ISSN 0960-7870

BRITISH BRICK SOCIETY

INFORMATION 106

FEBRUARY 2008

TRANSPORTING BRICKS ISSUE

OFFICERS OF THE BRITISH BRICK SOCIETY

Chairman E-mail: jwpc2@cam.ac.uk	Dr James W.P. Campbell	Queens' College CAMBRIDGE CB3 9ET
Honorary Secretary Tel. 020-8954-4976 E-mail: micksheila67@hotmail.com	Michael S Oliver	19 Woodcroft Avenue STANMORE Middlesex HA7 3PT
Honorary Treasurer Tel: 01889-566107 *e-mail*: graeme@giperry.co.uk	Graeme Perry	62 Carter Street UTTOXETER Staffordshire ST14 8EU
Enquiries Secretary Tel: 01494-520299 E-mail mh@bulldoghome.com	Michael Hammett ARIBA	9 Bailey Close HIGH WYCOMBE Buckinghamshire HP13 6QA
Membership Secretary *(Receives all direct subscriptions, £10-00 per annum*)*	Dr Anthony A. Preston	11 Harcourt Way SELSEY West Sussex PO20 0PF
Editor of *BBS Information* (*Receives all articles and items for* BBS Information) Tel: 01608-664039 E-mail: davidkennett@stratford.ac.uk (term-time only)	David H. Kennett BA, MSc	7 Watery Lane SHIPSTON-ON-STOUR Warwickshire CV36 4BE
Publications Officer	John Tibbles	19 Leander Road Bilton Grange HULL, East Yorkshire HU11 5QE
Printing and Distribution Secretary Tel: 01903-717648 E-mail: bucklandbooks@tiscali.co.uk	Chris Blanchett	Holly Tree House, 18 Woodlands Road LITTLEHAMPTON West Sussex BN17 5PP
Auditor E-mail: clerk@siblehedinghampc.org.uk	Adrian Corder-Birch F.Inst.L.Ex.	Rustlings, Howe Drive HALSTEAD Essex CO9 2QL

* *The annual subscription to the British Brick Society is £10-00 per annum.*
Telephone numbers and e-mail addresses of members would be helpful for contact purposes, but these will **not** *be included in the Membership List.*

THE BRITISH ARCHAEOLOGICAL ASSOCIATION : BRICK SECTION*

Liaison Officer	Michael Hammett	Address as above

* *Members of the BAA may join its brick section and, as such, will be eligible for affiliation to the British Brick Society at a* reduced *annual subscription of £7-00 per annum; BAA Life Members have a waiver of the subscription but they should inform the BAA:BS secretary of their interest so that they can be included in the Membership List.*

British Brick Society web site:

http://www.britishbricksoc.free-online.co.uk/index.htm

Contents

Cover Illustration:

Bricks on the back of a donkey at a brickyard in modern Bangladesh. Horses, mules and donkeys have been used to transport bricks for many centuries. A medieval instance is recordeded in the building accounts of the North Bar at Beverley, East Yorkshire, when the use of panniers is specifically noted in the accounts for 1409-1410. In Ulster in the early twentieth century, the use of horses for the transport of both bricks and coal is known from both documents and photographs.

Editorial:
Transporting Bricks

As with 'Tyne coal, road-rail, pig-lead, firewood, ironware and cheap tin trays', bricks can be seen as a cargo more typical of the

> Dirty British coaster with salt-caked smoke stack
> Butting through the Channel in the mad March days

rather than one carried by the Quinquireme of Nineveh or a stately Spanish galleon, which does not imply that the contrasting vessels in *Cargoes* might not have carried bricks: from the ancient world, we have the glazed bricks of the ceremonial gateway to Nineveh itself, now in the British Museum. The poet, John Masefield, was probably unaware of the order given by the governor of Cuba in 1753 for 100,000 bricks from Malaga when the governor's palace was rebuilt following the earthquake of 1748. In the eighteenth century, the Spanish also transported building stone across the Atlantic Ocean for new cathedrals at Leon, Nicaragua, and Lima, Peru.

Both the stone and the brick were used in these cases to stabilize large ships. A ship without cargo will ride high in the water and is liable to capsize. To reduce this possibility, heavy materials were loaded into the hold as a ballasting material but bricks were not used as normal ballast which is carried beneath the hold by sea-going vessels on all voyages. Because ballast can move easily, it is designed to prevent sudden shifts in a ship's stability and to enhance manoeuvrability in high seas. By carrying heavy building materials such as brick and building stone in large quantities, the Spanish maritime authorities were able to minimize the potential losses of their large vessels, which were, after all, very expensive pieces of highly complex technology.

Further evidence of long journeys, although confined to the east coast of England, is found at the end of the eighteenth century. In the 1780s and again in 1802, Sir John Soane was commissioned to rebuild and then enlarge Moggerhanger House, Bedfordshire, using London stock bricks. These were sent from London by water all the way round the bulge of East Anglia to King's Lynn or even inland to Ely before being transshipped to river barges for a journey down the rivers Great Ouse and Ivel to Mogerhanger Bridge where they were unloaded before being taken the final mile by cart. At the end of his site visits, Sir John would walk the two miles into the local town of Biggleswade to catch an overnight mail coach for early morning arrival in London and presumably a full day's work.

The bricks used at Moggerhanger House are an extension of the long-established coastal trade in bricks. The vessels carrying them used the coastal waters of Essex, Suffolk and Norfolk for safety. It is an extension of the usual trip down river to London from brickyards in either Essex or Kent. This is a trade which over short distances is known from the early decades of the fifteenth century and probably has a much earlier beginning not recorded in writing. One of the earliest instances occurs in 1418 and concerns the unloading of a *shute* or barge with *tegulas de brike* at Deptford when five men were paid for a day's work. However, a *shute,* meaning a barge, does not specifically imply a sailing barge. The sailing barge was the common carrier of bricks to London from both Essex and Kent, very much in the same way as the village carrier, also known as the common carrier, took produce from his village and others en route to market once a week. The great sewer outfall at Beckton and associated pumping works was built of bricks brought by many sailing barges from Essex in the 1880s.

The three papers in this issue of *British Brick Society Information* examine a number of

linked questions concerning the transport of bricks on both water and land. With rare exceptions, transport by water was likely to involve some degree of land transport. These three papers represent the first of at least two issues of *BBS Information* to be devoted to various aspects of the transport of bricks. The cover illustration reminds members both historically that pack animals were used to transport bricks and in the contemporary world that their use remains extensive. Hack barrows of the type illustrated on page 25 were very much in evidence in a Chinese-financed and Chinese-managed brickworks in Namibia visited by the presenter in the BBC2 programme 'Tropic of Capricorn' shown on 10 February 2008. Neither pack animals nor barrows are aspects of the transport of bricks not covered in the studies in this issue of *BBS Information.*

Contributions for a second issue of *BBS Information* to be devoted to transporting bricks have been proposed on the use of various types of transport involved in the movement of bricks in Ulster, including the use of packhorses, and an examination of the contrasting supply lines of bricks to two medieval brick buildings in Norfolk: Cow Tower, Norwich, and Caister Castle, north of Great Yarmouth. As with all themed issues of *British Brick Society Information,* this depends on sufficient material being forthcoming.

The query about 'Tall Chimneys' in *British Brick Society Information,* **104,** July 2007, has produced several responses, the first of which is included in this issue of our journal. Two other members have also sent in responses, the first of which is copiously illustrated and the second being of some length. These will be included in the next two issues of *BBS Information,* respectively. The editor is most grateful to contributors for responding to this query and he is aware that others have contributions to make, which have yet to be received.

The editor's thanks are due to Terence Smith for his excellent guest editing of *British Brick Society Information,* **105,** October 2007, which appeared four months ago. Terence's readiness to help does share the burden of editorial work particularly as the editor's paid work has become more onerous as his official retirement date looms ever closer. Terence's willingness to be guest editor has been especially appreciated.

The present issue became delayed in its production by work circumstances completely beyond the editor's control. It had been the intention to have this issue ready for distribution in December 2007, rather than in February 2008.

Provided that sufficient items are forthcoming, it is at present the intention to produce seven issues of *British Brick Society Information* over the course of a two-year period, although can mean two years with three issues being followed by two with four issues, rather than years with three and four issues alternating. Work on *BBS Information,* **107,** is in an advanced state of preparation with the intention to distribute in April 2008. *British Brick Society Information,* **108** should follow in July 2008, and *BBS Information,* **109,** later in the year, the Fall as our American colleagues call it. Contributions for this and future issues are most welcome.

DAVID H. KENNETT
Editor, *British Brick Society Information*
Shipston-on-Stour, 11 February 2008

HOW LARGE WAS A LOAD OF BRICKS?
Some Staffordshire Evidence and its Implications

Mike Kingman

In July 1788 Thomas Ward, the steward of the Kingstone estate of Earl Talbot, reported to his master that,

> I have Inspected into Metearials Wanting for Harises House at Thorney Lanes and find it Will take about 6500 of Bilding Bricks and 1200 of Floor Bricks and Considerable Quantity of Timber for Cilling which Metearals all ly at a distance. Haris has No Team Nor is not able to Hier the Caridge. Be Pleased to Send... What I must do in the Afaer.'[1]

In 1676 Parson Roades purchased a timber-framed house at Blithfield. In the introduction to his diary he describes its appalling state as,

> very bad... but one chymney below stares and but one very mean one above staires the floors below were dirt and clay ... those above of plaister sadley worn. Above a third part of the house had no Floore over it. (open hall house?) ... every body concluded it had bene an ould kiln. I had a mind to a sould it off the ground as it stud. I got it at 60 pound Value and was bid but 50 and parsuaded to take it becase we had no Brick mad at that time within les than 2 miles and these very small and dear.[2]

In 1680, Roades recorded that he had

> Laid out in all about my house 350ll of which I heartly Repented for I might have built a new tile brick house big enough for Blithfield parsonage and more convenient for ye Same money."

The value of these extracts is that they provide evidence of the role transport costs played in the decision to build in brick. Roades' diary is particularly valuable for his opinion that a substantial brick house at that time would cost about £350 and that his reason for rebuilding rather than starting from new was that there were no immediate brick supplies and those which were available were 'small and dear'. The clear implication is that the costs of the carriage of brick and tile, even for a distance of only two miles, could be an important part of the overall expenses incurred in building a brick house.

The traditional view that most brick was made on site is probably accurate. Immediate access to supplies of brickearth and the ability to build a clamp or kiln adjacent to the proposed building provided an important financial advantage in the decision to build in brick (although even this may have involved the substantial transport of coal and lime). Very rarely clay could be dug from immediately below the chosen site and provide a cellar for the new house. The Giffard accounts of 1729 for the Mass House at Wolverhampton (fig. 1), for example, included, 'To deduct out for Clay being taken from which was in the Vaults at 4d per Thousand comes to 36000... 14s 8d'(sic).[3] Recent research has however suggested that, at least in Staffordshire, there was considerable transport of bricks by road in the period before the building of the Trent and Mersey and Staffordshire and Worcester canals.[4]

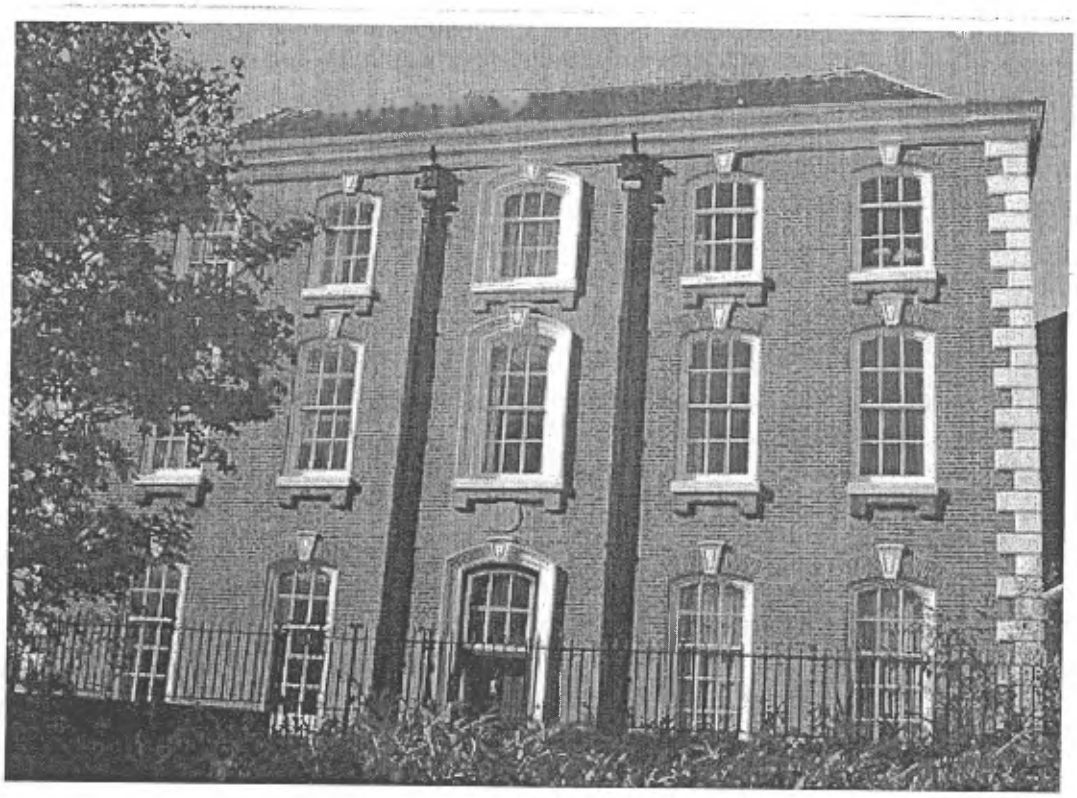


Fig. 1 The Mass House, Wolverhampton. The earliest Roman Catholic church in England, erected in 1727-1733 at a cost of £1069 2*s.* 2½*d.*

Table 1 (overleaf) has been constructed based on seventeen contracts which clearly identifies the cost of bricks for specific undertakings and the additional costs of their carriage as a proportion of the cost of the brick and as a proportion of the overall cost of brick and carriage. The table is based on a limited range of evidence, for in the majority of contracts the individual costs of brick and carriage are often difficult to identify. Most frequently the cost of bricks and their carriage were combined with the brickmaker taking responsibility for delivery, a typical example is that of a new felt hat workshop built in Newcastle-Lyme in 1753; the accounts included:

15410 Bricks and Timber		£16 16 0
3000 Bricks and carriage		1 16 0
Job Hulse for carriage of Brick		0 7 0
Wm Bayley for carriage of Brick		0 8 6
Benj Whiston for carriage of Brick	unpaid	0 19 0 [5]

The seventeen examples collected suggest that on average the cost of the carriage of brick was over 40% of the cost of the brick itself and 28% of the combined cost of the brick and its carriage. Given that brick was the most important single cost of any of the building materials then its carriage contributed significantly to the overall cost of most buildings. This is not to suggest that the market for brick was confined to sites adjacent to the kiln or clamp but rather that transport costs became a factor in the decision to select brick as the main building material. Brick was a very heavy material which had to be carried on mainly unsurfaced roads in farm carts. In that spirit of scientific enquiry which was so characteristic of the Enlightenment, Lord

Harrowby began the rebuilding of Sandon Hall, newly acquired in 1778, with a series of investigations of the weight and carriage of brick. He reported that he had, 'Weighed three bricks pretty exactly. The largest weighed seven and a half pounds, the next seven and a quarter pounds and the smallest six and three-quarter pounds ... I should from this experiment calculate the common weight of bricks to be about seven pounds ... or three tons and a half for 1000 bricks.'[6] Such weights which correspond reasonably closely to the author's own measurements, suggest that for a moderately sized building of say 35,000 bricks then over 100 tons of bricks would need to be moved to the building site.

Evidence for the size of 'loads' is scarce. At Sandon in 1693 Thomas Astbury's accounts include adjacent entries for 1000 bricks and for 'carreing 3 loads of brick' for 10s which would suggest that a load was about 330 bricks (approximately 1 ton).[7] In 1717 the Dyott accounts included two references to, '6 load of Bricks ... 4020,' possibly in this case a 'load' was 670 bricks weighing at least 4500 lbs (1 ton 19cwt).[8]At Stretton in 1730 an 'Account of Brick and Tile made.' includes a reference to '600 to the load in att guisey bank to blackmoor' (1 ton 15cwt).[9] At Meerbrook in the Staffordshire Moorlands, where the hills were steeper, a load seems to have been between 400 and 500 bricks (between 1 ton 4 cwt. and 1 ton 9 cwt.). The bricks produced there in the 1750s were listed as loads with a number immediately below. Thus for 19 August 1750, '10 loads 4 thousand' and in the same year for 2 September, '5 loads 2 thousand'.[10] Depending on the demands of the terrain and the size of carts used, a hypothetical house of 35,000 bricks would require between 52 and 87 journeys just to bring the bricks.[11] Extra payment was occasionally recorded for the loading and unloading of the carts. The Littleton accounts for 1754 record, 'Rogers wife unloading bricks 4s 6d' and a year later the 'Lad' received 2s 6d for 'Loading Brick'.[12] Usually however the cost of the carriage and unloading of the brick was included in the overall contract. The loading and unloading of brick carts however could delay completion and add to the overall cost of the building. Lord Harrowby was aware of the costs of transport as the total cost of the newly rebuilt Sandon Hall was over £2000 and included, 'for extra allowance ... upon account of extraordinary hard work in carriage for new buildings £24 6s 8d'.[13] Harrowby instituted a time and motion study in which his servant Shord 'observed that the time a cart took in going ... was 43 minutes ... with a load of bricks, and 35 minutes in returning ... I observed the time they took in unloading the carts ... 4 men ... 3 carts ... less than 30 minutes ... that is less than 10 minutes per cart'.[14]

If money was not a significant factor in the decision to build then building materials could be carried long distances. When Samuel Wyatt restored Fisherwick Hall in 1757-8 for its new owner, Samuel Hill, his detailed accounts included the purchase of '21 tons of Westmoreland Blew Slate at £2 10s per ton, delivered at Bristol £52 10s, freight from Bristol £7 11s 6d, ... For carr(iage) of the above slates to Fisher £33 12s 7d'. A later reference to a 'Quantity of slates from Bewdley' suggests that the price of £7 11s 6d may relate to the cost of shipping along the River Severn and the greater amount to the cost of land carriage from Bewdley to Fisherwick.[15] In 1770 Wyatt, who was restoring the east wing of Blithfield Hall, also received '11 ton of fine Westmoreland Slate d'livered at Burton at £4 15s (per ton), £52 5s 0d'.[16] After improvement in the early eighteenth century the river Trent was navigable by the broad beamed boats of the Burton Boat Company both upstream and downstream from Burton. The Trent and Mersey canal had been opened from Wilden Ferry to Shugborough in 1770 and the specific mention of delivery to Burton rather than to Blithfield suggests that either the Trent or the canal was used to transport the stone. Surprisingly the cost per ton of using the canal or river was slightly higher than the lengthy sea journey to Bristol, the transport along the Severn and the overland haul from Bewdley.[17] The completion of the Trent and Mersey canal and its feeder network was an important factor in the creation of a regional and national network for the distribution of building materials. J. Philips wrote in 1803 in his promotion of the Trent and

TABLE 1
THE COSTS OF THE CARRIAGE OF BRICK IN STAFFORDSHIRE, 1560-1760

No.	Date and Place	Number of bricks purchased	Cost of bricks £ s d	Cost of carriage £ s d	Carriage as % of cost of brick.	Carriage as % of cost of brick and carriage.
1.	1578 Beaudesert	4600	13 0	4 0	31%	24%
2.	1588 Persehowse	1800	1 7 0	16 0	59%	37%
3.	1664 Lapley	100 'quarie' and 83 tile	1 0 9	11 0	53%	43%
4.	1681 Hanbury	80	1 8	1 0	60%	37%
5.	1693 Sandon	'8 load of brick'	1 7 6	1 0 10	75%	42%
6.	1693 Sandon	'3 load of brick'	10 0	10 0	100%	50%
7.	1710 Checkley	3000	1 10 0	6 0	20%	17%
8.	1720 Giffard estate, Brewood.	27,500	13 12 6	6 16 3	50%	34%
9.	1727 Jervis estate,Chartley.	3000	2 10 0	6 0	12%	11%
10.	1729 Whitworth estate.	22,000	11 0 0	2s 6d per '000	25%	11%
11.	1730 Congreave estate.	9,200	4 2 9 (est)	2 6 0	55%	35%
12.	1736 Chetwynd estate, Betley.	3000	! 10 0	1 2 6	75%	32.5%
13.	1739 Edge estate Longnor	4000 brick 4000 tile	7 12 0	1 4 0	16%	14%
14.	1753 Newcastle	2950	15 0	2s per '000	40%	28%
15.	1756 Hilderstone	4500	2 5 0	9 0	20%	17%
16.	1756 Littleton estate	22,000	11 0 0	2s 6d per'000	25%	20%
17.	1760 Gough estate	3,600	2 2 0	17 6	42%	29%
Average					40%	28%

Mersey Canal, 'In the neighbourhood of Burslem, bricks and tiles are made of blue colour, which are so vitrified as to be harder than stone used in building; and these articles will find a demand through the whole course of the canal'.[18]

The cost of transport was obviously influenced by the length of the journey although this information is only rarely included in any surviving accounts. But at Betley in 1737 the Churchwardens' Accounts include entries for the purchase of bricks (3,600 for £1 16s), tiles and crests (2s) and the cost of 'drawing the tile and crests from Madeley Heath to Betley Churchyard' (7s).[19] The distance from Madeley to Betley is approximately 4 miles. Also in 1737 a journey of similar length was recorded for the provision of tiles for Patshull church from Rudge Pitts.[20] In 1720 Peter Giffard, for the building of Long Birch Farm, bought bricks from Brewood (2½ miles) Tettenhall (4 miles) and Penford (Lower Pendeford Farm?) (1 mile). In 1727 for the restoration of his seat at Blackladies, brick was purchased from Penkridge (6-7 miles).[21] The Gough estate at Perry Barr between 1733 and 1757 purchased bricks from as many as eighteen different suppliers. The centre of production for these heavy products is however rarely recorded other than in 1733 when '2000 of bricks & Carridge of ym from Aldridge to Perry' was recorded, a distance of 5-6 miles.[22]

The season of the year and the consequent state of the roads could also influence the costs of transport. In the summer of 1752 William Bucknell paid 10s per thousand for bricks and their carriage for his 'workhouse'. In October the cost was 12s per thousand.[23] This distinction between summer and winter rates was officially recognised and accepted as legitimate explanation of differences in price.[24] Transport costs were also increased by the need of the carrier to use a turnpiked road. The Shropshire estate papers of the Penbury family include a note from George Penbury to his son concerning estate repairs in which George allowed him 8s 6d for 'bricks and making the oven' and 1s 6d for 'carriage and turnpike.'[25] The very detailed building accounts for Penn Vicarage in 1778 include a carriage bill for waggoners of £2 13s and 'at Turnpikes £2 18s'.[26]

An unusual document from Yoxall entitled 'Charges about the Building & repairing of the Co(u)rt house Barne cowhouse and other necessaries about the House 1683 1684 & 1685', provides rare evidence of the sources and costs of its building materials.[27] As Figure 2 indicates the majority of the materials were obtained from farms and estates within a radius of 2-3 miles. Only 2400 'playne tyles' and 20 'Ridging Tyles' from Abbots Bromley (5-6 miles) and nails from Rugeley (7 miles) involved longer journeys (the origin of the stone and lime is not recorded). The total cost of the building works was £70 2s 4d, of that sum the specifically listed costs of carriage were at least £9 18s (14.5%). A further £11 17s 9d was spent on coals, lime, plaster, thatch, nails and bricks where the cost of transport was included. These sums would suggest that approximately 25% of the total cost of the building work was consumed in the carriage of very heavy materials in relatively small loads. In this contract the costs of the carriage of brick was at least 5.4% of the total monies spent.[28]

In general the distances over which brick was carried were short. Brick was relatively cheap to produce but expensive to carry for long distances. In most of Staffordshire, brick clays were readily available and most builders were able to take advantage of local access to the basic raw material. Much brick production, particularly in the countryside, was site specific. Chaloner and Musson, emphasise that in the hinterlands brick making remained in the hands of the craftsmen due to the high cost of transport.[29] The trade in specialist bricks could however involve their carriage over extended distances. Although there was a highly productive brick kiln at Meerbrook in 1750, its records show that floor brick for Birchwood Park was imported from Uttoxeter, a distance of approximately 25 miles.[30] The accounts of 1767 for the Longnor estate in the Staffordshire Moorlands include the purchase of 1400 bricks from Wheaton Aston, a distance of at least 35 miles.[31]

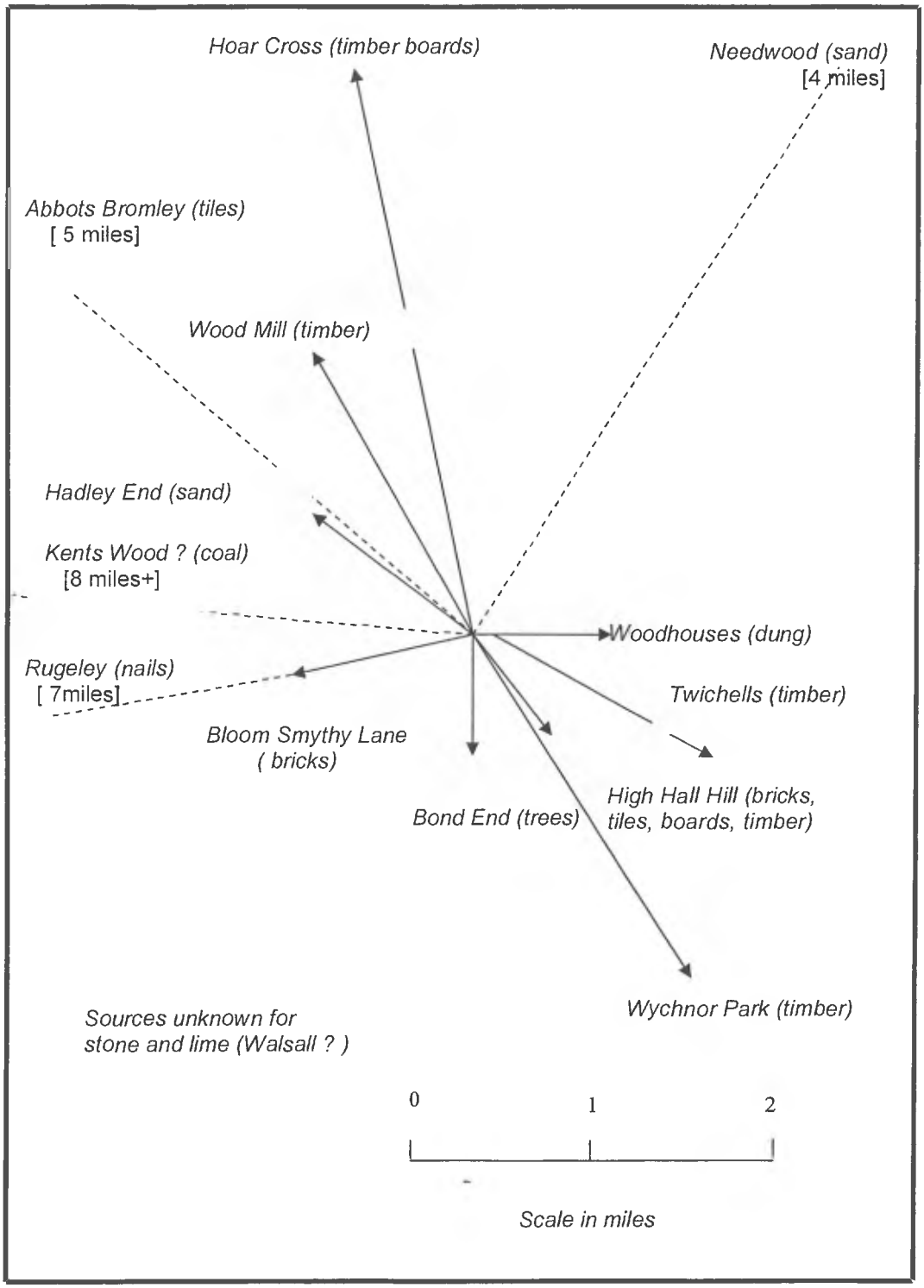


Fig. 2 Yoxall Court House: Raw Materials

Fig, 3 Lichfield Grammar School, rebuilt 1682-83 from locally produced bricks.

It is not the function of this article to discuss the transport of other building materials but analysis of building accounts suggests that the cost of brick, coal, lime and timber were the most important non-labour costs of house building.[32] The sheer volume of road traffic generated by the building industry has been little discussed. To take two examples, the building accounts for Betley 'Newhouse' in 1736-37 do not include the total number of bricks purchased but their cost was £99 18s. The supplier, John Lockett, in other accounts of Lord Chetwynd was charging 5s per thousand bricks so a reasonable estimate would be that the house and outbuildings required approximately 400,000 bricks.[33] To carry those bricks at about 650 to each load would need over 600 journeys from the kiln at Madeley Heath a distance of 4 miles. Allowing for empty journeys to the kiln the carriage of the brick alone required 4,800 cart miles. Added to this is the cost of the carriage of sand, lime and timber. The cost of the transport of lime was at least £25 whilst some timber deals were fetched from the port of Chester. An even more extreme example of the impact of the carriage of brick is that created by the purchase of a minimum of 1,850,000 bricks in 1720-21 by Lord Gower. These were fired in Burslem and transported to Trentham Hall a distance of approximately five miles. In that one year, assuming 650 bricks per load, a minimum of 2800 single journeys would have been required to carry the bricks to Trentham. The total cart miles including return journeys would have been 28,000 miles.[34]

Traditionally research into the road traffic of the seventeenth and eighteenth centuries has emphasised aspects such as turnpiking and long distance carrier and coach routes and their networks. However, a more regionally focused analysis of road traffic has extended consideration to private carriers and the transport of stones and minerals. Hey, for example, discusses the carriage, in Derbyshire and south Yorkshire, of coal, lead, millstones, lime and salt. He suggests that where the quantity to be carried was considerable, special arrangements were made with local farmers and that carrying was often a by-occupation at times when horses were not needed on the farm.[35] The Staffordshire evidence suggests that to this trade should be added a large-scale local trade in building materials. For example, the building accounts of Thomas

Allen for a house in Newcastle-under-Lyme include the purchase of 175 'loads' of lime between 30 May and 18 July 1708.[36] For the building of his house at Talke in 1736, Lord Chetwynd bought over 50 tons of lime. In the following years a further 31 tons were delivered which required 65 separate journeys.[37]

The building materials employed were heavy, cumbersome and expensive to transport even over short distances. Such additional costs were born by the builders and their clients and for some would-be purchasers these marginal expenses may have delayed or even have prevented the ready acceptance of brick buildings. Documentary evidence of such decisions is rare, only Parson Roades had the confidence to declare that his decision not to build in brick was because, 'we had no Brick mad at that time within les than 2 miles and these very small and dear'.[38]

NOTES AND REFERENCES

1. Staffordshire Record Office (hereafter SRO), D240/E (C)1/15/74.

2. SRO, D1386/2/1/5. By 1707 Roades had spent £426 on 'Repairs of ye Parsonage'

3. SRO, D590/634. It is claimed that 'The White Hart', Caldmore Green, Walsall has cellars from which the clay was extracted to make bricks. Arnold, P., *A Guide to the Buildings of Walsall*, (Stroud: Sutton, 2003) p. 31.

4. See Kingman, M. J., 'Brickmaking and brick building in Staffordshire,1500-1760', unpublished Ph.D. thesis, (Keele University, 2006). There were no navigable rivers in the county with the exception of downstream from Burton-upon-Trent from some time after *c.*1700.

5. SRO, D(W) 1788/59/6.

6. Sandon Hall, Harrowby Mss. Vol. 437, Doc. 67. For all the Harrowby Mss. references I am indebted to Appleby, J., 'Lord Harrowby's Home Farm at Sandon', unpublished D.Phil. thesis, (University of Nottingham, 1997).

7. SRO, D5009

8. SRO, D661/21/4/1c.

9. SRO, D1057/J/2/9.. The Persehowse Memorandum Book of the late sixteenth century includes several references to the purchase of bricks in lots of 600. SRO, D260/M/F/1/5 f.4.

10. SRO, D1028/2/1.

11. The size of the load presumably varied with the capacity of the cart and the number of horses available. In Dorset the diary of a farmer, James Warne, in 1758 includes many references to the carriage of 'Brix'. A load was 800 bricks and usually required five or six of the nine horses kept on the farm. James, E. F., 'Farming in Dorset, The Diary of James Warne, 1758', *Dorset Record Society*, 13 (1993) pp. 50, 52, 55, 73.

12. SRO, D260/M/E/116, pp.60-61.

13. Harrowby Mss, Vol. 438, Doc 67.

14. Harrowby Mss, Vol 438, Doc 76.

15. Birmingham Reference Library (hereafter BRL), 628 Elford Mss.

16. SRO, D1721/3/215. When Betley Hall was repaired in 1785 the contract also specified 'Blue Westmoreland Slates'. SRO, D(W)1788P56B25.

17. Barker, T., and Gerhold, D., *The rise and rise of road transport, 1700-1900*, (Cambridge,: Cambridge University Press, 1993) quoted from Jackman, W.T., *The Development of Transportation in Modern England*, 2nd ed. (1962) p. 449, 'the cost of canal carriage normally did not exceed one-half, and in most cases was from one-fourth to one-third of the cost of land carriage'.

18. Phillips, J., *A General History of Inland Navigation*, 4th ed. (London, 1803) p. 179.

19. SRO, D689/PC/1/2. Lord Chetwynd also purchased bricks from the same brickmaker, John Lockett, for his new house at Betley. These were also recorded as being carried from Madeley Heath.

20. SRO, D 21/A/PS, Rudge /Rudge Hall is at SO 8197(3 miles), Rudge Heath at SO 7995 (4 miles).

21. SRO, D 590/633/1.

22. BRL, Gough Mss, 3145/262/2.

23. SRO, D(W) 1788/59/6.

24. Lichfield Record Office, (hereafter LRO) D103/6/31/6. 'Rate of Carriage of Goods', 1784. The Quarter Sessions agreed to a price rise of 6d per cwt from Michaelmas to Lady Day for goods transported 'by waggon' from London to all Staffordshire towns. There were also seasonal variations in the cost of transporting lime, Kingman, p.164.

25. Shropshire Archives, 938/450.

26. LRO, B/V/6P5. The accounts also include 'Entertainment to [waggoners] at the Rose & Crown & White Hart £2 14s'.

27. SRO, D1326/2.

28 SRO, D603/F/3/1/13. In 1722-23 when further repairs were made to the Court House Henry Shipton paid £8 5s for 15,000 bricks and £3 15s for their carriage. The cost of brick transport was 27.5% of the total cost.

29. Chaloner, W.H., and Musson, A.E., *Industry and Technology*, (London, 1963) p. 14.

30. SRO, D1028/2/1.

31. Nottinghamshire Rec. Off., DD/E/52/3/14.

32. Kingman, pp.155-166.

33. SRO, D1798/HM/Chetwynd105. The accounts include a further payment for 'Bricks and Tiles' at £51 6s.. Chetwynd also paid for two kilns and some labour so the average cost per 1000 was actually higher than five shillings.

34. SRO, D593/N/2/2/3/17.There is a further unsigned contract for 500,000 bricks so the total may have been as many as 2,350,000 bricks.

35. Hey, D., *Packmen, Carriers and Packhorse Roads; Trade and Communication in North Derbyshire and South Yorkshire,* (Leicester, 1980). There may have been some conflict between the different demands made on farm transport. Brick building and brick making were predominantly Spring and Summer activities, i.e. at a time when there was greatest demand for carts for agricultural work. Carriers were also required for the transport of pottery, iron, coal and cloth. Edwards, P., 'The Horse Trade in Tudor and Stuart Staffordshire', *Staffordshire Studies*, 13 (2001) p. 38.

36. SRO, D(W)1742/4.

37. SRO, D1789/HM?Chetwynd/105.

38. SRO, D1386/2/1/5.

FROM BRICKYARD TO BUILDERS YARD:
An East Riding Study

Ann Los

INTRODUCTION

The construction industry today obtains its supply of bricks from a builders' merchant, a sales depot of a brick company or direct from one of the few brickyards still operating today. This paper will endeavour to prove that until about 150 years ago the "brickyard" went to the construction site and the bricks were made where they were needed. It is based on a lifetime's residence in the East Riding of Yorkshire. This is a county with little natural building materials but with plentiful supplies of clay and, as can be seen from the map (fig. 1), many villages had their own brickworks by 1850. Records for the area dating back to the fourteenth century show that bricks were made throughout the county in many locations and this continued until the middle decades of the twentieth century.

Alec Clifton-Taylor also emphasises this point claiming that the preponderant building material in the East Riding for centuries has been bricks due to the shortage of stone and timber and the abundance of clay. He also claims that the Hull and Beverley area was the first part of England in which brickmaking was established as a local industry.[1] Hull's brickworks may be traced from 1303 through various records to the twentieth century,[2] and Beverley records show that brickmaking was carried on in the town from the fourteenth century onwards. Beverley-made bricks were transported by water to Grimsby between 1391 and 1395 to build the walls of the new town hall and tiles were taken as well for the roof.[3] The earliest reference elsewhere in the Riding is at Bridlington in 1508,[5] but this is only from a casual inspection of mainly printed sources. Hedon had a brickmaker, William Smyth, in 1638[5] and Henry Best of Little Driffield was buying bricks from a Beverley brickmaker who appears to have gone to make them on site in 1635.[6] In the eighteenth century numerous references are made to brickmaking such as at Kilham in 1743, at Kilpin in 1743, at Lockington in 1760, and at Bainton between 1727 and 1746.[7] In some cases early references make mention of clay being extracted from the common, but this may be for use in wattle-and-daub rather than actual brickmaking. A document of 1713 states that clay was taken from Hummanby Common or outgangs "with which the walls and barn floor belonging to his master were repaired", and clay had also been so taken for at least thirty years last past, taking the practice back to 1683.[8] Thus it may be said that brickmaking was a local industry in the East Riding of Yorkshire from at least 1303.

Accounts and records kept by the local gentry and big landowners, as well as diaries kept by East Riding men that have survived, also support the statement that for centuries brick has been made and used in this area. Burton Agnes Hall was built between 1601 and 1610 of warm bricks and "orange-red bricks of great charm had been produced earlier" for the Hall.[9] Accounts concerning Everingham in 1776 record 3*d.* a day being paid to a boy for "raking straw at the brickyard",[10] whilst the Sykes family accounts for their Sledmere estate give numerous details of the brickworks at Ganton in the nineteenth century.[11]

The diary of William Ogle of Flamborough records straw and clay at 6*d.* a load as well as 1000 bricks from the kiln in the 1780s.[12] The diary of Charles Howard has reference to bricks in Melbourne in the early nineteenth century.[13] The account of Sir Charles Hotham making bricks on the corner of the Westwood at Beverley in 1716 illustrates beautifully the on-site works set up to satisfy a special need. George Pearse and Robert Riston built a kiln but two

brickmakers were "imported" to make the bricks in the coal-fired kiln on the Westwood to be used for Sir Charles Hotham's house in Eastgate, Beverley.[14] John Frank, an old Lincolnshire brickmaker states that many large farmhouses were built with bricks made on site, the clay being extracted from what eventually became the farm pond.[15] I am certain that a full search of local archives will continue to demonstrate that brickmaking has for centuries been a local industry in the East Riding of Yorkshire.

Another diary also shows us that bricks made at Newport were quickly achieving fame with builders. The diary of James Dunn of Patrington shows that Newport bricks were being shipped to Patrington even though the town had a brickworks of its own. The entries for 27 June 1804 and 31 July 1804 refer to "bricks from Wallingfen",[16] which eventually centred on Newport.[17] The date of the yard at Patrington agrees with William Marshall, writing in 1788, that "straw and heavy slate were the common coverings but of late pantiles have become universal for ordinary buildings".[18] Thus at this time yards needed to be able to meet the demands of the change in fashion. Strickland, writing in 1812, said that both large farmhouses and workers' cottages were now built of brick and covered in pantiles except on the Wolds and also extols the virtues of Newport bricks: "On Wallingfen great quantities of white bricks are made of a blue clay found there which are exported thence in various directions; being in great demand for superior buildings on account of their beauty of colour, accuracy of form and durability".[19] In 1823 Edward Baines claimed that Newport was "celebrated for its manufacture of tiles, bricks and coarse earthenware there being 1.7 million tiles and 2 million bricks produced annually".[20] An *Encyclopedia of Architecture* published in 1842 notes ".. Pickwell's patent white brick is sound, has a uniformity of colour, resists frosts and the action of acids much longer than others. They are manufactured near Hull", and "near Hull" was probably Newport.[21]

An examination of these early brickyards will help us to appreciate how they could easily be moved to the construction site. The early yards were very simple with little equipment and the occupation of "brickmaker" was held in low esteem and often disguised by the dual occupation of the brickmaker. The clay was dug out in the autumn and left in heaps for the winter weather to break it down as it was turned at periodic intervals. In late spring it was "trodden" and dug over to obtain the right plasticity, moulded into bricks which were then left to dry for about a month. They were then made into a clamp with turves, wood, refuse or coal and burnt or put into simple kilns with an open top. The early brickmakers needed only a spade and a mould and within a year the site would be returned to agriculture, leaving a kiln burn mark, a slight hollow and perhaps a pond. Thus it was easy to take a yard to the construction site, be it home, factory, canal, railway or any other civil engineering feature needing bricks.

INDUSTRIAL CHANGE

We can examine some of the reasons which brought about the changes in the brick industry from these simple intermittent village yards working to meet local demands.

The first half of the nineteenth century saw a dramatic increase in the population, especially in certain areas although specialist demographers do not always agree on the reasons for these increases. The major factors that influenced this growth were improvements in agriculture; the Industrial Revolution utilising James Watt's steam engines with rotary motion from 1785 onwards; improvements in medicine and sanitation including the foundation of hospitals, Jenner's vaccinations from 1796 and Thackrah's book on industrial medicine; and government legislation to improve working conditions, especially for women and children, such as the Factory Act of 1833, the Mines Act of 1842, and the Public Health Act of 1848 pioneered by Edwin Chadwick. These helped to maintain a high birth rate whilst reducing the death rate thus producing the increase in the size of the population. Between 1741 and 1781, the growth

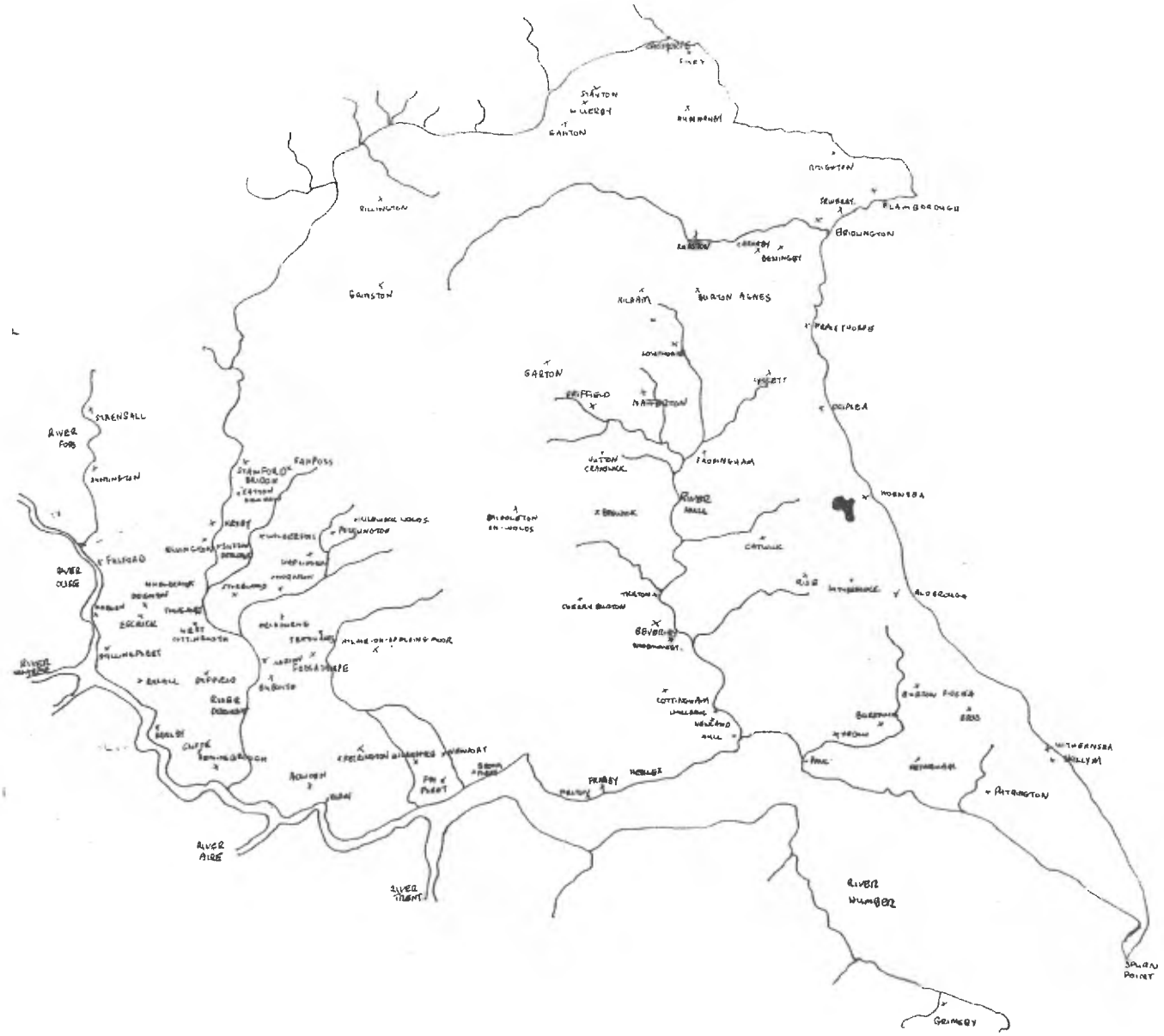


Fig. 1 Map showing Brickworks in the East Riding from the 1850 6-inch OS map. Additional information supplied by Dr Keith Allison from one of his study groups. See also Susan Neave and Stephen Ellis (eds.), *An Historical Atlas of East Yorkshire,* 1996, pp.82-83.

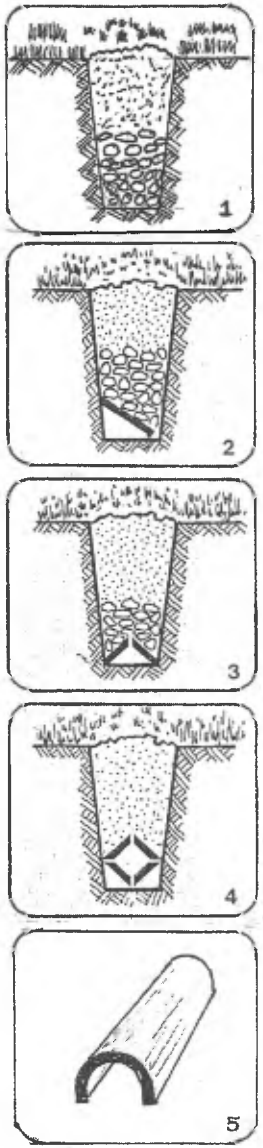
in population of Great Britain was between four and seven percent per decade; in the nineteenth century it never dropped below ten percent for Great Britain, being very high in the early decades of the century. In the East Riding of Yorkshire, this rapid growth rate was already noticeable by 1812 when Strickland wrote of an increase of twenty percent since 1801. As Table 1 shows, the average growth rate for Yorkshire between 1811 and 1851 was sixteen percent per decade, with a maximum of nineteen percent between 1811 and 1821. In the East Riding, the period of maximum growth was between 1801 and 1811: statistics showing more than a twenty percent increase confirming Strickland's comment. In the country, the county and the riding, the population doubled between 1801 and 1851. Twice the population needed twice the bricks, all the new products for sanitation which the brickyards could supply and also an increase in food supplies to feed them.

There is reference in the writings of Roman times to earthenware pipes being used in field drainage. They were made smaller at one end so that they fitted into one another and it is generally accepted that they were intended to carry water from one place to another rather than for the drainage of land but the drains cannot be accurately dated from design or shape. In the early days field drainage was usually a matter for Estate labour and clayware field drains were made in the local brickyards or the Estate brickyard. The development and improvements therefore originated locally rather than nationally. It is however possible to trace an overall logical pattern of developments.

The earliest form of covered drain was a trench part filled with bushy branches or stones and then completed with the excavated soil (Fig. 1). A Walter Blith writing in 1649 recommended this type and as late as the mid-nineteenth century some experts were still advocating this method. On the other hand S. Johnson reporting on the "Elkington" system of drainage in 1800 and other writers of that period indicated that clayware drains were by then in common use.

Between 1840 and 1855 the Royal Agricultural Society of England held a series of competitions for the design of a machine to make clayware drain pipes.

The obvious disadvantage of the stone-filled trench was that the water had to flow in the spaces between the stones and these were inclined to silt-up fairly quickly. As time passed various attempts were made to form a continuous opening along the bottom of the trench, one of which was to lay an ordinary clayware roofing tile across the bottom before adding the stones or bushes (Fig. 2). This was so successful that flat tiles were specially made for the purpose and illustrations in books published at that time show that they were used either singly or in pairs to make a triangular shaped opening or even four placed together at the bottom of the trench to make a diamond shaped opening (Figs. 3 and 4). Hence the use of the name "tile" for the clayware field drain pipes.



It was only a matter of time before the flat clay slab was bent into a U-shape before burning and used inverted to give a more stable opening along the bottom of the trench (Fig. 5). Although this was an improvement it proved in practice not to be completely satisfactory as the edges of the tile tended to sink into the bottom of the trench when it became wet and soft. Various methods were tried to combat this weakness either by bending the edge of the tile to form feet (Fig. 6) or by laying one tile on another, placed upside-down or on a flat sole tile (Fig. 7). Of these ways the flat sole was obviously the most satisfactory and was adopted generally.

With the advent of the extrusion press for making bricks it became possible to make the U-tile and the flat sole in one piece producing a D-shaped tile (Fig. 8). In time the centre opening was made oval or round because of the improved hydraulic properties of these shapes, but the flat base remained (Fig. 9) for some time before being superseded by the modern round pipe, (Fig. 10).

Many other innovations were tried from time to time such as making the pipes taperd so that they fitted into one another and producing short lengths of larger diameter pipe to form loose collars over the joints, but all had some drawback and fell into disuse.

Although it is not possible generally to date pipes specifically the old pipes stamped with the word "DRAIN" were almost certainly made between 1826 and 1850. In 1784 a tax was imposed on bricks and other clayware material and field drains were included. In 1826 after a great deal of protest and pressure field drains were exempted from the tax provided they had the word "DRAIN" impressed on them. In 1850 the tax was abolished altogether.

Many of the older tiles uncovered during the recent drainage works must be up to 200 years old and the excellence of their condition demonstrates the reliability of clayware as a material for field drain pipes.

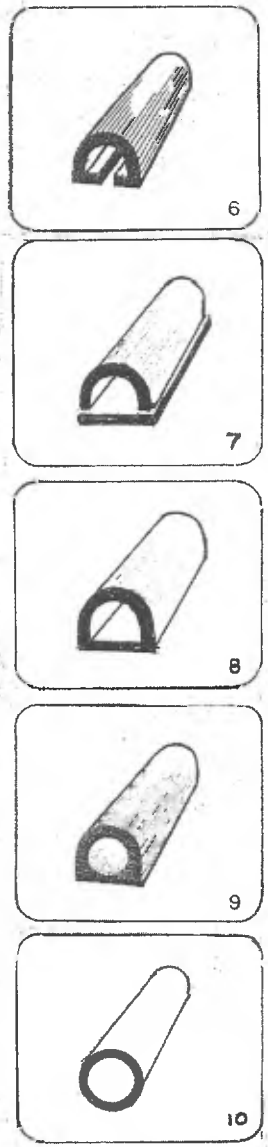


Fig. 2 *Clay Field Drains over Centuries of Time,* Leaflet issued by the National Federation of Clay Industries, n.d.

TABLE 1
POPULATION STATISTICS

Date	Great Britain (millions)	Yorkshire	East Riding
1801	10.69	859,133	111.192
1811	12.15	986,041	133,975
1821	14.21	1,173,187	154,643
1831	16.37	1,371,359	168,891
1841	18.55	1,582,004	194,936
1851	20.88	1,797,995	220,983
Rate of increase			
1801-1811	13.7%	14.8%	20.5%
1811-1821	17.0%	19.0%	15.4%
1821-1831	15.2%	16.9%	9.2%
1831-1841	13.3%	15.4%	15.4%
1841-1851	12.6%	11.4%	13.4%
1801-1851	95.3%	109.3%	98.7%
Average per decade	14.4%	16%	15%

Sources: *Census Returns.* 1801-1851; see additionally *VCH Yorks.*, **III,** 1913, pp.492, 496, and 497; *VCH Yorks,* **I,** 1969, pp.191 and 215, noting average decennial increase between 1780 and 1801 as 11% and between 1801 and 1831 as 17%. Strickland, 1812, p.324. Population statistics for Great Britain are given H. Perkin, *The Origins of Modern English Society,* London: Routledge, 1969, p.103; and P.A. Matthias, *The First Industrial Nation, An Economic History of Britain 1700-1914,* London: Methuen, Table 1 on p.449.

AGRICULTURE, FOOD AND BRICKMAKING

Agricultural changes at the beginning of the nineteenth century to meet the increased demand for food had an affect on brickyards.

Much has been written about the state of agriculture at the beginning of the nineteenth century and the improvements made do not need repeating here in depth. The problems caused by the Napoleonic Wars (1803-1815) and their aftermath were an incentive to the continued mechanization of farming, culminating in a machine for nearly every task being shown at the Great Exhibition of the Arts and Manufactures of All the Nations in 1851. The mechanization produced a most extensive establishment in Beverley: the large ironworks of William Crosskill, a well-known manufacturer of agricultural implements such as Crosskills sod crusher and Crosskills farm light railways. Great emphasis was placed on manure and here canals played an important part by cheap transport. Lime for manure was charged a toll of 6*d.* on the Market Weighton Canal, but for use as mortar lime was charged 9*d.*, and other manures only 3*d.*, such as bones, soot, and even night soil from Hull which was used at nearby Brantingham. In 1861, however, it was said that the farmers proverb was "USE NO MANURE TILL YOU HAVE DRAINED".[22]

The earliest form of a drain was a trench filled with twigs or stones and then covered over with the excavated soil, but by 1800 the flat clay tile was in common use. This soon developed into the half-round tile and flat or sole.[23] Between 1840 and 1855, the Royal Agricultural Society of England held a competition for the best design of a machine to make

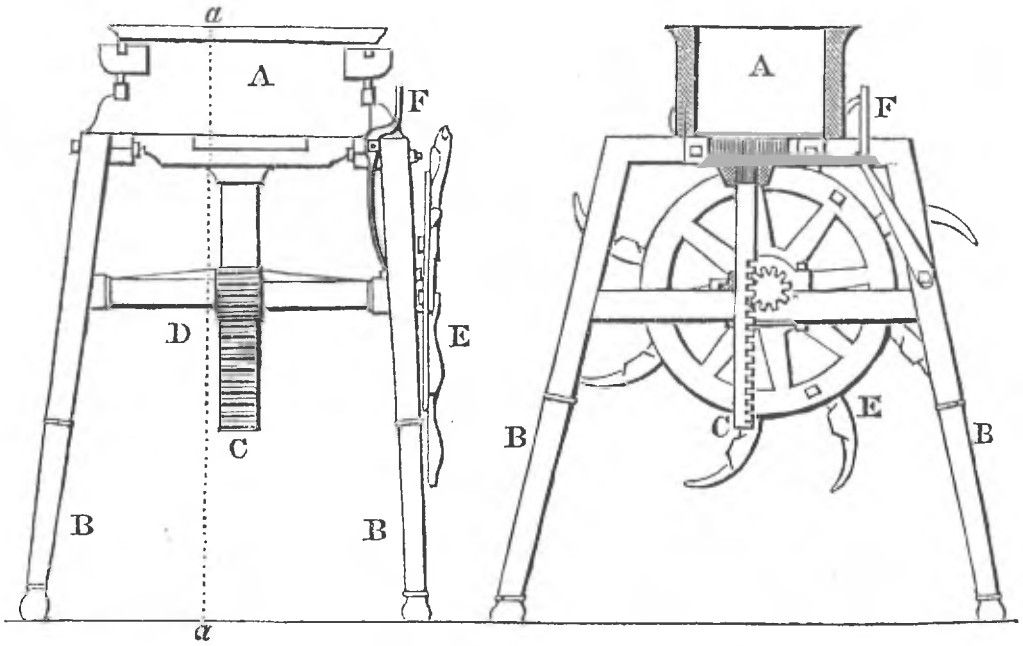


Fig. 3 Beart patent machine, 1841
from A. Cox, *Survey of Bedfordshire: Brickmaking A history and Gazetteer*, Bedford: Bedfordshire County Council, 1979

drain tiles. In 1848, an East Riding farmer was writing "where the thorns were used the results were good for a few years but the fields are now done with tiles ..." and in the same year another man wrote "Tile draining upon this land when carefully done and where drains are laid 2½ feet to 3 feet deep is doing more towards increasing the produce than anything that has ever been introduced". Special reference is made to the Vale of York area where draining is being carried on with laudable activity. Many proprietors have established tile kilns on their lands and have either done the whole work themselves for the tenants, charging them a percentage, or have furnished them with tiles.[24] On arable land draining became an absolute necessity and 1848 marked the commencement of a new era in farming; the work of draining was begun in earnest by landlord and tenant, the country at large reaping the benefits.[25]

Various agricultural publications, another innovation at this time, carried articles about the values, costs and methods of land drainage in 1839, 1842, 1843, and two in 1845.[26] A farmer, writing in 1848 from Brantingham, reported that "upwards of 200 acres have been drained in the last few years ..." and in cases up to 1847 with tiles and flats; in that years some land was drained with two-inch round pipes having a flat bottom".[27] By 1861, only fourteen years later, it was said that two-thirds of Yorkshire was drained with two-inch pipes.[28] The mechanization of the process was inevitable with such an increase in demand and Bearts patent machine appeared in 1841 at a cost of £10 (fig. 3). Tweeddales machine of 1843 cost £60. This enabled one man with two boys to produce 600,000 tiles and soles in a"fair season", *i.e.* weather permitting.[29] An acre of land needed 2,250 tiles; four to five miles was an economical radius to transport them by land in 1842 at 1*s.* 4*d.* per thousand tiles per mile. This radius enabled 150 acres to be drained, therefore 337,500 tiles were needed per year. Thus it was bad economics to erect a works outside a five-mile radius unless cheaper transport was involved.[30]

The cost of producing drainage tiles was dramatically reduced in this period of increasing demand by enabling more people to be able to afford the cost of drainage. In 1839, the cost of draining a single acre was between £3 and £12 with tiles and soles at £4 10*s.* 0*d.* per 1000 feet;

Tile-Yard, Plan No. 2.

	£.	s.	d.	£.	s.	d.
Single kiln, 12 feet 6 inches by 10 feet; 7 feet underground, 9 feet above.						
27,100 bricks at 21s.*	28	7	0			
3000 bricks for dead bottom	3	3	0			
Brought forward	31	10	0			
Set of kiln-irons	1	6	0			
5 cast-iron doors and frames	3	0	0			
Bars for kiln	2	10	0			
Digging pit, labour, and mortar	8	12	0			
				46	18	0
Sheds: four 50 feet T sheds, 4 feet wide, to contain 20,000 tiles or 40,000 inch-pipes.						
24 posts 7 feet long, 400 rafters, 400 feet wall-plate	0	0	0			
Workmanship and nails	3	10	0			
134 yards of patent felt	4	10	0			
				8	0	0
Barrows: 2 navvys, 3 crowders, 3 off-bearers				3	4	0
Carriage of machine, planks, and incidentals				19	16	0
				£77	18	0
Hopper for kiln if required				7	10	0
Total				£85	8	0

* Price of Clamp-Bricks for building a kiln, per 1000:—

	£.	s.	d.
Digging 2½ yards of clay, at 6d. per yard	0	1	3
Pugging and mixing with ashes, as used	0	1	3
Moulding and hacking	0	1	6
Opening (or skinkling) holes for drying	0	0	6
Clamping	0	1	6
Coals, or culm	0	2	6
Stacking	0	1	0
Duty	0	6	0
Ashes	0	1	6
Waste, &c.	0	1	6
	£1	1	0

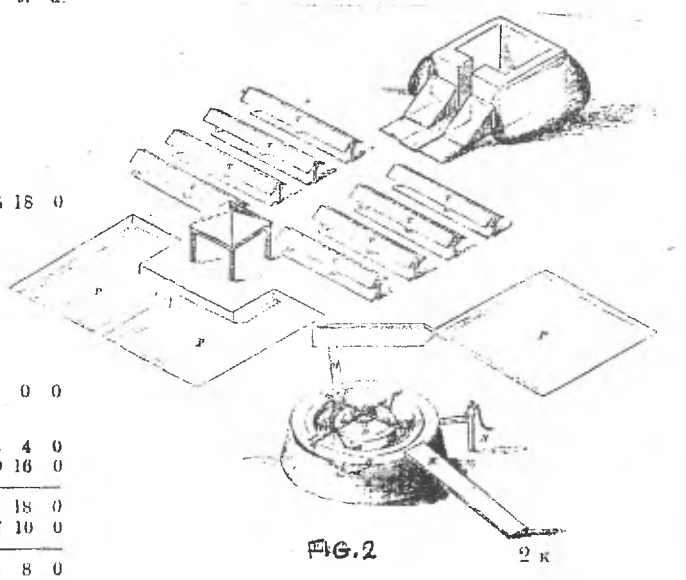


FIG. 2

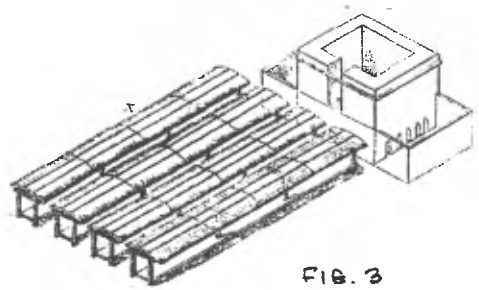


FIG. 3

Tile-Yard, Plan No. 3.

	£.	s.	d.	£.	s.	d.
Kiln 12 feet 6 inches by 10 feet; 7 feet underground, 8 feet above, with fire-holes on two sides.						
2360 clay lumps 18 inches long, 12 inches wide, and 9 inches thick, including workmanship and labour of building walls 3 feet thick, stone foundation rising 10 inches, at 10d. per yard, 1 foot thick	12	6	0			
2000 bricks for arches	2	2	0			
650 bricks for wall coping	0	12	0			
Sinking kiln-pit	0	10	0			
Coal-tar and labour on ditto	1	5	0			
Kiln-irons	1	6	0			
Putting up wooden brace	1	0	0			
				19	1	0
Sheds: four 50 feet thatched sheds 4 feet wide, to contain the same number as in plan No. 2.						
32 small posts and wall-plate	0	0	0			
20 wooden frames for thatch	0	0	0			
Labour, carpenter, &c.	3	10	0			
				3	10	0
Barrows: 2 navvys, 3 offbearers, 3 crowders				3	4	0
Carriage and putting-up machine				3	10	0
Incidentals				14	15	0
Total				£44	0	0

Straw not calculated.

The Cost of a Wash Mill.

	£.	s.	d.
3000 bricks to make trough	3	3	0
4 harrows and chains complete	4	4	0
Workmanship and cart-wheel for centre, fitted with iron box and cross-trees to attach harrows	5	12	0
Making mound on which to place machine so as to allow a fall for the clay to the pits	7	1	0
	£20	0	0

When the mill can be placed on the slope of a hill most of the last item is saved.

Fig. 4 Tileyard Economics
from *Journal of the Royal Agricultural Society of England,* **6, part 2,** 1845, pp.463-477.

in 1841 Bearts machine could produce tiles and soles at £1 12*s.* 0*d.* per 1000 feet. At this time the price for draining one acre had been reduced to between £1 and £4 depending on how close the drains needed to be.[31] The new machine reduced the number of men needed to make tiles, but the number of tile works increased by four hundred percent (400%) for "instead of there being one tile yard in a district there are now five ... Although machinery has reduced the price of the article it has not been the means of throwing out of employment a single hand, but that it has created not only labour for the poor by an immense increase in the consumption of tiles but also a greater amount of produce for the farmer".[32] It must be noted that drainage was encouraged by the government financially and after 1826 field drains were exempted from the Brick Tax. A tax had been placed on all clay products in 1784, the Brick Tax, but after 1826 if the tiles were stamped "DRAIN" they paid no tax. The Brick Tax was abolished in 1850. Pipes so stamped were probably made between 1826 and 1850.[33] An important improvement to agriculture resulted in new demands on the clay products industry at a time when they were hampered by taxes.

The numerous tile yards of the early nineteenth century were opened for land drain tiles and not, as the casual reader may suppose, for roof tiles.

BRICKYARDS AND THEIR PRODUCTS

The brickyards, as we have seen, produced drain tiles as well as roof tiles in addition to bricks and many other products. The bricks came in special shapes as well as fancy bricks with pretty patterns on them; the roof tiles were also of great variety such as pantiles, French tiles and some complete with decorations on; ridges, finials, hip tiles, dentils and other shapes to complete the roof were also made. The yards also produced bricks and/or tiles of various shapes and patterns for the floors of homes, yards and factories. In areas where the clay was of good quality, a potter would be employed to make plant pots, kitchen and dairy pots, garden pots, tableware and even urns to contain the ashes of loved ones from the crematorium! The skill of the brickmaker and the carpenter to make the mould had no limits and one could put in a special order for virtually anything from your local brickmaker.

THE LOCATION OF URBAN BRICKYARDS

The famous cartoon of 1829 by George Cruickshank, 'The Jerry Builders', shows the bricks bursting from the clamps on to the new land to be built on and this is perhaps not far from the truth. In many cases, an examination of successive editions of Ordnance Survey maps for a town will show the brickworks moving out as the town boundaries are extended. The bricks were made where they were needed. The old brickworks became valuable building land within the new area of the town and the pollution from the brickworks was kept outside the town.

TRANSPORTING BRICKS

These products were moved round the yard on barrows specially made for each worker to his height by the brickyard carpenter. The barrows varied in shape and size in relation to what they were moving, drain tiles being light but bricks being heavy needed a strong barrow to enable one man to move about seventy bricks at once. The size of the barrow not only varied because of what it was used for but also varied from district to district because of the different types of clay.

The human head was also a means of transporting bricks and wet clay in the brickyard and this is still a familiar sight in the brickyards of less developed countries. The human

shoulders may also be regarded as a means of transporting bricks and tiles with packs hung from a yoke, and there is the well-known brickie's hod.

The paintings found on tomb walls in Egypt depict both the yoke and the hod. [34] The yoke appears in an illustration to a thirteenth-century manuscript of *The Chronicle of Matthew Paris, Monk of St Albans.* Other early illustrations of brickmaking as in the *Nederland Bibel* of 1425 and a German example of 1568 illustrate the use of the barrow at a brickmaking site. [35] W.H. Pyne's illustrations from the early nineteenth century illustrate superbly the use of different barrows at early brickworks.

The advice in early agricultural journals emphasised that it was uneconomic to move bricks more than 5 miles due to the lack of roads and the poor condition of existing roads. Within this radius, a small cart was used. A cart has two wheels on a single axle in contrast to a wagon, or wain, which has four wheels on two axles. The cart would be strongly built to take the weight of the bricks. The 500 to 700 bricks would be loaded and off-loaded by hand and a fully-laden cart may weigh about 2 tons. The regulations enacted 13 George III (*i.e.* 1772-73) were as strict then as now, with fines for over-loading carts and causing damage to roads, and fines for parking carts "beyond the reasonable time allowed for loading and unloading so as to obstruct the passage of other carriages shall forfeit 10 shillings". In Beverley, however, in 1576 the fine for parking a cart had been only 3*d.* [36] The farmer going to market with a load of produce may use his cart to return home with bricks if the location was convenient.

THE MARKET WEIGHTON CANAL

In the eighteenth century, the cost of transporting bricks was reduced and the problems of transporting them vanished in certain areas as the 3000-mile spider's web of canals linked long established river routes together. Bricks could now be moved economically and the fuel to burn them could be moved cheaply to the brickyard, thus the need for the brickyard to go to the construction site was eradicated. The canals, themselves, however, were a construction site in their own right with vast quantities of bricks being needed for cottages, warehouses, bridges and other engineering structures. It is commonly accepted that where canals were cut in clay, the extracted material was made into bricks on the site and used in the canal.

During the course of my research in Newport, a village on the Market Weighton Canal that owes its existence to the brick industry, I found an old deed which actually detailed the use of clay extracted for the canal. A piece of land was described as "used as a brickyard". This was land near the Turks Head public house in Newport which Peter Moss owned and rented out to John Craven from 20 March 1788 along with the Turks Head and six acres of meadow. Part of the rent was paid in bricks. The deed does not mention a kiln, although several other buildings are named, but this is not unusual as clamp burning was a quick and easy way to fire the bricks. The brickyard extended to the canal and John Craven was given

> full and free licence and authority to dig and get clay from the earth and soil cast and thrown upon the bank of the canal for the purpose of making bricks and from time to time to make bricks in and upon the said parcel of land now used as a brickyard. And also all such part and so much of the said river bank as he shall dig take and clear all clay from ... and the said John Craven ... when and as often as he shall dig clay from and out of the said river bank for the purpose of making brick clear and take away the same and level the earth from when the same shall be taken. [37]

This written evidence proves the generally accepted statement that clay from canals and drainage excavations was used to make bricks.

TABLE 2
DIVIDENDS ON THE MARKET WEIGHTON CANAL
Quinquennial Averages

1820-1824	6.8%
1825-1829	4.9%
1830-1834	4.5%
1835-1839	6.2%
1840-1844	6.8%
1845-1849	7.2%

Sources: B.F. Duckham, *The Inland Waterways of East Yorkshire 1700-1900,* East Yorkshire Local History Society, 1973, pp.137-145, with pp. 40 and 67; see also C. Hadfield, *Canals of Yorkshire and North-East England,* vol.II, p.812.

TABLE 3
BRICK AND TILE PRODUCTION IN NEWPORT
Selected years

	Bricks	Tiles
1823	2,000,000	1,700,000
1845	3,222,860	1,315,656
1848	3,977,600	2,072,410

Source: HCRO, DDMW 7/176.

TABLE 4
PERCENTAGE OF INCOME EARNED FROM DIFFERENT CARGOES
ON THE MARKET WEIGHTON CANAL, 1848-1865
Selected years

	Coal	Bricks and Tiles	Timber
1848	29%	23%	11%
1853	48%	-	-
1854	-	42%	-
1865	65%	-	-
1848-1865 average	51.5%	28%	1.5 to 5%

Source: HCRO, DD MW 7/176.

Although the canal had been built for the trades of Market Weighton between 1772 and 1777 the development of clay industries from its discovery during the excavations of the canal quickly became the raison d'etre of the navigation. A considerable proportion of the canal's receipts were derived from the carriage of bricks and tiles, which in good years were moved by the million. Bricks and tiles were charged at 3*d.* and 6*d.* per thousand respectively in 1782 but by 1791 this had been increased to 9*d.* and 1*s.* 6*d.* per thousand. Dividends of the navigation increased after the Napoleonic Wars to 6.8% between 1820 and 1824 when there were seven brick and tile manufacturers producing 2 million bricks and 1.7 million tiles annually.[38] The

dividends continued to remain high for what had been planned as an agricultural canal (Table 2). The maximum dividend coincided with the maximum efforts in under draining and the introduction of the round drain pipe which have been discussed above. These dividends emphasise the industrial influence on the canal, compared with the 2% to 3½% dividends for the same period on the Pocklington canal, a predominantly agricultural concern.[39]

A dispute over tolls charged on the canal explains why the dividends were so high in the 1820s. Richard Grasby writing to the Honourable Charles Langdale on 31 March 1836 to complain about the dues charged on the canal claimed, that after the canal was built

> this place [Newport] got into repute for Bricks and Tiles there were very few Brickyards on the River Humber, Ouse or Trent and the prices was good that it was neither known nor felt.

He goes on to explain that the brickmakers feel the effect of the high dues now as there has been a reduction of fifty percent on tiles in the last few years without a reduction on coals or labour. Earlier in the same letter he claims that the brick and tile makers on the banks of the Market Weighton Canal cannot compete with those

> on the Humber and Ouse where there is no dues to pay, there is several Brickyards on the Banks of those Rivers which have been RECENTLY opened which have been the cause of reducing the price of Bricks and Tiles.

It appears that the fame of the Newport yards and the money they were able to make inspired others to establish yards in the 1830s where clay and water transport met. Richard Grasby also informs us that drain tiles were being made at the time and selling at 22 shillings (£1 2*s.* 0*d.*) per thousand but nearly ten percent of that price was taken up by canal dues at 1*s.* 6*d.* on the tiles and 4*d.* on the coal to burn them. He takes great pains to point out that the Hon. Charles Langdale can move bricks from his own yard above Sod House landing for ¾*d.* per thousand, whilst bricks from Ramsey's yard below the landing, a similar distance, cost 9¾*d.* per thousand. It was claimed that the system of tolls used in 1836 was unfair as it cost just as much to move bricks 100 yards on the canal as it did several miles. The maximum allowed for tolls by the Act of Parliament was 2 shillings on tiles and 1 shilling on bricks, but by the system operated the tolls were now 2*s.* 6*d.* on tiles and 1*s.* 3*d.* on bricks per thousand.[40]

In spite of the high tolls in the 1830s and the competition from new yards established along other waterways, productions increased in the 1840s. (Table 3) Brick production in 1848 was almost double that of 1823 and while fewer tiles were made in 1845, the 1.7 million figure for 1823 had increased to 2,072,410 in 1848.[41]

The income of the canal in 1848 was £1,432 16*s.* 11*d.* of which £160 9*s.* 7*d.* (11.2%) was obtained from bricks and £167 12s 10¼*d.* (11.7%) from tiles; the major income came from coal dues of £415 (29%). Coal dues increased in the seventeen years after 1848 (Table 4); the low figure in that year being due to the unusually high percentage (11½%) earned from timber. As Table 4 shows, coal accounted for about half the dues collected on the canal, but it is not possible from the accounts so far inspected to distinguish how much was used for brickyards and how much was for domestic consumption or other industrial uses such as the steam flax mill. With the percentage earned from transporting bricks and tiles, an average of 28% between 1848 and 1865, it can be said that by the middle of the nineteenth century over half the income of the canal came from moving coal up to the brickyards and moving bricks and tiles down the canal.

Although Newport is unique in the East Riding as being the only industrial village established by the development of a canal/drainage undertaking on an ancient fen, the use of

water transport is very common to brickworks. The numerous yards on the south bank of the Humber had jetties built into the Humber or the creeks by the side of their works. The famous Humber keels and sloops arrived at the yards with coal from the West Riding coalfields via the inland waterways and sailed away with bricks. Within the dual economy operated by brickmakers, some of them operated their own boats, a coal yard for local home deliveries, and a little bit of farming as well as a brickyard. The Frank family of brickmakers had their own sloop, *Nero,* which loaded up with bricks at Ferriby Sluice, the entrance into the Humber of the Ancholme Navigation, and delivered bricks to Grimsby, Brigg, Beverley and Hull with cargoes up to 35,000 bricks. In 1920, the rates were 9 shillings per thousand to Hull, 12 shillings per thousand to Grimsby and 15 shillings per thousand to Brigg but, as the account books for the *Nero* for 1896/97 show, coal was also a regular cargo.[42]

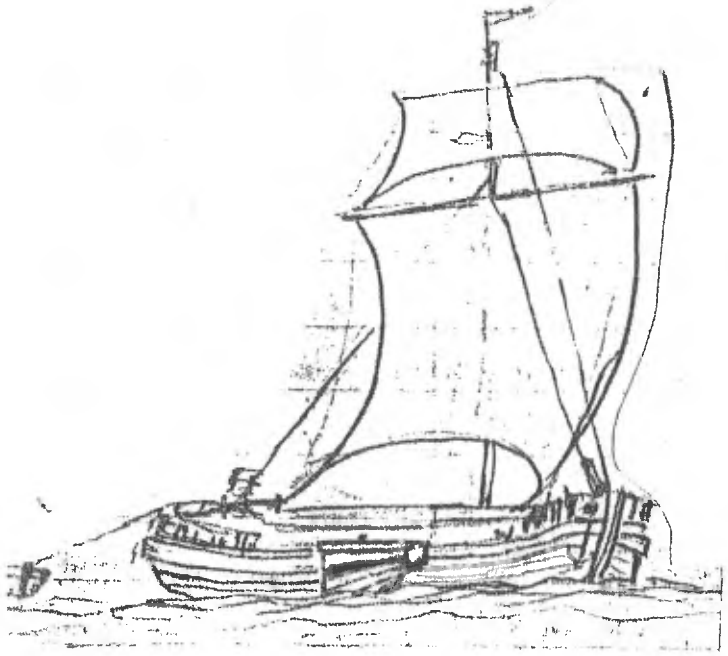


Fig. 5 Sketch of the sailing barge *Nero* drawn by the skipper, John Frank.

Perhaps the most famous brick-carrying ships are the sailing barges of Eastwoods Brick Company who built a fleet of seventy barges which sailed all around Kent and up to London making their red sails a famous site. In parenthesis, we can mention films featuring their barges. *Red Sails in the Sunset,* starring Jessie Matthews, and *Beauty and the Barge,* both featured the Eastwoods sailing barge *Surrey* and their barge *Wiltshire* appeared in *Sailing Along,* another film starring Jessie Matthews. [43]

The Kent yards of Eastwoods delivered many of their bricks to London and freight rates from Sittingbourne to London Bridge and London Docks were 3*s.* 2¼*d.* per thousand bricks and 1*s.* 6*d.* per ton for cement in 1921. The barges returned from London with refuse, ashes and coke which were used to make and fire the bricks. In this context, it is interesting to note that in the 1980s and 1990s London refuse was taken out to old LBC brick pits in Bedfordshire and used to fill them, with layers of refuse being interspersed with layers of earth and capped by a thick layer of soil so that the area could be returned to farmland.

The bricks at Ferriby Sluice were wheeled out on barrows 50 at a time and loaded from the barrows into the hold by three men and one man to stow in the hold Straw was placed between the side of the sailing vessel and the bricks to allow for changes in the shape of the

wooden hull due to sitting on the mud or floating in water at high tide. The bricks could be loaded at the rate of 4000 per hour with two or three gangs working a vessel at the same time using only a narrow plank to bridge the gap between quay and boat. Accidents did happen, and the man or boy who let his barrow load of bricks fall into the water found the cost knocked off his wages at the end of the week. Four men wheeling bricks to the ship and one stowing in the hold made a gang. The off-loading was done by throwing out three bricks at a time to the man on the quay and then stacking them in blocks: four men took eight hours to unload their sloop in an account by John Frank. The load was 30,000 bricks.[44]

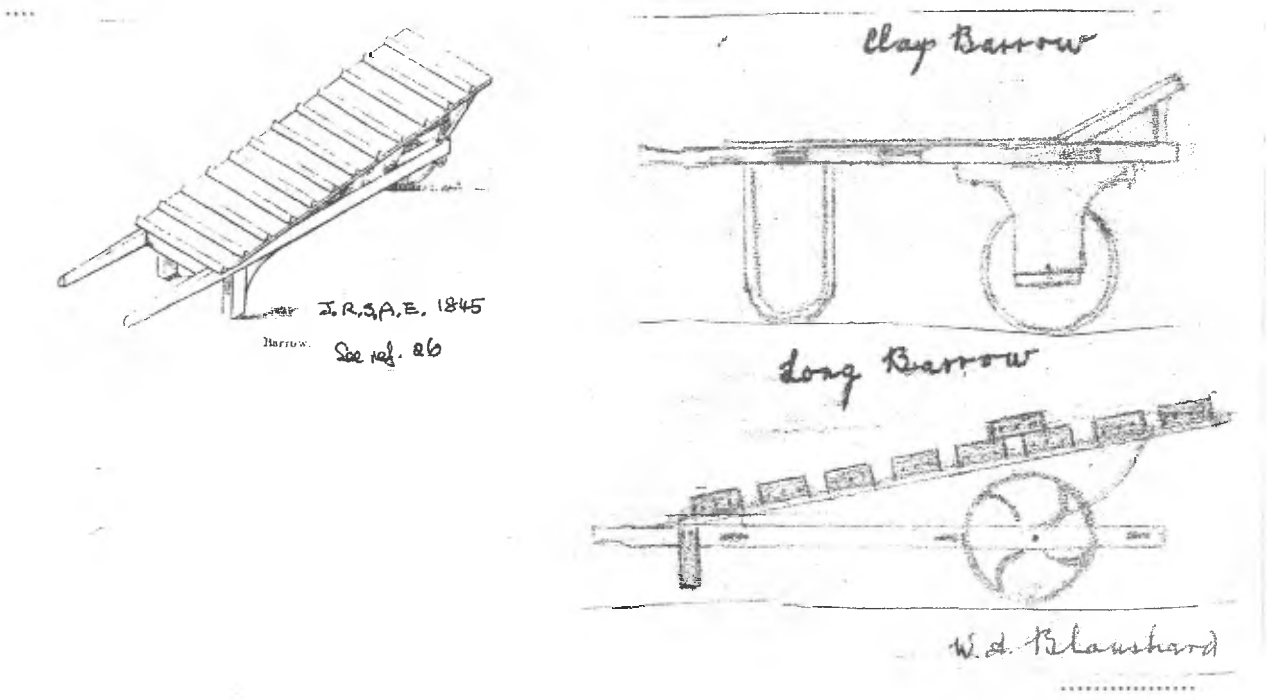


Fig. 6 (right) Various forms of barrows used in East Riding brickyards, drawn by William Blanchard, 7 May 1981.
(left) Barrow as illustrated by T. Law Hodges and Ph. Pusey, *JRASE,* **5, part 2,** 1845.

On the Market Weighton Canal, the boats were also loaded by barrow-loads of 50 bricks at a time being wheeled up narrow planks from the bank. A gang of five men could load 4000 bricks in one hour if three wheeled the barrows, one on deck to pass to the fifth, the stower in the hold. The number of bricks or tiles that could be loaded into the canal barge depended on the amount of water in the canal. In the year October 1846 to October 1847, a sample taken of boats passing through Sod House Lock showed a maximum of 17,000 bricks moved by William Craven on 2 April 1847, while the minimum in August 1847 was 1000 moved by Thomas Scott. A maximum of 11,000 tiles were moved one day in April by Thomas Armitage but the minimum was 700 tiles moved by John Rider in August. We have already quoted that the canal brickworks were at a disadvantage to those on the river and this can be seen, once again, for the loading capacity of vessels moving bricks from East Halton Skitter was 40,000 at high tide and 20,000 at low tide. Brickmakers at Newport had their own boats as well, for Richard Grasby wrote in 1836 "In the course of business I have occasion to send my vessels into neighbouring canals..." and a vessel of his used Sod House Lock twenty times with bricks, tiles or sand in 1846-1847.[45] Other brickmakers feature in the tolls for the same period: John Bishop was a brickmaker with his sons at Faxfleet by the canal; Joseph Brittain a brick and tile maker at Newport; John Rider

who, with his two brothers, made bricks, tiles and pots in New Gilberdike; and Thomas Armitage, a brick and tile maker from Newport.[46] The boats sailed out of the canal into the River Humber and sat on a sandbank at low tide and loaded the barge with sand, sailing back into the canal with the sand at high tide. They also delivered bricks into the West Riding and returned with coal for local use and to fire their kilns.

BRICKS AND RAILWAY TRANSPORT

The decline in canals was caused by the extensive railway network that spread across the country from the 1830s onwards. As with canals, brickworks were quickly established where clay was found during the construction of the lines. The contractor Thomas Brassey made thirteen million red bricks on the site of the Great Northern Railway's Digswell Viaduct, near Welwyn, Herts., constructed 1849-50. At the same time the clay removed from the Copenhagen Tunnel, immediately north of London's King's Cross Station, was made into bricks at the tunnel's mouth by Pearce and Smith.[47] The bricks were used to line the tunnel. Lancashire's largest viaduct at Whalley, 70 feet above the Calder, has twenty-eight spans of 30 feet and twenty spans of 40 feet and contains seven million bricks made on the site near Whalley Station.[48]

Across the Humber from the East Riding, clay was also found in Grimsby, a stronghold of the Manchester Sheffield and Lincolnshire Railway and its successor, the Great Central Railway. Eventually, as the docks were being excavated, George Babb obtained a site adjacent to the dock to make the extracted clay into bricks.[49]

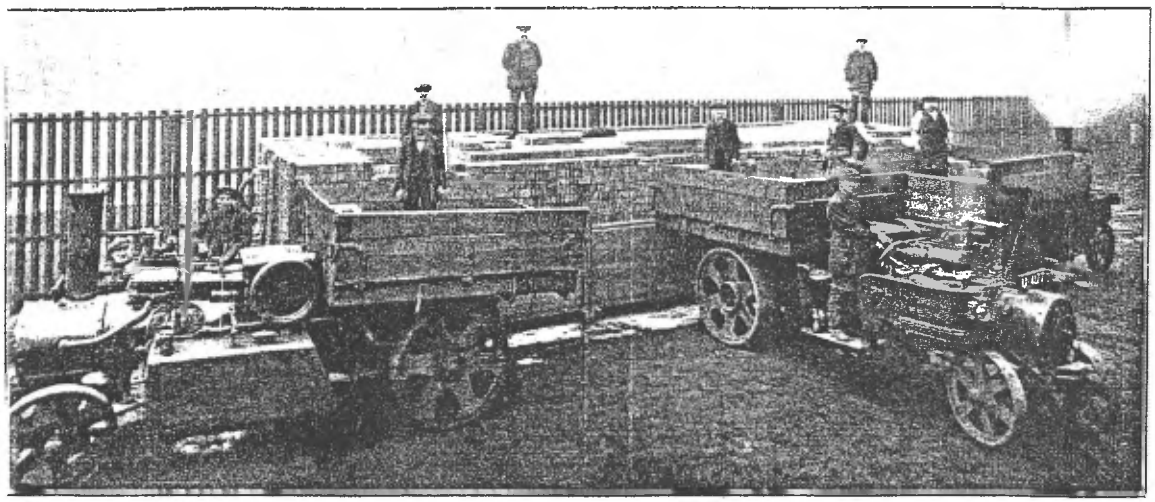


Fig 7. High-sided railway waggons for the Peterborough to London brick traffic on the Great Northern Railway, capable of carrying a 50-ton load.
From *The Railway Gazette*, 25 February 1921, page 267.

Brickworks throughout the country were a source of freight traffic for the railways with many works having their own sidings from the main lines to bring in the coal and to take out the bricks. The North Eastern Railway published several editions of its book *Traffic from Collieries, Works Sidings and Depots connected with the NER* and the 1918 edition has 141 entries used by brick companies.[50] At this period, the brick companies not only had their own sidings but some also had their own wagons in their own liveries to handle both bricks and coal. The wagons originally carried 10 tons of bricks each but by 1921, the Great Northern Railway was operating high-sided bogie wagons, 41 feet long, 8 feet wide and 3 feet 6 inches deep, capable of holding 50 tons of bricks: about 20,000 per wagon. The major brick producers developed handling

facilities at major railway stations. At Hull, for instance, the London Brick Company had a depot near Railway Dock, now part of Hull Marina, and LBC lorries worked from the depot delivering bricks locally. This continued into the late twentieth century for the rail freight speedlink system advertised in 1983 claimed that the Butterley Brick Company had sold over one million bricks from speedlink depots. As with sloops and barges, the bricks were loaded into the wagons by hand from barrows and off-loaded by hand into waiting lorries or carts.

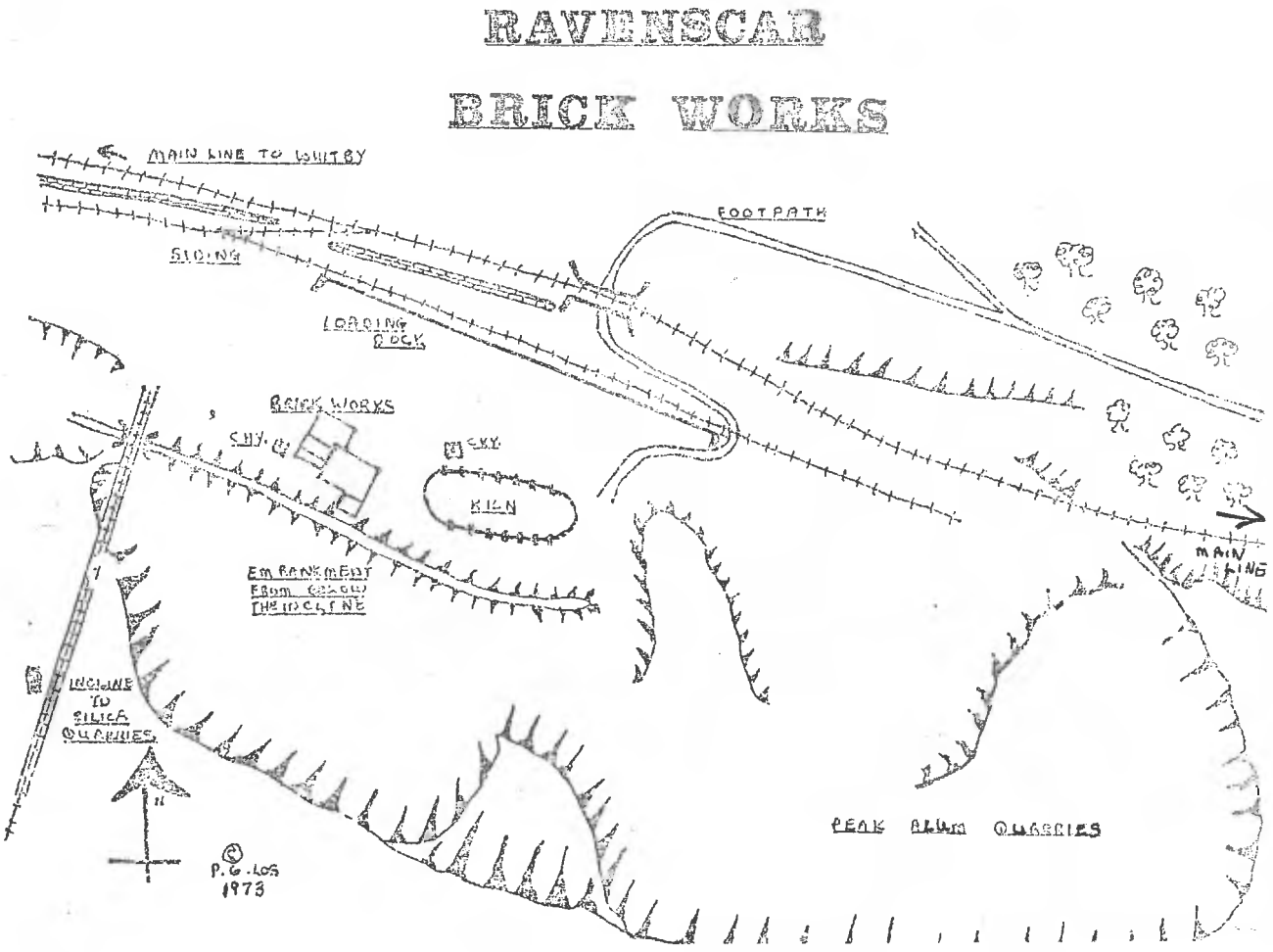


Fig. 8 Ravenscar Brickworks, showing railway sidings. drawn by Peter Los, 1973.

An examination of Ordnance Survey maps of the early twentieth century shows numerous railway sidings leading into brickworks. Thus, like the canals, the railways made bricks on site, used bricks in their construction and were a means of cheaply transporting the products anywhere in the country.

BRICKS AND ROAD TRANSPORT

The boats and trains were not an answer in themselves to move bricks from the brickyard to the construction site because the railway line or canal did not always go direct to the site. Road transport was used to take the bricks from the canal side or railway station to the construction site. We have already examined early builders' carts capable of holding 500 to 700 bricks. In the late nineteenth century these were followed by steam traction engines which were able to pull three trailers of bricks, each one holding a thousand bricks. The big problem when they were first introduced was the poor quality of the roads resulting in the brickmakers being prosecuted.

William Atkins, a brickmaker of Mountsorrel, Leics., was fined £105 in 1900 for damage to the road between Leicester and Loughborough caused by his traction engine which weighed 11 tons pulling trailers of bricks weighing 10 tons. The traction engines and early steam lorries were supposed to keep to a maximum speed of 4 mph but drivers often exceeded this limit reaching speeds of 20 mph.[52] The steam lorry from Newport brickworks was operated by a driver and a boy who was sent ahead at crossroads to make sure that it was clear for the brick lorry to carry straight on. The driver usually bet the lad 6*d.* that they would get to Hull without stopping, and in the 1920s he usually won! The steep hills in other areas of the East Riding necessitated the trailers of bricks being taken up one at a time.

....

Fig. 9 Steam lorry at Newport brickworks, September 1974.

In the 1940 the brick companies developed fleets of petrol or diesel lorries which transported the bricks door-to-door and reduced the handling costs. These lorries replaced the steam-driven wagons and were usually a long-wheelbase, flat bed type; they did not pull a trailer. The early lorries carried 2,000 bricks soon they were capable of loads of 7,000 bricks. Like the railway wagons, the brick lorries had their own liveries for their yards with the red lorries of LBC perhaps being the most famous, the lettering being in white. The revolution in the transportation of bricks occurred in the early 1960s with the idea of lorry-mounted cranes for on-site loading and stacking arriving from the U.S.A. and then developed here by the Butterley Brick Company and the Blaby Brick Company.[53] The bricks were strapped in packs of 500 at the kiln. This transforms the task of loading and unloading 5000 bricks from a laborious, protracted and costly operation involving half a dozen men to a simple fifteen-minute task for the driver. The lorry-mounted crane, often set amidships, is now a familiar sight throughout the country and makes it very easy to move bricks door-to-door from kiln to construction site.

Although our inland waterways move very little commercial traffic now, we must not forget the export market. The Hoe Hill and Farlings Tile yards situated near the south pier of the Humber Bridge export pantiles to Belgium and other countries in northern Europe. The large articulated lorry trailers are left at the works and filled with pantiles by barrows and then collected and driven to Hull or Immingham to cross the North Sea on roll-on-roll-off ferries.[54]

Butterley Brick Company also had large orders in the Netherlands in the 1970s, with a total of 9,000,000 bricks in 1977; a total of 20,000,000 bricks were taken by lorry to Fleetwood for despatch to Ireland and a large order for South Africa went by rail to Immingham for shipment. [55]

Fig. 10 Local brickmakers from the *Hull Journal,* 30 July 1981.
Left to right: Bernard Ashley of Doncaster; John Frank of South Ferriby; Harold Horsefall of East Halton; a brick barrow with a brick mould and a fired brick; Herbert Smith of Humnanby; and William Blanchard of East Halton.

A FINAL COMMENT

The brickworks went to the construction site and made a variety of products besides bricks. These were used in the immediate vicinity and gave the English countryside its local charm: the warm, mellow bricks in the Sussex Weald; rich purple bricks in Dorset; the red pantiles of East Yorkshire; the brilliant hard reds of the Midlands; Luton Greys in Bedfordshire; the blues of Staffordshire; and the yellow and brimstone of the Thames Estuary. The improvements in transport, coupled with the intense mechanization of the yards to meet demand, has resulted in different types of bricks being found everywhere. In the modern brickworks, today, virtually any colour and any texture is available for delivery anywhere, and firms like Ibstock are able to reproduce old-fashioned decorative bricks to repair and renovate old buildings.

For centuries, bricks have made the beauty of the English countryside a joy to behold; today BRICK KEEPS BRITAIN BEAUTIFUL so let us make full use of the natural clay resources and

our modern transport facilities for tomorrow's world for the next generation to BUILD A BETTER LIFE WITH BRICK.[56,57]

ABBREVIATIONS USED

EYLHS East Yorkshire Local History Society.

HCRO Humberside County Record Office, now known as East Riding Archives and Local Studies, The Treasure House, Champney Road, Beverley, East Yorkshire HU17 9BA, website: www.eastriding,gov.uk e-mail: archive.service@eastriding.gov.uk

HUL Hull University Library

HullRO Hull Record Office

JBAA *Journal of the British Archaeological Association.*

JRASE *Journal of the Royal Agricultural Society of England*

PRO Public Record Office, Kew

VCH *Victoria County History*

YASRS *Yorkshire Archaeological Society Record Series*

NOTES AND REFERENCES

1. N. Pevsner and D. Neave, *The Buildings of England: Yorkshire: York and the East Riding,* London: Penguin Books, 1995; New Haven and London, 2001, p.27; earlier N. Pevsner, *The Buildings of England: Yorkshire: York and the East Riding,* Harmondsmoth, Penguin Book, 1974, p.55.

2. F.W. Brooks, 'A Medieval Brickyard at Hull', *JBAA,* 3rd ser., **4,** 1939, 1512-174; K.J. Allison, *VCH Yorks.*, **I,** 1969, pp. 18, 41, 57, 296, 414 for the fourteenth and fifteenth centuries; pp. 150, 414, 370 and 168 for sixteenth and seventeenth centuries; pp. 460, 470, 282, 377, for the eighteenth and nineteenth centuries.

3. E. Gillett, *A History of Grimsby,* 1969, p.2.

4. *VCH Yorks.*, **II,** 1974, p.40

5. *Wills in York Registry, 1636-1652,* [being *YASRS,* **4,** 1888], p.59

6 Henry Boot, *Memorandum Book,* HCRO, DD HV 75/48, p.64. The payment was made on 12 October 1635, which is the usual time for the sale of bricks at this period; it being a seasonal occupation.

7. W.A. Los, 'Accounts from Archives: East Yorkshire', *BBS Information,* **31,** November 1983, pp.21-24; PE 72/2; HCRO PE 121/56, Kilpin Tithe maps; HCRO, DD WR 1/51; *VCH Yorks.*, **II,** 1974, p.238.

8. PRO E 134/12 Anne Trinity/9; Exchequer of Pleas 1713.

9. Pevsner, 1974, p. 56.

10. HUL, DD EV 56/280-282.

11. B. English, 'On the Eve of the Great Depression: The Economy of the Sledmere Estate, 1869-1879', *Business History,* **24/1,** March 1982, pp.24-47, at p. 37; *VCH Yorks.*, **II,** 1974, p.220.

12. F. Brearly, *Flamborough,* 1971, pp.194-196.

13. HUL, DD HV 2/5-9, for 22 June 1822, 16 October 1822 and notes on the back cover *re* bricks needed for a nine-inch wall.

14. K.A. MacMahon, *The Beverley House of the Hotham Family: an early-eighteenth- century building project*: "1713-1713, Thomas Plaxton and William Fenteman paid £9-12*sh*-6*d* (£9-62) for 141,000 brick"; and "1716, Joseph Troupe and John Dod made and fired 166,400 coarse bricks and 48,150 front bricks at a cost of £106-4*sh*-0*d.* (£106-20)".

15. John Frank, (1901-1988) brickmaker, South

Ferriby, Linconlnshire; oral evidence collected April 1981.

16. Diary of James Dunn, Manor House, Patrington. Details kindly supplied to me by Dr David Neave.

17. R.A. Manchester, 'Humberside Brick and Tile Yards', manuscript n.d.,: "Brick manufacture was well established at Patrington in 1799. The manufacturer at that time was Messrs William Little & Co. The 1852 OS map sheet 256 shows a brickyard adjacent to the steam flax mill, which had been erected in 1848 with its own site. The 25 inch map of 1891 sheet 256-3, shows the brickyard, flax mill and a siding into the main railway line between Hull and Withensea."

18. William Marshall, *Agriculture of Yorkshire,* 1788, Vol. **I,** p.107.

19. H.E. Strickland, *A General View of the Agriculture of the East Riding of Yorkshire,* 1812, pp.39-42 and p. 283.

20. E. Baines, *History, Directory and Gazetteer of the County of Yorkshire, Volume II East and North Ridings* 1823, [reprinted Newton Abbott: David and Charles, 1969], pp. 372-373.

21. Joseph Gwilt, *Encyclopedia of Architecture,* 1842, revised 1891, section 1831.

22. W. Wright, 'On the Improvements of the Farming of Yorkshire since the last reports in the Journal, *JRASE,* **22, part 1,** 1861, p. 111. HCRO DD MW 7/459. Also G. Legard, *JRASE,* **9 part 1,** 1848, p. 132. (see note 24 *infra*)

23. *Clayware field drains over centuries of time,* Information leaflet published by the National federation of Clay Industries, n.d., reproduced as fig.2.

24. G. Legard, 'Farming in the East Riding of Yorkshire, Prize Report', *JRASE,* **9 part 1,** August 1848, pp.85-136.

25. Wright, 1861, p.110.

26. W. Ford, 'Accounts of Mr Irving's New Machine for Constructing Tiles XXXII', *JRASE,* 1st ser., **5,** 1842, pp.398-400. T. Law Hodges and Ph. Pusey, 'On the Cheapest Method of Making and Burining Draining Tiles' XXXI', *JRASE,* 1st ser., **5 part 2,** 1845, pp.551-559. F.W. Etheredge, ' On the Cheapest and Best Method of Establishing a Tile Yard XXXVI', *JRASE,* 1st ser., **6 part 2,** 1845, pp. 463-477.

27. Legard, 1848, p.135.

28. Wright, 1861, p.99.

29. A. Cox, *Survey of Bedfordshire: Brickmaking: a History and Gazetteer,* Bedford: Bedfordshire County Council, 1979, pp.38-39. Illustration of Beart's machine is figure 24 on page 38.

30. Ford, 1842, pp.398-400.

31. Law Hodges and Pusey, 1845. In 1845, Etheredge's machine produced 15-inch flats and soles for 10 shillings and 16 shillings per thousand respectively.

32. Etheredge, 1845.

33. *Clayware field drains...* leaflet (see note 23).

34. J. Woodforde, *Bricks to Build a House,* London: Routledge Kegan Paul, 1976, pp.28-29.

35. Woodforde, 1976, pp. 54 and 58.

36. K.J. MacMahon (editor), *Beverley Corporation Minute Book 1707-1835,* [being *YASRS,* **122,** 1958], records "10th January 1576 Received of Peter Harpham for his cart standing in the street 3*d.*"

37. HCRO, DD BD 76/7.

38. B.F. Duckham, *The Inland Waterways of East Yorkshire 1700-1900,* EYLHS, 1973, pp.37-45.

39. Duckham, 1973, pp. 40 and 67; C. Hadfield, *Canals of Yorkshire and North-East England, Volume II,* p.312.

40. HCRO, DD MW 7/176; DD MW 7/475 p.25.

41. HCRO DD MW 7/176; DD MW 7/475, p.25.

42. N.J. Day, *Bricks and Sails. Saga of Boats and Bricks. The John Franks 1757-1957,* 1995, p.22. The sloop, *Nero,* alongside the Franks' brickyard. John Frank's log book of his sloop, *Nero,* 2 July 1920 to 21 September 1921. Also *Nero* accounts 9 January 1896 to 13 June 1898.

43. F.G. Willmott, *Bricks and Brickies,* 1972, pp.49-50.

44. John Frank, hand-written, unpublished manuscript, *No tale, An Illustrated account of taking a load of 30,000 bricks from South Ferriby to Grimsby.* Also details kindly given by W.A. Blanchard and Harold Horkstone on my visit in 1981.

45. HCRO, DD MW 7/462 and DD MW 7/176.

46. HCRO, DD MW 7/462 compared with 1841 and 1851 census returns.

47. Woodforde, 1976, p.132.

48. J. Marshall, *The Lancashire and Yorkshire Railway, Volume I,* 1969, p.183: "... 679 yards long, ... 7 million bricks and 430,000 cubic feet of stone at a cost of £35,000", in1850.

49. Gillett, 1974, p.132.

50. *Traffic for and from Collieries, Works, Sidings and Depots connected with NER,* 1918,. Numerous examples, *e.g.* p.85, B. Whitaker & Sons Ltd., Whitakers Brickyard Siding, Ravenscar. *Official Handbook of Stations including Junctions, Sidings, Collieries Works etc. on the Railways of Great Britain and Ireland showing the station accommodation, crane power, county, company and position,* 1938, *e.g.* p.488, Ravenscar Brickworks Siding.

51. See note 50, previous reference 17 for an example of many such examples.

52. *Brickbats,* [Journal of the Crossley Group], September 1974. In the picture, Arthur Underwood is shown with the first steam lorry at Newport in 1919.

53. R. Christian, *Butterley Brick, 200 years in the Making,* 1990, pp.197-198.

54. Information from Mr Coulam, manager of William Blyth, Hoe Hill, Barton-on-Humber, during my visit 29 March 1978.

55. Christian, 1999, pp.231-232.

56. Adverts issued by the Brick Development Association, Winkfield Row, Windsor, Berkshire.

57. Paper received July 2007, based on lecture given to Construction History Society in 1991.

SOME SOURCES OF FIREBRICKS USED IN LONDON

Terence Paul Smith

INTRODUCTION

Building in nineteenth-century London was on a prodigious scale, the vast majority of it in brick. With the spread of the railway bulk freight system from mid-century the possibility of acquiring bricks from more distant sources was increased.[1] But the extent to which that possibility was acted upon, though far from insignificant, has sometimes been exaggerated, and the picture therefore skewed, by concentration on the more prestigious, architect-designed projects. Smaller structures, including acres of housing in the ever-spreading metropolis, continued to employ the dark red bricks or the yellow-brown London Stocks which had long been in use and which were supplied from brickyards on the expanding periphery of London itself, around Cowley (Middlesex) and elsewhere on the Grand Junction Canal west of London, and on both sides of the Thames in Essex and Kent.[2] Only in the last two decades of the century was there serious competition – from the Fletton bricks manufactured in the Peterborough area and elsewhere on the Great Northern Railway: but even in 1892, according to (estimated) statistics published in *The British Clay-Worker*, Flettons accounted for only 12.5 per cent of all bricks required for London; the 'local' (London, Middlesex, Essex, and Kent) bricks accounted for 75.0 per cent.[3] There were, however, some specialist products (not represented in *The British Clay-Worker* figures) which could be supplied *only* from a distance because their manufacture depended on the availability of geographically restricted raw materials. Amongst them were firebricks (refractory bricks), now largely superseded by spray-on refractory linings.

FIREBRICKS

Firebricks were developed to withstand the extremely fierce heat of certain industrial processes, especially iron and steel manufacture, but also glassmaking, ceramic production, and some others; they also had other uses, such as in railway locomotive fireboxes. Their advantages for such applications are, first, that they can withstand high temperatures; second, that they chemically resist the slag produced during certain manufacturing processes; and, third, that they have a low coefficient of expansion, so that structures built from them are stable under wide fluctuations of temperature. Only occasionally were they used architecturally, in areas close to their places of manufacture.[4] British firebricks not only supplied the home market but were also exported around the world.[5]

Firebricks, it has been claimed, were first manufactured at Dinas, South Wales in the early nineteenth century, using the quartzite of the Vale of Neath;[6] but they were almost certainly developed even earlier, at some time in the eighteenth century.[7] By the time of the first edition of Edward Dobson's treatise on the manufacture of bricks and tiles in 1850 they were an established product.[8] Later in the nineteenth century, production expanded, using, normally, fireclay occurring in the Coal Measures and encountered during coalmining: it was therefore available only in a restricted number of areas: South Wales, the West Midlands, North Wales, South Yorkshire, Tyneside, and the Kilmarnock-Glasgow area of Scotland. They were also made from china clay (kaolin), for example in the vicinity of Plymouth.[9]

The term 'fireclay' seems to have been used fairly loosely in earlier times,[10] but strictly it is a deposit occurring immediately beneath the coal seams and being rich in alumina (Al_2O_3) and low in alkali fluxes.[11] Exploitation has thus been largely a collateral enterprise connected

with the extraction of coal, and many of the manufacturers of firebricks were primarily coal owners.

Once on the surface, the fireclay was carefully picked through by hand in order to remove 'any matter which may cause a flaw or fault in the article to be manufactured' and was 'heaped up in large mounds to "weather"' for about a year. It was crushed and ground and mixed with water and often with pulverised burned fireclay as a grog, which reduced shrinkage and cracking during firing. The material was left in storage ('soured') for some weeks and was then either hand-moulded or machine-pressed, dried, and kiln-fired at a temperature of 1500°C for a period of seven days.[12] Brickworks were sited close to the mines to minimise transport costs of a heavy raw material; coal for firing was, obviously, readily available, and indeed use could be made of small fragments which were not easy to sell.

The finished products have a hard granular texture and a light colour (cream or pink), although sometimes they are distinctly red, perhaps due, in some cases at least, to post-manufacture modification by the heat to which they were subjected. They have smooth faces and sharp or quite sharp arrises. Those which were in direct contact with the heat of kilns and the like often show highly vitrified and distorted surfaces.

They have been produced not only as standard (right parallelepiped) bricks but also as various specials for constructing such features as arches and vaults, circular flues, and boiler-bearers. One early twentieth-century trade catalogue lists 20 forms, all available in a number of sizes, giving a total of no fewer than 107 separate products.[13]

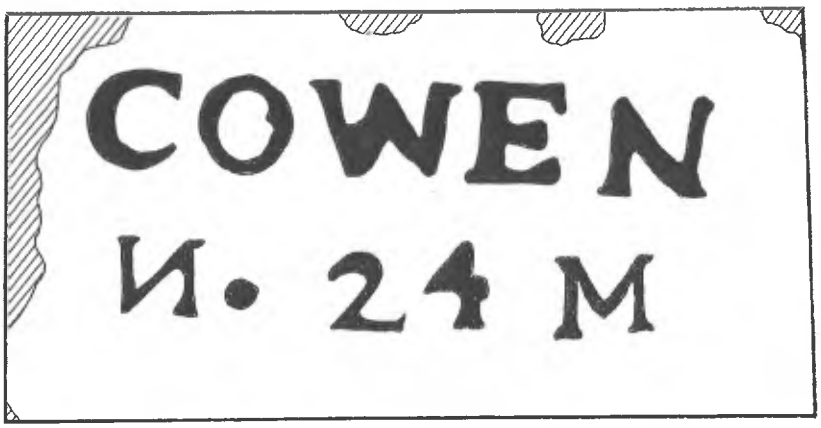


Fig. 1 Voussoir firebrick with manufacturer's and other stamps; hatching indicates damage; unprovenanced but from London, author's collection (scale ½).

BRICK STAMPS

The manufacturer's name and/or the place of manufacture were sometimes pressed into the bricks, usually in a bedface, but occasionally in a stretcher face. Often the stamps are rather casually placed, indicating that they were made with a separate stamp rather than with a die which was integral to the mould. Other markings might be impressed too, for example: **И. 24 M** under the name **COWEN** in the bedface of a voussoir brick from London (fig. 1; the '**N**' – for 'Number'? – is reversed): this is presumably a catalogue number or similar. Arabic numerals (2, 3, 4, or 5) were impressed in the stretcher faces of a number of voussoir bricks stamped on one bedface **MOBBERLEY & PERRY / STOURBRIDGE** found at a glassworks site on Bankside, SE1. The bricks on which the different numerals occur are of exactly the same form, suggesting that the numbers are either batch numbers or a means of identifying individual makers. There was presumably a numeral 1, though this was not present in the assemblage; there may also, of course, have been numerals higher than 5.[14] Most stamps seem to use sanserif capitals, but

Fig. 2 (left) Jospeh Cowen Jnr, as shown in R. Fynes, *The Miners of Northumberland and Durham,* Sunderland, 1873.

Fig. 3 (right) Known sources or probable sources of firebricks used in London; larger circles indicate locations with several suppliers; smaller circles indicate locations with a single supplier: **G** = Glenboig, **K** = Kilmarnock, **LM** = Lee Moor, **S** = Stourbridge, **T** = Tyneside (scale 1:6,000,000).

occasionally they are in seriffed capitals. Of the bricks that I have examined, including non-London examples, none have lower-case lettering, although 'Company' may appear in the form **C°** with the 'o' underlined. Occasionally the letters are set within a sunken rectangular frame. The sharpness of many of the stamps suggests the use of a metal rather than a wooden stamp: indeed, the intractability of fireclay probably necessitated a metal stamp.

IDENTIFYING SOURCES

According to the 1899 edition of Joseph Gwilt's *Encyclopaedia of Architecture*, Stourbridge 'supplies chiefly the London market'.[15] What little archaeological work has been done on these materials from London confirms the presence of Stourbridge products but also shows firebricks from Tyneside, from Glenboig and Kilmarnock in Scotland, and almost certainly from Lee Moor in Devon (figs 3, 4 and 5). The evidence for this lies in the stamps. Manufacturers, however, did not stamp *all* their products, so that when only a few bricks are recovered they may be

STAMP	LONDON FIND SITE(S)
COWEN	Doulton's stoneware pothouse, Lambeth, SE1; Doulton's drainpipe works, Lambeth Bridge House, SE1; Land to South of Merantun Way (Priory Park), SW19; unprovenanced
COWEN	Glasshouse Fields, Stepney, E1
J. & M. CRAIG KILMARNOCK	Woolwich Arsenal, SE18
HARPER & MOORES STOURBRIDGE[1]	Glasshouse Fields, Stepney, E1
J. & W. KING STOURBRIDGE	Albert Embankment, Lambeth, SE1
LUCAS[2]	Woolwich Arsenal, SE18
MARTIN LEE MOOR[3]	Woolwich Arsenal, SE18
MOBBERLEY & PERRY STOURBRIDGE	Riverside House, Bankside, Southwark, SE1
PRUDHOE	Vauxhall Pottery, SE1
RAMSAY	Vauxhall Pottery, SE1; Woolwich Arsenal, SE18; Land to South of Merantun Way (Priory Park), SW19
RUFFORD STOURBRIDG[E]	Riverside House, Bankside, Southwark, SE1; Woolwich Arsenal, SE18
STARWO[RK]S J * D GLENBOIG[4]	Doulton's stoneware pothouse, Lambeth, SE1
STEPHENSON	Doulton's stoneware pothouse, Lambeth, SE1
WALBOTTLE	Doulton's drainpipe works, Lambeth Bridge House, SE1

1. Of the bricks examined this is the only one to be stamped on a stretcher face.
2. Recorded by Kate Atherton for Oxford Archaeological Unit as 'Lucas', and not seen by the present author, but probably as given here (see text).
3. Recorded by Kate Atherton for Oxford Archaeological Unit as 'Martin Leemoor', and not seen by the present author, but probably as given here (see text).
4. The first and third lines of this stamp are curved to form a vesica (almond) shape.

TABLE 1
IDENTIFIABLE MANUFACTURERS OF FIREBRICKS FOUND IN LONDON

unstamped and therefore of no use in establishing sources. In other cases a set of initials is used, and this makes it difficult to identify with any confidence the particular company involved. Moreover, bricks are sometimes recovered broken, so that only a small portion of the stamp remains. Further, the casual application of the stamps may result in their being ill-defined or even incomplete at one end, making them difficult or impossible to read. Where, however, complete (or near complete) and clear stamps remain it is often possible to identify sources.

THE SUPPLIERS

Thirteen manufacturers of firebricks used in London have been certainly or almost certainly identified from their stamps: they are shown in Table 1, opposite.[16]

COWEN, whose stamp usually occurs without a frame (fig. 1) but which is within a sunken rectangular frame in at least one instance, refers to Joseph Cowen & Co. of Blaydon-on-Tyne, who owned coalmines and firebrick plants at Blaydon Burn and Garesfield Lily and operated between *c.*1823 and 1904. Cowen bricks were exported to Santa Cruz, California and to New Zealand.[17] John Brown plausibly suggests that the ceramic manufacturers Doulton, who used Cowen bricks in more than one of their London establishments, may have had an indirect connexion with Joseph Cowen Jnr (son of the firm's founder (fig. 2)) through Sir Edwin Chadwick, well known for his involvement with the London sewer system.[18]

J. & M. CRAIG / KILMARNOCK refers to the firm of that name, with a coalmine at Hillhead, Kilmarnock in the late nineteenth century; the Hillhead Fireclay Works was in existence from *c.*1858 to the 1930s.[19]

HARPER / & MOORES / STOURBRIDGE refers to one of the Black Country firms working in the Stourbridge area: they owned the Lower Delph Colliery at Cradley.[20]

J. & W. KING / STOURBRIDGE refers to another Black Country firm, Joseph & William King of Amblecote.[21]

The name 'Lucas' was thus recorded by Kate Atherton for the Oxford Archaeological Unit (OAU),[22] but it seems more likely that it was stamped in capitals: this was the stamp used by John Lucas, who had his works at Gateshead on Tyneside and who died in 1900. Paul Sowan has found firebricks stamped LUCAS in the Dietzsch kilns of the Dorking Greystone Lime Co. Ltd at Betchworth, Surrey.[23]

'Martin Leemoor' is again the form recorded by Kate Atherton for OAU, but it seems more likely that the second element comprises *two* words and that the stamp has the form MARTIN / LEE MOOR. Martin Brothers are recorded as 'China clay manufacturers' at Shaugh Prior, 7 miles (11 km) north-east of Plymouth and next to the village of Lee Moor, in *Morris and Co.'s Commercial Directory and Gazetteer* (Devon) for 1870, which also includes (though with no mention of Martin Brothers) the 'Lee Moor Architectural & Fire Brick Works'. Martin Brothers Ltd are recorded as 'Brick & Tile Makers' in 1890, with an address at 20 Lockyer Street, Plymouth; and in 1893 they are explicitly connected with the 'Lee Moor Architectural & Fire Brick Works', with offices at the Plymouth address.[24]

MOBBERLEY & PERRY / STOURBRIDGE refers to Mobberley & Perry of Hayes, Stourbridge, who owned coal mines at Merry Hill, Brierley Hill in 1880 and at Hayes and Hayes Lower, Lye in 1896.[25]

PRUDHOE may refer to the 'firebrick factory' shown on the 1865 Ordnance Survey map at Prudhoe on Tyneside. A mine named Prudhoe was worked in 1896 by Mickley Coal Co. of Stocksfield, although fireclay was not listed amongst its products; it was, however, listed amongst those of West Wylam mine, worked by the same company.[26]

RAMSAY refers to the coal owner George R. Ramsay, who owned one of the largest Tyneside firebrick works, at Swalwell, certainly working in the 1880s and 1890s.[27]

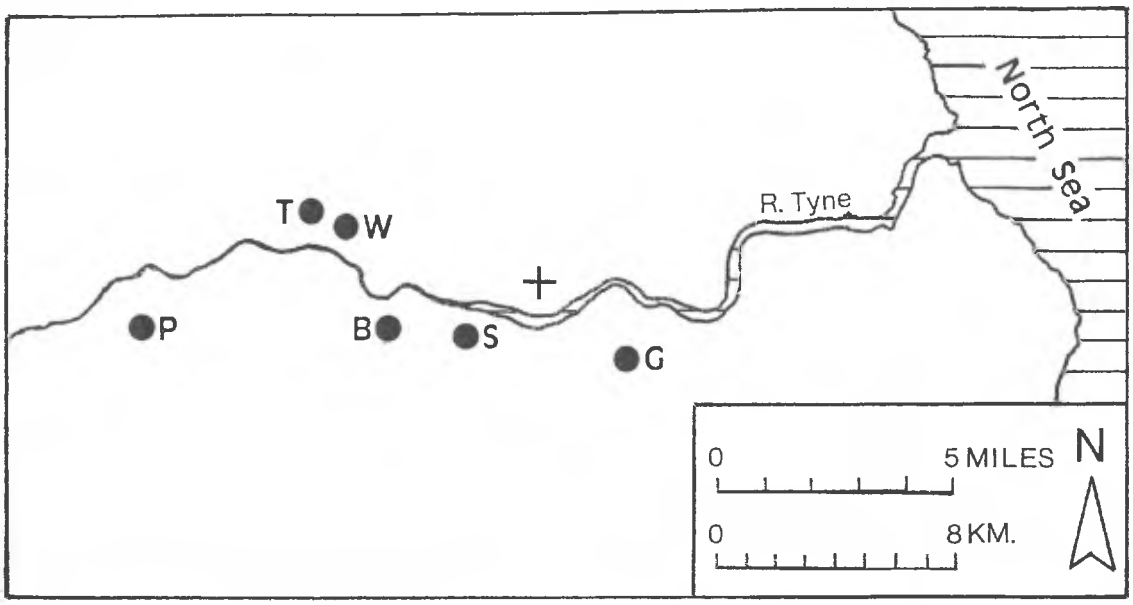


Fig. 4 Known sources on Tyneside of firebricks used in London: **B** = Blaydon, **G** = Gateshead, **P** = Prudhoe, **S** = Swalwell, **T** = Throckley, **W** = Walbottle; the cross marks Newcastle upon Tyne.

RUFFORD / STOURBRIDG[E] refers to Rufford & Co., who owned coal mines at Hungary Hill, Stourbridge in 1880.[28]

The STARWO[RK]S / J * D / GLENBOIG stamp is arranged with the first and third lines curved to form a vesica (almond) shape. The Starworks was founded by James Dunnachie (hence the initials J D) at Glenboig, north-east of Glasgow, in 1872, after the ending of a partnership with John Hurll and John Young in the Glenboig Fireclay Works, which dated back to 1852. In 1882, the latter amalgamated with the Starworks to form the Glenboig Union Fireclay Company Ltd, with Dunnachie as Managing Director. Bricks with this particular stamp are therefore well dated to the decade 1872–82. Glenboig firebricks had a very high reputation and orders for them were received not only from all over Europe but from Australia, Canada, India, New Zealand, Russia, and South America.[29]

STEPHENSON, whose stamp on the one brick examined appears within a sunken rectangular frame, probably refers to William Stephenson & Sons, recorded as coalmine operators and firebrick manufacturers at Throckley on Tyneside in 1880 and 1896.[30]

WALBOTTLE presumably refers to the Walbottle Coal & Firebrick Co., which was situated at Walbottle, Lemington-on-Tyne.[31]

TRANSPORT

The relatively small number of sites and the sampling policy necessarily adopted at some of them will not allow statistical analysis; but for what it is worth, current evidence suggests that Stourbridge and Tyneside were the principal sources of firebricks used in London, with Scotland and Devon supplying far fewer. Distances from London ('as the crow flies') vary widely, though all are significant: Stourbridge 114 miles (183 km), Lee Moor 192 miles (309 km), Tyneside 250 miles (402 km), Kilmarnock 344 miles (554 km), and Glenboig 350 miles (563 km). Possibilities for transport of their products also varied.

It was from the Newcastle area that various London industries obtained much of their coal for fuel; the Tyneside firebricks were therefore probably brought in by the same coastal route from Tyne to Thames. By the later nineteenth century firebricks were also moved around

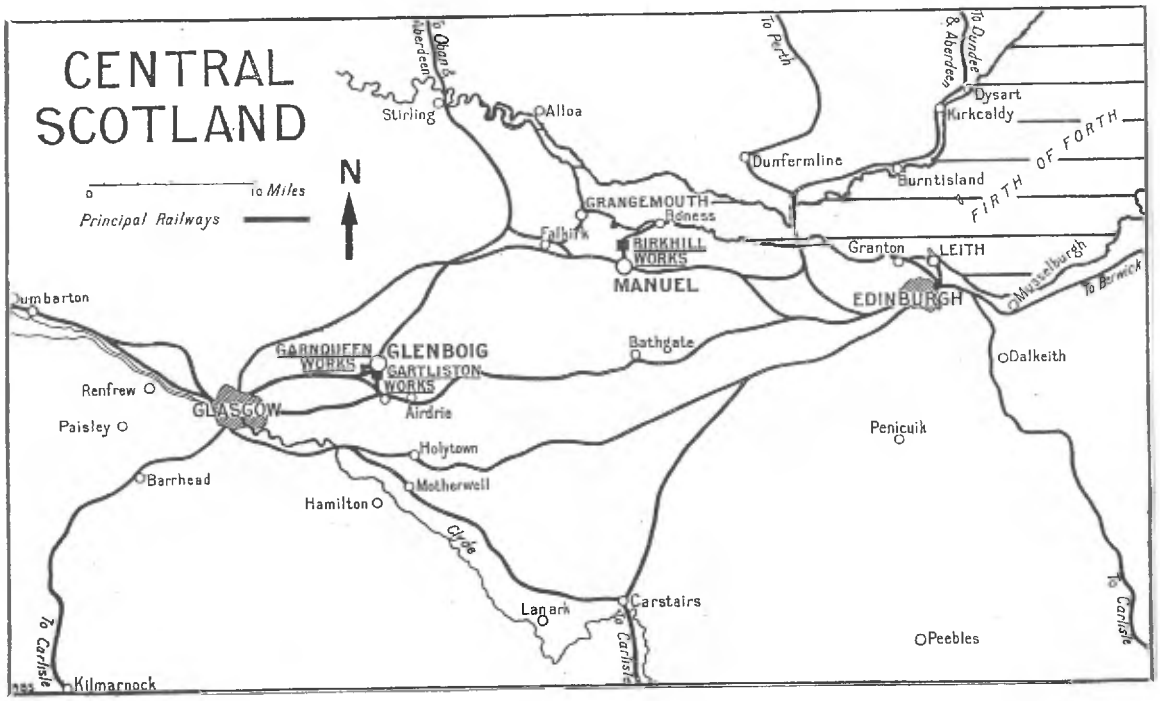


Fig. 5 Central Scotland, showing firebrick works and principal railways, from P. and M. Hurll, *"Hurll" Firebricks, Covers, Etc.*, trade catalogue, Glenboig: P. and M. Hurll Ltd, n.d., with additions.

the country using the railway bulk freight system. The Glenboig and Kilmarnock firebricks would have required rail transport for at least part of their journey (fig. 5): it would have been possible to transport them entirely by rail, although it may have been more convenient to use coastal shipping from the Firth of Forth down to the Thames.[32] So too the Lee Moor bricks could have been transported entirely by rail although coastal shipping from Plymouth to the Thames may have been preferred. Landlocked Stourbridge was, of course, unsuited to such shipping, but had good connexions with London both by the canal system and by the railway network: either of these could have been used to move the firebricks to London.

According to John Weale's *Contractor's Book for 1849* the cost of Stourbridge firebricks in London in that year was £11. 6*s.* 0*d.* per 1,000, including 'carriage to London and delivery at the works where the articles are to be used'; Welsh firebricks, by contrast, cost only £8. 12*s.* 0*d.*, and the (inferior) 'Windsor' firebricks less than half that of the Stourbridge bricks, at a mere £5. 8*s.* 0*d.*[33] That some London purchasers preferred the Stourbridge products despite their greater cost presumably reflects choice based on quality: according to Dobson, the Welsh firebricks were good, but the Stourbridge firebricks even better.[34]

NOTES AND REFERENCES

1. The railway freight system developed quite slowly at first and '[g]oods revenue did not overtake passenger revenue until 1852': G. B[oyes], 'Freight Traffic', in J. Simmons and G. Biddle, eds, *The Oxford Companion to Railway History from 1603 to the 1990s*, Oxford and New York: Oxford University Press, 1997, p.169.

2. When they were worked out, the peripheral yards were infilled and built over as the city expanded. For sources of London's bricks in the nineteenth century see especially A. Cox, 'Bricks to Build a Capital', in H. Hobhouse and A. Saunders, eds, *Good and Proper Materials: the Fabric of London since the Great Fire*, London: RCHM (England) in association with The London Topographical Society, publication **140**, 1989, pp.10–15; but also F.G. Willmott, *Bricks and 'Brickies'*, privately published, Rainham, Kent,

1972; J.M. Preston, *Industrial Medway: an Historical Study*, privately published, Rochester, 1977, pp.50–54, 91–8, 178–9, 199; R.-H. Perks, *George Bargebrick Esquire: the Story of George Smeed the Brick and Cement King*, Rainham, Kent: Meresborough Books, 1981; L. Clarke, *Building Capitalism: Historical Change and the Labour Process in the Production of the Built Environment*, London and New York: Routledge, 1992, pp.95–101; P. Ryan, *Brick in Essex: the Clayworking Craftsmen and Gazetteer of Clayworking Sites*, privately published, Chelmsford, 1999; and P. Hounsell, 'Up the Cut to Paddington: the West Middlesex Brick Industry and the Grand Junction Canal', *BBS Information*, **93**, February 2004, pp.11–16; also M. Robbins, *Middlesex*, London: Collins, 1953, pp.165–6. For the more general situation in England: S. Muthesius, *The English Terraced House*, New Haven and London: Yale University Press, 1982, pp.208–15.

3. The remaining 12.5 per cent were from yards on the Great Eastern Railway; figures in Cox, 1989, p.15; the percentage calculations are my own.

4. The various applications are usefully reviewed in J. Cooksey, *Brickyards of the Black Country: a Forgotten Industry*, privately published, Cradley, 2003, pp.16–91; pp.96–7 considers their architectural uses in the Black Country, with colour photographs at pp.60–62.

5. Those made by the firm of Cowen mentioned below, for example, have been found in the far west of the USA at Santa Cruz, California; they seem to have been made specifically for export since some of them are stamped not just with the manufacturer's name, like the London examples (*cf.* fig. 1 and Table 1), but: **COWEN-M / ENGLAND**: R.W. Piwarzyk, 'Lime Production in Santa Cruz County: The Bricks of Santa Cruz', http://www.santacruzpl.org/history/work/limebric.shtml. They, and other firebricks, were also exported to New Zealand: W.J. Harris, 'British Bricks in New Zealand', *British Brick Soc. Information*, **34**, May 1984, p.17. Those manufactured at Glenboig, Lanarkshire (see below) were particularly highly regarded and orders were received from many places throughout the world: Monklands, 'Monklands Online: Towns and Villages: Clay and Bricks', http://www.monklands.co.uk/glenathill/bricks.htm; P. and M. Hurll, *"Hurll" Firebricks, Covers, Etc.*, trade catalogue, Glenboig: P. and M. Hurll Ltd, n.d., p.3; Harris, 1984, p.17; G. Douglas and M. Oglethorpe, *Brick, Tile and Fireclay Industries in Scotland*, Edinburgh: RCAHM (Scotland), 1993, p.19.

6. J. Blunden, *The Mineral Resources of Britain: a Study in Exploitation and Planning*, London: Hutchinson, 1975, p.279.

7. Douglas and Oglethorpe, 1993, p.19; Cooksey, 2003, pp.11–12; also the West Midlands Historic Buildings Trust website at http://www.communigate.co.uk/bc/westmidlandshistoricbuildi n gstrust/ page2.phtml.

8. E. Dobson, *A Rudimentary Treatise on the Manufacture of Bricks and Tiles*, London: John Weale, 1850, reprinted in slightly reduced facsimile, ed. F. Celoria, as *J. Ceramic Hist.*, **5**, 1971, vol. 1, pp.13–14, 75, 78, 96, 115.

9. They were also made at Hedgerley, Bucks. using the sandy 'Windsor Loam': Dobson, 1850/1971, vol. 1, p.14; A. Pike, *Gazetteer of Buckinghamshire Brickyards*, Aylesbury: Bucks. County Museum, 1980, p.4; but these were inferior to those made from fireclay or china clay.

10. D. Yeomans, *Construction since 1900: Materials*, London: B.T. Batsford, 1997, p.69.

11. Percentages of alumina range from 30 per cent in South Wales to 43 per cent in Scotland: Blunden, 1975, p.285; china clay is also rich in alumina.

12. 'The Industry & Railways of the South West Black Country: Stourbridge Industry: Timmis & Co.' compiled by T. Cockeram: http://www/tom.cockeram.clara.net/Industry/190311tc.htm; R.W. Brunskill, *Brick Building in Britain*, 2nd edn, London: Victor Gollancz, 1997, p.42.

13. Hurll and Hurll, n.d., pp.8–20.

14. T.P. Smith, 'The Firebricks', in A. Mackinder and J. Bowsher, *Excavations at Riverside House and New Globe Walk, Bankside, Southwark*, MoLAS Archaeology Studies Series, London: MoLAS, in prep.

15. J. Gwilt, *An Encyclopaedia of Architecture: Historical, Theoretical & Practical*, revised W. Papworth, London, New York, and Bombay (Mumbai): Longmans, Green & Co., 1899, p. 525, §1827.

16. Several of these brickmakers are considered in T.P. Smith, 'The Materials Used to Build the Kiln', in K. Tyler with J. Brown, T.P. Smith, and L. Whittingham, *The Doulton Stoneware Pothouse in Lambeth: Excavations at 9 Albert Embankment, London*, MoLAS Archaeology Studies Series **15**, London: MoLAS, 2005, pp.32–6, and in Smith, in prep. London brick stamps are also recorded in unpublished archive reports by Kate Atherton for Oxford Archaeological Unit and by Ian M. Betts and T.P. Smith for Museum of London Archaeology Service.

17. See n.5.

18. J. Brown, 'Henry Doulton, Joseph Cowen, Edwin Chadwick and the Sanitary Movement', in Tyler *et al.*, 2005, pp.51–4; for the drainpipe works at Lambeth: D. Killock, J. Brown, and C. Jarrett, 'The Industrialization of an Ecclesiastical Hamlet: Stoneware Production in Lambeth and the Sanitary Revolution', *Post-Medieval Archaeol.*, **37/1**, 2003, pp.29–78. For Chadwick's involvement with the sewer system: S. Halliday, *The Great Stink: Sir Joseph Bazalgette and the Cleansing of the Victorian Capital*, Stroud: Sutton, 1999, *passim* as index.

19. http://freepages.genealogy.rootsweb.com/~cmhrc/list80.htm#AYRSHIRE; Douglas and Oglethorpe, 1993, p.53.

20. Cooksey, 2003, pp.110, 117. At some stage the firm was trading as Webb, Harper and Moores of Stourbridge: see photograph in Cooksey, 2003, p.62.

21. Cooksey, 2003, p. 117.

22. I was subsequently invited to re-examine a *sample* of the bricks from the Woolwich Arsenal site for OAU: they did not include this example or the 'Martin Leemoor' example which follows.

23. P.W. Sowan in 'Brick Marks Identified', *BBS Information*, **98**, November 2005, p.33; the stamp is in a shallow rectangular frog; Lucas bricks have been found as far afield as St Kitts and the Falkland Islands: *BBS Information*, **96**, April 2005, p.35.

24. For the 1870 directory: http://freepages.genealogy.rootsweb.com/~valhender/dirtrans/mor1870/ shaugh.htm. Other websites from which I derived some of these data (accessed 2004) seem no longer to exist, but the 'Blackalder Brick and Pottery Works' at Shaugh Prior, is mentioned (2007) as belonging to Martin Brothers on http://www.shaughpriorparish.gov.uk/history5.htm.

25. 'Collieries of the United Kingdom at Work in 1880': http://freepages.genealogy.rootweb.com/~cmhrc/list80.htm; Durham District Mines Historical Society Ltd website at http://www.tidza.demon.co.uk/1896?B4.htm; Smith, in prep.

26. Peak District Mines Historical Society Ltd, 'Northumberland's Mining Industry in 1896 – a List of Coal Mines', http://www.projects.ex.ac.uk/mhn/1896-33.htm. High Mickley, Mickley Square, and West Mickley lie between Stocksfield and Prudhoe.

27. Gateshead Libraries, '2003 Places', http://www.asaplive/iKnow/LocalHistory.cfm?ccs=10&cs=267; Durham Mining Museum, 'Swalwell Garesfield Colliery', http://www.mm.org.uk/company/s035.htm, and Durham Mining Museum, List of mines in 1888, http://www.mm.org.uk/company/lom/1888_302.htm. Ramsay bricks were exported to Santa Cruz: Piwarzyk, website as n.5.

28. 'Collieries ... 1880' website, as n.25; 'The Industry & Railways of the South West Black Country: Stourbridge Industry: Rufford & Co.', compiled by T. Cockeram: http://www.tom.cockeram.clara.net/Industry/188700rc.htm; Cooksey, 2003, p.117; Smith, in prep.; Rufford bricks were exported to New Zealand: Harris, 1984, p.17.

29. See n.5.

30. 'Collieries ... 1880' website as n.25, and website as n.26; Stephenson bricks were exported to New Zealand: Harris, 1984, p,.17.

31. Durham Mining Museum, 'Walbottle Coal & Firebrick Co Ltd', http://www.mm.org.uk/company/w034.htm; Walbottle bricks were exported to Santa Cruz: Piwarzyk, website as n.5.

32. Kilmarnock is much closer to the Firth of Clyde on the west than to the Firth of Forth on the east (see fig. 2), but shipment *via* the former would have involved a very much longer sea passage.

33. In Dobson, 1850/1971, vol. 1, p.16; the implication is, obviously, that Welsh and 'Windsor' firebricks were used in London, but so far I know of no archaeological evidence for them.

34. Dobson, 1850/1971, vol. 1, p.14.

TALL CHIMNEYS:
Some Initial Responses

Owen Ward and Kingsley Rickard

In *British Brick Society Information,* **104,** July 2007, a fairly detailed query about tall chimneys was made by Mr P.A. Earwaker who now lives in France.

The editor of *BBS Information* has received two short responses and has had three separate offers of articles from individual members. The two early responses from Owen Ward of Bath and Kingsley Rickard of Camborne are included here. In due course, it is anticipated that all or a substantial part of a future issue of *British Brick Society Information* will be devoted to articles on tall chimneys and their brickwork.

DHK

CONTEMPORARY PUBLICATION

On tall chimneys see Bancroft, *Tall Chimney Construction,* published in 1885 in Manchester

OWEN WARD

TALL CHIMNEYS IN CORNWALL

As a Cornishman and living in the county that can probably claim more chimneys per hectare than most areas, and although not an expert, I have studied local mine buildings for many years, finding them fascinating. I venture to offer the following thoughts on Mr Earwaker's query, using his questions as a guide, although comments on his third, fourth and fifth questions have been combined..

The Industrial Revolution

The advent of the Industrial Revolution certainly increased the need for many and bigger chimneys than had previously existed. The source of power used in the eighteenth century was coal which produced noxious gases when burned. These chimneys were tall to disseminate the gases but nevertheless a degree of scientific knowledge was employed to assess the height and the bore as it was important to have the correct amount of air flowing through the system to burn the fuel completely and scientific formulae exist for this. Unburnt fuel would increase costs. In Cornwall, a large mine pumping engine, running twenty-four hours a day, seven days a week, would consume some 50 to 60 tons of coal each week. Coal from different areas varies in its chemical constituents and it was a skilled job to tend the boilers to extract the maximum benefit. Boiler design was also important to obtain maximum heat transference.

The Earliest Examples

Then first engine to use steam, albeit to create a vacuum to move the piston was proven in 1712 to pump mine water but would, of course, have required a chimney. Over the next few years improvements were achieved by a number of engineers, notably James Watt, who improved the

original atmospheric operation to allow the use of low-pressure steam. In 1801, the Cornishman, Richard Trevithick, introduced high-pressure steam and in 1812 he obtained a patent for the Cornish Boiler, a monumental step at this point. Cornwall with its huge mining industry had many steam engines for pumping, winding and crushing and the Cornish Boiler both reduced coal consumption and increased efficiency, an important point in Cornwall, as the county has no indigenous coal supply. There were several hundred engines in Cornwall, each with its own boiler and attendant chimney.

The Structure of the Tall Chimney

The reason for round chimneys is that they offer lest wind resistance, which is important as many were sited on exposed headlands and other places with strong winds.

The reasons behind the height of these chimneys is covered in the comment on the Industrial Revolution.

Several answers arise from the point about shaped bricks and the taper. In Cornish chimneys, special shaped bricks were used as the chimneys were of smaller radius than the big mill chimneys of northern England. In Cornwall, the top third of the chimney was constructed of brick, the lower two-thirds being built of the local stone. At its base, the typical Cornish stack had masonry 6 feet thick and a bore of 2 feet. The height was often in the order of 100 feet but this varied, due sometimes to topographical features creating downdraughts.

The taper or "batter" in Cornwall was created by using a template of triangular shape, the outside edge being held vertical. The accepted angle was eleven-sixteenth of an inch per vertical foot.

The Use of Scaffolding

Many chimneys were built without scaffolding. The masons would leave a series of holes horizontally round the stack and once the mortar was dry, putlogs or short lengths of timber would be inserted into the brickwork. These would extend horizontally out from the masonry and then a plank could be rested on two adjacent putlogs and be used as a scaffolding board. As the chimney progressed in height, more putlogs would be inserted, roughly at six-foot intervals. On completion of the chimney, the masons would work their way down the stack, removing the putlogs and planks. In some chimneys, the putlog holes can be seen where they were never filled in.

The majority of chimneys in Cornwall were built into the corner of their engine house, thus proving extra stability.

KINGSLEY RICKARD

Book Review

Carillion, *Brickwork NVQ and Technical Certificate Level 2,*
Oxford: Heinemann, 2007, 301 pp.
ISBN 978--0435-43086-3, price £19-19

As we get further into the twenty-first century, I am sure that many of us must be thinking about the massive amount of building that is needed, both in the private sector as well as for business and, of course, the more spectacular building projects such as those that are needed for the

Olympic Games in London in 2012.

So as a Brickwork lecturer at the Colchester Institute in Essex, and having spent over 38 years as a Master Bricklayer, my interest is in who will be doing all this building, and in particular the brickwork.

I am hoping that many of the young school leavers I see and the full-time students I teach will be spear-heading this drive to provide and enhance the brickwork that will be needed as part of our future environment. The trainees I am working with deserve the correct guidance and information which is provided by the awarding body for our industry in the form of the Construction Industry Training Board (the CITB) in conjunction with the City and Guilds Institute. These awarding bodies produce standards in the form of units which can be achieved at each level of the students' training. The CITB also provide guidelines to help and assist in teaching, which brings me to this new publication which has been designed especially to enhance the teaching of the apprentice bricklayer by concentrating his/her attention on these units.

The publication to which I am referring — *Brickwork NVQ and Technical Certificate Level 2* by Carillion — has been well thought out and based, as I understand it, on the concept as taught within the Carillion Construction Training Centres. It has been produced in such a way as to concentrate purely on helping the trainee to gain the knowledge and understanding associated with the NVQs and Technical Certificate units relevant to the bricklaying trade. It is a publication that could be recommended by tutors to their students and I for one will have confidence in encouraging my learners to use the book as part of their training. It has a large and comprehensive health and safety section which will help in concentrating the young, impressionable mind in the right direction so as to get a better understanding of this very important part of their education.

A few of the other subjects which are covered in detail include first, the building team from architect to the craft operatives; second, communication skills within the industry, including standard documentation; third, hand and power tools, and using them safely; fourth, setting out; and fifth, mixing mortar. In addition many of the technical skills such as bonding and cavity walls are covered in depth. All is designed and presented to help build confidence in the learner so that he or she can complete work activities effectively.

The design of the book is colourful with very clear photographs with good use of illustrations. The fonts are easy to read with not too much on each page which will enhance the learning process. The format, along with the easy to understand 'definitions' and 'remember points' will encourage the student to stick to the task of study by keeping it lively and interesting and therefore, hopefully, help them to gain the necessary knowledge.

The book has a very modern and up-to-date approach to the tasks that our trainees will find in the workplace with each chapter colour-coded and very clearly marked. It concludes with a useful glossary which defines all the words in bold in the main text. Finally, I am particularly impressed that the book encourages use of the link to its web page for further information. So, if the student wishes, they can avail themselves of this service which in modern times has become a popular way of gathering further information.

LES SKINNER

BRITISH BRICK SOCIETY
MEETINGS IN 2008

Meetings planned for 2008 include

Saturday 26 April 2008
Spring Meeting
The Forest of Dean
The society has arranged a visit to Coleford Brick in the morning, with a further afternoon visit..

Saturday 21 June 2008
Annual General Meeting
Amberley Chalk Pits Museum, Sussex

A Saturday in July or early August 2008
Welsh Meeting
Neath including St David's Church and other brick buildings in the town.

A Thursday in August 2008
Summer Meeting
Coventry, a town walk with brick buildings of various dates including the award-winning library for Coventry University. At the end of the visit there will be an opportunity to view the centenary exhibition at the Herbert Museum and Art Gallery on the work of Sir Basil Spence (1907-1976).

A Saturday in October 2008
London Autumn Meeting
West London: Hillingdon Civic Centre, West Drayton manor, Harmondsworth Church and Barn

Full details of meetings in the Spring Meeting are in this mailing
Details of meetings in June, July and August will be in the next mailing.

The British Brick Society is always looking for new ideas for future meetings.
Suggestions of brickworks to visit are particularly welcome.
Offers to organise a meeting are equally welcome.
Suggestions please to James Campbell, 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 addess.