

The River Lea before 1767

An adequate flash lock navigation

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I

During the seventeenth and early eighteenth centuries, before the advent of the Canal Age, there was much interest in England in canal building and river improvement. With regard to canals, little was accomplished. With regard to river improvement, much was; though there is debate about what was achieved, and how important that achievement was.¹

The main features of river improvement were the introduction of artificial navigation cuts, the introduction of pound locks, and the provision of towing paths for horses. Such developments, later to be termed 'canalisation', were designed to provide an engineered track for the barges which, undertakers maintained, allowed a quicker, more regular and more efficient movement of barges than was possible with the traditional system of flash locks.

Along the River Lea, a tributary of the Thames, such developments did not take place until after 1767, with only two limited exceptions.² Instead, movement along the navigable non-tidal reaches of the river between Hertford and Hackney continued to rely upon the provision of pens and flashes from the numerous flash locks and mills along its course. Moreover, there was no concerted effort to canalise the river before 1767.

Historians have thought this unsatisfactory. Mathias stresses the importance of the Lea but states that in the early eighteenth century it was in a state of 'mediaeval inefficiency' and that it did not become an 'efficient artery of commerce' until after 1767. An engineering historian, Skempton, has expressed surprise at the long delay in replacing flash locks along the Lea.

Nothing in this article disagrees with the opinion that a river navigation dependent upon flash locks is technically less efficient than a canalised river navigation. What is to be argued is that the Lea was an important supply route to London long before 1767, and that it is not surprising that canalisation was introduced so late, for there were sensible reasons why the traditional system was retained.

II

It is necessary to describe the system of navigation along the Lea, concentrating on the period between 1600 and 1767. Between these dates the passage of barges relied upon the provision of pens and flashes, as had been the case for centuries before the 1570s when a short-lived but successful experimental improvement scheme had been introduced.⁴

It must be stressed that no contemporary descriptions of the system remain, and little evidence has been found about the construction of the flash locks. Therefore, any description has to rely on this scant evidence, and upon what is generally known about the construction and operation of flash locks on other rivers.⁵ New evidence concerning the Lea could seriously modify the ensuing discussion, but it is difficult to see where such evidence could be found.

The first task is to name and describe the components of the system. The most important was the assistance given by the flash locks which stood across the navigable channel, but important additional assistance was also provided by dams and sluices which stood in the adjacent millstreams and ditches.

There were two distinct types of flash lock along the Lea before 1761; turnpikes and fishing weirs. Turnpikes were flash locks built specifically to improve the navigation. If a toll was authorised, then it was collected every time a barge passed through and this toll entitled the barge to make the return journey as well. From the 1730s onwards new turnpikes had guillotine gates, but evidence of their construction before this date has not been found.⁶

Fishing weirs were flash locks erected within the boundaries of the private fisheries along the river, built by the owners or tenants of those fisheries. These locks were not built to improve the navigation (though they could have this effect) but to improve the economic return on investment in the fishery. If, and only if, the weir had to be shut to provide a pen and flash, then, by custom, a toll had to be paid, but this payment did not entitle the barge to make the return journey. Another payment had to be made on the return journey if the weir had to be shut. On occasion it was possible to pass along without the weir being shut, in which case no toll was paid. Nothing has been discovered about their construction but one hint in 1738 suggests that they did not have guillotine gates.⁷

Despite the differing terminology, turnpikes and fishing weirs were similar, in their operation, being constructed according to the principles common to traditional flash locks. They were dams in the navigable channel which, by local custom along the Lea, had to have a gap of 14-18 feet through which barges could pass. This gap could be closed by the insertion of flash boards or by letting down a guillotine gate so that the lock became a temporary dam. Closing the gap allowed a pen of water to build up which assisted the passage of barges above the lock whilst re-opening provided a flash of water to carry the barges downstream to within the influence of the next flash lock.

Even at best this process was subject to delay. If a pen was needed for barges to pass down to a weir, there could be a delay while a sufficient depth of water built up. When barges needed a flash, there was a delay to allow the initial force of the flash to abate somewhat, otherwise the barge could be severely damaged as it passed through. There could be further delays if the assistance provided by the flash evaporated too soon, thereby leaving the barge stranded. For barges coming upstream the system could be even more time consuming.

A survey of the river in 1766 noted eighteen fishing weirs and turnpikes along the 31 miles between Hertford and Bromley ⁸ but this large number was a late development; there had been fewer the previous century. The number of fishing weirs rose, perhaps doubled, between 1650 and 1720, ⁹ while the number of turnpikes increased substantially after 1739. ¹⁰

The provision of pens and flashes from such a large number of flash locks was the most important factor governing the movement of barges. Yet in particularly dry weather, or along certain stretches of the river, it was not sufficient. Additional assistance was required from the mills.

During the period under consideration most mills along the Lea did not possess a lock in the navigable channel, although some did benefit from the operation of a nearby fishing weir or turnpike, but all had arrangements whereby they could assist the navigation if required.

Some mills, such as Enfield Mills, possessed a lock at the mouth of their head stream, which could be closed at the bargemen's request, shutting off water to the mill in order to concentrate all available water in the navigable channel. Other mills could be required to manipulate the gates regulating the supply of water to the wheels so that a pen of water built up in the head stream, which eventually increased the depth of water in the navigable channel. All mills could also be required to provide a flash of water from their waste or tail streams. Such assistance took time to be effective.

This description of the components of the system has emphasised that, at best, delays and frequent interruptions could be expected. It must now be emphasised that the system never worked at best. It was not designed to, and was never expected to.

The system of navigation along the Lea was not a system designed to ensure the efficient passage of barges. The decision to erect any turnpike, weir or mill; their frequency, positioning and method of construction did not depend on the initiative of those interested in the navigation. Rather, it depended upon the individual initiative of fishermen, millers or riparian landowners who wished to enhance the economic value of their property, if need be at the expense of the bargemen.

Law, ¹¹ local custom and a Commission of Sewers appointed specifically to supervise the navigation ¹² regulated these individual initiatives so that the right to navigation was maintained. However, the system which evolved under such circumstances was inferior to that which could have been designed if the sole criterion had been the desire to provide the most efficient system of pens and flashes.

Furthermore, it must be emphasised that even the existing arrangements would never work at best. To do so would require all fishermen, millers and riparian landowners to subordinate their own interests to those of navigation. There is no reason to suspect that the bargemen entertained such naive expectations, for the interests of the bargemen and the interests of the millers and fishermen in the provision of any one pen and flash were

conflicting, even though there was sufficient reason to encourage a workable compromise.

Conflict arose with the fishermen because tolls were paid by the bargemen only if the fishing weir had to be closed to provide a pen and flash. It was in the interests of the bargemen if it was not closed; but in the interests of the fishermen if it was, especially since toll income was an important return on any investment in a fishery.¹³

The system had an inbuilt bias in favour of the fishermen. The process of penning back water meant that silt was deposited above the weir; the process of flashing churned up the river bed below. The system encouraged the natural growth of shoals above and below a weir, which meant that pens and flashes became even more essential to enable barges to pass over these shoals.

The fishermen went further. They indulged in various practices to ensure that pens and flashes were requested more frequently. They threw earth and stones into the river to speed up the growth of shoals; they opened up ditches next to their weirs to siphon off more water; they cleared weeds from the river so that flashes passed downstream more quickly and thus evaporated sooner; they rented adjacent fisheries and insisted that tolls be paid at all weirs even if assistance was only needed at one.¹⁴

Commissioners of Sewers had powers to restrain such practices and powers to insist that shoals were scoured; but the Commissioners met infrequently and did not institute measures to ensure regular maintenance. It was not until the appointment of Trustees in 1739 that regular dredging was introduced. Under such circumstances the fishermen were in a strong position.

Yet there were restraints upon them which encouraged co-operation rather than make them push their advantages too hard. Toll income was important; indeed, so important, that the decision to erect or rebuild a fishing weir might be motivated by a desire to obtain tolls rather than a desire to improve the fishing. Moreover, the provisions of pens and flashes, especially at regular or expected times, did not interfere too greatly with their fishing or osier cultivation.

The potential for conflict between the bargemen and millers was much greater and their conflicting interests that much more complex. The miller might receive a toll for his assistance but his mills were stopped from working, an inconvenience for which the receipt of a toll may have seemed scant return.

Indeed, reports of major hold-ups along the river always occurred when millers withdrew their co-operation.¹⁵ There are no reports of fishermen causing such major delays.

Millers did indulge in practices which meant that the bargemen had to ask for their help more frequently. They widened and deepened their head streams; they extended the wharfing at the mouth of these head streams further into the navigable channel to divert more water to their mills; they opened up new channels to augment their supplies; they

too threw stones and earth into the navigable channel.¹⁶ Yet their prime motive was most probably to obtain more power for their mills; the fact that it increased their toll income may have been secondary.

The bargemen could complain of such developments to a Commission of Sewers, but the millers were powerful and their demands upon the Lea important to the local economy. The bargemen could not automatically expect that encroachments made by millers would be reversed by the Commissioners, as was the case with the fishermen. Greater compromise was necessary.

One illustration of the power of the millers is that of the developments at Sewardstone Mill. At the beginning of the eighteenth century, successive owners substantially increased their power supply by taking more water from the Lea. During the same period they were able to force the bargemen to pay an increased toll, rising from 1s in 1700 to 5s during the particularly dry summer of 1719. The bargemen had balked at this last demand and had been delayed for fourteen days until they paid up.

In 1719 a new Commission of Sewers met and decreed that all encroachments made by the millers since 1700 be reversed and that the millers demand only 1s as toll for the future. If these orders were ever obeyed in the first place, they were soon ignored. In 1725 the miller was receiving a 3s toll, and in 1740 bargemen were complaining to a new Commission of Sewers about exactly the same encroachments as they had in 1719. On this occasion the Commissioners made no decree restraining such encroachments; they were thus tacitly condoned.¹⁷

There is evidence of steps taken to reduce the potential conflict between the millers and the bargemen by limiting or encouraging the bargemen to request assistance on certain days of the week only. Between 1680 and 1713 the miller at Enfield instituted differential tolls for closing Enfield Lock: 1s on a Tuesday, Thursday and Saturday, but 2s on a Monday, Wednesday and Friday.¹⁸ As late as 1767 it was the custom at Waltham Abbey Gunpowder Mills that assistance be provided only on a Wednesday or a Sunday, and in particularly dry weather on a Sunday only.¹⁹

There is also evidence which encourages speculation, by this writer anyway, that the system, of navigation was organised to a regular 'timetable' to allow the bargemen to make the most effective use of the numerous pens and flashes. With the least inconvenience possible to other interested parties.

Since evidence is so sparse, it must be stated baldly. In March 1699 Sarah Stout's body was found floating in the river by the miller at Dicker Mill in Hertford when 'he went out in the morning to shoot a flush of water by six o'clock'.²⁰ In 1743 bargemen at Stanstead applied for a flash from Stanstead Turnpike at 6 a.m. or 7 a.m., but were refused 'upon pretence that Notice had been given for a Flash from Ware'; a flash which did not in fact materialise until the following afternoon.²¹

Such evidence suggests some sort of control over the provision of pens and flashes, giving priority to movement from upstream. Such a system of priorities could ensure that a flash of water could be carefully marshalled downstream, and that delays were not caused by a flash being provided out of sequence further downstream. Furthermore, such control could allow millers and fishermen some idea of when their assistance might be necessary, so that they could adapt their working arrangements to accommodate such demands, an important factor which could ensure their continued co-operation.

Further speculation suggests that a group or convoy of barges could make the best use of such a system. A convoy would allow the most intensive use of any one pen and flash; it would allow the bargemen to help each other out if problems arose, or in the labour-intensive and time-consuming task of ensuring that millers and fishermen were aware of their need for assistance.

Convoys working to some sort of timetable could start out early in the morning from the head of the navigation and proceed downstream from weir to weir, taking additional help from mills when necessary on the days it was customary to do so, stopping overnight wherever they reached, picking up the system the next morning, and so on for the two or three days it took to reach the lower river. Barges from communities lower down the river could attach themselves to the convoy as it proceeded downstream, without any inconvenience to bargemen from further upstream.

This is only speculation: a possibility that fits a few known facts. There are references to groups of barges being together, but none to an organised convoy. No evidence has been found about how such control would have been organised, and there is no mention of such control in the remaining records of the Commissions of Sewers. Further evidence is necessary to substantiate such speculation, and it is difficult to imagine where that evidence might be found, but such control would be the most sensible and efficient way of making the best use of the system, for all parties.

This description of the system has shown a definite second-best technology, which was not designed to exploit its best potential, and which, in its normal operation, did not necessarily ensure the most effective movement of barges. No wonder comments about the river before 1767 have been adverse.

Yet the evidence shows that the Lea was an important supply route to London, even though the local road network provided a strong competitive threat. Furthermore, there is surprisingly little interest in canalisation before the 1760s. Comments about the delays and technical inadequacies of the system may be valid but the assumptions drawn from such comments - that the system itself was inadequate - must be questioned.

III

The task of assessing how important a route the river was is hampered by a lack of statistical data. No records were ever collected of the goods transported by barge. Some records of toll income for the turnpikes and fishing weirs do remain, but their usefulness

is limited. Such records are few, they do not cover any lengthy period of time, and tolls were charged upon each barge rather than upon the type or quantity of cargo. The evidence presented relies heavily, therefore, upon the impressions and claims of contemporary observers and bargemen.

Traffic had risen rapidly as a result of the Tudor improvement scheme. In 1585 angry road carriers stated that 'threescore thousand quarters of mault' were carried to London every year by the bargemen,²² whilst in 1591 officials of the Duchy of Lancaster were told of 1,000 quarters of corn a week being carried downstream.²³

Similar evidence does not exist for the first half of the seventeenth century, but there is sufficient to conclude that the re-emergence of the flash lock navigation after the Star Chamber decision in 1595 did not lead to any substantial reduction in barge traffic, and that during the ensuing decades the river remained in constant use and was well worth fighting for.²⁴

Traffic may well have increased. In 1604 the rent of Waltham Turnpike was most probably valued at £80 a year; by 1643 it was definitely £123 a year.²⁵ This is a substantial increase for a property the only return from which was the collection of a 5s toll from each passing barge. Such an increase does not prove a growth in traffic - it could be explained by the landlord better realising its economic potential - but it does suggest it. Moreover, a rent of £123 a year suggests at least 500 journeys a year, and more if a profit was to be made. During this same period the carrying capacity of the barges also rose, from 4-5 tons in 1588 to 8-10 tons by the Interregnum.²⁶

Further confirmation of just how important the Lea had become is that the stretch of the Old North Road leading from Huntingdon and Cambridge to Ware was the first road where turnpikes were set up to help pay towards the costs of maintenance, as early as 1663. The enabling Act specifically mentioned that the road had become ruinous 'bv reason of the great Trade of Barley and Mault, that cometh to Ware, and so is conveyed by water to the City of London' as well as by road traffic from the north to London.²⁷ Similar problems with the maltsters travelling to Ware had been noted in the 1630s.²⁸

In 1670 Sir Robert Murray and Christopher Wren reported that about 200,000 quarters of malt (25,000 tons) were carried downstream from Ware to London each year,²⁹ whilst in 1698 John Houghton provided an estimate of 300,000 quarters.³⁰ Further indications of this traffic are that in 1681 nineteen barges carrying 3,000 quarters of malt and meal were grounded at Waltham;³¹ that in 1683, 190 bargemasters and maltsters were said to get 'their Livlyhood by this River'³² and that in 1694, London aldermen reported 'seldome fewer than 26 barges a Weeke.'³³

During the same period there was a further expansion in the capacity of the barges. In 1670 Murray and Wren commented on such recent expansion: the nineteen barges grounded in 1681 were carrying an average of 160 quarters each (20 tons); the 1683 source refers to barges carrying 200 quarters (25 tons); whilst Houghton's calculations in 1698 were based on a capacity of 30 tons.

The next estimate found is that in 1739 Parliament was informed that traffic on the Lea 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, and other Commodities, have been annually carried'³⁴

For the ensuing decades toll income records provide some evidence of the numbers of barges using the river. Between 1 April 1740 and 31 March 1741, 863 barges made the return journey through Waltham Turnpike, whilst during the next four accounting periods 892, 802, 767 and 841 barges were recorded. Between 25 June 1749 and 5 June 1750 744 barges passed through Dobbs Weir at Broxbourne, and a further 1,420 barges between 6 June 1750 and 27 June 1752. Finally, 723 barges passed through Waltham Turnpike between 26 March 1762 and 25 March 1763 and 762 in the following twelve months.³⁵

A final estimate is provided by "Thomas Yeoman, one of the engineers responsible for canalising the Lea. He was to recall that in 1767 there had been some difficulty in estimating the traffic, but they had 'computed it at 36,000 Tons a Year.'³⁶ At this date barges had been carrying 35-40 tons downstream but only 10-15 tons upstream.³⁷

The above sources note the importance of malt, meal and grain downstream. The major upstream traffic was coal. In 1705-06 barges were recorded as returning to Ware with 5, 10 or 15 chaldrons of coal.³⁸ In 1721 a Chingford resident noted 'The Convenience of having Coals by water is to bee Valued'.³⁹ In 1739 bargemen stated that 10,000 chaldrons were carried upstream annually,⁴⁰ whilst a petition in 1743 does suggest that some bargemen concentrated upon this trade.⁴¹

The above evidence is impressionistic, but it does confirm constant use and suggests an important transport route and an overall trend of expansion. even if precise growth trends are hard to establish. Furthermore, the importance of the Lea is noted by contemporary historians and gazetteers such as Defoe, Ellis, Griffiths, Houghton, Salmon and Simpson⁴²

Some indication of that importance can be gained by comparing the above imprecise, possibly exaggerated, data with the estimates made by Chartres of London's consumption of corn for food and drink during this period: 500,000 quarters in 1605; 1,150,000 in 1661, 1,275,000 in 1676, 1,325,000 in 1696, 1,074,700 in 1700 and 1,275,000 in 1750.⁴³ Chartres stressed that coastal shipping seems to have been less important in that supply than previously thought, and it does seem that the Lea was one of the important alternative supply routes.

Yet it must be stressed that the above impressionistic evidence is not complete. Other traffic existed which was never emphasised by contemporaries. Gunpowder was an important downstream traffic; timber possible was. Coal was not the only upstream traffic. Little is known of the use made by local millers and industrialists to transport their raw materials and finished product. Little is known of traffic along the river which was not to or from London.⁴⁴

IV

The Lea was an important route to London despite strong competition from road carriers. In terms of ton-mile cost calculations, water transport enjoyed great advantages over road transport, but local conditions meant that the cost difference between the road and river routes in the Lea valley was much narrower.⁴⁵

Benefits from such cost advantages by water are greater the further the distance to be travelled, to offset the higher costs of more frequent transshipment. The distance between Ware or Stanstead and London, however, was short and it was much shorter for the road carriers. They could take a direct route of only 20 miles; the bargemen had to take a longer, more circuitous, passage.

Barges travelled 30 miles downstream to Stratford, where they waited for a favourable outgoing tide to take them down to the Thames; and then waited for a favourable incoming tide to carry them round the Isle of Dogs and up to London, a further 10 miles. Such were the delays along the tidal stretches that barges often unloaded at Hackney and Stratford, and their cargoes were taken to London by road.

In 1698 John Houghton assumed that barges made the round trip to London in a week. In September 1725 a barge took three days to travel between Ware and Stratford. In July 1733 a newspaper reported 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.' In 1759 a bargeman stated that 'a Vessel, with a proper Quantity of Water, may perform a Voyage in Five Days: but that sometimes they are Three Weeks, and sometimes a Fortnight.'⁴⁶

Delivery by river took time, and that time obviously varied and could be unpredictable. Indeed, in 1759 one bargemaster stated that the uncertainties were such that goods were often stored for some time at Ware or Stanstead before eventually being sent to London by road rather than by river.⁴⁷ Furthermore, the river traffic involved two expensive transshipments; the payment of tolls for pens and flashes, which were said to be 30s a journev in 1667 and 59s in 1767;⁴⁸ the payment of metage and portorage dues if unloaded at the London quays, and additional cartage costs from the quays to the customer.

Such factors reduced the cost advantage enjoyed by the bargemen, and also allowed the road carriers to compete by providing a more predictable and regular service. In 1695 Houghton had noted that problems of reliability and costs at London encouraged many brewers to bring their malt by land from Ware⁴⁹ and similar factors held sway during the nineteenth century after the river had been canalised.⁵⁰

Some contemporary cost comparisons are available. In 1670 Murrav and Wren reported that the navigation was in such a poor condition that water carriage was almost as costly as road carriage.⁵¹ In 1711 George Sorocold made a similar point, comparing 19s per ton by river with 20s per ton by road.⁵² In 1767 the miller at Dicker Mill in Hertford

said that he had once sent meal to London by barge, but rising costs had forced him to switch to land carriage.⁵³ It seems sensible to assume that such comparisons emphasised or exaggerated a worst possible situation; that cost differentials would normally have been greater.

In the 1750s Samuel Whitbread was paying a carriage rate of 1s 3d a quarter for malt brought by river from Ware to his Chiswell Street brewery, inclusive of wharfage and cartage charges in London, compared to 2s 2d a quarter for malt brought by land from Hitchin. It can be noted that his accounts for the period 1746-53 do not record any malt being brought from Ware by land.⁵⁴ Whitbread was a customer intent on maintaining his supply options, but many suppliers were as equally determined to maintain their alternatives. Many of the maltsters, mealmen and barge-owners who took steps to preserve and improve the Lea, were also serving on the local turnpike trusts, on the competitive Cheshunt Turnpike Trust as well as on trusts preserving the feeder routes to Ware.⁵⁵

V

It surely significant that these traders showed little interest in canalising the Lea before the 1760s; that they concentrated their efforts on maintaining the existing flash lock navigation instead, content only to implement limited minor improvements. It needed effort to maintain the Lea in a navigable condition the bargemen persistently made that effort, confirmation that the existing navigation was adequate. If it had not been then that energy would surely have been directed towards major improvement schemes.

It needed effort to preserve the navigation against constant natural deterioration, the persistent encroachments of millers and riparian landowners who wanted more water, the growing demands of the New River Company for water to augment their supplies from springs,⁵⁶ and against the demands of millers and fishermen intent on increasing their toll income. The bargemen made that effort.

The ultimate responsibility for such preservation lay with the Commissioners of Sewers, but it required the initiative of the bargemen to ensure that they fulfilled their tasks. Throughout the seventeenth century the bargemen always ensured that Commissions were renewed whenever they expired, and in the early eighteenth century, when the bargemen took on the task themselves, they still sought a Commission as a last resort. On other occasions, as the need arose the bargemen petitioned the Privy Council or the City of London to ensure that their rights were maintained.

One example of this determined effort is that in the second half of the seventeenth century the bargemen made several unsuccessful attempts to rescind the right to collect a 5s toll at Waltham Turnpike, with the intent to rescind or severely limit the rights to other tolls thereafter. As part of their determined campaign they persuaded the City of London to claim, quite mistakenly, that the City had built a canal during Elizabeth's reign. Less unexpected campaign tactics included numerous petitions to the Privy Council, several approaches to successive Commissions of Sewers, and the destruction of the turnpike.⁵⁷

The purpose of this effort was to reduce the cost of using the existing navigation. No interest was shown in altering or upgrading that navigation. Yet in 1670 Murray and Wren, called in by the Privy Council to report on the bargemen's problems, had given their expert advice that canalisation was the best option.⁵⁸

A further example of this determined effort is that in 1739, after several years of discussion and negotiation, after two unsuccessful approaches to Parliament and in the face of opposition from the City of London, an Act (12 Geo 11, c. 32) was obtained to improve the Lea.

The basic premise of the Act was that the existing navigation be retained, with only minor improvement, but that for the future the costs of maintenance would not be borne by the bargemen or riparian landowners but would be met out of payments made by the New River Company for the water they took from the Lea. A body of Trustees was appointed to handle the finances and implement the limited improvements, but otherwise the traditional technical and administrative arrangements were not altered.

The Act did authorise a new turnpike above Ware Bridge. but that is all. Of the river below Ware, the Act was silent, except for a clause authorising 'the purchasing, building, or hiring Locks ... in such Manner as the said Trustees ... shall direct'. As a result of this clause, the Trustees built turnpikes at Stanstead and Broxbourne, and purchased a fishing weir at Broxbourne which they converted to a turnpike.⁵⁹

There was a minority, who have not been identified, who opposed the Act and felt that more substantial improvement was necessary, but they had no influence on the passage of the Act.⁶⁰ The fact that this Act was one of the least ambitious river improvement schemes to be authorised by the Legislature is surely significant⁶¹ - further confirmation that the navigation was adequate. Even as late as 1759 the bargemen were still determined to improve the existing navigation rather than replace it. In that year they sponsored an unsuccessful improvement bill. They sought powers to scour the river deeper than it had been traditionally, to punish bargemen who misused the turnpikes and to provide proper towpaths for horses.⁶² It was not until the 1760s that canalisation was seriously considered and quickly implemented.

VI

Such conservatism can be considered sensible; canalisation was a risk. Initial investment costs were high and future maintenance costs would be higher than for the traditional system. Such costs could only be recouped by charging the bargemen tolls for using the canalised navigation. Payments would also have to be made to those who had rights to tolls on the river as compensation for their loss of income, and other customary rights of the millers, fishermen and riparian landowners would have to be preserved or bought out, all at a cost. Such factors offered little scope for cost reduction. If the traditional system was adequate, why change? Surely it is often economically sensible to avoid risk.

Yet there are aspects of the traditional navigation which suggest that it was not merely a case of putting up with second-best rather than face the problem of introducing the best. The traditional navigation had distinct advantages, and it is possible to suggest that it may have been a case where a second-best technology was the more appropriate economic solution.

A major advantage was cheapness. Flash locks were cheaper to build than pound locks; they did not require such precise skills in their planning or construction and they did not have to be maintained so carefully. The necessary skills were within the scope of the local labour force, so there was no need to seek expensive and scarce engineering skills. Not only were costs lower but also they were not all borne by the bargemen, as would have been the case with a canalised navigation. Fishing weirs and turnpikes, the facilities used by millers to provide pens and flashes, were all built and maintained at the expense of their owners. Some of their costs were recouped from tolls, but not necessarily all. Costs not so recouped were borne because such facilities brought other benefits to their owners.

The bargemen also avoided direct contribution to some other maintenance costs. Banks were repaired at the expense of riparian landowners because it was in their own interest, because it was the custom of the manor or because it was the custom insisted upon by Commissioners of Sewers. Some dredging costs were borne by millers, fishermen or riparian landowners on the orders of the Commissioners, again because it was the custom to do so.

Bargemen did contribute to the cost of maintaining the system. They paid tolls. They paid some of the costs incurred by any Commission of Sewers, and this element increased substantially in the early eighteenth century, when it became accepted that Commissions of Sewers had no right to raise a levy to maintain the navigation.⁶³

Yet the Act of 1739 allowed the bargemen to pass on these costs to the New River Company, who were made to pay a lump sum of £750 and an annual rent of £50 thereafter to maintain the navigation above Ware; and £2,500 and an annual rent of £300 to maintain the navigation below Ware. These sums were more than sufficient to maintain the traditional navigation. By August 1765 there was a surplus of £3,473 12s 6d on these accounts,⁶⁴ a substantial surplus which provides some idea of how cheap the system was.

The traditional system also had the advantage that it was flexible: change was possible, at little expense, without great disruption. For the bargemen the system was flexible: the capacity of their barges rose substantially and horses were introduced in place of men. For other interested parties the system was also flexible: several new weirs were erected along the river; millers expanded their capacity; more water was taken to supply London or the riverside communities.

Such flexibility was important to ensure the continued co-operation of the fishermen, millers and riparian landowners. This co-operation was essential if the system was to be

adequate. Self-interest was an important element in obtaining this co-operation, but so was custom, as was the role of Commissions of Sewers before 1739, and the Trustees and Commissioners after 1739.

The traditional system was slower and more subject to delays and interruptions than a canalised navigation would have been, but even this might not have been important. Speed was not essential for the bulky items carried, but regularity was. The toll records show that the river was used throughout the year, and that there was no pronounced seasonality in that use.⁶⁵

It is difficult to substantiate, but the fact that there were facilities to store f40,000 worth of corn at Stanstead in 1743⁶⁶ does suggest that the traditional navigation did have the potential to allow London brewers to store their malt along the upper river rather than at London, a service local maltsters were definitely providing at the end of the eighteenth century.⁶⁷ If major delays did occur along the river, then the immediate crisis could be met by using road carriage.

Such evidence suggests several sensible reasons why canalisation was postponed for so long. It may be of interest to consider just why it became the favoured option in the 1760s. The bargemen did present a strong case to Parliament.⁶⁸ emphasising the problems of the traditional navigation, but such problems had long existed and canalisation had only been favoured for a short time. Could it be that a widespread enthusiasm for canals, the result of the Duke of Bridgewater's success, finally overcame sensible inertia, and that rapidly changing expectations had as much to do with the enthusiasm for canalisation as the inadequacies of the traditional system?

Finally, it is pertinent to ask some questions about the Lea canalisation scheme. If canalisation was such a substantial improvement, why is there no evidence of substantial cost reduction? Mathias noted that freight charges borne by London brewers remained constant at 1s a quarter from 1746 until 1791, and Jones recently confirmed this.⁶⁹ If canalisation was so substantial an improvement, why did an Act in 1806 limit barges to a 40 ton maximum,⁷⁰ a capacity the traditional navigation had been able to handle? The success of the Lea canalisation scheme is itself open to question.

Notes

1. E. A. Pratt. *A History of Inland Transport and Communication in England* (1942), pp. 108-64: W T. Jackman, *Development of Transportation in Modern England* (1916), pp. 156-210: T. S. Willan, *River Navigation in England 1600-1750* (Manchester. 1936), and numerous articles cited in 1962 second edition of Jackman: A W Skempton. 'Canals and river Navigations before 1750, in C. Singer, E. J. Holmyard. A. R. Hall and T. I. Williams (eds), *A History of Technology* (Oxford. 8 vols. 1954-74). III. pp 438-70: A W Skempton. 'Engineering on the English river navigations to 1760 in M. Baldwin and A. Burton (eds) *Canals; a New Look* (Chichester, 1984). pp. 23-44: I. R. Ward. *The*

- Finance of Canal Building in Eighteenth Century England* pp.1-17: J. .A. Chartres. *Internal Trade in England, 1500-1700* (1977).
- 2 A pound lock was built next to Ware Mills when a new route was opened between Hertford and Ware in 1638. A lock was built at Hackney in 1762 by the proprietors of Hackney waterworks. This lock was so designed that across one half of the river stood a pound lock, across the other half stood one pair of gates which could provide a flash and admit the tide: K R. Fairclough, *The River Lea 1571-1767. A river navigation prior to canalisation*, unpublished Ph.D. thesis, University of London. 1986. pp. 161-9: Hackney Waterworks. *East London Record*. VIII (1985), pp 7-21.
- 3 P. Mathias. *The Brewing Industry in England 1700-1830* (Cambridge, 1959), pp. 437-47: Skempton. 'Engineering on the English river navigations', p. 37. Mathias's strictures have been accepted without challenge in two recent doctorates on the canalised Lea, and have not been challenged in the published work of local historians: P. I. Champion. 'The Lee Navigation. 1767-1369'. unpublished Ph D. thesis. London School of Economics, 1978: H. E. Jones, 'The Lea Valley. 1750-1900: a Regional Study of Transport and Industrial Development', unpublished Ph.D. thesis, University of Oxford, 1982: J. Boyes and R. Russell. *The Canals of Eastern England* (Newton Abbot, 1977). pp. 13-19: J. G. L. Burnbv and M. Parker. *The Navigation of the River Lee, (sic) ~ 1190 - 1790*. Edmonton Hundred Historical Society. Occasional Papers, N.S. no. 36 (1978).
- 4 For details of this improvement scheme: Fairclough, 'The River Lea'. pp. 17-111.
- 5 Besides authorities cited in note 1, see particularly. M J. T. Lewis. W. N. Slatcher and P. N. Jarvis, 'Flashlocks on English waterways', *Industrial Archaeology*, VI (1969), pp. 209-53, and VII (1970), pp. 190-4: M Prior. *Fisher Row: Fishermen. Bargemen & Canal Boatmen in Oxford 1500-1900* (Oxford. 1982), pp- 105-36.
- 6 PRO, RAIL 845/1. Trustees' minutes. 3 October 1739, 2 January 1740, 3 August 1741, 25 February 1743: *ibid.*, RAIL :845/2. Trustees minutes. 17 April 1758. It cannot be assumed that turnpikes always had guillotine gates for the purpose of their construction was sufficient explanation for the use of the term.
- 7 PRO. RAIL 845/2, Trustees' minutes. 14 November 1749, 30 January 1758, 27 February 1758. In 1758 the Trustees decided to repair a fishing weir they had purchased They put the job out to tender and chose William Hanscomb's submission. However. they instructed him to change his proposals and instead of making the Passage Pier a Weir it shall be made into a Turnpike . This suggests that by this date at least the term turnpike suggested a guillotine gate, whilst the term weir suggested flash boards.
- 8 *Reports of the late John Smeaton* (4 vols. 1812-14), 11, pp. 155-63.
- 9 In 1721 there were complaints to Parliament that of late several new weirs had been erected. In 1737 it was said that once barges had been able to pass between Waltham and Old Ford without the assistance of flashes, but that now this was impossible as weirs had been erected. Several weirs below Waltham are noted in a list of weirs compiled in 1725; *Commons Journals*, XIX. pp. 477-8. XXI I. pp. 825-7: Thames Water Authority Stronghold (hereafter TWA), Box 81. no. 354.

- 10 A turnpike was erected at Waltham around 1600 as a result of a private agreement. The Borough of Hertford built two turnpikes at Hertford in 1658 when they improved the navigation between Hertford and Ware. Then the Trustees of the River Lea appointed in 1739 built turnpikes at Ware, Stanstead and Broxbourne. and converted fishing weirs at Hertford and Broxbourne to turnpikes as well. Fairclough. 'The River Lea. pp 102-7, 161-9, 332-60.
- 11 Jackman, Development of Transportation, pp. 23-5, 157-9.
- 12 Willan's statement that 'Commissions of Sewers were not primarily concerned with navigation; their chief business was drainage and the prevention of floods' does not apply to the Lea Commissioners. They were concerned primarily with the navigation, and had little interest in drainage or flood prevention. Willan. *River Navigation in England*, p. 16: Fairclough, *The River Lea*. passim.
- 13 In 1551 a fishery within the manor of Netherhall was let for 30s a year, but by 1616 a weir had been erected and the rent increased to £5 a year. In 1681 James Flanders leased a fishery at Chingford for £5 a year, only to renew the lease in 1701 for £10 a year. The increase is probably explained by the fact that he had built a weir in the fishery. In 1767 a property known as Sotheby's Upper Weir in Sewardstone was let for £12 a year. and produced a reported income to the tenant of £60 a year from tolls, £17 a year from fishing and £20 a year for flooding local pastures. In 1769, when tolls were no longer collectable, the rent was reduced to £6 a year. In 1761 a property known as Sotheby's Lower Weir in Sewardstone produced an income of £50 a year from tolls and £10 from fishing. Essex Record Office (hereafter ERO), D'DBT74, D/DQ53/34, D/DQt 125, D'DHt E16, D/DHt T317/1.
- 14 Many examples are recorded in the remaining records of the Commissions of Sewers: London Borough of Enfield Library Services (hereafter Enfield). River Lee [sic], Book of Sewers in the Years 1719 & 1720: PRO. RAIL 845/53. See also RAIL 845/2, Trustees minutes. 5 August 1751.
- 15 A fortnight at Enfield in 1608: long delays at Tottenham. Mills in 1666: a fortnight at Waltham Abbey Corn Mills in 1681: long-standing problems with millers at Enfield and Sewardstone in the first decades of eighteenth century: W. H. Overall and H. C. Overall (eds), *Analytical Index to the Series of Records known as the Remembrancia* (1878). p 382: PRO. P.C. 2/59. 4 May 1666: S.P. 29/419 no. 6; Enfield. 'Lee Book of Sewers'.
- 16 See note 14. PRO, RAIL 845/1.
- 17 Enfield. 'River Lee. Book of Sewers' Court of Sewers, 23 September. 7 October. 15 October, 6 November 1719; 6 June, 21 September 1720; PRO RAIL 845/53, Court of Sewers. 4 August 1740; TWA. Box 81 no. 354
- 18 Enfield. River Lee. Book of Sewers'. Court of Sewers. 23 September 1719.
- 19 Commons journal. XXXI, p. 3118.
- 20 T. B. Howell and T. J. Howell (eds). *A Complete Collection of State Trials* (34 vols, 1816-28). XIII. p. 1116.
- 21 PRO, RAIL 845/53, Court of Sewers, 14 September 1743.
- 22 PRO, S.P. 12/177. no. 10.
- 23 PRO. D.L. 44/478.
- 24 Fairclough. 'The River Lea, pp. 108-10. 157-61, 196-201.

- 25 Hatfield House, CP Petitions 1434: BL, Add. NIS 5505, fos 23-11. For arguments supporting the valuation of £80: Fairclough, 'The River Lea'. p. 105.
- 26 Hatfield House, CP 166;47; Hertfordshire Record Office (hereafter HRO), Borough of Hertford Records, 39, fo. 1.
- 27 15 Chas II. c. 1; W. Albert, *The Turnpike Road System in England 1663-1840* (Cambridge. 1972). pp. 17-20; E. Pawson. *Transport and Economy* (1977). pp. 76-8. 164.
- 28 *Calendar of State Papers Domestic 1631-33*, pp. 66, 404; *Calendar of State Papers Domestic 1633-34*, pp. 232, 305-6 , 477-8.
- 29 TWA, Box 86, 'Robert Mylne's Commonplace Book'.
- 30 J. Houghton, *A Collection for Improvement of Husbandry and Trade* (4 vols. 1728), 22 April 1698.
- 31 PRO. S.P. 29419, no. 6.
- 32 HRO, Hobday Papers 'Articles by ye Barge Masters and Maultsters ... before Chief Justices Jeffereyes and Justice Withers' [copy, original not traced].
- 33 City of London Record Office (hereafter CLRO, Repertories, 98. fo. 246.
- 34 Lincolns Inn Library. MP 103, fo 241; BL, L. 23 c. 6 (37).
- 35 Waltham Tumpike. Northamptonshire Record Office, Additional Wake Papers 1965/129. 'Rentals of Mr Jones' estates at Waltham, Couthernhall, Wootham and Quinton', 'General Accounts of Essex' Estates 1762-82'. Charles Jones, as lord of the manor of Waltham, was entitled to half the 5s toll. Some of the monthly and annual incomes upon which the numbers of barges are based are not multiples of 2s 6d. Dobbs Weir: PRO, RAIL 845/3, Trustees' minutes, 25 September 1752.
- 36 *Commons Journals*, XXXIV, p. 642. 37 CLRO, Repertories 171, fo. 68.
- 38 CLRO, 'Cocket Dues, Accounts of duty on fruit, malt, salt, and passage of grain 1705-6'.
- 39 ERO, D/DU 158/1.
- 40 Lincolns Inn Library, MP 103, fo. 241.
- 41 CLRO, Repertories 147, fo. 195.
- 42 D. Defoe, *A Tour Thro the Whole Island of Great Britain* (4 vols, 3rd edn, 1742), II, pp. 198-9; W. Ellis, *The Practical Farmer* (1732 edn), p. 27; R. Griffiths, *An Essay to Prove that the Jurisdiction and Conservancy of the River of Thames is Committed to the Lord Mayor and City of London* (1746), pp. 55-6; Houghton, *Improvement of Husbandry and Trade*, 22 April 1698; N. Salmon, *The History of Hertfordshire* (1728), pp. 2, 246; S. Simpson, *The Agreeable Historian* (3 vols, 1746), II, p. 278.
- 43 J. A. Chartres, 'Food consumption and internal trade', in A. L. Beier and R. Finlay (eds), *London 1500-1700: the Making of the Metropolis* (1986), pp. 168-96.
- 44 Fairclough, 'The River Lea', pp. 274.
- 45 J. A. Chartres and G. L. Turnbull, 'Road transport', in D. H. Aldcroft and M. J. Freeman (eds), *Transport in the Industrial Revolution* (Manchester, . 1983), p. 82.
- 46 Houghton, *Improvement of Husbandry and Trade*, 22 April 1698; TWA, Box 81 no. 354; A. Boyer, *The Political State of Great Britain* (60 vols, 1711-40), XLVI, p. 242; *Commons Journals*, XXVIII, p. 436.
- 47 *Commons Journals*, XXX, p. 308.

- 48 PRO, P.C. 2/60,L 16 October 1667; *Commons Journals*, XXXI, p. 309.
- 49 Houghton, *Improvement of Husbandry and Trade*, 22 April 1698.
- 50 G. L. Turnbull, *Traffic & Transport: an Economic History of Pickfords* (1979), p. 59; E. Jones, 'A transport private saving calculation for the brewers Truman Hanbury & Buxton, 1815-63', *Journal of Transport History* (3rd series), VII, 1 (1986), pp. 1-17.
- 51 TWA, Box 86, 'Robert Mylne's Commonplace Book'.
- 52 CLRO, Bridge House Committee, Reports and Papers 1711, part. For details of Sorocold's career as an engineer specialising in water supply and river improvement: F. Williamson, 'George Sorocold of Derby: a pioneer of water supply', *Derbyshire Archaeological & Natural History Society Journal*, LVII (1936), pp. 43-93; F. Williamson and W. Crump, 'Sorocold's waterworks at Leeds', *Thoresby Miscellanea*, XI, part 2 (1941), pp. 166-82; C. Hadfield, *The Canals of Yorkshire and North-East England* (2 vols, Newton Abbot, 1972-73), I, pp. 96-100; Fairclough, 'The River Lea', pp. 286-7, 452.
- 53 *Commons Journal*, XXVIII, p. 346.
- 54 Guildhall Library, MS 9648.
- 55 Joshua Gilman, a Hertford Quaker with interests in distilling and malting, played an important role in discussing improvements to the Lea between Hertford and Ware during the early 1730s, and published a book in 1734 detailing the Borough of Hertford's interest in the Lea. He was also one of the surveyors to the Cheshunt Turnpike Trust from 1725 until his death in 1738; Fairclough, 'The River Lea', p. 298; HRO, TP 1/1. Anthony Fage, a Ware Quaker, was a maltster who lent money to preserve the navigation during the 1730s. He was also a Trustee and Treasurer to the Wadesmill Turnpike Trust: PRO, PROB 11/840 (263); 12 Geo II, c. 32; HRO, TP 7/1. The involvement of local maltsters and London brewers with the Lea is discussed: Mathias, *Brewing Industry*, pp. 436-47, 456-59.
- 56 Although the bill seeking authorisation for the New River did envisage the Lea being one source of supply, it was amended during its passage so that the company was specifically limited to springs near Ware. In 1618 a Special Commission authorised the company to tap the Lea, and there is a possibility that it had already begun that before that date. Thereafter there were serious differences between the bargemen and the company over the quantity of water taken from the Lea, which was the major source of the company's water from the 1620s onwards: B. Rudden, *The New River* (Oxford, 1985); Fairclough, 'The River Lea', pp. 157-61, 171-80, 188-91.
- 57 Fairclough, 'The River Lea', pp. 201-10.
- 58 TWA, Box 86, 'Robert Mylne's Commonplace Book'.
- 59 Fairclough, 'The River Lea', chapters 14, 16.
- 60 *Ibid.*, 306-7.
- 61 Perusal of river improvement Acts listed by Willan indicates that the great majority of such Acts authorised improvements such as artificial navigation cuts, pound locks; towpaths and other measures to allow an engineered track for the navigation. In addition most Acts authorised the undertakers to collect tolls or to enjoy a monopoly of carriage, and the traditional powers of Commissioners of Sewers were superseded. Few Acts did not include all or some of these measures.

- The Act of 1739 to improve the Lea was one of the few schemes which involved none of these measures: Willan, *River Navigation*, pp. 152-5.
- 62 *Commons Journals*, XXVIII, pp. 394, 436, 453; *The Gazetteer and London Daily Advertiser*, 10 February 1759.
- 63 For a tentative discussion of this change: Fairclough, 'The River Lea', pp. 151-3.
- 64 PRO, RAIL 845/3, Trustees minutes, 5 August 1765.
- 65 HRO, Borough of Hertford Records, vol. 48, fo. 42, vol. 39, fos 65, 80-4; Northamptonshire Record Office, Additional Wake Papers 1965/129, 'Rentals of Mr Jones estates'.
- 66 PRO, RAIL 845/53, Court of Sewers, 11 September 1743.
- 67 Mathias, *Brewing Industry*, pp. 459-64.
- 68 *Commons Journals*, XXXI, pp. 308-11.
- 69 Mathias, *Brewing Industry*, p. 441; Jones, 'The Lea Valley 1750-90', pp. 179ff.
- 70 45 Geo III, c. 69 Local.

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