

The Waltham Pound Lock

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In 1571 an Act of Parliament was passed 'for the brynging of the Ryver of Lee to the Northside of ye Citie of London'.¹ This act, sponsored by the city authorities, gave details of: plans proposed by the aldermen for building a new cut from the River Lee, through Hackney and Shoreditch, to terminate just outside the city walls near Moorgate. Once this canal had been completed, the aldermen further proposed that improvements be carried out along the existing river between Ware and the mouth of their new cut.

These ambitious plans, however, were never carried out. During the committee stage of the bill's passage through the House of Commons, several important additions and alterations were made to the original draft, the most important of which, was the insertion of a veto on the right to collect tolls for using either the improved river or the new cut. Such a veto meant that the City was unable to finance the canal and although the scheme was not shelved immediately it became obvious within a couple of years that the project could not go ahead.

Interest in improving the Lee had been awakened, however, and on 27th September 1575, a Commission of Sewers was appointed to improve the navigation on the river² in order that it might become an important artery along which grain, meal and malt could be brought to the capital. John Norden ascribes this later initiative to 'the instant suyte of the inhabitants of Hartfordshire'³ who saw that an improved navigation would allow them to capture an important share of a trade which had previously been dominated by land carriers known as 'badgers'

There is no evidence to suggest that the Commissioners ever seriously considered building the new cut to Moorgate; instead they concentrated on improving the existing navigable channel. They scoured and cleaned this channel, ordered the removal of all fishing weirs and impediments to navigation, raised all bridges over the river to allow the barges more headroom, laid out a rough towpath which included towing bridges, and came to a series of differing compromises with the many millers in the valley whereby they were to take water out of the river without the use of any flash locks which would hold up the passage of the barges.⁴ Though these improvements were much less ambitious than those originally proposed by the City, they were nevertheless extremely successful. Within four or five years of the Commissioners' appointment the river had been substantially improved and an expanding barge traffic was already arousing the opposition of the badgers.

The most ambitious task undertaken by the Commissioners was the construction of a pound lock at Waltham and it remains their best-known work for it was the first pound lock in England to be equipped with mitre gates at both ends. The only earlier pound locks known in England were those built between 1564 and 1567 by John Trew along the

River Exe. These were constructed as large pools in which several boats could lie at once. Mitre gates were used at one end only; at the other end were single guillotine gates.⁵

The Waltham lock is described in a poem written by William Vallans some time during the 1580s.⁶ In it two swans make a journey down the River Lee and one of the many sights they marvel at is:

.
But newly. made, a waterwourke: the locke
Through which the boates of Ware doe pass with malt.
This locke contains two double doores of wood,
Within the same a Cesterne all of Plancke,
Which onely fils when boates come there to passe
By opening of these mightie dores with sleight,
And strange devise, but now decayed sore.

Before the Commissioners began their work barges navigated the river above Waltham by means of a flash lock which stood across the main stream about three quarters of a mile above Waltham High Bridge. When shut this flash lock diverted water out of the river the head stream of Waltham Mill. Since few barges navigated the river at this time the flash lock was usually shut and consequently, it was later claimed, 'the auntient Channell did decay for lacke of continuall corse of. Water and soe did become unpassable for Boates"⁷

The Commissioners, however, chose not to 'scour and cleanse this traditional channel, but rather to open a new route. They ordered that 'the passage of the Boates should be directed to passe by the sayde Millstreame, And for that purpose that a newe Cutt should be made from the sayde Millstreame somewhat. distaunte from the sayde Mill towards the North unto the old River towards the West', and that along this new cut 'a newe devised Lock to Cawse the water to swell upp wherby Boates may passe and repasse betwixt the sayd river of Ley and the water belonging to the Mill' be constructed.⁸

To complete the arrangements for this new route the Commissioners further decreed that the old flash lock be pulled up and replaced by a 'loweshare of three foote and a half highe from the bottome of the river for the forcing of the water to his (Edwards Denny's) sayde Milles and yett not be suffered to be anie higher for that all white and superfluous waters may passe that way for the drayninge of the groundes adioyninge and keepinge open of the olde channell'.⁹ As a precaution the Commissioners added that the bargemen were to have the right of pulling up this loweshare using the traditional channel, if, for any reason, they were unable to use the newly opened route. This particular proviso was to assume great importance later when (in 1592) disputes arose and riots ensued over the rights of navigation through Waltham.

In October 1576 the Commissioners were still debating which route to take through Waltham¹⁰ Yet by November they were meeting to discuss the completion of their work in the area. Thus the pound lock must have been built during November 1576.

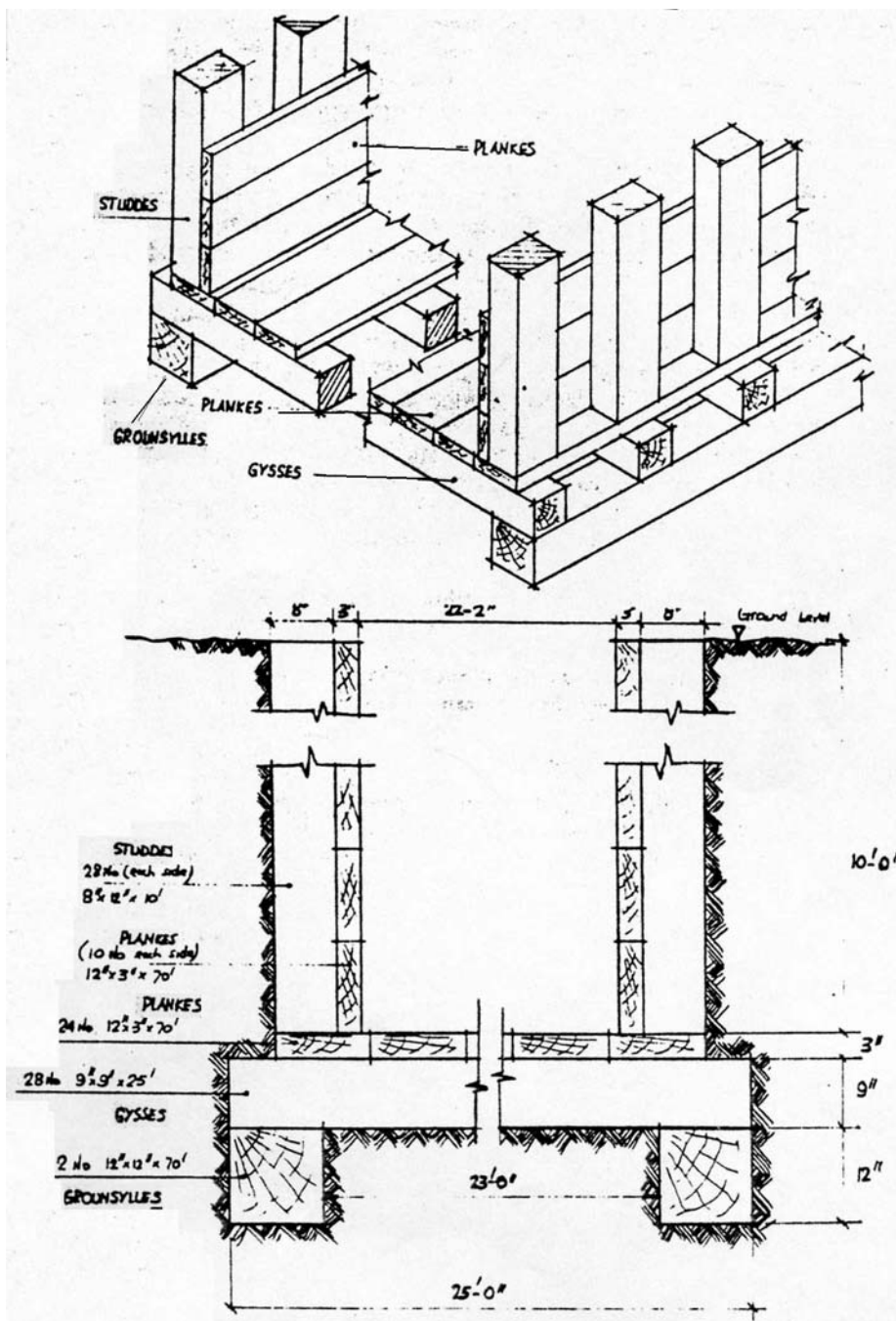
Besides discussions. about the route the Commissioners seem to have considered at least two alternative plans for the construction of the lock. A surviving estimate of costs, ¹¹ reproduced in full in the Appendix, provides a rather inadequate comparison between the cost of building the lock entirely of wood, and in an alternative proposal whereby the walls of the lock would be built of stone. Vallans' poem suggests that the Commissioners chose to build entirely with wood but no firm evidence remains to throw light on the reasons for such a choice.

The estimate itemises the different sections of the lock and calculates the amount of timber necessary for each section. Although the arithmetic is not quite correct a total of 44 Loades of timber is estimated and it was reckoned that the cost of this timber and the associated carpentry work - would be £40 5s. 0d. No allowance, however, is made for any mechanism to open the doors nor for any paddles or other devices to let water into the lock when the gates were shut. The estimate for the lock built with stone walls is even more incomplete, although it does seem likely that this would have been the more expensive piece of work.

| | | |
|-----------------------------|---|--|
| if it be don with timber | Tymb xliiiij.lodes at x ³ Sawinge + Carpenters woorke | $\begin{array}{r} \text{xxii}^{\text{li}} \\ \text{xviiij}^{\text{li}} \quad \text{v}^{\text{s}} \\ \hline \text{xl}^{\text{li}} \quad \text{v}^{\text{s}} \end{array}$ |
| the same with stone | Tymb xxiiiij lodes Lyme,viiij lodes at 16.8 Sand xvj lodes at ii ^s The walling Carpenters woork Stone | $\begin{array}{r} \text{xii}^{\text{li}} \\ \text{vi}^{\text{li}} \quad \text{xiii}^{\text{s}} \quad \text{iiij}^{\text{d}} \\ \quad \quad \text{xxxii}^{\text{s}} \\ \text{viiij}^{\text{li}} \\ \hline \text{xxviiij}^{\text{li}} \text{ [sic]} \end{array}$ |

In addition it was estimated that the digging of a new cut, 36 poles in length, ¹² would cost a further £48, while heightening Waltham High Bridge by two feet would cost £4. These estimates, however, turned out to be much too optimistic. Though the total estimated cost of the work was given as £88 5s: 0d. beforehand, the actual cost was reported to be £271 18s. 0½ ¹³

Assuming that the wooden lock was built according to the specifications laid down in the estimate, the reconstruction shown in the figures below indicates how the frame of the lock was constructed.¹⁴ First, timbers known as 'grounsylles' and 'gysses' (joists) were laid in the bed of the cut to provide a foundation upon which to fix the frame of the lock. The floor and walls of the enclosure were made up of planks, each measuring 70 feet by 1 foot by 3 inches, laid side by side. The floor planks, were nailed to the 'gysses', whilst the wall planks were nailed to vertical 'studdes' which were fixed at regular intervals along the sides of the lock. In this manner a frame 70 feet long, 24 feet broad, and 10 feet high was built up, and at the ends of this frame posts were fixed from which the four gates were hung.



Vallans mentions that the gates were opened by 'sleight and strange devise', but unfortunately the estimate gives no idea what this might have been. Conceivably chains were used because in 1581 it was alleged that 'Aron Yong of Waltham Abbey Tailor solde a chayne that belonged to the said lock to one Davie of Waltham Cross smyth for sixe pence'.¹⁵ On the other hand such a chain might have been used to lock the gates so that they could not be opened except with the cooperation of the miller.

It seems likely that the Commissioners opened this new route after representations from the owners and occupiers of Waltham Mill for it was the owners who were made to bear

the cost of the new cut and lock. The mill was owned by the Denny family as part of the manor of Waltham. At the time of the alterations Henry Denny had just died and his heir, Edward Denny, was still a minor and as such a Ward of Court whose interests were looked after by Queen Elizabeth. In view of this the Commissioners at their meeting in the Star Chamber decided that the cost of the work should be split equally between the executors of Henry Denny's will and the Queen in her role as Edward's guardian. All further costs of maintenance were to be borne by the miller, Thomas Perrott, during the remaining term of his lease after which they became the responsibility of Edward Denny and his heirs.

Since it was also reported that, despite their previous orders, the old flash lock was still standing, the Commissioners further decreed that the miller was to pull it down and build a lowshare by 14 February 1578 or else face a fine of £10.

Within a couple of years, however, major problems had to be faced. In 1579 full-scale repairs had to be carried out and the fact that the cost of this work was borne by the Treasury rather than the miller does suggest faults in the original construction. From hints in an account book ¹⁶ detailing these repairs it seems that one side of the wooden foundations had settled so far into the bed of the new cut that the lock had become lopsided. To rectify this the Commissioners were forced to close down the new cut so that the lock could be dismantled and masonry foundations constructed. The wooden frame was then replaced on top of these new foundations.

On the back of the account book a total cost of £96 13s. 3d. is recorded of which £40 6s. 9d. is attributed to 'redy money' and the remaining of £56 6s. 6d. to 'bills of Woork'. No further details are given about the 'redy money' but the account lays out in great detail the various charges which constituted the 'bills of Woork' These include the wages paid, the amounts spent on transportation and sums for many small items such as nails and planks, the need for which must have arisen during the actual course of the reconstruction.

Work commenced on 18 May 1579 and was completed by 13 June. During the first few days temporary dams were built and preparations made so that five carpenters could be employed at 'pulling upp the planks and laiiing them agayne' In between two masons and their assistants were employed to lay the masonry foundations. These carpenters and masons, being skilled workers, were paid 14d. per day.

Most of those employed, however, were unskilled men taken on either as general labourers or 'skavellmen'. The latter were so named because they were hired to bale out any water which seeped through the temporary dams using a tool known as a skavell. The two types of unskilled labour were interchangeable, men working at whatever job was available on any one day. Labourers worked during the day only while the 'skavellmen' were needed right round the clock. Since the men were paid either 10d or 12d. per shift it seems likely that they worked for either 10 or 12 hours and were paid at a rate of 1d per hour, the variation in pay per ft not depending on the type of work done. Some men only worked the odd shift whilst others took advantage of the availability of employment to put in extremely long hours. One man, John Foster, earnt 9s. one week and 11s. the

.following, which means that in the second week he worked the equivalent of 7 day and 4 night shifts.

The account book also mentions that a Mr Trewe was paid £6 13s. 4d. for directing and overseeing the work. It is conceivable that this was the John Trew who was responsible for improving the River Exe. Such a high salary does suggest that he was being rewarded for professional skills over and above the mere ability to oversee a work-force. Whether he introduced any basic changes into the design or operation of the lock cannot be said.

The problems experienced with the Waltham lock arose no doubt because of the technical novelty of the work. The Commissioners, however, enjoyed far more success with their other improvements. Their success, however, only aroused opposition. Not only did the millers, the fishermen and the riparian landowners feel that their traditional rights had been interfered with but the local badgers felt that their livelihood was directly threatened. Traditionally grain and malt had been brought to markets in the lower Lee valley, particularly Hoddesdon, where local dealers and badgers bought it in order to resell in the London markets. This traditional pattern was threatened by a growing barge traffic, not only because barges could carry at cheaper rates, but also because markets further up the valley, particularly those at Ware and Hertford, could "intercept much of the trade at the expense of Hoddesdon. The badgers, 'especially those living in Enfield, Cheshunt and Waltham, were to become the most persistent and vociferous opponents of the navigation.

In 1580 the badgers petitioned Lord Burghley requesting that the navigation be closed down. He advised them that he did not have the necessary authority and suggested that they approach Parliament instead. This they did but before their petition could be heard Parliament was prorogued.¹⁷ Having failed by legal methods the badgers turned to violence and during the summer and autumn of 1581, destroyed many of the works along the river. A full-scale enquiry was held at which the badgers were given full opportunity to express their grievances. Nevertheless the Commissioners obtained: the authority. to carry on with their work without any of the badgers objections being met. It was felt that the national interest warranted the expansion of barge traffic along the Lee even though it was admitted that the badgers did suffer as a result. For the rest of the decade the badgers continued to petition the authorities but to no avail and so they turned once more to violence. The outbreak in 1592 was better organized and barges were forced to stop using the river while appeals to the authorities to restore the navigation were made. Once more the verdict was in the bargemen's favour.

During both outbreaks of rioting Waltham Lock was a prime target. In May 1581 an approach was made to an employee at Cheshunt Mill for the loan of a handsaw with which to damage the lock but come July the less energetic course of setting the lock on fire was preferred. William Shanbrooke journeyed to London to purchase 'Rosseyne and brymston' for a goat. The lock was eventually fired in August but the damage was not as severe as hoped. One local inhabitant, Christopher Pennyfather, told bargemen who were using the lock several days later that he wished there had been a barrel of gunpowder in the lock when it had been set on fire.¹⁸ In 1592, however, the lock was completely

destroyed.¹⁹ In June of that year Edward Denny ordered his servants to dismantle the lock, to block up the new cut and to lower Waltham High Bridge to the height it had been prior to 1576. Denny argued that the Commissioners had made their alterations whilst he had still been a minor and therefore it could not be assumed that he had given his permission to changes affecting his freehold property and traditional rights. There were, however, veiled accusations that he had received money from the badgers to encourage him to take the steps he did. Whatever the case, however, his orders were quickly carried out.

Deprived of access to the new route the bargemen tried to take advantage of the provisions made by the Commissioners for just such a contingency. When, however, they tried to pull up the lowshare and proceed down the old river channel they met with violent opposition from large gangs of badgers and other local inhabitants who had gathered on the banks to thwart the bargemen's efforts. Throughout the summer, autumn and early winter, the violence continued. Boats were damaged, one was even sunk, and men on both sides suffered injuries. Eventually the bargemen found it impossible to continue, so once more they had to appeal to the central authorities for help.

In their case before the Star Chamber, however, the bargemen made no complaint whatsoever about the destruction of the pound lock; they concentrated solely on establishing their rights to use the original river channel. Indeed the destruction of the lock is only mentioned in passing by one of Edward Denny's servants under cross-examination. This suggests either that the bargemen felt their case to be stronger if they accepted Denny's arguments about his freehold property and concentrated on their own traditional rights, or that they were dissatisfied with the workings of the lock. Unfortunately there is no evidence to establish conclusively which was the case.

Though the bargemen succeeded in reopening the navigation the pound lock was never rebuilt. This was because the navigation reverted to the traditional route and the new cut in which the pound lock had stood was no longer used. The remaining evidence is incomplete²⁰ and on some points contradictory, but what does emerge is that soon after the end of the Star Chamber case some form of compromise was effected between Denny and the bargemen.

The evidence definitely establishes that Edward Denny built a turnpike, in fact a flash lock, at which he collected a toll of five shillings from each passing barge. This turnpike was still in existence in the eighteenth century despite many complaints from the bargemen that the lords of the manor of Waltham had no right to collect such a toll. The position of the eighteenth century turnpike on the map (Figure 2) is taken from a contemporary survey²¹ but the turnpike which Denny built must have been roughly the same position, as must also the flash lock which was replaced by a lowshare in 1576-7. In evidence before a 1682 Commission of Sewers²² certain local inhabitants claimed that Denny had built a new cut of over a mile in length in which the turnpike was sited but it seems very unlikely. It is much more probable that the old river channel was scoured and cleaned and that local memory had confused the measures taken by the Commissioners of Sewers in 1576-7 with those taken by Denny after 1595.

The confused evidence given to the 1682 Commission also mentions a 'Longe Poole very neere the said Corne Mills' through which barges had passed prior to the making of Denny's turnpike. P J. Huggins²³ has already suggested that this 'Longe Poole' must have been the same as the cut built by the Tudor Commissioners and this is confirmed by measurements taken in the area. The new cut was said to have been 36 poles in length,²⁴ which would have made it just under 200 yards if it is assumed that 1 pole equals 16½ feet. This approximates to the distance along the 'Long Poole' as it is shown on the map in Figure 3. Any cut between the mill stream and the river beginning at a point any further up the mill stream would have been some 40-50 yards longer. It thus seems indisputable that the pound lock was situated at the place marked on the map. There is no trace of this 'Longe Poole' today and it seems unlikely that any remains of the lock would be found even if the site were excavated. However there is evidence that barges could still use the 'Longe Poole' until well into the eighteenth century. Notes in the margin of the 1682 Commission of Sewers' records mention that barges used the route within living memory though they had to carry much lighter loads than if they had used the turnpike.

Figure 2. Branches of the River Lee near Waltham Abbey showing the site of the pound lock and of the turnpike. From a contemporary survey

Appendix

The estimate of costs to construct the pound lock at Waltham is taken from Public Record Office, State Papers Elizabeth, Domestic Series, Vol. 109 no. 133.

A modern English version follows the original.

26 November 1576

An estimate of the Charges of the newe Locke that shalbe made at Waltham yf yt be all of tymber as followeth, and beinge in leynge lxx foote and xxiiij foote in breathe

Imprimus xxviiij gysse to lye in the bottom, under the plankes, every gysse being ix enches square and xxv foote longe so every gysse will Conteyne xvj foote, one quarter of a foote whiche will amownte to ix Lodes of square tymber.

Itm for the bottom xxiiij plankes, every planke Conteyninge lxx foote Longe, and one foote brode + iij enches thicke, so every planke will conteyne xvij foote &, which will amownte to viij Lodes xx foote of square tymber

Itm ther, moste be ij grounsylles, every grounsyll of lxx foote Longe and one foote square, which will Conteyne vij^{xx} foote of square tymber, that is ij Lode, forty foote

Item for every syde ther moste be xxviiij studdes, every studd beinge xij enches brode and viii enches thicke and x foote heygh; so every studd will Conteyne vii foote in square, tymber, which will amownte to viii Lodes.

Item ther moste be ij peces of tymber to Lay upon the sayd studdes, every pece of lxx foote long, and one foote square, which is ii Lodes xl foote.

Itm every side will aske x plankes every planke beinge lxx foote Longe, one foote brode and iij enches thicke, so every planke will Conteyne xvij foote & whiche will amownte to, for bothe sydes, vij Lodes of tymber.

Itm the iij gates with the postes to hange them upon, and Certeyne Lande keyes for the same, will aske vi Lodes of tymber.

Suma of the Lodes of tymber xliij)
 every Lode Rated at x^s the lode) xxij^{li}

Itm, the sawing worke of all the foresayd tyrnber will amownte to lvj hundred at xx^d the hundred iij^{li} xvij^s iij^d

Itm the Carpenters worke for the same Locke will Coste xx markes so that the Carpenter be put to no other Charge but only the framynge, and settinge upe of the same.

Itm yf the sydes and endes of the sayd Locke be made of stone or brycke, then the tymber y^t shale go to the same will amownte to xxiiij Lodes or ther abowtes.

Itm the workmanshipe of the same walle, beinge x foote heyghe, and iii foote thicke will Coste xvj^s a pole, so that the mason be putt to no other Charge, but only the Reysinge of the same walle, and the same worke will Conteyne by estimacon x pole, every pole being xvj foote.

Itm ther will go to the same walle viii Lodes of Lyme whiche will Coste xvj^s viij^d the Lode, whiche is vi^{li} xij^s iij^d.

Itm ther moste be to the same worke xvj Lodes of sande at ii^s the Lode, xxxij^s

Itm the heyghtinge of the hyghe brydge at Waltham to Reyse yt ii foote hygher will Cost by estimacon iij^{li}

Item the Charges'of the Cuttynge of the newe Cutte from the myll river to. the ryver. of Lee, which Conteynes xxxvi pole, every pole rated at xxvj^s viij^d the pole, whiche will amownte to xlvij^{li}

| | | |
|-----------------------------|--|--|
| if it be don with timber | Tymb xliij lodes at x ^s Sawinge + Carpenters woorke | $\frac{\begin{matrix} \text{xxii}^{\text{li}} \\ \text{xvii}^{\text{li}} \end{matrix}}{\begin{matrix} \text{x l}^{\text{li}} \\ \text{v}^{\text{s}} \end{matrix}}$ |
| the same with stone | Tymb xxiiij lodes Lyme, viij lodes at 16.8 Sand xvj lodes at ii ^s | $\begin{matrix} \text{xii}^{\text{li}} \\ \text{vi}^{\text{li}} \end{matrix} \quad \begin{matrix} \text{xiii}^{\text{s}} \\ \text{xxxii}^{\text{s}} \end{matrix} \quad \text{iiij}^{\text{d}}$ |

| | |
|-------------------------------|-----------------------------|
| The walling | viiij ^{li} |
| Carpenters woork | |
| Stone | |
| | <hr/> |
| | xxviiij ^{li} [sic] |
| | |
| The heightening of the bridge | iiij ^{li} |
| The chardge of the Cut | <u>xlviiij^{li}</u> |
| | Lij ^{li} |

MODERN VERSION

26 November 1576

An estimate of the cost of the new lock that shall be made at Waltham if it be all of timber as follows, and being in length 70 feet and 24 feet in breadth

First of all 28 joists to lie in the bottom, under the planks, every joist being 9 inches square and 25 feet long so every joist will contain 16 feet and one quarter of a foot which will amount to 9 loads of square timber.

Item, for the bottom 24 planks, every plank being 70 feet long, and 1 foot broad and 3 inches thick, so every plank will contain 17+ feet, which will amount to 8 loads and 20 feet of square timber.

Item, there must be 2 ground-sills, every ground-sill of 70 foot length and 1 foot square, which will contain 140 feet of square timber, that is 2 loads and 40 feet.

Item, for every side there must be 28 studs, every stud being 12 inches broad and 8 inches thick and 10 feet high, so every stud will contain 7 feet. in square timber, which will amount to 8 loads.

Item, there must be 2 pieces of timber to lay upon the said studs, every piece of 70-foot length, and 1 foot square, which is 2 loads and 40 feet.

Item, every side will require 10 planks, every plank being 70 feet long, 1 foot broad and 3 inches thick, so every plank will contain 17+ feet, which will amount to, for both sides, 7 loads of timber.

Item; the 4 gates with the posts to hang them upon, and certain 'Lande Keyes' # for the same, will require 6 loads of timber.

Total loads of timber = 44)
every load rated at 10s. per load) £22

Item, the sawing work of all the aforesaid timber will amount to 56 hundred at 20d. the hundred £4 18s. 4d. #

Item, the carpenters work for the same lock will cost 20 marks§ so that the carpenter be put to no other charge but only the framing, and setting up the same.

Item, if the sides and ends of the said lock be made of stone or brick, then the timber that shall go to the same will amount to 24 loads or thereabouts.

Item, the workmanship of the same wall, being 10 feet high, and 3 feet thick will cost 16s. a pole, so that the mason be put to no other charge, but only the raising of the same wall, and the same work will contain by estimation 10 poles, every pole being 16 feet.

Item, there will go to the same wall 8 loads of lime which will cost 16s. 8d. the load, which is £6 13s. 4d.

Item, there must be to the same work 16 loads of sand at 2s. the load, 32s.

Item, the heightening of the high bridge at Waltham to raise it 2 feet higher will cost by estimation £4.

Item, the charges of the cutting of the new cut from the mill river to the river of Lee, which contains 36 poles, every pole rated at 26s. 8d. the pole, which will amount to £48.

| | | £ | s. | d. |
|--------------------------------|---------------------------|----|----|------------------|
| if it be done | Timber, 44 loads at 10s. | 22 | 0 | 0 |
| with timber | Sawing & carpenters' work | 18 | 5 | 0 |
| | | 40 | 5 | 0 |
| the same | Timber 24 loads - | 12 | 0 | 0 |
| with stone | Lime 8 loads at 16s. 8d. | 6 | 13 | 4 |
| | Sand 16 loads at 2s. | | 32 | 0 |
| | The walling | 8 | 0 | 0 |
| | Carpenters' work | | | |
| | Stone | | | |
| . | | 28 | 0 | 0 (<i>sic</i>) |
| The heightening of the. bridge | | 4 | 0 | 0 |
| The charge of the cut . | | 48 | 0 | 0 |
| | | 52 | 0 | 0 |

Explanation of symbols (provided by Dr Norman Smith)

* One 'lode' of timber equalled 50 cubic feet.

'Lande keyes' probably means timber-work anchored into the ground to "" brace the posts; or, conceivably, it refers to some wooden. device to open. and close (hence key) the gates

The amount given is in fact incorrect, it should be.£4 13s. 4d.

§ One mark was equal, to two-thirds of a pound sterling, i.e. 13s. 4d

1. 13 Eliz. I c. 18.
2. Bodleian Library, Rawfson MSS, Essex 11.
3. John Norden's 'Description of Middlesex', British Library, Harleian MS 570.
4. For a full account of events along the Lee in the Elizabethan period, see my account ~_ 'The River Lee: A Tudor Experiment in River Navigation'
 5. See A.W. Skempton, 'Canals and River Navigation before 1750' in Vol. 3, A History of Technology (ed. C. Singer et al., London 1957, p. 456); Philip Chilwell De la Garde, 'Memoir of the Canal of Exeter 1563-1724' in the Proceedings of the Institution of Civil Engineers, Vol. IV, 1845, pp. 90.102; George Oliver, The History of the City of Exeter, Exeter 1861-84.
6. William Vallans, 'A Tale of Two Swannes. Wherein is comprehended the original, and increase of the River Lee' [1590]; in J. Leland, The Itinerary, Vol. V, Oxford 1710.
7. In 1594-5 a manuscript book entitled 'Proceedings in the Star Chamber' was compiled by William Harte. It is now kept in the Guildhall Record Office. Beside giving the 1594 Star Chamber case in great detail, it also provides copies of many other ancient documents relating to the Lee. Folios 174-7 provide a record of a Commission of Sewers' meeting held in the Star Chamber on 19 November 1577. This is the only remaining evidence to the Commissioners' decisions relating to Waltham.
8. *ibid*
9. *ibid*
 10. British Library, Lansdowne MS 22 no. 48. Thomas Fanshawe wrote to Lord Burghley that he had just visited Waltham 'to see whether passage might not be made from the mylne Dame thorough the towne by some of the channelles there'.
11. Public Record Office, State Papers Elizabeth, Domestic Series, Vol. 109 no. 33.
12. The Oxford English Dictionary mentions a statute in 35 Eliz. 1 which defined a pole as being 16½ feet. If this measurement can be applied to this particular estimate then the length of the new cut would have been 176 yards.
13. Harte *op. cit.*
14. I would like to thank Dr Norman Smith for his helpful discussion and Dr Denis Smith for drawing figures 1 and 2.
15. British Library, Lansdowne MS 32 no. 41.
16. Public Record Office, State Papers Domestic Addenda 1580-1625, Vol. 27 no. 6.
17. British Library, Lansdowne MS 32 no. 40, paginated 109.
18. British Library, Lansdowne MS 32 nos. 35 and 41.
19. Harte, *op. cit.* folios 1-38 deal with the Star Chamber case.
20. British Library, Lansdowne MS:77 no. 16; British Library, Add MSS 33576 fo. 63; Public Record Office, Exchequer 178/4965; and Northamptonshire Record Office, WC 244.
21. Northamptonshire Record Office YZ 6097:
22. Northamptonshire Record Office; WC 244. . -
23. P J Huggins, 'Excavations of a Medieval Bridge at Waltham Abbey, Essex in 1968'; Medieval Archaeology, XIV 1970, pp. 126-47.
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