An Investigation Into

the application of the principles of

Watermanship

to the handling of vessels

On The River Thames

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LIST OF CONTENTS

PREFACE i

THE EARLY YEARS
London Bridge area -- coracles -- curraghs -- Roman ships -- early tugs 1

Saxon barges 4

Viking ships 5

Hinged rudders -- the Cog 6

FORE AND AFT RIG
Caravels -- lateens -- spritsails -- gaffs -- lugsails -- lateral resistance -- Peterboats -- leeboards 7

THE CROWDED RIVER
The Watermen's Company -- London Bridge -- State barges -- Tilt boats -- Wherries 10

THE NINETEENTH CENTURY
Early steamboats -- paddles -- screw propellers -- new shoals -- the lighting of working arches -- Rattler -v- Alecto 13

THE TWENTIETH CENTURY
Passenger vessels -- watermen pilots -- apprentice watermen 17

THE WIND
Effect on rectangular pontoons -- swim-ended barges trading ahead -- trading astern 18

THE ROWING OF BARGES
Barge oars -- rowing positions -- 20

Effect of wind -- navigating under oars -- winding wind aginst tide -- single handed -- light airs 22

List of contents

Effect of current -- straight reach -- bends-- clean points -- flushes -- 6 : 1 ratio.... .. 24

Driving through bridges -- kedging -- barge towing with skiffs 27

Sheering ashore -- sheering afloat 28

THE HANDLING OF TUGS

Characteristics -- towing barges -- towing ships -- capsize risk -- Kort nozzles 31

Pleasure craft 35

THE FUTURE

Ships through bridges -- Kort nozzle rudders -- Schottel -- Voith Schneider -- pusher tugs -- barge trains -- LASH ships -- estuarial barges -- passenger craft -- hovercraft -- sidewalls -- hydrofoils -- sailing craft -- under oars .. 36

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I

Watermanship is the skill displayed by river men operating boats, just as seamanship is the skill displayed by seamen operating ships.

The practice of good watermanship demands:

an appreciation of the effect of wind and current on boats.

an understanding of the limitations of any controlling device fitted to boats.

an awareness of the forces acting upon other river craft.

a knowledge of physical barriers and obstructions.

a readiness to accept and observe the rules.

an ability to consider all the variables and then to act in the required manner.

June 1970.

Ted Hunt.

II.

For the purposes of this investigation the practice of watermanship on the River Thames has been examined with particular emphasis on the handling of a variety of craft over the centuries.

To the casual observer the waterman's skill is impressive, to the initiated it often has the merit and appeal of art.

Today, watermen may be placed in three main categories:

1. The licensed waterman, carrying fare paying passengers in launches from public piers and causeways.
2. The licensed waterman pilot, shifting and berthing ships of unlimited size.
3. The licensed lighterman, engaged in the navigation of tugs and barges.

These categories have existed in one form or another for two thousand years, and the first part of this study will deal with developments from Roman times until the beginning of the nineteenth century. The second part with the impact of steam, and the third part with modern times. Finally an attempt will be made to indicate the changes which the immediate future may bring.

THE EARLY YEARS

Two thousand years ago Julius Caesar's Romans arrived on the banks of the River Thames after journeying overland from the Kent coast. They must have examined a number of likely crossing places in their search for a ford, but none was found until they arrived in what is now the London Bridge area. The lower reaches of the Thames were not very well defined for high water inundated many square miles of marshland in Essex and Kent. The river was tidal upstream as far as Richmond, and both banks provided many landing places for men and materials. Thus was established the role which the Thames was to play as a highway and a port.

The London Bridge area had much to commend it as a crossing place. High ground on each bank limited the width at high water, and a rocky shelf allowed fording at low water. It is certain that the brief periods when fording was possible were not sufficient to satisfy the needs of cross river traffic. The average low water springs today reduces the depth in midstream to seven feet, and it is likely that in those times this depth was possibly three feet. Neap tides would add another three feet, and north-westerly gales another four feet. It follows that they must have relied on small boats to maintain cross river traffic before the first bridge was built, and the men engaged in handling these craft were our first watermen.

We know a little of the river craft of that time; the wooden boats resembled dug-out canoes, and the skin boats resembled the coracles which are still used by salmon fishermen on some South Wales rivers. The canoes were propelled by paddles held vertically but the coracle's round shape demanded a style of paddle movement peculiar to those vessels. The loom of the paddle is pressed into the collar bone while the shaft is moved from side to side, the blade is turned about its own axis at the end of each movement simulating the action of propeller blades in such a way that the coracle follows in the wake of the paddle instead of preceding it. The larger skin boats were constructed by sewing together a number of skins and stretching these over a light wooden frame, not unlike the curraghs of Ireland.

The Romans brought with them new ideas and new methods of boatbuilding,and the dugout canoe was transformed into a vessel with extra strakes running fore and aft on each side, joined at the ends to a stem post and stern post. The extra freeboard invited extra burdens and paddles gave way to oars. The early oarsmen no doubt discovered that long and narrow vessels may be moved at speed while the short beamy ones may be turned more easily. Oared vessels became firmly established by the third century, and watermen engaged in the tasks which called for their special skill.

Passengers were carried across and along the Thames.

Ships were shifted and berthed with the assistance of local men.

Ships were towed by oared boats for a greater part of the river journey.

Barges carried cargoes from ship to shore and along the river.

Passenger craft grew in size and number and became more sound in construction.

Watermen with local knowledge were almost certainly engaged in the berthing and shifting of ships as mariners learned that one of the hazardous parts of the journey comes as the vessel approaches the ground. Knowledge of local tide sets and mudbanks, and experience of the handling qualities of ships in a river would put a premium on the waterman's services and many of these men must have acted as pilots.

The ships were fitted with an upright mast amidships and a forward raking artemon mast forard, and were not suited to river sailing. The mainmast carried a large square sail cut very full,not unlike a spinnaker, and the artemon sail which was quite small was used to assist steering rather than propulsion. Two steering oars one on each quarter were fitted with tillers at right angles to the blades and it is certain that the windward steering oar,in partially disturbed water would have less control than its fellow on the lee side, but both would play a part in balancing the lateral resistance of the hull with the propulsive effort of the sails. With three steering devices it is not difficult to appreciate that orders would come from one ship's officer, and that these would follow a route direction from the waterman pilot.

Navigation under sail was an intermittent luxury in the winding river for the square rig allowed only running before the wind and broad reaching. For most of the time the mainsail was furled with brails which drew it up to the yard and towing had to be undertaken by small rowing boats. These early tugs may have been manned by ships crew but it is more than likely that local boats and watermen were used for the task.

During the Roman occupation barges of considerable size were built and the earliest surviving remains are from a vessel 51 feet long and 8 feet beam. Some were shorter and beamier but all had flat bottoms and were carvel built with each plank fastened to its neighbour with wooden pegs called 'tree nails'.

The trade of the port increased in the 4th century and it was necessary to build a long wharf on the river bank just above Billingsgate to supplement those inside the Walbrook and Fleet rivers. The wooden bridge which the Romans built was impassable to ships, and the new wharf became crowded with barges discharging pottery, wine, oil, and cloth. The largest single export cargo was corn, and in the year 359 no less than 800 ships sailed from London with grain, much of it ferried to them by barge from the higher reaches.

London was the capital of the East Saxons in the year 527, but a curtain is drawn across much of the Saxon period and little is known of barges of that time. In 1900 there was discovered a barge of the

9th century in the banks of the river Lea at Walthamstow. She was 45 feet long with a beam of 7 feet, had no keel but was fitted with a heavy elm plank 14 inches wide along her centre line which in 19th century wooden barges was called a 'middle tree'. The remaining strakes were of oak12 inches wide, fastened together with tree nails, and the whole shell was fastened to oak frames with iron clinch nails.

In the 9th century the Vikings brought a new style of ship to the Thames; banks of oars ensured mobility in all weathers and much of their success was due to their oarsmanship. The Gokstad ship discovered at Sandefjordin 1880 is a fine example of this type; clinker built, 77 feet by 17 feet, her single mast, stepped three feet the fore side of amid-ships (to discourage broaching), carried a large square sail. One steering oar on the starboard quarter had sufficient area to control this vessel at speed and turning-round-short was accomplished by judicious use of the pulling oars, of which there were sixteen on each side. It is worth recording that a replica caled the 'Hugin',which now rests at Pegwell Bay, was rowed from Norway to the Kent Coast in two weeks by a crew of fifty three Norwegians. She was later rowed through the Thames bridges in 1949 by Thames watermen under the pilotage of the late Harry Dove, a Freeman of The Watermen's Company. It was his opinion that she turned best to port when ten oarsmen on the port bow backed-astern and six oarsmen on the starboard quarter rowed ahead, and an appraisal of her shape supports this view.

By the 13th century the size of sails had developed to such an extent that great strain was put upon quarter steering oars and at this time these gave way to a hinged rudder hung on the sternpost where it could be more heavily constructed and attached. The improvement in handling which followed caused it to be universally adopted and twin rudders were not to be seen again until twin screw vessels made their appearance six hundred years later.

During the following two hundred years the square rig developed slowly in ships which still had to be towed on the river. The increase in size of ships called for more sail area and this was acheived by carrying two and three sails on each mast, but perhaps the greatest advance in sail management came in the 15th century with the appearance of the Cog. Measuring about 90 feet by 25 feet she was fitted with a bowsprit, and bowlines led from it to the leading edge of a square sail set amidships. By hauling on a bowline the leading edge was kept steady and full when the vessel lay close to the wind. In this way the first step was taken towards converting the square rig into a fore-and-aft rig. Still unable to climb to windward she was propelled by two oars whilst in the river. In recent years it was a practice among sailing barge men to take aboard an extra waterman, known as a 'huffler', to help out in strange and difficult waters, and it is almost certain that watermen were taken on in this way when Cogs from the East Coast arrived in the middle reaches of the Thames.

FORE-AND-AFT RIG

This rig came to us in a variety of patterns during the next three hundred years, each having its own peculiar quality suited to a particular condition. For the first time sails were adopted by a variety of river craft. The superior qualities of the rig brought about a revolution in sail design and application. No longer were vessels confined to running downwind and reaching, they could sail at will without constant recourse to oars, and most important, they were able at last to climb upwind off a lee shore.

Ships like the caravel arrived with lateen sails set on all three masts. Lateens were known in the eastern Mediterranean in the 6th century A.D. but did not appear in Europe until the end of the 15th century. They were triangular and hung from a yard with the fore end held close to the deck.

A hundred years after the caravel, small fishing vessels in Holland began to use a spritsail, and it was quickly adopted here. This was a four sided sail with its luff attached to the mast and its peak held aloft by a sprit, a spar which ran diagonally across the sail to the base of the mast where it was securely attached by means of a tackle called a 'stanliffe'. The top end of the sprit was controlled by two vangs which were belayed on deck near the port and starboard quarters. On one tack the sprit interfered with the shape of the sail to a certain extent, on the other tack the sail took upon itself something of the aerofoil shape which gave it considerable driving force. A disadvantage of the sprit rig was that it brought great strain on the gear in a heavy swell when the sprit tended to throw itself about like an inverted pendulum, causing

the sail to flog and the vessel to roll excessively.

A natural development of the sprit rig was the gaff rig, which used a shorter spar hoisted aloft so that it ran from the mast along the head of the sail to the peak. The rig was common among the many Hoys which carried passengers as well as cargo on the river. It was liked by watermen who appreciated the benefits of having no great weight aloft, and a sail which could be lowered and stowed quickly in a sudden blow, unlike the spritsail which was brailed. Soon it was found that sails which were cut to a full shape served very well on the run or on a reach in light airs, but suffered from backwinding when close-hauled,especially in a strong wind. The problem was met by lacing the foot of the sail to a boom. By hauling tight on the peak and throat halliards,and stretching the foot along the boom by means of clew outhauls, the sail could be flattened and backwinding reduced.

Sometimes a gaffsail was carried alone, as on the Norfolk Wherry with the mast set well forward, but an appreciation of the aerofoil shape led to the introduction of the staysail. Its leading edge on the forestay this sail helped to balance the main allowing the mast to be stepped further aft. Sail balance was also achieved by using a bowsprit to carry an extra staysail forward ahead of the stem in the manner known as cutter rig. Flat bottomed vessels tended to broach-to when they heeled excessively and the extra sail could be used to counter this. The bowsprit was preferred on vessels frequenting the lower reaches where broaching was most

likely and it was often withdrawn onto the foredeck in the congested upper reaches where a long overhanging spar was found to be a nuisance. Sailing in this condition on a reach, the centre of effort of the sails would be brought so far aft that a lot of weather helm would be needed to keep them steady.

The lugsail, in its two forms, standing lug and dipping lug, was used on the smallest vessels. The handier of the two was the standing lugsail which hung from a spar attached to the mast with a greater part of the sail abaft the mast. On starboard tack the sail could develope its full shape, but on port tack the sail would press against the mast and lose its fine shape and some of its efficiency. The dipping lug allowed the sail to have its full shape on either tack. Tacking was somewhat complicated as it involved lowering the yard, unhooking the tack, dragging the yard and the sail round to the new lee side, re-hooking the tack, and then hauling the sail aloft. This operation needed time and space and for this reason the dipping lug was not favoured in the upper reaches.

The ability of vessels to climb up to windward demanded attention to the design of their underwater shape so that adequate lateral resistance met winds attacking from the bow. Such resistance was provided in a variety of ways.

Peterboats, as their name suggests, were fishing boats; a common size was 30 feet by 10 feet, and they often carried gaffsail, topsail, and staysail on a bowsprit. A wooden keel,6 inches deep,was shod with a 2 inch thick iron band weighing about five hundredweights. The keel extended into a long forefoot as much as 16 inches beyond the bows and this took a good

grip on the water and held the boat up to wind. The projecting keel caused the Peterboat to lay over when she grounded and this was not always acceptable to craft which had to ground in a variety of berths. To overcome the problem of lateral resistance many flat bottomed vessels fitted two leeboards one on each side of the mast.

Leeboards came to us from Holland, a country blessed with shallow waters, and found favour among watermen operating sailing barges on the river and estuary. The early sailing barges were essentially rectangular boxes with swim ends, and their flat bottoms allowed them to berth almost anywhere. Drawing about three feet when light, these barges could sail very well by raising the leeboard on the weather side and lowering the one on the lee side. In the lowered position the leeboard extended below the chine by as much as five feet, gripping the water in a manner necessary for close-winded sailing. A further refinement, copied from the Dutch, was the slight convex shape given to the inner surface of the leeboard to increase its efficiency to that of a lifting hydrofoil.

THE CROWDED RIVER

The complexity of shapes of rig and hull which evolved during the 17th and 18th centuries required the watermen of the period to assess the sailing qualities of a variety of vessels in order to avoid collision. Some idea of the river's crowded state may be had from the figures given by Stow in his Survey of London 1598. At that time there were 40,000 watermen

plying their trade on the river between Windsor and Gravesend. Until the year 1555 the watermen had acted independently of authority,and the inexperience of many of them had led to some loss of life. In that year The Watermen's Company under an act of Parliament introduced apprenticeship for a term of one year, but this was found to be inadequate, and was altered to a term of seven years by another Act in 1603. The hazard of collission grew with the trade of the port as the off-shore moorings became more and more crowded. To avoid falling athwart moored vessels the watermen had to be able to stem the tide which in many places had a speed of three knots. London Bridge with its 19 arches was an even greater hazard; during the last two hundred years of its life the bridge supports were protected by'starlings'. These were timber stockades built around the abuttments and filled with stone to give protection to the bridge foundations. The severe restriction on the flow of water through the arches was such that on a good spring ebb the passage through was a perilous one. Towards the last years of the bridge's existence, a Royal Commission enquired into the demands for its replacement, and found that the head of water on the upper side of the bridge was sometimes as much as five feet higher than that downstream. Shooting the rapids was a risk which many waterborne passengers were not prepared to take, and it became a practice for them to go ashore at causeways above the bridge and re-join their waterman at Billinsgate.

The largest of a variety of oared vessels at this time were the state barges owned by the Livery

Companies, each with its uniformed crew pulling as many as eighteen oars and steered by a bargemaster. The smaller shallops owned by a few of the very rich were fast and manoeuvrable. Tilt-boats plied for hire and were distinguished by their awnings of canvas which gave some protection to passengers on long journeys. Cardinal Wolsey recorded that he once covered the 26 miles from London to Gravesend in a tilt-boat in three and a half hours. Outnumbering all these was a vast fleet of wherries which catered for the numerous passengers making short trips across and along the river.

The wherry was a shallow rowing boat varying in length from 16 feet to 24 feet and having a length-to-beam ration of about 4 : 1 . A raking stem, a fine entrance, flare sides, and a fine run aft made them fast, manoeuvrable, and dry. In one respect they were like the watermen's skiffs which succeeded them, that was in the way that the oars were set between thole pins on the gunwale. The advantage of open tholes lay in the speed with which oars could be unshipped and brought inboard when coming alongside a wall or a ship in the tideway. The method involved flattening the blade in the water, raising the grip of the oar smartly to bring the loom free of the thole pins, bearing down on the grip so that the loom rested on the gunwale and finally levering the blade forward and inboard where the drips from it would not interfere with the comfort of passengers.

THE NINETEENTH CENTURY

The first practical steamboat in these islands was the Charlotte Dundas, built in 1802, she had a single stern wheel which turned in a recess aft, and was steered by two rudders controlled by a horizontal wheel forard. On her trials she towed two 70 ton barges on the Forth and Clyde Canal and made about three and a half knots against a strong headwind. Her active life was short for her wash damaged the canal banks and she was finally broken up in 1861.

The Margery was the first steam packet on the Thames, making her appearance on 23rd January 1815. Carvel built, her length was 73 feet and the breadth of the hull was 12 feet,and sponsons protected the paddles giving her an extreme breadth of 19 feet and a draught of only four feet. Steered by a tiller and having a top speed of six knots she must have been a handy vessel with her pivoting point about a quarter of her length from her stem. On alternate days she ran between London Docks and Gravesend commanded by a Freeman of The Watermen's Company. Her place was taken by the Caledonia, more reliable,having two pistons acting on a crankshaft with arms ninety degrees apart, thus lowering the risk of engines stopping 'top-dead-centre'. It is not recorded how long was the delay between going ahead and coming astern, but it must have been appreciably shorter than that of Margery.

Though the Savannah was the first steam vessel to cross the Atlantic, she made the westward crossing under sail only with her paddles stowed on deck. The first steam crossing was made by the Rising Star built at Rotherhithe in 1821, she was 123 feet long by 28 feet

beam. Her paddles were set inboard and she was rated a good sea boat with a speed of 12 knots. On the Thames she was reduced to a speed of 6 knots to avoid making a troublesome wash. Her paddles lay between three keels which ran throughout her length and these would making turning a slow business requiring a lot of room. Paddle vessels abounded in the 1830s, some of them, known as penny steamboats, operated a thriving passenger business between Thames Conservancy piers. These vessels changed dramatically the means of livlihood of watermen, and a new skill was required to that which had been practised for so long.

Old London Bridge was removed and with it the restriction to the flow and the immediate result was that the level at low-water was now four feet less than hitherto. New shoals had to be considered like: Parliament Shoal, Waterloo Shoal, St.Saviours Shoal, Billingsgate Shoal, and to a certain extent they exist today. In a report submitted to The Corporation of London by a Lieut Ackerley a suggestion was made that as the navigable channel through the bridges led through only one arch at low-water time these arches should be lit at night with red gas lamps to indicate where the channel lay. The suggestion was adopted but the upriver journeys were not without incident; some paddle steamers had difficulty in passing through the bridges at Putney and Battersea as these allowed only two feet clear on each side. It says much of the skill of captains of these craft that they were able to steer successfully so often. With no telegraph to indicate their engine

requirements, they relied on a youth known as a 'call-boy' to transmit their orders to engine-room staff, and many watermen were introduced to their trade in this way, before their tenth birthday.

Paddle wheels were to last for one hundred and fifty years on Thames craft, set about one third of the vessels length from forard near her pivoting point they acted in relatively undisturbed and shallow water. Many new ideas emerged, and one of these was the introduction of wheels which could move independently of each other. As late as 1860 there was a tug called the Monarch whose paddles could be operated only in unison. To improve her turning circle a trolley loaded with pigiron was wheeled along railway lines across her deck and over the sponsons. By giving the tug a list to port the starboard paddle was lifted clear of the water and the turn to starboard improved.

In 1826 in the Howland Great Wet Dock off Lime-house Reach a hand operated screw propeller was first used, and there soon followed many experimental shapes and sizes. Some of these were fashioned after an Archimedian Screw, and there was an occasion when an increase in speed followed the fortunate loss of half the propeller. The Robert Stockton was fitted with counter rotating screws in 1838, and one would assume that this arrangement would nullify any tendency for the stern to wander one way in the manner of vessels fitted with modern screws. Unfortunately the screws of this vessel did not turn at the same r.p.m., her rudder was hung on the fore side of her screws, and helm move-ments caused her to behave in an erratic manner. When one screw was removed and the rudder hung behind the

screw remaining, she behaved very well and worked as a barge tug for many years.

A tug of war took place in 1845 between a paddle tug and a screw tug; the Rattler with a screw won the contest by pulling the paddle tug Alecto stern-first at a speed approaching three knots, and this result led to a wider adoption of the screw by tugs, and to experiments which improved design.

It can be said that from this moment the changes which occurred in the types of vessel emanated from the drawing board rather than from the crew. For centuries improvements in hull shape and sail design had been slow and had been brought about by men discovering for themselves the advantages and disadvantages of ideas introduced by men who earned a living handling boats. The birth of the steamboat marked the end of an era of discovery by crewmen, and the beginning of the age of the technician.

THE TWENTIETH CENTURY

The beginning of the 20th century brought with it many changes in river traffic. Passenger vessels, long and slim and shallow draughted, glided almost silently between the piers above bridges, while their larger sisters, still sporting paddles, carried Londoners to the sea. Ships grew in size, and after the indifferent performance of the Great Eastern with her paddles, screw, and sails, the screw propeller became the accepted tool. Watermen pilots were required to handle these monsters and their particular skill has remained virtually unchanged over the last hundred years.

The watermen pilots have learned the rudiments of their trade as young apprentices. Their apprenticeship often began at the age of fourteen when they were engaged as boatboys, rowing watermens skiffs in the tideway day after day they became familiar with the strength of the stream, learned to respect it and learned to use it to advantage. Some of their time was spent in assisting lightermen to row their barges in daylight hours and at night, and they learned of the vagaries of wind and current, seeking to avoid the periods of great muscular effort which followed each error of judgement. After two years afloat, an apprentices licence allowed them to navigate small barges under oars alone, and in doing this they learned to differentiate between the handy barges and the awkward ones. They became familiar with many natural and artificial obstructions and learned a great deal of their own limitations and something of the limitations of other vessels which they sought to avoid. Bye-laws relating

to lights and sound signals and to rules of the road had to be learned quickly in order to survive. At the end of their apprenticeship they could look back upon seven years instruction at the hands of older men and the natural elements, and could look forward to many years of practice which would add a certain polish to their skill.

From the turn of the century until the second world war the rowing of barges, or driving as it is called, was a valuable introduction to the skills required to operate river craft of many kinds. Among the first things learned was the importance of judging the effect of wind and current.

THE WIND

Never constant in speed and direction, its effect on vessels can best be understood by noting its effect on the simplest of vessels, the rectangular pontoon, floating freely in a strong wind.

Such a vessel might have a length of 60 feet, a beam of 20 feet, and a depth of 7 feet. When loaded to a draught of 6 feet she would be affected slightly, and would move downwind and turn until her fore-and-aft line was at right angles to the wind. When empty and drawing only 1 foot she would react more rapidly as her freeboard would constitute a larger sail area and her small draught would offer little lateral resistance. She would move quickly downwind and turn quickly until the wind was abeam, any attempt to bring one end upwind would be resisted.

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The swim-ended barge acts in a similar manner having a similar shape but with a little more freeboard forard, and aft a fixed rudder called a budget. In a light condition her sail area forard is often equal to that aft, but the lateral resistance of the budget has a noticeable effect when she is allowed to drift freely in a strong wind. Instead of moving purely sideways her stern is held slightly up-wind bringing the wind slightly aft of abeam. She gathers considerable leeway and a little headway, and this peculiar motion of barges is known as 'trading ahead'. Loaded down by the stern, a barge's inclination to trade ahead will increase as the lateral resistance aft increases and the sail area aft is diminished, and the wind now attacks from the quarter. In the still waters of a dock care is taken to see that the barge is on the right 'tack' before casting off. A westerly wind on the barge's port side will move her in a direction approximating to ENE, and when the starboard side is exposed the direction will be ESE. When a barge is loaded down by the head sufficiently to bring her budget out of the water, she will trade astern.

Barges have been navigated under oars for many centuries, the practice is known as 'driving', and techniques have developed which make use of a barge's willingness to trade ahead. Post-war barges are not fitted with rowing crutches but many pre-war craft have them still, and may be seen on rare occasions being navigated in this way.

Barge oars vary in length from twenty feet to twenty eight feet. A flat blade for a third of its length

changes to a round section, and then to a three inch square section through the loom to the grip, which is of small round section about 12 inches long. The weight of an oar averages 40 lbs., and when balanced in the square rowing crutch it is not difficult to handle. No attempt is made to 'feather' the oar when rowing for the square loom does not allow this.

There are five rowing positions; one aft, above the budget, one on each bow, and one on each side of the huff which is right forard. The bow positions are used mainly to propel the barge forward, and the stroke is made by extending the arms while the feet are placed on the cross coaming, burying the blade and with a smooth action allowing the weight of the body to pull the grip forward until first one foot then the other is lowered to the deck to maintain body balance. The grip is then pressed down to bring the blade out of the water, and then moved aft over the cross coaming to prepare for the next stroke. Small barges of 50 tons burden were often navigated by one man handling a pair of oars in unison. Above 50 tons the task was carried out by two men, and above 150 tons by three. The after position was used partly for headway but mainly for steering. Here, the blade was immersed at an angle of about 60 degrees to the fore-and-aft line, the grip was pulled with arms outstretched as the lighterman walked backwards in an arc across the sternsheets, terminating when the oar had reached a fore-and-aft alignment; any continuation of the stroke would induce undesirable sternway. The stem positions near the huff were used on those occasions when it was desired to pull the barge's head violently round,

5a

and this was done by immersing the blade at an angle of 40 degrees to the fore-and-aft line and pulling the grip from the centre line towards the side of the barge until the oar was aligned almost fore-and-aft. When this was done on a barge which had headway considerable pressure of oncoming water on the blade made this a strenuous but effective stroke. In light airs both bow positions would be used to produce headway, which, in a light barge would often approach a speed of half a knot.

In very strong winds it would often be foolish to get under way, and in moderate winds account had to be taken of the barge's readiness to align herself with the wind just abaft abeam. This often had to be resisted lest the barge run onto a lee shore or run athwart obstructions such as barge roads and bridge abuttments. Driving upstream with a strong wind blowing up the reach, an effort was needed to hold the stern directly into wind, for if the stern paid-off a little and the wind attacked from the quarter, wind eddies on the leeward quarter and water eddies on the windward bow would swing the stern round against the action of the steering oar until the wind was almost abeam. The barge would then trade ahead towards the shore and possible trouble. It would then be time to unship the oar and trail it through the water and ship it in the windward stem position to stem the head up-wind, and if possible through the eye of the wind so that she would trade away from the undesirable shore. 'Winding' a barge in this way was often beyond the physical powers of the man or men in a strong wind, and another method had to be adopted. This involved controlling headway, either advancing or retarding it, in order to make a fetch alongside a selected barge roads

near the approaching and undesirable shore. Advancing was best achieved by rowing ahead on the windward bow or rowing her stern upwind as much as possible, bringing the wind abaft to increase her trading. Retarding was best accomplished by stemming her head upwind so bringing the wind forward and helping her to trade astern. Arriving alongside a roads, a line forard would check her and bring her head on to wind and tide. In a three knot current she would then have what might be described as 'three knots headway'. By making fast aft and casting off forard her head would begin to swing out away from the shore and the after line would be cast-off when she was athwart wind and tide. Without any effort the barge would then begin to trade away from the undesirable shore. If the reach was long and straight the opposite shore might soon become the undesirable one, and the process would have to be repeated. It will be seen that similar action would be needed when a strong wind was blowing against the tide, the main difference being that the 'tacks', as they may be called, would be more numerous on a given journey with considerably less progress being made between each.

By far the most enjoyable condition is that which finds the single handed barge with a gentle breeze on one quarter with her head upstream with the tide. This situation allows the oarsman to ship his oar on the windward bow and row steadily; the barge's attitude to the wind can be kept constant, or, if he wishes to turn into wind slightly, he stops rowing, or by rowing more strenuously he can turn away from the wind.

In light airs with two men rowing, one man would provide headway by rowing on the bow and his partner would row aft to prevent the barge turning, and when a slow turn had to be made one of them would stop.

The effect of current.

The flow of water in the Thames has such a complex character that its behaviour cannot be predicted with any accuracy. There are however a number of behaviour patterns which are basic and which are worthy of study. In a long straight reach the flow is fastest in midstream and when the shores are uncovered the water near the banks moves especially slowly. When the shores are covered the direction and speed of the flow is affected by all manner of obstructions such as jetties, causeways, campsheds, storm outlets etc. A barge drifting freely in light airs should maintain a midstream position throughout a straight reach.

At the end of a straight reach the water attempts to flow straight on towards the bight, the water piles up a little in the bight, and the flow is particularly fast there. Hiding behind the point there is an area of slack water which is either still or slow moving. A barge allowed to drift free in midstream will at the end of a straight reach fall away towards the bight until it is in the next reach, at which time it will move slightly away from the bight but will not arrive back at a mid-stream position. In short, there is a strong on-set as the bight is approached and a slight off-set as the bight is left behind. Many clues to the behaviour of water are uncovered at low water time, and a study of the nature of each shore is rewarding.

On the shore in the bight one normally finds a narrow strip of clean stone which has a definite slope towards the water's edge. On the opposite shore round the point there is often a wide expanse of mud or sand which has very little slope to it. One may gather that the deep water channel lies towards the bight where the flow is fast, and shallows exist where there is little flow round the point. Shallow draughted vessels like the small passenger boats which operate from public piers will seek out the slow moving shallows when navigating against the tide, so leaving the deep channel free for larger vessels.

There are one or two places on the Thames where one finds mud in the bight and clean stone around the point. The reason for this phenomenum lies in the existence of a knuckle or minor promontory some distance away from the clean point on the other shore. A good example of this may be seen in Long Reach where a knuckle exists near the bottom of the reach on the Kent shore. On the ebb, the flow of water is deflected by this knuckle in such a way that it moves over towards the point some distance downstream on the Essex shore, sweeping it clean and allowing mud to form in the bight on the Kent shore. At those few places where this kind of movement exists there is considerable turbulance hiding behind the point and invariably a strong contrary flow of water running close to the shore. Indeed these up-flushes and down-flushes as they are called, exist whenever an obstruction, natural or artificial, disturbs the flow of fast moving water. Watermen take account of these flushes especially when navigating against the tide and when rounding short.

When navigating under oars in light airs due regard is taken of the inclination which barges have to falling away into the bight, and an attempt is made to keep clear of the roads and ship tiers which lie there.

Approaching the end of a straight reach the barge is rowed towards the shore on which the point lies so that a midstream position may be gained when the point has been passed. The change of heading towards the shore must be made at a proper time; if executed too early the barge will run into slack water where progress will be slow, if it is done too late the barge will fall towards the bight. For centuries young men have been urged by their elders to "Hold her up to the point" and the need for this action may be judged by assessing the relative speeds of flow and headway under oars. In light airs headway of half a knot can be maintained with a light 50 ton barge, and the flow on a good spring ebb often reaches three knots. This ratio 6 : 1 has to be constantly borne in mind and is the reason for barges being held athwart the river for much of the time.

The final approach to a destination may be judged only after a number of variables are taken into account: size of barge, light or loaded, wind force and direction, tide set, depth of water, and accessibility of the place. The ratio of 6 : 1 requires the barge to be 'well placed' ~~some distance~~ some distance from the destination; not too far offshore lest she 'goes-by', nor too far inshore lest she goes 'athwart-hawse'. A reasonable angle of approach is about seven degrees to the tidal flow with the barge athwart the tide. It is an advantage to use the destination as a transit point lined up with another point beyond it. In this way it is possible to judge

when one needs more headway or less in order to keep on the line. During the last moments the barge's head is rowed up-tide and offshore to bring her in line with the flow so as to reduce the force of impact and the liklihood of bouncing away.

Driving through bridges.

The variable already mentioned affects the method of approaching bridges, and the restriction of the abutt-ments calls for extra vigilance. Advantage can be taken of the centre of an arch as a transit point so that the success of an approach can be measured. Every bridge has its own peculiar tide set, and these must be learned. For example, the tide set at the centre arch of Southwark Bridge on the ebb is towards the north shore, and the close proximity of Cannon Street Bridge demands that one passes through Southwark in the southern half of the centre arch. In light airs this may be done by keeping the barge in line with the southward abuttment until the last moment, at which time the barge can be allowed to fall away through the arch. When abuttments are broad in their structure, very strong eddies exist behind them, and these may be used when it is desired to swing the barge through 180 degrees.

Kedging.

Until 1946 it was a practice (now forbidden) for sailing barges to negotiate bridges by kedging. With their masts lowered on deck and unable to sail, the anchor was lowered so that it dragged along the river bed, thus giving the barge headway and consequently steerage way. In this fashion a barge would approach a bridge stern-first and be steered through it by liberal use of the

rudder, often passing through the bridge at two knots in a three knot current.

For centuries barges and vessels of similar size have been towed by rowing boats, and the immediate pre-war years saw the end of this method of navigation. During the late thirties one of the lighterage firms shifted most of their barges on short journeys in this way. Barges of up to 150 tons were towed on a tow line about 10 fathoms in length reaching from the barge's samson post to the after thwart of a watermans skiff. A lighterman on the barge gave directions to two men in the skiff and they would attempt to induce some headway in the required direction. A watermans skiff does not turn very easily and care had to be taken that the skiff did not wander too far away from the barge's heading, for when this happened it was not always possible to bring the skiff on a parallel course to the barge without releasing the towrope. One advantage of using the towing method was that the line could be rowed away and made fast at the destination when it seemed likely that the barge would be unable otherwise to arrive there. Short journeys of the kind so often accomplished by towing with skiffs could be best enjoyed only after a good start, and here, it was important to get a really good sheer on the barge especially when the destination lay on the far shore a short distance away.

Sheering.

The art of sheering lies in knowing exactly when to let go. When properly executed it is a skill much admired by watermen, and is the method used for moving barges across the tide without muscular effort.

The principle involved is the same as that which allows an otter board or paravane to be towed at some distance abreast of a minesweeper. A similarity also exists with the way a kite is able to gain altitude in a wind which attacks it at an angle. When a barge has to be moved at right angles to the tide a line is made fast on the bow post and all other lines are cast off. The immediate result is that the barge adopts an attitude to the tide of about 30 degrees. The action of the force of the tide on the inclined plane of the barge's side plates produces a lateral movement across the tide. The locus of the point traced by the bow post is along the circumference of a circle of which the line is the radius. The bow post will move along the arc until the line makes an angle with the tide of about 45 degrees. In this way the barge moves across the tide and succeeds in making some progress against it. The momentum of a loaded barge at the beginning of a sheer will sometimes give it a headway of 4 knots in a three knot current, and this allows the line to be shifted from its original anchoring point to another abreast of it, where the process may be repeated until the desired position is reached. The sheering method is adopted when a barge is about to be navigated under oars from a berth close in-shore when immediate progress towards midstream is essential. The line is made fast on the inshore bow post, the barge's head pushed away from the shore and the sheer begins. The longer the line - the longer the sheer; the headway developed when the barge is at a good angle to the tide will take it well away from the shore.

The skill of the waterman lies in knowing exactly when to cast off the sheering line. When the line is held much beyond the moment of greatest momentum it will cause the barge to swing head inshore and another attempt has to be made. When the line is cast off at the right time it will be noticed that the barge's head will swing very slightly down-tide immediately afterwards due to the strong eddies acting on the downstream bow, and she will gradually lose the headway which has been so easily gained. Naturally, some barges will sheer better than others, and it is generally agreed among watermen that: loaded barges will sheer better than light ones, those in level trim will sheer better than those loaded by the stern, and those loaded slightly by the head will sheer best of all. Sheering is required also when a barge is released from the tow of a tug which, for draught reasons, is unable to approach too closely the barge's destination. It will be appreciated that extra care is necessary at this time to avoid damage to other vessels lying at the destination. Having cast off in this situation the lighterman knows that his course will be affected by wind and by the slackening flow which may be expected as the shore is approached.

Ted Hunt.
Bargemaster to
Her Majesty The Queen.