BRICK AND TILE-MAKING AT ASHBURNHAM, SUSSEX

by

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Originally published in
Sussex Industrial History, Number 1 (1970–1)
and *Sussex Industrial History*, Number 11 (1981)

The Ashburnham Estate Brickworks 1840–1968

by Kim Leslie

INTRODUCTION

THE ASHBURNHAM estate brickworks, which ceased production in November 1968, is situated a quarter mile NW of Ashburnham Forge, (National Grid reference TQ 684161), the property, until July 1970, of the Reverend J.D. Bickersteth, a great grandson of the fourth Earl of Ashburnham. The Ashburnham estate also formerly owned works for two other important extractive industries. In 1808 the Reverend Arthur Young noted that the limestone mine and works in Dallington Forest achieved for the second Earl the distinction of being 'the greatest lime-burner in all the kingdom'.[1] Better known is that the family had its own iron workings, the Ashburnham furnace and forge being the last of the Wealden iron works to operate in the early-nineteenth century. The factor shared by these three estate industries is that they were all based on wood fuel.

Although on a more limited scale of production than either of the other two works, the brickworks possessed some outstanding features. In Sussex it was the last of the small rural works of its type to operate, probably being one of the most primitive commercial undertakings to survive in the county into the 1960s. Even in the country as a whole it was a survival of a method of production rarely, if ever, seen today.[2] Brickmaking was by hand, by methods that have passed from generation to generation. Perhaps more unusual than this was that the bricks were burnt in an open kiln fired with wood. Until 1961, when tiles were last made at the yard, a pug mill for grinding the clay was driven by a horse. This mill is the last recorded instance of a stationary horse engine (a horse gin) to have worked in Sussex. In other words, until its recent closure, the Ashburnham brickworks continued to demonstrate the state of brickmaking as it was before the brickmaking revolution of the nineteenth century. Indeed the methods and equipment employed at Ashburnham have remarkable resemblances to those evident in some of the earliest known illustrations[3] and descriptions of the industry.[4]

HISTORY

The working of clay at Ashburnham can be traced back at least to 1362 when there was a 'building called a Tylehous for baking tiles'.[5] References as early as this have not been investigated for brickmaking, although it is quite clear that brickmaking was established before the opening of the new brickyard in 1840,[6] the subject of this paper.

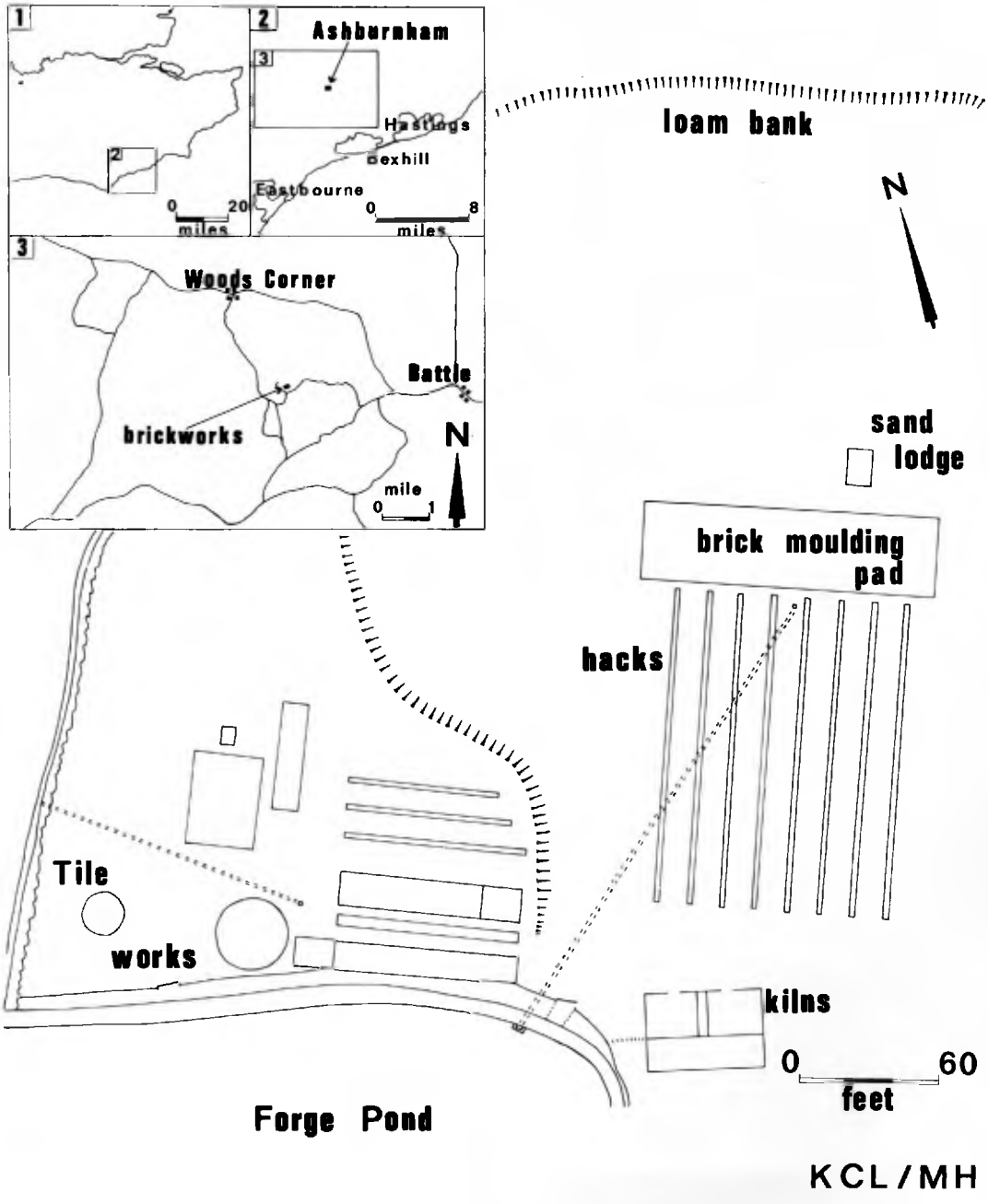

Fig. 1. Location and site plan

The Ashburnham brickworks began on its new — and last — site in 1840, in what was formerly an arable ten-acre field, attached to Court Lodge Farm, called Lower Spring Field.[7] Before this date the estate had its brick and tile works adjacent to the Forge, where today scant remains set in the side of an earth bank may be traced (TQ 687160). There are two reasons, perhaps related, which may be advanced to account for the removal of the site in 1840. Ten years earlier, Edward Driver, having surveyed the estate and observed that too many of its buildings were of timber, made the recommendation that future building work should be carried out in brick. His recorded comment was that brick would 'last for ever'.[8] If Driver's report was acted upon, then expansion of the brickyard was inevitable to meet the new demands, but any expansion on the earlier site would have clearly disfigured the area immediately around the north entrance to the Park (i.e., by Forge Lodge). This would have hardly stood as an attractive proposition, more particularly as plans were being made in the 1830s to reconstruct Ashburnham Place with a casing of locally made brick. Expansion then might have been one reason for the move. That the move was made in 1840 possibly introduces the immediate reason for change. It is said that the fourth Earl, Bertram, came to order its removal when he was about to marry, as he feared to offend his new bride with an unsightly industrial appearance to the entrance to the Park. So relates oral tradition, still a very strong feature of an estate where in some cases the same families have been settled for centuries. Whatever criticism there may be of the validity of oral tradition, it is perhaps significant that the year of both the marriage and the removal of the brickyard is the same. Nevertheless, although the cause might be disputed, the fact of the removal is clear: the Steward's Account Book for 1840–1[9] records the transference of sites, the building of the new yard and the stocking of it with fuel:

1840		PAID	£	s.	d.
October	12	Jas. Colman labor to new brick kiln	2	14	0
"	"	Jno. Winchester labour in new yard	3	16	1½
Novr.	14	Jas. Barden do	2	12	6
"	"	Jno. Billings building Clayhouse	2	2	6
"	"	Brick Duty	7	13	1½
"	"	Jno. Sinden for Kiln Faggotts	2	5	0
"	"	Richd. How carrying matrl. to new brickyd.	5	8	6
Decr.	7	Brick Duty	3	13	6
1841					
January	7	Saml. Cornford Arch Bricks	3	12	0
"	11	Thos. Hobday Carrying Clay sand & c.	9	4	0
"	14	Thos. Croft for Kiln Faggot	1	2	6
"	"	John Shaw for Bricks	1	14	6
"	15	Jno. Isted Carrying Kiln Faggots	12	10	11
Febry.	8	T. Harvey Pulling down old brick kilns and building new lodges	7	16	0

March	1	Hy. Barden Brick and Tile Making 1840	83	5	10
May	14	Geo. Geering Smiths work	2	11	7
"	"	T. Dray Bricklayer to new brick kilns	12	0	4
"	"	J. Baker Carpenters work	11	16	3
"	16	Brick Duty	1	10	7½
"	"	Alfred Dawes Bricklayers work	8	2	6
			185	12	3½

Probably significant is that the building of the new brickworks took place between October and May; it was normal practice in a traditional brickyard such as this — using open top kilns and air drying — to reserve the autumn and winter months for site maintenance and fuel stocking preparatory to the burning period, mainly concentrated in the drier months of the year.

The subsequent history of the brickworks to its closure in 1968 can be divided into five distinct periods.

1840–5	Mainly estate production, with small commercial sales
1846–55	Ashburnham Place restoration and enlargement
1856–96	Expansion of commercial sales
1897–1927	Estate repairs and building
1928–68	Expansion of commercial sales

In its first few years of working, the yard was producing mainly for the requirements of the estate itself, rather than for sale in any significant quantities to private builders. This policy may well reflect the recommendation made by Edward Driver in 1830 about the need to use more brick rather than timber on the estate. However, there is no doubt that the major supply of bricks in the early years was for the refacing of Ashburnham Place.

Although Ashburnham Place had been clad in a Regency-Gothic casing of cement for the third Earl in 1813 by Francis Bernasconi, it soon proved so unsatisfactory by cracking and flaking, that the fourth Earl commissioned a new face for the mansion, and at the same time decided on certain enlargements. The work was to be in red brick pointed with black mortar which was then popular.[10] As wood-fired kilns produce grey-headed bricks, these were conveniently worked into the overall design to form decorative patterns, one of the most distinctive features of the building. It is this work for Ashburnham Place that represents by far the most ambitious single building project carried through in the history of the brickworks, and was the time when it was at its peak of production, a level that it never subsequently attained. The expenditure recorded by the steward would seem to suggest that the major work for the rebuilding was carried out between 1846 and 1855. Figure 2 shows income (which in the early accounts refers only to sales outside the estate) and expenditure incurred by the yard between 1841 and 1860, as derived from the steward's accounts.[11] This indicates that sales to outside purchasers declined progressively between 1841 and 1853 (although there

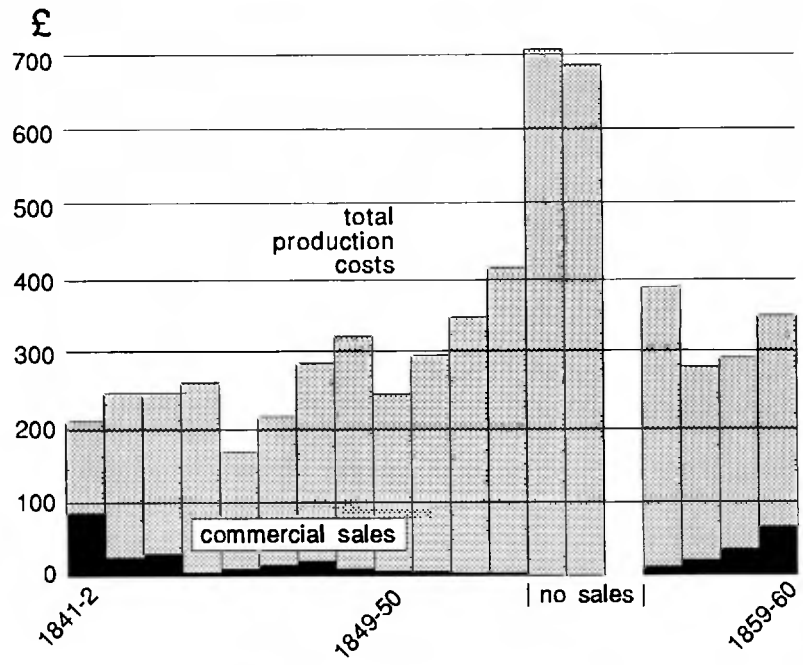

Fig. 2. Income and expenditure, 1841-1860

was a minimal increase in 1847–8), and that there were no sales at all between 1853 and 1855. It will be noted from the graph that it is precisely during this two year period that brickmaking was at its peak, according to the production costs, the 1853–4 figure representing an increase of 400% over that for 1845–6. This can only be accounted for by increased brick production as there is no evidence at all to indicate that basic production costs were rising. The increased production was organised solely for internal consumption, for work on Ashburnham Place.

Another indication that it was necessary to increase the level of production for the reconstruction is shown by the purchase of an Ainslie's Brick & Tile Machine in June 1847 for £37 9s. This would have been one of two machines patented by John Ainslie in either 1845 or 1846.[12] Thus the latest mass production machinery then on the market was bought, (the Ainslie machines being amongst the earliest of the successful machines), and further, bought at a time when their use was still not extensive.[13] The later history of the brickworks, however, shows the machinery did not become a feature of production, though there is no record when the Ainslie machine was last used. Investigation at the brickworks has failed to locate any surviving machinery. That the restoration of the house was complete by June 1855 is suggested by two terse references in the accounts: in the period 1 June 1854 to 1 June 1855 appear two very human touches in the steward's accounts:

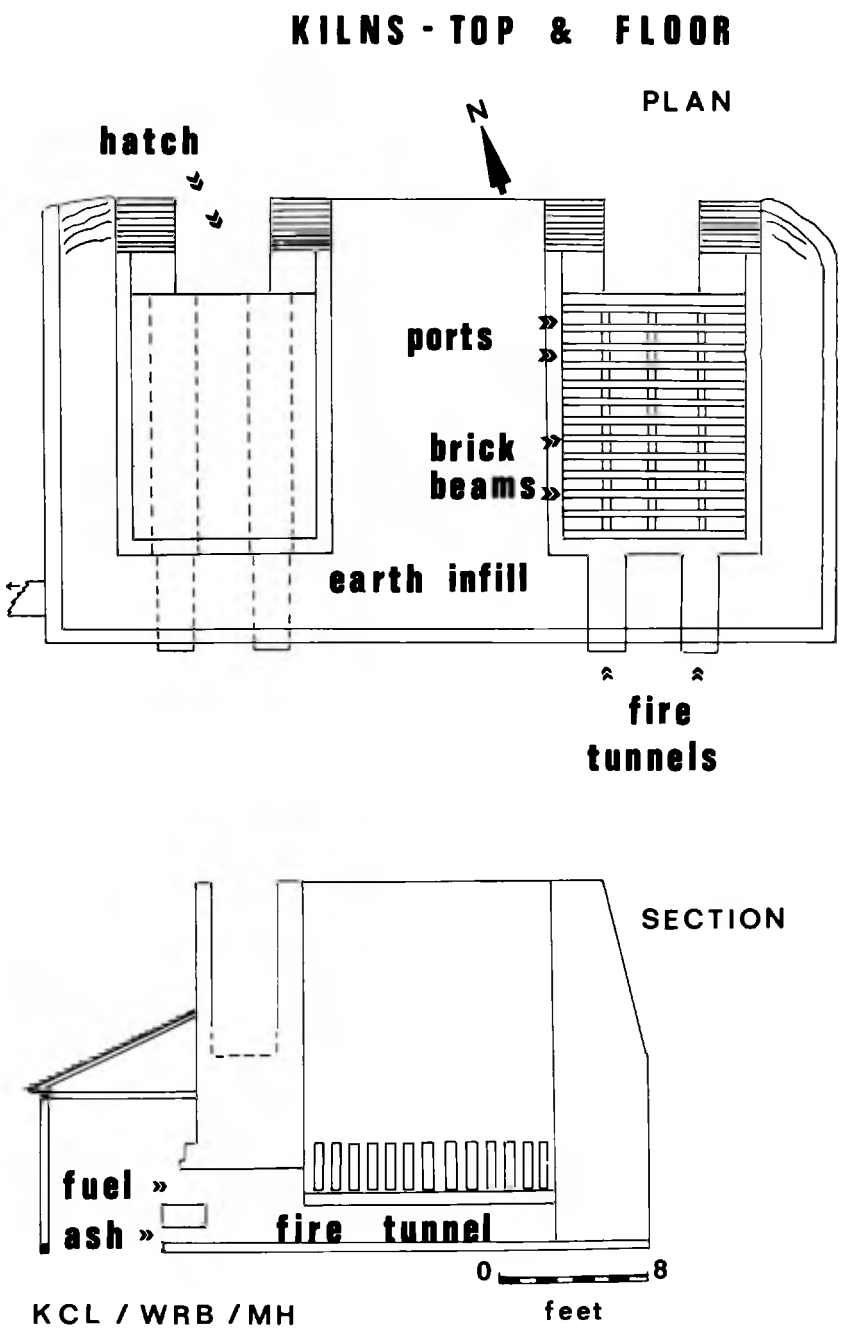

Fig. 3 The Scotch Kilns

James Barden — a present from his Lordship	10	10	0
Beer for makers		18	0

Then production seems to have ceased as the accounts make no reference at all to any work on the site in the following year 1855–6, this possibly because of over-stocking. In the following year expenditure was resumed.

However, from 1856 production was on a much lower level than before, although the sales made to outside the estate on a commercial basis did in fact expand. What is noteworthy about the commercial expansion which is evident in the period 1856–96 is that it correlates with the Victorian building expansion so marked in many areas of the country, not least in the eastern part of Sussex. The area the brickyard came to supply in the nineteenth century extended from Burwash in the north to Hollington (Hastings) in the east and to Eastbourne in the west. For the same area Kelly's directories for 1855 and 1895 show an increase in commercial brickyards from eight to thirty-five. What is clear is that by developing its sales on the open market the estate was responding directly to the demand of the local building trade, of which it was fully prepared to take advantage. Within its triangular sales area the furthest orders would have therefore been to Eastbourne, a distance of twelve miles. In 1877 a load went to Faversham, Kent, but such a distance was quite exceptional.[14] The principal customer in the 1870s was George Harmer, a builder at Gardner Street, Herstmonceux. Other customers in the nineteenth century included the Hastings Highway Board (for bridge building), the Commissioners of Hooe Levels, Battle Rural and District Councils, the Duke of Cleveland at Battle, and the estate of Thomas Brassey, the railway builder, at Normanhurst, Catsfield. The latter was for the supply of 365,000 bricks and 36,500 plain tiles in 1887. The brickworks had obvious difficulties in dealing with the order, for it was not geared to supplying a large commercial contractor in such quantities. The foreman confused the quantity ordered, and many of the bricks had to be returned from Normanhurst to Ashburnham because they were moss grown, discoloured and chipped.[15] There is the strong suggestion that in view of the enormous quantity ordered — by the yard's standards — it was found necessary to send old stock. From evidence such as this it is quite apparent that the brickworks never presented strong competition in the open market; however, the value to the estate of this trade was that it did ensure the works remained open when there was no great demand from the estate itself, and so always in a state of maintenance and ready availability should occasion arise.

The yard came to develop a wide range of products to offer the market. Although the earliest records in the 1840s merely indicate the manufacture of 'bricks and tiles', later records in the nineteenth century become more specific and precise. From the accounts it appears that the following were produced:

BRICKS	Building, Paving, Copin, Moulded, Squince, Chimney, Bureau, Cannon, Arch, Bindsmouth, House, 6 in., Cornish.
TILES	Plain, Drain, Hip, Ridge, Valley, Taper, Corner, Large, Paving, Weather, Angle.
DRAINAGE PIPES	Five sizes.
FLOWER POTS	

During this century the range had been gradually restricted. Flower pots, most of which were made for Ashburnham Place gardens, were the first to be discontinued by the end of the First World War. Drainage pipes then ceased to be made, and in 1961 the last tiles were made with an order for 10,000 reds. In recent years the yard came to concentrate on two types of brick, building and paving, although special types were made to order. In 1967, for instance, a small number of coping bricks were made.

With estate repairs necessary towards the close of the nineteenth century, outside sales declined from 1898 until 1927. For these years sales average less than £3 per annum, whereas apart from the war years the estate repairs account was annually debited with sums between £180 and £466.[16] Sales in other words became a mere fraction of the amount used for internal estate consumption. After Lady Catherine Ashburnham inherited the estate in 1924, the accounts suggest that she soon instituted a positive policy of once more entering the commercial market, a policy which, although never yielding substantial profits, does largely account for the survival of the brickworks for a further forty years. To 1941 when the works closed through blackout regulations, the best year was 1934 with profits of £281. Even in the post-war period the highest profit recorded was only £316 in 1954.

Figures such as this clearly emphasise that the brickworks was never a profitable investment of any consequence, in contrast to the earlier estate iron and lime works. Indeed, profit was obviously not the intention when the new brickworks was opened in 1840; rather it was to be a service industry to the estate. As a viable proposition its expansion has always been hindered by its low yield: the construction of only two kilns with a total carrying capacity of only 20,000 bricks each and the fact that the entire open-air manufacturing procedure from moulding to drying and burning has always been subordinate to weather conditions have been its severe handicaps. Particularly in this century such limitations have led to inflationary costs which can be indicated by the price at the kiln per thousand of a first-class building brick between 1858 and 1968:

1858	30s.	1898	30s.	1938	90s.
1868	30s.	1908	30s.	1948	240s.
1878	30s.	1918	40s.	1958	360s.
1888	30s.	1928	85s.	1968	540s.

Limited production, high overheads and insufficient returns increasingly underlined the brickyard's uneconomic position. By 1968 the last kiln was in a deteriorating and dangerous condition. The choice that faced the estate was either extensive modernisation and the introduction of machinery, or closure. The choice was for closure, and the last burn was in the week commencing 4 November 1968, the kiln being put out in the early hours of Saturday 9 November. The greater proportion of this last kiln was used as paving bricks for a car park in Storrington.

Not only has a centuries old tradition of clayworking now passed at Ashburnham; here has now ceased an ancient tradition of craftsmanship and primitive working no longer to be seen in this country.

PRODUCTION

The following account is based on personal observations during two brickmaking seasons (1967 and 1968), and conversations with the foreman, Mr Jack Harmer, and his assistant Mr Will Beale, the last two employees to work at the yard. It is important to re-emphasise that the methods were essentially no different from those indicated by the earliest known brickmaking engravings and descriptions.[17] What is perhaps even more important to consider is that despite the use of a most primitive technology, particularly at the burning stage, a high quality brick was produced, striking testimony to the skill in controlling both materials and techniques. It is perhaps one of the most impressive conclusions to be drawn from early technological practice that despite the use of the most simple and basic equipment a high level of control was attainable to produce a desired end. Possibly it is true to say that the mark of the craftsman is the degree to which he can freely relate and adjust method to produce a calculated objective without the use of sophisticated instrumentation and equipment. In this sense the more carefully one studies what was produced at Ashburnham in the light of the practices employed, the more it is possible to sense the level of skill achieved, a skill that has obviously only been acquired through patient, steady application during a lifetime's work.

The particular value of the record given in this section is that it embodies the recording results of the last two firings of the kiln, and an analysis of the bricks, through the co-operation and interest of Redland Bricks Ltd. It is thought this was the first occasion that a traditional type of brickyard has been recorded in this way in the country.

The plan of the yard was based on the need to ensure the most economic movement and smooth continuous production between the several processes involved, closely related to the topography of the site and the provision of raw materials. There is nothing haphazard about the layout, the design in fact providing a most efficient flow of production.

Briefly, the manufacturing process took the following form:

Loam cutting → loam ↘
preparation → moulding → drying → burning
Sand winning → sand ↗

1. *Loam cutting and Sand Winning*

The mould and topsoil having been removed, the clay, which was always referred to by the men as loam, was dug from within the brickyard area to a depth of about seven feet, using a tool called a graft. It was dug in strips about five feet wide, working from west to east across the loam bank. This bank is a substantial cross section through a narrowing tongue of Ashdown Sand (an inlier outcropping against the Wadhurst Clay caused by faulting) in which the brickmaking beds occur.[18] Ideally the loam was dug in the autumn months to allow a period of weathering by rain and frosts to break it

down, as recommended in many early brickmaking treatises. However, in the last few years of operation at Ashburnham, the loam was often dug just one week before moulding took place, a practice which according to Mr Harmer was not to the detriment of the quality of the bricks. He rather believes that the only effect of using non-weathered loam was to make the work of preparation and moulding just a little harder for the brickmaker.

Before brickmaking could begin it was necessary to bring sand into the yard for two purposes: for dusting the moulds and to provide a heat barrier in the hatch of the kiln. All the sand was dug from solid rock with pick and shovel at a small quarry known by the men as the sand hole. This is a quarter mile north of the Forge on the east side of the track leading to Ashburnham Furnace (TQ 688163). The rock was broken and then passed through a scry (a screen) to make it as fine and smooth as possible. At the yard it was spread on a concrete pad in the sun, and stored in a little brick building known as the sand lodge.

2. *Loam and Sand Preparation*

The day before brickmaking, in the morning, enough loam for one day's making was pulled down from the weathering heap with a half-mattock, and thoroughly turned over. Water was then added, being at hand to the brickmaking area from a man-made conduit leading from Forge Pond; the bucket was lowered into the well at the end of the conduit using a water hook, similar to a shepherd's crook. Water and loam were mixed with a shovel, the procedure being called 'packing down a soak', the soak being the total amount of loam worked at any one time. Left until the afternoon, covered if the weather was particularly dry, the wet soak was then further worked into a plastic consistency using a turning iron (like a skeleton spade) called 'turning in'. A half-mattock pounded the loam smooth, removing the lumps, known as nubs. This was 'hummocking'. By now it had been worked into a smooth and easily worked mass, and was known as pug. Covered and left, it was ready for brickmaking the next day. The secret of the operation was to know exactly how much water to add so that the pug would be neither too dry and stiff, nor too wet and soft. If the pug was too soft the brick would suffer by slumping, causing it to lose its shape as soon as the mould was removed. On the following morning, immediately before moulding, the pug was again turned, and then was quite ready for the moulding bench. Many works similar to Ashburnham tempered their clay in a horse mill, but at Ashburnham the horse mill was only employed for the heavier, more obstinate Wadhurst Clay, used not for bricks, but for tile, pipe and flower pot making. It is recorded that at Broadmayne, Dorset, tempering has been done with naked feet.[19]

Immediately before brickmaking started the dried sand was taken from the sand lodge, screened again to remove any superfluous waste matter (the sand grits) and then placed in a sand bodge (a box) and taken to the moulding bench.

3. *Moulding*

The brickmaker's huts were portable, eight foot square, wooden sheds, providing a moulding bench and cover from the weather. Secured to the moulding bench was a stock, a flat wooden base onto which the mould was set, the stock being hinged to facilitate the removal of the moulded brick. The mould — four sides with no top or bottom — made of beech wood and shoed with iron, fitted over the stock and sat on four square-headed screws. Before each day's work it was necessary to check the height of these screws and to set them according to the thickness required, depending on whether building or paving bricks were being made. At this stage the brick had to be made to a size in excess of that of the dried and burnt brick, to allow for shrinkage. Because of the high silica content (Table II) the overall shrinkage from wet to fired state was in fact slight; shrinkage by width ranged between ¼in at the bottom (5.5%) to ⅛in at the top of the kiln (2.7%). This is equivalent to an overall average shrinkage of 3.9%. In comparison the average shrinkage for a typical Wealden Clay brick is 9.2%.

With the stock adjusted, pug sufficient to make 36 bricks was placed on the bench, and from the lump enough to make one brick was separated by hand, or with a crescent-shaped cutter called a cuckle if the pug was stiff. The mould was then fitted on the stock, and both were sanded to prevent the freshly made brick sticking to the wood. This also had the effect of producing a slightly roughened surface, adding texture to the brick.

The art of moulding is to dash the pug into the mould with such force and at such an angle so that it will be spread evenly throughout the mould. The pug should strike the bottom centre of the mould, to ensure that air pockets do not form (in which water and frost would accumulate) and that the sand remains evenly distributed and not unduly disturbed in the mould.

The superfluous pug was struck off with an instrument similar to a rolling pin called a strike, lubricated by water (see Plate I). The stock was then hinged upwards, a thin pallet board being placed on either side of the mould, and the brick, now termed a green brick until it was burnt, was removed to a hack barrow, where the mould was taken from the brick and returned to the bench to make another brick. The average production rate at Ashburnham per brickmaker was between 500 and 600 bricks a day in 1967 and 1968, a relatively low rate as both moulders had also to perform all other brickyard operations. Until the last war when there had been more than a dozen working at the yard, there had been specialist division of labour, the moulder moulding bricks, nothing else, and thus the rate of production was much higher.

The hack barrow is a light framework supporting a flat latticework top to seat 36 bricks (see Plate II). As the green bricks had to be handled with great care at this stage, the barrow was so designed to provide the easiest of handling, being well sprung and balanced so not to require unnecessary force to drive. Its proportions were fundamental to its effective use. On this barrow the bricks were wheeled to the hacks along iron runways put down to ensure smooth movement.

PLATE I Brick moulding using the strike

PLATE II Mr Will Beale and hack barrow

4. *Drying*

The hacks are long narrow concrete strips onto which the green bricks were set off for the drying process, ideally to a height of seven bricks. The positioning of the hacks between the moulding area and the kilns accords with recommended practice for ease of movement within the yard. The drying process could take up to three weeks with favourable conditions in the summer, double if conditions were bad. As soon as the bricks could withstand movement they were re-arranged at an angle — called 'skinkling' — allowing them to catch the wind and so draw air through them to permit uniform drying. This was essential lest a differential rate of shrinkage in a brick should lead to shattering when in the kiln. There is also significance in the hacks running north to south, so that the bricks would receive an equal share of sunshine on each side for even drying. Wind, rain and frost had to be guarded against, and also excessive sun, and for this purpose wooden hack covers were placed over the drying bricks when required (see Plate III). In earlier days this protection was given by straw. The bricks were ready for the kiln when bone dry to the touch and the colour had distinctly lightened.

5. *Burning*

There are two intermittent updraught kilns, originally constructed in 1840–1, the easterly of the two being the only one used during the last working years of the yard. They are both of the most primitive type, sometimes termed Scotch kilns,[20] or box kilns, each merely an open topped rectangular brick structure set in the side of an earth bank. This setting provides access at three levels; to the two fire tunnels beneath each kiln at the lowest level; to the kiln chambers with slotted floors through which the heat rises on the next level; and, by brick steps, to the top of the kilns so that various control procedures could be operated. Each kiln has an opening (a hatch) on the north side for loading and unloading, and on the south side is a low roofed covered shed (the hovel) to protect the men charging the fires, and also to prevent the wind urging the flames.

Each kiln was designed to accommodate approximately 20,000 bricks, although towards the end of the working life of the last used kiln the capacity was reduced to approximately 19,000. Kiln walls of this type have a tendency to lift themselves with the heat and this has been the cause of severe distortion at the top of the chamber, with consequent reduction in carrying capacity.

Setting (or filling) the kiln took up to three days, requiring considerable art to achieve two objects; first, to ensure continuous openings from floor to top for even heat distribution throughout, the second, to provide a firm, solid arrangement within the setting to prevent movement and thereby reduce the risk of severe damage.

When the kiln was full, the loading hatch was sealed to prevent loss of heat and minimise underfiring. This was achieved by building a double wall of brick, with a cavity between, which was then filled with sand taken from the nearby sand hole. The upper half of the outermost wall was 'skinkled' to ensure a bond as no mortar was used (Plate IV). Sealing the top of the kiln was by 'cladding down', that is by laying three courses of rough bricks to act as a heat barrier, but making sure that there were open

PLATE III The brickyard
(*foreground:* empty hack covers;
background: the two kilns)

PLATE IV
The hatch sealed with 'skinkled' wall and sand

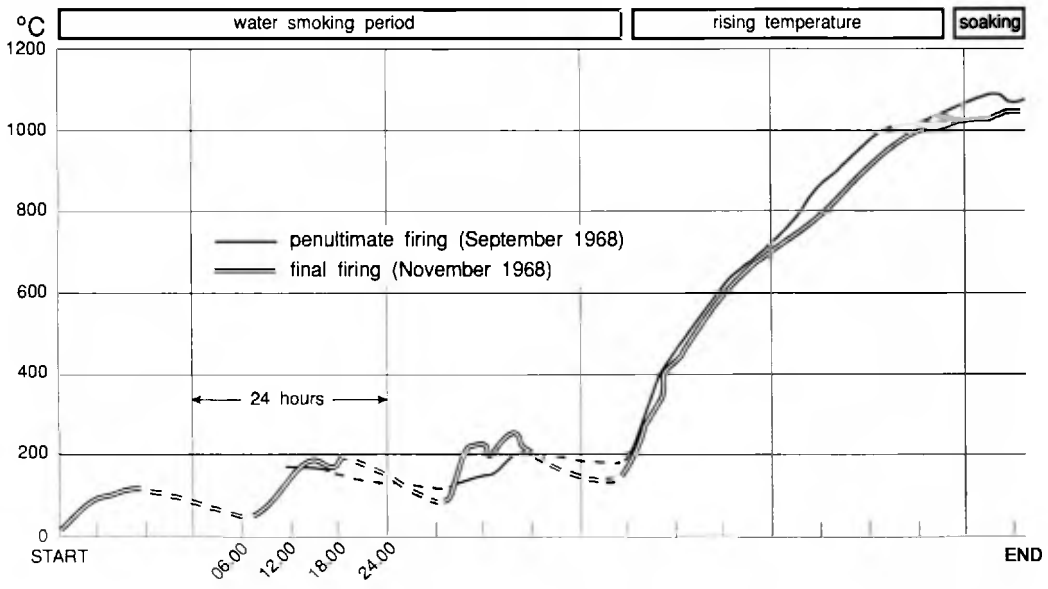

Fig. 4. Firing curves for the last two firings
(The dashed line on the graph indicates estimated temperatures, when no burner was present. Recording at the penultimate firing commenced late).

spaces to allow an updraught. Unless the weather conditions were bad, the corrugated iron roof was removed before firing.[21]

Firing was necessarily preceded by a water smoking period using a slow, steady fire to both dry the kiln and drive off the remaining water content in the green bricks. The fires were lit at the far end of the fire tunnels with paper and brushwood faggots which flared immediately and gave maximum draw. It was necessary at this stage to see that the temperature did not rise too quickly, else there would be discolouring, or the bricks would twist, swell and lose shape. During the last two firings the maximum temperature recorded at water smoking was 240°C (Fig. 4). In 1850–1 and 1853 coal was used for water smoking, presumably as an experiment which it was not considered worth repeating.

After four days of water smoking the temperature was gradually increased by stepping up the supply of fuel. Estate underwood was used, generally cut in the winter: hornbeam, silver birch, willow, sycamore, alder, scots pine, and sweet chestnut. Preference, however, was for silver birch as it flares immediately, but failing an adequate supply most of the wood fuel was hornbeam. To increase and maintain the required temperatures the wood was continually fed to the fire tunnels, sufficient to fully occupy a burner for his entire six hour shift. Charging the fires (see Plate V) literally provided no respite, painfully experienced by the writer who worked through a full midnight to 6 a.m. shift in 1967! When the fires were not being charged, the burner had to make sure that the ashes were raked from the tunnels using a revel, a long wooden pole with a flat wooden board wedged on the end. The revel was soaked in running water for at

least six months before use to withstand the intense heat. In earlier days, until about 1930, it had been necessary to employ at least two burners at each kiln then used, as fiercer-burning brushwood faggots were used instead of cordwood.

Loss of plasticity and conversion to a rigid body occurs during the burning process; on the last two firings this took 50 and 54 hours respectively. On these occasions a pyrometric thermocouple connected to an indicator was inserted into the centre of the kiln to determine the rate of temperature rise. As will be noted from the resulting firing curves (Fig. 4) the gradients during the rising temperature periods were steep, from 200°C to 1,000°C in 30½ and 34 hours in each case. This is a rapid rise when seen against comparable figures for a standard commercial brick.[22] The Ashburnham bricks could withstand this rapid increase on account of the high silica content — over 75% — whereas many commercially made bricks would shatter were they subjected to such a sharp temperature rise. After about 40 hours, maximum temperatures were approached, and then maintained for a soaking period of approximately eight hours, which was essential in improving the evenness of heat distribution. The peak temperatures reached during soaking at the last two firings were 1,100°C and 1,070°C respectively. It is an instructive comparison to note that Redland bricks are soaked at peak temperatures — which are generally below 1,070°C — for anything between 18 and 30 hours against the eight at Ashburnham.

What is remarkable about the Ashburnham procedure is that the kiln was controlled without the use of measuring equipment, but by the feel that comes of years of experience and the use of three simple devices.

Firstly, maintenance of the heat at a fairly level rate during the soaking period was gauged by observing the colour of the fire tunnel walls. Mr Harmer says he was taught this by being given a gold sovereign to keep in his hand as he charged the kilns. Its colour had to be matched and maintained for a specific time.

Secondly, if the burning was overdone the bricks could be mis-shapen and miscoloured. The critical problem, therefore, was to know exactly the right time to stop the firing. This was achieved by 'levelling', based on the principle that the total mass of burning bricks within the kiln reduces its height by shrinkage. The amount of shrinkage will indicate the amount of burning and make it possible to produce a calculated brick size to within 1/16 inch accuracy.

On the rim of the kiln top three level sight lines were constructed. One of these sight lines is shown at two stages of the firing in the two cross sections (Fig. 5). Two bricks were placed on either side of the kiln, and on each pile nine pieces of broken tile were placed. In the centre of the kiln were then placed three bricks, the topmost being on edge. With expertise the three points made a dead level sight line across the top of the kiln — see Figure 5 (a). Plate IV shows Mr Harmer stooping to adjust the level of one of these sight lines. After about 40 hours the mass of bricks began to shrink as the maximum temperatures were reached, and thus the three centre bricks fell in height, thereby destroying the level of the sight line. The level could only be maintained, therefore, by removing, one at a time, the nine pieces of tile on each side of the top of the kiln.

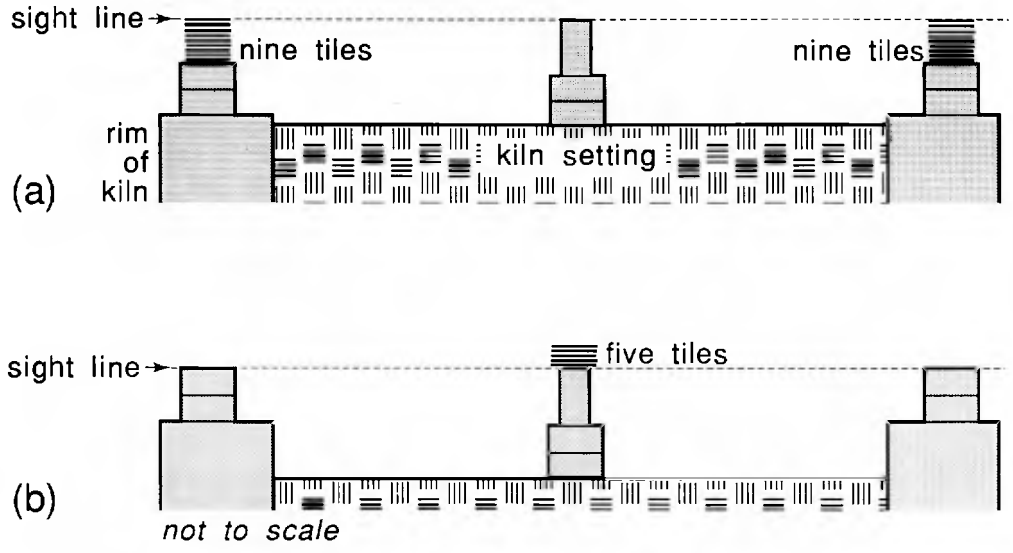

Fig. 5. Levelling the kiln

With all the tiles removed at this stage the top brick on each of the piles on the kiln rim would be level with the brick set on edge at the kiln centre. This was being 'down to brick and edge'.

At this point the fires were left for one hour; the fire tunnels were not re-fuelled, and 'the tins were put up', that is metal covers were placed over the tunnel throats (the end through which the fires were charged) to exclude draught. The effect of this was to drive the heat to the top of the kiln away from the more well-cooked bricks at the bottom. This encouraged more uniform burning.

After one hour five pieces of tile were placed on the brick on edge at the centre — see Figure 5 (b). Burning would then restart, and there was thus further shrinkage. When the topmost tile, through this shrinkage, was level with the top two bricks on the side of the kiln, the shrinkage that had occurred was sufficient to indicate that the bricks were by now adequately burnt. At this point 'the tins were put up', i.e. firing ceased.

Thirdly, the other problem to be overcome was that the kilns have shown a tendency to concentrate heat on the south sides, due possibly to faulty reconstruction of the tunnel arches. The effect has been that bricks on this side have always shrunk faster than elsewhere, and it has been necessary to restrain the heat at this point and drive it elsewhere to achieve more uniform burning. A method of 'damping in' was used by digging clay, rather oddly but conveniently, from between the top of the two kilns,

PLATE V Charging the fires with wood
(*left*, Mr Will Beale; *right*, Mr Jack Harmer)

PLATE VI The kiln top
(Note the bricks for the levelling procedure and the nine tiles on the left.)

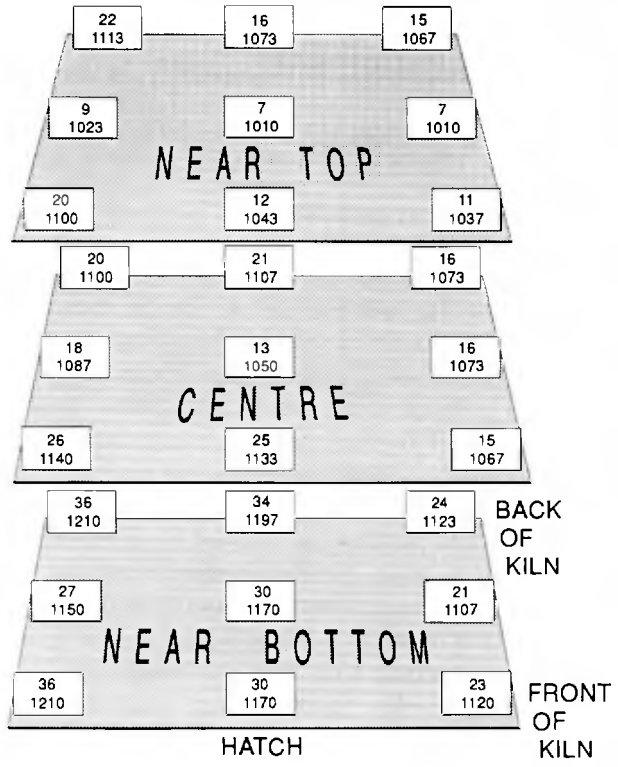

Fig. 6. Bullers Firing Trial Rings test at last firing

mixing it with water to make a slurry, and spreading it on the top of the kiln over the over-heating area to block the updraught. During the last firing a test was made to indicate the variations in temperature experienced at various positions throughout the kiln, and this clearly demonstrated this tendency towards unequal heat distribution.

This test well underlines the basic problem of working such a primitive kiln, the problem of trying to guarantee the production of good quality bricks by a method which involves so many uncertain variables. The test took three sections through the kiln and within each level were placed nine Bullers Firing Trial Rings at positions indicated in Figure 6. These rings work on the principle of contraction resulting from heat treatment, their radial shrinkage being measured on a gauge which indicates the contraction in diameter as a number. Each number is associated in a table with a nominal temperature which shows the heat treatment over the full burning period. The diagram (Fig. 6) shows these numbers and their associated nominal temperatures. The results of this test demonstrate the following points:

1. The variation in temperature between the back and front of the kiln (which would be considerably greater were it not for 'damping in').

2. The variation in temperature between the bottom and top sections in the kiln.

3. One or two of the nominal temperatures are high and this could be due to the rings being in direct contact with the flames from the fire in the kiln.

4. Given the method of firing employed, each section is reasonably uniform.

When the firing had finished, care had to be exercised to avoid opening the kiln too soon so as to ensure that cooling was gradual. At the last firing five days elapsed.

Normally 75% of the bricks produced in a firing were first class in grade. As this percentage best in the product of a modern kiln would be good, it is proof of the effective control over the manufacturing process. The bricks produced were sand-faced Ashburnham reds, distinguished by their rich red colour (revealing their iron content), and by the burnt grey ends of those whose heads had been exposed to the direct fire. At the time of writing no research has been conducted into the cause of this burnt grey deposit, although it is possibly potash-glass derived from the burning of the wood in reaction with the silica and alumina. In the nineteenth century and earlier these grey headers were worked into patterns, in which connection Ashburnham Place has already been cited. Another excellent example is Forge Lodge on the estate.

Craftsman-made bricks such as this, like any other craft product, are generally considered to be superior in quality to those mass produced by machine. Certainly Ashburnham bricks have a high reputation — 'the best bricks in the world' is the understandable boast on the estate. It was thus the final purpose of recording to try and reach some objective conclusions about the quality, and so a sample of ten building bricks was tested at the Redland Brick Laboratory at Horsham to British Standards Institution tests (BS 3921).

Table I shows the results of these tests, from which it may be concluded that these bricks were of good acceptable quality when compared with hand-made bricks produced by Redland. Their particular quality and popularity is in their attractive texture and colour.

The important point, however, is that a yard working such archaic methods could produce bricks to standards absolutely comparable to those produced by works employing the most up-to-date techniques. This is the measure of achievement of all who have worked at Ashburnham.

TABLE I *Results of British Standards Institution tests (BS 3921) on a sample of Ashburnham building bricks.*

Brick Number	Length	Width	Thickness	Strength in p.s.i.	Moisture absorption %
1	8.80	4.25	2.55	3110	20.2
2	8.70	4.25	2.60	4480	17.8
3	8.80	4.25	2.55	4310	21.0
4	8.75	4.30	2.50	4220	18.5
5	8.80	4.20	2.50	3150	20.6
6	8.70	4.10	2.50	4650	18.7
7	8.70	4.20	2.50	4290	17.6
8	8.75	4.25	2.50	4120	19.5
9	8.70	4.10	2.50	4900	18.4
10	8.80	4.20	2.50	2060	22.1
Average	8.75	4.20	2.50	3930	19.4

TABLE II *Chemical Analysis of Ashburnham brick loam.*

SiO_2	76.357
Al_2O_3	9.990
Fe_2O_3	5.320
CaO	1.800
MgO	0.430
Na_2O	0.674
K_2O	1.686
Loss on Ig.	3.450
Not determined	0.293
	100.000

REFERENCES

1. Rev. Arthur Young, *General View of the Agriculture of the County of Sussex* (1808), 205.

2. In 1946 an anonymous writer stated that it was doubtful if there were a dozen brickmakers in the country who still used wood fuel, 'Brick Burning with Faggots', *The British Clayworker*, lv (1946), 37-8. A request by the present writer asking about wood-burning yards still operating failed to elicit information relevant to this country, *The British Clayworker*, lxxvii (1968), 54.

3. For example, illustrations in 'Nederlandische Bijbel' (Utrecht, c.1425), and Hartmannus Schopperus, *PANOPLIA* (Frankfurt, 1568), reproduced in Nathaniel Lloyd, *A History of English Brickwork* (1925), 390-1.

4. For example, description in 'The manner of Making Bricks at Ebbisham, in Surrey, in a Letter to the Worshipful Captain James Twiford, now Sheriff of Bristol', *A Collection of Letters for the Improvement of Husbandry and Trade*, ii (1683), 186, and 'L'Art de Tuilier et la Briquetier', *Description des Arts et Metiers, xxiv (1761), quoted by Lloyd,* op cit., 33-5, 30-1.

5. L.F. Salzmann, *English Industries of the Middle Ages* (1913), 123-4.

6. Documentary evidence of brickmaking at Ashburnham before 1840 is given, for example, in the Stewards' Day Books, 1756-1823 in East Sussex Record Office, Lewes, (hereafter referred to as E.S.R.O.), Ashburnham MSS. 1633-9.

7. E.S.R.O., TD/E68, Ashburnham Tithe Map, 1839.

8. E.S.R.O., Ashburnham MS. 1173, Edward Driver, 'A Survey and Valuation of the Estates in Sussex . . .' (1830), 18.

9. E.S.R.O, Ashburnham MS. 1735, 77-8.

10. Christopher Hussey, 'Ashburnham Pace, Sussex, III', *Country Life*, cxxiii (1953), 1334-8.

11. E.S.R.O., Ashburnham MSS. 1735-49.

12. Either Patent no. 10,481 (1845) or no. 11,155 (1846).

13. '. . . . machines, however, are not yet in anything like common use.' *Morton's Cyclopedia of Agriculture* ii, n.d. *c.*1850, 346. Clearly the estates of landed proprietors were amongst the first to implement the use of new techniques. Compare the Goodwood Estate brickworks at Westhampnett. As early as 1786 consideration was being given for brickmaking machinery, West Sussex Record Office, Chichester, Goodwood MS. E5408, p.355.

14. Compare the small brickyard at Broadmayne, Dorset, typical of a small country works, mainly supplying a ten mile radius, but with the occasional exotic order, as at Cosham and London. Donald Young, 'Brickmaking at Broadmayne', *Proceedings of the Dorset Natural History and Archaeological Society*, lxxxix (1968), 319.

15. E.S.R.O., Ashburnham MS. 1496.

16. These figures, and others quoted in this paper to 1968, are from uncatalogued documents still retained in the Ashburnham Estate Office.

17. See references 3 and 4, and James Malcolm, *A Compendium of Modern Husbandry of Surrey, illustrative also of the best practices in the neighbouring counties, Kent, Sussex, &c.* (1805), 74-92.

18. G.S. Sweeting, 'The Geological Structure of the Ashburnham Battle and Crowhurst Districts (Sussex)', *Proceedings of the Geologists' Association*, xli (1930), 44-52.

19. Donald Young, *op cit.*, 320.

20. F.H. Clews, *Heavy Clay Technology*, 2nd edn. (1969), 237, and anon., 'Scotch Kiln', *The British Clayworker*, liii (1944), 116-17.

21. At Broadmayne the iron roofs of the Scotch kilns were not removed until after the first day's burning. The gable ends were filled with loose bricks to complete the roof seal. Donald Young, *op. cit.*., 321. This extra sealing layer was possibly used at Broadmayne because coal, rather than wood, was used, the fires being much less fierce using the former.

22. The problem was to decide on such a brick. Consultation with Redland Bricks Ltd. resulted in the choice of machine-made Tonbridge kiln stocks, of Wealden Clay. Their rising temperature period, over the range 320°C–960°C, has been recorded for a duration of 60 hours.

ACKNOWLEDGEMENTS

The author gratefully records the co-operation of the Reverend J.D. Bickersteth for access not only to the brickyard but also to documents retained at Ashburnham, and to the staff of the East Sussex Record Office, Lewes. This paper could not have been written were it not for the interest and enthusiasm of Messrs Jack Harmer and Will Beale, and for the most generous and unstinting help at all stages from Redland Bricks Ltd. The firing curves, ring tests, BSI tests and chemical analysis of the loam have been produced by Messrs A. Watts and M. Worcester of the Graylands Laboratory, Horsham. Help and encouragement with ideas and references have come from Messrs J. Kenneth Major of Reading and John Farrant, the Editor of *Sussex Industrial History*. The kiln plan and section has been based on detailed records prepared by Mr W.R. Beswick of the Sussex Industrial Archaeology Study Group. The finished art work owes much to the help and advice of Mrs Marjorie Hallam who considerably improved my original drawings.

The Use of Clay at Ashburnham Brickworks

by Jack Harmer

The Difference between 'Loam' and 'Clay'

Probably from the earliest days of English brickmaking, the word 'clay' has been used to describe the medium from which bricks are made. However, this is to a large extent a misconception, certainly as far as Ashburnham brickyard was concerned.

The silica content of the subsoil used for brickmaking, termed 'loam', was as high as 75%, making a highly suitable, mild 'pug', which shrank very little on burning. But the subsoil used for tiles had little silica in its composition (less than 25%). It is true to say that, while the brickmaking loam would have been quite useless for the making of tiles, fittings and land drains, it would have been equally impossible to make bricks with clay, at least with the hand-making methods which were used. In view of its low silica content, the clay was in every respect more difficult to handle, being extremely sticky to prepare and with much higher shrinkage throughout.

The word 'clay' henceforth will be used to refer only to this low-silica material.

Obtaining the Clay

Until 1840, when the brickyard was at its old site at the Forge, the clay was obtained from a field on Peans Farm (TQ 689163). When the yard was moved to its final site, clay was obtained from the Clayhole Field on Ponts Green Farm (TQ 683157) half a mile to the south of the brickyard. Loam for brickmaking in each case was, of course, obtained on the actual site of the yard.

Clay was usually dug in the winter. Twelve inches of topsoil were removed, exposing on average four feet of suitable clay. This was dug in 'spits' with a special narrow spade called a 'graff'. This constantly had to be dipped into a bucket of water because of the sticky nature of the clay. The spits, which were so stiff that they remained intact, were loaded into a cart, seven loads being a day's work for one man, horse and cart. On arrival in the yard, they could be stacked quite neatly in the clay ring, using a type of Canterbury hoe, a three-pronged fork with blunt tines set at right angles to the haft. About 40 cartloads were required to fill the ring. The clay then lay exposed through the winter, allowing the frost and other elements to work on it, a natural helping hand in the final preparation.

The clay ring was a shallow bowl approximately 24 ft in diameter lined with bricks, in the centre of which stood the grinding mill (Fig. 7). At the end of April each year, about a week before the making of plain tiles usually started, clay preparation began. A quantity of clay was pulled down from the main lump on to a space left for the purpose on the brick floor of the ring. Buckets of water were thrown over it, hard lumps were chopped up with a shovel and the resultant slurry thrown into another

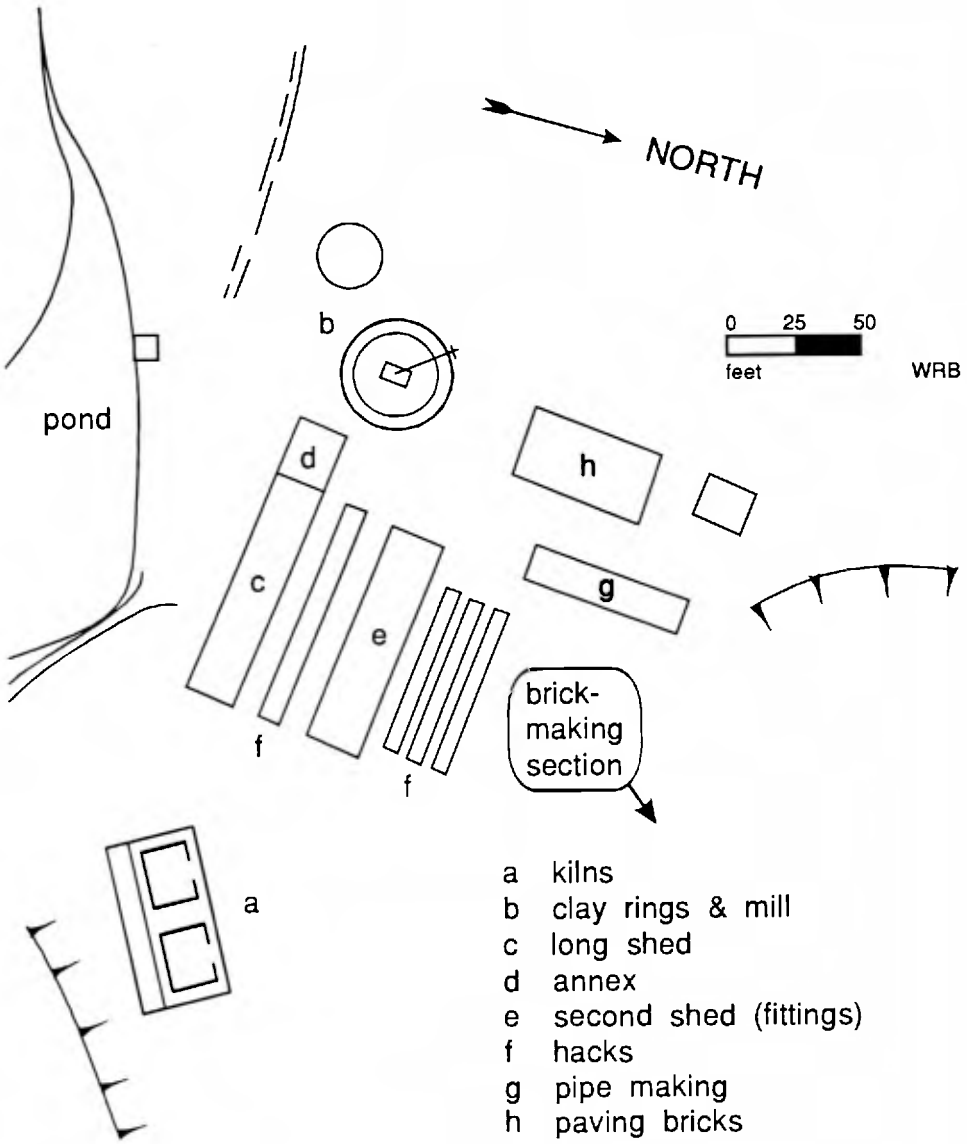

Fig. 7. The tile works

heap. This process was repeated until enough had been prepared for a day's grinding. The heap of soaked clay was then covered to prevent any further wetting or drying and left for three days for the clay to become thoroughly impregnated with water. The heap was then turned once again with a shovel. No more water was added, but a bucket full

of water was in constant use as a lubricant for the shovel. After the second turning, the heap was again covered and left for a further three or four days, by which time it was ready for grinding.

The term 'grinding' was always used, although the process did not involve any crushing of stones. It was rather a process of churning the clay and expelling air. The mill was situated in the middle of the ring. It consisted of a large cylinder 2 ft 6 ins in diameter and 3 ft 6 ins high, with an oblong hole measuring 7 ins by 10 ins at the bottom. Inside the cylinder was a set of five knives, each 4½ ins wide and set at an angle on the shaft in the centre. Attached to the top of the shaft was a timber pole which stretched to the perimeter of the ring and to which a horse was tethered.

The prepared clay was put inside the open top of the mill. The horse, upon being told to 'gee up', walked round and round the perimeter of the ring pulling the pole behind him and so operating the mill. The knives rotated inside the cylinder, churning the clay and forcing it downwards until it was finally pressed through the hole at the bottom. Two men were required for this work. One had to keep the mill continually filled with clay and see to the horse. The second man had to deal with the ground clay. When this had been squeezed through the hole to a length of approximately 18 ins, it was cut off with a special tool. The lump, which dropped into a pit beneath the mill, measured about 7 by 10 by 18 ins and was known as a 'wedge' of clay.

The wedge was picked up by hand and taken to a table which had previously been sanded. Here it was shaped up and then carried to the tile-house, a brick-built shed, the damp walls of which ensured that the clay retained its moisture. A day's grinding produced just over 200 of these wedges, which would in turn be enough to make approximately 7,000 plain tiles, about a fortnight's work for one man.

Moulding Plain Tiles

All tiles were hand-moulded, the procedure being basically the same as for bricks. A beech-wood stock was attached to the table. The mould, also made of beech-wood, fitted over this and rested on four screws in the table, which could be adjusted to ensure that the mould projected the requisite amount above the top of the stock (about $\frac{5}{16}$ in for a plain tile). A slightly concave shaping was given to the tile by scraping the stock with a special tool for about 2 ins around the edge, leaving a slight rise in the middle. Shrinkage of about 12% took place when the clay was burnt and the internal measurements of the mould had to allow for this. Thus, to produce a tile 9¾ by 6½ by ½ ins it was necessary to use a mould measuring 11 by 7 ins, the thickness of the tile being regulated as already explained.

A 'wedge' of clay and a bodge (wooden box) filled with sand were placed on the moulding table and work could begin. The mould was sanded and a quantity of clay pressed into it. The surplus was then struck off the top, leaving a level surface, but when the mould was lifted off the table and the tile inverted on to a board, it was slightly hollow in the centre. Twenty-five tiles, know collectively as a 'quartant', were placed one on top of each other and by the time the last tile was in place, the hollow had become quite pronounced. This hollow was referred to as the 'housing'.

The sanding of the mould was important, not only because it prevented the clay from sticking and made removal of the tile from the mould easier, but also because the final colour of the tile was affected by the type of sand used. For red tiles, sand straight from the pit on the estate, called the Sandhole, was used, whereas for dark tiles, black manganese was mixed with the sand; a small flower-pot full would colour a bodge full of sand, sufficient for about 350 tiles.

Both red and dark tiles, though commonly called plain or sometimes clay tiles, were also referred to as peg tiles. This was because they were hung on the roof by a peg instead of a nib, which is used on other types of roofing tile. Until the latter part of the 19th century, these pegs were made of wood ¼in square by 1¼in long. The holes for these were made in each tile before it was removed from the stock, being punched in by hand with a square piece of wood. With the advent of the metal tile pin, round holes could be used and the process speeded up. A metal bar on a swivel was fixed on the moulding table at one end of the mould and stock. As each tile was made, this bar was brought sharply down on to the head of the tile, punching both holes simultaneously.

Drying and Burning the Tiles

On completion of each quartant, the tiles were lightly sanded and carried into the adjoining drying shed. Here there were three rows of boards resting on bricks, one down each side and one in the middle, and the tiles in their quartants were put down on these. Anything made of clay, especially plain tiles, had to be dried slowly. It was the handed-down theory that, should they dry too quickly, they would become brittle, even to the extent of being so when burnt. Consequently the drying shed, although open-sided, had shutters which could be lowered in the event of an exceptionally drying wind.

When the tiles became dry enough to handle, they were 'chequered' or put down in fives, in staggered rows, which created spaces through which the air could circulate. More would be placed on top in a similar manner until a height of 15 groups of chequered tiles had been reached in each row. Drying time varied. Plain tile making usually lasted from May until August and tiles made earlier in the season dried faster than those made towards the end. Even so several weeks were required before they were dry enough for burning.

Tiles were burnt in the same kiln as bricks, but always in the top third of the kiln, where there was no great weight on them and the heat was not so intense, the peak temperature being around 1,000°C. Twelve thousand plain tiles were needed for one kiln and before they were put in, the bricks in the top layer were laid flat to form a floor (all the rest of the bricks were stacked on edge). One row of bricks was placed on edge down the middle of the kiln and between this and the walls the tiles were stacked on edge, as tightly as possible to prevent movement, the spaces for the hot air to circulate being provided by the housing, i.e. the slightly concave shape of each tile. Even so, problems could occur. When the tiles were shrinking and sinking as the temperature in the kiln rose, unless they sank evenly in their rows, occasionally a tile would twist and this would cause the whole row to do likewise, distorting all of them.

Making Fittings

The tile range comprised plain tiles, taper tiles for oast houses, large tiles (or tiles-and-a-half as they were called), ridge tiles, both half-round and sharp, valley tiles and corner tiles. The special tiles, known as 'fittings', were always made at the end of the season, the reason being that, in relation to the number of plain tiles needed, a much smaller number were required. Furthermore, these tiles were set out to dry individually and so drying time was considerably reduced.

The method of making fittings was similar to that employed for plain tiles. In the case of ridge tiles, the mould measured 14 by 11¾ ins and it projected about ⅝in above the top of the stock, thus producing a thicker as well as a larger tile. This was not lifted off on to a board. Instead the mould was removed, leaving the tile lying on the stock. It was slid off, using two hands, and placed over a semi-circular plywood support. In this way it began to take its rounded shape. It was then taken in to the drying shed, placed on boards and the support removed, the clay being sufficiently stiff to allow the tile to stand on its own. When time had been allowed for a certain amount of drying, the ridge tiles were 'dressed'. This entailed placing each one on a 'horse', a semi-circular block of wood on legs. Here it was patted into its final shape with a wooden tool similar to a short cricket bat. It was then lifted off on to a rack and left to dry.

Corner and valley tiles were made in a similar manner, only the mould and stock were of quite a different shape. This was almost triangular, measuring 11 ins on each of two sides, 3¼ ins across the top with a curved base of 18 ins. After each tile was made, it was draped over a triangular block of wood and finally dressed to the correct shape on a horse. The same mould produced both valley and corner tiles, the difference in shape coming when they were given their final dressing. The corner tiles were dressed on a much sharper horse than the valley tiles and, in addition, each had a hole made in the top so that it could be pinned into position on the roof of a building.

Ridge tiles were the most difficult to make; to finish 200 between 7 a.m. and 5 p.m. was considered to be a good day's work. Corner and valley tiles were easier to make and 300 of these could be completed in the same time. Plain tiles, in contrast, could be turned out at the rate of 750 a day, although to do this it was necessary to start at 6.45 a.m. depending to some extent on the consistency of the clay. Certainly, to keep up these rates left the maker little time for reflection! Tile-making was paid for on a piece-work basis: 9s. per 100 for fittings, against 14s. per 1,000 for plain tiles and 16s.6d. per 1,000 for bricks.

Fittings were burnt at the very top of the kiln because of their awkward shapes. Great care had to be exercised when stacking them, to obtain the maximum number of best quality products. However, some inevitably would twist and some would have fire-cracks, no matter how well they were stacked. Nor did it seem to matter whether they were slightly damp or completely dry when put into the kiln.

Making Land Drains

Another product of the yard was agricultural drainpipes. These were designed not so much to carry water from point 'A' to point 'B' as to drain wet places in a field or

a wood. They were made on a pipe-machine which was simple but highly efficient in operation. It was of the extrusion type and could be modified to produce pipes of 2, 3, 4, 6 or even 8 ins diameter. Wedges of prepared clay were put into the box and the lid clamped down. A ram, operated by a reciprocating handle, forced clay through twin perforated metal strainers of ⅜in mesh and then through the required sized die on to a channel, which was lubricated with water. This was known as 'pumping out'. When the extruding pipe reached the end of the channel, which was approximately 13 ins in length, it was cut off by a fixed piece of wire. As the pipe lay on the channel, a wooden plunger, kept in a bucket of water in readiness, was pushed into the end of it and the pipe was lifted, carried and turned up vertically on to the concrete floor of the drying shed. The plunger was then removed, leaving the pipe standing on its own.

One box of clay would produce thirteen 3 inch, nine 4 inch or five 6 inch pipes, these being the sizes most commonly made. To make the smaller sizes, usually a man and boy would work together, the man filling the box and pumping out, while the boy set the pipes off, put them in shape if necessary and made sure that there was an adequate water supply for lubrication of both plunger and the channel. Production for a working day (7 a.m. to 5 p.m.) for man and boy would be approximately 1,200 3 inch pipes. The 6 inch pipes were always made by a man working on his own, as it was very much heavier work. A box of clay produced only five pipes and had therefore to be filled more often. Also the weight of each pipe to be 'set off' put a very much greater strain on the wrists. To make 200 of these was considered a good day's work.

All pipes were made late in the season. They were mainly dried inside the shed, although to speed up the drying process, the 6 inch pipes were often taken outside on to the brick hacks. However, they had to be covered in the event of rain or at night. Anything made of clay (or loam, for that matter) had to be safeguarded from frost before burning. When dry, or almost dry, the pipes were placed in the kiln. They were always the last things to be put in and they stood vertically. One layer at the top of the kiln would consist of either 1,200 3 inch, 800 4 inch or 400 6 inch pipes. Usually these would burn successfully, although occasionally some would crack down their entire length, due mainly to being stacked in the part of the kiln where the flame was fiercer.

Clay Flower Pots

Clay flower pots were also made in the brickyard at one time, but not within the writer's memory. For these, a special washing process was required to free the clay from any impurities. Stones, sometimes left in the clay used for tiles, could cause cracks, due to the stone remaining neutral when the clay shrank during burning. For flower pot making, stones had to be eliminated, not only for this reason, but also because the pots were spun on a wheel. For the washing process, a small, brick-lined ring was used, similar to the large clay ring, but with channels through which the clay, in suspension, was run off, leaving stones and any other foreign bodies behind. A full range of flower pot sizes was made, but quantities can never have been great, as they were for use only in the gardens and greenhouses at Ashburnham Place.

The Lay-out of the Tileworks

The smaller ring shown on the site plan of the works (Fig. 7) is the one for washing flower pot clay. The larger one is the main clay ring, which contained the grinding mill. In the long shed nearest to this were the tilemakers' tables. There were two of these for making plain tiles in the annex, and two more inside the main shed, one for making ridge tiles and the other for corner and valley tiles. The rest of the long shed was used for drying plain tiles. Between the two parallel sheds is a concrete base for standing tiles out of doors, but this was not often done. The second shed contained racks for drying fittings and drainpipes. The three rows of hacks beyond this shed were for drying 2 inch paving bricks, which were moulded in one of the sheds which stands at right angles to the hacks. The other shed housed the pipe-making machinery. Although the kilns were shared with the brick works, the lay-out was so constructed that there was direct access to them from both areas. The water supply was quite primitive and simply involved buckets being filled at a point beside the pond and carried on a shoulder yoke some 20 yds into the works.

(The writer first worked in the brick works during his school holidays. He was employed there full time from 1930 onwards, working principally as a tilemaker until tile and pipemaking came to an end in 1961. From 1955 until the brickworks closed in 1968 he was also works foreman.)

A HISTORICAL FOOTNOTE

by W.R. and M. Beswick

The earliest known date for tilemaking at Ashburnham is 1362, when there was a 'building called a Tylehouse for baking tiles'.[1]

By the seventeenth century, when the Ashburnham ironworks were in full production, both bricks and tiles were being made in quantity. In 1682, for example, 14,700 bricks and 4,000 tiles were supplied to the furnace from the Earl of Ashburnham's kilns, and in the following year 38,900 bricks were required for 'the new Boring House'.[2] An interesting use of clay (as defined above) may be noted in this connection. In March 1780, the brickyard supplied the furnace with 300 tiles, 1,600 double bricks, 3,700 common bricks and also 3,700 bricks mixed with clay.[3] The inference which may be drawn is that it had become apparent that a high-silica brick was unsuitable for blast-furnace use, particularly where limestone was added to the furnace burden as a flux, and therefore a brick with a higher alumina content was needed. Hence the admixture of clay in bricks for the inner lining of the furnace.

Drain tiles were added to the range of products early in the nineteenth century, at a time when agricultural improvements of all kinds were being encouraged. A survey of the estate made in 1830, ten years before the brickyard was moved to its final site, pointed out that the heavy soil of the district could be much improved with drainage. In fact some work of this kind had already been carried out, as the surveyor writes:

'Upon enquiry into this matter I learn it has been the practice very lately to allow the tennants willing to use draining tiles to have them from the kiln at half price, they being at the expense of laying them down'.[4] Drain tiles bore little resemblance to modern drainpipes. They consisted of a series of 'soles', or flat tiles, laid in the ground with tunnel-shaped tiles placed on top of them. The latter were made by bending large flat tiles into a U-shape before firing, probably by dressing, as described above.

In 1852, a set of 'Ainslie's patent drain tile models' were purchased for the brickyard.[5] This follows the acquisition of an 'Ainslie's Brick & Tile Machine' in 1847 and suggests that some mechanisation was introduced into the production of bricks, tiles and drain tiles in the mid-nineteenth century. In 1871, what is described in the accounts as a 'brick and tile machine' was bought from James Tester, the ironfounder at Hurst Green, but it seems probable that this was in fact a drainpipe machine, as the first sales of 3 inch and 4 inch pipes are recorded in 1872 and various spare parts, such as die plates, cores, strainers and racks were purchased from Oakleys, the agricultural engineers who later took over Tester's business.[6]

The introduction of dark tiles to the range of products took place at about the same time, the first purchase of 'colouring for plain tiles' being recorded in 1869. About 3 cwt. of manganese were used each year during the latter part of the century and dark tiles sold at 2s. per 1,000 more than red ones (32s. and 30s. respectively in 1879).

Flower pots were first mentioned in the accounts in 1865, when C. Nicolls was paid for making them. This is the only specific payment made for this work as, once flower pot making had been introduced, it became a tilemaker's job. Flower pots 'for the Gardens account' continued to be mentioned until the early years of the twentieth century and in addition, in 1905, 'pans for the Game account' figured as well, but neither appears again when production was resumed in the yard after the end of the 1914–18 war. The last man known to have made flower pots was Harry Barden, who was yard foreman from 1900 to 1925.

It cannot be said with any certainty when the use of the brick and tile machine was abandoned. Hand-moulded bricks were produced alongside machine-made ones in the latter part of the nineteenth century, the accounts for 1879, for example, listing 'bricks' at 32s. per 1,000 and 'moulded bricks' at 40s. per 1,000. Of the tile range, fittings, at least, must always have been hand-moulded. In 1926, when there were some signs of increased activity in the yard, the estate carpenter spent three weeks making new brick moulds and it seems likely that a return to hand-moulding of all bricks and tiles was made at that point, if not before. The pipe machine, of course, continued in use until pipe-making ceased altogether.

REFERENCES

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2. East Sussex County Record Office (ESRO), account books of the Ashburnham ironworks: ASH 1817 f.595 and 607.

3. ESRO ASH 1815 f.571. (We are indebted to D.W. Crossley for drawing our attention to this and the foregoing reference).

4. ESRO ASH 1173, Edward Driver's survey of the estate.

5. The references to brickyard expenditure and sales which follow are taken from i) ESRO ASH 2028, Brickyard accounts for 1872-84; ii) ESRO ASH 1743-1771, Steward's account books for certain years between 1847 and 1925; iii) ESRO ASH A1434, Steward's account books completing the foregoing series to 1927.

6. ESRO A2596, account books of Albert Oakley Ltd.

ISBN 0-905259-19-X

Published by the Weald and Downland Open Air Museum
Singleton, Chichester, Sussex
1991

Printed by Caric Press, Andover, Hants