THE
GEORGIAN
GROUP

Robin Lucas, 'The Brick-Trade in Colonial America', *The Georgian Group Jounal*, Vol. VII, 1997, pp. 146–159

THE BRICK-TRADE IN COLONIAL AMERICA

ROBIN LUCAS

Architectural ideas travel continents and oceans and so, too, do the techniques involved in construction and the preparation of building materials. A practice transported from the Old World to the New in the seventeenth and eighteenth centuries was that concerned with the manufacture and use of bricks. The agency which brought this about were the colonists who took with them to their new country ideas about the use of bricks and skills appropriate to brickmaking and bricklaying. A memoir of Virginia in 1623 recorded that in that colony the clay for brickmaking was widespread:[1] the desire for building in brick was already present and the first capital of the Commonwealth of Virginia, Jamestown, was made up of houses with brick foundations and a parish church which, after a series of timber forbears, was walled solely in brick (Fig. 1). In the middle and northern colonies brick was also used, the Dutch taking the lead in their settlements at Renselaar, in the upper Hudson Valley, and at New Amsterdam, renamed New York in 1664 after its cession to the British crown.[2] Brickkilns were operative at Salem, Massachusetts, in 1629[3] and, a decade later, in and around Hartford and New Haven, Connecticut.[4] Brickmaking in and around Burlington in 1683 prompted the issue of regulatory laws by the General Assembly of New Jersey.[5] From such small beginnings a regular trade in the manufacture and use of bricks developed, aiding the creation of colonial, later state capitals, at Williamsburg, Annapolis, Philadelphia, Providence and Boston, and providing the Eastern Seaboard with specimens of colonial brick architecture that are now revered. As early as 1690 John Goodson wrote of Philadelphia, in terms marked by exaggeration and prejudice but undoubtedly expressive of the taste and aspirations of the time:

Figure 1. The tower added after 1647 to the 1639 build of the parish church, Jamestown, Virginia. The bond is English bond; the parapet, now lost, may have been crenellated. *R. Lucas*

'They Build all with Stone and Brick now, except the very meanest Sort of People, which Build framed Houses with Timber . . .'. Goodson continued: 'We have now . . . Four Brick-makers, with Brick-kills'.[6]

It was inevitable that the brick-trade in the colonies should follow English example. The craftsmen were, as has been indicated, trained in the English tradition. We might mention here the two bricklayers forming part of the first settlement at Jamestown;[7] the contingent of Staffordshire brickmakers at work, from the 1620s onwards, in Stafford County, Virginia;[8] the bricklayers recruited by William Penn from Sussex for the colony of Pennsylvania;[9] or the steady stream into New England and the colony of New York of brickmakers and bricklayers from East Anglia. That stream, interrupted by the American War of Independence (1776–83), was to resume at the restoration of peace.[10] But tradition, alone, did not determine the course of development of the brick-trade in colonial North America. Common factors in the economic and social situation on both sides of the Atlantic directed the development of the North American brick-trade along similar lines to that in England. The high cost of brick relative to other walling materials and the limited resources available for building delayed the mass use of brick in North America as much as it did in England. A local study has shown that brick did not become the norm for walling in the 'brick counties' of England before the mid eighteenth century:[11] in the colonies that point was reached in the 1790s, or later, by which time the colonies had become states of the Union.

In reviewing the history of the brick-trade in the American colonies I shall discuss, firstly, aspects of the manufacture of bricks; and, secondly, aspects of their use. I shall not be discussing the unsubstantiated claim that houses in the colonies were built with bricks imported from England but think it appropriate, in this article concerned with historical parallels, to draw the attention of readers to a parallel not in fact, but in wrong-headed historical speculation. For when writers on brick architecture first came to account for the raising of brick buildings in England in the medieval period they were inclined to reckon it the consequence of bricks brought from elsewhere, in this case, from the Netherlands. The reason why, of course, the brick buildings of medieval England were not raised with imported bricks, any more than the brick buildings of colonial North America were raised with imported bricks, was the limited carrying capacity of vessels of the time in comparison with what was required for building; and the economic nonsense of giving over valuable cargo space to low-value, high-bulk goods.[12]

MANUFACTURE OF BRICKS

From the first days of brickmaking in the colonies parallels could be drawn with the practice in England: for at seventeenth-century Jamestown and most other early settlements in North America it was deposits of the alluvial clay which were dug and tempered for brickmaking, just as it was alluvial clay in England which served as material for the country's first brickmakers and which continued to serve as a major brickmaking material in post-medieval England.[13] The first English settlements in North America and, indeed, much later settlements, were on the banks of rivers: alluvial clays, of estuarine silt, were, therefore, self- selected. Inland settlements exploited older clays.

According to descriptions of English brickmaking made in the seventeenth and eighteenth centuries there was a calendar to brickyard activities: the clay for brickmaking was dug in the late autumn and winter; the heaps turned and 'frosted' in the late winter and early spring; and the clay conditioned

Figure 2. Experimental brickyard at Colonial Williamsburg, Virginia, where moulded, unfired bricks are dried on earthen balks before being stacked inside an arched kiln. *R. Lucas*

for moulding by the treading action of man or beast from late spring onwards.[14] The calendar for brickyard activities in the colonies was scarcely different. An order, dated 1679, of the Superior Court of Essex County, Massachusetts, stated as an official requirement what was common practice. Brick-earth 'shallbe digged before the 1st of November, and turned over in the moneth of February and March ensuing, a moneth before it is wrought'.[15] Thomas Jefferson, who had bricks made on his estate at Monticello, Albemarle County, Virginia, referred in his Farm book to the turning of the clay in the entry for 9 March 1795.[16]

Very little is known of the colonial kilns in which bricks were fired. It is likely that, as in England, a variety of types were in operation and the type used in any one location may have been determined by the type used in the part of England from which the operating brickmaker originated. The excavation report of a kiln of the mid seventeenth century uncovered at Jamestown shows it to have been a sunken arched kiln, that is, an updraft box kiln partly buried in the ground with firing arches and 'benches' inside on which to stack the bricks.[17] The arched kiln, which lacked permanent fire channels, was amongst the simplest of kilns and may have been the most commonly used kiln of any type in seventeenth-century England. An arched kiln, in use on the Hunstanton estate in Norfolk in the early seventeenth century, was rediscovered in the early eighteenth century.[18] A modern version of the arched kiln, in use in the post-War period at the South Cove Brickworks in Suffolk, was last fired in April 1989. Bricks manufactured in the experimental brickyard established, in recent years, at Williamsburg, Virginia (Fig. 2), have been fired within an arched kiln.[19]

The unknown author of *A perfect description of Virginia*, a tract printed in 1649, commented that roof-tiles could not be made at Jamestown for reason that 'the Brickmakers have not the art to do it, it shrinketh'. It would appear that brickmakers overcame that particular problem: stacked within the excavated Jamestown kiln were unburnt tiles as well as bricks.[20] In view of how much colonial practice was shaped by English practice it will come as no surprise to learn that in English brickmaking roof-tiles were also fired in the same kilns as bricks, albeit in special positions in the firing chamber.[21]

Bricks could be fired in clamps as well as in kilns, although evidence of the early use of clamps in the colonies is sparing. Clamps were not, like kilns, permanent enclosures for the firing of bricks but rather heaps of unfired bricks interspersed with the fuel for firing. In 1663 the town authorities of Dedham, Massachusetts, granted to John Littlefield liberty 'to take so much clay as may be sufficient for makinge a clampe of Brick for to supply the Towne'[22]. In the years after 1815 clamps were used at Haverstraw and Tarrytown, New York, by James Wood, a brickmaker from Essex, England. Wood mixed coal-dust with the brick-clay to assist the firing, according to the practice of brickyards in London's Home Counties.[23]

The quality of bricks produced in kilns varied widely and that of bricks produced in clamps even more so. Although there was always a proportion of the firing which was rejected as useless, fired bricks were not regarded so much as good or bad but rather as suitable for different purposes. The hard-burnt but distorted 'kiln-bottoms' were selected for foundations, the soft-burnt 'samels' for internal walls protected from the weather. In 1684 the Superior Court of Essex County, Massachusetts, ruled that 'every toune (where bricks shall be made or sold) shall annually choose two or more able men . . . to veiw, divide, and cull all bricks from time to time that shall be exposed to sale'.[24] Similar regulations were in force at the time in the English city of Norwich.[25]

The seasonal character of the brick-trade determined that brickmakers themselves were recruited for defined periods. Thomas Jefferson's account books reveal the contracts into which he had entered for the payment of brickmaking activities: with George Dudley in 1769 and 1772–3; with Bishop in 1771; with William Pond in 1774; and with John Brewer in 1778.[26] Jefferson's brickyard was what in an English context would be called an estate brickyard. The practice of seasonal recruitment in England is illustrated by the accounts of the Felbrigg estate in Norfolk. Between 1673 and 1717 there were employed consecutively at the Felbrigg kiln brickmakers whose names were Spearing, John Lound, Spink, Adcock, William Sexton, William Barret, Bartholomew Knowles and Spink. The name Spink occurs in accounts in 1684–5 and again in 1717 and may refer to the same brickmaker.[27]

We can imagine that the siting of brickyards was a cause of common concern on both sides of the Atlantic, since transport charges made up a sizeable portion of brick costs. We thus find, in the colonies as in England, brickyards sited on the edge of towns where building was concentrated. The excavated kiln at Jamestown was sited within the urban area itself,[28] as was the case with a brickyard in the English town of Swaffham, Norfolk.[29] The burgeoning port of Boston, Massachusetts, was supplied with bricks and tiles by brickyards at Medford, a settlement on the town's northern perimeter where bricks were, most probably, made from the mid seventeenth century.[30] Brick-kilns were observed, in the eighteenth century, in and around Philadelphia.[31] In the countryside it was commonplace for brickyards to be set up next to the houses under construction, as has been observed in Virginia and Maryland,[32] New Jersey,[33] and at a number of locations in New York.[34] In England graphic reminders of brickyards set up for single building projects are estate maps,

maps like that dated 1629 of the Sedley estate near Wymondham, Norfolk, which shows the 'Bricke Yarde' adjoining the plot occupied by Old Morley Hall which was built a score or so of years earlier.[35]

At some building sites the clay was not suitable for making into bricks; and at other sites the water required for tempering the clay and the fuel for firing the bricks had to be brought such distances that it was scarcely worth the trouble of making the bricks on site. Thomas Jefferson questioned whether it was not more economic to purchase the bricks with their carriage.[36] For later works he did so.[37] To some locations, in the colonies as in England, bricks were carried by river vessels and distributed from markets. Brick markets were established in New York and other towns at the outflow of rivers, as was the case also, for example, at England's Great Yarmouth.[38] New York spread out in the nineteenth century to join up with the city of New Jersey. The vast urban complex constituted a super-sized market for bricks which was supplied by brickyards lining the Hudson river as far north as Poughkeepsie, some sixty miles away.[39] The English parallel was, of course, the city of London, whose need for bricks was, from the seventeenth century onwards, met by brickyards on both the northern and southern banks of the Thames estuary.[40]

Looking at the colonial brickmaking scene as a whole it is evident that a number of features in its operation and development would be familiar to the English brickmaker. Some of these features were incidental to the manufacture of bricks: but others were shaped very much by English experience. Brick moulds as used in the colonies were, for example, commonly of the single-brick type favoured by English brickmakers[41] and made to dimensions which ensured that the size of the average colonial brick scarcely differed from the size of the average English brick.[42] Given a parity of critical factors it is not surprising that American reports of the daily output of brick-moulders matched English reports.[43]

We have emphasized common elements in brick-manufacture on both sides of the Atlantic. There were, of course, some major differences. Brickmaking in the colonies was geographically dispersed, making it more difficult for brickmakers to operate on an itinerant basis as was the common practice in England. As Jefferson's use of slaves reminds us, there was access to slave labour in Virginia and the southern colonies for basic brickyard tasks. It is not known whether large numbers of blacks became skilled in the business of brickmaking but amongst the slave craftsmen who sought freedom by escaping to British forces during the War of Independence there was one brickmaker, Brister by name, bound to Joseph Mitchell of Nansemond County, Virginia.[44] The want of a sufficient work-force may have stimulated the early use in North America of brickmaking machinery, as noted by the London press in 1810.[45] In this and in other brickmaking practices the Americans were no longer learning from England but were, instead, providing examples of new techniques, some of which would influence developments in England.

USE OF BRICKS

In the colonies, as in England, the use of brick for building was governed by availability and cost. Bricks were in limited supply: few brickyards produced more than ¼ million bricks a year, which was scarcely sufficient for two substantial houses. The price of bricks, which may in part have been determined by availability but more probably by the cost of production, was such that walling in brick was appreciably more expensive than walling in other materials. We know the cost of bricks in England: colonial costs would seem to have been higher. A thousand bricks from the English county of Norfolk

cost between 12 and 15 shillings in the 1680s and 1690s[46], to be be compared with the charge levied in 1698 at Burlington, New Jersey, of 20 shillings a thousand for 'Bricks at the Kiln'[47]. Thomas Jefferson estimated the cost of 100 square feet of walling with painted weatherboard on timber frame with plaster infill at £2.2*s*.3*d*, as compared to £3.12*s*.0*d* in brick[48]. In England there was also a price difference between brick and timber construction, though not as marked.[49]

The manner in which the construction industry in the colonies faced up to the limited availability of bricks and their high relative cost was broadly similar to what had been and continued to be the manner in England. In England bricklayers requiring a supply of bricks had, from the medieval period onwards, organized the manufacture of bricks themselves.[50] We find in the colonies, where supply was no less a problem, an expectation that the same practice would continue. Thomas Eames, resident in Medford, Massachusetts, described himself as 'Brickelayer, and maker of bricke' when in 1660 he took Joseph Mirrible as apprentice, agreeing to instruct him 'in the art and trade of a brickelayer, and brickemaker'.[51] Contracts in seventeenth-century Virginia assumed that bricklayers made the bricks they would need to lay.[52]

The colonial adjustment to the price of bricks was, as in the north-west of England, either not to use them at all, or else to use them sparingly, which for common dwellings was the case through most of England before the mid eighteenth-century. In parts of the northern colonies bricks were disregarded and use made instead of naturally occurring materials. 'For the building [of] houses, townes, and fortresses' John Smith questioned, 'where shall a man finde the like conveniency, as stones of most sorts, as well lime stone, if I be not much deceived, as Iron stone, smooth stone, blew slate for covering houses, and great rockes we supposed Marble, so that one place is called the marble harbour'.[53]

Examples of the sparing use of brick occur throughout the colonies. Here we find brick used for special purposes, to face a house, to cover a floor, to line an oven or to raise a chimney. The raising of brick chimneys within timber-framed houses in Massachusetts has been documented: in Salem in 1675, Boston in 1701 and Braintree in 1706.[54] By this date most of the houses in Virginia had been provided with brick chimneys.[55] In Connecticut it has been observed that whilst chimneys were built of stone, they were topped off with external stacks of brick.[56] In Dutchess County, New York, the Glebe House at Poughkeepsie, the house of Lewis Du Bois at

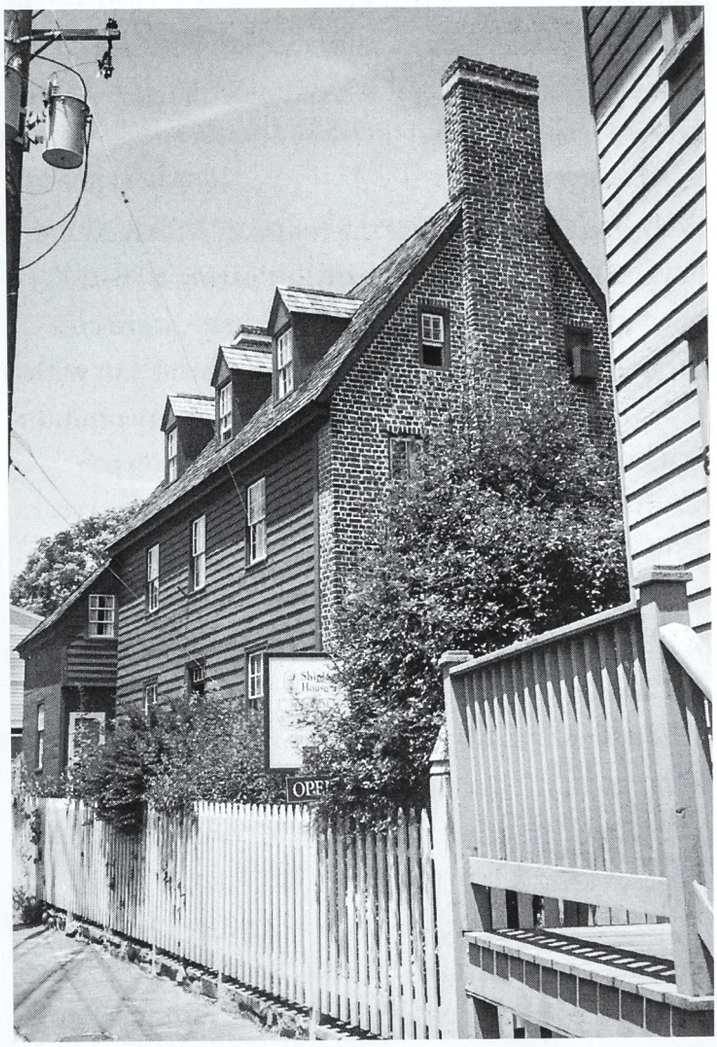

Figure 3. Brick gable to the otherwise timber-framed and timber-clad Shiplap House in Annapolis, Maryland, dating from *c*.1713. *R. Lucas*

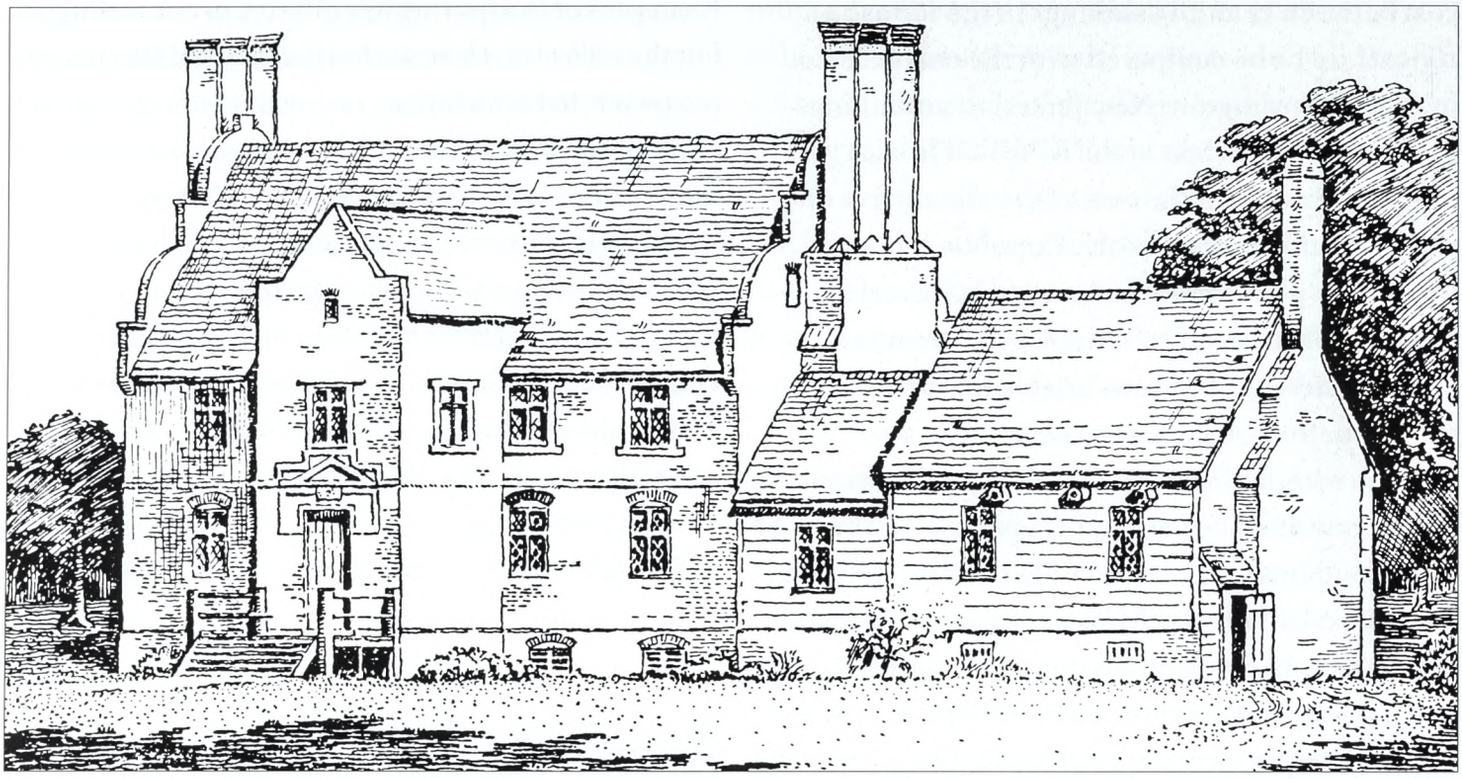

Figure 4. Double-storeyed porch and gable-end chimney stacks at Bacon's Castle, Surrey County, Virginia, raised c. 1655. The outhouse chimney stack is of the more common stepped-back type. Line-drawing reconstruction by Henry Chandler Forman.

Wappingers Creek, and the house of Abraham De Peyster at Mill Farm, Fishkill, all dating from the third quarter of the eighteenth century, were constructed with front and side walls of brick but with rear walls of stone.[57] In Maryland a not uncommon construction in the seventeenth and eighteenth centuries was to have timber-framed front and rear walls between gables of brick (Fig. 3),[58] a type of construction known to exist in the English county of Norfolk at the time.[59] In Annapolis, Alexandria and Washington brick houses were commonly constructed on basements of stone. But here the use of stone may not have been to save bricks but rather, as in English buildings where flint is used for foundation courses, to provide a basic dampcourse (Fig. 6).

In the design of brick buildings the colonists did, as might be expected, pick up ideas dominant in England at the time of their emigration. A continuing theme in English house-planning was the through-passage, the entrance to which was – in some cases – the double-storeyed porch, as instanced by buildings ranging from Barnham Broom Hall in Norfolk, dating from the early sixteenth century, to Crossways Farm, at Abinger in Surrey, dating from the mid seventeenth century. The provision of a through-passage was repeated in the colonies, with unporched versions occurring, for example, in two neighbouring houses in Princess Anne County, Virginia, the Adam Thoroughgood House and the Lynnhaven House, both dated to about the year 1680; whilst a porched version, representative of a number of greater houses, occurs at Bacon's Castle in Surrey County, Virginia, thought to have been built about 1655 (Fig. 4). The colonial houses mentioned displayed other features of English origin, notably the gable-end chimney stacks which, in the case of the Thoroughgood and Lynnhaven Houses, were of the common English stepped-back type; and which, in the case of Bacon's Castle, was a grander affair, straight in its ascent but set off against a shaped gable and topped off with a group of diagonally-set shafts (Fig. 4). The

Figure 5. One of a pair of crinkle-crankle walls facing an approach walk to the campus of the University of Virginia, Charlottesville. Thomas Jefferson's layout plans including the walls are dated 1822. *R. Lucas*

chimney arrangement of the 1676–9 build of the Peter Sergeant House in Boston, Massachusetts, now demolished, was closely similar. There are, in the English county of Suffolk, approximations to the chimneys mentioned.[60] The shaped gable, familiar in Kent and East Anglia, was sometimes applied to early colonial brick architecture, as was the case with the second Bruton parish church at Williamsburg, Virginia (1683), now demolished, and as remains the case with the south wing of Middleton Place, South Carolina (1755).[61] The Old State House in Boston, raised in the early eighteenth century, is, in respect of its gable, which is partly stepped and partly scrolled, to be compared with the general form, although not the specific shape, of the Shire Hall at Woodbridge in Suffolk. The stepped gable is also a feature of the brick architecture of eastern England but, like the shaped gable, it occurs also in the Netherlands. The inspiration of the stepped gable, applied to the City Tavern of New Amsterdam, raised in 1641–2, and to Medway, South Carolina, raised by a Dutch-born immigrant

Figure 6. Prestigious houses of the mid eighteenth century at Annapolis, Maryland, were raised in header bond, as here in the William Paca House, begun in 1763, where the basement storey is built up in local limestone. *R. Lucas*

in 1686, is, in these instances, more likely to be found in Dutch architecture than English. There can be little doubt, however, as to the English antecedents of the stepped gable applied to Newport parish church (Saint Luke's), Smithfield, Isle of Wight County, Virginia, raised in 1632.[62]

Later buildings in the colonies reflected the formal designs of post-Restoration England in the symmetry of bays, projections, window- and door-openings and chimney stacks. Greater buildings have their pedimented centres and columnar porticoes, smaller buildings suggestions of the same with their pedimented doorcases. The brick-built Westover in Charles City County, Virginia, raised about 1730, is – with its seven bays in two storeys, dormers in the hipped roof and scrolled doorcase – a near replica of Mompesson House in Salisbury's Cathedral Close, although the English 'original' is faced with stone. The one-and-a-half-storeyed house of the seventeenth century, as popular in the colonies as it was in England, gave way gradually to the two-storeyed house, although eighteenth-century examples of the former type – as is shown by the architecture of Williamsburg – remain numerous. The churches of Boston and Philadelphia incorporate Wrenian and Gibbsian elements. The Wren Building of the William and Mary College at Williamsburg, Virginia, although not designed by Wren, is, clearly, a building of Wren's period and might be compared, generally and loosely, with the Royal Hospital, Chelsea. Thomas Jefferson read law in the Wren Building: when, years later, he was to write on architecture he called this building and the mental hospital in Williamsburg 'rude, mis-shapen piles, which, but that they have roofs, would be taken for brick-kilns'.[63] Jefferson's remarks were intemperate and uncritical. By this date colonial architecture had moved on and Jefferson and others were looking to the continent of Europe for their inspiration, Jefferson himself being taken up with Palladian models which have their expression in his own house at Monticello and at the University of Virginia at Charlottesville. But even then English design elements had their place: the approach walks to the campus at Charlottesville (Fig. 5)[64] are framed by serpentine walls, otherwise called ribbon or crinkle-crankle walls, which are largely peculiar to East Anglia.[65]

The approach of bricklayers to the task of bricklaying was similar on both sides of the Atlantic. English bond, that is, the method of laying alternate courses made up entirely of headers or stretchers, was, before the late seventeenth century, the bond for all purposes: thereafter, in the colonies as in England, English bond was replaced as a facing bond for display walls by Flemish bond, which was made up of mixed headers and stretchers in each course. Flemish bond was admired for being neater and more uniform than English bond, although more difficult to lay. It was, therefore, reserved for facing purposes. For example, the house of Adam Thoroughgood at Virginia Beach, raised *c.*1680, was faced in Flemish bond whilst the side and rear walls were of English bond. The house of Fairfield in Gloucester County, Virginia, begun in 1692, was walled in English bond up to the top of the basement plinth or, as the Americans term it, the water-table, and thereafter in Flemish bond. There are numerous colonial houses walled in the same manner, with as many English parallels.[66] And then there is header bond, a bond made up of headers alone and used to front the William Paca House (Fig. 6) and six other substantial houses raised in Annapolis in the mid eighteenth century and shortly afterwards[67]. The English enthusiasm for header bond, as seen in buildings of the 1740s in towns throughout the south of England and the Thames Valley, occurred slightly earlier. The bond might well be called the Dorchester bond, given its prominent use at Dorchester in Dorset and Dorchester-on-Thames.

The colonial importation of brick bonds was accompanied by methods of colour-patterning

Figure 7. Lozenge-form diaper of the late seventeenth century on the gable-end of the now-demolished Malvern Hill, Henrico County, Virginia. Line-engraving from *Battles of the Civil War* (vol. 2, 1887).

Figure 8. Timber balks above the windows at Brick House Farm, Pleasant Valley, Dutchess County, New York, raised c. 1760, have been painted to resemble window-heads of brick voussoirs. *R. Lucas*

which made use of bricks whose ends had been turned blue or purple through vitrification in the kiln. Both interlaced and chevron diaper appear on the gable of the house called Make Peace in Somerset County, Maryland, raised *c.*1663.[68] Lozenge diaper was recorded at Malvern Hill, Henrico County, Virginia, on the gable of a house raised in the late seventeenth century but destroyed by fire in 1905 (Fig. 7).[69] The diapers could be compared with English diaper designs recorded by Nathaniel Lloyd.[70] The enthusiasm for diaper had largely waned before Flemish bond, with which diaper was incompatible, was introduced. But Flemish bond did, in the opportunity it provided for chequering a wall with blue headers, permit a different if mechanical scheme of colour-patterning: in the Virginian parish churches of Williamsburg (Old Bruton) in James City County and Ware and Abington in Gloucester County, dating from the 1710s to the 1760s, as well as in numerous other brick buildings in the colonies, we see the repeat of Flemish-bond header patterning displayed in Hooke Hall, Uckfield, Sussex, dating to *c.*1700, and in other buildings in the south and east of England dating from the last quarter of the seventeenth century. Philadelphia has an outstanding collection of buildings in Flemish-bond header patterning.

The picture we have of the use of bricks in colonial North America closely reflects English practice in design and construction. There was some delay, as might be expected, in the implementation of the new fashions, there was some lingering attachment to practices superseded in the Old Dominion (such as the laying of facing bricks in English bond in Rhode Island),[71] there was even some anticipation of English practice, notably in respect of the colour-chequering of Flemish-bond walls, which was a noted feature of buildings in the city of New York in the 1690s.[72] Overall, however, the brick architecture of the colonies was English architecture and was expressive of the desire which exists in all expatriate communities to replicate cultural forms of the land of their origin. But the way brick construction developed in the colonies could not be said to be identical to that which occurred in England. We have identified ways in which colonial brickwork followed English brickwork but it could not, for want of skills and other factors, recreate every facet of English brick architecture. Colonial buildings sometimes lacked the moulded and cut bricks required to complete a composition: at Brick House Farm or the Zaccheus Newcomb House in Pleasant Valley, Dutchess County, New York, raised about 1760, painted timber balks above the windows take the place of arch bricks or voussoirs (Fig. 8). At the same time there was being assembled in the centre of Philadelphia a collection of brick buildings displaying skills in moulding and laying comparable to the best London work. The distribution of craftsmen and craftsmanship in the colonies was, therefore, uneven. Whether it was for want of expertise in their production or differences in fashion the compelling taste in England for white bricks did not cross the Atlantic. In England the relative high cost of bricks led to the creation of walling methods involving the mixed use of brick and stone in common dwellings and agricultural buildings, such as is observed especially in Norfolk, Sussex and Dorset: walling with mixed masonry materials was not taken up in the colonies, with the noted exception of Dutchess County, New York, where the combined use of brick and stone has been observed in some buildings dating from the mid eighteenth century.[73]

There was a rural-urban dimension to differences in the development of brick construction between England and her North American colonies. It was the case in England that brick construction took place in the town and countryside alike. There were towns like Blandford Forum, Bristol, Great Yarmouth, Kingston-upon-Hull and Liverpool

which were, in the seventeenth and eighteenth centuries, either built or rebuilt in brick, but brick construction was not a peculiarly urban phenomenon in England. Notwithstanding the number of rural churches and planters' houses raised in brick, brick construction in the colonies was concentrated in towns, notable amongst which are those mentioned previously in this article: Williamsburg, Annapolis, Philadelphia, New York, Providence and Boston. Mention should also be made of Newport, Rhode Island; Burlington, New Jersey; Richmond, Virginia; Baltimore, Maryland; and of the Tidewater towns of the southern colonies in general. The development of brick construction in these areas was prodigious. It was stated that there were in Philadelphia in 1698 2,000 houses, 'most of them Stately, and of brick',[74] and some 1,000 brick houses in Boston in 1722.[75] The North American contrast in the use of brick between town and country may have been because, as evidenced by the Virginia new towns' legislation of 1662, building in brick in towns was government policy;[76] it may also have been because brickyards were few in number and were most often sited near towns; and yet again it may have been because lime for mortar was in limited supply and was more easily available in urban locations served by cheap transport. At a number of places in the colonies lime could be produced only by the gathering up of oyster- and mussel-shells, there being no limestone or chalk available for limeburning.[77] The absence of lime may be one reason why the dominant mode of early construction in New England was timber-framing covered by weatherboard, or clapboard as the Americans prefer to term it. In England there were areas where lime was wanting and this led to low levels of building in brick: but in England as a whole lime was relatively plentiful.

NOTES

The reader is advised that unnoted statements regarding surviving buildings are based on personal observation by the author.

1 Susan Myra Kingsbury (ed.), *The records of the Virginia Company of London*, Washington, DC, 1906, IV, 260.

2 Helen Wilkinson Reynolds, *Dutch houses in the Hudson Valley before 1776*, New York, 1929, 22; Hugh Morrison, *Early American architecture from the first colonial settlements to the national period*, New York, 1952, 103, 108–09.

3 Abbott Lowell Cummings, *The framed houses of Massachusetts Bay, 1625–1725*, Cambridge, Mass., 1979, 119.

4 Norman Morrison Isham and Albert F. Brown, *Early Connecticut houses: an historical and architectural study*, Providence, RI, 1900, 178–80.

5 N. R. Ewan, *Early brickmaking in the Colonies*, Camden, NJ, 1938, 1, 14.

6 *Ibid.*, 5.

7 Edward Arber (ed.), *Travels and works of Captain John Smith, President of Virginia, and Admiral of New England, 1580–1631*, Edinburgh, 1910, I, 93–4.

8 George Alfred Townsend, 'Houses of brick imported from England', *Records of the Columbia Historical Society*, VII, 1904, 201, 208.

9 Townsend, *op. cit.*, 204.

10 Cummings, *op. cit.*, 42, 119; Robin Lucas, 'Vassar brick-making in the state of New York', *Dutchess County Historical Society Year Book*, LXXVI, 1991, 57–69.

11 Robin Lucas, *The example of Norfolk in the English brick-trade: a collection of historical studies*, PhD thesis, University of East Anglia, 1993, I, 242–69.

12 For a discussion of the importation of bricks from the Netherlands-England perspective see Lucas, *The example of Norfolk*, *cit.*, I, 66–7. For a discussion of the same topic from the England-North America perspective see Ewan, *op. cit.*, passim; and Townsend, *op. cit.*, passim: other references occur in Lewis Augustus Coffin and Arthur Cort Holden, *Brick architecture of the colonial period in Maryland and Virginia*, New York, 1919, 8; Cummings, *op. cit.*, 119; Isham & Brown, *op. cit.*, 18; Reynolds, *op. cit.*, 21–2, 322.

13 Ronald John Firman, 'A geological approach to the

study of medieval bricks', *The Mercian Geologist*, II, 1967, 312, 316; Ronald John Firman and Patricia Eleanor Firman, 'Loessic brickearth and the location of early pre-Reformation brick buildings in England – an alternative interpretation', *British Brick Society Information*, No. 47, February 1989, 4–14.

14 See, for example, the calendar of brickyard activities outlined in 'The manner of Making Bricks at Ebbisham, in Surrey, in a Letter to the Worshipful Captain James Twiford, now Sheriff of Bristol' dated 16 June 1683, reprinted in Nathaniel Lloyd, *A history of English brickwork*, London, 1925, 33–5.

15 Cummings, *loc. cit.*

16 Edwin Morris Betts (ed.), 'Thomas Jefferson's farm book, with commentary and relevant extracts from other writings', *American Philosophical Society*, XXXV, Princeton, NJ, 1953, 45.

17 J. C. Harrington, 'Seventeenth century brickmaking and tilemaking at Jamestown, Virginia', *Virginia Magazine of History and Biography*, LVIII, 1950, 22–8.

18 Norwich, Norfolk Record Office, Hunstanton estate papers, Q 38, Notebook of Sir Hamon and Sir Nicholas L'Estrange, 1613–1721, (77). Arched kilns in Norfolk are discussed in Lucas, *The example of Norfolk*, *cit.*, I, 174–5.

19 Bill Weldon, 'The brickmaker's year', *Colonial Williamsburg Historic Trades Annual*, II, 1990, 1–39.

20 Harrington, *op. cit.*, 18, 24, 28, 32, 36–8.

21 Lucas, *The example of Norfolk*, *cit.*, I, 161.

22 Cummings, *loc. cit.*

23 Lucas, 'Vassar brickmaking', *cit.*, 61.

24 Cummings, *loc. cit.*

25 Norwich, Norfolk Record Office, Norwich City records, case 10, shelf b, box 1, Byelaws governing tylers, 1681

26 Edwin Morris Betts (ed.), 'Thomas Jefferson's garden book, 1766–1824, with relevant extracts from his other writings', *American Philosophical Society*, XXII, Philadelphia, 1944, 18, 42, 57, 80; Betts (ed.), 'Thomas Jefferson's farm book,*cit.*, [338].

27 Norwich, Norfolk Record Office, Felbrigg estate papers, WKC 5/154, 400 × 6, Felbrigg estate disbursements, compiled by John Salman, 1673–4; WKC 5/155, 400 × 6, Felbrigg estate and household accounts, compiled by Smith, Joseph Eldon and Edward Fairchilde, 1681–7; WKC 5/158, 400 × 6, Felbrigg rent accounts, 1687–93; WKC 5/162–210, 400 × 6, Felbrigg bailiff's accounts, compiled by Stephen Legge, 1688–1717.

28 Harrington, *op. cit.*, pp. 19–22.

29 William Faden, *A topographical map of the county of Norfolk, one inch to the mile, 66½ inches by 48 inches*, London, 1797 (enlarged-scale inset showing the town of Swaffham).

30 Cummings, *op. cit.*, 42, 119; Morrison, *op. cit.*, 72.

31 Ewan, *op. cit.*, 8–9.

32 Coffin & Holden, *op. cit.*, 13; Townsend, *op. cit.*, 199, 200.

33 Ewan, *op. cit.*, 2, 13.

34 Lucas, 'Vassar brickmaking', *cit.*, 67 (note 15); Reynolds, *op. cit.*, 322, 356, 377.

35 Norwich, Norfolk Record Office, Morley Saint Botolph and Morley Saint Peter parish papers, PD 3/108(H), The town of Morley, part of the estate of Martin Sedley Esq., lord of the manor there. Map by Thomas Waterman, 1629, 40 inches by 30 inches.

36 Clemens Catesby Jones, 'A geologic and economic survey of the clay-deposits of the lower Hudson River valley', *Transactions of the American Institute of Mining Engineers*, 1899, 1–44; Hienrich Ries and Henry Leighton, *History of the clay-working industry in the United States*, New York, 1909, 10, 15, 150–52, 158; Lucas, 'Vassar brickmaking', *cit.*, passim.

37 Betts (ed.), 'Thomas Jefferson's farm book, *cit.*, [338–9].

38 Lucas, *The example of Norfolk*, *cit.*, I, 72, 304.

39 *Ibid.*, [443].

40 Richard-Hugh Perks, *George Bargebrick esquire: the story of George Smeed, the brick and cement king*, Rainham, Kent, 1981, passim; Alan Cox, 'Bricks to build a capital', in Hermione Hobhouse and Ann Saunders (eds.), *Good and proper materials: the fabric of London since the Great Fire*, London, 1989, 11.

41 The use in Philadelphia of the mould designed to produce a single brick at a time is mentioned in a letter of Timothy Pickering dated 1792 and quoted in Ewan, *op. cit.*, 10–11. The English use of the single-brick mould can be inferred from numerous descriptions, one such being found in a brickmaking contract of the late seventeenth century published in Robin J. E. Bush, 'A Somerset brickmaker of 1680', *Somerset Industrial Archaeology Society Journal*, No. 3, 1981, 17.

42 Regulatory laws passed by the General Assembly of New Jersey in 1683 fixed the size of a common brick at 9½ × 4½ × 2¾ inches. Ewan, *op. cit.*, 1. In a contemporary English work we read: 'The Common

Bricks that are made here . . . are Nine Inches in Length, Four Inches and ¼ in Breadth, and Two and an half in Thickness; and sometimes Three Inches thick' [Joseph Moxon, *Mechanick exercises: or, the doctrine of handy-works applied to the art of bricklayers-works*, London, 1700, 2].

43 There are contemporary colonial and English statements to the effect that a brick moulder, with helpers to provide him with tempered clay and to 'bear off' and lay out moulded bricks, could mould two thousand bricks a day [Ewan, *op. cit.*, 11; Lloyd, *op. cit.*, 19–20].

44 Michael Nicholls, 'Skilled Black Virginians and the American Revolution', *Colonial Williamsburg Historic Trades Annual*, II, 1990, 58.

45 'Foreign occurrences – America', *Gentleman's Magazine: and Historical Chronicle*, LXXX, 1810, part 2, August, 175.

46 Lucas, *The example of Norfolk*, *cit.*, I, 306.

47 Ewan, *op. cit.*, 7. The charge levied in 1697 at Medford, Massachusetts, was 30 shillings a thousand for hard bricks, 13 shillings a thousand for soft bricks [Cummings, *loc. cit.*].

48 Betts (ed.), 'Thomas Jefferson's farm book', *cit.*, 37.

49 Lucas, *The example of Norfolk*, *cit.*, I, 252.

50 *Ibid.*, 85–7.

51 Cummings, *op. cit.*, 42.

52 Philip Alexander Bruce, *Economic history of Virginia in the seventeenth century*, New York and London, 1895, II, 136.

53 Arber, *op. cit.*, II, 951.

54 Cummings, *op. cit.*, 118.

55 Daniel D. Reif, *Small Georgian houses in England and Virginia: origins and development through the 1750s*, Delaware, 1986, 195.

56 Isham & Brown, *op. cit.*, 7–8, 191, 193–4.

57 Reynolds, *op. cit.*, 323, 335–8, 339–41.

58 Morrison, *op. cit*, 157–8.

59 Robin Lucas, 'Some observations on descriptions of parsonage buildings made in Norfolk glebe terriers', *Transactions of the Ancient Monuments Society*, XXXIX, 1995, 89, 96 (note 34).

60 Stepped-back chimneys occur at Clopton Hall in Wickhambrook, at Thorpe Morieux Hall, and at Thurston Hall in Hawkedon; and chimneys capped with diagonal shafts and set against decorative gables occur, or did occur, at the Moor Farmhouse in Middleton, at Mutford Hall near Beccles, and in a house, now thought lost, at Bury Saint Edmunds [Eric Sandon, *Suffolk houses: a study of English domestic architecture*, Woodbridge, 1977, 130, 137, 186, 221, 276, 277; Reif, *op. cit.*, 198].

61 Henry Chandlee Forman, *The architecture of the Old South: the medieval style, 1585–1850*, Boston, Mass., 1948, 83, 179.

62 Coffin & Holden, *op. cit.*, 21; Morrison, *op. cit.*, 105–07, 154–6, 171–2;

63 William Peden (ed.), Thomas Jefferson, *Notes on the state of Virginia*, Chapel Hill, NC, 1955, 152–3.

64 Coffin & Holden, *op. cit.*, 25 (plan).

65 Norman Scarfe, *Suffolk: a Shell guide*, third ed., London, 1976, 37; Paul Rutledge, 'Crinkle-crankle walls', in Arthur William Ecclestone (ed.), *A Yarmouth miscellany*, Gorleston, 1974, 150–52.

66 Reif, *op. cit.*, 202–04, 207, 208, 211, 214; Lucas, *The example of Norfolk*, *cit.*, I, 51–2, 310.

67 Houses raised in header bond in Annapolis can be listed, in order of construction, as: Lockerman-Tilton House, 9–11 Maryland Avenue (c. 1740); Reynolds' Tavern, Church Circle (1747); Saint Anne's Rectory, 215–17 Hanover Street (1759); Peggy Stewart House, 207 Hanover Street (1761–4); Upton Scott House, 4 Shipwright Street (1762–5); William Paca House, 186 Prince George Street (1763); John Ridout House, 120 Duke of Gloucester Street (1765); and James Brice House, 42 East Street (1767–74). For other examples of the use of header bond in Maryland see Coffin & Holden, *op. cit.*, 4, 16, pl. 35.

68 Forman, *op. cit.*, 125. Other colonial examples of diaper are illustrated on pp. 84, 153, 155.

69 Coffin & Holden, *op. cit.*, 21, pl. 72.

70 Lloyd, *op. cit.*, 437–8.

71 Isham & Brown, *op. cit.*, 196.

72 Morrison, *op. cit.*, 104.

73 Reynolds, *op. cit.*, 21.

74 Harold Donaldson Eberlein and Cortlandt Van Dyke Hubbard, *American Georgian architecture*, London, 1952, 19–20.

75 Morrison, *op. cit.*, 75.

76 John W. Reps, *Tidewater towns: city planning in colonial Virginia and Maryland*, Williamsburg, Va., 1972, 53, 84, 114.

77 Cummings, *op. cit.*, 122; Ewan, *op. cit.*, 9; Isham & Brown, *op. cit.*, 182–8; Morrison, *op. cit.*, 39, 68–9, 157; Reynolds, *op. cit.*, 18–20.