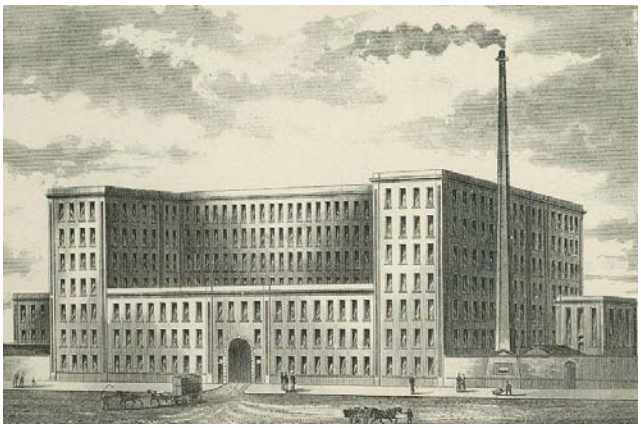

BRUNSWICK MILL, BRADFORD ROAD, ANCOATS,
Manchester

Documentary Account

Oxford Archaeology North

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Mr M Jenner

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SUMMARY

In August 2005, Oxford Archaeology North (OA North) was commissioned by Mr M Jenner to compile a documentary account of Brunswick Mill, situated on Bradford Road, Ancoats, Manchester (centred on NGR SJ 8585 9872).

Brunswick Mill originates from 1839, and forms part of an impressive group of mid-19th century cotton-spinning mills that flank the Ashton under Lyne Canal on the eastern fringe of Ancoats. It was designed by the firm of David Bellhouse, who emerged as one of the leading mill architects of the early 19th century, with a particular specialism in fireproof construction techniques. When erected, Brunswick Mill represented one of the largest textile factories in the country, built in one principal phase to a quadrangle layout and to an unprecedented length of 92m. The main mill block, situated alongside the canal, was erected to a height of seven stories, with full-height wings extending northwards from both ends. The central courtyard was enclosed by a three-storey block fronting Bradford Road, which incorporates the arched main entrance to the complex. The main block was used predominantly for spinning, which was undertaken initially on self-acting mules positioned transversely, one to each of the 28 bays per floor within the mill. The wings were used for a combination of spinning and ancillary processes, and the primary function of the front range was for warehousing and offices. The machinery was driven by a steam-powered beam engine that was almost certainly compounded to increase its output rating.

The mill was remodelled and expanded slightly during the 19th century. During the 1840s, a small three-storey block was added to the north-eastern end of the main spinning block, and by 1856 the original boilers had been replaced by the improved Lancashire type.

In 1865 the mill complex was taken over by the Bannerman Mills Company, the manufacturing subsidiary of Henry Bannerman & Sons, who became one of Manchester's leading textile-manufacturing firms. The mill remained at the forefront of technology and, in 1908/09, was the first factory in Manchester to replace steam-power with electric drive motors.

Henry Bannerman & Sons Ltd was amalgamated with the Lancashire Cotton Corporation Ltd, and Brunswick Mill was conveyed to this new combine. Cotton-spinning continued to be undertaken at the mill until the mid-1960s, after which the site was used by a number of small firms for a variety of purposes.

ACKNOWLEDGEMENTS

Oxford Archaeology North would like to thank Mr Mike Jenner for commissioning the project and for his considerable assistance during the data-gathering process. Thanks are also expressed to Norman Redhead of the Greater Manchester Archaeological Unit for facilitating access to the Greater Manchester Textile Mill Survey archive. Further thanks are due to the staff of the Manchester Central Library and Greater Manchester County Record Office for providing relevant historic mapping and primary documentation.

The report was compiled by Ian Miller, and the illustrations were manipulated by Mark Tidmarsh.

1. INTRODUCTION

1.1 CIRCUMSTANCES OF THE PROJECT

1.1.1 In August 2005, Oxford Archaeology North (OA North) was commissioned by Mr M Jenner to undertake a programme of historical research into the development of Brunswick Mill in Ancoats, Manchester. The research was based on primary documentation and cartographic sources, and was required to inform a wider study of the mill complex.

1.2 LOCATION, STATUS, GEOLOGY AND TOPOGRAPHY

1.2.1 Brunswick Mill is situated within the Ancoats area of Manchester, and lies approximately 1km to the north-east of the city centre (Fig 1). It occupies a trapezoidal plot of land (centred at SJ 8585 9872), bounded by Bradford Road and the Ashton under Lyne Canal to the north-west and south-east respectively (Plate 1).

1.2.2 In 1994, Brunswick Mill was designated a Grade II Listed Building (no. 387942). The mill is entered on the Greater Manchester Sites and Monuments Record (SMR 2051.1.0 – MGM271), and the National Monuments Record (NBR 53304).

1.2.3 Although Permo-Triassic red mudstones, siltstones and sandstones ('New Red Sandstone') constitute much of the geology of the Lancashire lowlands, the solid rock rarely emerges from beneath its thick covering of glacial and post-glacial deposits, which is dominated by clay soils (Countryside Commission 1998, 87). The overlying drift incorporates Pleistocene boulder clays of glacial origin, and sands, gravels, and clays of fluviatile/lacustrine origin (Hall *et al* 1995, 8).

1.2.4 Topographically, the Manchester Conurbation as a region is within an undulating lowland basin, which is bounded by the Pennine uplands to the east and to the north. The region comprises the Mersey river valley, which is dominated by its heavily meandering river within a broad flood plain (Countryside Commission 1998, 125). The topography of the study area, however, reflects the shallow valley of Shooter's Brook, a rivulet that flows westwards from Newton Heath, through Ancoats and into the river Medlock (Ashworth 1987, 22). Brunswick Mill lies on the southern berm of this natural valley, although Shooter's Brook was culverted during the early 19th century, and the topography of the area has since been masked considerably by in-filling associated with urban expansion and redevelopment.

2. METHODOLOGY

2.1 HISTORICAL BACKGROUND

2.1.1 Several sources of information were consulted as part of the historical research, which have provided a good understanding of the developmental history of the study area. Archive sources that have been consulted include:

- ***Greater Manchester Sites and Monuments Record (SMR):*** the Sites and Monuments Record for Greater Manchester, held in Manchester, was consulted. This consists of a list of known archaeological sites within the county, and is maintained by the Greater Manchester Archaeological Unit (GMAU). The SMR also maintains an updated copy of the Greater Manchester Textile Mill Survey.
- ***Greater Manchester County Record Office (GMCRO):*** the County Record Office in Manchester holds original documents and maps for the area, and was visited primarily to consult early maps and other relevant documents, which can provide details of the development of the study area.
- ***Manchester Central Library Local Studies Unit (MCL):*** Manchester Central Library holds printed and manuscript maps and plans of relevance to the present study, and an extensive collection of published sources.
- ***Oxford Archaeology North:*** OA North has an extensive archive of secondary sources relevant to the present study, as well as numerous unpublished client reports on work carried out both as OA North and in its former guise of Lancaster University Archaeological Unit (LUAU). These were consulted where necessary.

3. BACKGROUND

3.1 INTRODUCTION

3.1.1 The following section provides a summarised account of the development of Brunswick Mill. The site was selected for detailed recording as part of the Greater Manchester Textile Mill Survey during the late 1980s, and information provided in the archive generated from that survey has been incorporated into the present background, along with references to original documents where appropriate. This account is preceded by an overview of Manchester's contribution to the textile industry during the 19th century and the development of Ancoats as the world's first true industrial suburb, which is intended to facilitate an understanding of the mill complex in a local and regional context.

3.2 SUMMARISED HISTORY OF THE ENGLISH COTTON INDUSTRY

3.2.1 At the beginning of the 18th century, the English cotton industry was comparatively small. Most cotton materials were imported from India, but in 1701, and again in 1721, Acts of Parliament were passed which prohibited the wearing of Indian calicoes. These measures were aimed at assisting the English woollen industry, although it was actually cotton manufacturers that benefited. However, the benefits were slow to be realised because of two limitations: the restricted supply of raw cotton, and the slowness of hand-spinning (Holland 1976, 39).

3.2.2 Improvements in the spinning process began with the introduction of James Hargreaves' spinning jenny in 1764, whereby a single worker could operate eight spindles simultaneously. Five years later, Richard Arkwright took out a patent for a water-driven spinning machine, called the water frame. The success of this machine enabled Arkwright to establish England's first cotton factory at Cromford, near Derby, in 1771 (Cossons 1975, 249). Arkwright's invention was improved upon by Samuel Crompton, who introduced the spinning mule in 1779. This machine combined the best features of the jenny, which made thin thread, with those of the water frame, which made strong thread. By using the mule, English spinners were able to make thin, strong thread from which fine cotton goods, such as muslin, could be manufactured.

3.2.3 During the second half of the 18th century, the technical revolution in the cotton-spinning industry transformed the economic and social structure of the North West. At the beginning of this period, the manufacturing processes of spinning and weaving were still based upon the country cottage, but had expanded to an incredible extent by the end of the century; between 1780 and 1800, imports of raw cotton into Lancashire increased from 5-6 million lb to 50 million lb *per annum* (Deane and Cole 1962, 52). Similarly, the number of spindles in operation in England increased from an estimated 1.7 million in the early 1780s to 4-5 million by 1812 (Baines 1835, 226), reflecting the widespread introduction of the factory system based on the successful application of steam power to the spinning process.

3.2.4 During the 1790s, the cotton industry was characterised by a series of boom and slump conditions, although by the close of the century cotton imports were increasing rapidly and exports soaring, particularly to the North American and Caribbean markets. Imports of cotton reached a new record peak in 1800 and, in October 1801, the signing of a peace treaty with France resulted in a period of very rapid expansion as the markets of Europe were opened to English cotton-spinners (Edwards 1967, 12). During this period the industry became polarised towards Lancashire; by 1815, 90 per cent of Britain's cotton industry was located in Lancashire (Holland 1976, 43).

3.2.5 It was during this period that Manchester emerged as a leading cotton-spinning town, and the centre of the Lancashire textile industry; the number of cotton-spinning firms in the township of Manchester more than doubled from 51 in 1799 to 111 in 1802 (Bailey 1985), although a proportion of this total incorporated concerns that rented space in multiple-occupant factories, known as 'room-and-power' mills. The high capital cost of mill construction in the town was spread over the maximum amount of productive capacity by building multi-storey mills of dimensions that surpassed those of any previous industrial buildings; the average size of Manchester's spinning mills increased six-fold between 1795 and 1820 (*ibid*), reflecting great advances in the size of textile machinery and the engines that powered them.

3.2.6 Manchester retained its position as the leading centre for cotton-spinning throughout the first half of the 19th century and, after the boom of 1848-53 detonated by the repeal of the Corn Laws, the number of cotton mills in Manchester reached a peak of 108 in 1853 (Williams and Farnie 1992, 21). Thereafter, the number of mills began to decline under the pressure of the continuing inflation of land values, and new firms selected sites on the periphery of Manchester and outlying areas.

3.2.7 Lancashire dominated the English cotton industry into the 20th century; during the early years of the century, it has been estimated that some 76 per cent of the cotton operatives of the United Kingdom were within Lancashire (Chapman 1905, 37). The cotton industry reached its peak in 1914, with India, the largest single customer, buying 3,000 million yards of cotton cloth (Holland 1976, 142). However, Manchester's share of the industry declined; a total of 2,666,000 spindles were operative in Manchester and Salford at the beginning of the 20th century, compared to 11,603,000 in Oldham and 5,035,000 in Bolton (Chapman 1905, 41).

3.2.8 Despite cotton remaining to be Britain's leading export until 1938, the industry declined rapidly between the wars, largely through a fall in exports. Countries that had formerly provided lucrative markets, and particularly India, developed their own mills. Japan captured many former British markets in China and the Far East, and the imposition of tariffs by America and Brazil caused further damage to the export of British cotton goods. A short boom period began in 1945 as a result of shortages caused by the war, but after 1952 British cotton textiles faced intense competition from manufacturers in the Far East, from which it was never to recover.

3.3 DEVELOPMENT OF ANCOATS

3.3.1 Brunswick Mill is situated on the north-eastern fringe of the township of Manchester, within an area known as Ancoats. At the beginning of the 13th century, this area was referred to as *Elnecot*, derived from the Old English *ana cots* meaning 'lonely cottage' (Cooper 2002, 13). Ancoats retained a semi-rural aspect until the late 18th century, but by 1800 the area had been transformed into an effective industrial suburb.

3.3.2 This transformation began in the 1770s, when land owned by the Leigh family was sold to Thomas Bound, a builder, who then sold it on to others for development. William Green's *Map of Manchester and Salford*, published in 1794, shows the focus for initial development to have been at the corner of Great Ancoats Street and Oldham Road, and depicts the main elements of the existing street plan laid out on former fields of the area. Building speculation then drove further expansion, with plots of land within a grid-iron pattern of streets being sold for development.

3.3.3 A small number of water-powered mills erected along Shooter's Brook represented the earliest textile factories in the area. These included a 'room-and-power' mill known as Salvin's Factory, and New Islington Mill, which originated in the late 1780s as an Arkwright-patented water frame mill (OA North 2004a). However, in seeking a solution to the inadequate power supplied to their waterwheels from Shooter's Brook, several firms experimented with steam power. Notably, John Kennedy is reputed to have first applied steam power to one of his spinning mules whilst renting space at Salvin's Factory in 1793 (Lee 1972, 9).

3.3.4 It was on the basis of a breakthrough in the application of steam power, and the national demand for textiles, particularly cotton, that created the explosion of factory building in Ancoats (Little 2004, 31). This was fuelled by the potential of cheap and reliable transport for goods and materials offered by the construction of the Rochdale and Ashton under Lyne canals, and led to the creation of a new breed of mill building in Ancoats. These were built on an unprecedented scale, many depending upon the developing network of short branch canals for transport and a source of water for the steam-power plants. The net result was the creation of an industrial suburb; an edge-of-town industrial estate with associated housing and related businesses.

3.3.5 From its origins as the first true industrial suburb to Manchester during the late 18th century, Ancoats expanded rapidly throughout the first half of the 19th century. Bancks and Co's detailed map of the area, published in 1831, shows an early stage in the development of land between Mill Street and the Ashton under Lyne Canal, on the eastern fringe of Ancoats (Fig 2). The deeds to Brunswick Mill describe several changes in land ownership before any building commenced, which probably reflects a high demand for building land on the outskirts of Manchester in this period. The rate of expansion during the mid-19th century, and particularly with the development of land to the south of the Ashton under Lyne Canal, is highlighted by comparing Bancks and Co's map with that surveyed by the Ordnance Survey in 1848 (Fig 3), and that produced by Adshead two years later (Fig 4).

4. BRUNSWICK MILL

4.1 ORIGINS AND SPECIFICATION

4.1.1 Brunswick Mill was one of the largest textile mills to have been built in the country during the mid-19th century, and represented a 'state of the art' factory when it was first put into production. The mill was built to a very high standard, using the best materials available, and incorporated some advanced design features that are unusual for mill of its date, although became characteristic of textile factories constructed during the late 19th century.

4.1.2 The origins of the Brunswick Mill complex may be traced to January 1837, when a plot of undeveloped land along the northern bank of the Ashton under Lyne Canal on the eastern fringe of Ancoats was released in fee from David Worthington to Messrs Charles Pooley, Alexander Kelly and James Gilmour. The greater portion of the land, comprising 4736 square yards, was to be shared by Kelly and Gilmour, whilst Charles Pooley was to have the remaining 348 square yards, which adjoined his existing cotton-spinning factory; Pooley's mill had been erected in 1826, but remained unoccupied until 1829 (PP(HC) 1834 XX). However, in September 1838, the two plots were combined to form a single block of land comprising 5084 square yards, which was to be released to Kelly and Gilmour for development. At this time, Alexander Kelly and James Gilmour are both listed in a trades' directory as independent cotton-spinners in Ancoats, although their factory premises are not specified (Pigot 1838). Kelly and Gilmour appear to have formed a cotton-spinning partnership in 1839, and embarked upon commissioning a new cotton mill to be erected on their newly-acquired land in Ancoats.

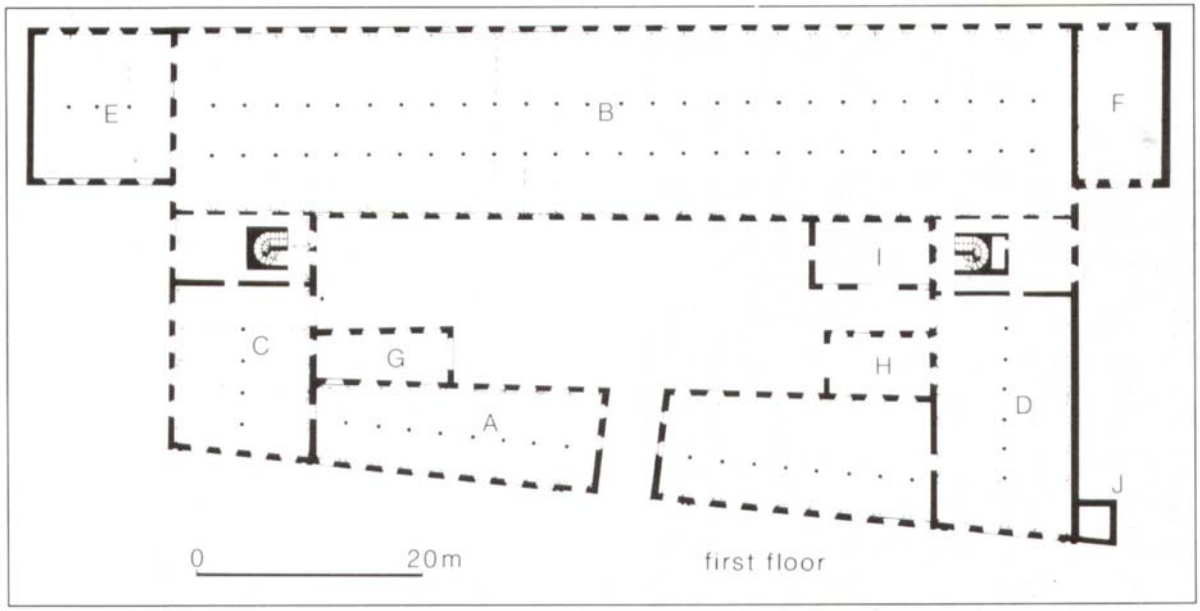
4.1.3 A detailed specification for the erection of the mill was devised in February 1839 by David Bellhouse Jnr on behalf of Kelly and Gilmour. The firm of David Bellhouse had been responsible for constructing a number of early to mid-19th century textile mills in Manchester, and became one of the earliest specialist textile mill building firms; most of their mills were of fireproof construction, and the firm appears to have combined the range of trades involved with fireproof mill construction, occupying a foundry and a timber yard, and being referred to as 'architects' from the early 1820s (Clark 1978, 213). However, examination of the deeds to Brunswick Mill has indicated that the eminent millwright and engineer William Fairbairn also had some input into the design of Brunswick Mill, as the design of the cast-iron beams and columns used in the mill was subject to his approval. Moreover, several notable features that were adopted in the design of Brunswick Mill mirrored those of mills built by Fairburn, particularly Orrell's Mill in Stockport, which was erected in 1834/5.

4.1.4 The specification provided for a mill complex comprising four main blocks, arranged in a quadrangle with an enclosed central courtyard. The main mill block, placed to the rear of the plot and adjacent to the Ashton under Lyne Canal, was an unprecedented 92m long and built to a height of seven stories. Forward-projecting wings, also of seven stories but of reduced widths, were attached to each end of the main block. The central courtyard was enclosed by

a three-storey block fronting Bradford Road, which incorporated the arched main entrance to the complex. This layout was essentially preserved throughout the lifetime of the site as a cotton-spinning mill.

4.1.5 All of the component buildings were to be of an advanced fireproof construction, comprising transverse ceiling vaults supported on Hodgkinson-type cast-iron beams and columns. The brick ceiling vaults were to be reinforced by cast-iron arch ribs, which were located at intervals along the length of the vaults. The floors of all the upper stories were to comprise square tiles, with stone flags providing the surfacing of the ground floors.

4.1.6 This type of construction was enabled largely by experiments undertaken by Eaton Hodgkinson during the 1820s. Hodgkinson had embarked upon a detailed investigation into the optimum design of cast-iron floor beams in response to a series of well-publicised collapses of fireproof mills caused by failures of cast-iron beams and columns. Hodgkinson's experiments were undertaken partly at William Fairbairn's foundry in Ancoats, who started to produce a greatly improved type of cast-iron beam during the early 1830s that was based on the results of Hodgkinson's work. These beams were of I-shaped cross-section with a wider bottom flange, and were reputed to be lighter and could safely be made longer that the earlier inverted T-section beams (Pole 1877). This allowed fireproof mills to be built to a greater width, with a corresponding increase in the size of machinery they could contain, and a resultant expansion of output. This technological advance represented a significant stage in the evolution of mill design, and the beams within Brunswick Mill have been described as amongst the most spectacular application of Hodgkinson-type beams that survive in the region (Williams and Farnie 1992, 80).



Composite Plan of Brunswick Mill

A Bradford Road Block
B Main Block
C East Wing
D West Wing
E Waste House (added 1844)
F Engine House
G, H loading Bays (added by 1888)
I Transformer House (added 1909)
J Dust Flue (added *c*1910)

4.2 KELLY & GILMOUR'S BRUNSWICK MILL

4.2.1 A trades' directory for 1841 contains an entry for the firm of Kelly & Gilmour, cotton-spinners at Brunswick Mill (Pigot 1841, 296). This is the earliest trades' directory to list Brunswick Mill, suggesting that the mill had been put into production during 1840/41. However, given that the design specification is dated February 1839 (*4.1.3 above*), it is debatable whether all four blocks had been completed when Pigot's directory was published. This is reinforced by the detail shown upon a small-scale map produced to accompany this directory, which does not depict Brunswick Mill.

4.2.2 In September 1844, Kelly & Gilmour obtained from Sir Oswald Mosley a further 148 square yards of land, adjoining the eastern extent of their existing plot of 5084 square yards, to allow for a three-storey extension to the mill. This structure may have been intended for storage, although in 1856 it was noted to contain machinery associated with the production of cotton yarn. During the same year, Kelly & Gilmour mortgaged the mill to Robert Barbour, presumably in order to raise additional capital to finance this extension.

4.2.3 In 1846, another plot of land at the eastern end of the mill was released to Kelly & Gilmour to allow further expansion of the complex. This plot was considerably larger than the plot obtained in 1844, extending up to what is now the Cambrian Street bridge over the Aston under Lyne Canal. However, this land was not developed immediately; the first detailed map of the mill is provided by the Ordnance Survey 60": 1 mile series, which was surveyed in 1848 and published in 1850, and this shows the newly-acquired plot as undeveloped (Fig 3).

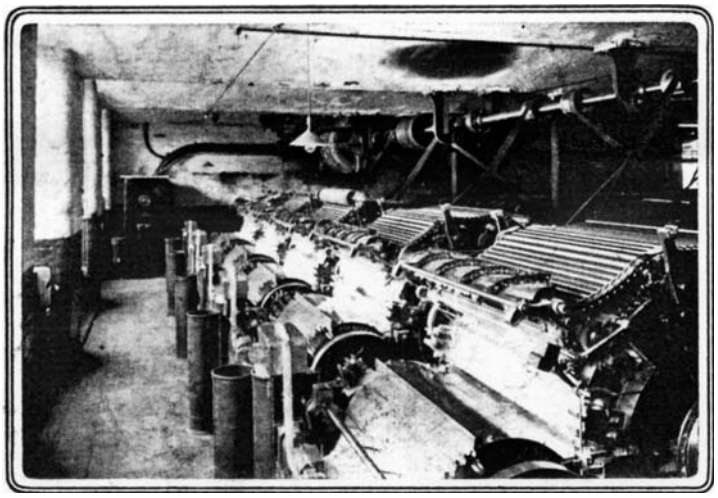
4.2.4 In order to raise an additional £2,500, the mill was mortgaged for a second time in April 1848. Again, Robert Barbour accepted the mortgage, although this time in conjunction with John Parlance. This appears to have been paid off in September 1856, when the mortgage was released.

4.2.5 Detailed plans of Brunswick Mill at this time are provided by the Ordnance Survey 60": 1 mile, and a comparable map of the site produced by Adshead, which was similarly published in 1850 (Fig 4). These maps show the mill complex laid out forming its distinctive quadrangle plan. The main block, overlooking the canal, has smaller buildings attached to each end. The building at the south-western end is marked as an engine house, whilst its large dimensions suggest that it contained a double-beam engine (*4.2.15 below*). Access to the engine house from the central courtyard appears to have been afforded via a wide passage through the West Wing block. This passage also provided direct access to the canal bank. Neither of the maps show the position of the boilers associated with the steam engine, although the chimney is marked adjacent to Bradford Road. It is therefore possible that the boilers were placed within one of the mill buildings, and probably the West Wing Mill. This suggestion is reinforced by the presence of a rectangular building immediately adjacent to the West Wing Mill, which is marked on the Ordnance Survey map as a 'coal shed and platform' (Fig 3).

4.2.6 The main entrance to the mill complex is show on both maps to have been via a wide passage through the centre of the Bradford Road block. The 1850 Ordnance Survey map (Fig 3) shows this main gate to have been flanked on each side by narrower passageways, which may have been for the use of mill operatives; a similar layout existed at Murrays' Mills in Ancoats, which also had an enclosed courtyard plan (OA North 2004b).

4.2.7 Alexander Kelly died on 26th November 1852 and, in 1856, a schedule was compiled as part of the process of conveying Kelly's real estate to James Gilmour. This schedule states that the mill complex had been valued at £29,779, and also provides considerable details of the mill's infrastructure at this time. This includes a summary of the cotton processing machinery within the mill complex, which comprised 276 carding engines, 81 roving frames, 20 drawing frames, 50 slubbing frames, 129 cop reels, and nearly 77,000 mule spindles. It is interesting to note that the spinning mules were of the self-acting type, which had been developed by Richard Roberts by 1830. This machine was to have a significant impact on the cotton-spinning process, but its widespread adoption was slow to be implemented, and initially did not affect the spinning of fine yarns as it was confined largely to the production of coarser yarns (Catling 1986, 115-16). Indeed, it was noted as late as 1865 that '*self-acting mules are seldom found in use for finer numbers than 80. The finer yarns are spun on hand mules*' (Neste 1865), highlighting the fact that Brunswick Mill incorporated the most up-to-date machinery.

4.2.8 ***The Main Block:*** appropriately referred to on the 1856 schedule as 'Large Mill', the seven-storey main block was used predominantly for spinning. The advanced type of fireproof construction provided the mill with an internal width of 16m (Plate 3), forming five bays and allowing self-acting mules of 400 to 500 spindles each to be accommodated transversely across the upper stories of the building, maximising efficient use of the available space. The internal organisation of a large early to mid-19th century mill normally allowed for spinning mules within the upper stories and preparation machinery to be installed on the lower floors, a format that was largely adhered to within Brunswick Mill. Carding engines were situated on the second storey of the main block, and roving, slubbing and drawing frames were installed throughout the third storey. The upper stories were dominated by spinning mules arranged transversely across the building. In addition, and unusually, the ground floor of this block also contained 28 spinning mules, one per bay.



Carding engines within wthe main block of Brunswick Mill in 1909 (reproduced from the Illustrated London News July 1909)

4.2.9 ***The Wing Mills:*** two forward-projecting wings, also of seven stories, were attached to each end of the main block. These were used for a combination of spinning, preparatory and ancillary processes, including yarn winding. Both mills were four bays wide, although they differed in length, reflecting the trapezoidal shape of the site; the West Wing was nine bays long, whilst the East Wing was seven bays long. Both were of fireproof construction, although only contained a single row of cast-iron columns (Plate 4). Each wing incorporated a stone stair tower, which provided the access to each floor within the wing mills and the main block. Cross walls placed within the south end of each wing isolated the stair towers, and separated the wings from the main block. Most mills of this period had stone stair towers, normally square of circular in plan, attached to their external elevations. Both of the Brunswick Wing Mills, however, incorporate unusual internal semi-circular towers, each having a half-domed ceiling in the top storey.

4.2.10 The West Wing Mill housed the initial preparation machinery, including bale-breakers and scutchers on the second floor. It is likely that the system of internal ducting specified in the 1856 schedule connected with this floor and led to a dust house on the roof of the mill. Roving frames were housed on the third floor, with the upper stories being dominated by spinning mules. It seems that the spinning mules in this mill were arranged longitudinally, probably with two mules on each side of the central row of cast-iron columns. There is also some evidence for the West Wing Mill having contained the original boiler. Evidence for this is derived from wide arched openings in the five north end bays of the west wall of the ground floor. These are of similar dimensions to those in boiler houses of Sedgewick Mill and Chorlton New Mill, and suggests that the original boiler house was internal, situated on the ground floor of the West Wing.

4.2.11 The East Wing similarly housed preparatory machinery on the lower floors and spinning mules arranged longitudinally on the upper four stories. The detail of the schedule with the conveyance indicates the ground floors of these wings to have been used originally for storage, a feature that was to become common during the late 19th century but was unusual for a mill of this date.

4.2.12 ***The Bradford Road Block:*** the range along the Bradford Road frontage was originally three stories high and 20 bays long, and of a trapezoidal plan. The main point of access to the mill complex was via a large gate through the two central bays (Plate 5), and comprised a two-storey high through-passage with a brick-vaulted ceiling (Plate 6). This entrance was highlighted with rusticated voussoirs and flanking doorways, similar to the entrances of some earlier mills in the area, but also incorporated double pilasters that are more characteristic of the second half of the 19th century (Williams and Farnie 1992, 78). These features represent the move to architectural adornment of spinning mills, which stemmed from the 1830s. Internally, the transverse cast-iron beams are in two pieces of unequal length, supported by a single row of columns running parallel to the north side wall.

4.2.13 The ground floor of this wing unsurprisingly contained the company offices and counting houses. The second floor appears to have contained more processing machinery, whilst spinning mules occupied the top floor. Again,

these are likely to have been arranged longitudinally either side of the central row of columns.

4.2.14 ***Steam Power Plant:*** power for the mill was provided by a large double-beam engine, fitted with two side-by-side cylinders working a single flywheel. This type of engine was used increasingly in textile mills from the mid-1830s, such as that known to have powered Orrell's Mill in Stockport. The original engine at Brunswick Mill was installed in an external engine house, attached to the western end of the main block (Plate 7). This three-storey high structure incorporated three tall arched windows, and an unusual flat roof. Access to the engine house from the central courtyard appears to have been afforded via a wide passage through the West Wing block (Plate 8). This arrangement was typical of large mills that were being built by the 1850s, whilst those of an earlier date tended to house the engines internally.

4.2.15 Details of the engine within the 1856 schedule are vague, although it appears to have been a 'pusher-type' beam engine. This engine was probably compounded, with 47" low pressure cylinders and 26" high pressure cylinders placed in the northern part of the engine house. It was probably not of the McNaught type as the high pressure cylinders connected to it by spur wheels, suggesting that they were situated close to the flywheel in the southern end of the engine house. Power transmission from this engine was via spur-gears, upright shafts and bevelled gears to line shafting on each floor. The mules were probably powered directly from belt drums on the line shafts, which was to become common practice during the late 19th century (Williams and Farnie 1992, 89).

4.2.16 The steam for this engine is likely to have been provided originally by wagon-type boilers. Surviving physical evidence indicates that these had been located internally to the West Wing Mill (*4.2.10 above*), with an attached coal shed and platform, as marked on the 1848 Ordnance Survey map. However, the details of the 1856 schedule indicate that the putative wagon boiler was replaced by a bank of four double-flue boilers, presumably of the Lancashire-type, that was situated to the north of the engine house, subsuming the 'coal shed' and 'platform' marked on the Ordnance Survey map of 1848. This revolutionary boiler design, patented by Fairbairn and Hetherington in 1844, was a variation on the Cornish design and became widely adopted during the second half of the 19th century (Watkins 1999, 218). The Lancashire boiler had two furnace tubes, each about one third of the diameter of the outer shell, and would measure typically 2.44m (8') diameter by 9.1m (30') long with a working steam pressure of 120 pounds per square inch (Hayes 2001, 28). The construction of this type of boiler consisted typically of a steel cylindrical shell, comprising several rings of steel plate that were rolled into cylindrical form and rivetted longitudinally. A single end plate would then have been connected to each end of the shell. The two furnace tubes, through which were drawn the hot furnace gases, would have been connected to the front end plate. The front part of each furnace tube would have held the fire-bars, through which was drawn the air required for combustion. The boilers will have been built into a brickwork setting.

4.2.17 It seems probably that the boiler installation was fitted with a fuel economiser, although such a device is not alluded to in any of the available documentation. The economiser, patented by William Green 1845, pre-heated feed water on its way to the boiler by using hot gases expelled from the boilers. Also known as a feed water heater, an economiser comprised a series of vertical tubes connected together in rows by manifolds situated at the top and bottom of the pipes. The various rows of pipes were coupled together at diagonally opposite sides, which formed feed and delivery pipes. It was normal practice for the feed water to be introduced at the end nearest to the chimney, in order that the flow of water and gases were in opposite directions. It consisted of banks of cast iron pipes, usually 4" (0.1m) diameter and 9' (0.23m) long, and could reduce the temperature of flue gases by as much as 150^{0}C whilst increasing the temperature of feed water from about 65^0 to 120^{0}C. In order that the feed water did not enter the economiser at too low a temperature, a National Circulator was frequently fitted. This device allowed the cold feed to mix with heated water, and prevent furnace gases condensing on the tubes, which would have resulted in corrosion. The tubes were kept free from soot by a scraper mechanism, which consisted of a worm wheel driven chain drive. Watkins argues that the economiser '*undoubtedly saved more fuel for industry than any other single invention*' (1999, 218).

4.2.18 The form of the chimney is not described in any of the available primary documentation, although it is depicted upon two engravings of the mill complex, dating from 1893 (Plate 9) and 1926 (Plate 10). These show a detached, multi-faceted stack, tapering to its crown that incorporated some form of embellishment, probably acting as an over-sailor. Whilst the detail is unclear, the stack appears to have been mounted on a tall plinth that seems to have incorporated recessed panels, mirroring the chimney of Orrell's Mill in Stockport. This type of chimney represents a stage in the evolution of chimney design, and a departure from the attached or internal types characteristic of early 19th century mills.

4.2.19 The schedule also lists five gas meters together with fixtures and fittings required for 994 gas lights. There is no mention of any gas retorts or holders within the mill complex, implying that gas was derived from the Manchester Corporation.

4.2.20 On 24th December 1856, James Gilmour mortgaged the mill again, this time to Messrs William Young and James Bannerman. This represented the first stage in a process of conveying Brunswick Mill to the Bannerman Mills Company (*4.3.1 below*).

4.3 THE EMPIRE OF HENRY BANNERMAN & SONS

4.3.1 By 1861, Brunswick Mill was occupied by the firm of James Gilmour & Co (Slater 1861), although Gilmour had mortgaged the mill to William Young and James Alexander Bannerman in 1856 (*4.2.20 above*). The firm of James Gilmour & Co was to be short-lived as, in March 1865, Gilmour's mortgage of the site had not been repaid and the entire site was conveyed to Young and Bannerman, partners in the firm of Henry Bannerman & Sons. From this date, Brunswick Mill was owned and occupied by the Bannerman Mills Company, the manufacturing subsidiary of Henry Bannerman & Sons.

4.3.2 Henry Bannerman was a prosperous Scottish farmer who sent his son David to Manchester during the early 19th century, seemingly with the intention of investigating opportunities in the region's textile industry (Mortimer 1891). David evidently met with considerable success, as his father and three brothers with their families were induced to relocate to Manchester to establish the firm of Henry Bannerman & Sons. Initially, the firm was engaged as textile merchants, with a warehouse and offices in Market Street Lane. The success of the firm by the 1840s is reflected by their commissioning the erection of an immense block of warehouses on York Street, Manchester, which acted as their head office and main warehouse facility.

4.3.3 During 1864, the firm diversified into cotton-spinning and manufacturing in addition to continuing their role as textile merchants. They took over four large textile factories, including Brunswick Mill, leading to the formation of the Bannerman Mills Company, which had come into existence to facilitate the management of the industrial departments (Men of the Period 1895, 41). These mills appear to have each concentrated on complimentary processes, either spinning different counts of yarn or weaving, and it seems likely that all of these factories were managed as a single concern by the 1880s.

4.3.4 In 1889, the Bannerman Mills Company was registered as a limited liability company. This was followed in 1890 by the registration of the parent company, which became known as Henry Bannerman & Sons Ltd. A few years later, the firm was described as '*one of the giants of Manchester commerce and industry*', and that no other business could '*claim a more eminent or a more honourable position in the city's trade*' (The Century's Progress 1892, 102). This accolade was reinforced three years later, when Henry Bannerman & Sons Ltd was reported to have '*attained colossal dimensions, and is a monument to the splendid energies and administrative powers that have been brought to bear upon it*' (Men of the Period 1895, 42). The same report alludes briefly to Bannerman & Sons mills, which are described as ranking amongst the largest and finest in Lancashire and being '*elaborately equipped with the best modern machinery*' (*ibid*).

4.3.5 By 1910, Brunswick Mill served as the head office of the Bannerman Mills Company Ltd, the Bradford Road block being referred to as the 'administration block' in that year.

4.4 LATE 19TH CENTURY DEVELOPMENT OF BRUNSWICK MILL

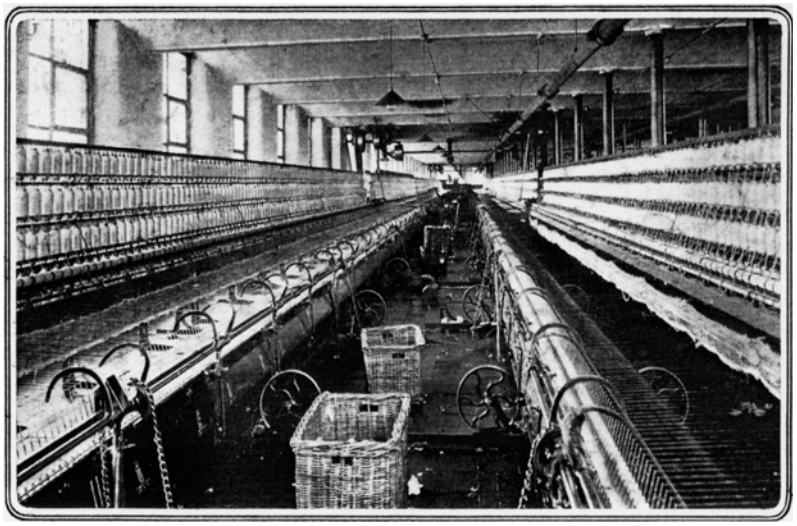
4.4.1 An indication of the changes wrought to the mill complex during the second half of the 19th century may be obtained by comparing the detail of the site as depicted on Ordnance Survey mapping of 1850 and 1893. The latter map, published at a scale of 25": 1 mile (Fig 5), shows the layout of the mill complex as essentially unchanged, although some additions may be noted. Two loading bays were placed in the central courtyard, in the angle between the Bradford Road block and each wing mill. The western loading bay, attached to the West Wing Mill, was two stories high and four bays long, with a full-height double doorway in the east end. The doorway was served by a single hoist, although this was not an original feature. It seems likely that this loading bay may have been used primarily for taking in raw cotton, as the adjoining West Wing Mill contained the initial preparation machinery. Conversely, the East Wing Mill contained yarn reeling machinery, suggesting that the eastern loading bay may have been used for the dispatching of spun yarn to its market. A weighing machine, probably associated with these operations, had also been installed in the mill yard by this date.

4.4.2 The 1893 Ordnance Survey map also depicts the plot immediately to the east of the mill to have been developed, seemingly comprising a structure contiguous to the West Wing block and the Waste House. However, subsequent mapping of the site indicates this addition to have been divided into four rooms, all except one of which were of a single storey. These were used predominantly for warehousing purposes, although it seems that one room was used to house ring spinning frames, and the two-storey room incorporated an office on its upper floor (Fig 6).

4.4.3 A minor but nevertheless interesting addition to the complex shown on the 1893 map is a short plateway running between the canal and the mill's steam-power plant. This was doubtless intended to facilitate the delivery of coal from canal boats to the boiler house, and reinforces the continued crucial role of the canal in the operation of the mill during the late 19th century. During this period, a single cylinder horizontal steam engine had been installed to supplement the power provided by the original twin cylinder beam engine, providing a combined power of 1600 hp. This new engine was located in the south-western corner of the mill yard, on the site that was to be occupied subsequently by the transformer house (*4.5.1 below*). Power transmission from this engine to the machinery utilised a rope drive system, whereby the main line shafts on each floor were driven from the engine flywheel by a number of cotton ropes, providing a more efficient, reliable and quieter drive than the traditional geared system. Developed in America, the installation of rope drive systems became widespread in England during the 1880s.

4.4.4 During this period, and possibly associated with the installation of the new engine, the original spinning mules were replaced by larger mules that were orientated longitudinally along the main block. The precise date at which this occurred is uncertain, although a renewal of machinery in 1884 is documented (Mills 1917, 68). The mill was accredited with operating 80,000 mule spindles at this time (Worrall 1884), although it is unknown whether this total accounted for the new machinery. Similarly, orders for new scutchers, carding

engines and ten mules of up to 1308 spindles were placed with Platts of Oldham between 1889 and 1893. This programme of renewal led to a strike by the minders and piecers in the mule-spinning department, as a temporary adjustment of wages was proposed. This was the eleventh strike at the mill since 1876 (*ibid*).



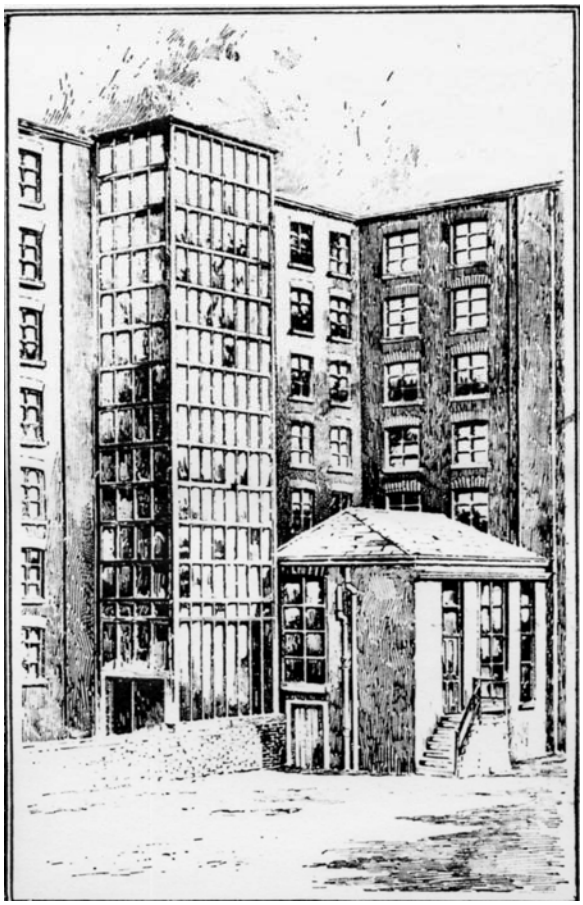
A view along one of the spinning rooms at Brunswick Mill, showing the remodelled mules arranged longitudinally (reproduced from the Illustrated London News, July 1909)

4.5 EARLY 20TH CENTURY DEVELOPMENT OF BRUNSWICK MILL

4.5.1 In 1908/09, Brunswick Mill was reputedly the first mill in Manchester to adopt electricity as a source of power, which was applied to every part of the mill (Williams and Farnie 1992). Electricity was supplied from the Manchester Corporation main at 6,500 volts, and was transformed down to 400-440 volts for machinery and 220 volts for lighting purposes in a newly-built transformer house, located in the south-western corner of the courtyard (Plate 11). The installation of electric drive motors necessitated the entire system of gearing within the mill to be replaced, except for one pair of bevelled gears that continued to drive a small amount of machinery in one of the wing blocks (Illustrated London News 1909). This remodelling appears to have included the removal of the two steam engines.

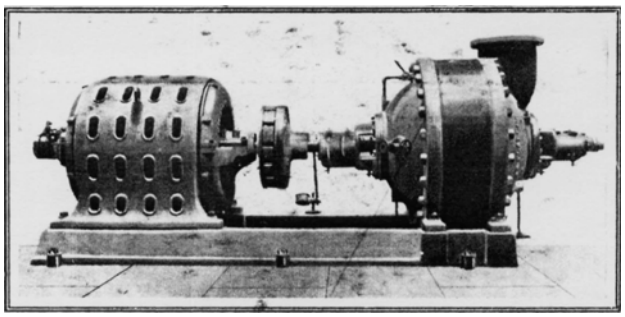
4.5.2 The new system comprised 37 electric motors, which were supplied by the British Thompson-Houston Company of Rugby. Most of these motors were installed within two external towers that were erected against the courtyard elevation of the main block. These towers were constructed of steel framing with glazed casings, purportedly to protect the electric motors from dust (*Textile Mercury* 1910), although concerns of fire associated with what was essentially untried technology is likely to have been a factor.

4.5.3 Each spinning floor was served by two electric motors, which were fixed directly to the spinning mules' line shafts by means of a flexible coupling. Each of the motors for the spinning mules was rated at 75hp, and ran at 485 revolutions per minute. The motors used to power the ring spinning frames were rated at 30hp, running at 725 revolutions per minute, and were similarly coupled to existing line shafts by flexible couplings (Illustrated London News 1909). These motors were all installed in the eastern tower, and one motor was required to drive four ring spinning frames per floor. A more powerful motor, rated at 45hp, was installed in the western tower to drive six frames. For driving the preparation machinery, electric motors were directly coupled to the original line shafts (*ibid*).



One of the towers erected to house the electric motors (reproduced from the Illustrated London News, 1909)

4.5.4 The firm took advantage of the remodelling necessitated by the installation of electric motors to install a new sprinkler system. This included the erection of a water tank on top of the eastern motor tower. The supply of water to this tank was provided by an electrically-driven pump, which had a capacity to raise 650 gallons of water a minute to the reservoir tank. Whilst this may have been the first automatic sprinkler system to have been fitted to the mill, it would seem unlikely that there had previously been no provision for fire-fighting equipment.



The electrically-driven, high-lift turbine pump that supplied water to the sprinkler system (reproduced from the Illustrated London News, July 1909)

4.5.5 At some point during this period, and possibly after the conversion to electric power, a large rectangular external dust flue was added to the western end of the Bradford Road block (Plate 12). This had a decorative and distinctive castellated top, with the dust chamber at its base inserted into the former boiler house. Also at this time, an additional storey with a flat concrete roof was

added to the Waste House (Plate 13). The east end wall of this storey contained six windows, in contrast to the lower stories that had none.

4.5.6 Other modifications to the mill complex at this time included the replacement of all the original roofs. Also, the original cornice around most of the main walls was replaced with terracotta embellishment. Single-storey sheds with multi-aisle roofs were added to the eastern end of the site during the late 19th century. These were attached to the East Wing Mill, and enclosed the ground floor of the Waste House. The precise function of these structures is uncertain, although they are likely to have been intended for storage and warehousing purposes. The following year, a trades' directory accredited Brunswick Mill with 23,000 ring spindles, together with 46,500 mule spindles (Worrall 1910). This demonstrates that the process of replacing the tradition mule with the ring frame which was to dominate the final years of cotton spinning in Lancashire had begun at Brunswick Mill by the first decade of the 20th century.

4.5.7 A visit to the mill by a representative of the *Empire Mail* in 1925 resulted in the publication of a useful article that described the mill at this time. The newspaper correspondent was clearly impressed with the scale and magnitude of the factory, commenting that '*it is one of the most interesting cotton mills in the country, one of the oldest and largest and best equipped*' (Empire Mail 1925). It is clear within the published article that the Bradford Road block had been raised to four stories by 1825, and this incorporated a flat concrete roof with a row of inclined sky-lights (Plate 14). Whilst the additional floor is not shown on an engraving published in 1926 (Plate 10), it is probable that this had actually been produced several years previously.

4.5.8 By 1923, the Bannerman Mills Company Limited was in liquidation, and the business was merged with the parent company. Hence, Brunswick Mill continued to be operated by Henry Bannerman & Sons Ltd, as listed in trades' directories. The final entry for the firm in association with the entire mill complex, however, occurs in a directory for 1928, as the following year Henry Bannerman & Sons Ltd was amalgamated with the Lancashire Cotton Corporation Ltd, and Brunswick Mill was conveyed to this new combine. Within 12 months, the Bradford Road block had been leased back to Henry Bannerman & Sons Ltd, initially for a period of ten years.


Telephones:
Private Branch Exchange
City 8274
(6 lines)

Telegraphic Address:
"BANNERMAN,
MANCHESTER."

ESTABLISHED 1805.

Henry Bannerman & Sons Ltd.

Cotton Spinners, Manufacturers and Merchants.

33, YORK STREET——————MANCHESTER

Chairman and Joint Managing Director: Sir CHARLES W. MACARA, Bt.
Joint Managing Director: Mr. WILLIAM C. MACARA.
Director and Secretary: Mr. R. H. W. BANNERMAN.

BRANCHES:
LONDON: 13, Bread Street, E.C. 4 (T.N. Central 3501.)
BIRMINGHAM: 67, Carlton House, High Street.
NOTTINGHAM: Swan Court, Long Row.
LIVERPOOL: 21, Leigh Street.
GLASGOW: 20, Springfield Court, Buchanan Street. (T.N. Central 5703.)

MILLS:
BRUNSWICK MILL, ANCOATS, MANCHESTER.
OLD HALL MILL, DUKINFIELD.
BANNER TEXTILE FACTORY, ALTRINCHAM.

An advertisement for Henry Bannerman & Sons Ltd taken from Skinner's Cotton Trades Directory for 1928

4.5.9 The Lancashire Cotton Corporation Ltd replaced the spinning mules with ring-spinning frames, presumably as part of a programme of modernisation in the face of increasing foreign competition. Ring-spinning frames were somewhat heavier than spinning mules, necessitating the strengthening of the original cast-iron floor structure (Jones 1985, 183). This was achieved by installing a system of trussed tie-rods mounted beneath the beams on short vertical brackets.

4.6 POST-COTTON SPINNING

4.6.1 Brunswick Mill ceased to be used for cotton production during the mid-1960s, and in January 1968 the mill was sold by the Lancashire Cotton Corporation Ltd to the Trownbay Property Company Ltd. Since that date, the mill complex has been used by a variety of small firms. At least one of these was associated with ancillary textile processes, and represents a very rare survival of textile-related industries still operating in Ancoats during the 21st century.

5 BIBLIOGRAPHY

5.1 PRIMARY AND CARTOGRAPHIC SOURCES

Primary Sources

PP(HC) 1834 (167) XX, 1834 *Queries Addressed by the Central Board of Commissioners to Manufacturers*

Empire Mail, June 1925

Illustrated London News, July 1909

Textile Mercury, 1910, **42**, 142-7

Men of the Period, 1895

The Century's Progress, 1892

Goad, Insurance Plan, Manchester, Vol II, Sheet 213, Revision of 1943

Cartographic Sources

Map of Manchester and Salford, William Green, begun in 1787 and completed in 1794

A Map of Manchester and Salford, Bancks and Co, 1831

Ordnance Survey 60": 1 Mile, Manchester Sheet 25, published in 1850

Ordnance Survey 10': 1 Mile, Manchester Sheet 104.7.18/19, published in 1891

Ordnance Survey 25": 1 Mile, Lancashire Sheet 104.7, published in 1893

Ordnance Survey 25": 1 Mile, Lancashire Sheet 104.7, 1908 revision (surveyed 1905)

Ordnance Survey 25": 1 Mile, Lancashire Sheet 104.7, 1922 revision (surveyed 1915)

Ordnance Survey 25": 1 Mile, Lancashire Sheet 104.7, 1931 revision

Ordnance Survey 25": 1 Mile, Lancashire Sheet 104.7, 1969 revision

5.2 SECONDARY SOURCES

Ashworth, G, 1987 *The Lost Rivers of Manchester*, Altrincham

Bailey, AJ, 1985 *The Impact of the Napoleonic Wars on the Development of the Cotton Industry in Lancashire: A Study of the Structure and Behaviour of Firms During the Industrial Revolution*, PhD Thesis, Cambridge University

Baines, E, 1835 *History of Cotton Manufacture in Great Britain*, London

Catling, H, 1986 *The Spinning Mule*, Newton Abbot

Chapman, SJ, 1905 *The Cotton Industry and Trade*, London

Clark, S, 1978 Chorlton Mills and their Neighbours, *Ind Archaeol Rev*, **2**, 207-39

Cooper, G, 2002 *Illustrated History of Manchester's Suburbs*, Manchester

Cossons, N, 1975 *Industrial Archaeology*, Newton Abbot

Countryside Commission, 1998 *Countryside Character Volume 2: North West*, Cheltenham

Deane, P, and Cole, WA, 1962 *British Economic Growth 1688-1959*, Cambridge

Edwards, MM, 1967 *The Growth of the British Cotton Trade 1780-1815*, Manchester

Hall, D, Wells, CE, and Huckerby, E, 1995 *The Wetlands of Greater Manchester*, Lancaster Imprints **3**, Lancaster

Hayes, G, 2001 *Stationary Steam Engines*, Princes Risborough

Holland, AJ, 1976 *The Age of Industrial Expansion*, Sunbury-on-Thames

Jones, E, 1985 *Industrial Architecture in Britain, 1750 – 1939*, London

Lee, CH, 1972 *A Cotton Enterprise 1795-1840: A History of M'Connel and Kennedy, Fine Cotton Spinners*, Manchester

Little, S, 2004 Ancoats - The First industrial Suburb, in R McNeil and D George (eds), *The Heritage Atlas 4: Manchester - Archetype City of the Industrial Revolution*, Manchester, 31-33

Mills, WH, 1917 *Sir Charles Macara, Bart: A Study in Modern Lancashire*, Manchester

Mortimer, J, 1891 Henry Bannerman and Sons Ltd: Its Origin, Rise and Progress, *Diary and Buyer's Guide for 1891*

Murphy, WS, 1910 *The Textile Industries*, **3**, London

Neste, K, 1865 *The Mule Spinning Process*, Manchester

OA North, 2004a *Oldknow's Mill, Hillgate, Stockport: Archaeological Investigation*, unpubl rep

Pigot, J, 1838 *General Classified and Street Directory of Manchester and Salford*, Manchester

Pole, WM (ed), 1877 *The Life of Sir William Fairbairn, Bart, Partly Written by Himself*, Newton Abbot (1970 facsimile)

Pragnell, H, 2000 *Industrial Britain: An Architectural History*, London

Slater, I, 1861 *Manchester and Salford Directory*, Manchester

Spencer, E, 1880 Improvements in Machinery for Preparing and Spinning Cotton, *Proc Inst Mech Eng*, **31**, 492-528

Watkins, G, 1999 *The Textile Mill Engine*, 2nd edn, Ashbourne

Williams, M, 2004 Ancoats - Where the Steam-Powered Textile Mill Began, in R McNeil and D George (eds), *The Heritage Atlas 4: Manchester - Archetype City of the Industrial Revolution*, Manchester, 34-38

Williams, M, and Farnie, DA, 1992 *Cotton Mills in Greater Manchester*, Manchester

Worrall, J, 1884 *Cotton Spinners and Manufacturers Directory*, Oldham

Worrall, J, 1910 *Cotton Spinners and Manufacturers Directory*, Oldham

Worrall, J, 1935 *Cotton Spinners and Manufacturers Directory*, Oldham

6 ILLUSTRATIONS

6.1 LIST OF FIGURES

6.2 LIST OF PLATES

Figure 1: Location Map

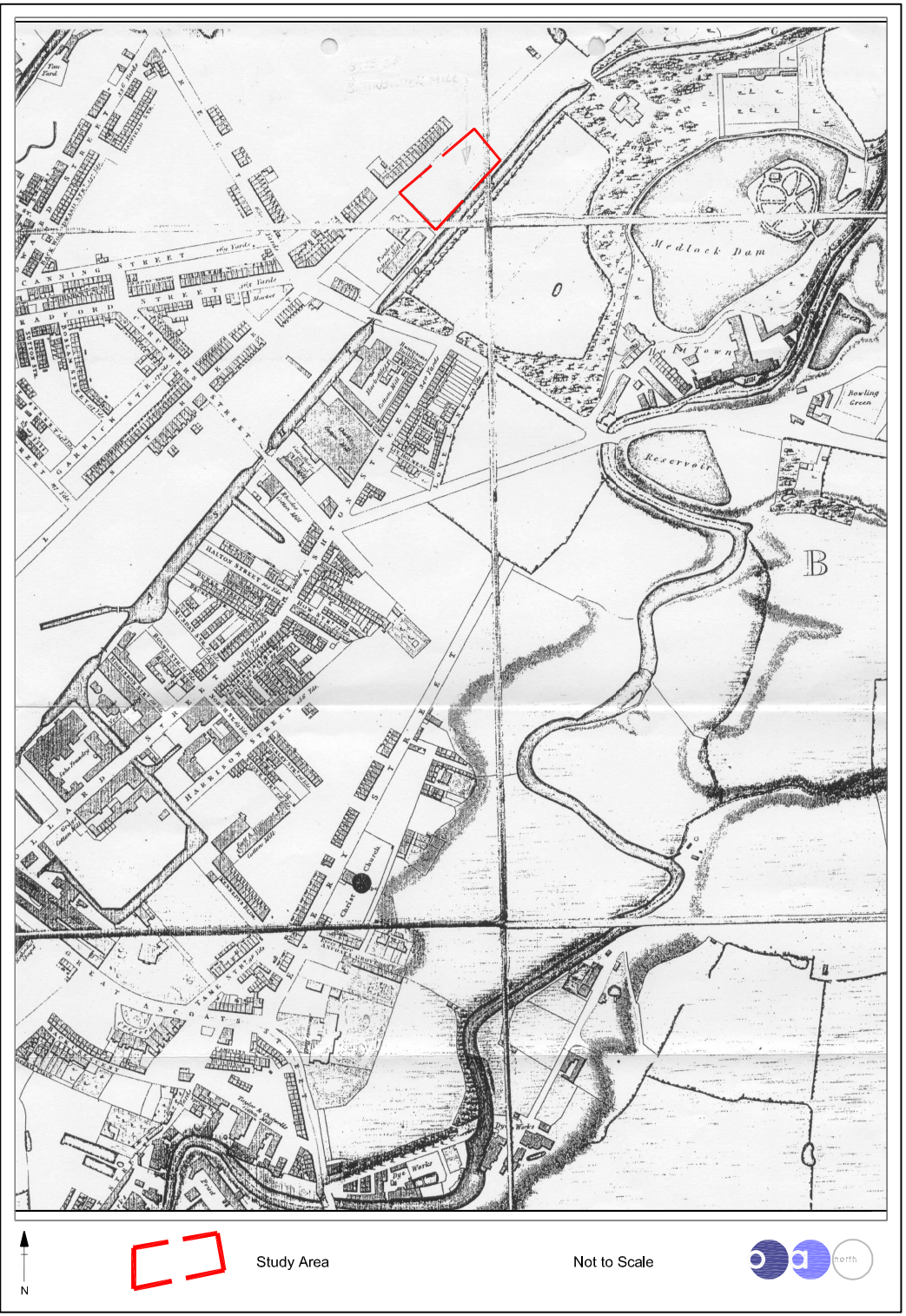


Figure 2: Extract from Bancks and Co's map of Manchester, published in 1831

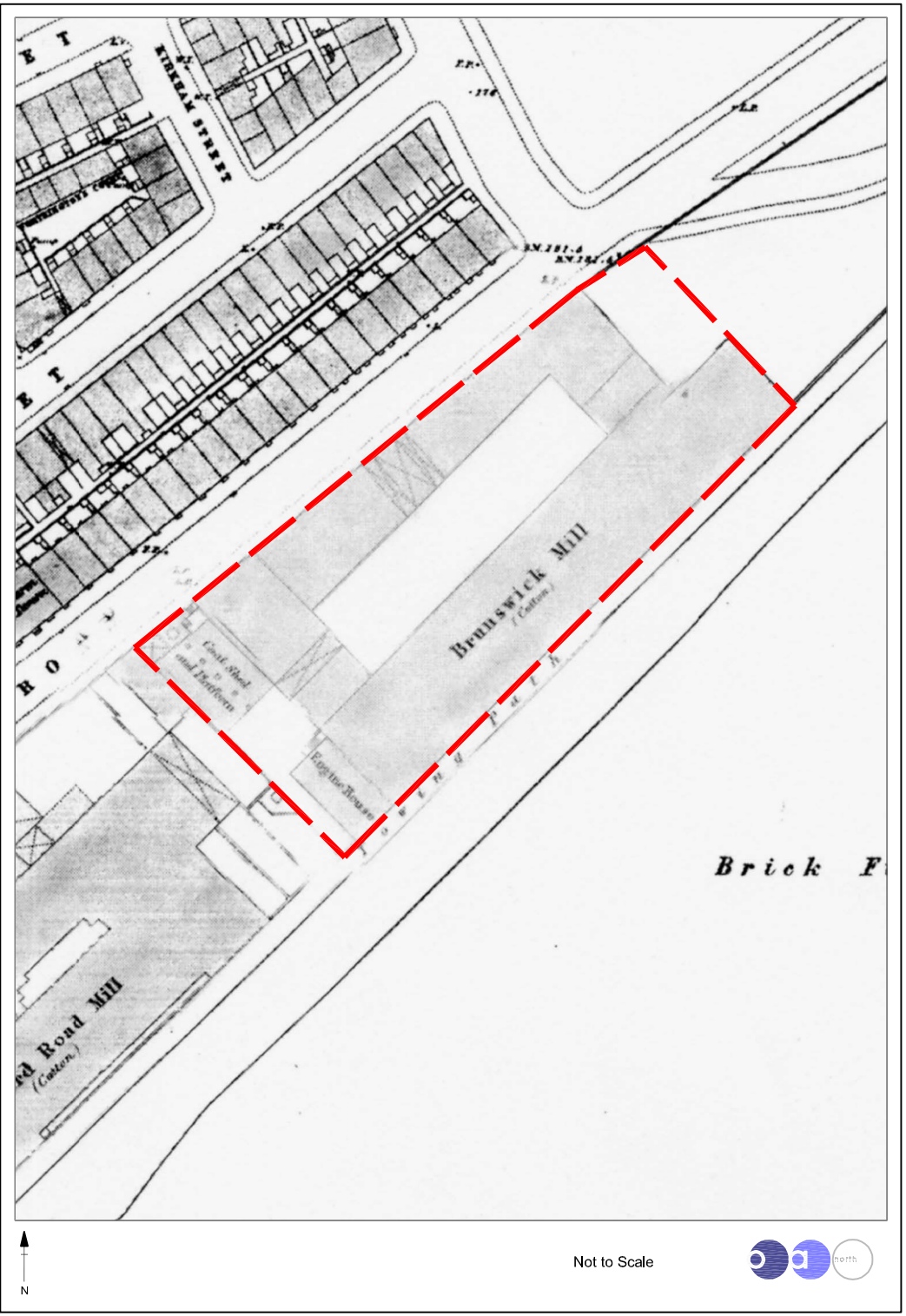


Figure 3: Extract from the Ordnance Survey 60": 1 mile map, published in 1850

Figure 4: Extract from Adshead's Map of Manchester, published in 1850

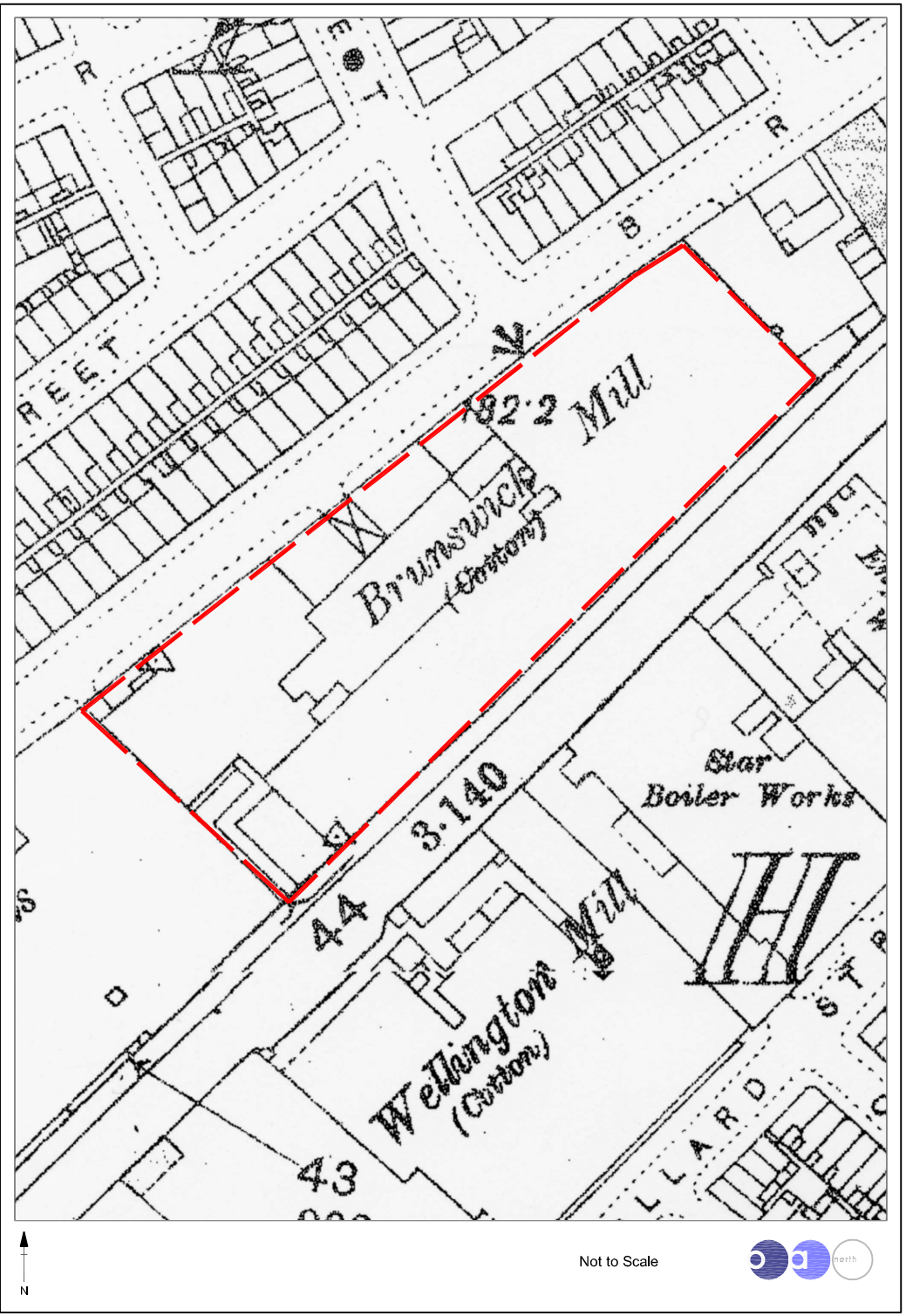


Figure 5: Extract from the Ordnance Survey 25": 1 mile map, published in 1893

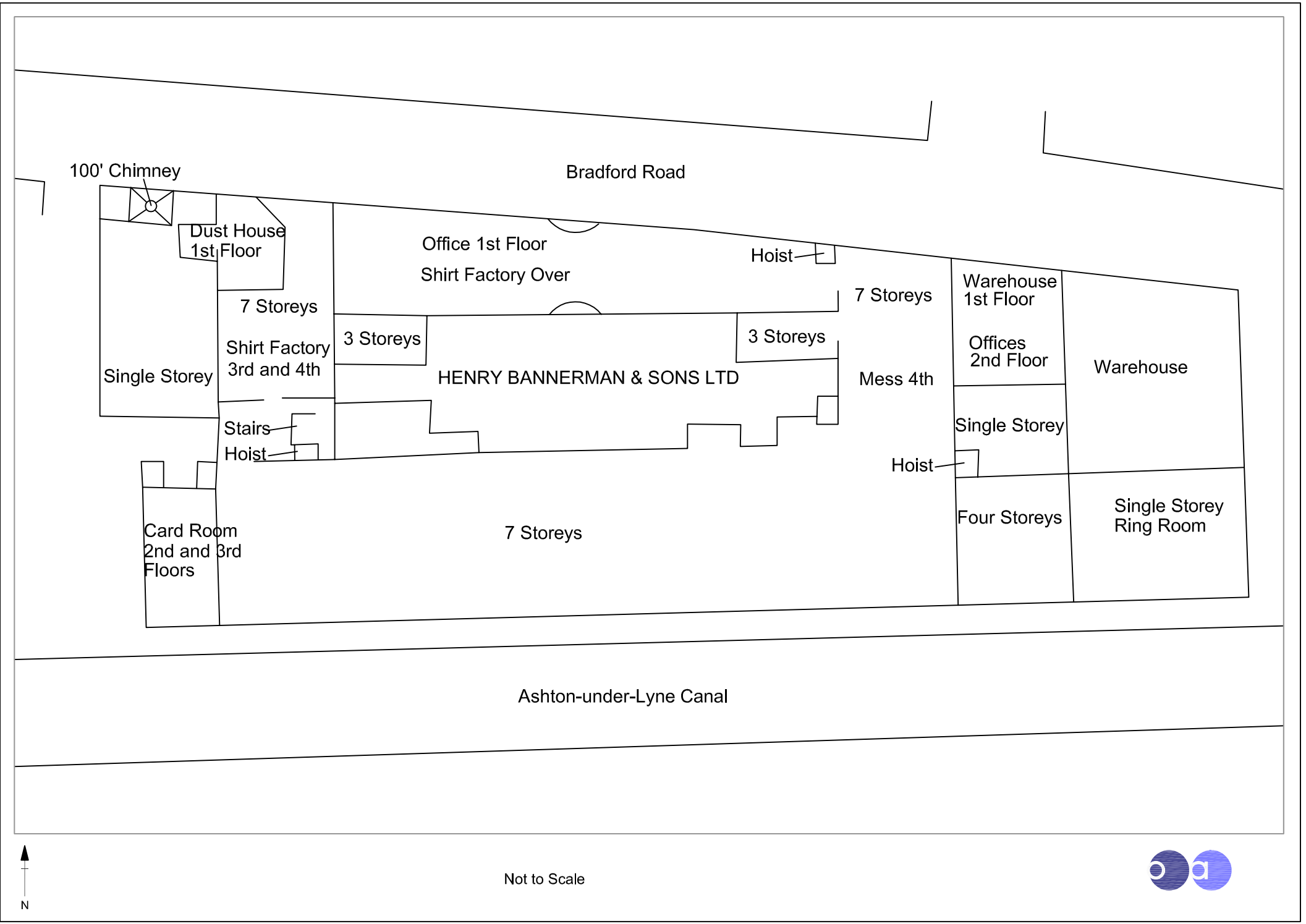


Figure 6: Plan of the mill complex based on Goad's insurance map, 1943 revision

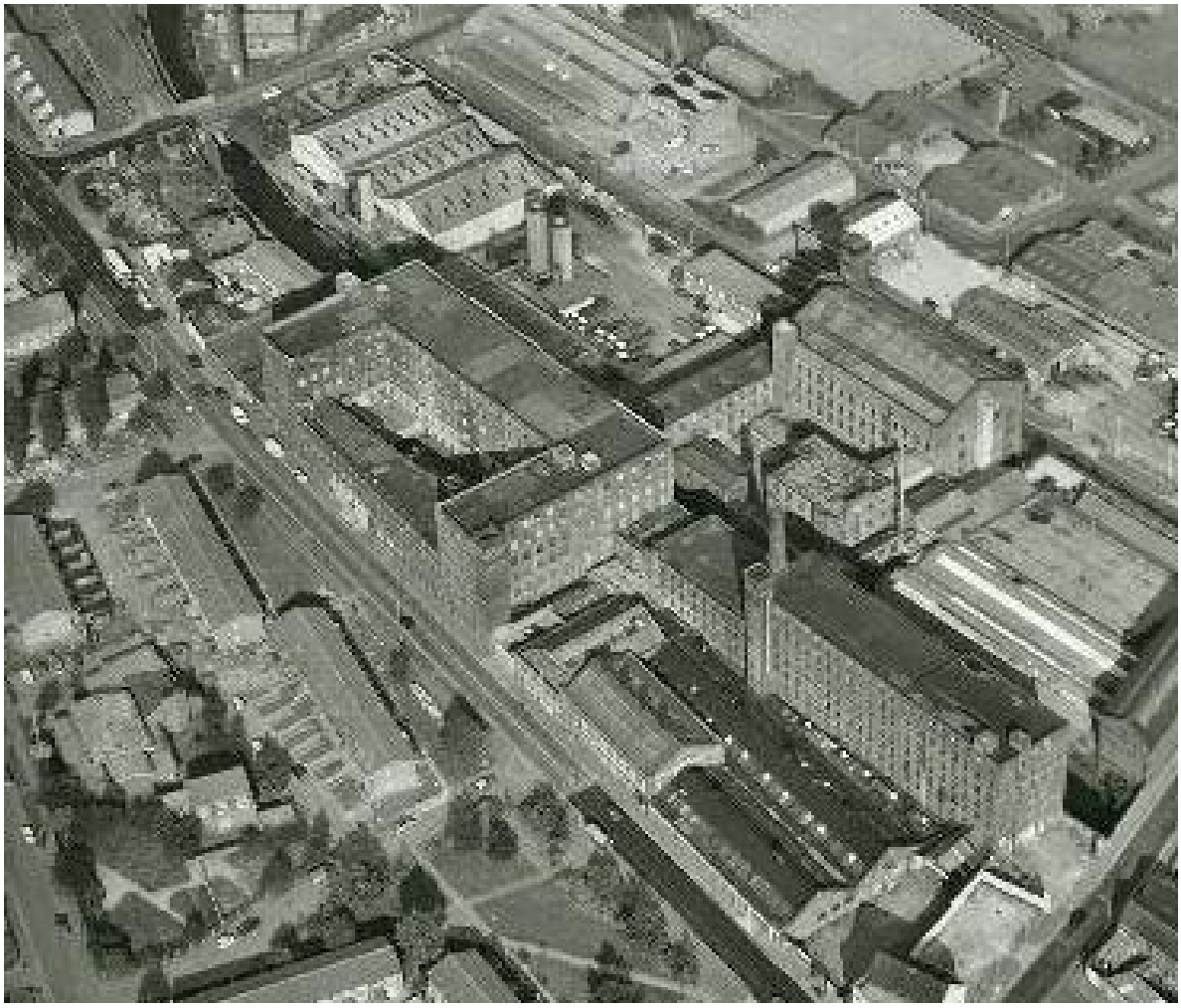


Plate 1: Aerial view of Brunswick Mill and adjacent textile mills

Plate 2: Aerial view of Brunswick Mill taken during the 1980s

Plate 3: The top floor of the main spinning block, showing the fireproof construction

Plate 4: View across the top floor of the West Wing Mill, showing brick-vaulted ceiling and single row of cast-iron columns

Plate 5: The main entrance to the mill complex, showing blocked side passageways


Plate 6: Interior of the main entrance

Plate 7: The remains of the engine house

Plate 8: Passageway through the West Wing Mill from the courtyard

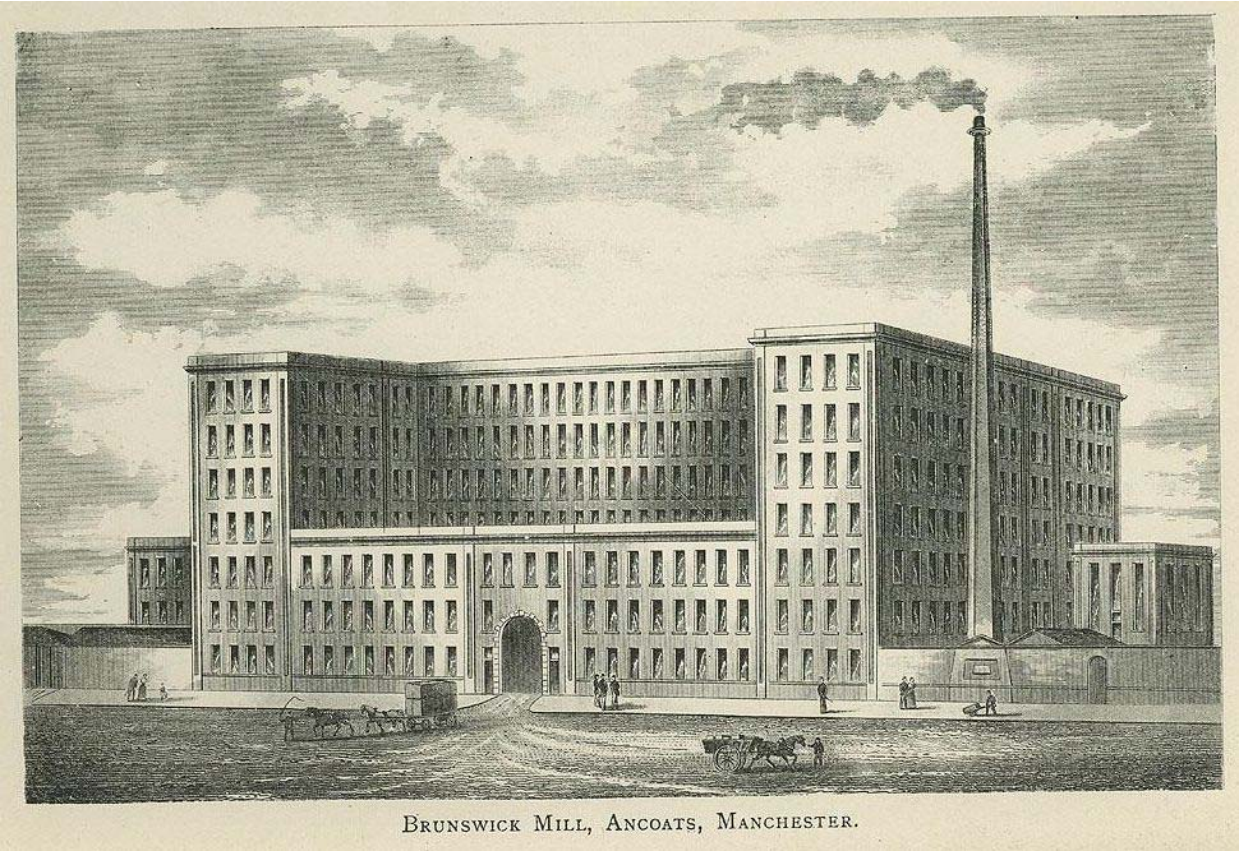


Plate 9: An engraving of Brunswick Mill from 1893

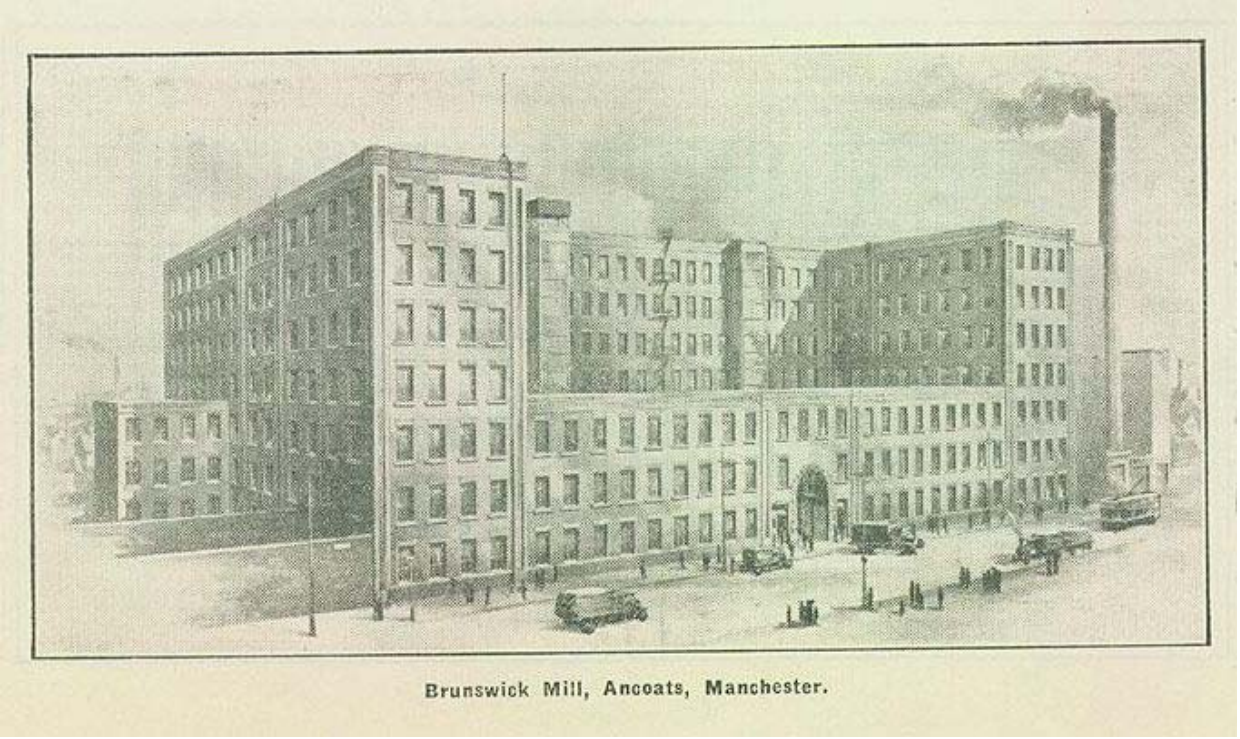


Plate 10: An engraving of Brunswick Mill from 1926

Plate 11: Transformer house in south-west corner of the courtyard

Plate 12: west-facing elevation of the mill, showing the late 19th century dust flue

Plate 13: The upper three stories of the Waste House

Plate 14: View along the roof of the Bradford Road block, showing inclined sky-lights