

SUSSEX INDUSTRIAL HISTORY



ST. JOHN'S MILL EASTBOURNE © R. A. Martin
1997

Sheffield Park Garden – Brighton Tunbridge Ware Industry – Railway Cutting
Excavation – Eastbourne Mills – Tunnels of South Heighton – Sussex Lime Kilns

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SHEFFIELD PARK GARDEN STONE BRIDGE AND SLUICE

Ron Martin

INTRODUCTION

Sheffield Park is one of the jewels in the crown of the National Trust in Sussex and is located in the parish of Fletching at TQ 4124. It comprises 120 acres (40 hectares) of ornamental garden on a sloping site running down from the House to a stream at the bottom of a valley in which runs a tributary of the River Ouse. This stream has been dammed to create the two Woman's Way Ponds. There are two other lakes between the Upper Woman's Way Pond and the House, the Middle Lake and the Ten Foot Pond and to the southwest side of the garden is the Storage Pond (Fig. 1). The House is no longer part of the estate. The Stone Bridge, which is the subject of this article, is located at the outlet of the Ten Foot Pond and for purposes of descriptions, the bridge is assumed to be orientated due north - south with the Ten Foot Pond at the west side. The bridge was investigated in January and February 1997, during the period that it was being demolished prior to reconstruction.

HISTORY

The property had various owners prior to its purchase in 1769 by John Baker Holroyd who was created the Earl of Sheffield. By 1774 the House was rebuilt by James Wyatt in Gothic Revival Style¹, the Woman's Way Pond was constructed by damming the stream and an Upper Lake formed on about the site of the Ten Foot Pond.² It is known that Lancelot 'Capability' Brown in 1776³ and Humphrey Repton in 1791 were both consulted about improvements to the gardens but it is uncertain what these recommendations were and to what extent they were acted upon. By 1791 the Woman's Way Ponds had been divided into the Upper and Lower Ponds with the Cascade between the two. There are various maps of different dates showing the lakes and these show a variety of different sizes and locations and thence cannot be relied on, probably due to inaccurate surveying or mapping.

A wheel pit and pump located at TQ 420242 was investigated in 1996 by members of the Society. Although no very firm conclusions were arrived at it was probably part of an earlier attempt to provide water for the garden.

In 1876 the 3rd Earl of Sheffield inherited the property and started developing the estate. He was a keen

cricketer and organised visits to this country of the Australian cricket team. For many years the first match of the season was played at Sheffield Park against the Duke's Eleven on the ground which was created on the east side of the Woman's Way Ponds. He was very keen on improving the gardens and eager to show off his improvements to the many visitors to the estate.

The Earl evidently had a rapport with the local press and over the years between 1881 and 1886 there were frequent and detailed reports of the activities at Sheffield Park. There are account of work being done over most winters. The Earl was pleased to provide work for a very large number of workmen during the winter months.⁴ He also would have wanted the work of each winter completed so that the place was neat and tidy for his visitors to come and admire his improvements later in the year.

During August 1881 boring was undertaken to provide water to irrigate the cricket ground but this proved inadequate.⁵

By May 1882 the Storage Pond for 100,000 gallons had been created. This was fed by a pair of hydraulic rams which are still extant and are located beside the Cascade between the two Woman's Way Ponds. These were supplied by Messrs. Green and Carter on 18th. January, 1882 and were capable of supplying 6 gallons per minute.⁶ This would have been sufficient to fill the Storage Pond over a period of some two weeks working continuously. These hydraulic rams have recently been restored by the original manufacturers and new pipes installed to feed directly into the Ten Foot Pond but this has not proved satisfactory and has been abandoned as the major source of water but are run occasionally for public interest.

During the winter of 1882-83 the Ten Foot Pond was enlarged and two other lakes were formed beneath the waterfall creating the Middle Lake. A 50 h.p. engine, possibly a coal-fired producer gas engine, was installed in a pump house located close to the Lower Woman's Way Pond. This building is still extant, although devoid of any machinery, is mainly underground, with brick walls and a flat concrete roof. There is a large opening skylight across one end and a circular header tank adjacent. The water was pumped through a 27" diameter earthenware pipe into the Storage Pond and from which there was a 24" diameter earthenware pipe taking water by gravity into the Ten Foot Pond.⁷ On the survey map drawn by Duke and Ockenden Ltd. in October, 1912 these pipes are shown and the pumps were described as "centrifugal". This map indicates a "Sluice Chamber" at the entry to the Storage Pond but inspection of this would seem to show that this is a branch chamber with one pipe going directly into the Storage Pond and the other

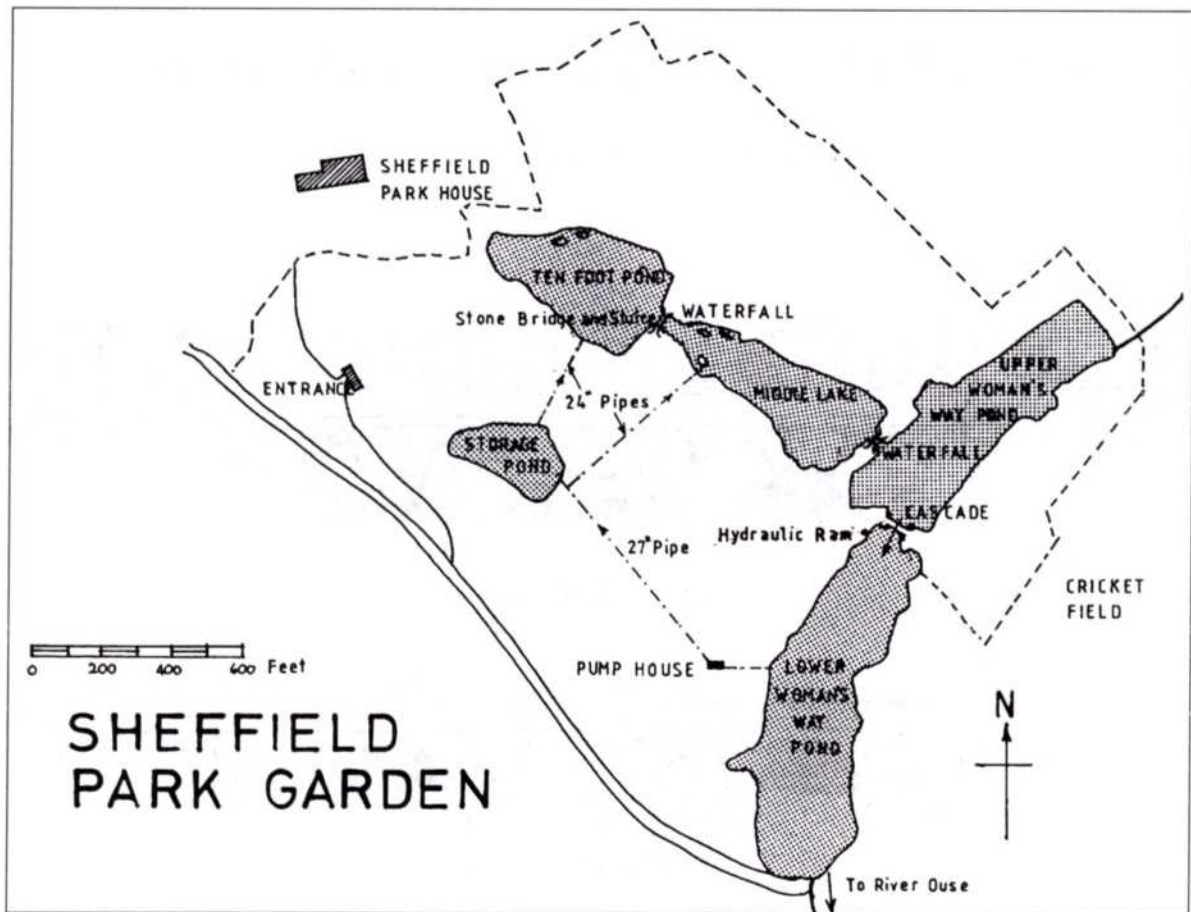


Fig. 1

going northwards possibly directly into the Ten Foot Pond. This would have enabled the Ten Foot Pond to be topped up both from the Storage Pond and from the Pump House.

During the winter of 1883-84 the waterfall between the Ten Foot Pond and the Middle Lake was reconstructed with several tons of rock being used. By April 1884 it was reported that water was being discharged down the Upper Waterfall (Grand Cascade) at the rate of 160 tons per minute.⁸

During the winter of 1885-86 the Storage Pond was raised by 3 feet to accommodate an extra 4,000 tons of water⁹ and in January, 1886 it was reported that "some thousands of tons of water every minute fall over the face of the cascade".¹⁰

DESCRIPTION

The bridge is 3.74 m (12'3") wide and of three spans 7.77 m (25'6") overall. The outer abutments are of local sandstone, part 150 mm (6") thick but thickened out to 300 mm (12") or thicker at the central part. The two intermediate piers are of brick 400 mm (1'4") thick the central span being 2.67 m (8'9"). These piers are

cranked, the span reducing to 2.29 m (7'6") at the west side. At the east (downstream) side the piers are thickened to 685 mm (2'3") thick with the central span 1.82 m (6'0") and the outer spans reduced to 1.22 m (4'0") with additional side walls (Fig. 2).

Located in the centre of the middle span is a cast iron sluice with a tail race 1.82 x 0.60 m (6'0" x 1'11") and 0.99 m (3'3") long. The sluice gate is panelled and diagonal braced, sloping at 25° from the vertical, pivoted at the top and operated by a quadrant rack at each end with pinions. These are mounted on a 2" diameter shaft which runs towards the north abutment and turns through 90° by way of bevelled reduction gearing with a cast iron spur wheel and a bronze pinion. The shaft passes through the north end of the east wall where it presumably was connected to a vertical shaft and control wheel where there is a cast iron position indicator.

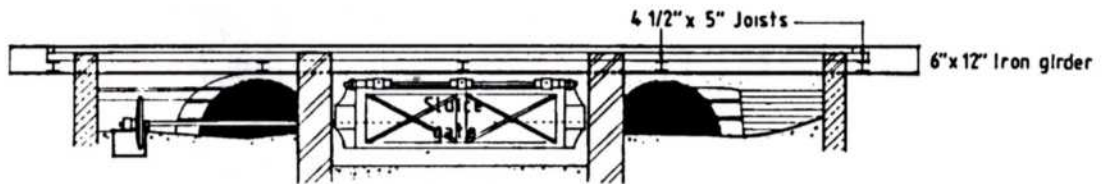
At the west side 300 mm (1'0") clear of the bridge structure is a 400 mm (1'4") thick dam wall built on a concrete base with a segmental arched opening to the central span. The two outer bays are pierced with 8" diameter cast iron pipes with gate valves. There is another valve located at the bottom of a pit a short distance into the Ten Foot Pond with a low level pipe

SHEFFIELD PARK GARDEN FLETCHING

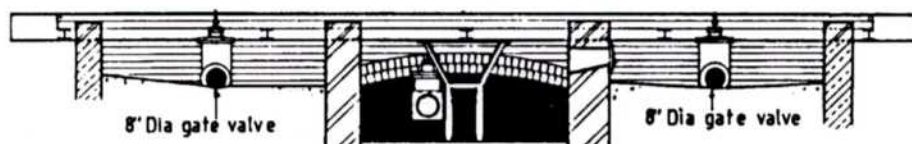
STONE BRIDGE AND SLUICE



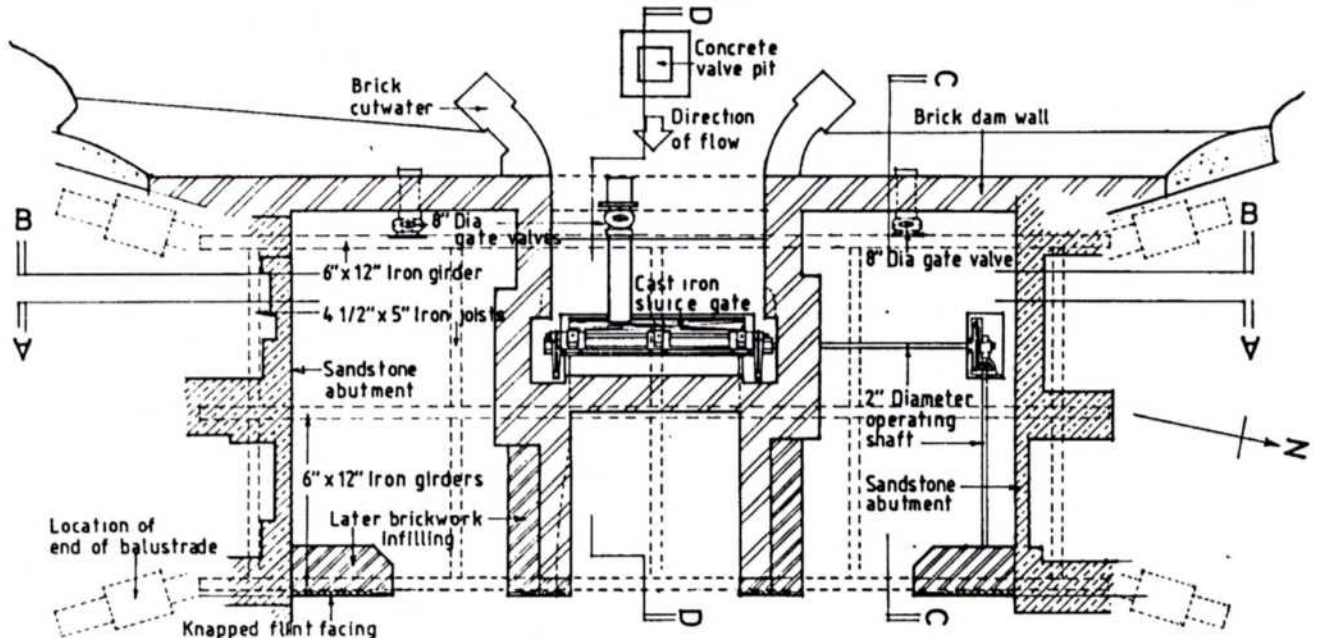
EAST ELEVATION



SECTION A-A



SECTION B-B



PLAN OF SUPPORTING STRUCTURE

Fig. 2

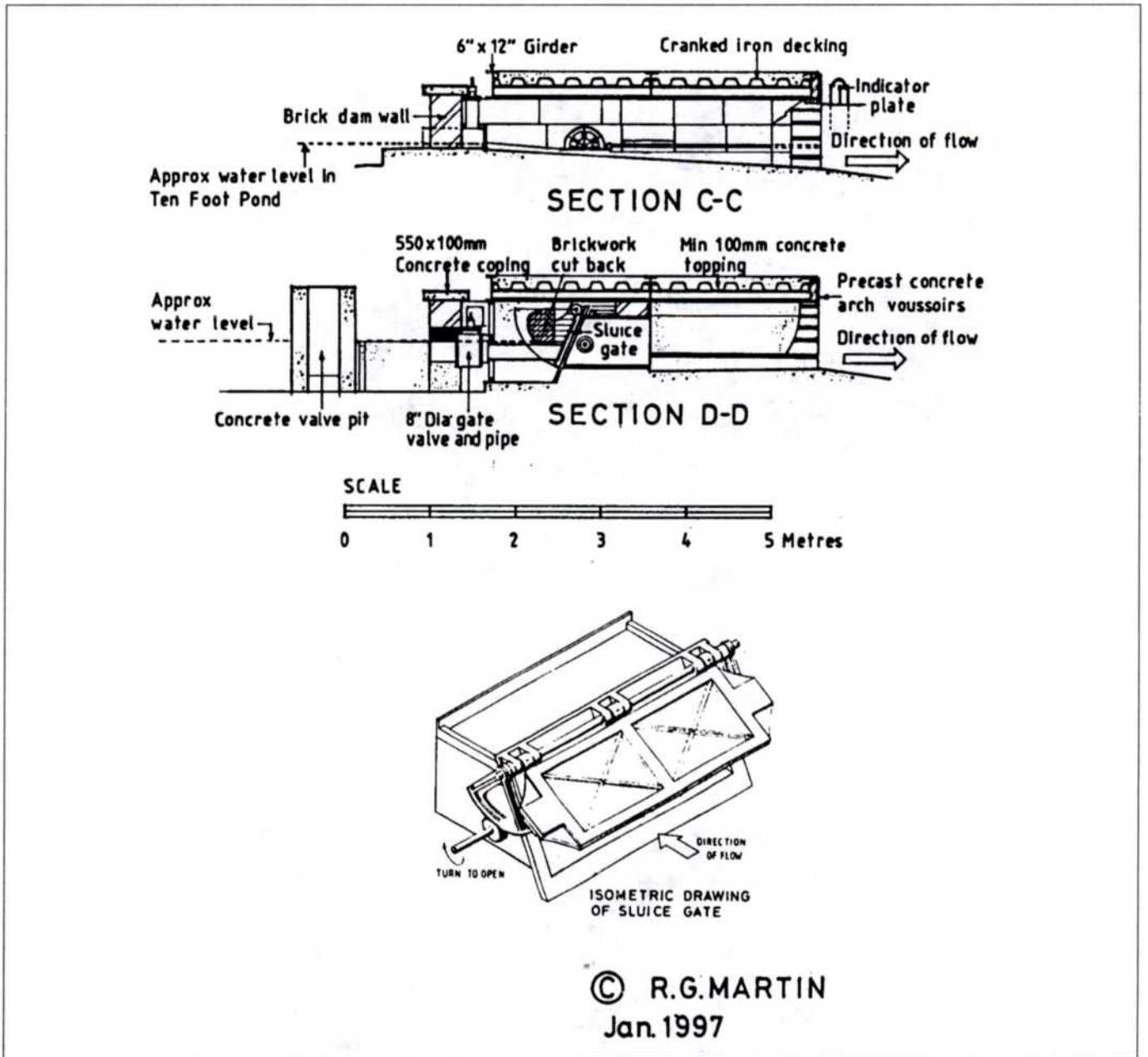


Fig. 3

running under the sluice to discharge part of the way down the waterfall. Yet another 8" diameter pipe with a gate valve is located in the centre span and a hole has been cut through the bottom of the sluice gate to accommodate this.

The bridge structure comprised steel cranked decking supported by five lateral 4½" x 5" steel joists which were in turn were supported by three 6" x 12" longitudinal steel girders. The decking was in 600 mm (1'11") widths and was riveted together along the long edges at 100 mm (4") centres and to steel angles bolted to the sides of the 6" x 12" girders. Also the decking was twice bolted at 150 mm (6") centres to the 4½" x 5" joists. The decking was topped with 100 mm (4")

concrete, finished with compacted sandstone chippings. Fastened beneath the centre of the west 6" x 12" girder was an H-shaped bracket of tee-section members. At the west end of the north intermediate pier is a cast iron plate incorporating a bronze bearing angled downwards 15°. If this line was projected it roughly coincided with the cross member of the H-shaped bracket. A steel flat connects this to a vertical rod which is built in to the soffit of the arch. There seems to be no explanation for any of this.

The bridge balustrade is of sandstone with a base, coping and turned balusters, and a solid central feature bearing a coat of arms. The balustrades were supported by the outer 6" x 12" steel girders and had

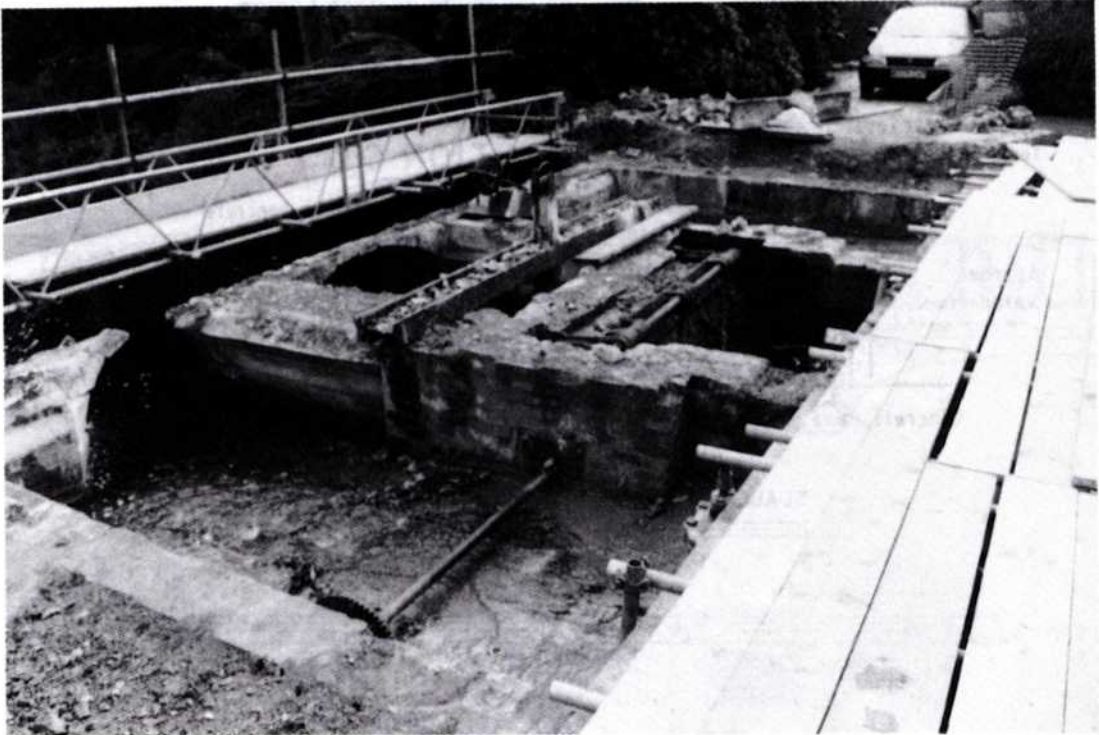


Fig. 4 General view from the north-west during demolition of old bridge

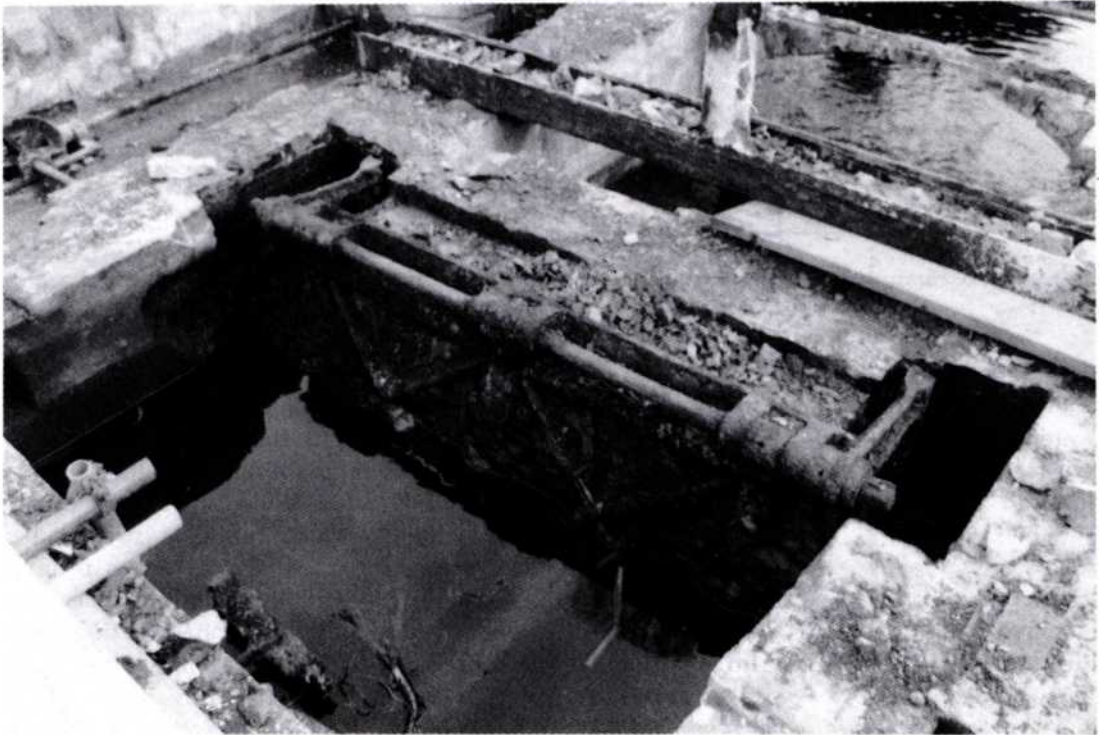


Fig. 5 The sluice gate during demolition of old bridge

been removed at the time of the survey but have been reinstated after the bridge decking was rebuilt. The east side of the bridge is faced with random knapped flints with false precast concrete arch voussoirs bedded on to the brick backing or the outer 6" x 12" steel girder before this was removed.

CONCLUSIONS

The outer sandstone abutments suggest that these predate the rest of the structure. The view from the house across the Ten Foot Pond would have been considered important and it seems probable that a bridge would have been constructed here possibly in the time of 'Capability' Brown or Repton. The fact that part of this abutment is increased in thickness suggests that this was where the bridge was supported. There is no way to determine whether this was a single or a multi-arch bridge.

Judging by the work that was carried out each winter between 1881 and 1886 it would appear that the Third Earl was continuously developing the gardens and the water systems. He did not necessarily get things right first time.

The work of 1881-82 created the Storage Pond but it is unlikely that there was a very effective supply of water from the two hydraulic rams installed during that winter. The flow of water down the waterfall could have been controlled by the valve at the outlet of the Storage Pond. The following winter, in 1882-83 the water supply was increased by the construction of the pump house and engine with the interconnecting water pipes and a considerable flow of water could have been possible. This may have given the Earl the idea of producing a really spectacular flow of water.

To achieve this he probably installed the sluice in the winter of 1883-84. The 160 tons of water that were reported as flowing down the cascade could only have been achieved by holding back the water and then releasing it in a torrent for a comparatively short period. This was probably the reason for the type of sluice fitted. But did it work? The flow of water would have been 2 foot deep, the force would have been enormous and the erosion to the waterfall considerable. The two 8" diameter pipes and control valves in the outer spans would have been used to provide a modest flow down the waterfall at other times. The side walls of the central piers are rendered similarly to the outer west side of the dam wall. It is possible that at this time there was no large bridge in position. The Earl would have been anxious to show off his new apparatus and a simple timber bridge and viewing platform could have been provided.

Having determined that the massive torrent was impractical it is possible that the use of the sluice was abandoned and the steel decking was built over the top of the existing structure. It seems inconceivable that the bridge would have been built in the form used if the sluice continued to operate. Access to the sluice would have been impracticable as there was no trap in the decking for the purposes of maintenance and the clearing of debris. Furthermore cutting through the bottom of the sluice gate for the central 8" diameter pipe would have been extremely difficult with the bridge structure in situ. The construction of the arches at the east side and the thickening of the central piers and the stone balustrades would have all been done in possibly 1885 or 1886.

COMMENTS

The conclusions arrived at are based on the known historical facts and reports coupled with the evidence of the site itself.

The construction of the steel decking and supporting beams did seem over-designed considering that it was only intended to be a garden bridge with no heavy vehicles using it.

It seems strange that the decorative side of the bridge (after say 1885) was the east side, where the views of this were beyond the waterfall whilst no attempt was made to beautify the west side where there were views from the house across the Ten Foot Pond.

The Report on 1886 of "thousands of tons of water every minute" flowing over the waterfall must be disregarded as journalistic exaggeration. The earlier figure of 160 tons per minute could be achievable through the sluice for comparatively short periods but anything greater would have been quite impossible.

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6. *Ibid.*, 02.05.1883, p.3
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BRIGHTON'S TUNBRIDGE WARE INDUSTRY

Brian Austen

The popularisation of sea-bathing from the mid-eighteenth century was, in the matter of a few decades, to transform Brighton from a decaying town reliant on fishing and the sea-carrying trades, to a thrusting boom town dedicated to health and the pleasures of life. The first sea-bathers, concerned to promote their health, had arrived in the 1730s and it was the publicity given to sea water cures by Dr. Richard Russell, and his residence in the town from 1754, which stimulated growth. As at inland spas medicinal requirements were rapidly overtaken by the need for facilities that would promote social activity and entertainment. By 1754 an Assembly Room existed at the Castle Inn and another was added at the Old Ship in 1761. Six years later a Master of Ceremonies was appointed. The first visit by royalty was in July 1765 by the Duke of Gloucester.¹ Tradesmen were attracted to the town to serve the visitors, such as booksellers and librarians, toymen, perfumers and milliners. There was a demand for attractive and fashionable objects that would provide memories of the time spent in the town, or presents for those family or friend at home. It was to service this need that the Tunbridge ware industry developed in Brighton.

Libraries played an important part in providing for the needs of the visitor. They were not only places where books could be borrowed and newspapers and periodicals read, but were centres where Society met. They maintained registers listing the arrival of fashionable visitors, acted as a focus where visitors could meet and take their ease and provided entertainments, sometimes musical. They were also providers of the fashionable trinkets which visitors were anxious to acquire. The first library to open in the town was established by a Mr. Baker who set up business for the season in 1760. His premises faced the Steine on its east side, and were maintained on a seasonal basis for several further years, before becoming permanent. Baker died in 1764 and the business subsequently traded under the direction of a Mr. Thomas, to be followed by Dudlow, Gregory, Donaldson and Lucombe. A rival establishment operated by a Mr. Woodgate was open by 1765 and was situated on the south side of the Steine near Russell House. This was subsequently to be managed by a Miss Widdgett, Mr. Bowes, Mr. Crawford, Mr. Fisher and Mr. Shaw.² It is very clear that these libraries from their establishment were important stockists and sellers of Tunbridge wares. Decorative wooden boxes for writing materials, sewing, jewelry,

the storage of tea and the vending of cosmetics and other products, and small turned wares such as pin cushions, had by the end of the eighteenth century been familiar products to visitors to Tunbridge Wells for over a century. It is therefore little surprise that these also appear at Brighton in the late eighteenth century and were important stock of the libraries in the town. Direct sale was not the only method of disposal for they provided ideal prizes for the "raffles" organised by library proprietors. The author of *The New Brighthelmstone Directory* (1770) noted the way that Brighton libraries as early as this date were using part of their premises as shops "stocked with china and gay toys" where the goods might be "set up for sale, by the rattling of dice". The stock at Fisher's Library in 1800 included "Jewelry, Stationery, Perfumery, Tunbridge-Ware, Canes, Gloves, Toys &c". Ruffling in public places was to be banned by law but librarians got round the act by resorting to trinket auctions and the adoption of a game called "loo" which involved the staking of money. In 1810 a case was brought against both Donaldson's and Walker's Libraries and it was heard before the Lewes magistrates but failed. A further prosecution in 1817 did however have a greater degree of success, though its effect was probably short-lived for in 1826 Lucombe's and Tuppin's Libraries were stated to be distinguished by the crowds which flock to them every evening ... to partake of the Loos conducted".³

The Tunbridge ware disposed of in Brighton in the period before c.1810 was, in common with other fashionable wares, sourced from outside the town. The closeness of Tunbridge Wells made its supply easy. By the late eighteenth century visitors might easily take in both towns in their excursion, and it is possible that the stocking of the ware at Brighton came as a result of visitors who had noticed it at the Kentish spa. There were a number of makers at Tunbridge Wells and it is unclear which of these initially supplied Brighton libraries. By the turn of the century however the picture is clearer and one of the suppliers to Donaldson's Library, and probably other outlets in the town, was the firm of Thomas Wise, later George Wise, of Tonbridge. This firm commissioned the production of their own topographical prints which were used to decorate their boxes. They adopted the procedure of pasting the title, and often the imprint including the date of publication below it, inside their boxes thus identifying their wares. The earliest Wise print with Brighton associations was a circular map entitled "The Environs of Brighthelmstone" and "Published 12 Sept 1800". This is known decorating the lids of small turned whitewood boxes with screw thread opening. Other larger rectangular prints by Thomas Wise include "View of the Pavilion 25 March 1803" and "1 March 1806, "Marine Parade 1 March 1806", "The

Fish Market 1 March 1806" and "Mrs. Fitzherbert's House 1 March 1807". Prints published by his successor and nephew George Wise and used for box decoration are "The Royal Mews (Dome) 1 Apr 1807". "The Chapel Royal, North St. 1 Apr 1807" and "The Royal Pavilion", Donaldson's Library" and "Mrs Fitzherbert's House" all dated 1807. This suggests a great activity in commissioning prints between 1806 and 1807 and these no doubt continued to be used for box decoration in subsequent years. Apart from being decorated with topographical prints, Wise is known to have made a wide range of items decorated with paint or penwork. These are not identified with trade labels but would undoubtedly have been sold to Brighton stockists.⁴ Other West Kent suppliers to the Brighton market are more difficult to detect and the growth of local production in the early nineteenth century would have made the market less attractive to outsiders. Two prints are however known, "The Steine and Donaldson's Library 1 March 1808" and "The Marine Parade April 1808" with the imprint of Fenner & Nye of Tunbridge Wells. These are of a size suitable for box decoration and may well represent an attempt by this important partnership to break into the Brighton market.⁵

The success of wares made in Tonbridge and Tunbridge Wells spawned local manufacture which was to develop in the 1820s and 30s into a substantial industry. The author of an 1838 guide book was bold

enough to state that "The principal manufacture" of the town was Tunbridge ware.⁶ The Brighton industry probably dates from c.1810 and by 1818 was declared by one commentator to be "an object of importance" though he admitted that the manufactories were still in their infancy.⁷ In part the Brighton industry was established by craftsmen moving from Tunbridge Wells to the larger and more rapidly growing market on the south coast. William Upton proudly proclaimed on a label used to mark his wares "From the Original Place, Tunbridge Wells" (Fig. 8).⁸ Other major producers that set up do not appear to have a Tunbridge Wells connection. The firm of Morris, who operated a substantial manufactory at Brighton and were one of the leading fancy goods bazaars, appears to have had a London connection. Trade directories of the early nineteenth century show substantial numbers of Tunbridge ware makers and sellers in the capital. A trade card c.1815 of the Morris enterprise (Fig. 1) gives us a glance at the methods of production used in the industry. Depicted are scenes from their workshops at Trafalgar Place on the Level. One craftsman is shown operating a treadle lathe to produce turnery wares, whilst others work at benches on box production.⁹ Also shown is the decorating of the wares and the showroom. The Brighton trade specialised in whitewood wares, also widely made in the West Kent trade. Boxes and turnery items were produced from light coloured woods such as sycamore and then decorated with engraved prints and painted borders and sprays

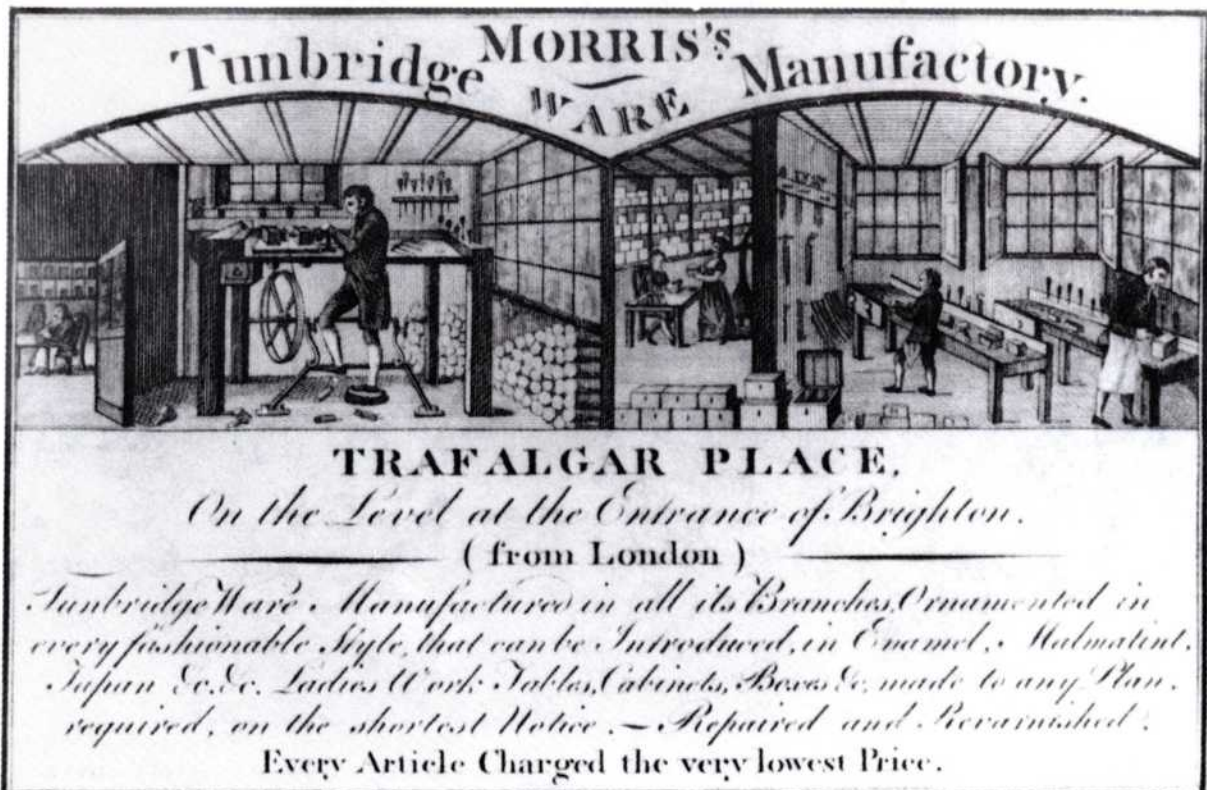


Fig. 1 Trade card of Morris, c.1815, showing the manufacture and decoration of whitewood and cabinet goods (British Museum - Department of Prints.)



Fig. 2 Whitewood wares of Brighton manufacture decorated with prints of the Chain Pier and Marine Parade or the Royal Pavilion. The two turned objects to the left in the form of the domes of the Royal Pavilion are a spice grater and box, and a sewing companion. c.1825-35.

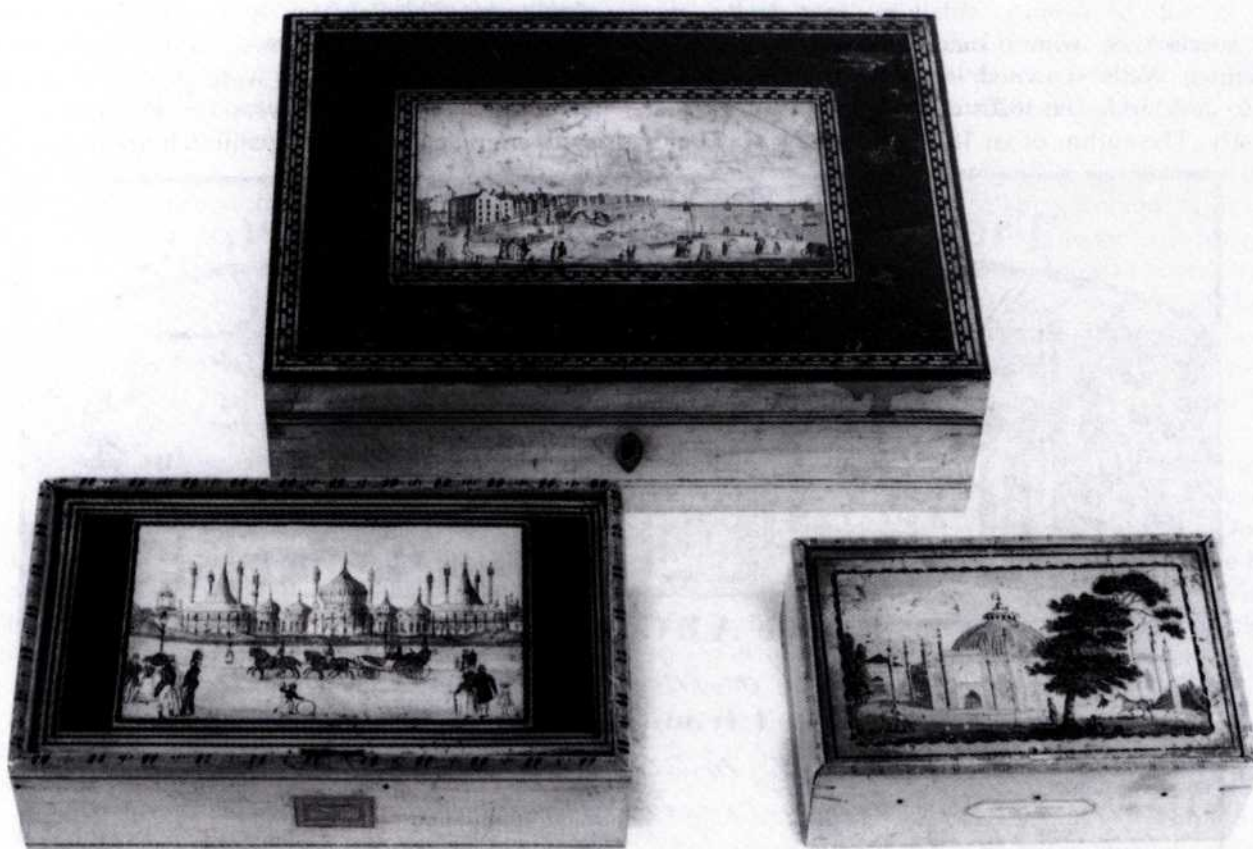


Fig. 3 Brighton made whitewood wares. The workbox with simulated rosewood finish to the lid at the rear is decorated with a print published by William Upton from 26 East Street c.1825 and the box front right with a print published by S.W. Morris c.1815. The box front left has a pencilled date on the base "27 Dec 1832".

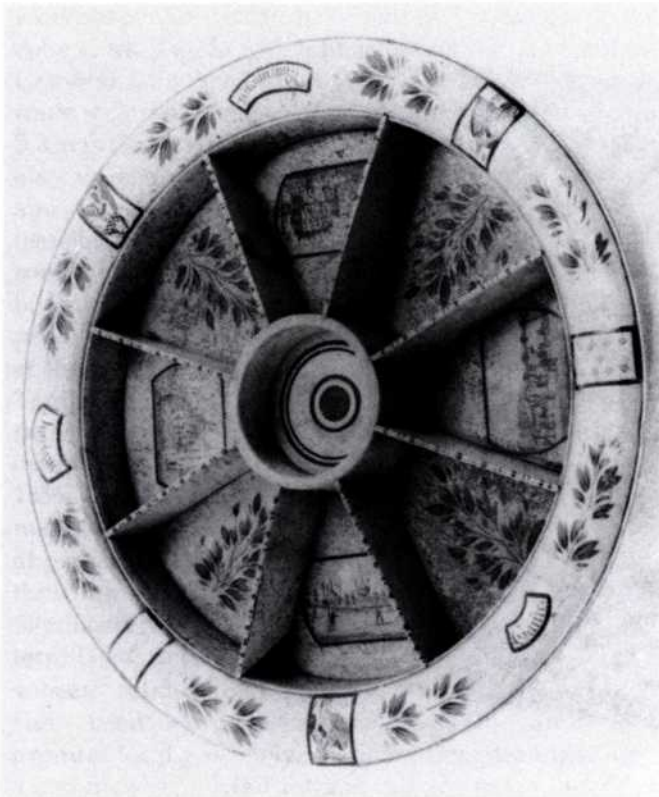


Fig. 4 Whitewood wheel used in connection with the card games Pope Joan and Matrimony decorated with small coloured prints of the Royal Pavilion, the Royal Mews, Donaldson's Library and the Parade and Chain Pier c.1825.

of flowers and foliage. An alternative was to use penwork. A dark, dense black ink was used to produce decorative borders or even to completely cover the box with floral sprays and landscapes. Penwork was particularly used for items decorated in the Chinese taste, revived in part because of the Prince of Wales' interest in the style. Turned wares, apart from boxes, were pin cushions, sewing clamps, needle and pen cases and were similarly decorated. Smaller items might be related to the town of purchase by the application of printed paper labels inscribed "A BRIGHTON GIFT", "A TRIFLE FROM BRIGHTON", "A GIFT FROM BRIGHTON", "A Present from BRIGHTON" etc. A particular Brighton speciality from the 1820s was the production of sewing companions, nutmeg graters and spice boxes and writing sets shaped like the domes of the Royal Pavilion¹⁰, then recently converted to the "Hindoo" style by John Nash. The detail was applied to these in paint or ink (Fig. 2). Some Brighton makers scorched whitewood items to simulate tortoiseshell. All whitewood wares were finished by applying number of coats of clear varnish and in their finished form would have presented to the public a bright and attractive appearance at an affordable price. In use however such wares were liable to deteriorate as the surface became scratched; and the varnish over a period of time would tend to go dull. Makers therefore found it necessary to offer a refurbishment service to clients whose wares had deteriorated.¹¹ The number of manufacturers in Brighton was never large and nor did these enterprises employ large numbers of workmen. Their output was however considerable for they not only had to supply their own showrooms but

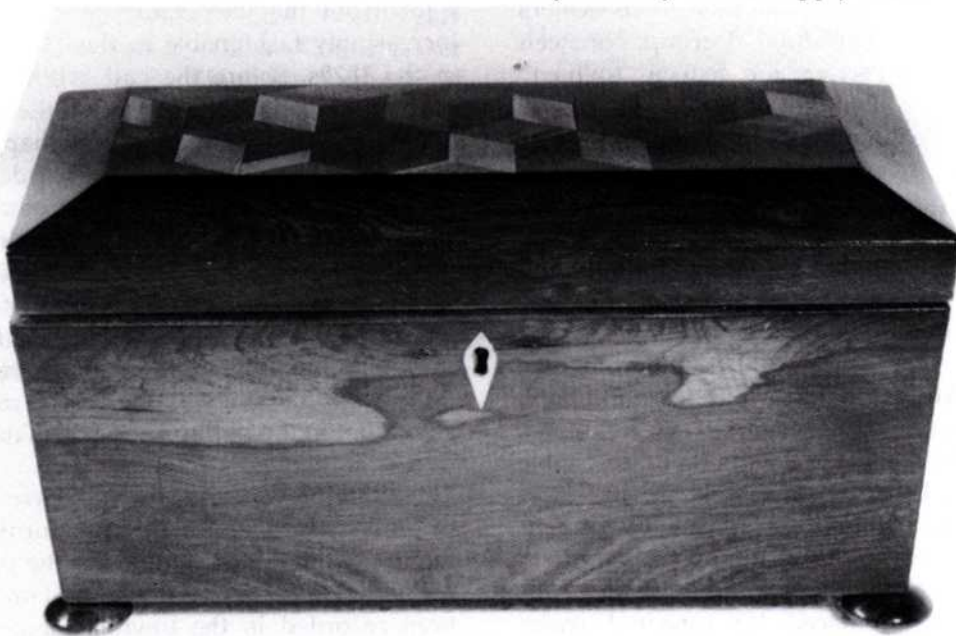


Fig. 5 Rosewood tea caddy, the top decorated with perspective cube work. The base bears the label "CHEESMAN ... No.9 CRANBOURN STREET" c.1830.



Fig. 6 Rosewood stationery box, the lid decorated with a tessellated panel of a boy in a kilt (Edward, Prince of Wales) and the front with perspective cube work. Tessellated borders surround both. Label on base "W M UPTON Tunbridge Ware Manufacturer No.5 KINGS ROAD" c.1855. (Tunbridge Wells Museum).

also the libraries and the numerous shops in the town retailing fancy goods in general. Brighton directories tend to group manufacturers with fancy goods dealers and together they form a substantial group. Nineteen were listed in a 1822 directory and sixteen "toymen" or "toy dealers" were identified in 1832. All of these would have been dealing in small decorative items aimed in the main at an adult market.¹²

Although the Brighton trade produced mainly whitewood wares, attempts were made to simulate fashionable wood veneers such as Brazilian rosewood by staining and graining (Fig. 3). Whitewood wares were not unique to the Brighton trade but were also produced in the West Kent Tunbridge ware industry. In that area however boxes veneered in rosewood, burr yew, amboyna, coromandel and other fashionable timbers probably played a larger role in the trade. Most of the items sent to Brighton for sale by Thomas Wise and George Wise of Tonbridge were veneered. Whitewood wares declined in popularity in the West Kent industry being replaced by veneered wares additionally decorated in parquetry. Using contrasting woods of fine grain pattern, veneers could be assembled resembling a series of cubes viewed in perspective (Figs. 5, 6) or borders of contrasting woods

of elongated triangular shape set base to apex (vandyke work). Such patterns had been known in the trade from the late eighteenth century but became increasingly fashionable in the Tunbridge Wells area in the 1820s. Before the end of this decade attempts had been made to miniaturise the parquetry using mainly triangular and diamond shapes in contrasting woods and elegant geometrical borders and bandings could be produced. To increase production and reduce costs the parquetry could be assembled in the form of blocks from which identical veneers could be sawn. The early 1830s were to see the use of small, square or rectangular tesserae which enabled the depiction of flowers, animals, butterflies and even buildings. This tessellated mosaic is the form most commonly associated in the public mind with Tunbridge ware.¹³

The skills of veneering would have been present in Brighton which had a thriving furniture industry in the early nineteenth century. In the period up to 1840 no fewer than 186 furniture making businesses had been recorded in the town.¹⁴ Many of these would have had facilities for veneering. Some Brighton Tunbridge ware makers undoubtedly did turn their attention to veneered wares. A maker named Cheesman was manufacturing rosewood veneered

workboxes and tea caddies decorated with perspective cube work (Fig. 5) which he sold from an address at 9 Cranbourn St., West St. in the 1830s. Items bearing the trade stamp or label of William Upton and the address 5 Kings Road, where he traded in the early 1850s, were also veneered and decorated with perspective cube and tessellated mosaic (Fig. 6). It is unclear if the tessellated mosaic was manufactured in Brighton and some of the items with Upton's labels would appear to be imports from Tunbridge Wells. He may well have produced the perspective cube work and the majority of the items that he sold. Other traders claiming to be Tunbridge ware manufacturers also exist such as Benjamin Whittaker, who declared his business, operating from 1a Hampton Place, Western Road from 1856 as a "tunbridge ware and fancy cabinet manufactory". Items bearing his label do however appear to be identical in shape, style and decoration to those made in the Tunbridge Wells trade.¹⁵ Significantly, no Brighton buildings are known in tessellated mosaic. Although it is likely that tessellated veneers produced in Tunbridge or Tunbridge Wells were used by Brighton makers, some attempt to produce locally is likely. A trinket box, decorated with a complex tessellated mosaic design, unlike anything known in the West Kent trade, is recorded with a Morris label, and probably dates from the 1840s.¹⁶ No other Morris examples are known. It is likely that even in the 1840s the majority of the items produced in the Brighton trade were still whitewood wares.

This is confirmed by the dress of the figures shown in Brighton prints used for box decoration. By the late 1840s the Brighton industry was in terminal decline. Tunbridge wares were still sold at Brighton but largely by fancy goods dealers such as William Childs, father and son, who traded from 53 Kings Road (corner of Middle Street), later renumbered 51, from 1844 to the closure of the business in 1873. A directory of 1867 described the business as a 'wholesale and retail English and foreign fancy toy, cabinet and papier maché warehouse'.¹⁷ The census of 1861 recorded only two Tunbridge ware makers in the town.¹⁸ The local industry that had commenced around the end of the first decade of the nineteenth century, by the 1820s and 30s had a production probably equal to that of West Kent, but in the two decades that followed was to totally collapse.

NOTES:

1. Sue and John Farrant, "Brighton 1520-1820: From Tudor Town to Regency Resort", *Sussex Archaeological Collections* 118 (1981) p.342; Clifford Musgrave, *Life in Brighton* (1970) pp.65, 73-75.
2. Henry Smith, *Eighteenth Century Books etc relating to Brighton* (Hove nd 1994) p.3; John and Jill Ford, *Images of Brighton* (Richmond on Thames 1981) pp.80-82.
3. Ford *op.cit.* pp.81-82; *Brighton New Guide* (Brighton 1800) advertisement; Anon., *The New Brighthelmstone Directory* (1770) p.41; R. Sicklemore, *An Epitome of Brighton* (Brighton 1815) p.60; C. Wright, *The Brighton Ambulator* (1818) p.147; *Baxter's Stranger in Brighton & Guide* (Lewes & Brighton 1826) p.27.
4. Observations based on boxes in the Brighton Museum and other collections.
5. Both prints in the collection of Brighton Public Library. Both are known also with the imprint of J. Izard, a Brighton Tunbridge ware maker.
6. Anon., *The Stranger's Guide in Brighton* (Brighton 1838 p.28).
7. Wright *op.cit.*
8. Workbox in the Tunbridge Wells Museum collection. Label illustrated in Brian Austen, *Tunbridge Ware and Related European Decorative Woodwares* (new edn. 1992) p.171.
9. British Museum, Department of Prints, Banks Collection 122.13.
10. Graves, Son & Pilcher (Hove) sale 24 May 1977 lot 503; Bracketts (Tunbridge Wells) sale 16 May 1977 lot 15.
11. See Morris trade card p.9
12. *Baxter's Stranger in Brighton & Directory* (Brighton 1822); T.A. Swaysland & J. Gill, *A New Directory of Brighton* (Brighton 1832).
13. For details of these changes see Austen *op.cit.* pp.53-57, 82-97.
14. Angela Evans, *Index to the Dictionary of English Furniture Makers 1660-1840* (1990) pp.17-18.
15. For example a triangular shaped stationery cabinet decorated with a representation of Pansies, Sotheby Sussex 20 April 1993 lot 169
16. Displayed in an exhibition of Tunbridge ware organised by Derek Roberts of Shipbourne Road, Tunbridge, Nov. 1981.
17. Austen *op.cit.* pp.76-77, 247; *Post Office Directory* (1867).
18. *Census of England and Wales for the Year 1861: Population Tables*, Vol. II (1863) p.xxxviii.

APPENDIX
A DICTIONARY OF BRIGHTON
TUNBRIDGE WARE MANUFACTURERS.

This dictionary contains the names of those who claimed to manufacture Tunbridge ware. For a full listing of Tunbridge ware stockists in Brighton see Brian Austen, *Tunbridge Ware and related European Decorative Woodwares* (new edn. 1992) pp.246-249.

Abbreviations used:

- Austen – Brian Austen *Tunbridge Ware and related European Decorative Woodwares* (new edn.1992)
- BM. – British Museum
- BRL. – Brighton Reference Library
- D. – Trade Directories
- ESRO. – East Sussex Record Office, Lewes.
- Ford. – John & Jill Ford, *Images of Brighton* (Richmond-on-Thames 1981)
- PRO. – Public Record Office

CAMFIELD, William, Tunbridge ware and brush manufacturer, 76 St. James' St. (fl. 1851-59).

Described purely as a brush maker as early as 1858 and continued trading as a brush maker and cooper as late as 1868. A George Camfield, box maker, is recorded in the baptismal register of St. Nicholas on 21 Oct 1821. His daughter Elizabeth married at the Chapel Royal on 19 March 1843. George Camfield's trade was listed as Tunbridge ware manufacturer. The relationship of George Camfield to William Camfield is unknown [D; ESRO. PAR 259/1/3/15].

CHEESMAN, Tunbridge ware manufacturer, 9, Cranbourn St., West St. (fl. 1830s).

Two labelled items by this maker are known, a rectangular rosewood veneered workbox and a sarcophagus shaped rosewood veneered tea caddy with two tea compartments and provision for a sugar bowl (Fig. 5). Both bear the paper label of this maker on the base but the labels are not identical. On these labels he described his trade as "Turner and Tunbridge Ware Manufacturer". He claimed to have been formerly employed by "Morris's" and offered for sale "Ladies Work Boxes, Fire Screens &c" which were made on the premises. He offered also plain whitewood boxes for decorating with prints and offered to refurbish existing boxes, the appearance of which had deteriorated. He does not appear at the Cranborn St. address in any trade directories nor in surviving rate books and may have been a sub-tenant. [Austen p1 10a, 10b, Fig. 26, pp.37, 74]

CHEESMAN, Thomas, Tunbridge ware manufacturer, Riding School Lane (fl. 1832).

Appears only in *Pigot & Co's National London & Provincial Directory* (1832). On 14 June 1818 his son William was baptised at St. Nicholas. The father's address was given as Richmond Row and his trade as "Turner". He was still at this address in June 1823. By 30 August 1825 he had moved to Albion St. A print of the front of the Royal Pavilion exists in the Brighton Museum & Art Gallery and bears the imprint of T. Cheesman. It was derived from J. Bruce, *The History of*



Fig. 7 Trade card of Morris showing the Royal Repository, Richmond Place on the left c.1830 (Henry Smith Collection).

Brighton and was included in several editions from 1827 to 1834. Two whitewood workboxes displaying a near variant of this print, with simulated rosewood surrounds and penwork borders, are known in a private collection. The Cheesman trading at 9 Cranbourn St. may be the same person. [D; Ford pp308-09]

CONNARD, Edward, 21 East St. (fl. 1822)

The business was described in *Baxter's New Brighton Directory* (Brighton 1822) as a "Brighton Ware Manufactory" but in T.H. Bore, *Brighton Annual Directory* of the same years as a "fancy japanner", a term which would suggest either lacquer or more likely penwork decorated wares. The trade card of a Tunbridge ware maker called "Connard", operating at Tunbridge and dating from c.1800 is known. [D; Messenger/Cavendish sale 21 July 1995 lot 899]

FRY, Richard, Tunbridge ware manufacturer, 57 Cavendish St. (fl. 1824).

Recorded in *Baxter's Stranger in Brighton and Directory* (Brighton 1824) and paid rates, valuation £1.16s (£1.80) in August 1824 at this address. The baptism of a son and daughter are recorded 1825-30 when the father recorded his trade as "Tunbridge Ware Maker". On 22 May 1825 and 26 August 1827 living in Nelson St. and on 21 Feb 1830 at Carlton Row. [D; BRL.SB351.2 BRI; ESRO PAR 255/1/2/4, 255/1/2/5]

IZARD, John, Tunbridge ware manufacturer and fancy repository, 18 St. James' St. (fl. 1822-50).

After 1851 the business was carried on for around a further ten years from the same address by his son Frank William. His baptism is recorded on 13 Sept 1829. The son however declared his trade as "toyman" and manufacturing had probably ceased by this date as he was employing only one man and a boy. John IZARD may have been a substantial manufacturer but did not identify his wares by the use of trade labels. A substantial number of Brighton prints, of a size suitable for box decoration, bear his imprint. The scenes depicted include the Marine Parade, the Chain Pier, Mrs. Fitzherbert's House, the Pavilion, the Royal Mews and the Royal Crescent. [D; ESRO. PAR 255/1/2/4; PRO. HO107/1644; Ford]

MORRIS, Abraham, Tunbridge ware manufacturer, 26, 27 & 28 Richmond Place (fl. 1835-48).

Son and successor of Sergeant Witten Morris. Baptism recorded 30 Mar. 1817 when his father's address was given as John St. A billhead of 1840 describes the business as "Fancy Cabinet, Desk, Dressing Case, Work Box and Tea Chest" manufactory. He also described himself as a "Turner in curious inlaid woods" and offered "Work box and other Articles Revarnished equal to new". Jewellery, stationery and perfumery was retailed and old jewellery taken in part

exchange. The building from which the enterprise was conducted was close to the new church of St. Peter on the Level and was surmounted by a pediment with the inscription "MORRIS'S ROYAL REPOSITORY" and the royal coat of arms flanked by a lion and a unicorn (Fig. 7). Claims to royal patronage were frequently made in this period with little justification. Morris's did however supply the Lord Chamberlain's Department on a limited basis and in 1846 supplied four dozen "Cap Stands" at 30s (£1.50) per dozen for Windsor Castle. In 1839-40 an additional showroom was maintained at 79 Kings Road and in directories it is shown under the direction of Christopher Morris. An Edward Morris living at 4 Richmond Gardens also appears to have played a role in the business. A person of the same name also operated a "French & Fancy Repository" and traded as a Tunbridge ware Manufacturer from 47 George St. Hastings, 1839-40 and is likely to be the same person. [D; BRL. Erredge Vol. 8; SB 352.1 BRI 1844 Poor Rate Book; PRO. LC11/134/37; ESRO. PAR 255/1/2/2]

MORRIS, Sergeant Witten (sometimes referred to as John Witten), Tunbridge ware manufacturer, Trafalgar Place, later Richmond Place (fl. 1814-35).

At Trafalgar Place 1814-15 and from this address published an elaborate trade card illustrating the processes of production. By 1822 at 26 Richmond Place but the Trafalgar Place premises were retained and used as a "saw mill". By 1824 recorded as 26 and 27 Richmond Place. Not only was Tunbridge ware manufactured here but from this address he conducted the "Royal Fancy Repository", one of the most fashionable of the Brighton bazaars stocking jewellery, stationery, perfumery, apart from other fancy articles Morris published a number of Brighton prints, the subjects being the Pavilion (prior to John Nash's alterations), the Royal Mews, St. Peter's Church, the Morris Repository and even Martha Gunn, the renowned Brighton bather. The Royal Mews print has been recorded on a whitewood cotton reel box (Fig. 3). Morris did not normally label his wares but intermittently did so. A box with a print of the Chain Pier is known with the inscription in a frame above the view "FROM MORRIS'S REPOSITORY BRIGHTON". Other examples of the use of Morris trade labels have been recorded. S.W. Morris died in 1835 and the business was carried on by his son Abraham. [D; BM. Banks 122.13; BRL. SB 352.1 BRI Poor rate Book Aug. 1824; Ford 133, 604, 721; Bracketts (Tunbridge Wells) 4 Dec. 1987 lot 32]

ROBINSON, John, Tunbridge ware manufacturer & perfumer, 30 North St. (fl. 1822).

Listed in *Baxter's Stranger in Brighton & New Brighton Directory* (Brighton 1822) and also in T.H. Boore, *Brighton Annual Directory and Fashionable Guide* (Brighton 1822) where the street number is given

erroneously as 29. A John Robinson, Tunbridge ware manufacturer and perfumer traded from various addresses in London 1795-18 and also from an address on the Parade Tunbridge Wells 1792-1809. It is possible that he either moved to Brighton or ran an outlet in the town [D; Austen pp 254, 258; Margaret A.V. Gill, *Tunbridge Ware* (Princes Risborough 1985) p 5; Christopher Gilbert, *Pictorial Dictionary of Marked London Furniture 1700-1840* (1966) p.393.]

ROSE, John, Tunbridge ware manufacturer, 109 Trafalgar St. (fl. 1845-46).

Although the Post Office Directory shows him as a Tunbridge ware manufacturer, and this was the trade declared when his son Jacob Rose was married at the Chapel Royal on 22 Nov. 1846, *Leppard & Co.'s Brighton & Hove Directory* (1845) lists him as a beer retailer. [D; ESRO. Par 259/1/3/18]

SAUNDERS, Edward, toy & Tunbridge ware maker & Turner (fl. 1839-43).

At 14 Cheltenham Place (1839), then 26 New Road (1839-41) and subsequently at 3 & 4 Western Road, Hove. In 1843 he issued an advertisement under an impressive royal coat of arms. He stated his business to be that of a "Stationer, toy, comb & fancy repository, wholesale and retail, Tunbridge ware manufacturer, ivory, bone and hardwood turner". At his premises near Norfolk Square he offered to repair, revarnish and alter "Work Boxes and other Articles". The Tunbridge ware manufacturing appears to have ceased soon after 1843 though the business survived as a "toy & fancy repository and stationer" till as late as 1870. [D]

SOUCH, Frederick, Tunbridge ware manufacturer, 33 Ship St. (1822-24) and 113 St. James' St. (1832-33).

One 1822 directory declared his trade as Tunbridge ware manufacturer while the other records "toyman &c". By 1832 the trade is changed to "Moravian Worker"

UPTON, William, Tunbridge ware manufacturer (fl. 1822-59).

At 12 New Road (1818-22), 26 East St. (1824-35) with the addition of 6 Boyces St. (1824-28), 5 Pool Lane (1832-33), 5 Somerset Pl. (1833), 1 & 2 Kensington Pl. (1834-35), 94 Gloucester Lane (1839-55), 34 Old Steine (1844-45), 1 (later 2) Marine Drive (1845-48), 19 Pool Valley (1848), 5 Kings Road (1848-56), 68 East St. (1855). The multiplicity of addresses is perhaps a reflection of the fact that Upton tried to maintain retail warerooms in the fashionable part of Brighton (East St. and Kings Road for instance) and workshops initially in Boyces St., then Kensington Place and Gloucester Lane in the North Laine district. Upton was born at Speldhurst, Kent, a parish which included the Upper Walks (Pantiles) area of Tunbridge Wells. He was born

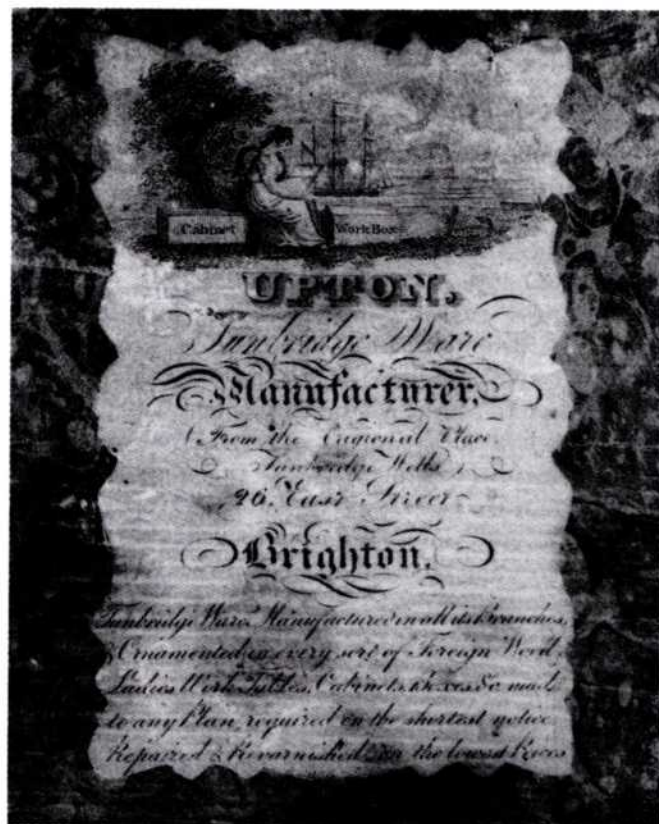


Fig. 8 Trade label of William Upton from the base of a workbox decorated with a print of the Parade and Chain Pier c.1825. (Tunbridge Wells Museum).

in 1799 and other members of his family were engaged in the trade. After moving to Brighton he may initially have worked for Morris for on 14 Feb 1815 he was living at Trafalgar Place and he declared his trade as "turner". By September 1818 he had moved to New Road and was declaring his trade as "Tunbridge ware maker". His son William, later to assist him in the business, was baptised on 20 Sept 1818. A fine workbox from the 1820s, decorated with a print of the Chain Pier and Marine Drive, is in the collection of Tunbridge Wells Museum and bears on its elaborate trade label the 26 East St. address (Fig. 5). He declared his ability to produce items "ornamented in every sort of Foreign Wood". The workbox has however simulated rosewood veneers and it is unclear if he was offering veneered wares or merely promoting his ability to simulate on whitewood wares in varnish and stain any fashionable timber. As other makers he offered to repair and revarnish wares tarnished in use.

Upton was to continue to manufacture in Brighton until the end of the 1850s. By this period the whitewood wares that he had been manufacturing in his earlier years had a limited public appeal. Upton turned his attention to veneered boxes, using Brazilian rosewood in most cases. He also appears to have used parquetry panels simulating cubes in perspective. He also used the tessellated square mosaic introduced into the West Kent trade in the early 1830s. The wares so

decorated bear his trade label with the No. 5 Kings Road address (1848-56) (Fig. 6). In 1855 he described his premises as a "Mosaic Tunbridge ware manufactory". It is however unclear if he was manufacturing the tessellated mosaic in Brighton or buying it in wholesale from Tunbridge Wells or Tonbridge. A box bearing an Upton label decorated with a view of St. Helena Cottage, the Common, Tunbridge Wells is very unlikely to be of Upton's manufacture. He certainly maintained a workshop at this period but may not have made all that he sold. His son William, who was assisting him in the 1840s, had by 1851 left the business, though another son Charles in this year declared his trade as "polisher" and was probably working for his father at 94 Gloucester Lane. The Miss Upton who retailed wares from 40a Old Steine 1858-59 and 68b East St. 1862-64 was probably related. A domed rosewood glove box with parquetry decoration is known with a label "From Uptons 40A Old Steine, Brighton".

[D; PRO HO/107/1645; ESRO Par 255/1/2; Sotheby, Belgravia 5 Aug 1981 lot 292; Sotheby London 13 Nov 1992 lot 426; Ethel Younghusband, *Mansions, Men and Tunbridge Ware* (Slough 1949) pl. xx]

WHITE, Frederick, Tunbridge ware manufacturer, St. James' St. (fl. 1822).

Only known from a single directory entry. [D]

WHITTAKER, Benjamin, Turner, fancy cabinet & Tunbridge ware manufacturer, 1a Hampton Place, Western Road (fl. 1855-59).

Items bearing Whittaker's trade label are known but look identical to those manufactured in the Tunbridge Wells trade at this period. They were probably purchased wholesale from this source. Whittaker may well have manufactured some items on a limited scale but these have not to date been identified. [D; Sotheby, Sussex 20 April 1993 lot 169]

BRIGHTON'S PLACE IN THE DEVELOPMENT OF THE 'TUNNELLING- AND-SHOOT-HOLE' SYSTEM FOR MAKING RAILWAY CUTTINGS

Paul W. Sowan

THE WESTERN APPROACH CUTTING TO THE HOVE TUNNEL IN BRIGHTON

There is on display in the Brighton Museum and Art Gallery an extraordinary watercolour, attributed to one George Smith (fl. 1833-56), entitled 'Excavating the Brighton Railway (Shoreham Branch)'.¹ This is dated 1839, and the branch from Shoreham was the first line of railway into Brighton to be opened to traffic, on 12 May 1840. It has been suggested that the artist was the same George Smith, of Brighton, whose depiction of 'The Viaduct on the Brighton to Lewes Railway', 1845, is also held by the Museum and Art Gallery.

Smith's view of the Shoreham branch appears to be from a point above or near the western end of the Hove tunnel (231 yards), with the cutting which now lies between Addison and Highdown Roads shown in course of excavation in the foreground, looking westwards towards Shoreham. The western end of the cutting has been excavated down to trackbed level, but a significant part nearer the tunnel has only been excavated for part of the final depth. The open hillside to north and south, where Highdown and Addison Roads now lie, is shown quite clear of any evidence that spoil was being removed up the cutting sides: no spoil banks, heads of barrow-runs, horse-whims, or contractors' railways or roads are shown. It seems very clear that spoil was being removed downwards, gravity-assisted, and taken away towards Hove by rail. Men are depicted on lateral working benches part-way up the cutting sides, and what appear to be wooden muck-slides have been placed at suitable angles either side to conduct tipped chalk to the temporary base of the eastern part of the cutting. Within this temporary base there are shown eight rectangular openings (perhaps timber-framed) which are presumably hoppers to conduct the spoil to trucks placed in a temporary tunnel (at the final track-bed level) underneath. Clearly, trimming the cutting sides back to a uniform slope (perhaps at a gradient of 1:1) was to be a subsequent operation. Smith's painting appears to be the earliest evidence for the 'tunnelling-and-shoot-holes' method being used to make cuttings on railway lines, a method known to have been recognised at least into the 1870s. It therefore represents an important document in civil engineering history.

Exactly how many railway cuttings were made this way cannot be determined. Any archaeological evidence within the finished cuttings has inevitably been removed by their completion. The only archaeological evidence to be expected on the hillside either side of the cutting is the entirely negative evidence of the absence of spoil-banks or traces of horse-whims or contractors' railways or roads. The remainder of this article places on record the only documented evidence discovered, to date, for the use of the tunnel-and-shoot-hole method of working on other lines and at later times.

THE APPROACH CUTTING TO THE DITCHLING ROAD TUNNEL, BRIGHTON

The best known example of tunnel-and-shoot-hole working is also in Brighton, presumably reflecting a concentration of interesting subjects near an increasingly fashionable resort attracting artists in some numbers. An article in the *Illustrated London News* of 13 June 1846 celebrates the opening of the railway from Brighton to Lewes, which had taken place on 8 June the same year. There are four illustrations on the first page of this article, depicting 'The Brighton viaduct across the Preston-road', 'The Hodschrove skew bridge', 'The Falmer tunnel', and 'The Rose Hill cutting.' (Fig. 1). The accompanying text includes the following, clearly referring to the 'Rose Hill' illustration (not to that showing the Falmer tunnel as some later authors have supposed):

... after crossing the Brighton Viaduct, we than pass through a short tunnel (sixty yards) beneath the Ditchling Road, and the deep chalk cutting on either side: we have engraved the latter; and our artist has shown the mode adopted by Mr. Wythes, the contractor for the works, for getting and filling his chalk cuttings: the first step was to bore a hole, or heading, at the intended level of the railway, through the cutting; then four shafts were sunk into the heading from the top, at from 18 to 20 feet apart, down which the chalk rolled into waggons placed beneath, when it had once been loosened by the men with their picks.'

The text and illustration clearly refers to the approach cutting (whether on the east or west side is not clear) to the extremely short tunnel under Ditchling Road, immediately to the east of London Road station. This view, unlike the earlier one on the Shoreham branch, is particularly helpful in that it is towards the associated tunnel, and thus shows the temporary tunnel and two shoot-holes very clearly. As depicted, the cutting is close to completion. There was little more chalk to be removed, and there is no trace of cutting-side working

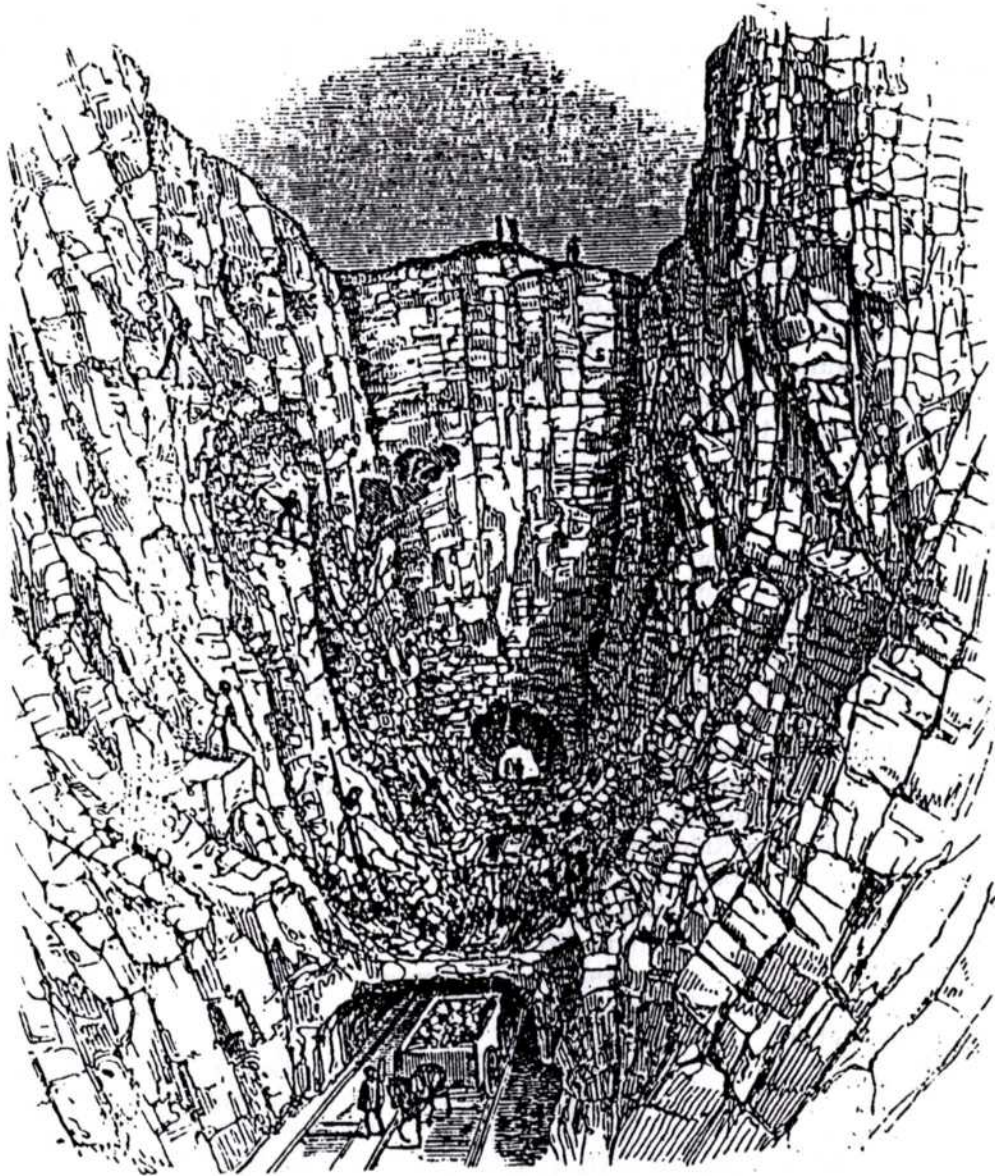


Fig. 1 The Rose Hill Cutting (*Illustrated London News* 13 June 1846)

benches, muck-slide boards, and rectangular frameworks for the shoot-holes, etc.

THE BRIGHTON MAIN LINE CUTTINGS

Turner, in his *London, Brighton and South Coast Railway* (1977), describing the Brighton – Lewes line, expands the *Illustrated London News*' description of Wythes' excavation method, but rather carelessly confuses the Rose Hill and Falmer tunnels. He goes on to comment, reasonably enough, that he ...

'considers it reasonable to assume that a similar method has probably been used to form the very large chalk cuttings south of Merstham tunnel, and south of Clayton tunnel on the main line to Brighton ... but has not found any evidence to that effect.'

The two locations, of course, were far less accessible places in the late 1830s – early 1840s than the then outskirts of Brighton: It will be noted that Turner assumes the tunnelling-and-shoot-holes excavation system to be peculiar to deep steep-sided approach cuttings to tunnels through chalk.

TEMPORARY TUNNELS ON THE SURREY & SUSSEX JUNCTION RAILWAY

The ill-fated Surrey & Sussex Junction Railway, authorised by its Act of 1865, was to have connected Croydon with Oxted and other places further south. That part of the line running through the chalk of the North Downs in Surrey, from South Croydon to Oxted, was well advanced when a financial crisis led to its abandonment. Some two-thirds of the surface

earthworks (cuttings and embankments) had been completed, although it is likely that much of the Oxted tunnel (if not the Riddlesdown tunnel) had yet to be started before work on the line ceased. Fortunately for the history of railway civil engineering, the unfinished earthworks were recorded both by surveyors for the Ordnance Survey's first large scale maps and plans, and also by an amateur geologist, Caleb Evans, whose published work includes explicit reference to the driving of temporary tunnels in the course of making open cuttings. The 'Oxted line' was subsequently completed, by different contractors, for the Croydon, Oxted, & East Grinstead Railway Company following the passing of a further Act in 1878. The line finally opened on 10 March 1884, and is now electrified and continues to operate.

Evans' paper (intended as an exclusively geological account) records three abandoned temporary tunnels, all of which were planned to be opened out to cuttings on completion. He does not record shoot-holes, so presumably these were still to be made when, as he records, all work on the line ceased early in 1867. Interestingly, only one of the temporary tunnels noticed by Evans was made in the course of excavating a tunnel approach cutting (the southern approach to the Riddlesdown tunnel, between Riddlesdown and Upper Warlingham stations.) The other two were at the sites of what became quite shallow open cuttings where no permanent tunnels were ever envisaged – one at Purley Downs (between Sanderstead and Riddlesdown stations), and one at Succombe Hill (between Upper Warlingham and Woldingham stations.)

CHARLES GRIPPER'S 'TUNNELLING IN HEAVY GROUND'

The evidence presented so far indicates the 'tunnelling-and-shoot-holes' method to have been characteristic of chalk cuttings, not necessarily deep or steep sided, and not necessarily leading to permanent tunnels, made during the period 1839 - 1867. That this method, perhaps pioneered at Brighton (or, at least, on the Brighton line), was probably more widely used than this, and at later dates, is suggested by Charles Gripper's manual on tunnelling techniques published in 1879. His text, and an accompanying plate (Fig. 2) contains a very clear description and illustrations of tunnels and shoot-holes as a standard means of excavating tunnel approach cuttings. Gripper advises:-

'From the shafts sunk at either end of the Tunnel it will be found advantageous to drive a heading back through the cuttings leading up to the Tunnel mouth, until it reaches the face at which the cutting excavators are working. ... Holes called "shoot holes" can then be

driven upwards from the roof of the heading to the surface of the ground above; strong trap-doors are then fixed in the bottom of each hole at the level of the heading roof and downwards. Tip waggons can then be run under the holes, the doors opened, and the earth shovelled down from the top; when the waggon is full the trap-doors are closed, the navvies go on shovelling down, and the waggon is moved forward and another brought up under the hole, and so on until the set is full. In good ground, indeed in almost any ground, two men at the hole will do as much as four filling in the ordinary way.

This method does not work well in a wet, or rock cutting, as the water naturally all drains into the waggon, and by the time it has got to the tip-head its contents are all slurry, and rock falling down the holes breaks down the doors and waggons.'

Gripper fails to cite any specific works in his manual, but he is thought to have been associated with work on a number of lines in Nottinghamshire and counties further north, where chalk is not found. Apart from advising against using tunnels and shoot-holes in wet or rock cuttings, he does not comment on rock-types suitable for the technique.

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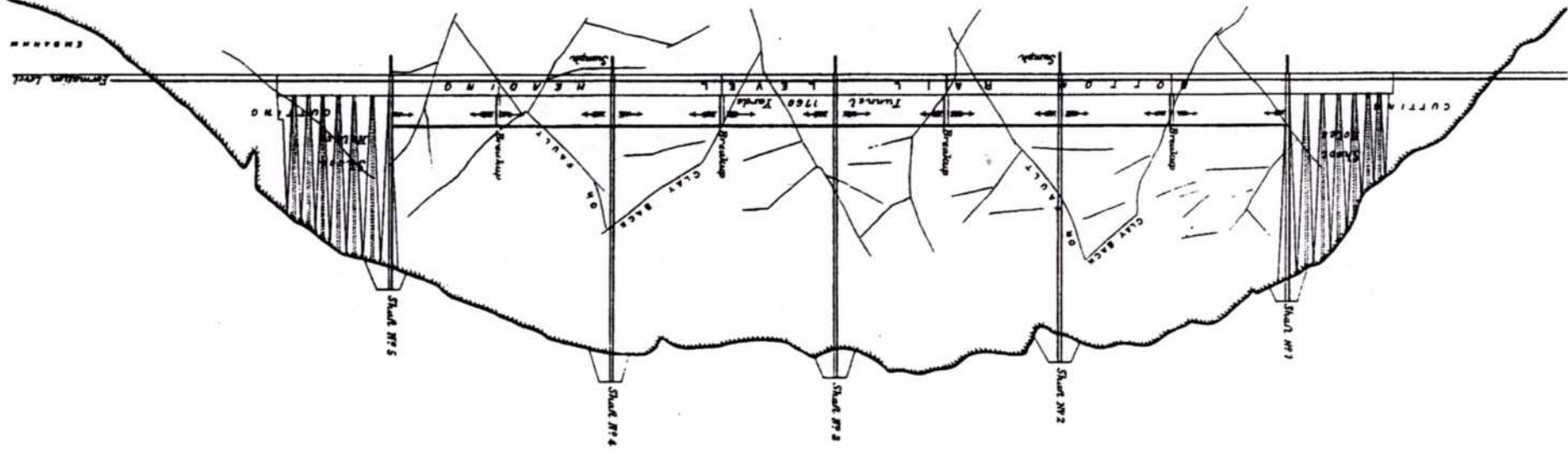
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Fig. 2 from Charles Grippes's 'Railway tunnelling in heavy ground showing the tunnel-and-shoot-holes method for making tunnel approach cuttings.

E. & F. N. Spon, London & New York.

Vertical, 60 Feet to an Inch.
Horizontal, .12 Chains to an Inch.

SCALES



MILLS OF THE EASTBOURNE BOROUGH COUNCIL AREA

Lawrence Stevens

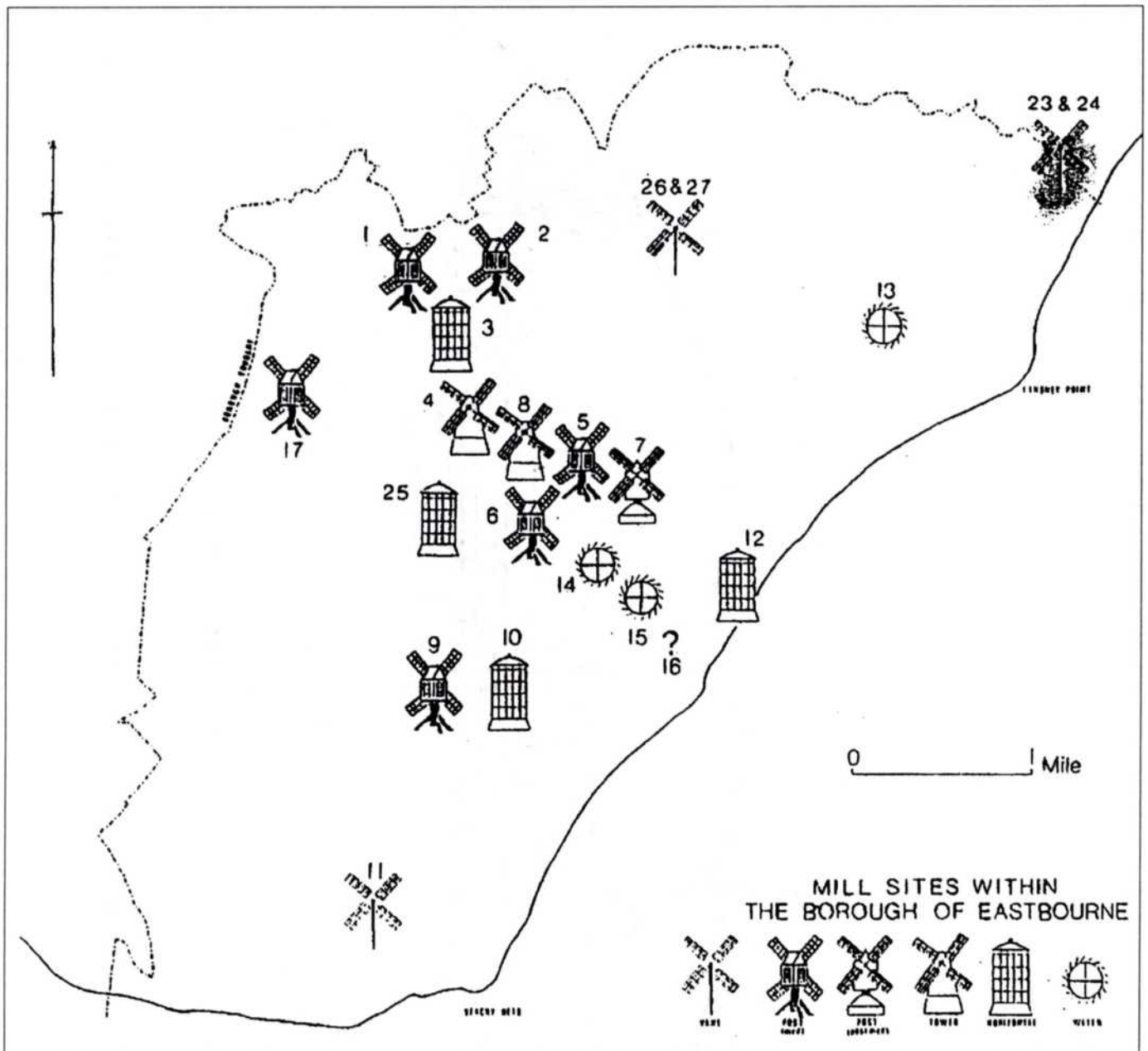


Fig. 1

The number of mills in the Eastbourne Borough Council area should be of no surprise when we consider the community's dependence on an agrarian economy since Saxon times and the extensive prehistoric evidence of field systems and associated finds of grain storage pits, quern fragments and grain-drying ovens. A glance at the Eastbourne Tithe Map of 1842 shows field after field of arable and pasture-land and a handful of farms in what was good corn country and also by then, extensive sheep pasture. In 1842, the parish covered slightly more than 4,000 acres, whereas

modern Eastbourne covers nearly 6,500 acres, having expanded into the parishes of Eastdean, Jevington, Willingdon and Westham during the late nineteenth and twentieth centuries.

In 1980, a list of 'Mills of the Eastbourne Borough Council Area' (Stevens 1980) was compiled in which an attempt was made to catalogue the salient facts of each mill, to clarify its position and record sufficient information so that confusion might be avoided. In order to appreciate the milling industry within the old

Hundred and Parish of Bourne, it is necessary to subtract those originally of Willingdon Parish (Nos.1-4, 17, 26 & 27) and those similarly from Westham (Nos.13, 23 & 24).

Apart from the ruins of the mills on Pashley Down (Nos. 9 & 10), there are no surviving mill remains in the area and the accompanying plan merely shows sites of mills within the Borough of Eastbourne. The windmills seem to fall into two main groups, namely those on Ocklynge Hill (Nos.1-4) and those on St. Anne's Hill (Nos.5-8). Each of these groups has a collective history from the medieval period to the nineteenth century. The history of the two mills on Pashley Down (Nos. 9 & 10) spanned nearly three hundred years, from the sixteenth century to the end of the eighteenth century.

There were three watermills, two (Nos. 14 & 15) on the upper reaches of the Bourne Stream, east of Old Town and whose late medieval documentary evidence is sometimes difficult to unravel. The third watermill (No.13) was situated near Langney and appears to have been the earliest documented tide mill in Sussex. Worthy of special mention are the two medieval cruciform millstead trenches excavated on Ocklynge Hill (Nos. 1 & 2) in 1970. Their function was at first a mystery, but the presence of millstone fragments and a similar find at Mucking Anglo-Saxon Cemetery, Essex (Jones, M.U. 1975, 73-80), solved the mystery.

Eastbourne is unique in having had three horizontal corn mills built during the eighteenth century by a local-born windmill inventor, Thomas Mortimer (?1697-1774). His first (No.10) built in 1752, predated the first built by Capt. Hooper of Margate. Mortimer's second mill (No.12) was built on the seashore in about 1757 and his last (No.3) he erected in 1767 on Ocklynge Hill, then in Willingdon Parish.

Almost all the known activities of the mills were associated either directly or indirectly with agriculture and most of the mills seem to have been producing meal flour. However, the barn-top mill of Bullock Down Farm (No.11) was probably used to cut chaff or crush animal feed. Some mills were pumping water on the marsh to maintain reclaimed land for agriculture (Nos. 23 & 24), while the Goffs watermill (No.14) changed from grinding to fulling during the eighteenth and early nineteenth century, no doubt reflecting the demands of an expanding sheep industry. The only non-agricultural mills recorded are the brickfield mills (Nos. 26 & 27). Wind-powered corn mills came to an end during the late nineteenth century, particularly after 1880-81 when steam-driven roller mills were installed at Hurst's mill (No.8), although the mill was turned by wind until 1917.

Almost all the entries owe something to the extensive *Mss Gazetteer of mills* compiled by H.E. Simmons and consulted in the Science Museum Library, London. The Defence Schedule of 1801 referred to in the list was drawn up at the time of the Napoleonic threat to assess the availability of flour and is held at the East Sussex Record Office (ESRO). The writer also acknowledges help received from Vera Hodson, Rosemary Milton, Ronald Hawkesley, Frank Gregory, Patricia Stevens and the late Richard Gilbert. No research is ever complete and the writer would welcome any corrections and additions to the following list.

LIST OF MILLS IN THE BOROUGH OF EASTBOURNE

'E' numbers relate to 'RS' numbers in the *Gazetteer of Archaeological Sites in Eastbourne* (Stevens 1980a). This substitution anticipates a new edition.

1. No name survives.

Map Ref: TQ 59500069 (E52)

Situated south of mill No.2 and north of Mill No.4, on the crest of Ocklynge Hill, to the west of Willingdon Road (A22). Once in Willingdon Parish.

Post Windmill. Excavated remains consisted of a cruciform trench 1.98m deep with 5.35m cross trenches, cut into undisturbed chalk (Stevens, 1982, 122-130). Finds included millstone fragments and medieval pottery.

HISTORY: Medieval origin. ?fifteenth or early sixteenth century demise. Probably Radmeld-Beverington mill, see No.20.

2. No name survives.

Map Ref: TQ 59460070 (E52)

Situated north of mill No.1 and north of Mill No.4, on the crest of Ocklynge Hill, to the west of Willingdon Road (A22). Once in Willingdon Parish.

Post windmill. Excavated remains consisted of a cruciform trench 1.37m deep with 2.82m cross trenches, cut into undisturbed chalk (Stevens 1982, 122-130). Finds included millstone fragments and medieval pottery.

HISTORY: Medieval origin. ?fifteenth or early sixteenth century demise. Probably Radmeld-Beverington mill, see No.20.

3. Mrs. MORTIMER'S ROUND MILL
or Ocklynge Horizontal mill.

Map Ref: TQ 59520070 (E262)

Situated north east of mill No.1, close to the A22 on its west side and on the crest of Ocklynge Hill. Once in Willingdon Parish.

Horizontal windmill, probably of the turbine shutter type. On 21 December 1770 Thomas Jones who visited Mr. Mortimer, wrote in his diary "This mill was built of a circular form upon rising ground above the town ... the vanes of which moved, not in a vertical, but horizontal direction, and the current of the wind was regulated by valves, which were opened or shut according to the point it came from ... it was said to be one of his own invention." (Jones 1951). Excavated remains consisted of a circular chalk block foundation 15.85m diameter and enclosing evidence of a burnt wooden floor (Stevens 1982, 131-134).

HISTORY: Designed around 1767 by Thomas Mortimer who died in 1774. It was his third and last known horizontal windmill (See mills Nos.10 & 12). His daughters Elizabeth and Catherine inherited. In Defence Schedule (1801), two sacks of meal flour every 24 hours were promised. In 1811, when Elizabeth held the mill it was burnt to the ground and never rebuilt. The *Sussex Weekly Advertiser* of 6 May 1811 records that the mill "...caught fire from the velocity of its motion, owing to the dry state of its machinery, which had not been properly supplied with grease." It was never rebuilt as it was estimated it would cost twice the £500 for which it was insured. The lease was offered at auction in June 1811.

4. OCKLYNGE MILL, Ockland Mill, Ockling Mill,
Baker's Mill.

Map Ref: TQ 59490053 (E313)

Situated south of Mills 1, 2 and 3, on the line of Windmill Close, west of the A22. Once in Willingdon Parish.

Tower windmill, cement rendered, four shuttered spring sweeps, fan, no gallery, two pairs of French Burrs. Three floors and basement, flour machine, auxiliary steam engine in later years. Always produced flour only. The modern 'Mill House' is associated with the mill in name only.

HISTORY: Probably built between 1811 and 1820. It does not appear on the Willingdon Tithe Map of 1842. Owners: Joseph Seymour, then Edgar Baker who purchased it in 1848, then his son S. Baker, then Harry Baker. Mill ceased to work in 1894. Stood derelict until sold for redevelopment in 1933. Demolished in 1934 by dynamite (Budgen W. 1912, 341).

5. RECTORY MANOR MILL, Rectory Mill, Parsonage Mill, White Mill, Vicar's Mill.

Map Ref: TV 60229993 (E311)

Situated on the north side of Watts Lane, at its junction with Mill Road.

Post windmill, painted white with tail pole. Two cloth and two spring sweeps. Working clockwise. Body tilted to rear.

HISTORY: Part of the Rectory Manor holding and of probable medieval origin. Insurance for 'Parsonage House' etc. for 1785 includes £220 for the windmill. Owners of the manor seem to have sub-let the mill. Occupiers during the nineteenth century include William Baker, Thomas Baker and Edgar Baker. William Baker is recorded in the Defence Schedule (1801) as promising two sacks daily. Its sale for removal advertised in the *Sussex Weekly Advertiser* 7th Jan. 1885. Mr. Baker purchased it for £15. Samuel Dallaway demolished the mill and used the cap at Stone Cross mill as a shed, which itself was demolished in 1935. The shed can be seen in a painting by A. Foord Hughes (Fowell 1930, opp.33) (Budgen W. 1912, 341).

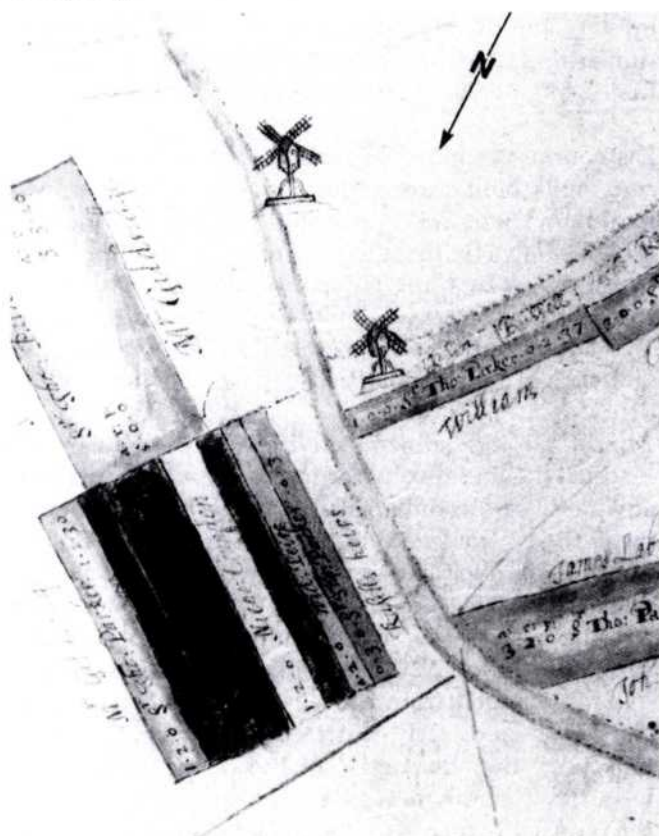


Fig. 2 Rectory Manor mill and Gildredge Manor mill (above), by the side of what is now Mill Road and St. Anne's Road. Shown on a plan of 1636 by William Gier, taken from a 3¼" x 3¼" glass lantern slide in the possession of the writer. The original plan is believed to be held at Chatsworth House, Derbyshire.

6. GILDREDGE MANOR MILL (Fig. 2), Black Mill, Bignell's Mill.

Map Ref: TV 60399981 (E312)

Situated in the grounds of Eastbourne College of Arts and Technology, and opposite the reservoir in St. Anne's Road.

Post windmill, black (tarred?), with tail pole and flint roundhouse. Two spring and two cloth sweeps, working clockwise.

HISTORY: History obscure. Probably of medieval origin. Held by Gildredge Manor and for some time held in plurality with the Watermill No.14, where in the nineteenth century the millhouse seems to have been. William Bignell occupied it before 1792 to 1833. The 1801 Defence Schedule records William Bignell as promising one sack of flour daily. William Simmons occupied from 1833. Advertised as renovated by Robert Simmons and to let, 1840. Mill and machinery unsold at auction in 1878. Subsequently demolished that year by Mr. George Boulton who developed the site (Budgen W. 1912, 341).

7. CHAPEL MILL

Map Ref: TQ 599000

Situation unknown. Probably to the south of Mill Road either near St. John's Mill or actually on its site.

Post Windmill (assumed)

HISTORY: Considered to have been a precursor to St. John's mill, No.8. The history of a plot can be traced from the holding of the Manor of St. John of Jerusalem, which Henry Fennell held in 1621. Subsequently, in 1803 Harry Hurst rented 1 rood and 8 perches of land and a windmill (Budgen W. Mss notebooks & index, Barbican House Library, Lewes). Henry Hurst of Chapel Mill could supply two sacks of meal-flour daily (Defence Schedule 1801), which suggests that he had occupied the mill previously.

8. ST. JOHN'S MILL, Hurst Mill, Upperton Mill.

Map Ref: TQ 59980001 (E267)

Situated west side of Ocklynge Manor House in Mill Road.

Tower Windmill. Grade 3 listed building. Four floors, cap, three pairs of over-driven stones – one Derbyshire Peak, two French Burrs. Circular store round base. Basement with tunnels leading to adjacent buildings.

HISTORY: May have been built in 1808 as proclaimed by the date stone. Passed from Harry Hurst to Edward Hurst to Hurst Bros. and then to Stapley and Hurst. Gas engine installed in 1880-81 in basement to drive roller plant. Subsequent decline of use by wind. Struck by lightning in 1884. Last used by wind in 1917, when the cap jammed and the sweeps were taken down. In 1932 a pair of these sweeps was fitted to what is now Polegate Windmill.

Acquired by Y.J. Lovell, Builders in 1941. All but the ground floor demolished in 1950. Totally demolished and the basement filled-in 1980 (Stevens 1979). Fragments of millstone from the site have been incorporated in the boundary wall of the development. (Stevens 1986).

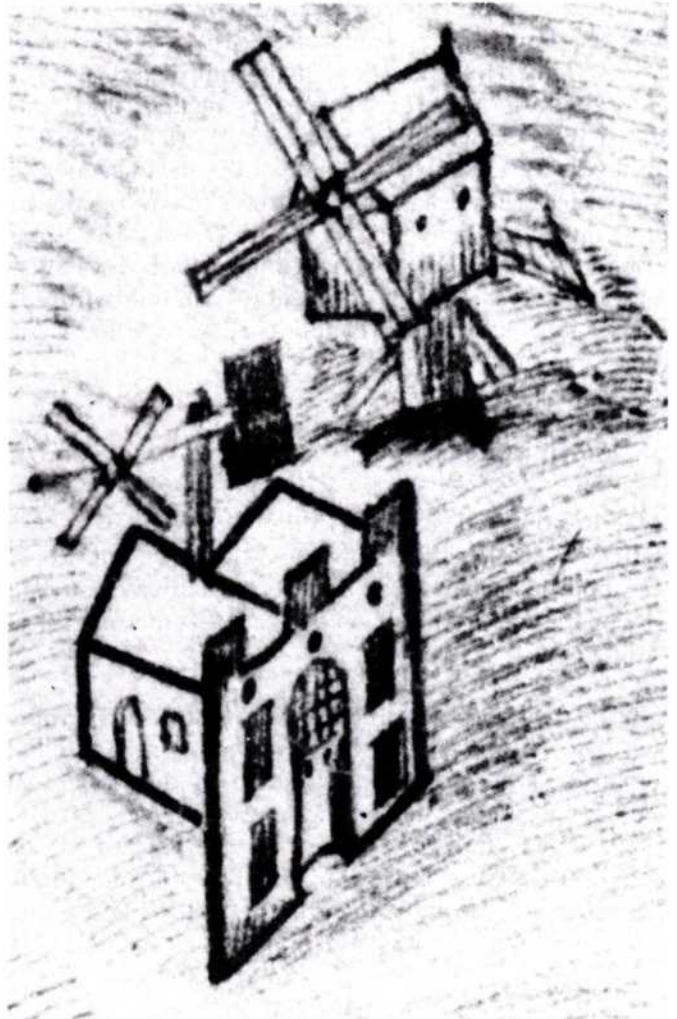


Fig. 3 Pashley Down post mill and bolting house depicted on a map of 1739 by Samuel Cant. Reproduced by kind permission of the Trustees of the Chatsworth Settlement, Eastbourne, with whom the original resides. A photographic copy is displayed at the Eastbourne Heritage Centre, Carlisle Road, Eastbourne.

9. PASHLEY DOWN MILL (Fig. 3)

Map Ref: TV 59239815 (E260)

Situated on Pashley Down overlooking the Royal Eastbourne Golf Course and almost halfway between the reservoir and the sheep pond. A few metres west of mill No.10.

Post windmill with low round house. Excavation revealed a circular sunken basement 10.92m in diameter, revetted by chalk blocks with brick plinths on the floor that was 2.13m below the turf level (Stevens 1982, 105-116).

HISTORY: Probably late fifteenth or early sixteenth century origin. The first mention of a mill on Pashley Down in 1527 when Robert Burton leased the mill for 8d. In 1724, Spencer Compton purchased it from the Wilsons and in 1729 leased it to Thomas Mortimer, whose father John had leased the mill before him. A new bolting house was erected nearby and was extensively damaged by storms in 1734. In 1738 the mill was leased to Henry Marchant who subsequently surrendered the lease (see No.10). The basement was dug under the mill for storage in 1739 by Mortimer (Budgen, Mss. Notebooks and index, Barbican House Library, Lewes). S.H. Grimm shows the mill with one sweep in 1780. It had probably been abandoned some time previously.

10. PASHLEY DOWN

Map Ref: TV 59259814 (E61)

Situated on Pashley Down overlooking the Royal Eastbourne Golf Course and about halfway between the reservoir and the sheep pond. A few metres east of Mill No.9.

Horizontal windmill, probably of the shuttered turbine type (see also Nos. 3 & 12). Excavation revealed the remains of the circular foundation of the horizontal mill, incorporating the bolting house.

HISTORY: (see also No.9). In 1752 the Mortimers took out another lease and converted the bolting house into a horizontal mill. This mill appears to have ceased working in 1776. S.H. Grimm (1780), shows the building as low and shed-like (Stevens 1982, 105-121).

11. BULLOCK DOWN FARM MILL

Map Ref: TV 58509647

Situated within and atop the old barn at Bullock Down Farm.

Barn Top Mill. Small multi-swept mill with

associated belt wheels in the barn. Access by ladder to trap door in roof under sweeps. Possibly used to drive crushers or cutters.

HISTORY: Period of use unknown. Extant towards the end of the nineteenth century. Barn demolished in 1968-69. Information from Edgar Williams, farmer of Bullock Down Farm.

12. THE ROUNDHOUSE, Mortimer's Horizontal Mill.

Map Ref: TV 61819894

Situated on a low cliff at the water's edge to the east of the present pier.

Horizontal windmill, probably of the shuttered turbine type (see also Nos. 3 & 10).

HISTORY: Thomas Mortimer leased the site in 1757 and built his second horizontal mill. It ceased to work in 1768 when damaged by a storm. The round house was converted to a dwelling house by James Gandon in 1769. Many pictorial representations exist of the round house but none of the mill. It was occupied by members of the Royal Family in 1780. With the cliff undercut the round house was washed away in 1840 (Stevens 1982, 134-136).

13. LANGNEY MILL, Mill of Longanea, Langanea Mill

Map Ref: TQ 6302 (E279)

Site unknown. Probably sited in the vicinity of Langney Grange and the Langney Cliff.

Tide Mill

HISTORY: Established by some time in the 1160s – and held by Lewes Priory. It may have ceased working sometime during the thirteenth or fourteenth century as a result of reclamation of land. There is no relationship with 'The Mill' public house on the Willingdon Levels (Stevens 1981 and 1996).

14. THE GOFFS WATERMILL

Map Ref: TV 60359940 (E307)

Situated on the course of the Bourne Stream at the rear of 28, The Goffs and on the site of the present convent building 34, The Goffs. A large mill pond was behind the old Drill Hall in The Goffs, now a veterinary surgery.

Water mill, probably over-shot. Ground corn, but latterly was used as a fulling mill.

HISTORY: Thought to be the mill recorded in Domesday Book (1086) then belonging to the Great Manor of Bourne. Later Gildredge Manor held it, together with Mill No.7. No return in the 1801 Defence Schedule. It is said that the machinery was disposed of early in the nineteenth century by Mary Ann Gilbert (Budgen, 1918).

15. GROVE ROAD WATERMILL

Map Ref: TV 60709913 (E308)

Situated to the west of Southfields Road near to Old Orchard Road.

Watermill. Probably undershot.

HISTORY: Early sixteenth century but probably earlier. Part of the Manor of Tye, later held by Pashley Manor, together with a windmill, probably No.9. No references after the seventeenth century. The map reference refers to a find of a French Burr stone and medieval pottery in 1980, which is compatible with Budgen's suggested site. The mill is shown on a



Fig. 4 Lower watermill shown on a late seventeenth century plan. The stream follows the alignment of the present Southfields Road and East Hall Cross is the site of the present Town Hall. Redrawn by L. Stevens from a $3\frac{1}{4} \times 3\frac{1}{4}$ glass lantern slide in his possession. The original was catalogued by the Rev. Walter Budgen as being in the Compton Place Muniments, Eastbourne c.1920. It is now believed to be at Chatsworth House, Derbyshire.

seventeenth century plan drawn by William Gier (Fig. 4).

16. No name survives.

Map Ref: TV 61159901

Situated between Mark Lane and Hyde Gardens on north side of Cornfield Road.

Unknown category.

HISTORY: Alleged reference in a deed relating to this area of nineteenth century date in an article that leaves much to the imagination (Donne, 1979). No other evidence of this mill has come to light and in the absence of further collaborative material one has to be sceptical of the existence of a mill at this most improbable position on the marsh.

17. OLD WILLINGDON MILL, Jevington Mill.

Map Ref: TQ 57720092

Situated on Willingdon Hill 20 metres to the south of the Willingdon Moot site (Toms 1917).

Post windmill with roundhouse. Represented early this century by a shallow circular depression with evidence of cross timbers and round house (Budgen 1929, 201-211). No longer easily discernible.

HISTORY: Little known. It is mentioned in 1769 as having been damaged by a storm. Represented in a drawing by S.H. Grimm of 1781 and again in 1785 in a watercolour by Lady Sophia Burrell. In 1790 there was an advertisement for a good grinder for the mill. It was probably still working in 1801. The mill was destroyed by a violent storm on 3 March 1817. Recorded in the *Sussex Weekly Advertiser* on 10 March. This mill was the precursor of Willingdon Windmill (now Polegate) whose burr stone bears the date 16 September 1817.

18. MILL DOWN

The name Mill Down describes a down running from Halfway Cottages on East Dean Road to Birling Manor. The name strongly suggests the existence of a mill but there is no tradition of a mill nor any direct documentary evidence has come to light. However, Richard Gilbert pointed out that a study of the cart tracks shown on the 1875 6" O.S. map may bear fruit. Two circular archaeological features were examined on Mill Down in 1976 by Mrs. C. Worsfold. A 20' diameter ring of calcined flint fragments (E142) and a circular area of burnt clay (E143). There is no evidence that they were associated with a windmill.

19. RODMILL FARM MILL

Recorded by Simmons in his list of Sussex Mills, in which he quotes the maps of Greenwood (1823-4) and Figg (1861) as showing a mill at Rodmill farm. There is no other evidence for this mill and its existence is doubtful.

20. RADMELD-BEVERINGTON MILL

Simmons derived the reference to Radmeld-Beverington mill from the *Eastbourne Herald Magazine*, May 5th 1934, p.11. Some references to the mill allude to Ocklynge or Baker's Mill. Simmons and others refer to an earlier mill, "records of which are said to exist". Walter Budgen states that "portions of the land running alongside the parish boundary on the west side of Willingdon Road have long been held with the Manor....." (Budgen 1912, 325). This would include the top of Ocklynge Hill and would strongly suggest that mill sites 1 and 2 are those of the ancient manor of Radmeld-Beverington.

21. MANOR HILL MILL

Manor Hill Mill is a name created by the late Martin Brunnarius in his book *Windmills of Sussex*. Subsequent to its publication, Mr. Brunnarius agreed that it was a fabrication. (Brunnarius 1979 and Hodson 1981).

22. MORTIMER'S SMOCK MILL

Built midsummer 1791 at Eastbourne situated in fine corn country adjoining the sea. Large and commodious warehouse and dwelling apartments on the premises. The several conveniences were so numerous as to render the mill as one of the most 'completest in the country'. Again, the *Sussex Weekly Advertiser* in September 1791, described the mill as, 'new erected' and having three pairs of stones. In 1795, Mortimer advertises for a grinder and a similar advert appears under the name of Joseph Coleman. This is an enigmatic mill that has not been identified. It is assumed that Mortimer is Charles Smith Mortimer, eldest son of Thomas Mortimer.

23. MOUNTNEY SEWER PUMP (1)

Map Ref: TQ 64360311

Situated on the same site as mill No.24 that superseded it.

Probably a wooden wind pump similar to the wind pump from Westham, displayed at the Weald and

Downland Open Air Museum, Singleton, West Sussex.

HISTORY: Destroyed by fire before 1902. Originally in Westham parish. Referred to in a tenancy agreement between The Right Hon. Lord Brassey and the Commissioners of Sewers for the Levels with the Rapes of Pevensey and Hastings (ESRO. A5634/1/77/4).

24. MOUNTNEY SEWER PUMP (2)

Map Ref: TQ 64360311

Situated immediately to the west of Eastbourne Borough Boundary at the junction of the Old Mountney Sewer and Langney Haven.

Wind Pump

HISTORY: Erected on land belonging to the Rt.Hon. Lord Brassey by the Commissioners of Sewers for the Levels with the Rapes of Pevensey and Hastings, to pump water from the Langney Haven to Mountney Sewer in order to maintain levels in the latter. Originally in Westham Parish. Referred to in the same tenancy agreement given under No.23 (ESRO A5634/1/77/4).

25. HOOPER'S MACHINE FOR DRAWING WELL WATER BY WIND

Map Ref: Unknown

Situated at Mr. Gilbert's at East-Borne

Horizontal Shutter Mill for raising water

HISTORY: In an advertisement in the *Sussex Weekly Advertiser* of 19th April 1779, readers were invited to see "one of the said machines, lately erected and now in full work, which raises water out of a well 266 feet deep". The inventor was to be on hand at Eastbourne to meet "any Noblemen or Gentlemen desirous of speaking to the inventor". The machine was almost certainly Stephen Hooper's engine for raising water, patented in 1777 (No.1149). The power was provided by a horizontal shuttered mill and it lifted buckets fastened to an endless chain. The Mr. Gilbert referred to is probably Nicholas Gilbert, holder of the Manor of Eastbourne Gildredge from 1774 to his death in 1797. The other possibility would be his brother, Charles Gilbert (1736-1816), but he lived in Lewes and only purchased what is now The Towner Art Gallery and Local History Museum, Eastbourne in 1792.

26. GOLDSMITH'S BRICKFIELD WIND PUMP

Map Ref: TQ 61190232

Situated to the south of what is now Dallington Road, and east of Hampden Park Station. Once in Willingdon Parish.

Metal Wind Pump

HISTORY: The brickfield is documented between 1908 and 1932 (Beswick 1993, 75) and an associated wind pump appears on maps dated 1908-1925. Well before 1940, E.C. Arnold purchased the brick ponds as a nature reserve which he called 'The Mere' and presented them to Eastbourne College who in turn sold them for development in 1972. Arnold describes The Mere in detail but there is no mention of a wind pump (Arnold, 1940, 3-22).

27. MARK MARTIN'S BRICKFIELD

Map Ref: TQ 613025 (exact site unknown)

Situated on the west side of Mark Martin's old brickfield pond to the N.E. of site No.26. Once in Willingdon Parish.

Similar metal wind pump to No.26.

HISTORY: Pumped water out of the brickfield pond.

MILLSTONES AND FRAGMENTS

Millstones can very often be evidence of a nearby mill site, but with their use as garden ornaments and the ease of modern transport, such evidence must be treated with caution.

Manor Gardens, Old Town. (all runner-stones)

- (a) TV 59959935 – Bird table of Derbyshire Peak type Stone
- (b) TV 60119933 – Bird table of Derbyshire Peak type Stone on mound
- (c) TV 60179932 – Derbyshire Peak type Stone forming the floor of a semi-circular seat
- (d) TV 60109931 – Possible runner stone set in path

The Counting House, Star Road.

- (e) TV 60099951 – Two Derbyshire Peak type stones set in pathway to main entrance

Mill House, Willingdon Road.

- (f) TQ 59580055 – Two millstones in garden

7, Watts Lane.

- (g) TV 60079968 – Fragment of possible French Burr

set in boundary wall (E250) exhibits part of a furrow.

Lovell Court, Mill Road.

- (h) TV 59960004 – Fragments of millstone salvaged from the site of St. John's mill (No.8)

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THE SECRET TUNNELS OF SOUTH HEIGHTON

Geoffrey Ellis

SUBJECT: The abandoned tunnels of HMS Forward, Royal Naval Headquarters, Newhaven, 1941-45.

Deep beneath Heighton Hill, one mile north of Newhaven, lay the forgotten remains of a once vibrant maritime intelligence centre which remained undetected by the foe during World War II, and unrenowned by the country thereafter. Only recently has it been realised just how secret this establishment was, and how important its contribution to the war effort must have been.

Newhaven Royal Naval Headquarters originated during the tumultuous early years of the war when invasion seemed a likely sequel to the fall of France. Newhaven was originally a casualty clearing station for the British Expeditionary Force in France, and there was some discussion whether Newhaven could be demilitarised and declared an 'open town' under the Geneva Red Cross Convention. Twelve fully equipped hospital boats plied between Newhaven and Dieppe, with special trains to carry the sick and wounded further inland. Medical supplies were conveyed by return.

Geographically, Newhaven lies roughly midway between Dover and Portsmouth and has the only river in the area which is navigable at all states of the tide. The port was then equipped with marine workshops and facilities for maintaining cross-channel steamers and vessels with tail shafts of up to 19ft. There were also ample berthing facilities, and a marine passenger terminal with its own dedicated railway terminus.

All this made Newhaven a desirable prize for the enemy, and with the fall of Dunkirk, 'open town' status was quickly replaced by military defence. The army arrived, and evicted the navy from their quarters at the Sheffield Arms Hotel. The Senior Service, in its turn, requisitioned the highly suitable Guinness Trust Holiday Home from 20 June 1940, for the duration.

The Guinness Trust Holiday Home was an architecturally pleasant building (Fig.1). Built in 1938, it stood majestically on Heighton Hill looking down on lush green meadows in the Ouse valley, with views to Newhaven Harbour, Seaford Bay and the Channel. It was built to provide holiday accommodation for the city bound tenants of the Guinness Trust estates, and had sixteen dormitory apartments with a communal dining room and sun lounge. Most apartments had access to a large sun terrace and lawn, while a private suite on the first floor housed a resident caretaker.

Under the sterner title of HMS Forward, the holiday home became a naval headquarters, with responsibility for HMS Marlborough at Eastbourne, HMS Aggressive and HMS Newt at Newhaven, HMS Lizard at Hove, and two Resident Naval Officers at Shoreham and Littlehampton. Naval Stores depots were established at Lewes and Burgess Hill to supply permanent, consumable, and after action stores; and a naval canteen service was organised for the area. Numerous large establishments were requisitioned, locally and at Seaford, to accommodate the WRNS. It is recorded that there were eventually over ten thousand naval staff on HMS Forward's ledgers. Special sick quarters were requisitioned, fully staffed and equipped, in what had been Gracie Field's former home, now Dorothy House, 127, Dorothy Avenue, Peacehaven.



Fig. 1 View of Denton House from the rear. The sun terraces and lawns remain unaltered, but some glazing had been modernised. Room 16, wherein the tunnel surfaced, at extreme left.
11 Dec 1992 (Geoffrey Ellis)

HMS Forward was always commanded by a Captain (often an Admiral serving in the rank of Captain) who occupied the conveniently appointed caretaker's suite. In 1940 his immediate responsibilities included reorganisation of the sub-command and the provision of maritime protection for the Sussex coastline and harbours with minefields and blockships.

In March 1941, an Admiralty direction ordered specified ports to establish and maintain naval plots in conjunction with a coastal radar chain giving surface coverage from the Dover area. The coverage soon spread to Newhaven and in order to provide the necessary communications equipment with adequate security, it was decided to burrow deep into Heighton Hill.

The mass of equipment required for intelligence gathering, interpretation, and dissemination, was assembled sixty feet below ground. The principal operational entrance, situated in room 16 of the Guinness Trust Holiday Home gave access via 122 steps to an impenetrable fortress and the most sophisticated contemporary communication devices. No expense was spared and the complex was well equipped for every contingency from direct enemy action to failure of the public utilities. There were two telephone exchanges (one, a four position PMBX1A) ten Creed 7B teleprinters, two Typex machines, a W/T

office with eleven radios, and a VF line telegraph terminal for 36 channels. The tunnels contained a stand-by generator, an air-conditioning system with gas filters, a galley, toilets, cabins for split shifts, and the recently invented phenomenon of 'daylight' fluorescent lighting.

Col. F.H. Foster DSO OBE TD RL RIBA CRE, 4 Corps Troops Royal Engineers, disclosed how he designed the subterranean labyrinth after visiting Montgomery's headquarters at Reigate. It was excavated by the 1st Tunnelling Engineers Group, No.172 Tunnelling Company (No. 2 Section), under Major Lindsay Fox. No.577 Army Field Coy. Royal Engineers was engaged in the fitting out under Major R. Hawker. Excavation of the tunnel commenced in July 1941 and was completed later that year. (Figs. 2 and 3). It was used from late 1941 until decommissioned on 31 August 1945, and abandoned on 21 November 1945. The tunnel was shared by the Canadian Corps Coastal Artillery who also maintained a headquarters here.

Ten coastal radar stations between Fairlight and Bognor Regis reported directly to HMS Forward every twenty minutes, more often if necessary, and all their information was plotted before being relayed by teleprinter to similar plots at Dover and Portsmouth. Between them, the plotting stations gave a

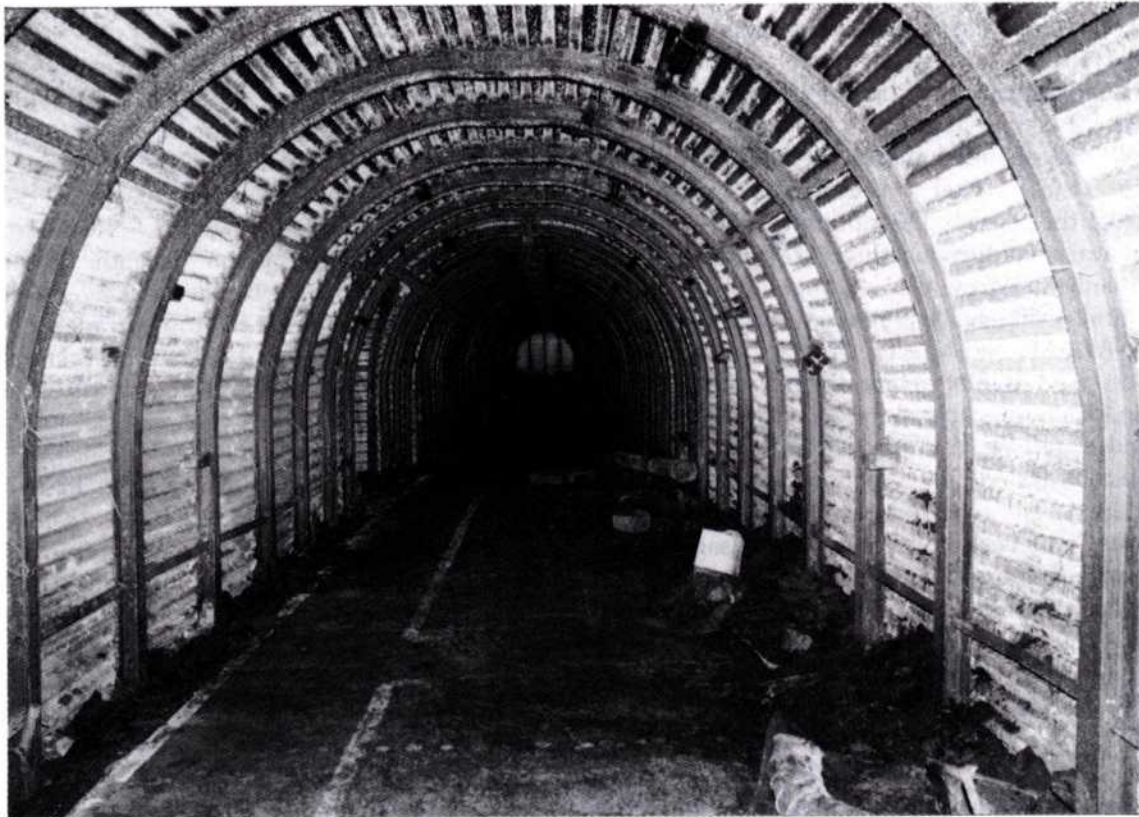


Fig. 2 East main gallery. The wooden Cipher Offices stood right foreground within white lines. Passageway on left. Switchboards and telephone equipment racks stood just beyond. (Tom Bonner)

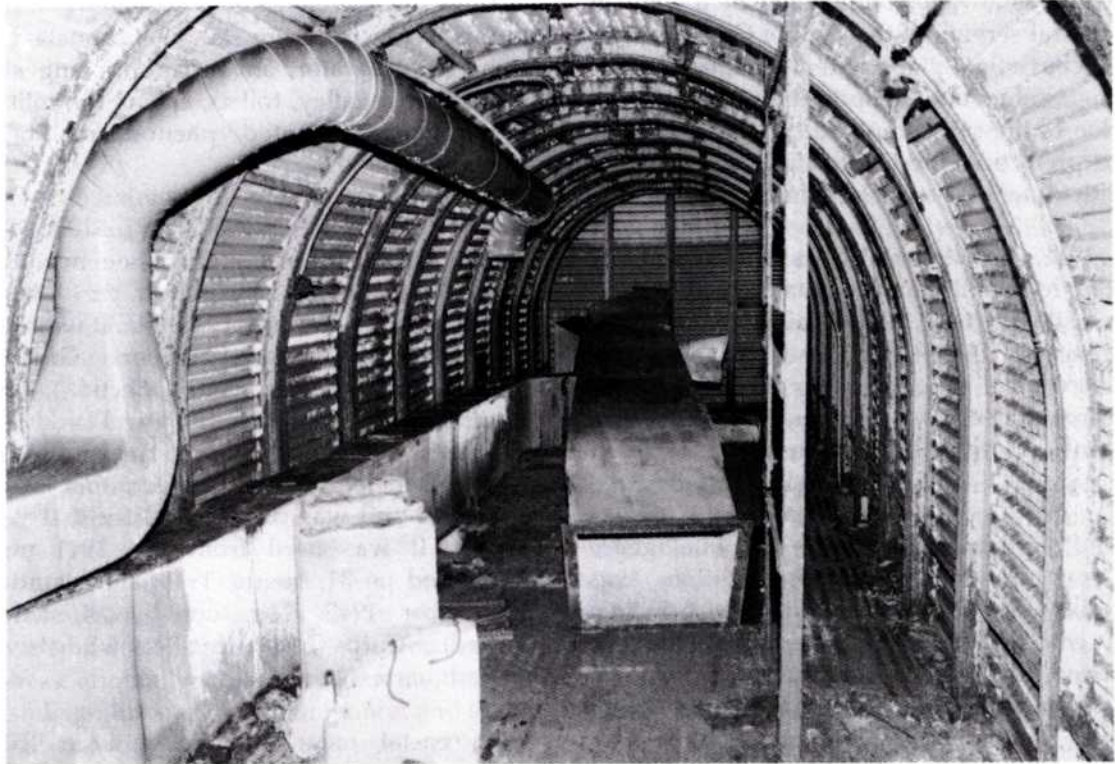


Fig.3 Air-conditioning plant. Trunking in centre of picture originally sat on lower trunking and connected with high level tubular trunking. Fans, filters and decontamination plant were at far end. The concrete stanchions supported an electrical air-heater; the vertical framework carried electrical switching and distribution equipment. (Geoffrey Ellis)

comprehensive picture of everything that moved on, under or over the English Channel from Dungeness to Selsey Bill. Further intelligence was obtained from military airfields by means of private telephone lines.

Initially, WRNS personnel staffed the W/T office, the teletypewriters, the cipher office, the telephone switchboards, the Signals Distribution office and the Naval Plot on a continuous three watch rota. They were supplemented by RN ratings for 'special' occasions, and on D-Day were joined by members of the RAF, WAAF, and ATS. These crew wore headphones, not helmets; brandished morse keys, rather than machine guns; despatched bulletins, not bullets; and carefully contemplated the courses of clandestine convoys.

HMS Forward was heavily involved in the saga of the German battle-cruisers Scharnhorst, Gneisenau and Prinz Eugen on 11 February 1942, and in the Dieppe Raid of 19 August 1942, and controlled frequent MTB raids or commando 'snoops' on the occupied French coast. For a while, air/sea rescue was also coordinated from here.

Few records survived the Admiralty's withdrawal from HMS Forward and so far there have been no concerted attempts by national bodies to record or publicise its extraordinary past. Indeed, the Imperial

War Museum tried to deny its existence.

Today, the only obvious evidence of past military activity at the Guinness Trust Holiday Home is a granite commemorative plaque above the fireplace in the main hall. On the plaque, carved in relief, is a crown flanked by the dates 20 JUNE 1940 and 31 August 1945. The words 'ROYAL NAVAL HEADQUARTERS' appear beneath. One other date was covertly recorded by the bricklayer who built the solid wall which sealed the top entrance to the tunnel. This read 21 November 1945, and is a certain indicator that the property was still in the hands of the Ministry of Works at the time.

One surviving naval artifact remains in active civilian service doing its original job. A twenty-five foot communications mast previously employed by HMS Forward is now used by the author in his capacity as an amateur radio enthusiast.

In 1964 the author fortuitously photographed the surviving surface relics of the complex as childhood memoirs. During the 1970s Heighton Hill was 'redeveloped' and all five of the internally accessed pillboxes on the hill were destroyed (Fig. 4). The cable and ventilation shafts were also obliterated, leaving only the bricked up western entrance as a reminder of what lies beneath.



Fig. 4 Hillside pillbox access. Geoffrey Ellis (standing) discusses the access to the hillside pillboxes with two assistants. (Tom Bonner)

The Guinness Trust Holiday Home, later named Denton House, has had a chequered history over the last fifty years and has now been partly demolished. It was the news of this impending disaster which inspired members of the Newhaven Historical Society to approach the Guinness Trust Estates with a view to reopening the former principal (east) entrance in the floor of room 16 and conducting a detailed survey of the labyrinth below. They kindly consented on condition that there would be no publicity which might increase vandalism in the vacant property.

Over the next few months every passage was measured, every step and stair counted, every room plotted, and every remaining artifact recorded. The entire complex was photographed using prints, transparencies, and professional-quality video photography. The data obtained have enabled scale drawings to be produced, and a model of the complex is now displayed at the new Local & Maritime Museum, Paradise Park, Avis Road, Newhaven.

As the new museum is only two hundred metres from the western entrance of HMS Forward, a feasibility study has been recommended to South Heighton Parish Council, Newhaven Town Council and Lewes District Council to consider the possibility of guided tours around 500 metres of galleries which remain suitable for public access. Newhaven Historical Society

is willing to participate in the preparation for, and administration of, any such access.

Unfortunately it is no longer possible to use the Denton House principal entrance to this former intelligence centre which once helped protect this country.

The author of this article has written a book and produced a seventy minute video entitled *The Secret Tunnels of South Heighton*. These describe in detail the revelations produced by a site survey, and visits to the Public Record Office. Interviews with military and civilian veterans who served here during the war provide authentic information about unrecorded matters concerning the equipment, accommodation, procedure, and administration of the establishment.

The book is published by SB Publications, Seaford, ISBN 1 85770 101 1. Both are available from the author, Mr. G. Ellis, 11, Fairholme Road, Newhaven, BN9 0NY. The book costs £5.99 plus £1 (UK) p&p; the video, in VHS PAL (other formats available), costs £9.99 plus £1.50 (UK) p&p.

Newhaven Local & Maritime Museum (tel: 01273 612530) is open on Saturday and Sunday afternoons in the winter months, with extended opening during the summer.

SOME SUSSEX LIME KILNS

Ron Martin

This article is the result of the beginnings of a survey of lime kilns in Sussex and will be complemented by a further one when the research is completed. I have started with some general remarks about the uses of lime and finished with the description of three lime kilns which have been surveyed.

In the eighteenth and nineteenth centuries lime was one of the most wide spread non-food manufactured products. Although used in many different manufacturing processes, the two principal uses in Sussex were for agriculture and in building.

In agriculture lime was used as a "manure" on the heavy soils in order to make them more open and friable, to improve drainage and to make the land more easily worked to a good tilth.¹ Lime is an essential plant food and its presence is essential in fair quantity to produce good crops. To correct soil acidity lime has a beneficial effect which converts the organic matter of the soil into soluble plant food.

Lime has been used in building since Roman times. Mortar for laying masonry was made by mixing lime with sand, and to make concrete the lime was mixed with an aggregate such as crushed or natural stone. Plaster had backing coats of a similar mix to mortar, with a neat setting coat of neat lime. Lime putty was used to set fine brickwork and masonry. Lime white is a mixture of lime and water and was used for whitening walls, the traditional "whitewash".

The material from which lime is derived is calcium carbonate (CaCO_3) which occurs naturally in Sussex as limestone or chalk, although there are other sources throughout the world such as coral and shells. In Sussex, the most common source is chalk from the South Downs. Chalk from the Holywell Pits at Beachy Head was shipped in sloops to Bexhill, Rye and Hastings² but most was obtained from the north face of the Downs. The only limestone used in Sussex was Sussex marble, commonly known as "winkle stone" and extensively used decoratively, but this was mined by the Earl of Ashburnham.³ When calcium carbonate is burnt at a temperature of 900°C , carbon dioxide is driven off and the calcium oxide is left. ($\text{CaCO}_3 = \text{CaO} + \text{CO}_2$). This is known as quick lime due its violent reaction when mixed with water (slaking). The resultant product is calcium hydroxide (Ca(OH)_2) or slaked lime. For agricultural purposes the quick lime was applied directly onto the fields, but for building

purposes the lime was slaked in large vats and stored for several months to mature. In use it is then mixed with sand to produce "course stuff" for mortar or rendering coats for plasters.

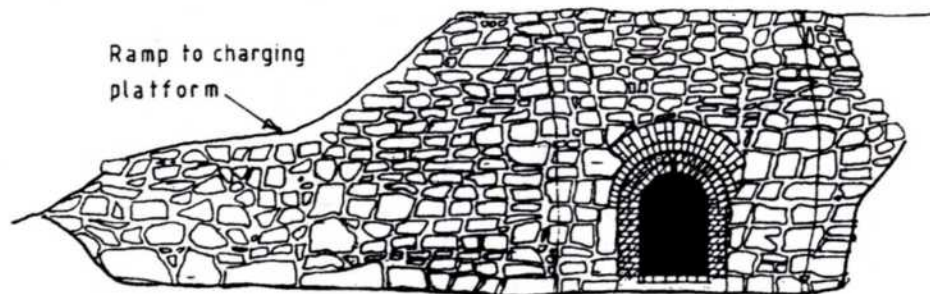
Early lime kilns in Sussex fall into two categories. On the heavy Wealden clays it was found necessary for most farms to have their own lime kiln and many of these would have been in existence in the eighteenth century. In one area looked at in Northchapel, in an area of 15 square kilometres there were no less than 20 kilns. From the few surviving examples it would appear that these were probably flare kilns similar to the one at Ebernoe described later. The practice would have been for the farmer to collect the chalk from the Downs, a distance of up to 12 miles. Young in 1813⁴ gives a detailed breakdown of the cost of liming in Northchapel, the chalk being obtained from Duncton. It is significant that the two greatest items of cost were cartage and fuel.

The second category of kilns are the ones on the South Downs, mostly occurring at the foot the scarp face. Most of these are mid-nineteenth century kilns and were in the nature of lime works providing burnt quick lime as a finished product. These were mainly in the form of shaft or bottle kilns and would have probably been used as continuously burning mixed-feed kilns. Many of them are associated with the means of transport, with river or canal navigation or rail connections as at Chichester, Houghton Bridge, Offham and Southerham. Most of these sites had multiple kilns with for example at Houghton as many as 16 kilns in addition to the De Witt kiln which was erected in 1903. The example described later at Goat Farm in Streat does not seem to fit into either of these categories. It is a single kiln on a farm site, located on the South Downs, but it is an excellent example of its type.

EBERNOE LIME KILN

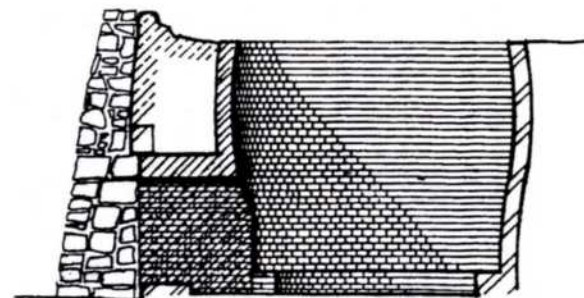
The lime kiln is situated at the south edge of Ebernoe Cricket Field at SU 972278 on flat ground and earth had been built up to form a ramp at the east side for access to the charging platform. The kiln probably dates from the eighteenth century and was restored in 1996.

The pot is circular on plan with an internal diameter of 2.8 m (9'2") at the top and 2.6 m (8'6") at the bottom, widening out to 2.95 m (9'8" about 1 m (3'3") from the top. Around the bottom is a brick shelf 250 mm (10") wide and 300 mm (1'0") high. The total height is 2.7 m (8'10"). The inside of the pot is vitrified to a height of about 1 m (3'3") above the shelf. At the north side is



Ramp to charging platform

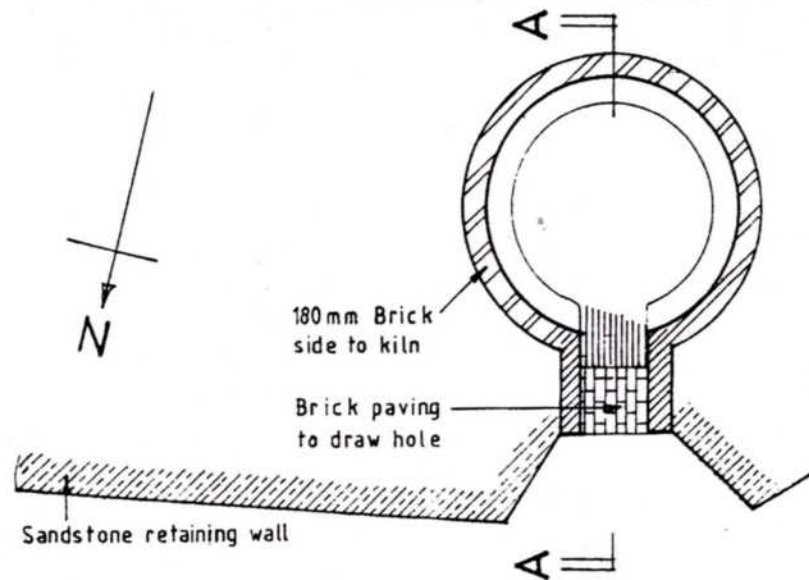
ELEVATION



SECTION A A

EBERNOE

LIME KILN



N

180 mm Brick side to kiln




Brick paving to draw hole

Sandstone retaining wall

A A

PLAN

KEY TO HATCHING

-  Old brickwork
-  Restored brickwork
-  Stonework

SCALE



0 1 2 3 4 Metres

© R.G. MARTIN
1996

the firing hole, 1.1m (3.7") long, 0.70 m (2'3") wide and 0.84 m (2'9") high to the springing of a semi-circular vault. The floor of the firing hole is paved, partly with bricks laid flat and partly on edge.

Along the north side of the kiln is a retaining wall, total length about 9 m (29'6"), and splay recessed at the firing hole. At the east end this retaining wall reduces in height to follow the fall of the ramp to the charging platform.

MATERIALS – The pot is built of tapered bricks laid flat in header bond. These measure 120 - 130 mm (4¾" x 5") wide and are 180 mm (7") long. This is interesting as normally bricks are 112.5 x 215 mm (4½" x 8½") and this has possibly been done so that the volume of the brick is similar to a standard brick which might assist firing of the bricks in a kiln with some standard and some kiln bricks. They were almost certainly made locally in the brickworks on Ebernoe Common which is still extant. The retaining wall is built of sandstone random rubble, probably from the Pulborough area.

FIRING – A flare kiln was loaded by first building a rough dome of chalk on the shelf around the base of the kiln on a timber centre. Lumps of chalk of about fist size were then filled in on top to the top of the kiln. The fuel comprising furze or faggots was fed in through the firing hole as long as required to burn the lime through, a total duration of about 72 hours.

GOAT FARM LIME KILN, STREAT

This kiln is located at the foot of the scarp face of the South Downs in a chalk pit at what was formerly known as Goat Farm (now The Gote) in the parish of Streat at TQ 348131. This is an excellent example of a shaft kiln typical of the sort found in Sussex. It probably dates from mid-nineteenth century.

The pot is lined with brickwork laid in header bond., 0.8 m (2'8") diameter at the bottom and 2.7 m (8'10") at the top and 8.4 m (27'6") high. The upper 2 m (6'7") has nearly vertical sides and has been rebuilt. At the bottom of the pot is the draw hole which is 0.6 m x 1.1 m (2'0" x 3.7") which is spanned by a segmental brick arch. There is a 50 x 50 mm (2" x 2") iron bar across the top of the draw hole below the arch. The tunnel which leads to the draw hole is 1.85 m (6'1") wide and 3.3 m (10'10") long with brick walls containing two panels of flint rubble. The vault over the tunnel is brick two-rings thick and semi-circular. The tunnel is paved in bricks laid flat.

The retaining wall is 6.8 m long and stands to about 6.3 m (20'8") high, returning to the front about 2.5 m (8'2") at each end and is built of field flint rubble

incorporating some "bungaroosh", a term used to describe a mixture of flint and old bricks often laid diagonally. The ends of the walls are quoined in red brick as are also the internal angles between the front and return walls. Small sloping buttresses have been built at the front of the draw tunnel and at the end of the northern retaining wall.

There is evidence of the remains of a shelter to protect the lime workers and the lime when being drawn out of the kiln.

CONDITION – The pot is in nearly perfect condition as a previous owner has had the foresight to cap the pot with a concrete slab. As a result there is no filling or rubbish inside the pot. There is some cracking of the vault of the draw tunnel at the back of the retaining wall. The wall itself has the upper part slightly eroded and vegetation has damaged the outer face of the flintwork over a considerable area.

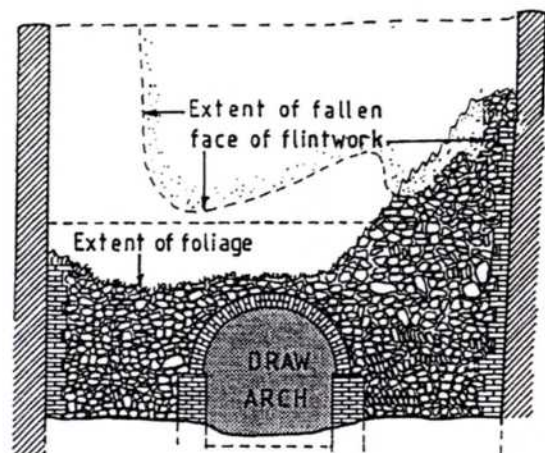
FIRING – This type of kiln was probably a mixed feed kiln loaded with alternate layers of chalk and fuel. It was presumably an intermittent feed kiln as there is no evidence of poke holes which are normally found in the case of running or draw kilns.

COMMENT – It is interesting that this kiln is located on a farm whereas most of the kilns in similar locations are commercial lime works. This was for small scale production and may have been used on the farm. Further investigation might reveal an explanation for this.

DUNCTON LIME KILNS

The kilns are situated in the scarp face of Duncton Down at SU 961163. Access is from the bridle path about 140 m from the foot of Duncton Hill on A285 which was the original track by which the lime was carted away. This track then doubles back on itself and connects to the track at the top of the kilns where charging took place. Above this is the pit from which the chalk was dug and there are various heaps of finings containing the chalk not suitable for burning.

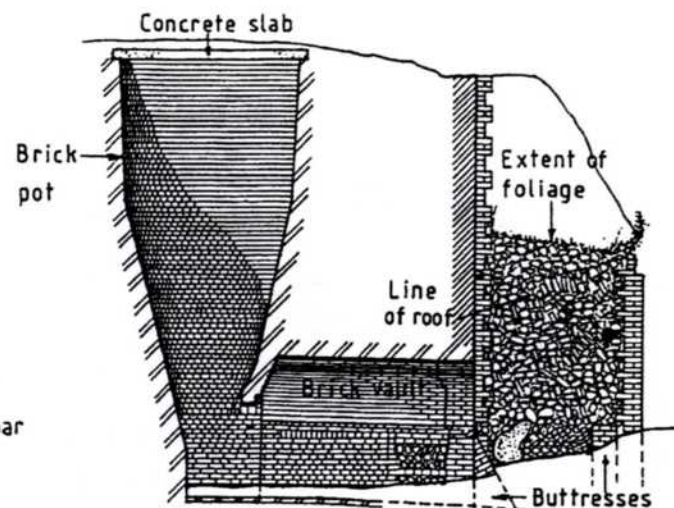
DESCRIPTION – Kiln No.1 as originally built was a draw kiln, the pot being circular in plan and fairly evenly tapered from 1.2 m (3'11") at the bottom to 2.6 m (8'6") diameter at the top with a height of 6.8 m (22.4"). The pot is constructed of brickwork only a half brick 115 mm (4½") thick and is a mixture of bricks-laid-flat, bricks laid-on-edge and bricks laid-on-end. At the foot there is a draw hole 1.2 m (3.11") wide and 1.26 m (4'1½") high to the springing of a segmental arch and across the top of which are two iron bars 75 mm (3") below arch springing level, the inner one 80 x



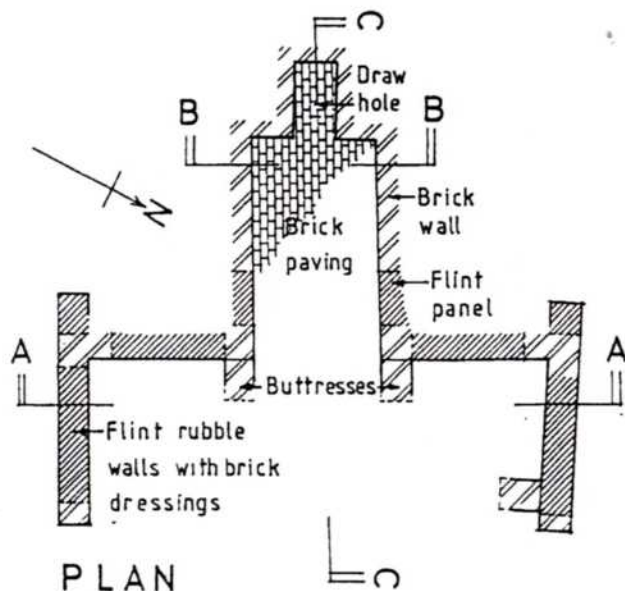
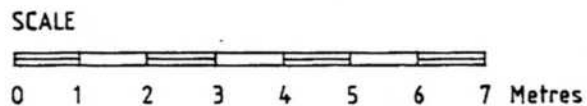
SECTION A-A



SECTION B-B



SECTION C-C



PLAN

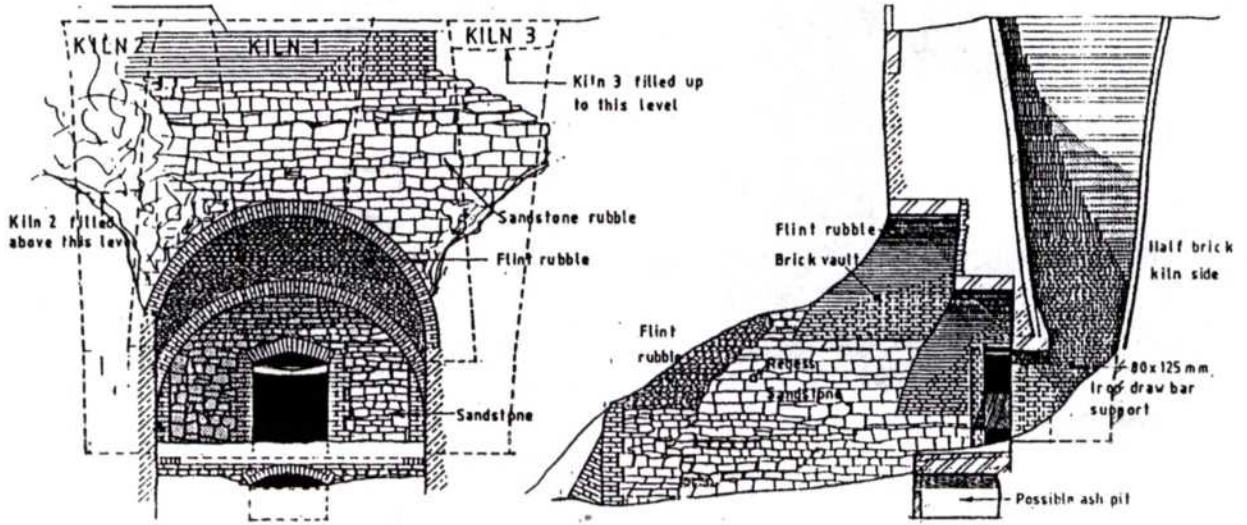
STREAT - GOAT FARM

LIME KILN

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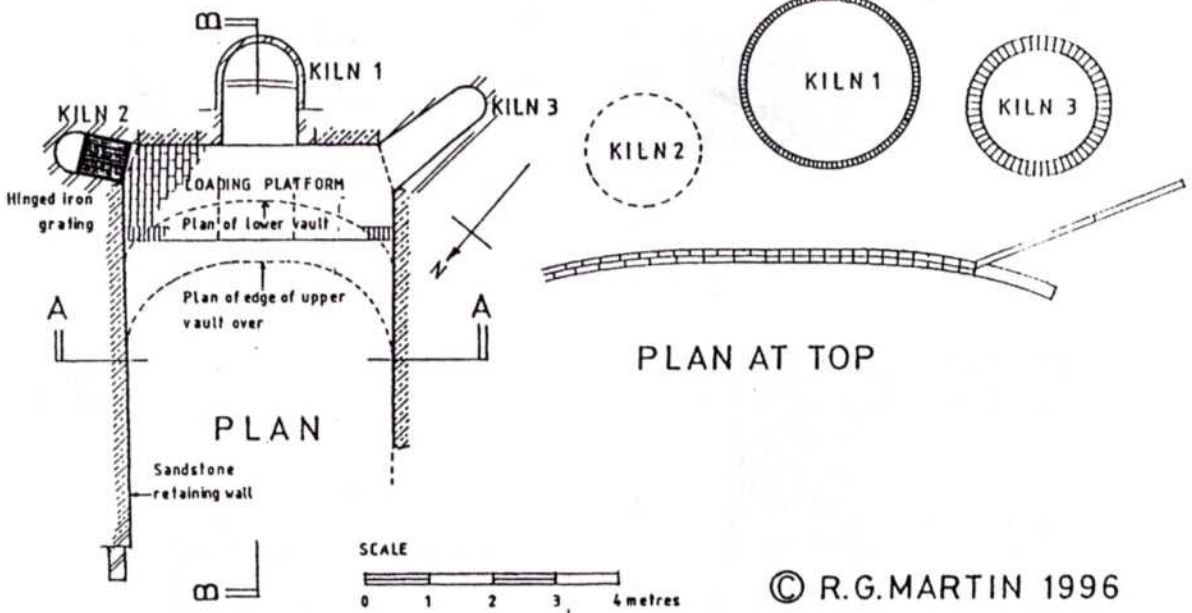
DUNCTON

LIME KILN



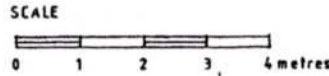
ELEVATION A-A

SECTION B-B



PLAN

PLAN AT TOP



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125 mm (3¼" x 5") and the outer one being 60 x 15 mm (2½" x ½") on which it is presumed the draw bars were supported.

The wall in front of the kiln is located only 610 mm (2'0") from the kiln side which is unusual. Normally with this type of kiln this wall would be several metres away and the access to the draw hole would be by a tunnel. In this case the wall is 4.28 m (14'0") long and connected at right angles at each end to retaining walls

supporting the ground at each side. Springing from, and spanning between these retaining walls, are two semi-circular brick vaults, the lower one springing from 0.47 m (1'6") above bottom of kiln and projecting between 1.8 and 0.9 m (5'11" and 2'11") and the upper one springing at 1.67 m (5'6") above bottom of kiln and projecting a further 3.4 to 1.9 m. (11'2" to 6'3") Above the upper vault the wall continues to the top of the kiln.

In front of the kiln is a loading platform 1.53 m (5'0") wide paved in bricks laid flat with a bull-nosed edging. Although the ground has become filled almost up to the platform level it seems likely that there originally was an upstand at the front of the platform of about 0.9 m (3'0"). Centrally in this upstand is an opening with a segmental headed arch, 1.2 m (3'11") wide giving access to a chamber about 1.2 m (3'11") deep and 0.9 m (3'0") high. The front is partly bricked up and the void filled but there is evidence of ash in the fill. There appears to be no access to this void from the base of the kiln or to the loading platform. There is no obvious reason for this chamber unless it was for the temporary storage of ash to clear it away from the loading platform before lime was being emptied from the kiln.

MATERIALS - The pot is of brickwork, heavily vitrified, and it is impossible to determine the type of bricks. The wall in front of the kiln and the retaining walls are of sandstone, probably from the Pulborough area, both the yellow variety and the dark brown carstone. There may be some clunch but is so heavily lichen encrusted that it is difficult to be sure. Most of the stone is roughly squared and laid in courses and with brick dressings. The area immediately over the draw hole, and a patch at the north end of the east retaining wall, is laid in field flints roughly coursed. The top of the front wall has been repaired with brickwork and there is some repairs flanking this in concrete blocks. There are two recesses in the retaining walls 4 m (13'1") from the draw hole of No.1 kiln and about 2 m above ground level which might have supported a beam carrying a temporary roof. This might have been necessary as the working area might have been a bit exposed compared with the normal tunnel access pattern.

KILNS NOS. 2 AND 3

There appears to have been a subsequent alteration to add two additional kilns to the original one. These were located east and west of kiln No.1 and are much smaller in diameter, No.2 being 0.71 m (2'4") diameter at the bottom less than 1 m (3'3") in diameter for most of its height and No.3 being 0.68 m (2'3") diameter at the bottom and 1.8 m diameter at the top. The sides of the pots (of No.3) is 215 mm (9"), of bricks laid flat. The draw holes have been cut through at the internal angles between the No.1 kiln wall and the flanking retaining walls, the soffit supported by iron bars. Across the draw holes are iron bars, very rusty, presumably to support draw bars. In the bottom of the draw hole of No.2 kiln there is extant a sloping iron grating 660 x 1060 mm (2'2" x 3'5") with a 25 x 25 mm (1" x 1") frame and 12 x 12 mm (½" x ½") bars at 30 mm (1¼") centres hinged at the top.

CONDITION - The kilns generally are structurally in good condition. Kiln No.1 has some chalk or lime remains in the bottom. No.2 has a plug of lime at about 3 m (9.10") above the bottom and earth fill above. No.3 kiln is filled from the bottom to within 0.6 m (2'0") of the top. The loading platform and the ground in front are heavily silted up and there is quite a bit of vegetation on the walls. There is some deterioration to the walls and some cracking to the front edge of the lower vault and to the east retaining wall. The north end of the west retaining wall has fallen away.

CONCLUSION

This group of three kilns is a most interesting and due to the wide and deep vaults over the draw holes which give it a very monumental appearance, a feature unusual in Sussex. They were probably built in the mid-19th century, No.1 as a mixed-feed draw kiln probably being operated as a running kiln. Nos. 2 and 3 kilns were possibly built at a later date to produce lime for mortar. The fuel may have been wood or coal, although the small remains of ash suggest the latter. The fact that No.1 kiln has walls only half brick thick suggests that this was for short term use, however the presence of the other two later kilns belies this.

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1. Board of Agriculture and Fisheries. *Leaflet No. 170*, p.2 (1907, Revised 1918)
2. Rev. Arthur Young, *General View of the Agriculture of the County of Sussex*, (1813) p.203
3. *Ibid*, p.205
4. *Ibid*, p.201

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