

CHAPTER THIRTEEN

AN ADEQUATE FLASH-LOCK NAVIGATION

13.1 The operation of the navigation

Once the experimental Tudor improvement scheme had been jettisoned, the navigation once more reverted to the traditional reliance upon pens and flashes of water provided by weirs and mills along the river. This system remained in operation until 1767. It was only then that the Lea was canalized by the introduction of pound locks and navigation cuts, a late date for such developments compared to other navigable rivers in England.

The map of the river made in 1741 by William Whittenbury shows just how numerous were the turnpikes, weirs and mills which could provide assistance to the bargemen if necessary. However by this date the number of fishing weirs had grown substantially compared to the first half of the seventeenth century, particularly along the lower river below Waltham (see 11.3 and 11.5). The provision of pens and flashes thus became more frequent, and with the growth in the size of the barges, became more necessary as well, but the lack of evidence means that this trend cannot be properly evaluated.

The most important component of this system of navigation was the assistance provided by the turnpikes and fishing weirs which stood across the navigable channel. Precise details of their construction during this period are not known, but they were built in such a way that they could act as temporary dams if necessary. A gap of between 14 feet and 18 feet was always left somewhere in the weir or turnpike so that barges could pass through, and this gap could always be closed by the insertion of boards known as flash boards or by the operation of a guillotine gate. All turnpikes built from 1730 onwards had guillotine gates, before that there is no evidence.

When barges were coming downstream the bargemen could request that the flash boards be inserted or the gate closed. This meant that water was penned back behind the turnpike or weir, and the increased depth of water that resulted enabled barges to pass down to the weir or turnpike. The gap could then be opened once more to allow the pen of water to pass downstream. The barges would wait for the initial surge of water to abate, and they would then ride through the gap on the 'flash' of water, taking advantage of the increased depth of water immediately below the turnpike or weir and the current of the flash to carry them downstream towards the influence of the next weir or turnpike.

Coming upstream, either empty or much more lightly laden, the barges might need a flash to bring them up to a turnpike or weir even though they had to pull against the current. Then having pulled through the gap in the weir or turnpike, they might need it to be shut so that a pen could build up and provide a sufficient depth of water for them to continue upstream.

Thus the pen of water provided by the turnpike or weir was as important as the flash. Both increased the depth of water in the river, and so allowed the barges to pass over

shoals which had built up along the river bed or through particularly shallow stretches. Indeed when water was particularly short, in hot dry summers, no movement at all was possible without the assistance provided by the weirs or turnpikes.

Yet there were other times when there was sufficient water in the river, enabling the barges to move without the assistance of the weirs or turnpikes. The bargemen would then not have to request that the gap in the weir or turnpike be closed. Indeed customary practice was that the weirs and turnpikes had to be left open so that flood waters could pass downstream without interruption. Otherwise adjacent lands would be flooded.

Although turnpikes and weirs both provided the same assistance, there was a distinguishing feature. Turnpikes, of which there were two at Hertford and one at Waltham, were built specifically to assist the navigation, and by custom a toll was payable by every barge that passed through them. Fishing weirs on the other hand were built to increase the catch of fish within a private fishery, and had been adapted so that they could allow the passage of barges and provide assistance as well if necessary. The custom was that tolls were only payable to the owners of fishing weirs if they had been closed to provide a pen and flash. If barges could pass through without such assistance then no toll was payable.¹

It was thus a temptation to weir-keepers to take steps to ensure that such assistance was required, a temptation which was not resisted. Shoals which built up naturally above and below weirs were not scoured, even though it was customarily the responsibility of the weir-keepers to do so. Indeed they often assisted the process of shoal formation by throwing in earth and stones from the banks. They also cut weeds in the river below the weirs so that the flashes of water passed downstream more quickly and thus exhausted their effect quicker than they otherwise would have done. Adjacent weirs were brought within the control of one tenant, who could then refuse to provide a flash at one weir unless the bargemen would pay a toll for the other weirs, even though they did not need assistance from these. Every Commission of Sewers must have heard complaints of such practices.²

Another component of this system of navigation was the assistance that could be provided by the mills along the river. An unusual feature of the Lea was that mills did not possess locks in the navigable channel, as was customary along many other rivers. The only exception was the pound lock next to Ware Mills, and this had been erected as part of a special agreement made when a new route was opened (see 10.3). It can also be noted that Waltham Turnpike was most probably first erected as a lock to benefit Waltham Abbey Corn Mills, and indeed continued to function in this manner, but it was usually let separately from the mills, and was rarely under the control of the miller.

Despite this, mills did provide valuable assistance, particularly during dry weather. Mills at Broxbourne, Cheshunt and Enfield had locks across the mouth of their head stream which could be shut when barges approached so that all the available water could be concentrated in the navigable channel whilst barges passed. Once they had passed the locks would be opened, to supply power to the mills once more.

Other mills, which did not possess locks near the mouths of their head streams, could still close down their mill gates when requested, in order that water could be penned back to such an extent that the depth of water in the navigable channel increased. In addition all mills could be asked to manipulate their gates in such a manner that a flash of water could be made available from their tail streams.

Such assistance had only a marginal effect compared to the pens and flashes provided by weirs and turnpikes, and was most probably requested less often. Nevertheless such assistance was at times essential, and when it was, the millers were entitled to a toll, as compensation for the loss of power or other inconvenience that such arrangements involved. It is almost certain that these arrangements differed at the various mills, depending upon the structure of the mill and the lay out of the head stream, but the only evidence of the exact arrangements which survives is that applicable to Broxborne Mills shortly before 1740.³

the Navigation is difficult to Barges heavy laden, especially in a dry season, the Water being then very shallow, and therefore time out of mind they have had Flashes from three several Locks upon the Mill Stream; the first of these called the little Lock is built at the upper end of the mill stream, the other lower ... the great Lock, the third is near the mill & is called the back Gates(.) When the Barges require water of the miller they have constantly paid him three shillings for drawing these three gates, the uppermost of which seems to have been built for the sole service of the navigation and when lately decayed was rebuilt at the desire of the Navigators by the Tenant of the said Mills ... these locks or Gates are built & kept in repair by the owner or occupier of ye Mills & ye Flashes are never refused ye barges paying the accustomed price.

Tolls were some recompense to the miller for the interruption to his working, but too persistent interruption would have been too damaging. There is some evidence that suggests that arrangements were in force to restrict such a possibility.

It has been noted that before 1713 the miller at Enfield Mills had been entitled to a toll of 1/- for closing Enfield Lock (at the mouth of his head stream) on Tuesdays, Thursdays and Saturdays, but 2/- on Mondays, Wednesdays and Fridays.⁴ In 1767 Parliament were told that the arrangements at Waltham Abbey Powder Mills were 'the Stated Days for this Supply of Water are Wednesdays and Sundays, but in short Water Times, Sundays only'.⁵

If such restrictions were general, they would the better ensure the co-operation of the miller, for they would restrict interruptions to his power supply to certain pre-determined days of the week. Such restrictions would not be too disadvantageous to the navigation, for the assistance from the mills was not that important, except in dry weather, and the bargemen could adjust their schedules to take such restrictions into account.

It should be noted that the millers were as adept as the weir-keepers at improving their own situation at the expense of the bargemen. They widened and deepened their head

streams, they threw earth and stones into the navigable channel so that more water flowed down to their mills, or built piers into the navigable channel to the same effect. The example of Stanstead Mills (see 11.5) shows the lengths they were prepared to go to.

The importance of flashes to the navigation, and their cost, is emphasised by the document reproduced below, an account of a three day journey down the river detailing the mills and weirs which provided assistance on that journey in September 1725.⁶

TABLE 6

'Account of Locks & Wears on Lee River taken Friday Saturday & Sunday 4,5,6 September 1725'

Numerical progression	to whom they belong	Names of each	Sum	paid
1	Mr Byde	Priors Lock above Ware	1	6
2	Mr Byde	Ware, below the town	1	-
3	Mrs Field	Mrs Fields Lock belongs to Stansted Mill	1	-
4	Mrs Field	Stanstead Ware	1	-
5	Mrs Field	Fields Lower Ware	1	-
6	Mr Archer	Pages Middle Ware	1	-
7	Mrs Plumer	Ford's Ware	1	6
8		The King's Ware		now no pay
*				
9		Holyfield Bridge		
10		Woolastons bridge Sometimes a Ware		
**				
11		Waltham Turnpike	5	-
12		Flander's Frame	1	-
13		Pigborn's Ware with Sluices	1	-
14		Enfield Lock	2	-
15	Mr Parr	Suistons Mill	3	-
16		Pigborn's Lower Ware	1	-
17		Flanders Ware	1	-
18		Bleakhall Ware	1	-
19		Higham Hill Ware	1	-
20		France Ware	1	-
21		Lowen's als Abraham's Ware	1	-
22		Tisons Ware		
23		Jeremy's Ferry	1	-
24		Bow Lock		

* Cheston Locks, 4 feet wide 3 feet deep 18 inch head

** Coopers Lock, 2 feet wide

Source:- Thames Water Authority Stronghold, Box 81 no.354

That this was the expected time for such a journey, if the conditions were favourable, is confirmed from other sources. In July 1733 a newspaper report stated that the extremely dry weather meant that 'Barges that generally come from Ware in less than two days, were then about a Fortnight in coming down, being obliged to wait for Flashes'.⁷ In 1698 John Houghton made calculations about traffic on the river which assumed that a round trip between Ware and London took about a week.⁸

To achieve such a regular timetable at times when insufficient water, flooding or frost did not otherwise prevent it, the co-operation of the miller, weir-keepers and riparian landowners was essential. Compromise on the level of tolls, on the regulation of flashes, on the bargemen's access to the bankside was necessary, as was compromise on the conditions affecting the operation of the mills, the catching of fish, and the drainage and watering of the surrounding lands. Various conflicting rights had to be respected, if the flash-lock navigation was to operate successfully.

Just how such co-operation was achieved, maintained and allowed to evolve is absent from the record. It has to be assumed that custom played a major part, that individual initiative could bring permanent change, and that the Commission of Sewers had some role in determining the arrangements, in initiating and confirming change, and in settling disputes.

However the exact methods of achieving the many necessary compromises cannot be established. They most probably varied greatly, depending upon the importance of any particular problem, the personalities of the interested parties, and indeed the prevailing attitudes towards the bargemen and the importance of the navigation. Another case of muddling through, but successfully?

Besides this necessary co-operation amongst the riverside community, there is evidence to suggest that there was an element of controlled co-operation amongst the bargemen themselves in order that all could use the navigation to the best advantage. Indeed such co-operation would seem essential if the timetable of a round trip in a week was to be maintained. Since the evidence is extremely sparse, it seems best to state it baldly at the outset.

In March 1699 Sarah Stout's body was found floating in the river by James Berry, the miller at Dicker Mill at Hertford, when he 'went out in the morning to shoot a flush of water by six o'clock'.⁹ In 1743 bargemen at Stanstead applied for a flash from the newly erected Stanstead Turnpike at 6 or 7 in the morning, but were refused 'upon pretence that Notice had been given for a Flash from Ware', a flash which did not materialise until the following afternoon.¹⁰

Such evidence suggests some control over the provision and use of flashes, so that barges could start out early in the morning from the head of the navigation, and proceed downstream from weir to weir, taking additional help from the mills whenever necessary, stopping overnight wherever they reached, picking up the same system the following morning, and so on. Barges from communities further downstream could join the

procession when it arrived, so that more and more barges joined the convoy as it passed down river.

Such a convoy pattern would make the best use of any one flash from any one weir, and the element of control could ensure that the convoy would not be held up because a weir further downstream had provided a flash before the main convoy arrived. Such a pattern could also ensure the best possible co-operation from the weir-keepers and the millers, for they would know when their assistance was likely to be needed and they could adapt their working pattern accordingly.

It must be emphasised that the above pattern is only a possibility that would fit the known facts. It is too simplified, it may only have been necessary when there were extreme shortages of water, and that the arrangements could have been less precise when there was a lot or a normal amount of water in the river. It may be wrong.

One thing that does emerge from the above summary is that there was great potential for dispute, both between the bargemen and the rest of the riverside community, and amongst the bargemen themselves. Even though they must have recognised the benefits of the flashes the bargemen must have resented the level of tolls and the restrictions on the very availability of the flashes, they must have resented the very persistence with which the millers and weir-keepers encroached upon the navigation at their expense. Many such disagreements have been noted in the earlier chapters, many such must no longer be on record.

Yet for all this, it should be emphasised that the system did work, and there is no evidence to suggest any concerted effort to replace the flash-lock navigation before 1767, when the benefits of canals had gripped the public imagination.

13.2 Use made of the navigation

It has been argued (see 8.4) that the re-introduction of the flash-lock navigation at the end of the sixteenth century did not bring any drop in the level of traffic along the river from those quoted for the period when the experimental navigation introduced in 1575 had been in operation.

Thereafter the precise trend cannot be determined, but there is no reason to suspect any major interruption or any decline in traffic, and some reason to suspect that the underlying trend was one of expansion. By the end of the seventeenth century evidence shows that two trends had definitely emerged. The level of traffic had substantially increased, and so had the carrying capacity of individual barges.

It has been argued that the rent of Waltham Turnpike may have been £80 at the beginning of the seventeenth century (see 8.2). By 1643 it was £123 a year.¹¹ Since the only return was the income from the collection of a 5/- toll, this suggests that by the 1640s at least 500 journeys a year were being made, and that if any profit was to be made, many more. Furthermore there is reason to suspect that the size of the barges doubled during

this same period, so that they were carrying at least 8-10 tons downstream by the Interregnum. (1649) (see 11.1).

Such evidence cannot be used to estimate the levels of traffic or its growth, but it does seem sufficient to suggest that there was continued growth during the first half of the seventeenth century. The efforts of the Hertford burgesses to improve the river above Ware emphasise the potential the navigation offered.

The earliest estimate that has been found for traffic during the seventeenth century is that in 1670 Wren and Murray reported that 200,000 quarters of malt (25,000 tons) were carried from Ware to London down the Lea every year.¹² Further indications of this traffic are that in 1681, 19 barges coming downstream, carrying 3,000 quarters of meal and malt, were held up at Waltham; whilst a few years later 190 bargemasters and maltsters were said to get 'their Livlyhood by this River'.¹³

In 1698 John Houghton reported that 300,000 quarters of malt were stored at Ware at any one time, and added:¹⁴

Below Blackwell are 26 Barges, 24 whereof come from Ware, and, as I have been inform'd, bring twelve score Quarters each about two and fifty times in a Year; for although sometimes they cannot make a Voyage in a Week, at other times they do more; and all these amount to (299,520) ...Quarters besides what is brought by Cart to serve the North Side of London.

Houghton's calculations may be too literal, but they seem to have been based on an aldermanic report in 1694 that there were 'Seldome fewer than 26 barges a weeke'.¹⁵

Once more the evidence suggests an expansion in traffic during the second half of the seventeenth century. Similarly there seems to have been a continued expansion in the carrying capacity of the barges during this period. In 1670 Wren and Murray commented on the recent rapid expansion in the size of barges, in 1683 there were references to barges carrying 200 quarters, whilst Houghton's calculations in 1698 were based on a carrying capacity of 30 tons.¹⁶

Then during the 1730s the bargemen, whilst discussing improvements to the navigation, themselves emphasised the size and importance of their carrying trade. One petition stated that traffic along the river was 'now so considerable, that by a moderate Computation, about two Hundred Thousand Quarters of Malt, and large Quantities of all sorts of Grain, Flower(Flour), and other Commoditie have been annually carried by Vessels Navigating thereon'.¹⁷

Such contemporary estimates are all that is available. Quantitive data about inland transport was not normally collected, and none survives for the Lea. There are other references which confirm the importance of malt, meal and grain as the dominant down river traffics¹⁸ but there are also some references to timber as well.¹⁹ That this reliance upon scattered evidence may provide a misleading picture of the traffic on the river is

raised by the probability that gunpowder may have been a major item even though it was not mentioned by the bargemen in their petitions or by the few contemporaries who made reference to traffic along the Lea.

From about 1640 onwards the valley emerged as a major centre of the gunpowder industry, and most mills along the lower Lea below Waltham were producing gunpowder at some date between 1640 and 1690. Even after 1690 when most mills ceased to be gunpowder mills, production continued at Sewardstone Mills until about 1714 and at Waltham Abbey until 1941.²⁰

Complaints in 1672 refer to barges being loaded with gunpowder at Waltham Abbey, and in 1739 the owners of Waltham Abbey Gunpowder Mills, Philippa and John Walton, emphasised just how important the Lea was for carrying gunpowder to the Ordnance warehouses, especially since the barges did not pass through major towns on the journey.²¹ Other gunpowder producers in the valley must have also used the river, although no evidence now remains of this. Such a supposition is strengthened by an order from the Ordnance Board in 1674 that producers were not to carry powder through London streets but were to bring it to the Tower by water.²² Even if this was not obeyed to the letter, it remains obvious that water carriage was the sensible option for producers in the Lea valley.

Of the upstream traffic, it can be said that it was much less. One factor was that barges travelling upstream against the current had to have lighter loads. Evidence in 1767 compares the downstream capacity of 35 tons with the 10 or 15 tons that was all that was possible upstream.²³ Another factor was that bargemen often chose to return with empty or lightly laden barges, so that they would be able to travel without the assistance of flashes, and thus cut tolls to a minimum on what would otherwise be an unprofitable journey upstream.²⁴

Coal was most probably the major upstream traffic. In 1721 a Chingford resident noted 'The Convenience of having Coals by water is to bee Valued'. Evidence from meteage duties shows barges returning to Ware with 5 chaldrons, and on occasion with 10 or 15. In 1739 it was stated that 10, 000 chaldrons were carried upstream annually, whilst a petition in 1743 suggests that some bargemen concentrated exclusively on this trade.²⁵

It should be borne in mind that the Lea valley was well wooded, that Hertfordshire was not a major industrial area, and that the maltsters still used wood and charcoal in their processing rather than coal.²⁶ There were thus some important limits to the upstream coal traffic. It might be that it was not until the eighteenth century that the coal traffic really began to expand.

Other upstream traffics existed. Such was the fame and quality of the Ware malts that barley was carried upstream from London for local processing.²⁷ Other goods of which there is mention include iron, timber, oats, beans, pease, and oysters.²⁸ Millers in the valley who produced gunpowder or oil brought their raw materials up by river, as did dyers and distillers in Stratford.²⁹ One point to stress is that no evidence has been found

of manure or other fertilizers being carried upstream, although this does not mean that such materials were not carried.³⁰ Specific details of the barges which carried these goods have not been uncovered. Along the river, men, not horses, haled the barges from the bankside. Along the lower tidal Lea and the Thames, sails and oars provided the motive power. It is not clear whether the complex rigging later to be associated with sailing barges had evolved by this period, or whether single sails were still the norm. It is known that in 1683 it was reported that the bottoms of the barges had recently become flatter, and that in 1720 it was stated that the barges did not draw more water even though they were carrying larger loads 'because they are larger & flatter built than formerly'. It can also be noted that as early as 1696 John Houghton distinguished a Ware barge as a distinct craft.³¹

13.3 An adequate navigation

During the seventeenth and early eighteenth centuries the dominant trend in river improvement was the introduction of pound locks and artificial navigation cuts, a process later known as canalisation. Such improvements were undertaken either as part of a determined policy for a whole river or as a limited response to a particular local problem along its course.³² This last motive induced the opening of the new route between Hertford and Ware in 1658, but otherwise the Lea was not affected by such developments, until 1767.

There were suggestions that such improvements be introduced along the Lea before that (see 13.4), but no determined effort to actually implement them. The bargemen were satisfied with the existing arrangements, and only attempted minor improvement, retaining the principles of the flash-lock navigation rather than replace them with the more efficient technology that canalisation undoubtedly was.

Technically, pound locks and navigation cuts which were built specifically to improve the navigation were a much more efficient method of transportation compared to reliance upon pens and flashes from a series of privately owned flash locks, the construction and siting of which was not necessarily determined by what was best for the navigation. The benefits of such technology were known in England, both from English and continental experience, long before Canal Age of the 1750s onwards.

That such technology was not introduced along the Lea until 1767, even though it was an important river navigation close to the capital, should not automatically be interpreted as an example of lethargy or ignorance. It will be argued that there are positive reasons to explain why this was the case, that the existing flashlock navigation was adequate to the demands placed upon it.

In present day discussions about the best policies to be pursued in the developing nations, there is a concept termed Intermediate or Appropriate Technology, which emphasises the technical, economic and social advantages which might accrue from deliberately introducing technology which might not be the most advanced available in the industrialised nations.³³

There must be great reservations about using such concepts in seventeenth and eighteenth century England, but it can be argued that the flash-lock navigation along the Lea is a good example of an appropriate technology. It successfully met the transport demands placed upon it, and it did not severely restrict the rights and demands of other interested parties. For instance during this same period there was a substantial expansion in milling capacity along the Lea, and the river began to be tapped as a source of water for both London and the riverside communities. These last developments did bring problems for the bargemen, but they were always accommodated, and the navigation never suffered permanently.

The evidence already discussed suggests that the flash-lock navigation was indeed adequate to the demands placed upon it. It allowed an expansion in traffic, allowed an increase in the size of barges, and allowed a regular passage in two or three days and a round trip in a week, quite an acceptable timetable for the bulky goods carried. Interruptions to this timetable must have been frequent. Water shortages, floods, freezing, disagreements with millers and fishermen could all cause delay. Indeed the bargemen made frequent complaint of the latter, but only to reach agreement, they never implied that the flashlock navigation be replaced.

In one important sense the navigation had to be adequate, otherwise it would not have been used. There were several competing and more important transport routes such as the Thames and coastal traffic. Even down the Lea valley the road network provided a viable alternative. If problems along the Lea had been too severe or too permanent, if the navigation had been inadequate, then the river would either have fallen out of use as a transport route or radical improvements schemes would have been essential. It did not, and they were not.

Fishing weirs, Waltham Turnpike, the pound lock next to Ware Mills, all the paraphernalia used by millers to provide pens and flashes on request, were built and maintained at the expense of their owners, not at the expense of the bargemen. Banks were often maintained and breaches mended at the expense of riparian landowners, by custom of the local manors. Some of the costs of scouring the river were borne by the fishermen or by the millers, once more because of custom.

Such costs were borne by those with no real interest in the navigation both because it was customary and because such work was necessary to their own private interests, to prevent flooding, to control the flow of water, to increase the catch of fish. The requirements of the navigation might mean that the cost of such work was increased, but many obtained recompense from tolls.

Towards the end of the seventeenth century the bargemen were forced to bear some extra costs of maintenance(see 9.4), but the bargemen in turn passed these costs on to the New River Company by means of the Act of 1739 (see Chapter 14). During the intervening period the total costs borne by the bargemen were not that high (see 11.7), and the profits made from dealing and carrying were such that they were well able to bear them.

To replace the flash-lock navigation with a more efficient canalised navigation would have been expensive, incurring both high initial investment costs and higher future maintenance costs. Land would have to be bought, existing rights of millers, fishermen, and riparian land owners would have to be preserved, bought out, or otherwise compensated for. Furthermore future costs of maintaining the locks and banks, of scouring the navigable channel, would have to be borne by those responsible for the improvements, not by the millers, fishermen, or other members of the riverside community.

Whilst existing arrangements were felt to be adequate, the bargemen had little incentive to undertake such expensive developments themselves, and indeed had sufficient incentive to be extremely cautious towards or to be actively opposed to any who favoured such developments. They could not be sure that such improvements would be successful, and must have feared increasing tolls and costs. Some of the financial problems that occurred after the Lea was canalised suggests such caution to be well founded.³⁴

The existing arrangements also had administrative advantages, once more appropriate to the prevailing circumstances. The body which was responsible for effecting the compromise between conflicting interests so necessary to the success of the flash-lock navigation, and which was ultimately responsible for maintaining the legal rights of the bargemen to use the river, was the Commission of Sewers, the body whose existence and operation has already been discussed in Chapter 9.

Commissions were not permanent, met infrequently at best, and must often have not met for long periods. Members were local gentry, often without any particular interest in the navigation, and almost certainly without any requisite professional expertise. There was no full time staff to make up for these defects.

Yet this body did not only preserve the navigation, it also supervised its expansion, and accommodated an expansion in the conflicting interests of milling and water supply. As an administrative structure it was adequate to the demands placed upon it. It was also appropriate. Administrative costs were cheap; members met their own expenses, both because this was the legal requirement, but also because it was part of the accepted duties of local landowners towards ensuring that the functions of local government were carried out. It was indeed a benefit to the bargemen that prominent members of the local community did have some responsibility for the river; it may have reduced the likelihood of one particularly recalcitrant landowner bringing the navigation to a stop. The initiative and administrative approach that canalisation required would surely have precluded this cheap form of administration, and would have necessitated permanent paid administrative and engineering expertise. These can only have added to fears about the costs of replacing the flash-lock navigation, as well as raising fears that any attempt could founder through inadequate means of preserving a committed administrative structure.

Fears about the costs of improving the navigation were important, for the local road network did provide a viable alternative, which was not necessarily the case along many rivers.

The navigable Lea was not long, about 40 miles at this date, so transshipment costs were an important component of total costs. In addition the river route to London was not direct, and additional delays were incurred because of the need to wait for favourable tides and winds to navigate first the lower Lea and then the Thames. Many barges unloaded at Hackney or Stratford to avoid these delays, and to avoid the problems of distributing from the congested wharves along the Thames. The bargemen also had to pay heavy and increasing tolls to the weir keepers and millers.

In contrast the road route from Ware to London was shorter, and was direct. Also road carriers did not have to pay tolls or otherwise contribute to the maintenance costs of the roads they used, at least not before the spread of the turnpike system in the early eighteenth century. Houghton in 1698 emphasised these particular aspects:-³⁵

For altho' there is a great Disproportion between Land and Water Carriage, yet considering those about Old-street and Shoreditch...may have it brought by Water to the Wharf much cheaper; yet the Landing and Carrying home by Carts over the Stones of London, and Charges attending, besides the Certainty of coming at set times(for in the River sometimes they want Water, and sometimes have too much Ice). For these Reasons, I say, these North Side Folk think it worth their while to have a great deal brought by Land from so short a Cut as Ware; but I hear of none that comes by Reading, Newberry, Abingdon, or Oxford, or from distant Places in Kent, but by Water.

Such factors meant that the Lea bargemen concentrated on the carriage of bulky items, there was no potential for any passenger traffic or to act as common carriers of general goods, as was the case on other rivers.

No evidence has been found about the carriage rates during this period, but a major component of these must have been the tolls paid to the millers and weir-keepers along the valley. In 1667 the bargemen complained that they were paying about 30/- for each trip that a barge made. In 1670 Wren and Murray noted that the problems along the river were so severe that the cost of water carriage was nearly as much as that for land carriage. In 1711 George Sorocold made the same same point, arguing that the excessive tolls meant that the rate of water carriage was 19/- per ton compared to 20/- per ton by land.³⁶

It should be expected that the cost differential was usually greater; particularly after each newly appointed Commission of Sewers had been at work. Yet these specific local conditions did mean that many maltsters and bargemasters retained an interest in transport by both land and water, even though the Lea was potentially the cheaper artery.³⁷

Several reasons have been forwarded as to why the flash-lock navigation along the Lea during this period should be regarded as adequate to the demands placed upon it and to the needs of the time. It remains to point out that contemporary experts regarded the Lea somewhat differently.

In 1670 Murray and Wren surveyed the Lea and found several faults with the existing arrangements. They noted the swiftness of the current, the steepness of the fall and the winding course of the Lea itself; noted the various malpractices of the millers and weir-keepers with regard to the flashes; and noted the expanding size of both the barges and the mills. They suggested solutions within the framework of the existing arrangements, but their true opinion was that the navigation would not be adequate until the river was canalised (see 13.4).

In a book published in 1677 Andrew Yarranton, a leading exponent of the advantages of river improvement, passed over Bow Bridge and commented 'There is no care taken for the amendment of the River Lee ... in all dry times much out of order'. However he made no suggestions as how to rectify this state of affairs.³⁸

13.4 Early improvement schemes

Wren and Murray did propose improvements to the existing arrangements, but their true opinion was given at the conclusion of their report:-³⁹

But when all this is done the River Lee cannot be made complete for Navigation without some expense be laid out upon it by Act of Parliament in order to cut other Channells through the Meadows in some places, to make Locks or Sasses in other places where the River is too swift, to make convenient banks for the Draughts of Men and Horses, in floods to deepen the bottom over some shelves, to buy out some Mills that do the greatest prejudice, and such other things as are and would in such cases in foreign parts be put in practice for the public benefit, which can only be ascertained by a particular Map and full Observation of the Levels

It is unlikely that any further action was taken with regard to these ambitious proposals. Later suggestions were much less ambitious. Canalisation was favoured by a minority during the 1730s (see 14.4), but otherwise it was not seriously considered again until the 1760s.

During the winter of 1702-03 George Sorocold, a leading engineer with a particular interest in water supply schemes, surveyed the Lea at his own expense. Details no longer remain, but he was later consulted by the City of London about the proposed tumbling bay at Stratford (see 12.3), and he took the opportunity to propound his theories of river improvement once more.

He favoured a series of locks, each with a moderate rise of 4 feet, rather than one large lock to overcome any particular difference in level. He cited his successful improvements to the Derwent and Cam as proof of the validity of his ideas.

For the Lea he made the novel suggestion that a series of temporary and seasonal flash locks be built:

I would nott onely make a 5 foot Lock at Old Ford but severall Small ones of 2 or 3 foot in Severall other Places up ye Streame; yt should take up in Winter + bee of use onely in Sumer or very dry Seasons

Once more there is no evidence that these proposals were ever given serious consideration.⁴⁰

The next proposals were in 1721. Captain Richard Boswell suggested that the City of London obtain an Act of Parliament to improve the Lea between Hertford and Bromley

by setting up proper locks and other proper conveniences to keep the River Lee always full of water for barges and tiltboats to pass ... at all times and tow with horses instead of men.

Such improvements, he argued, would allow barges to double their capacity and to make the journey in half the time they now did. Not only would this substantially reduce the costs of carriage for existing traffic, it would allow the bargemen to compete as common carriers of general goods and develop a regular passenger service. His proposals envisaged that Stratford would become a major transshipment centre, and that London would be served by land from there.

Boswell, somewhat optimistically, estimated that such improvements could be implemented for only £5,000, and that thereafter £300 a year would be needed to maintain the navigation and pay the wages of the lockkeepers. Such a low estimate does suggest that Boswell was proposing a series of flash locks along the river rather than pound locks, but exact technical details were never recorded.

Since such improvements would benefit the capital, Boswell proposed that the City should bear the costs of implementing his scheme, recouping their investment by collecting a toll of 1/- a ton from all goods carried on the river. He estimated that a potential income of £1500 a year could be obtained.

As his reward for surveying the river and supervising the improvements, Boswell asked that he be allowed a quarter of all future profits, be made a freeman of the City, and be allowed to operate a tiltboat to carry passengers and small parcels along the river without paying any tolls. He expected other benefits as well, for he was a local trader in timber and coal with leases to three wharves at Stratford where he obviously envisaged goods would be transhipped.⁴⁰

The aldermen decided to support Boswell's proposals, but were told that on the previous day (13 March) several Ware maltsters and bargemasters had sought leave to introduce a bill to improve the river. The wording of their petition suggests only limited improvements to the existing arrangements, but their actual intentions are nowhere recorded (see 11.6). Neither the City nor the bargemen were ever to submit bills at this date, and so no improvements were made during the 1720s.

What does emerge from this survey of early improvement schemes is just how unambitious they were. Only Wren and Murray suggested radical change, the others were content to make minor improvements to the existing arrangements. They wanted to increase the efficiency of the flash-lock system, they did not want to replace it. Such limited aims provide further evidence to support the thesis that the navigation was adequate, and this is confirmed by the very limited nature of the improvements which were authorised by the Act of 1739, the subject of the ensuing section.

NOTES TO CHAPTER THIRTEEN

1. Trustees, 14 November 1749.
2. PRO, P.C. 2/59, 4 May 1666; P.C. 2/70, 20 July 1683; PRO, C7 124/25; CJ, xix.477; CJ, xxii.826; Enfield, 'River Lee, Book of Sewers in the Years 1719 & 1720'; HRO, B190; Trustees, 5 August 1751.
3. HRO, B1110.
4. Enfield, Court of Sewers, 23 September 1719.
5. CJ, xxxi.308.
6. TWA, Box 81 no.354.
7. A. Boyer, *The Political State of Great Britain*, xlvi.242.
8. J. Houghton, *A Collection for Improvement of Husbandry and Trade* (4 vols, London, 1728), 22 April 1698
9. T.B. Howell, T.J. Howell, editors, *State Trials*, xiii.1116.
10. PRO, RAIL 845/53, Court of Sewers, 14 September 1743.
11. BL, Add. Mss. 5505 fos.23-24.
12. TWA, Box 86, Robert Mylne's *Commonplace Book* 451,
13. PRO, S.P. 29/416 no.6; HRO, Hobday Papers, part.
14. J. Houghton, *Collection for Improvement*, 22 April 1698.
15. CLRO, *Repertories*, 98 fo.426.

16. TWA, Box 86, Robert Mylne's Commonplace Book; HRO, Hobday Papers, part; J. Houghton, Collection for Improvement, 22 April 1698
17. Lincolns Inn Library, MP 103 fo.241.
18. BL, SPR L23 c6(37); _CJ, xxii.788; BL, L.R. 33 d 27, Extracts ...relating to... the River Lea between Hertford and Ware,2 -29; N. Salmon, History of Hertfordshire,2; D. Defoe, A Tour Thro the Whole Island of Great Britain(4 vols London, 3rd edition 1742),ii.198-99; W. Ellis, The Practical Farmer(London, 1732 ed),27.
19. N. Salmon, History of Hertfordshire,2; PRO, P.C.2/66, 2 August 1678.
20. K.R. Fairclough, Essex Journal, 1985.
21. NRO, BH(K) 783; Lincolns Inn Library, MP 102 fo.174.
22. PRO, WO 47/19B, 24 September 1674.
23. CJ, xxxi.308-11.
24. Enfield, Court of Sewers, 23 September 1719, 23 April 1720, 6 June 1720.
25. ERO, D/DU 158/1; Lincolns Inn Library, MP 103 fo.241; CLRO, Repertories, 147 fo.195; CLRO, 'Cocket dues'; Enfield, Court of Sewers, 23 April 1720; N. Salmon, History of Hertfordshire,246.
26. P. Mathias , The Brewing Industry in England 1700-1830 (Cambridge,1959) 412-413
27. CLRO,'Cocket dues'.
28. Ibid; CJ, xxiii.166; Lincolns Inn Library, MP 102 fo.74; MP 103 fo.241; HRO, BHR Vol 20 fos.518-19; T. Sprat, True Account of the Horrid Conspiracy, Copies of Information, p44.
29. CLRO, 'Cocket dues'; Lincolns Inn Library, MP 102 fo.174; PRO, E112 1185/1140; E112 1183/1060; Guildhall Library, MS 13539.
30. J. Thirsk, 'The Farming Regions of England' in J. Thirsk,editor, The Agrarian History of England and Wales 1500-1640(Cambridge,1967),52. References cited therein do not prove that such materials were carried upstream.
31. HRO, Hobday Papers, part; Enfield, Court of Sewers, 23 April 1720; J. Houghton, Collection for Improvement, 28 February 1695/6.

32. T.S. Willan, River Navigation in England 1600-1750, 86-95; A.W. Skempton, Engineering on the English River Navigations to 1760' in M. Baldwin, A. Burton, editors, Canals: A New Look(Chichester,1984),23-44.
33. P.D. Dunn, Appropriate Technology, Technology with a Human Face (London,1978).
34. P. Mathias., Brewing Industry; 445-56; P.I. Champion, 'The Lea Navigation 1767-1867 (unpublished Ph.D. thesis, London School of Economics,1978),83-84.
35. J. Houghton, Collection for Improvement, 22 April 1698.
36. PRO, P.C. 2/60, 16 October 1667; TWA, Box 86, Robert Mylne's Commonplace Book; CLRO, BHC 1711, letter from George Sorocold.
37. For instance the names of several Ware and Hertford maltsters with interests in the Lea are to be found in the lists of Trustees of local road turnpikes: HRO, TP 1/1; TP 7/1; TP 8/1; see also Chapter 10 fn. 68.
38. A. Yarranton, England's Improvement by Sea and Land. (2 vols,London,1677-81), i.177.
39. TWA, Box 86, Robert Mylne's Commonplace Book.
40. CLRO, BHC 1711, letter from George Sorocold. For details of Sorocold's work in water supply and on the navigation of the Derwent: F. Williamson, 'George Sorocold of Derby:A Pioneer of Water Supply',Derbyshire Archaeological and Natural History Society Journal, lvii (1936), 43-93; F. Williamson, W. Crump, Sorocold's Waterworks at Leeds', Thoresby Miscellanea, xi pt.2 (1941),166-82; H.W. Dickinson, Water Supply of London, 38; C. Hadfield, The Canals of Yorkshire and North-East England (2 vols,Newton Abbot,1972-73), i.96-100. Of Sorocold's work along the Cam, nothing seems to be known besides what he wrote in the above letter. He said he had made 5 locks with a pen of 4' or 5' each rather than 2 of 8' as first suggested. Claimed that his work a success, 'ye Boates used to watee for Flashes ere 15 or 20 dayes whereas they now pass & repass at exact houres like those in Holland'.
41. CLRO, Repertories, 125 fos.171,173,254; CLRO, Court of Aldermen, Reports and Papers, 1721; CLRO, Committee of City Lands, Journals 16 fo.187; Guildhall Library, MS. 13533; MS. 13539; PRO, C8 625/54; ERO, D/SH1, Court of Sewers, 20 April 1693, 23 September 1693, 6 October 1705, 30 April 1709; J.A. Sharpe,editor, "William Holcroft His Booke":Local office-holding in late Stuart Essex Essex Record Office Publications no.90 ,1986 ,30.