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BRITISH BRICK SOCIETY

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* *The annual subscription to the British Brick Society is £20-00 per annum. There are now no concessionary subscriptions.*

Telephone numbers and e-mail addresses of members would be helpful for contact purposes, but these will **not** *be included in the Membership List.*

British Brick Society web site:

http://britishbricksoc.co.uk

Contents

Cover Illustration:

Brick houses on Castle Hill, Lincoln, between Lincon Castle and Exchequer Gate. These will be included in the afternoon tour following the Annual General Meeting On Saturday 18 June 2022.

Editorial:
Brickmaking — Local, National, International

Lincolnshire had many small-scale brickworks in the nineteenth century. The late David Robinson, sometime member of the British Brick Society, when extending the entry by Terence Miller on 'Geology' in Nicholas Antram's second edition of *The Buildings of England: Lincolnshire,* London: Penguin Books, 1989, pages 22-23, noted 187 brickmakers in the county in 1882. He was using the fourth edition of William White, *History, Gazetteer and Directory of Lincolnshire,* Sheffield: William White, 1882. A generation earlier, in 1856, the second edition of William White, *History, Gazetteer, and Directory of Lincolnshire,* Sheffield: William White, 1856, reprinted New York: Augustus M. Kelley, 1969, listed 132 brickmakers in 86 parishes. At least 68 of the brickmakers were recorded as brick- and tilemakers. These firms varied from village enterprises, probably employing no more than half a dozen workers, including children, to multi-faceted businesses with interests in timber, slate, and stone as well as bricks, rather akin to a modern builders' merchants: Payne & Co in Sleaford were one such business.

Geologically, Lincolnshire is particularly fortunate in having a wide variety of clays suitable for brickmaking: Estuarine, Kimmeridge or Oxford, and Lias clays of the Jurassic era; Tealby and Hundleby clays from the Cretaceous era; riverine alluvium; and the clays of the Isle of Axholme. In the 1980s, when David Robinson was writing, the remains of historic kilns could still be seen at Baumber, Stixwould, and Sutton-on-Sea, the first two inland but the last-named in the coastal strip adjacent to the North Sea.

Just as in the fifteenth and sixteenth centuries when brickyards were opened for specific projects — that at Edlington Moor for Tattershall Castle probably in the late 1420s, certainly by 1431, or the one for Sir William More's Loseley Hall, near Guildford, Surrey, in 1561 — so, two centuries later, in preparation for building Louth Town Hall in 1853-54, Dales' Brickyard was opened of Brackenborough Road, the road north out of the town. In 1856, John Dales, builder, was noted has living in a house on Chequergate, a fashionable part of town not far from St James' church. John and Benjamin Dales are reported as in business on Eastgate as bricklayers and brickmakers. They were also noted as lime burners. The town had two other brickmakers: James Hunter Ryley on Chequergate and Thomas Simons on Eastgate. Among the other fourteen bricklayers in Louth in 1856 was William Dales on Bridge Street.

Similarly, in the village in south Bedfordshire, Stopsley, where I grew up, there were visible signs of clay extraction for more than one brickworks. These were uneven surfaces where the layer on clay-with-flints on top of the chalk at the northern end of the Chiltern Hills had been dug for brickearth leaving a pock-marked surface of humps and bumps: at fourteen, still quite exciting to ride one's bicycle over. I would walk past one former brickworks on my way to Stopsley Junior School in the early 1950s; I walked and then cycled past another on my way to Luton Grammar School in the late 1950s and early 1960s; and the humps and bumps which were traversed on my bicycle were situated behind the flat I had for four years in the late 1970s. One of Stopsley's three pubs was and still is 'The Brickmakers' Arms' on St Thomas' Road. Such was the ubiquity of brickmaking in the village.

But one side-effect of the Great War (1914-1918) was to close down many small rural brickworks, just as a side-effect of the Second World War (1939-1945) was to close down most of the small-scale builders who might erect three pairs of semi-detached houses in one year or four, larger detached houses in the next year. The bricks from which the six semi-detached houses were built were 'Luton Greys', produced locally, perhaps elsewhere in the expanded town of Luton, which doubled its population between 1911 and 1939, or in the village of Caddington, to the south-east of the expanding town

National brickmaking firms, not least the London Brick Company, took over supplying bricks to housebuilders and construction firms. The nationwide building company which erected the new house which my parents and I shared between December 1956 and March 1977 used bricks made the London Brick Company. The 20-year-old bungalow my parents purchased for their retirement in a village outside Great Yarmouth was also built of London Brick Company bricks. After 1945, there were, and still are, other brickmaking firms with a national profile, not least Ibstock.

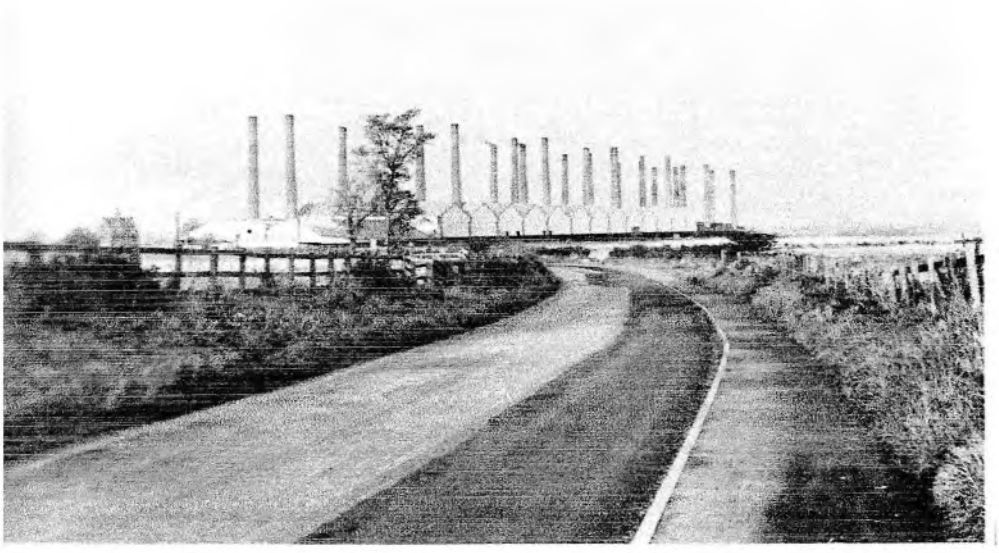

Fig.1 Chimneys and kilns at the brickworks at Lidlington, Bedfordshire, in 1967. The works opened in 1929 and ceased on 9 March 1977.

But London Brick fell foul of strict environmental laws, restricting noxious emissions. The result was the demise of the forest of chimneys between Marston Moretaine and Kempston. Other chimney forests, visible the railway from Bedford to Bletchley (the central part of the important rail link between Cambridge and Oxford, so cruelly reject by Lord Beeching). Local roads provided good views also. Other chimney forests were at Lidlington (fig.1) and Kempston, respectively south and north of the main concentration of brickmaking activity. Once there were 167 chimneys in the continuous area of brickmaking in Stewartby and Marston Moretaine. Then there were just four; now there are none. On Sunday 26 September 2021, large crowds gathered to witness the controlled demolition of the last four chimneys of the brickworks at Stewartby and Kempston Hardwick: neither the underlying Oxford clay nor the brickworks respected parish boundaries. Now the site will be reused for a thousand new homes and a business park.

But as the second half of the twentieth century progressed and even more in the twenty-first century, brickmaking has become more international with companies whose headquarters are elsewhere in Europe owning individual and successful brickworks in England. One such is Wienerberger, which as its name implies is an Austrian company with its headquarters in Vienna (Wien in German).

Even more recently, the United Kingdom has been importing bricks from half-way across the world. Later in this issue of *British Brick Society Information* is notice of an on-line publication, *Disaster Trade: The Hidden Footprint of UK Production Overseas,* produced by researchers at Royal Holloway College, University of London (see pages 32-33, below).

Two relatively recent items in broadsheet newspapers have drawn further attention to the perils of the UK sourcing its brick supply from South Asia.

On Monday, 6 September 2021, *The Guardian* published across it two central pages, Haribur Raiman's photograph entitled 'Bangladesh: Low-paid migrant labourers carry bricks from a brickfield in Keraniganj, south-west Dhaka'. Workers are unloading a clamp kiln. The multiple rows of bricks tower above the labourers. The rows are stacked with header faces in one row and stretcher faces in the rows above and below. Thirty-three rows of bricks are visible, but how many the total number of rows is cannot be judged. The bricks tower above the workers. Most labourers, even women and pubescent boys and barely adolescent girls, carry ten bricks on their heads, protecting the cranium by a thick pad above the head covering. On such young persons is the future of a middle-income country at the lower end of that category being built. But at what cost

to the health and lives of the young persons who are 'old' at thirty and many are dead before their fortieth birthday.

The bricks are without a frog but carry the imprint 'N B M'.

More recently, on 23 December 2021, it was reported in *The Guardian* that a consignment of bricks from Pakistan delivered to a distribution firm, Manchester Brick Specialists, which is based in its twin city of Salford, was found to contain a saw-scaled viper, one of the deadliest snakes in the world. The container with the bricks and the snake had arrived in late November.

It may be asked why a country with a long history of brickmaking is importing bricks from Pakistan and the other countries of South Asia, where working conditions for the brickmakers and other employees are not what they are in Britain, nor are safety standards, and then there are serious questions about carbon emissions, both from the manufacture of the bricks and from their transport on a long sea voyage.

As this issue of *British Brick Society Information* was being put to bed, Ben Robinson in *Country Life*, 12 January 2021, drew attention to the loss of craft skills and climate change, with winters no longer sufficiently cold, in relation to an important roofing material, Collyweston slates. The village of Collyweston in north Northamptonshire, close to the border with Rutland and Lincolnshire, has been making its distinctive slates for several hundred years. In the twenty-first century, the material is being superseded by foreign imports, not least because the stone log from which the slates are split by frosts is slowly giving out.

The material has connections with Ralph, third Baron Cromwell (*c.*1394-1456) who owned Collyweston Hall and was lord of the manor there.

This issue of *British Brick Society Information* is the first of two issues in 2022 to have a focus on brick and its manufacture and uses in Lincolnshire. Material for *BBS Information,* **150,** May 2022, should be with the editor by Tuesday 15 March 2022 at the very latest and should, preferably, be submitted electronically to the Editor, *British Brick Society Information* at *davidkennett510@gmail.com.* This is to allow for publication in late May 2022 and distribution at least 21 days before the society's Annual General Meeting on Saturday 18 June 2022 at Bailgate Methodist church, Lincoln.

As this issue was being finalised, the society received the sad news that Molly Beswick, a long-standing member, had died in late 2021. Molly was a woman of Sussex and published two editions of *Brickmaking in Sussex: A History and Gazetteer,* Midhurst: Middleton Press, 1993 and revised edition 2001. The society extends its condolences to her family.

DAVID H. KENNETT
Editor, *British Brick Society Information,*
31 January 2022

Bricks and Lime Fired Together: Some Further Evidence

Mary Bentley and David H. Kennett

INTRODUCTION

In *British Brick Society Information,* **147,** March 2021, Brian Murless noted comments made by Sir Joseph Banks (1743-1820) when he aged 24 in 1767/68 when he was travelling around England about the burning of lime and the firing of bricks in the same kiln. He asked if this was a common practice in the eighteenth century, linking Banks' observations to those of Peter Kalm, a Swedish traveller, who in 1748 had observed the practice at Ivinghoe Common, Buckinghamshire.[1]

Mary Bentley responded[2] to Brian Murless by drawing attention to comments made by the Rev St John Priest in 1810 in the *General View of Agriculture of Buckinghamshire* where there is a brief description of a kiln used for both materials at Buckingham and the comment that 'Many kilns in Bucks burn lime, bricks, and tile, over the same fire at the same time'.[3] (see below).

David Kennett has subsequently checked a new translation by the late Professor W.R. Mead (1915-2014) of Peter Kalm's travels, self-published in 2003 as *Pehr Kalm: A Finnish Visitor to the Chilterns in 1748*[4] for descriptions of buildings and building materials — bricks, flint, and lime production — in the mid eighteenth century. Kalm's investigation was centred on the Hertfordshire parish of Little Gaddesden[5] with visits to the Buckinghamshire parishes of Dagnal and Ivinghoe[6] and the Bedfordshire village of Totternhoe.[7]

David Kennett has also found evidence of the burning of bricks and lime together from the accounts made by Sir William More of building costs regarding Loseley Hall, near Guildford Surrey in the 1560s of the practice of burning bricks with lime, and possibly also of burning tiles with lime.[8]

MAKING BUILDING MATERIALS IN BUCKINGHAMSHIRE, *circa* 1810

In the *General View of Agriculture of Buckinghamshire,* the Rev. St John Priest wrote:

> **Section IV Prices of building, materials, and artisans' labour**: 'These do not appear higher than in other counties.'
>
> Lime is various prices - 2s 4d, 2s 9d, 3s 6d per quarter or 6d or 9d a bushel.
>
> Bricks are generally from 38s to 40s per thousand. Those not more than 38s are not so good, having many stones in them. At Amersham, they are 40s; and at Buckingham and Risborough 45s per thousand; at Brill 42s 6d per thousand.
> Freestone, Olney 2s a cartload, which will make 3 yards of wall between 18" and 2ft thick.
>
> Tiles - generally flat. At Newport £2 per thousand, but at Buckingham 45s. Pantiles at Newport are £1 per thousand: 9 inch pavement, 4*d.* each; 12 inch, 6*d.* each; pavements 9" x 4½", 6*s.* per hundred.
>
> Many kilns in Bucks burn lime, bricks, and tile, over the same fire at the same time. At Buckingham there is one, the walls are 24 inches thick, and the room is a square of 14 feet, and its height 22 feet. This kiln burns 50 quarters of lime, which are laid at the bottom, and form arches in which the fire is made, upon the lime 8000 bricks are laid, and upon the bricks 6000 tiles. The tiles when burnt are ten inches long, six inches broad, and half an inch thick. These require 1500 of furze faggots, which are bought at 19s per thousand.

Timber - At Newport Pagnell, Riga fir is 5s 6d per foot; oak from 3*s.* to 3*s.* 6*d.* per foot; elm 15*d.* per foot; ash, from 16*d.* to 18*d.* per foot; red and white deals are alike. At Buckingham, oak is from 2*s.* to 5*s.* per foot; elm, from 1*s.* to 2*s.*; and ash from 2*s.* to 2*s.* 6*d.* per foot. At Fenny Stratford, large oaks sell at 8*s.* per foot.[9]

PEHR KALM IN THE CHILTERNS

Pehr Kalm (1716-1779) was a Finnish botanist, geologist and agricultural economist who spent six months in England between 2 February and 31 August 1748 when on his way to study the flora and agricultural practices of the eastern seaboard of North America from Canada to the Carolinas with a view to collecting plants and seeds to see if they would grow in his native Finland. On his return from North America, in 1751 he was appointed Professor of Rural Economy at the Åbo Academy: Åbo is now Turku, in which city Kalm remained for the rest of his life. As was the custom in the eighteenth century, as an academic, he was ordained a minister in the Finnish Lutheran Church in 1757 and appointed to the pastorate of St Maria's church on the outskirts of Åbo.[10]

During his travels in England and North America he kept a diary in six volumes, manuscripts which survived the fire which engulfed most of Åbo in 1827 because they had been loaned to Prof. J.F. Wallenius whose house escaped the conflagration. An English version of the sojourn in North America was published in 1770[11] and the original manuscripts were rediscovered by Georg Schaunman in 1899, who published the sections on North America in 1904 in Finnish.[12] Earlier in 1892, Joseph Lucas, an English geologist, had published *Kalm's Account of his visit to England on his way to America in 1748.*[13]

The latter was picked up by W.R. Mead exactly two hundred years after the events described by Kalm. Like Joseph Lucas, Prof. Mead knew the Chilterns well, traversing it on his horse 'Christmas Carol' for over twenty years. An expert on the historical geography of Scandinavia and proficient in its languages, Prof. Mead translated the section on the visit to Little Gaddesden whilst dealing with a family crisis which involved a daily train journey of an hour each way. Kalm and his handyman, Lars Jungström, spent from 25 March to 15 April 1748 lodging at the inn in Little Gaddesden.[14]

Kalm's diary in Little Gaddesden contains two accounts of chalk pits, three comments on lime burning and two short notes on brickmaking in the eighteenth-century. These have been extracted here.

The diary also contains a long account, made on 6 April 1748,[15] of the extraction of chalk as a building material from the still-operating quarries at Totternhoe, Bedfordshire; the material being known as 'Totternhoe clunch':[16] transcription of these five printed pages have not been included in this piece.

BRICK EARTHS AND BRICKMAKING

Pehr Kalm actually says very little about brickmaking, apart from his comments about the firing of a kiln containing both bricks and lime. However, on 4 April 1748, at Little Gaddesden, he noted the raw material for making bricks.

> *Bricks made from the Yellow Earth.* Brick is made and burnt from the reddish-brown, yellow-streaked earth that lies everywhere immediately on top of the chalk, though they formerly mixed a little sand with it. It was said that sometimes brick was made from it without the addition of sand. The yellow earth looks like a yellow-reddish clay and is very sticky and binding.

FUELS USED IN BRICKMAKING

In general observations on Little Gaddesden and the area made on 30 March 1748, Kalm records the brickyard at the Duke of Bridgewater's seat at Ashridge Park.

In the Duke of Bridgewater's park, which lay close beside Little Gaddesden, there was a large brick yard, where large numbers of bricks were prepared. The fuel that was usually put into the kilns to burn the bricks consisted of small bundles of beech twigs and more particularly of bracken. We saw heaps of it thatched with straw and lying in the brickyard. People said that bracken gives off a much more intense heat than many kinds of wood. It was said that *Genista spinosa* was not as effective by a long way. A local worthy told me from long experience he could testify that bracken is reckoned among the best of fuels. He used it for baking bread and for much else. (Mead, pp.51-52)

Kalm had previously given a botanical description of bracken.[17]

On 4 April 1748, Kalm made another observation on the choice of fuel for use in a brick kiln.

Furze with which to fire Bricks. Everywhere in these places where there is a shortage of wood people must us *Genista spinosa vulgaris* as fuel in fireplaces. My Williams [a local farmer] now told me that is similarly used in this area to fire bricks. It is collected, bound into small bundles, dried and, during brick burning, these bundles are pushed into the brick kiln instead of other fuel. Afterwards at the brickyard of the Duke of Bridgewater, I saw that this was collected and the land in heaps to be used like bracken as fuel in the kiln. (Mead, p.78)

USES OF BRICK

Three times Kalm notes how brick was used in the mid eighteenth century in the Chilterns. Commenting more on the use of flint than of brick, on 29 March 1748, he noted the uses of both materials in the construction of houses.

Since there is not the slightest sign of granite in these parts, flints are often used as foundations for houses. Here and there, outhouses are to be seen the walls of which are mostly made of them. Bricks are also widely used for foundations as wells as for the entire house. (Mead, p.47)

The comments about flint were echoed in an entry made on 5 April 1748 at Ivinghoe.

Flint for the Floor and the House Foundations. In some places the floor of the entrance hall to houses consisted entirely of flints, which were laid in clay, with their flat sides uppermost. In many places the foundations of the houses, from 1 to 2 *alnar* up from the ground were made entirely of flint. (Mead, p.90)

An *aln* was an old Swedish linear measure equivalent to 594 mm (1 foot 11.38 inches)[18] so the flint walling was between approximately 2 ft and just under 4 ft (0.6-1.2 metres) high.

On the visit to Ivinghoe, a decayed market town, Kalm recorded a description of the village.

Description of Ivinghoe. Ivinghoe is a parish the inhabitants of which live for the most part by farming. A few shopkeepers also live here as is customary in parishes in England. The houses or farms are not all built in a row as in Little Gaddesden, but in a rounded pattern as in a town. In the centre of the parish stood a beautiful stone church with a tower on the top. The tower was not quite constructed in the English manner, but had a spire in which there was set a clock without a hand. All of the houses in the parish, except for a few outhouses made of oak planks, were built of stone or brick, though the brick was set wholly between cross-timbering. The timber-work went both *ad angulos rectos et acutos.* The roofs were nearly all of straw, well-constructed and quite steep. The settlement itself was set in a hollow. High chalk hills press close to the village on the eastern side and arable land is found right on top of them. (Mead, pp.89-90)

Fig.1 Map of the roads and tracks of the Chilterns, showing the villages visited by Pehr Kalm: Little Gaddesden, Hertfordshire; Dagnal and Ivinghoe, Buckinghamshire; Totternhoe, Bedfordshire. After W.R. Mead, 'Pehr Kalm in the Chilterns', *Acta Geographica,* **17,** 1, 1963.

Four days earlier on 1 April 1748, Pehr Kalm had recorded the use for brick dust as a cleaning material.

> *Brick* crushed to a fine powder or meal was used here to scour or polish all sorts of iron and brass ware, such as candlesticks, candle snuffers, knife handles, tongs and so on. Some of this powder was laid dry on a cloth and used to polish the iron or brass utensils. If the powder was wet, the iron or brass ware became tarnished. (Mead, p.60)

CHALK AND ITS EXTRACTION

Pehr Kalm makes two observations about chalk pits in an early account of the country around Little Gaddesden, both made on 4 April 1748. The first reads:

> *Pits from which Chalk was formerly taken.* Out in the fields and even on the grazing lands we saw in a number of places broad and deep pits, which they used to take chalk in former times either for manuring the and or for some other purpose. In most of these old pits not only was the bottom overgrown with a thick grassy cover, but tall sturdy beeches flourished in some of them. Sch pits were to be seen on all the hillslopes around this tract. (Mead, p.76)

Later in the same day's record, Kalm noted the chalk formation:

> *Strata in Chalk Pits.* In the hill on which Little Gaddesden was built was a chalk pit, from which they took chalk in former times. In it the strata were in this order:
> 1. Uppermost, the dark mull or brick-coloured earth consisting of decayed vegetation and the brick-coloured clay and chalk in some places a half *aln* deep, elsewhere an *aln.*
> 2. Chalks of the ordinary loose type, 6 *alnar.*
> 3. A layer of brick-coloured clay, a half *quarter.*
> 4. Then only chalk right to the bottom. (Mead, p.80)

An *aln* is an old Swedish linear measure equivalent to 594 mm (1 foot 11.38 inches) In 1748 an *aln* was made up of 2 *fot.* Thus, 6 *alnar* is 3.56 metres (11 feet 8 inches); 3 *alnar* were a *famn* (or fathom: the naval unit of 6 feet). A *fot* had a length of 247 mm (9¾ inches) and a *quarter* (*kvarter* in Swedish) was half of this, being 123 mm (4.85 inches). The layer of 'brick-coloured clay' was thin one at around 2½ inches (62 mm).[19]

Deep chalk pits are a common feature of the Chiltern Hills. At their eastern extremity in historic Stopsley, an area on the eastern side of Luton, there are several chalk pits, some much deeper than others. Stockingstone Road, the historic boundary between Stopsley and the township of Luton, bends sharply to the left as it approaches the bottom of the hill. Opposite this bend is one of the deepest chalk pits in Stopsley;[20] here, the architect Peter Browning Dunham (1911-1997) built himself a modernist house at 232 Stockingstone Road.[21] The strata described by Pehr Kalm can clearly be seen in the pit surrounding the house although it could be that the depths of the clay and chalk at the top of the pit were somewhat different. Almost certainly, the chalk from the lower part of this pit had been used for building.[22]

LIME BURNING

The first entry on lime burning was made from Kalm's observations at Ivinghoe on 5 April 1748, a day of sunshine and scattered clouds.

> *Lime burnt from Chalk* The man who accompanied us told me that when a pit was opened up in the valleys between the chalk hills it is often possible to go down from 14 to 20 feet or more before coming to the place here the chalk takes over. On the chalk hills it is never necessary to dig for more than 1 or 2 feet before striking the chalk. The soil everywhere in the valleys was of the flint-sand and it almost always had a reddish or rusty colour.
> *Genista spinosa for Fuel* We saw in many places on the broad, dry grazing land big heaps of *Genista spinosa* which had been cut here and collected together in order to be taken home for fuel. The fuel consisted of a mixture of *Genista spinosa,* bracken, and dried grass, but *Genista spin.* predominated. (Mead, p.84)

Later the same day, a further entry on lime burning was made.

Lime burnt from ordinary Flints Various people in Ivinghoe told us that, twenty miles away, lime is burnt from the ordinary flint that is found everywhere on the ploughed fields. I made the suggestion that it might be some form of limestone which resembled flint. They answered, 'No, it is ordinary flint that is found on the fields and that is used for striking fire. But they were not able to describe the way in which it was converted into lime. The smith at Little Gaddesden, an old man, confirmed that at a number of places, lime is burnt from flint — adding that this lime is very good and strong and better than other lime. Furthermore, there is a special method by which flints are reduced to lime, but he had no knowledge of it. (Mead, p.93)

LIME AND BRICKS FIRED IN THE SAME KILN

Pehr Kalm's intention on visiting Little Gaddesden was to visit and converse with William Ellis, a local farmer who had published two books on current farming practices in the chalk lands of the Chiltern Hills and after Kalm's visit would publish two more. One conversation took place on 8 April 1748, a mostly cloudy day when the talk turned to the subject of lime being burnt from chalk.

How Lime is burnt from Chalk. When I asked Mr Ellis today about the process by which chalk is burnt into lime, he bade me go with him to the place where they burn it. I did so and found it in the following way. There was an ordinary stone-built kiln in which bricks are fired. In it, lime and bricks are burnt together at the same time. Chalk is dug out in larger or smaller pieces from the hillside and taken to the kiln. When bricks are to be fired, the kilns nearest the fire are covered over with as much chalk as is needed for lime. The largest pieces are put nearest the heat and the smaller on top of them. On top of the chalk are laid the bricks, which are fired in the usual way. Afterwards a fire is kindled in the kiln pipes of which there are two. First all of the wood is put in to heat up the kiln, but afterwards only small bundles of twigs. *Genista spinosa.* grass, moss, and bracken are used. With the aid of these, firing continues for three or four days, until both bricks and chalk are fully baked. After the bricks and lime have cooled somewhat, they are covered over with a mixture of moss and *Genista spinosa* which had been cut and bound together on the common land. At the same time the mouths of all the kilns are stopped up so that no moisture can be drawn in. Afterwards first the bricks and then the chalk are taken out. When it has been burnt the chalk is much lighter than before. It is then slaked with water as with other unslaked lime, after which it crumbles into a fine white meal or powder which is the lime that is used to build houses, manure arable and pasture land, and much else. (Mead, pp.109-110)

BRICK AND LIME BURNT TOGETHER IN THE SIXTEENTH CENTURY

In addition to the eighteenth- and early-nineteenth-century instances of lime being burnt above bricks, it is possible to point to a much earlier use of the practice. In the 1560s, Sir William More of Loseley, Surrey, kept detailed accounts of the building of his new house outside Guildford.[23] At Loseley Hall, most of the stone used in the exterior walls was recycled by Sir William from Waverley Abbey, 5 miles distant. The accounting periods varied in the period for which building activities recorded and in one case, Midsummer 1563 to Midsummer 1566, covered three years. Whilst the accounts record the making by bricklayers of both a clamp kiln for bricks and a lime kiln, they also record burning chalk for lime and bricks together.

In the initial account, from Michaelmas (29 September) 1560 to Christmas 1561, we read under 'The makyng of lyme and lyme bought':

ffyrste dyggyng of xxx. Lode of Chalke	5 *s.*
Item. the caryage of the same	10 *s.*
Item. the burnyng of the same with my brycke	30 *s.*
Item. for making and burnyng of a kill of lyme and lyme bowght of sondrye persons	7 *li.*

Summa £9 5*s.*

In period from Christmas 1561 to 22 February 1562, there is a detailed account of 'The chargys of making of my lyme keele, besides brycke':

Ffyrste, to Dyrryke, ye brykleyer and his man for 10 dayes ...	10 *s.*
Item. theyre bordynge	8 *s.* 4 *d.*
Item. to Norryce and his boye for 3 dayes	2 *s.*
Item. Mabbanke the mason's man for 5 dayes	2 *s.* 1 *d.*
Item. his borde	2 *s.*
Item. to Thomas Mabbanke the brykleyere for 2 dayes	12 *d.*
Item. his borde	8 *d.*
Item. to Mychaell the lyme burner to helpe make the kyll for 22 dayes	11 *s.*
Item. his border all that tyme	9 *s.*
Item. To 2 laborers to carrye stuf to the masons 11 dayes	7 *s.* 8 *d.*
Item. theyre borde	7 *s.* 8 *d.*
Item. the carage of the brycke, to the quantyte of 10 M, and of whygtht stone, to fill the walls withal	10 *s.*
Summa 62 *s.* 2*d.*	

The bricks used in building the lime kiln were presumably some of the 126,500 made by an unnamed brickmaker in the clamp built in the period ending at Christmas 1561. The brickmaker was paid £9 9*s.* 9*d.* for his work, but the entry for 'meate & drynke' for sustenance refers to the brickmakers, at a cost of £9 0*s.* 0*d.* It is unclear whether any bricks were burnt with the lime or any lime with the bricks in the initial period of building activity.

In the thirteen months and one week between 22 February 1561 and 28 March 1562, we have a detailed record of the practice of lime and bricks being burnt together:

ffyrste to Dorry, Nymes, and Whyght for dyggynge of rowghe stone and chelke to make lyme, 62 dayes amongst theym ...	44 *s.*
Item. to Mychaell the lyme burnere, for burnynge 2 kills of lyme,, conteyninge 60 quarters, and an[d] 2,000 of bryke, after 6 *d.* the day & 7 [*d.*] nyght that he watched	15 *s.* 3 *d.*
Item. to a laborer that helpe him to burn after 6 *d.* the day & nyght	5 *s.* 6 *d.*
Item. bothe theyre bordynges the tyme of theyre works, the one 17 dayes the other 10 dayes	9 *s.*
Item. to those persons that helpte to brynge chalke to the brycke kyll, and carye the same away after burnynge, where it shold be made	6 *s.* 8 *d.*
Item. 28 lode of wood, to burne both kills, as 16 lode to the first, & 12 [lode] for the second, worth with caryge & makynge 2 *s.* 8*d.* the loade	3 *li.* 14 *s.* 8 *d.*
Item. the caryage of chalke from the place of dyggynge to the kill, for both kills, after 4 *d.* the lode	12 *s.*
Item. for meate & drynke to the caryers of the chalke	4 *s.*
Sum of the chargis of making 60 quarters of lyme and 2 M of bryke,	£6 19 *s.* 1 *d.*

In the seven weeks between Easter and Whit Sunday 1562, individual bricklayers and their labourers are paid but no bricks seem to have been made in these weeks. However, Mychaell the lime burner and 'his man' worked 18 days and 15 days, respectively, together with 'certeyn nyghts', presumably alternate nights to

watch over the lime kiln. Mychaell was paid 6*d.* per day and 7*d.* for night work; his man received 4*d.* per day but only 2*d.* for a night's work; their wages totalled 19*s.* 4*d.* No mention is made of meat and drink for them but the next entry has victuals for the eight masons and labourers recorded in four entries before that for the lime burner and his man; their meat and drink is presumably included in £9 3*s.* 4*d.* recorded for feeding three masons, six labourers, and a boy.

In the following period from Whit Sunday to 16 August 1562, Mychaell the lime burner and his man worked 5 and 12 nights between them and were paid 38 *s.* 8*d.* with an allowance for food and drink at 5*d.* a day, totalling 23*s.* 4*d.* In the subsequent four months and one week to Christmas 1562, £5 6*s.* 0*d.* was spent on lime burning by Mychaell and his boy with victuals for 50 days.

Between the start of building work at Michaelmas 1560 and Christmas 1562, in the summary account drawn up that Christmas, Sir William recorded the cost of bricks as £34 15*s.* 5*d.* However, when writing the detailed account of building the clamp kiln with 126,500 bricks, the total cost was £34 12*s.* 3*d.* made up as follows:

ffyrste payd to the brickmaker for making syxe score thowsand at 18 *d.*
the thowsand with odde thowsands ... ... 9 *li.* 9 *s.* 9*d.*
Item. the making and showing with yron of the mold ... ... 2 *s.* 6 *d.*
Item. a hundred lode of wood to burne the same ... ... 10 *li.*
Item. afterwards 40 lodes more to burne the brycke ageyne bycause hit was not well burnt before ... ... 4 *li.*
Item. the caryage of sande to the place for makynge thereof ... 20 *s.*
Item. strawe for the same ... ... 40 *s.*
Item. meate & drynke for the brycke makers durynge all the tyme of theyre worke ... ... 8 *li.*
Summa 34 *li.* 12 *s.* 3 *d.*

However, 2,000 more bricks were fired, in a lime kiln in the following accounting period, as noted above. Thereafter, no more bricks seem to have been made or purchased from an outside source.

In the next three years, Midsummer 1563 to Midsummer 1566, eight kiln loads of lime were burnt, costing 15 *s.* 0d. per load. With fuel and the costs of digging the chalk, the total cost of the lime for mortar was £26 0*s.* 0*d.* In the fifteen months between Midsummer 1566 and Michaelmas 1567, twelve kiln loads of lime were burnt, again at 15*s.* 0*d.* per kiln load. With fuel and extraction costs, total expenditure on lime was £39 0*s.* 0*d.* Another nine kiln loads of lime were manufactured between Michaelmas 1567 and Whit Sunday 1568. With wood as the fuel and the cost of digging and carrying the chalk, the total was £29 5*s.* 0*d.* Another seven kiln loads of lime were burnt at the same costings between Whit Sunday 1568 and the close of building operations at Michaelmas 1569, setting Sir William back a further £32 10*s.* 0*d.*

In none of the instances after 28 March 1562 is any mention made of firing bricks when lime was being burnt. Nor are brickmakers employed in these seven and a half years.

CONCLUSION

This paper has drawn attention to the simultaneous use in both the sixteenth and the eighteenth centuries of a kiln to burn lime, fire bricks, and fire tiles. If small quantities of each commodity were required it made economic sense for the kiln burner to combine these three together. While there is almost two hundred years between the kiln at Loseley Hall and the earlier record of those in Buckinghamshire, it can be considered that the practice of firing the kiln to provide different commodities was long-standing. Afterall, one cannot build a wall with mortar and lime mortar was used during the period in question and on into the nineteenth century.

One would like to know if the practice of using a kiln for making lime and firing bricks at the same time was found elsewhere and at what dates. Buckinghamshire and Surrey share a common county boundary in the River Thames.

APPENDIX 1
THE MANUFACTURE AND SALE OF LIME IN LINCOLNSHIRE

It may be instructive to look at a large county, Lincolnshire, where the raw material for lime mortar was the limestone hills of the county. In 1856, according to the edition of White's *History, Gazetteer and Directory of Lincolnshire* published in that year,[24] with two exceptions — Candlesby and the town of Louth, both on the chalk of the Lincolnshire Wolds — the only places recorded with men who gave their occupation as lime burners were on the limestone ridge which runs north south through the county. Including Lincoln, fourteen lime burners are noted in eight places. Six of the places are on the limestone ridge: from south to north they are Sleaford, Dunston, Lincoln, Nettleham, Tealby, and Hibblestow.

In Sleaford, both lime burning enterprises were part of much wider businesses. One, Payne & Co have been mentioned in the Editorial to this issue of *British Brick Society Information* as brickmakers but they were also recorded as 'timber, stone, and slate merchants'. Also in Sleaford, the architects' practice headed by Charles Kirk and James Parry listed themselves also as brickmakers, timber, slate, and stone merchants. Running what today would be seen as a builders' merchants' firm would be incompatible with the practice of architecture but this was not the case in 1856.

In Dunston, Luke Clipsham was also a stonemason. Three lime burners were noted in Lincoln, all with addresses not far from the city centre. Of these, John Foster at 20 High Street was also noted as a brickmaker while neither William Nelthorpe at 24 Lindum Road nor Benjamin Wray at 15 Eastgate seems to have had another trade. At Nettleham, just north of Lincoln William Vickers was also without another occupation. Further north, Edmund Colton at Tealby was also a bricklayer whilst Mr Platts at Hibblestow concentrated on lime burning. The size of these enterprises almost certainly varied. Payne & Co. and Kirk and Parry in Sleaford ran multiple businesses. Mr Platts, significantly without a Christian name, a rarity in the directory entries, seems to have been a proprietor with a business worked by others. But, at the other end of the scale, Luke Clipsham and Edmund Colton, operating in villages with populations in 1851 of 594 and 861, respectively, both seem to be men with dual occupations, making their own lime for the buildings they erected and repaired. Similarly on the Wolds, William Bourne at Candlesby also ran a beerhouse, presumably to boost his income in a relatively small village of 245 inhabitants whilst the four lime burners in Louth were three who no other recorded occupation and one, the brothers John and Benjamin Dales who had a brickworks on the north-east outskirts of the town and worked as bricklayers.

Unusually, the next village north from Candlesby, Welton-in-the-Marsh, boasted a lime merchant in Richard Dawson. Lime merchants, as opposed to lime burners, were to be found in towns such as Boston and Spalding. Of the four lime merchants in Spalding, the splendidly-named Farmery Epworth Cunnington on London Road was also a brick- and tilemaker, a bricklayer, and a slater and plasterer, and the same is true of Samuel Dolman whilst Stephen Dawson was noted both a brickmaker and a bricklayer in addition to being a lime merchant. All three look suspiciously like men who began as bricklayers and branched out into making bricks and in two cases dealing in lime and other materials. At Gainsborough, five firms were recorded as 'Gypsum merchants for tillage and plaster': Arthur Young's *A General View of Agriculture in Lincolnshire* notes lime for plaster ceilings made in Doncaster and shipped down the Don and the Trent.

NOTES AND REFERENCES

1. B. Murless, 'Eighteenth-Century Accounts of Firing Bricks and Burning Lime in the Same Kiln', *BBS Information*, **147**, March 2021, pp.35-37.
2. By email, with carbon copy to David Kennett.
3. Rev St John Priest, *A General View of Agriculture in Buckinghamshire,* London: Richard Phillips, 1810, pp.45 and 46, and available on-line via Google Books: put the book title into a search engine and it will come up first. Priest was the Secretary to the Agricultural Board for Norfolk.
4. W.R. Mead, *Pehr Kalm A Finnish Visitor to the Chilterns in 1748,* Aston Clinton: The Author, 2003.
5. For a recent account of the buildings of Little Gaddesden see J. Beetley, N. Pevsner, and B.K. Cherry, *The Buildings of England: Hertfordshire,* New Haven and London: Yale University Press, 2019, pp.369-372.

6. For a recent account of Ivinghoe see N. Pevsner and E. Williamson with G.K. Brandwood, *The Buildings of England: Buckinghamshire,* London: Penguin Books, 1994, pp.416-419; Ivinghoe Aston, a hamlet of Ivinghoe, had an egg-shaped lime kiln in use until 1960: the kiln was built into the side of a chalk pit. Dagnal is noted *ibid.*, pp.265-266, an entry mostly taken up by an account of a modernist house, 'Hillfield'.

7. For a recent account of Totternhoe see C. O'Brien and N. Pevsner, *The Buildings of England: Bedfordshire,* New Haven and London: Yale University Press, 2014, pp.313-314. An earlier description is D.H. Kennett, *Portrait of Bedfordshire,* London: Robert Hale, 1978, pp.150-157.

8. J. Evans, 'Extracts from the Private Account Book of Sir William More of Loseley in the time of Queen Mary and Queen Elizabeth', *Archaeologia,* **36,** 185, pp.284-310.

9. Priest, 1810, pp.45 and 46.

10. Details of Pehr Kalm's life in this and succeeding paragraphs have been taken from Mead, 2003, pp.7-25 and 143-153.

11. Mead, 2003, p.17 with no.10 citing G. Schauman, *En boks historia, Pehr Kalm Resa till Norra Amerika,* Helsingfors [Helsinki], 1904.

12. See work by Schauman cited in note 11 *supra.*

13. J. Lucas, *Kalm's Account of his visit to England on his way to America in 1748,* London and New York: Macmillan, 1892.:

14. Mead, 2003, pp.34-140. Mead gives dates in both the Julian Calendar, in use in Britain until 1753, and the Gregorian Calendar, in use in continental Europe from the late sixteenth century. Only the Julian dates are given in this paper. Citations in subsequent sections to Mead's book have been given in parentheses at the end of each quotation.

15. Mead, 2003, pp.101-108. Pehr Kalm calls Totternhoe 'Tatanol'. When researching Kennett, 1978, I heard more than one local resident call the decayed town, now village, 'Tattanoe'.

16. Apart from Totternhoe parish church, the most prominent churches to have been built of Totternhoe clunch are St Mary, Eaton Bray, in the next village to the south-west, and Dunstable Priory. The parish church of Luton, dedicated to St Mary, is also built of chalk but it is highly unlikely that the material was transported across the top of the Chilterns and far more likely that chalk quarries in the large medieval parish were used. Those on Stockingstone Road and in which Hartley Road was constructed are potential sources of the hard chalk.

17. Mead, 2003, pp.43 and 51.

18. Mead, 2003, pp.24-25, note 17 gives an explanation of the metric equivalents of old Swedish linear measures. Imperial equivalents supplied from the metric distances by David Kennett. For much of the eighteenth century, the southern part of Finland was part of the Kingdom of Sweden; even today both Swedish and Finnish are the country's official languages.

19. See note 18 *supra.*

20. David Kennett walked and more often pushed his bicycle up Stockingstone Road at least twice a week in the seven years (1956-1963) during which he was a pupil at Luton Grammar School.

21. Peter Dunham's house is briefly noted J. Gould, 'Gazetteer of Modern Houses in the United Kingdom and the Republic of Ireland', in *The Modern House Revisited* [being *Twentieth Century Architecture,* **2,** 1996], p.114b. The same paper also noted another house by Peter Dunham at 324 Old Bedford Road for a Mr and Mrs T. Corney. Both of these are omitted from O'Brien and Pevsner, 2014, but on p.236 that book does note the house at 278 Old Bedford Road by Evelyn Simmons for the hat manufacturer Charles Dillingham. Each house is rendered but Peter Dunham's house certainly was of brick. The three houses are within walking distance of each other and of Luton Sixth Form College and its predecessor, Luton Grammar School for Boys, noted *ibid.*, p.228 with note on the building I knew so well.

22. See note 16 *supra* for a potential building constructed of the hard Lower Chalk from the Stockingstone Road chalkpit.

23. Evans, 1855, *passim.*

24. W. White, *History, Gazetteer, and Directory of Lincolnshire ...,* Sheffield: William White, 1856. Details for the various lime burners and sellers of lime have been taken from the directory entries for the places mentioned. An earlier edition of the *Directory* was issued in 1842 and later editions n 1872 and 1882. These have not been consulted.

25. A. Young, *A General View of Agriculture in Lincolnshire,* London: Board of Agriculture, 1799, seems to make no mention of brick and lime being burnt together.

A Semi-Continuous Multi-Chamber Kiln at East Halton, Lincolnshire

Ken Redmore

INTRODUCTION

In the mid-1800s a brickyard was set up in a corner of East Halton parish on the bank of the Humber estuary (TA 156 213). It had two small Scotch kilns, a large hack for drying bricks and tiles and, like most other yards on the shoreline, a wooden jetty at which coal was imported and the yard's products despatched.
Early in the twentieth century, as the Grimsby-Cleethorpes conurbation expanded rapidly, the yard was taken over by the building contractors Wilkinson & Houghton. In order to increase the output of the yard they replaced the Scotch kilns with a downdraught kiln of eight chambers which operated on a semi-continuous basis (figs.1,2,3). They also erected a new artificially heated drying shed and introduced brick-making machinery. Over the next thirty years the 24-acre site was stripped of clay and more than twenty million items were burnt and transported, principally by boat, to Grimsby, 10 miles to the south-east.

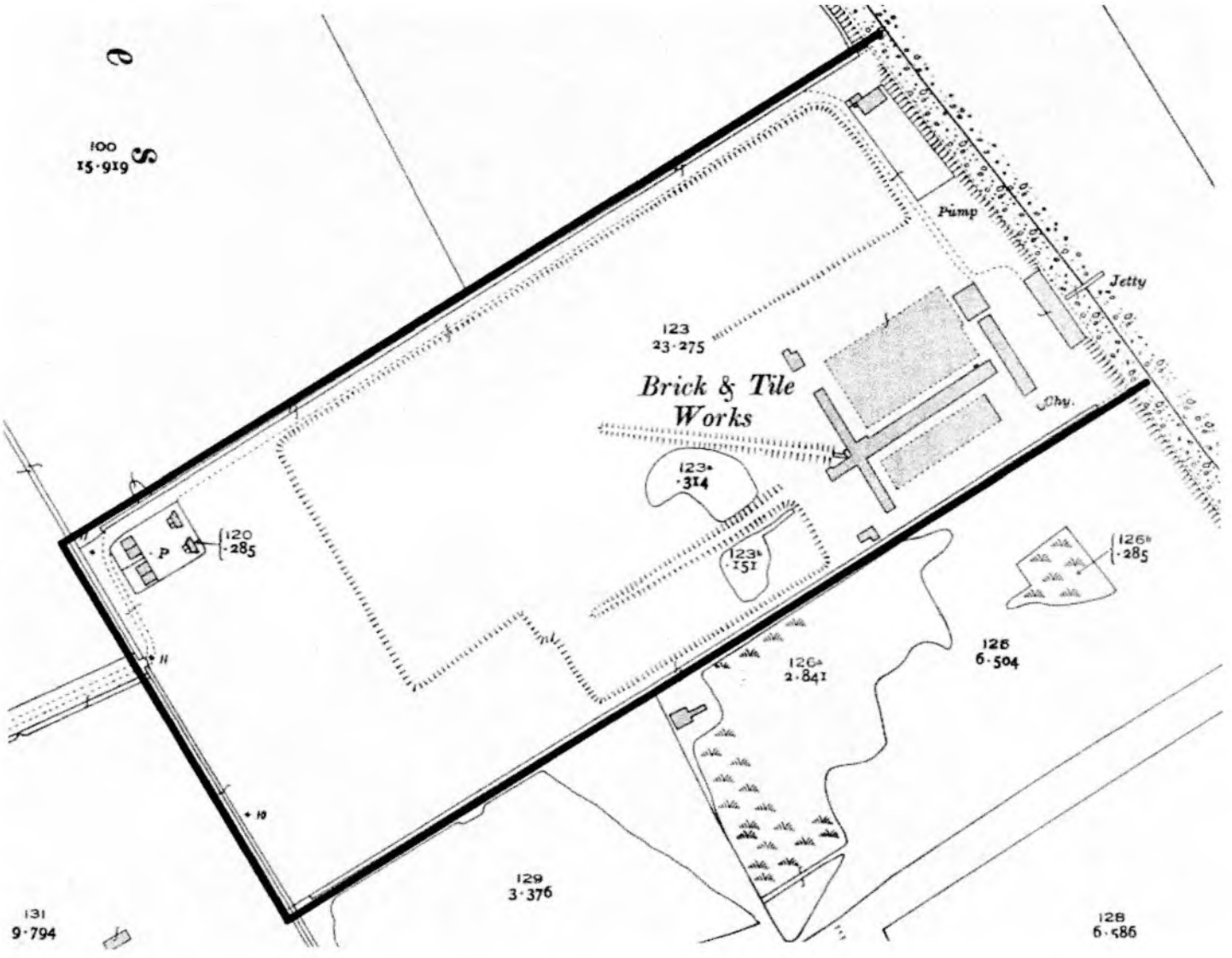

Fig. 1 The brickyard site at East Halton, 1930. The kiln chimney is marked near the east corner of the site (extreme right), with the long rectangle of the kiln (running south-east to north-west) immediately above. To the south of the yard is a second site, under different ownership, which once provided for the manufacture of cement in Hull.

Fig. 2 East Halton brick kiln: view from the north.
(Ken Redmore, 2015)

The kiln presents something of a puzzle. No other kiln of this type is known to have been built in Lincolnshire and no similar example appears to have been described in the literature of brickmaking. Moreover, published descriptions of the structure and operation of other multi-chamber kilns, whether designed for continuous or semi-continuous working, do not include all the features encountered at East Halton.[1] Unfortunately, when the site was visited in 2015 and again in 2019, it was not possible to examine all elements of the kiln's structure, especially underfloor ducts, and hence some aspects of the kiln's operation remain unresolved.

DESCRIPTION OF THE KILN[2]

The East Halton kiln is constructed in red brick laid in English Garden Wall bond (three rows of stretchers) and reinforced by substantial concrete buttresses. It has eight barrel-arched chambers arranged transversely in a line. Both ends of each chamber have a centrally placed opening or wicket.

The chambers are floored with beaten earth. At the base of each long wall separating adjoining chambers are six evenly spaced trace holes which interconnect the chambers. They are lined with firebricks and fitted with dampers in the form of sliding metal plates which could be raised and lowered by vertical metal rods from the top of the kiln.

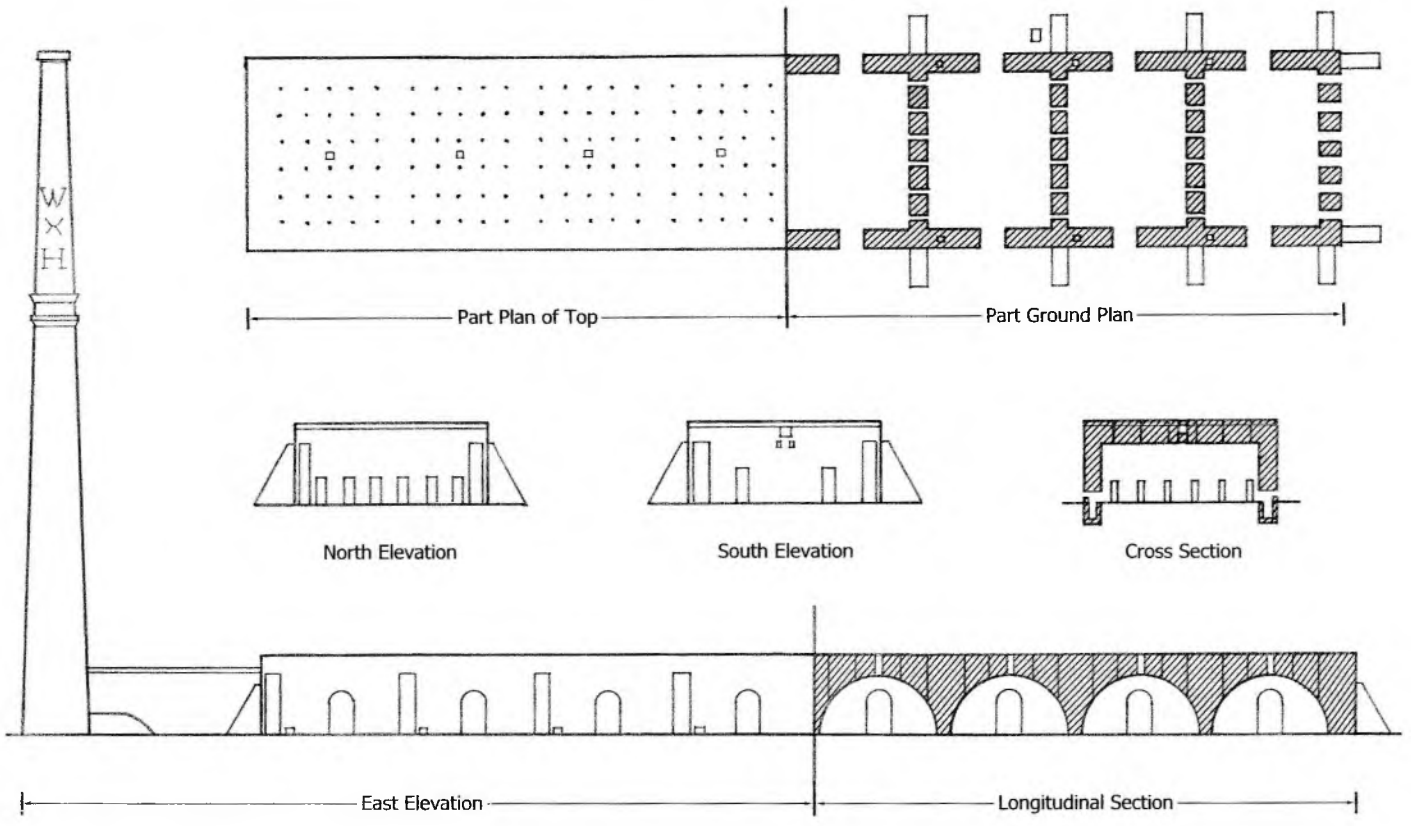

Fig. 3 East Halton brick kiln: plans, elevations and sections.
(Ken Redmore)

Chamber 1, the end chamber furthest from the chimney, has six fire holes set in its outside (north) wall. There was once a firing shed attached to this end of the kiln to provide shelter for fuel and workers. There are no openings in the south wall of the Chamber 8, the chamber at the other end of the kiln, next to the chimney.

The vaulted roof of each chamber is pierced by a regular array of 30 narrow vertical feed holes for introducing small coal to the chamber from above. In the centre of the roof there is also a larger opening, of rectangular cross-section, which was probably linked to a hot air duct running above the chambers to the chimney (fig.4).

Arched openings at ground level near the corners of both internal end walls of the chambers give access to chamber flues. Immediately opposite these openings are horizontal slots in the external faces of the chamber walls. The chamber flues lead first down and then horizontally across to the main kiln flue, thought to run centrally along the length of the kiln below ground level to the base of the chimney. Sliding metal damper plates enable the flues to be opened or closed according to the position of a chamber in the firing cycle, and also allowing air to be admitted from the outside through the slots (fig.5).

In the ground outside the west walls of Chambers 3 and 8 are rectangular brick-lined pits with heavy metal cover plates (fig.6). Two parallel flues, lined with firebricks, run horizontally from these pits under the chamber. It is not known how far these flues extend beneath the kiln or whether they are connected to any ducts linking the chambers and/or the chimney. Similar inspection pits and flues may have existed alongside the other six chambers when the kiln was in operation, but there is no surviving visual evidence for them.

The chimney, at the southern end of the kiln, is built of red brick laid in English Garden Wall bond (five rows of stretchers). The letters 'W&H', referring to Wilkinson and Houghton, are picked out in white glazed bricks on three sides of the upper part of the stack (not on the west side, facing inland).

On the north face of the stack facing the kiln are two openings, one at ground level and one just below the level of the top of the kiln. The lower opening is probably where the main kiln flue entered the chimney.

After running below the kiln, this flue rises to ground level and enters a brick lined channel covered by a thick protective layer of soil before entering the chimney.

The upper opening into the chimney also received a flue from the kiln. Two parallel steel girders, which presumably supported the flue, run between this opening and the top of the kiln. This appears to be a later construction.

When in operation the kiln was topped by a lightweight roof giving protection for stokers and fuel as well as the chambers. In the final years of the brickyard's operation there was a hoist, powered by a 5hp Jap oil engine, halfway along the east side of the kiln, for raising coal; details of its construction and operation are not known. The upper surface of the kiln was paved with bricks or paviours, probably laid loose without mortar.

All other structures of the brickyard have been demolished or removed from the site. The kiln and immediate surrounding area are currently part of a smallholding, with the kiln chambers in use as animal housing or storage. Some of the openings into the kiln have been modified or blocked but most of the original features remain unaltered.

Fig. 4 Chamber interior, showing trace holes, at ground level, and feed holes, midway up chamber wall. (Ken Redmore, 2015)

Fig. 5 Air intake slot.
(Ken Redmore, 2015)

OPERATION OF THE KILN

Some elements of the structure of the East Halton kiln are identical to those of the Staffordshire kiln patented in the UK in 1904, one of several types derived from Hoffmann's kiln of 1858. As with other multi-chamber updraught kilns, hot combustion gases could be passed between chambers in heating and cooling phases of the process to allow considerable savings in fuel. However, unlike the usual Staffordshire kiln, where the chambers are arranged in a 'loop' to allow continuous firing, the eight vaulted chambers in this kiln are arranged in a single line. Firing commenced in the chamber furthest from the chimney by the burning of fuel at the floor-level fire holes and then proceeded at intervals from chamber to chamber, further fuel being supplied as necessary through the feed holes in the chamber roofs.

The sequence of firing apparently came to an end with the firing and cooling of the bricks in the eighth chamber, the one closest to the chimney. At this point, or possibly even earlier, the brickmakers could have chosen to re-commence the sequence by setting chamber 1 with fresh bricks and kindling the fireholes there. Alternatively, if the flow of business required it, re-starting the cycle may have been delayed. This may have been an advantage for a firm with a modest building programme or limitations of transport or storage. In fact, the record of the yard's output suggests that they could have fired many more items if they had chosen to run the kiln with minimal interruption.[3]

Fig. 6 Parallel flues, lined in firebrick, leading under Chamber 3.
(Ken Redmore, 2015)

Little more can be said with certainty about the operation of the kiln, but it leaves one significant unresolved issue. What was the purpose of the underfloor ducts and inspection chambers identified on the west side of two of the chambers and possibly extending throughout the whole kiln? Were these features part of the well understood network of chamber flues already encountered elsewhere in the kiln, or were they elements of a second network of flues which, say, allowed hot gases from chambers such as No. 8 to be transferred back to chamber 1 and earlier chambers in order to pre-heat the bricks at the beginning of a new firing sequence?

The East Halton kiln appears to be very rare, and one assumes there were good reasons for building it rather than a conventional Staffordshire kiln of 12 more chambers.[4] The capital outlay for this smaller kiln was considerably less, while the semi-continuous operation still gave worthwhile economies in the use of fuel. It is impossible to determine whether it was a good investment for Wilkinson & Houghton, but it is perhaps significant that no other brickyard on the Humber Bank chose to follow suit. Conventional Hoffmann kilns were built at Barton and Goxhill around this time and the remaining yards – numbering more than thirty, mainly modest in size and turning increasingly to making tiles instead of bricks - retained and when necessary rebuilt single-chamber downdraught kilns which operated intermittently.

Fig. 7 Girder supports for flue leading to chimney.
(Ken Redmore, 2015)

NOTES AND REFERENCES

1. Detailed descriptions of the operation of brick kilns derived from Hoffmann's prototype are given in M.D.P. Hammond, 'Brick Kilns: An Illustrated Survey', *Industrial Archaeology Review*, Vol.1, No.3, 1977 pp.181-192, and Alfred B. Searle, *Modern Brickmaking*, London: Ernest Benn, 1931, pp.325-345, but neither of these detailed and important sources describes a semi-continuous kiln with all the features seen at East Halton. The operation of the Staffordshire kiln surviving *in situ* at the Bursledon Brickworks Industrial Museum in Hampshire is well understood, but it differs from the Lincolnshire kiln in several respects.

2. A survey of the kiln was undertaken in July 2015, and briefly revisited in March 2019, by members of the Society for Lincolnshire History and Archaeology. Access to the site was generously allowed by the owners Miss J.A. Winter and Mr D.M. Winter. Information about the kiln and its history has been provided by Miss Winter and by the late Mr G.F. Winter.

3. In 1922, the most productive year in the 26-year period covered by the account book, Wilkinson & Houghton made about 910,000 bricks and tiles at East Halton. (The book is held by North East Lincolnshire Archives, reference 1047/8.) Based on a reasonable assumption of the kiln's capacity and the likely length of the firing cycle, it is estimated they could have fired three or four times this number of items.

4. The kiln was probably designed and erected by the Allen Brick Company of Hipperholme, Halifax, based on designs by A E Brown. This firm is known to have built semi-continuous kilns at the time, but information about their design has not been located. Unfortunately, the description and illustrations submitted by Brown for the registration of patent for improvements to a kiln in 1898 and described in *Modern Brickmaking* (Searle, 1931, p.327) bear little relation to the East Halton kiln. Nevertheless, the records of Wilkinson & Houghton include payments to 'Brown' from 1905 until 1910; but it is possible that these payments related to a dryer and not the kiln (NELA 1047/2/1). The cost of building the kiln is unknown.

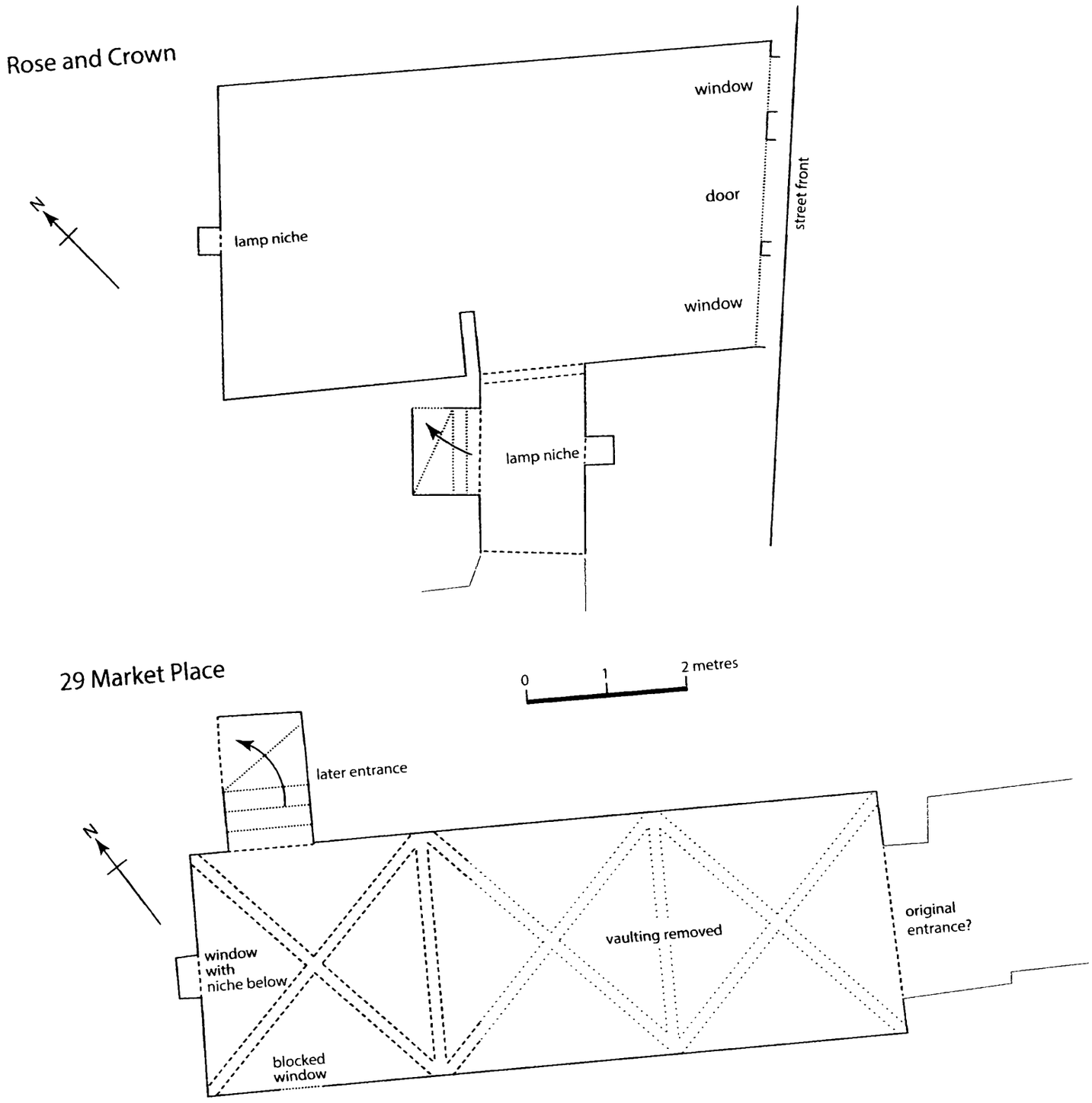

Fig. 1. Plans of the undercrofts at the Rose and Crown, and 29 Market Place, Wisbech.

Two Late Medieval Brick-Built Undercrofts in Wisbech and the Early Use of Brick in Eastern England

Mark Gardiner

Wisbech was the smallest of the three towns that grew up in the Middle Ages on rivers leading into the Wash. It never achieved the size or prosperity of its neighbours, King's Lynn to the east, and Boston to the west, although its growth was driven by the same factors. It was a riverine port with access to the North Sea and the markets of northern Germany, and had a substantial agricultural hinterland. Perhaps, because it stood in the shadow of its neighbours, or because it lacked the obvious medieval architectural heritage of them, Wisbech has not seen a similar level of archaeological investigation. Many of the buildings now standing in the historic core belong to the Georgian period, reflecting a wave of late eighteenth- and early nineteenth-century prosperity. Buildings on the street frontages, where commercial pressures were the strongest, were most likely to be replaced. Even the remains of the castle at Wisbech were removed with the development of the Castle Estate in the second decade of the nineteenth century, although much of the medieval structure must have already gone when a house was built on the site in the mid-seventeenth century. As the *Victoria County History* commented laconically about Wisbech's buildings, 'the town has few examples of really ancient domestic architecture'.[1]

One consequence is that, whereas the early brick buildings of King's Lynn and Boston are relatively well known, similar structures have not been noted in Wisbech.[2] A project supported by Fenland District Council has identified and recorded two brick undercrofts. In retrospect, it is obvious that we should have expected to find early brick buildings in Wisbech. Some of the earliest use of brick in England occurs on the coastal part of eastern England, an area that had extensive contact with the Low Countries and north Germany. These places adopted brick as a construction material from an early date. Brick was being made and used in Boston in the fourteenth century, certainly by the last decade when St Mary's Guildhall was constructed.[3] A series of high-status brick buildings were constructed in the Boston area in the mid-fifteenth century. These included the well-documented castle at Tattershall, the nearby Tower-on-the Moor in Woodhall Spa, Hussey Tower in Boston and Rochford Tower near Fishtoft.[4] Nearer to Wisbech, it is said that Bishop Morton of Ely (*in office* 1479–86) constructed Tower House at Guyhirn and rebuilt the castle in Wisbech, both in brick.[5] Neither structure survives.

In contrast to all these, the brick in the Wisbech undercrofts was not in conspicuous, high-status buildings, but in structures where the nature of the construction material was less evident. Of course, we do not know the type of the buildings which surmounted the undercrofts. It is possible that these were also of brick, but more probably they were timber-framed. A now-rare example of a surviving timber-framed structure can be found behind one of the Wisbech buildings discussed here, at Tallow Court, New Inn Yard. Although described in the Listed Buildings schedule as a granary or warehouse, the use of jettying, a moulded jetty rail and close-studding all suggest this is unlikely to have been its original purpose.

Brick was used locally in a number of other undercrofts in East Anglia – at King's Lynn already mentioned, Lowestoft, Great Yarmouth and particularly Norwich. The last of these has the greatest number, perhaps more than any medieval town in England, with 68 surviving to some degree and another 34 whose existence is well documented.[6] It will be argued in the second part of this paper that Wisbech's undercrofts bear some resemblance to those at Norwich which were also built of brick. The third section of this paper will discuss the use of early brick in eastern England more generally. It is necessary, however, to begin with short descriptions of the two Wisbech examples.

ROSE AND CROWN

A series of conjoined cellars underlie the front of the Rose and Crown hotel, but only the two earliest are of interest here (Fig. 1): the remainder were built in the nineteenth century to serve for storing wine. The first room is similar in plan to those discussed by Faulkner at Southampton and Winchelsea, a form

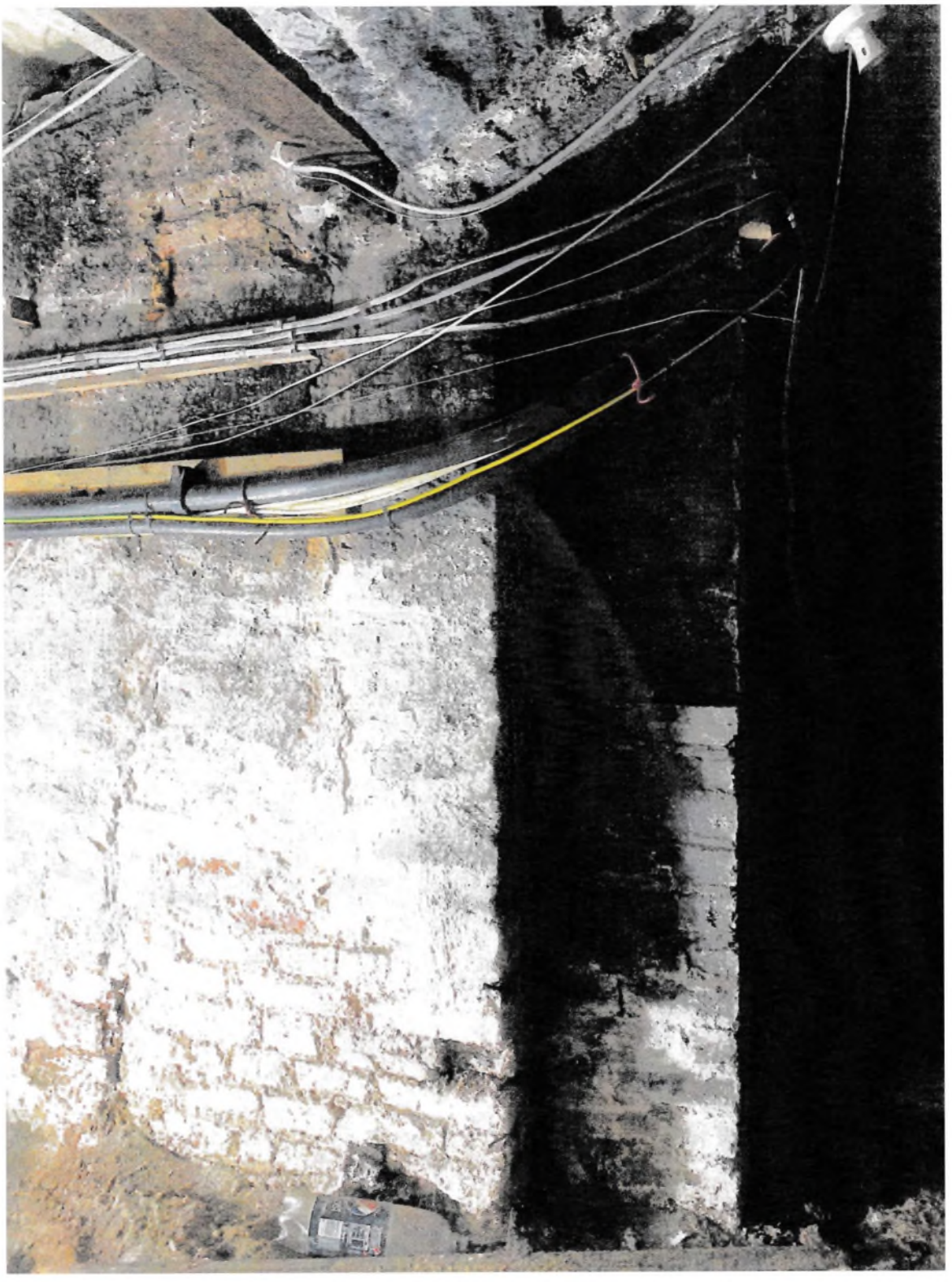

Fig. 2. The undercroft at the Rose and Crown showing the construction of the vault as a full semi-circular arch with an inset wall at the southern entrance.

which will be referred to as the 'Southampton-Winchelsea type'.[7] For purposes of description, the undercroft is assumed to be aligned east-west. At the east end, facing the street was a large doorway 1.24m wide slightly offset from the centre and flanked by two lights. The southern light is now blocked with cob and has a roughly arched head. The light to the north is also now blocked with later brick. It is possible that this was a secondary feature as it has been squeezed in between the door and the wall and that necessitated cutting away part of the vaulting at the end to increase the illumination. The cellar has a circular barrel vault and was constructed without ribs. It is built of brick with an arch which rises from the floor. At the far end is a blind arcade of two semi-circular arches between which is a triangular-headed lamp niche. There are traces of smoke-blackening on the interior of the niche. The pier between the arches is supported on a corbel.

A second room opens from the main space and provides a short passage and a set of steps to ground level. A lamp niche is situated at the foot of the stairs. Again, there are slight traces of smoke-blackening at the head of the niche. The stairs are now blocked at the top and have more recent treads. The north-west corner of the stairs is slightly inset to accommodate the vaulting of Room 1.

Two features suggest the builder had limited experience in brick (or any masonry) construction. The vaulting of the vault of Room 1 was constructed as a full semi-circular arch carried down to floor level. The usual pattern with barrel-vaulted undercrofts was to set the arch on low walls and have a segmental profile for the vault (Fig. 2).[8] Secondly, no groin was formed at the intersection of the vault of Rooms 1 and 2 to create a structurally sound junction. Instead, a rather inadequate lintel was contrived from a row of bricks. Yet, in spite of these awkward elements, there is no reason to think that the two rooms are not contemporary.

The use of early, long thin brick, together with the plan of the vault suggests a fourteenth- or fifteenth-century date for their construction.

29 MARKET PLACE

The undercroft lying to the rear of the building is currently entered through a trapdoor set in the floor which leads directly into the west end of the only completely surviving bay (Fig. 3). (Again for simplicity it is assumed that the undercroft was set east-west.) The entrance was originally by steps, but the stairway has been partially infilled. The first bay has a quadripartite vault with brick webbing and brick walls. Chamfered ribs of stone rise from corbels set about 750mm above the present floor level converging at a central boss. The corbels were probably all decorated with heads, but most of these are so heavily eroded that they cannot be certainly identified. The corbel on the south-east corner of the first bay is less damaged and shows a grotesque figure with a projecting tongue. The central boss of the first bay is decorated with a bearded figure set in a border of leaves or cable-moulding (Fig. 4). The figure may be a Green Man. The boss of the rib between the first and second bays is apparently a female figure set against a roseate background.

The first bay has the door, as mentioned, in the north wall to the west end. This is a secondary opening as the wall has been broken-out and scars are apparent on both sides of the jamb. The ashlar jambs which have been formed around the new doorway stand slightly proud of the cellar wall face, suggesting that the wall was then covered with render and the brick walls would have been concealed. The jambs have no rebate and there is no trace of iron pintles, implying that there was no door at the base of the stairs.

In the western wall was a window – now bricked up – with a sloping sill. This is shown in a print in Walker and Craddock and described as then having a grate (Fig. 5).[9] The window would have allowed light to enter the undercroft by means of a light well, implying that the ground-surface building extended no further back than the length of the undercoft. Below the window was a lamp niche to illuminate that end of the undercroft.

On the south wall of the first bay is a larger window, which appears to be secondary to the construction of the undercroft as the head partially cuts through the webbing of the vault. It appears to have been bricked up in two stages, both of which pre-date 1840, since no opening is shown in the engraving in Walker and Craddock.

The springing of the second bay and the first few stones of the ribs survive, but the remainder is concealed behind joists and an inserted floor. In order to reduce the height of the shop at ground level,

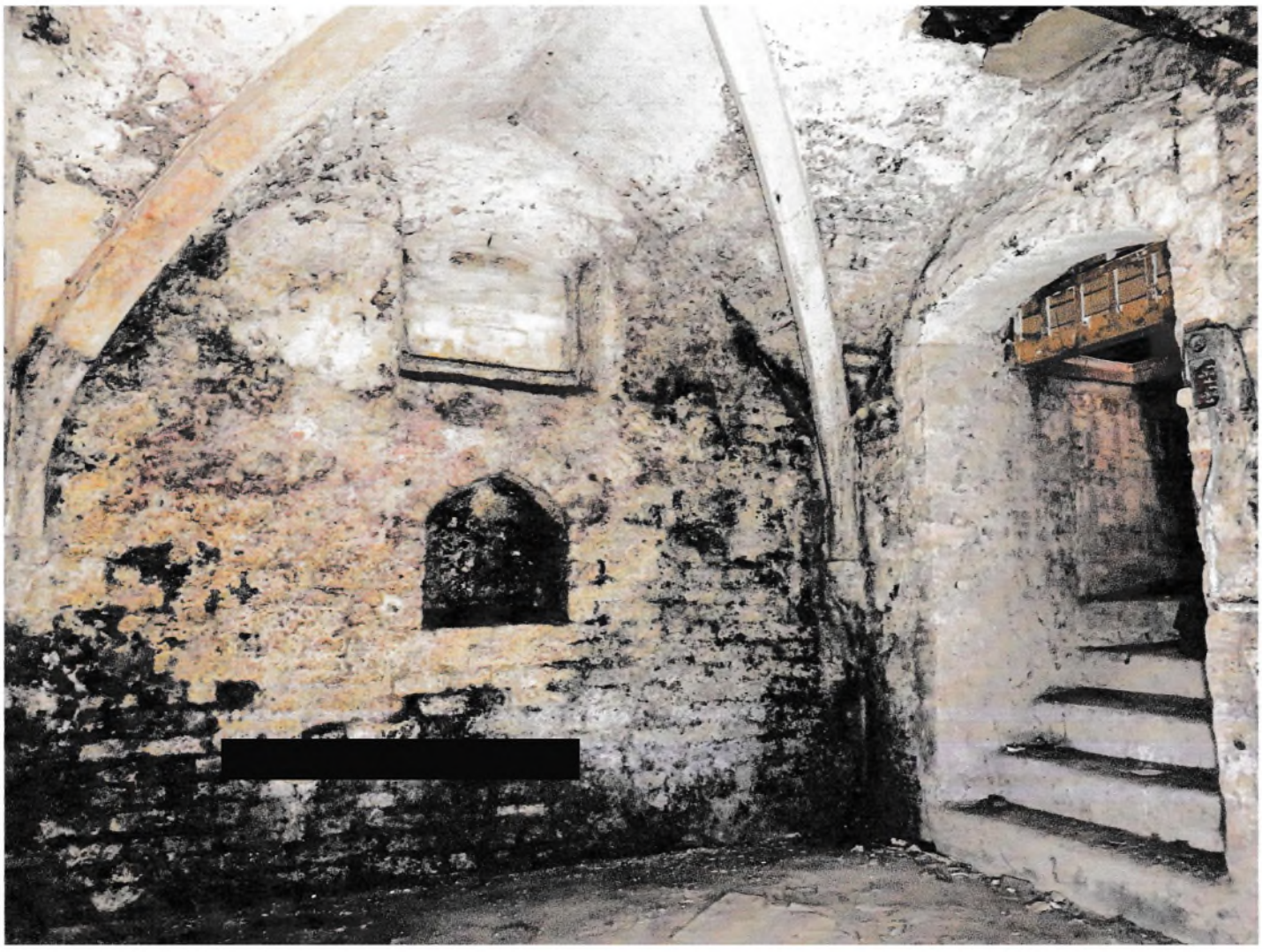

Fig. 3. The west end of the vault at 29 Market Place, showing the window and lamp niche, together with the later stairs inserted in the north wall.

most of the vaulting of the second and third bays has been removed. The north wall of the second bay is covered in render and little detail of the walling is visible. The brickwork of the south wall appears to be similar to that of the first bay. The springing for the vaulting at the end of the second bay is marked by stones, but no details are present as the moulding has been cut back. The Walker and Craddock engraving (Fig. 4) suggests that this bay, like the second, had a decorated boss at the intersection of the diagonal ribs.

The evidence for the fabric of the third bay is also limited. Much of the north wall is covered in recent render, except towards the east end of the bay. The south wall of the third bay is constructed of brick as before. The south corner of this bay with the rib and corbel still survives and is similar to that in the corner of the first bay, but is heavily eroded.

It is probable that the undercroft originally finished at this point. There is no springing for a further bay, and it is evident that the wall ran across the end of the undercroft at this point. There is a now step in the wall at the point the original work stopped. The quoins of this step in the wall are clearly applied to the original north-south wall which must have been broken through when the undercroft was extended eastwards towards the street frontage at a later date. There is also a slight, but clearly noticeable change in orientation of the next section of the undercroft here and it is also noticeable that it narrows. A change in construction period is thus clearly indicated.

Fig. 4. Central boss at the intersection of the rib vaults in the first bay at 29 Market Place.

BRICK-BUILT UNDERCROFTS

Undercrofts are known from English towns from the late ninth and early tenth century, but they become more common from 950 onwards. These subterranean or semi-subterranean buildings were used for storage and set below ground-level structures.[10] Most of the early undercrofts were lined with timber, but set below ground in damp conditions, this must have had the disadvantage that it was liable to rot. Stone-lined undercrofts became increasingly common from the twelfth-century onwards; examples include those at Howard Street South in Great Yarmouth, the Norman House (46–47 Steep Hill) in Lincoln and St Martin at Palace Plain in Norwich, and more distantly at Foundry Yard in Colchester, St Nicholas Place in Leicester and the Inn of the prior of Lewes at Southwark.[11] Some of these seem to have been built primarily for storage, while others seem to have been constructed as much to raise the chamber or hall above ground level.[12] The number of undercrofts grew further during thirteenth century when pressure of space on the principal trading streets encouraged the expansion of buildings both upwards and downwards.

Earlier reviews of undercrofts in England tended to treat them as a single type and suggest that they had a similar function. It is becoming increasingly apparent that such an approach is not tenable and that they may have served different roles in different towns. Faulkner proposed that the quality of finish of the cellars in Southampton and Winchelsea implied that they were unlikely to have been used just for storage. The use of carved handrails on the stairs down, the moulded ribs of the vaulting and the elaborate bosses and corbels suggest that the interior of these spaces was expected to be seen. He argued that they were used as showrooms for both retail, as well as for holding stock.[13] In a few cases, it is possible to point to the nature of goods sold. The vine leaves on the roof boss of The Crypt at

Seaford in Sussex suggest that that it was for the sale of wine.[14] Keene concluded in Winchester that many taverns and vintners had cellars, which were used for the sale and consumption of drink. And many vintners also had cellars. Undercrofts in the eleventh and twelfth century may have been used by moneyers and goldsmiths to act as strongrooms.[15]

Faulkner's interpretation has been followed by Harris, looking at England undercrofts in England as a whole and by the Martins in their re-examination of the Winchelsea cellars. It was noted that the greatest number of undercrofts had access directly from the street. Harris suggests that this accounted for 89% of those dating from before 1350.[16] All these authors therefore conclude that while the cellars may have served for bulk storage, they may also have provided for the sale of wine within taverns and for other commodities.[17]

The plan of the undercroft beneath the Rose and Crown clearly conforms to the Southampton-Winchelsea type. It has direct access to the street (and market place) with a centrally set doorway and was originally built with one or possibly two flanking windows. It was not finely finished, although the presence of the blind arches at the rear shows some elaboration. It had a secondary entrance to the rear of the street. The undercroft at 29 Market Place had a primary entrance which lay to the rear of the buildings on the street frontage. There was a later entrance made to the small street, New Inn Yard, running up the side of the property, although the present of the rather fine timber-framed building at Tallow Court suggests that it may have greater importance as a thoroughfare than is now apparent. However, the quality of finish with chamfered rib vaulting, carved corbels and bosses suggest that it was intended that the undercroft was intended to be seen by clients who were drinking in the cellar or purchasing goods there. It is uncertain whether it resembles to the Southampton-Winchelsea type because the original entrance is now lost, but it is notable that access was not possible directly from the market place as it was set well back from the street frontage.

Finally, it is necessary to consider the date of these buildings. The use of thin, early brick, together with the late medieval style vaulting at 29 Market Place suggests a fourteenth- or fifteenth-century date. In an area where there was no building stone, brick was used earlier than elsewhere. Smith has drawn attention to the brickyards established at Boston and King's Lynn in the fifteenth century and to the range of pre-Reformation brick buildings around King's Lynn, including in the Wisbech area.[18] Moreover, work in Norwich discussed below suggests brick was used for undercrofts from the late thirteenth or early fourteenth century.

THE EARY USE OF BRICK AS A BUILDING MATERIAL

We are now in a position to consider the meaning brick had as a building material and the pattern of usage. Was the brick at Wisbech simply employed because stone could not be readily obtained in the adjoining Fenland, or did its use have a prestige value? Brick was a novelty in the fourteenth and fifteenth centuries, and therefore building in brick might have conferred a status upon the user. Yet it was not always used in a position in which it was readily visible. The large number of late-medieval brick-built undercrofts in Norwich are not of the Southampton-Winchelsea type with entrances from the street. In almost all cases they were reached from the building above or from a private yard. There was no intention to demonstrate status through the use of brick in such an inconspicuous setting.[19] In the Norwich examples, we must assume that the choice of brick was driven solely by the need to find a durable walling material. Moore has argued generally that earliest use of brick was driven by this consideration, and it was not until the early fifteenth century that it began to be associated with high-status buildings and to be regarded as prestigious.[20] As a new building material, brick had a significance which had yet to be firmly fixed. To take another example, brick was used in the webbing of the two foot-passageways and the central vehicle passage at Exchequer Gate in front of Lincoln cathedral dated to *c.* 1300. The brick is perhaps the earliest post-Roman usage of the material in Lincolnshire. Exchequer Gate is built of local limestone, so the inclusion of brick was deliberate. The supply was evidently limited because the webbing in the central passage, the last to be built, had to supplement the brick with limestone which was painted with ruddle to conceal its nature. The application of ruddle implies, moreover, that the brick webbing was not covered with render, but was intended to be seen. Why was brick used in this one area? It appears both to have ensured and to have demonstrated the character of

Fig. 5. Engraving from Walker and Craddock, *History of Wisbech* showing the undercroft in the1840s looking westwards. This may be compared with Figure 3, showing a similar view.

the room above, as being fire-proof; the room may have served as either the treasury — as the name implies — or the store of deeds for the cathedral.

Brick in early buildings had, therefore, various meanings which were evolving, and were determined by context. Although the two brick-built undercrofts recorded at Wisbech may have been intended for the supply and sale of goods to consumers, the choice of brick for their construction was probably determined more by the need for cheap masonry than any prestigious association. The same is likely to be true for its use in many other early medieval undercrofts in eastern England. Brick only became a material of prestige once it started to be used in major buildings in the fifteenth century.[21] At that point, brick acquired a new significance. This was expressed in the production of special bricks with more complex mouldings to allow for architectural elaboration. We can contrast that with the mouldings of the ribs of the vaults, the corbels and the bosses at 29 Market Place. Though these did provide a degree of embellishment, they were not made in brick but in stone. Similarly, the early use of brick in Norwich was often concealed by render, so that it resembled stone. Stone was clearly the material of choice, even though brick was widely used in the fourteenth century in walling in that city along with flint. It was not until after 1400 that brick began to be used in a decorative manner in Norwich.[22] More generally, during the fifteenth century there was a new understanding of the meaning of brick.

The adoption of brick was not simply a consequence of technological advances or the economics of masonry, but was also influenced by the cultural implications of this new material. By examining the places where early brick was used and how it was used, it is possible to develop a more refined interpretation of the evolving meaning of it as a construction material.

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Brick Query: Making Silica Bricks

In the Lake District, near Wythop west of Bassenthwaite Lake, there are the remains of a silica brick factory. It was worked in the 1930s. The idea was to sell silica bricks to the steel-making industry in the north-west. Since the finished product had to be able to withstand high temperatures as furnace lining, was there anything/ special about silica brick manufacture? The mined/quarried silica was reasonably pur: was there any preparation (apart from washing) likely to be needed? What temperature was used in the kilns? Are there patents which relate specifically to silica bricks?

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Book Notice:
Disaster Trade

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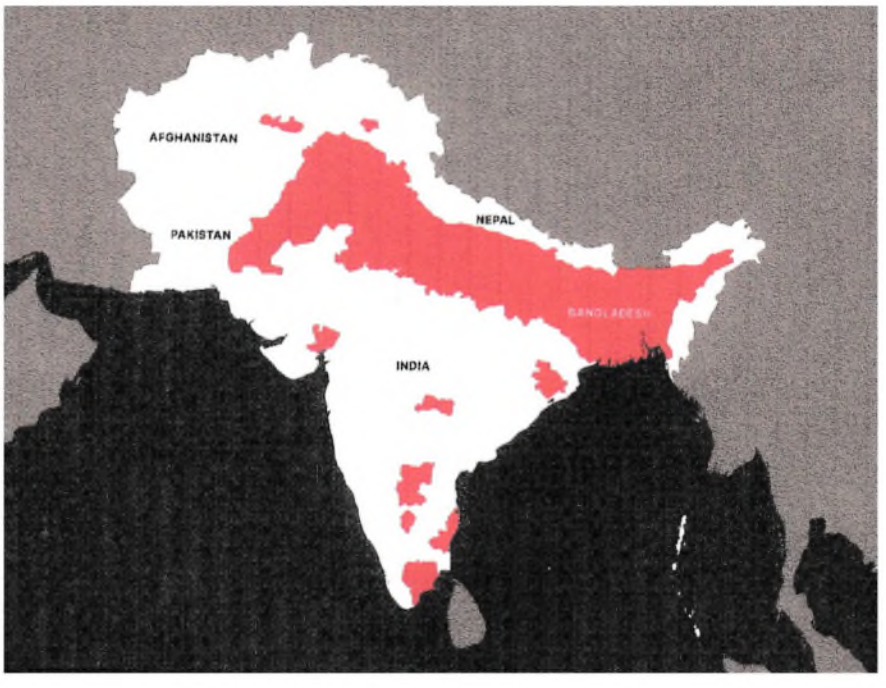

Fig.1 The brick belt of South Asia stretches from Bangladesh in the east to Pakistan in the west, passing through much of northern India and including the south-western edge of Nepal. It covers an area of 1,551,997 square kilometres (599,229.4 square miles) and supports an estimated 55,387 kilns. Each kiln is responsible for an estimated 131 tons of carbon dioxide every year, a cumulatively total of 7,255,697 tons of carbon dioxide annually across the brick belt.
(Map compiled by Royal Holloway College, University of London)

In academic years 2016-17 and 2017-18, Royal Holloway College, University of London, conducted a survey of the brick industry of Cambodia and Vietnam under the title 'Blood Bricks' Led by Laurie Parsons, these reports are partly a follow-up but also breaks new ground, comparing Tea from India and Bangladesh; Bricks from Bangladesh, India, and, to a lesser extent Pakistan; and Garments from Cambodia: all these arrive in Britain in 40-foot containers piled high on monstrous container ships like the *Ever Green* that clearly lack the grace of the *Thermopylae* in full sail gliding through the South China Sea.

Bricks and their import into Britain from South Asia are considered on pages 50-73 of the longer report and pages 13-17 of the shorter one. What the researchers have revealed is quite frankly shocking. One was well aware of the poor labour conditions, the terrible living arrangements, the exploitation of child labour, and

Fig.2 Child labour is illegal but endemic: the children suffer the same medical traumas as the adults with skin diseases and eye infections increasing common as they spend their adolescence working in dangerous and often degrading conditions.
(Photograph: Royal Holloway College, University of London)

the incidence of debt bondage, a form of modern slavery. But new to this writer was the environmental impact of the continuous degradation of the land resulting from the selling of topsoil by farmers to the kiln owners thereby impoverishing their neighbours who are then forced to sell their topsoil because rainwater stagnates in the destroyed paddy field. This is in addition to the health risks to both brick kiln workers and to neighbouring farmers and other village residents.

Then there is the hidden impact: bricks, tea, and garments make up 44% of the real carbon footprint of the United Kingdom. The United Kingdom is the world's largest importer of bricks, up from 3.1 million bricks in 2015 from non-EU countries, mainly those in South Asia, to a staggering 31.9 million tons in 2019: a ten-fold increase in only four years. The bricks from South Asia are much cheaper than those produced in Britain: £94-26 to £160-00 per 1,000 bricks as opposed to £686 in Britain. But the carbon footprint from making the bricks is excessive: 0.56 kg per brick as opposed to 0.45 kg per brick at the British factory gate. With carbon emissions from long-distance transport, the total carbon emissions add up to 1.1 kg per brick but one may ask what price the health of both the planet and the brickyard workers? A house constructed of imported bricks emits 5,280 kg of carbon more than one built using bricks made relatively locally.

The reports are a wake-up call to British brick manufacturers to produce more bricks to meet the rising demand for new housing. And for all of us to remember that 'the cry of the children of the brickfields' remains unheard from the Indus to beyond the Yangtze and also east of the Bramaputra and the Ganges.

It is the intention of the Editor of *British Brick Society Information* to seek an article from the researchers at Royal Holloway College, University of London, on the import of bricks in the UK from South Asia and the conditions under which these bricks are produced.

D.H. KENNETT

The development of strength and yellow colour in London Stock bricks

Ian Smalley

ABSTRACT

The loess deposits in South-East England were often exploited for the production of bricks, particularly during the expansion of London in the Nineteenth Century. The classic loessic brick was the London Stock brick. This brick fired to a yellow colour and grew stronger and harder with age. This strengthening process was due to the development of cementing compounds in the brick during firing. Chalk was added as part of the manufacturing process, this produced reactions which led to the formation of pyroxene minerals which accounted for the characteristic yellow colour.

KEYWORDS

London Stock bricks, loess, loess bricks, brickearth, strength development in loess bricks, colour development in loess bricks.

Introduction

The classic brick made from loess in the nineteenth century was the London Stock brick(Smalley 2021). This was the default metropolitan brick, made from the brickearth/loess deposits in North Kent and South Essex (Smalley 1987). These deposits were widely exploited and in some cases more or less exhausted before scientific interest in loess developed. The Smeed Dean works at Murston near Sittingbourne in Kent was said to be the largest brickworks in the world:

> The Murston works was noted for its manufacture of London Stock bricks, burnt to golden yellow and textured with flecks of ash. These bricks were claimed to be imperishable as the more they age the harder they become. (Perks 1981, p.29)

London had a construction advantage in the same way that the north of England had an industrial advantage. The north was built on coal- the tilt of Britain(Taylor & Smalley 1968) brought the useful strata to the surface, or usefully near to the surface. A quirk of geology delivered energy to where it was needed and could be utilized. In another quirk of geology the perfect material for making bricks was delivered exactly where it was needed- to post-fire London. There was no brick making technology, but here was a brick that required no technology. Easily dug ground, easily moulded by hand (and many hands available), easily dried; firing to give a hard useful brick- the local brickearth was a silty residue of the Ice Age, present in the UK in moderate amounts- which was concentrated in or near London. The greatest achievement in brick construction was the development of the great Bazalgette sewer system from about 1860 to 1880; this used over three hundred million bricks, mostly London Stocks (Smalley et al 2021). The London Stock, with its unique strength-development characteristics was the ideal brick for the extensive sewer tunnels. The long-term strength development had, for many years, something of the aspect of an urban myth but now with the application of some basic cement chemistry concepts, can be satisfactorily explained. And the development of the characteristic yellow colour can also be accounted for.

London Stock bricks are made from brickearth/loess with various admixtures. Freeman (1964) in his listing of British brick clays indicated 75% Pleistocene Kentish brickearth, 10% washed chalk, 10% estuarine mud and 5% sifted town refuse (the material once known as 'spanish'). The content of the bricks made from the brickearth varied widely, no standards were applied and some brickmakers produced inferior bricks by enormously increasing the spanish content (Smalley 2021). The brickearth was essentially classic loess consisting largely of silt, most of which was quartz; the London Stock was a silty brick rather than a clayey brick, but the brickearth did contain a modest amount of clay mineral material which could react with the chalk to produce cementing compounds.

FIRING

When the London Stock brick was fired the brick unit essentially modelled the conditions for the production of Portland Cement. The cement was made by heating together chalk and clay to produce tri-calcium silicate C3S and di-calcium silicate C2S and various other less useful compounds. These are known as cementing compounds and give strength to hydrating cement systems, and eventually to concrete. In this first stage of compound production the brick is stable; the small C3S content is metastable but will not react until hydrated. The CaO-SiO2 equilibrium diagram shows that C3S is metastable but C2S is a stable compound; this causes C3S to hydrate more rapidly, but the hydration product is the same.

HYDRATION

The hydration process converts C3S and C2S to calcium silicate hydrate C-S-H which provides the cementing action. C-S-H is quite hard to define and has a complex chemistry, it is usually referred to as C-S-H and this describes all active hydration products. The water for hydration will be expected to come from rain on exposed bricks and from water in any mortar which is used for construction purposes. Initial wetting should cause a small, but rapid increase in strength as C-S-H forms in the affected regions.

There will then be a small but long-term increase in strength due to pozzolanic action. The reaction which produces C-S-H also produces by product lime Ca(OH)2; this reacts with siliceous materials in the mix to slowly produce more C-S-H and thus more strengthening. The siliceous materials are readily available in the brickearth, and, in the Stock Brick mixture, so is chalk which may contribute to the useful reactions. The pozzolanic actions, in concrete or in Stock bricks, provide a slow but long-term and continuous increase in strength. The pozzolanic actions, like so much of cement chemistry, are not well understood and may include various non-stoichoimetric actions. Ahmed et al (2019) have reviewed chemical reactions in pozzolanic concrete.

COLOUR

London Stock bricks fire to a characteristic yellow colour. Red is the default colour for fired bricks; it is well known that the main colouring agent in brick clays is iron oxide. Red or red-brown colours are usually obtained due to the appearance of fine grained, dispersed hematite, which develops during firing from iron minerals (goethite, siderite, pyrite etc) under oxidising firing conditions.

The formation of yellow firing colours has been investigated by Kreimayer (1987), Klaarenbeek (1961), Sandfort & Liljegren (1963). Firing colours in various red shades expected on the basis of relatively high iron content (3-7%) may fail to appear due to the incorporation of Fe in specific high temperature crystal phases rather than its occurrence as free iron oxide in the form of hematite.

X-ray investigations have shown that these minerals are probably one or the other of mullite or metakaolinite or a fassaitic pyroxene in which Fe is present in the tri-valent form. Yellow and beige to light brown colours result from the formation of these minerals.

Fassaitic pyroxene is formed from CaCO3 rich materials in which the carbonate is fine grained and homogeneously dispersed. These conditions are met in the Stock brick firing regime; the chalk is added to the brick mixture as a fine-grained admixture in sufficient quantities to produce the yellow firing colour. In Freeman's (1964) typical stock brick mixture there was 10% chalk. If the conditions are not favourable to form these minerals the firing colour of the bricks will be in various shades of red due to fine-grained dispersed hematite.

COMMENTARY

In his historical studies of the London Stock brick Cox (1977) wrote:

> It is made from superficial deposits of brickearth overlying the London Clay, which are easily worked and produce a durable, generally well burnt brick. This durability actually increases, since the London Stock brick has the fortuitous advantage of hardening with age and in reaction to the polluted London atmosphere. (Cox 1977 p.57)

The atmospheric reactions have not been investigated and may be ephemeral, an unnecessary explanation for the hardening caused by chemical reactions on firing and hydrating.

CONCLUSIONS

London Stock bricks are remarkable bricks with properties that other bricks do not possess (Smalley et al 2021). The London Stock brick is a brick made from loess, rather than from a clay-based material. The Stock brick owes its yellow colour to added chalk and it owes it remarkable ability to grow harder and stronger with age to reactions occurring during the firing process which produced cementing compounds in the fired brick. Loess bricks are made all over Europe, but they tend to fire to a red or pink colour. The great test for the London Stock brick was the construction, from about 1860 to 1880, of the great Bazalgette sewer system for London. The Stock bricks with their high quartz content and their capacity to strengthen with time were ideal for sewer construction (Smalley et al 2021).

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Brick in the Massingberd Papers

Mike Kingman

1. 'One house of brick & Lime mortar', A Lincolnshire building contract of 1682.[1]

Sir Drayner Massingberd, 1615-1689

In 1638 Drayner Massingberd, a member of a locally prominent and solid Lincolnshire family of gentry status, purchased the South Ormsby estate using a legacy from his mother. Over the next fifty years he expanded it to over 2,800 acres. During the Civil War Drayner and his brother Henry fought for Parliament and consequently prospered during the Protectorate. Surprisingly they were not punished at the Restoration, in fact Drayner was knighted in 1661 and Henry was allowed to retain a Cromwellian knighthood.

At Ormsby in 1640, Drayner commissioned a new manor house. This was probably of brick for in 1659 his brother Henry signed a contract with Lyon Bar of Hundleby, John Gudger and Edmund Balding of Partney to make 50,000 bricks '*of the same size my brother Massingberd's are of.*'[2] Little of the house survives for the whole house was almost entirely re-built by James Paine in the 1750s although it did incorporate materials from the old house. Paine's house in its turn was subsequently altered and the only evidence of its original appearance is a contemporary painting of Anne Massingberd showing an impressively ornamented brick house in the background.

THE CONTRACT

The contract below was probably completed as a part of a continuous programme of estate investment. It is of particular interest as a very early example of a purpose-built, two roomed cottage. It is rare to find such a detailed contract for such a small house. Its overall quality is unclear – it was essentially a single storey building whose outside walls were only nine feet high and with a partition wall of only single brick, yet its two rooms were each fifteen feet square and it contained an extravagant brick chimney seven feet wide and three and a half feet deep within which was an oven. The cottage was possibly roofed in the following year for in 1683 his accounts recorded

> *Peregrin Cressett of Boston about Pan tyles (250 at 55s. per 1000). Asks him to go to London via Boston and Lynn, 1683.*

There is no reference to the carpentry work which was presumably given to another contractor. Interestingly, although described as a 'Bricklayer', English possessed his own lime kiln.

> Articles Covenants & agreements indented & made
> ye nine & twentith day of May in the yeare of our Lord
> & Saviour 1682. Betwtene S^{r} Drayner Massingberd of
> South Ormsby in the County of Lincolne kn^{t} of the one
> part And John English of Dalby in the same County
> Bricklayer of ye other pt. Witnesseth
> Imp(rimis) that ye said John English shall build for ye sd S^{r} Draner Massingberd
> one house of brick & lime=mortar to consist of two rooms in ye
> place in Ormsby afore sd where ye Sd S^{r} Draner Massingberd
> shall appoint and that he shall make the foundation one foot
> at least below ye ground, and make the walls on ye two out sides
> & one end to be two brick in thicknes from the foundation to
> the water table, & from thence to the pan[3] to be one brick & an
> halfe in thickness, & ten foot in height from ye bottom of ye
> foundation, & a partition wall to divide the rooms of one

brick in thickness & the other end wall to be a Gavill end[4]
called a terne over or tumbled over Gavill end with a chimney
in it of aboute seven foot broad betwixt the jawmes[5] & aboute
three feet & an halfe deep from ye back to ye mantle tree,[6]
& finish ye same before he work with any other person, &
shall begin of it on Thursday next being the first day of
June now next coming, & to make an Oven in the chimney
end. & ye whole building to be thirty foot within & fifteen
foot wide within.
It[em] ye sayd S[r] Draner Massingberd is to pay him for the workmanship
aforesaid as followeth, that is to say, for the two side walls &
the end wall wch are to be ten foot high three shillings & six
pence a rood & for ye particion wall two shillings a rood, & for
ye Gavell end chimney & oven fourty shillings & to bring
all materials for the walles & scaffolding to the place, &
to pay him nine shillings a chalder for lime sleaked at his
Kilne, and he is to have every day a bottle of small beare,
and he is to have a labourer allowed him to help the digging
of the foundation. In witness whereof ye partyes to these
presents have interchangeably hereunto sett theire hands
& seales the day & yeare first above written.
Signed & sealed D. Massingberd
In presence of
Thomas Ely John E(mark) Inglish

2. Gunby Hall, Lincolnshire

Henry Massingberd's estate was based at Bratoft and in 1680 was inherited by his son William who shortly after moved the estate administration to nearby Gunby. The National Trust, the owners of Gunby Hall, suggest that 'The main part of the house was finished for Sir William Massingberd on the site of a small manor house.' The generally accepted story is that the original house was demolished and a new brick-built Gunby Hall was completed in 1700 which is the date inscribed on a cartouche over the main door. This very plain house has often been described as like a doll's house, similar to a Wren type town house. John Harris in the first edition of *The Buildings of England: Lincolnshire* was not particularly impressed calling it 'a mason-bricklayer's rather than an architect's design'.[7] The date of the commencement of the building is assumed to be after August 1695 when Thomas Pain was paid for 51,000 bricks. The building accounts kept in '*Sir W M expense Book beginning February 1694, ending October 1711*' suggest that the construction was a lengthier process than generally assumed.[8] As late as 1700, the original Manor House still stood and was presumably inhabited for in that month Massingberd recorded 'Pd Mr Osborn in full for colours and painting at the church and Gunby Old House £11 4*s.* 6*d.*'.[9]

Later expenses included 'Given Ecrington the carpenter when he began to nail the floors at Gunby on Whit Monday.2s 6d. 9th June 1701'.The building records continue to show that the building was not finally completed until 1706 when the total cost was calculated as £2,134 9s 3½d.

Adding complications to the account is the purchase of bricks, deals and other building materials well before 1695. Between 1687 and 1690 Massingberd purchased 'bastard' marble stones,[10] 2044 feet of Sunderland stone, 1000 feet of Pinchbeck stone,[11] half a ton of iron and 600 deals', most of these were delivered to Skegness port. In 1687 he recorded:

> *November 1686. "pd. Hugh Franklin for digging clay for 100,000 brick and 60,000 tile to be made the next year. £4.* In *July 1690 For digging clay and making 63,000 bricks, £17. For 20,000 of bricks made in 1689, for 760 rig tiles made in 1690, for 1400 pan tiles made in 1690, for 2100 flat tile made in 1690, for 133000 brick made in 1690 and for burning 14000 left by Richard Atkins. £15 3s 6d.*

Fig.1 Gunby Hall (on the right), built of brick with stone quoins between February 1694 and October 1711. The left-hand, two-storeyed, five-bay extension was constructed in 1873.

(The figure of 133,000 is doubtful and given the money paid is more likely to be 13,300). 210,000 bricks were purchased between 1687 and 1690 but their purpose is not given. They may represent: Repairs/Rebuilding of Bratoft Manor House; Repairs/Rebuilding of the original Grunby Manor House; Repairs/Rebuilding of estate buildings or the Collection of material for the anticipated Grunby Hall.

If the planning for the new Gunby Hall did begin in 1695 then the delay in completion may lie in Massingberd's ability to pay for the materials and craftsmen or possibly in the availability of bricks. In total 383,060 bricks were purchased of which 3060 at the very high price of 15s per'000 were fired by Fr(ancis) Batchelor in 1701. The remainder were fired by Thomas Pain who began to burn bricks as early as August 1695 and was paid 'making 51000 brick and for setting the bricks that were burnt about the clamp. £14 7s 6d'. The later deliveries were: Nov.1700 - 50,000, Aug. 1701- 78,000, Sept. 1703- 63,000, Jan. 1706-126,000. For whatever reason it took eleven years to fire and purchase enough bricks to complete the project. Is there is a hint of panic by the purchaser in September,1703 when Pain was given a bonus over and above his usual price of 5s 6d per'000, 'a shillin over and a strike of malt for every score of bricks 21,000 to the score'? Massingberd records in some detail the manufacture of brick, in 1703 Pain was paid for 'making and finishing 63,000 bricks' and in January,1706 for 'digging, turning, moulding, setting, packing and burning 126,000 bricks. £33'. The National Trust, *Archaeological Survey of Gunby Hall* in 1986 speculated that the Ice House Pond was dug to provide clay for the bricks. The Pond is not however shown on an estate map of 1780.

Of particular interest is the purchase of 'Dutch Bricks'. In September 1692 Massingberd recorded.,'7800 Dutch brick bought at Hull, £3 18s. Taken by boat from Hull to Salfleet'. In July 1698, he noted, 'The custom (custom duty) for 12000 Dutch brick." £1 5s 2d. and 'For taking the bricks out of the ship and loading them into the boat. 16s 6d'. Gunby is only 12 km (7½ miles) east of the port of Skegness and a drain near to the house is a tributary of the River Witham, so that bricks from Holland could be easily imported.

The traditional hypothesis of the import of bricks as ballast in ships returning from the Low Countries is now regarded with some scepticism for heavy bricks banging together in the hold of a ship would hardly be fit for use.[12] Robin Lucas has called this the 'economic nonsense of giving over valuable cargo space to low-value, high-bulk goods.[13] Where bricks were imported it was probably as a specific order – between 1428 and 1430 the Southampton Port Book recorded the import of 'bakstone' i.e. baked stone, from Antwerp and Middleburg. It also recorded the import of brick from Hythe in Kent.[14] The continental bricks cost the large sum of 4s 5d per '000 while the Kentish bricks were a penny cheaper. As late as the seventeenth century the memory of the Dutch connection was preserved in the recommendation that 'Holland bricks' and 'Holland earth' should be used for the paving of horse stables.[15] In 1668, a passport was requested from the Duke of

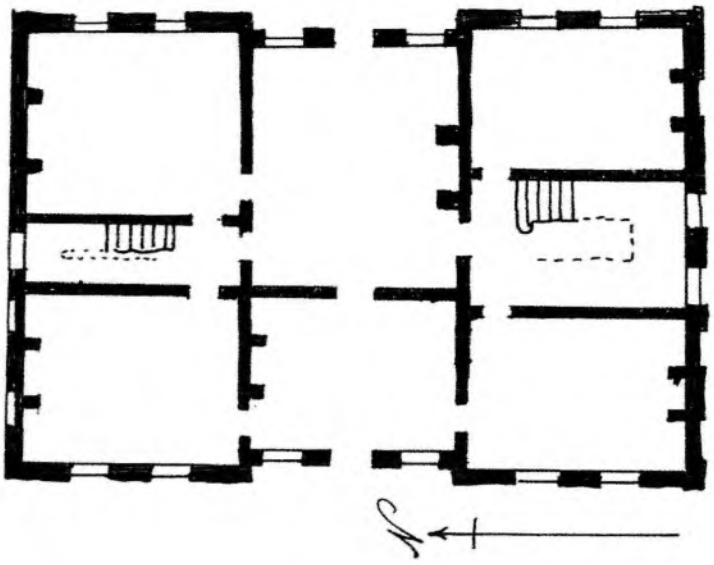

Fig.2 Sketch plan of the raised ground floor of Gunby Hall, showing six reception rooms: the kitchen was in the basement, thus allowing free space on this floor for a spacious entrance hall, a saloon, for other reception rooms, and for two staircases.

'brick brought out of Flanders...that is neater and stronger than common or Clay bricks'.[16] As late as 1763-64 the account book for the River Weaver recorded the carriage of 'Flanders brick'.[17] It may well be that the 'Dutch bricks' purchased in 1692 and 1698 were for the flooring of the stables. In 1701 Massingbred paid 15s per '000 for 3060 bricks from the brickmaker Fr(ancis) Batchelor, these at nearly three times the cost of the majority of the bricks presumably had a special function, either for the stables or as 'front bricks'.

There are no references to the fuel employed by the brickmakers. Robert Plot writing in 1686 suggested that 'for burning a Clamp of 16000 bricks they use about 7 Tunns of coal.'[18] At a rough estimate 20-25 tons of coal would be required to fire 50-60,000 bricks. Presumably the cost was included within the overall price of the bricks. One of the advantages of the site of Gunby Hall was its nearness to the coast and the ease in which coal could be delivered inland. In 1687 Massingberd listed 'Spent at landing of the coals and stones." 4s.'.

Lincolnshire Archives hold many references to the distribution of coal by river and 'sewers' (drains), for example the 1664 petition of the Spalding watermen 'about the low state of the river. They transport coals, deals and other merchandise'.[19] The Massingberd papers of c1720 include a reference to the sale of an estate 'with two landing places and tolls on coal'. The builder of Gunby was able to take advantage of its proximity to Skegness. In 1701 he 'Pd for the carriage of 30 ton of Ketten stone, it being delivered at Scegnes in lieu of being delivered at Boston. £19 15s'. A considerable amount of Ketton stone was bought for the window surrounds, the steps, yard paving, drains and the 'bigger and lesser peers'.

This study demonstrates the great advantage of building and brickmaking near to the east coast ports. Coastal shipping, numerous small ports and a network of inland rivers and navigable drains provided convenient access to Newcastle coal and the easy delivery of deals most of which came from the Baltic.

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1. *Lincolnshire Archives*, (hereafter *LA*) The Papers of Sir Drayner Massingberd, 1/MM/6/4.
2. *LA*, 1649-1680 MG/5/2/1.
3. 'pan' The horizontal timber along the top of the wall which received the rafters. Often associated with 'post and pan' see *Yorkshire Historical Dictionary*, yorkshiredictionary.york.ac.uk.
4. The Middle English 'gable' or 'gavel' is from the Norman-French 'gable' and from the Old Norse 'gafl'. In modern architecture the term 'Gavel end' is used, particularly in Europe, as a synonym for 'Gable end'. In this document 'gavill 'would seem to refer to the whole wall as there would not seem to be the triangular piece from eaves to ridge.
5. 'jawmes,' From 'jawm' a regional spelling of jamb, the side post of a doorway or chimney piece. 2

6. 'mantle tree' A beam across the opening of a fireplace which supported the masonry above. 2
7. N. Pevsner and J. Harris, *The Buildings of England: Lincolnshire,* Harmondsworth: Penguin Books, 1964, pp.259-260. John Harris of the RIBA drawings library was responsible for the domestic buildings while Nikolaus Pevsner tackled only the churches and a few medieval secular buildings in the county. The division of labour in preparing the initial edition is explained *Ibid.,* p.11. The comment on Gunby Hall is repeated N. Pevsner and J. Harris, rev. N. Antram, *The Buildings of England Lincolnshire,* London: Penguin Books, 1990, p.353.
8. Lincolnshire Archives, MG/5/2/7.
9. *LA,* MG/5/7/2, 34.
10. 'Bastard' marble stone. Possibly a limestone with the superficial appearance of marble, like Purbeck marble or Frosterley marble from Weardale?
11. The village of Pinchbeck is about 2 miles north of Spalding but lying in the Fens is unlikely to have substantial quarries.
12. T.P. Smith, 'Bricks, Tiles and Ballast: A Sceptical View', *BBS Information,* **85**, October 2001, pp.5-9.
13. R. Lucas, The Brick Trade in Colonial America, *Georgian Group Journal,* **7,** 1997, p.147.
14. P. Studer, ed., 'The Port Books of Southampton, 1427-1430', *Southampton Record Society,* **15,** 1913, pp.76, 99.
15. G. Worsley, *The British Stable,* New Haven and London: Yale University Press, 2004, p.44. Whether these were imported is uncertain, but no reference to their manufacture in England is recorded.
16. *CSPD, Charles II, 1668-69.* ed. M.A.E. Green, London: HMSO, 1894, p.132.
17. R. Neve, *The City and County Purchaser's and Builder's Dictionary,* 2nd ed. London, 1726, p.135.
18. T.S. Willan, *Navigation of the River Weaver in the Eighteenth Century,* Manchester: Chetham Society, 1951, p.210.
19. R. Plot, *The Natural History of Staffordshire,* 1686, p.128.
20. *LA,* 464/2.

Bricks and Brickmaking at the British Film Institute

The British Film Institute has released a number of historic films on bricks, brickmaking, and brickworks. all of which can be watched without payment. These are:

Felling of Hibson Roaf Brick Works Chimney in Nelson (1906):
https://player.bfi.org.uk/free/film/watch-felling-of-hibson-road-chimney-in-nelson-1906-1906-online

Blasting at Newhey Brickworks 27th July 1935:
https://player.bfi.org.uk/free/film/watch-blasting-at-the-newhey-brickworks-27th-july-1935-1935-online

Making of Bricks:
https://player.bfi.org.uk/free/film/watch-making-of-bricks-1938-online

Brickmaking at Pycroft Brickworks, 1974:
https://player.bfi.org.uk/free/film/watch-brickmaking-at-pycroft-brickworks-1974-online

Bricks for Better Building, 1978:
https://player.bfi.org.uk/free/film/watch-bricks-for better-building-1978-online

ALUN MARTIN

BRICK IN PRINT: LINCOLNSHIRE AND BEYOND

Between April and December 2021, the Editor of the British Brick Society has received notice of a number of publications on brick and its uses in Lincolnshire and its adjacent counties; these have been deliberately collected together. 'Brick in Print' has become a regular feature of *BBS Information*, with surveys usually two or three times a year. Members who are involved in publication or who come across books and articles of interest are invited to submit notice of them to the editor of *BBS Information*. Websites and television programmes may also be included. Unsigned contributions in this section are by the editor.

DAVID H. KENNETT

Anon., 'Saved ... tiny castle fit for mini wives of Windsor'
Metro, 9 December 2021, page 21.

British Brick Society Information, **127**, July 2014, carried, at pages 7-17, an article on 'Drayton Lodge: a Fifteenth-Century Hunting Lodge near Norwich' (fig.1). The whimsically, and somewhat misleadingly, titled report, including a colour photograph, in the freebie newspaper notes that the Grade II* listed brick structure — placed on the Heritage at Risk Register in 1998 — has now been repaired, helped by a grant from Historic England of £11,000 towards the cost of the work. The bricks for the repair, matching the original bricks, were made at Bulmer Brick and Tile Company, Sudbury Suffolk.

The hunting lodge — *not* a 'tiny castle' — was built for Sir John Fastolf (1380-1459), and completed *circa* 1437. The report notes that he was far from Sir John Falstaff in Shakespeare's *Henry IV*, Parts One and Two and in *The Marry Wives of Windsor*, but fails to mention that he also appears in *Henry VI*, Part One. The *BBS Information* contribution was based on a survey and on-site discussion by David Kennett and myself some three decades ago. It is good to learn that the building now seems to be safeguarded.

T.P. SMITH

William Aslet, 'Variations on Perfection',
Country Life, 19 May 2021, pages 104-109.

One of the few buildings in England inspired by the Villa Capra, 'La Rotonda', in the Veneto, the hinterland of Venice, was Nuthall Temple, Nottinghamshire, sadly destroyed after a fire in 1929 and now under the M1 motorway. Black-and-white photographs of the exterior and the internal rotunda (page 109) conclude the article. Whilst giving the appearance of being built of stone, it was raised on a brick undercroft, a lower ground floor which was extended beyond the actual rectangular house. Also illustrated and definitely externally of stone are the Temple of the Four Winds at Castle Howard, North Yorkshire (1724-26: Sir John Vanburgh) (p.108); Chiswick House in West London (*c.*1729: Lord Burlington) (p.106); and a twentieth-century example, Henbury Hall, Cheshire (*c.*1985: Patrick Kelly and Julian Bicknell) (pp.104-105). With the walls now covered in stucco, Mereworth Castle, Kent (1723: Colen Campbell) (p.107), the actual walling material is uncertain.

None of these houses is an exact copy of the celebrated villa outside Viacenza designed by Andrea Palladio as a summer residence for Paulo Almerico, a churchman given to scholarly pursuits, and illustrated in *I Quattro Libri dell' Architecttura*, first published in 1570 from which the plan, half-elevation, and half-section shown on page 105 are taken. None of the English examples is an exact copy, differing in several details. 'La Rotonda', an exact square, has four straight sets of steps to the principal floor with its four porticoes, each with six columns. Nuthall Temple had a single bifurcated stair rising to the front of the hexastyle portico which draws on the stair to Chiswick House where two bifurcated stairs rise to the edges of the hexastyle portico. Both the Temple of the Four Winds and Henbury Hall have only four columns to the porticoes. 'La Rotonda' had a circular dome rising from a circular central space but at both Nuthall Temple and Chiswick House the central space and the dome were or are octagonal. Except for the Temple of the Four Winds, none of the buildings is an exact square. The function of Chiswick House and the garden building at Castle Howard was as a place whereat to eat dinner while Henbury Hall and its other eighteenth-century predecessors were intended as homes.

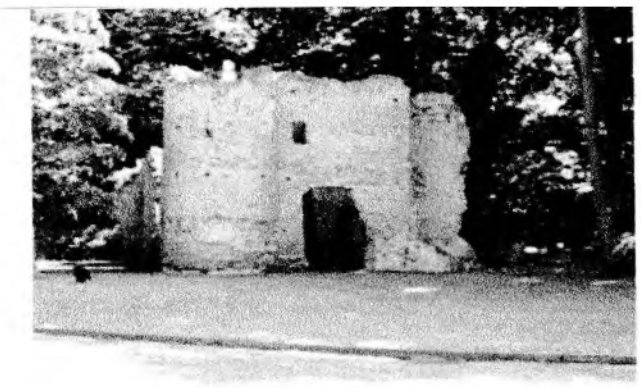

Fig.1 Drayton Lodge, near Norwich; the hunting lodge built for Sir John Fastolf, *circa* 1437.

Neville Birch, edited Chris Lester, *Stamford's Industrial Past: An Untold Story,*
Lincoln: Society for Lincolnshire History and Archaeology, 2021,
172 pages, 110 illustrations including maps, plans and photographs,
ISBN 978-0-903582-62-9, Price, £14-95 (£17-95 by post)
Available from The Postal Sales manager, SLHA, Jews' Court, Step Hill, Lincoln, LN1 2LS.

The book covers the industrial engineering and manufacturing history, the people and companies involved, with a specific and detailed look at the different types of clay building materials that were locally produced to sustain the building boom associated with the town's expansion, whose historic built environment was very much influenced by the fine local stone.

Foremost amongst the brickmaking enterprises was the firm of Williamson Cliff Ltd, whose premises the British Brick Society have visited on several occasions.

MIKE CHAPMAN

Emily Cockayne, *Hubbub: Filth, Noise & Stench in England 1600-1770,*
New Haven and London: Yale University Press, re-issued in paperback, 2021,
xiv + 431 pages, 62 illustrations, 6 maps,
ISBN 978-0-300-13756-9, Price, paperback, £11-99

This is a re-issue with new 'Afterword' of a book first published in 2007 and reissued in paperback in 2008. Based on deep research into the archives relating to four cities — London, Oxford, Bath, and Manchester — and wide reading of literature of the seventeenth and pre-industrial eighteenth centuries, its chapters cover all nuisances which assault the senses. Titles include 'Ugly', 'Itchy', 'Mouldy', 'Noisy', 'Grotty', 'Busy', 'Dirty', 'Gloomy'. These eight are preceded by 'The City in a Hubbub' and followed by 'Such things as these ... disturb human life'.

Bricks, brickmaking, and bricklaying feature prominently in 'Grotty' (pages 131-156). Here, there is much evidence of sub-standard workmanship both in making bricks and their use.

The author remarks (page 9) on Margaret Cavendish's favourable reaction to Nottingham in 1660 and (page 131) on a visitor in 1725 who was surprised to find the city 'constructed almost entirely of brick'. The artist Thomas Sandby (1721-1798), who was born in the city, illustrated brick houses in his views of the Market Place in Nottingham. Ms Cockayne also notes that, like Manchester, in the course of the middle decades of the eighteenth century, that 'even the once highly praised city of Nottingham was slipping into filth and became increasingly crowded' (page 248).

Eleanor Doughty, 'Sail away with me',
Country Life, 28 April 2021, pages 80-85.

Lincolnshire has many fine windmills. Ms Doughty writes of the county's mills:

> Driving into Lincoln from the A46, it's not only the cathedral that can be spotted on the skyline, but Ellis Mill. Twenty miles away, overlooking the village of Kirton-in-Lindsey, is the Austin family's Mount Pleasant Windmill and Bakery. Due east, six miles from the coast is the seven-storeyed, five-sailed Alford Windmill; Maud Foster Mill, which is the same size, is 25 miles away in Boston.
>
> That Lincolnshire is renowned as the flat county is one reason for there being so many extant windmills — 'you haven't got the fast-flowing rivers for watermills,' explains Charles Pinchbeck, chair of the Heckington Windmill Trust and a deputy lieutenant of Lincolnshire. His home windmill, five miles from the market town of Sleaford, is unique in being the only working eight-sailed windmill in the world. 'In the 18th century, as cast iron became more available, there was experimentation with bigger mills,' he continues. Most important was being able to mill in light winds and, the more sails, the lighter the wind that could be milled in — hence Heckington's eight. The mill produces a range of flour, sold both online and on site. Last spring [2020], when basics were at a premium, 'people came to Heckington simply to buy flour. There was a stage when my job was to manage the queue, and I was delighted to do it,' remembers Mr Pinchbeck, who has lived in Heckington all his life.
> (pages 84-85).

The Maud Foster Mill is also mentioned in the article as one where flour is still ground. Another is the five-sailed Holgate Mill in York built in 1770 and now in the centre of a roundabout. An even more surprising location is on Brixton Hill, Lambeth, London, where the four-sailed tower mill was built in 1816 and, after being deprived of its sails in 1860 and closed, was reopened in 2011, after eight years work. In 2021, run by the Friends of Windmill Gardens, it is still working and providing flour for local shops and the local foodbank.

The photographs do not include a Lincolnshire mill. Illustrated are Berkswell Mill, in Balsall Common, near Solihull, West Midlands, built in 1826, which is a working mill owned by Jeanette McGarry (pages 80-81); and the Jack and Jill mills on Clayton Hill, West Sussex: a Jack and Jill mill is a combination of a brick-built tower mill where only the cap with the sails turns and a timber-framed and timber-clad post mill where the whole structure turns above the basal roundhouse. The post mill is the earlier form, first recorded at Wedly, East Yorkshire, in around 1185. There are also excellent photographs of and two non-working windmills on the north Norfolk coast: Tower Windmill at Burnham Overy Staithe, where there is also a watermill, and that overlooking Cley Marshes. Burnham Overy Staithe mill was erected in 1816 and tail-winded in 1914, thus putting it out of action; it became holiday accommodation in 1958. Cley Mill was a house already in the 1980s.

Kathryn Ferry, 'Architecture for Education: Newnham College, Cambridge University',
Country Life, 28 April 2021, pages 68-73 and cover photograph.

Speaking for himself, the writer cannot think of a university or college campus he has visited which is as peaceful as that of Newnham College, Cambridge, one of the first two women's colleges in the university. The article ends with a quotation the *Daily News* in 1879:

> A brave, healthy, and cheerful spirit pervades the place, and its result is seen in the splendid percentage of success which the students achieve.

None of the writer's five universities give the feeling of so much warmth as he experienced on a single day's visit to Newnham for a conference about brick and paint (*BBS Information,* **48,** July 1989, pages 4-6). The writer's own university experience has been of stone perhaps a little pompous and occupying one edge of a city centre park, Cardiff in the mid-1960s; a converted children's home and then an out-of-town collection of inter-locking courtyards of plate class, Bristol Polytechnic in the early 1990s; miscellaneous buildings of varying dates, styles, and building materials set within a park, Salford in the mid-1990s; a campus mostly of houses whose walls of brick are in various shades had been built round a late-eighteenth-century town square, Liverpool in the 1990s; and a complex in brick on the top of a very windy hill, Lancaster also in the 1990s.

Newnham were extremely fortunate in their architect, Basil Champneys (1842-1935) who was chosen on the strength of his building for the London Board School on Harwood Road, Fulham (1872: demolished), which was the subject of T.P. Smith's article in *BBS Information,* **74,** June 1998, pages 14-20.

Champneys designed all of the earliest buildings at Newnham: what became Old Hall (1875); Sidgwick Hall (1879-80); Clough Hall (1886-87) with the dining room; the Pfeiffer Building (1892-93); the Yates-Thompson Library (1896-98); the Kennedy Building (1906) for the college fellows and lecturers; and Peile Hall (1910). The article has excellent photographs, by Will Pryce, of Old Hall (page 71), Clough Hall (page 68-69 and cover, exterior; page 72, interior), an interior view of the library (page 73), and Peile Hall (page 70). Through these, one can trace the evolution of the architect's style in the 35 years he worked on designing buildings for the college. All these buildings have load-bearing brick walls with shaped gables and white-painted woodwork.

It is not patronising to say that a college needs study-bedrooms for the undergraduates (and now flats for the postgraduates), a dining hall, and social space. Champneys provided the necessary requirements of a late-nineteenth-century college. But his solution to the first of these requirements was rooms off a corridor. It is a solution one encounters in halls of residence from Cardiff to Kalamazoo. It breaks with the Cambridge (and Oxford) tradition of sets off a staircase.

Significantly, although Champneys retired before the Great War, Newnham College did not add to the series of buildings provided by him until after his death. Elizabeth Whitworth Scott gave the college the Fawcett Building in 1938, also in brick. Because female undergraduates were not admitted to the university library until 1923, the college had to rely on donations of books, some of which were of international importance in their rarity. To accommodate the rare books, Joanna van Heyningen and Birkin Haward provided the college with the Katherine Stephen Rare Books Library. John Miller & Partners extended the main library in 2004 (page 72) but kept to spirit of Champneys' interior, replacing the completely open space between the two floors with lightwells, one containing a staircase from ground floor to first floor.

Only one post-1945 did not find favour, Strachey Hall erected in the 1960s but demolished for the Dorothy Garrod Building of 2018 by Walters & Cohen Architects (page 71), where the decorative element is provided by dog-tooth brickwork, which also admits light.

The previous literature about the buildings of Newnham College is substantial. Each of the editions of *The Buildings of England: Cambridgeshire,* devote more a single page to the buildings: most recently, the third edition, New Haven and London: Yale University Press, 2013, pages 157-161, with plan, and plate 104. It notes Strachey Hall but not on its replacement, the Dorothy Garrod Building. All buildings at Newnham College are too recent for the Royal Commission on Historical Monuments, London: HMSO, 1975 and 1988, whose remit stopped at 1850. Discussions in two specialist works are important: M. Girouard, *Sweetness and Light: The Queen Anne Movement 1860-1900,* New Haven and London: Yale University Press, 1977, paperback 1984, pages 70-76, with figures 53-56, and M.B. Vickery, *Buildings for Bluestockings: The Architecture and Social History of Women's Colleges in Late Victorian England,* Newark NJ: University of Delaware Press, and London: Associated Universities Presses, 1999, pages 40-78.

Adrian Green, 'Law and Architecture in Early Modern Durham',
in M. Lobban, J. Begiato, and A. Green, editors, *Law, Lawyers and Litigants in Early Modern England: Essays in Memory of Christopher W. Brooks,*
Cambridge: Cambridge University Press, 2019, paperback 2021, pages 265-291,
ISBN, paperback, 978-1-108-74064-7; price, paperback, £25-99.

Festchriften are often a mixed bag. The volume has a distinct focus, being a memorial to one of the major scholars of English legal history of my own generation. Professor Brooks was born in 1948; sadly, he died of a sudden heart attack on 19 August 2014. He was a cautious scholar who did not rush into print, producing twenty-one papers in learned periodicals, including two in French, together with twenty-four contributions to the *Oxford National Dictionary of Biography* over forty-one years but there again, he wrote five big, scholarly books and edited two more. Sadly, his major writing, the 1525 to 1688 volume of the *Oxford History of the*

Laws of England, remained only partially researched and completely unwritten, although pieces thinking out his approach to certain questions had been composed, two of which are included in the volume.

Adrian Green, the author of the paper here highlighted, was one of Christopher Brooks' academic colleagues at the University of Durham. His contribution to his friend's memorial is a study of the buildings associated with the law in and around Palace Green in the city. Whilst the official buildings were built of stone, the houses lawyers built as both residence and office could be of brick. Cosin's Hall, whose present name derives from its sometime use as student hall of residence, is a house on Palace Green, probably constructed by Michael Mickleton (1663-1711), of the 'antiquarian-minded legal dynasty', in about 1695, is seven bays of brick, but in two unequal parts. Five bays to the left are the residence-cum-office but two bays to the right allow entry to the rear portion. Originally of two storeys with a plat band, the whole was heightened in the eighteenth century, when sash windows were inserted and the plat band replaced by shaped aprons below the windows. At the same time, the fine Rococo doorcase was inserted and the frontage rendered, giving the building in its present state a 'somewhat dog-eared appearance'. In the eighteenth century, the house was connected to no.46 North Bailey, a smart, apparently early-eighteenth-century building in local brick derived from the brickearth in coal measures but with orange rubbed brick over the sashed windows. These were the offices of the solicitors, Mickleton and Spearman, whose papers Prof. Brooks had studied and used judiciously. Here, too, Christopher Brooks had his book-lined university study, a neat juxtaposition of his historian and the source of his material. Behind the façade of no.46 is an earlier house, internally preserving its original staircase. Also part of the university's History Department are the adjacent nos.44 and 45, North Bailey, where a snecked stone frontage, including a re-used late-seventeenth-century doorcase, hides a much earlier house.

A second house with legal connections is 1 South Bailey, a brick house of seven bays built in 1735 for William Pye, a lawyer, who give his three-storeyed, brick-built house a stone front. The extreme right-hand bay gave access to the rear.

Legally, the Mickletons in the seventeenth century had strong London connections, not least to the Inns of Court. Architecturally, the house on Palace Green reflects another London connection, the city's rebuilding after the Great Fire.

Adrian Green raises interesting questions about law and architecture in the context of castle, court, and prison, a subject on which the present writer has pondered for well over a decade. While, because of Durham's palatinate status, there was greater involvement in all aspects of law — civil and criminal as well as canon law — there are other county towns where the lawyers constructed their residences-cum-offices in the vicinity of the courts: Lancaster is an obvious example, with lawyers' offices adjacent to the former judges' lodgings on Castle Park. With a castle as the focus of judicial involvement, one thinks of Lincoln and Exeter. When the castle was out of use as the place of justice, the early-nineteenth-century houses opposite the former assize courts in Derby provide one example. Although not dwellings, the proliferation of solicitors' offices round the former town hall in Salford, a building which is now the magistrates' court, equally illustrates the point.

For Bishop Cosin's Hall see M. Roberts, N. Pevsner, and E. Williamson, *The Buildings of England: County Durham,* New Haven and London: Yale University Press, 3rd edn, 2021, page 348; no.1 South Bailey is noted *ibid.*, pages 356-357. The buildings are noted pages 242 and 247 respectively of the volume's second edition (1983), and on page 133 of the first edition (1953) for both buildings. The doorcase of the Palace Green house is illustrated on plate 58 of the first edition and plate 69 of the second edition but not in the third edition.

Marianne Wilson, 'Peacock Feathers and Pater Nosters: The Post-Mortem Identity of Sir Thomas Burgh',
The Ricardian, **30,** 2020, pages 151-167.

Sir Thomas Burgh (*c.*1430-1496) was certainly the builder of the west wing of Gainsborough Old Hall and possibly other parts of the mixed timber-framed and brick house, seen by members of the British Brick Society following its Annual General meeting in 1999.

The article examines the provisions made by Sir Thomas Burgh (*c.*1430-1496) for his burial and monument beside his wife, Margaret, in the chapel he had built in the parish church of All Saints at Gainsborough, Lincs. Sir Thomas requested he be shown with a weapon, the emblem of the Garter, and a

garter on his leg. The tomb had armorial shields to emphasise his lineage. The will provides for a chantry with a priest to says masses for his soul, with the five beadsmen of his almshouse as the participating congregation. Generous provision of vestments was included in the will. One suit was embroidered with peacock feathers, an unusual motif. Unfortunately, the church was totally rebuilt between 1736 and 1744. The monument was not saved.

The same issue of *The Ricardian* has several other articles on fifteenth-century Lincolnshire, two others of which as with that noted here derive from the Lincoln Records Society's conference in September 2019 on 'Lincolnshire and the Wars of the Roses': J.L. Laynesmith, 'Cecily Duchess of York and her Lincolnshire Lands', (pages 1-11) and Nicholas Bennett, 'The Road to Lanercost Field', (pages 137-149).

POTENTIAL BRITISH BRICK SOCIETY VISITS TO BRICKWORKS IN 2022

In the light of recent articles in *British Brick Society Information,* thought has been given to a programme of visits to brickworks in 2022. Four suggestions can be made:

- Wienerberger's works at Sittingbourne, Kent. This is the only factory now making a true Kent London stock brick from brickearth. See the articles on London stock bricks in *BBS Information,* **146,** October 2020, pages 25-37; *BBS Information,* **147,** March 2021, pages 26-34; and *BBS Information,* **148,** September 2021, pages 10-19; and *BBS Information,* **150,** May 2022, forthcoming. Despite being somewhat out of the way, but with Faversham accessible by a fast inter-city train from London St Pancras International, not as much as it once had been, this could prove very interesting.
- Ibstock Lodge Lane Works at Cannock, Staffordshire, where blue bricks are produced. Ibstock have offered the society a visit there.
- MBH Freshfield Lane factory, which is a largish clamp kiln works, at Daneshill, Haywards Heath, RH17 7HH. This would align with the article in *BBS Information,* **148,** September 2022, pages 31-33, about the Ibstock West Hoathly works.
- W.T. Knowles, Elland, West Yorkshire, which has beehive kilns. This works was cited in conjunction with the former kilns at Great Linford, Milton Keynes, in *BBS Information,* **148,** September 2021, pages 21-26.

It probably would not be possible to hold visits all four brickworks during 2022, so I am asking the membership to respond by email as to which three brickworks in order of preference they feel it would be most appropriate to visit in 2022.

MICHAEL CHAPMAN
Chairman, British Brick Society
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NOTES ON CONTRIBUTORS

MICHAEL CHAPMAN is Chairman of the British Brick Society. He spent his working life in the UK Brick Industry, gaining a range of professional qualifications enabling him to work in technical and managerial roles and gaining expertise in all aspects of brick production and general management. Since retirement, he has remained active as a consultant, working on environmental, training, and quarry projects. He also remains active in the industry's professional institution, the Institute of Materials, Minerals and Mining, being a Fellow of the Institute and through it a Chartered Environmentalist. His principal interests lie in all aspects of both historical and modern brick manufacture and the application of brick in the built environment and as a contributor to *British Brick Society Information.*

MARK GARDINER is Professor of Medieval Archaeology at the University of Lincoln. His first degree was from University College, Cardiff and his doctorate in Archaeology was from the University of London. He has a particular interest in the social significance of the use of various building materials, including brick, in the Middle Ages. He is currently completing a paper for *A Cultural History of Medieval Interiors,* for Bloomsbury Academic, on the impact of the introduction of various building materials.

DAVID H. KENNETT is the Editor of *British Brick Society Information.* A retired lecturer in Sociology, he holds degrees in Archaeology, in Construction Management and Economics, and in Technology and Society from Prifysgol Cymru, Bristol Polytechnic, and Salford University, respectively. His brick interests centre on the relationships between building patronage, the building patron's wealth, and the resulting buildings; applying construction management skills to the documentary evidence about buildings; and on the use of brick in religious buildings.

MIKE KINGMAN is a retired teacher and lecturer in Environmental Studies at the University of Central England. He holds degrees in History and English Local History from Leicester University and a Ph.D. from Keele University. His thesis, inspired by the W.G. Hoskins approach to landscape, was on 'Brickmaking and Brick Building in Staffordshire, 1500-1760'. He has written articles on Tudor marketing, enclosures, and employment history for *Warwickshire History,* on the adoption of brick for *Midland History* and the *Staffordshire Archaeological and Historical Society* and has contributed a variety of studies to *British Brick Society Information.*

KEN REDMORE is a retired local government officer with a degree in Chemistry. He taught in secondary schools and a college of education before working with Lincolnshire County Council in curriculum development, school administration and capital construction projects. Since retirement he has developed his interests in industrial archaeology, especially agricultural engineering, the gas industry and nineteenth-century brick making. His article 'Some Brick Kilns and Brickmakers of East Lincolnshire' was published in BBS *Information* 108. He is planning a website on Lincolnshire bricks and brickmaking.

IAN SMALLEY is Honorary Professor of Physical Geography at Leicester University and proprietor of the Tin Drum bookstore in Narborough Road in West Leicester. He worked with Grenville Lill on the thermogravimetry of brickearth and loess at Leeds University and works with Arya Assadi-Langroudi on the nature and properties of loess material. He has a very particular brick interest focussed on the Crayford Brickearths and the London Stock brick. Publishes Loess Ground blog *www.loessground.blogspot.com.* PhD City University, London

BRITISH BRICK SOCIETY
MEETINGS in 2022

Saturday 21 May 2022
Spring Meeting
Industrial Worcester
A walk from Shrub Hill Station to the city centre before lunch; a walk along the canal in the afternoon, returning to Worcester Shrub Hill in time for the London train around 4.00 pm
Contact: David Kennett, *davidkennett510@gmail.com*
7, Watery Lane, Shipston-on-Stour, Warwickshire CV36 4BE

Saturday 18 June 2022
Annual General Meeting
Lincoln
Meeting in Bailgate Methodist church. With afternoon visit to Upper Town, on the flat, including the brick buildings within Lincoln Castle and the Cathedral Quarter.
Contact: Mick Oliver, *mickshelia67@hotmail.com*
19 Woodcroft Avenue, Stanmore Middlesex HA7 3PT

It is hoped to include two visits to brickworks in the 2022 programme: due to Covid-19 restrictions no brickworks was open for works visits in either 2020 or 2021. Visits to Alcester, Warwickshire; Abbots Bromley and the Ridwares, Staffordshire; Risley and Ockbrook, Derbyshire; Cardiff Bay; and Tewkesbury are being planned for future years.

At the 2021 Annual General Meeting on Zoom it was agreed to hold the next southern Annual General Meeting in Bridport; this will now be held on Saturday 17 June 2023.

All meetings are subject to attendance at the *participant's own risk*. Whilst every effort is made to hold announced meetings, the British Brick Society is not responsible for unavoidable cancellation or change.

Full details of future meetings will be in the subsequent BBS Mailings
The British Brick Society is always looking for new ideas for future meetings.
Suggestions of brickworks to visit are particularly welcome.
Offers to organize a meeting are equally welcome.
Suggestions please to Michael Chapman. Michael Oliver or David Kennett.

Changes of Address

If you move house, please inform the society through its Membership Secretary, Dr Anthony A. Preston at 11 Harcourt Way, Selsey, West Sussex PO20 0PF.

The society has recently been embarrassed by material being returned to various officers from the house of someone who has moved but not told the society of his/her new address.