remaining portion being sold to the Kelstedge cupola, a situation which lasted until 1788 when Twigg's share was transferred

to Sykes, Milnes and Co. Milnes' memorandum continues, "In 1774 a water wheel was erected to lift the water into Gregory Sough. The lift was 27 yards, the pump 9 inch diameter, . . . After Michmas 1778 Robt Banks Hodgkinson agreed that Overton Mine should be consolidated with cockwell Mine. Ore got before this time 146 tons 10 cwt. Loss to this time £1,965. 7s. 3d. but very little ore got in the Veins about Cockwell." One reason for the financial loss sustained was the expense of driving new levels in the search for ore. In describing the operations of this period Milnes writes that "a level was driven Northwards in a vein called the great rake, till it met with the Toadstone, in which stratum it was continued to an Old Shaft in Birks pasture, afterwards called the blue hillocks, this shaft was then sunk down to the level and afterwards it was sunk 24 yards in the Toadstone below the Level, when the 2nd Stratum of Limestone was discovered." However, the whole project was abandoned on meeting considerable quantities of water. Meanwhile in cutting back the Gregory Vein to the New Engine Shaft of that mine, the Chimney Vein had been discovered, and as it was on the north side of Gregory Vein it was worked by the Cockwell and Overton Mines Partnership. The low copes for ore in the opening reckoning — for the 13 weeks ending September 27th, 1783 — show the comparative ease with which this new vein could be worked:—

| | Tons cwts. | | £ s. d. | | | | | |
|--------------------------------|------------|------|---------|----|---|----|----|---|
| William Twigg & Co. Gettg Ore. | 18 | 10 @ | £3 | 15 | 0 | 69 | 7 | 6 |
| " | 11 | 1 @ | £3 | 10 | 0 | 38 | 13 | 6 |
| George Mather & Co. | 17 | 2 @ | £2 | 10 | 0 | 42 | 15 | 0 |
| " | 20 | 6 @ | £2 | 5 | 0 | 45 | 13 | 6 |

The last two quarters of this year showed a profit of £1,344; the next year with an output of 907 tons made a profit of 3,497; 1785 saw production increased to 1,190 tons with a corresponding increase in profits to £5,387; 1786 witnessed both a fall in output and in profit to 538 tons and to £1,587; the next year saw a slight recovery to 619 tons and to £2,571 profit. Probably profits over the next three years, approximately at the 1787 figure,

might have been much larger if the attempts made at discovering new veins had not proved abortive. The level in the Toadstone previously mentioned was driven further northwards in the attempt to locate the Second Limestone. Here, a shaft was sunk in 1785 through and below this level, but it proved impossible to discover a new vein. Another level was then driven from the bottom of this shaft 150 yards south-eastwards, but again, despite more boring and driving across, the Second Limestone was not found. Milnes then continues in his memorandum: "The next plan was to return to the Blue Hillock Shaft and about 20 Yards North of this shaft a rising gate out of the level was driven eastward about 18 yards and there a Turn was sunk about 26 Yards in depth which reached the 2nd. Limestone and then about 2 Yards in the Limestone was sunk and that height driven off about 6 yards eastwards, but no vein was discovered."

Woodhead Mine had, in the meantime, been opened by a partnership almost entirely owned by the Gregory family. The accounts for this mine are unfortunately fragmentary. In 1784, it produced 80 tons of ore, but the next year was not so successful, output falling to 71 tons. The next year was even worse, the mine only producing 34 tons. The accounts for 1787 and 1788 are missing, but those for 1789 show that only 16 tons were mined.

During these years, Gregory Mine had been declining both in output and profits, though the real depreciation had been somewhat masked by a rise in lead ore prices towards the end of the period — output which in 1783 had been 1,249 tons had declined gradually to 970 tons in 1788 and profits had dropped in a similar fashion from £4,192 to £2,472. Working costs had risen as the mine had penetrated further under the escarpment towards Holestonegate Road, the miners having to descend the climbing shaft and then walk over half a mile to the face. Similarly, ore had to be brought back to the gear shaft, hauled to the surface and be dressed on a site nearby, water for which was provided by sinking a shaft above the gear shaft. Moreover, the profits of Gregory Mine had been inflated by an agreement made in 1785

with the proprietors of Cockwell Mines, whereby "in consideration of the two Fire Engines which belong to Gregory's Partnership — it was agreed and thought reasonable to allow the Proprietors — 7/- per ton as a composition for all ore that is got — and drawn up Gregorys or Overton shaft" — a contract which brought in £238 in 1789.

In 1789, Gregory Mine became from the standpoint of the partners, a liability. The first quarter of that year showed the usual profit, but a decline in production from 228 tons to 76 tons in the second quarter turned this profit of £811 into a loss of £158. It is apparent from the accounts that the vein had become much thinner and that heavy expenditure had been incurred in driving the level forward to find richer ore. To meet this changed situation, the lord's cope was lowered to an eighteenth, but even so the whole year's working showed a loss of £45, which by the following June had grown to £308. The partnership met the changed situation by a levy of £12. 10s. on each share, which brought in £550 to finance the mine. It was also decided to sink another shaft called the forefield shaft 258 yards west of New Engine Shaft, with the motive of cutting down underground haulage costs and of opening up new veins of ore, the majority of copes now being in the region of £6 a ton. This shaft was for that period a difficult task, as 60 fathoms of gritstone, 73 of shale and 19 of limestone had to be penetrated, so that it was not completed until 1795 at a cost of £5,000. These years were however for the shareholders, a period of unrelieved gloom, output continually falling and losses growing, together with frequent levies of additional capital to finance the sinking of the forefield shaft. Of course, in the case of Hodgkinson and the Bournes, these losses were somewhat mitigated by the payment to them of a large share of the lord's cope.

One of the few letters in the Twigg Collection written at the end of the century, refers to this collapse of Ashover lead mining. This is an undated letter from John Twigg to his uncle at Paisley. It can, however, be dated by its reference to the death of R. B. Hodgkinson and to the impending war to the year 1793. John Twigg writes:

“The proprietors of Westedge Mine is just going to erect an Engine as they find it quite impossible to give it a fair tryal without. Fallhill Mine is in arrears of upwards of £ — this mine is overdone with water the mine has been drowned out for near two months Gregory’s Cockwell Mine still keeps going the wrong way, so you may judge what situation we are in Ashover.” Information about Westedge is unfortunately small, but this mine appears to have been started at this time, as the following statement occurs in an account book kept by the Rev. L. Bourne: —

1792 5th of FEBRUARY

| | | |
|---------------|----------------------------------------------------------------------------------------------------------------------------|---------|
| | Paid Mr John Milnes of Ashover for my 12 th share of the first assesement made for defraying the expenses of Westedge Mine | £20 |
| July 30 | Paid to a second assesement | ... £20 |
| Oct. 13 | „ third „ | ... £20 |
| Dec. 31 | „ fourth „ | ... £40 |
| 1703 April 24 | „ fifth „ | ... £20 |

Another mine in difficulties was Ravenstor. This had been refinanced by a new partnership in which the chief shareholders were the Gregory family, the Banks — Hodgkinson group, the lead smelting firms of Barker and Wilkinson and Sykes, Milnes and Co., the odd shares being held by other Ashover families. The mine must have been from their standpoint a complete failure, as the sales of ore to Sykes, Milnes and Co. were minute — in 1792 they totalled only four tons. By May 3rd, 1794, Ravenstor had lost £77 in addition to £360 of invested capital. Cockwell too made its first loss in the September quarter of 1793. The subsequent years were disastrous as a profit was only made in a single year (1799) — and that was but £9. Production fell slowly but surely from 182 tons to 37 between 1794 and 1800. Working was concentrated in the Chimney Vein east of Holestone Road but this became “divided by riders or flown into strings”. A cross vein was discovered several fathoms below the top of the limestone and was followed in a rising direction until it disappeared on reaching the shale. As a result it was decided to abandon Cockwell

and to concentrate on Overton. Although a profit was made 1802-3, compared with those of former years it was miserable in amount — £213.

When the sinking of the forefield shaft at Gregory Mine had been completed, Francis Thompson erected a whimsy engine. The material for this was supplied by local firms — the boiler plates came from Charles Hurt's Morley Park plant, castings from Smith's Griffin Foundry at Brampton and other material from Butler's furnace at Wingerworth. Despite this introduction of steam haulage, the discovery of a new vein on the south side of Gregory Vein and the working of the old hillocks for ore, Gregory Mine remained a failure — during the March quarter of 1798, Henry Ludlam and Co. produced 52 tons of ore at a cope of only £3. 10s., but nevertheless the shareholders had to make good a loss of £127. Naturally an attempt was made to mend this by driving new levels, by driving in the old forefield vein and by deepening the whimsy shaft and then opening up new levels. As a result, despite a great increase in the price of lead to £17 a ton, heavy losses were incurred and frequent levies had to be made on shareholders.

It was the hard fate of Boulton and Watt to receive little but enmity from the mineowners they so much benefited. With the decline in the fortunes of Gregory Mine recrimination set in between Soho and the Milnes, the latter accusing Watt of falsifying deliberately the readings of the engine counter. When Watt investigated the matter he found that the Thompson brothers had been interfering with the engine, so diminishing its efficiency — as it was reported to Soho "Tompson's brother works at new engine and makes all the mischief he can. Frank Tompson took off ye cylinder head & advised it long ago". The cylinder head had even been filled with horse manure to check steam leakage. The engine too was being overworked, pumping night and day, as the old Newcomen engine was not drawing all the water, some of which was running back to be pumped again by the Watt engine. The purchases of coal from Swanwick in the December quarter 1791 reflect the seriousness of

the situation as the old engine during these months consumed 400 tons of coal and the Watt engine 300 tons. The inevitable result was that the engine worked badly and Stratford had, to quote Milnes, "an uncommon slavish life" until the purchase of a new cylinder from Wilkinson of Bersham installed by engineers from Soho made the engine once more efficient. The quarrel was embittered by Stratford's demand for a higher wage than 12/- per week and a house in return for the overtime he had put in, but in December, 1792, Milnes made a long overdue payment of the premium to Watt. Good relations were resumed but it is noticeable that on the expiration of Watt's patent in 1800 a Thompson replaced Stratford at the New Engine.

Several meetings of the partners were held, a new manager was advertised for and consultants were called in, but no policy was decided upon. The end of Gregory Mine came in 1803 when the spring supplying the Watt engine failed, so stopping the engine, allowing the water to rise.

At Christmas, 1803, Milnes notes that a new partnership was formed to work both Gregory and Overton Mines. In this were all the former shareholders, newcomers being Bache Thornhill and Richard Arkwright. Expenditure was concentrated at Overton where two new shafts were sunk, many new headings driven, many turns sunk and much driving across carried out.

The steam engines at Gregory Mine were but little worked during the next three years, probably because the forefield vein now in process of extraction in the direction of Carolina, west of the scarp face, had narrowed down to four or five feet in width and was, to quote Milnes, "chiefly filled with dog tooth spar with no regular carriage of ore". Probably another discouraging factor was that the vein dipped rapidly as it was mined further to the west and although little water was actually met with near the forefield shaft, the fact that the workings were below the level of the Derwent at Matlock Bridge may have presaged drainage trouble in the future. In any case, cope in this vein had risen to £12 a ton and as output was small — 46 tons in 1805 — the small

profits realised in that and the following year were only due to the fact that lead was selling at the exceptionally high price of £40 per Hull fodder. Milnes is very condemnatory of the standard of management during these years, accusing it of being lacking in geological knowledge and of not working to any definite plan of development. Finally, in 1807 all the mines were shut down, apparently because the partners could not agree to any plan of keeping them clear of water. There is a strong tradition in Ashover that it was one of the Wilkinson interest of Chesterfield who was finally responsible for the peremptory stoppage of mining operations. However, all the engines were dismantled, the whimsey being sold to Woolley and the two others to Westedge. A cope book belonging to the Bourne family shows that this mine was extremely profitable in the winter and spring quarters 1806-7, but the mine closed down on Lady Day 1808, as a result so local tradition asserts, of a bitter quarrel between the two brothers Milnes. So ended the great era of Ashover lead mining. Lead smelting continued at the Stanage cupola of Sykes, Milnes and Co. but the Chesterfield-Stockwith Canal statistics show the great decline of activity even in this sphere. At the turn of the century, 1367 tons of lead were transported on this canal. By 1820 lead shipments had declined to a mere 58 tons. The available statistics end at 1826, but these show comparatively little recovery in lead traffic, 105 tons being carried in that year.

The collapse of the Ashover lead mining industry could not occur without baneful economic effects. Some indication of this may be studied in the Poor Law Accounts. Between 1790 and 1808 the amount paid out by the Overseers doubled; before Waterloo it had doubled again. This continual increase continued until 1820, when no less than seven times the 1790 figure was expended. The situation became so serious financially that although the statutory overseers were still elected, the totally illegal office of permanent overseer was created and William Basset was selected for it at a salary of £25 a year. His accounts are full of payments to men and girls "out of employ". The vicious Speenhamland system

of making up wages was also adopted, Basset often making payments on the ground "his wages very small". Work on the roads was used as a method of dealing with the able bodied poor and the Vestry passed a resolution that "any person being out of work and wanting relief from the parish to be employed on the Highways as much as possible". An equally pernicious system, the roundsman system, was also in use in Ashover. In 1817, the Vestry ordered that paupers should be taken off the roads and that they should be employed by farmers, the parish paying them a wage of 3/- each, together with an additional 1/9 for a wife and each child. Although a note attached to this declares that "this order was never acted upon", in fact Basset's accounts show that paupers were employed compulsorily by farmers at the rate of 1/2 a day without victuals. Basset, too, spent a very considerable time trying to find work for the unemployed — his expense account shows him visiting the Strutt mill at Milford, Unwin's mill at Sutton, Litton, Cressbrook and Holloway mills in this search.

The economic effects of this collapse of the staple industry took a long time to work themselves out. Even as late as 1841, when the "workhouse test" was introduced by the recently formed Chesterfield Union, it is obvious that pauperism was a more obstinate problem in Ashover than in the other villages of that Union. As a high percentage of the expenditure was on old people, it is highly probable that there was a good deal of emigration from the village, a supposition supported by the fact that the census of 1831 shows that there were more uninhabited houses in Ashover than in any other place of comparable size in the neighbourhood.

A SHEFFIELD BUSINESS PARTNERSHIP, 1750-65.

By G. G. HOPKINSON, M.A.

THE names of John Fell, of his second wife, Madam Fell, and of her trustee, Richard Swallow, all of whom were associated with Attercliffe Forge, are familiar to most persons conversant with the history of Sheffield. However, printed information as to the business activities of Fell and Swallow is scanty¹ and it is the aim of this article, based upon their journals and ledgers, to show what part they played in the economic life of Hallamshire and north-eastern Derbyshire in the middle of the 18th century. That theirs was an important part is made apparent by both the Yorkshire and the Nottinghamshire and Derbyshire journals, which show Fell and his partners leasing blast furnaces at Chapelton, Staveley, Whaley, Foxbrooke and Kirkby; forges at Roche Abbey, Wadsley, Attercliffe, Staveley, Carburton and Clipstone; slitting mills at Renishaw, Attercliffe and Rotherham; and finally steel furnaces at Attercliffe and Ballifield. It is obvious that such a large-scale business unit, with the demand for raw materials which it of necessity entailed, together with its demands on transport for moving quantities of heavy goods, must have been an important factor in the economic life of the Sheffield region at this time.

Fell, in addition to acting as what might be termed managing director of the concern, provided funds for ten out of the thirty-two shares into which the partnership was divided, in respect to its South Yorkshire interests. The Nottinghamshire and Derbyshire iron works were financed separately, Fell here holding three out of a total of eight shares. The steel concern, too, was a separate company in which Fell owned five-eighths of the shares. His other partners in the latter business were the executors of his brother-in-law, Gamaliel Milner, and Mr. Clay of Bridgehouses. These also had interests in the Nottinghamshire and Derbyshire company, together with the Rev. John Simpson of Stoke Hall, Derbyshire, and of Babworth, Notts. (a son of John Simpson of Renishaw, who had been one of the active partners in the business in the first quarter of the century), and Mr. Horton, who, however, sold his eighth share to Fell in 1759. This group, too, provided most of the capital for the South Yorkshire iron works except that John Spencer of Cannon Hall, the last in the direct line of the famous family of Yorkshire ironmasters, held five shares. Another partner in the group was John Watts, of Barnshall, Cawthorne. Fell drew a salary in addition to his share of the profits, based upon each constituent furnace, forge and slitting mill in operation. After his death in 1762, Fell was succeeded in control of the business by Richard Swallow, who, as the

¹ See Raistrick, A., and Allen, E., "The South Yorkshire Ironmasters, 1690-1750", in *Economic History Review*, Vol. IX; and Raistrick, A., "The South Yorkshire Iron Industry, 1698-1756", in *The Newcomen Society Transactions*, 1938-9.

journals show, had formerly been in charge of the supply of charcoal and in looking after the sale of timber from the various woods bought by the group. Swallow then proceeded to buy an interest in the three distinct companies into which the holdings were separated, as may be seen from the following verbatim extracts from the journals.

| | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----|----|--|--|
| Mrs Fell is Dr to Richd Swallow Acct in Partnership for 1/16 part or 2/32 Shares of Stocks in the Severall undermentioned Works which she Sold to him as by an Acct drawn out Ending at Midsummer 1762 being as the Stocks then Stood when the Books were Ballanced. D.N. Works, ² Roach Abbey Forge & Barnby Furnace | | | | | |
| Good Stock | £774 | 11 | 7½ | | |
| 1/16 part of £1191 18 4½ bad debts | 74 | 9 | 10 | | |
| Steel Trade 1/16 part—Good Stock | 118 | 8 | 9 | | |
| 1/16 part of £138 14 10 bad debts is | 8 | 13 | 5 | | |
| Founders 1/16 part of D.N. Stock | 175 | 10 | 0 | | |
| 1/16 part of £992 0 2½ of Bad Debts... .. | 62 | 0 | 0 | | |

The above extract is taken from the Yorkshire Journal; the one quoted below is taken from the corresponding Nottinghamshire and Derbyshire Journal.

Mrs Fell is Dr to Richd Swallow Acct in Partnership for 1/16 part of Stock in the Severall Works in Derbyshire and Nottinghamshire which she sold to him as by an Acct drawn out Midrs 1762 then Ending & According as the Stocks then Stood when the Books were Ballanced.

| | | | |
|----------------------------------------|------|----|----|
| 1/16 part of Good Stock | £633 | 12 | 6½ |
| 1/16 part of £977 7 3 bad debts | 61 | 1 | 8½ |

However, in 1765 Mrs. Fell and the other partners sold out to a new company in which Swallow, Clay and a newcomer, Mr. Younge, each invested £2,648 to purchase the ironworks in Nottinghamshire and Derbyshire. It is apparent from these figures that this business was not making any progress as the capital invested in it in 1750 had been over £10,000 and when Horton had sold out in 1759 his eighth share had been bought by Fell for £1,280. After 1765, Clay took over Swallow's functions in these two counties.

The original company leased Chapel Furnace from the Duke of Norfolk at a rent of £40 a year. Iron ore was mined (the accounts include payments for pit-props and for drainage soughs) at Thornes and Hollin Delph on land rented from Lord Rockingham. As was the usual practice throughout the whole of these Journals, more was paid for winter than for summer

² i.e., Duke of Norfolk Works. These included Chapel Furnace and Wadsley and Attercliffe Forges. Barnby Furnace had been rebuilt by Mr. Cotton in 1686 at a total cost of £111. The accounts of Wm. Battie in the Bateman MSS. at Chatsworth show it to have been rented to the Spencers in 1754 for £11.

transport of ore to the furnace. The ore was then washed, riddled and stone thrown out. As there are no payments for limestone, it was evidently not used here, apparently a not unusual feature in the South Yorkshire industry.³ The furnace was blown by a water wheel and in 1759 and in 1761-2 serious difficulties were encountered as a result of water shortage. The furnace came into blast in the autumn and continued in blast until the late spring when a feast was provided for the furnace men. As an example, in 1760-1 the furnace was blown in on 26th November and was blown out on 21st June, producing in that period 424 tons of pig iron, for which the founder, George Procter, was paid at the rate of 3s. 4d. a ton. A certain amount of casting was done direct at the furnace of articles such as grate bars. One item of interest in the furnace accounts is the importation of small quantities of Cumberland iron ore via Hull and Rotherham in 1759. Cumberland iron was esteemed as it was very easy to work when hot, but when cold was "exceeding tough" and was used "for all kinds of ware that requires to be punch'd (or) bended".⁴

The Nottinghamshire and Derbyshire Company leased four furnaces—Staveley, Foxbrooke, Whaley and Kirkby. Foxbrooke had been a highly productive unit in the early years of the century, but when a lease was made out between Francis Sitwell and John Fell in 1749, the furnace was described as "now ruinous and in Great Decay". In fact, the lease empowered Fell to convert the furnace into a sicklewheel and the Journal shows that this conversion was carried out.⁵ Kirkby Furnace was on an estate belonging to the Duke of Portland, but although occasional repairs were done to it, the furnace was never in blast during these years. Kirkby had been built by Humphrey Jennens of Eardington Hall, Warwickshire, the great Midlands ironmaster,⁶ c. 1673, but when it came into the hands of the Fell partners is as yet uncertain. Whaley on the borders of the two counties, was put into blast in 1752-3, Henry Clay the founder being paid for 259 tons of pig. To put this furnace into commission again had been a costly business, as in addition to a new hearth, bellows had to be brought from Staveley and, much more expensive, ore transported from Brimington Moor at a cost of £122. Whaley was, however, well situated for supplies of charcoal, the bulk of which came from across the county border from Rufford. Whaley was again in blast in 1755-6, but the next year's blast, when 63 tons was made, is the last to be mentioned in the accounts. The new partnership had no use for it, handing it back to its owner, Lord Bathurst, in 1769 and making a payment to him in lieu of repairs.

3 See "Blast Furnace Construction and Costs in 1740", by H. G. Baker, printed in *The Newcomen Society Transactions*, Vol. XXIV.

4 Quoted from a document evidently dealing with the proposals to abolish duties on American iron in the Spencer Stanhope MSS.

5 There is a copy of this lease in the Spencer Stanhope MSS.

6 This contract is amongst the Portland MSS at Shire Hall, Nottingham.

Staveley was an almost ideal site for a furnace. The Rother and the Handley Brook provided plenty of water to drive the wheel, ore was in plentiful supply in Staveley, Brimington, Whittington Moor and in the woods around the old Foxbrooke Furnace, and there were many woods around to provide the necessary charcoal. The early history of this furnace is at present rather obscure. The earliest Survey of Staveley at Chatsworth—that of 1639—records the existence of the furnace, but unfortunately fails to give any details of ownership or rent. The forge is mentioned in the Staveley Constable's accounts of 1643-4. According to Swift⁷, both Forge and Furnace were leased by William Clayton of Whitwell from 1665 to 1670, together with Foxbrooke. Swift then continues, "Robert Sitwell was Tenant to the Countess of Holderness for the Forge and Furnace being part of the demesne lands of Staveley. The Countess died February, 1690, and then the rents belonged to Colonel Culpepper. Sitwell paid £90 a year for the forge and furnace and left about 1690". After his death, Sitwell's heir, Swift says, took over the concern. Swift then continues, "John Hayford took it and came to dwell at Stayley House". It is, however, probable that it was leased by John Jennens of Eardington Hall in 1693,⁸ possibly in conjunction with the Heyford family, as a note in the Spencer Stanhope Collection in reference to Staveley, points to a dissolution of a partnership, with Jennens taking Wingerworth Furnace and New Mills Forge.

Ore for this furnace was mined and, before transport, was burned with both coal and coke. Women, according to the accounts, were employed to throw up the ore at the furnace. As at Chapel, the furnace was in blast during the winter, although it made one unusually long run from 24th October, 1758, to 10th April, 1760, during which time it produced 991 tons of pig. Castings were minute in quantity—in 1762-3, for example, 60 hammers were cast together with 1 ton 14 cwt. of country castings. As in the case of the other furnaces in the partnership, sales of pig outside the forges belonging to the group were small.

More important than the supply of ore to the furnaces was that of charcoal—at least, when judged by the space given to it in the Journals. To meet the big demand for this fuel, the group bought both standing timber and also supplies of charcoal. In Yorkshire, so the accounts reveal, the development of the Walker interests drove up the price of cordwood by 3s. 6d. per cord and in 1760-1 the partners were paying prices for timber in Houghton Park, Skyers Spring and other woods owned by Lord Rockingham, which were well above their agents' valuations, with the deliberate intention of keeping the Walkers out of "his Ldships Woods &

⁷ Amongst Swift's Rough Notes in the Jackson Collection in Sheffield City Library, evidently taken from contemporary MSS.

⁸ Nottinghamshire and Derbyshire Notes and Queries, Nov., 1894, p. 146.

Ironstone as they had Erected Works in opposition to Mr. Fells Works & other Ironmasters". Relations between the two firms had probably been strained when the Fell group had to give up their rights at Rotherham Mill to the Walkers and transfer equipment to Attercliffe, where a considerable amount of its capital value had to be written off. Certain areas of woods were cut almost continuously. In Yorkshire, the Duke of Norfolk's Pryor Wood, the Marquis of Rockingham's Edlington Woods, Lord Scarborough's Maltby Woods and Lord Galloway's Salby Woods were all felled heavily during these years. The Nottinghamshire and Derbyshire Journals show heavy falls at Clumber, Thoresby and Winkeburne, all at a considerable distance from the area where the iron ore was mined in Derbyshire. Richard Swallow handled this very important side of the group's business. In Yorkshire, timber valuations were done by John Brook, who also supervised the felling of the timber and the sale of bark to tanners after it had been peeled from the trees. Sales of surplus timber were also arranged with other merchants and pit-props and baskets made for Chapel Furnace and ironstone pits. Coaling the wood was in the hands of seven colliers—presumably in charge of other men—paid on output, and the accounts are full of expenses involved in leading dust and cover to the woods and in moving hurdles and shields to regulate the draught in the woods while making charcoal. These expenses were charged up each financial year to the individual furnaces and forges in accordance with the amount of charcoal actually used. There are references in the accounts to measuring charcoal carts and to sack money, so it may be assumed that pack horse transport as well as carts were in use. Although the heaviest falls of timber for the Nottinghamshire and Derbyshire group of works were in the former county, there was a considerable quantity of charcoal made in the woods to the west of Staveley, particularly in the region between the Barlow Brook and the River Drone—Cobnar, Brierley and Monk Wood were all heavily felled between 1751 and 1759. There are a number of contracts in the Portland MSS.⁹ referring to these woods. A typical example is a contract between Margaret, Duchess of Portland, and Alexander Barker of Edensor, and John and Jonathan Bromehead of Eckington, whereby they were to fell Cobnar and Copy Woods, except for 6,220 wavers. The lessees were to have the right to make saw pits and charcoal pits and also the right to erect kilns for making charcoal and drying white coal—the latter for use in lead smelting mills. On their part the lessees undertook to clear 124 acres of timber before the end of 1765 and to sell to the Fell partners not more than 600 cords at nine shillings a cord. A few payments of turnpike tolls—notably from Wales—are recorded in the Journals, but it is safe to say that the greater part of the charcoal supplies in the area came by packhorse over unturnpiked routes. There

⁹ At Shire Hall, Nottingham.

can be little doubt that the expenditure by the Fell partnership on cordwood must have been of great importance not only to the great magnates such as the Dukes of Portland, Norfolk and Kingston, but also to the ordinary minor gentry such as the Staceys of Ballifield and the Rodes of Barlborough. Both had good reason, apart from their value for sport, for keeping—as the estate books have it—their woods “in hand”. Indeed, the iron industry in its every aspect was a great source of wealth to the land-owning classes. A calculation amongst the Spencer-Stanhope Collection in a paper dealing with the importation of bar iron from America asserts that “It may be conjectured that for every tun of rod iron sold in Yorkshire Gentlemen Gain £5”, made up of £3 18s. 0d. from cordwood, 3s. 6d. royalty on ironstone and the remainder pit coal used in the slitting mills.

One of the most important technical developments in the 18th century was the discovery by Abraham Darby I of the process of smelting iron ore with coke to replace the fast diminishing supplies of charcoal. There can be no doubt that this problem was affecting the Sheffield area and that the supply of pig for the forges was becoming steadily more difficult. In 1661, there had been in Derbyshire a furnace at Stretton, a forge and furnace at Wingerworth, another forge and furnace at Staveley, another furnace at Barlborough and ironworks at Norton and Pleasley.¹⁰ The list is plainly incomplete in that it omits the furnace at Barlow, blown in for the first time in 1605¹¹ and transferred to John Jennens in 1693 by John, Earl of Clare, in exchange for Kirkby Furnace,¹² together with its associate forge at Dunston and the Sitwell Furnace at North Wingfield.¹³ The Stretton furnace seems to have been shut down before the end of the 17th century; there is no mention of any furnace at North Wingfield in Fuller’s list of 1717; the furnace and forge at Barlow do not appear on this list either; Wingerworth Forge was certainly closed before 1750; Norton ironworks, too, seem to have been shut down, as they are not included in Fuller’s list. Other plants shut down by the middle of the 18th century included, in addition to Foxbrooke, Kirkby and Whaley Furnaces previously mentioned, the forges at Cuckney and Clipston in Nottinghamshire. As the Yorkshire Ledger of the Fell partnership records the fact that foreign pig was both scarce and expensive in 1762 at a time when the group had a number of furnaces out of blast, it is fairly conclusive evidence that there must have been some physical check to their use, which can only have been limitations in the supply of charcoal. Another proof of the shortage of pig for the

10 A Breviate of the Survey of the 31 townships within the Hundred of Scarsdale, 1641-61. D.D.P. 59.21. Shire Hall, Nottingham.

11 *The Reliquary*, Vol. 21, p. 9.

12 Barlow Leases, No. 76, Portland MSS., Shire Hall, Nottingham.

13 *Journal Derbyshire Archaeological Society*, Vol. X, p. 33.

14 Pamphlets—on the Bill for taking the duty from Imported American Iron in Wharcliffe Muniments, Sheffield City Library. Amongst these is a list of forges which, although undated, presumably refers to the situation of 1750. Wingerworth Furnace was, however, still in blast in 1778 as a charcoal furnace.

forges is seen in correspondence relative to the duties on American iron when Sir Lionel Pilkington and Mr. Wilkinson of Boroughbridge asked the Sheffield ironmasters for their views on this important subject. Broadbent, one of Fell's best customers, replied that although he himself was a furnace owner, "I believe the Introduction of Pigg Iron duty free would be the least national mischief—I sincerely wish it to take effect", on the ground that the abolition of duty on American pig would give the forge masters another 30,000 tons of iron a year to manufacture. Cockshutt, of Wortley Iron Works, who incidentally was sent to London as the Sheffield representative on this matter, wrote very much to the same effect.

"17 Feb 1749.

"The only thing that seems likely to be of service to this Nation and likewise to the plantations, will be to encourage their making pig iron so as to Destroy the furnaces in England and consume the wood now used by them at Forges in Making American pig iron barr Iron by which Means this Nation will be able to Make Near double the quantity of Barr Iron it dose at present and by properly Mixing the hard and soft american pigg Iron together May Make Sorts of Iron More Nearly resembling Sweeds Iron which would enable this nation to do with less Sweeds Iron by ten or twelve thousand tons yearly and to take from the plantations between thirty and forty thousand tons of Pigg Iron Yearly."

The solution to the difficulty of increasing supplies of iron to the forges came, however, not from increased imports, but from a technical development, of which no mention is made in this correspondence—the smelting of ore by coke, first put into large-scale commercial use ten years later by a Sheffield ironmaster at Carron in Scotland. The Journals and Ledgers show the Fell group unsuccessfully attempting to introduce the new method at Staveley and Chapel. In the 1759 Yorkshire Journal occurs the following entry:

| | |
|---------------------------------------------------------------------------------------|--------|
| allowd Henry Clay going to Colebrook to learn how to blow with Ground Coals | £1 7 6 |
|---------------------------------------------------------------------------------------|--------|

In the same account follows:

| | |
|--------------------------------------------------|--------|
| Mr Allen Pitt Coals & for carriage & Coaking ... | 25 0 0 |
|--------------------------------------------------|--------|

The next half year's accounts include:

| | |
|---------------------------------|---------|
| Mr Allen Coals & Coaking | 25 6 10 |
|---------------------------------|---------|

At the end of the year the inventory records £50 worth of coal and coke so that it may be assumed that charcoal was the sole fuel used that year. The Journal shows that in this year—1759-60—the furnace was in blast for 26 week 3 days, in which it produced 277 tons of pig, with a charcoal consumption of 36½ seam per ton of iron made, an unusually bad performance, explained in the Ledger as due to "Water short all this blast

makes the Yield run so deep and such a bad Acct". Indeed, Henry Clay the founder received £5 5s. 0d. extra pay for this reason. Coke was certainly not used the next year when the furnace put up a far better performance, 424 tons being made in 29 weeks 5 days, with a charcoal consumption of 26½ seam per ton of pig. However, an entry in the 1761-2 Journal shows a further purchase of coke:

| | |
|----------------------------------------------------|---------|
| Mr Allen 141 dozen Coals Coaking at 8d per day ... | £4 14 0 |
| Mr Allen Carr 231 dozen at 9d | 8 13 3 |

Proof that coke was used this blast is to be found in the entry to the effect that George Procter was paid £1 "for blowing with coals". Baker¹⁵ points out the failure of this new process at Chapel. "During its life of 23 weeks and 4 days the furnace was laid off on three occasions for feying or cleaning; the daily output was a trifle over the average, while the consumption of charcoal—neglecting the mineral fuel—was normal. The run of the furnace was the shortest recorded; the consumption of ore the highest per ton; and the fact that the furnace was rebuilt at a cost of over £220 suggests that the use of mineral fuel was not a success."

The new process was also tried out at Staveley in 1764-5 when the Ledger records the fact that "part of the Stone (was) Burned with coaks". Unfortunately, the books do not always give the length of blast and it is omitted for this particular year. Here, too, smelting by coke cannot be regarded as a success, as the Ledger account for 1766 mentions that "The stone (was) all burned with brays". Although there is no indication of heavy repair bills, ore consumption was distinctly above the average per ton of pig made and charcoal consumption—again neglecting the coke—little better than the years in which charcoal alone was used. It is very doubtful if this process was again attempted at Staveley and in the final valuation of 1783 when the new company surrendered the furnace to the Duke of Devonshire, coke does not appear at all.

It is impossible to assign any definite reason as to the failure of this process at Chapel and Staveley, without further knowledge of the type of coke used and the design of the furnaces in question. It may be, as the Walkers discovered when they were experimenting with this process about the same time, that the contemporary furnace was not tall enough and needed increased height.

The forges of the group took almost the whole of the make of pig. Normally, the pattern of distribution was that Roche, Attercliffe and Wadsley took the Chapel pig and Staveley and Carburton Forges took that made at Staveley. However, there were inevitable variations in this pattern, pig from Derbyshire often being sent to the Yorkshire forges, which often,

15 Amongst H. G. Baker's notes in Sheffield City Library.

too, bought heavily from the associated Spencer furnace of Barnby. None the less the group found itself totally unable to supply its own needs with the result that it was essential to buy what the Journal terms "foreign metal". As an example of these diverse sources of supply, Attercliffe Forge in 1754-5 took 107 tons from Chapel, 81 tons from Barnby and 45 of imported pig. This latter came down the river from Hull to Tinsley in the case of the Yorkshire forges and to Bawtry for Carburton and Staveley. The foreign pig was imported by Mr. Sitwell and Company and by Jukes and Company of London, both of which firms were well known in the Sheffield region. It is noticeable that the imported pig was purchased at a higher price than the English made iron—as an example, in 1752-3 the group bought pig from Sitwell at ten shillings a ton more than they paid the Walkers of Masborough, and their charge was five shillings a ton more than the price of Staveley iron. References show that Sitwell was importing Baltimore iron, a type which well suited the Sheffield trade, as it was of a soft nature and was agreed to be a good substitute for English iron. A fair amount of scrap was also imported via Hull for all the forges. Of course, the Seven Years' War sent prices higher and the Nottinghamshire and Derbyshire forges were paying £2 10s. a ton more for imported metal than for pig from the group's furnaces, another proof of the restraint put upon the industry by restricted supplies of charcoal.

The forges when first sited had been well placed as regards the furnaces. The complete closing down of Kirkby Furnace and the intermittent production of Whaley, however, seem to have made Clipston Forge uneconomic. It was also old, as a deed in the Portland MSS. mentions flooding from the lower forge pond in 1664. The lease was surrendered in 1769-70 and a money payment made to the Duke of Portland in lieu of repairs.

Most of the pig made at Staveley Furnace went to the nearby Forge, situated near the River Rother. A considerable amount of capital expenditure was undertaken here in the years 1762-5, when a new cut was excavated, a new weir constructed and new roads built. The forge was well situated as regards fuel supplies. The bulk of the charcoal came from across the county border—from Rufford, Birkland and Winkburne—but appreciable quantities of forge charcoal came between 1750 and 1756 from Frith Wood, Brierley Wood, Monk Wood and Lounds Wood, within easy reach of the Forge. Staveley Forge was, however, a large-scale user of coal, which was at this date coming into greater use in forge processes as a result of the shortage of charcoal. The bulk of this came from pits owned by the Bowden family of Clowne, but the site is not mentioned. Other supplies came from Coal Aston and Dunston. Coal from the last place was brought to Staveley by pack horse, as the Journal quotes it in horse loads.

Carburton Forge, if rent is any criterion, was a more important forge than Staveley, as the partners paid the Duke of Portland an annual rent of £130 as against £40 a year to the Cavendish family for Staveley. There had been a forge at Carburton at the time of the Restoration, but it had been abandoned. A deed amongst the Portland MSS. records the rebuilding in 1695 by John Wheeler of Woolaston Hall, Worcestershire, but apparently he gave it up, as another unexecuted deed of 1703 naming John Neale, iron merchant of Mansfield Woodhouse, assigns to him the Forge for seven years at a rent of £44, together with 500 cords of wood for charcoal at eight shillings a cord, as well as Kirkby Furnace at a rent of £10. The Spencer Stanhope papers show that Carburton was being worked in 1701 by one of the Spencer partners and it was probably through this partnership that it was leased by the Fell group fifty years later. The inventory for Carburton shows that the forge consisted of a chafery, a finery and a smithy. Probably, on account of its proximity to charcoal supplies, Carburton did not use coal on anything like the scale shown in the Staveley Forge accounts.

Forge iron, unlike pig, was sold in large quantities outside the partners' own works. Payments in the Journals for transport indicate that a considerable amount of the production of both forges was sold to scythesmiths—a typical extract from the Carburton accounts of 1763-4 is as follows:

| | | | | | |
|------------------------------------------------|-----|-----|-----|-----|---------|
| Matthew Webster Carr 51 T 18 C Iron to Scythe- | | | | | |
| smiths at Sundry Prices | ... | ... | ... | ... | £25 6 1 |

Extra payments were often made for winter transport, as in the case of the above-mentioned Matthew Webster, who was paid £2 10s. more "Corn being dear and roads bad". From the Ledgers, it is possible to show who the customers of these two forges were. The biggest purchaser was George Inkersall of Hackenthorpe, who was at the end of this period buying over £1,000 worth of iron a year. Other large-scale purchasers were Thos. Biggin of Norton, Hutton and Booth and Robert Turner, both located at Ridgeway, and Edward Osborne of Greenhill. However, almost all the edge-tool makers in the area were customers of these two forges, and such well-known names locally as the Gillotts of Woodseats, the Fields of Eckington Marsh, the Biggins of Little Norton, the Staniforths of Hackenthorpe and Snowden Lane, the Mullins of Ford, the Littlewoods of Handley and the Booths and Hobsons of Mosborough, all appear in the Ledgers. Carburton, as has been mentioned, sold part of its production outside the Sheffield region and the Journals show clout bars, short broads, squares, peals, loops and slabs being sent to Bawtry for shipment to Jukes of London, who in 1753-4 bought £1,000 worth of iron from the Nottinghamshire and Derbyshire ironworks. However, the purchases of this London firm fell off rapidly after this date and it is probable that competition from the coke smelting furnaces was the cause of this loss of trade.

Part of the forge iron was, however, retained by the partners for manufacture into rod at Renishaw Slitting Mill, situated on the Rother where it crosses the Staveley-Eckington parish boundary. The mill was owned by the Sitwell family of Renishaw, who had worked it almost a hundred years before. Here, the iron was reheated—there are frequent purchases of coal from Bramley Moor pits—rolled into rod and slit by water power. The mill was not in continuous operation and apparatus and labour seem to have been brought here specially, as may be seen from the following entries dated 1751-2:

| | | | | |
|------------------------------------------------|-----|-----|-----|---------|
| Hy Haslehurst Slitting 5 weeks | ... | ... | ... | £1 15 0 |
| Thomas Longden 5 weeks | ... | ... | ... | 1 10 0 |
| ditto each their board 5 weeks at 4s. per week | ... | ... | ... | 2 0 0 |
| A man and a horse bringing cutters | ... | ... | ... | 3 0 |

The most important customer in the early '50's was Mr. Sitwell and Company of London, who between 1750 and 1753 purchased over £600 worth of rod annually. William Sitwell, however, succeeded to the Renishaw estates in the latter year and after 1755 the accounts are in the name of his other partners, Tappenden and Handby.¹⁶ Another large purchaser was Joseph Hague and Co., in which Swallow apparently had a financial interest, as in 1763-4 he and Hague appear in the Journal as buying £483 worth of rod. Barlow was a centre of the nailing industry and Jno Shaw of Brindwood Gate and the Lings family of Oxenrakes were also good customers from that village. Nailing, too, was carried on at Bolsover, where the Couzens family bought rod from Fell. A certain amount of rod was sent to Chapeltown. The early Journals record sales at Belper, but none after 1752. The bulk of the rod went to Eckington, where the group rented an ironhouse from which the rod presumably was distributed. Renishaw was not of major importance in the Fell group of works as it only slit 30 to 50 tons of rod a year and from the financial standpoint its profits were minute. The static nature of the trade here may be discerned from the fact that the turnover for an average year, about £1,000, between 1750 and 1765, was approximately the same for the only two years recorded in the Spencer Stanhope MSS.—1700 and 1702.

Another slitting mill customer of Carburton and Staveley Forges was Rotherham Mill, although naturally this was in addition supplied from the South Yorkshire forges. Although the labour force at Rotherham does not seem to have been much larger than that at Renishaw, the mill was in operation for much longer periods, so that its output was twice or three times as great as that of the Derbyshire mill. Coal for Rotherham was obtained from Kimberworth and Carrhouse, but the greatest amounts came from Mr. Bowden's pits—almost certainly one of the Clowne Bowdens

¹⁶ For William Sitwell see Sir R. Sitwell, "The Hurts of Haldworth", p. 251.

then living at Darnall." In the early '50's, as at Renishaw, Sitwell was a good customer, the accounts for 1751-2, for example, showing a purchase of rod worth £300 to be distributed to the nailers. The Rotherham Mill tapped a new circle of customers. A very important one was Joseph Parkin of Anston, whose business shortly after this period had the contract for supplying the Proprietors of the Canal Navigation from Chesterfield to the River Trent with nails during the construction of that canal to Stockwith. Other large purchasers of rod were the merchant house of Messrs. Kenyon, Mrs. France and Co. (later Mr. Burkitt), Samuel Broadbent of Hartshead, Joseph Wilson and Henry Bromehead. Unfortunately, the Rotherham Mill accounts are not detailed and give no indication as to the profits earned. The accounts show that the Mill was given up to the Walkers and the engine, valued at £140, together with two water wheels, two wallow wheels, two cogg wheels and the slitting shears were brought to Attercliffe in 1758-9.

The three South Yorkshire forges each paid a rent of £30 a year. Wadsley and Attercliffe were rented from the Duke of Norfolk and Roche from Lord Scarborough. The first two forges, like Staveley and Carburton, had an annual production, on an average of approximately 200 tons. Roche however, produced much less, and at no time during these years did output reach 100 tons—in fact, in some years, production fell well below 50 tons. This forge seems to have been badly hit by lack of water, as the Ledger notes that the small output and high fuel consumption in 1759, 1760 and 1762 was due to this factor. Experiments were made at this group of forges as well as those across the county border in substituting coal for charcoal. Trials were made at Wadsley Forge in 1755 and again in 1759 and 1760, at Roche in 1757, and at Attercliffe in 1760. The experiment cannot have been successful as the Ledgers make no further reference to the practice and charcoal consumption per ton of iron made shows little or no deviation from previous figures. Coal supplies for these attempts and for the smithies were purchased from a number of pits—Stacey's at Ballifield, the Engine Pits at Attercliffe, from Mr. Binks and Mr. Assibrook's pits and from collieries at Orgrave Common, Highlane and Porto Bellow. Many of the customers of the Nottinghamshire and Derbyshire group also bought from the South Yorkshire forges, some sending their teams to collect forge iron from Attercliffe and Wadsley. It was, of course, as easy to supply the manufacturers at Ridgeway Moor, Gleadless, Norton and Woodseats from these two forges as from Staveley. Most of the output at Roche was, however, retained for further manufacture by the partnership.

At all the forges, houses were provided for the workers or a contribution made towards the rent. House coal, too, was provided free. Removal expenses were also paid and occasional payments were made for working

clothes. At Carburton, the concern paid for seats to be installed in the chapel. Each forge had its stocktaker paid quarterly. There are many payments in the accounts, in addition to the normal payments for forge iron by tonnage, for laying up charcoal or for overtime on repairs. Evidently a good forgemaster was a valuable asset, as when Paul Pichin left Wadsley in 1762 the accounts show that Wm. Cousins and Benj. Tyler were sent to hire James Fairfield at a cost to the firm of £7, that their journey took ten days and that Fairfield was given a guinea earnest money. There is only one reference to apprenticeship in the Journals, when Sam. Burgan, a member of a family whose name occurs in the accounts of 1700, was bound to Mr. Fell. It was generally assumed that it took five years to make a good forge hand.

A considerable proportion of the output of the South Yorkshire forges was retained by the partners for use at their Rotherham and Attercliffe slitting mills. Particularly was this so in the case of Roche, where often three-quarters of its production went to these mills. Until the loss of Rotherham Mill, Attercliffe was slitting an annual average of about 200 tons of rod. However, in 1756, the partners began to expand this plant, building new houses, improving the waterways, installing new cutters, overhauling the furnaces and hiring fresh staff, a process which, to use a modern term, involved the plant in teething troubles during the running-in period. The whole of the material for this expansion was obtained locally—cutter plates, boxes, shears and standards were bought from Cockshutt's Wortley Forge, stone came from Calver, Manor Delph and Canklow, and brick from the Common. As a result, the loss of Rotherham Mill was soon made good and by 1764 output of rod had been pushed up to 408 tons, in addition to 124 tons of steel slit here. The furnaces and forges of the group proved totally incapable of meeting this demand and recourse was made to foreign supplies. As an example, from 24th December to May, 1760-1, the group spent £1,100 with Sykes of Hull and with Mr. Osborne in the purchase of Brinskey iron—a low-grade Russian iron suitable for nail manufacture. After Fell's death, the Journal shows Clay visiting London and making large purchases of this type of iron from the Jukes concern. Despite this big increase in output, the Mill did not prove proportionately more profitable, and in fact it made a loss of £111 in 1764 with the output previously quoted as against a profit of £92 thirteen years earlier when only 241 tons of iron had been slit. The majority of the pits which supplied Attercliffe Forge also sold coal to the Mill. In 1761, the Mill employed four men and as they were paid an annual wage of £20, as against the weekly wage usual at Renishaw and Rotherham, it may be surmised that unlike these it was in operation all the year round. The actual slitters were piece-workers, paid at the rate of five shillings per ton of iron and nine per ton of steel, with overtime rates for holidays. Joseph

Parkin of Anston was here, too, a large purchaser of rod. Fell, however, arranged for the transport of most of the rod made at Attercliffe to Sheffield, where it was sold to factors and nailmasters. After Fell's death, when Joseph Hague became an important figure in the group, very large quantities of rod were sent to Chapeltown.

Another activity carried on at Attercliffe was the manufacture of iron pans. This was, however, on a very small scale—in the early '50's the total turnover was in the region of £500 a year. Almost the whole output was sold to the Sitwells, although a list of bad debts shows other customers at Leeds, Scarborough, Hull, Beverley and Kendal. This business was taken over by its manager, Hussey, in 1754, but it continued to be supplied with iron from the Forge.

Milner, Fell and Clay were, as previously mentioned, the owners of two steel furnaces. Ballifield Furnace was on the Stacey estate and it is noticeable that when it was rebuilt in 1755-6 all the materials were provided locally. Stone came from Canklow, sand from Orgrave and clay from Woodthorpe and Handsworth. The iron for conversion was bought from Sykes of Hull, who forwarded it to Rotherham or Tinsley, where it was picked up by Fell's teams. This iron was of much superior quality to that imported for the nail trade and averaged about £6 a ton more in price. It was, of course, Swedish iron, as only steel of an inferior quality could be made from English iron. Coal for both the Ballifield and Attercliffe furnaces came chiefly from the Stacey pits. Production was usually in the region of 100 tons a year, although in 1764 229 tons were made—an exceptional year. It is of interest that Cockshutt estimated Sheffield production of steel to be about 1,200 tons in 1749. Jars the French metallurgist who came to Sheffield in 1765, described the process of converting iron into steel. The furnaces were largely built out of sandstone, except for a brick arch, about twelve feet long, six feet wide and seven feet high in the middle. Below this was a grating covered with pieces of sandstone to temper the heat of the flames, which were thrown upwards through a series of holes on each side of a sandstone hearth, in which four to five tons of Swedish iron, well covered with sand and dust, were placed to be heated for five days. Jars noted that in general the Sheffield furnaces were smaller than those at Newcastle, that they were cheaper to construct and, of course, less productive individually. Fell sold small quantities of steel across the Pennines,¹⁸ but naturally the Sheffield market took the greater part. Some was sold to Owlerton and Brightside tilts to be made into shear steel. Edge-tool makers at Norton, Gleadless, Highlane, Ridgeway and Hackenthorpe took small amounts; the group of factors in Sheffield took

¹⁸ Tibbitts Collection 362 and 404, Sheffield City Library. These show Fell, Clay and Younge supporting the petition to turnpike the Sparrowpit and Buxton roads, one of the aims of which project was to facilitate trade between Sheffield and Manchester.

more and some was sold to the filemakers and saw manufacturers. The best customers for steel were Wm. Hellifield, Joseph Law and Joseph Wilson. Financially, the steel trade proved more steady than the iron and a regular profit of some hundreds a year were earned on a capital of less than £2,000.

The iron trade, on the contrary, showed an almost continuous decline during these years and even the Seven Years' War, which in the case of other concerns sent profits rocketing up, only provoked a comparatively feeble response in those of the Fell group. The Ledgers show a heavy falling off in the sales outside Sheffield and even the local factors were buying much less as time went on from the partnership. As an example, trade with the London firm of Jukes fell from £1,600 in 1753 to £128 in 1765, while the rod trade with Tappenden and Handby came virtually to an end in 1758. In the Sheffield area concerns such as John Greaves, Joseph Wilson, Robert Dent, Mrs. Attwick, George Marriott and Broadbent all cut their purchases considerably. No doubt, the fact that the technique of the partnership had remained virtually unchanged for almost three-quarters of a century was of importance in this loss of trade. Yet, other firms such as the Walkers were able to adapt themselves to the new techniques based on coal and it may be that further research into the history of the Fell organization will show that, at bottom, the failing was a human one. It is significant that so many of the families which had helped to build the unit up had withdrawn from active management—Simpson's heir was a parson, when Milner died in 1748 he had no son to succeed him, Millington Hayford who died in 1742 had no son and Fell who died in 1762 had no children. The reorganization of the concern in 1765 did not save it from extinction and when the new era began at Staveley and Chapeltown some twenty years later with new coke-fired furnaces, the owners were men with no connection with the Fell organization.

Finally, I should like to thank the Director of the Cartwright Memorial Hall, Bradford, for permission to consult the Spencer-Stanhope MSS, the Nottinghamshire County Council for permission to use the Portland MSS. at Shire Hall, and the Librarian at Sheffield City Library and the Earl of Wharnccliffe for permission to use the Wharnccliffe Muniments there.

THE ETHICS OF THE SHEFFIELD OUTRAGES.

By S. POLLARD.

WHEN the Commissioners of Enquiry rose in Sheffield on the 8th of July, 1867, they had not only succeeded in placing the responsibility for the outrages squarely on the shoulders of some of the trade unions, but had also, incidentally, with the help of their generous powers of legal indemnity and their inquisitorial skill, completed a work of social investigation of unusual depth. Yet most of the lessons were lost on contemporaries. The organs of public opinion in particular, blinded by prejudice or myopic by opportunism, diverted the conclusions drawn from the enquiry to erring channels from which they can be rescued only with difficulty even now.

It was axiomatic in 1867 that the agents of the trade union violence in Sheffield were criminals, fundamentally in conflict with the tenets of civilized society. Extenuating circumstances might be found by sympathetic minds, but all critics agreed that Broadhead and his associates had been guilty of violating not only the Criminal Law, but the basic laws of social conduct and morality as well. It is in those terms, and in those terms only, that the history of the Sheffield outrages was written.

This attitude extended, beyond official Conservative and Liberal opinion, to the organized Trade Union world itself. The unions were, in 1867, in the midst of a major crisis: with their funds threatened by the Hornby *vs.* Close decision, their legality uncertain, their actions restricted by unfavourable legal decisions, their status inferior under Master and Servant regulations and their very existence put in question before the Royal Commission, they were desperately trying to create a public impression of rectitude, respectability and support for the liberal principle of freedom of the market, which was held, indeed, with unreserved fervour by the leaders of the Model Unions. The violence and restrictionism of the Sheffield societies could not have been uncovered at a less propitious time for them. The "Junta" of the Model Unions, the L.W.M.A. of George Potter, and the United Kingdom Alliance of Organized Trades (led by the non-compromised Sheffield unions), though scarcely on speaking terms with each other, were unanimous in condemning the Sheffield outrages. The *Times* and the *Beehive* agreed for once in deploring the indemnity given to Broadhead, Crookes and the rest.¹

This purely criminal judgment, supported by Left and Right, has persisted into our own day.² Explanations were not lacking to show why

¹ *Beehive*, 29th June, 1867; *Times*, 21st June, 1867.

² The judgment of the "Junta" will be erased from the textbooks only with difficulty; see, e.g. S. and B. Webb, *History of Trade Unionism*, 1920, pp. 260-9; G. Howell, *Labour Legislation, Labour Movement, Labour Leaders*, 1912, pp. 159-160; G. D. H. Cole, *Short History of the British Working Class Movement*, 1927, Vol. 2, p. 97.

THE DEVELOPMENT OF INLAND NAVIGATION IN SOUTH YORKSHIRE AND NORTH DERBYSHIRE 1697-1850.

By G. G. HOPKINSON, M.A.

HALLAMSHIRE and the Hundred of Scarsdale, the old historic units of South Yorkshire and North Derbyshire, lie along the Pennine foothills, across a series of folds and undulations with a general trend from north to south, gradually decreasing in altitude and size as they die away to the east. With a comparatively high rainfall, the whole area is scarred with the valleys of streams, cutting deep into the hillsides and rushing turbulently down rapid and waterfall, on their journey to join the Don or the Derwent. By the end of the seventeenth century, these streams had been dammed up at many points on their courses to provide power—power to drive bellows and hammers or to turn grindstones or cutters and slitting mills. Near the sources of these streams, high up in the hills, in lonely places on the East Moor or in Loxley Chace, where their poisonous fumes could do no harm, stood the lead smelting mills, drawing their ore from what was, at that time, one of the richest lead mining areas in Europe, the Peak of Derbyshire. Lower down were the blast furnaces, drawing their iron ore from the easily accessible supplies on the edge of the Coal Measures and their charcoal from the woods on slopes too steep or on soils too poor for cultivation. Near them stood the forges, slitting mills and grinding wheels. From these and their associated domestic industries came a supply of pig and forge iron, edge tools, nails, cutlery, pig lead, red and white lead, the greater part of which was marketed outside the region, through the port of Hull.

These rapid, swift flowing rivers, on which the industrial strength of the area depended before the days of steam, were, however, in the early eighteenth century, its greatest weakness from the standpoint of communications. The rivers were too shallow, too much impeded by weirs, their run-off too rapid for navigation. Not until its products reached Holmestile on the Don, Bawtry on the Idle, or Nottingham on the Trent could they be carried by the cheapest, safest and most rapid form of transport at this time—the inland navigation.

THE BIRTH OF THE DUN NAVIGATION, 1697-1751.

Any attempt to improve the course of the River Don had to face considerable natural and man-made difficulties. The river fell 119 feet between Sheffield and Barnby Dun, the biggest gradient being at the Sheffield end. Communication between Sheffield and Doncaster was rendered impossible by a series of weirs and dams near the Wicker, at Attercliffe, Rotherham, Thrybergh, Kilnhurst, Conisborough and Sprotborough. Below Doncaster, navigation as far as Fishlake was hindered by sand and gravel beds, so that in summer navigation between these two points was confined

to small boats.¹ At Fishlake, since the old course of the Don had been stopped up, keels had used the Dutch River on their journey to the Humber, a route rendered unnecessarily hazardous by the dangerous positioning of the bridges at Rawcliffe and Goole.²

The first attempt to secure powers to make the Don navigable as far as Sheffield was in 1697, when Sir Godfrey Copley, the chief landowner in Sprotborough, alongside the river, introduced a Bill—unsuccessfully—into the Commons for this purpose.³ Seven years later, a similar attempt on the part of the Corporation of Doncaster was equally unsuccessful.⁴

The plan to improve the river as far upstream as Sheffield was revived in 1722, when the Company of Cutlers supported a scheme to circumvent the weirs across the river by a series of cuts.⁵ The first of these, commencing near the Wicker, was to by-pass the Walk Mill, two corn mills and Attercliffe Forge; the second, on the opposite side of the river, was to avoid the cutler's wheels at Brightside; the third, was to avoid Jordan and Ickles Dams; the fourth, at Aldwark, was to cut off a meander; the fifth, from Kilnhurst to Mexborough, was to by-pass a section of the river which drove two forges, a series of corn mills and two tilting mills; a sixth, was to cut off another bend at Sprotborough; another was to avoid the mills at Doncaster and a last cut was to be constructed not far from Thorne at Fishlake. It was natural that this plan should arouse the antagonism of Bawtry, through which Sheffield exported most of its products, with the result that this inland port endeavoured to dissuade the Company of Cutlers from proceeding with the project by raising the spectre of Doncaster as a rival centre of the cutlery trade using Rotherham coal, Kilnhurst iron and Thrybergh grindstones.⁶ It is, however, unexpected to find the Duke of Norfolk, the principal landowner in Sheffield, threatening to combine with other local landowners to kill the Bill in the House. His main objection seems to have been the damage likely to be done to his property by severances, an argument which the Company tried to counter by pointing out that the Navigation would benefit the Norfolk property by opening up new markets for Handsworth coal, by enabling bark from his woods to be sold to tanners in Hull and Beverley, and by bringing a greater population into the town, thereby increasing the price of building land and sending up farm rents. The Duke also declared that the cut from the Walk Mill to Attercliffe would draw off water from the river, thus depreciating the value of the works along the Don. The Company of

1 A Case in Relation to Making the River Dun Navigable. n.d.

2 Journals of the House of Commons. XXI, 626.

3 Journals of the House of Commons. XII, 79.

4 Journals of the House of Commons. XIV, 437.

5 William Palmer. A Survey of the River Dun in order to improve the Navigation from Hull to Doncaster and to continue up to Sheffield. 1722.

6 Several Reasons why the Town of Sheffield and the Corporation of Cutlers should Rigorously Oppose the Navigation of the River Dunn.

Cutlers replied to this objection by making the obvious point that they were the very last body to support any plan which might do this. They also sought to convince the Duke that the new cut would use comparatively little water and that in times of heavy rain it would draw off floods. The Company went so far as to offer to lease all the Norfolk mills on the Don at the existing rents to satisfy the Duke on this point. Probably these questions might have been settled satisfactorily, but for the Duke's attempts to impose conditions on the Company "in regard to his Royalty and in recompense for the losses he must inevitably suffer." In return for permission to construct a basin at the Wicker, the Duke demanded a monopoly of the warehouses there and the right to collect wharfage and tonnage. The Company pointed to the obvious necessity of landing goods at other points near to the town and refused to move from their principle that "Warfes and Warehouses goe together".⁷ Whether it was this particular difficulty or the engineering problems of a river which fell 55 feet in the three miles below Sheffield, which caused the Company to abandon the idea of making the river navigable as far as Sheffield is uncertain, but Tinsley, outside the Norfolk lordship, was finally chosen as the terminus.

Supported in the Commons by a number of petitions from various towns, the result of vigorous propaganda by many leading Sheffield merchants⁸ and steered through the Lords by the Duke of Devonshire,⁹ the Bill became law in 1726. The Act, however, necessarily contained many clauses designed to protect the owners of works alongside the Don from interference by the Navigation. The Company was not to erect any dam, to raise or lower the water or to pull down any ironworks on the river; they were to give security to Lord Frederick Howard against injury to his Rotherham Mills; they were prohibited from making a cut between Jordan Dam and Eastwood except in certain specified places; special precautions were to be taken in placing the lock at Jordan Dam so that water could not be diverted from Holmes Goyt, feeding Rotherham Slitting Mill; at Aldwark, the cut connecting the mill dam with Thrybergh mill dam was to be on the opposite side of the river from the village; at Sprotborough, the Company had to agree to keep the cut supplying the water engine on the Copley property in good order and to lease the corn mills for 21 years. Finally, no cut was to be made out of the corn mill dam at Doncaster.

In the following year, the Corporation of Doncaster again sought powers to improve the river from Holmestile to Wilsick House. The resulting Act also transferred to the Corporation control over the three wooden bridges over the Dutch River, empowering it to fit them with draw leaves,

⁷ The Navigation of the River Dunn considered in Respect to my Lord Duke of Norfolk.

⁸ Particular Expenses about the Navigation in *Leader's Burgery of Sheffield*, p. 350-1.

⁹ Letters of John Smith—concerning the River Dun Navigation Bill 1725-6. *Leader Collection* 70. Sheffield City Library.

so that boats could sail through them, without the necessity of unshipping their masts.

By 1729, the Company of Cutlers had made the Don navigable from Holmestile to Mexborough, a distance of six miles. At this juncture, the venture proved too costly for them to undertake out of their own resources, so that additional capital was raised in Sheffield to complete the project. The agreement between the Company of Cutlers and the new body of undertakers provided for the election of a Committee of seven to supervise the improvement of the river. The first Committee consisted of William Steer of Ecclesfield; Samuel Shore, a Sheffield factor and partner in Rockley furnace; Thomas Buck of Sheffield, grocer; James Crawshaw, the Town Collector, representing the Burgery of Sheffield; John Smith of Bellhouse, a former Master Cutler, who had seen the Act of 1726 through Parliament; Samuel Staniforth of Darnall; and Thomas Heaton, a Sheffield ironmonger and wiredrawer. Heaton was also nominated the first Treasurer of the Navigation.¹⁰

By 1730, Sheffield interests had spent £8,692 and Doncaster another £3,774 on the improvement of the Don. Two authorities on one river were, however, plainly excessive, so in September of that year the two were amalgamated. This agreement between the Sheffield and the Doncaster interests was afterwards incorporated in the Act of 1732, passed to regularize the position and to regulate the powers of the new Dunn Company.

For the next twenty years, the new Company was busy implementing the powers given it by this Act. Active direction of its affairs lay in the hands of the Committee of seven, headed by an annually elected Treasurer and Chairman. Among the men who served the Navigation during these early years of its history in either or both of these capacities were many of high standing in the business affairs of Hallamshire. They included John Fell, the Bridgehouses ironmaster, controlling the Duke of Norfolk's ironworks on the Don; Gamaliel Milner, one of Fell's relatives and a fellow ironmaster; Samuel Shore, Fell's chief rival in the iron industry; Joseph Broadbent, a prominent Sheffield ironmaster and factor; Francis Sitwell of Bridgehouse, a Sheffield lawyer; William Steer of Darnall, cutler, and his eldest son, the Rev. William Steer, Vicar of Ecclesfield; Joseph Steer, mercer; and Samuel Staniforth, a member of a well-established land-owning family in Darnall. Day-to-day control of the affairs of the Navigation were in the hands of Thomas Radford, the book-keeper, and John Smith, the engineer—originally a Brightside carpenter—whose function it was to purchase materials, to see that "Stone and Woodwork be done in a Substantial Manner" and to settle accounts. A general meeting was held

¹⁰ From this point the chief authority for the history of the Navigation is the first Minute Book of the Company now at the British Transport Historical Records, London.

in either Doncaster or Sheffield annually for shareholders, but the control exercised by them over the direction of affairs was purely nominal.

In March, 1731, the Committee began work by ordering stone and timber at Hooton and Dalton for the construction of a lock and bridge at Aldwark. In September, instructions were given to Smith to clear out the river below Thistlebed Ford, near Eastwood. In October, the construction of locks was authorized at Denaby, and between Eastwood and Rotherham High Mill. In the February of the next year, Smith was instructed to pull all the roots and trees out of Thrybergh and Aldwark dams "and Everywhere Else that is necessary". Below Doncaster a new cut was authorized at Barnby, and a lock at Redcliffe; and Sandall Weir and Goole Bridge were repaired. By 1733, the completion of the first stage of the Navigation was heralded by the construction of warehouses at Swinton and Aldwark, the latter being for a period the temporary head of navigation on the Don. At this time the Committee framed a schedule of tolls for the river. The majority of commodities—iron, steel, cutlery, horns, boxwood, cheese, salt, groceries, tallow and wine—were to pay a toll of 3/- a ton. Dues on certain goods were, however, lower. Coal was to pay 1/6 a ton, to enable coal mined around Rotherham to compete with coal brought down by the Aire and Calder Navigation, in the Humber and Trent valleys. English timber was charged a shilling a ton to attract timber felled on the Duke of Leeds's property around Kiveton from the River Idle. The tariff on Derbyshire lead was 1/6 a fodder, a figure once again fixed with reference to dues on the Idle.

The Navigation paid its first dividend of 5% in March, 1734. The General Meeting of shareholders, however, passed a resolution that "this Navigation be let by ye Committee for any term not exceeding seven years provided they can have a good Tenant that will give six pounds per annum for all the moneys already expended". It was not, however, until Lady Day, 1738, that the Navigation was leased to Henry Broadhead, Francis Cripps and Thomas Ellison, all of whom had interests in the Doncaster-Thorne section of the river, for the next seven years at a rent of £1,200. The lessees also contracted to rent the Don for a second term of seven years at an "improved" rent of £1,500.

With their financial position assured, the Committee were able to plan the completion of the Navigation from Aldwark down to Tinsley and in addition to set on foot improvements below Doncaster. Above Aldwark, they notified landowners as to what land would be required for the cuts on this section in April, 1738; in August, preparations were begun to carry the Navigation into Rotherham High Dam; two years later, wood and stone were ordered for Ickles Lock and, two years later, work was commenced on a lock at Bromley Sands. By 1751, the Navigation was open through to Tinsley, where wharves and warehouses were built. Below Doncaster, the Committee deepened the channel from Stainforth to Fishlock Ferry, made

a lock and cut on the south side of the river, to by-pass the ford and shallows at Stainforth and Bramwith, and constructed a dam above the Twenty Acre Drain near Bramwith Upper Ford to deepen the course of the river to Wilsick House. It is obvious that the Committee were profoundly dissatisfied by the slow progress made in improving the river during these years, but it is impossible to say whether their reason, that this was due to the dilatory payments of the lessees which injured their credit, has any foundation in fact.

THE NAVIGATION AT WORK, 1751-75.

In 1751, when the lease of the river expired, it was transferred to Joseph Broadbent, Thomas Smith and Joseph Atkinson for a period of seven years at a rent of £3,500. When this lease terminated in 1758, the Annual Meeting of shareholders decided to administer the Navigation directly and not to lease it again, a decision which proved to be an extremely profitable one. The Committee were fortunate enough to secure the services of two men—John Hill of Thorne and William Martin of Tinsley—who had managed the Navigation for the previous lessees, who in return for a salary of £590 a year undertook “the whole management of the River in forwarding and expediting the Carriage and Delivery of Goods and Merchandises the charging of Tolls and Duties thereon, the superintending the Locks and Wharfs and keeping a proper number of agents, Lock Keepers, Wharfingers and Porters—and keeping and making regular and fair accounts”. When Martin resigned in 1765, he was replaced by William Stanley of Chesterfield, “a person well recommended to the Committee for his Ability Industry Care Sobriety and Integrity” who served the Company as its Secretary until his death in 1793. Much of the success of the Company during these years must be ascribed to the honesty and diligence of these men and to the administrative routine introduced by them into its affairs.

Naturally, with the completion of the Navigation, there ensued a period of quiescence in its history. Over the next thirty years, little new capital expenditure was authorized and the greater part of the work carried out was in the nature of routine repairs or minor improvements. In 1754, Sandall Weir was rebuilt; in the next year, the dam at Deadman’s Hole was improved; in 1759, the channel below Barnby Dun lock was contracted to give a better flow of water; in 1760, Brindley, after viewing the three bridges across the Dutch River, designed the leaves authorized in the 1727 Act to enable keels to pass through the bridges without unshipping their masts; in 1765, as trade was so good on the River, new warehouses were erected at Rotherham and Swinton, the river dredged at Aldwark and Thrybergh and at the Long Cut at Kilnhurst, and in 1768 the bridges at Denaby, Bramwith and Stainforth were rebuilt, so that boats could pass under them when the river was in flood. In addition, the

Company began at the end of this period, when it leased Doncaster Corn Mills and the mill at Aldwark, a policy which it was to pursue consistently in the future, that of acquiring water rights at as many points along the Don as was possible.

Probably the basis of this policy was the lesson learned from a bitter and humiliating quarrel with the Walkers of Masborough, who had leased the water rights at the Holmes, owned by the Earl of Effingham. Here, they had built a furnace, rolling and grinding mills on a site previously occupied by an old slitting mill worked by John Fell.¹¹ During the period in which the Navigation had been leased to Broadbent and his partners, the Walkers had enjoyed preferential tolls, but once the Company had resumed control over the river, these were abolished. Somewhat naturally, the Walkers complained about this step. A more logical complaint was that all boats passing through Doncaster on their way to Tinsley paid the same dues, whatever their destination, with the result that the Walkers felt that they were being overcharged to the extent of sixpence a ton by the Company. On their side, the Navigation had a grievance in that the new works with their four water wheels took three times as much water out of the river as the old slitting mill had done, thereby passing water straight through from Jordan Dam to Rotherham Dam, thus diminishing the supply of water available for navigation at the Ickles. The Company tried to deal with the situation by endeavouring to purchase land to construct another cut from the Holmes to Bromley Sands. In 1761, members of the Committee met the Earl of Effingham in person and offered to compensate him for any losses he might suffer if he would agree to a diminution of the amount of water taken by Walker's works, but to no purpose. In 1762, the Navigation introduced a Bill into the Commons to enforce what they considered to be their rights, but the influence of the Earl was sufficient to secure its rejection. At this, the Company called on Brindley for advice. He suggested that a channel should be dredged three feet deep in Ickles Dam and that the cut from Jordan Dam should be extended to the Ickles, but a successful law suit against the Walkers prevented this scheme being put into practice.

On their defeat, the Walkers attempted to reach an agreement with the Navigation, offering in return for the restoration of preferential tolls throughout the river, together with complete exemption from dues between Rotherham and the Holmes and a payment of £60 annually, to pass sufficient water through the works into a new cut into the river to keep Ickles Dam full of water. As the Navigation had been shut for four months in the previous two years in this section of the Don by a shortage of water, the Company might have been wise to accept this proposal, whatever their

¹¹ Journals House of Commons XXIX, 159, 192, 225 and 228. A map in the Fairbank Collection of the Holmes Works at Masborough, ROT 66S, dated 1829, shows the cuts in the vicinity of the works as they were in 1760.

legal rights. In addition, the Walkers had leased the water rights at Thrybergh, where they were in a position to paralyse navigation on the river as thoroughly as they had done at the Holmes. Here, they offered to stop the works when the cut was short of water, on condition that the Company allowed them to reduce dues between Rotherham and Thrybergh and paid £25 a year to help maintain the river at this point. The Committee rejected both proposals contemptuously. The Minutes contain no further reference to this quarrel until 1770, when the Walkers completely paralysed the Navigation by preventing all traffic through the Long Cut at Thrybergh. The Minutes record the fact that on 23rd August a number of boats were grounded here for lack of water and were only released when the ironmasters condescended to fill the cut on payment. Stanley went to Thrybergh to attempt to smooth matters over and on meeting Samuel Walker remarked that he hoped "the little animosities" between them were over. Walker's reply, however, was uncompromising and showed the depths of bitterness which this quarrel had engendered—he declared, "No—things remained just as they were—they were aggrieved by the Company and till these Grievances were removed he should take every opportunity to impede the Navigation and he hoped his Children would do it after him". He was as good as his word. On 15th September—a Saturday—he set the new rolling mill at Thrybergh at work at a time when the river was several inches below the level of the weir, completely closing the Long Cut. On the Sunday, as the forge was not at work, Stanley organized a convoy of boats to steal through the Cut. As soon as they were seen, the Walkers set the forge at work and successfully prevented any more water flowing down the Cut. Altogether, they succeeded in grounding between 70 and 80 boats for a week and they were only released at the end of that time by flood water. On 7th October, there were two more boats aground in the Long Cut and on the following Sunday the rolling mill was once more at work, paralysing another convoy of 30 boats. Stanley admitted defeat when he declared to the Committee, "I left them there till they should be relieved by rain or till it should be Mr. Walker's Pleasure to set them at Liberty". The Navigation were compelled to admit defeat and to pay the ironmasters £90 annually and to allow their claim for freedom from tolls between the Holmes and Rotherham, in return for which Walkers promised to keep the Navigation supplied with water.

THE CONSTRUCTION OF THE CANALS, 1750-1820.

The Don and Trent in their lower courses flow parallel and at no great distance from one another, separated by a belt of low-lying land. The principal traffic from the Don into the Trent was coal from the collieries at Park Gate. It was estimated in 1769 that 30,000 tons of coal was sold between Gainsborough, Lincoln and Newark, the greater part of which

was supplied from around Rotherham.¹² By this time, however, many of the more accessible seams here were worked out, a situation which resulted in a spate of canal projects, designed to bring the Trent valley into communication by water with coalfields as yet comparatively undeveloped.

The first of these canals to be planned from the Trent was one into the North Derbyshire coalfield, terminating at Chesterfield. It was anticipated that coal mined here could undersell expected Yorkshire coal in the Trent valley by as much as 2/- a ton, as barges using this canal could make two journeys between the coalfield and the river in the time that a keel could travel from Lincoln to Rotherham, thus cutting freights substantially. The scheme also promised other advantages. Chesterfield was already manufacturing a coarse brown earthenware, which it was thought would find a ready market in Lincolnshire. The canal would pass, in its central section, through the magnesian limestone formation, noted for its barley, which could then be easily transported to the coalfield for malting. This formation, around Kiveton and Shireoaks, also produced large amounts of lime, needed to enrich the thin, poor soils of the coalfield, which with a canal could be cheaply brought to this district. Finally, there already existed a considerable through trade between Derbyshire and Bawtry on the Idle, particularly eastwards in lead from the mines at Ashover and Matlock, and in groceries in the other direction, which could be trusted to desert land transport should water transport be available.¹³

Three Committees—at Chesterfield, Gainsborough and East Retford—were set up to decide upon a suitable route. Brindley, who had been engaged as engineer, presented two different schemes to the members of these Committees at a meeting held in Worksop in late August, 1769.¹⁴ The first was for a canal from Chesterfield to Stockwith, via Worksop, Retford and Drakehole Hill, estimated to cost £95,000. The second scheme, estimated to cost £105,000, was for a canal from Chesterfield to Gainsborough, via Cappel's Hill.¹⁵ Both schemes, it was declared, would yield a 5% dividend after all repairs and bad debts had been met. It was decided to accept Brindley's second route and to petition Parliament for the necessary powers to construct the canal. Proceedings here ran smoothly, the only opposition being that of the Don Navigation, which feared that there might be a decreased amount of water flowing into it from its tributary, the Rother. The necessary Act was easily obtained.¹⁶

12 *Seasonable Hints Relating to the Intended Canal from Chesterfield—to the River Trent.* 1769.

13 These points are made in a pamphlet supporting the Canal addressed to "The most Noble Henry Duke of Newcastle and Lord George Cavendish and Godfrey Bagnall Clarke". 1769.

14 From this point the chief authority for the construction of this canal is its first Minute Book and Ledger in the British Transport Historical Records, London.

15 Another survey for an alternative route was made in 1770 by the owner of the Idle Navigation, John Lister. See "The Report of John Grundy Engineer Respecting the Proposed Navigation from Chesterfield to the River Trent". Spalding, 1770.

16 *Journals of the House of Commons*, XXXII, 676; XXXIII, 82 and 223.

Unlike the share list of the Don Navigation, in which the names of the great landowners in South Yorkshire are conspicuously absent, that of the Stockwith Canal shows that the majority of the great families owning land near it subscribed to its capital. Amongst these were included the Dukes of Devonshire, Leeds and Newcastle. After this class, the most important shareholders were the lead merchants of North Derbyshire, who had much to gain by cheap transport facilities into the Humber basin. Amongst them were the Twiggs of Ashover and of Chesterfield; the Quaker, Joseph Storrs; Alexander Barker, the right-hand man of the Duke of Devonshire in respect to his lead-mining interests in the Peak; Allwood Wilkinson of Chesterfield; and William Milnes of Ashover. Wilkinson was, in fact, appointed joint treasurer of the Canal, along with George Popplewell of East Retford.

Brindley was appointed engineer at a salary of £300 per annum, but with his other responsibilities obviously could not give his full attention to the construction of the canal. His pupil, John Varley, who had made the original survey of the canal was, therefore, made Clerk of the Works at a salary of £100 a year. At a meeting of the Proprietors, held at the inn at Harthill in June, 1772, Brindley outlined his plans. The first operation was to complete the tunnel through the magnesian limestone ridge at Norwood in two years and then to open up the section of the canal from the east of the tunnel to Shireoaks. Brindley estimated that the whole canal would be complete in four years.

Tunnelling began at Norwood almost immediately. In the following February, the Committee ordered Varley to stake out the line of the canal from Norwood to Worksop and in May to continue it as far as Retford. However, trouble was brewing for the Committee, as they neglected to appoint another engineer on the death of Brindley, until March, 1774, when his brother-in-law, Hugh Henshall, was appointed to his post. During this period Varley had been using his opportunities to provide his relatives with lucrative contracts and to pass work of inferior quality. These practices were quickly discovered on Henshall's arrival and Varley was compelled to confess his malpractices. He, himself, was lucky to escape without any punishment other than being compelled to enter into a bond of £500 for the proper performance of his duties, but his relations were dismissed on the spot.

Unfortunately, simultaneously, the Proprietors had run into financial difficulties, reporting "a great shortage of cash" to their shareholders. The Committee met this problem by suspending essential constructional work, particularly on the provision of reservoirs to compensate for loss of water on the canal and by closing down all brick kilns; and a stricter accounting system was introduced. However, Allwood Wilkinson was able to borrow

on his own personal security and with this money construction was resumed. The line of the canal was staked out across Misterton open fields and common, then in process of enclosure, and soon after that to Retford. In August, 1774, contracts were given out for cuttings from West Retford to Bishop Gate Cross Roads and for new bridges and aqueducts near Babworth. In May, 1775, Varley was ordered to finish this section of the canal. This was not a serious task, as the only major work was the tunnel through Drakelow Hill. By next April, the Committee were able to advertise that the canal was open from Killamarsh to Stockwith.

The Proprietors, before the completion of this part, had begun work on that section of the canal from the west end of the tunnel, following the Rother valley into Chesterfield. There were no engineering difficulties on this stretch and with the experience already gained work proceeded very smoothly. However, financial difficulties still continued to plague the Committee. In August, it announced that another £12,000 was needed to complete the undertaking, and appealed to shareholders to subscribe the additional capital in proportion to their original holdings. As shares were, at this time, changing hands at a discount of £30, it is obvious that shareholders took no rosy view of the Canal's immediate future. This appeal, therefore, proved fruitless, so that the Committee was compelled to have recourse to borrowing from bankers at York and at Nottingham. In all, they borrowed £53,000 to complete the canal. With this sum, they were able to build wharfs at Retford, Norbriggs and Killamarsh; warehouses at Stockwith and Chesterfield; and a dwelling-house and offices at the latter terminus for their Superintendent and Book-keeper. Finally, the Committee announced the tolls at a meeting in Chesterfield, together with the fees for wharfage and cranage, extending over a great variety of articles, including casks of nails, crates of glass, packs of wool, bobbins of flax, foddors of lead and hogsheads of pots, all typical products of the Chesterfield region. Then came the long awaited day in June, 1777, when it became possible to travel from end to end of the canal. The first barge arriving in Chesterfield was met "by several Gentlemen of the Committee and a great number of Proprietors", a crowd of onlookers and the inevitable band, after which, says the *Derby Mercury*, reporting the event, "the goods were unloaded and put into waggons, which were drawn to the town by the Navigators preceded by the Gentlemen of the Committee and Proprietors, who walked in procession with the Music playing before them".

Even before the canal was completed, there was a well-founded apprehension amongst its shareholders that the great increase in expenditure over the original estimates would prevent it paying the expected dividends. This did, in fact, occur, as interest charges upon the sum borrowed to complete the canal swallowed up more than half the profit. In addition,

traffic failed to develop as had been anticipated.¹⁷ The original estimates had been based upon a revenue of £15,225, but five years after the canal had been opened this had only risen to £4,811. As a result, the Proprietors offered to lease the canal in 1782 "for any term not exceeding eleven years"¹⁸ but it proved impossible to find anyone willing to take it up. Traffic, however, with the development of Newcastle railways to collieries at Inkersall, Spinkhill, Norbriggs and Glasshouse Common¹⁹ grew steadily and although the anticipated revenue was never reached during this period, the shareholders were, after 1800, paid a dividend averaging 6%, which undoubtedly they considered most disappointing, when they compared it with those paid by the Don Navigation or the Erewash Canal.

The decline in coal exports from Park Gate to the Trent valley had also stirred coal-mining interests in South Yorkshire to project new canals. As early as 1763, Brindley had been engaged by the Don Navigation to survey the Thorne area and to provide estimates of the cost of a canal between the Don and the Trent. Any plans that may have been made were, however, pigeon-holed until 1772, when the Navigation's engineer, John Thompson—appointed in 1766 to assist the ageing John Smith—was instructed to make another survey of the route. He drew up a plan for a canal thirteen miles in length from Stainforth Cut on the Don, through Crowle Common to Althorpe on the Trent to carry 40-ton barges. This was estimated to cost £14,600.²⁰

This proposed scheme was but part of a larger plan, designed both to open up the virtually untouched reserves of coal on the Bute, Fitzwilliam and Strafford estates and to shorten the distance between pit-head and consumer in the Trent valley. The other half of the project was to drive a canal from Conisborough Lock on the Don, up the Dearne valley to Barnsley, where the canal would divide into two branches, terminating at Haigh and Cawthorne Bridges. Like the canal between the Don and the Trent, and unlike the Chesterfield Canal, it was to be a wide boat canal. The scheme had the support of many local landowners, who might expect to receive financial benefits in the shape of coal royalties, but neither this plan, nor a variant of it for a canal through to Worsborough only, nor the plan for a canal between the Don and the Trent were proceeded with. There is nothing in the documentary material to suggest any reason for the collapse of these plans, but the construction of the Chesterfield Canal, with its threat of much cheaper coal in the region from Lincoln to Gainsborough, may well have been an important factor.

17 Statistics of the traffic on the Chesterfield to Stockwith Canal 1774-89. Jackson Collection No. 1255. Sheffield City Library.

18 *Derby Mercury*, 26th September, 1782.

19 B. Baxter, "Early Railways in Derbyshire". *Trans. Newcomen Society*, Vol. XXVI, p. 185-97.

20 A Report on the Practicability of Making a Navigable Cut to the River Trent at Althorpe from levels taken by Mr. John Thompson. 1772.

In 1769, Varley had made a survey for the Marquis of Rockingham for a canal from the River Don to Greasborough, where there were large reserves of coal in close proximity to the river.²¹ This route was resurveyed in 1775 by John Smeaton and shortly afterwards work on the canal was commenced under the supervision of William Jessop, a civil engineer, who had been engaged on the surveys for the canal along the Dearne valley. When completed, this canal was leased to the Fentons, who held a lease of the coal at Greasborough, on a rent varying with the quantity of coal moved along it into the Don. The success of this canal was such that Earl Fitzwilliam had estimates made for another canal to develop his coal around Low Wood and Elsecar, on the supposition that some 60,000 tons of coal mined here could be sold on the Don if only water transport could be provided to the pits. Nothing came, however, of this plan, probably because it was replaced by a much more ambitious project, sponsored by the Don Navigation and the Aire and Calder Canal jointly, to open up direct communication by water from the Calder to the Don and from the Don to the Trent, thus enabling the rich coalfield around Barnsley to be developed and its coal to be transported cheaply into the valleys of the Calder, the Don, the Trent and along the Humber estuary.

A coal shortage had, in fact, again appeared in the Trent valley, as a result of the continued reduction in output around Rotherham, and the diversion of coal mined in North Derbyshire from the trade along the Stockwith Canal to the newly erected ironworks at Staveley, Renishaw and Chesterfield.²² Such a situation, naturally, turned attention to "that valuable tract of country abounding in coal of the best quality" between the Calder and the Don, and to a renewed interest in the canals projected in 1772. It was, obviously, to the advantage of the Don Company to support these plans to the fullest extent, as the coal traffic which would pass along it from the Dearne valley coalfield into the Trent would yield valuable tolls. The Company offered to subscribe half the capital for the canal from the Don to the Trent and three-fifths of that into the coalfield. In addition, it set up a special Committee and engaged extra legal aid to deal with the many problems inherent in these developments; it arranged meetings to be held at Thorne and Barnsley with the local landowners, at which the scheme was explained; it opened negotiations with the Aire and Calder Navigation, which was to build the section of the canal north of Barnsley; it made arrangements for Thompson and Fairbank to survey the country from Stainforth on the Don to Keadby on the Trent²³ and for Mylne, a London civil engineer to survey the district from Swinton to Barnsley²⁴ and for

21 Report of John Smeaton, Engineer upon the Proposition of Making a Canal from Cinder Bridge—to the River Dunn. Wentworth Woodhouse MSS. M.P. 47. Sheffield City Library.

22 Observations on the Dearne and Dove Canals. Lincoln. 1793.

23 Fairbank Collection F.B. 72 p. 62-5; F.B. 73 p. 74-8 and 88; F.B. 233 p. 1-end.

24 A. E. Richardson, "Robert Mylne, Architect and Engineer", p. 150-4.

Whitworth or Jessop to give evidence at the Committee stage of the Bills in Parliament. The Dearne and Dove Act of 1793 authorized the raising of £60,000 for the construction of a canal from Swinton to Barnsley, together with two cuts to Elsecar and Worsborough, where the nine feet Barnsley Bed could be mined at comparatively small depths. Tolls were to be at the rate of a penny per ton mile for lime and coal, but special concessionary rates were granted where barges brought lime to the coalfield and returned with at least 30 tons of coal. The Stainforth and Keadby Canal Act provided for the building of a canal between these places at a cost of £24,200. With rising costs, the original estimates were exceeded and it became necessary to secure additional powers in 1798 for the Stainforth and Keadby Canal, and in 1800 for the Dearne Canal to raise more capital.

The construction of these two canals, linked together by the Don, made it essential for the Company to improve the river between Stainforth and Swinton, to take the sea-going sloops for which the Keadby Canal had been designed. The company, therefore, in 1795, engaged Benjamin Outram of Butterley to make a survey of the whole river. Outram reported that the lock at Stainforth Cut could not be used at high spring tides; that the river from Bramwith to Barnby Dun was winding; that, at the latter place and at Wheatley Ford, there was insufficient depth of water for navigation and that the channel through Doncaster was crooked and shallow. Above Rotherham, Outram declared, there were shoals at Aldwark, Eastwood, Ickles and Tinsley Wharf. He also reported that every lock on the river needed repair. To remedy these defects, he proposed that a new cut should be constructed from Bramwith to Kirk Sandall; that another cut should be made 500 yards long at Doncaster, leaving the old winding section of the Don for use as wharfs; that a third cut should be dug at Eastwood; that the ford at Wheatley should be replaced by a bridge; that the shoals above Rotherham should be dredged; and that nine bridges should be reconstructed to widen the waterway and to provide towing paths. Outram estimated that, at a cost of £13,737, "The Navigation will be a very complete one, liable to as few impediments and having as great advantages as any Inland Navigation in the Kingdom". The Company, however, delayed action until 1800 and then only sought powers to improve the river from Swinton to Stainforth by the construction of new cuts at Cadeby, Doncaster, Kirk Sandall and Stainforth. A further survey of the Don by Jessop, however, led to the postponement of the Bill, on the ground that the programme of improvements was not sufficiently extensive. A second survey in 1801, however, only led to the further suggestion that the course of the river at Eastwood should be constricted to scour out the bed. The Company then again decided to promote a Bill to give them the necessary powers to make these improvements. This met unexpected resistance from the local land-owners, who wanted the Company "to protect the Country from all the

Inundations that may possibly happen from floods on the River", a demand which naturally the Navigation rejected. Another unexpected opponent was Earl Fitzwilliam, the owner of a large new colliery at Elsecar on the Dearne Canal and of extensive coal royalties worked by the Fenton family at Greasborough, who threatened to use his powerful Parliamentary interest against the Bill, unless the increased tolls were dropped and the river improved both above and below Swinton, so that coal from the Wentworth estates could find a market in the industrial belt along the Don up to Tinsley as well as in the agricultural areas down river. To placate such a powerful opponent, the Company declared that the projected improvements "will be of such essential advantage to the Coal Owners in carrying their Coals down the River without the present interruptions"; that as the Dearne Canal would take barges with a draught of five feet it was essential to improve the Don or otherwise traffic would use the Barnsley Canal route through to the Humber; and finally offered to build up a sinking fund from the additional dues to pay off the cost of the new cuts, after which the extra tolls would be abolished. These arguments failed to move the Earl and so the Minutes of the Company record as there was no "probability of the very reasonable dues intended to be taken for the Money to be expended in making the proposed Alterations and Improvements", the scheme would be abandoned. Three years later, the Committee of the Navigation met Earl Fitzwilliam personally and believed that they had won his support for a further attempt to gain powers for the new cuts. Hence, in 1807, a Bill was promoted to improve the Don at Tinsley and to construct new cuts at Sprotborough, from Kirk Sandall to Barnby Dun, and from there to the upper end of Stainforth Cut, together with the right to levy additional tolls at these points. The Earl was not satisfied that these measures would improve the river above Swinton and demanded that a new cut be constructed at Aldwark, where there was only 3 ft. 6 in. of water in summer on a section of the river, used by three-quarters of the traffic along the whole river. Fenton, the lessee of the Earl's coal at Greasborough, supported him in this demand, declaring that Jessop's plan of "vamping" the river "by a System of Patchwork, by streightening the Channel and side weiring where the shoals are situated", would not survive the next flood. In view of this opposition, the Company withdrew their Bill.²⁵

In 1815, after Rennie had made a survey of the Don around Doncaster, the Company made a fresh approach to the Earl "to ascertain whether his Lordship would co-operate with the Committee in the Improvement of the River Dun and would consent to a reasonable Composition for Money to be expended thereon". These negotiations proving successful, another Bill was promoted, but this, too, was withdrawn when the Company received

²⁵ Wentworth Woodhouse MSS. 68 e. Correspondence in 1808/9 with the Dunn Company relative to their intended New Act.

the estimate from Rennie, judging that in the economic circumstances of the day, £70,000 was too great a sum to invest.

Four years later, proposals were made to build a canal from Knottingley on the Aire, through Womersley, to Holmestile on the Don, with a branch at Wentworth.²⁶ As this canal would have provided an alternative route to the Don and rendered new cuts below Doncaster superfluous, it was supported by the Don Company. It aroused the hostility of the Aire and Calder Navigation, which was itself promoting a rival Bill to construct a canal from Knottingley to Goole, with the result that the Aire and Dun Bill was thrown out at the second reading.²⁷ In the following year, the Don Company, at the suggestion of Lord Hawke, promoted another Bill to construct a canal from Doncaster through Wilsick House to Wentmouth, thus short-circuiting the course of the river, with a branch to Womersley, where there were large limestone deposits, which it was hoped to develop for agricultural purposes. Once again, the opposition of the landowners around Doncaster, who were only ready to support a canal on the south side of the river, where it could be used for drainage purposes, led to the withdrawal of this Bill.

Almost equally depressing is the history of the attempt to improve transport facilities between Tinsley and Sheffield. A coal crisis in the latter town in 1792 prompted the Don Navigation to consider the construction of a canal from Rotherham to Sheffield with a branch to Renishaw in Derbyshire, with the object of supplying Sheffield with an additional 40,000 tons of coal a year.²⁸ However, even before Outram had completed his survey, the Company was hesitant about undertaking the Renishaw branch "in consequence of the strong probability that a cheap and competent supply of coal will be furnished to the town of Sheffield by means of the Intended Dearne and Dove". When Thompson pointed out the value of this branch to feed the main line of canal with water, the Committee then decided to continue with this part of the project. At the end of 1792, the Committee met the Duke of Norfolk, who agreed to lease land near the Shrewsbury Hospital in Sheffield for a wharf and basin. When Outram submitted the detailed estimates, the Committee, alarmed by a total cost of £46,292, decided to abandon the whole scheme, only to reverse this decision when Mylne made a very favourable report on the plan. A General Meeting of shareholders was held to discover their feelings on the whole project, at which it was decided that the Don Navigation should build the canal from Rotherham to Sheffield, but that a separate company should be formed to construct the branch to Renishaw, to which the Don Company should subscribe a quarter of the capital. Local landowners, however, showed

26 *Plan of Navigable Rivers and Canals Connected with the Aire and Calder Navigation*. 1818.

27 *Journals of the House of Commons*. XXXIV, 101, 259, 285, 297 and 313.

28 *Report of Benj. Outram, Engineer on the Proposed Sheffield Canal*. 1793.

not the slightest interest in the branch canal and refused to find their quota of capital, with the result that the Navigation dropped their plan for the branch canal. This decision raised strong feelings in Sheffield, where a meeting of manufacturers declared that "a communication betwixt this place and the Coal Country towards Eckington is . . . of high importance to the commercial interests of this Manufacturing Town". Despite this resolution, the Navigation not only continued to withhold support from the Renishaw branch, but, for some reason not stated in the Minutes, also decided not to proceed with the main line of the canal from Rotherham to Sheffield.

Ten years later, an application was made to Parliament for powers to construct a canal from the terminus of the Don Navigation at Tinsley to Sheffield, by a group of Sheffield business men.²⁹ The survey for this canal, which also included a branch through to the North Derbyshire coalfield, was made by William Dunn, a Sheffield civil engineer, who had recently been employed on canal construction around Melton Mowbray.³⁰ This project aroused the opposition both of the Duke of Norfolk and of the Don Navigation. The latter, indeed, declared their willingness to give their support to the scheme, provided that their wharfs at Tinsley were purchased by the Canal Company and compensation made for the loss of dues there. Naturally, the Canal Company refused, pointing out that through communication by water with Sheffield must lead to an increase of traffic on the river, which would more than compensate for the losses sustained at Tinsley. Probably it was the opposition of these two powerful interests which led to the withdrawal of the Bill.

In 1813, another Committee was set up in Sheffield, to press forward a plan for connecting Tinsley and Sheffield by canal, to construct a branch through to the Chesterfield to Stockwith Canal at either Eckington or Killamarsh and to continue the main line of the canal up the Sheaf valley to Padley Mill, where it would join the projected High Peak Junction Canal, thereby bringing Sheffield into contact by water with the Lancashire and Midland canal systems. William Chapman, a Newcastle civil engineer, who had been engaged on the Dearne Canal and on drainage schemes around Doncaster, was engaged to make the necessary surveys. He reported on two alternative plans for the canal from Tinsley to Sheffield, one on the north side and the other on the south of the Don. Of the two, Chapman recommended the former, on the ground that the engineering difficulties would be smaller. He advised against the construction of the other two canals on account of the natural geographical difficulties involved, suggesting

²⁹ House of Commons Journals. LVIII, 191.

³⁰ Papers relating to the Making of the Sheffield Canal 1800-3. M.D. 1740. Sheffield City Library.

³¹ Report of Wm. Chapman Civil Engineer on the Various Projected Lines of Navigation from Sheffield. 1813.

that railways be constructed instead.⁸¹ Engineering problems were, however, amongst the least important factors affecting the fate of these schemes. The Ashton Canal dropped the High Peak Junction plan and with it went the Canal from Sheffield to Padley Mill; Earl Manvers, the most important single landowner along the branch through to the Chesterfield Canal, showed himself very lukewarm in support of this plan and so this, too, was abandoned; Earl Fitzwilliam, who owned valuable coal-bearing land at Tinsley, too, showed comparatively little interest in the scheme. The Duke of Norfolk, however, displayed an active interest in the route of the canal, offering his powerful support in Parliament, provided that the canal ran on the southern side of the Don, presumably—it is nowhere stated explicitly—so that a branch could be built through to the coal pits on the Norfolk property on that side of the river. The Canal Committee felt itself constrained to accept the southern route in face of the advice offered by Chapman or see the Bill once again be rejected in Parliament. They offered the Don Navigation the option of constructing the canal, but that company rejected it, declaring that making it on this side of the river would be so costly as to involve them in an annual loss of £1,400. The Navigation itself, moving with the times, suggested that the most satisfactory system of transport between these two points would be a double track iron railway. The Canal Committee, however, went ahead with its plans and after buying off the opposition of the Navigation by paying £11,000 for its Tinsley property, was able in 1815 to secure an Act to construct a canal from Tinsley to Sheffield with a branch to Greenland Engine “towards the valuable collieries and Beds of Coal and Ironstone which abound in that direction”, with reservoirs on the Darnall Brook and Acres Hill Dyke and with power to take water from the Sheaf and from the mines at Greenland Engine and at Crookes Croft. Four years later, on 22nd February, after costing £104,719, the canal was ceremonially opened by the *Industry* of Thorne leading six other vessels into the basin at Sheffield. Almost a hundred years after the plan to make the Don navigable through to Sheffield had been dreamed of, it was now possible to sail a keel direct from tide water to within a few yards of the site of Sheffield Castle.

THE LATER CANAL AGE, 1820-40.

Once through water transport had been assured from Sheffield to the sea, business men in the town began to press for the construction of canals to link Sheffield with the Lancashire and Midland canal systems. Junctions with these would place South Yorkshire in direct contact by inland navigation with Liverpool, through which a large part of Hallamshire's products were exported to the Americas, and with the Midlands, which sent to Sheffield some 2,000 tons of Stourbridge clay annually for making crucibles, together with quantities of iron, and which took in return Sheffield steel

and manufactured goods for sale in the Black Country and in the West of England. Two schemes were widely discussed in the early 1820's. The first of these projects, planned by Telford, was for a canal from Kelham Wheel outside Sheffield, along the Don valley to Wortley, ascending to Penistone by means of 80 locks, tunnelling under the moors at Woodhead and then descending down the Etherow valley by Tintwistle and Mottram to Hyde on the Ashton Canal by another 66 locks. The engineering difficulties of the route, with what would have been the highest summit level of any canal in the country, the high cost—estimated at half a million—together with the fact that little traffic could be expected from the sparsely populated country around the Don and the Etherow, were all factors which dissuaded its promoters from seeking Parliamentary powers, once estimates had been prepared. The second scheme was much more ambitious, as it aimed at building canals to connect the termini of the Tinsley, Chesterfield, Cromford and Ashton canals.³² In general, the plan was to construct a narrow boat canal from Sheffield to Chesterfield, thereby connecting the canals at these two places, with a branch swinging from side to side up the Cordwell valley to decrease the gradient, tunnelling under the East Moor to Padley Mill, along the Derwent valley through Hathersage, through Edale to join the Ashton Canal at Bugsworth by a tunnel through the Cowburn Ridge. From Chesterfield, the canal would tunnel under the watershed between the Rother and the Amber at Clay Cross and join the Cromford Canal at Buckland Hollow. Altogether, the whole scheme would involve the building of 120 locks and cost £365,769. Apart from the advantages of enabling barges to travel from Sheffield into Lancashire and into the Midlands, it was envisaged that large reserves of coal and ironstone would be opened up for development and that large quantities of Peak District lime would be made available for agriculture. The Chesterfield Canal showed itself ready to consider building the section through to Padley Mill at a cost of £100,000.³³ Nevertheless, this Grand Commercial Canal, as it was so grandiloquently named, never got beyond the stage of contradictory pamphlets and pious resolutions "that a Canal to effect an Union by Water, in one bottom, between the Eastern, Western and Southern parts of the Kingdom, through the Midland Coal and Lime Districts—is the great desideratum wanted by all Commercial Men in the United Kingdom". Canal shareholders, disappointed by the dividends paid by the Chesterfield and Tinsley Canals—the latter paid its first miserable dividend of 2½% in 1826—were in no mood to advance capital for further extensions. Landowners and farmers, dispirited by the depression in agriculture, were no longer enclosing

32 First Report on the Grand Commercial Canal. James Dean. 1824; Second Report upon the Proposed Grand Commercial Canal by Joseph Haslehurst Civil Engineer. 1824; The Proposed Canal to link four existing canals at Peak Forest, Sheffield, Chesterfield and Cromford. 1824; The Grand Commercial Canal. Thomas Bishop's proposed line through Edale. 1824 and Observations on the Proposed Communication by a Navigable Canal between the Town of Sheffield and the Peak Forest Canal. Hy Sanderson 1826.

33 Copy of an Address to the Chesterfield Canal Proprietors, 26th February, 1824.

common and waste, so that the market for lime was stagnant. Heavy industry in the area was in no position to absorb increasing supplies of coal at a time when so many furnaces were out of blast. Although meetings were held to enlist support for the Grand Commercial scheme until 1827, after that date it faded into oblivion as men's minds began to turn to railways as the means by which Sheffield, Lancashire and the Midlands might be knit together.

The completion of the canal from Tinsley to Sheffield, with a depth of six feet, theoretically capable of taking 70-ton Humber "Billy Boys" made imperative further improvements along the Don. In 1821 the Company held meetings with landowners around Doncaster to secure their support for a Bill empowering it to make new cuts near that town. As a consequence of these negotiations, Parliamentary proceedings initiated by Lord Milton, heir to Earl Fitzwilliam, ran smoothly and the Company obtained an Act to make new cuts at Arksey, Arksey Ings and Barnby Dun. Once these improvements had been completed, an application was made in 1826 for another Act to authorize the Company to make further cuts above Doncaster. There was, however, general opposition to this Bill by the Dearne and Stainforth Canals and by industrialists in the Don valley, and William Newman, solicitor to Earl Fitzwilliam, undoubtedly expressed what was common opinion about this Bill, when he wrote to the Earl, "Altho' they are a very opulent body, they never make any Improvement (altho' the Public have Reason to complain of the defective State of the Navigation) without charging additional dues more than sufficient to remunerate them."³⁴ Faced by the powerful interest of the Earl in Parliament, compromise was advisable and although the Company was able to secure its point that it should be allowed to abandon the old line of the river from Mexborough to the entrance of the Dearne Canal, it had to agree to halving its original demand for additional dues and to collecting them at two points, so that boats only using a section of the cuts would not be compelled to pay all the new tolls. With the opposition conciliated, the Company was able to secure another Act, empowering it to deepen and extend the cuts from Rotherham to Mexborough, to improve the river at Eastwood, Aldwark and Kilnhurst, to make new cuts around Denaby, to cut off the Devil's Elbow further down stream and to make another cut at Conisborough and another lock at Sprotborough.

Two years later, the Company began surveys from Thorne, Stainforth and Bramwith towards Goole with the object of constructing a canal independent of the Don, capable of taking the additional traffic which might be expected to arise from the building of a canal from Balby on the Don to Stockwith on the Trent. With the collapse of this plan, the surveys were

³⁴ Wentworth Woodhouse MSS. Correspondence of 3rd Earl Fitzwilliam, No. 49. Correspondence from Wm. Newman, Earl Fitzwilliam's solicitor. 1826-57. Letter dated 22nd February, 1826.

discontinued. A somewhat similar plan was put before Parliament in 1836 for a canal from Stainforth to the Ouse at Swinefleet, but this was withdrawn in face of the demands of landowners in Hatfield Chase that the Company should make itself largely responsible for drainage in that area, a financial burden which it rightly refused to carry.³⁵

In addition to these attempts to secure powers through Parliament to improve the river, the Company was able to make considerable purchases of property along the Don, in continuance of its policy of buying up water rights wherever possible. In 1821, Rotherham Mills were bought from the Walkers of Masborough, and when the lease came up for renewal in 1824 restrictions were placed on the tenants using water from the river, so that the depth of the channel was increased from four to five feet. Three years later, the Company bought Ickles Mills for £8,000 and when these were leased in 1829 there was incorporated in the deed a clause whereby the owners were able to regulate the flow of water through the shuttles in a dry season. In 1833, the mills at Sprotborough were shut down and compensation paid to the miller, so that there should be sufficient water in this cut, then in process of being deepened. In the following year, after Aldwark Mill had been destroyed by fire, the Company bought the site and the water rights for £5,000.

THE EARLY RAILWAY AGE, 1840-50.

The shadow of the approaching Railway Age began to creep over South Yorkshire in 1830 with the proposal to build a line from Sheffield to Goole along the Don Valley. The reaction of the Don Company was prompt. They lobbied Earl Fitzwilliam, the Duke of Norfolk, the Master Cutler, the Mayor of Doncaster, Sir Joseph Copley and Sir William Cooke to oppose the scheme on the ground that "the projected railway is uncalled for and is unnecessary to the Interests of the Country and will materially injure the interest of the Don Proprietors". Faced by such opposition, the decision of the Railway Company that it was "inexpedient" to apply for an Act was almost inevitable.³⁶

Five years later, however, the combined opposition of the Don Company and the Duke of Norfolk was insufficient to prevent the Sheffield and Rotherham Bill from becoming law. Neither this line nor the North Midland Railway, opened in 1840, were serious threats to the waterways, as the former was too short, and the latter only competed with them over short distances. Nevertheless, the Committee was sufficiently foresighted to see that the Don valley with its great mineral wealth and its natural routes must inevitably attract the attention of railway promoters, and naturally set itself

35 Leader Collection 84/ 29 and 30. Letters to John Read—connected with the Don Navigation Company. Sheffield City Library.

36 This Section is based on the second and the third Minute Books of the Company in the British Transport Historical Records, London.

to stave off the evil day as long as possible. In 1841 all dues were reduced, as were those on the Sheffield Canal. A quiet period of railway promotion lulled the Committee into a false complacency, and in 1843 the old rates were restored, except on vessels entering the Don from the Trent.

In the next year the full fury of railway speculation beat on South Yorkshire. The Midland, with Hudson at the helm, proposed to construct new lines from Rotherham to Doncaster and from Swinton to Lincoln. Both the projected London and York and the Direct Northern had plans to build feeder lines into the South Yorkshire coalfield. To meet this threat, the Don Company purchased the Dearne Canal, reducing dues on coal to a halfpenny per ton mile, demanding as a return for this concession that "the Coal Owners (both as Coal Owners and as Landowners) will join in opposing any Railway scheme which will be prejudicial to the Consolidated Canal and River Navigation".

Unfortunately for the Don Company, the chief coalowners in South Yorkshire—Earl Fitzwilliam, J. Stuart Wortley and F. W. T. Vernon Wentworth—were themselves planning to construct a railway through the heart of the South Yorkshire coalfield to join the Great Northern at Rossington, the Midland at Swinton, and the Sheffield and Manchester at Penistone. To challenge such a combination of Parliamentary and territorial influence would have been folly. Yet this new railway threatened to draw off at the pit head the coal which provided so much of the Don Company's revenue. Undoubtedly, from the standpoint of the shareholders, the Don Committee did the wisest thing, when it approached the Railway Company with the suggestion that the Navigation should subscribe heavily towards the new line and that in return waterway and railway be amalgamated and the Don shareholders be guaranteed a dividend of £120 annually on each share of £324, the then current dividend. The Railway Company made a very generous counter offer of £3,000 stock in the amalgamated Company for each Don share, which, apparently, at that time was not acceptable to the Navigation.

However, the situation deteriorated still further from the point of view of the waterways, as the Midland, the Great Northern, and the Manchester, Sheffield and Lincolnshire planned in 1846 to open new lines either through the coalfield or to connect it with Lincolnshire. In the following year, the Don Company, in the face of these developments, accepted on the behalf of its own shareholders and those of the Dearne Canal, absorption in the South Yorkshire Coal Railway, but on terms so generous—£3,000 for a Don share and £350 for a Dearne share—that, in reality, they constituted a victory for the navigations. Flushed with success, the Don Committee then turned on the Manchester, Sheffield and Lincolnshire Railway, which had purchased the Sheffield Canal, primarily with the object of securing the warehouse accommodation at its terminus. The Don Company, suspecting

that the Railway might try to close the canal by increasing dues to a prohibitive level, applied to Parliament for powers to construct another waterway from Tinsley, past Brightside and Attercliffe Forges to Blonk Street in Sheffield. Simultaneously, pressure was brought to bear on the Railway Company by the Town Council of Sheffield, as a result of which the Canal was sold to the Navigation. After this success the Don Company leased the Stainforth and Keadby Canal, guaranteeing its shareholders a dividend of 7% during the next seven years, thereby amalgamating the whole of the inland waterways of South Yorkshire, with the exception of the Barnsley Canal, fast in the grip of the Aire and Calder Navigation. In 1850, the Railway Commissioners issued their official certificate to what had now become the South Yorkshire, Doncaster and Goole Railway, that as half its capital had been paid up, its amalgamation with the Don Company and its subsidiary canals could be legally completed. Here, the Minute Books of the Don Company terminate, ending 120 years of transport history, on which hinges so much of the economic history of South Yorkshire. Significantly enough, about the same time, the Admiralty made a report on the Don, in which it was stated that the River was neglected between Thorne and Goole, with its banks washed away on account of neglect and that the Railway Company, taking advantage of the legal technicality that Humber keels were not always sea-going vessels, in defiance of a clause in their Act, kept the bridges across the Don permanently closed, so that boats had to unstep their large masts and rigging at Stainforth and to come down the river under jury masts, which they had to strike at all bridges.³⁷ The Age of the Inland Waterway had plainly ended: the future was obviously for the railway and the steam locomotive.

Finally, I wish to express my thanks to the staffs of the British Transport Historical Records Department and of the Local History Department at Sheffield City Library. Without their help and co-operation this article would not have been written. In addition, I wish to thank the Trustees of the Fitzwilliam Settled Estates for permission to quote from the MSS. now in Sheffield City Library.

³⁷ Report of the Admiralty under 11 & 12 Vict. South Yorkshire, Doncaster and Goole Railway. 1850.

ARTHUR HAYBALL—A DREAMER IN WOOD

By ARTHUR E. BEET, B.Met., Ph.D.

ARTHUR HAYBALL'S youngest daughter, Clara, married the writer's mother's elder brother, William Keeling, a well-known Sheffield landscape artist of his day, and Mrs. Keeling completed her 101st year on 22nd December, 1953, at Ashover, Derbyshire. She died on 28th April, 1954.

Arthur Hayball was a pioneer in photography, and in an old stable loft at Ashover were found in December, 1951, nearly 400 photographic negatives, taken by him between 1853 and 1885, of practically all the important wood-carving work he had done. They were prepared by the "wet plate process", thus being home-made, and they range in size up to 12 inches by 10. Considering their age they are in excellent condition.

He was the second son of Thomas Hayball and Mary (née Taylor), and was born in Tudor Street, Little Sheffield (now Thomas Street) in September, 1822. Thomas Hayball, a joiner and builder, had a hand in the construction of many houses (e.g., Banner Cross Hall) and churches, notably St. Philip's, built 1828. The child was fond of spending nearly all his time in the joiner's shop watching the men at work and asking questions. The workshop was on the first floor and had an external wooden stepway with a landing on top. One day in 1826, hurrying from the shop to meet his father, he had the misfortune to fall from the landing to the ground and to break his leg. The fracture was badly set and recovery was of long duration. To entertain the invalid and to reduce the boredom of convalescence, his father gave him pieces of waste wood to carve with a knife, later replaced by simple wood-carving tools. He attended Mr. George Wilkinson's day and boarding school in Broomhall from 1830 to 1838, for some years having daily to be assisted there by his brother Charles. At the age of 16 he left school and joined his father in the wood-working shop at 60 Rockingham Street. Even whilst attending school most of his spare time was devoted to learn wood-carving, and this was later to prove very useful to his father in his church building, for even at that comparatively early age one may suppose that his work would be appropriate when simple design and plain work only were needed. Some examples of such work were found when St. Philip's Church was demolished in 1953.

On his marriage in 1845 to his cousin, Hannah Lenton (1818-1895) of London, he removed to 29 Clarence Street, almost opposite to where Godfrey Sykes lived, but continued to work as a journeyman with his father until about 1852, being permitted to take on an apprentice and an assistant.

Prior to 1845 he started attending classes at the Sheffield School of Design, Victoria Street, and was so successful that at the Annual Meeting and Prize Distribution on 7th September, 1847, the chairman, Lord

THE DEVELOPMENT OF THE SOUTH YORKSHIRE AND NORTH DERBYSHIRE COALFIELD, 1500-1775

By G. G. HOPKINSON

THE Yorkshire, Nottinghamshire and Derbyshire coalfield covers an area roughly oval in shape, with its longest diameter extending along the Trent between the Humber and the city of Nottingham. A bold escarpment separates the coalfield into two distinct regions—an eastern “concealed” coalfield and a western “visible” coalfield. In the latter area, bounded on the west by the moorlands covering the millstone grit and on the east by the fertile farmlands of the magnesian limestone, three important seams of coal outcrop between Barnsley on the north and Alfreton on the south, roughly parallel to one another and to the line of the gritstone. Furthest to the west, the thinnest and poorest of the seams, known in Yorkshire on account of its association with deposits of fire clay as the Ganister Coal and in Derbyshire as the Alton Seam by reason of its outcrop near the village of that name, bassets out from Wessington, through Ogston, Alton, Owlter Bar, Millhouses, Stannington, Crookes and Loxley to Bullhouse, near Penistone. Further east, basseting out through South Wingfield, Clay Cross, Chesterfield, Brampton, Staveley, Sheffield, Thorncliffe, Mortomley, Pilley and Silkstone is a five-foot seam, called after the last-named village and famous as producing a good house, gas and coking coal. Nearest to the magnesian limestone escarpment, outcropping from Blackwell, through Tibshelf, Sutton, Renishaw, Woodhouse Mill, Parkgate, Elsecar, Worsborough Park to Gawber, near Barnsley, is the most important of all seams in the region, the nine-foot Barnsley Bed or, as it is known in Derbyshire, the Top Hard, yielding a coal which, when coked in open hearths, makes a hard coke, well suited to carrying a heavy burden in blast furnaces. In the Admiralty trials of 1849 it was adjudged the equal of the best Welsh and Newcastle coal for steam-raising as it lights easily, burns freely and leaves only a small quantity of white ash and cinders.

In South Yorkshire, the seams dip gently to the east, faulting being generally absent except in the Don valley, where a number of seams basset out in a circle of some seven miles radius, centred on Rotherham. In North Derbyshire, an anti-clinal disturbance centred on Brimington throws up the coal measures on its flanks, so that coal mining in this area was particularly easy. Subsequent erosion of the Coal Measures here in the valley of the Rother and its tributaries again led to the exposure of the seams around Eckington and Staveley, once again facilitating mining operations. As a result, until the 1840's the South Yorkshire and North Derbyshire coalfield faced few of the problems of haulage, ventilation and drainage which confronted deeper fields such as the Lancashire and Durham

coalfields.¹ Another great advantage enjoyed by this coalfield was the concentration of land ownership in relatively few hands, as estates such as those of the Duke of Norfolk in Sheffield and Ecclesfield, the Duke of Devonshire at Staveley, the Earl of Effingham at Rotherham, Earl Fitzwilliam at Wentworth, the Marquis of Ormonde around Sutton Scarsdale, the Hunlokes at Wingerworth, the Cokes at Pinxton and the Morewoods at Alfreton, enabled mining operations to be planned on a large scale without the distraction of the often exorbitant demands of the owners of intervening freeholds for underground or surface wayleaves or for the purchase of their coal at a price far above its real value.

THE SIXTEENTH CENTURY.

A number of deeds and accounts shows that coal mining was actively carried on in the area in the sixteenth century. In 1518, Ralf Constable of Catfoss, Yorkshire, leased to Nicholas Hewett, described as of "the Manor place of Barlborough", a pit in that village.² Sixty years later, the wage book of Bess of Hardwick shows her making payments for ropes and other material for a colliery on her property. About the same time, the Selioke family sold to Francis Rodes of Barlborough—one of the thrusting, ambitious lawyers characteristic of the Elizabethan age; Serjeant at law in 1578, Queen's Serjeant in 1582, and Justice of the Common Pleas six years later—property there which included "all and singular woods and cole mynes". In 1587, when Rodes made his will, he left certain rent charges to his servant, Jeffrey Watson, on condition that the latter assisted Rodes's son, John, to mine coal and ironstone at Staveley, Watson being paid £6 13s. 4d. for the first 2,000 loads mined, with an extra five marks for each additional 1,000 loads.³ In the same parish, Peter Barley of Barlow made a contract in 1578 with Henry Berresford of Nottingham whereby he reserved to himself the right to mine ironstone for his smithies and "sea cole" for his house.⁴ In the same year, the Earl of Shrewsbury made an agreement with his tenants at Bolsover, whereby both parties to the contract were to have the right to mine coal on Shuttlewood Common, the tenants, however, promising not to mine within ten poles of a sough put in by the Earl for draining the seam. According to the Shrewsbury accounts, this colliery made a profit of £83 in 1586. On the same estate, coal was being mined at this period in Handsworth, Gleadless and Dronfield. At the latter colliery at Stubley, the agent reported that the "colliers say they have for getting of coales in ye eye of ye pitt half of ye coales and my Lord ye other half and when they drive out of ye eye they have two parts and my Lord a third", declaring

¹ Water did not become a serious problem on the South Yorkshire Coalfield until 1877, *vide* H. Saul's articles, "Water Levels for Mine Drainage", in *Colliery Engineering*, 1936, pp. 203-6, and "Outcrop Water on the South Yorkshire Coalfield", in *Trans. Mid. Institute Mining Engineers*, 1937, pp. 64-76.

² Barlborough Hall MSS.

³ Crewe Muniments No. 372. Sheffield City Library.

⁴ Portland MSS. 73/1. Shire Hall, Nottingham.

that the colliery would be worth to each of the two men employed there twenty pence a week.⁵ Across the county boundary, the Earl was also mining coal in Sheffield.⁶ Further south in Derbyshire, Godfrey Foljambe in his will of 1595 left to his wife, Isabella, the right to mine ironstone and coal on his Walton property, outside Chesterfield, on consideration that she paid £4 3s. 4d. annually to Dame Constance Foljambe for wood and coal.⁷ In the same parish, a lease of the manor of Linacre, made in 1544, specifically mentions the right to mine "sea cole". According to a customary of this manor, freeholders could mine coal on the common. Nearby, the right of mining coal on Beeley Moor was sold in 1560 for £1 2s. 3d. a year.⁸ In the southernmost parish of the Hundred of Scarsdale, Edward Holte of Stanton had sold the pits at Greenhill in Alfreton in 1593 to John Tenery of Stapleford. It is obvious enough that certain features of the industry, which were to remain characteristic of coal mining throughout the period in question—sough drainage, piece work and the dominance of the landowning class—were already well established in the Tudor period.

THE SEVENTEENTH CENTURY.

For the next century, more evidence has survived in the form of deeds, rate assessments and mine accounts to show how widespread coal mining was in the area. Judged by rentals, a fair enough guide, the most important pits in South Yorkshire and North Derbyshire were those in Sheffield Park. In 1619, the coal under this property, then in the hands of the Earls of Arundel and Pembroke, was leased at £76 annually, an amount which had been increased to £200 a year on the eve of the Civil War. After the Restoration, this colliery was leased by John Eyre, a Sheffield ironmaster, at a rent of £145. When Eyre became bankrupt, this colliery came into the hands of George Bamforth, one of the Lords of the Manor of Owlerton. In 1692, Richard Richmond, a London merchant, leased for twenty-one years, at a rent of £140, the coal mines in Sheffield Park within the Great Lawns and the Nunneries. He, however, sub-leased the colliery to Richard Bagshawe of Castleton, one of the leading lead mine owners in the Peak, who worked the pits until 1700.

Outside the town, collieries were much smaller in size. To the west of Sheffield, on the outcrop of the Alton seam at Crookes, the coal under the Norfolk property there was being mined at the end of the century by a partnership which included Henry Bromehead, yeoman of Fulwood and two lawyers, each at some time agent to the Duke. Thomas Chappell and Joseph Banks. This group paid £40 a year and a fifth of the profits as rent for this colliery. On the other side of the town, Stephen Bright of Carbrooke, one

⁵ Ronksley MSS. No. 12110. Sheffield City Library.

⁶ Lawrence Stone, "An Elizabethan Coal Mine", *Economic History Review*, Vol. III, No. 1, pp. 97-106.

⁷ Star Chamber Proceedings Jas. I. 139/20.

⁸ *Collectanea Dakeynæ*, Vol. 10, p. 345. Derby County Council Offices.

of the leading lead merchants of Sheffield, leased a colliery from Lady Grace Cavendish at Handsworth in 1635 at an annual rental of £66. At the end of this century, this colliery was leased to Samuel Shepley, a small freeholder on this manor, at £30 a year. Two other men of much the same social class, William Fenton and John Savage, were working small pits in the same area in the reign of Charles II. Another small landowner, Randolph Ashenhurst, was selling coal in Sheffield from a colliery at Intake in the reign of William III.⁹ To the south of the town, the coal on the Bright property at Ecclesall was rented during the Commonwealth at £5 a year, an amount which had only increased at the end of the century to £6 a year, when it was worked by Henry Bromehead, mentioned previously as a partner in the pits on Crookes Moor.

North-east of Sheffield, the largest collieries were in the Don Valley at Kimberworth and Whiston on the Effingham estate. During the Commonwealth, these were in the hands of Lionel Copley, the most important ironmaster in South Yorkshire at this time, who rented them at £100 and £55 respectively. Another colliery at Kimberworth was worked at this time by the Hurt family of Ickles Hall.¹⁰ The pits near Barnsley—known, according to the topographer Blome as “Black” Barnsley on account of its connection with coal mining—were also in the hands of ironmasters after the Restoration. The coal under Barnsley Moor was leased by William Simpson, a member of the Spencer group which dominated the iron industry in the region. Simpson, however, sub-leased the coal to Gamaliel Milner of Burton Grange, another member of this group of ironmasters. In 1676, the lease passed to the Hon. Sydney Wortley, who again sub-leased the coal to Valentine Hurt of Ecclesfield at a rent of £40 per annum. Twenty years later, Wortley acquired another lease of this Crown property and after buying out the other royalty owners on the Moor, leased the colliery to William and John Rooke and to Peter and John Shippem, members of two well-known Catholic landowning families in the area.¹¹

Evidence for coal mining in North Derbyshire during this century is much more complete than that for South Yorkshire and it is apparent that although the material is scattered chronologically there were collieries at work in almost every parish of the Hundred of Scarsdale during this period. Aided by seams of good coal at a shallow depth, the Derbyshire coalmasters sank a multitude of small pits, and it is likely that however tiny may have been their individual output, cumulatively they may have equalled the less numerous but larger South Yorkshire mines in productivity.

A rate assessment made during the Commonwealth shows that there were coal mines at work at Alfreton, Bolsover, Brimington, Eckington,

⁹ T. Walter Hall, “The Park in the City of Sheffield”, p. 100.

¹⁰ Sir George Reresby Sitwell, “The Hurts of Haldworth”, Ch. XI.

¹¹ Wharncliffe Deeds, Nos. 344-53. Sheffield City Library.

Heath, Staveley, Walton, Dore, Sutton and Tibshelf.¹² Other material amplifies this information. A lease drawn up in 1649 of a farm at Shireoaks, included as part of the rent, the obligation on the part of the tenant "to fetch one waine load of cole—from Barlborough pitts to Gateford Hall". The mines at Barlborough were then worked by the Rodes family, as may be seen by a letter written in 1677 by Dame Martha Rodes, then hard at work trying to pay off the heavy debts incurred by her late husband, to Andrew Clayton of Romeley, a wealthy lead merchant, appealing for a loan. This expressly states that "This money is for Manageing of ye Coal Delph for Colliers must be paid or els their is no enduring". A Chancery petition of her creditors of much the same date states that Dame Martha "hath for several years last past sold great quantitys of Cole—amounting to the sume of £500". Evidence in a case as to the ownership of certain commons near Eckington shows that coal was mined there during the Cromwellian era, as one witness testified that "Major Bolton had about twenty-five years ago purchased the King's right in the Manor of Eckington from the then Commonwealth and he directed Mr. Godfrey Bright to sink a cole pitt—which he did and went forward until they were driven out by water". A Parliamentary survey of this particular manor, made in 1650, shows that there were pits on Bramley Moor, leased by Francis Stephenson, a landowner in Unstone and on Mosborough Moor and at the Marsh, worked by Richard Taylor of Durrant Hall, a Chesterfield lead merchant.¹³ To the north of Barlborough, John Ogilby's map "Illumination of the Kingdom of England" marks in a "Moore with a great many cole Pitts". On the Yorkshire border, a rate assessment for 1697 shows William Newbold and Robert Haslehurst, two farmers, mining coal at Beighton.

To the west, another assessment for Dronfield, dated 1667, includes amongst the property rated, collieries at Dore, Coal Aston, Unstone and Sommerwood Common. In the same parish, a petition from a number of farmers on the Newcastle estate in the reign of Charles I shows that Godfrey Outrem and George Calton, both members of the class of minor gentry, had opened an opencast working at Hill Top, fifty yards broad and ten deep, from which they had carried away a hundred loads of coal. In the adjoining chapelry of Barlow, the accounts of the headborough for 1643-4 show him buying coal in that village for the Royalist garrisons at Wingfield Manor and Bolsover Castle. His disbursements for the next year include payments for coal bought at Dunston for the Puritan troops billeted in Chesterfield. In the same parish, John Frecheville leased the coal under the common and enclosed grounds at Eastwood in Staveley to John Hewett of Beightonfield in 1659 on a forty-one year lease for £46 annually. During the reign of James II, German Pole of Park Hall—like Hewett, one of the

12 A Breviate of the Survey of the 31 Townships within the Hundred of Scarsdale, 1641-61. Portland MSS., Shire Hall, Nottingham.

13 T. Walter Hall, "Worsborough, Sheffield and Eckington", p. 71.

few Catholic gentry in this part of Derbyshire—leased the coal in Staveley Westwood for seven years from Lord Conyers at an annual rent of £30. The Court Baron records for this manor, now at Chatsworth, contain many entries ordering miners to fill up coal pits near the highways through Staveley West Wood. When, in 1647, the Parliamentary Committee for Compounding sold the property of the greatest supporter of the King in the north of England, the Earl of Newcastle, Cosse Manor and the right to mine coal on Shuttlewood Common, were sold to William Newton, a later Mayor of Chesterfield.¹⁴ In the same area, a trust deed devising property on his daughters by William Woolhouse, Lord of the Manor of Glapwell, shows that family mining coal there, and another deed forty years later—in 1695—shows them leasing coal from other landowners in the vicinity.¹⁵ Within a few miles of Glapwell, the Devonshire family were mining coal continuously through this century, on their Hardwick property.

On the western side of the coalfield, the Earl of Newcastle had leased the coal in the Manor of Newbold to Anthony Eyre of Rampton in 1637. Eyre, however, sub-leased the coal to Gabriel Wayne, one of the Lords of the Manor of Whittington. Wayne put in four soughs down to the River Rother and by 1688 almost all the coal under Newbold Great Moor had been extracted.¹⁶ On the east of Chesterfield, at Spital, where the Rother had exposed the coal measures, the Jenkinson family of Walton Hall were mining coal after the Restoration. Another Brampton family mining coal on the moors beyond Chesterfield were the Clarks.¹⁷ In the same area, Plot records an explosion in a colliery at Wingerworth, which not only badly burned the miners, but also “going forth of the mouth of the pit like a Clap of Thunder” blew out the windlass at the top of the shaft.¹⁸

South of Chesterfield, the existence of coal mines at Tibshelf, Blackwell, Pinxton and Normanton is shown in a letter written by John Twentyman, Vicar of Tibshelf, in 1673, appealing for a reduction in the assessment on his colliery.¹⁹ The coal rights on the Coke property in the last two places were leased to Godfrey Haslehurst of Teversall, described by the Heralds in 1687 as “A great dealer in Coles, thought to be worth £10,000”.²⁰ Another parson with coal mining interests was William Sleigh of Shirland, who was accused by his successor, John Towne, in a suit over dilapidations, of having impoverished the glebe by getting the coal under it. The Coroner’s Inquests for the Hundred of Scarsdale include one for two colliers killed at Stretton in 1694, when they fell off pick shafts inserted in the haulage

14 Calendar of Committee for Compounding, p. 1735.

15 Glapwell MSS. Derbyshire County Council Offices.

16 Newbold Case for Arbitration. 1688. No. 1701. Derby Borough Library.

17 Wm. Senior. Plans of the Estates belonging to Wm. Cavendish, Earl of Newcastle, 1629-32. Welbeck Abbey MSS.

18 “Natural History of Staffordshire”, pp. 135-6.

19 *D.A.J.*, Vol. XXXI, pp. 221-3.

20 “A Derbyshire Visitation Manuscript, 1687”. *D.A.J.*, Vol. XXXII, p. 69.

ropes while descending the shafts. Two estate surveys give further information as to coal mining in this locality. One, now at Chatsworth, mentions coal mines on the Cavendish property at Hardstoft and Pentich in 1610. The other, of the Duke of Norfolk's Derbyshire estate, made in 1684, includes amongst the Wingfield property a coal delph at Ufton Fields. Finally, the Turner family, having bought all the minerals in Alfreton from the Crown and from the Zouches of Codnor Castle, were mining coal continuously in that parish throughout the century.²¹

It is obvious that both in South Yorkshire and North Derbyshire coal mining was largely in the hands of the land-owning class. A new feature in the industry during this century is the appearance of the lead merchant and the ironmaster who were taking a leading part in the development of coal mining. Capital from at least one other source flowed into the industry: the Turners of Alfreton, who were probably the most important family of coalmasters in the Hundred of Scarsdale during this century, were originally mercers.

The typical coal lease of this century contained both a fixed annual rent and restrictive covenants drawn up in the interest of the landowner to prevent more than the customary output of coal. For example, when the Earl of Newcastle leased a colliery at Henpit Leyes in Barlow in 1632, the lessees were restricted for nine months of the year to working one pit at a time, employing a maximum of four hewers, two drawers and a barrowman. For the other three months of the year, when the roads were dry enough to bear heavy traffic, they could work two pits with double the number of men.²² The lease previously referred to between Hewett and Frechville in 1659 limited the former to the working of two pits with full companies from the end of September to the beginning of February, but allowed four pits to be worked for the remainder of the year. The same type of restriction may be seen in the lease of the Sheffield Park coal by Richmond in 1692, whereby he was not to get coal at more than two pits at a time nor to employ more than ten getters. In addition, the lessee contracted to carry on work on the deep of the seam equally with the basset and to leave two pits in working order at the expiration of the lease.

The technique of coal mining throughout the area seems to have varied little from colliery to colliery. In South Yorkshire mining methods can best be studied at the Handsworth pits, worked by Sir John Bright.²³ Bright took over this colliery, valued at £1,800, in 1651, at a rent of £30 a year, from the Countess Dowager of Arundel. To drain the coal, a sough was dug at a cost of £265 "beside our labour". In February, 1651, the colliers began to sink three pits which were completed a year later. Ventilation was

21 R. Johnson, "An Ancient Swanwick Coal Mine". *D.A.J.*, Vol. LXXXIII, pp. 114-21.

22 Barlow Leases No. 34, Portland MSS., Shire Hall, Nottingham.

23 Sir John Bright's Papers Concerning Handsworth. Wentworth Woodhouse MSS. Br. 52/6. Sheffield City Library.

provided at this stage by "trunks" or wooden pipes, through which air was forced by bellows. One pit was on the outcrop of the coal and the other on the deep, so that the intervening seam could be extracted by driving benches into the coal and then mining the seam between each pair. Such an arrangement provided natural ventilation. As the life of each pit was short, a third was usually being sunk while coal was being extracted from the other two. The coal was hauled along the workings in baskets placed on sledges. During the first year, when construction work was at its heaviest, 32 men were employed. Later payments were made to six getters, so that it may be assumed that together with the manager, Thomas Stacey, and a banksman, the total regular labour force was about fifteen. Annual output during the third quarter of the century averaged about 1,000 loads a year.

Further information as to the technique of mining can be gained from a study of the accounts of Heath and Beightonfield collieries, the former worked by the Duke of Devonshire and the latter by Henry Bowden, who had acquired this property of the Hewetts by inheritance. The Heath Coal Book for 1697, when the colliery produced 259 horse loads, contains an inventory of the colliery equipment. This included a wheelbarrow, five new mandrels, three new hammers and twenty-four wedges with which to bring the coal down, three new spades and one new mattock and, most interesting of all, a new fire pan showing that artificially induced ventilation was in use in North Derbyshire at the end of this century. The Bowden accounts show that at Beightonfield almost all mining operations were done on piece work, as may be seen from the following agreement, typical of others drawn up between the coalmaster and his colliers.

2 Oct 1699. Bargained with Henry Ryall to gett coales till Feb ye 2nd and was to give him 10d 2 qrs a 3 Quart he allowing me one att ten to make good ye stack; for any bye work or if it run in he is to bear his share. I am to allow 8d a score for punches getting and 12d a yard for heading.

These accounts, incidentally, are almost unique amongst those so far discovered in that they contain details of profits—the coalmaster made £25 in 1698 and £33 the following year, in addition to clearing the whole cost of pit sinking and equipping the two new pits sunk.

Markets for the coal produced around Sheffield are indicated in a letter written by the banksman of the Park colliery in 1630, when he reported a diminished demand from cutlers, brewers and householders as one of the reasons for a fall in output. In Derbyshire, great houses such as Chatsworth and Hardwick consumed large quantities of coal—the latter, for example, was supplied in 1666 with 975 loads from a colliery on the estate at Hardstoft. It is probable that apart from its use for heating and cooking at Hardwick, coal was used there for malting, as this part of Derbyshire was already well known for its production of barley. Other markets

taking increasing amounts of coal were brick making and lime burning. Brick only slowly replaced stone as the traditional building material of the region, but houses such as Swanwick Hall, built by the Alfreton coalmaster, John Turner, on the occasion of his marriage to Elisabeth Thoroton, daughter of the famous historian of Nottinghamshire, in 1672,²⁴ and a house in St. Mary's Gate in Chesterfield erected by the lead merchant, Richard Youle, show the trend of architectural fashion away from the old halls with their walls of native grit or sandstone. The Welbeck estate accounts show building in brick towards the end of the century.²⁵ In Yorkshire, an agreement of 1640 in connection with a brickworks at Ecclesfield, specifying that both coal and wood were to be provided for the use of the burner, shows an early use of coal in this industry in the area.²⁶ The first brick house to be built in Sheffield was traditionally erected in Pepper Alley in 1696.²⁷ Peak District rentals show an increasing amount of lime burning during this century and odd leases specifying the quantities of lime to be used on farms by tenants, and entries in estate accounts, point to its increasing use in agriculture. Another market for coal was in the manufacture of pots—the first big pothouse in the area seems to have been set up in Crich by Thomas Morley, a Nottingham potter, in 1698. In addition to these internal markets, coal was supplied from the pits on the eastern edge of the field into Nottinghamshire and from those on its southern perimeter into the counties of Leicester, Rutland, Northampton and Lincoln.²⁸

THE PRE-CANAL AGE.

Three rivers penetrate the Yorkshire, Nottinghamshire and Derbyshire coalfield—one, the Don in its central section and the other two, the Calder and the Trent, on its flanks. These two latter were, in the seventeenth century, unlike the Don, naturally navigable to points within the coalfield. As a result, the coal on the northern and southern edges of the coalfield, at places such as Sharlston, near Wakefield, and at Strelley and at Woolaton, outside Nottingham, was more extensively exploited than it was in the central area of the field, the greater part of which was many miles from a navigable river.²⁹ Improvements on the Don, initially as far as Aldwark in 1733 and subsequently as far as Tinsley in 1751, placed the South Yorkshire coalfield on an equality with its competitors as far as transport facilities were concerned, leading to a spectacular expansion of the industry in the Don valley, as it responded to the stimulus offered by the demands

24 Reynold's Derbyshire Notes. Bagshawe Collection 12/2/17. John Rylands Library, Manchester.

25 Andrew Clayton v. Duke of Newcastle concerning the administration of the Welbeck Estate. D.D. 2.P. 24/73. Portland MSS. Shire Hall, Nottingham.

26 Wentworth Woodhouse MSS., Br. 45, Sheffield City Library.

27 John Bigland. History of the County of York, p. 817 (1811). (The statement has been challenged.)

28 Richard Blome, "Britannia" (1673).

29 Sharlston Colliery was leased by Thomas Stringer in 1664 for a period of seven years for a rent of over £1,000 annually; the Strelley colliery made a profit of over £10,000 from 1654 to 1667; the importance of mining at Woolaton is shown in H.M.C., Middleton MSS.

of a rapidly expanding market. By 1732, South Yorkshire coal was effectually competing with Durham coal in the Humber estuary and the valleys of the Trent and Ouse.³⁰ During the sixties, coal mined around Rotherham penetrated the Trent valley as far south as Newark and along the Fosse Dyke to Lincoln, from which the adjacent parts of the county were supplied, as a result of the temporary exhaustion of the collieries around Nottingham and the inability of the South Derbyshire mines at Heanor, Shipley and Langley to compete in this market as the roads between them and the Trent were in such poor condition.³¹ It is probable that the introduction of the atmospheric engine into the Nottingham coalfield and the turnpiking of the Bramcote road between the Trent and the Erewash valley coalfield led to the capture of the market for coal in the lower Trent valley by the southern portion of the coalfield once again, but a traveller in Lincoln in 1772 noted that the supply of coal in this county was chiefly from Yorkshire collieries.³² The South Yorkshire pits, however, had no monopoly of this market as it was fiercely contested by coal brought by barge from the mines along the Calder near Wakefield.³³ Another extensive market for coal mined in South Yorkshire was along the Derwent Navigation to Malton in the East Riding, an inland navigation controlled by the Marquis of Rockingham and leased by the most important coalmasters on his estate, the Fenton family. Altogether, it was estimated that the total coal traffic down the Don in 1772 was some 40,000 waggons—probably between 80,000 and 90,000 tons.³⁴

The extension of the Don Navigation to Tinsley, within a few miles of Sheffield, with which it was later connected by a turnpike, led to a considerable expansion in the trade both of Rotherham and Sheffield. When Arthur Young visited the former town in 1769, he noted the foundries there making plough shares, boilers and pans; a pottery making earthenware; and two collieries supplying these with fuel. He also noted the great prosperity of Sheffield, where during the previous twenty years the number of forges had increased by seven, tilts by two, grinding wheels by eleven and the number of troughs by 262. As most operations in Sheffield industry consumed coal, this expansion in business activity necessarily led to an increase in the demand for coal. Technological change, particularly the substitution of coke for charcoal in forges, also led to an increased demand for fuel. Increased industrial development and the growth of population brought an increased amount of building in their train, a considerable proportion of which was in brick. Both the Norfolk and Bright rentals show the construction of new brickyards in or around Sheffield. The Wentworth

30 Journals of the House of Commons, XXII, 456, 458 and 467.

31 Journals of the House of Commons, XXIX, 712, 796, 915 and 971.

32 A Short Tour of the Midland Counties of England performed in the summer of 1772, pp. 41-2.

33 List of Common Carriers of Coal to the River Calder. Bretton Hall MSS. Yorkshire Archaeological Society, Leeds.

34 Bundle 116 (Barnsley Canal). Bretton Hall MSS.

Woodhouse rentals show the establishment of brickyards at Greasborough and Wentworth and tileworks at Swinton. To meet the demand for glass, new glass houses were built at Bolsterstone and Catcliffe, at each of which small collieries were worked by the owners, to provide the necessary fuel.³⁵ An increase in the number of houses led to an expanding market for domestic fuel—visitors to the area were astonished at the cheapness of coal and the amount burned by householders.³⁶ The increase in population stimulated agricultural development and led by such landowners as the Marquis of Rockingham and the Duke of Leeds, landlords began to enclose waste and common land on a considerable scale. Lime was a necessity to bring this under cultivation and to keep it in good heart. Young, on his Northern Tour, noted that farmers in Ecclesfield used four quarters of lime per acre. As the River Don cut consecutively through the magnesian limestone formation and the Coal Measures between Doncaster and Sheffield, it was easy to transport both along the river and to burn the stone down to lime. The Don Company established lime kilns at Conisborough in 1733 to stimulate its use; the Marquis of Rockingham worked lime kilns at Hooper, Wentworth and Kilnhurst in conjunction with his collieries on the Wentworth property; Young noted lime kilns in Rotherham and other documentary evidence shows lime kilns at work at Sprotborough, Warmsworth and Tinsley during this period. Two other coal-consuming industries which underwent considerable expansion in South Yorkshire at this time were the manufacture of malt and of cloth.

This combined internal demand and export trade led to a massive development of coal mining in the first three-quarters of the century in that section of the Don valley where the river cuts through the Coal Measures. The rentals stipulated in coal leases of this period show a vastly increased scale of output. In 1723, John Hirst leased two collieries on the Wentworth estate at Swinton and Greasborough with a combined rent of about £200 a year. Two years later, William Spencer of Bramley Grange, a Yorkshire landowner with considerable interests in the Derbyshire lead industry, leased a colliery at Kimberworth from the Earl of Malton at an annual rent of £245 and another at Greasborough for £63. These latter pits were taken over by the Derbyshire coalmaster, John Bowden of Beightonfield, in 1742 for the same rent, but output at Greasborough rose so rapidly that this was soon increased to £240 a year. The account books of this estate show Richard Bingley paying a rent of £124 at this time for a colliery at Brampton Linthwaite lower down the river. These rents are, however, dwarfed by that paid by Thomas and William Fenton, who leased the coal under the Wentworth estate at Basingthorpe in 1757 at a rent of £324 for the first two years of their lease and of £648 for the remaining nineteen years. By

³⁵ Ronsley Collection, No. 1587. Sheffield City Library.

³⁶ *Magna Britannia et Hibernia*, Vol. 6, p. 448 (1730), and "Travels in England", Letter II (1761), M.D. 1769. Sheffield City Library.

1773, their sales down the Don were more than 20,000 waggons—about half the total amount of coal sold down river.

Coal mining naturally developed around the terminus of the Don Navigation at Tinsley, near the outcrop of the Barnsley Bed. At Darnall, a colliery was opened by a local landowner, Joseph Alsabrooke. At his death, this colliery came into the hands of his son-in-law, Joseph Swift, who, in 1760, entered into a partnership with Walter Osborne, a Hallamshire merchant and a leading Committee man of the Don Navigation, and with Joseph Clay of Bridgehouses, the most important of mid-eighteenth century Sheffield lead merchants. By 1762, competition from this colliery had become sufficiently acute in Sheffield for the Duke of Norfolk to take legal advice, whether, as Lord of the Manor of Attercliffe, he could prevent traffic crossing the Common from the colliery to the town. Ten years later, Darnall was supplying half the house coal used in Sheffield, as it had the advantage of good road communication with Sheffield, whereas the Norfolk pits had to bear the cost of heavy repairs on what were then private roads through the Park. Coal from this colliery was also exported down the Don.

Despite competition from Darnall Colliery, mining in the Park at Sheffield expanded rapidly under the dual stimulus of increasing industrial and domestic demand. At the beginning of the century, after the expiration of Richmond's lease, the Sheffield lawyer, Banks, took over the colliery for a period of twenty-one years. A rate assessment of 1716, however, shows this colliery then to have been in the hands of Robert Clay, a Walkley yeoman, the owner of a lead smelting mill at Dore. After his death, the colliery was leased by John Bowden of Beightonfield at a rent of £400 a year and a fifth of all sales in excess of £2,000 annually. Payments in the Cash Books of the Norfolk estate show that Bowden in the last six years of his lease, which ended in 1758, paid £1,377 in excess rents. No further records of mining in the Park have been discovered until 1774, when a twenty-one years' lease was granted to Townshend and Furniss, whereby they undertook to pay a minimum rent for Sheffield Colliery of £100 per annum and in addition a royalty of £2 4s. 0d. for every Tenn (44 loads) of coal mined over 600 tons. This partnership also took over the Manor Colliery at a minimum rent of £50, with an additional royalty of eight pence per cart load on all coal mined in excess of 4,400 loads. This partnership invested £3,200 in improvements and with the advantages of shallow pits and plenty of the hard coal demanded by the cutlers easily accessible, increased output here to the extent that they were paying the Duke of Norfolk, at the end of the period, over £1,000 a year in rent and royalty.

Although no river penetrated North Derbyshire, improved road communication with the lead mining areas of the Peak and the agricultural districts of Nottinghamshire widened the market for coal. There is ample

evidence to show that during the first half of the century coal transport was confined to a comparatively short season between hay making and the corn harvest, and that after the end of October the roads were almost useless for heavy traffic. The creation of a road system usable throughout the year must have been a big advantage to the collieries. A primary motive in road improvement was to facilitate coal traffic. The Turners of Swanwick rebuilt the road from their pits to Matlock at their own expense in the thirties.³⁷ The chief purpose of the turnpike road from Little Sheffield to Buxton, via Grindleford Bridge and Hucklow, and to Sparrowpit via Hathersage, Hope and Castleton, was to enable coal mined around Heeley to compete with coal mined in Cheshire, carried along the Sherbrooke Hill Trust's road from Chapel-en-le-Frith toll free.³⁸ In the next year, when the road between Baslow and Calver bridges was turnpiked, one clause of the Act stipulated that coal brought from Baslow colliery by the owners of the lime kilns at Calver or by the Duke of Rutland's tenants should only pay half toll. Another road turnpiked in 1759, that connecting Chesterfield with Mansfield, was improved with the object of facilitating the transport of coal from the pits at Heath, Barlborough and Staveley to Worksop and Mansfield and other parts of Lincolnshire and Nottinghamshire.³⁹ A third road turnpiked in this year, largely through the influence of Anthony Tissington, the trustee of the Turner property at Swanwick, the Newhaven Turnpike, connecting the collieries at Alfreton with the Winster, Matlock and Ashbourne districts, gave waggons carrying coal a concession of one-third of the toll. An Act passed the next year, turnpiking the road from Chesterfield to Matlock Bridge, exempted all coal traffic entering this road from a side gate from paying toll. In 1764, when the road from Alfreton to Mansfield was made into a turnpike, the Bill contained a clause whereby coal from Blackwell colliery would only pay half toll. Two years later, when the High Moors Turnpike was made over the East Moor, concessions were once more given to coal traffic. In the same year, a cross-country road from Ashover to Temple Normanton was made into a turnpike, largely through the efforts of the Quaker Lead Company, which wished to improve communications between the pits along the Mansfield turnpike and their Bower's Mill lead smelting plant.⁴⁰

There is no doubt that coal traffic between the Derbyshire coalfield and the lead mining areas in the Peak was heavy, even before these roads were turnpiked. One reason for this was the introduction of the Newcomen engine to clear the deeper mines of water. There were three of these at work

37 British Museum Add. MSS. 6692, p. 180.

38 "The Humble Petition of the Town of Sheffield" in Tibbitts Collection No. 362, Sheffield City Library, and "Petition respecting the Chesterfield Turnpike", in Bagshawe Collection 13/3/296, John Rylands Library, Manchester.

39 Case on behalf of the Bill . . . for Repairing the Road from Chesterfield in Derbyshire to the town of Mansfield. n.d.

40 A. Raistrick, "Quakers in Science and Industry", pp. 184-5.

at Winster in 1730.⁴¹ Shortly after this time, according to Farey, usually a most accurate witness, there were ten of these engines working at lead mines in the Peak.⁴² Another was installed at Foolow by William Soresby, a Chesterfield lead merchant, in 1748.⁴³ The Gregory Mine partnership bought another of these engines in 1768. As the efficiency of these machines was low, their high fuel consumption must have greatly stimulated coal production. Another technical innovation was the introduction of the cupola, which used coal instead of kiln-dried wood, to smelt lead. The first of these was built at Ashover by the Quaker Lead Company, but others were constructed during this period at Kelstedge, outside Ashover, on the Sir William Turnpike, and at Barber Fields on the moors between Hathersage and Sheffield. The intensive development of the Alton Seam, on the eastern margin of the coalfield, must be largely ascribed to these new markets in the Peak.

Turnpike development and increasing population undoubtedly did much to stimulate the enclosure of common land in the Hundred of Scarsdale and of the wastes in the Peak. Lime was needed to bring both under cultivation. Arthur Young, on his Eastern Tour in 1771, noted that it was customary to use a hundred bushels of lime per acre around Chesterfield. On the infertile grits, twelve horse loads per acre were used for wheat growing and as much as 350 bushels per acre were used to destroy the ling on the newly enclosed land between Chatsworth and Tideswell. As the coalfield was flanked on both east and west by limestone formations, it was easy to take fuel to the quarries and burn the stone down to lime. To the west there were kilns at Ashover, Hockley, Calver and Stoney Middleton, and to the east at Cleasby and Worksop. These kilns, in addition to supplying lime for farming, also supplied it for building.

Brickyards also provided another market for coal. Brick, as may be seen from the advertisements in the *Derby Mercury*, was replacing stone as the principal building material of the region. Successful lead merchants, such as William Soresby, who built himself "a capital mansion house" near Saltergate in Chesterfield, and Isaac Wilkinson, who built Tapton House, outside the town, both built in brick. Even smaller houses, such as the delightful little house erected for the use of a master at Dronfield Grammar School, were built in this material. The construction of the Chesterfield Canal, for which three million bricks were made at Harthill for lining Norwood Tunnel and another million made at Shireoaks for building locks, must have led to a considerable demand for coal in this area at the end of the period.

Brewing was another industry which expanded during these years. Mansfield had become an important malting centre, supplying markets in

41 "Dr. Clegg, Minister and Physician", *D.A.J.*, Vol. XXXV, p. 28.

42 Farey's "Agriculture and Minerals of Derbyshire", Vol. I, p. 338.

43 Wheat Collection 530/5. Letter dated 10 June, 1748. Sheffield City Library.

Cheshire and Lancashire with malt, and Alfreton was noted for its beer.⁴⁴ A German professor, Ferber, who visited Derbyshire at the end of this period, described the process of making coke for malting. The coal was placed in piles about seven yards long and a foot high, with the lumps loosely packed so that the air could circulate through them. The heap was then ignited by throwing lighted coal down holes left for that purpose. The pile was then allowed to burn until it was considered that all the coal had been turned into coke, when the heap was broken up with iron bars and the fire put out.⁴⁵

This expansion in demand was not met, as in South Yorkshire, by an enlargement of existing collieries, so much as by an increase in the number of collieries at work. The pattern is similar to that of the previous century with pits at work in almost every parish. The majority of these, where production figures are available, seem to have had an annual output of from 1,000 to 2,000 tons a year. Whereas the construction of the Don Navigation tended to canalize mining along one narrow sector of the coalfield, the development of the turnpike system in Derbyshire, crossing and criss-crossing the coalfield, tended rather to open up new pits and to decentralize rather than concentrate production.

The pattern of ownership during these seventy-five years is clear. Coal mining was still dominated by the land-owning class. The part played by the aristocracy was, however, a minor one when compared with that of the gentry. These, as elsewhere in the country, were recruited both from the families whose names appear in the Tudor and Stuart Heralds' Visitations and from the new men, investing the profits of trade and industry in land. Both these classes provided men working collieries in the eighteenth century. Typical of them was John Bowden who, apart from the collieries already mentioned on the Norfolk and Wentworth estates had other pits on the Portland property at Shuttleworth, on the Duke of Leeds's estates at Todwick and on the Devonshire property at Beightonfield, Hollingwood and Inkersall in Staveley. This Catholic, descended from two of the best families in the county—his mother was an Alleyne of Wheston Hall, near Tideswell—called himself "yeoman" and registered himself with the Derbyshire Quarter Sessions as owning land worth a mere six shillings a year, but had considerable landed property in the hands of trustees bonded to him for rents. Altogether, he must have been a very rich man and his son, in times more peaceable for Catholics in the second half of the century, was able to acquire a large landed property in Clowne, where he built Southgate House. Of equal importance as coalmasters as the Bowdens, although the major part of their coal mining interests were in the south of the county, were the Fletcher family. In the seventeenth century they

⁴⁴ *The Universal Magazine* for October, 1748.

⁴⁵ J. F. K. Ferber, "Versuch einer Dryktographie von Derbyshire" (1776), p. 43.

can be traced as yeomen, living at Kilburn. In 1684, Robert Fletcher was offering Francis Stanhope, the owner of the important Zouch coal royalty at Heanor, £70 for the lease of a pit there. His two sons, John and Robert, had a lease of the coal there in 1715 for sixty-three years and the family worked this colliery until 1766.⁴⁶ During the next half century, the brothers extended their mining operations, working collieries at Hartsay, Denby, Smalley, Shipley, Langley, Ripley and Pentrich.⁴⁷ John, who lived at Stainsby Hall, had a grant of arms in 1731; Robert, of Heanor, married the daughter and heiress of William Richardson of Smalley, another South Derbyshire coalmaster. This family first became interested in coal mining in the Hundred of Scarsdale in 1728, when they leased the coal on the Coke property at Pinxton. Later, in 1758, they took a further lease of the coal on this property at South Normanton.

Other members of this same social class working collieries in Derbyshire were the Rodes of Barlborough Hall with pits at Nitticar Hill and under the open fields of that village; the Hunlokes of Wingerworth Hall, the leading Catholic family in the district, who had a colliery alongside the Derby turnpike; the Wraggs of Stretton Hall who were working coal on the Hunloke and Woodyear estates near Clay Cross; and Thomas Thoroton of Scriveton, M.P. for Newark (according to Reynolds, the Derbyshire antiquary, writing in 1760) after having inherited the Turner property in Swanwick, received "a large income from the coal mines there". Three other land-owning families who were mining coal at this period, all with their roots in lead mining in the previous century, were the Brights of Chesterfield with a colliery at Eckington,⁴⁸ the Gladwins of Stubbing Court with pits at Boythorpe,⁴⁹ and the Milnes of Dunston with a colliery on their property there.⁵⁰

The same situation can be found across the county border in Yorkshire. In Handsworth, three families which had risen into the ranks of the gentry by wealth derived from either coal or lead mining—the Staceys, the Noddors and the Fentons—were all mining coal under their own land. The Fenton collieries on this property and one rented from the Duke of Norfolk came by marriage into the hands of John Rotherham of Dronfield, a member of a family which, starting as mercers in the previous century, had become agents to the Duke of Portland, and lead smelters and lead merchants in the early eighteenth century, investing their profits in the purchase of the Manor of Dronfield. North of Sheffield, the Phipps family were mining coal in Ecclesfield in the forties, selling it to Wortley Forge.⁵¹ In the upper

51 Accounts of carriage, No. 27, Cannon Hall MSS. Sheffield City Library.

46 Charlton of Chilwell MSS, Shire Hall, Nottingham.

47 John Fletcher v. Francis Barber. Accounts for sale of coal 1713-55. Parcel CXCIV, Bemrose Collection. Derby Borough Library.

48 Eckington Rental, D.46, Fairbank Collection. Sheffield City Library.

49 Crewe MSS, No. 1139. Sheffield City Library.

50 Beauchief MSS, No. 905. Sheffield City Library.

part of the Don valley, a series of disputes between the Duke of Norfolk and the Bamfords of Owlerton show the latter family mining coal in the early part of the century at Loxley, on the common between Bradfield and Wadsley. In the middle section of the river, where it was navigable around Rotherham, another family of landowners, the Hirsts, in possession of a colliery advantageously sited near the Don, were selling some 15,000 waggons of coal down stream in 1774. Near Barnsley, coal mines were being worked in the first quarter of the century by such local families of gentry as the Shippems, the Archdales and the Elmhirsts.

The class below the gentry, that of the small landowner and tenant farmer, too, provided much of the capital and initiative for developing coal mining. In 1700, Peter Browne, a Staveley yeoman, leased the pits, later held by John Bowden at Westwood, for £30 a year and another colliery at Eastwood for £100 for the first year of the lease and £70 annually for the remaining four years. Nine years later, as shown by another lease at Hardwick Hall, he took over the coal at Beightonfields on the deep of Mastin Moor for £100 a year. Another family of this class, the Allwoods, had collieries on the Devonshire property at Heath and on that of the Earl of Scarsdale at North Wingfield. More important than either of these in the long-term development of the Derbyshire coalfield were the Barnes family. Joseph Barnes of Linacre Farm was mining coal on the Oxford estate at Barlow and Brampton in the first half of the century. A second member of the family, another farmer, Edmund of Leadhills, was at the same time buying coal rights in Brampton. The real founder of the family fortunes, however, was John Barnes of Holme Hall, a man with a multitude of business interests in addition to coal mining. He farmed land—both his own and rented—on a large scale at Holme Hall, Ashgate, and Chander Hill in Ashgate. According to a memorandum written by one of his descendents he exchanged coal against an equal weight of bones, which he crushed at a windmill on his farm. In addition, he was a timber merchant, buying and felling standing timber and selling bark to the local tanners—of which there were a large number in Chesterfield, Sheffield and Rotherham—and sawn timber to local joiners and wheelwrights. Finally, to add to this total, he ran a brickworks. In the forties he was mining coal at Barlow on the Oxford estate. In 1756, he bought 70 acres of land at Ashgate and another 30 at Newbold, under which to get coal; in 1763, he leased another pit at Barlow; in 1765, he leased from the Duke of Devonshire “that delph of coal lying within and under the North side of Chatsworth Park” and in the same year he leased another colliery from the Duke at Heath. The deeds of the Coke family of Pinxton contain a number of coal leases to farmers on this property; John Stones, a tenant farmer on the Oxford property at Brampton rented a colliery on his farm; on the Wentworth property in Yorkshire, leases show William Beaumont, husbandman, and Farham, a

tenant renting over 150 acres, in possession of pits at Tankersley and at Westwood respectively.

Compared with these classes, the production controlled by the aristocracy was small indeed. The Duke of Devonshire was working a colliery on the Hardwick estate during the first half of the century, which, when leased in 1749, was valued at £300. Over the Yorkshire border, the Duke of Leeds took over a colliery on his property at Woodall Moor from a local farmer who had gone bankrupt and found himself in York Gaol in consequence. Its output in 1740-1 was 2,500 loads. At a later date, two more collieries worked by the Duke at Todwick Common and at Wales had a total sale of coal in 1765 of £430. On the Wentworth estate, the policy during the first half of the century was to lease the coal, but in 1752, after a visit to the Duke of Bridgewater's colliery at Worsley, the Marquis of Rockingham took over a small colliery at Elsecar, largely for the purpose of burning the lime which was brought down the Don to Kilnhurst from the magnesian limestone scarp near Brotherton. Other limekilns at Hoover were supplied with coal from a number of shallow pits at Braithwaite and Swinton Common. In 1763, on the death of the lessee, the Marquis began to work a larger colliery at Law Wood. At this time, 22 colliers were employed here and eight at Elsecar. Coal from Law Wood was also used to burn bricks and pantiles for estate use. Of interest, if not of any real economic importance, were the efforts of the Marquis to supply his town house in Grosvenor Square and his estate at Higham in Northamptonshire with coal mined on his Wentworth property. The coal was first sent by barge to Thorne, where it was placed in larger keels for shipment to Hull. There, it was forwarded by collier to London or Lynn. These areas were normally supplied by the North-Eastern Coalfield and as these shipments were from the cost standpoint uneconomic, they can be regarded as a relic of feudalism, the determination of a great nobleman to use the products of his own estate, rather than an attempt to break into new markets.⁵²

The colliery lease underwent considerable change during this period. In the early years of this century, the typical lease on the Devonshire, Manvers, Portland, Norfolk and Newcastle estates,⁵³ contained a fixed rent without any reference to the amount of coal mined. The interest of the landowner, however, continued to be protected by clauses stipulating the maximum number of hewers to be employed and the number of shafts to be worked at any one time. As an example, the lease between the Duke of Devonshire and Peter Browne, drawn up in 1700 for the colliery at Staveley Westwood may be quoted—Browne was restricted to working two shafts at any one time, limited to employing not more than the usual number of men and bound by a bond of £600 not to use any mining

⁵² Wentworth Woodhouse Muniments. R. 174/23. Calculation of the Expences attending a Chald. Coals from the River Humber to Lynn and Thence to Higham up the Nothampton River.

⁵³ Rents of the Duke of Newcastle, 1737-74. British Museum. Add. MSS. 33165.

methods whereby "the said mines may be sooner wrought out or rendered the less beneficial". With the expansion in coal output, brought about by the improvement in communications, landowners and their lawyers began to draft leases, whereby there was some definite relationship between output and the royalty paid by the coalmaster. The normal practice on the Wentworth property in the second half of the century was a fixed payment per hewer. This varied from colliery to colliery. The amount stipulated was probably arrived at by a consideration of all the factors which governed profitability—the thickness and number of the seams, the depth worked and the situation of the colliery in relation to markets and communications. The royalty on each hewer at Fenton's Basingthorpe colliery, situated alongside the Don, was £40 10s. 0d. in 1762. At Richard Bingley's Law Wood colliery, where although there was a thick seam of good coal, the pit was a considerable distance from water transport, the payment per hewer in that year was seventeen guineas. At Parkin's Bolsterstone pit, working a thin seam in a sparsely populated district, it was only £3 10s. 0d. On the Coke property at South Normanton, probably influenced by what was customary practice in South Derbyshire and Nottinghamshire, 15 acres of coal was leased to Goodere Fletcher in 1758 at a royalty of 1/6 a stack.⁵⁴

The fairest system—and one which virtually replaced all others during the Early Railway Age—was that in which royalties were calculated on the acreage of coal extracted. In addition to the virtue of fairness between the two parties, it offered another advantage in that it was both cheap and simple to operate, the only operation needed being an annual scaling by a surveyor. The first example discovered of this type of lease is one for coal under the Ogston estate, dated 1742, in which the lessees were to pay £42 for each acre of coal mined. This lease is also of particular importance in that it contains a clause whereby a minimum annual payment of £45 is stipulated, a practice which again became general during the Early Railway Age. Another example, twenty years later, between Anne Cartledge of Dronfield and Anthony Gallimore, whereby the former was to sink two shafts and make a sough at Dore, provides for a coal rent of £60 per acre.⁵⁵ In 1765, John Barnes of Ashgate leased the Top Hard Seam on the Hardwick estate and a poorer coal at Brampton from the Duke of Portland. In the first case, the royalty to the Duke of Devonshire was £120 per acre and in the second the coal rent was £40 per acre. Despite its advantages, the acreage lease did not, however, completely replace the older type, examples of which can be found at a much later date.

In a few cases, the landowner agreed to meet a part of the initial costs of mining development. On the Wentworth property, when Richard Bingley leased Elsecar colliery in 1752, he was allowed to work the coal free of

⁵⁴ A stack was 74 in. long, 46 in. high and 57 in. wide.

⁵⁵ Deed No. 37/2. Brookhill Hall, Pinxton.

royalty for two years provided he cleaned out a sough, constructed by a previous tenant, as far as Elsecar Green and continued it as far as "the foot of the coal now lying . . . in a certain close . . . situate in Hoyland . . . called the great arm royd". In the same year, another collier submitted a proposal to the Marquis of Rockingham to make a boring for coal at Hooton Roberts, in which it was suggested that he should not pay any rent for the first two years. On the same estate, £50 was paid in 1761 to the tenant of Elsecar colliery towards the cost of extending a sough. In the 1765 lease mentioned above between Barnes and the Duke of Devonshire, the latter was to pay the cost of the sough for draining the Hardwick coal. In his other lease of the same year, Barnes was allowed to mine six acres of coal without payment as an allowance towards driving a sough from the bottom of Brampton Moor.

Information as to the amount of capital engaged in coal mining is, unfortunately, sparse. It is conspicuously absent for the more important owners, such as the Fentons. What exists almost entirely relates to the smaller collieries. In 1716, Thomas Wentworth leased to John Green of Swinton, yeoman, the coal on the west side of Wath Common at a rent of £15 for the first year, when only one pit employing three men and three boys was to be at work, and of £30 for the remaining six years of the lease, when two pits would be in operation. Green sub-leased the two pits to working miners, but the lease had to be surrendered when the sough became stopped up. An inventory made at this time, shows the meagre equipment needed in the early decades of this century in coal mining—thirty pit props, four corves, three pairs of turnstakes, a fire pan, trunks and a pair of bellows for ventilation, a hurrying hook, planks and footboards—the whole valued at about £9. An inventory of Woodall Moor colliery, made in 1740, at the time of its transfer to the Duke of Leeds, shows the amount of capital invested in a colliery capable of producing well over 2,500 loads a year—corves, sledges, hammers, mandrels, dressers, axes, saws, wedges, a fire pan and bank hooks were valued at £85, pumping machinery at £63—a total, with other items, of about £200. In 1754, a colliery on the Wentworth property at Braithwaite was sold for £115. Three years later, when the coal on the north side of Swanwick Hall was worked out, Anthony Tissington estimated the cost of sinking a new colliery on the south side of the house at £700, with an additional £1,100 for a Newcomen engine.⁵⁶ In 1767, another colliery working the Alton seam at Barber Fields, outside Sheffield, was sold for £57.⁵⁷ John Barnes spent £130 on sinking pits and making a sough at Heath Colliery before it came into production in 1767. It is obvious that the capital needed to begin coal mining during this period was not large, a fact which largely explains why the industry was so much in the hands of individuals, whereas contemporary lead mining and iron

⁵⁶ Turner MSS. Flintham Hall, Nottinghamshire.

⁵⁷ Tibbitts Collection No. 830. Sheffield City Library.

smelting, which demanded much larger initial investment, were almost entirely in the hands of partnerships.

Information as to the profits made during this period, again, mostly relates to the smaller collieries. One owned by the Duke of Leeds at Kiveton, selling coke as well as coal for making bricks, made a profit of £125 between September, 1718, and February, 1719. A much larger concern, that in the Park at Sheffield, was, according to the Duke of Norfolk, selling coal in 1725 to the value of £1,200 and £400 of this was profit. In 1730, when the colliery was worked by the Duke, almost exactly the same amount of coal was sold, but the profit realized was only £276.⁵⁸ The Bowden account book for Todwick colliery shows that sales averaged from £400 to £500 annually from 1720 to 1734 and that the pits made about £80 a year profit. In 1747, when D'Ewes Coke, the owner of the Pinxton property, was heavily in debt, he drew up a balance sheet of his assets, in which he included the value of his colliery, which he estimated at that time to bring in £400 a year. As part of his plan to free himself from his encumbrances and to settle the property on his son George, he proposed to lease the colliery to Goodere Fletcher, who was to expand production to 4,000 loads annually, which it was estimated would bring in a profit of £1,000 a year. Nearby, at Swanwick, Anthony Tissington, when planning his new colliery there in 1757, considered that it would make an annual profit of £600. On the Wentworth estate, Law Wood colliery, in 1753, cleared £140 in selling 558 pit loads—about 2,800 tons; in 1756, Elsecar sold 2,200 dozen of coal—about 4,500 tons—and made a profit of £160; a colliery on Swinton Common made a profit of £200 on 1,521 dozen in the first eight months of the next year; and at the end of the Seven Years' War, Law Wood and Elsecar realized £777 profit. At Heath, John Barnes, in the years between 1768 and 1775, just cleared his expenses. His methods of accounting, however, hide a substantial profit in that he charged the colliery with a management fee of £20, drawn by himself, as well as 5% interest on the capital he had invested in sinking the colliery initially, and on the money employed as circulating capital in the business during these years. There is, therefore, every reason to believe that coal mining was a most profitable activity in this period.

Coalmasters such as Barnes, the Fletchers and the Bowdens obviously managed their own pits. The only example of a paid manager discovered during this period is Thomas Smith, employed on the Wentworth estate at a salary of £20 in addition to the wages of an ordinary workman. Generally speaking, the mining problems encountered could be dealt with by men native to the coalfield. On two occasions at least, however, engineers had to be called in from outside to solve problems too difficult for the Derbyshire or Yorkshire miner. In the early part of the century, the

⁵⁸ William Ellis's Account for Sheffield Colliery 1730-1. Deed Box 25, Norfolk Estate Office, Sheffield.

collieries belonging to the Archdale and Shippem families on Barnsley Moor ran into serious trouble with water. Wortley, the ground landlord, who had big mining interests on the North-Eastern Coalfield, called in two Durham viewers to advise on draining the pits.⁵⁹ In 1771, the steward of the Townley collieries in Lancashire came to Sheffield to advise on the future development of the Duke of Norfolk's Handsworth colliery, then leased to the Rev. Mr. Stacey of Ballifield.

In general, the technique of coal mining shows little advance on the methods in use during the previous century, until the end of this period. There was, in fact, little necessity for any change as coal could still be mined in large enough quantities to satisfy the demands of the market from shallow pits. The shafts at Whittington Moor colliery were only six yards deep; those at Hardstoft were eight yards; at Barnes' Heath colliery they were sixteen yards and at Beightonfield they were twenty yards deep. Across the Yorkshire border, in the third quarter of the century the pits at Elsecar, Ecclesall and Basingthorpe were fifteen, fourteen and twenty-five yards deep respectively. As a result, it was more economic to mine coal by sinking a large number of shafts than to drive long headings into the coal. "A Scratch of Jonathon Swift's Colliery" at Darnall, drawn probably at some date prior to 1750, shows five shafts; the same number are shown on a plan of Elsecar colliery made in 1757;⁶⁰ another of Westwood colliery at Tankersley, made in the same year, shows the whole of the wood scored with the remains of old shafts;⁶¹ seven pits were sunk at Ecclesall in 1758; the accounts of the Duke of Leeds' collieries at Wales and Todwick show that nine pits were sunk there in 1765; a map of Sheffield Park, now in the Norfolk Estate Office, shows seven pits at work in 1765; a plan of Fentons' Easingthorpe colliery, drawn in the same year, shows four pits in operation and another plan made in 1776, after a Newcomen engine had been installed to drain the coal to a depth of eighty yards, shows the whole area to be one mass of old pits which had been filled in, with coal then being mined from ten separate shafts.⁶² Evidence from Derbyshire tells a similar story. Bowden, for example, sank seven pits at Beightonfield between 1703 and 1707; John Barnes, in evidence against William Soresby, who amongst his many business activities was agent to the Oxford property in Derbyshire and who was accused of having abused his position to grant himself advantageous leases, declared that he had sunk no fewer than eighty-five pits at Barlow between 1726 and 1743;⁶³ six shafts were sunk at Heath colliery from 1766 to 1770. It seems, indeed, to have been normal mining practice to begin to sink a new shaft immediately production began in its predecessor.

⁵⁹ Barnsley Moor Collieries 1705-26. Wharnccliffe Muniments, No. 114. Sheffield City Library.

⁶⁰ F.B. 12, pp. 58-65, Fairbank Collection. Sheffield City Library.

⁶¹ F.B. 12, p. 67, Fairbank Collection.

⁶² F.B. Supp. 40, pp. 2-7, and F.B. Supp. 46, p. 4, Fairbank Collection.

⁶³ *Henrietta, Countess Dowager of Oxford v. Wm. Soresby*. Jackson Collection, No. 1285. Sheffield City Library.

Leases and accounts of workings suggest that most collieries were worked by two shafts, one on the basset and the other on the deep of the coal. In the larger collieries, two or more pits were worked simultaneously. Such a layout made ventilation simple, especially where a fire lamp was employed. Where levels were longer, separate wind pits were sunk to the workings. The first chimney built on top of the airshaft to improve ventilation was probably at Beightonfield as early as 1700. Gas does not seem to have been a serious problem at this period and when met with it was driven out by installing trunks—pipes constructed out of wooden boards—through which air was blown by bellows into the pit.

Coal was extracted, as is shown by the numerous references to benks, endings and gobs in colliery accounts, by a method which was only to disappear in the Victorian era, known as narrow work.⁶⁴ In this a bord or level was cut transversely to the grain of the coal and from this endings or roads were cut at intervals of thirty yards against the end of the coal. When these endings had been carried the requisite distance on either side of the main level, a communication was established between their extremities and the coal worked by short faces, leaving behind a goaf—or, as the accounts write it—a gob. In Derbyshire, at least at the beginning of this century, some coal was mined by the board and pillar method as is evident from the remarks of Celia Fiennes when visiting the Chesterfield district⁶⁵ and from an account of land to be sold at Newbold Fields, c. 1720, which declares that it was the normal Derbyshire practice to “leave about a third of the coal to support the roof”. It seems probable, however, that most Derbyshire collieries were adopting the more economic “narrow work” at the end of this period. Explosives do not seem to have been widely used, although there are references to their purchase in the Bowden accounts in 1700 and in an inventory of Swanwick Hall in 1744. After the hewer had extracted the coal, the coal baskets or corves were filled by his mate and then “hurried” to the bottom of the shaft—sometimes through post holes, i.e., roads cut diagonally through the ribs of coal separating the benks—by a barrower. In a few of the Barnsley Bed collieries, where a nine foot seam was being worked, horses were used to drag the corves or sledges to the pit bottom. Gins, in most cases driven by horses, were used to haul the coal up the shaft. Sometimes these were in charge of girls, who seem to have been restricted to this work alone on the coalfield. Barnsley Colliery seems to have been unique in its use of water power for raising coal, if the “water gin, house and ropes” mentioned in an inventory of 1713 refers to a haulage engine.

Drainage throughout this period was mainly by sough. Little information is available as to the cost or extent. John Barnes, in the case previously

⁶⁴ On Coal and Iron Mining in South Yorkshire. Parkin Jeffcock in Proceedings Institute of Mechanical Engineers, April, 1862.

⁶⁵ “The Journeys of Celia Fiennes”, ed. Morris, p. 96.

referred to, declared that he had spent £500 on a sough at Barlow; proposals were put forward to construct a sough at Barnsley Moor in 1716, 900 yards long and costing £1,000, but it is doubtful if anything came of the plan; Sheffield Colliery was drained in 1773, by a sough a mile and a half long, flowing into the Sheaf. Barnsley Colliery, again, seems to have been unique in its employment of a wind gin for pumping. This, however, was not sufficiently powerful to drain the pits on the Moor and Shippem suggested to Wortley that he should install a "Newcastle gin" for this purpose. There is no evidence that it was ever erected. Probably the first Newcomen engine to be erected in South Yorkshire was that which William Spencer of Bramley Grange contracted to build in 1735 "for the draining and recovery of the coals" at Carr House "as well as those lying within the Precincts of Kimberworth as those coals also which lye within Greasborough Bierley" by raising water from the Thick Coal to a sough driven through to the Don.⁶⁶ As the only "fire engine" shown on Dickinson's "New and Current Map of the South Part of the County of York" published in 1750 is at Carr House, and as Bowden, who took over Spencer's colliery in 1742, is included in a list of three Newcomen engine owners at Greasborough, printed in the *Gentleman's Magazine* in 1763—the others were Hirst and Fenton—it may fairly be assumed that Spencer did fulfil the terms of his contract in this respect. It is probable that another Newcomen engine was installed at Darnall Colliery about the same time.⁶⁷ Evidence as to the introduction of the "fire engine" into the North Derbyshire section of the coalfield is, unfortunately, as indirect as that for Yorkshire, but it seems from a comparison of the first accurate map of Derbyshire to be printed—Burdett's Survey of Derbyshire 1762-7—and Brindley's survey for the Chesterfield to Stockwith Canal made in 1769, that the first was installed at Staveley at some time between those dates. It is highly probable that it was erected either by John or Henry Bowden, as the former had leased the Devonshire coal there in 1756. Another Newcomen engine was at work at what a German visitor to the county described as one of its largest collieries, at Alfreton, in 1775.⁶⁸

The miner himself remains, during this period, a shadowy, indistinct figure. One thing, however, is certain, that in numbers he was not, as he was to become during the Railway Age, the dominant social type in the region. The number of hewers at various collieries—two at Westwood, four at Cortwood and four at Bolsterstone in 1755, and twelve at Carrhouse, seven at Law Wood and sixteen at Basingthorpe in 1759—shows that throughout the area the miner was everywhere outnumbered by the agricultural population. Indeed, an examination of the land system of the coalfield and a comparison of it with that of the magnesian limestone district to the east, brings out the high proportion of very small holdings throughout

⁶⁶ Wentworth Woodhouse Deeds, No. 1727. Sheffield City Library.

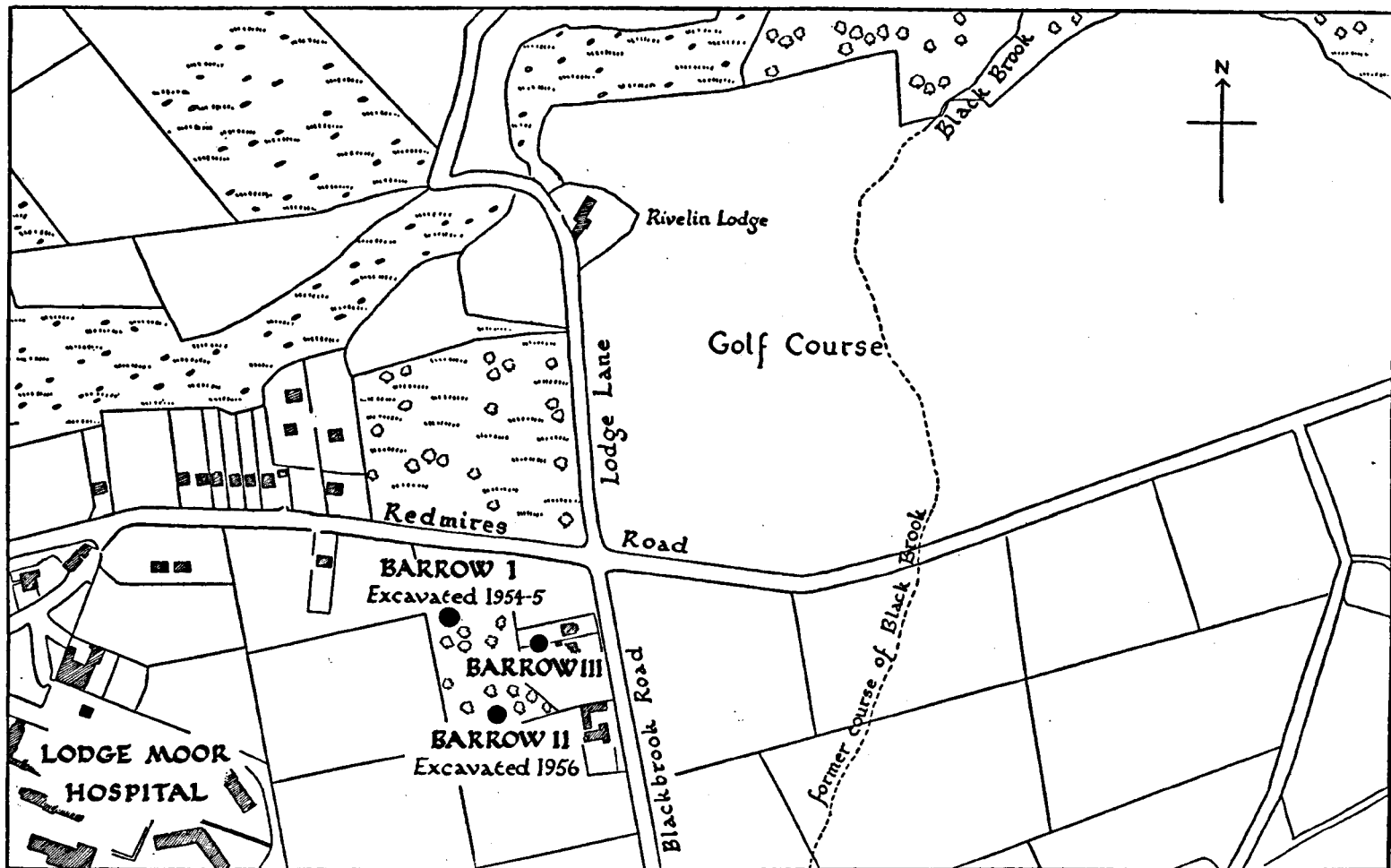
⁶⁷ John Needham's Map of the Colliery on Darnall Common. Wheat Collection, No. 1751. Sheffield City Library.

⁶⁸ Ferber, *op. cit.*, p. 40.

the coalfield, suggesting that the collier, like the nailer and the edge tool worker, was probably a landholder himself. It is certain that the majority of the miners were natives of the area in which they worked, as the Poor Law certificates in such typical mining parishes as Attercliffe, Staveley, Brampton and Barlow, show only a thin trickle of movement into these parishes and in almost all cases such migration was from a narrowly restricted region.

Almost everywhere the collier worked as a member of a group. The "butty system", whereby one man contracted with the coalmaster to drive headings at so much per yard or to get coal at so much per ton, was strongly established. As an example, at the Duke of Leeds's Todwick Common Colliery in 1765, Allen & Co. were paid three shillings for each three quarters of coal got, threepence a yard for filling pits, half a crown a yard for driving headings and a penny each for recovering pit props. Wages were paid either fortnightly or monthly. Such a system renders it almost impossible to ascertain a collier's real wages or to compare them with those of other workers. In addition, the miner enjoyed many perquisites. The sinkers were given sod ale when a new shaft was started and pricking ale when it reached the coal; ale was also given when a gin was moved; a colliers' feast was an annual event at Elsecar; colliery accounts contain items for Christmas presents; many coalmasters provided flannel for pit clothes; free coal, coal at reduced price or a money payment in lieu, were everywhere provided. Probably many coalmasters felt, like Bowden, that it was all an intolerable burden and that colliers, like other workmen, should be satisfied with wages but, as he wrote in his account book, there was no evading it or "else they pretend their custom".

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Based upon the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office.

FIG. 1. Location of Barrows at Lodge Moor, Sheffield.