ART. XIV – *Building survey at the Carnaud Metal Box site, James Street, Carlisle*

BY TOM BURKE AND JULIAN COTTON

FOLLOWING a proposal to redevelop the Carnaud Metal Box site, James Street, Carlisle (NY 40185536), a programme of mitigative archaeological works was undertaken by Lancaster University Archaeological Unit (LUAU) prior to the determination of a planning application. The first two parts of this programme, comprising a desk-based assessment and trenched evaluation, were reported on in these *Transactions* (Drury, 1998), and provided evidence of early mill buildings and water management channels near the current course of the River Caldew.

The final part of the programme is reported on here, comprising a detailed building survey of the surviving mill and ancillary structures in the northern part of the Carnaud Metal Box site, dating from the early nineteenth to early twentieth centuries. The site forms an inverted triangle bounded by James Street to the west, Water Street to the east and Wood Street to the north, on generally low-lying, marshy ground near the River Caldew.

Background

The site (Fig. 1) is on the periphery of Roman and medieval Carlisle, being situated just to the south of Carlisle railway station. There is very little documentary evidence relating to its medieval and early post-medieval history, and it is likely that at this time the general area was used for rough grazing only and was not settled. Sixteenth century maps suggest more interest in the area, with lanes and small mill buildings close to what appears to be a leat, or canalised water channel.

Towards the end of the eighteenth century, this leat is described as the "Corporation Dam" (Hutchinson, 1794), and may partially have been used as a power or water supply to the nascent mill buildings alongside it. The dam was aligned approximately south to north through the site, and was probably subject to a regular programme of cleaning and maintenance. Evaluation trenching in 1997 demonstrated that the channel of this "dam" had been recut several times and revetted with stakes and brushwood (Drury, 1998).

The later history of the site has been summarised by Drury (1998) but those elements pertinent to the buildings are reproduced here. The first really good evidence for organised mill buildings on the site comes from maps of 1808 (CRO(C), D/Lons/L/Plans) and 1811 (Jollies), which show a "Twist Mill" between Water Lane and the Corporation Dam. Documentary evidence shows that the Slater family (CRO(C), Ca/2/209/25a) ran this mill (almost certainly the cotton mill forming the earliest phase of the extant buildings), and they were soon to expand the business. By 1821, a rectangular building had been added on the north side, and an oval millpond constructed to the south (Wood, 1821). At this stage, however, no development had taken place on the other side of (i.e. to the west of) the Corporation Dam.

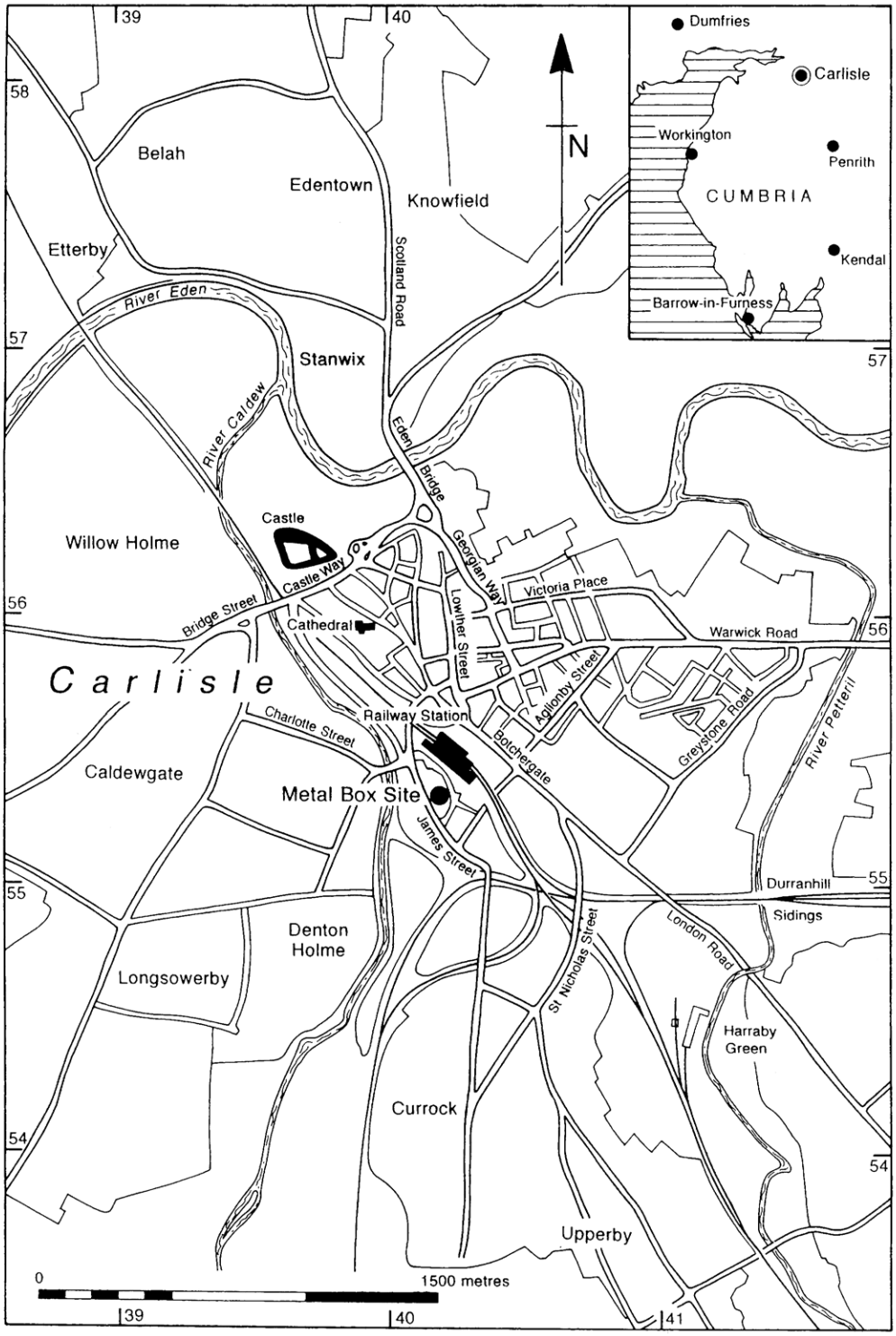

FIG. 1. Site Location.

By 1853 (Asquith, 1853) the area to the west of the Corporation Dam had been developed, with a new road (James Street) in place, and a range of new buildings – Slaters biscuit mill – placed between the Corporation Dam and James Street. Some minor changes were made to the layout of the site in the following decades, including culverting the Corporation Dam and improving the garden area to the south-east (Fig. 2). The main mill buildings to the north came to be known as "Slaters Cotton Mill".

The year 1871 was significant in the history of the site, for it was then that the Slater family decided to enlarge and rebuild the cotton mill. A substantial new mill was constructed on the site of the old (CRO(C), CaE4/203), and later amendments included the construction of a new boiler house (1897; CRO(C), CaE4/12965), a new factory shed to the west (1899; Ordnance Survey 1901), and a new north wing (1903; CRO(C), CaE4/13573). By 1903 the layout of the mill (now a metal box manufactory) was very like its current form, and most of the changes that occurred after this date were comparatively minor.

Survey Methods

The building survey concentrated on the five principal components of the Metal Box site: the engine house; the 1871 mill; the 1897 boiler house; the 1899 factory shed; and the 1903 factory. The other buildings appeared to be later twentieth century in date, and were thus not recorded. The survey consisted of hand-drawn plans and elevations linked to a total station control network; conventional and rectified photography was employed to support the drawn data.

Description

Evidence for the early nineteenth century mill

Prior to the commencement of the building survey, it had been thought that little if any evidence of the early nineteenth century mill (Slaters Cotton Mill) survived on the site. Close inspection of the internal structure of the east wall of the 1871 mill, however, revealed that some of the early mill's brickwork had been incorporated into the northern part of this wall, the ground floor brickwork being bonded with a different mortar (a white lime mortar) to that employed in the rest of the 1871 mill. This element of the wall was also some 100 mm thicker than that above it, and the division was marked by a thin course of sandstone, which seems to have been decorative. Associated with this was a square-sectioned chimney, now enclosed by the engine house that was built against the eastern wall of the mill; this chimney was also built of similar brickwork to the early mill, again with a narrowing of wall thickness at a similar height, and structurally it clearly pre-dated the engine house. The height of this chimney adds weight to the hypothesis that the early mill was smaller than its 1871 successor, since it would need to have been taller than the mill to be effective.

The presence of the stringcourse also indicates that the engine house was originally elsewhere, since it was weathered, demonstrating that this elevation had once been external. It was common in mills of the early nineteenth century for the

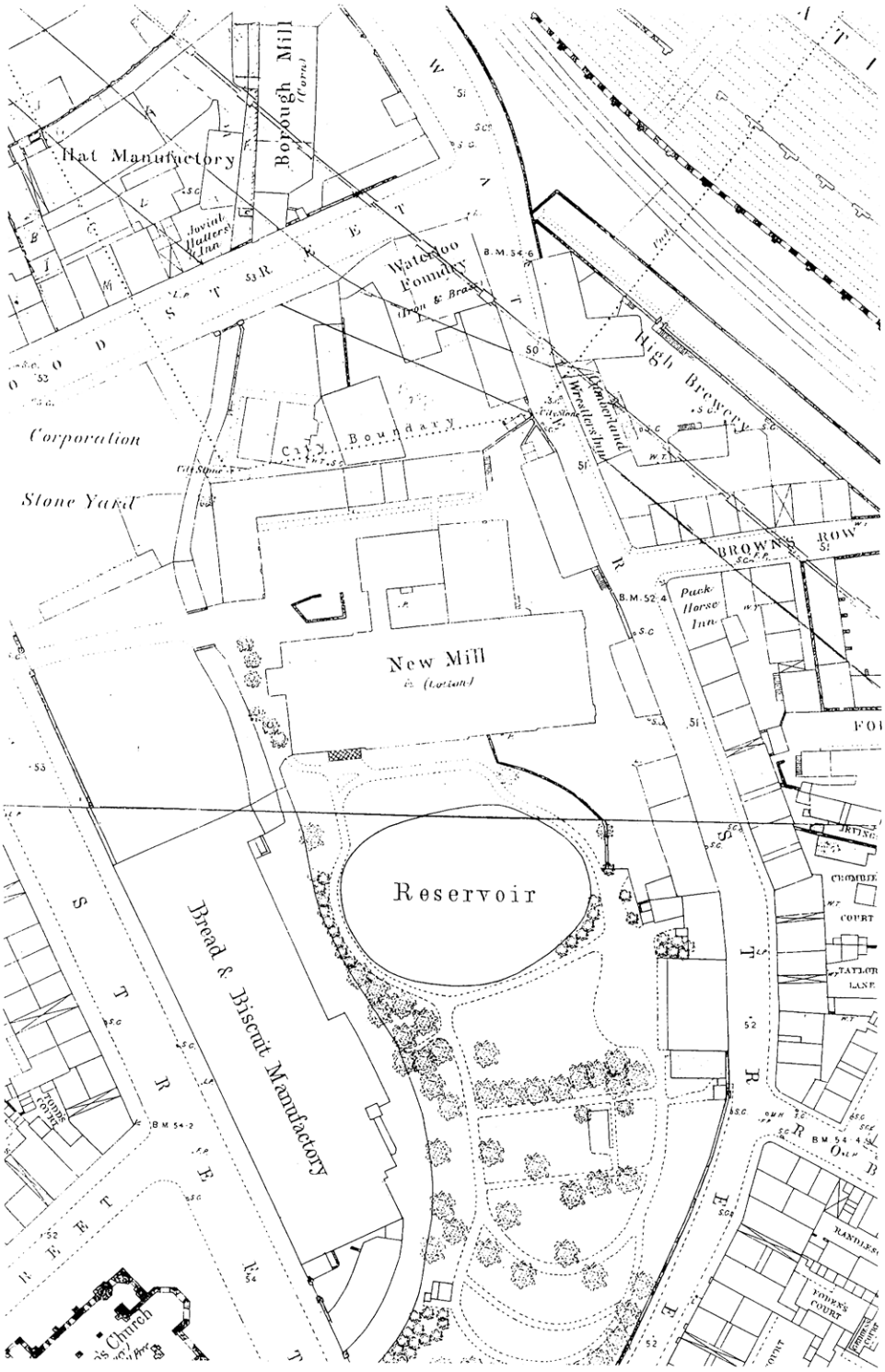

FIG. 2. Extract from the Ordnance Survey 6" to 1 mile map of 1865.

engine (usually a single cylinder condensing beam engine) to be contained within the mill itself, often transversely across one end of the mill, and this in all likelihood is what happened at Slaters Cotton Mill, although direct evidence is lacking.

Engine house

The engine house (Fig. 3) was added to the eastern end of the early nineteenth century mill, perhaps by the 1820s, with the early wall and chimney forming its western side. It is clear from a study of the brickwork in its north wall that the engine house was built in at least two structural phases, and that originally it was quite a small building, measuring some 18 m in length and 6.25 m in width. At a later date, the building was extended by 3.4 m to the east. The earlier engine house is characterised by rough-cast brick in an English Garden Wall bond of 1-5-1, whilst the extended building was of Flemish bond with sandstone stringcourses. It is not clear exactly when this extension was made.

The engine house had four floors and an attic, the windows to all elevations having stone sills and lintels. The principal elevation was to the south, and had three large windows with rusticated voussoirs. On the east elevation of the engine house were two brick pilasters, which can be discerned on Ordnance Survey maps from 1865 onwards, providing good evidence that the extension of the engine house had occurred before this date. No direct evidence of power provision was found within the engine house, but this is probably because the engine itself was taken out from ground level, either to be re-used elsewhere or scrapped.

The upper floors were supported by cast-iron columns and brick-vaulted arches. Line shafting brackets were identified on the second floor, but no other evidence of power supply or machinery was present. The engine house had a hipped slate roof, and the roof timbers consisted of an elaborate arrangement of braced posts and purlins. The floor space in the attic was relatively limited, but would still have provided storage space.

1871 Mill

The main mill building (built in 1871 (CRO(C), CaE4/203)) was the largest surviving structure on the site (Fig. 3) and, with the exception of the re-incorporated early mill wall at its eastern end, represents a single phase of construction. The mill measured some 38 m by 24 m, and was situated in the mid-southern part of the area available for survey. It was 12 bays long by six bays wide, and was four storeys and an attic high. The mill was constructed in rough-cast brick in an English Garden Wall bond of 1-3-1, and had a pier and panel framework with a series of shallow brick buttresses to the exterior, dividing the tall window bays.

The windows had brick-arched lintels and stone sills, and the gables were embellished with herringbone brickwork in arched recesses. The brick-vaulted ceilings were supported by cast-iron columns with tie bars at first and second floors, producing a fire-proof design, although structural defects were visible at third floor level. The roof was divided into two gambrel roofs with a gully between, and the trusses comprised dual-section principal timber rafters, jointed by cast-iron brackets and fixed by collar bolts. Several of these rafters were replaced during the life of the

mill, suggesting that dampness was a problem.

It is clear that the rebuilt mill was taller than its predecessor and therefore would have substantially reduced the effectiveness of the square-sectioned chimney. It is thus likely that the taller circular stack to the north of the engine house was constructed at this time.

Evidence for the main vertical drive shaft still existed within the engine house and some of the wall boxes at ground, first, second and third floors within the mill also survived, marking the point at which power was transferred horizontally into the mill (Fig. 4). These wall boxes varied in manufacturer, with those on the ground floor marked with the name of "Lees & Graham Carlisle 1871", which would suggest this company installed the power system for the mill when it was constructed. The others, by Rothwell & Co. of Bolton, were either later or re-used. The arrangements for line shafting would indicate a relatively standard layout for the mill, with the upper floors used for cotton spinning and the ground floor used for preparation processes, such as carding, drawing and roving. Evidence for additional line shafting on all floors seems unlikely to be associated with cotton spinning and is probably an adaptation of the power system for the manufacture of metal boxes.

In the angle between the 1871 mill and the engine house, and forming part of the same build as the mill, was a staircase tower. Originally designed with smaller windows and WCs in the corners, the bay containing the staircase tower underwent several modifications, including enlargement of the windows and the construction of new toilet facilities. The openings from the staircase were at first, second, and third floor level, and there was some evidence that the position of the stair itself had been altered, perhaps in the 1950s. A large water tank was positioned on top of the staircase bay, decorated with a chevron pattern.

Boiler house

The boiler house was a relatively featureless brick-built single-storey structure, constructed in 1897 (CRO(C), CaE4/12965), with a corrugated roof supported by king-post roof trusses. The main alterations occurred in 1903, when the north wing was constructed, requiring the north elevation of the boiler house to be rebuilt (CRO(C), CaE4/13573). This elevation was an open one with sliding doors, allowing easy installation, and serving also perhaps as a safety measure. There was no evidence for the original boilers.

Factory shed

Map evidence (OS 1900) indicates that this single-storey building, which measured some 40 m by 32 m, was constructed between 1897 and 1900 (a brick inscribed with the date 1899 is present in the western elevation). Because the shed was built after the construction of the biscuit mill, of which only vestigial remains existed (Fig. 3), it would appear that the shed utilised the north wall of the mill as a component of its own design. The reliance on this wall might explain the somewhat idiosyncratic design of the roof, in which the northern three of the four bays had an asymmetric north-light construction, whilst the southern bay had a contrasting

symmetrical arrangement with wrought iron and timber trusses. A three-storey office block was inserted into the south-west corner, but otherwise the internal arrangements were uncomplicated. This factory shed was characterised by some quite ornate exterior brickwork, including occasional stone courses and dentillated decoration, with the possible remains of a sandstone pediment.

North wing

The north wing (Fig. 3) was constructed in 1903 (CRO(C), CaE4/13573), parallel to the 1871 mill, and using a similar constructional technique. Three storeys were present, plus an attic floor, and the wing was 12 bays long by three bays wide. The building was constructed in rough-cast brick in an English Garden Wall bond of 1-5-1, and had a gambrel roof with arched recesses in the gables, although these were not of the same quality as those in the 1871 structure. The internal construction consisted of cast-iron columns supporting I-section steel girders. The columns all had brackets for line shafting, although there was no evidence for wall boxes associated with this other than at ground floor level where a blocked wall box was identified in the east wall, on line with the southern row of columns. This was surrounded by a circular scar, perhaps suggesting that some form of wheel or drum was mounted on the box; a blocked opening at the south-east corner of the mill at the same level may have been associated. Large concrete bases in the south-east corner of the room on the first and second floors may be associated with the introduction of electric power, being the seats for the motors. The ceilings were flat, and the roof trusses appeared to be similar to those in the 1871 mill, including in addition pairs of inclined struts and tie bars to the principal rafter joints.

Conclusions

Other than the lower section of the original east wall and the square-sectioned chimney, very little survived of the original mill building, although from map evidence and remaining elements of fabric it can be postulated that it was a lower building than its replacement. The southern elevation was the principal façade, and probably had a symmetrical appearance with projecting bays, perhaps similar to Cressbrook in Derbyshire (Menuge, 1993). The original power source for the mill has not been established, although it is likely that a steam-powered system was in place from the outset, with the first engine housed within the mill building itself.

During the first half of the nineteenth century the power system was modified, and a two-phase engine house was added on the east side of the mill. During the same period, a biscuit mill was constructed on the site, indicating the broadening business interests of the Slater family. In 1871, a substantial change took place with the construction of a new, enlarged mill replacing the early nineteenth century structure. The Slater family also appears to have sold its interest in the biscuit mill by 1869 (CRO(C), CaE4/203) and to have moved into full-scale cotton manufacturing, rather than simply spinning, by 1884 (Bulmer, 1884). Following the sale of the site to Hudson Scott and Sons Ltd in 1897, expansion and diversification occurred, reflected in the subsequent construction of the large single-storey factory

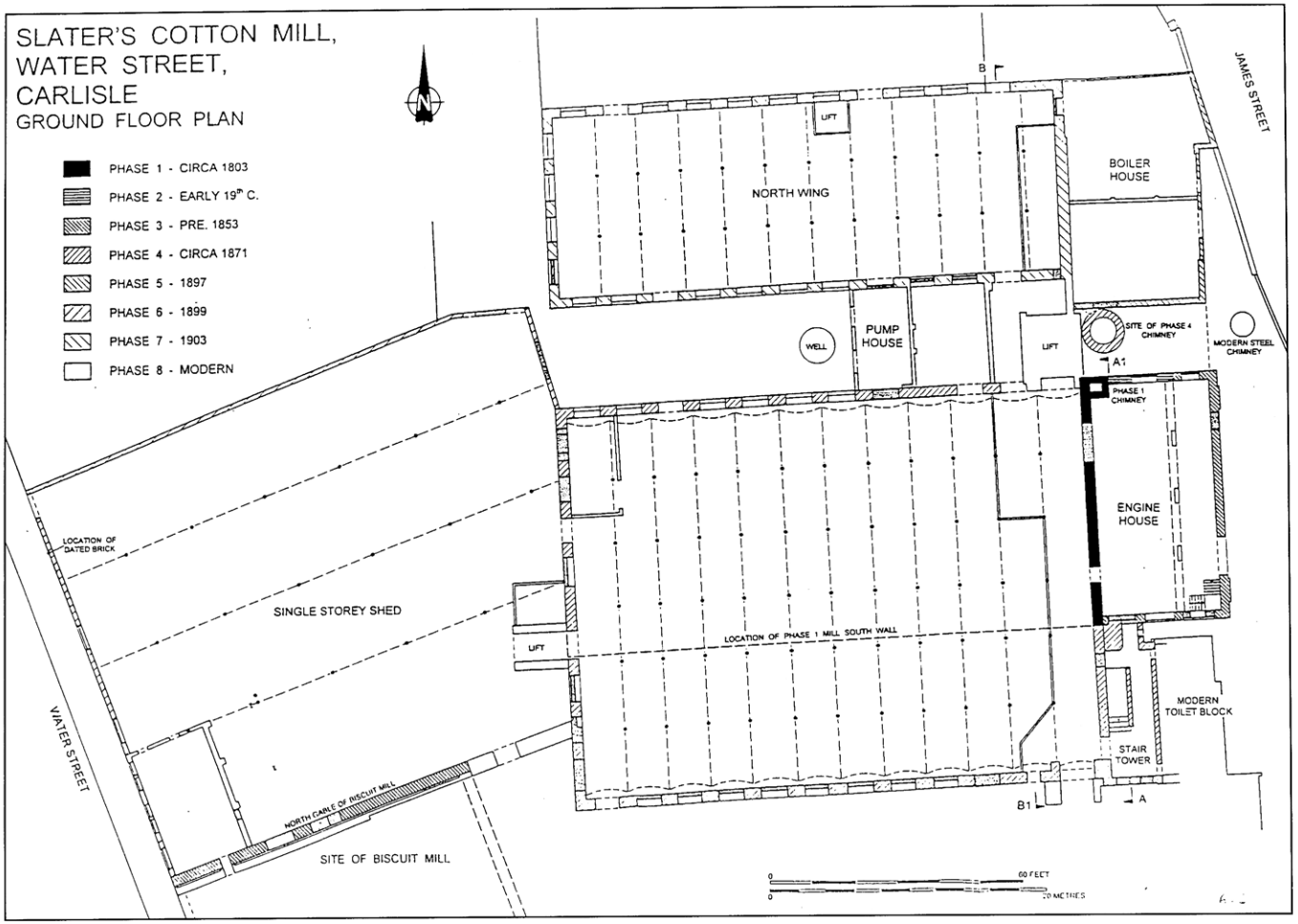

FIG. 3. Slaters Cotton Mill, Water Street, Carlisle: Ground Floor Plan.

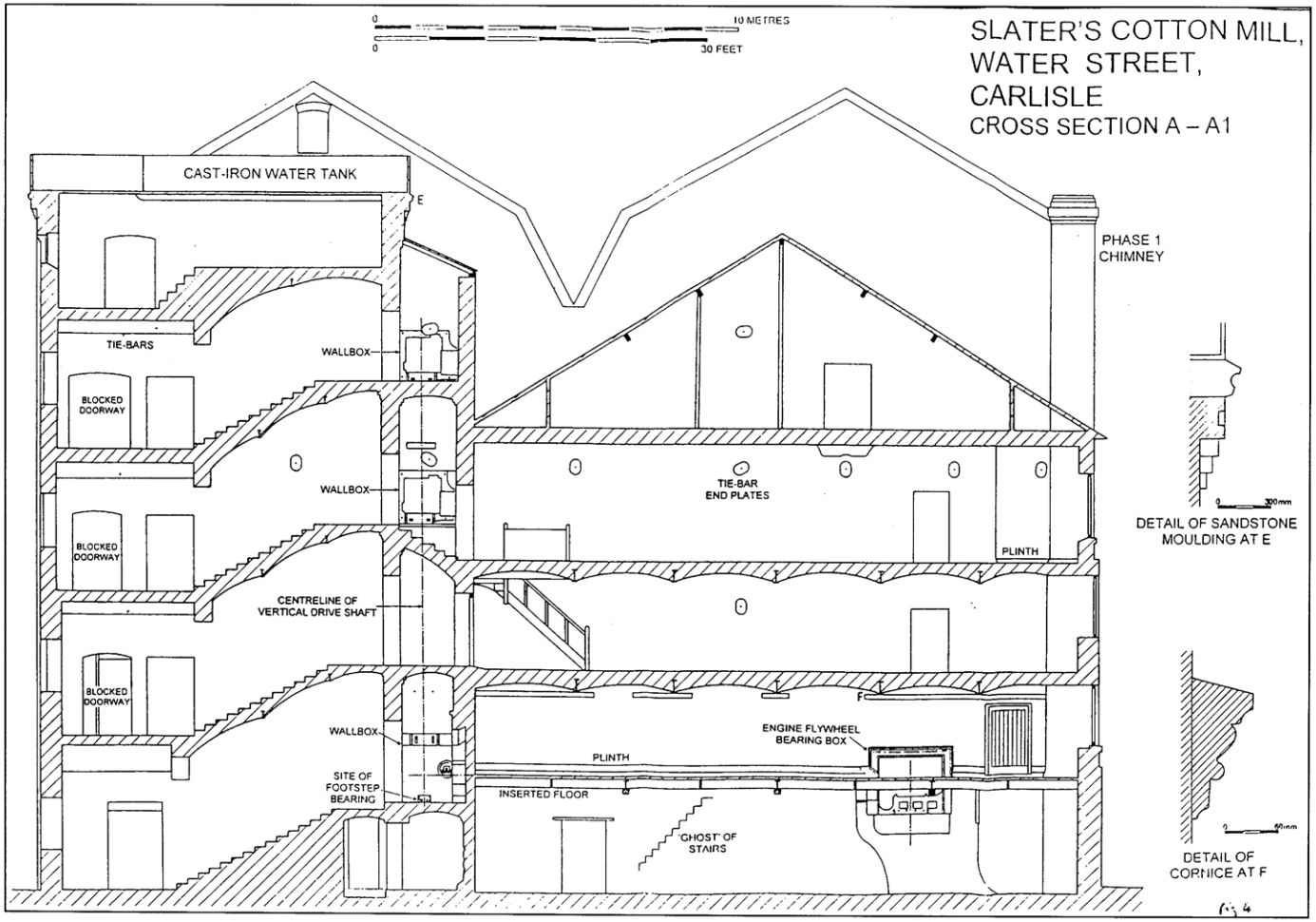

FIG. 4. Slaters Cotton Mill, Water Street, Carlisle: Cross Section A-A1.

shed in 1899, and the four-storey north wing in 1903.

Elements of many of the developments on the site had survived in the existing structures, clearly demonstrating the evolution of a nineteenth-century textile works under changing market conditions. In particular, the power systems employed appear to have been the subject of repeated modifications. Many of the buildings on the site dated to the early years of metal box production, and are thus some of the earliest buildings of their type in the industry; they also showed the adaptability of both the site and its pre-existing buildings to changing economic conditions.

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*c.*1808 CRO(C), D/Lons/L/Plans, To the Right Hon William Earl of Lonsdale Lord Lieutenant, and *Custos Rotulorum* of the Counties of Cumberland and Westmorland, Recorder of Carlisle etc. This plan of That City with the projected improvements, is respectfully Inscribed by his Lordships' most obedient and humble servant, Robt. Carlyle.

*c.*1811 Plan of the City of Carlisle and Places Adjacent, in Jollies, 1811 *Cumberland guide and directory* (Carlisle).

1821 Plan of the City of Carlisle from actual Survey by John Wood.

1853 Board of Health Map surveyed by Richard Asquith, Carlisle, 10" to 1 mile, sheets XI and XVI.

1865 Ordnance Survey (OS) 6" to 1 statute mile, Co. Cumberland sheets XXIII.7.10 and (Eastern Division) XXIII.7.5.

1865 Ordnance Survey (OS) 25" to 1 statute mile, Co. Cumberland (Eastern Division) sheet XXIII.7.

1900 Ordnance Survey (OS) 50" to 1 statute mile, Cumberland Carlisle sheets XXIII.7.10 and XXIII.7.5.

1901 Ordnance Survey (OS) 25" to 1 statute mile, Cumberland sheet XXIII.7.

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CaE4/203, 1871, Building Inspection Plan, Messrs Slater & Co's Mill.

CaE4/12965, 1897, Building Inspection Plan, Messrs Hudson Scott & Sons Proposed Alterations to Water St. Works.

CaE4/13573, 1903, Building Inspection Plan, Messrs Hudson Scott & Sons Ltd. Addition to Water St. Factory.