

Swettenham Mill

A History and Survey

Wind and Water Mills
Number 18

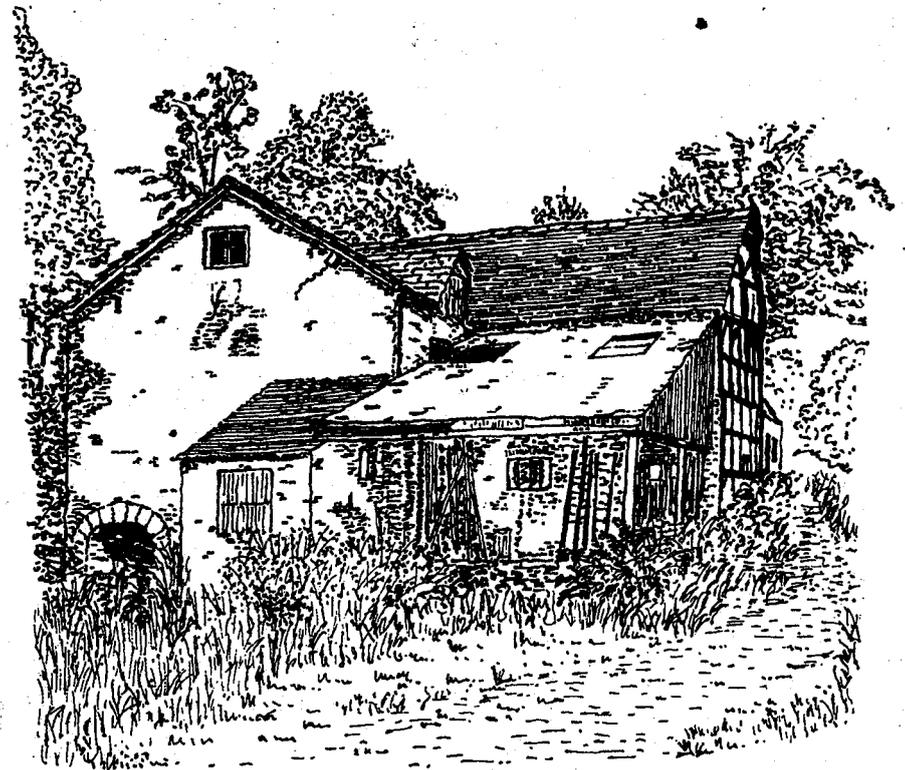
THE MIDLAND WIND AND WATER MILLS GROUP

This Journal is published by the Midland Wind and Water Mills Group, which is concerned with the study of the history and technology of mills and with their preservation and restoration. Its area is the region loosely defined as the Midlands, especially the central counties of Staffordshire, Shropshire, Worcestershire and Warwickshire.

The group holds monthly meetings, with talks and discussions, during the winter, and arranges mill tours and open days during the spring and summer. Members periodically receive a Newsletter and the Journal.

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The Midland Wind and Water Mills Group

Wind and Water Mills is the Journal of the Midland Wind and Water Mills Group and is therefore naturally concerned with the mills of the Midlands, but it is not intended to be narrowly parochial. Interesting and important articles relating to mill matters in other parts of Britain and the world will be included whenever available. In general, articles by members will have priority for publication, but submissions by non-members will be willingly included.

Cover illustration. Swettenham Mill viewed from the west (drawn by Tim Booth).

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SWETTENHAM MILL

A HISTORY AND SURVEY

By Tony Bonson, Tim Booth, & Barry Job

Part 1 - Introduction

The village of Swettenham is situated in South Cheshire some 20 miles south of Manchester. The nearest towns are Congleton, which is about 4 miles to the south east, and Holmes Chapel 3 miles to the west. The watermill at Swettenham (SJ 811673) lies in the delightfully secluded valley of the Swettenham Brook, sometimes known as the Midge Brook, which is a small tributary of the River Dane. The mill, which is a Grade II listed building, is about 1¼ miles east of the confluence of the brook and the River Dane (see Figure 1).

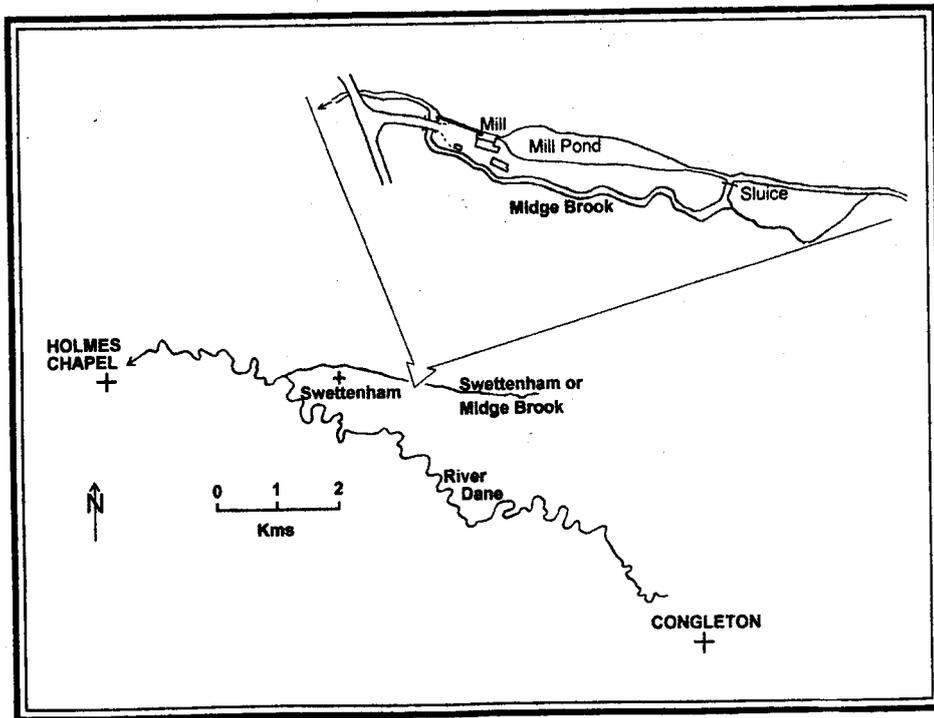


Figure 1. Location Map.

The mill was operational until 1986 when the last miller, Wilf Lancaster, died. Wilf Lancaster was a great raconteur and collector of interesting artefacts. The mill and yard became known for all manner of items of local interest and it was a popular venue in the Spring when crowds of visitors would attend to walk up past the pond to Daffodil Dell, with collected money going to local charities. It is probably for the hosts of daffodils that the mill will best be remembered.

Since 1986 the mill has had a succession of owners culminating in 1997 with a request to Congleton Borough Council for planning permission to convert the mill for residential use. Although the mill is in Cheshire and hence in the area covered by the North West Mills Group, it is only 8 miles from the Staffordshire county boundary and Midland Mills territory. Due to the local proximity of some of its members, the Midland Mills Group made representations about the planning application and attended a site meeting with the then owners and Roy Gregory who was the chairman of the Mills Section of the Society for the Protection of Ancient Buildings (S.P.A.B.) at the time.

It was obvious at the site meeting that the mill was of great interest due to the many uses it had been put to in the 20th century. These represent the ingenuity that an enterprising miller needed in order to survive and provide a living from a watermill after its primary function of flour production was no longer required. However, the building was in a very poor state due to the effect of water ingress and general neglect. The floor and roof beams were rotting and some of the walls near to collapse. The local council's attitude was that house conversion was the only viable plan that would raise sufficient capital to rescue the mill building, a view that Midland Mills Group and S.P.A.B. endorsed provided certain conditions were met.

Immediately after the planning application was approved, in November 1997, the then owners put the mill up for sale at auction, at which time it was purchased by Mr & Mrs Walker, the current owners. Their intention is to proceed with the conversion to a residence, albeit to plans somewhat different from those originally agreed in 1997.

In granting the planning application the Borough Council attached a number of conditions to the approval, one of which was that the mill and its machinery must be surveyed and recorded prior to any work starting on the mill. The Midland Mills Group was given the opportunity to survey the mill on the last day of June 1998, the survey party consisting of David Baddeley, Tony Bonson, Tim Booth, Chris Bradley, Tony Green and Barry Job. Subsequent visits were then found to be necessary to correct the errors and omissions of the first visit. Due to variations in the equipment used, some of the drawings were prepared using metric units and some using imperial units. It is from this survey work that the text and drawings that form this report were produced by Tony Bonson, Tim Booth and Barry Job. A set of the drawings have been deposited in the Cheshire Record Office.

The Midland Wind & Water Mills Group would like to thank the current owners, Mr. & Mrs. Walker, and their agents, Thomas Murphy and Partners, for their cooperation and assistance in allowing the Group to carry out this survey.

Part 2 - The History of Swettenham Mill

Although the mill building and its machinery have survived to the present day there is not much documentary evidence of its history and what there is does not illuminate the major changes that took place at the mill during its lifetime. Certainly what information does exist, especially for its early history, is largely dependent on oral tradition and the evidence provided by the building itself. Details of the mill's later history, in the 20th century, reflects the memories of the last miller's family.

The existing evidence suggests a mill site of considerable antiquity although the mill is not mentioned in the Domesday Survey of 1087. The first reference to be found is in a document of 1345 which mentions a "moliendum de Swetenam". No other detail is given so although the mill was most likely to have been on the current mill site it is also possible that it was sited elsewhere in the parish. If so, the most likely place is about half a mile downstream on the Midge Brook.

The next reference that is often quoted dates from 1629 when Edward de Swettenham or Swetenham died leaving the Hall of Somerford, garden, orchard, water mill, etc. There were two branches of the Swettenham family, one (spelt with two Ts) residing at Swettenham Hall and the other (spelt with one T) residing at Somerford Hall. This difference in surname has been the cause of much confusion, as its significance was not readily recognised, and the spelling with two Ts was often used regardless of which family was being referred to. The above reference probably relates to the latter branch of the family and therefore could refer to Somerford Mill and not that at Swettenham.

Oral tradition claims that the mill was built on its present site in 1675 by Thomas de Swettenham with William Lea as miller. Certainly there is an inscription carved on one of the half timbered beams at the front of the mill that reads "TS 1675", but it is also possible that the mill was built later using a "second hand" beam from another building. Alternatively someone may have added the inscription at a later date. The Lea family history has a tradition of a long family involvement with the mill from its building in 1675 up to the middle of the 19th century but unfortunately there is no record of any Leas in the Swettenham parish register before 1736.

There is another inscribed date on the building, namely "WS 1714". This is on a stone which is positioned low down in the wall between the mill and the pool, opposite the kiln building. Its significance in the history of the mill is not known. Its position is not usual for a commemoration and was perhaps moved to this position during the later rebuilding.

That there was a watermill at Swettenham during the early 18th century is confirmed by two indentures. The first is dated 26th November 1724 between Thomas Swettenham and Thomas Norbury of Lower Withington and states "...will grind all his corn at the mill of the said Thomas Swettenham, in Swettenham or pay 2s-6d for every bushel of corn (Winchester measure) which he shall grind from the said mill, and also, if any extraordinary breach shall happen in the weir or dam at Swettenham Mill pool, shall send sufficient workman with a shovel to assist to help repair the same so many days (not exceeding four) as shall be necessary or pay 3s-4d to the said Thomas Swettenham in lieu thereof". Similarly an indenture of 13th January 1736 between Thomas Swettenham and William Lockett states "...providing a workman with a shovel to repair Swettenham Mill

dam in case of any extraordinary breach therein....all corn to be ground at Swettenham Mill". It is perhaps no coincidence that the Arms of the Swettenham family contains three shovels!

Tradition has it that the mill was rebuilt after a fire in 1765, which is confirmed to some extent by the datestone built into the gable of the mill which is inscribed "Rebuilt by TS 1765". However there is no evidence to determine what type of machinery was fitted at that time or of what was replaced (most of the current machinery dates from sometime in the second half of the 19th century). From the date, it is conjectural that the machinery fitted was the relatively "newfangled" great spur wheel type driving four pairs of stones, similar to the present machinery but made almost entirely out of wood. Perhaps the surviving wooden upright shaft dates from this time. This could have replaced the previous system of each pair of stones being driven by a separate waterwheel. In the stone wall separating the ground floor of the mill from the waterwheel there are two holes that have been bricked up at some time. These are the remains of two shaft holes for two waterwheels that would have driven one pair of stones each. Also on the ground floor, situated in the base of the stone wall that forms the wall of the dam (i.e. the east wall), there is a bricked up arch. The original purpose of this arch is not known, perhaps it was for the original by-wash, or for a very early undershot waterwheel used before the pond was formed. It would need archaeological excavation to find out any more information concerning the original purpose of this arch.

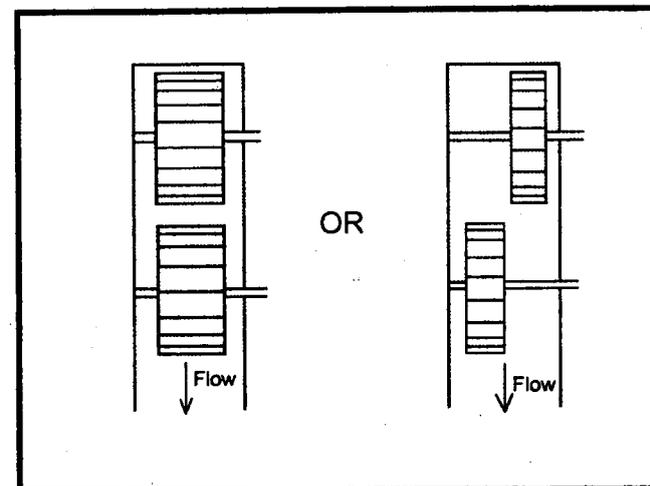


Figure 2. Plan views of the wheelpit showing two possible configuration of waterwheels before the rebuilding in 1765 (assuming the same thickness of dam wall as at present).

Evidence for the layout of the site just before the rebuilding of 1765 is provided by a map of the Swettenham Estate from 1762. This clearly shows the water supply system exactly the same as today with pictograms of the mill and kiln buildings showing that they were in exactly their same positions as today. As for the millers during the 17th and 18th century, there is only the Lea family history to rely on. This claims that the original miller in

1675 was William Lea, followed in 1690 by John & Mary Lea, in 1710 by James & Ann Lea and in 1745 by John & Mary Lea. Unfortunately the Swettenham parish register does not include any Leas prior to 1736 and even then does not record their occupations. Similarly, the Land Tax of 1780 to 1792 lists a John Lea at Swettenham paying 19s-8d per annum but does not give any information as to the nature of the property involved. In fact, the mill is not mentioned as such in the Land Tax returns at all in the period 1780 - 1830.

There is evidence that John Lea left Swettenham in 1792 to go to Bosley, a village a few miles to the East of Congleton, where he was the miller at Bosley Corn Mill. In 1796 he returned to Swettenham with his wife Mary, and his son John and his wife Sarah. It is possible that he went to Bosley to have his own mill and returned to Swettenham when it was possible for him (but more probably his son) to become the miller there. In 1818 William Lea is mentioned as a miller of Swettenham in the parish register together with his wife Anne Lea (née Newton), but almost immediately they moved to Brereton Mill, in the next parish, eventually moving to Lower Peover Mill, which is not far away in Cheshire. After they had moved to Brereton, James (the son of John & Sarah Lea) took over as miller at Swettenham with his wife Catherine. They appear quite regularly in the parish register at the baptisms of their many children. Their long tenancy, of over thirty years, continued in spite of the fact that Swettenham Mill was offered to let in 1829 in the Macclesfield Courier with an advert that stated "To be let for a term, a well accustomed water corn mill and farm in Swettenham." They and their family were enumerated in the 1841 and 1851 censuses and it is interesting that William Newton was listed as a miller and servant to James Lea in 1841.

The Lea family history claims that James & Catherine left Swettenham in 1852 to go to Brereton Mill due to their landowner's insistence that they convert to Roman Catholicism. However, some of the family were still at Swettenham up to 1856 because Henry Lea is mentioned in the parish register as a miller, residing in Swettenham, when he married Sarah Collins in 1854 and at the baptism of their first child in 1855. After 1855 Henry Lea is recorded as being a miller of Brereton.

After the Lea family left Swettenham the miller there is listed in 1857 as Francis Hine but by 1860 it was Arthur Malkin. Arthur Malkin and his wife Hannah came from local Swettenham families and Arthur is listed in the 1861 census as being 26 years old with one house servant, aged 13, one miller's servant, aged 15, and two children. By 1871 this had increased to six children.

In 1873 the parish register records William Newton as a miller of Swettenham with his wife Jane. The Newton family was connected by marriage to the Lea family since 1818 and they operated the mill with their son Theophilus until the mid 1880s, although during this period the Trade Directories listed Dakin & Co as millers under the heading of Swettenham.

By 1888 the mill had been taken over by James Snelson and his son Henry. In the 1891 census James Snelson is listed as a corn dealer living in Kermincham (the next parish) with his son Henry, whereas a Price Englefield is actually living at the mill as the employed miller. In 1893 the Snelsons were paying a rent of £80 per year for the mill. Eventually the historical circle was completed when the Lea family once again provided the miller at Swettenham, in the guise of Herbert James Lea, grandson of James and Catherine, who operated the mill between 1902 and 1916.

At some time during the latter half of the 19th century, the main machinery and waterwheel were replaced with cast iron versions, as were the kiln tiles. Although oral

tradition assigns Jonathon Booth as the millwright probably responsible for this work, there is no indication of a date when it took place.

In 1924, the mill was taken over by Wilf Lancaster after his marriage. It had been purchased from the Swettenham Estate by his uncle just after the end of the First World War. Wilf was born at Tan House Farm, Buglawton, near Congleton, in 1899 and left school at thirteen years of age to work on the farm. By sixteen he was driving steam rollers and traction engines, although he needed a box to stand on to see over the front end (Wilf could never have been described as tall even as an adult!). One of his stories from these early years was about driving a steamer in Buglawton when it ran away down the steep hill there and all he could do was blow the whistle continuously, hang on for dear life and hope for the best. Fortunately, he survived to become the miller at Swettenham until his death in 1986.

By the 1920s it was obvious that there was no future for the small country watermills as just producers of flour for human consumption. They could not compete with the large, efficient, steam (eventually electric) driven roller mills that had been established at the major ports to process imported wheat. Consequently Wilf Lancaster had to diversify in order to make a living from Swettenham Mill. To do this he installed extra line shafting to provide the necessary power to drive ancillary machinery such as a suite of wood saws (a flat bed plank saw, a circular saw and a band saw) with which he was able to make all manner of wooden items such as farm carts, farm machinery, etc. Many of the patterns for this type of work can still be found at the mill today. As an adjunct to these activities he became a wheelwright and also used the mill's waterpower to produce wooden bobbins on a lathe which were sold to the silk mills in places such as Leek.

Shortly after arriving at the mill, Wilf installed a direct current (d.c.) electric generator which he acquired from Jonathon Booth, the Congleton millwright, in exchange for some timber. It has been said that this generator started life as the motor for an anchor winch on a tug working on the Manchester Ship Canal! When coupled to the waterwheel via belting this generator enabled him to provide lighting in his farmhouse and to drive some household appliances. It also opened up another developing market to be exploited, namely that of radio (or the wireless as it was then called). In rural England at this time there was no mains electricity power supply, not even in some of the smaller towns (Congleton received its first mains electricity in 1935), so wireless sets, which were becoming very popular, were powered by batteries (these were quite large and heavy, containing liquid acid). With his d.c. generator, Wilf was able to provide a battery charging service which, in its heyday, serviced the area of South Manchester and East Cheshire.

At about the same time, Wilf purchased a second hand refrigeration plant which he installed between the mill and the pool, again driven by belting off the lineshafts. Without a widespread electricity supply, ice was not readily available. Large houses had used ice houses in the past to store ice taken during the winter from local sources but, by the 1920s, the level of demand resulted in most ice being imported from Scandinavia. The ice produced at Swettenham Mill was sold throughout the same area as the wireless batteries, to hotels and restaurants, even as far afield as Derby. It was while supplying ice and batteries that one of his customers who owned a plant nursery, being unable to pay his account, settled his debt to Wilf by giving him a large quantity of daffodil bulbs. These were planted in the valley by the mill and so started Daffodil Dell which was beloved by many people in South Cheshire and in the Potteries, as a place to visit in the Springtime.

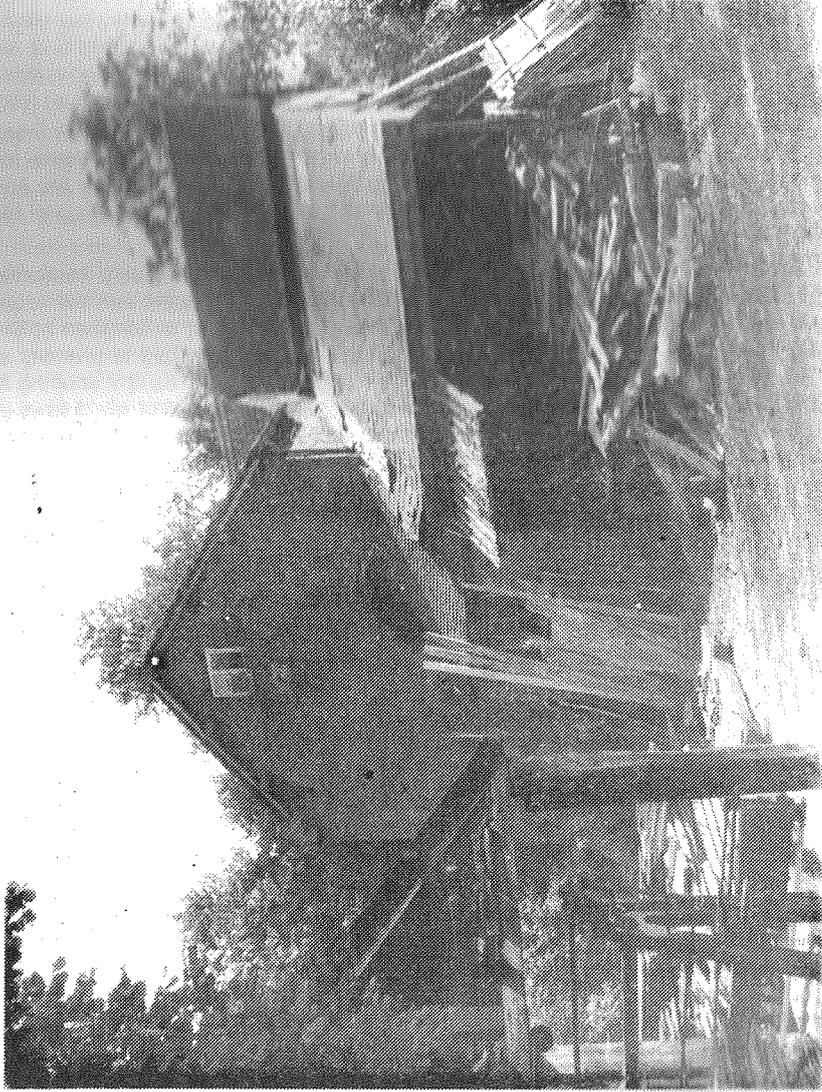


Plate 1. View of the mill in 1979, with the plank saw in the foreground and showing the stock of wood.

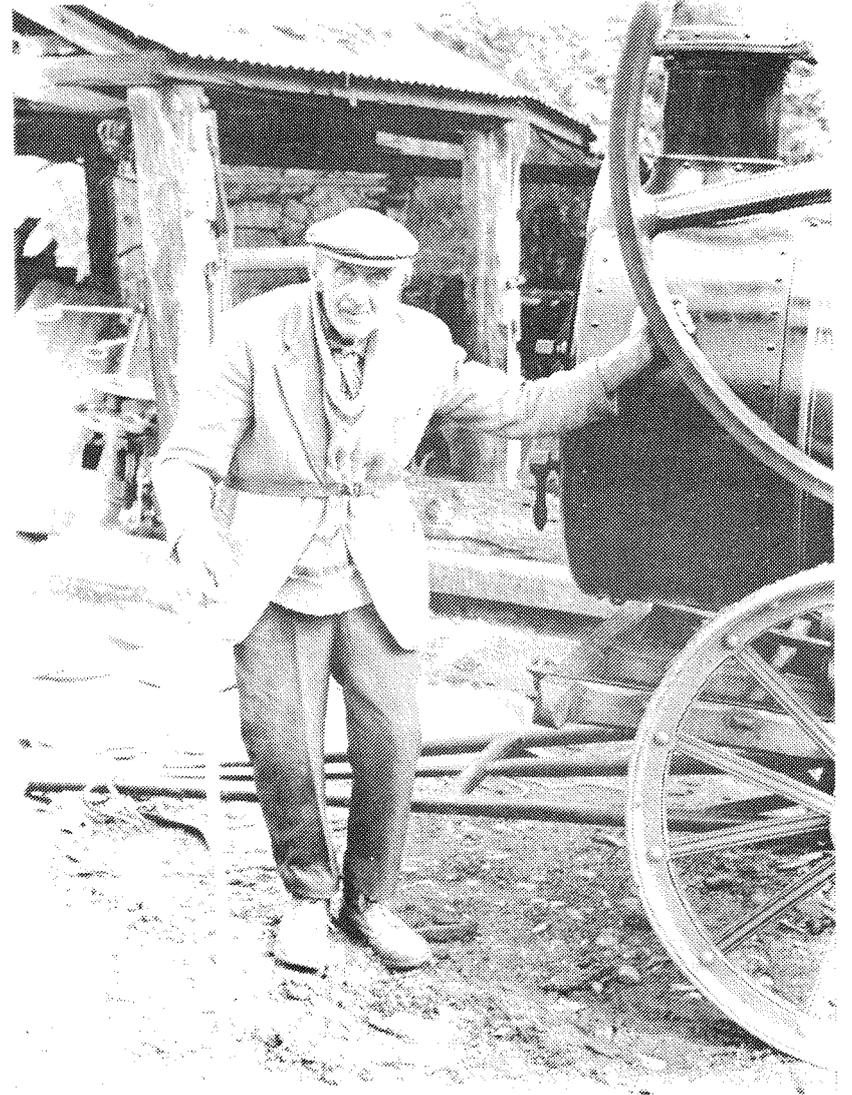


Plate 2. Wilf Lancaster, the last miller, aged 84, at a steam rally held at the mill in 1983.

With his early experience with steam power, a successful set of businesses based on the mill, working as a blacksmith and running a farm, it is not surprising that Wilf had a long line of various steam engines to assist him. At one time the mill was even the base for road making gangs using steam rollers, including one made by Aveling and Wallis. Wilf was a great aficionado of steam wagons, having an Atkinson steam lorry and also one by Foden (he claimed to have been present for the trial run of the first Foden steam lorry). He used an early Wellington steam tractor on the farm and for road transport, as well as having a portable steam engine driving the saw bench at the mill. At one time he had a Robey steam engine but did not keep it long as it was "too hungry".

With the coming of the internal combustion engine, he had an early Titan tractor which he could also belt up to the mill to drive the saws and the ice machine. Later, he was to have an International tractor and a couple of Cox's of which he was particularly fond ("always started first time"). On 20th June 1928 Wilf purchased a brand new semi-diesel engine from Crossley Brothers of Manchester. This was installed to provide a drive capability for the d.c. generator that was independent of the water supply and hence provide a less fluctuating supply of electricity. This seems somewhat out of character as Wilf got most of his equipment second hand or through a barter system.

After the Second World War, it became increasingly difficult to get electrical equipment that would work on a d.c. system and so Wilf installed an alternating current (a.c.) generator (second hand, of course). It is not known where this generator came from but the regulator used in conjunction with it was from a surplus R.A.F. radar system. This worked very well and enabled the farmhouse to switch over to an a.c. supply. Many years later, when the electricity board were installing the mains supply in Swettenham, Wilf claimed he would not have it unless they could supply at less than 1d per day, which is what he estimated it cost in grease to keep the mill working and generating.

At one time, Wilf went to the trouble of installing a small waterwheel in the tailrace of the mill just by the Crossley engine. He intended to use this to drive the a.c. generator via a drive shaft, etc., so that he did not have to run the whole mill just to generate his electricity. Unfortunately he never completed this project.

Eventually, the need for battery charging, ice, and even self-generated electricity subsided and the associated machinery in the mill stopped work and was allowed to slowly decay. However, there was still a market for wooden furniture which Wilf continued to make almost up until his death using the water powered sawing equipment of the mill. In his later years, he used to specialise in furniture such as coffee tables made from yew wood. He even had an arrangement with the Church Commissioners for the first choice of any yew trees that were felled on church lands around Cheshire and North Staffordshire.

After Wilf Lancaster's death in 1986, his son Alf sold the mill to a local businessman who had plans to restore the mill and open a heritage centre. Some work was done on the mill, not very proficiently (according to Alf), but the project came to grief when the local authority, Congleton Borough Council, refused planning permission, insisting that as a listed building dating from the 18th century, it should be restored using 18th century materials only and that any extra buildings for the heritage centre were not in keeping with the mill's setting. After that, the mill passed through various hands with the mill buildings getting more and more derelict. Once the integrity of the roof failed, rain was able to enter the building and eventually the floors rotted and the walls cracked and bulged alarmingly. It was this desperate state that persuaded Congleton Borough Council to finally grant planning permission for the mill to be converted into living accommodation as the only way

of providing the large amount of money needed to save the building. Although there is a legally binding agreement with the owner and his successors to keep and preserve the main milling machinery and the kiln floor, this protection does not cover the ancillary machinery, indeed the saw milling equipment was removed from the mill prior to this agreement being signed and prior to listed building consent. (One condition placed on the planning approval, a full survey of the buildings and machinery, has been met and has led to this publication.)

Sources

Map of the Swettenham Estate, 1762, CRO D/4025/8.

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Acknowledgement

The author would like to thank Alf Lancaster for his invaluable information about the mill and his father Wilf Lancaster, the last miller of Swettenham; and also Mrs. Mary Allcock, a descendent of the Lea family, for information on her family history.

Part 3 - Description of the Exterior of the Buildings

On the south side of the track from the entrance bridge to the mill is a timber shed, originally much longer, latterly used for the sale of flowers and garden produce. To the north of the track is a primitive timber and corrugated iron structure, built to offer some weather protection to the horizontal plank saw, which has recently been removed. Beyond this is the mill itself, no doubt occupying an old site and probably originally rectangular in plan. An early rebuild produced the single bay return to the south to complete the 'L' shaped plan. A much more modern extension to the west offered accommodation for the oatmeal plant and electricity generation. The derelict modern extension to the east was an office containing a fireplace and a wall safe. A completely separate building is the kiln and store, with a privy adjoining its eastern end (see Figure 3). Response to the popularity of the site with visitors may be represented by the wishing well in front of the store to the west but not by the unimproved toilet facilities!

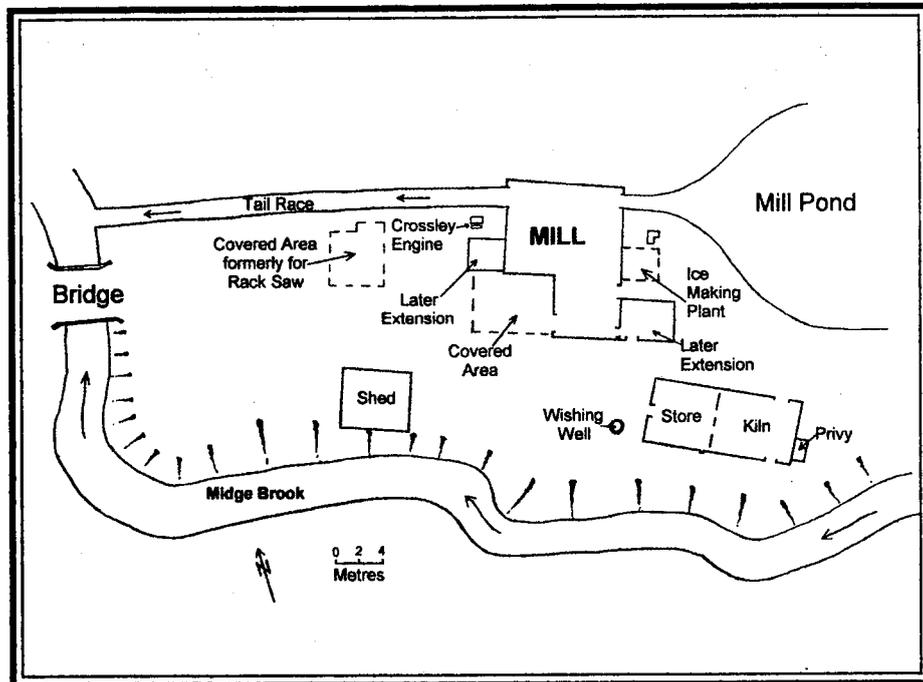


Figure 3. Site Plan.

The mill building has three floors, two stories and an attic, brick built on occasional stone foundations. The original stone flag roof has partly been replaced by machine-made

tiles. Inscribed dates are TS 1675 carved on a first floor beam, WS 1714 on a carved stone tablet set low in the wall and TS 1765 on a carved stone tablet set high in a brick gable. The mill building butts up against the dam so the head race from the pond to the east brought water into the mill at first floor level in a cast iron pentrough. The water wheel is completely enclosed in its own chamber within the building, but access is difficult being via narrow arched openings. The tail race leaves the mill to the west. The building displays a variety of window and door styles, some of which are boarded up making recording difficult or impossible. The mill's ground floor windows are barred on the inside.

The west elevation of the mill (see Figure 4) reveals the attractive stone tailrace arch. However, this was bricked up almost down to water level until after 1971, to help to prevent the waterwheel freezing up in cold weather. Directly alongside is an opening for the belt drive from the Crossley engine. This engine is in a partially dismantled state (although all the removed parts appear to be stored within the mill) and is a VOE 7 pump scavenged two stroke semi-diesel dating from 1928. The drive belt from this engine used to enter the mill via a very crude hole in the west wall. To the side is the relatively modern small brick and tile extension, not bonded into the mill brickwork, currently housing the winnower and the a.c. generator equipment. Above is the inscribed stone recording a rebuild by T.S. in 1765.

On the south side of the building is the extension from the 'L' shape, previously mentioned, which is unusual in that, whilst being mainly in brick, the first floor workshop bay is timber framed with brick infill. This may be a re-use of part of an earlier mill building, to preserve the construction date and character of the mill. This extension provided the main ground floor entrance to the mill via a wide doorway with strap hinges. The area in front of the doorway was partly occupied by a brick floored platform, no doubt used for loading wagons. The preoccupation with producing wooden products resulted in the platform and adjacent area being covered by a sloping roof, with glass roof lights, supported on a timber frame and cast iron columns. This roof was itself partly extended by corrugated iron sheets (now removed). It provided weather protection for the saw bench, plus providing storage space for a considerable quantity of timber when the saws were in use, although this did hinder the access to the doorway (see Plate 1). This roofed area also covers the belt drive from within the mill down to the pulleys for the band saw, circular saws and a.c. generator (see Figure 5). Above, a dormer in the stone-flagged roof of the mill contains a wooden hatch for access to the top of the elevator.

On the south elevation of the extension, the first floor timber framing, carrying the inscription "T S 1675", is clearly seen. The black and white effect has been continued by painting the ground floor brickwork (omitted from the Figure). The timber framing in the upper floor of the extension also shows on the east elevation (see Figure 6), but has been partly cut away to allow the insertion of the purlins for the roof of the much later 'office' extension (shown dotted in the Figure). Access directly into the mill via the office has been created by inserting a doorway. The height of the dam also allows a doorway directly into the first floor of the mill in its eastern wall. Outside the mill to the east are the remains of the compressor, cold tank, warm tank, and ammonia cylinder together with the cooling tubes situated in the head race that comprise the ice-making plant. The drive from the mill to the fast and loose pulleys on the compressor and pump can be clearly seen on the Figure, again this is just a crude hole of approximately the correct shape. As mentioned earlier, the head race water enters at first floor level.

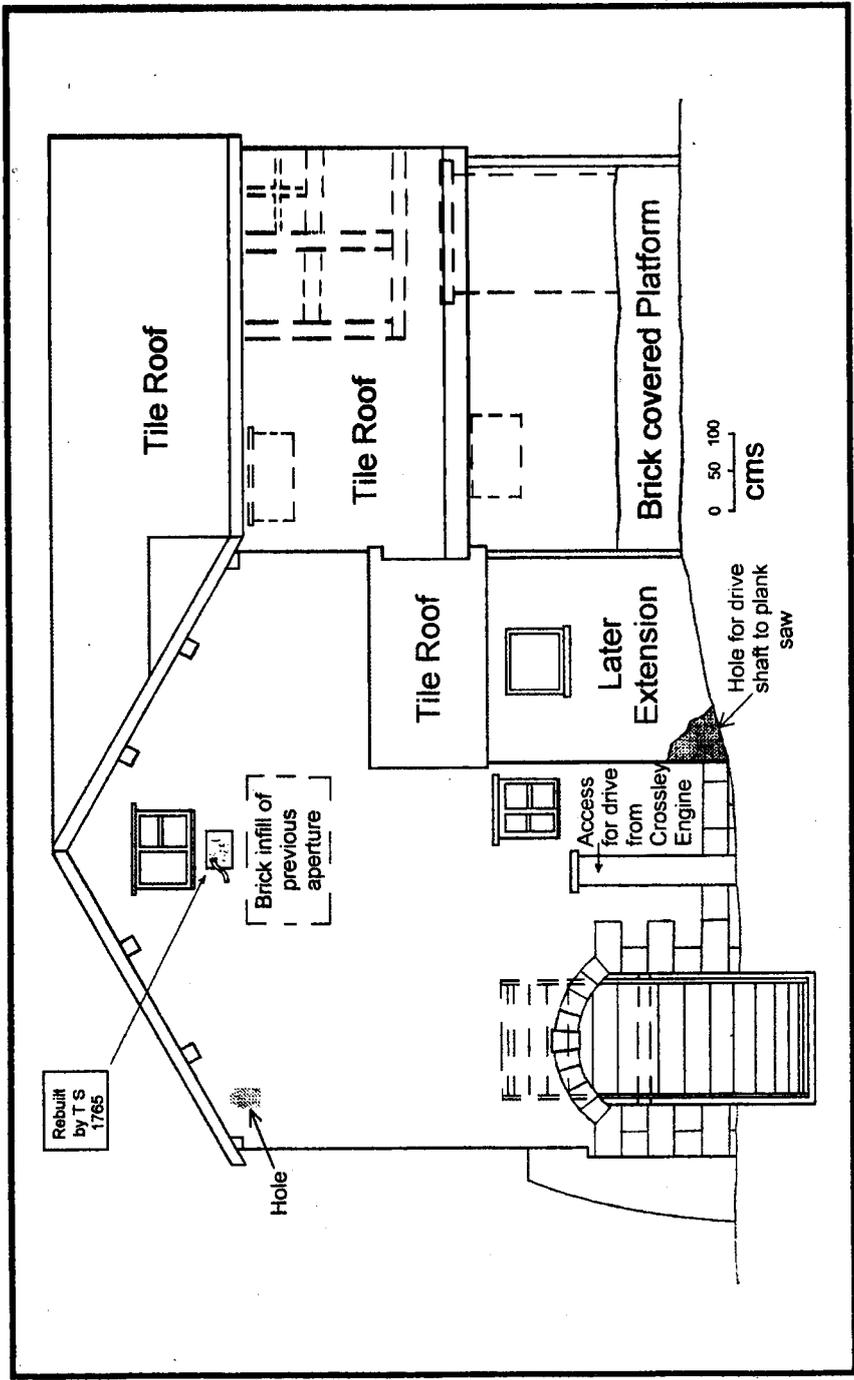


Figure 4. The west elevation of the mill.

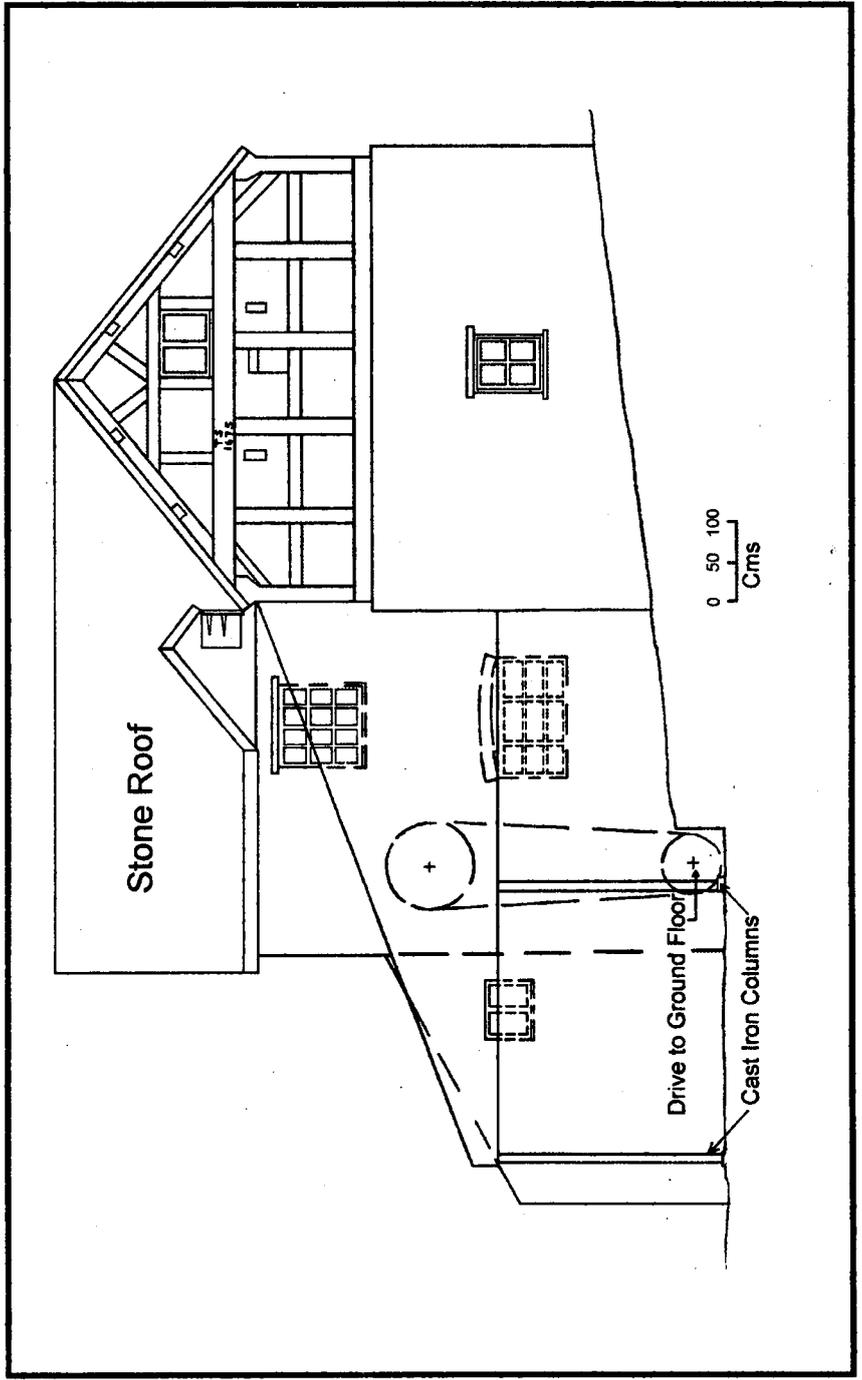


Figure 5. The south elevation of the mill.

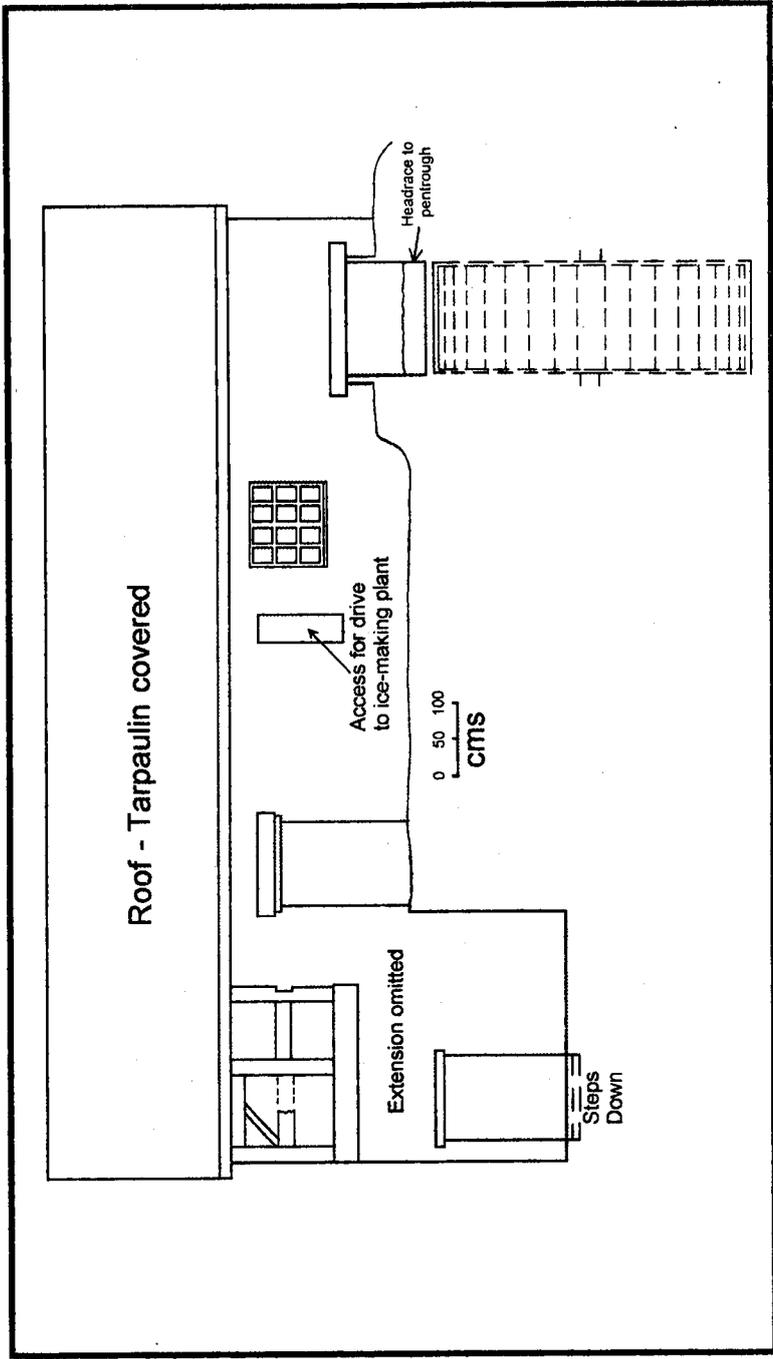


Figure 6. The east elevation of the mill.

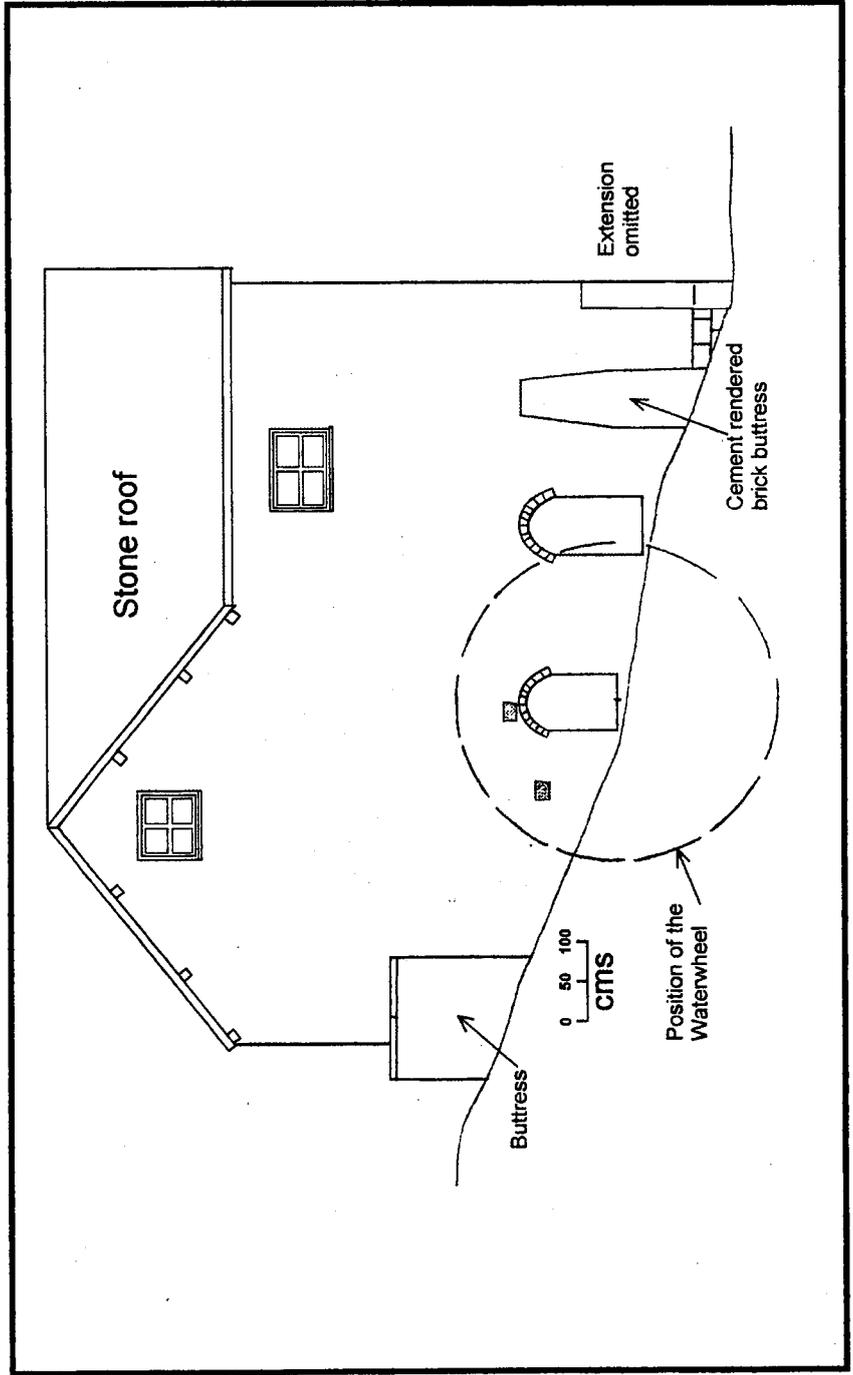


Figure 7. The north elevation of the mill.

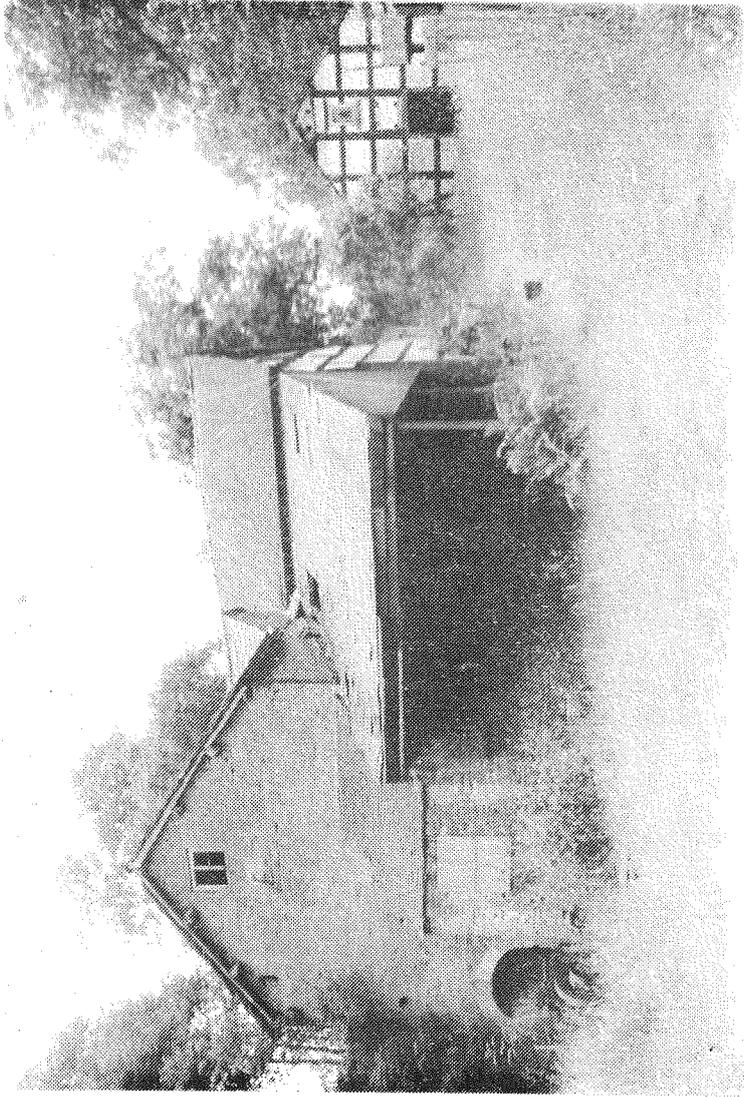


Plate 3. The mill on the left and the kiln/store on the right as seen from the west.

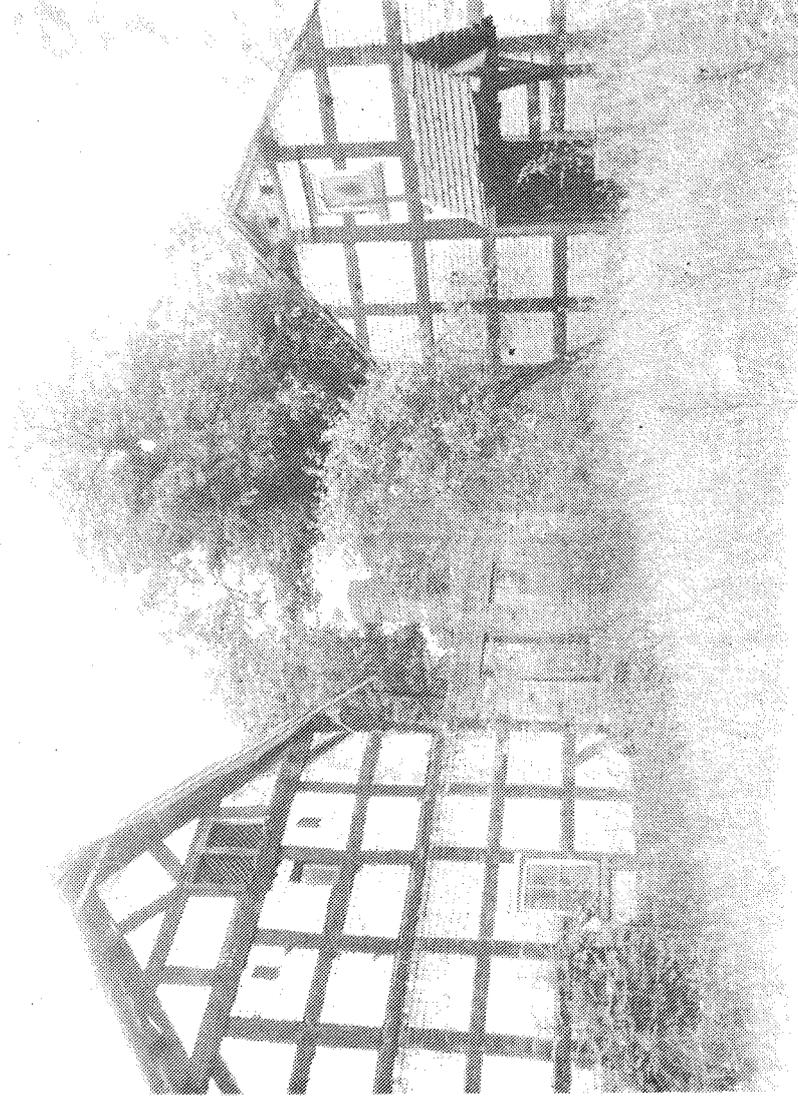


Plate 4. The south wall of the mill showing half-timbering on the first floor and attic. The ground floor and the kiln/store are built of brick and painted.

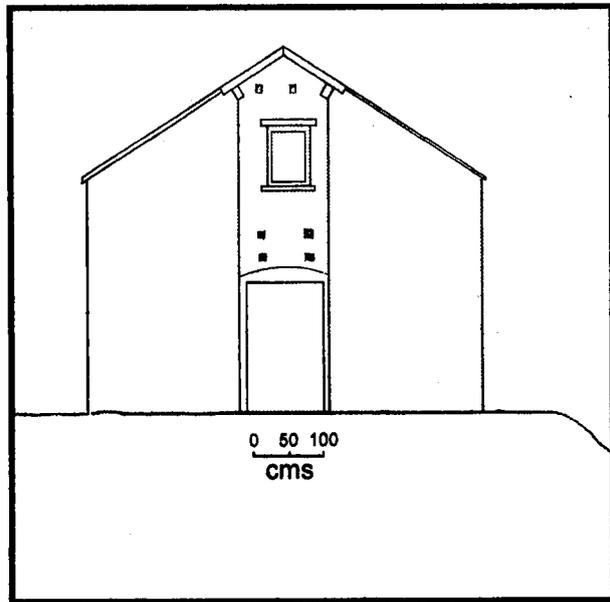


Figure 8. Kiln and Store, west elevation.

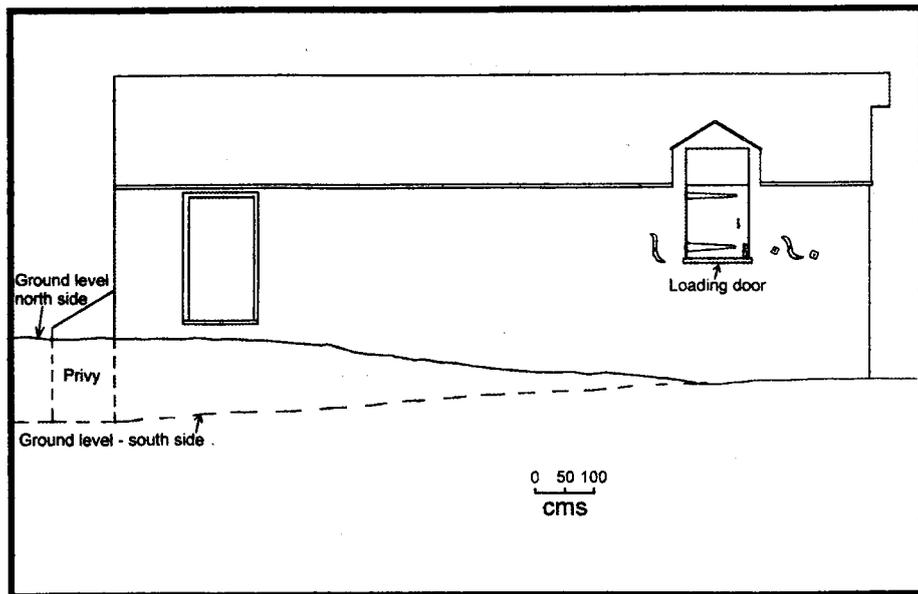


Figure 9. Kiln and Store, north elevation.

The north elevation (see Figure 7) shows the arched openings giving access to the water wheel shaft and shroud. Unusually, the brickwork contains random stone blocks. Attempts to support the bulging brickwork are indicated by the brick buttress.

The west elevation of the kiln and store (see Figure 8) face the approach to the mill. This again emulates the "Cheshire Maggie" look by appearing to be half-timbered (omitted from the Figure), however, this is painted and the building is entirely of brick with a tile roof. This elevation comprises a ground floor entrance doorway with a first floor window above which is actually offset from the centre line. The machine made tiles are supported by a kingpost truss and purlin roof.

The north elevation of the kiln and store (see Figure 9) includes an external loading doorway for each, that for the store having its own attractive gable, although the state of the brickwork is now so poor that opening the door would cause it to collapse. Damp grain would have been brought in by horse and cart, backed up the path, and unloaded into the store through this doorway. The kiln floor was originally made of clay tiles, a few of which remain around the edge, but latterly of cast iron tiles. The grain was spread over the tiles so that the heat from the furnace would reduce its moisture content. Access to the furnace was from the lower level, near the entrance to the privy which is found at east end of the kiln, on the south side of the building.

The water supply for the mill comes from the Midge Brook, or the Swettenham Brook as it is called here. Some 200 yards east of the mill is a small weir on the stream which diverts the flow into a leat which runs towards the mill on the northern side of the valley with the remnants of the stream running parallel but just to the south. After about 150 yards, just before the leat flows into the mill pool, there is a sluice on the southern side of the leat. This is the waste or overflow sluice used to control the flow into the pool. It has two wooden paddles that can be raised or lowered using a hand spike via metal gearing, operated from the wooden bridge that crosses the sluice outfall. The discharged water at this sluice falls away directly into the Swettenham Brook some ten or twelve feet below.

The pool itself is about 50 yards long by about 15 yards wide and there is a spring to the north of the pool, the flow of which enters the pool about two thirds of the distance from the waste sluice to the mill. For maintenance purposes, it is necessary to be able to drain the pool. However this spring causes complications and the pool bottom has had to be contoured such that there is a high point near where the spring enters, falling away towards the mill and towards the waste sluice. When drained, any water entering from the spring will then flow away from the mill towards the sluice and then into the stream. At the moment the pool is drained and overgrown with vegetation. Water, possibly from the spring, appears to be seeping through the high ground to the north of the mill and into the tailrace thus causing the ground under the north wall to be unstable.

Part 4 - Description of the Interior of the Buildings

The Ground Floor

The ground floor of the mill houses the waterwheel with the main gearing, upright shaft and the drive and tentering machinery for four pairs of millstones. The waterwheel is housed in a separate enclosure on the north side of the mill. The outside wall of this enclosure is mainly brick but the inside wall separating the waterwheel from the rest of the mill is constructed of sandstone blocks up to a height of 5ft. 6ins. above the floor, the rest being of brick. Access to the waterwheel is limited to two small arches in the outside wall, one at the shaft bearing and the other one giving access to the rim. Until recently the tailrace arch was bricked up above water level. The main gearing of the mill is situated in a recess in the ground floor about 10ins. deep where the bearings for the inside end of the waterwheel shaft and for the upright shaft are to be found (see Figure 11).

Also to be found on the ground floor are the d.c. generator against the west wall, the elevator alongside the south wall, and the oatmeal winnow and the a.c. generating equipment situated in the small, western extension. The drive shaft to the plank saw used to run from this extension out through the wall to the machinery in the covered area west of the mill (see Figure 3).

Under the lean-to roof by the entrance to the mill, the floor is on two levels; that nearest to the door being paved with brick on a stone base; and that at a lower level with an earth floor which was originally used to house the horse and carts while loading and unloading. On the lower level, running parallel to the small vertical wall between the two levels, is a lineshaft that distributed power to this area. At one time there used to be two circular saws on the lower level and a bandsaw on the bricked area but these machines were removed in 1997 just prior to the planning application being granted (see Figure 11).

The ground floor of the mill building is stone flagged except in the extension housing the a.c. generator which is earthen and about 2ft. below the level of the rest of the ground floor. The eastern wall, against the dam, is constructed from sandstone blocks to a height of 5ft., with brick above. In this wall is to be found the top of an arch some 5ft. wide and 2ft. high at its centre, situated about 13ft. from the wall separating the wheel from the mill. The wall separating the waterwheel from the mill has two holes through the stonework, probably the positions of previous waterwheel shafts, that have been filled in with brickwork. The position of the old shaft hole nearest to the dam wall suggests that this wheel could have been about 8ft. in diameter (i.e. its centre is 4ft. from the dam wall). However, if the dam wall was not as wide as it is now then this waterwheel could have had a larger diameter. Near to this shaft hole, on the inside of the wall, there is a stone that had grooves cut in it by the rotation of a waterwheel (see Figure 10). Unfortunately this stone has been moved at some time, possibly during the rebuilding in 1765, and the grooves are not repeated in adjacent blocks, so it is not possible with such a small sample of grooves to determine the size of wheel that made them. Possibly, during the renovation of the mill, further marked stones maybe found in the waterwheel area that will throw more light on the subject. The second old shaft hole is located about 18ft. from the dam wall. Both these old shaft holes are about 3ft. 4ins. above the ground floor level, over four feet higher than the current waterwheel shaft.

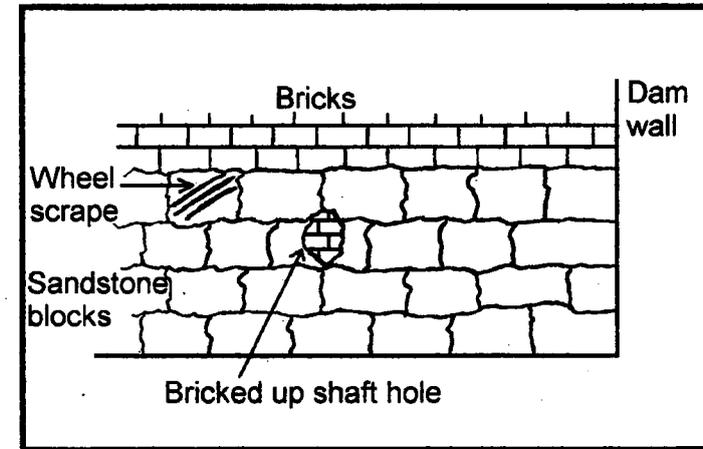


Figure 10. Ground floor wall showing the previous waterwheel shaft hole.

The Stone Floor

The first floor of the mill is the stone floor (see Figure 12). Access to the stone floor used to be possible via a flight of steps from the ground floor but these have been removed as they were in a dangerous condition. Access is, however, still possible by a door in the east wall. In the north-east corner of this floor is the pentrough and in the centre of the floor is the upright shaft and the four pairs of millstones with their furniture. Leading from the upright shaft and crown wheel there is a lineshaft running to the south at head height. On the west wall there are two lineshafts, one at floor level that runs through the wall for power to be taken to the ground floor level, and another at head height (see Figure 26). In the south-west corner of the mill is a pair of millstones, with their furniture, used for oatmeal production and a bean splitting machine and its associated elevator. The wooden floor at this level is in a very dangerous state of decay and the main floor beams for the second floor have considerable rotten sections, however the steps up to the second floor are complete. There is a crude hole in the eastern wall of the stone floor through which the belt drive to the ice machine compressor from the lineshafting used to be routed.

The Garner Floor

The top or garner floor is quite restricted in height as the eaves come down to floor level (see Figure 13). Near the top of the steps from the stone floor is the mechanism of the sack hoist with its hatch nearby (there is also a hatch in the stone floor directly underneath). There are five meal bins inserted into the garner floor. In the south-west part of the mill there is one bin feeding the oatmeal process and one bin feeding the bean splitter. Alongside the bean splitter bin is the top of the elevator which has a spout into the bin (omitted on Figure 12 for clarity) and its drive pulley. There are also two large bins that feed the two pairs of millstones nearest the pentrough. In the centre of the floor is a small bin with a lid which is arranged to feed the easterly of the two pairs of French burr stones.

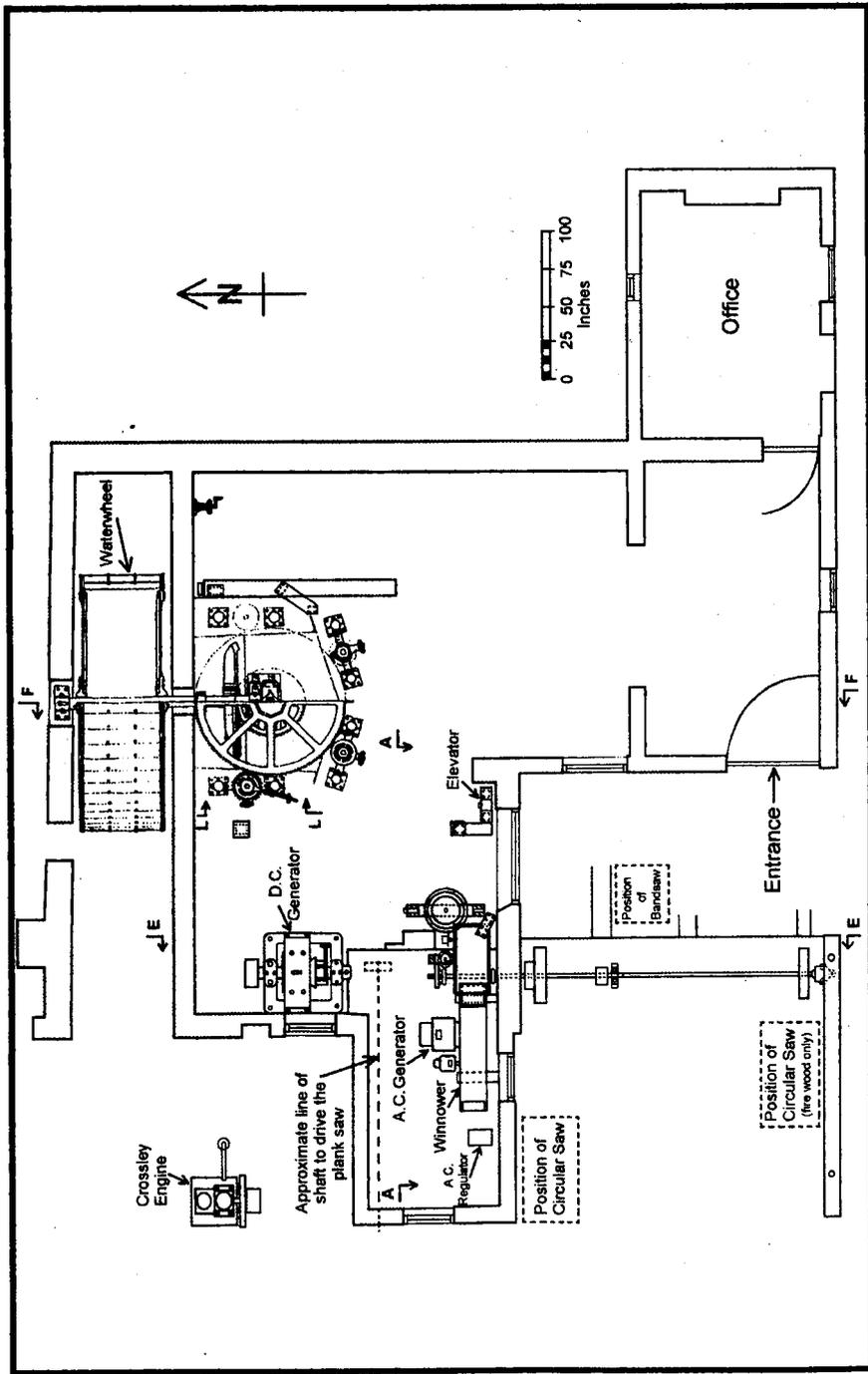


Figure 11. Plan view of the Ground Floor.

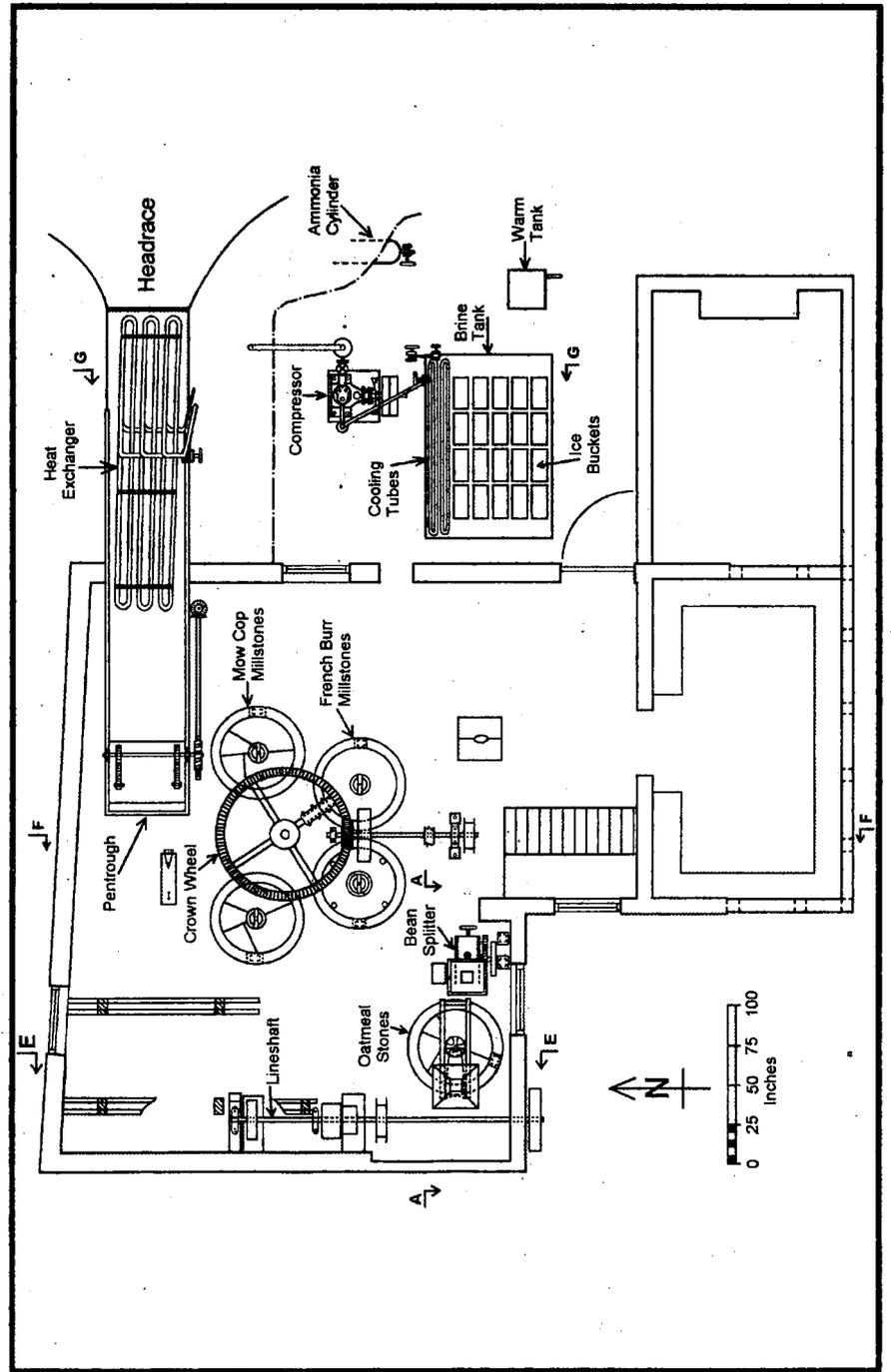


Figure 12. Plan view of the Stone Floor and ice-making equipment.

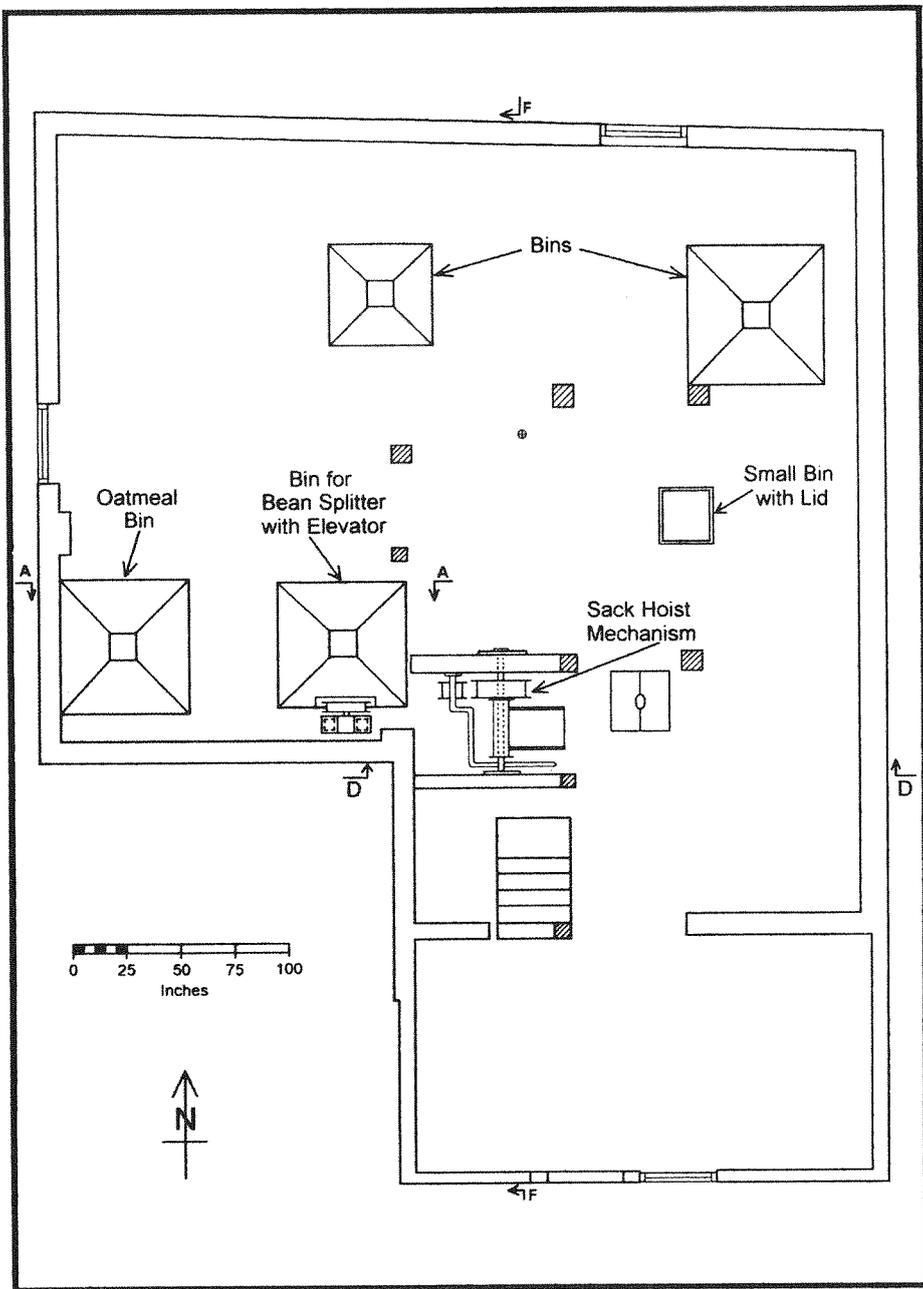


Figure 13. Plan view of the Garner Floor.

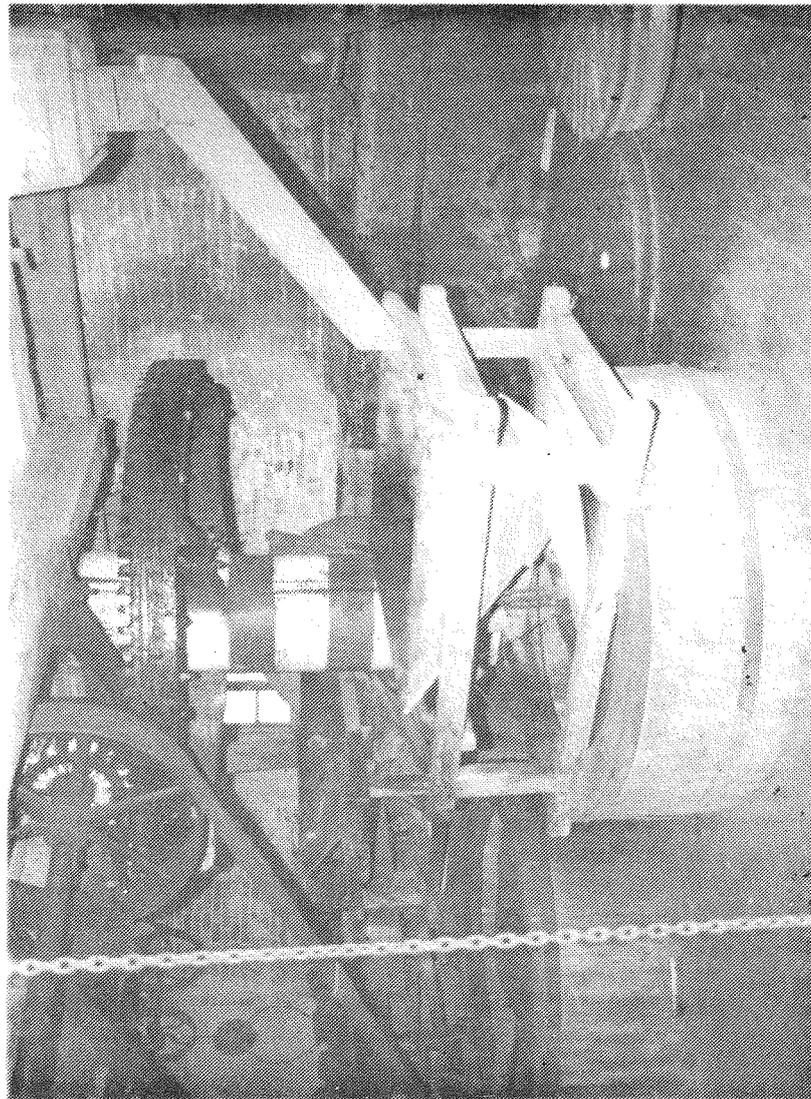


Plate 5. Millstone furniture on the stone floor with the upright shaft, crown wheel & pinion, lineshaft with pulley & drive belt.

The Store and Kiln

The storage area of this building is at the western end and consists of two floors connected by a short flight of steps in the south-west corner of the building. On the top floor there is a loading door in the north wall which is positioned at a suitable height for unloading from a cart (see Figure 9). There is a slight ramp in the floor towards the base of this doorway. The only other aperture is in the centre of the interior partition wall which gives access to the kiln floor some distance below. The entrance to the kiln itself is in the north wall at its eastern end at ground level. This door gives access to an area of stone floor separated from the kiln floor by a small brick wall 18ins. high (see Plate 7 & Figure 14).

The kiln floor consists of 136 cast iron perforated tiles with a row of 13 ceramic perforated tiles set at an angle along each side. There is a small chimney made from a field drain in the north-west corner. Leading from the kiln floor there are two chutes through the partition wall separating the kiln from the storage area, that lead into the lower of the storage rooms (see Plate 6 & Figure 15).

The entrance to the furnace is in the south wall near its eastern end which is alongside the entrance to the privy which empties into the Midge Brook.

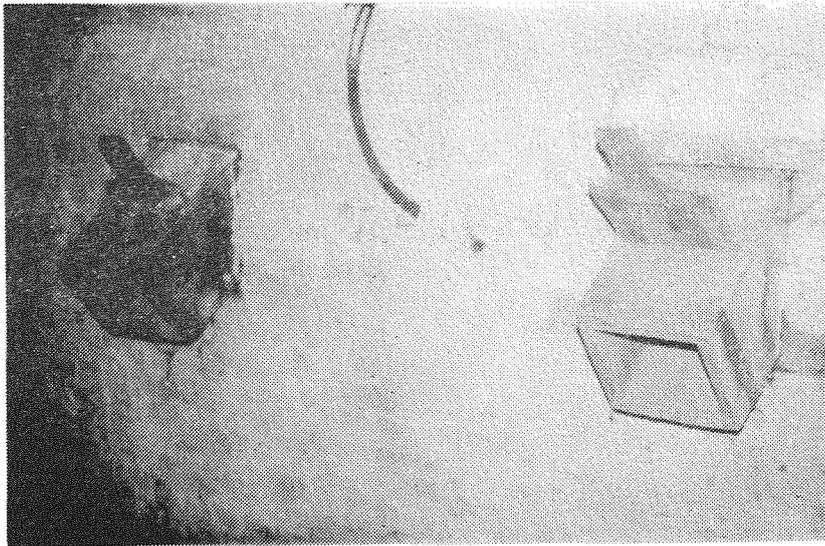


Plate 6. The two chutes leading from the kiln floor to the lower storage area.

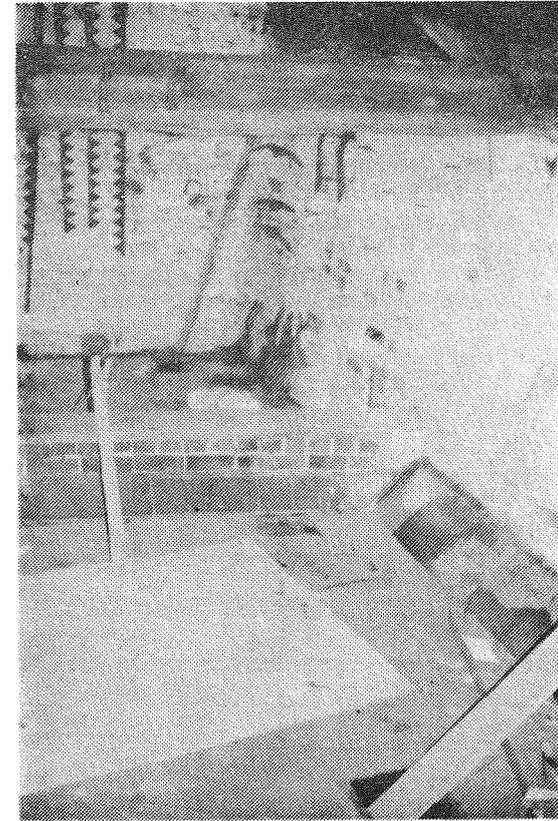


Plate 7. The kiln floor with one of the cast iron tiles out of place and the ceramic tiles along the edge set at an angle. The serrated items hanging on the far wall are saw blades for the plank saw.

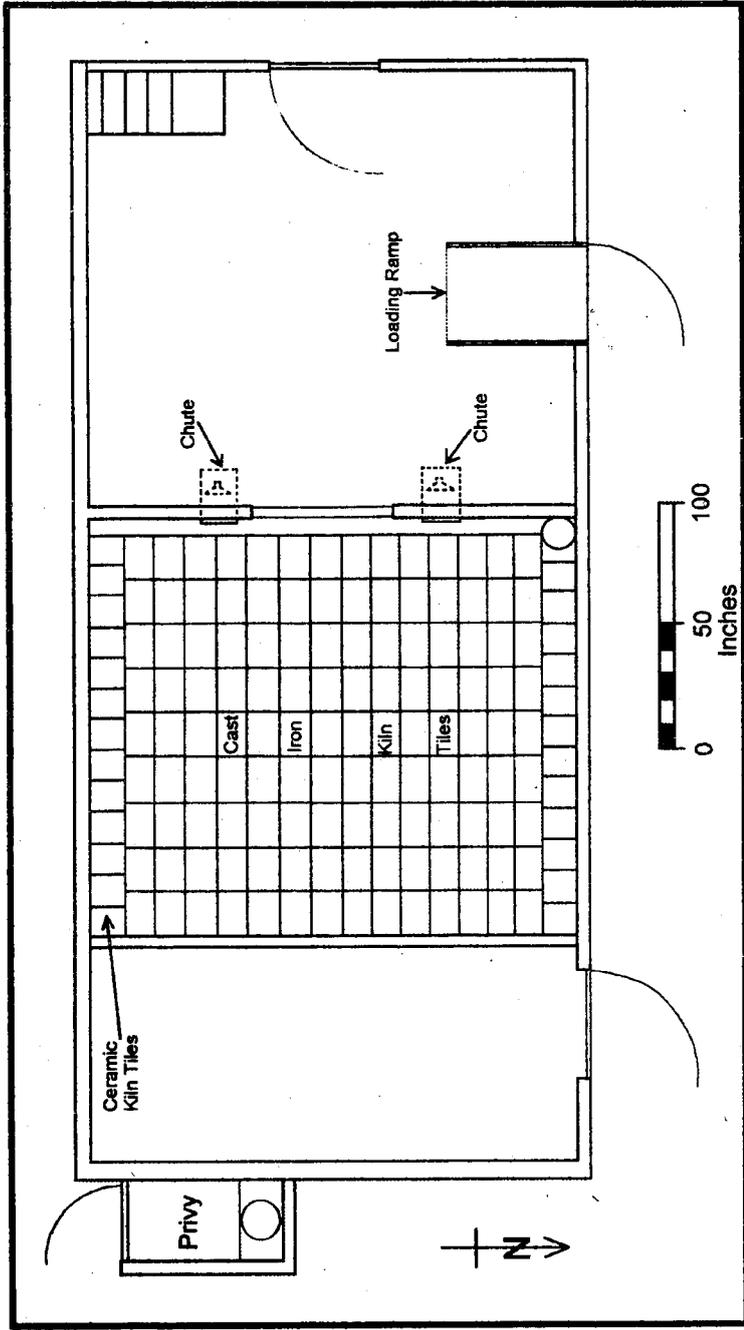


Figure 14. Plan view of the interior of the Kiln & Storage Building.

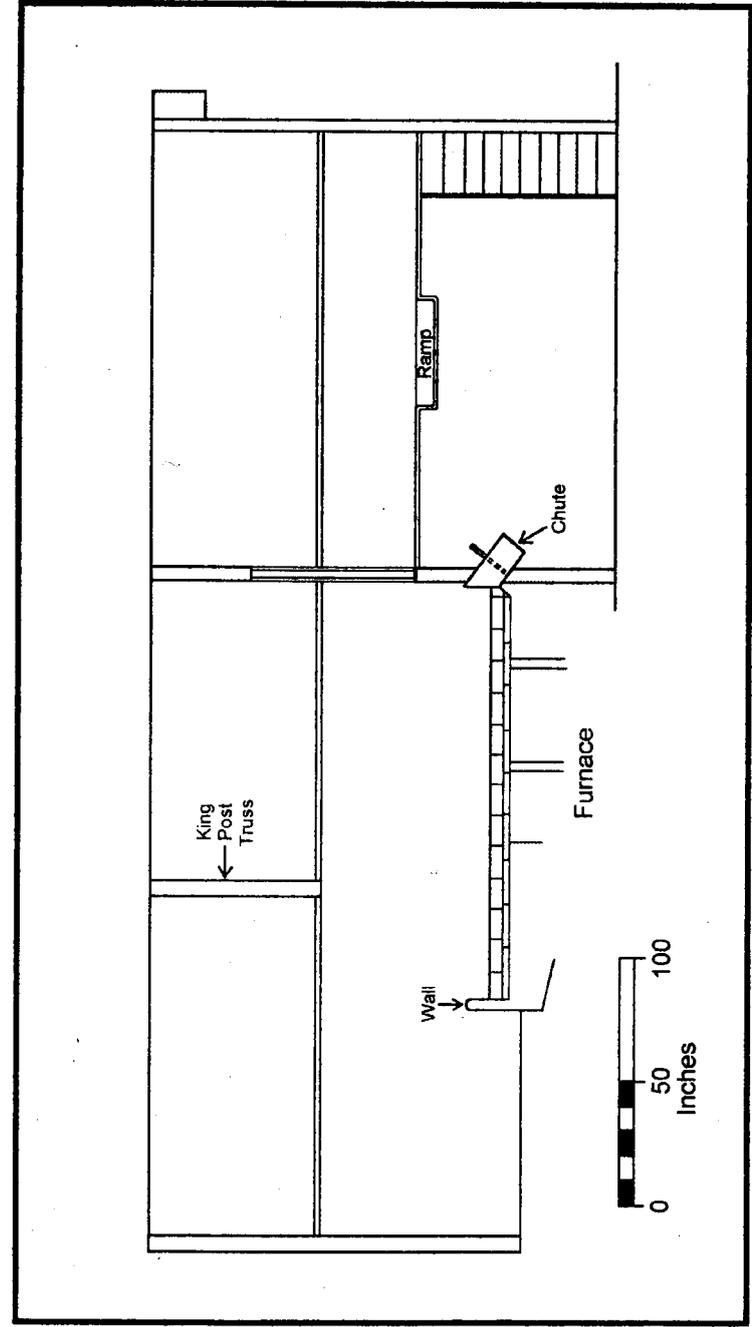


Figure 15. A sectional view through the Kiln & Storage Building.

Part 5 - Description of the Machinery

The Penstock and Waterwheel

The headrace from the mill pond enters the mill at the north - east corner of the first floor, i.e. on the stone floor. The penstock consists of a metal trough 21ft. 6ins. long, 5ft. 6ins. wide and 3ft. 3ins. deep. Of this trough, a length of 12ft. 6ins. is inside the mill (see Figure 12, the plan of the stone floor). The sluice which feeds the water onto the waterwheel is controlled by a rotary handle to be found in the north east corner of the ground floor. The shaft of this handle runs up through the first floor to the top of the penstock where its motion is converted from the vertical to the horizontal via two 9in. diameter bevel gears. The control shaft has a cranked section on the stone floor which can also be used to control the water feed in addition to the handle on the ground floor. The horizontal shaft from the bevel gears is terminated by a 4ins. long worm gear that meshes with an 28ins. diameter gear (see Figure 16). This arrangement transfers the

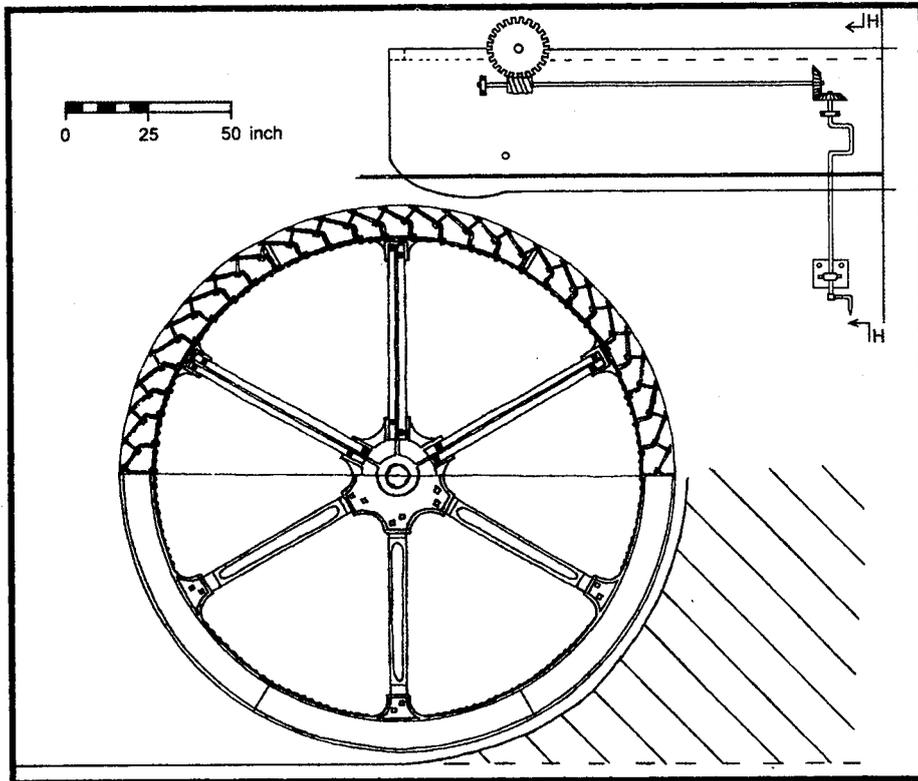


Figure 16. The penstock and waterwheel.

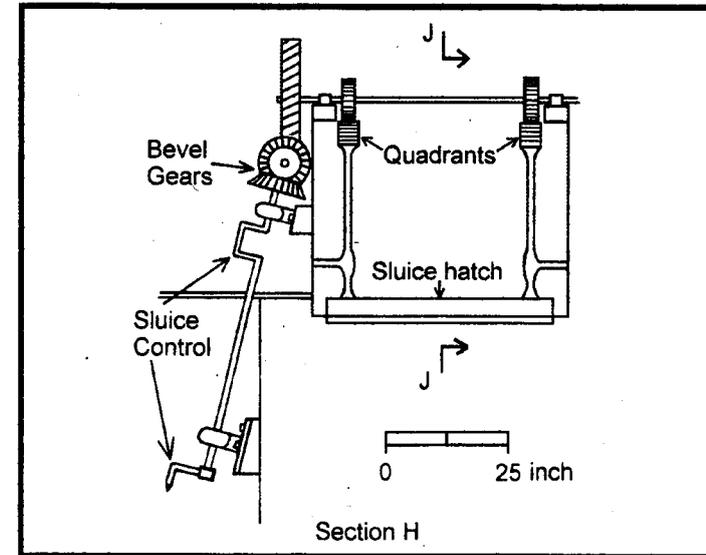


Figure 17. A view, at Section H on Figure 16, through the penstock showing the control handle and gearing.

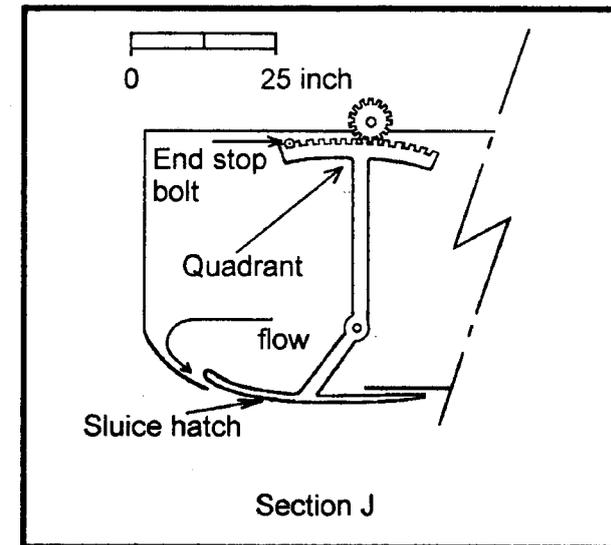


Figure 18. A view, at Section J on Figure 17, showing the quadrant and sluice hatch in the penstock.

control motion to a horizontal shaft running across the top of the pentrough. On this shaft there are two 5½ins. diameter gears, one at each side of the pentrough that mesh with gear teeth on the quadrant arms that are attached to the sluice hatch itself. The end gear teeth on these quadrants are filled by bolts to provide end stops to stop the quadrants from being moved beyond their limit. The sluice hatch itself is a curved plate set into the floor of the penstock. The curves at the end of the penstock and of the hatch are such that the direction of flow of the water in the penstock is effectively changed as it falls into the buckets of the waterwheel below (see Figures 17 & 18)

The all iron waterwheel has a pitchback configuration and measures 14ft. diameter by 4ft. 6ins. wide. It is an elegant piece of casting, with scalloped naves and two sets of six slightly tapering arms, indented on the outside and with a strengthening rib on the inside. The shrouds, jointed in 6 places, are 10ins. deep and there are 54 angled buckets, some of which have entirely rusted away. The wheel is keyed onto a 7ins. diameter iron shaft which passes through a small opening into the mill.

The Main Gearing and Hursting

An iron pitwheel is fitted on the inside end of the waterwheel shaft. It is of 6ft. 6ins. diameter with 112 teeth of 6ins. face and 2ins. pitch. The pitwheel is cast in two parts, bolted together, having eight arms and an octagonal hub. The space between the hub and the wheel shaft is filled by a casting 23ins. across (see Figure 16). This suggests that there may previously have been a wooden wheel shaft and that the waterwheel and present shaft are late replacements.

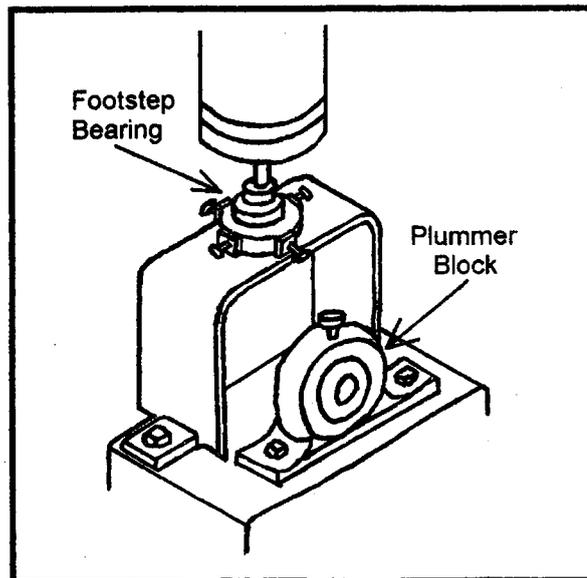


Figure 19. The plummer block bearing for the waterwheel shaft with the main upright shaft footstep bearing above it.

The pitwheel meshes with a cast iron wallower mounted on the wooden upright shaft. The eight arm wallower measures 3ft. 8ins. diameter and has 64 teeth. The footstep bearing of the upright shaft rests on a substantial cast iron arch which lifts the shaft clear of the plummer block housing the bearing for the inside end of the waterwheel shaft (see Figure 19). At its lower end, the upright shaft is 15ins. diameter, increasing to 18ins. by the time it reaches the stone floor. Above the wallower is the cast iron great spur wheel which has eight arms and is cast in two parts. It measures 8ft. diameter and has 150 teeth of 6ins. face and 2ins. pitch.

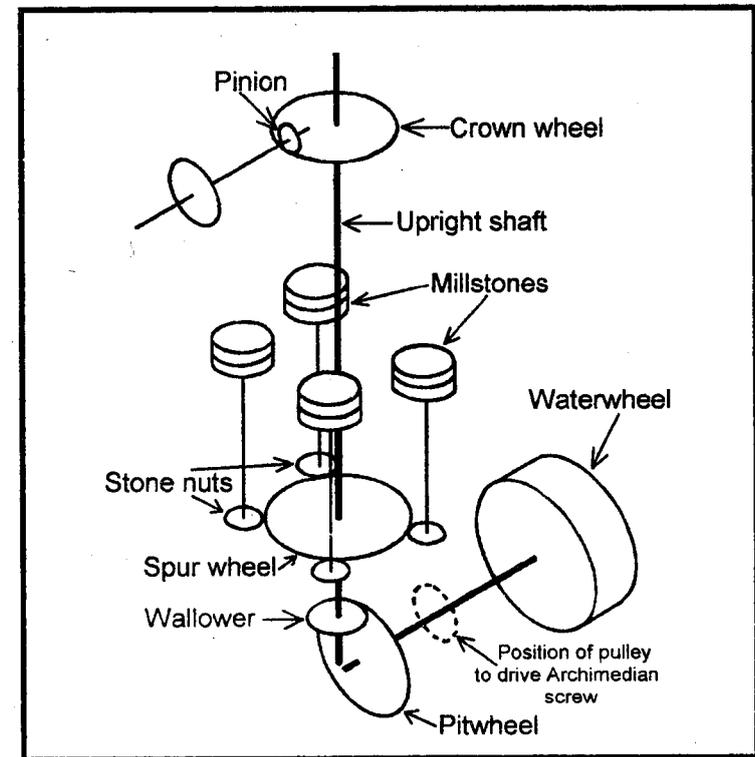


Figure 20. Schematic view of main gearing between waterwheel and millstones.

The hurst consists of four pairs of circular cast iron columns rising from the stone block floor to individual stone pans above. The pairs of columns are linked by cast iron bridgetrees which incorporate the centre-lift centering mechanism, the means of adjusting the gap between the millstones. Slots in the columns allow the height of the bridgetrees to be adjusted by as much as 6ins., so it may be that these were a standard casting, intended to suit a variety of situations. The 3ins. diameter stone spindles have iron cones keyed onto them near their lower ends. These cones, with a maximum diameter of 6½ins., and a raised rib form the seats for the iron mortised stone nuts. Each stone nut has 28 mortises but only one is complete with its wooden cogs, giving it an overall diameter of 19ins. The bottom of these cogs show considerable damage from an occasion when a previous owner attempted to drop the stone nut into gear while the machinery was running! Each stone nut casting incorporates a groove and collar on its upper face to hold the journals on the ends of the forked arm of the disengaging lever. The fulcrum of the lever is on one of the hurst columns and, as with the bridgetrees, is adjustable over about 6ins. The stone nut is kept up out of gear by the outer end of the lever being held down by a pin which slots through a projecting arm (see Figures 21 & 23). As the outer end of the lever is shorter than the inner, there is no mechanical advantage to assist in lifting the weight of the stone nut. It seems likely that there was once an extension piece which fitted onto the

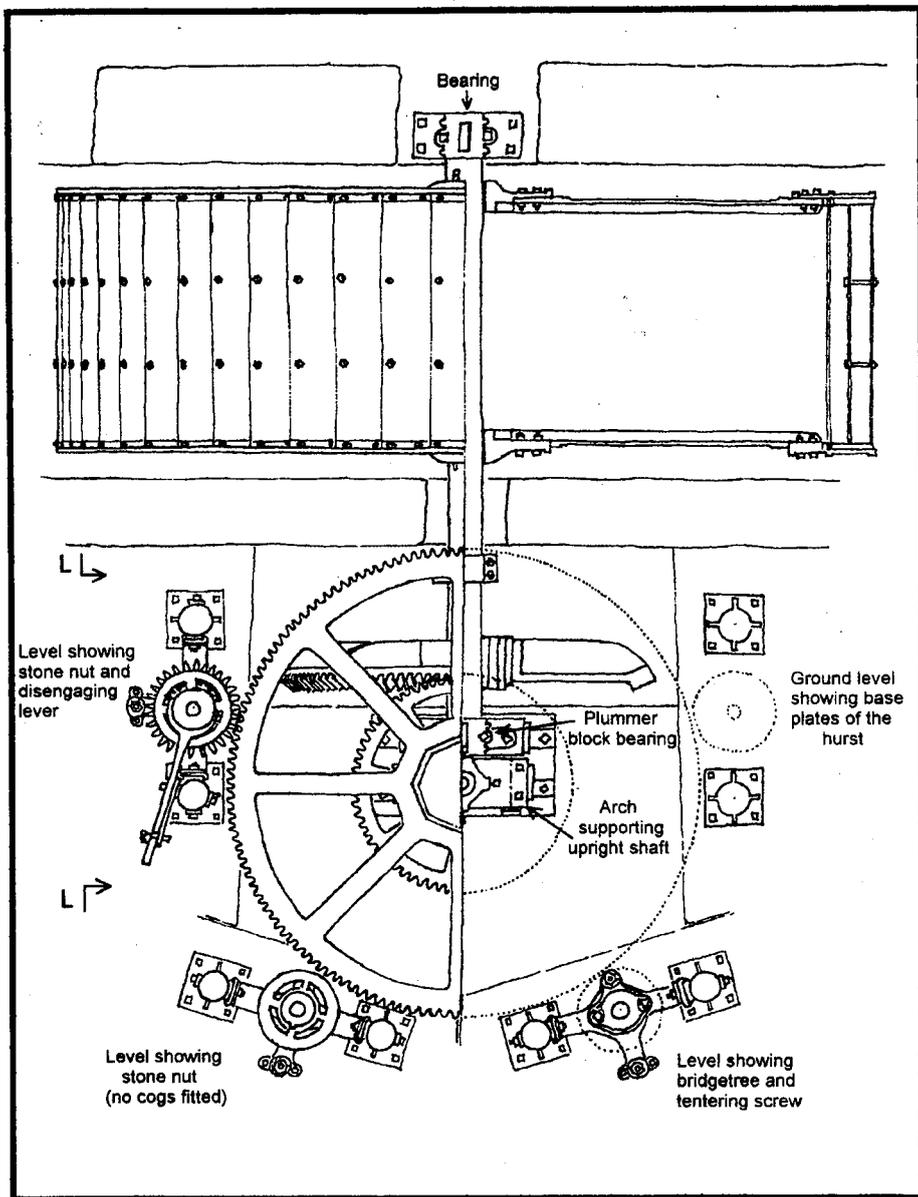


Figure 21. Plan view of the waterwheel and main gearing, with the hursting shown at four different levels, and the pit wheel and wallower cut away to show the bearings of the waterwheel shaft and the upright shaft.

end of the lever. The hurst columns, bridgetrees and disengaging levers are very well engineered to an excellent design. It is a pity that it has not so far been possible to attribute them to a particular millwright. The stone pans above were certainly made for this specific location as they were cast with flanges which allow them to be bolted together and to the wheelpit wall. They each have three screw pins set in them to enable the bedstones to be accurately levelled.

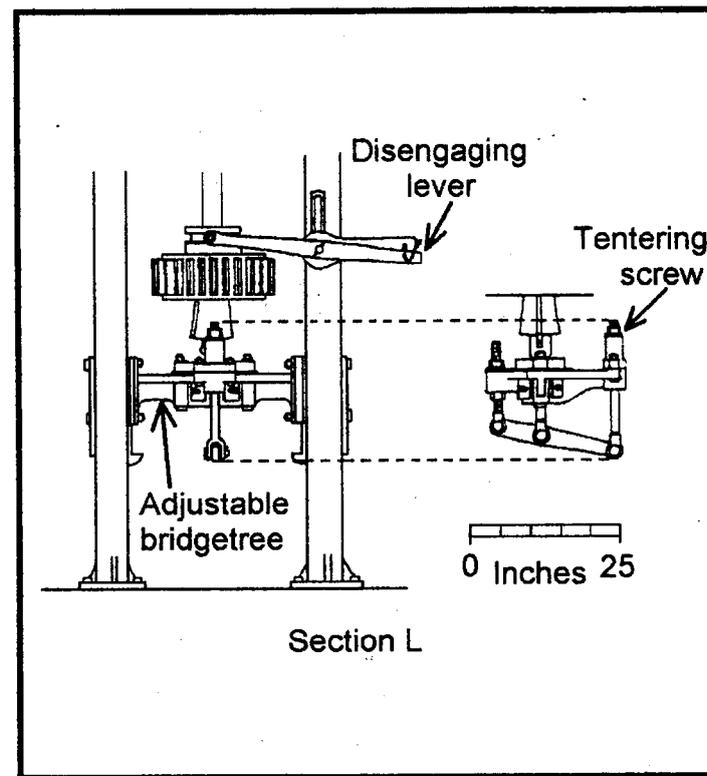


Figure 22. View of the hursting showing the bridgetree, tentering screw, stone nut and disengaging lever, as at Section L on Figure 21.

As usual, the whole of this machinery is boxed in with a timber frame and boards. Openings allow access to the tentering screws and disengaging levers, as well as for lubricating. Attached to the upstream side of this framework is an Archimedean screw which carried the meal from two pairs of stones to a single bagging point. The screw has a small pulley on the end nearest the wheelpit wall and this was driven by belt from a pulley which used to be mounted on the waterwheel shaft, between the pitwheel and the wall. Two of the stone spindles also carry small pulleys but there is now no evidence of their purpose.

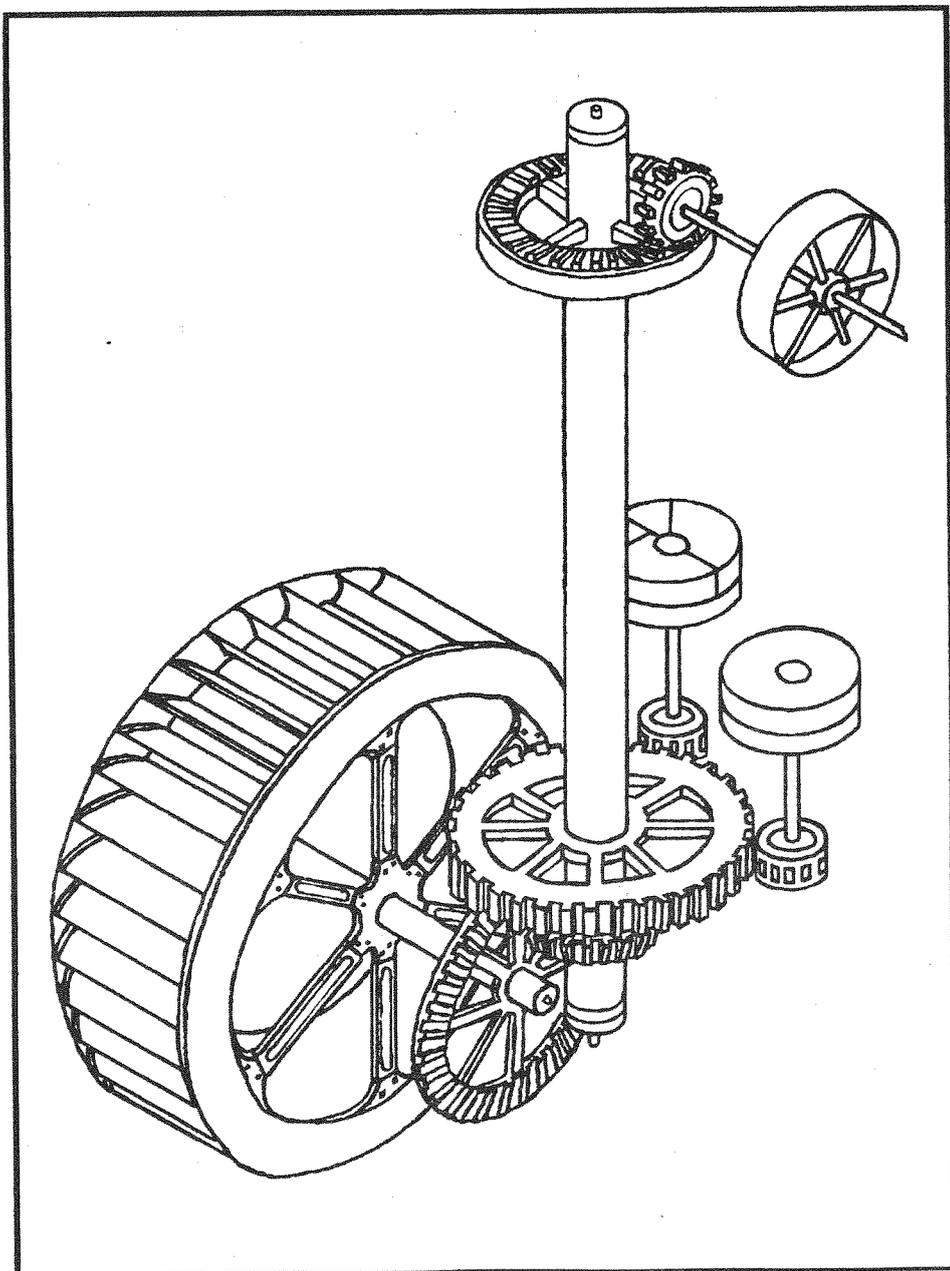


Figure 23. An isometric representation of the waterwheel, main gearing and upright shaft, showing two sets of millstones only.

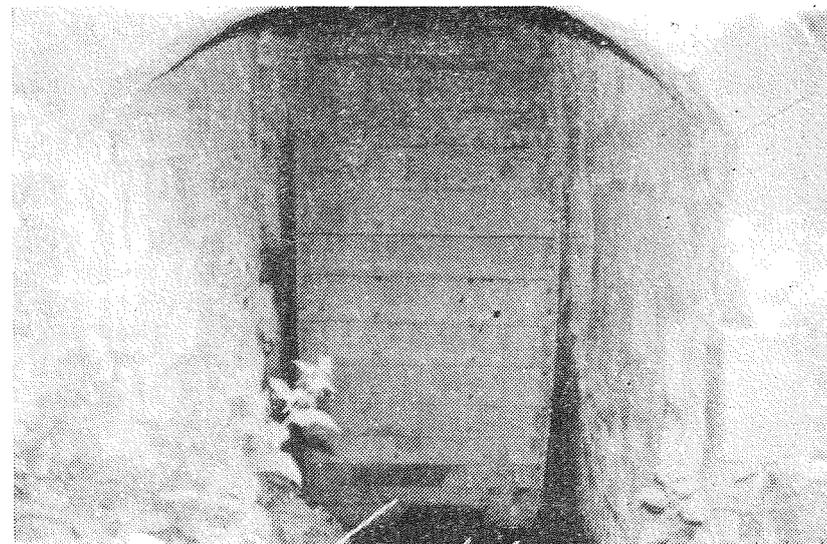


Plate 8. The waterwheel as seen looking up the tailrace arch.



Plate 9. The pitwheel and wallower inside the boarded area with the Archimedian meal screw on the right.

The Millstones

On the stone floor are to be found the reason for the mill's existence up until the 20th century, namely the four pairs of millstones that produced both flour for human consumption and animal feed by grinding corn and various other grains. The four pairs of millstones are complete with all their furniture; circular tuns, plain box-framed horses and large hoppers. There are two pairs of French burrs, both 4ft. diameter. The runners both have four balance boxes and one is named at the eye "Davies & Sneade, Charters Street, Liverpool" which is thought to date it to the 1890s. The other two pairs are millstone grit, almost certainly from Mow Cop which is only about seven miles south east of the mill. One pair is 4ft. 2ins. diameter and the other 4ft. diameter. Both pairs are made up from pieces of stone which have been cemented together and banded with iron. The dressing on the millstones is quite conventional (see Plate 10). The larger runner has been balanced with a lead weight. All four runners are mounted on simple balance rynds.

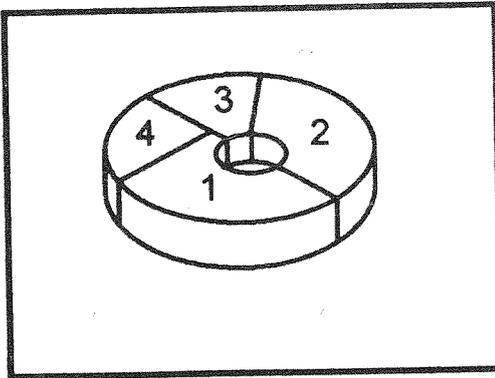


Figure 24. Mow Cop millstone in four sections.

To achieve the optimum rotational speed for millstones of this size, which is about 120 r.p.m., the gear ratios of the pitwheel to the wallower, $112/64$, and spur wheel to the stone nuts, $150/28$, indicate a waterwheel speed of between 12 and 13 r.p.m.

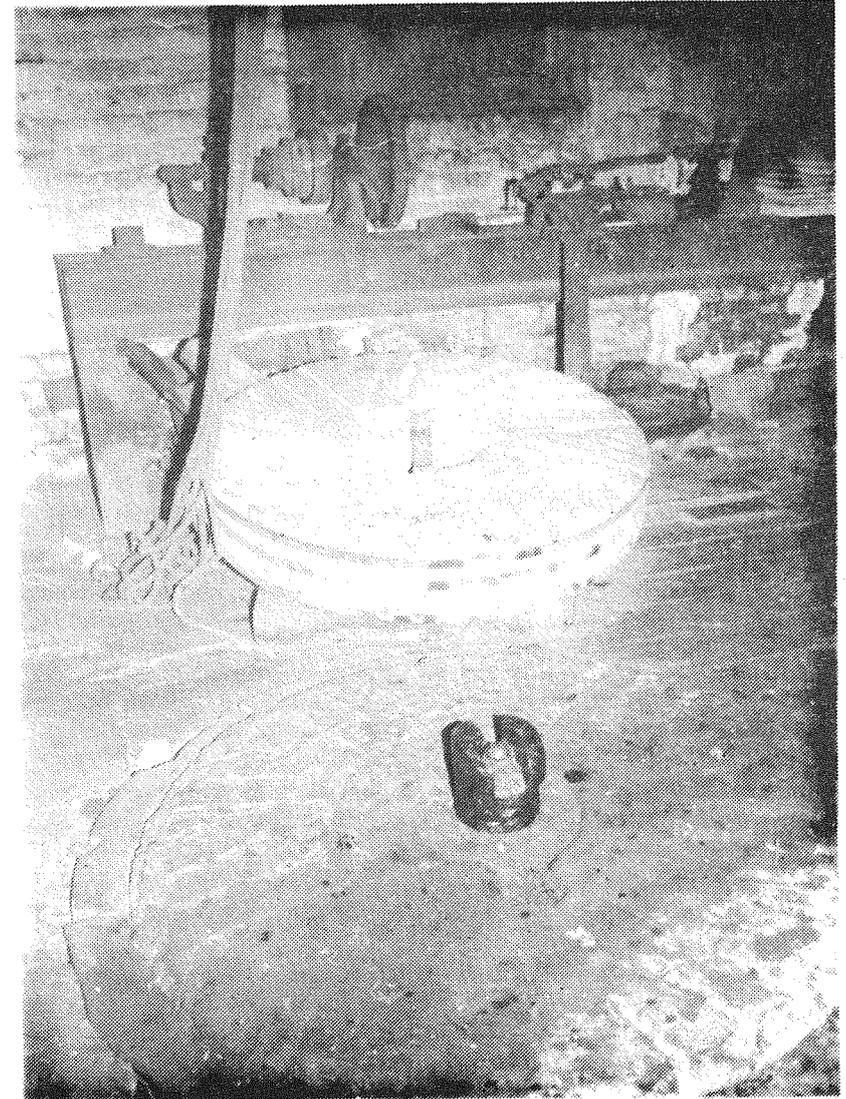


Plate 10. A pair of millstones opened up showing the dressing. Some of the old lathes can be seen on the bench behind the millstones.

Power Transmission & Distribution

The power generated by the waterwheel is transmitted to the main upright shaft which takes the power up to the first floor of the mill. Near to the top of the upright shaft there is a wooden crown wheel of 7ft. 4ins. diameter with four arms mortised into the upright shaft. One of these arms has been broken sometime in the past and has been repaired by fixing two pieces of iron channel above and below the arm and connecting them to each other via four bolts per side. This is a typical "blacksmith style" miller's repair. On top of the crown wheel is a ring of six curved cast iron plates with 18 vertical gear teeth on each segment, giving a total of 108 teeth on the whole of the crown wheel. Meshing into these gear teeth is a wooden cogged pinion of 18ins. diameter, having 18 cogs, attached to the end of the main auxiliary drive shaft which transmits the power throughout the mill using pulleys and belts (see Figure 23). The waterwheel would normally be revolving at 12-13 r.p.m, say, so the gearing on the pit wheel and wallower would make the upright shaft revolve at 22 r.p.m. As the crown wheel has 108 teeth and the pinion has 18 teeth it follows that the main lineshaft would be normally rotating at about 135 r.p.m. As the waterwheel is a pitchback configuration the upright shaft will rotate clockwise (as seen from above) and hence the main lineshaft will also rotate clockwise as viewed looking towards the waterwheel from the south.

The smooth meshing of the crownwheel and the pinion is essential to the efficient running of the mill as all the auxiliary power goes through this one set of gears. Alf Lancaster says that in order to adjust the crown wheel there are metal shims positioned under the four arms in the mortise joints in the upright shaft. Also at the other end of these four arms, where they are connected to the crown wheel itself there is another set of shims for adjustment. These are reached from the outside of the crownwheel and when finalised are covered with canvas patches to keep out the muck and dust. The shims allow the miller to adjust the level of the gear ring on the crownwheel so as to be exactly horizontal throughout its circumference. At the moment the main line shaft has a distinct downward angle as it leaves the crownwheel which is not how it was when the mill was working for a living. The owner who purchased the mill from Alf Lancaster altered the position of the bearing furthest from the crownwheel in order to get more space for the pulleys at the end of the lineshaft. Alf Lancaster's view of this alteration is not printable in this family journal!

The auxiliary power transmission system at Swettenham Mill is very complicated, so in order to make references simpler a logical nomenclature is required for the various shafts and pulleys. Consequently the lineshafts will be referred to as Lineshafts A, B, C and D which are as follows:-

Lineshaft A - The main lineshaft taking the power from the crownwheel via a pinion. (see Figures 25 & 27)

Lineshaft B - The lineshaft at floor height on the stone floor at the west end of the mill. (see Figures 26 & 27)

Lineshaft C - The lineshaft at roof height on the stone floor at the west end of the mill. i.e. directly above lineshaft B. (see Figure 26 & 27)

Lineshaft D - The lineshaft in the lean-to, at the south-west corner of the mill, which also runs inside the ground floor. (see Figure 26 & 27)

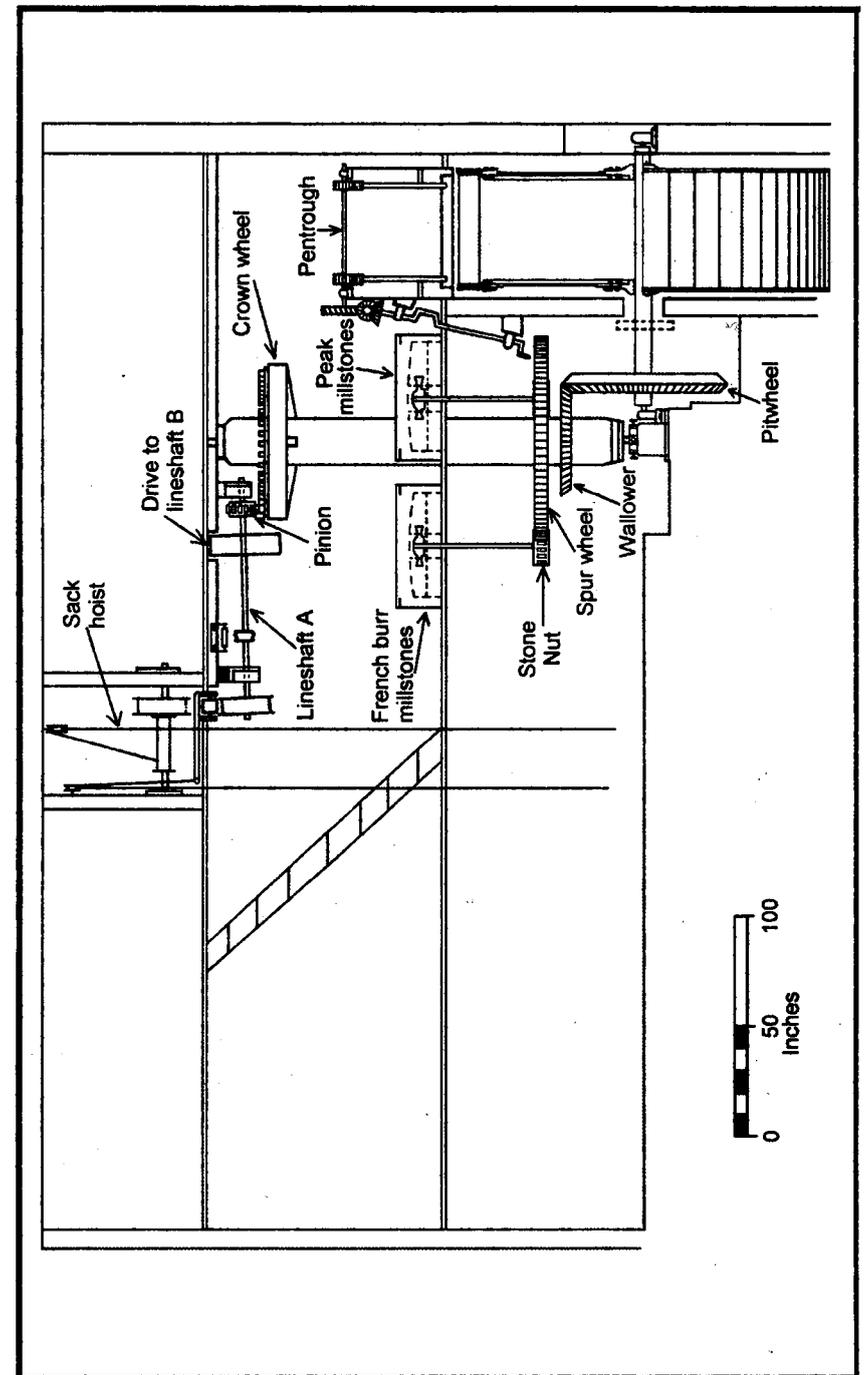


Figure 25. A cross sectional view through the mill at Section F on Figure 11, 12 & 13, showing the main gearing, upright shaft, lineshaft A and the sack hoist.

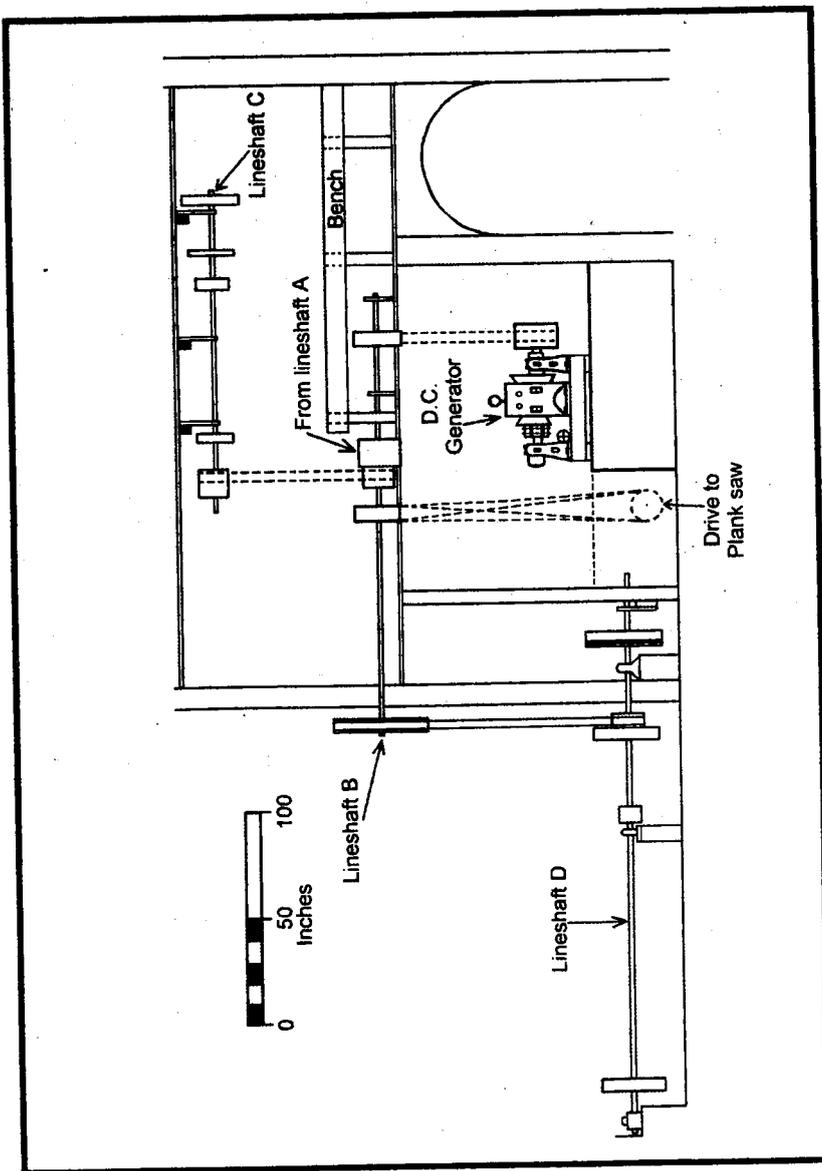


Figure 26. A cross sectional view through the mill at Section E on Figures 11 & 12 showing lineshafts B, C & D and the D.C. Generator.

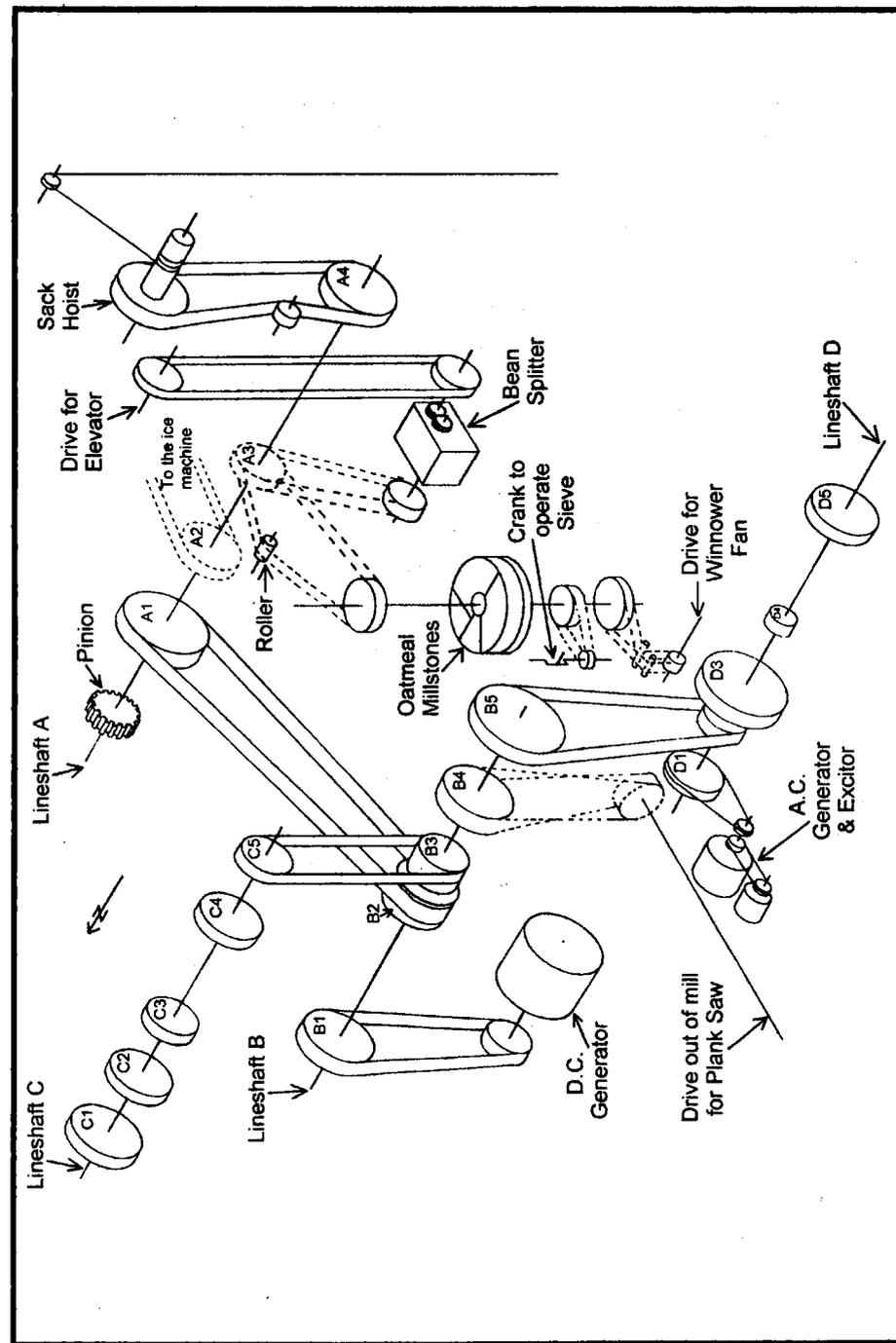


Figure 27. An overall isometric view of all the lineshafts, pulleys and belts in the mill.

The various pulleys are numbered in the order that they occur on a particular lineshaft starting with the one nearest to the waterwheel, or north, end of the mill. e.g. C2 will be the second pulley on lineshaft C from its northern end. (see Figures 26 & 27)

Lineshaft A

PULLEY	DIAMETER	WIDTH	COMMENT
A1	35"	8"	6 straight spokes: to lineshaft B
A2	?	?	Missing: to the ice machine
A3	?	?	Broken remains on shaft: to oatmeal/bean splitter
A4	18"	6½"	6 S-shaped spokes, 2 flanges of 5": to sack hoist

Lineshaft B

PULLEY	DIAMETER	WIDTH	COMMENT
B1	24"	6"	8 spokes: to the d.c. generator
B2	22"	13"	from lineshaft A
B3	18"	10"	to lineshaft C
B4	20"	6"	2 flanges, 6" and 4", all wooden: to the plank saw
B5	40"	6"	12 straight spokes: to lineshaft D

Lineshaft C

PULLEY	DIAMETER	WIDTH	COMMENT
C1	27"	4"	6 curved spokes: to a lathe
C2	23"	3"	6 S-shape spokes: to a lathe
C3	15"	5"	4 straight spokes
C4	18"	4"	wooden: to a lathe
C5	12"	4½"x2	Pair of "fast & loose" pulleys: from lineshaft B

Lineshaft D

PULLEY	DIAMETER	WIDTH	COMMENT
D1	17"	7"	10 straight spokes: to the a.c. generator
D2	17½"	6"	4 straight spokes: from lineshaft B
D3	32"	7"	6 curved spokes: to the circular saw
D4	9"	8"	to the band saw
D5	30"	6"	8 straight spokes: to the firewood circular saw

The first pulley on the main lineshaft, A1, distributed the power to the other lineshafts via a belt which connects to a pulley on lineshaft B, namely B2. As the ratio of pulleys A1 and B2 is 35/22 then given that lineshaft A rotated at 135 r.p.m then lineshaft B would have rotated at about 215 r.p.m. From there the power was distributed from lineshaft B to lineshaft C via a belt between pulleys B3 and C5. These pulleys have a ratio of 18/12 so that lineshaft C would normally have rotated at about 320 r.p.m. As C5 is a "fast and loose" combination it was possible to stop lineshaft C without affecting the other lineshafts. Also lineshaft B passes through the wall of the mill into the space under the lean-to by the mill entrance where another belt connects pulleys B5 to D2, so distributing power to the ground floor. There was a considerable difference in speed between lineshafts B and D, as the ratio of B5 to D2 is 40/17½, which gave a speed of around 490 r.p.m of lineshaft D. Note that all these lineshafts rotated clockwise as viewed looking towards the waterwheel. From these four lineshafts the power was finally transmitted by pulleys and belts to the various items of machinery that were used in the mill.

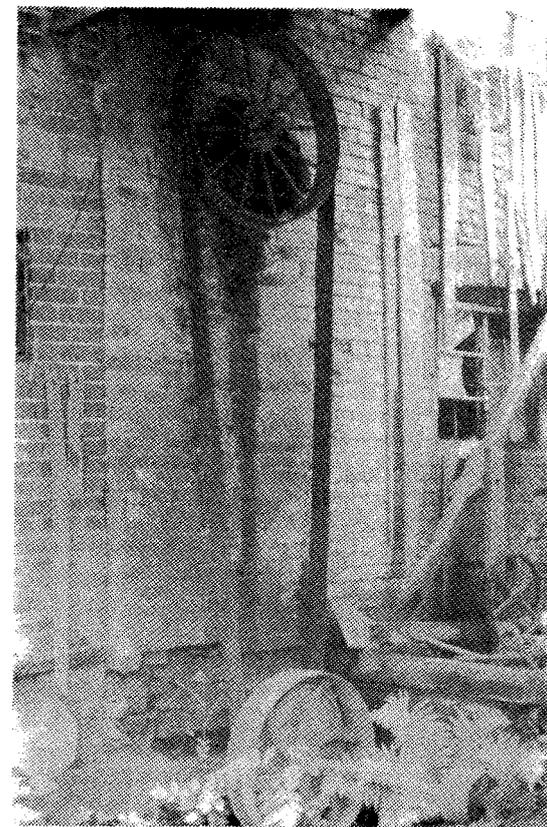


Plate 11. The belting between lineshafts B and D outside the mill in the lean-to near the entrance (between pulleys B5 and D2). Note the wooden patterns for making horse drawn carts hanging on the wall.

Sack Hoist

Lineshaft A is supported by two bearings, one positioned between the upright shaft and the pinion, and the other positioned between pulleys A3 and A4. (see Figure 25). Each bearing is supported by a large, custom made, cast iron bracket, designed to fit in with the mill's floor beams. Lineshaft A is the only lineshaft that was present in the 19th century, all the others were fitted in the mill by Wilf Lancaster some time in the 20th century. One of the uses of lineshaft A was to drive the sack hoist. This mechanism allowed sacks of grain to be attached to a chain which runs up through a series of trap doors in the floors, from the ground floor to the top floor of the mill. Then, under the control of the miller, the sacks can be hoisted up through the mill by the chain. The sack hoist at Swettenham Mill is operated on the "slack belt" principle.

At the end of lineshaft A furthest from the upright shaft is pulley A4. The rest of the sack hoist mechanism is situated on the garner floor where there is a four spoked, flanged, pulley directly above pulley A4. These two pulleys have a slack belt passing between them, such that normally no power is transmitted from one pulley to the other. When the sack hoist cord is pulled on any floor, the pulling movement is transferred over a pulley block attached to the roof on the top floor and thence to a cranked arm attached to a small roller, called a jockey pulley, (see Figure 28). The pull on the string raises the end of the cranked arm which in turn swings the jockey pulley into the path of the belt, so tightening it and ensuring power is transferred from pulley A4 to the sack hoist pulley on the top floor. Integral with this pulley on the top floor is a much smaller diameter winch drum with the sack hoist chain attached to its circumference. As the drum turns, the sack chain is rolled around the drum so pulling it up through the trap doors and over a large block pulley attached to the roof of the top floor (see Figure 28). Once the cord is slackened, the drive belt slackens and the weight of the chain and sack unwinds the chain from the drum until the weight is removed (i.e. when the sack settles on top of a sack hoist trap door.)

Ice Machine

The ice machine is situated between the mill and the pool, where the ground is at first floor level (see Figure 12). Installed second-hand about 1926, the ice machine essentially consists of two heat exchangers with a compressor and pump. Ammonia was supplied from a pressure vessel which is buried in the embanking of the dam. The ammonia was compressed to a liquid and pumped to a set of pipes in a tank which would have contained sodium chloride solution (brine). In this tank of brine there were twenty buckets, each of which could contain one hundredweight of fresh water drawn from the pool. The liquid ammonia in the pipes in this tank would expand and evaporate to gaseous ammonia. The energy required by this process could only be supplied in the form of heat which was taken from the pipes' surrounding medium, i.e. the brine solution, thereby lowering the temperature of the brine. Eventually the temperature of the brine would fall below 0° C and the fresh water in the buckets standing in the brine would freeze. The brine would stay liquid as it has a lower freezing point than water.

Once the ammonia had evaporated, it was led into a matrix of cooling tubes located in the head race of the mill so that the heat extracted from the brine could be transferred to the cold water flowing onto the waterwheel. (see Figures 12 & 29 and Plates 12 & 13). Once cooled the ammonia returned to the compressor (see Figure 30) for the whole process to be repeated.

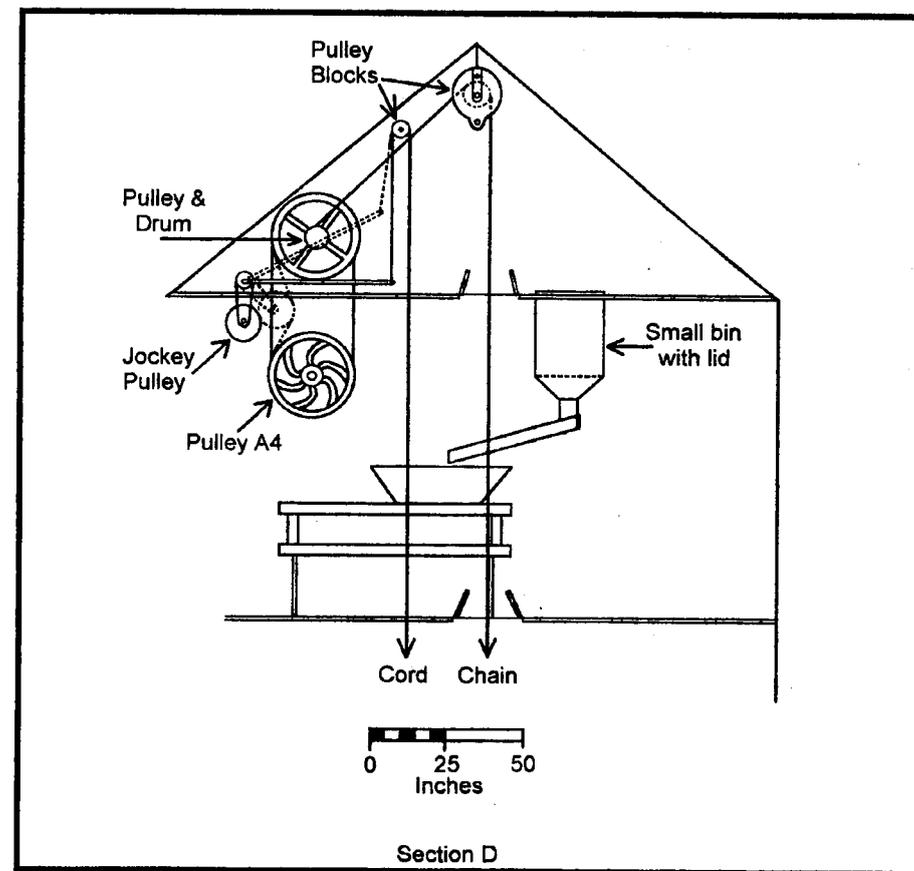


Figure 28. A sectional view of the stone floor and garner floor at D on Figure 13 showing the sack hoist mechanism.

The whole refrigeration system was made by Haslams of Derby but the compressor bears the monogram of Crossley Brothers who were obviously the original equipment supplier of this component. The compressor was driven by belting from pulley A2 on the main lineshaft but this is no longer present in the mill. The belt reached the compressor via a crudely made slot in the east wall of the mill at first floor level, connecting by a "fast and loose" pulley mechanism. One interesting feature is the stuffing box on the compressor shaft. This must be tightened exactly equally, by three nuts, in order to maintain parallel clearance in the stuffing box. This has been achieved by using nuts with gear cogs

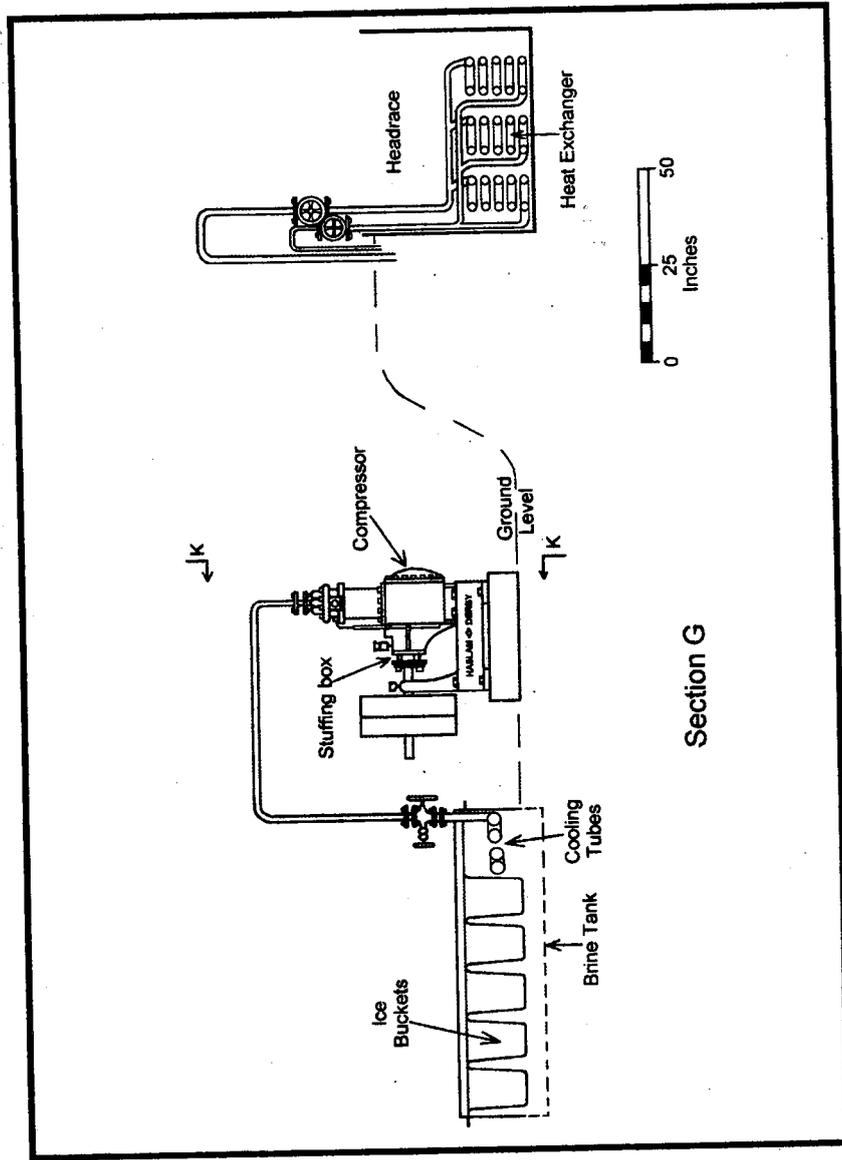


Figure 29. A view of the ice machine along Section G of Figure 12.

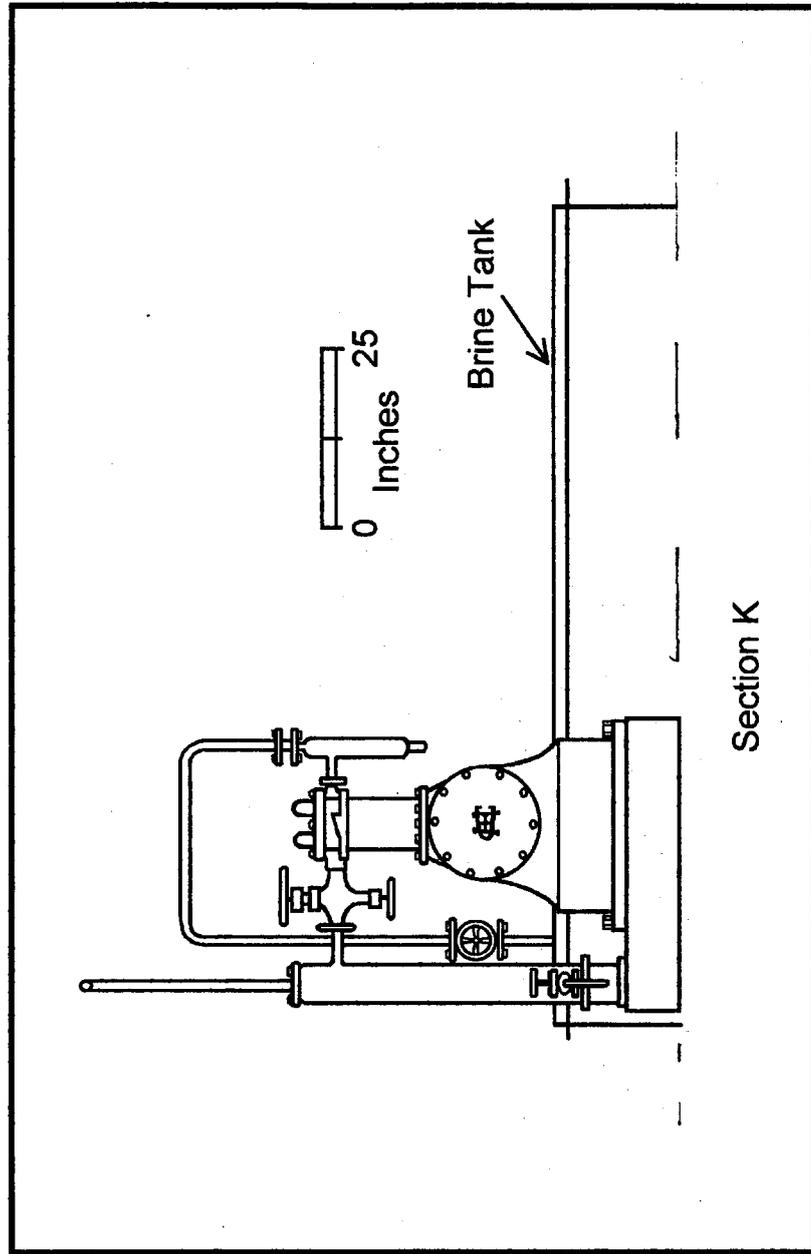


Figure 30. A view of the ice machine compressor at Section K of Figure 29.

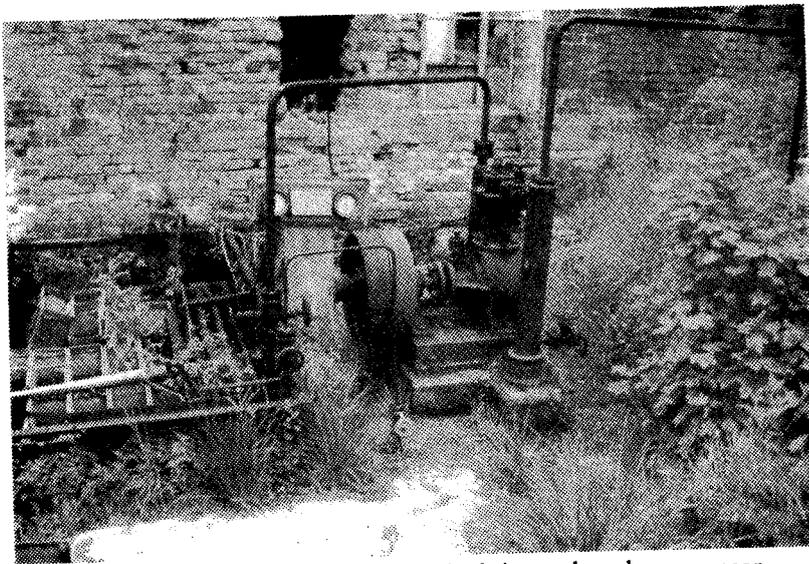


Plate 12. The ice machine showing the brine tank and compressor.

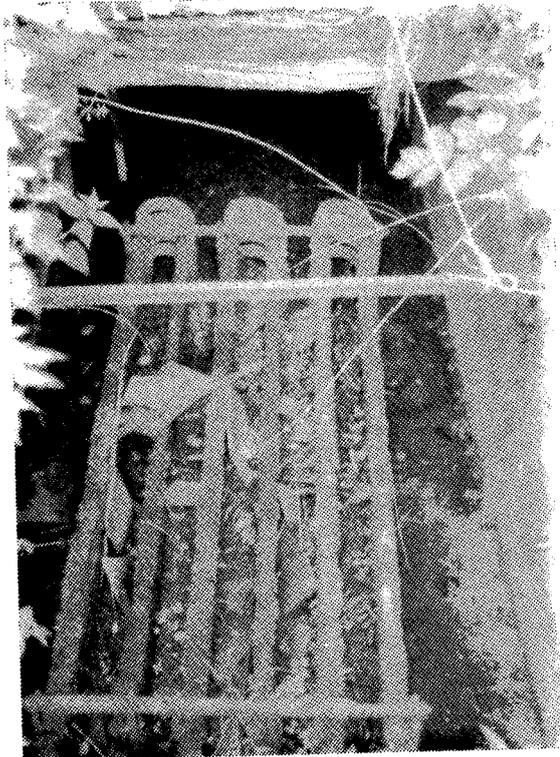


Plate 13. The ice machine heat exchanger in the headrace.

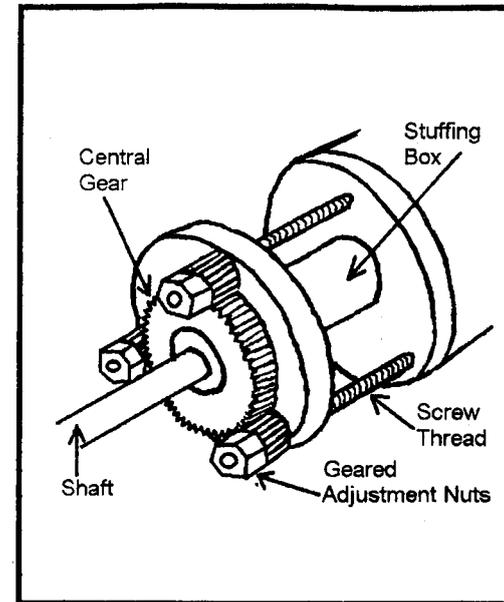


Figure 31. Compressor stuffing box showing the geared nuts and centre gear ring allowing parallel adjustment from just one nut.

attached, which all mesh with a gear ring around the shaft aperture. If any nut is moved, the movement is transferred to the central gear ring and hence to the other two nuts. Therefore, tightening one nut ensures that all nuts are tightened by an equivalent amount, so maintaining equal spacing all round the stuffing box (see Figure 31). A neat way of avoiding having to measure the gap exactly during adjustments!

Once the fresh water in the buckets sitting in the brine tank had frozen, the buckets would be removed from the brine tank and dipped in a small tank nearby containing warm water (see Figure 12). This, aided by the tapered shape of the buckets, allowed the ice block to be removed. They were then stored in a wooden hut (since demolished) and insulated with soot until ready for transport on horse drawn waggons. One set of buckets yielded one ton of ice, the process taking about 12 hours to complete.

Bean splitter & elevator

The bean splitter process also occupies all three floors, situated next to the oatmeal plant (see Figures 32 & 33). The beans would be stored on the top floor and when required would be tipped into the appropriate bin which would feed the beans down into the hopper on the patent splitting machine on the first floor. Power for the splitter was supplied by a belt from pulley A3, that could also be used to drive the oatmeal plant. This belt connected to a 10ins. diameter pulley on the machine. This meant that the oatmeal plant and the bean splitter could not be operated at the same time as they required different belts to be used on pulley A3.

The hopper on the bean splitter has an adjustable gate through which the beans pass onto a screen which would separate out stones and other rubbish. The beans are then crushed and split open between two fluted rolls. The pressure exerted by the rolls could be adjusted by a handwheel on the end of the machine.

The output from the bean splitter machine passed through the first floor into a chute into the elevator. This elevator runs down from the top floor down almost to floor level on the ground floor and then returns up to the top floor (see Figure 33). The power supplied to the bean splitter is passed through the machine via a gear train to a 14ins. diameter pulley on the opposite side of the machine to that where the machine is connected to the lineshaft. From this output pulley a belt connects up to the 21ins. diameter elevator drive

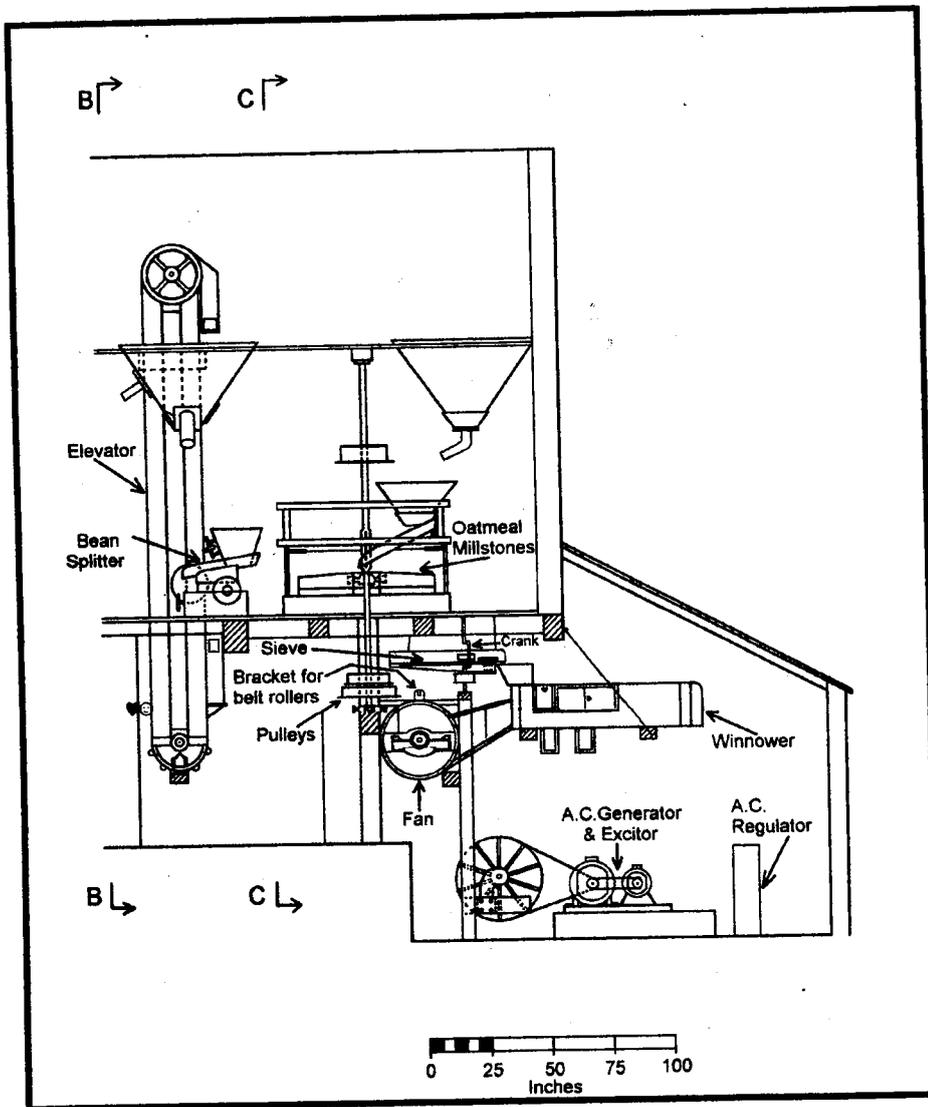


Figure 32. A view through all three floors at Section A on Figures 11, 12 & 13 showing the bean splitter and elevator, the oatmeal stones and winnower and the a.c. generating equipment.

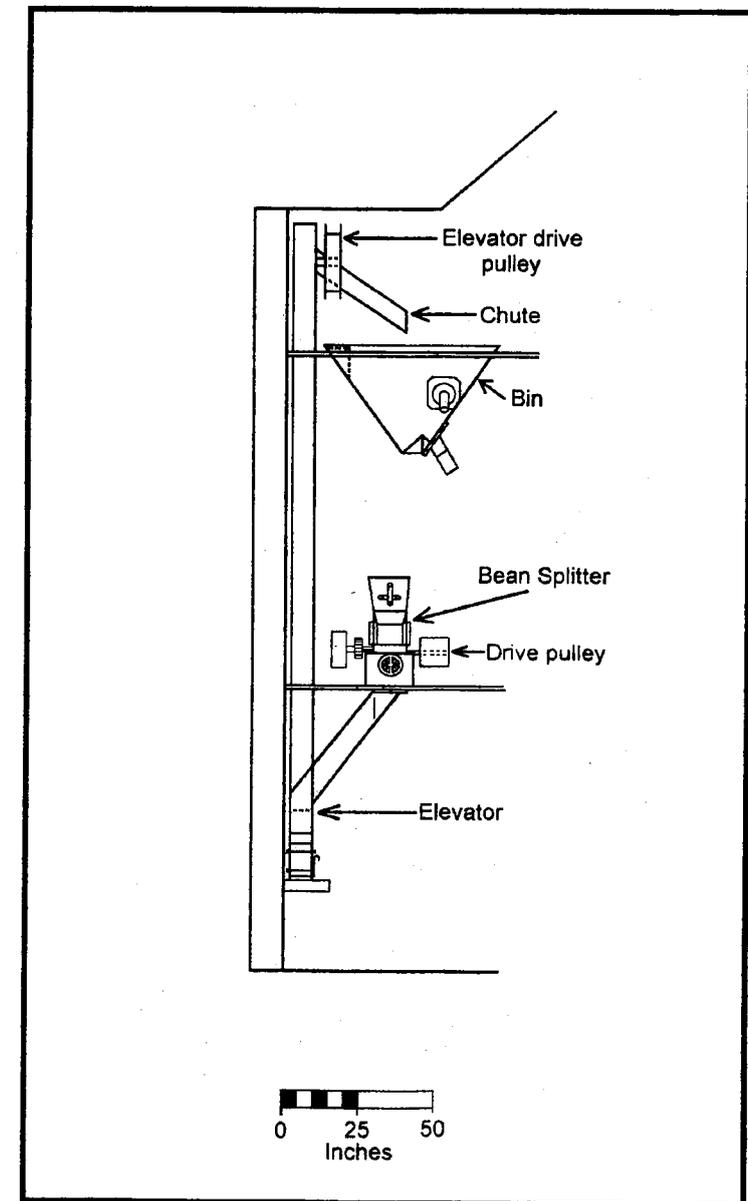


Figure 33. A view of the bean splitting process through all three floors at Section B on Figure 32.

pulley on the top floor. The product from the bean splitter drops to the bottom of the elevator where the elevator buckets, attached to an internal belt, pick up the material and transport it up to the top floor. Once the material passes over the top of the elevator and starts to descend it is deposited back into the bin and passed through to the machine to complete the cycle again. This process can be repeated as often as required until the finished product is available. Then the spout from the bin can be diverted away from the machine's hopper into a collecting sack

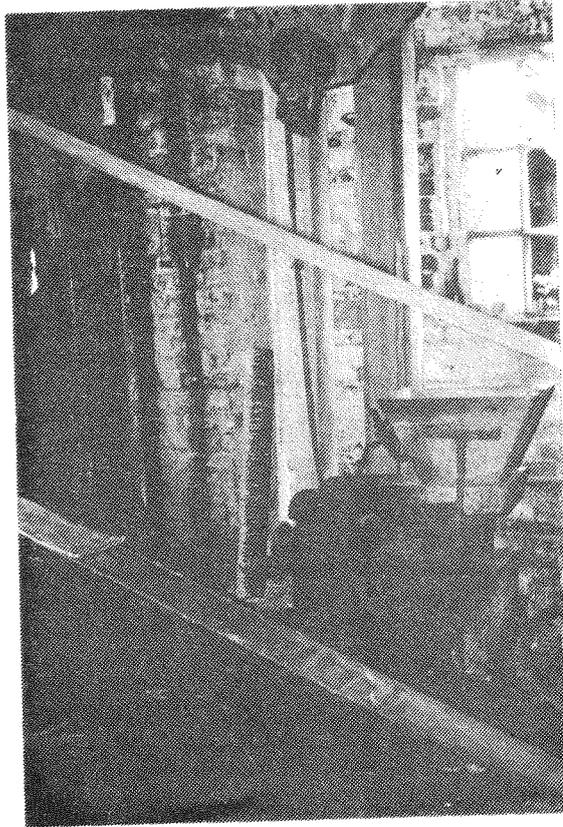


Plate 14. The bean splitting machine. (The two lengths of belting crossing the picture at an angle is the main drive belt from lineshaft A to lineshaft B.)

Oatmeal plant

The oatmeal plant is situated on all three floors in the south-west corner of the mill (see Figures 32 & 34). The power for the plant was provided by a belt from pulley A3 on the main lineshaft, of which only the hub is still to be seen, with its wooden wedges holding it in position on the lineshaft. This belt connected to a 20ins. diameter pulley with a flange on its lower edge, fixed to the vertical quant running down to a pair of millstones, which are thought to be from Mow Cop. When this belt was in place it connected a pulley with a

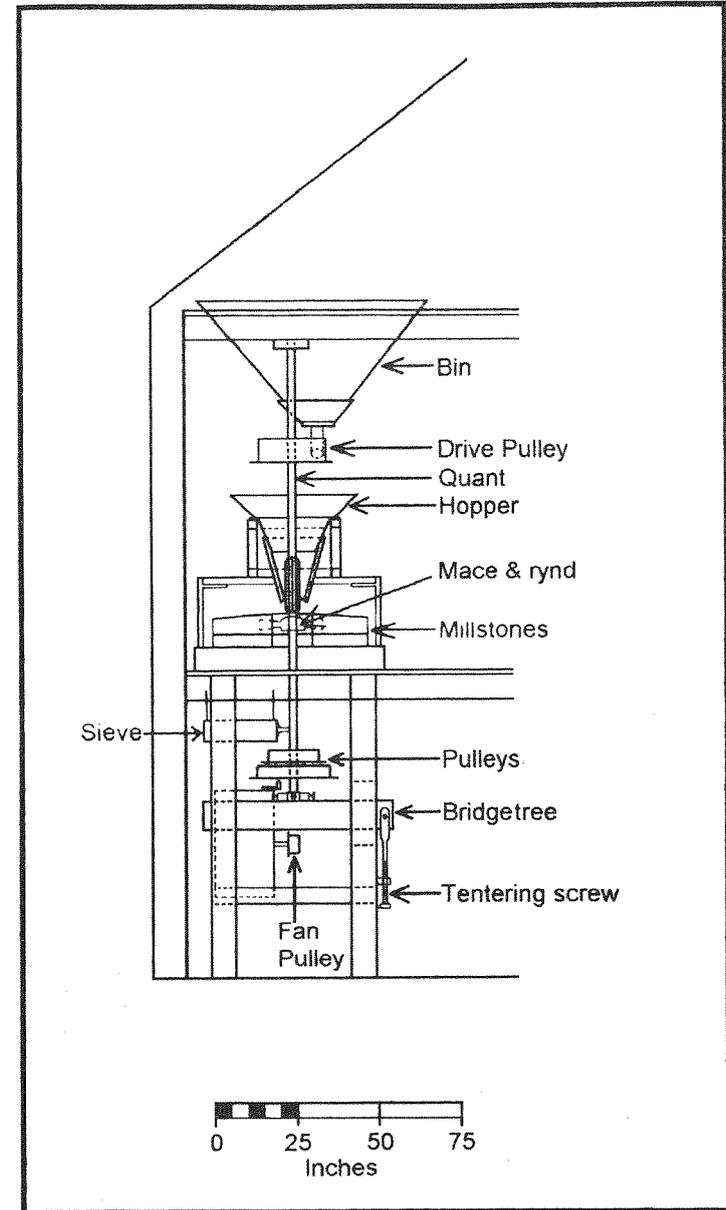


Figure 34. A view of the oatmeal process through all three floors at Section C on Figure 32 showing the tentering arrangement.

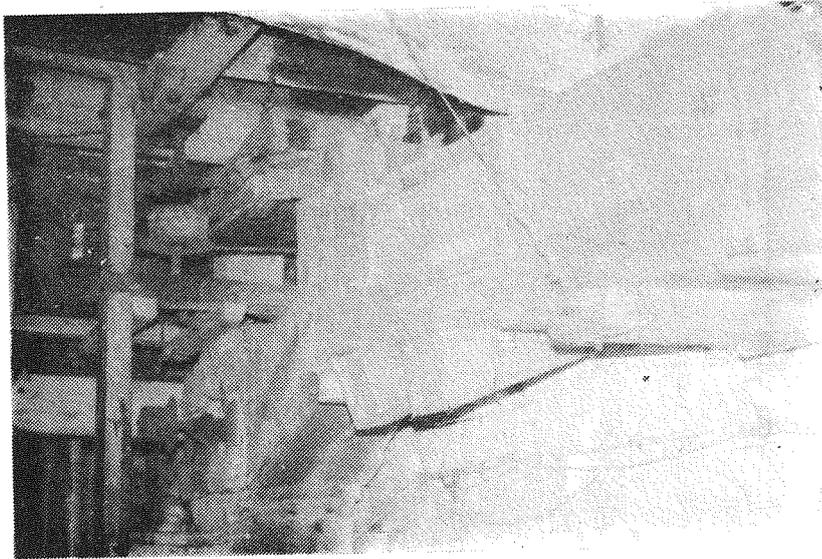


Plate 15. The winnower showing, on the left, the fan drive pulley and above it the sieve drive pulley and crank.

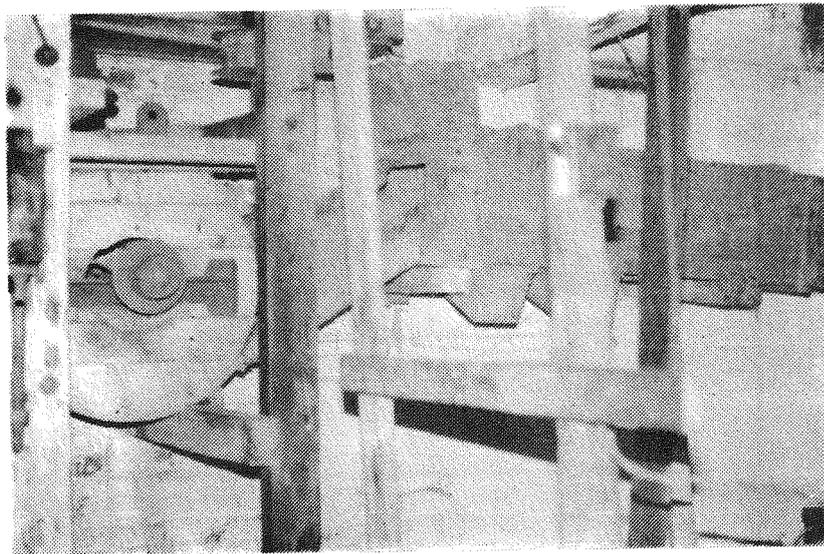


Plate 16. The winnower showing the fan, and above it, part of the sieve drive pulley.

horizontal axle, A3, to one with a vertical axle, so needing to be twisted through 90°. This was helped by passing the belt over a small cast iron roller fixed to one of the roof beams near to pulley A3 (see Figure 27). As lineshaft A would be rotating at around 135 r.p.m. then pulley A3 would have had a slightly smaller diameter than the pulley connected to the oatmeal stones in order to provide a speed of 120 r.p.m. at the oatmeal stones.

The system consists of a bin on the top floor which feeds into the hopper and shoe sitting on top of the tun surrounding the Mow Cop stones. The quant has a square sleeve keyed onto it to vibrate the feed shoe. The runner stone is mounted on a four-armed rynd and mace on top of a vertical shaft which is driven by the quant and passes through the bedstone to terminate at a footstep bearing mounted on a bridgetree supported by wooden hursting on the ground floor. The position of the bridge tree, and hence the gap in the millstones, is determined by the position of a screw mounted on the end of the bridgetree. Just above the bridgetree there are two pulleys, with flanges on their lower edges, fixed to the vertical shaft. These pulleys are 17ins. and 23½ins. diameter each, with the smaller of the two being the topmost (see Figure 34).

The belts from these pulleys, which are now absent, drove the sieve and winnower. The sieve is suspended from the ceiling beams of the ground floor by four pieces of string, one at each corner. The top belt connected to a 7½ins. diameter horizontal pulley with flanges, the short shaft of which has a crank attached to the side of the sieve. This crank imparts a sideways shaking movement to the sieve at a rate of nearly 275 oscillations per minute (see Plate 15). The lower of the two belts drove the winnower fan via a 4½ins. diameter vertical pulley, consequently the fan would have rotated at something in the region of 660 r.p.m.. This belt has to change from a horizontal plane to a vertical plane in the very confined space between these two pulleys. This was achieved by passing the belt over two rollers that used to be attached to the fan casing. Unfortunately these rollers are no longer present but the bracket that held them in place is still to be seen (see Plate 16).

The winnower has a large wooden trunk with the fan blowing air in one end, where the milled material also enters. There are a couple of positions along its length to hang sacks to collect the various grades of the output and the lighter waste material would be blown out of an opening at the end furthest from the fan.

The oatmeal process starts in the kiln. The sacks of oats are delivered to the loading door on the side of the kiln facing the mill and are stored on the top floor of the kiln. The furnace is accessed by a door on the side of the kiln facing the stream to where the fuel would be brought for the furnace to be lit. When required the oats would be deposited onto the kiln floor from the central doorway from the store room, spread evenly over the kiln floor and left to dry. Once dry they would be shovelled down the two spouts leading from the kiln floor into the room under the store and into sacks. These sacks would then be transported to the top floor of the mill via the sack hoist. This process would have been used on most of the local grain brought to the mill.

The first part of the oatmeal process was to remove the husk from the oats, this was called "shulling" and gave rise to the phrases "shulling mill" and "shulling stones". To achieve this the oats would be poured into the bin on the top floor and allowed to feed down into the hopper above the oatmeal stones on the first floor. The gap between the stones was set quite wide for this part of the process, sufficient just to "crack" the oats, removing the husk from the kernel. The output from the stones was then fed into the sieve on the ground floor whose shaking motion ensured that the dust passed through the sieve to be collected and the larger material was passed into the winnower. Once in the

winnower the air blast blew the lighter husk material out of the end of the winnower while the heavier kernel was collected in a sack part way along the machine.

The next stage in the process was to return the kernel material to the milling process where the stones would be set to a smaller gap. The output would be once again be sieved to remove any dust and the winnower would separate out the product into various grades of fineness as required.

Lathes and other small machinery

In the north-west corner of the first floor there used to be a number of 19th and early 20th century lathes and other small machines. These were used for a variety of jobs such as making wooden bobbins for the Leek lace industry. All these machines were belt driven from the auxiliary drive shafts. The power was transmitted via pulleys A1, B2, B3 and C5 to lineshaft C. On lineshaft C there are four pulleys a various size, C1 - C4, which were used to drive these lathes, etc.

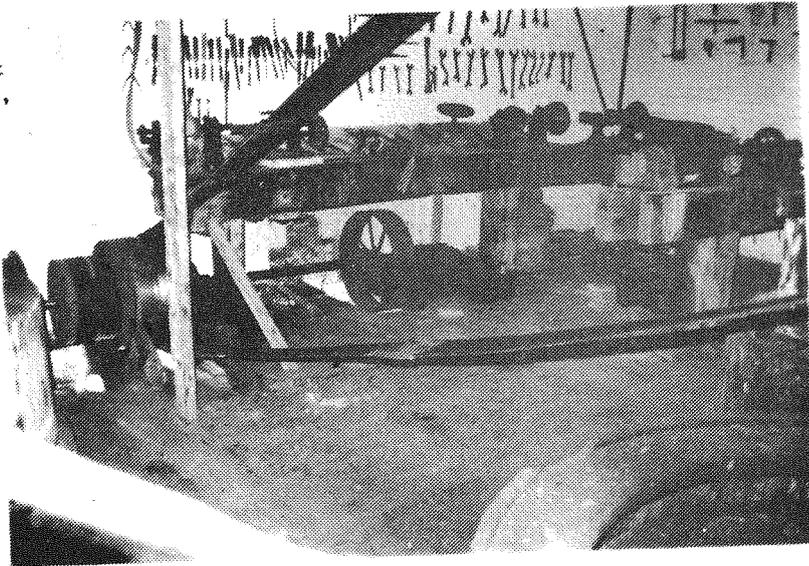
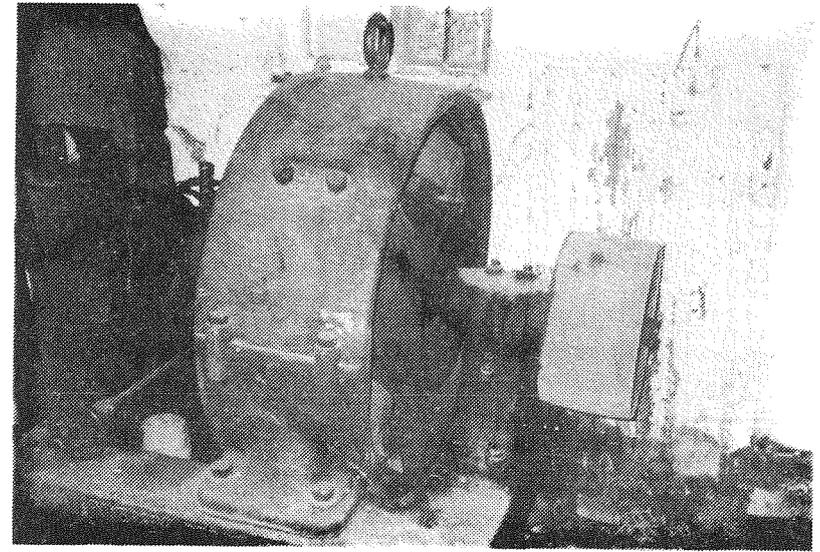


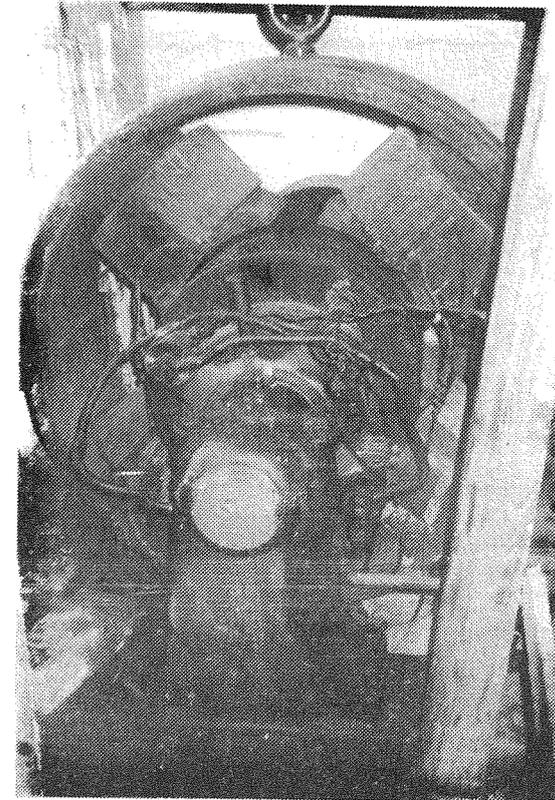
Plate 17. The benches and tools in the north-west corner of the stone floor with the various lathes driven from lineshaft C (above the bench, not in the picture). Note the main belt drive from lineshaft A to lineshaft B (lineshaft B runs under the bench).

Electricity generation

Originally a direct current (d.c.) generator was installed for use as the domestic supply to the mill house and for charging batteries. This large generator, or dynamo, situated on the ground floor, was made by Paterson Cooper & Co. Ltd. of Paisley, and



Plates 18 & 19. The d.c. generator made by Paterson Cooper & Co. Ltd. of Paisley.



supplied by Jonathon Booth, millwrights of Congleton in the early 1920s (see Plates 18 & 19). The power for this dynamo came to lineshaft B via the main drive belt from pulley A1 to B2. From lineshaft B there was a belt from pulley B1 passing down through the floor to the 17ins. diameter pulley attached to the dynamo drive shaft (see Figure 26). If the waterwheel was run at normal stone grinding speed then the dynamo would have a speed of about 300 r.p.m.

This power became so important to Wilf Lancaster that in 1928 he purchased a Crossley Brothers 7 HP semi-diesel engine which he installed outside the mill near the tailrace (see Plate 20). The engine was then connected by a belt directly to the dynamo drive pulley instead of the belt from pulley B1. In order to facilitate this connection, a crude hole was knocked in the wall to pass the belt from the engine to the dynamo. There is no evidence that the engine drove any more machinery than the dynamo but at least the supply to the house was guaranteed at all times, even if the water supply was low. It would also ensure far less fluctuation in the domestic supply.

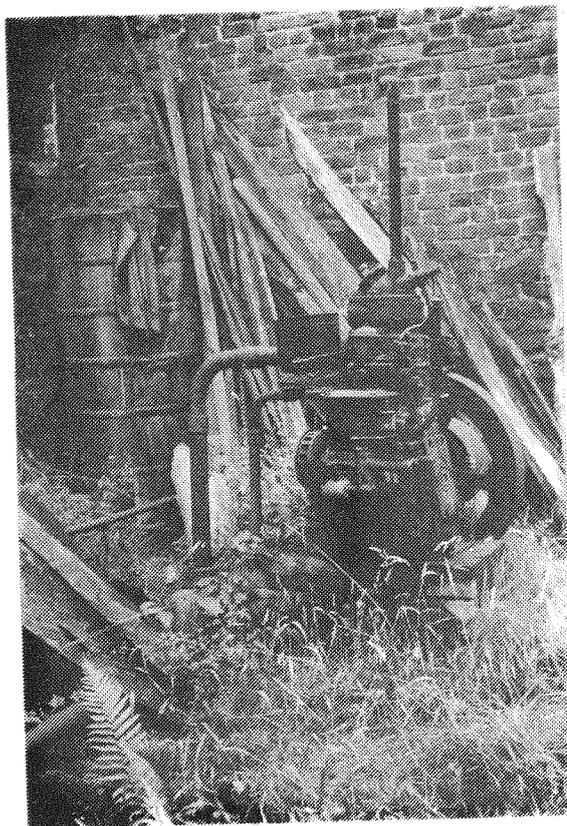


Plate 20. The Crossley Brothers' semi-diesel engine used to generate electricity.

The alternating current (a.c.) generator was acquired much later, after the Second World War, and although the generator and regulator are situated in the small extension on the ground floor quite close to the dynamo (see Figure 32), the power transmission followed an altogether different route. Power having been delivered to lineshaft B by the belt from pulley A1 to B2, it was then taken through the south wall of the mill by lineshaft B into the space under the lean-to on that side of the mill where pulley B5 is connected by a belt to pulley D2 on lineshaft D (see Plate 11). Although lineshaft D runs across the lean-to, it also enters the mill, so bringing the power back into the mill underneath the winnower on the ground floor. Here pulley D1 is connected by two narrow belts to two parallel pulleys of 5ins. diameter on the a.c. generator which in turn is connected by two belts, via similar 5ins. diameter pulleys, to the excitor (see Plate 21). The ratio of the pulleys involved would have given a machine speed of 1500-1650 r.p.m. from a water wheel speed of 12-13 r.p.m. Between them these machines generated 240 volts a.c. and as a.c. devices are much more critical in their operation with respect to fluctuations, not only of voltage but of frequency, a regulator was also used on this supply which according to Alf Lancaster "worked a treat"!

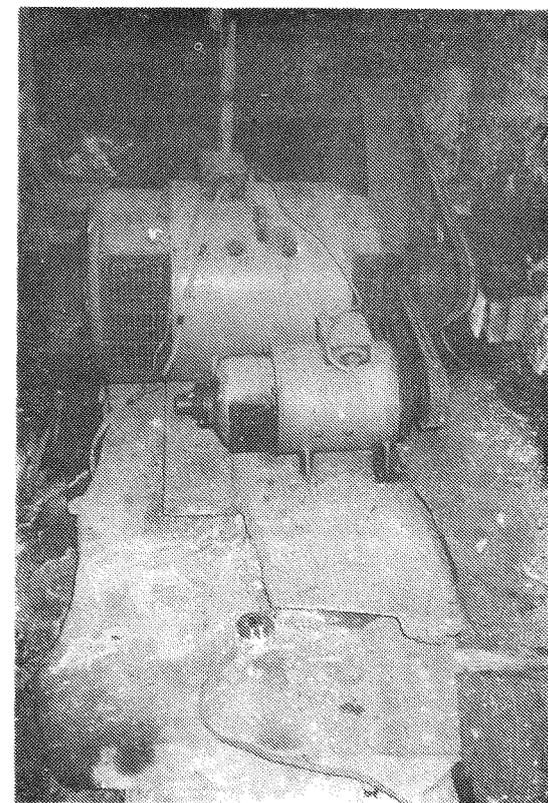


Plate 21. The a.c. generator and excitor showing the interconnecting drive belts.

Saw Milling Machinery

At the time of the survey all the saw milling equipment had been removed from the mill although it is possible to determine what type of machines were used and how they were driven by examination of the remains at the mill and through old photographs. The largest wood working machine was a plank saw, made by Thomas Robinson & Son, of Rochdale (see Figure 35 and Plates 22 & 23), accommodated in a roofed structure about 10 yards to the west of the mill (see Figure 2). Power was required for the carriage which fed the tree trunk to the saw and for the saw blade itself.

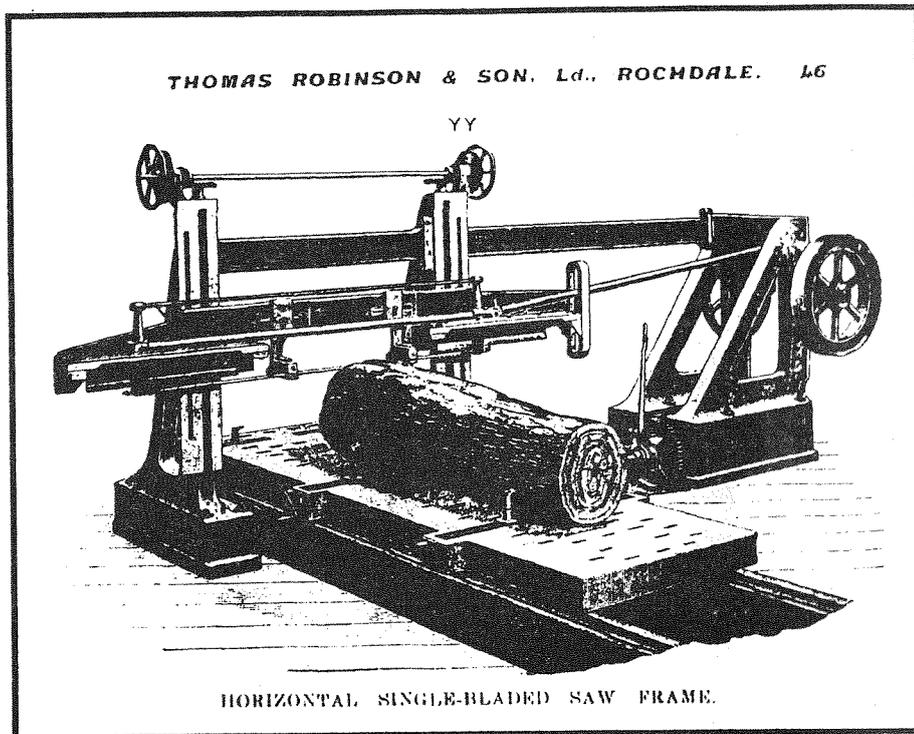
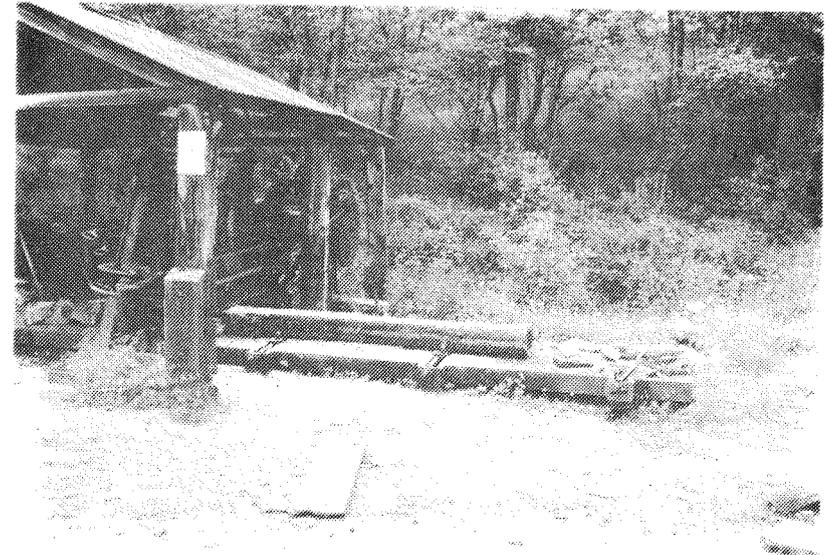
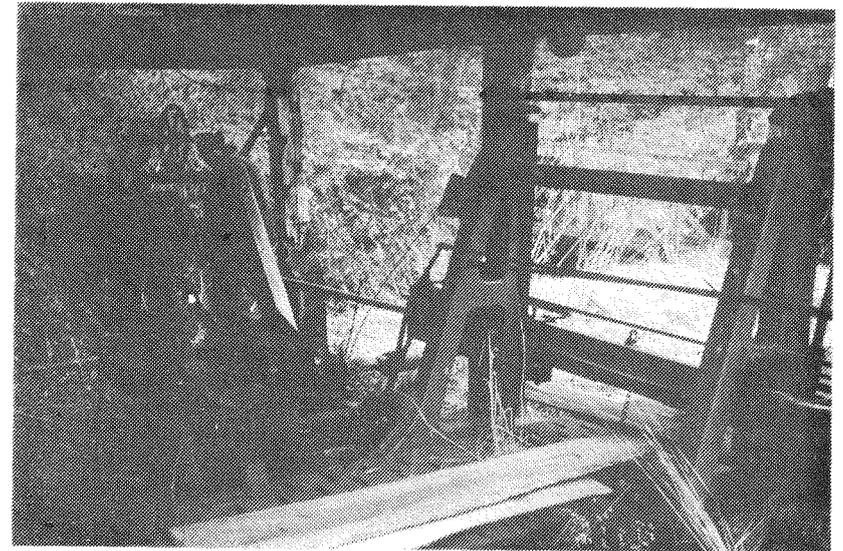


Figure 35. Illustration from a catalogue of Robinsons of Rochdale (c.1900) showing a plank saw similar to that once used at Swettenham.

Power was delivered to lineshaft B as described previously. From lineshaft B there used to be a drive belt from pulley B4 down through the first floor to a pulley on another shaft at ground floor level. This shaft ran at right angles to all the other lineshafts in a westerly direction in order to connect with the frame saw in its enclosure. Because of the change in direction of the shafts the drive belt from pulley B4 would have to be twisted during its travel. As both shafts were horizontal this twisting was achieved without recourse to any rollers.(see Figure 27)



Plates 22 & 23. Two views of the plank saw in operation.



The other wood working equipment comprised of a circular saw and a band saw which were housed in the lean-to attached on the south-west corner of the mill (see Figure 11). Both these saws were also made by Robinsons of Rochdale. The circular saw stood at the west end of the lean-to alongside the mill wall and was belt driven from pulley D3. The rest of lineshaft D has been recently removed from its correct position (presumably when the wood working machines were removed) and is lying loose inside the lean-to. When in its correct position, lineshaft D drove the band saw by a belt from pulley D4. The band saw was positioned on the raised section of the floor under the lean-to alongside the mill door. In earlier times, there used to be another circular saw, used for rough sawing, positioned near the mill entrance. This was powered by a belt from pulley D5. This pulley could also drive a large, free standing lathe which, also in earlier times, was situated just outside the lean-to near the rough cut circular saw.

The Kiln

The use of the kiln has been explained in connection with the production of oatmeal and was also used for drying other cereals before milling. This was a very common and necessary process in the wetter parts of the country, with a long history of use. There was a kiln on the same site at Swettenham in 1762.

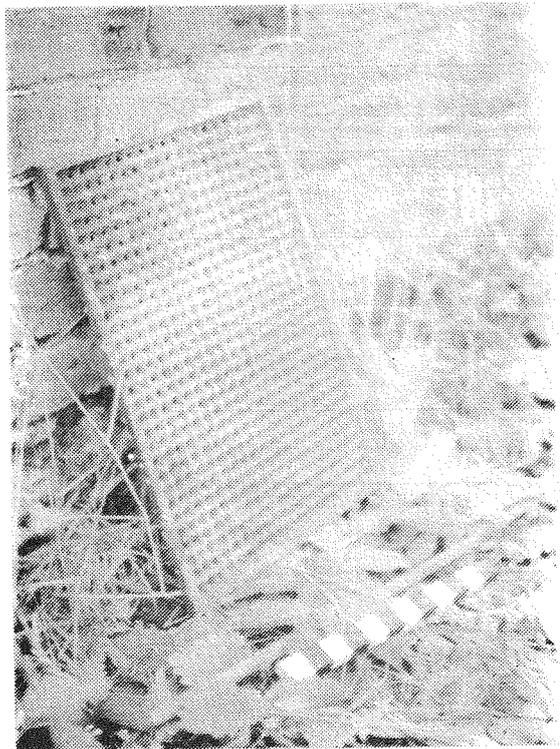


Plate 24. A view of the underside of one of the of the cast iron kiln tiles, showing the countersinking. (The rule is in 1ins. sections.)

The kiln floor at Swettenham is 14 ft. wide by 16ft 4 ins long made up of cast iron plates measuring 12ins. wide by 18ins. long each, supported by a cast iron framework. This leaves a space about 18 inches high, between the top of the furnace and the kiln floor, for the hot air to circulate. The plates have a matrix of small holes in them to allow the hot air to rise through the grain. There are 29 rows and 19 columns of holes in each plate which on the underside have a concave countersink (see plate 24). Along the long edge on each side of the kiln floor there is a row of ceramic tiles, each 12ins. square, arranged at an angle to the kiln floor. These are also pierced by a matrix of holes and are probably the survivors of a ceramic kiln floor that existed before being replaced by cast iron in the 19th century. In one corner of the floor there is a chimney leading from the furnace area under the floor but ending about three to four feet above the kiln floor. Any smoke from this chimney would then have to find a way out of the kiln through any gaps in the roof. Obviously working in the kiln would have been not only quite hot but probably very smoky!

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