COLDHARBOUR MILL

UFFCULME

DEVON

Architectural Investigation
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HISTORIC BUILDINGS REPORT

COLDHARBOUR MILL
UFFCULME
DEVON

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REPORT BY MIKE WILLIAMS
PHOTOGRAPHY BY MIKE HESKETH-ROBERTS & PETER WILLIAMS
DRAWINGS BY NIGEL FRADGLEY AND MIKE WILLIAMS

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Cover photograph: the headrace of Coldharbour Mill, with the grist mill on the left, the wheel house and main mill in the centre and the stair tower and main entrance on the right.

SUMMARY

Coldharbour Mill was investigated and recorded in April and May of 2001 following a request for information about the architecture and history of the site from the Director of the Coldharbour Mill Trust. The site was built by the well-known and highly successful firm of Fox Brothers and Co. and operated as a textile mill from the late 18th century to c1980, after which it has been maintained as a working mill museum. The potential historical significance of the site was noted during the RCHME / EH South-West Textile Mill Survey in 1997-8, which made brief contextual records of all known surviving textile mills in the South-West region.[1]

Investigation of the site has revealed that it is probably one of the best-preserved textile mill complexes in the country. It retains the full range of buildings and power system features which characterised the development of the 19th century textile mill with much of the machinery which was used at the site in the 20th century. It includes structures dating from all the main stages in the development of the factory-based woollen textile industry in the South West. The main mill building itself is a relatively large example of the first generation of powered factories. In plan it was one of the largest of the early textile mills in the South West and was of comparable dimensions to the contemporary steam-powered factories in the north of England. A variety of other well-preserved buildings illustrate the wide range of ancillary functions at a working textile mill, including powered workshops, stables and a gas retort house. Of additional interest is the intact survival of a combined water- and steam-power system. This remained in use until the second half of the 20th century and is consequently very well preserved. It comprises the full range of buildings, structures and machinery associated with the two power systems, including an early to late 19th-century waterwheel and an early 20th-century steam engine. The power transmission system is preserved in its early 20th century configuration along with several sections of line shafting, which were apparently driven simultaneously by both power sources. The lower two storeys of the mill also retain much of the machinery which was used for worsted combing and spinning from the late 19th century.

SITE LAYOUT (see drawing 1/4)

The complex has developed around the three-storeyed main mill building, which dates from c1800 (B, drawing 1). It is oriented on a roughly east-west axis and stands at the end of a head race which flows from a large pond to the east of the site. The leat supplied water for both the waterwheel (C) and the later steam plant. A two-storeyed extension (D) and a fireproof stair tower are attached to the north side of the mill, and a single-storeyed north-light shed attached to the south side (E). The wheel house is attached to the east end and the buildings and other structures of the steam-power system adjoin the west end. To the east of the main mill is a smaller mill building which is known as the grist mill; this originally pre-dated the main mill but was extensively modified in the 19th century (A). The smaller ancillary buildings at the site are located around a yard to the north of the main mill. These include stables (L), powered and un-powered workshops (N), on-site housing (later modified) and the highly unusual intact survival of a gas retort house (M).

Fig 1. Coldharbour Mill from the south west, 8th May 1988.

HISTORICAL BACKGROUND

Staff based at the museum are currently undertaking detailed documentary research into the history of Coldharbour Mill which will provide more specific information on the dates of construction and the history of use of the buildings. The research includes important early documents obtained since the closure of Fox Brothers and Co. at Tonedale Mills, Wellington, Somerset; the following account is a summary of the currently available information, parts of which may require updating after more research is carried out.

Fox Brothers and Coldharbour Mill

Coldharbour Mill was built and operated throughout its entire working life by the firm of Fox Bothers and Co., based in Wellington, Somerset. This was probably the largest and most extensive woollen and worsted business in the history of the South-West textile industry. The firm's origins date from the mid-18th century with business partnerships between members of the Fox family and the Were family; the latter were at that time the largest woollen firm in Wellington, although they had originated in Burlescombe and Uffculme in Devon.[2] By 1796 Thomas Fox was left in sole control of the firm, which occupied the Town Mill, a former grist mill near Wellington, and another mill at the nearby Tone Works. In 1797 the firm acquired an interest in the Coldharbour site, occupying a small grist mill and converting it to contain gig frames for the finishing of woollen cloth. Thomas Fox then began the construction of two large, water-powered woollen mills, firstly at Coldharbour in 1799-1800 and then at Tonedale in 1801-3; the latter was a rebuilding of the former Town Mill. The mill at Tone Works was developed as a textile finishing works. In the 19th century the business adopted powerloom weaving and acquired additional mills throughout the South-West to become one of the largest woollen and worsted manufacturers in the country. Fox Brothers were later also distinguished as one of the longest-surviving family firms in the English textile industry. Coldharbour Mill remained in use until at least the 1970s while the firm's other main sites at Tonedale Mills and Tone Works remained in production until the mid-1990s.

The grist mill

At the Coldharbour Mill site the grist mill probably contains the earliest structures, although the present building shows evidence of extensive alterations (see Description). It may occupy the site of a 17th-century paper mill which was damaged by floods in the mid-18th century and re-built as a grist mill in the late 18th century.[3] This mill was offered for sale in 1788, when it was described as "lately built entirely new", containing four pairs of stones and powered by wheels at each end by separate watercourses.[4] The advertisement gives the dimensions as 46 feet by 24 feet; the extant building is of similar proportions with dimensions of 42 feet by 24 feet. The grist mill was probably the building which Fox purchased in 1797 for use as a gig mill.[5] This would have entailed adapting the mill to contain water-powered teazle gigs for raising the surface of fulled woollen cloth. It is not known whether fulling was also carried out in the building or elsewhere. Structural evidence indicates that parts of the extant building date from before the construction of the leat supplying the main mill, suggesting that the present building is a partial survival of the 18th-century grist mill (see Buildings Report).

Fig 2. The grist mill from the east. Parts of the lower walls and the north end probably date from before c1800.

The position of the grist mill and its associated water-power features had a marked influence on the location and the water-power system of the new mill. No clear physical or documentary evidence has been found of the power system of the grist mill, although the orientation of the building, perpendicular to the direction of the leat, strongly suggests that it was formerly water-powered. Thomas Fox stated that he intended to stop working the existing mill when the new mill was completed in c1800, so the power system may have been removed at an early date.[6] Fox also stated that the "present course" of water supplying the mid-18th century mill could be used to supply the new mill. This suggests that the leat of the mid-18th century mill was in a similar position to the extant leat and that the new mill was positioned to make use of the existing water supply. The 1788 sale description stated that the grist mill had a wheel at each end, implying that it was probably located between two watercourses in a similar arrangement to the extant building. Thus it seems likely that the construction of the main Coldharbour Mill involved the alteration of the watercourses associated with the earlier grist mill. There is also tentative documentary evidence of a different leat arrangement which may have pre-dated the one described in 1788. An 1834 plan of the site includes a pencil sketch which seems to indicate the line of a single earlier leat passing beneath the grist mill. The date of the earlier leat, and the accuracy of the sketch, is not known, but this may be the line of the former leat of the grist mill before it was rebuilt in the late 18th century.

The main mill

The construction of the main mill is described in letters written by Thomas Fox in 1799 which have recently been transcribed by staff at the museum. The letters provide a rare insight into the construction of a large textile factory at the turn of the 19th century. They accurately describe several distinctive features of the extant building, and it is clear that Thomas Fox played an important role in the design of Coldharbour Mill. A letter dated 7th March 1799 mentions the intention to build the mill and discusses its design.[7] In its original form the mill was to contain jennies, for hand-powered spinning, but powered machinery for carding and other preparation processes was to be added shortly later. The eventual aim was to install 12 jennies with associated preparation machinery on each of the three floors of the mill. A waterwheel was to be located at one end so that it could be used to power both the mill and any later extensions added to the end wall.[8]

Another letter of 15th April 1799 states that the foundations of the building had by then been constructed fifty feet below (ie: to the west of) the existing mill.[9] The present distance between the grist mill and the end wall of the main mill is about thirty-seven feet, although a distinctive thicker section of the south side wall of the main mill is located almost exactly fifty feet to the west of the grist mill (see Buildings Report). The design of the mill had been changed to incorporate alternating wide and narrow bays, as found in the extant building, with windows only sited in the wide bays. The letter implies that Fox was responsible for this distinctive design feature, which is also found in the surviving parts of the Tonedale Mill. The beams were to be supported by oak posts instead of iron; in the extant building the upper floors are still supported by square timber props which appear to be original to the beams.

The range of machinery which was originally installed at Coldharbour Mill is indicated in an inventory of 1802.[10] The new building contained the full range of machinery for woollen spinning and was powered by a waterwheel valued at £450. Spinning itself was carried out on jennies, however, which were normally hand powered. This suggests that the mill was originally intended to be part-powered, with the waterwheel used only for the carding engines and other preparation processes. A similar use of both powered and un-powered machinery has been identified as a feature of some early mills in other regions.[11]

Fig 3. The main mill from the south east. The lower three storeys date from c1800.

Evidence of the later development of machinery and power at the mill is contained in a series of early 19th-century Stock Books (inventories of machinery and goods), which are currently being researched by staff at the museum.[12] The 1816 Stock Book indicates that by that date worsted spinning frames were in use at the mill in addition to jennies. The 1822 book includes a new waterwheel valued at £1,500.[13] This was probably larger than the earlier wheel, which was valued at £450 in 1802, and parts of it may survive in the extant wheel (see Buildings Report). The Stock Books seem to indicate that after the new wheel was installed the proportion of spinning frames in the mill increased and the use of jennies decreased. Thus the installation of the new waterwheel may have been associated with an increase in the production of worsted yarn. It is not known whether the worsted spinning frames were powered by hand or by the waterwheel. Another important factor was the partial destruction by fire of Fox Brothers other mill at Tonedale in 1821, which may have necessitated an increase in production at Coldharbour.[14]

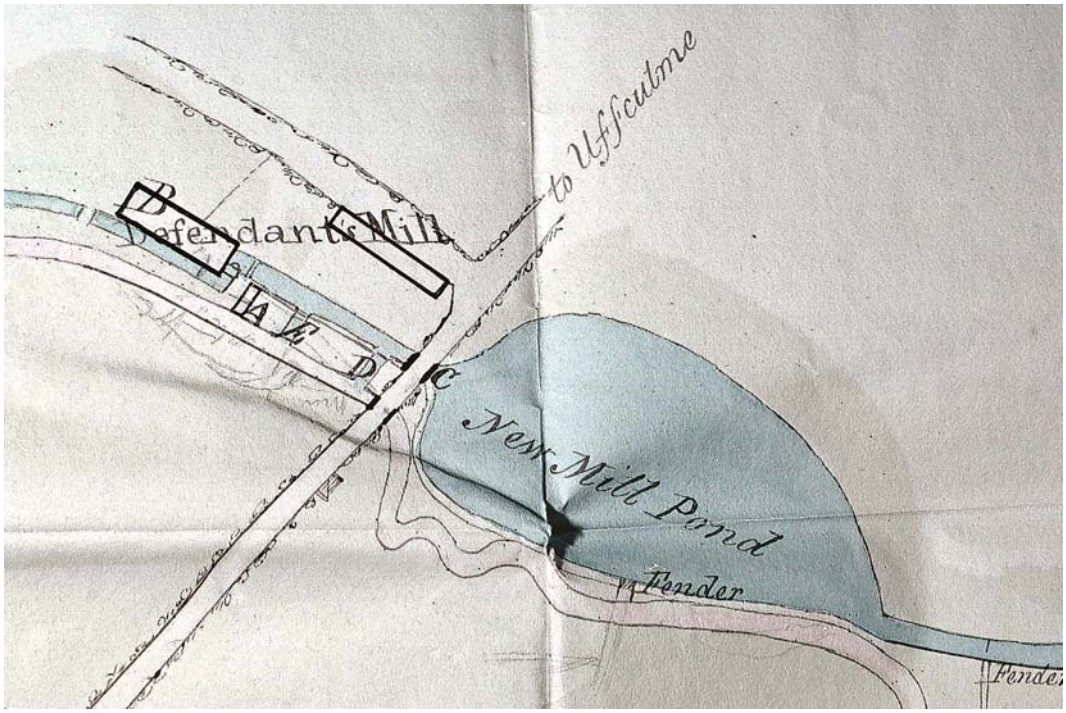

Fig 4. Extract from c1834 map showing watercourses, buildings and wheel position.

Maps dating from the 1830s to the 1850s suggest that the watercourses and the original parts of the main mill have retained their early 19th-century form and that no significant additions were made to the site until the second half of the 19th century. Up to the 1850s the site comprised the main mill and the grist mill with another long narrow building, probably

housing, to the north east. A plan of the surrounding area which shows the site was produced in 1834, when the owners of mills downstream of Coldharbour took legal action against Fox Brothers to protect their water rights (Fig 4).[15] The plan shows the watercourses accurately but the buildings are only drawn in outline. The waterwheel was marked in its current position, however, attached to the east end of the main mill, although the wheel house had not yet been built. The pond, sluices, leat and bypass are all shown in their present configuration. The former grist mill is named and shown as a rectangular structure in the position of the extant building. The Tithe Maps of 1841 and 1851 indicate that few changes had been made to the site; a small extension was added to the west side of the grist mill and the building in the north-east corner of the site was now marked as three attached structures.

Late 19th-century additions

From the late 19th century to c1910 a series of extensions were made to Coldharbour Mill which were associated with the addition of steam power and alterations to the internal arrangement of processes and machinery. Various ancillary buildings were also added, including stables, engineers' workshops and a gas retort house. Most of the alterations which date from this period are well-preserved and now form a rare example of a completely intact textile mill complex.

The components of the steam-power system were added in three phases to the west end of the main mill. The first phase of 1865 comprised a beam engine house with a contemporary boiler house and economiser house; the second phase, of the 1890s, saw the extension of the engine house and the construction of the extant free-standing chimney; in the third phase of 1910 a new engine house for a horizontal engine replaced the east end of the boiler house, while the boiler house itself was extended to the west and the north. The economiser house was also extended to the north and the existing chimney retained.

No primary documentary evidence of the steam-power features has been found; the interpretation in this report is largely based on comparisons of O.S. 25" plans with the extant structures. The 1865 beam engine house is shown on the 25" plan surveyed in 1877.[16] The plan indicates, however, that the adjoining structures were altered later. The boiler house adjoining the north end of the engine house seems to have formerly extended eastwards up to the end wall of the mill, occupying part of the site of the later horizontal engine house. The

west end of the original boiler house is also shown further to the east than the end of the extant boiler house. The economiser house to the west is shown on the plan but there is no sign of any free-standing chimney associated with the economiser.[17]

A Fox Brothers poster of early 20th-century date includes an illustration of Coldharbour Mill as it appeared in c1900 (Fig 5).[18] This shows an extension added to the south end of the beam-engine house and the extant free-standing chimney. The Second Edition 25" plan, revised in 1903, shows both features and indicates that the boiler house was similar in plan to that shown on the 1887 plan. The c1900 illustration also shows the boiler house roof extending eastwards up to the end wall of the mill. The horizontal engine house, which replaces part of the original east end of the boiler house, was added in 1910.[19] The nature of the other alterations which were carried out when it was built is indicated by physical evidence (see Buildings Report). The 25" plans also show a small greenhouse attached to the south side of the boiler house, the foundations of which were exposed at the site in June 2001.

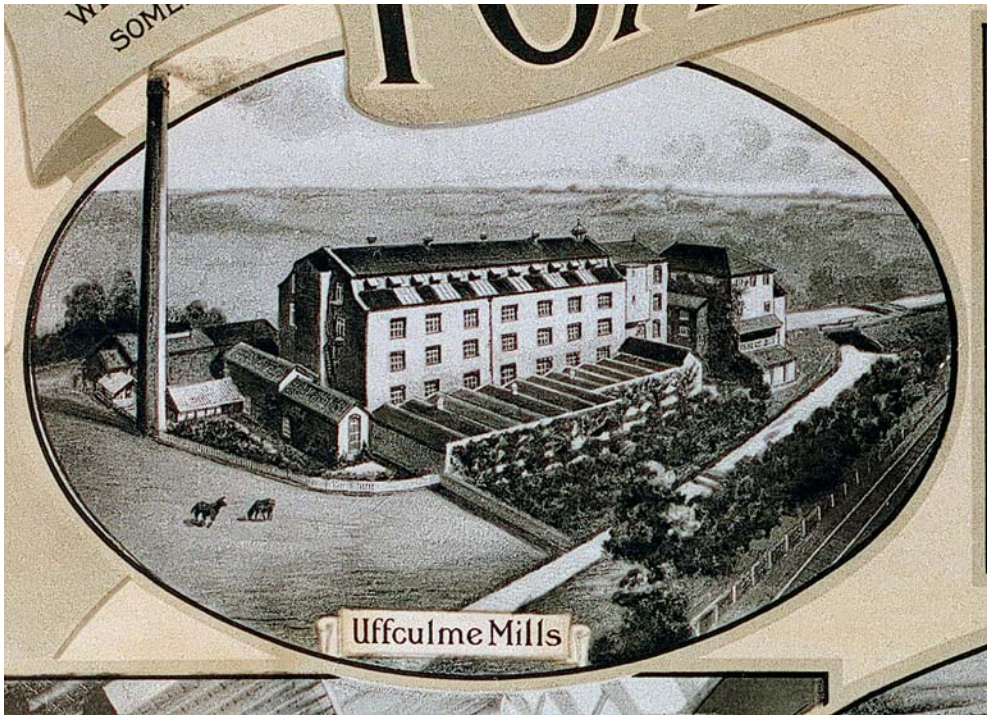

Fig 5. Illustration of Coldharbour Mill in c1900, from a Fox Brothers' advertisement.

Three major extensions were added to the main mill in the late 19th century. A single-storeyed combing shed was attached to the south side, a two-storeyed extension added to the

north side and a new roof built creating a spacious attic storey. The side extensions are both shown on the 25" plan surveyed in 1887. Structural evidence indicates that both were probably added in two phases of similar date, each phase occupying about half the length of the main mill (see Buildings Report). The Combing Shed was apparently built in 1884-5,[20] and this is probably the approximate date of the north extension. No documentary evidence is available of the construction of the attic, although structural evidence suggests that it was contemporary with the fireproof stair tower and that both pre-dated the addition of the north side extension.

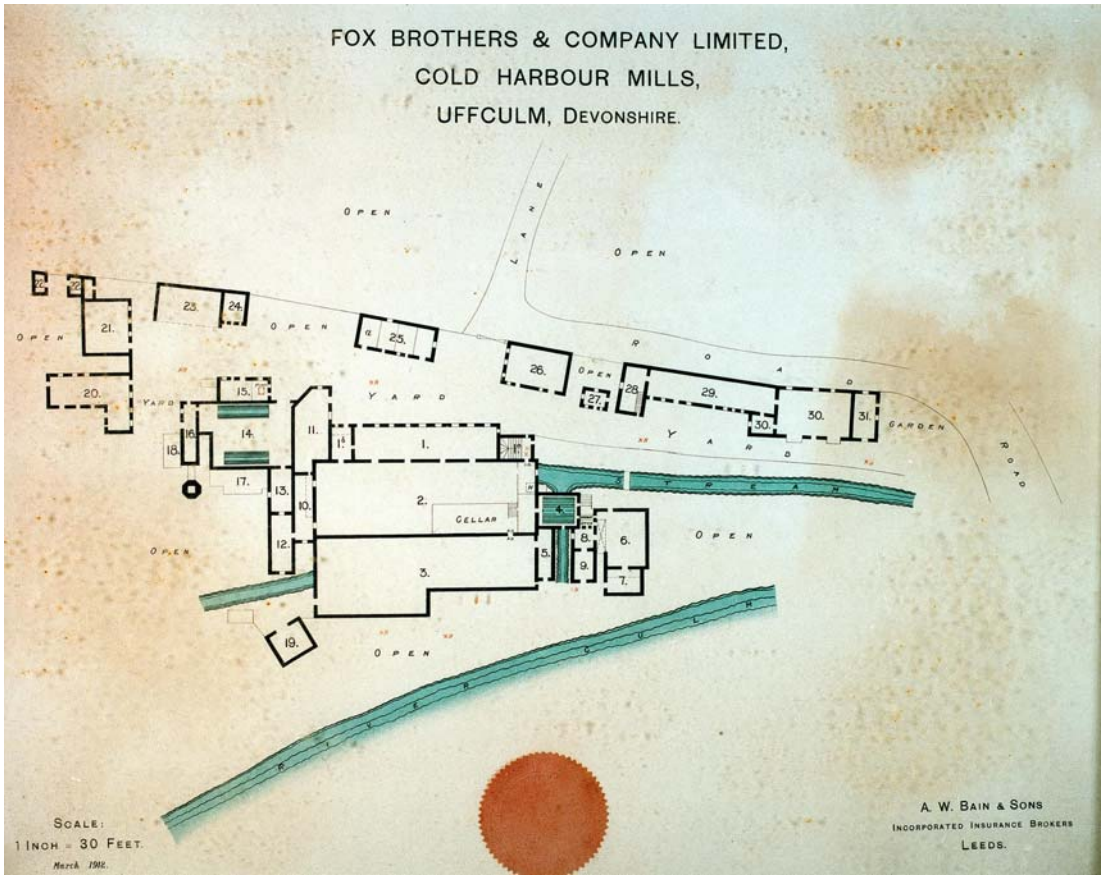

Fig 6. Block plan dated 1912.

The extensions to the main mill, and the expansion of steam power in the same period, probably related to a reorganisation of internal processes and machinery. In the early 19th century the mill seems to have been used for both woollen and worsted production.[21] In this period, the processes of production were organised horizontally, with each of the three storeys containing a full complement of preparation, carding and spinning machines. In the 1880s it was stated that by then the mill was used entirely for worsted combing and

spinning.[22] The addition of the combing shed and the north side extension in this period suggest that processes were now arranged vertically, with combing mainly in the ground floor and spinning and related processes in the upper storeys. This vertical division of processes is similar to that used in late 19th-century textile mills in other regions.

The mill in the 20th century

A block plan dated 1912 (Fig 6) shows the final form of the site after the addition of the 1910 engine and confirms that all of the main buildings from that period have been retained. As stated above, the site remained in use for worsted production until the 1970s, and this led to the preservation *in situ* of much of the power system and machinery. A description of the steam and water-power systems was made during a visit to the site by George Watkins in 1962.[23] The description confirms that most parts of the power and transmission systems were identical to their current configuration in the museum. The rope drive was still fully in-use, with 13 ropes driving all four storeys in the mill and the water feed pump for the single Lancashire boiler. The description also states that a water turbine had been used at the site until the combined water- and steam-power system was rearranged following the installation of the 1910 steam engine. No clear evidence of the site of the turbine has been found.

BUILDINGS REPORT

Landscape features

Coldharbour Mill is today distinguished by the intact preservation of an unusually wide range of textile mill structures covering a wide date range. The site is also notable, however, for the survival of the very extensive landscape engineering features which characterised large-scale water-power systems in the 19th century. The layout of watercourses and other features has largely been determined by the local topography but has similarities with Fox Brother's other large water-powered mill at Tonedale. Most of the watercourses at Coldharbour date from the construction of the main mill in 1800; the 1834 plan of the site includes the sketched outlines of earlier watercourses (Fig 4).[24] The headrace supplying the wheel chamber in the main mill is fed from a large pond located immediately east of the site. The 25" plan surveyed in 1887 indicates that the pond was then similar in extent to the mill complex itself. The pond is fed a long feeder channel from a weir on the River Culm about 500 metres to the east. The river itself passes to the south of the mill site. A bypass stream flows from a weir in the pond and passes close by the south side of the grist mill and the combing shed (see Drawing 1/4). The head race includes two overflow sluices immediately upstream of the mill, which are marked on the 1834 map, to divert surplus water in to the bypass channel. The tail race below the wheel chamber has been excavated to a depth of about 1.5 metres below the level of the bypass[25] to increase the head of water available at the wheel. It then flows in a culvert beneath the combing shed to meet the bypass channel about 400 metres downstream of the site. Further information on the water supply system is contained in two reports on the waterwheel by Martin Watts (see Bibliography).

The grist mill

The grist mill contains structural evidence of extensive alterations and some rebuilding, and it is likely that substantial parts of the building date from after it ceased to be used as a grist mill in the 1790s. The earlier parts are of stone rubble and the late 19th-century additions of red brick (Fig 2, p6). Internally the building has inserted ceilings and plastered walls which probably obscure other evidence. Externally the fenestration is divided into six window bays, but internally the timber floor structure comprises four wider bays. Most of the timber floor

beams have been re-used and do not match the spacing of the windows, indicating that the floors are probably of later date than the walls. The building is of four storeys, the top storey and the roof having been added in the late 19th century.

The north end and the adjoining part of the east elevation may be the earliest parts of the building. In the north end wall, the segmental head of a blocked opening is located just above the footpath along the embankment of the adjoining head race, indicating that this part of the building pre-dates the present form of the race. The four north end bays of the east side wall, below the top storey, appear to be contemporary with the end wall. These bays have small square windows with internal splays and some retain opening wooden casements which could date from before c1800.

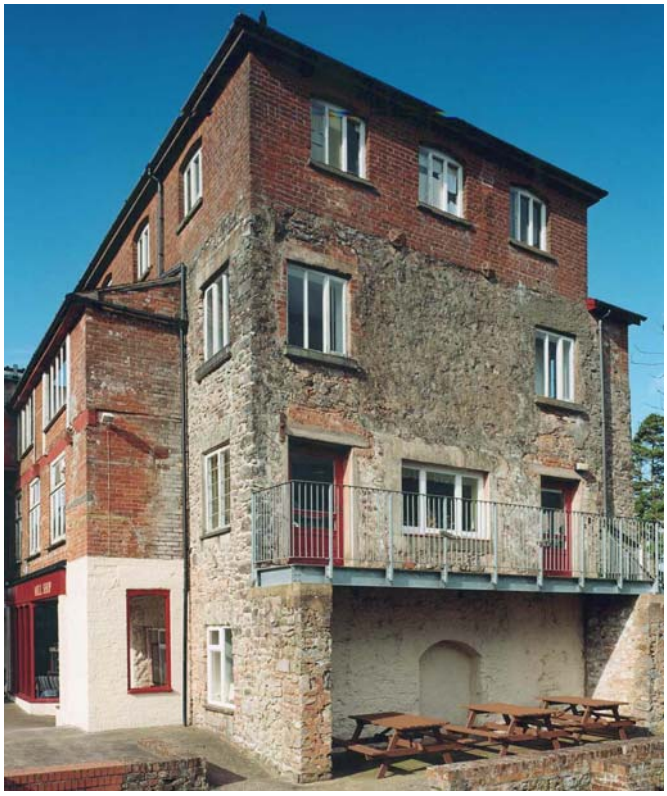

Fig 7. South end of the grist mill.

The west elevation is largely obscured by later alterations but retains evidence of more than one phase of building. The third storey and the south end of the second storey of this wall may be a later addition. In the second storey, the west side wall includes a prominent set-back just below the ceiling of the four northernmost bays. The thicker section of wall, which

continues to the south end of the building in the ground floor, may be the remains of an earlier structure.

The south end of the building shows more evidence of reconstruction, but may include the site of one or more waterwheels. The south end of the east elevation comprises a projecting tower which appears to be a later addition. The tower is shown on the 1887 25" plan but not on the 1841 Tithe Map. Its width matches the spacing of the inserted floor beams. The adjoining south end wall seems to be contemporary with the tower, and includes a central blocked arched opening which may indicate the position of a former wheel shaft.

No evidence has been seen of a wheel pit on either side of the wall, however. A small extension was formerly attached to the south end of the building, the lowered walls of which survive as a garden feature, and this is a possible location for a wheel house. The 1834 map of the area includes a sketch of a race which seems to enter the centre of the building, which could therefore be another possible wheel position.[26] No internal physical evidence of former waterwheels has been identified. Evidence of the former head races may survive in the footings of the east elevation, below the present ground level.

Late 19th-century alterations include the addition of the red brick top storey and the timber hipped roof. The top storey is lit by small windows with segmental brick heads which are similar to those in late 19th-century buildings in other parts of the site. A narrow brick extension was also added to the five northernmost bays of the west elevation. The function of the extension is not known, although the top storey may have contained wide openings beneath a continuous timber beam, for either good lighting or ventilation. The third storey is linked to the room above the nearby wheel house by a late 19th-century covered iron footbridge.

The main mill

The main mill is of four storeys including the attic and is built to a long rectangular plan of fourteen bays (Fig 3, p8). It is entered by a wide door in the base of the stair tower attached to the east end of the north side. Each of the storeys may originally have been open from end-to-end, but a brick cross-wall of mid- or late 19th-century date now segregates the east end bay of the lower two storeys. A two-storeyed extension is attached to the north side and

the combing shed to the south side. The floor of the shed is at a lower level than the ground floor of the mill, and is reached via a small basement area in the mill's south-east corner.

In comparison with many other surviving early textile mills in the South West the mill is of relatively large plan for its date of c1799-1800, with an internal width of about 39 feet and a length of 123 feet. The earliest part of Fox Bothers' Tonedale Mills, for example, which has walls of similar date, has an internal width of 38 feet and a length of 91 feet. Coldharbour Mill was of comparable size to the largest of the early South-West textile mills and is similar to the scale of the early steam- and water-powered powered textile factories which were built in Lancashire, Yorkshire and the Midlands.

The side walls are of rubble stone, rendered in the south elevation. The original part of the west end wall is also of stone but the east end, which is closer to the site entrance, is of red brick in Flemish bond. The red brick gable ends were added later. The fenestration is distinctive and matches the description made by Thomas Fox when the building was under construction in 1800.[27] The mill has alternating wide and narrow bays with large windows located only in the wide bays. The only other known example of this arrangement is at Fox's Tonedale Mill. Most large mills of this period have smaller rectangular windows in successive bays. The functional purpose of the alternating fenestration is not known; it may have related to an original machinery layout which only required good lighting in alternate bays, or may have simply been seen as a way of constructing a mill with large windows without reducing the strength of the walls. The windows are a novel feature of the mill, however, and suggest that Fox took an active role in the design of the mill. Internally, most of the windows have sloping sills, although those in the lower two storeys of the north side have been cut through to give access to the later extension. Most of the wooden frames appear to be late 20th-century replacements, although two earlier frames survive in the west end of the ground floor which may be of the mid-19th century or earlier.

The south side wall of the mill includes a thicker section between the second and fourth bays from the east end (see Drawing 2 / 4). This part of the south elevation projects forward about four inches between the carding shed floor and the level of the window heads of the second storey, where the top of the projection is protected by an angled coping. The thicker section aligns with the small basement area in the ground floor of the mill. It appears to be a deliberate feature but its function and archaeological significance is not known at the time of

writing. The east end of the thicker wall is located almost exactly fifty feet downstream from the grist mill, the position where Thomas Fox stated he was building the new mill in c1800.[28]

The floors are of joisted timber construction and retain most of the original beams and joists, although the floor structure was extensively reinforced in the late 19th century. The modifications included the replacement if the original boards. The spacing of the floor beams alternates between about 9 feet 6 inches in the wide bays and 7 feet 10 inches in the narrow bays (typical measurements). The two-piece beams are scarfe-jointed in the centre[29] and in the upper floors are still supported by a central row of square timber props with rectangular wooden top pads. The props have a beaded edge moulding and appear to date from c1800. The beams in the ground floor and the east end of the first floor are supported by cast-iron columns of late 19th- or early 20th-century date. The former use of timber props in these areas is indicated by the chamfers on the beams, which stop to either side of the position of the former wooden top pads. Some of the beams in the ground floor are also supported by additional square timber props which are probably not original.

Fig 8. The first floor, showing original timber props and top pads with later reinforcement to beams and joists.

Most of the original beams and joists show evidence of significant warping and all have been reinforced at a later date. The method of strengthening is unusual and may have been carried out when heavier machinery was installed in the mill. The beams have been strengthened with the bolting of long angled square-section timbers to each side, extending from the soffits at the outer ends of the beams to the top edge of the beams in the centre of each span. The ends of the angled side pieces are located in small cast-iron brackets bolted to the beams. The intention seems to have been to create a shallow truss structure to counter the downward warping of the beams. One possible advantage of this technique was that it retained the original headroom in the mill. Contrasting methods of floor strengthening have been noted in textile mills elsewhere, usually coinciding with the installation of new machinery.[30] In many cases, however, beams were strengthened by the addition of a system of trussed iron tension rods beneath the soffits, resulting in a reduction of headroom. The outer ends of the beams at Coldharbour are supported by cast-iron soffit plates fixed into the walls; these appear to part of the modification, since they also support the cast-iron brackets which locate the ends of the angled side pieces. The original joists have been cut-back to give clearance to the side pieces but were not removed. The floorboards are now supported by a second layer of joists which have been inserted above the level of the original beams.

In the two lower storeys, the east end bay is separated by a full-width brick cross wall. This segregates the main entrance in the stair tower from the main production areas and also supported parts of the power transmission system. Access beyond the cross wall is via iron fireproof doors of similar design to those in the stair tower, confirming that part of its function was to serve as a fire break. In the ground floor, the southern half of this bay has a brick-vaulted fireproof ceiling, which was presumably built to contain a process with a high fire risk. The cast-iron beams supporting this ceiling are unlikely to date from c1800, however, suggesting that the ceiling and possibly the cross wall are a later insertion. The power transmission system from the waterwheel is located in the central part of the east end bay and a pier on the west face of the cross wall supported the drive the main line shafts in the mill (see below).

The attic storey was probably added in the late 19th century, in the period when other extensions and the steam-power system were also being added. The raised sections of the end walls take the form of a Dutch gable and are built in a lighter red brick than that used in the ends of the lower storeys. The attic floor is supported by timber beams which have been bolted directly on top of the earlier beams in the third storey ceiling. The roof trusses are of

an unusual design which creates a spacious attic while supporting full-length dormer windows. They are of bolted construction comprising deep principals with a bolted-on collar supporting a short king-post with angled struts. The collars project outwards beyond the principals to support the full-length dormers. The outer ends of the collars are supported by paired queen-posts, which are bolted onto both faces of the principals. The rafters run from the tops of the dormers to the roof apex and are supported on two ranks of purlins on short vertical posts mounted on the principals. Although the design of the trusses is unusual, the method of assembly, and the use of tie-beams bolted directly on top of the original third-storey ceiling beams, indicates that the roof was probably added in the late 19th century.

Fig 9. The attic from the west end.

The fireproof stair tower, attached to the two easternmost bays of the north elevation, appears to have been built in one phase and gives access to the attic, suggesting that it may have been added at the same time. The exterior walls are of similar Flemish-bond red brick to that used in the end walls of the mill. Internally, the east half of the tower comprises flag landings and the west half a half-round staircase of granite steps. The ceilings of the landings comprise two brick vaults supported on cast-iron beams. The beams have parallel-sided flanges which appear to date from after the original period of construction of the mill in c1800. The main entrance to the mill is in the east side of the tower and the landings in the

upper three storeys have taking-in doors in the north side. Access from the tower into the mill is via double-opening hinged cast-iron fire doors. The latter are of an unusual panelled design with delicately-moulded edges which suggest that they may pre-date the construction of the stair tower.

The extensions to the north and south sides of the mill both date from the period when steam power was added in the late 19th century. The twelve-bay combing shed, attached to the full length of the south side, has lightly-built walls of red brick and a timber "north light" roof (see Fig 3, p8). The glazed north lights face east. It was built above the tail race, which still flows beneath the building. The shed was originally lit solely by the north lights, but additional metal-framed windows with concrete lintels were inserted into the walls in the mid-20th century. The eastern half of the shed is narrower and has a stone flag floor. The wider west half has a wooden floor including trap doors, possibly to enable access to water for use in manufacturing processes.[31]

The shed roof has timber principals and ridge pieces with a single rank of purlins attached by iron straps. The north ends of the ridges are hipped, presumably to facilitate drainage into a gutter along the side wall of the mill. The valley gutters are of cast-iron and are supported by unusually heavy paired timber beams. These are in turn supported by longitudinal tie-beams, with cast-iron columns beneath each intersection with a valley gutter. *In situ* line shafting remains attached to the bolting faces of the columns and suspended from hangers beneath the tie-beams (see below). The two halves of the roof show subtle differences of construction, such as in the spacing of the principals, and may be of slightly different date, although it is not clear which half was built first.

Fig 10. The north side extension added to the corner of the stair tower. 1910 engine house in the background.

The north side extension is of two storeys and was originally adjoined the twelve bays from the stair tower to the west end of the mill. Its west end bay was later replaced by part of the 1910 engine house. At the east end, a straight joint indicates that the extension was added to the stair tower, suggesting that the top storey and the attic were built before the extension. The external wall is of coursed rubble, obtained from a different source to that used in the wall of the main mill. Like the combing shed, the north extension also seems to have been built in two phases of similar date. A slight change in the angle of the coursing can be discerned between the fifth and sixth bays from the east end, indicating the presence of a structural joint. Internal, the joint is reflected in differences in the first floor beams. Those to the east of the joint are probably slightly earlier, comprising one-piece beams which have bolted-on side-pieces to support the joists. To the west of the joint, paired beams are used which are bolted to central metal flitch plates.

The north elevation is lit by alternating wide and narrow windows. The narrow windows appear to have been inserted sometime after both phases of the extension were completed. A lighter brick is used in their segmental heads and the stonework in the jambs shows evidence of having been cut and re-set. The wider windows match the positions of the windows in the

alternate bays of the main mill. Slight differences in the stonework of the upper storey of the extension suggest that it too may be a later addition. The coursing is consistently narrower than that of the ground floor and the stone has chiseled tool marks which are absent in the ground floor. Internally the upper floor is open to the two-bay north-light roof which is of similar timber construction to the roof of the combing shed.

The water-power system (see Drawing 3 / 4)

The waterwheel attached to the east end of the main mill is in the same position as that marked on the mid-19th century maps, and it is possible that the wheel pit and parts of the wheel itself are the remnants of the new wheel which was recorded in the Stock Book of 1822. An earlier wheel may have been located slightly to the south of the extant wheel. Structural evidence suggests that the wheelhouse was a later addition and that it was later raised to its present height. The map of 1834 seems to show the wheel exposed to the elements, but the 25" plan of 1887 shows the wheelhouse in the same position. The water-power system is disused but remarkably well-preserved and should be considered of considerable historic significance. The wheel itself is one of a very small number of early suspension wheels still *in situ* in a textile mill; wheels of this type were widely used in larger textile mills in the early to mid-19th century but most were later replaced by turbines or steam plant. The surviving power transmission system, comprising a ring gear and pinion, a gear chamber, main belt drive and line shafting, is a later modification which includes some re-used components. These features are also well-preserved in working condition, however, and are themselves of great historic interest.

A full technical description and survey of the waterwheel together with its associated sluices and other fixtures was made by Martin Watts in reports of 1996 and 2000 (see Bibliography). The following description aims to provide a brief summary of the main features of the wheel, power transmission and related structures. The cast- and wrought-iron breast-shot wheel is 18 feet in diameter by 14 feet wide and fits closely within the dimensions of the wheel pit. It has 48 shaped wrought-iron buckets (C, Drawing 3 / 4). The wheel has been designed to utilise the available head of water of about 14 feet, which has been achieved by deepening the bottom of the wheel pit and the tailrace. The wheel comprises cast-iron shrouds and a centre ring with wrought-iron rods used for the arms and diagonal braces. The naves and the wheel shaft are also of cast-iron. The shrouds and centre

ring comprise eight bolted segments which have cast-on flanges to accept both the T-shaped ends of the wrought-iron rods and the ends of the buckets. The design of the shrouds, centre ring, wrought-iron rods, and the naves, together with the method of assembly, suggests that they probably date from the 1820s. The wrought-iron buckets have a slightly-curved profile which seems to be influenced by the form of wooden buckets which were used up to the 1820s.[32] The wheel shaft is a massive ribbed casting comprising three pieces joined with hexagonal bolts and probably dates from the late 19th century.

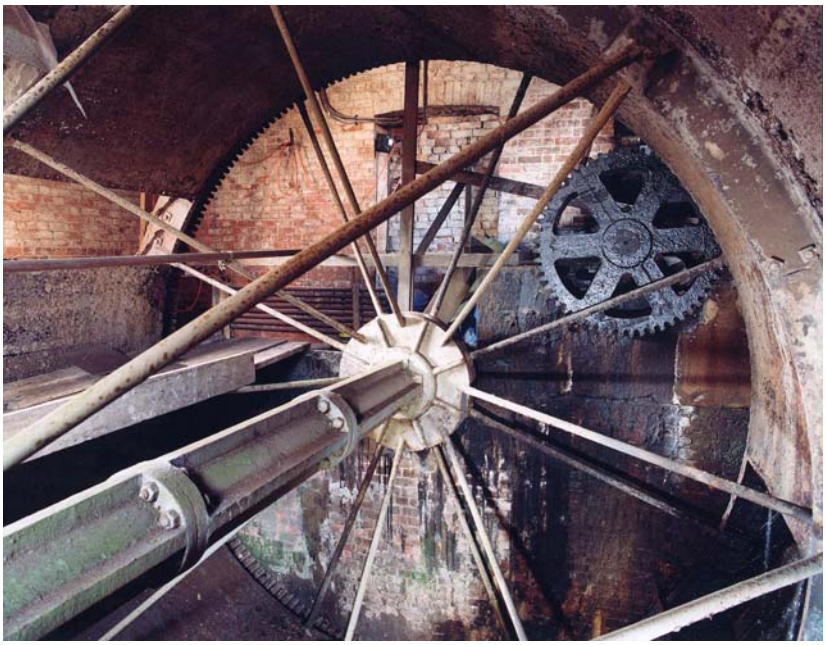

Fig 11. Interior of the waterwheel, showing the ring gear and pinion wheel.

There is tentative evidence that an earlier wheel may have been located slightly to the south of the extant wheel. The end wall of the mill, adjacent to the wheel pit, contains a blocked doorway just to the south of the present wheel shaft. This would be an appropriate location for an earlier wheel shaft, geared directly to shafting in the mill through the open door.

The penstock which controlled the flow of water in to the wheel also appears to be well-preserved, although most of it is inaccessible below the water level in the headrace.[33] It spans the full width of the wheel, comprising a rack-and-pinion sluice mechanism mounted on a heavy timber beam. The mechanism appears to be intact, and was operated from a small lean-to brick building in the angle between the wheel house and the mill. An additional control for the sluice mechanism was located inside the mill. This is also intact, comprising a

system of horizontal shafts which were bevel-geared to the penstock from the ground-floor room adjacent to the south end of the wheel chamber; this room may have been the site of a governor to maintain a constant power output from the wheel. The entrance to the penstock is protected by a curved iron grill in the headrace. A similar grill in this position is shown on the 1834 map.

Fig 12. West shroud of the wheel, showing the rack and pinion mechanism of the penstock.

The *in situ* power transmission system comprises a ring gear with internal teeth bolted to the western shroud of the wheel, with a four-foot diameter pinion wheel taking the drive to a small gear chamber inside the mill. This use of a ring gear and pinion was common to all suspension wheels, but in this case the components of the power transmission are later replacements. The ring gear has been obtained from another wheel and the shroud was modified to accept it.[34] The cast-iron pinion has H-section arms and probably dates from the very late 19th or the early 20th century.

The gear chamber and the belt-drive system probably date from the installation of the 1910 steam engine (see Combined water- and steam-power system, below), although evidence survives of an earlier upright-shaft drive system. The gear chamber is a small room which has been inserted in the centre of the east end bay of the mill between the end wall and the

cross wall (R). The brickwork of the gear chamber appears to post-date the cross wall. It contains a series of massive four-foot and six-foot diameter gear wheels which drive the main line shaft in the ground floor of the mill. The gear wheels increased the rotational speed of the pinion shaft from the wheel chamber and drove a belt-drive system used to power the lower two stories of the mill and the combing shed. The main belt drum, which is over 6 feet in diameter, is mounted on the ground floor line shaft inside the gear chamber; the ceiling of the chamber has been raised above the level of the 1st floor to accommodate the drum and its drive belt. The line shaft is supported on a brick pier which post-dates the brickwork of the adjoining cross-wall. It passes through the cross-wall in an original round-arched opening, however, which seems to part of an earlier power system. The arch is flanked by small blocked openings which probably indicate the position of a former projecting bracket for an upright shaft. The first-floor room above the gearing chamber contains a blocked arch in the cross-wall flanked by similar openings which probably marks the position of a higher upright shaft bracket and the first floor line shaft. This was probably not the original power system, however, since the cross-wall itself appears to be a later insertion.

Fig 13. The wheelhouse from the north east.

The wheelhouse is of Flemish-bond red brick. It comprises two storeys above the wheel chamber itself, with joisted floors supported by pairs of heavy north-south timber beams. Structural evidence confirms the documentary evidence that it has been added to the end wall of the mill. The south side wall abuts the mill wall and the north side wall cuts across a former opening, possibly a window, in the mill wall. The walls in the upper part of the central storey are of a lighter red brick and appear to have been raised or rebuilt at a later date. The top storey has slate-hung walls, which could also be an addition.[35] The wheel chamber contains evidence of an earlier structure pre-dating the wheelhouse. The adjoining end wall of the mill includes an angled cement mark which probably indicates the former position of a pitched roof above the southern half of the wheel pit. At the north end of the wheel chamber, the brickwork of the extant walls is built against the brickwork of an internal plinth, which may also be a remnant of an earlier structure.

Steam-power system (see Drawing 4 / 4)

The structural and mechanical features of the steam-power system at Coldharbour Mill are of similar significance to those of the water-power system. Steam power was added in three principal phases between c1865 and 1910, illustrating the development from beam engines with shaft-drive systems to horizontal engines with rope-drive systems which was typical of large textile mills in this period. Unusually, the final phase of steam power remained in use, in combination with the water-power system, up to the end of the working life of the mill in the 1970s. This has resulted in the exceptional survival of the full range of steam plant and buildings. The mill retains three engine houses, an intact rope drive system, the boiler house with two Lancashire boilers, an economiser house with an *in situ* economiser, an intact late 19th-century chimney and a horizontal cross-compound engine in working order.

Phase 1. Beam engine house, boiler house and shaft drive system, c1865.

The original steam-power system comprised a detached beam engine house built parallel to the west end wall with a boiler house attached to its north end (F and G, Drawing 4 / 4). All the buildings of the steam-power system were built in red brick. Most of the original boiler house was later replaced when it was extended to the west and the north and given a slightly higher roof. The original south side wall has been retained, however, and is contemporary with the brickwork of the engine house. The former west end of the boiler house is indicated

by a straight joint in the south side. During investigation of the site the top of a disused brick flue was discovered immediately to the west of the straight joint. This was probably the external flue of the original boiler house. Its position suggests that it was associated with a former chimney located slightly to the east of the extant chimney, although no chimney is marked in this position on the 1887 25" plan. The original east end of the boiler house was replaced by the 1910 engine house. The 1887 25" plan and the c1900 illustration of the site indicate that the boiler house formerly extended up to the west end wall of the mill. The roof was also later replaced. Some of the sawn-off ends of the original tie-beams and principals protrude from the south side wall below the eaves of the extant roof.

Fig 14. The west end of the site, showing (L – R) the economiser, boiler house, chimney, beam-engine house, rope race and beam-engine house extension.

The tall and narrow proportions of the engine house indicate that it was built to contain a beam engine. The gabled timber roof has been retained, along with large round-headed sash windows in the north end and the west side. The original door seems to have been in the north end of the east side. The engine house now contains a recently-installed beam engine which may be of broadly-similar type to the original engine, although evidence of the former engine beds is not accessible. The side walls, however, retain large ashlar blocks indicating the positions of the former engine's flywheel and entablature. These suggest that the engine was partly house-built, being attached only to the east side of the engine house.

There is no clear mechanical evidence of the nature of the power transmission system associated with the c1865 engine. Any fittings were probably removed when the later rope-drive system was installed. A large blocked opening at ground level in the east side of the engine house indicates that the output shaft of the engine was probably in-line with the centre of the mill. The c1900 illustration of the site shows a full-height vertical structure attached to the west end of the mill in this position, which was probably an upright-shaft tower. Upright-shaft power transmissions were the type most commonly used in large textile mills until rope drives were introduced in the last quarter of the 19th century. The support brackets, shaft boxes and footstep bearing of the upright shaft have all been removed, however, although the upright-shaft tower itself may have been adapted to form part of the extant rope race (see below).

Phase 2. Extensions to beam-engine house, new chimney and economiser, c1890s.

The beam-engine house was later doubled in length by the addition of a full-height extension to its south end (Fig 14). The brickwork of the extension probably dates from the 1890s. The extant chimney was probably contemporary with the engine house extension. It is a typical free-standing octagonal design for the 1890s, built in brick and well-preserved with its original corbelled top. The 1904 25" plan and the c1900 illustration indicate that the chimney pre-dated the construction of the 1910 engine house, and physical evidence suggests that the flue of the 1865 boiler house was connected to another chimney which does not survive. The extant economiser house may also have originated in this period (J). A building of similar proportions is marked on the 1904 map, and it was later stated that the economiser at Coldharbour Mill dated from c1890 and was replaced in 1931-2.[36]

These developments indicate an increased use of steam power at the site, but no documentary evidence has been found of the size or type of engine which was installed. The extension is generally well-preserved, including the original roof and round-headed window in the south end, but the engine beds do not survive. The south end of the original engine house was removed when the extension was added to create a single long building. This suggests that either a separate engine was installed in the extension and coupled to the original engine, or that the original engine was removed and replaced by a single much larger engine. The proportions of the extended engine house suggest that it may have contained a horizontal tandem engine.

Phase 3. Horizontal engine house, extensions to boiler house, 1910.

The final major alteration to the steam-power system was the addition in 1910 of a horizontal cross-compound engine and rope-drive system to replace the beam engine and upright shaft drive. The engine house and its 320 hp engine, by Pollit and Wigzell, have been preserved in working order (Fig 15).[37] The main components of the engine are arranged in a typical layout for the period, although new-built in other regions were often equipped with larger tandem cross-compound engines. The high-pressure cylinder and the governor are on the west side of the engine house and the low-pressure cylinder and condenser on the east side. The engine was positioned so that the central flywheel, which contains the grooves for the drive ropes, was in-line with the west end wall of the mill. As a result both the boiler house and the north side extension of the mill had to be modified when the new engine house was built.

Fig 15. The 1910 engine from the south.

The red brick engine house itself appears to be completely intact. The north end and east side are lit by the original sash-opening windows and the south end is open to the rope race. The internal walls are of glazed white brick. The pitched wooden roof is supported by steel trellis

beams. The rope race is a sloping wooden structure attached to the west end of the mill, the south end of which is a separately-framed structure which may be the remains of the former upright shaft tower (K). The rope race still contains the rope pulleys attached to the ends of the line shafts on each floor of the mill, although most of the ropes have been removed. The shaft boxes supporting the pulleys appear to have been inserted when the rope race was built, and probably replaced the earlier supports for the upright shaft drive. In 1962 a system of 13 ropes was in use to drive all four storeys of the mill, the combing shed and an overhead line shaft passing from the engine house to the boiler house.[38] The latter drove the water feed pump for the boilers and the cleaning mechanism for the water tubes of the economiser, both of which remain *in situ*. The combing shed was driven from a second rope pulley on the mill's ground-floor line shaft. This remains *in situ* in a boxed-in rope race built into the west-end bay of the mill, with a drive rope running southwards to a pulley on the combing sheds main line shaft.

The addition of the 1910 engine house also resulted in a series of alterations to the adjoining boiler house. The extension to the west end of the boiler house, indicated by the straight joint in the south side, was probably made when the new engine house replaced the original east end. This intruded into the floorspace of the boiler house, and may have necessitated the re-siting of one or more boilers further to the west. A disused late 19th-century boiler has been preserved *in situ* along the south side of the boiler house.[39] Its west end is located beyond the original west end of the boiler house, however, indicating that this boiler position could only have been used after the boiler house was extended. The door which now gives access from the boiler house to the beam engine house appears to be a later insertion, and was probably added after this boiler was re-located.

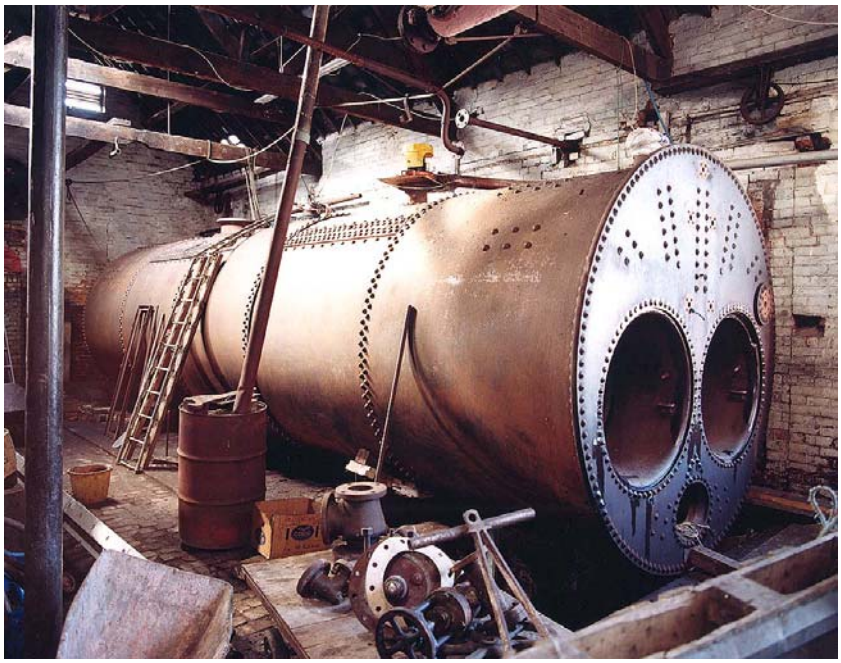

Fig 16. A Lancashire boiler undergoing maintenance in the north side of the boiler house.

The double-span timber roof of the boiler house may also date from this period. The c1900 illustration shows two unequal roof spans covering the boiler house, that to the south being lower (see Fig 5, p11). This suggests that the south half of the original c1865 boiler house roof may have been replaced as part of the 1910 alterations, and that the north half may have been replaced earlier. Other documentary evidence suggests that parts of the north side wall of the boiler house have also been rebuilt. The 1912 block plan shows the site in roughly its present configuration, with a small workshop and pump house attached to the north side of the boiler house. The 1904 25" plan shows a larger building on the site of the workshop, however, extending up to the original east end of the boiler house. A closer inspection is needed to identify any physical evidence of rebuilding in the north side of the boiler house.

The combined water- and steam-power system

The combined use of water power and steam power in 19th-century textile mills was not unusual in areas which were suited to the use of both power sources, but very few examples of combined steam and water plant survive. The continued use of a combined power system at Coldharbour into the second half of the 20th century was extremely unusual, and possibly unique for a large textile mill. It has resulted in the intact survival of most parts of the power

system as it was configured following the installation of the 1910 engine. The drive systems from both the waterwheel and the steam engine were connected to the same line shafts in the lower two storeys of the mill and the combing shed. No evidence survives of a clutch mechanism to disconnect the drive from either power source, although museum staff point out that drive belts and ropes could be disconnected and reconnected using crowbars. The system seems to have been designed, however, so that both water and steam power could be used simultaneously.

Water power was transmitted from the gearing chamber via the main belt drum on the ground floor line shaft to a series of further drums and belts running southwards into the combing shed (see T, U, Drawing 3 / 4). The main line shaft in the shed was driven by a belt drum mounted on its east end, which remains in place complete with its drive belt inside a wooden belt race attached to the east end wall. The belt drive from the gearing chamber also powered the first floor of the mill.[40] Water power was also probably used to drive line shafts in both storeys of the north extension. In the lower two storeys of the mill, the beams of the two bays adjoining the east end cross-wall are supported by closely-spaced pairs of cast-iron columns supporting horizontal brackets for line shaft bearings. The columns appear to be contemporary with the other columns which were inserted in the ground floor, and were probably used to support the pulleys of a rope- or belt-drive to line shafts in the adjacent rooms of the north extension.

At the west end of the mill, steam power was transmitted via the rope race to the line shafting in all four storeys, and via a smaller rope race in the ground floor to the west end of the main line shaft in the combing shed. It is not clear why rope drive was used to transmit steam power and belt drives for water power. Museum staff claim that the relative proportion of steam and water power transmitted to the line shafts could be judged by observing the amount of slack in the drive ropes and belts.

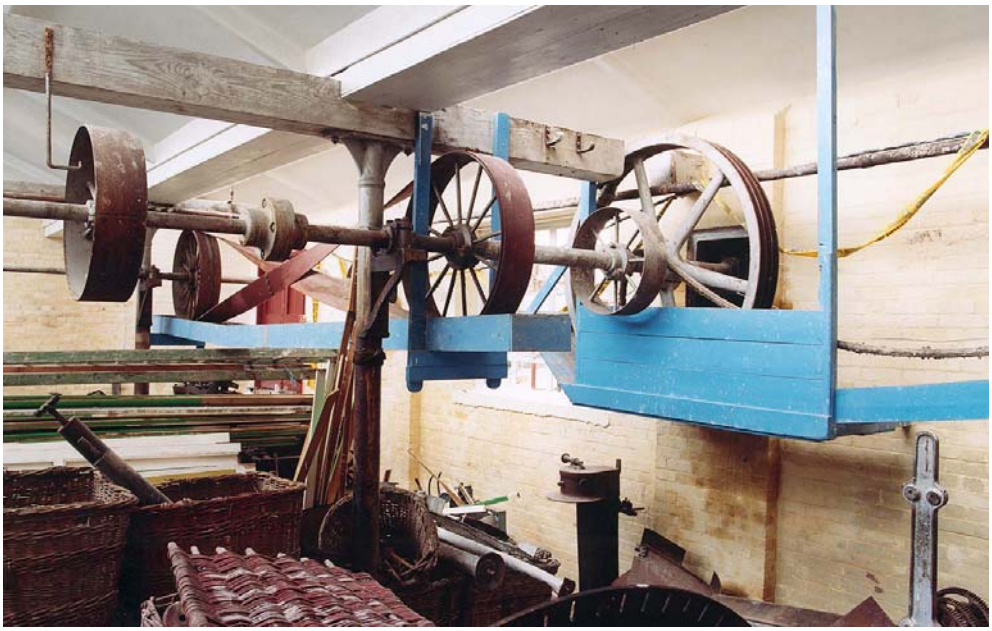

Fig 17. Rope drive system at the west end of the combing shed line shaft.

In the ground floor of the mill only the end sections of the line shafts are still *in situ*, supported by bearing brackets bolted to the columns. Other short sections of line shafting have been inserted later to power machinery used for demonstrations in the museum. The line shafts in the north extension have also been removed. The combing shed retains two intact line shafts, however, supported by brackets bolted to the columns and others suspended from the soffits of the tie-beams. The main shaft supports a belt drive to a shorter shaft near its west end. The drive belt has been twisted to reverse the direction of rotation in the south shaft. Both shafts retain numerous belt drums of different sizes used to power machinery in the shed. The line shafts themselves may be of late 19th-century date, but marks on the shafts and cut-outs in the tie-beams indicate that the belt drums have been moved or replaced. The shed currently contains disused puttee knitting machines; the earlier belt drums may have been used to drive the combing machines which were formerly located in the shed.

Prior to 1910 the combing shed must have been powered by another system, although no evidence of this has been found. Bolting faces on the columns indicate that the shed was intended to contain powered shafting when it was built in c1885. Sections of the tie-beam in the roof have been cut-out to clear the belt and rope pulleys of the c1910 drive system, however, confirming that the present power system is a later alteration.

Textile machinery

It is now extremely rare for an extant early textile mill to retain any textile machinery, but Coldharbour Mill has retained much of the machinery which was still in use when the site was converted into a museum. Some machines are in their original positions while others have been re-sited by museum staff. The machinery ranges in date from the late 19th to the mid-20th century, when the mill was solely used for worsted preparation and spinning. This necessarily brief summary concentrates on the machines which were actually in use when the site ceased to function as a working mill. Additional machinery, some of which is of great historic interest, has been obtained from Tonedale Mills and from other sites in the South West for display in the museum. The *in situ* machinery indicates that the general distribution of processes at Coldharbour Mill was typical of many late-19th century multi-storeyed textile mills. The initial stages are concentrated in the lower levels, with preparation in the Combing Shed and roving[41] in the ground floor of the mill. Spinning was carried out on ring-frame machines located in the upper floors of the main mill, although the ring-frames themselves have been removed.

The Combing Shed retains a variety of disused machines which demonstrate the full range of preparation processes from opening the raw fleece to the production of a slubbing[42] for use on the roving frames in the mill. The machines have been arranged in a linear pattern with the earlier stages in the west end and the later stages in the east end. They are sited to be powered from belt drums on the *in situ* late-19th century line shafts. None of the machines appear to date from the construction of the shed in c1885, however, and additional redundant belt drums on the line shafts probably survive from an earlier machinery layout. Combing was carried out in several stages using gill boxes[43] in combination with other related processes such as cleaning and washing the wool and the removal of short fibres.

Fig 18. Gill box (left) and Noble comber powered by line shafting in the combing shed.

The initial cleaning and combing of the unwashed wool involved eight early 20th century opener gills made by Taylor Wordsworth and Co. The machines are currently stored in the north-west corner of the shed but were formerly powered by the two line shafts in the wider west half of the shed (see drawing 1/4 and 2/4). The wool was then transferred to a large backwasher located in the centre of the shed, in which it was cleaned further by passing it through a series of steam-heated rollers. This was followed by further gill boxes arranged to produce successively finer degrees of combing, after which the slivers of fibre were transferred to a Noble comber. This is a large circular machine in which a system of rotating inner and outer combs is used to separate the shorter fibres which are not wanted in worsted spinning. A final series of gill boxes and related machines in the east end of the shed involves further fine combing and the drawing and doubling of the slivers of fibre to produce the slubbing.

Fig 19. Part of a roving frame in the main mill.

The ground floor of the main mill retains many of the roving machines which were in use up to the mid-20th century. Most are of early 20th century date but one near the west end dates from 1898. The roving was gradually improved as it was passed through a succession of machines starting at the west end of the mill. The roving frames are arranged longitudinally, with two rows flanking the central row of columns and two more along each side wall.[44] They were formerly driven by belts from the central line shaft, with secondary line shafts suspended from the beam soffits to drive the outer rows of machines. The *in situ* machines are now driven by electric motors, in some cases with short line shafts which have been installed by museum staff. It is likely that in the late 19th century the whole of the ground floor of the main mill and the north extension was used solely for roving. In the late 1950s, however, a modern auto-levelling gill box and auto-levelling draw box were installed near the west end of the ground floor and other machines were later installed by museum staff near the east end. Some of the roving frames in the ground floor have recently been adapted for use as spinning frames.

Ancillary Buildings

The late 19th-century maps of the site show about ten small ancillary buildings arranged mainly around the yard to the north of the main mill. Only one building has been demolished, which was formerly located to the north of the 1910 engine house. The other structures remain as a rare illustration of the variety of ancillary and service functions which were found at a large textile mill. The largest group of buildings is located along the north-east perimeter of the site and stands partly on the site of an earlier long narrow building shown on the early maps of the site. These buildings are occupied as private housing and have not been inspected internally. They include a narrow range which may be the heavily-modified remains if the building on the early maps. The proportions of this building suggest that it may have originated as a row of factory-workers dwellings, but further research is needed to ascertain its original function. A larger house survives at the east end of the range which may have been built as a late 19th-century manager's house.

Fig 20. The gas retort house.

Gas Retort House (M, Drawing 1 / 4)

Most large mills used gas for lighting from the early 19th century but very little physical evidence survives of the gas-making facilities. The late 19th-century retort house at Coldharbour is another very rare survival. It comprises a small gabled building open to the roof in the north-west corner of the yard. The building is shown on the 25" plan surveyed in 1887, but not on the Tithe Map of 1851. A small circular gas holder was located immediately to the west, but was removed prior to the revision of the 25" plan in 1904. The roof is itself of interest, with lightweight trusses of cast- and wrought-iron and an intact ventilation louvre. Parts of the horizontal cast-iron retorts have been retained at the site.

Stable block and cart shed (L)

A single-storeyed L-shaped building at the west end of the site included accommodation for animals and may have been built as a stable block. It comprises a four-bay front range, which appears to be shown on the 25" plan surveyed in 1887, and a three-bay wing extending westwards from the north end. The rear elevations of both ranges contain double doorways facing a yard.

Another two-storeyed building nearby is also shown on the 1887 map. This has not been inspected internally. Its ground floor is divided into two rooms which were probably originally open to the yard at the front, suggesting that the building may have been a cart shed.

Engineers' workshops (N)

The site retains two separate workshops which formerly contained powered machines for use in the maintenance of machinery and buildings. One is a single-storeyed building with a gabled roof attached to the north side of the boiler house. This is on the site of a longer structure shown on the late 19th-century maps, but probably dates from the alterations to the boiler house of c1910. It contains two rooms with separate entrances. The larger eastern room is still in use as a mechanics workshop. It retains shaft boxes in the end walls which indicate that it formerly contained two line shafts powered by a belt-drive from the line shaft in the boiler house. The western room contains a well-preserved steam-powered Ashworth

water pump. Museum staff claim that this was obtained from Bliss Tweed Mill near Chipping Norton, Oxfordshire, which was also owned by Fox Brothers. It was used to pump water into the stand pipe of the mill's fire-fighting system, located in the stair tower. The pump is shown in this position on the 1912 block plan.

The second workshop is located in the ground floor of the two-storeyed late 19th-century building of four bays to the east of the main gate. The workshop is in the two west bays of the ground floor. It may have been used primarily for buildings maintenance. The other parts of this building may have been used for storage. The ground floor room contains a small Marshall horizontal steam engine of about 5 hp[45] which formerly powered a belt-drive to line shafting suspended from the ceiling; only the bolt holes of the line shaft brackets remain in place. This workshop also retains a lathe and an upright drill, both of which appear to be of 19th century date and were formerly powered by line shafting. It is not known whether the machines are original to the building.

ACKNOWLEDGEMENTS

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NOTES

[1] *Buildings of the South-West Textile Industry*, 1998, unpublished internal report by RCHME / EH.

[2] Allen and Bush, 1981, p39-40.

[3] Information provided by Geoff Slater, Coldharbour Mill Trust (ongoing research).

[4] Advertisements in the Exeter Flying Post, 4th December 1788 and the Sherborne Mercury, 22nd February 1790. Transcriptions courtesy of Martin Watts.

[5] Allen and Bush , ibid. The Land Tax Assessment, Devon Records Office, lists Fox at Coldharbour from 1798. Information on the probable use of the building as a gig mill provided by Geoff Slater, Coldharbour Mill Trust.

[6] Letter from Thomas Fox to Henry Leake, 15th April, 1799. Transcription from the Hoskins papers at the Devon and Exeter Institution, Exeter, courtesy Geoff Slater.

[7] Letter from Thomas Fox to Henry Leake, 7th March 1799, op cit.

[8] The leat and waterwheel arrangement at Coldharbour was very similar to that of the c1801-3 Tonedale Mill, which was later extended to be powered from the single central wheel chamber.

[9] Letter from Thomas Fox to Henry Leake, 15th April 1799, op cit.

[10] Fox, Joseph Hoyland, p54-5.

[11] Eg: Piccadilly Mill, Manchester, c1790; Dunkirk Mills, Nailsworth, Gloucestershire, c1798.

[12] The Stock Books were obtained by museum staff during a recent clearance of Tonedale Mills and are now held at Coldharbour Mill Museum.

[13] Other information obtained by staff at the museum suggests that a new waterwheel may also have been installed in c1816 but was replaced by the 1822 wheel.

[14] Reported in the Taunton Courier, 21st August 1821. See also NMRC buildings report, NBR 90889.

[15] *Brown & Davy vs Fox Brothers, Plaintiffs Map,* in documents relating to 1834 Arbitation, DRO: 74B / ME98.

[16] Engine date obtained from *Coldharbour Mill, A General History*, Coldharbour Mill Trust.

[17] The chimney may have been attached to a building; otherwise this may be a cartographic error.

[18] The framed poster was photographed in the offices of Tonedale Mills; it includes illustrations of other Fox Brothers mills showing structures dating from c1920.

[19] Watkins Collection, record 1114.

[20] Fox, F.H., p11.

[21] Fox, Joseph Hoyland, op.cit.; Fox Brothers Stock Books, Coldharbour Mill Trust.

[22] Fox, F.H., p7.

[23] Watkins Collection, op cit.

[24] *Brown & Davy vs Fox Brothers, Plaintiffs Map,* 1834, op cit.

[25] Watkins Collection, op cit.

[26] *Brown & Davy vs Fox Brothers, Plaintiffs Map,* 1834, op cit.

[27] Letter from Thomas Fox to Henry Leake, 15th April 1799, op cit.

[28] Ibid.

[29] It was not possible to determine the exact nature of the joints in the original beams. A single large dovetail is visible in some of the soffits.

[30] Examples of structural alterations include Brunswick Mill, c1839, (NBR 53304) and Sedgwick Mill, c1818, (NBR 53296), Manchester. At John Boyd's Horsehair Factory, Castle Cary, Somerset, a late 19th century weaving shed was added with trussed beams as an original feature (NBR 106473).

[31] Information from Jill Taylor of the Coldharbour Mill Trust.

[32] Information from Martin Watts.

[33] Described in the reports by Martin Watts.

[34] Watts, 1996, p6.

[35] Not inspected internally.

[36] Fox, F.H., p53.

[37] Watkins Collection, op.cit.

[38] ibid.

[39] The boiler may date from 1885, but according to museum staff is not original to the mill.

[40] Watkins Collection, op.cit.

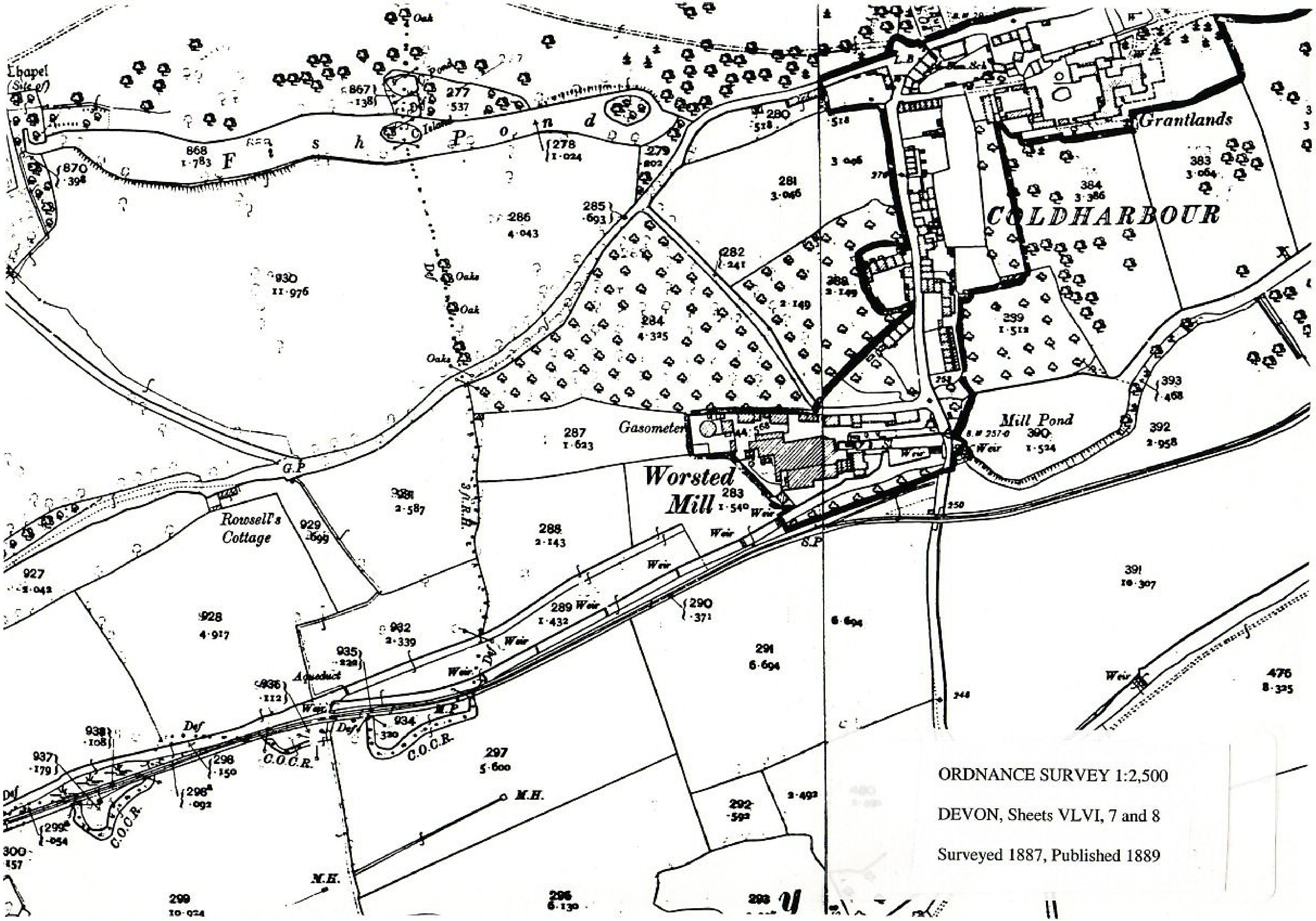
[41] Roving refers to the production of a loosely-twisted cord of fibre which is then transferred to the spinning machines for the production of the yarn.

[42] A slubbing is the continuous sliver of prepared fibre ready to be drawn and twisted on the roving frames.

[43] Gill boxes are the machines used for the combing of worsted wool. They are similar in appearance and operation to the cylindrical carding engines used for other types of fibre.

[44] According to museum staff the roving frames were arranged in the "Bradford open draw system".

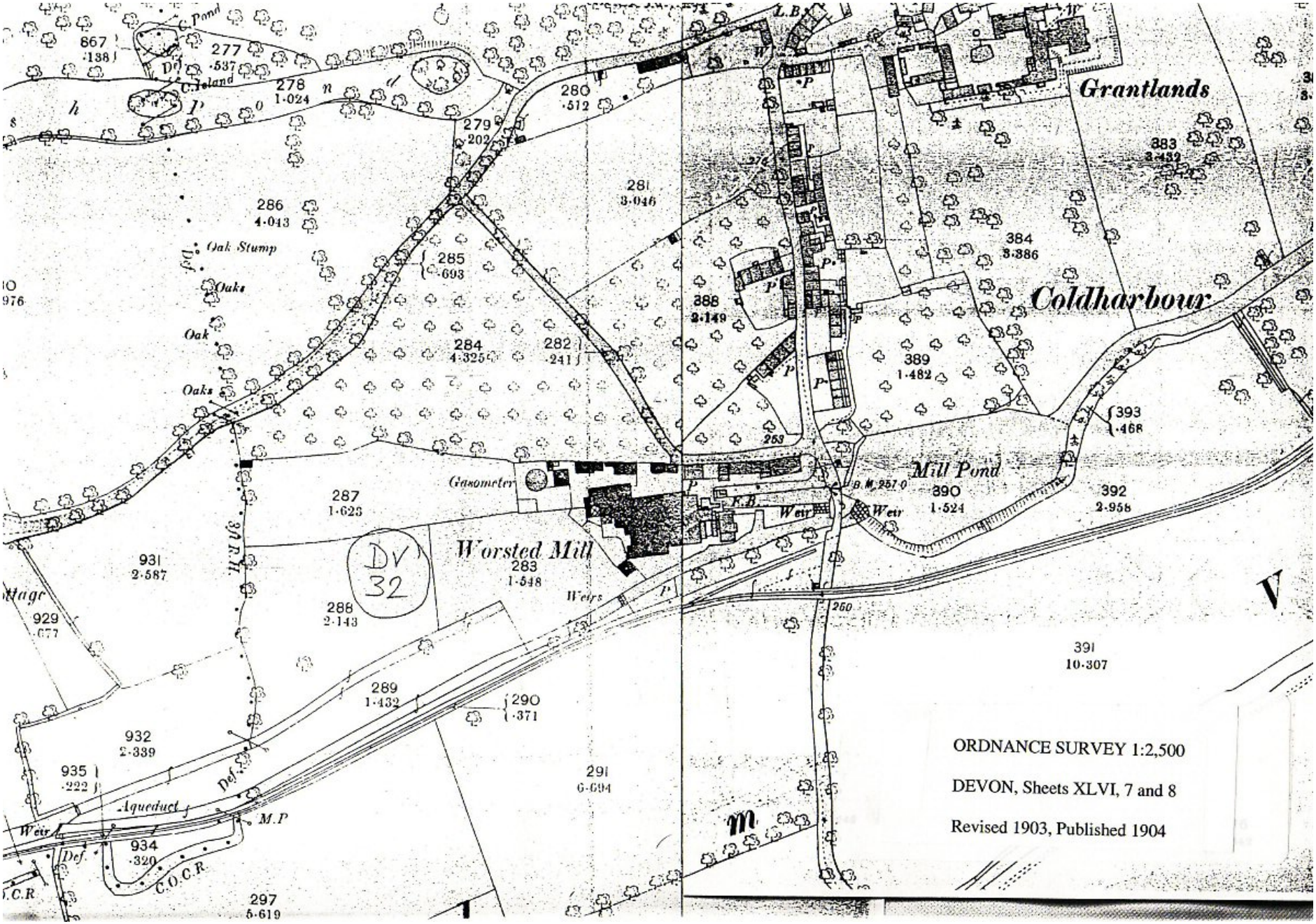
[45] Watkins Collection, op.cit.



ORDNANCE SURVEY 1:2,500

DEVON, Sheets VLVI, 7 and 8

Surveyed 1887, Published 1889


Grantlands
Coldharbour
Mill Pond
Worsted Mill
Gasometer
Weir
Weirs
Aqueduct
Oak Stump
Oaks
Oak
Pond
Island
L.B.
K.B.
M.P
B.M. 257.0
G.W.R.
C.O.C.R
Def.
Dv 32
867 ·138
277 ·537
278 1·024
279 ·202
280 ·512
281 3·046
282 ·241
283 1·548
284 4·325
285 ·693
286 4·043
287 1·623
288 2·143
289 1·432
290 ·371
291 6·694
297 5·619
383 3·432
384 3·386
388 2·149
389 1·482
390 1·524
391 10·307
392 2·958
393 ·468
929 ·677
931 2·587
932 2·339
934 ·320
935 ·222
253
260
ORDNANCE SURVEY 1:2,500
DEVON, Sheets XLVI, 7 and 8
Revised 1903, Published 1904

GATES

N

M

L

I

N

G

H

J

D

B

C

A

HEAD RACE

gate removed

LINE OF FORMER FLUE

F

K

SHED FLOOR AT BASEMENT LEVEL

TAIL RACE

LINE OF SHAFTS

E

BYPASS

PLAN of the GROUND FLOOR
Coldharbour Mill
Uffculme
Devon

Surveyed: May 2001
Print scale: 1:300
Drawing no: 1 of 4
Grid ref: ST 062 122
NBR no: 106895

20 0 100 Feet

4 0 8 16 24 32 Metres

KEY

A Grist Mill
B Main MIII
C Wheel House
D North Extension
E Combing Shed
F Beam Engine House
G Boiler House
H Horizontal Engine House
I Fire Pump
J Economiser
K Rope Race
L Stables
M Gas Retort House
N Workshops

Key

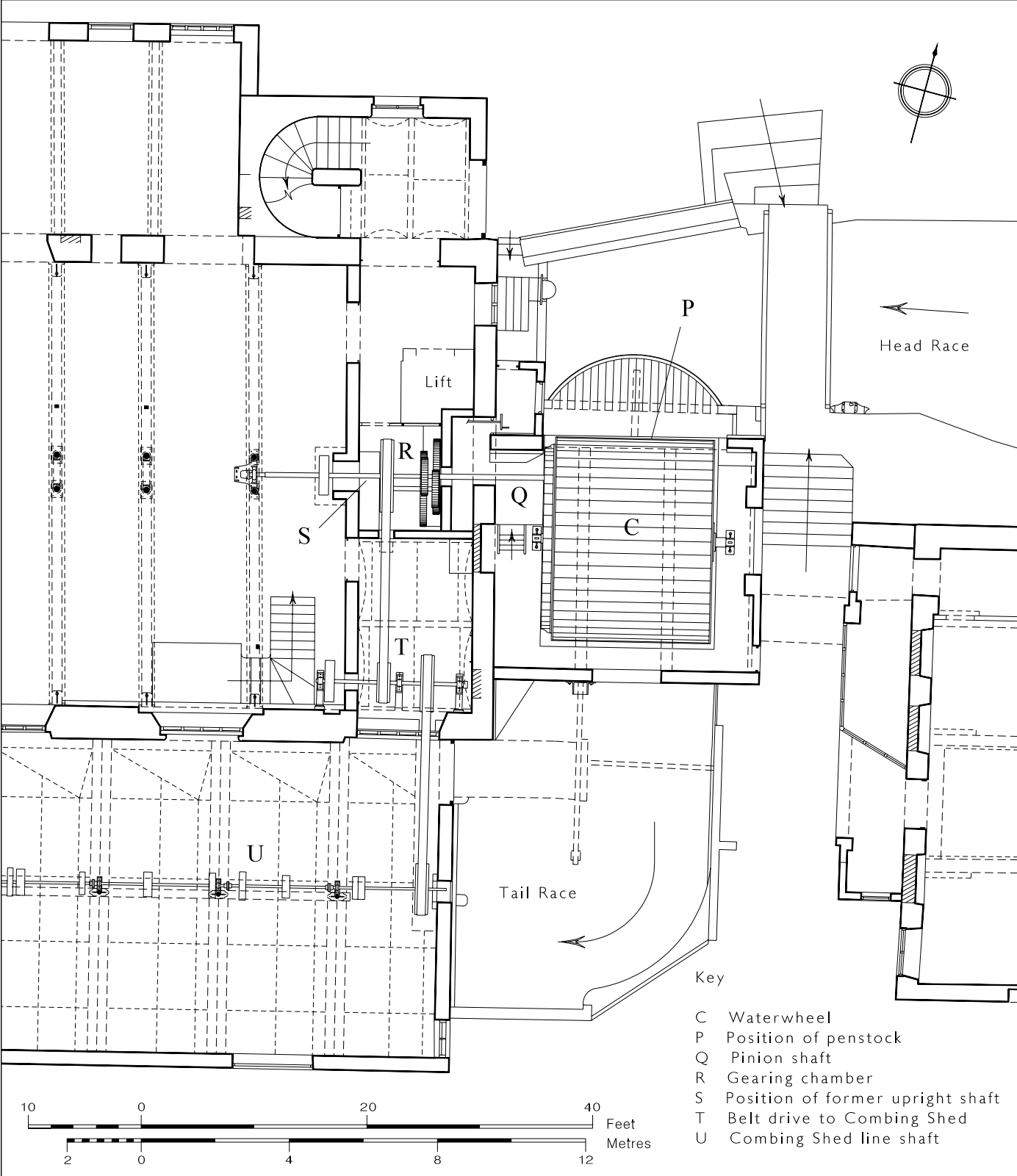
B Main MIII
C Wheel House
D North Extension
E Combing Shed
F Beam Engine House
G Boiler House
H Horizontal Engine House
I Fire Pump
J Economiser, showing water tubes
K Rope Race
N Workshop

N
I
BOILER
FORMER BOILER
G
BOILER
H
J
D
FORMER GLASSHOUSE
gate removed
COLDFRAMES
B
Lift
C
LINE OF FORMER FLUE
K
F
EXTENSION OF BEAM ENGINE HOUSE c.1890
STAIR WELL
THICKER WALL
LINE SHAFTS
E
SLUICE

PLAN of the CENTRAL AREA
Coldharbour Mill
Uffculme
Devon

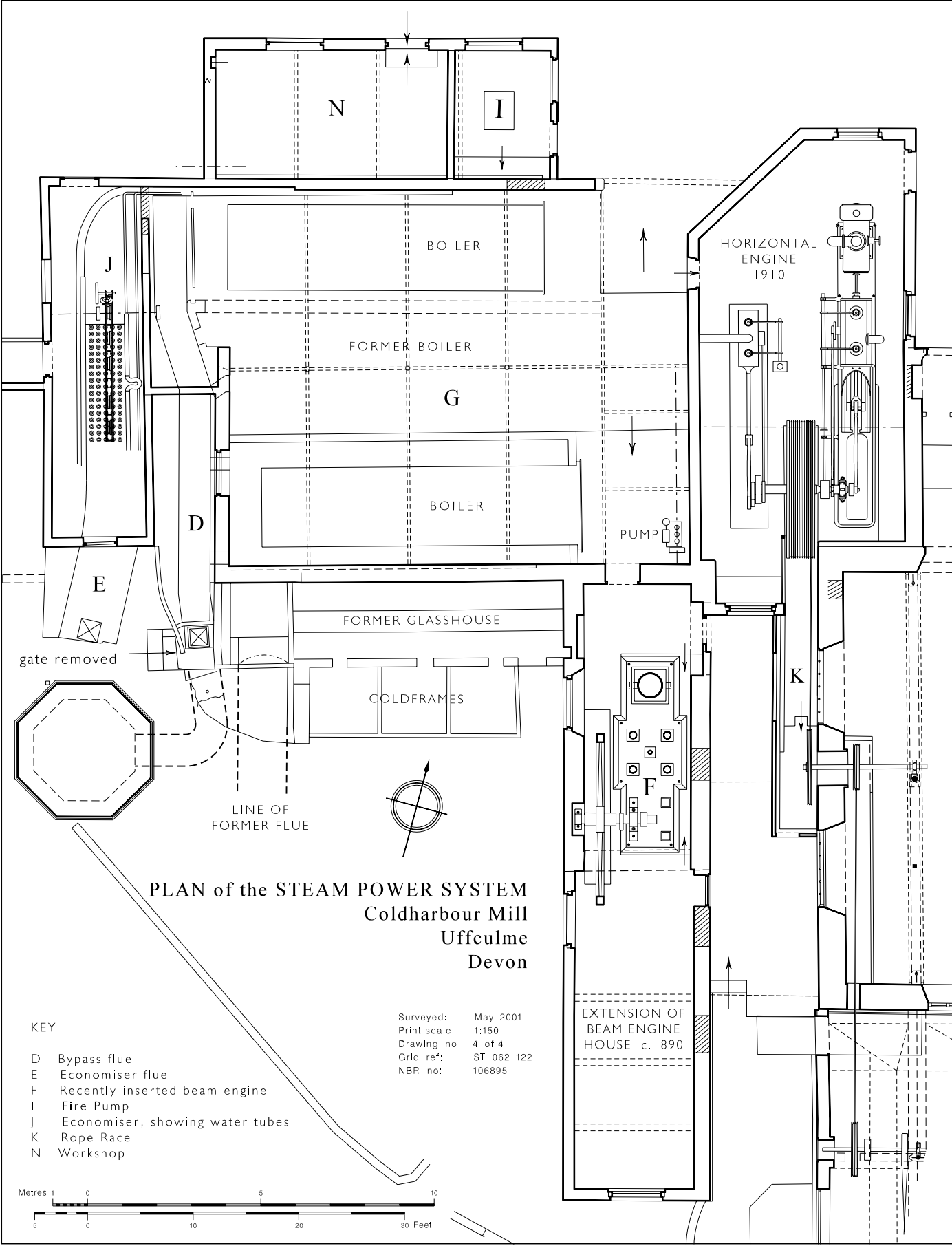
Surveyed: May 2001
Print scale: 1:200
Drawing no: 2 of 4
Grid ref: ST 062 122
NBR no: 106895

10 0 20 40 60 Feet
2 0 10 20 Metres



PLAN of the WATER POWER SYSTEM
Coldharbour Mill
Uffculme
Devon

Surveyed:	May 2001
Print scale:	1:150
Drawing no:	3 of 4
Grid ref:	ST 062 122
NBR no:	106895



PLAN of the STEAM POWER SYSTEM
Coldharbour Mill
Uffculme
Devon

KEY

D Bypass flue
E Economiser flue
F Recently inserted beam engine
I Fire Pump
J Economiser, showing water tubes
K Rope Race
N Workshop

Surveyed: May 2001
Print scale: 1:150
Drawing no: 4 of 4
Grid ref: ST 062 122
NBR no: 106895

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