The Life and Death of a Flourmill: McCrossin's Mill, Uralla

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To varying extents old buildings are historical documents. In the following paper Luke Godwin of the Department of Prehistory and Archaeology, University of New England, discusses his recent investigations of McCrossin's Mill, a late 19th century flourmill at Uralla in northern New South Wales. He sees the construction of the mill and the material remains of its working life, closure and subsequent use, as a reflection of the economic history of New England, in particular of the history of the former flour and wheat industry of this area. Furthermore, he sees the life and death of this mill as part of a changing economic pattern in Australia, in which flourmilling, like some other industries, gradually became concentrated in the main cities. The millstones of small country mills like McCrossin's were unable to produce a flour that could compete with that of the steel roller mills of the big cities and, because the country millers could not afford to adopt the new technology, their mills were doomed to closure.

During May and September 1981 a flourmill in Uralla (a small town 20km south of Armidale, N.S.W.) was surveyed and selected areas excavated, by myself. This work was carried out for the Heritage Council of N.S.W.[1] During the excavation many artefacts were recovered, some confirming the known history of the mill in that their stratigraphic relationship was consistent with the oral and written records. Of more immediate interest, however, was the building itself and the major structural features related to its life as a flourmill, recorded during the survey and excavation. It is this second aspect I will be considering in this paper. I will describe the mill as a functioning unit, as far as can be determined from the remaining features. I will also attempt to set the mill within a regional economic history background, as a means of explaining some of its features.

HISTORICAL BACKGROUND

McCrossin's Mill was built in the late 1860s and early 1870s by John McCrossin.[2] At that time there were two other steam-powered flourmills operating in Uralla, one run by a man named Kirkwood and the other by a Mr. Alex Porter.[3] There were, all told, seventeen steam, wind and water-powered mills operating in the New England region in the early 1870s.[4] Fifteen of them had steam-driven machinery.

McCrossin's Mill was equipped with a sixteen horsepower engine, capable of driving three sets of millstones. The production capacity of the mill was about 1000 bushels per week.[5] While this is negligible by today's standards and minor by those of the larger mills of the day,[6] it was nevertheless an enormous output relative to the population of Uralla in the 1870s, which was certainly less than 350 people.[7] Assuming a population of 350 people, the mill running at full capacity and a bushel of flour weighing 44 pounds, the amount of flour per person per week in Uralla would have been in the vicinity of 130 pounds. Bearing in mind that there were two other mills operating in Uralla at the time, the rationale for building this mill does not appear to have been simply to supply the local market, even if one takes into account the population of the nearby Rocky River Goldfield. Production potential of the large number of mills in the New England region must have been far in excess of the needs of the local population.

The New England region was seen at this time as a great wheat-growing area by both locals and visitors. Statements extolling the suitability of the region as an agricultural centre are readily available, many making mention of the wheat-growing potential of the area.[8] Suggestions were proferred concerning the markets to which the great surplus of wheat grown in the region in 1866 could be exported.[9] With the outbreak of stem rust in the wheat crops of the N.S.W. central coast,[10] millers probably did not have to look too far.

Production figures bear out this need to find wider markets for New England wheat. In the late 1850s and early 1860s there was a good market for local wheat and flour, and a price of 8 shillings per bushel of wheat could be obtained.[11] By 1865 and thereafter, local production exceeded local consumption, with a concomitant price drop to between 3 shillings and 4 shillings and 3 pence. In 1870 the price was 4 shillings a bushel. In 1871 the price rose to 7 shillings a bushel, but no more than 69 per cent of the crop was locally consumed. In 1872 there was an increase in population due to an influx of tin miners but the price dropped to 6 shillings and 3 pence per bushel as the local crop increased by 53 per cent.[12]

This evidence clearly demonstrates that the region was actually producing and processing more wheat than it could use. Moreover it implies that people could think in terms of exporting the surplus. I think this offers some explanation for the profusion of flourmills in the area. They were built in the belief that prospects of a long-term, well-paying business in exporting flour were very good. There is some circumstantial evidence that John McCrossin thought this. At about the time that he would have been planning to build the mill, we find him making the statement that he wanted to sell his general store in order to pursue another line of business 'more congenial to his habits'.[13]

The reasons for this growth in the New England flour industry can be attributed to a number of factors. Perhaps foremost amongst these were the movement of the industry, during the period 1860-1880, away from the coastal zone to the Tablelands and thence to the western slopes and plains, and Robertson's Land Acts of 1861.[14] It seems, however, that owning a flourmill was not necessarily as profitable an enterprise as McCrossin and others perhaps envisaged. The complexities and fluctuations of the flour trade of this period have been examined in detail elsewhere and the effects analysed.[15] Here I will only present some details illustrating the situation in Uralla and the New England region.

Not long after the second of the mills commenced operation in Uralla, prices charged for 100 pound bags of flour started to drop. In August 1867, Porter's flourmill was charging 13 shillings and 6 pence. Kirkwood was charging a slightly lower price of 13 shillings.[16] These prices were 6 pence and 1 shilling lower respectively than prices charged in Armidale and Inverell at that time.[17] In November of the same year the prices charged by these two mills averaged 12 shillings, fully 2 shillings below general current market price.[18] In previous years Kirkwood had been charging the same price as mills in Armidale.[19] These lower rates seem to represent a price-cutting war between the millers of Uralla.

In 1870 one of the two mills operating in Walcha was offered for sale by auction.[20] It must have been passed in at auction because there is an advertisement less than two months later offering the same mill for sale by negotiation.[21] This later advertisement appeared regularly for a couple of months. In December of that year the mill owner was listed as being insolvent.[22] The following year there is an account of Armidale in which it is reported that only one of the four flourmills was operating on a full-time basis and at least one of the others was losing money.[23] This was during a drought but it emphasizes the uncertainties of business faced by the local flour traders. Sydney millers could overcome such problems by importing wheat from South Australia, Tasmania or overseas if necessary.[24]

Apart from the shift of the wheat belt to areas west of the Tablelands, and this leading to less wheat production and hence less flour production in the area (a problem partially off-set in some other areas by importing wheat) two other connected factors led to the demise of the local industry. The first of these was the importation of flour into the area. This occurred from at least 1871 onwards.[25] South Australian flour appeared to be the major culprit. One correspondent to the *Armidale Express* felt moved to write in 'scientific' defense of the local product:

> 'Know this, Mr. Cincinnatus, and it is a fact. That good New England flour makes sweeter bread than Adelaide flour; it is not so rich a colour, but for sweetness and nutritious properties it excells any flour that the colony can produce. Do you doubt it? Well, I can prove it, even by a dumb animal. Put a feed of Adelaide bran and a feed of New England bran before a horse; he will invariably take the New England, both being in bulk the same lot'.[26]

South Australian wheat could be produced for less than New England wheat. Machines could be used to sow and harvest the South Australian wheat, but the conditions required for these to be employed could not be met on the Tablelands. Because of the extra labour required as a result, production costs for the Tablelands exceeded 4 shillings per bushel. At Inverell where the new techniques were used, a price of 3 shillings per bushel gave the farmer a profit.[27] Also South Australian wheat grew in a drier, warmer climate so that the grain ripened more speedily than did wheat grown in the wetter, cooler climate of New England. This influenced the grinding and baking quality of the flour, South Australian flour being of a better quality.[28] The second reason was the introduction of steel roller technology. This was first used in South Australia in 1879; it appeared elsewhere in Australia in the early 1880s. The effect of this on flour production was two-fold. First, it gave a better grade of flour, as it scraped away the husk rather than crushing the grain, as grindstones did.[29] This, in turn, led to an increased demand for roller-ground flour because of the resulting improved baking qualities. People were prepared to pay higher prices for it in preference to cheaper stone-ground flour.[30] Second, steel rollers were much more efficient than grindstones, doubling the daily output of a mill without the need for more labour or fuel.[31] The mills in the New England area were all grindstone mills. To convert to steel rollers would have been prohibitively expensive, particularly given the already depressed state of the local industry. The cost of establishing a grindstone mill was between three and four thousand pounds. The cost of a steel roller mill was five to seven thousand pounds.[32] Anyway, as Linge argues, only big mills in the main cities displayed any significant improvement in tonnage per unit capital invested, so that change-over might not have saved the local industry in New England.[33] The hard times experienced and the closure of mills in the New England region was not, however, an isolated historical event. A number of country mills in most areas of Australia closed partly for these reasons at this time, and the bigger Sydney, Melbourne and Adelaide milling companies established their control of the industry. In South Australia there were 113 mills operating in 1878, but by 1890 there were only 81.[34]

After closing down as a flourmill in the mid-1890s, the McCrossin's Mill building was used for a variety of purposes. Early this century the building was bought by a skin-buyer and used as the premises for this business. Then the Coopers, a local business family, bought it and used it for their undertaking and hardware business. They also had a tank-maker named Crossman using part of the mill to ply his trade. It was at some time during this part of the mill's history, c.1900–c.1930, that the engine was removed to the Rocky River Goldfield. It was also probably during this period that the milling machinery was removed and the boiler room demolished. About 1935 the building was bought by the McRae family and used as a storehouse for their grocery and produce business. The boiler was buried on the site of the boiler room by Ken McRae in the early 1960s.[35] In 1979 the building was bought by the Uralla Historical Society, and restoration, funded by the Heritage Council of N.S.W., began at that time. The building is now being used as a local museum, with displays of both Colonial and Aboriginal local history.

STANDING REMAINS

McCrossin's Mill faces south-west onto Salisbury Street, Uralla. It is 18m long, 12m wide and three stories high (Fig. 1). Level with the ground floor (about 1m above present street level) and running the length of the mill, is a front verandah, 1.5m wide (Fig. 2).

Originally, the rear of the mill only had one row of windows in it, these being on the first floor. The ground floor originally had a solid back wall with only a single-door entrance near its centre.[36] The rear of the mill has been substantially remodelled in the past, however, and most of the wall was removed, leaving two wide entrances separated by a brick pier, as well as the original door.

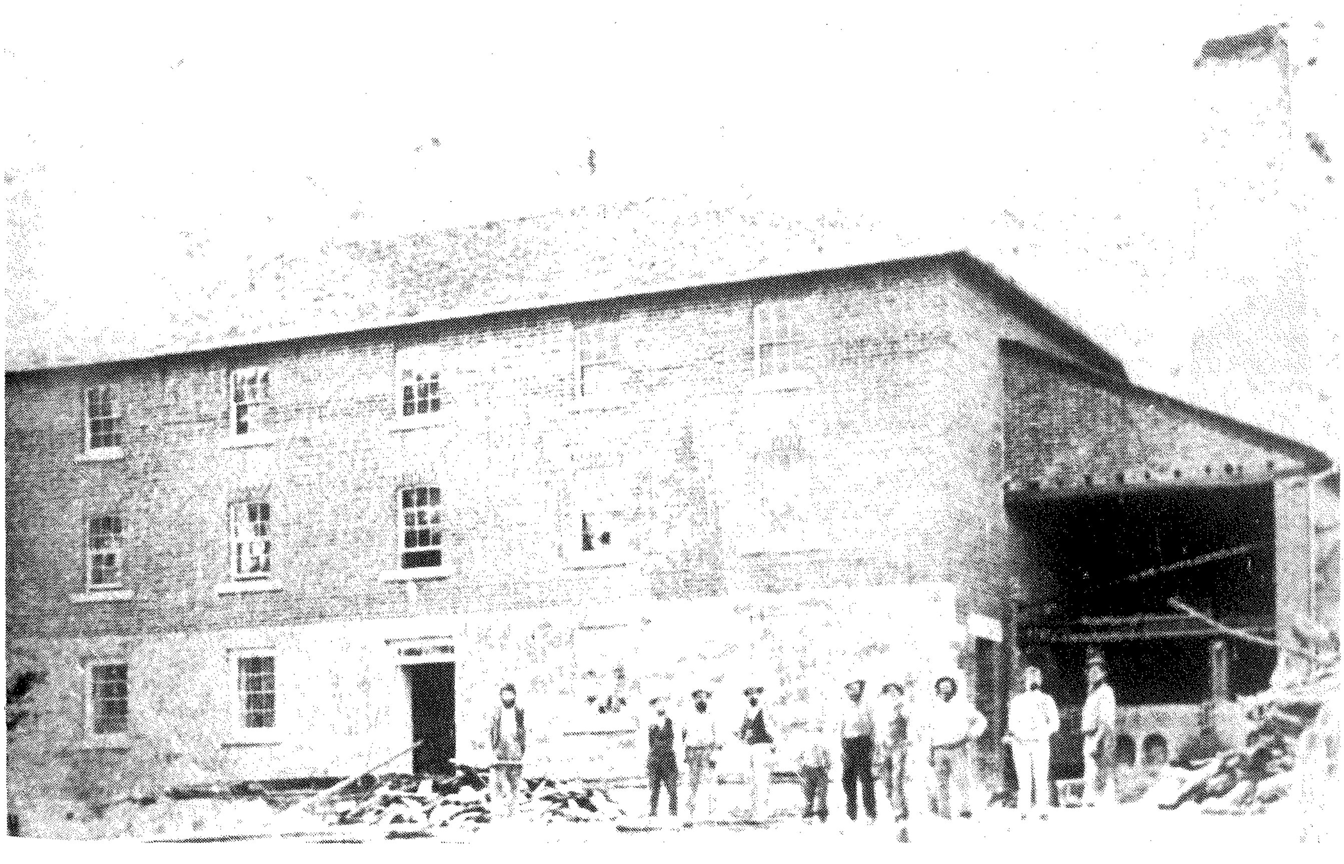
The foundations and ground-floor level of the front, rear and north-western walls of the mill are built of locally-quarried white granite. The south-eastern wall is constructed entirely of brick. The upper stories of the front, rear and north-western walls are also built of brick. The bricks appear to be handmade, as suggested by their porous quality and variations in demensions. I located the ruins of a brickworks on the northern outskirts of Uralla. Samples of the bricks found there bear many similarities with the bricks used in the mill, and this may have been their source.

The walls of the mill are not a consistent thickness on the three floors. The ground-floor walls are 605mm thick; the first-floor walls are 490mm thick; and those of the second floor are only 360mm thick (Figs. 2–4).

There are two features of interest in the brickwork of McCrossin's Mill. An examination of the bonds employed to tie the brickwork together revealed that two bonds were used. In the main, and certainly for the outer wall of the mill, the bricks were laid using English Bond, which is a course of headers and a course of stretchers alternating up the wall.[37] However, on the inside back walls of the first and second floors, the brickwork is a crude example of Colonial Bond, the ideal of which is a course of headers and three courses of stretchers.[38] It is a crude example because there are as many as five courses of stretchers between lines of headers. If this brickwork can be labelled Colonial Bond, then it represents an early example of this form. Although this bond was in use in Sydney in the late 1850s, it was not widely popular until the 1880s.[39] By way of contrast at its early use in Uralla, Colonial Bond had not reached Wagga Wagga, a town of similar distance from Sydney as Uralla, until 1905.[40] (Some explanation for this may possibly be found in the different economic developments of the two regions.)

This use of a relatively new form of bond so early, in an outlying area of the colony, suggests that some of the apparent conservativeness in rural architecture may be a reflection of the difficulty in obtaining the necessary raw materials, rather than an unwillingness to use the new ideas. For instance, wooden shingles were used on the roof of the mill rather than the corrugated iron that was available at the time. This was probably due to the fact that materials which could not be locally produced had to be freighted in on bullock drays, a costly and slow process. Corrugated iron *was* used for roofing the chaff shed (built in the 1880s) because the railway had been extended to Uralla by

Fig. 1: Henry Beaufroy Merlin's photograph of the front of McCrossin's Mill during construction.



that time, thus providing a cheaper means of transporting heavy, bulky items.[41]

To temper this speculation it is worth emphasizing the irregular aspect of the Colonial Bond used in McCrossin's Mill. This may be indicative of a labour force lacking skill and experience, rather than an attempt to incorporate a new style of brickwork (i.e. Colonial Bond).

As pointed out earlier, the south-eastern wall is built entirely of brick, whereas the front, rear and north-western ground-floor walls and foundations are constructed of granite, but all the walls of the upper floors are made of brick. The south-eastern wall is suffering considerably from the amount of water in the bricks: the wall is bowing out and the bricks are becoming very friable. The cause of this problem seems to be the amount of deposit next to the outside face of the south-eastern wall, this deposit retaining a lot of moisture close to the wall. Simple exposure to the elements can be eliminated because the upper floors of the mill, equally exposed to the elements, do not have this problem. This problem would not have occurred in the early days of the mill, as the south-eastern wall would have been protected by the now demolished boiler room and its roof, adjoining the mill at this end. It was perhaps necessary to construct the other ground-floor walls and foundations of granite because they would not have been protected in this way. The local bricks, described as 'somewhat porous' and absorbing 'much water',[42] would have been subject to the attrition mentioned above if used. Two inferences would present themselves. The first of these concerns the date of the building of the chaff shed, adjoining the north-western end of the mill, which will be discussed in detail below. The second concerns the reason for using bricks.

It seems that bricks were utilized whenever possible in the construction of the mill (e.g. the south-eastern wall), at the expense of granite. This suggests that bricks were cheaper than granite for construction purposes, or that they were more easily obtained than granite (this may of course have been a contributing factor to the relative cost of bricks and granite). We can safely dismiss the second of these options, as the source of granite used in McCrossin's Mill was a quarry a couple of kilometres west of Uralla.[43] Of course another factor controlling ease of obtaining granite would be the presence of stone masons in the area, to quarry and dress the stone. The beautiful masonry-work to be seen in McCrossin's Mill, however, is silent testimony to the presence of skilled masons in the locality.

Unfortunately I have no prices of bricks and stone for the period when McCrossin's Mill was built. If figures available for 1903 can be taken as a relative guide to the costs of bricks and stone thirty years previously, bricks were certainly much cheaper than granite as building materials. Granite cost from 7 shillings and 6 pence to 11 shillings per cubic foot. The cost of enough bricks to build one cubic foot would have been 4 shillings and 3 pence (2 pounds and 10 shillings per 1000 bricks;[44] the bricks having the assumed dimensions of 8 inches x 3½ inches x 2½ inches).[45] They were also probably quicker and easier to lay than granite, and a relatively unskilled labour force could be used, thereby further lowering costs. (It is worth noting that although brick and/or stone appear to have been used in a majority of mills, it was not necessarily essential. At least one flourmill of this period in the New England region was constructed of wood, with granite foundations.[46] Wooden mills, of course, would not be as durable as brick and/or stone ones, and so few, if any, examples of them are to be found now).

Inside the mill two main features are evident. These are: (a) the milling area, and (b) the engine room. The engine room is located in the south-eastern section of the mill (Fig. 2). The room is about 12m long and 3m wide. Before excavation commenced there was a wooden floor in the engine room at the same level as that now in the milling area. On removal of this floor a series of granite blocks were found extending up the centre of the room. These blocks represent a large portion of the bed for the steam engine. The length would suggest that the mill was equipped with a horizontal steam engine.[47] Mid-way along the wall separating the engine room and the milling area is a square opening. This is best interpreted as a wall box, designed to allow the transfer of power from the engine room to the milling machinery.[48]

In the milling area a number of features may be noted, despite the removal of all the milling machinery at some time in the past. At the front of the building are two flights of steeply-inclined wooden stairs leading to the first and second floors. Dividing the mill on the ground floor into three portions are a series of four brick piers towards the rear and a series of riveted, cast iron posts about 4m from the front wall (Fig. 2). On these supports are laid large wooden beams, which in turn support the floor-bearers above. On the underside of this floor are the remains of calico which has been stretched between the bearers and treated with a mixture of flour and water. The calico was intended to catch dust from the floor above.[49]

Next to the above-mentioned wall box are some substantial wooden beams (21cm x 21cm) some placed vertically, some horizontally. They were most likely associated with the power take-off from the engine and with support for the millstones located on the floor above.

On the first floor (Fig. 3) there are wooden posts instead of the riveted, cast iron posts. They serve the same purpose. The brick piers, of a lesser dimension, continue up through this floor. The floor above is supported in the same way as the first floor. Set in the floor about 2m from the front wall, quite close to the stairs, is a trapdoor arrangement. It consists of two doors, each double-hinged, opening upwards. These seem to be self-closing trapdoors to allow the hoisting of bags of wheat to the top floor.

The second floor has the same arrangement of brick piers but does not have the wooden posts (Fig. 4). The piers are to support the hipped roof of the mill. At the front of the building the roof is a normal height (about 3m) above the floor. At the back, however, it is only 1.2m above the floor. The roof of the mill was originally covered with wooden shingles, as evidenced by some still being present and by the close-set battens in the roof frame. The roof is now entirely clad in corrugated iron.

Adjoining the north-western end of the mill is a building almost as large as the mill itself (Fig. 2). This was the chaff-cutting shed. Its rear and north-western walls are of vertical slab construction. The front wall, level with the verandah, is made of corrugated iron.

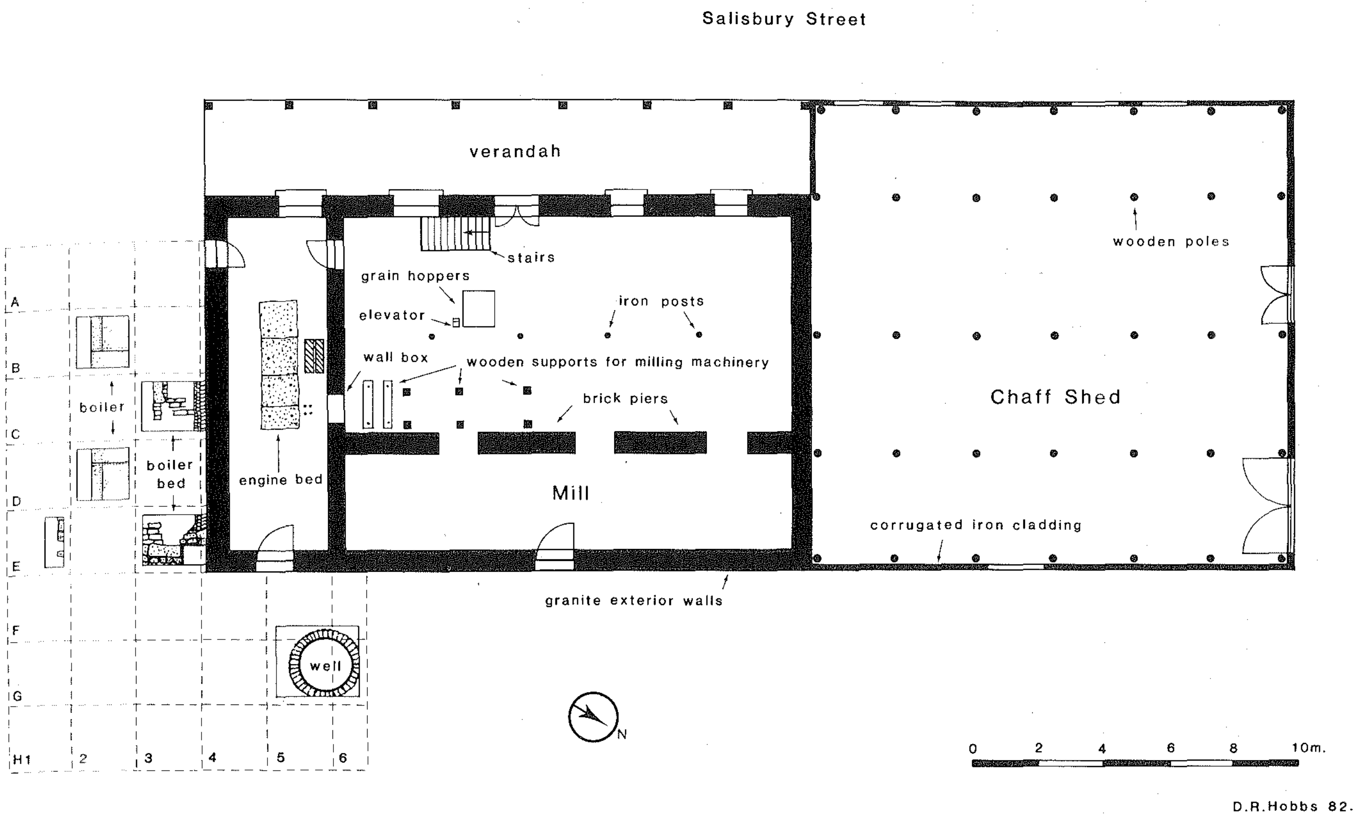


Fig. 2: Plan of the ground floor in 1981, also showing the excavation layout on the site of the boiler room.

Large, undressed poles support the roof frame, which is covered in corrugated iron also.

The exact date of the construction of the chaff shed is not known. However, a number of clues point to a date sometime after the construction of the mill, probably in the early 1880s. In the early photographs of the mill the chaff shed is absent (see Henry Beaufroy Merlin's photograph: Fig. 1). Nor do any of the early advertisements for the mill's produce make any mention of chaff-cutting facilities. Furthermore, if bricks were used wherever achitecturally possible in the construction of the mill, we may assume that it was not possible to use them in construction of the north-western wall of the mill. That is, granite had to be used because of the problem of groundwater soakage in an outside wall. This would imply that the chaff shed was not built at the time that the mill was constructed, nor had it even been envisaged.

In an advertisement dated to August, 1883 there is the first mention of the mill's chaff-cutting facilities. The advertisement also mentions a complete overhaul of the mill, and the chaff shed may have been built during this overhaul.[50] I think that the building of the chaff shed can be set within the scenario of declining trade for the local millers, as described earlier. Unlike the rest of the mill, the chaff shed is built of wood. Moreover, the shed is made of roughly-trimmed slabs, not the neatly-sawn planks that could have been purchased from one of the sawmills operating in town.[51] The chaff shed seems to have been constructed as cheaply as possible at a time when New England millers, including the McCrossins, were trying to attract as much of the local trade as possible, by offering cheap prices and as many services as possible. To speculate, it may be that, unable to afford to outfit the mill with steel rollers, the chaff-shed idea was developed by the McCrossins to try to offset this deficiency by offering some other service to encourage local custom.

The positioning of a wall box in the first-floor wall between the milling area and the chaff shed (Fig. 3) can be seen as a consequence of the later building of the chaff shed, and of the materials of which the mill's north-western wall is built. Because the chaff shed was built later than the mill and because the ground-floor wall of the mill at this end had been built of granite with no provision for a wall box, the quickest and simplest means of constructing the required wall box was to cut through the bricks in the first-floor wall. Implicit in this is the assumption that power for the chaff cutter was drawn from the engine driving the rest of the mill machinery. The chaff-cutting machinery was set up on a platform constructed at the height of the mill's first floor to facilitate this arrangement (Fig. 3).

McCrossin's Mill was apparently equipped with a sixteen horsepower engine designed to drive three sets of milling stones. Steven's flourmill at Walcha had three sets of stones driven by a fourteen horsepower engine.[52] According to Renwick in 1830 it was an adage of steam flour-milling that five horsepower were necessary for every pair of milling stones and associated machinery.[53] Tremendous developments took place in the steam engine during the period of forty years between Renwick's writing and the construction and equipping of McCrossin's Mill.[54] Despite this it seems that the old adage of the 1830s still held in the 1870s. From this it might be surmised that while engines themselves had become more efficient, the power-transmitting systems from the engine to the

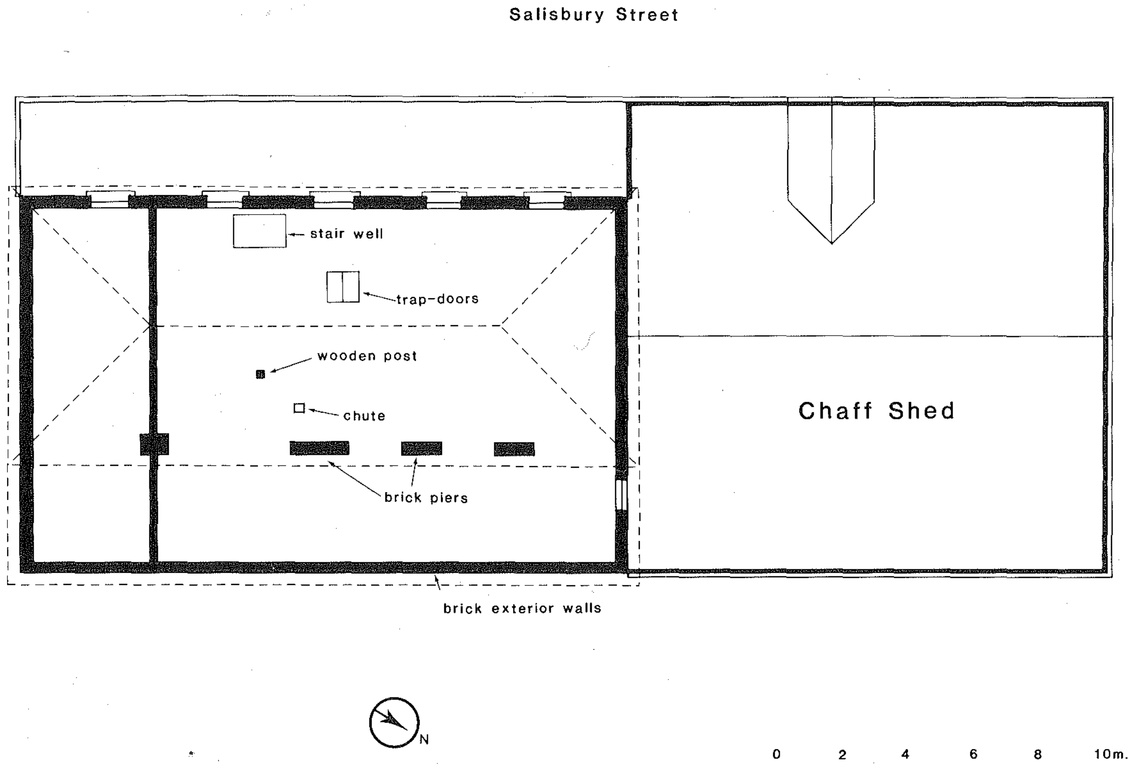


Fig. 3: Plan of the first floor in 1981.

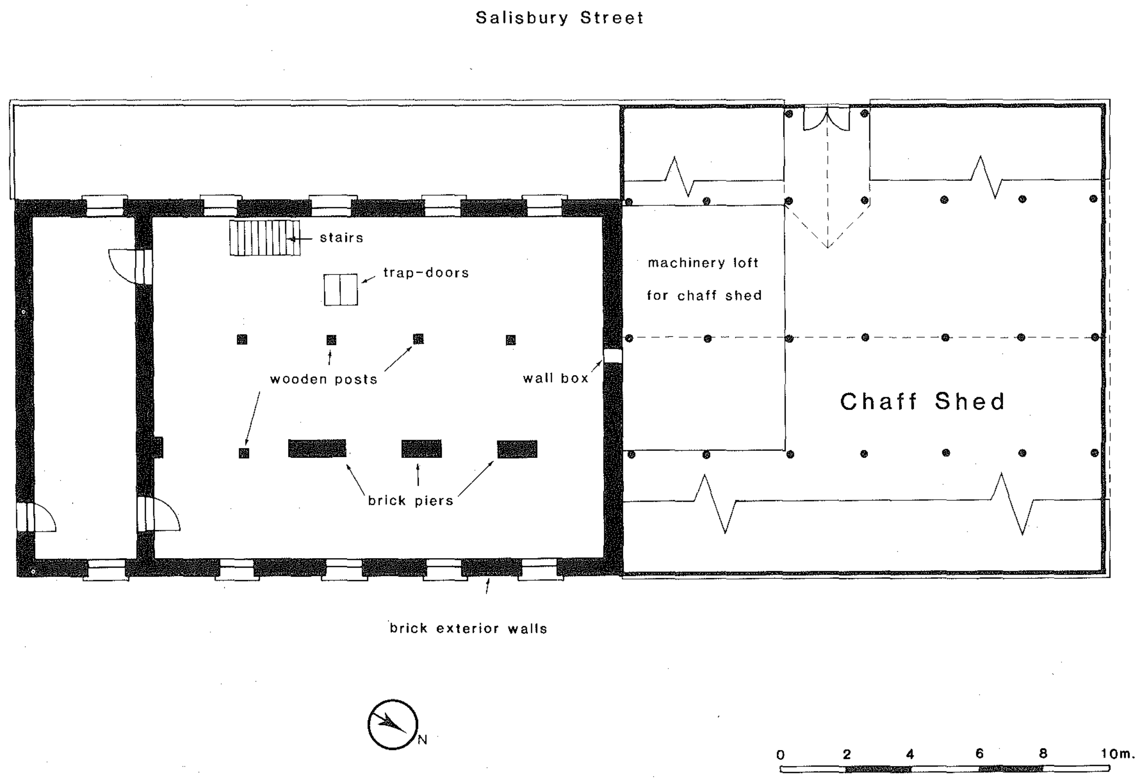


Fig. 4: Plan of the second floor in 1981.

machinery had not developed as much, and so it was necessary to maintain the same amounts of power from the engine to do the actual work of milling the flour. This conclusion gains support from Fairbairn's discussion of power transmission from the steam engine to factory machinery. He described in some detail the various methods available for power transmission, including drive shafts, but concluded by saying that, by and large, he still favoured the use of leather belting: the time-honoured form of power transmission.[55] It is apparent that, in the view of this steam-power expert, there was not much to choose between the available systems, and the old systems were as effective as the newer ones.

Looked at in another way, it could be argued that most mills were fitted with fifteen horsepower engines.

Calculating the average horsepower of flourmills in Victoria from Linge, the figure derived for flourmills in the 1860s and 1870s is between fifteen and seventeen horsepower.[56] Obviously some mills would have had more power and others less, but the correlation is very suggestive. Perhaps fifteen horsepower was an optimal size for mill engines, possibly because of an attempt to compromise between cost per horsepower and return on investment.

EXCAVATED REMAINS

There were four objectives in undertaking excavation at McCrossin's Mill. These were:

1. To empty the engine room of accumulated debris.
2. To uncover the boiler and any remains of the boiler room.
3. To locate and excavate a well in the vicinity of the mill.
4. To locate the base of the chimney stack for the boiler room.

Standard archaeological excavation techniques were employed, using grids to control the areal extent of the excavation. The first three objectives were substantially realized, and there is some evidence that the fourth may have been achieved. Here I will discuss features found during the excavation of the engine room, of the well and of the boiler room area (Fig. 2).

The engine room had a floor in it prior to renovation. On removal of this floor, the granite blocks forming the engine bed were uncovered. Surrounding them was a deposit of fine, dry sand containing much building rubbish such as glass, sheet iron off-cuts and rubble. The layering of this deposit roughly conformed to the known history of the mill. Iron off-cuts resulting from tank-making were found towards the base of the deposit. Then there was evidence of coffin-making in the presence of pressed tin and lead coffin decorations, and wood-working tools. On top of this was a variety of material, indicative of the mill's later use as a general storehouse facility for the McRae's grocery and produce business.

The deposit was not, however, of a consistent depth. On the south-eastern side of the room a bed of lime mortar was reached at a depth of 70cm below *engine room* datum (established on the back door sill). On top of this was 12cm of finely-crushed brick and mortar. Overlying this was a thin layer of greasy dirt, quite distinct from all other deposits above it. There were no artefacts in any of these layers. I interpreted the crushed brick and mortar as being the original floor of the engine room. It was based on the lime mortar in which was bedded the granite engine bed. The thin, greasy dirt layer represents the accumulation of oil and dust during the working life of the engine.

The area next to the wall separating the engine room and the milling area, however, had none of these features and was about 1.7m in depth below engine room datum. Scorings on the wall around the wall box were interpreted as resulting from the flywheel brushing the wall. If so, these indicate that the flywheel had a diameter of 290cm. The need to accommodate a wheel of this size would explain why this side of the engine room is so much deeper than the other.

The centre of the flywheel would have been approximately in the centre of the wall box. It seems that the axle of the flywheel passed through this opening to the milling area and power was then taken off it to drive the milling stones directly above on the first floor. The flywheel itself must have weighed somewhere in the vicinity of two and a half tons. The weight of the flywheel was calculated thus: multiply the number of horsepower of the engine by 2000, and divide by the square of the velocity of the circumference of the wheel per second. The weight obtained by this calculation is given in hundredweights.[57] At McCrossin's Mill the flywheel was approximately 290cm in diameter, and the engine was sixteen horsepower. Unfortunately we do not know the velocity of the flywheel. The following figures, however, are available for an engine to power an English flourmill.[58]

built : 1860
horsepower : 16
flywheel diameter : 10 feet
velocity : 50 r.p.m.

This machine has a number of features in common with the engine at McCrossin's Mill: it has almost the same flywheel diameter, the same horsepower, and was built for the same purpose at roughly the same time. I think it reasonable to assume that the flywheel velocity at McCrossin's would have been the same. A simple, straightforward calculation is now all that is required to convert this to flywheel weight.

$$\text{velocity} = \pi \times 290\text{cm}/\frac{60}{50}\text{ sec}$$
$$= \frac{\pi \times 290 \times 50}{60}\text{ cm/sec}$$
$$= \frac{\pi \times 290 \times 5}{6 \times 2.54 \times 12}\text{ ft/sec}$$
$$= 25\text{ ft/sec}$$
$$\frac{\text{HP} \times 2000}{\text{V}^2}$$
$$= \frac{16 \times 2000}{625}$$
$$= 51.200\text{ cwt}$$
$$= 2.56\text{ tons}$$

On the deeper (flywheel) side of the engine room there was a cavity under the footing of the rear wall with a basal depth of 1.92m below site datum. (Site datum was established on the east corner peg of panel E1 (Fig. 2). All engine room depths were taken from the door sill datum and then the depth of the door sill below site datum was added when necessary). I will discuss this feature further in relation to the well, to which we now turn.

The well was located just to the north-west of the engine room rear door, a slight depression indicating its location (Fig. 2).

Discussion with local residents yielded two important pieces of information. First, the well had been filled in during the past 50 years by the owners. Second, the well was supposed to be 7m (23 feet) deep. Excavation revealed a brick-lined well with an homogeneous filling with little change in stratigraphic detail, and two items dated to the 1950s (a coin and a bottle) were found 2m to 3m down the well. Over 4m of deposit was removed from the well during the period of excavation but its bottom was not reached.

Fig. 5: The portion of the boiler uncovered during the excavation of panel B2.

Three features of note were uncovered during the excavation of the well. Between 3m and 4m down the well five finely-worked, large pieces of granite were encountered and removed. These blocks had a number of holes through each of them and some had a thick layer of caked grease over some of their surfaces. The blocks are similar overall dimensions to those found in the engine room. The positions of bolt-holes through the blocks from the well also match those in the engine room blocks. The blocks recovered from the well may be the upper layer of the engine bed, removed and dumped down the well to make way for the floor in the engine room.

Closer to the surface, two pipes were found extending into the well, protruding from the well wall. One was 40cm below ground level and was a piece of downpipe. A water-pipe (38mm (1½ inches) diameter) was found 1.3m below ground level. The downpipe is in line with a downpipe from the roof of the mill. It appears that the well was really an underground cistern, filled by rain collected from the large area of mill roof. (Assuming the well was 7m deep and using the diameter of 1.55m recorded during excavation, it would have held about 7400 gallons.) One local informant told me, however, that the well was also a proper drawing well (i.e. it extracted water from the surrounding strata). The mill is situated on a slope leading down to a creek. Underlying strata consist of clay and granite, both very water-retentive. These factors would tend to support the informant's claim. If the well was also a drawing well, this would have eased the danger of running out of water if little rain fell during a given period.

The use of the water-pipe is not so clear. There is a good depth relationship between this pipe and the cavity in the engine room wall. The base of the cavity is 1.92m below site datum; the top is 1.55m below this point. The water-pipe is 1.62m below site datum. It may be that the pipe was associated with some system of pumping to and from the condensing chamber of the steam engine, to facilitate the steam condensing process.

In the boiler room area (Fig. 2), the layering of artefacts once again confirmed the oral and written sources for the later history of the mill as had the stratigraphy of the engine room debris. Two other main features were uncovered in this area. The first of these was the boiler itself. This was uncovered in panels B2 and D2 (Fig. 5). The second was a section of brickwork in panels C3 and E3, interpreted as being the boiler bed (Fig. 6). The bed is of a form developed for Lancashire boilers, with flues running down both sides of a brick support and the walls of the bed curving up around the boiler.[59] I am not sure, however, if this type of bed was used exclusively for Lancashire boilers or not. Unfortunately only the top of the boiler was uncovered so it was not possible to ascertain its complete form. Further excavation will resolve this question.

Comparison of the position of this boiler bed with the position of the boiler in Henry Beaufroy Merlin's photograph (Fig. 1), taken during the mill's construction, reveals an anomaly. In Merlin's photograph the boiler is much further from the wall than is indicated by the boiler bed uncovered during excavation. This discrepancy can be resolved: a long-time resident of Uralla said he thought the boiler had been replaced in the early 1880s.[60] This possibility is supported by an advertisement placed by Helen McCrossin (John

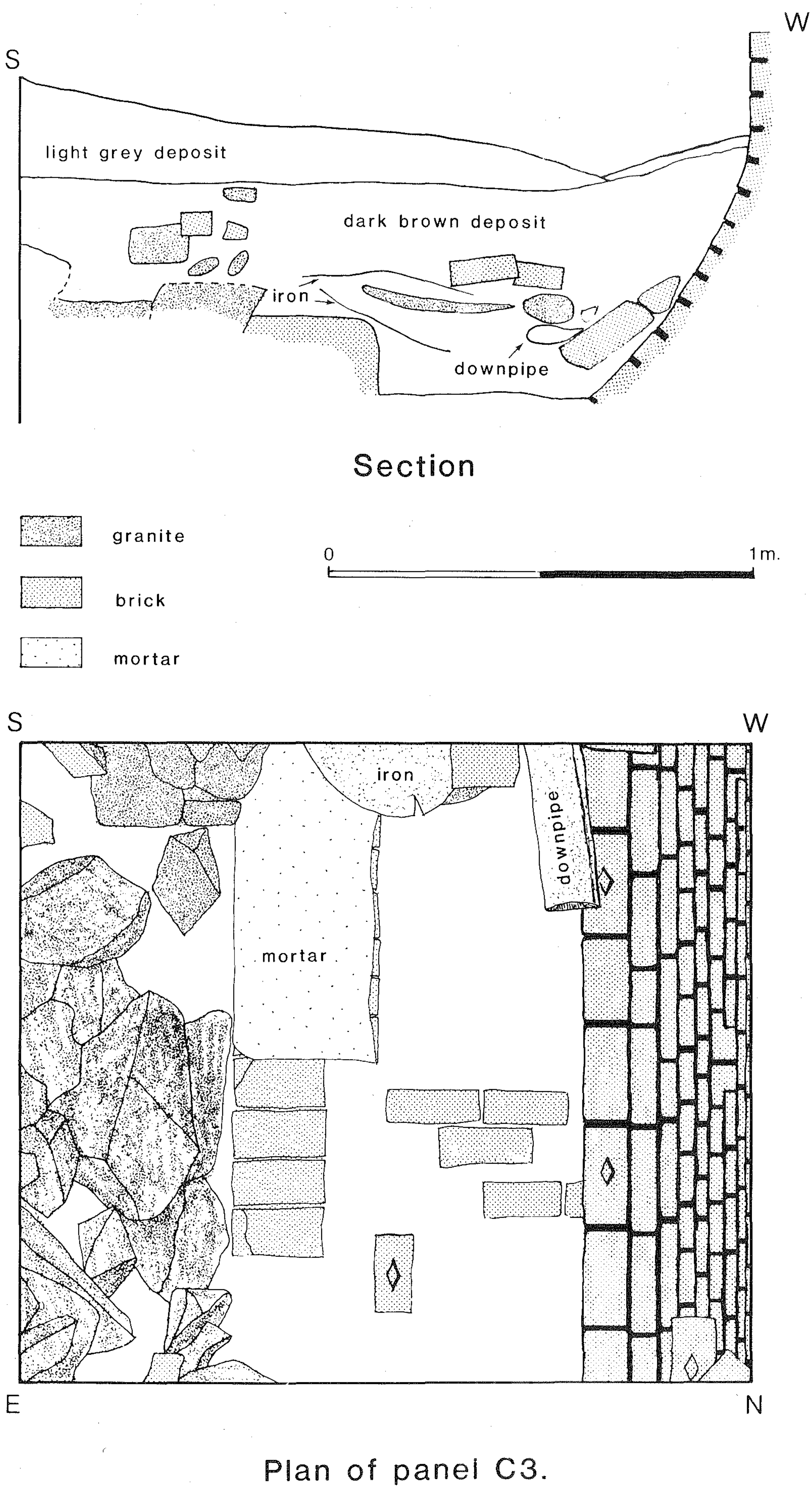


Fig. 6: Plan and section of panel C3 showing part of the boiler bed.

McCrossin's wife, who ran the mill after he died in 1881) in a local newspaper of 1883, informing local residents that an overhaul of the mill's machinery was complete.[61] There are also technological reasons that would explain the replacement of the boiler at this time.

A boiler's working life was determined by a number of factors, including water salinity, the fuel burnt in the furnace and how well the boiler was maintained.[62] A good working life for a boiler was 10 to 13 years.[63] If McCrossin's Mill commenced operation in 1872, the boiler would have needed to be replaced some time in the early 1880s. The placing of the new boiler on a different foundation may have been due to the bricks of the original bed being too soft and brittle to take the new boiler. It may also have been to minimize the time that the mill would have been out of operation while the new boiler was being installed.

The mill itself closed down in the early to mid-1890s.[64] On the face of it, this would seem to have been a result of the declining trade in locally-produced flour, as discussed earlier. In accepting this date for the closing of the mill, I do not think we can see its closure as a simple function of that economic situation. Trade had been declining throughout the mill's history, yet it was not closed until the 1890s. If the boiler had been replaced in 1883 it would have needed to be replaced again in 1893–95, for the mill to continue functioning. With trade being poor the cost of such an item would not have been justified in terms of return on investment. Unable, or not wishing to replace the boiler, the owners were forced to close the mill. During excavation no parts of the steam engine were found. There is some suggestion that it was taken to the Rocky River Goldfield, 7km north-west of Uralla.[65] It seems strange that the boiler required to provide steam for the engine was not removed too, unless the boiler was useless because it was burnt out. Thus the reason for the closing down of the mill was undoubtedly the poor trade, but the actual date of closing down was determined by the need to replace machinery, in this case the boiler.

CONCLUSION

In this paper I have attempted to describe the remaining features of McCrossin's Mill and to explain their function. I have also attempted to explain the development of some of these features in terms of the local and regional economic history, with particular reference to the flour and wheat industry of the New England region at that time. The archaeology of the mill, including both standing and excavated remains, has been shown to be a material reflection of the vaguer picture developed from written sources alone. However, the archaeology has also provided new insights into historical events (e.g. the closing date of the mill) that the written sources tend to gloss over. The mill was as important as the artefacts contained therein, to our understanding of this site. On this note one final point can be made. From the 1830s, when the New England region was first settled, to the 1850s, the regional economy was based solely on pastoralism. The density of population was low and centres of population were small. Little development of anything other than pastoralism took place. Captain Richard's house at Winterbourne captures this: the house was largely built of local stone and wood, and bonded with clay mortar. Bricks were used sparingly. This was due to two aspects of the region at that time: the difficulty of transporting goods into the region and the absence of any local industry.[66] By the 1870s and the building of McCrossin's Mill, local industry had been established (e.g. brickmaking), agriculture had developed and transport had markedly improved, allowing the importation of large pieces of machinery and the rapid export of foodstuffs. The construction of McCrossin's Mill demonstrates this rapid development of the region and its closure records the demise of the local wheat industry.

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NOTES

1. Godwin 1982.
2. *U.W.T.* 16/11/1881: 2.
3. *A.E.* 2/3/1867: 3.
4. Linge 1979: 529.
5. *A.T.C.J.* 7/10/1871: 248.
6. Linge 1979: 320–30.
7. Handley n.d.: 28.
8. See for example *A.T.C.J.* 30/9/1871: 426.
9. *A.E.* 13/1/1866: 2.
10. Linge 1979: 526.
11. Walker 1966: 66.
12. loc. cit.
13. *A.E.* 9/3/1867: 1.
14. Robinson 1976: 1 & 55–79.
15. See Linge 1979 *passim;* Robinson 1976 *passim.*
16. *A.E.* 10/8/1867: 3.
17. *A.E.* 17/8/1867: 3.
18. *A.E.* 23/11/1867: 3.
19. *A.E.* 20/11/1866: 3.
20. *A.E.* 2/7/1870: 3.
21. *A.E.* 20/8/1870: 3.
22. *A.E.* 3/12/1870: 3.
23. *A.T.C.J.* 30/9/1871: 496.
24. Linge 1979: 320.
25. *A.T.C.J.* 30/9/1871: 496.
26. *A.E.* 14/1/1876: 2.
27. Walker 1966: 67–8.
28. Linge 1979: 320–30.
29. loc. cit.
30. loc. cit.
31. loc. cit.
32. loc. cit.

33. loc. cit.
34. Linge 1979: 609.
35. Information from Messrs. Ken McRae and Jack Munroe, long-time residents of Uralla.
36. Information from Arnold Goode, Uralla, who has an early photograph of the rear of the mill in his possession.
37. Denholm 1979: 82–6.
38. loc. cit.
39. loc. cit.
40. loc. cit.
41. The railway reached Uralla in 1882.
42. Gilbert and Elphick 1977: 248.
43. Information from Jack Munroe.
44. Gilbert and Elphick 1977: 248.
45. Measurements obtained from bricks at McCrossin's Mill.
46. *A.E.* 2/7/1870: 3.
47. Dickinson 1963: 135–58.
48. Sutcliffe 1895: 762.
49. Information from Pat Halliburton, Secretary of the Australian Technical Millers Association (N.S.W.).
50. *U.W.T.* 15/8/1883: 3.
51. *U.W.T.* 9/8/1882: 3.
52. *A.E.* 2/7/1870: 3.
53. Renwick 1830: 260.
54. Stowers 1958: 125–40.
55. Fairbairn 1863–65.
56. Linge 1979: 326.
57. Renwick 1830: 158.
58. Stowers 1958: 130 and plate X.
59. Munro 1899: frontispiece.
60. Information from Jack Munroe.
61. *U.W.T.* 15/8/1883: 3.
62. Dickinson 1963 *passim;* Munro 1899 *passim.*
63. Dickinson 1963: 162.
64. Information from Jack Munroe and Arnold Goode.
65. Information from Jack Munroe and Ken McRae.
66. Connah et al. 1978: 14–18.

BIBLIOGRAPHY

Published sources

CONNAH, G., ROWLAND, M. & OPPENHEIMER, J. 1978. *Captain Richards' house at Winterbourne: A study in historical archaeology,* Department of Prehistory and Archaeology, University of New England, Armidale.

DENHOLM, D. 1979. *The colonial Australians,* Penguin Books, Middlesex.

DICKINSON, H. W. 1963. *A short history of the steam engine,* (3rd ed.) Frank Cass & Co., London.

FAIRBAIRN, W. 1863–65. *Treatise on mills and millwork,* (vols. 1 & 2) Longman, Green, Longman, Roberts & Green, London.

GILBERT, L. & ELPHICK, E. (eds.) 1977. *New England readings,* Armidale College of Advanced Education, Armidale.

HANDLEY, I. n.d. *The land of the McCrossins,* The Author, Armidale.

LINGE, G. J. R. 1979. *Industrial awakening,* Australian National University Press, Canberra.

MUNRO, R. D. 1899. *Steam boilers: their defects, management and construction,* (3rd ed.) Charles Griffin & Co., London.

RENWICK, J. 1830. *Treatise on the steam engine,* G. & C. & H. Carvill, New York.

ROBINSON, M. E. 1976. *The New South Wales wheat frontier 1851 to 1911,* Research School of Pacific Studies, Australian National University, Canberra.

STOWERS, A. 1958. The stationary steam engine, 1830–1900, *in* Singer, C., Holmyard, E. S., Hall, A. R. & Williams, T. I. (eds.) *A history of technology,* (vol. 5) Clarendon Press, Oxford.

SUTCLIFFE, G. W. 1895. *Steam power and mill work,* Whittaker & Co., London.

WALKER, R. B. 1966. *Old New England,* Sydney University Press, London.

Unpublished sources

GODWIN, L. 1982. A report to the Heritage Council of N.S.W. on the survey and excavation of selected areas of McCrossin's Mill, Uralla.

Newspapers

Armidale Express (A.E.)

Australian Town and Country Journal (A.T.C.J.)

Uralla and Walcha Times (U.W.T.)